



# Clearing up Caulerpa

1

Done. Have a great talk Grant!

Gerbrand van Melle, 31/03/2023

# Caulerpa

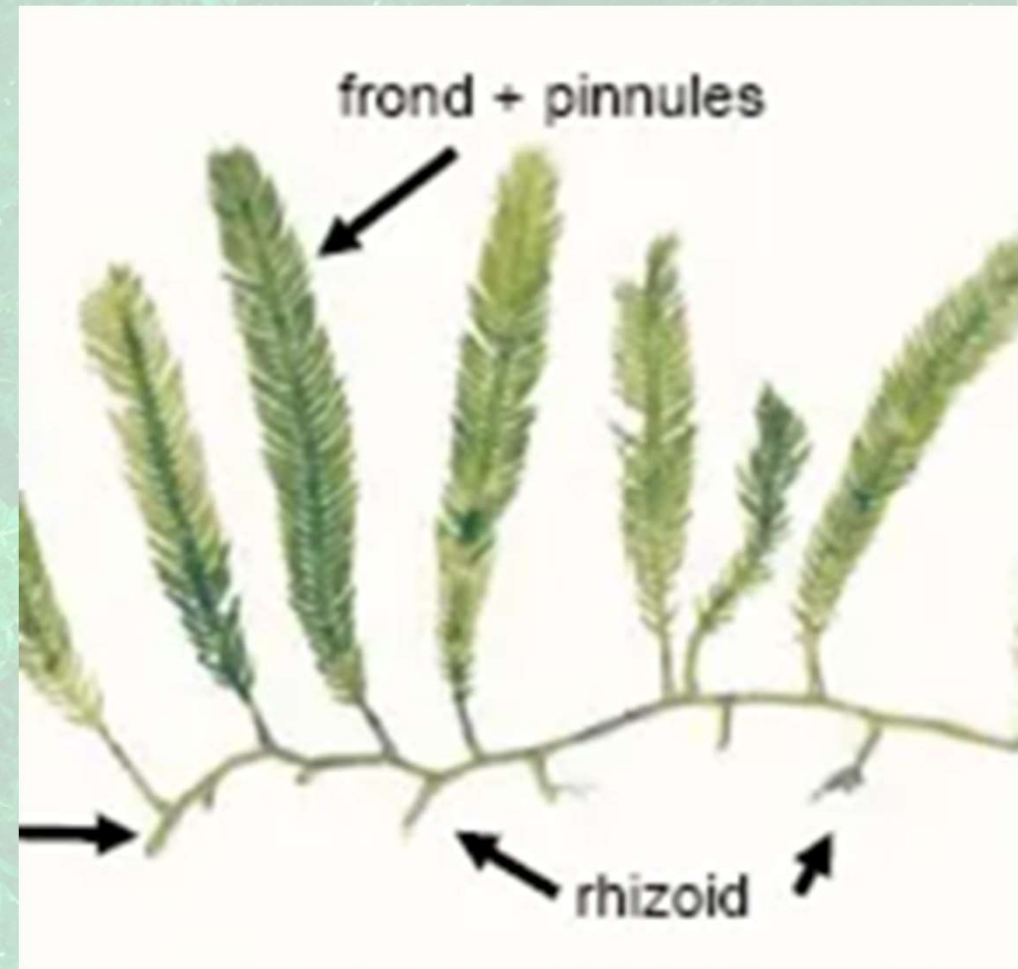
- What is Caulerpa?
- Where is it found?
- Where is it a problem, and why is it a problem?
- What happens if we do nothing about it?
- Once established what are our options?
- MPI and Biosecurity NZ
- What is WMP doing about it – a community lead approach?

# What is Caulerpa?

Caulerpa is a single celled green seaweed that grows via a spreading stolon.

New plants can form from fragments >1mm to 5mm.

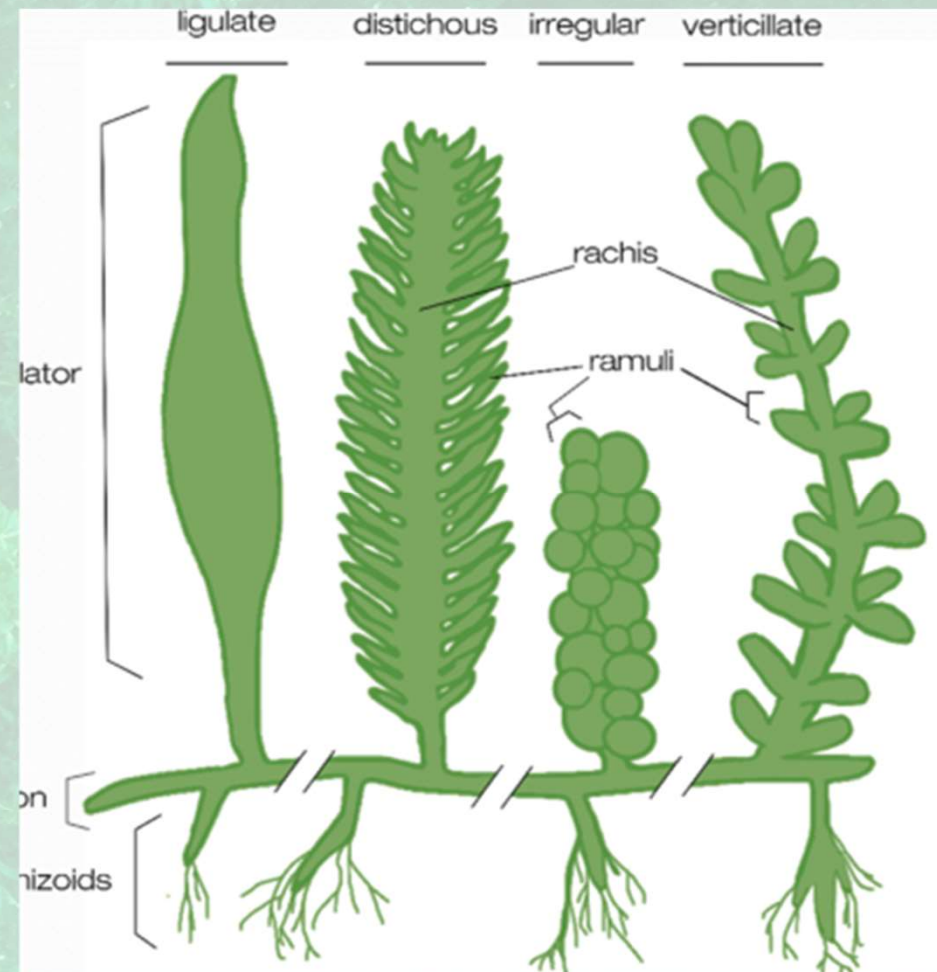
(Ceccherelli et.al 2001)



# What is Caulerpa?

As of 2019, there are 101 accepted species, with 40 varieties and 67 forms with varying frond shapes.

([https://en.wikipedia.org/wiki/Caulerpa#cite\\_note-8](https://en.wikipedia.org/wiki/Caulerpa#cite_note-8))



# What is Caulerpa

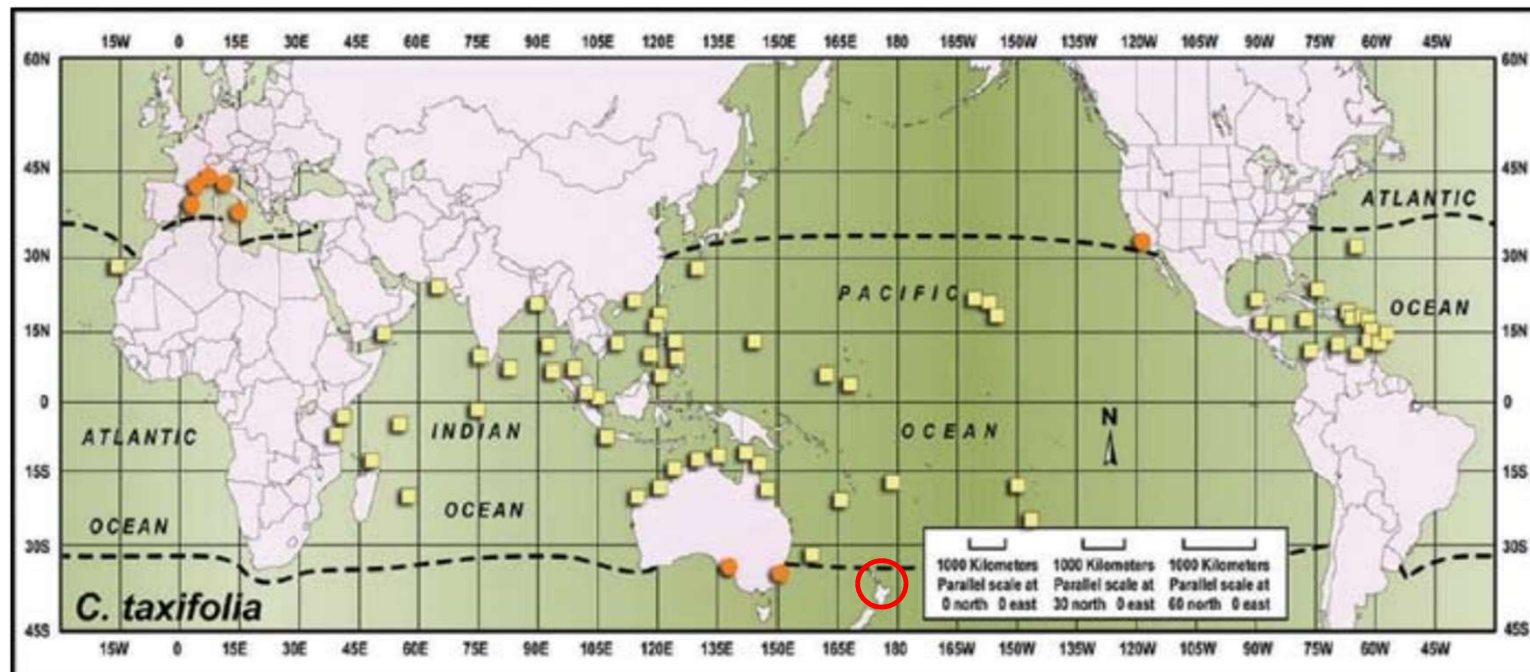
A unique plant that can grow in incredibly dense 'mats' up to 40 cm\* thick and cover 1,000's of Ha when left unchecked.

(\*Creese R.G et.al 2004)



# Where is caulerpa found?

## Caulerpa



*Worldwide distribution of Caulerpa taxifolia. Yellow squares = native range. Orange circles = invasive populations of Caulerpa taxifolia. Dashed line = 15°C average winter sea-surface temperature. Modeled after Verlaque et al. 2000.*

# It is not a problem at home

In its tropical home range there are natural predators including herbivorous fish and some urchins and sea slugs, keeping everything in balance.

In many places, such as the Philippines, some varieties are valued as food and cultured.

Even NZ has 2 native species





# Where is it a problem and why?

Outside of its home range it has taken over local marine ecosystems in:

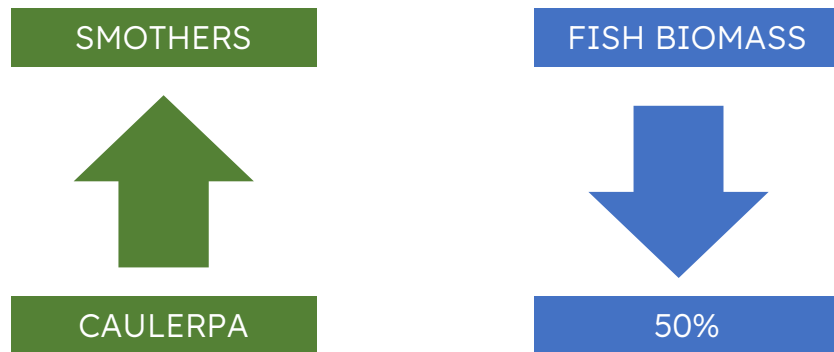
- USA
- Southern Australia
- Monaco
- France
- Italy
- Spain
- Tunisia
- Croatia
- Malta
- Cyprus
- Greece and...  
New Zealand



Caulerpa secretes a toxin that is avoided by mollusks, herbivorous fish and sea urchins, and it has no known predators outside of its native tropical range.

Lynda Holland

# Where is it a problem and why?

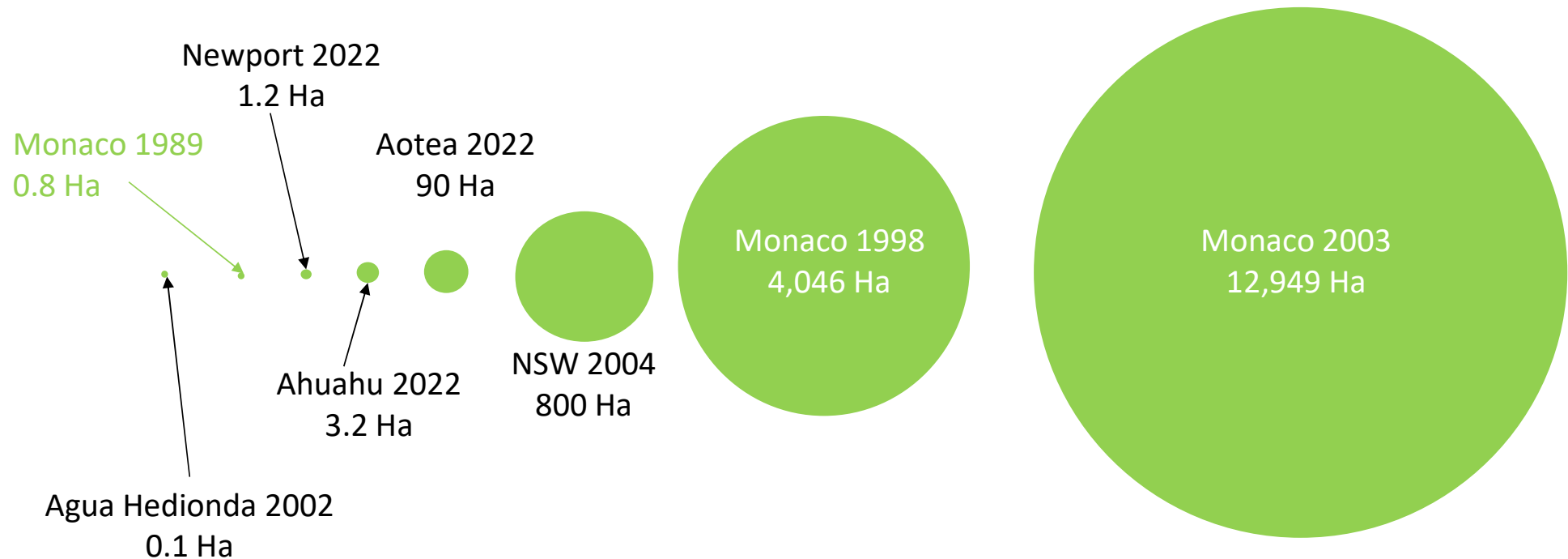


30% reduction in biodiversity and a 50% reduction in fish biomass.

Impact of caulerpa taxifolia on Mediterranean fish – a 6 year study.  
Harmelin-Vivian. M et. al. 1999

*“If you totalled up all the damage done by harmful pollution, the potential destruction from caulerpa dwarfs all that, if it can’t be controlled it will destroy the entire coast”*. – Greg Peters – Regional Water Quality Board California

# What happens if we do nothing about it?

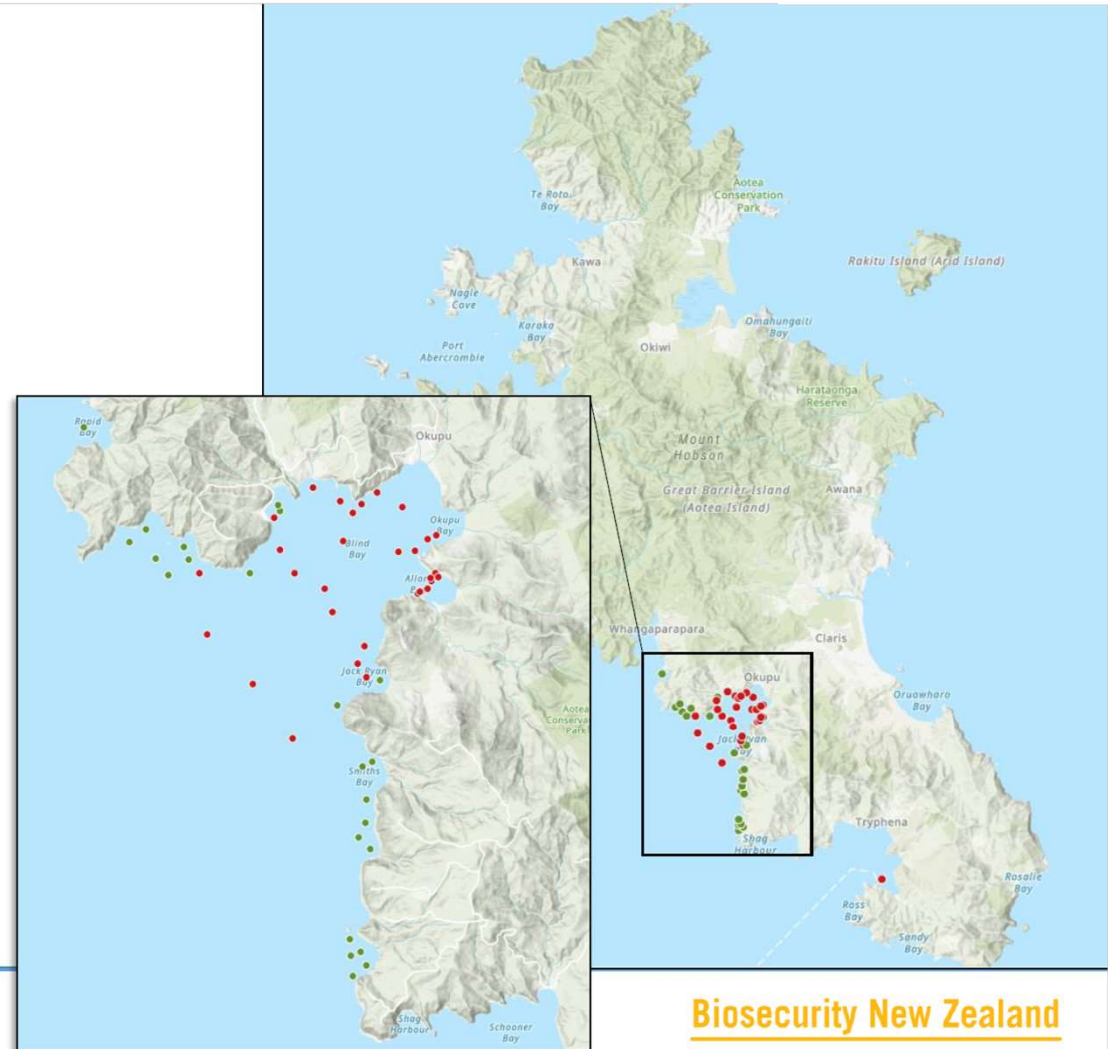


**Monaco – 14 years to go from 0.8 Ha to 12,949 Ha**

(Munoz.E – 2016)

# Aotea

- Dive surveillance to determine the extent of *Caulerpa* carried out in August 2021.
- The infestation in Blind Bay was found to be large, with a footprint of approximately 88 hectares.
- Note: red dots are confirmed detections. Green dots show areas checked where *Caulerpa* was not found.



# Blind Bay Aotea

Approx  
88Ha



Beach Cast Caulerpa  
after Cyclone Gabrielle

Estimated at 50 ton



Irene Middleton, NIWA



## Schooner Bay – Aotea March 2023

Photos by Glen Edney – Ocean Ecologist

# Ahuahu Great Mercury Island

- *Caulerpa parvifolia* detected in the western bays area in March 2022.
- New 'star search' method used to quantify infestation size.
- Approximate footprint of 32,380m<sup>2</sup>
- Regional Governance group formed with members from Biosecurity New Zealand, Ngāti Hei, Waikato Regional Council, DOC, local board, and landowners.



# Once found what are our options?

## The *Caulerpa* Response

### Objectives of the response

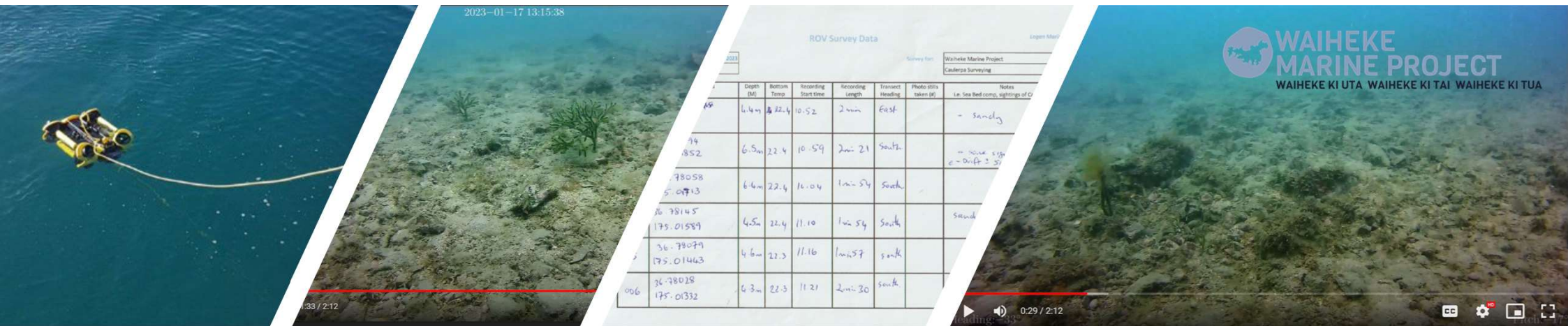
1. Reduce the potential risk of exotic *Caulerpa* spreading around the affected islands and Aotearoa New Zealand.
2. Minimise the potential impacts to the environment, communities and visitors.
3. Enhance the mana of mana whenua and all partners in the Response.



## Where to from here?

- Eradication is not possible with size of populations and tools available.
- *Caulerpa* management programme is recommended to prevent further spread incorporating:
  - CAN extension
  - Enhanced communications and awareness
  - Revised ambassador programme
  - Local capacity development
  - Surveillance
  - Treatment when feasible
  - Research
  - Pathway Management Programme
- \* Future actions yet to be confirmed.





RDV Survey Data

Depth (M)	Bottom Temp	Recording Start time	Recording Length	Transect Heading	Photo stills taken (#)	Notes
6.4m	22.4	10:52	2min	East		- sandy
6.5m	22.4	10:59	2min 21	South		- some sponges - Drift 3 20
6.6m	22.4	11:04	1min 54	South		
4.5m	22.4	11:10	1min 54	South		Sandy
4.6m	22.3	11:16	1min 57	South		
4.3m	22.3	11:21	2min 30	South		

**WAIHEKE MARINE PROJECT**  
WAIHEKE KI UTA WAIHEKE KI TAI WAIHEKE KI TUA

## Waiheke Marine Project 'The Waiheke Way'

- Local Capacity Development
- Surveillance
- Treat where feasible



# Surveillance - WMP with the support of The Hauraki Gulf Forum

- Engaged the services of Logan Marine Projects
- Engaged with Ngati Paoa Ki Waiheke to include mana whenua on the water
- Undertook 24 ROV dives around popular anchorages on Waiheke on the 17<sup>th</sup> of January
- Undertook a further 31 ROV dives on the 13<sup>th</sup> of March
- WMP seeks to maintain momentum in creating regular surveys that search and map locations of invasive marine species including caulerpa and Mediterranean fan worm.

# WAIHEKE MARINE PROJECT

WAIHEKE KI UTA WAIHEKE KI TAI WAIHEKE KI TUA



17<sup>th</sup> January 2023

WMP027

- WMP019
- WMP009
- WMP012
- WMP018
- WMP017
- WMP014
- WMP013
- WMP015
- WMP007
- WMP006
- WMP005
- WMP003
- WMP016
- WMP020
- Fishermans Rock
- WMP021
- WMP026
- WMP025
- WMP024
- WMP022
- WMP023
- WMP004
- WMP002
- WMP001

Enclosure Bay, Waiheke

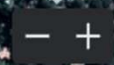
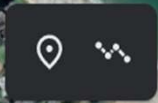
Fishermans Rock

Blowhole

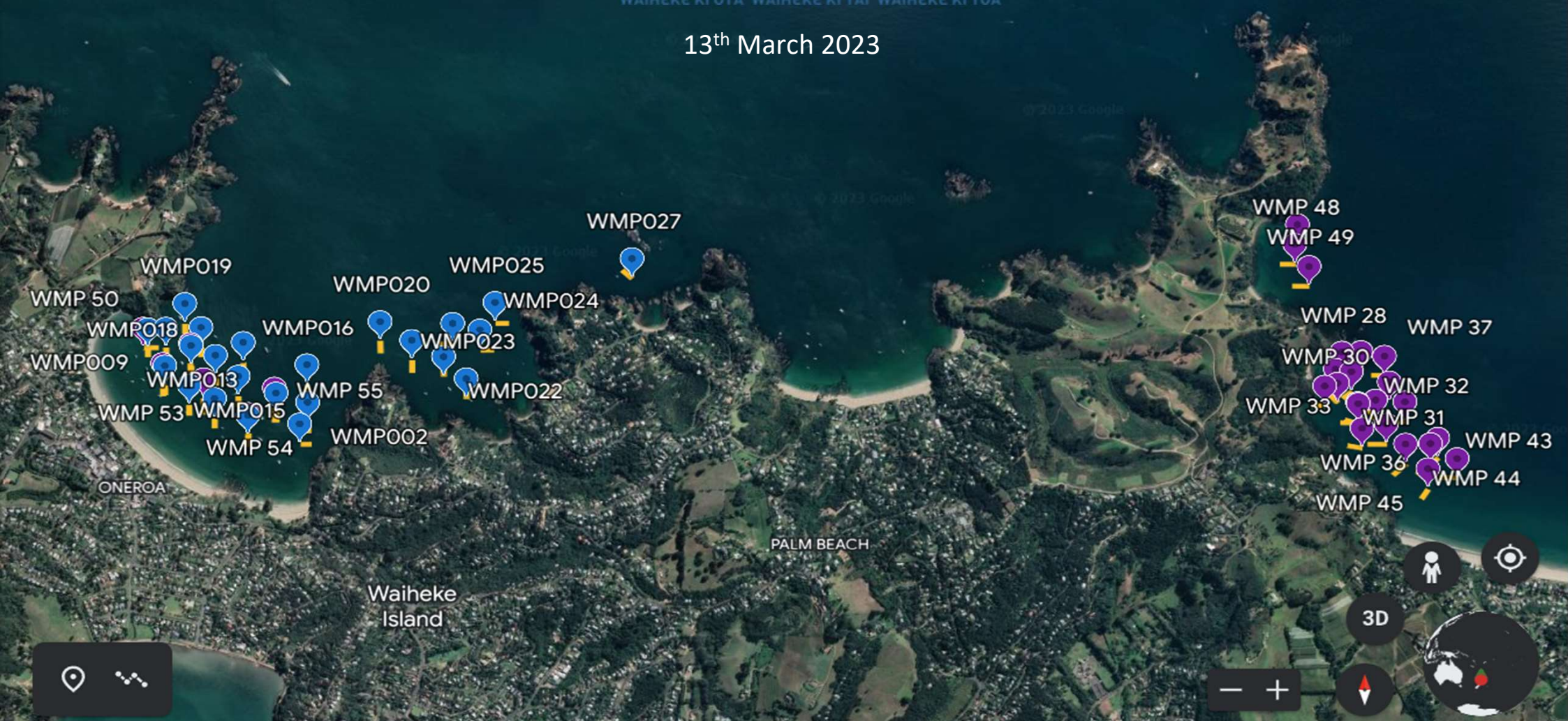
Newton Reserve

McKenzie Reserve

Sacred Bl...  
Sanctuary



13<sup>th</sup> March 2023



# ROV Dives

Each dive  
approximately 2  
minutes duration

Each transect  
length  
approximately  
50m

Total transects  
searched = 54

Total area  
searched  
estimated at  
4,900m<sup>2</sup>

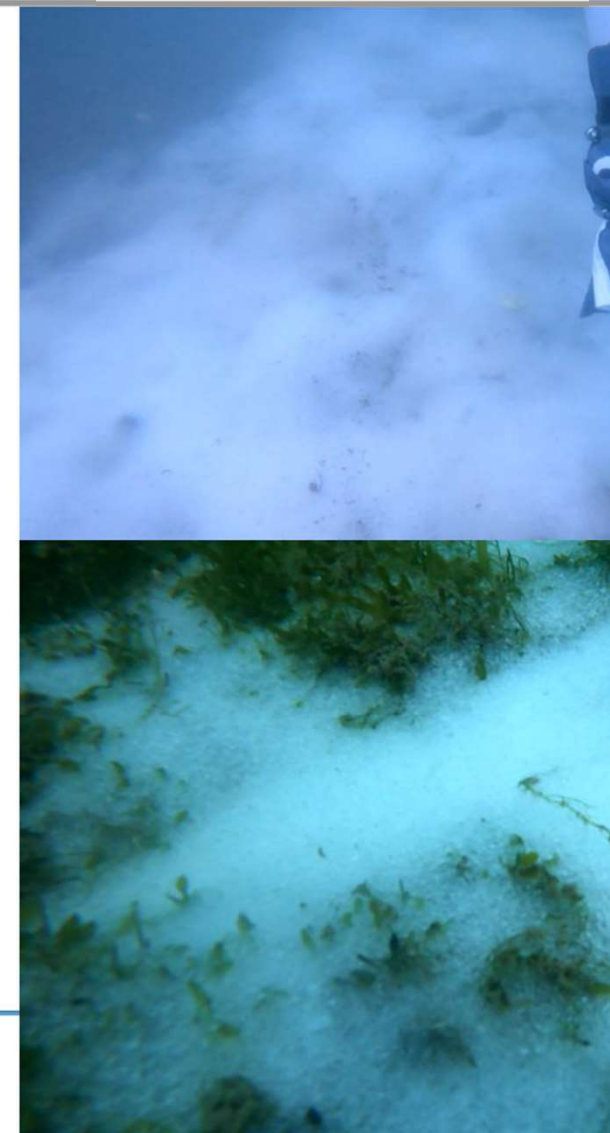
Rubbing in the salt!

# Preparing for Action – taking on Caulerpa



## Salt treatment

- Local elimination using salt was planned for December 2021 in Whangaparapara and Tryphena.
- However, populations found to be significantly larger (approximately 2,000 m<sup>2</sup> in each bay) than previously known.
- Instead use of coarse salt, at a rate of 50kg per m<sup>2</sup> was trialled.
- Hessian mats were used to aid smothering of *Caulerpa* and minimise fragmentation risk.

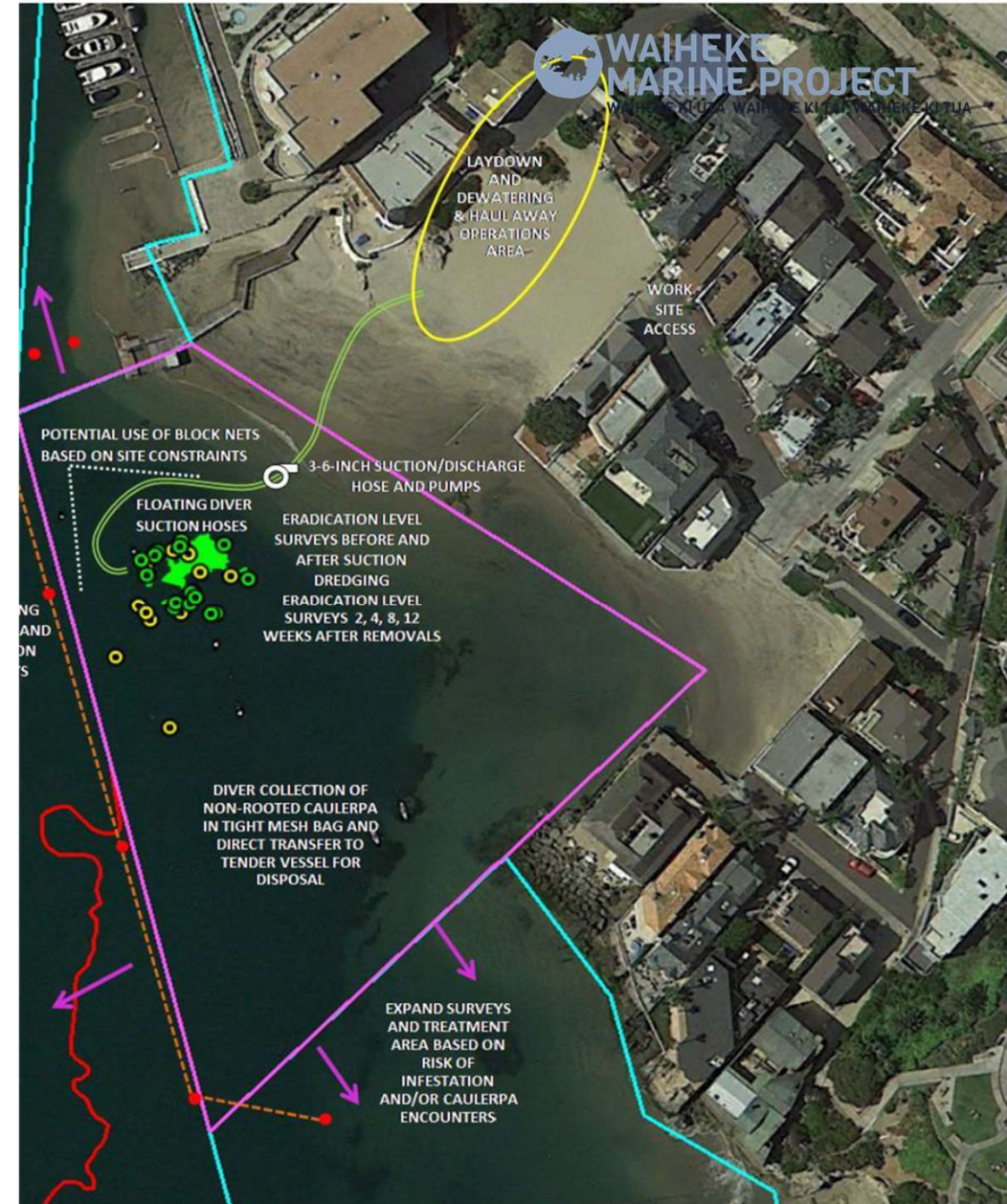


# Remove Biomass

## Get it out of the water!

The use of dive teams and hydraulic dredging to capture bags has proven successful in California.

(Newport Bay – Rapid Response Plan 2021)



# Getting Prepared

‘Southern California Caulerpa Action Team’ (SCCAT).

Facilitated consensus building and setting clear eradication goals among a large number of state, federal and local agencies as well as private groups and non-governmental organizations (NGOs)



**UC DAVIS**





# Getting Prepared – Lessons from California

## ‘Southern California Caulerpa Action Team’ (SCCAT)

The invasive marine alga *Caulerpa taxifolia* was discovered June 12, 2000, in California at Agua Hedionda Lagoon

Field containment and treatments began 17 days after the discovery due to:

1. timely identification and notification of the infestation;
2. the proactive staff of the San Diego Regional Water Quality Control Board who deemed this invasion tantamount to an **‘oil spill’**, thus freeing up emergency funding;
3. the mobilization of diver crews already working at the site.

# A National approach taken in the USA

## National Management Plan for the Genus *Caulerpa*



Photo by R. Woodfield, Merkel and Associates

Submitted to the Aquatic Nuisance Species Task Force

Prepared by the *Caulerpa* Working Group

October, 2005

# Agree Clear Goals - USA

**Goal 1:** Prevent the introduction and spread of Caulerpa species to areas in U.S. waters where they are not native.

**Goal 2:** Early detect, rapidly respond to and monitor Caulerpa species in U.S. waters where they are not native.

**Goal 3:** To eradicate Caulerpa populations, in waters to which they are not native, where feasible.

**Goal 4:** Provide long-term adaptive management and mitigate impacts of populations of Caulerpa species in U.S. waters where they are not native and where eradication is not feasible.

**Goal 5:** Educate and inform the public, agencies and policymakers to advocate for preventing the introduction and spread of Caulerpa species.

**Goal 6:** Identify research needs and facilitate research to fill information gaps.

**Goal 7:** Review, assess progress and revise the management plan and continue developing information to meet national management plan goals.

# The Hauraki Gulf – what it means to us?

“He taonga tuku iho – treasures handed down from the ancestors Tīkapa Moana / Te Moananui-ā-Toi – the Hauraki Gulf is vibrant with life, its mauri strong, productive, and supporting healthy and prosperous Communities.”

(Sea Change Stakeholder Working Group, 2017)

Revitalising the Gulf - Government action on the Sea Change Plan



Table B. Assessed economic activities in Auckland and the Hauraki Gulf.

	Year	Direct value added \$ <sub>2011</sub> million <sup>1</sup>	Indirect + induced value added \$ <sub>2011</sub> million <sup>1</sup>	Total value added \$ <sub>2011</sub> million <sup>1</sup>	Employment <sup>2</sup>	
Tourism	2008	656	281	937	15,742	FTEs
Marine recreational <sup>3</sup>	2008	na	na	550	5781	FTEs
Recreational fishing	2010	na	na	81	na	
Aquaculture <sup>4</sup>	2008/2010	49	50	99	939	FTEs
Commercial fishing <sup>5</sup>	2010	41	na	41	1183	FTEs
Ports of Auckland	2008	113	143	257	2027	ECs
Cruise industry	2009	35	34	69	928	ECs
Sand mining	2010	na	na	10	100	FTEs

1. Direct impacts are initial injections of revenue and expenditure that accrue to that specific sector; Indirect impacts are the net increase of economic activity generated by the provision of goods and services to the study sector; Induced impacts are the net increase of economic activity due to increased household expenditure in the study sector.

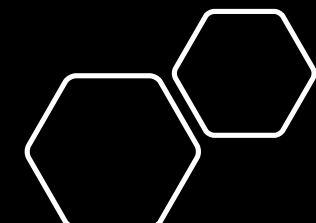
2. Employment Counts (ECs) are not directly comparable to Full-Time Equivalents (FTEs) as they count equally both full- and part-time jobs. Therefore, they tend to be higher than FTEs.

3. Value added includes some indirect impacts within the marine cluster but not induced impacts.

4. Values for Auckland refer to 2008, values for the Waikato refer to 2010.

5. Including processing.

*\$ 2 Billion Annually*



WHERE IS THE  
BUDGET?



FOLLOW THE  
MONEY



# The Hauraki Gulf Caulerpa Action Team

**We know the goals set in other  
countries.**

**What are ours?**

# References.

Ceccherelli, G. and Piazzzi, L.. "Dispersal of *Caulerpa racemosa* Fragments in the Mediterranean: Lack of Detachment Time Effect on Establishment" , vol. 44, no. 3, 2001, pp. 209-213. <https://doi.org/10.1515/BOT.2001.027>

[https://en.wikipedia.org/wiki/Caulerpa#cite\\_note-8](https://en.wikipedia.org/wiki/Caulerpa#cite_note-8)

Eradicating and preventing the spread of the invasive alga  
*Caulerpa taxifolia* in NSW

R.G.Creese<sup>1</sup>, A.R. Davis<sup>2</sup> and T.M.Glasby<sup>1</sup> 2004

1. NSW Fisheries, Port Stephens Fisheries Centre, Private Bag 1,  
Nelson Bay, NSW 2315, Australia.

2. School of Biological Sciences, University of Wollongong, NSW 2522, Australia

Impact of *caulerpa taxifolia* on Mediterranean fish – a 6 year study. Harmelin-Vivian. M et. al.  
1999

*Caulerpa* Conquest: A Biological Eradication on the California Coast  
Eric Noel Muñoz (Author) July 20, 2016

Rapid Response and Eradication Plan for the Invasive Green Alga *Caulerpa prolifera* in  
Newport Bay

Southern California *Caulerpa* Action Team

Final May 2021 as revised July 2021

National Management Plan for the Genus *Caulerpa* Submitted to the Aquatic Nuisance Species  
Task Force, Prepared by the *Caulerpa* Working Group October, 2005

Towards an Economic Valuation of the Hauraki Gulf: A Stock-take of Activities and  
Opportunities - November 2012 Technical Report: 2012/035

Note WMP Website: Additional reading and resources

# Thanks to our Phase 2 Funders



## Endorsed by



## Umbrella Entity

