The Oceans and Coastal Information Management System

Aquaculture Decision Support Tool

Date time and venue

Dr Marié Smith

Coastal Systems and Earth Observation Research Group

science & innovation
Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA

NATIONAL OCIMS

forestry, fisheries & the environment
Department:
Forestry, Fisheries and the Environment
REPUBLIC OF SOUTH AFRICA

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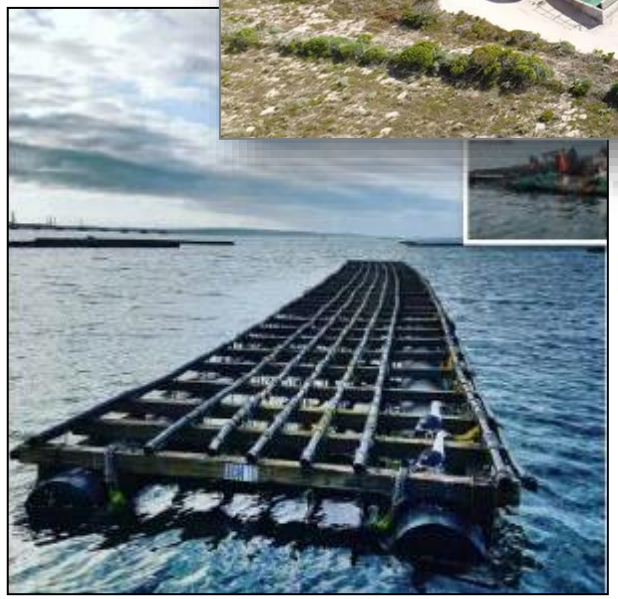
Operation Phakisa: Aquaculture

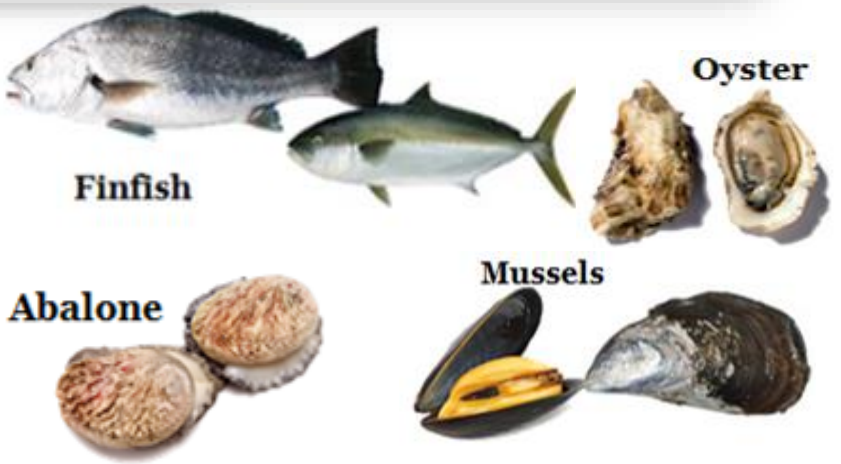
- Relatively young industry with potential for growth

- Together, the Aquaculture and Fisheries sector could contribute approximately R10-15 Billion to SA's GDP

Marine Aquaculture in South Africa

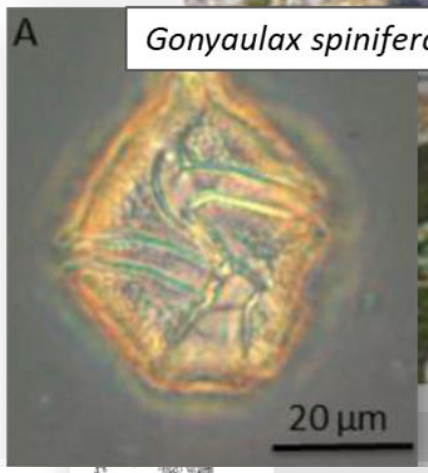
- Marine Aquaculture in South Africa includes:
  - Abalone
  - Mussels
  - Oysters
  - Finfish
- Depending on the cultured organisms these could include
  - In-water cages or rafts
  - Land-based pump-ashore operations
- Each operation method has different environmental risk





Environmental risk: Harmful Algal Blooms (HABs)

- Phytoplankton or Algae are microscopic plant-like organisms
- They can discolour the water if they occur in “blooms” or high concentrations
- Some can be harmful to the aquaculture industry through:
  - Toxicity
  - Mechanical damage
  - Hypoxia



ELSEVIER

Harmful Algae

journal homepage: www.elsevier.com/locate/hal

Devastating farmed abalone mortalities attributed to yessotoxin-producing dinoflagellates

Grant C. Pitcher[a,b,*], Charles J. Foord[a], Brett M. Macey[a,b], Lisa Mansfield[a], Anna Mouton[c], Marie E. Smith[d], Steven J. Osmond[e], Lynndal van der Molen[f]

[a] Fisheries Management Branch, Department of Agriculture, Forestry and Fisheries, Cape Town, South Africa
[b] Department of Biological Sciences, University of Cape Town, Cape Town, South Africa
[c] Independent Researcher, Stanford, South Africa
[d] NRE Earth Observation, Council for Scientific and Industrial Research, Cape Town, South Africa
[e] Amanzi Biosecurity, Sandbaai, South Africa
[f] Food and Beverage Laboratory, Aspirata, Cape Town, South Africa

Economic risks to aquaculture and fisheries

RED TIDE DEVASTATES SOUTH AFRICAN ABALONE FARMS

Dr. Anna Mouton, BVSc, MSc

South African abalone farms suffered dev
harmful algal bloom earlier this year. Three farm
on the South coast, lost up to 50 percent of t
held an estimated 24 million abalone, or a
African farm

News › South Africa › Wcape

Red Tide outbreak on Garden Route

WESTERN CAPE / 15 December 2015, 8:22pm

Jabulile S. Ngwenya

Cape Town - An outbreak of Harmful Algal Bloom (HAB), also known as Red Tide, has been confirmed along the Garden Route coastal area, the Department of Environmental Affairs (DEA) announced on Tuesday.

person Zolile Nqayi said some of the HAB-affecte
included popular tourist spots Plettenberg Bay,

watches crayfish walk out of the sea at Elands Bay

BL Premium

BusinessDay

OPINION NATIONAL POLITICS COMPANIES ECONOMY BUSINES

COMPANIES

DIVIDEND SKIPPED

Abagold in red tide sales alert

The abalone farming venture warns shareholders it is still assessing red-tide impact

20 MARCH 2017 - 06:06 by MARC HASENFUSS

AFRICA TRADE

ADVANCING COMMERCE AND INVESTMENT IN THE EMERGING CONTINENT

HOME NEWS TRADE MARKETS INVESTMENTS

Home NEWS

Congo posts budget surplus in H1 despite commodity slump: central bank

Harmful Algae Kills 200 Tons of Rock Lobsters Off South Africa

Wednesday, 11 February 2015 Written by Bloomberg

Operation Phakisa - Initiative 6
The National OCIMS

Vision

- Develop a locally relevant and globally cognisant **technological solution** that supports the economic potential of South Africa's Oceans through information for **effective governance**.

Mission

- Integrate current and future systems, information and expertise into a user-friendly and cost effective national Oceans and Coasts information system for the **benefit** of relevant **stakeholders**

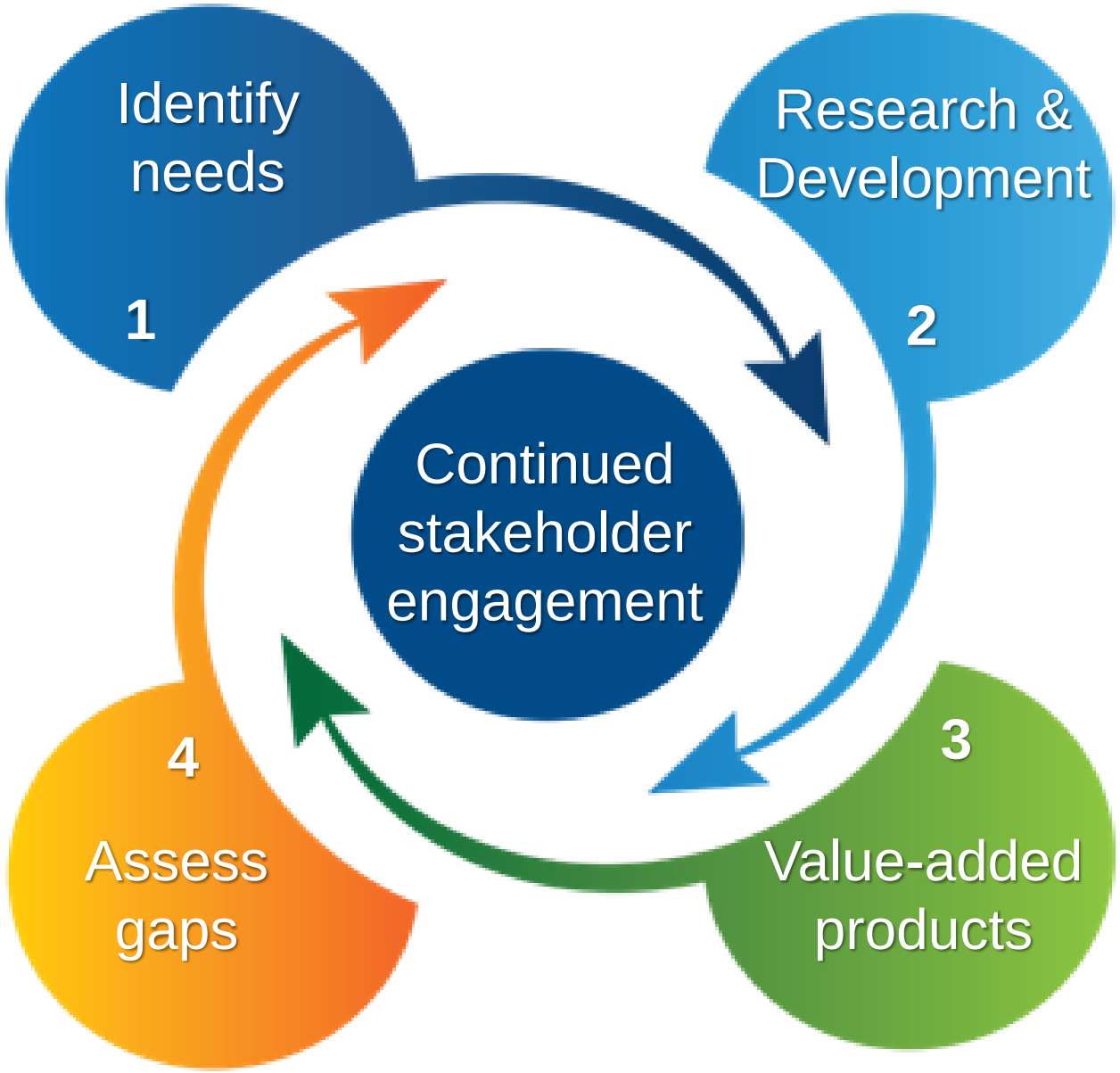
Benefit

- Decision making support
- Strategic and operational **planning**
- **Protection** oceans and coastal environment
- Economic growth and **job creation**

OCIMS Decision Support Tools (DeST)

- Multiple tools servicing different sectors across the marine domain
- Decision Support Tools developed through consultations between developers and stakeholders

OCIMS DeST development cycle



- Champion users, stakeholders and developers make up Technical Advisory Groups (TAGs) which meet regularly
- Simple, powerful value-added products shared for user input

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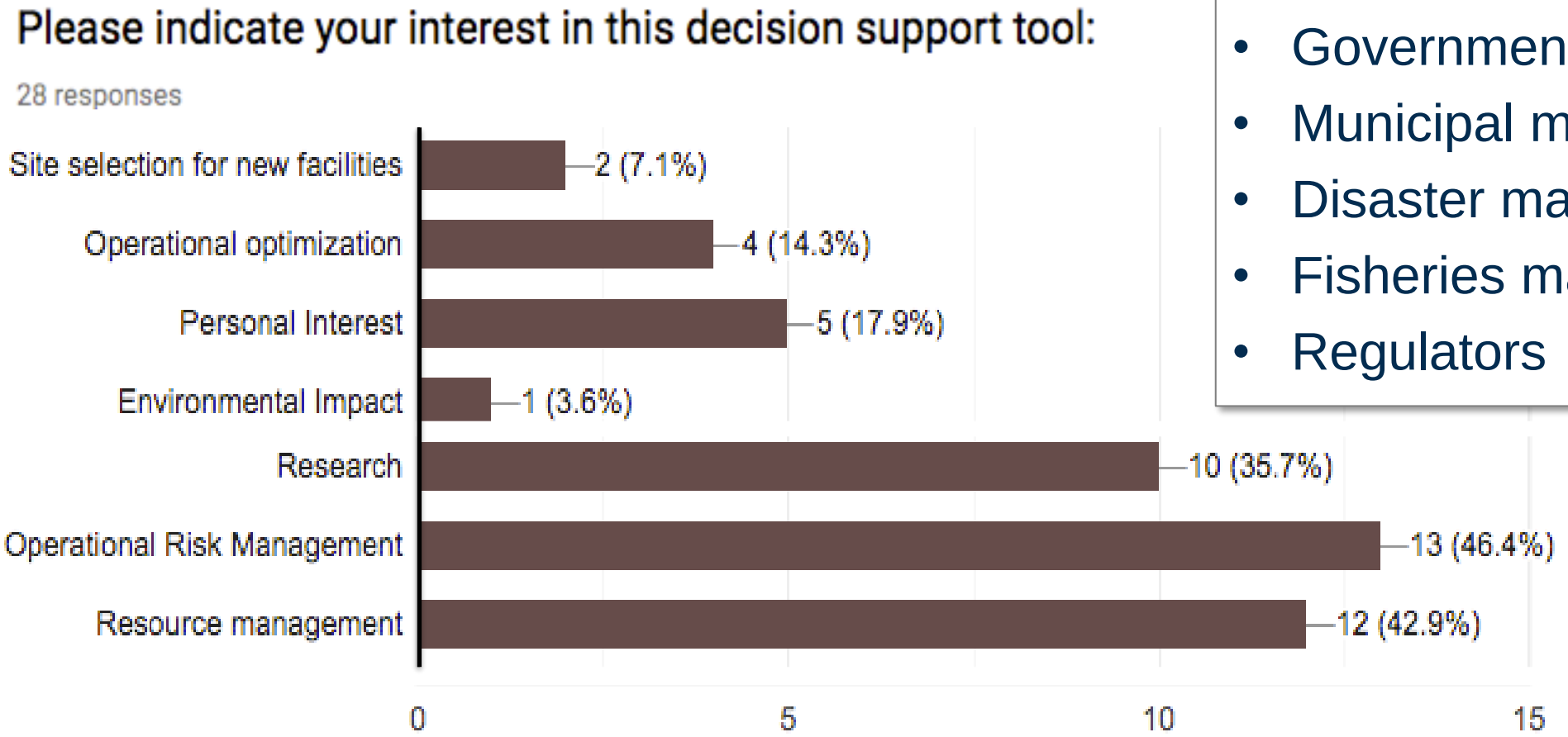
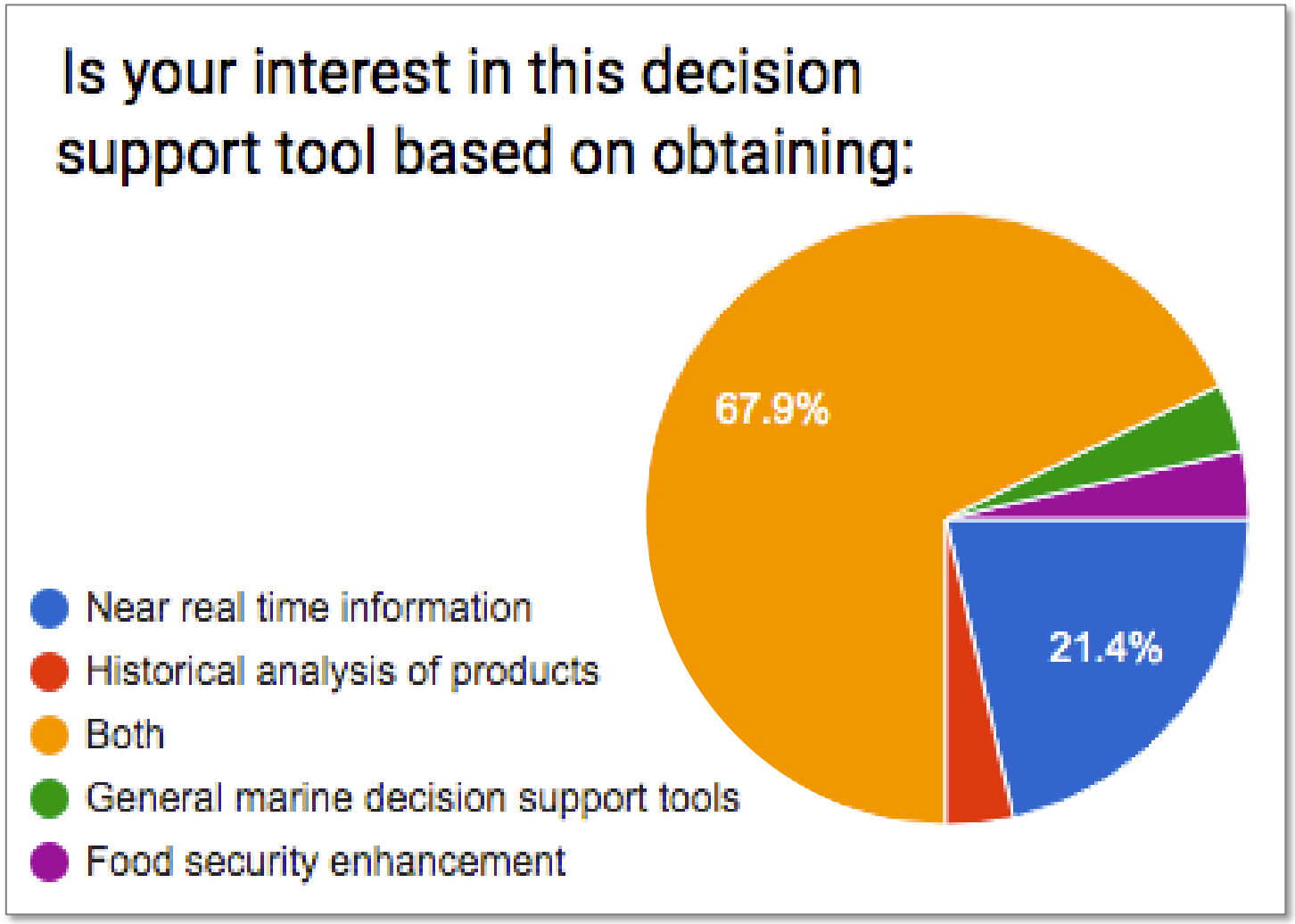
Identify Needs:
Users and stakeholders of the Aquaculture DeST



Users include:

- Aquaculture farm managers
- Government (e.g. DFFE)
- Municipal managers
- Disaster management
- Fisheries managers
- Regulators

Identify Needs:
Harmful Algal Bloom Detection requirements



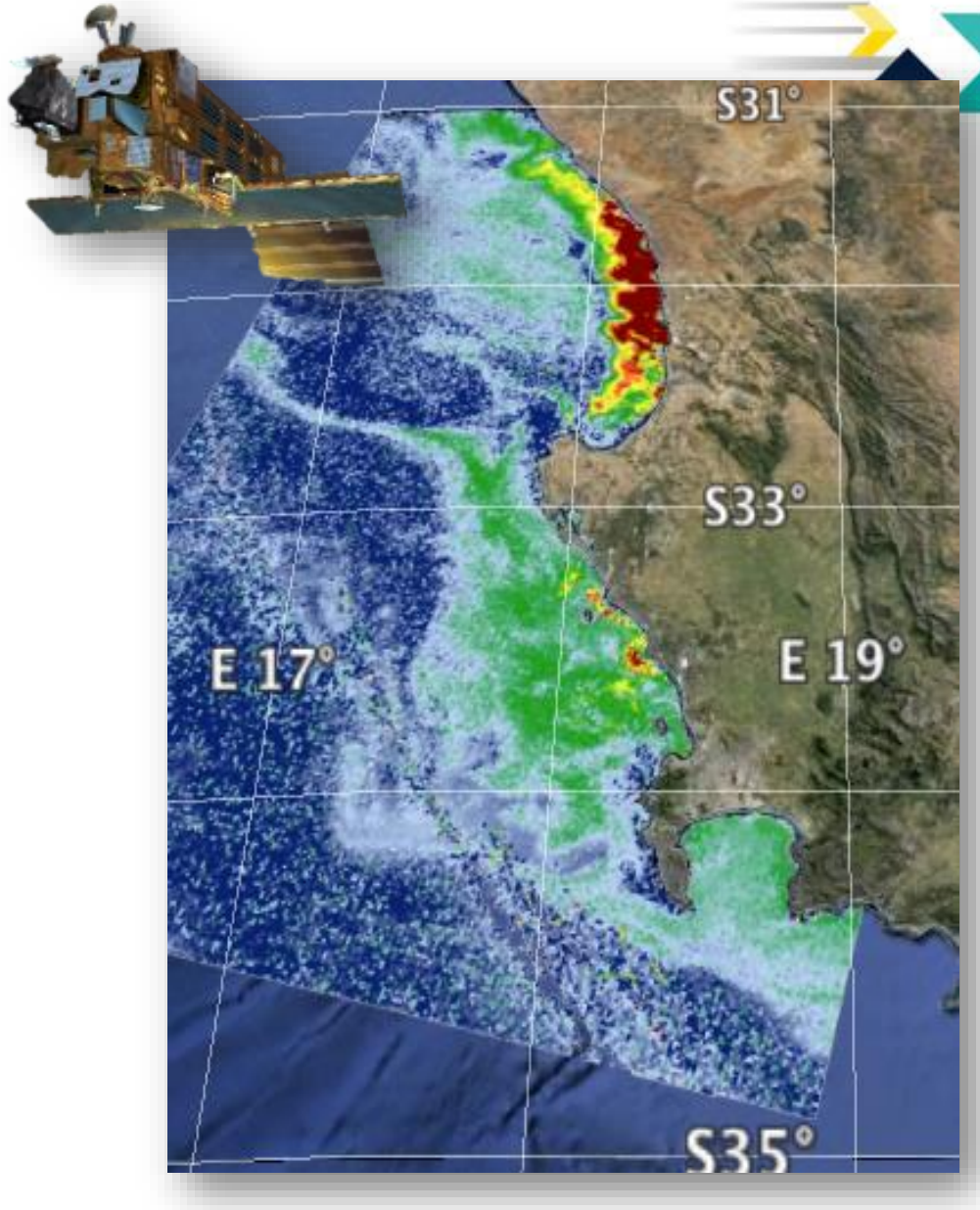
Useful information for management include:

- Bloom proximity
- **Phytoplankton type ~ risk**
- Bloom spatial extent
- Persistence ~ anoxia
- Trajectory

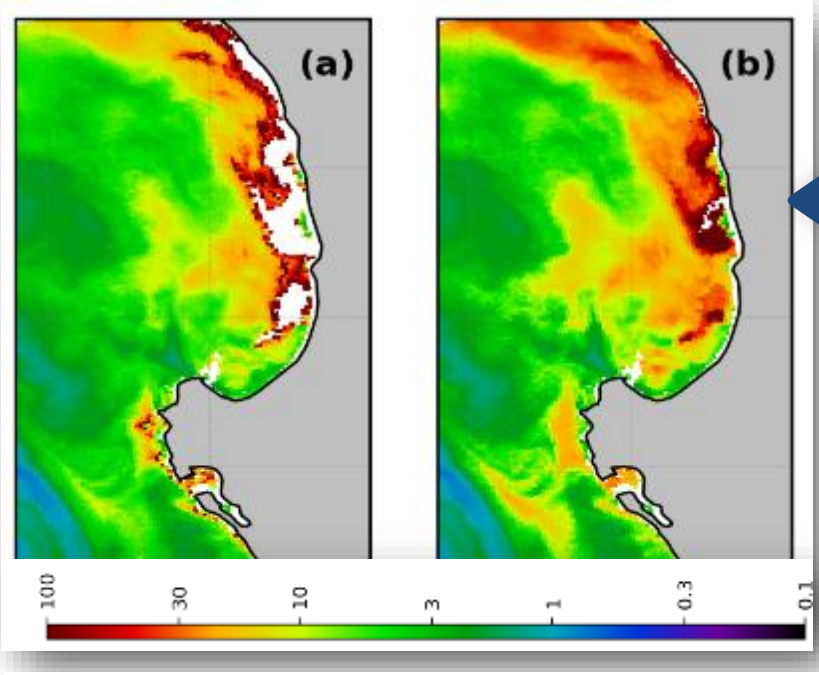
provided in near-real time and historically

Research & Development: Marine Earth Observation

- Satellite provides information over much greater space and time scales than possible with only in-water measurements
- Our research has focused on:
  - Understanding the **regional oceanography** and how it affects HAB formation
  - Assessing the best **sensors** and **detection techniques** for HABs
  - Creating **regional algorithms** to improve satellite-derived products



Research and Development



Regionally appropriate ocean colour algorithms

Remote Sensing of Environment 215 (2018) 217–227

Contents lists available at ScienceDirect

Remote Sensing of Environment

journal homepage: www.elsevier.com/locate/rse

An optimized Chlorophyll *a* switching algorithm for MERIS and OLCI in phytoplankton-dominated waters

M.E. Smith[a,*], L. Robertson Lain[b], S. Bernard[a]

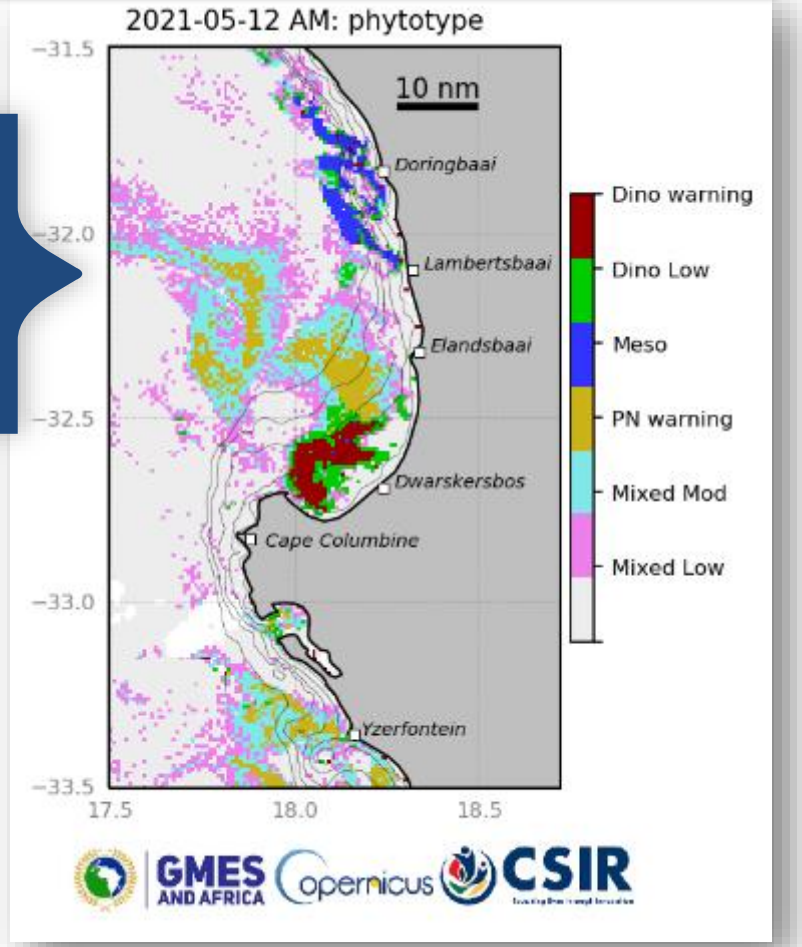
frontiers in Marine Science

ORIGINAL RESEARCH
published: 14 February 2020
doi: 10.3389/fmars.2020.00061

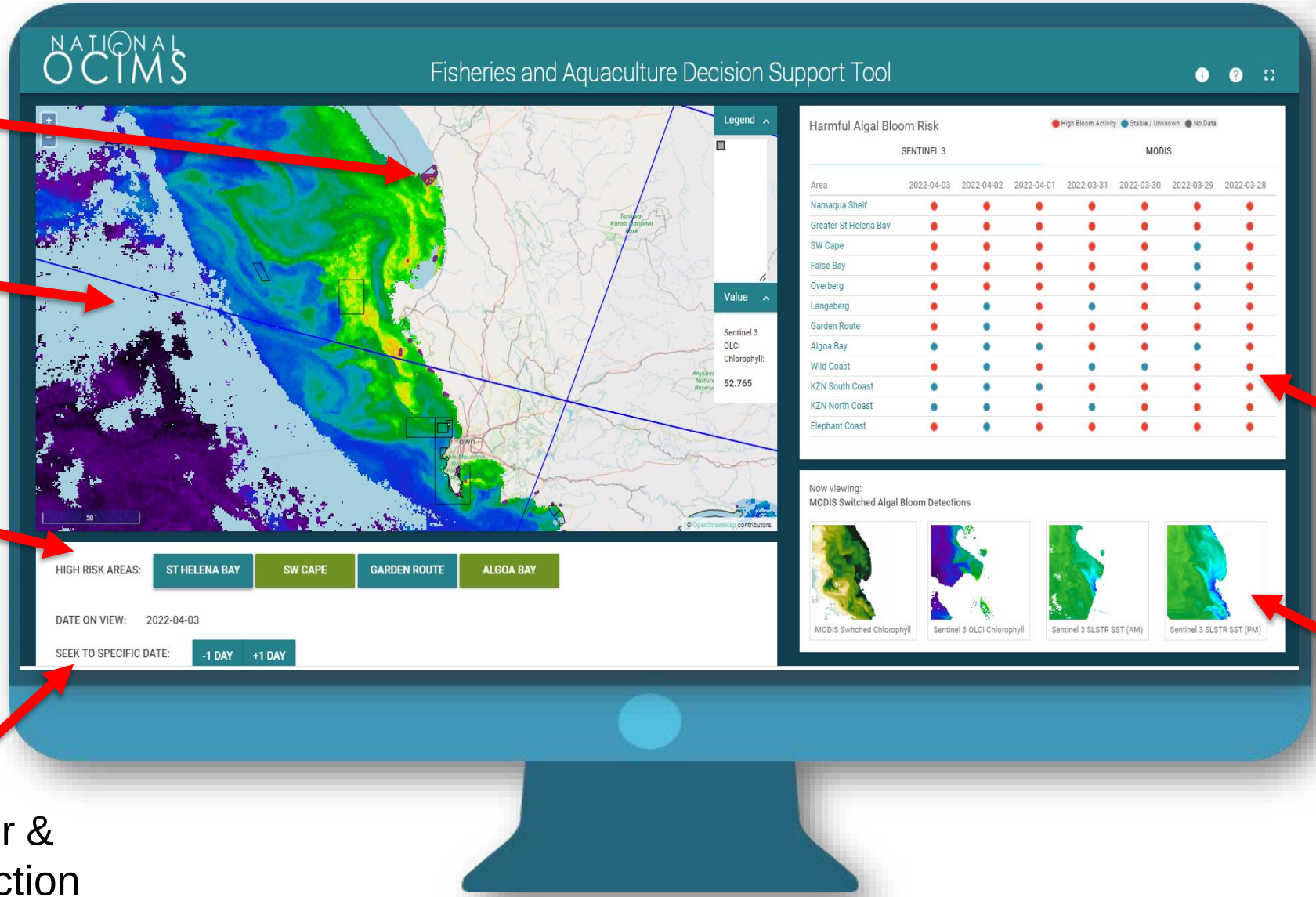
Satellite Ocean Color Based Harmful Algal Bloom Indicators for Aquaculture Decision Support in the Southern Benguela

Marié E. Smith[1] and Stewart Bernard[1,2]*

Phytoplankton type identification products



Value-added products:
The OCIMS Aquaculture Decision support Tool



Bloom analytic

Product window

Jump to high risk regions

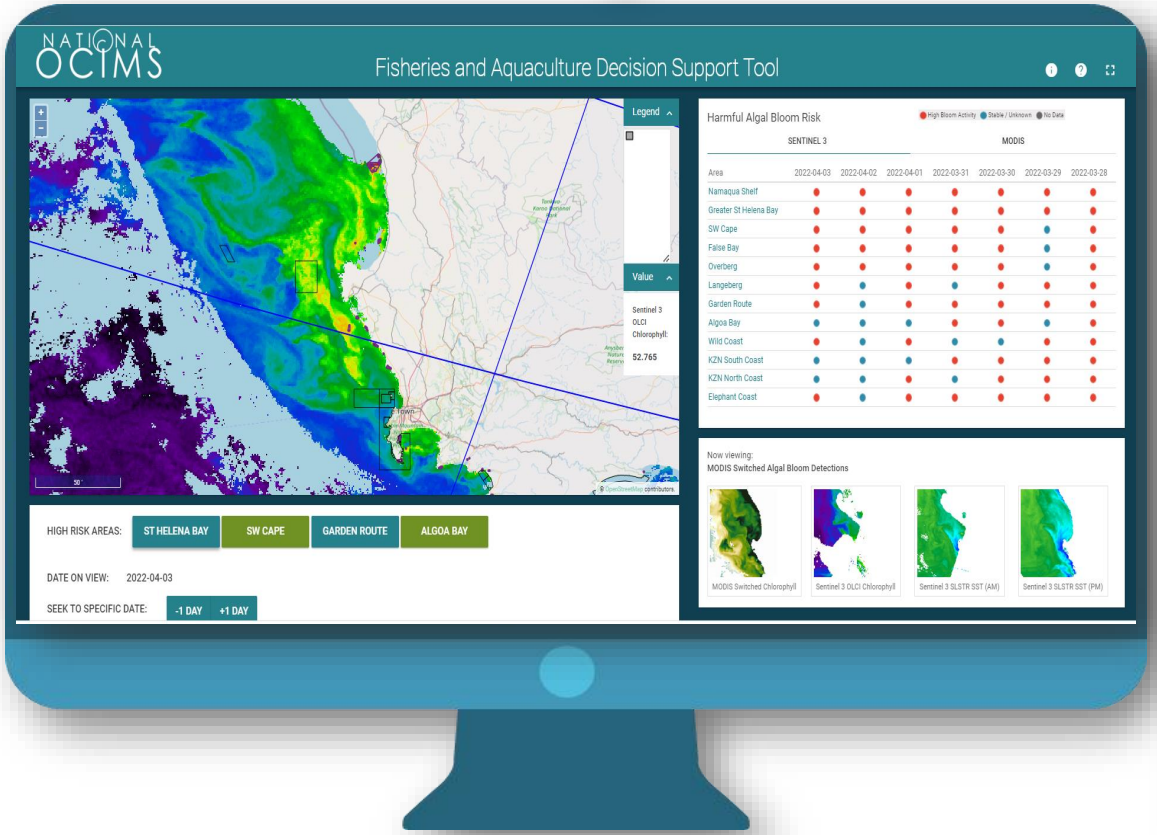
Date selector & scrolling function

7-day bloom persistence indicator

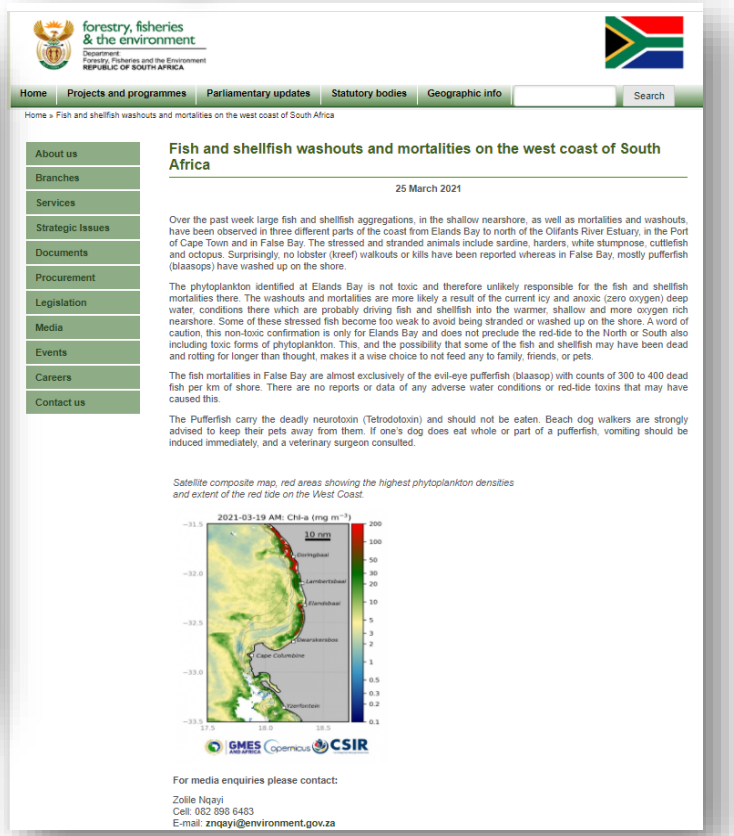
Product selector

Value-added products: Information dissemination services

OCIMS Fisheries and Aquaculture Decision support tool

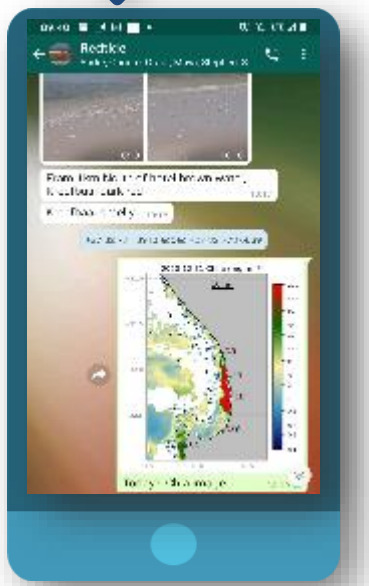


Government advisories



Email HAB bulletins

Regional WhatsApp groups



Example of decision-making and information uptake

Routine

Clear water, low phytoplankton concentrations; winter

daily sampling of incoming seawater for temperature, O_2 and phytoplankton counts + type

Awareness

Red tide season; Red tide in the region

increased information gathering; staff awareness

Preparation

Red tide visible off-shore; phytoplankton counts >20k; warm weather with little wind; increase in sea temperature

enhanced water sampling; offshore bloom sampling & ID; give less feed

High alert

Onshore wind; toxic cells >50k; dino-flagellates cells >200k; total cell counts >500k

hourly water sampling; pump off for short periods (if needed); smallest mesh on drumfilters

Quarantine

Red tide reaches the farm; incoming water phytoplankton cell counts reach >1M

Pumps off; Increase aeration move animals to other sites; pre-emptive harvesting

Web-tool ***Email bulletins*** ***WhatsApp***

Success stories and user testimonials

2017

- Walker Bay HAB caused a R70m loss across the abalone industry and major stock losses
- 14% loss of annual GDP contribution

2019

- OCIMS Aquaculture tool available
- A red tide persists for 3 months in Walker Bay
- *No losses to abalone farms*

“This is a super useful tool as it gave me a 2 month warning for the current bloom that has entered Saldanha Bay”
- industry user

"This is AMAZING!!!!! … I cannot overstate the importance of a tool such as this to our industry… it will make a big difference to our troubleshooting ability"
– aquaculture farm manager

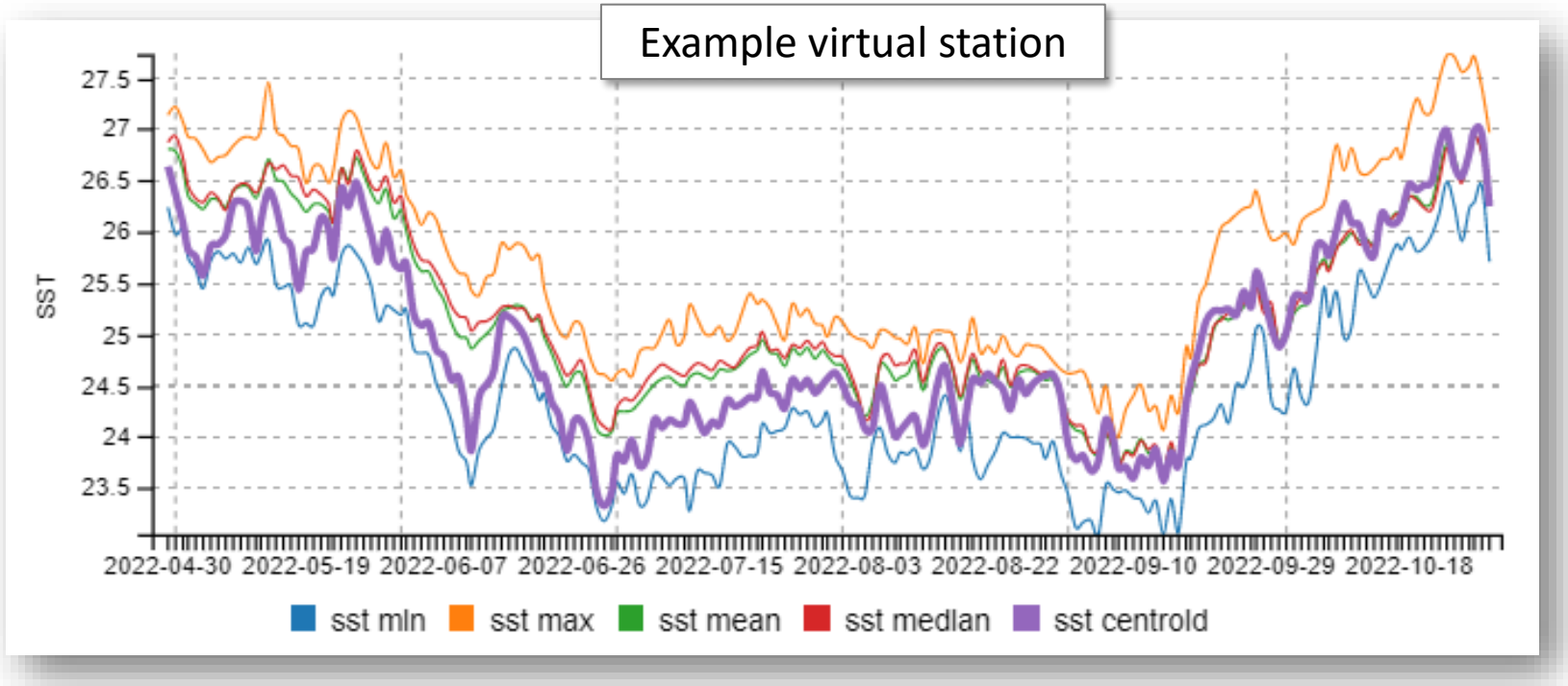
Development plans for OCIMS phase 2

- Period 2022-2026
- Inclusion of exciting new products on the DeST
- GIS tool for farm-based phytoplankton counts
- Historical datasets made available via online data cubes for research purposes

Phytoplankton types maps

Anomaly maps

Virtual Stations



THANK YOU

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