



# The National Oceans and Coastal Information Management System (OCIMS)

## Aquaculture decision support tool

03 November 2022, 10:40-10:50 Ruby Auditorium

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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Touching lives through innovation



# Operation Phakisa: Aquaculture

- Relatively young industry with potential for growth
- The aquaculture and fisheries sector could contribute approximately R10 – R15 billion to South Africa's gross domestic product (GDP)

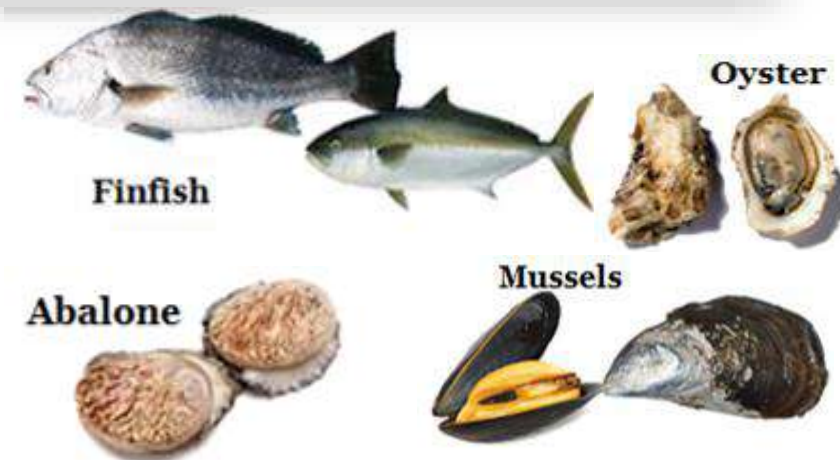




# Marine aquaculture in South Africa

- Marine aquaculture in South Africa includes:
  - Abalone;
  - Mussels;
  - Oysters; and
  - 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 risks

Aquinion Romansbaai Farm



# 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; and
  - Hypoxia.





# Economic risks to aquaculture and fisheries



## RED TIDE DEVASTATES SOUTH AFRICAN ABALONE FARMS

Dr. Anna Mouton, BVSc, MSc

South African abalone farms suffered devastating losses from a harmful algal bloom earlier this year. Three farms on the South coast, lost up to 50 percent of their stock. One farm held an estimated 24 million abalone, or a third of the country's total.



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 ILAB-affected areas included popular tourist spots Plettenberg Bay, Port Alfred and Port Elizabeth.

BL Premium

BusinessDay

OPINION NATIONAL POLITICS COMPANIES ECONOMY BUSINESS

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



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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



watcher watches crayfish walk out of the sea at Elands Bay

# Operation Phakisa: Initiative Six

## The National OCIMS



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

### Vision



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

### Mission



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

### Benefit





# OCIMS decision support tools (DeST)



**Coastal Viewer**



**Fisheries & Aquaculture Support**



**Marine Spatial Planning**



**Coastal Flood Hazard**



**Water Quality**



**Marine Predators**



**Coastal Operations at Sea**



**Integrated Vessel Tracking**

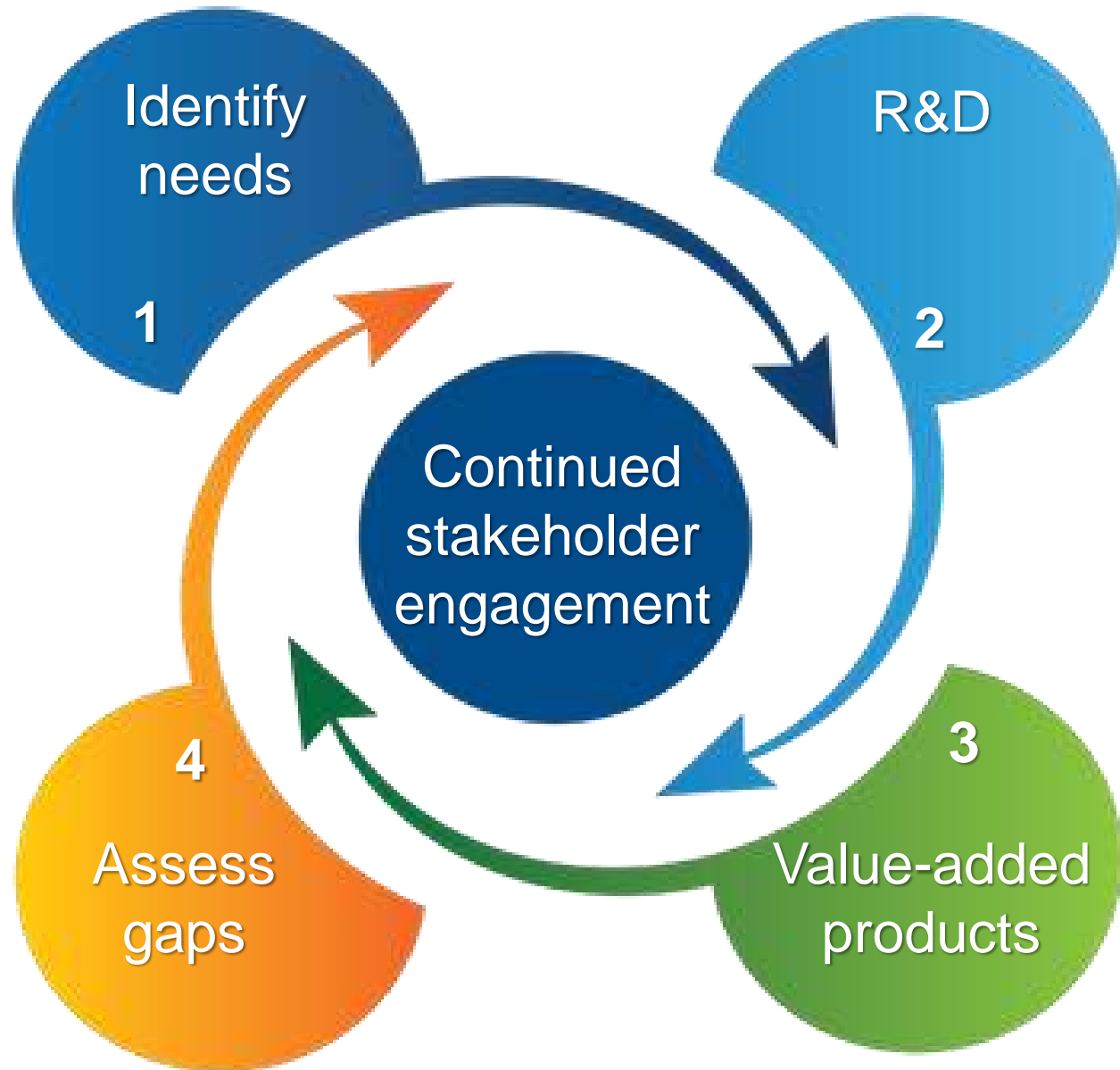


**Marine Information Management System (MIMS)**



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

# OCIMS DeST development cycle



- Champion users, stakeholders and developers make up technical advisory groups, which meet regularly
- Simple, powerful value-added products shared for user input

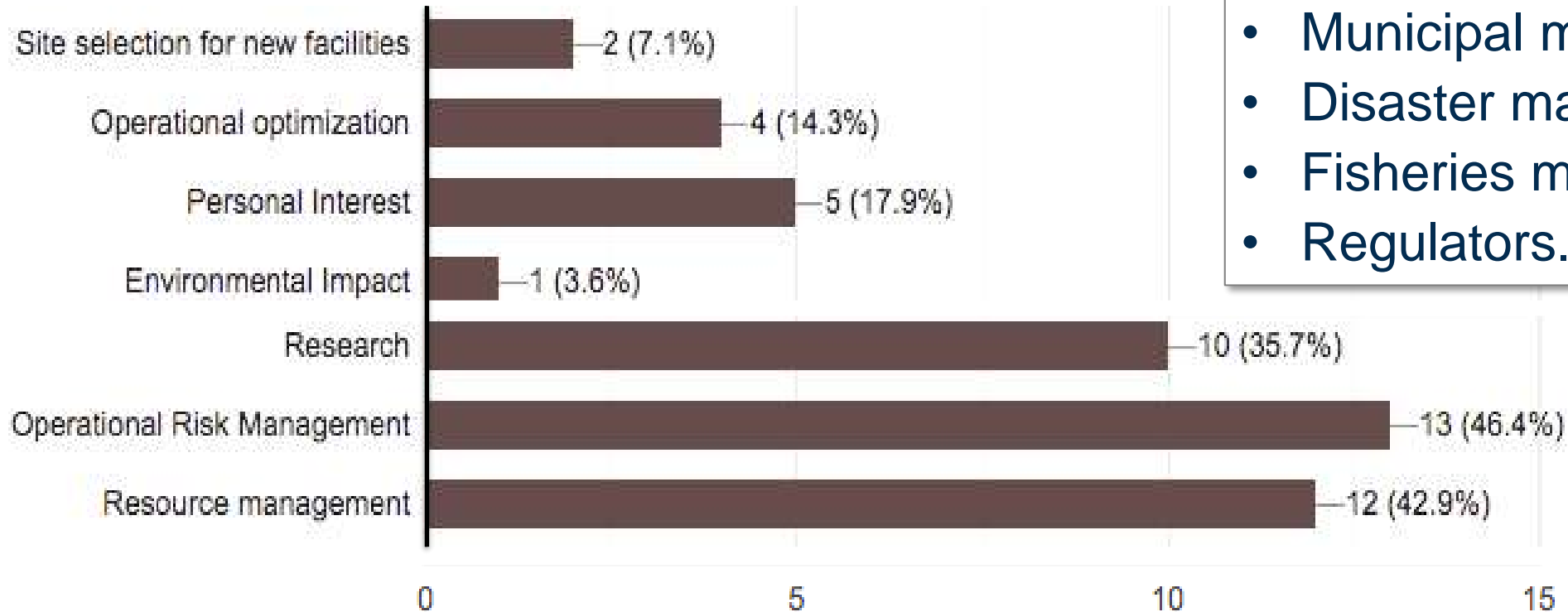


# Identify needs: Users and stakeholders of the aquaculture DeST



Please indicate your interest in this decision support tool:

28 responses



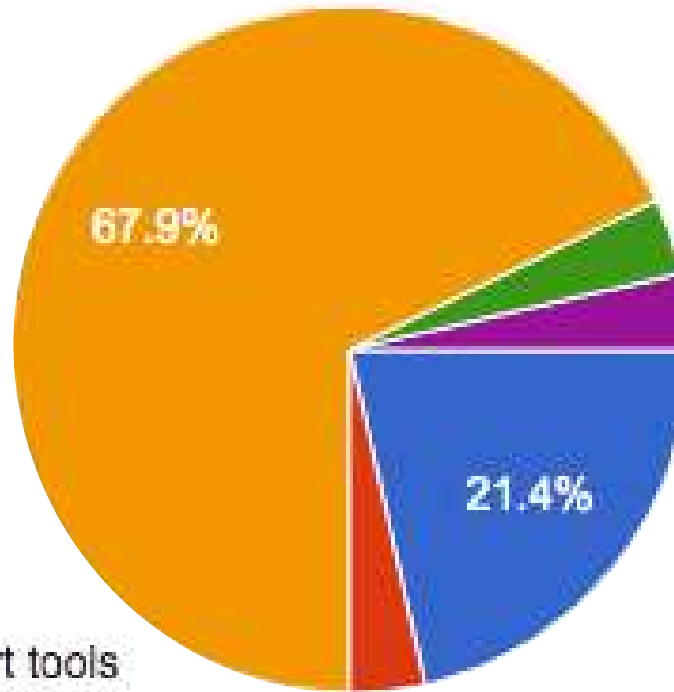
Users include:

- Aquaculture farm managers;
- The government (e.g., DFFE);
- Municipal managers;
- Disaster management;
- Fisheries managers; and
- Regulators.

# Identify needs: HAB detection requirements



Is your interest in this decision support tool based on obtaining:



- Near real time information
- Historical analysis of products
- Both
- General marine decision support tools
- Food security enhancement

Useful information for management includes:

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

This information is provided in near-real time and historically.



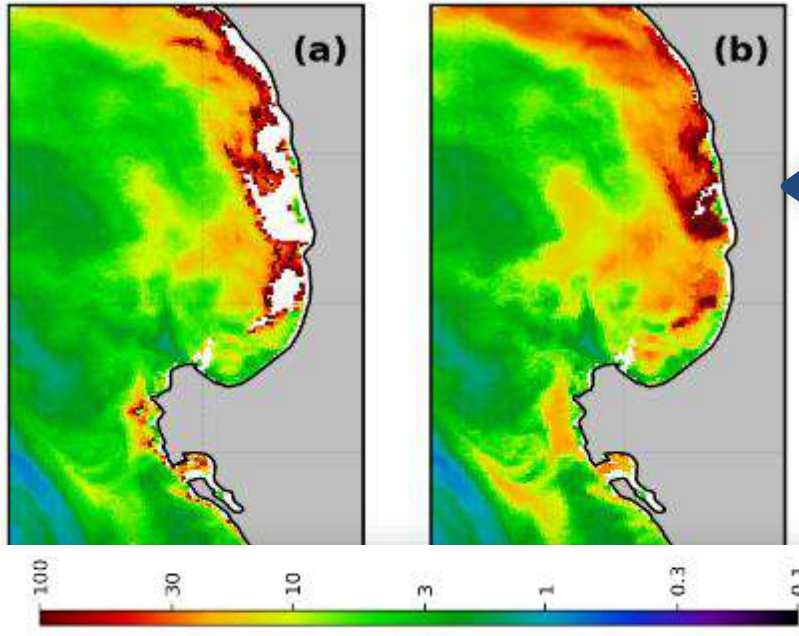
# R&D: Marine Earth observation

- 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; and
  - Creating **regional algorithms** to improve satellite-derived products.



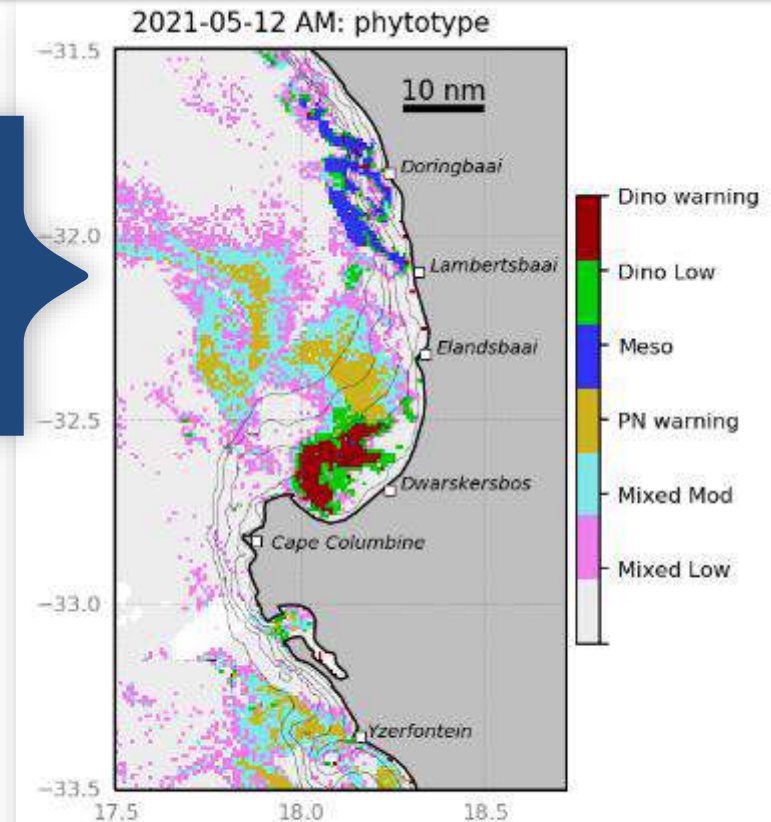
## Satellite Ocean Color Based Harmful Algal Bloom Indicators for Aquaculture Decision Support in the Southern Benguela

Marie E. Smith<sup>1\*</sup> and Stewart Bernard<sup>1,2</sup>



Regionally appropriate ocean colour algorithms

Phytoplankton type identification products



Remote Sensing of Environment 215 (2018) 217–227

Contents lists available at ScienceDirect

Remote Sensing of Environment

journal homepage: [www.elsevier.com/locate/rse](http://www.elsevier.com/locate/rse)



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

M.E. Smith<sup>a,\*</sup>, L. Robertson Lain<sup>b</sup>, S. Bernard<sup>a</sup>





# Value-added products: The OCIMS aquaculture DeST

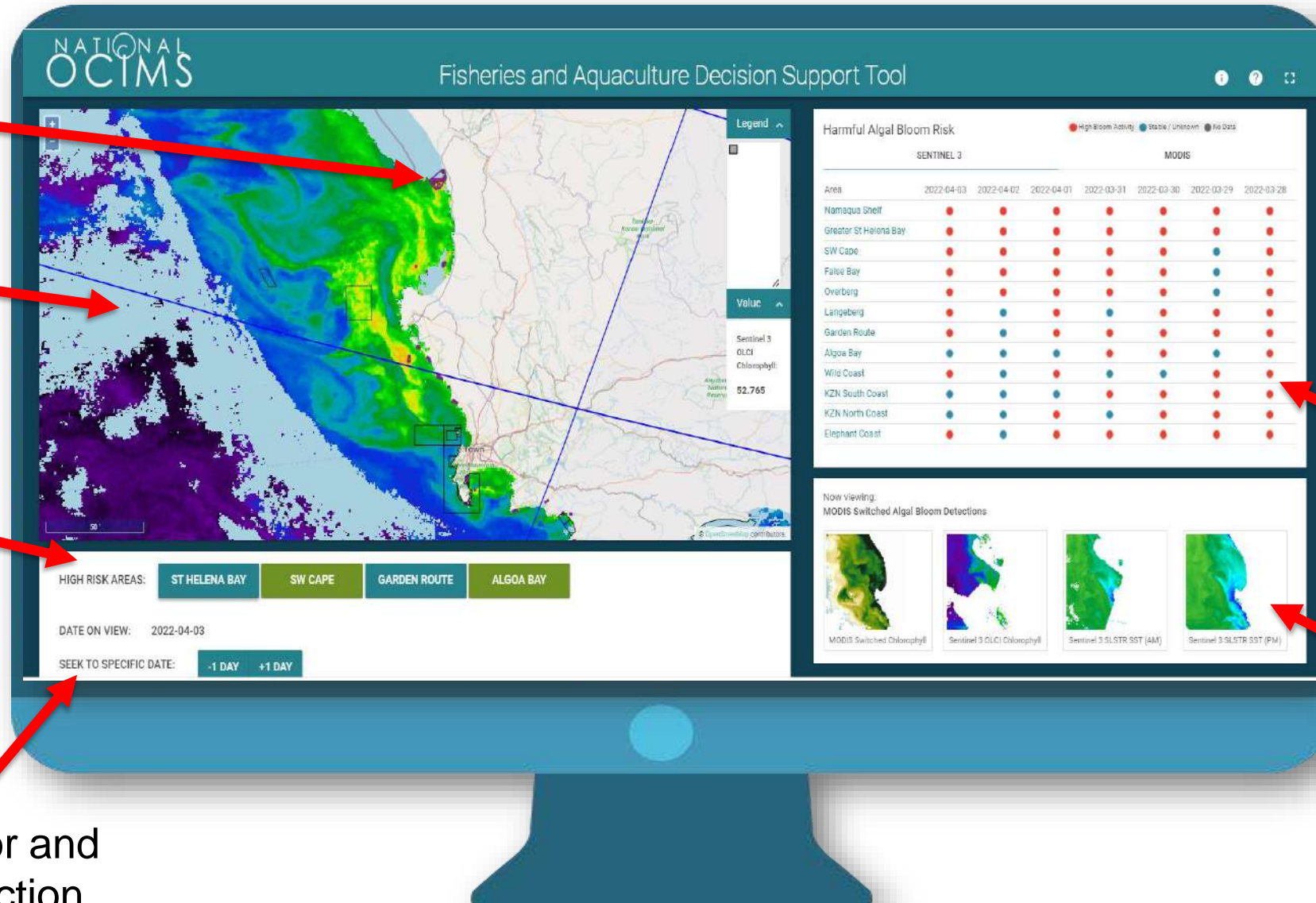


Bloom  
analytic

Product  
window

Jump to  
high-risk  
regions

Date selector and  
scrolling function



Seven-day  
bloom  
persistence  
indicator

Product  
selector

# Value-added products: Information dissemination services

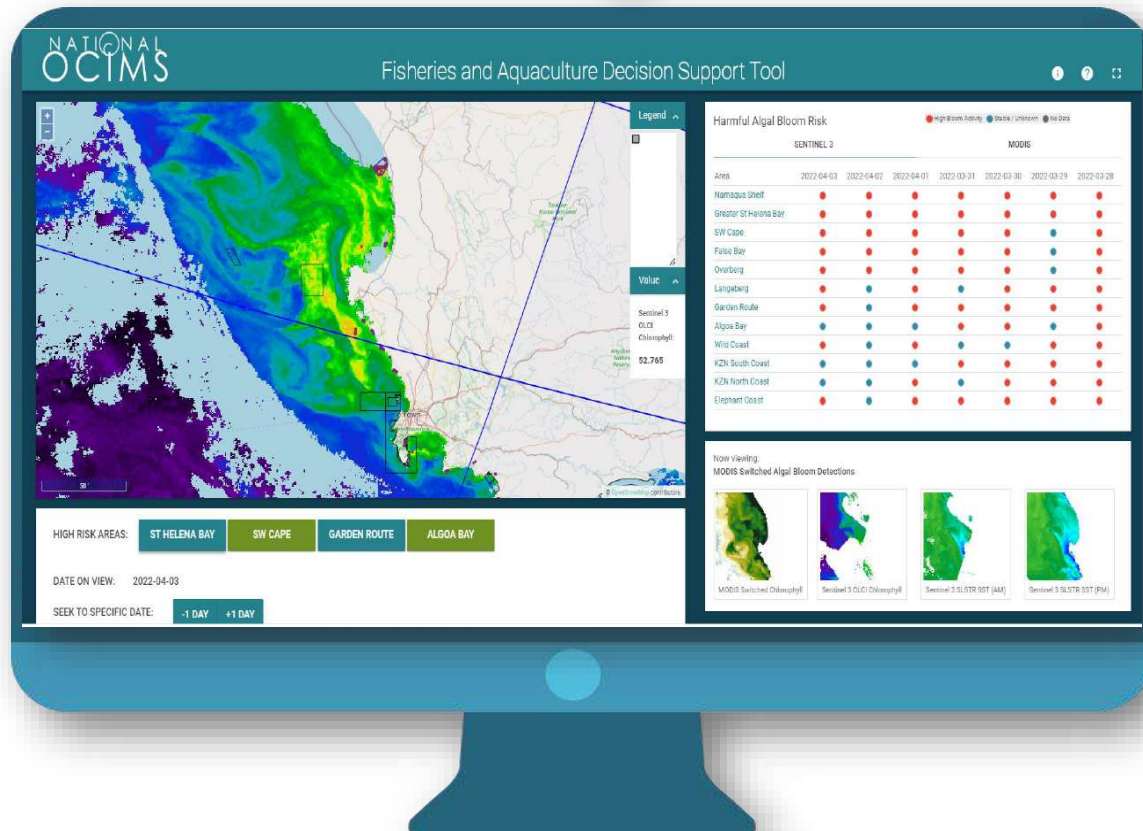
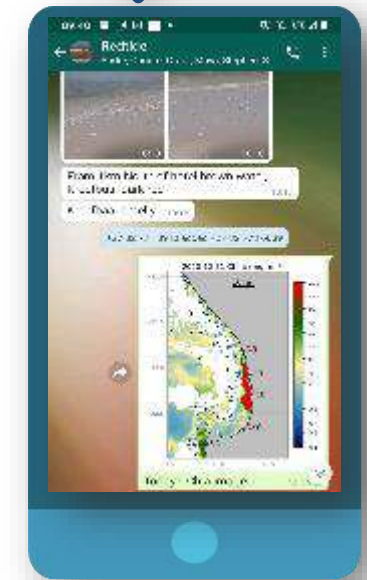
OCIMS fisheries and  
aquaculture DeST

Government  
advisories

E-mail HAB  
bulletins

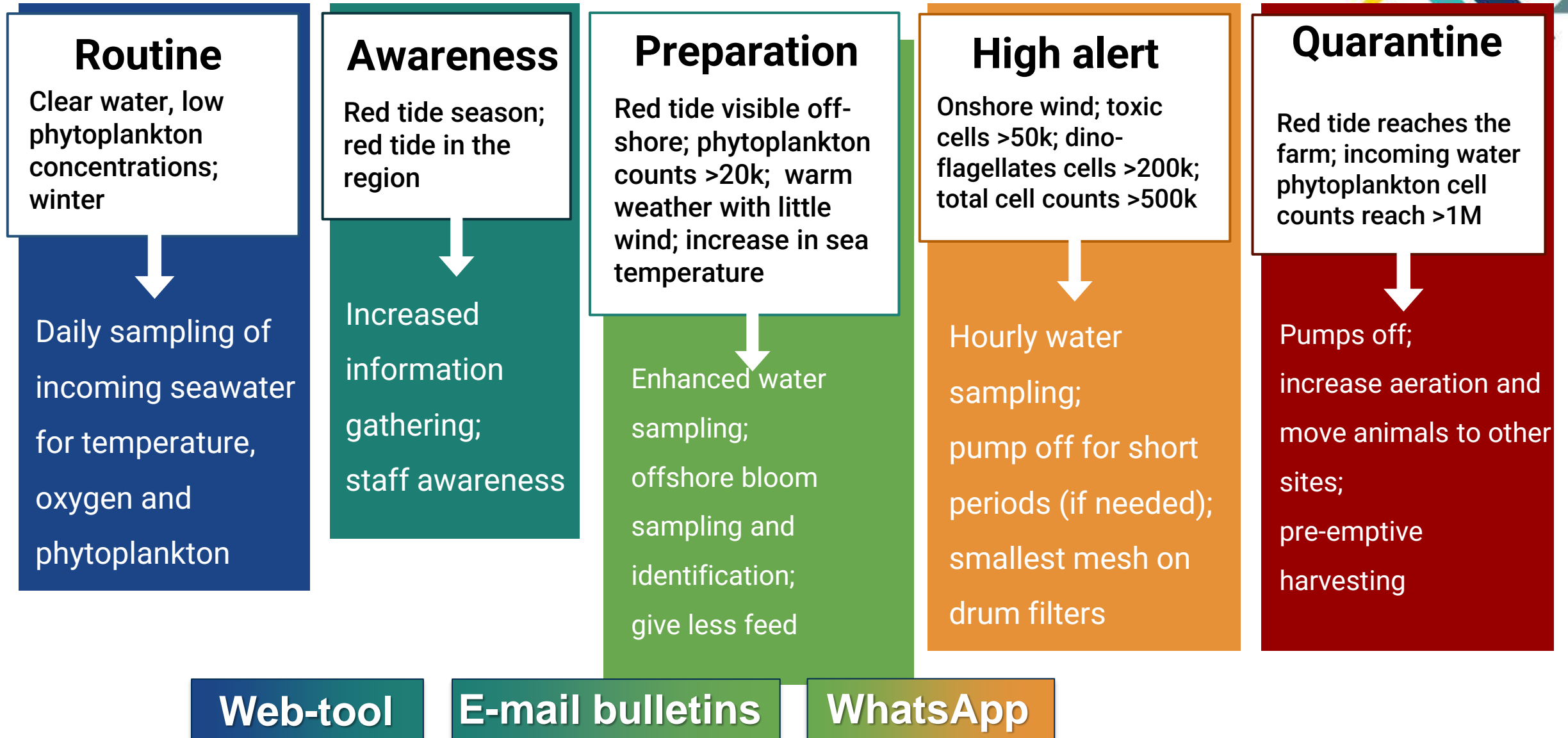


Regional  
WhatsApp  
groups



# Example of decision-making and information uptake



# Success stories and user testimonials



2017

- Walker Bay HAB caused a R70 m 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 three months in Walker Bay
- *No losses to abalone farms*

*"This is a super useful tool as it gave me a two-month warning for the bloom that entered Saldanha Bay."*

**- Industry user**

*"This is amazing! I cannot overstate the importance of such a tool to our industry. It will make a big difference to our troubleshooting ability."*

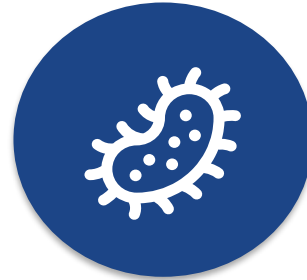
**– Aquaculture farm manager**



# Development plans for OCIMS phase two

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

Phytoplankton  
types maps



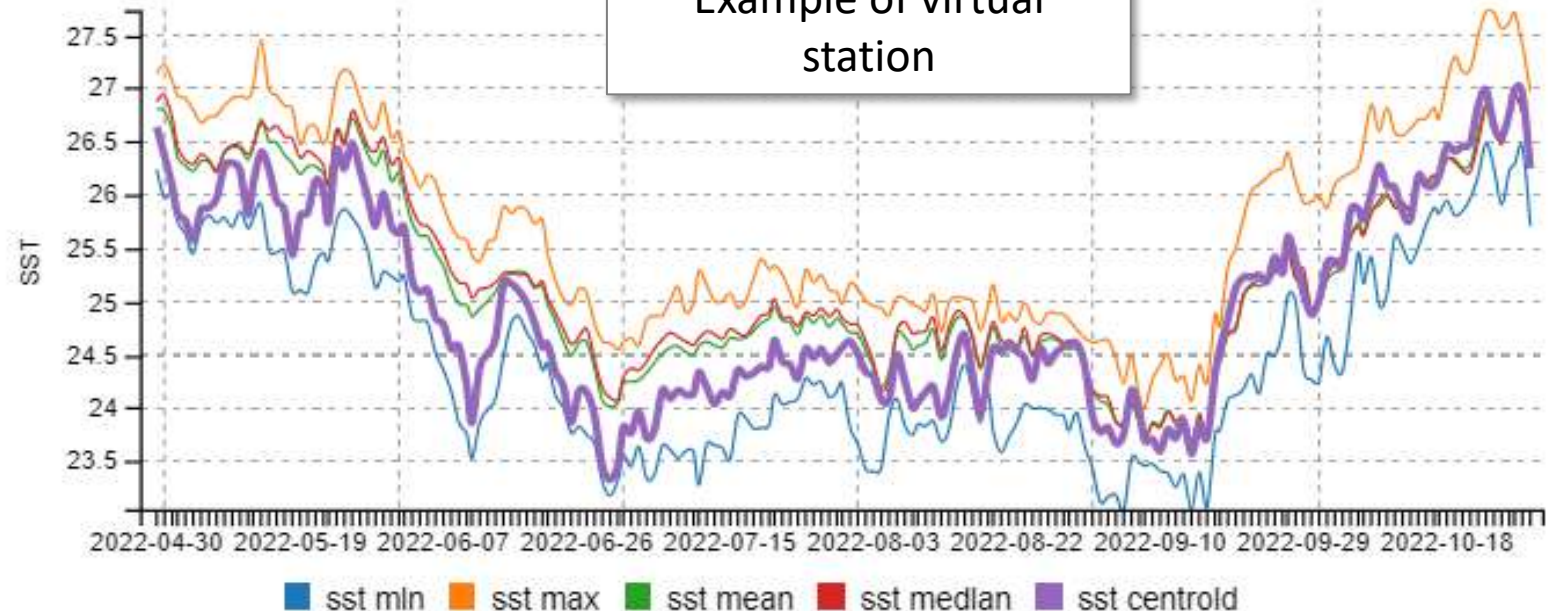
Anomaly  
maps



Virtual  
stations



Example of virtual  
station





**THANK YOU**  
[msmith2@csir.co.za](mailto:msmith2@csir.co.za)