

A satellite-based decision support service for the marine fisheries and aquaculture industry of southern Africa

Marié Smith^{1,2,*}, Raymond Molapo ³, Mabuela Ngulube ³, Bolelang Sibolla ³, Luvuno Vhengani ³

¹ Coastal Systems and Earth Observation, CSIR

² Department of Oceanography, UCT

³ Spatial Information Systems, CSIR

*msmith2@csir.co.za

BW 5: Blueprint for large-scale, operational, Earth Observation-based systems for Harmful Algal Blooms monitoring
International Ocean Colour Science Meeting, Darmstadt, Germany, 2 December 2025



Find us:
Department of Forestry,
Fisheries & the Environment



Follow us:
@EnvironmentZA



Follow us:
EnvironmentZA



Follow us:
@Department of Environmental Affairs

www.dffe.gov.za

<https://ocims.environment.gov.za/>



Forestry, Fisheries and the Environment
Science, Technology and Innovation

NATIONAL
OCIMS



Oceans and Coastal Information Management System

NATIONAL OCIMS

Home About Tools Data & Resources News Contact us

NATIONAL OCIMS

The National Oceans and Coastal Information Management System (OCIMS) was developed by the Department of Forestry, Fisheries and the Environment (DFFE) in partnership with the CSIR, SAEON and SAWS through Operation Phakisa

Decision support tools for the effective governance of South Africa's oceans and coasts

- ✓ Operational tools that incorporate satellite-derived, in situ, and modelled information
- ✓ Providing decision-support services, static planning tools, and data related initiatives (e.g. data capture apps, archives)

Fisheries and Marine Aquaculture concerned about HABs



- **Abalone** are generally grown in tanks on land-based pump-ashore systems



- **Mussels** and **oysters** are cultured on in-water cages or rafts



- **West coast rock lobsters** are wild-caught in commercial, small-scale and recreational fisheries

Each industry has different environmental risk factors, but all are found in the productive southern Benguela upwelling system, where harmful algal blooms occur on a regular basis

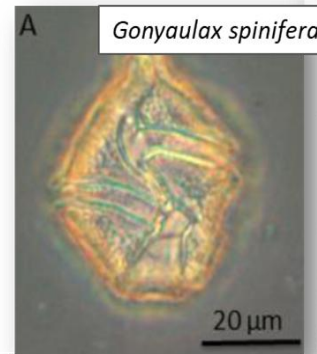
Environmental risk: Harmful Algal Blooms (HABs)

Most HABs along South Africa's coastline are caused by dinoflagellates

Blooms often occur in high concentrations [Chl-a >100 mg/m³]

Some can be harmful to farmed and wild organisms through:

- Toxicity
- Mechanical damage
- Hypoxia



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, Lynnndal 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, Sandbaal, South Africa
^f Food and Beverage Laboratory, Aspirata, Cape Town, South Africa

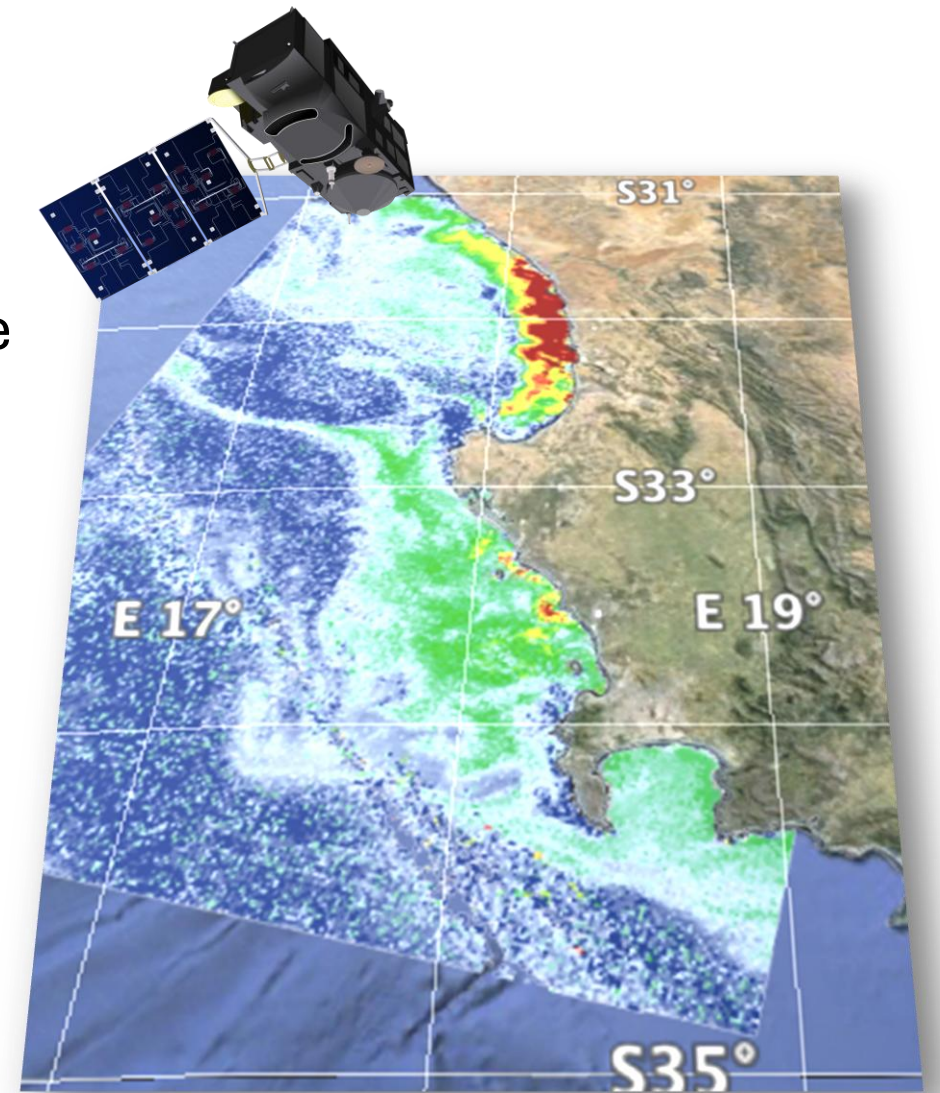
Marine Earth Observation

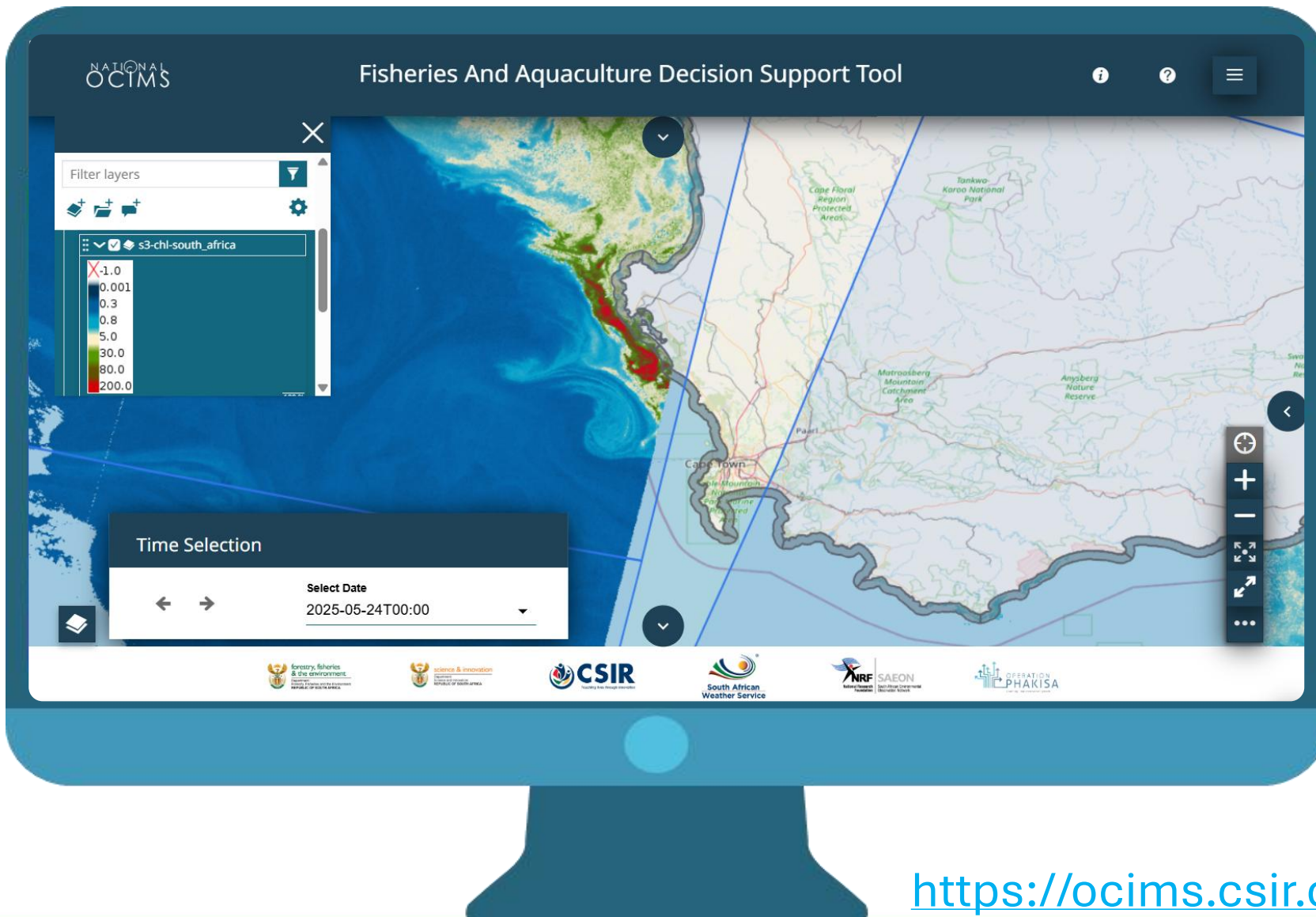
Satellites provide a synoptic overview of the system, with information over much greater space and time scales than possible with only in-water measurements

Operational use of satellite products enables

- Early detection of blooms
- Visualization of size and intensity of blooms
- Tracking the persistence of blooms over time

Which allows for improved preparedness and the ability to mitigate negative impact





Fisheries and Aquaculture Decision Support Tool

- ✓ OPEN and FREE
- ✓ Mapped satellite products over South Africa's EEZ
- ✓ Bloom analytics
- ✓ Chl-a time series charts
- ✓ Updated twice daily



<https://ocims.csir.co.za/habs/#/viewer/new>

Find us:
Department of Forestry,
Fisheries & the Environment

Follow us:
@EnvironmentZA

Follow us:
EnvironmentZA

Follow us:
@Department of Environmental Affairs

www.dffe.gov.za

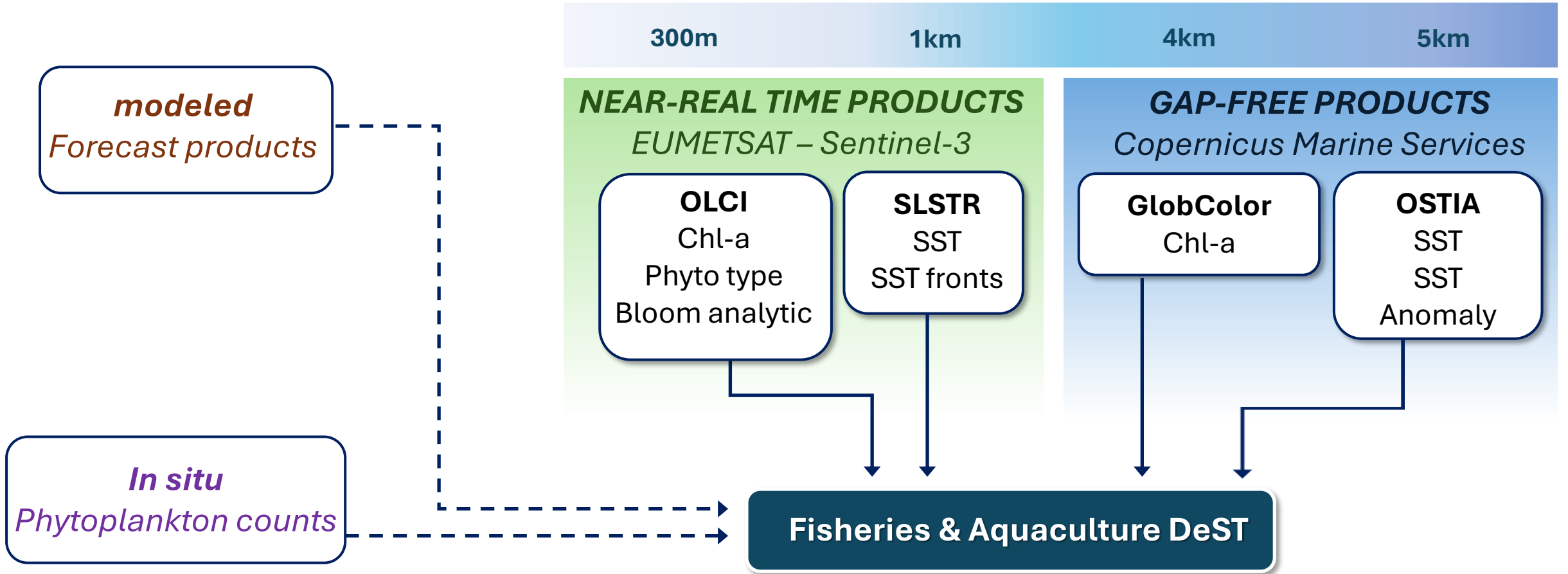
<https://ocims.environment.gov.za>



Forestry, Fisheries and the Environment
Science, Technology and Innovation

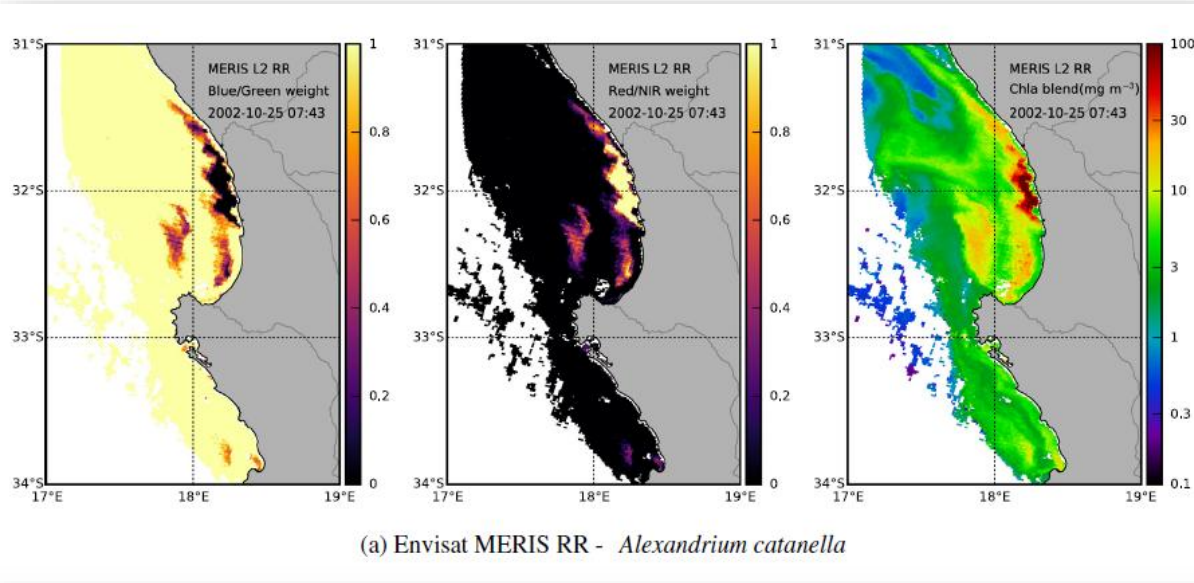


Flow of data and information

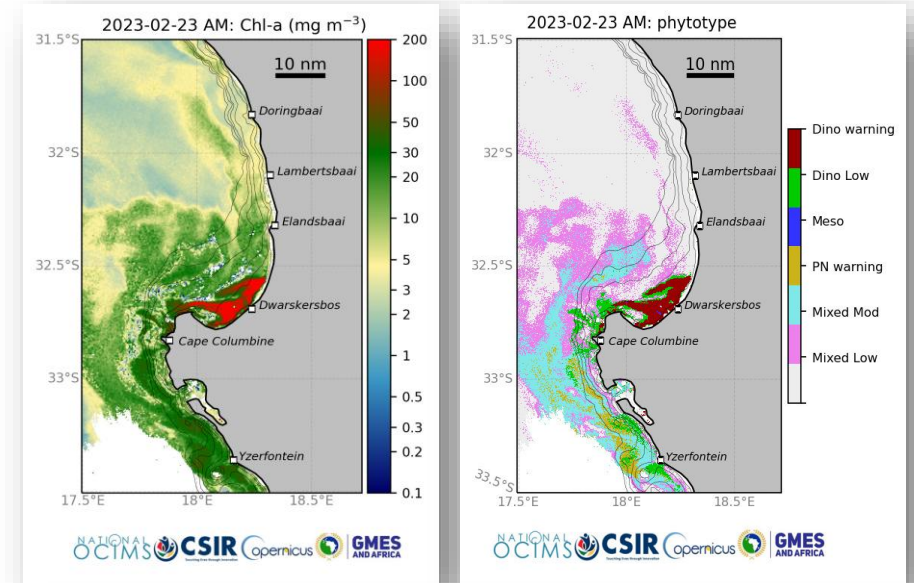


Regional aspects of the data products

- Extremely high biomass necessitated the development of regional Chl-a algorithm



- Spectral signatures assist with delineating different bloom types



Remote Sensing of Environment 215 (2018) 217–227

Contents lists available at ScienceDirect



ELSEVIER

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

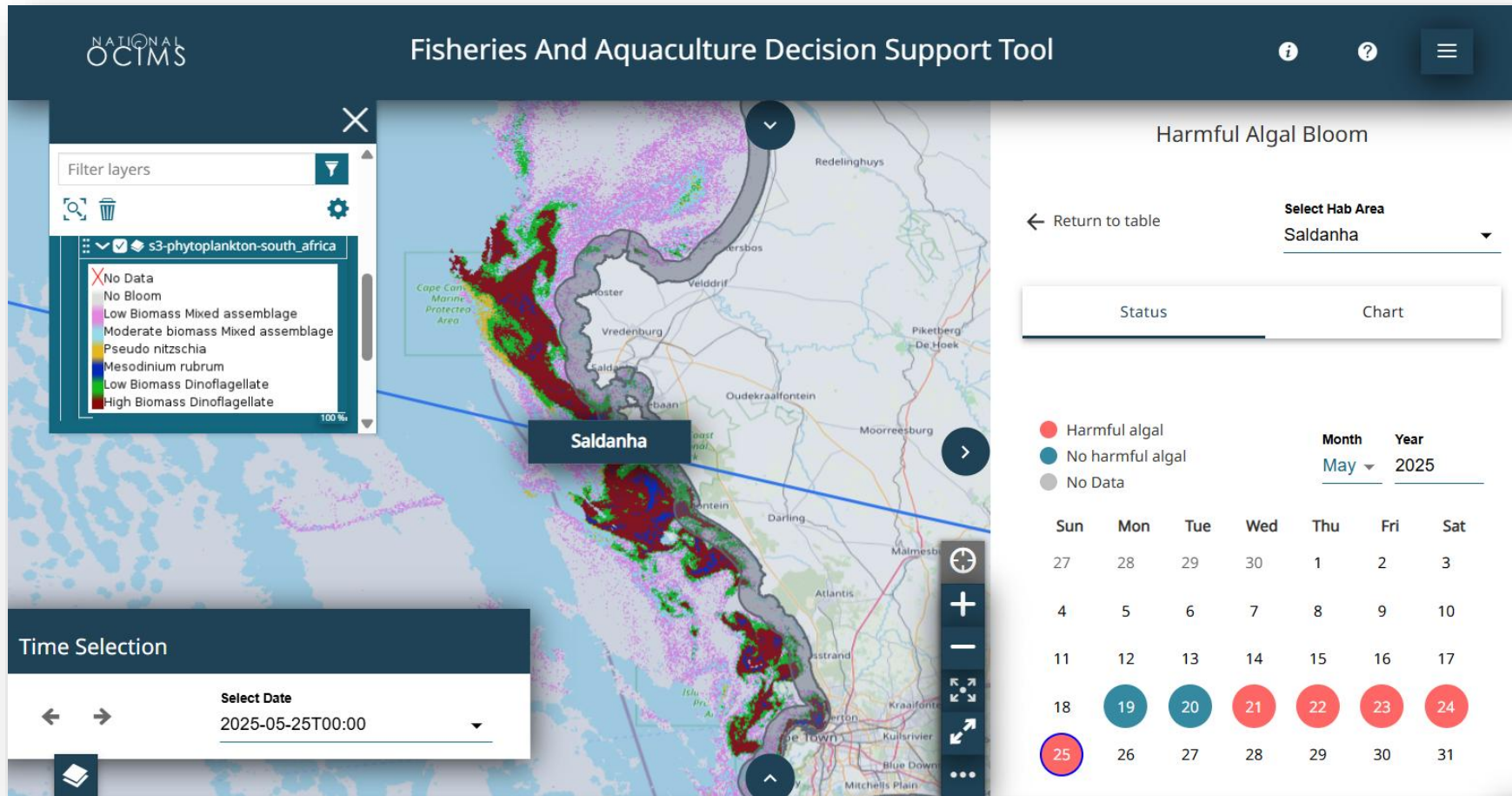
ORIGINAL RESEARCH
published: 14 February 2020
doi: 10.3389/fmars.2020.00061



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

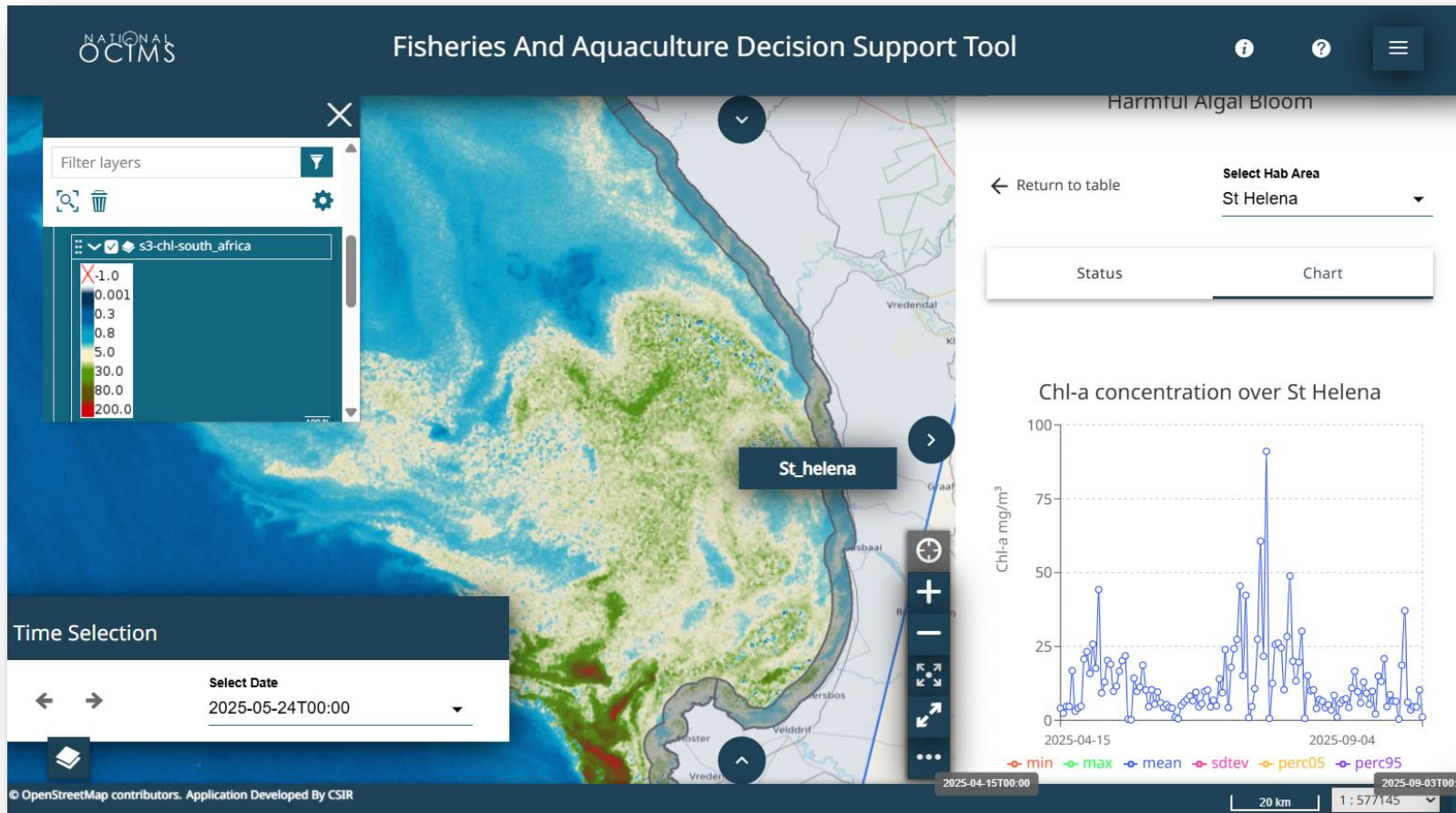
Marié E. Smith^{1*} and Stewart Bernard^{1,2}

Analytics: weekly bloom status



- ✓ 18 Coastal regions to select from
- ✓ *Weekly bloom status* indicates how many times in the past week a “high biomass dinoflagellate” bloom has been detected within a specific section of coast (i.e. a “red shift” has occurred)

Analytics: Chl-a timeseries chart



- ✓ 18 Coastal regions to select from
- ✓ *Timeseries chart* shows the statistics for Chl-a concentration over a specific section of coast

Considerations

❑ HAB Risk vs Impact

- Generally the EO-based tools/products only provides an indication of risk, not a definitive conclusion

❑ Don't only rely on Chl-a

- Where possible make use of spectral features, RGB images, and/or combinations of different products

❑ There's probably always going to be regional aspects

- Different environments/regions = different HABs = differences in optics, detection thresholds, impacts
- Often the operational tool/service is user-driven; different questions to answer, different decisions to make

Thank you for your attention

Contact : MSmith2@csir.co.za



Scan for access to the OCIMS Fisheries and Aquaculture Decision Support Tool