

Observations of HABs in the Shetland Islands, IFCB installation and operation

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A partner of



**THE
DATA LAB**
value from data



Scottish Government
Riaghaltas na h-Alba
gov.scot

marinescotland

UHI | SHETLAND

GlobalHAB symposium on automated in situ observations of plankton

IFCB - Installation

Located in former hatchery pumphouse at UHI
Shetland, Scalloway.

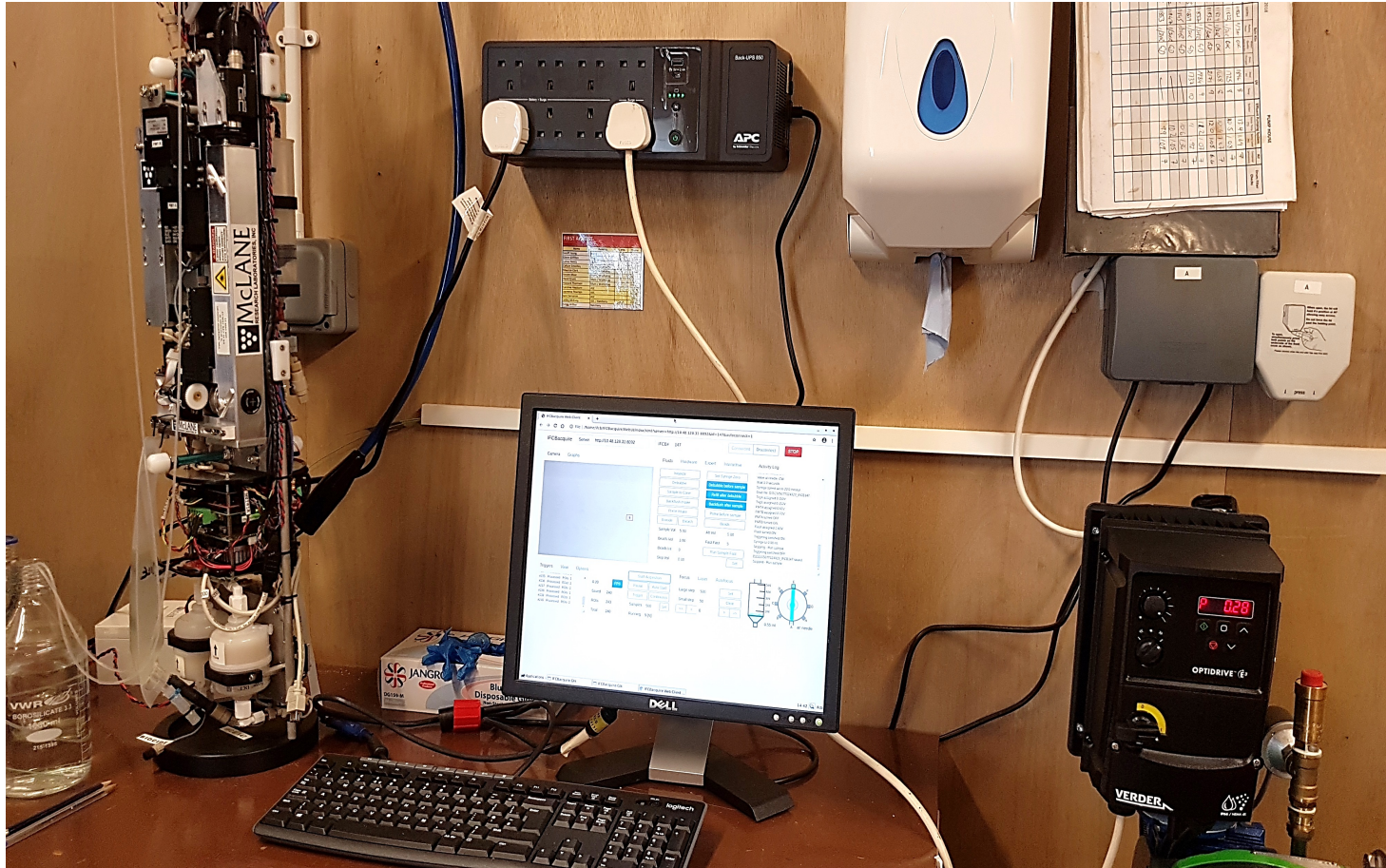


IFCB - Installation

- Intake pipes for IFCB were fed through existing, large diameter water pipes for protection.
- Pipes were fitted with a slotted sleeve to filter large pieces of seaweed or other flotsam

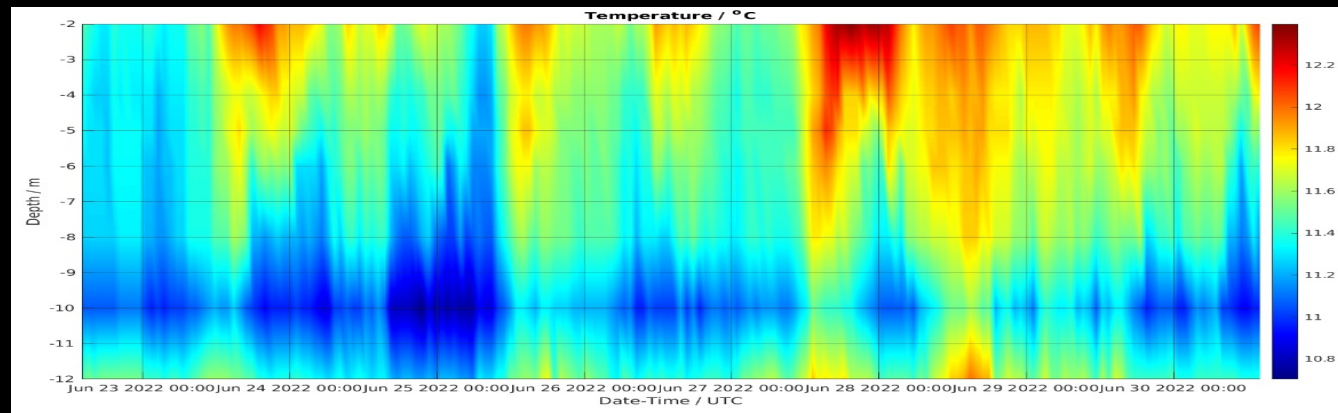


IFCB Installation

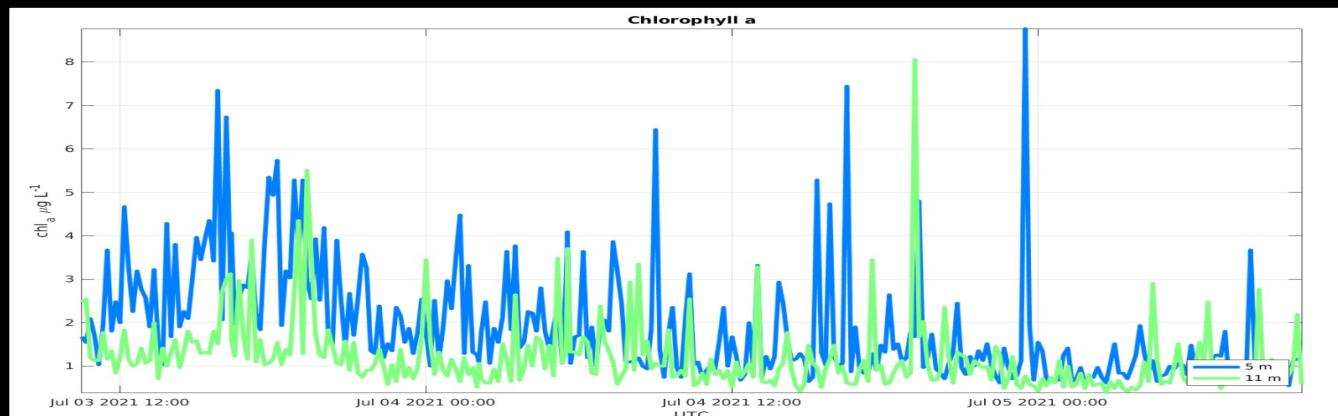


OptiCAL sensor chain

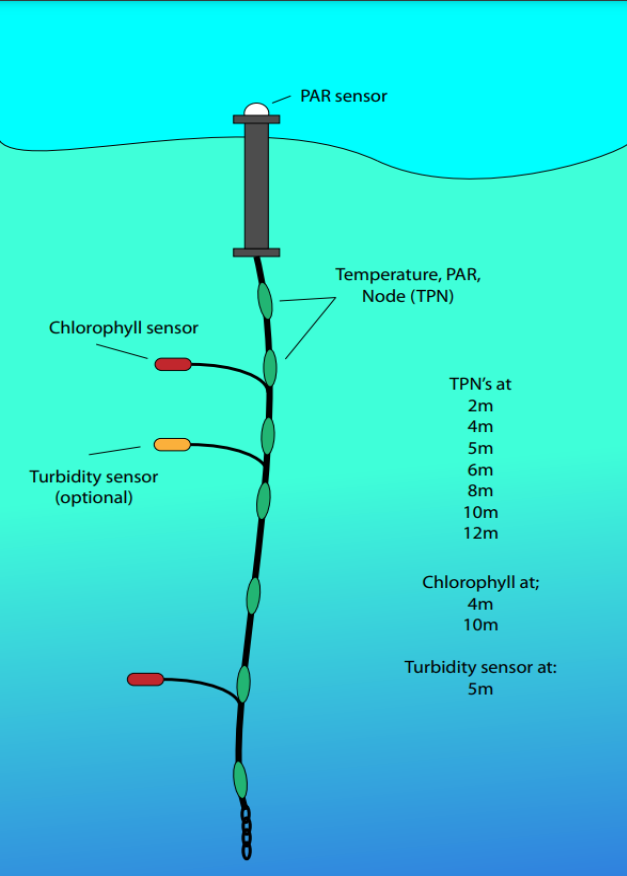
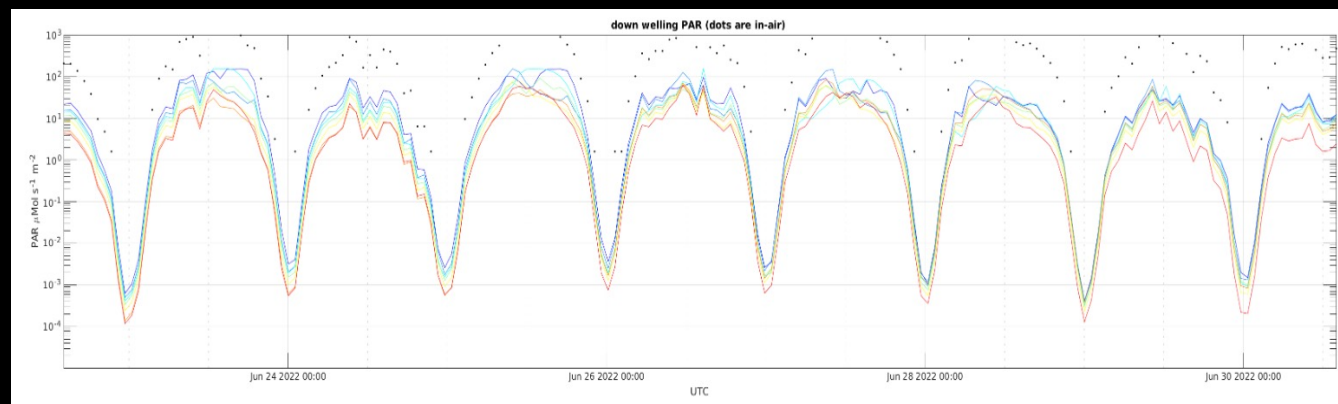
Temperature $^{\circ}\text{C}$



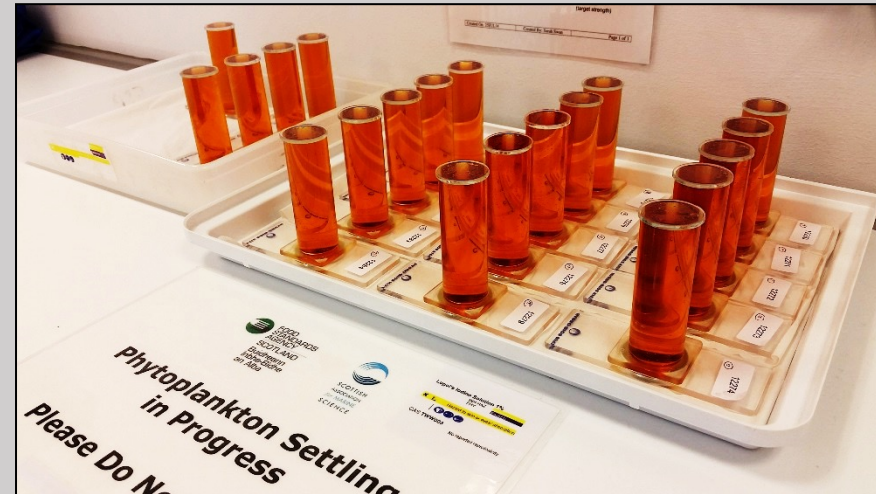
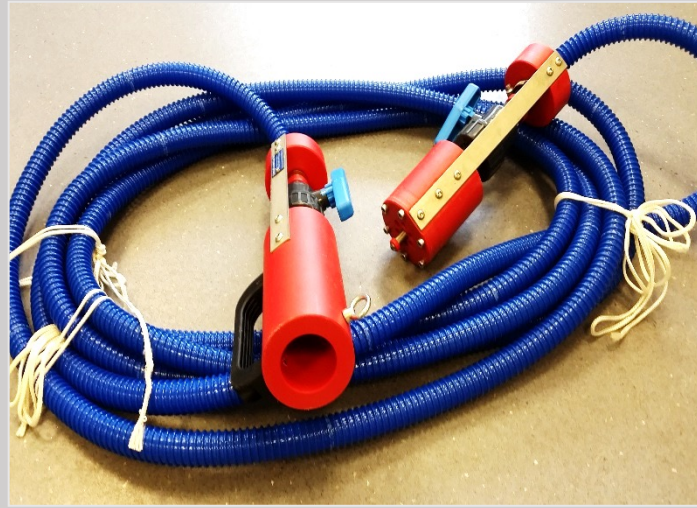
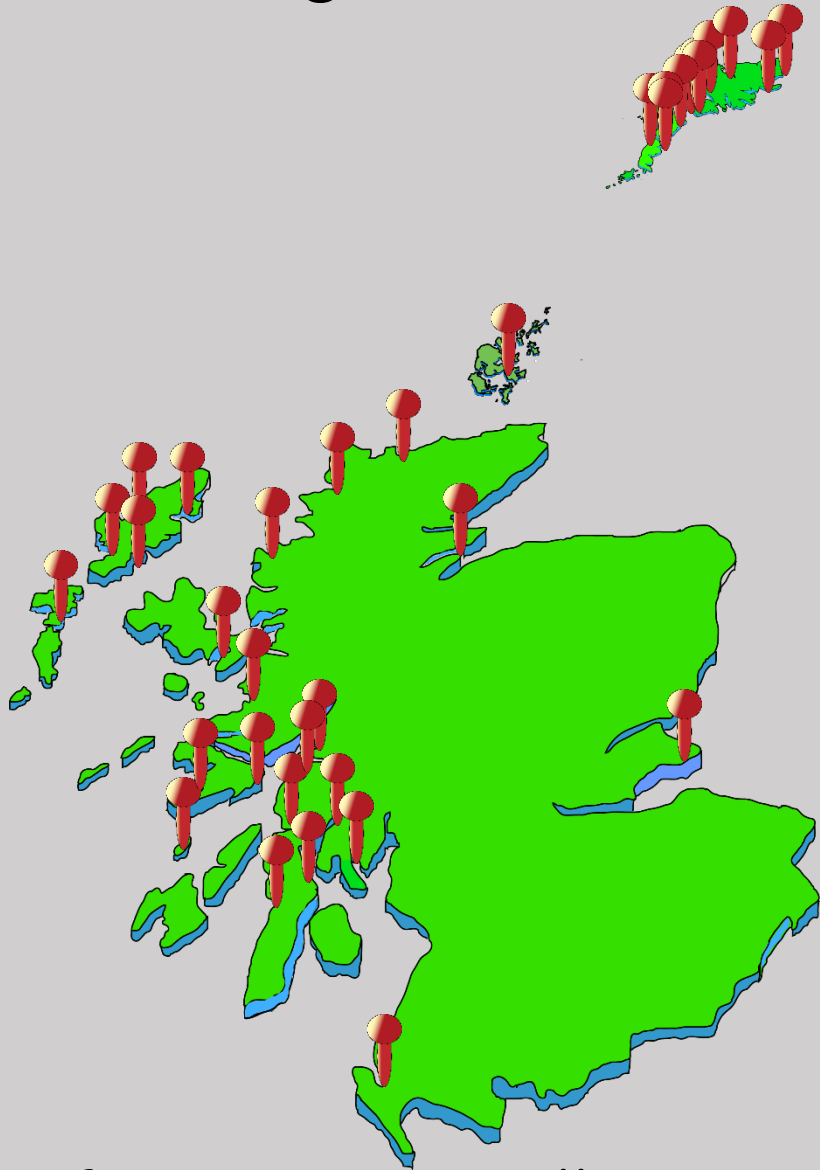
Chlorophyll



PAR



Monitoring for Toxin Producing Microplankton in Scottish Waters



As Of 2021 SAMS will monitor 40 active shellfish growing sites weekly - analysing approximately 1250 samples during the year

Shetland suspends mussel harvesting after food poisoning

70 people report symptoms consistent with having consumed shellfish toxins, some in restaurants owned by Belgo chain

James Meikle

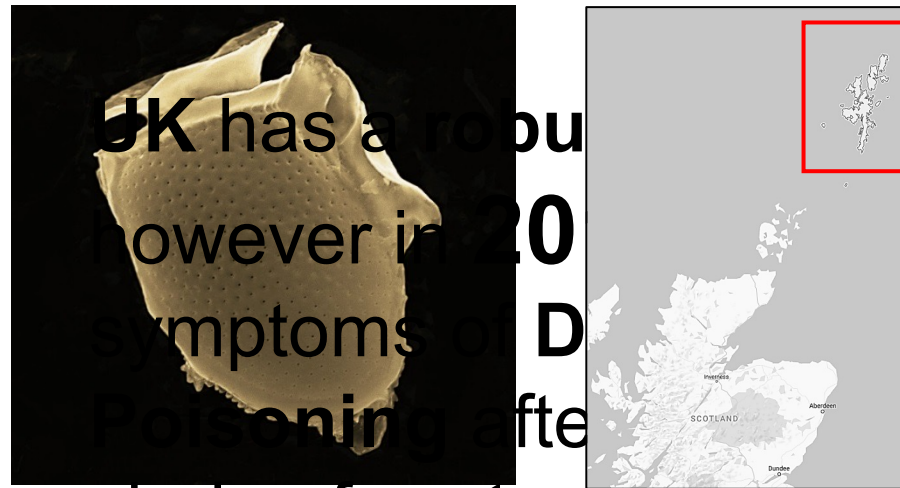
The Guardian, Thursday 25 July 2013 18.42 BST



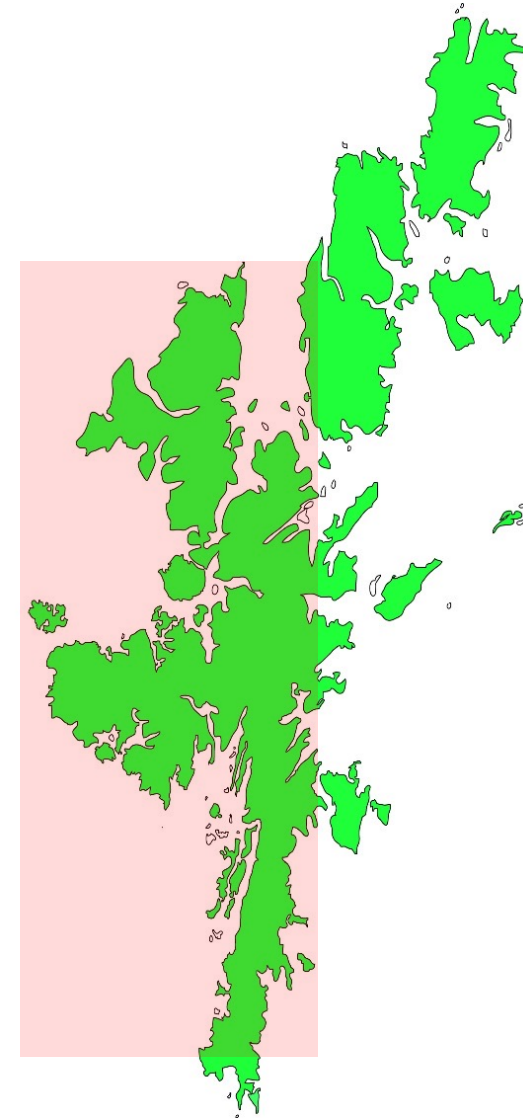
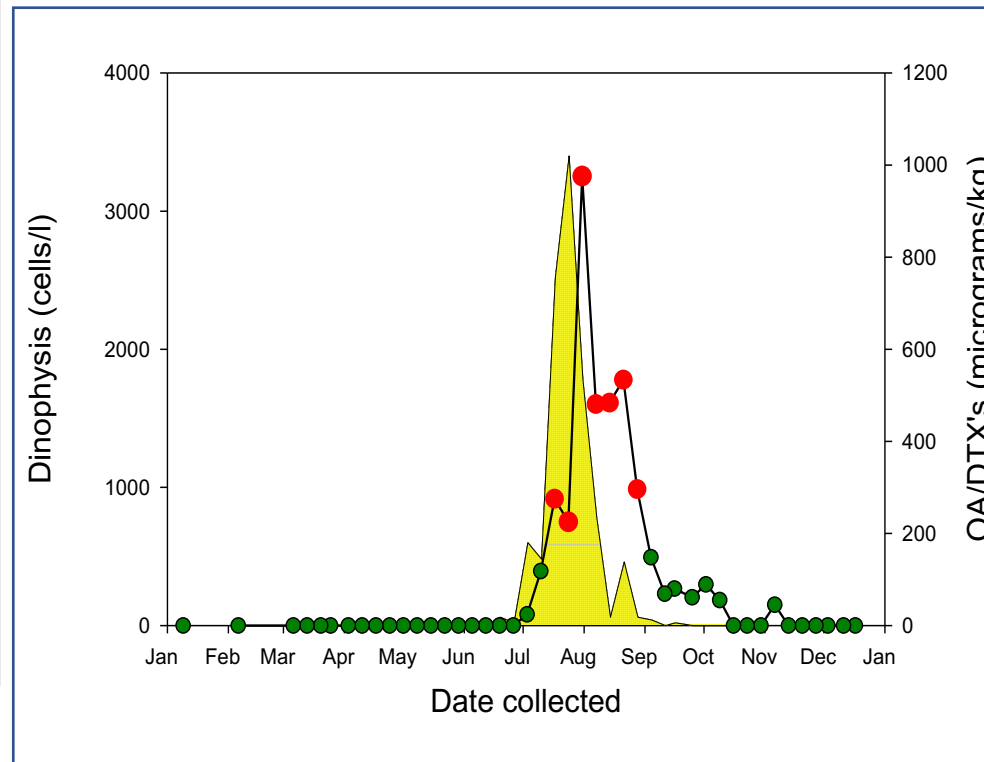
Shetland Mussels says all the mussels from the affected batch have either been eaten or disposed off. Photograph: Jerry Lampen/EPA

The mussels industry in Shetland has suspended all commercial harvesting after food poisoning incidents linked to restaurants belonging to the Belgo chain and others in south-east England.

About 70 people have reported symptoms consistent with having consumed shellfish toxins, most between 10 and 12 days ago, the UK Food Standards Agency) said. The company that supplied the shellfish, Shetland Mussels, says all the mussels from the affected batch have either been eaten or disposed off. Other farmers have voluntarily



UK has a problem with food poisoning however in 2010 symptoms were reported in a chain of restaurants in





SO
MUCH
TO SEA...



Shetland Bulletin on the status of harmful & toxic algae Week 24, 8th - 14th Jun 2020

Biototoxin report:

- PSP toxins:** Ten sites were tested this week. Toxins were not detected.
- DSP toxins:** Fourteen sites were tested this week. Toxins were detected in low concentrations in Braewick Voe and Scarvar Ayre.
- ASP toxins:** Three sites were tested this week. No toxins were detected.
- YTX toxins:** Fourteen sites were tested this week. Toxins were detected in low concentrations in Inner Site 1—Thomason.
- AZA toxins:** Fourteen sites were tested this week. No toxins were detected.

Harmful algae report:

- Alexandrium:** Twelve samples were analysed this week. *Alexandrium* was detected at/above trigger in Stream Sound, Scarvar Ayre, Sandsound Voe, East of Linga and Braewick Voe and at warning level in Seggi Bight.
- Dinophysis:** Twelve samples were analysed this week. *Dinophysis* was detected at/above trigger level in Scarvar Ayre. It was found in low numbers in Stream Sound, Braewick Voe and Sandsound Voe.
- Pseudo-nitzschia:** Twelve samples were analysed this week. *Pseudo-nitzschia* was found above trigger level in Seggi Bight and Slyde. It was found in low numbers in all other sites.
- Prorocentrum lima:** Twelve samples were analysed this week. *P. lima* was detected above trigger level in Inner Site 1—Thomason and in low numbers in Parkgate.
- Karenia mikimotoi:** Twelve samples were analysed this week. *Karenia* was detected in low numbers in East of Linga.

Shetland: trends and forecast

Alexandrium/PSP: *Alexandrium* is at/above trigger levels in many sites and while toxins have not been detected, care should be taken in those sites.

Dinophysis/DSP: We are coming into the season for *Dinophysis* and they are beginning to appear in our samples. Low levels of toxins are also being detected and we would advise caution.

Pseudo-nitzschia/ASP: While *Pseudo-nitzschia* are high in two sites, it is unlikely that bloom of *Pseudo-nitzschia* this week.

AZA and YTX: It is highly unlikely that *Yessotoxins* will exceed threshold levels this week. However, *Protoceratium reticulatum* have resulted in Yessotoxins in one site.

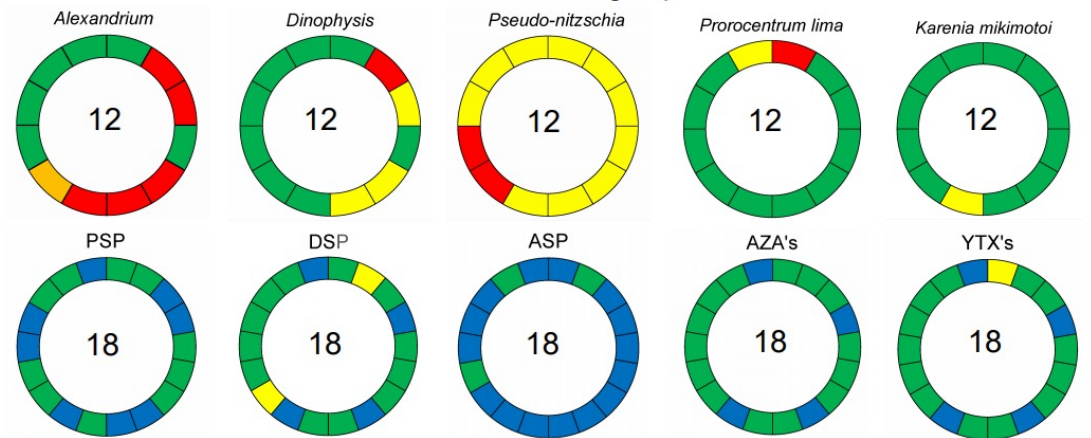
Risk for PSP: Moderate
 Risk for YTX: Low
 Risk for AZA: Low

While this bulletin is based on our expert opinion, it is not intended as a basis for harvesting or husbandry decisions. Those decisions should be based on the advice of the industry.

Blended approach:
 Same information but presented as an infographic

Shetland Bulletin on the status of harmful & toxic algae Week 24, 8th - 14th Jun 2020

Status of biotoxins & harmful algae present in Shetland



Segments - no of individual sites, Colours: Green, red, amber and yellow as per key. Blue - not analysed. Coloured segment indicates approximate position of site in Shetland

Biotoxin & Species	Green	Amber	Yellow	Red
PSP	<RL	RL - 399 µg/kg	400 - 800 µg/kg	>800 µg/kg
OA/DTX/PTX	<RL	1 - 79 µg/kg	80 - 160 µg/kg	>160 µg/kg
ASP	<LOQ	LOQ - 9.9 mg/kg	10 - 20 mg/kg	>20 mg/kg
YTX	<RL	1 - 1.7 mg/kg	1.8 - 3.75 mg/kg	>3.75 mg/kg
AZA	<RL	1 - 79 µg/kg	80 - 160 µg/kg	>160 µg/kg
<i>Alexandrium</i>	<20 cells/l	n/a	20 cells/l	≥ 40 cells/l
<i>Dinophysis</i>	<20 cells/l	20 - 79 cells/l	80 - 99 cells/l	≥100 cells/l
<i>Pseudo nitzschia</i>	<20 cells/l	20 - 39,999 cells/l	40,000 - 49,999 cells/l	≥50,000 cells/l
<i>Prorocentrum lima</i>	<20 cells/l	20 - 79 cells/l	80 - 99 cells/l	≥100 cells/l

NOTE:
 This page is intended as a quick overview of the situation in the Shetland Islands. If the status for a particular species or biotoxin is amber or red please check the relevant pages in the bulletin for more details and specific locations.

RL - reporting limit;
 LOQ - Limit of quantification



Toxin concentrations provided courtesy of the Centre for Environment, Fisheries and Aquaculture Science



Funding for these bulletins is kindly provided by EMFF

Primary data for biotoxins and biotoxin producing phytoplankton available at: <http://www.food.gov.uk/enforcement/monitoring/shellfish/algatoxin/#.UY0TkqcTQ6O>

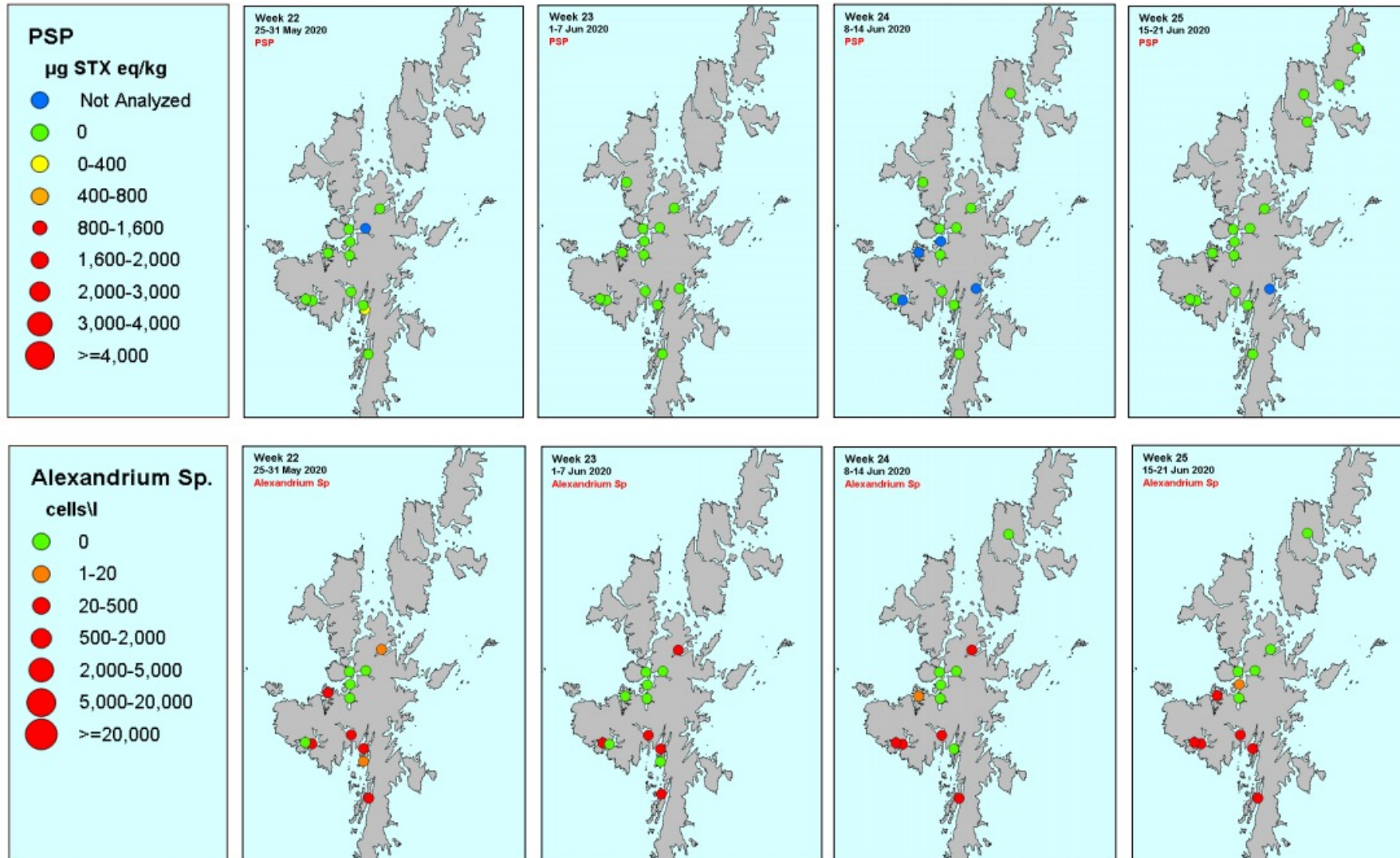
	Warning/Threshold Levels
<i>Alexandrium</i> (PSP causative)	Warning 20 cells/l Threshold 40 cells/l
<i>Pseudo nitzschia</i> (ASP causative)	Warning: 40,000 cells/l Threshold: 50,000 cells/l
<i>Dinophysis</i> (DSP causative)	Warning : 80 cells/l Threshold: 100 cells/l
<i>Prorocentrum lima</i> (DSP causative)	Warning: 80 cells/l Threshold: 100 cells/l

The maximum permitted levels are:
PSP: 800 µg/kg
ASP: 20 mg/kg
Lipophilic toxins (total OA/DTXs/PTXs): 160 µg/kg
YTXs: 3.75 milligram
AZAs: 160 microgram

Trends, Risk assessment

Shetland Bulletin on the status of harmful & toxic algae Week 25, 15th - 21st Jun 2020

Paralytic shellfish poisoning toxins & causative phytoplankton



← PSP

Maps of Sites with toxin and phytoplankton concentrations in this example the toxin is Saxitoxin and the causative species is *Alexandrium*.

← *Alexandrium*

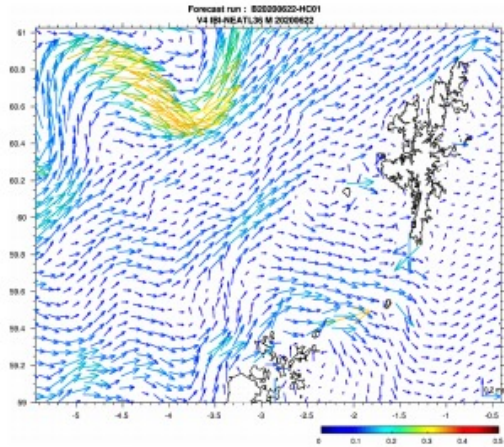
Preceding three weeks

Current week

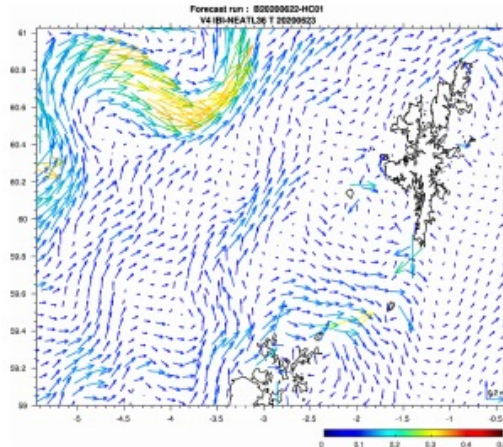
Shetland Bulletin on the status of harmful & toxic algae Week 25, 15th - 21st Jun 2020

Forecasted Sea Surface currents for the next few days

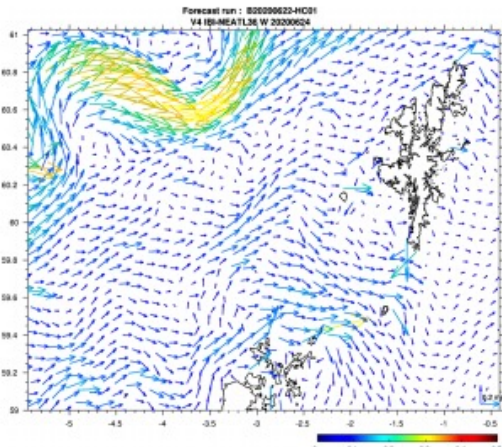
22 Jun 2020



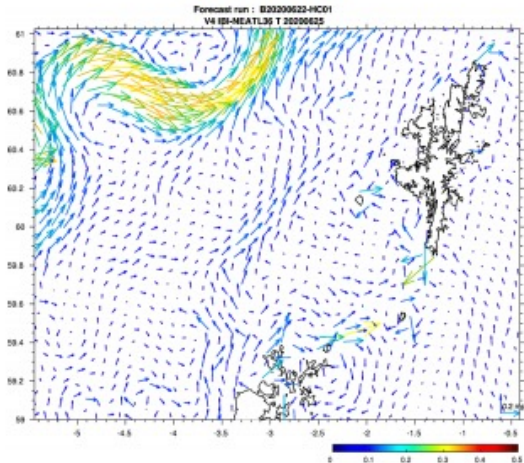
23 June 2020



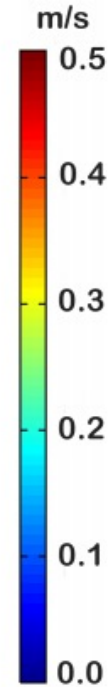
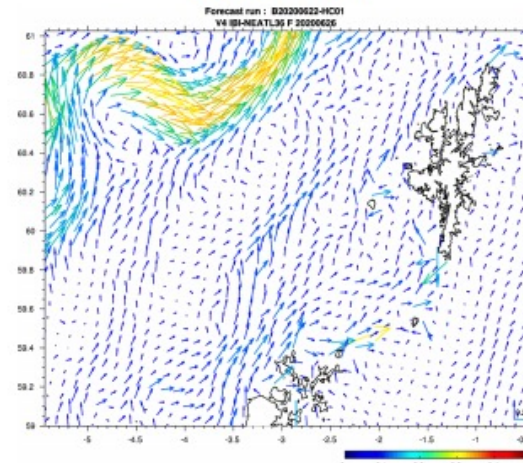
24 June 2020



25 June 2020



26 June 2020



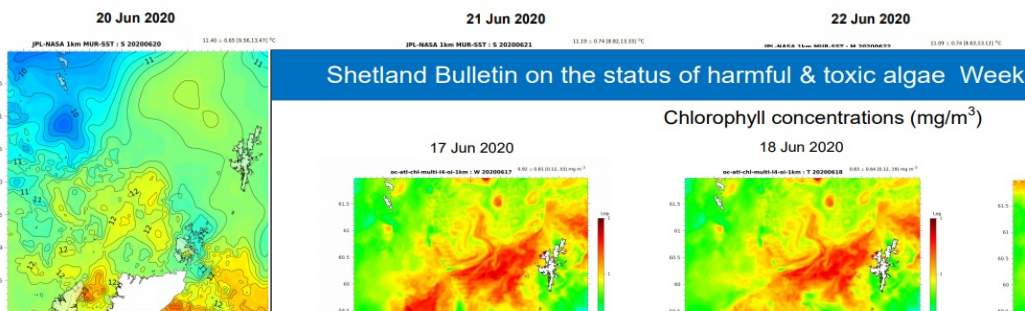
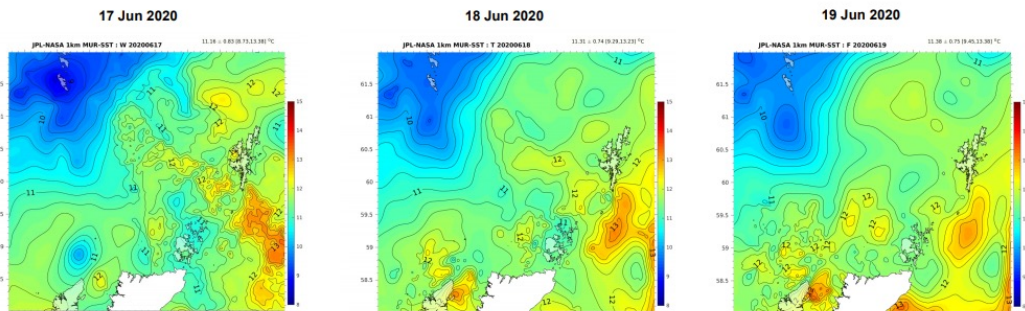
These diagrams show the predicted current directions around Shetland for the next few days. Greens to reds indicate stronger currents. In general strong currents run parallel to the deep water channel between the Faroes and Shetland. Problems can arise when these currents turn Eastwards potentially carrying *Dinophysis* and *Karenia mikimotoi* blooms, from the shelf edge, into shore.

Forecasted
Sea Surface
Currents 3 - 4
days

Sea Surface Temperatures

Shetland Bulletin on the status of harmful & toxic algae Week 25, 15th - 21st Jun 2020

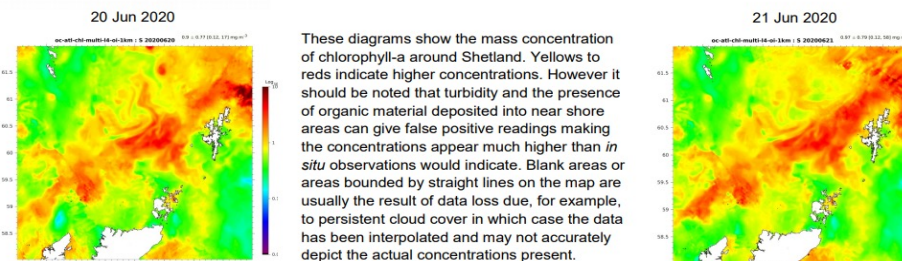
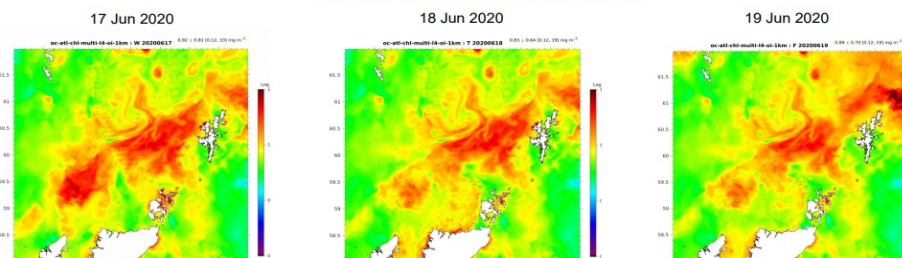
Sea Surface temperature (°C) in preceding 6 days in the Shetland Islands



Maps

Shetland Bulletin on the status of harmful & toxic algae Week 25, 15th - 21st Jun 2020

Chlorophyll concentrations (mg/m³)



These diagrams show the mass concentration of chlorophyll-a around Shetland. Yellows to reds indicate higher concentrations. However it should be noted that turbidity and the presence of organic material deposited into near shore areas can give false positive readings making the concentrations appear much higher than *in situ* observations would indicate. Blank areas or areas bounded by straight lines on the map are usually the result of data loss due, for example, to persistent cloud cover in which case the data has been interpolated and may not accurately depict the actual concentrations present.

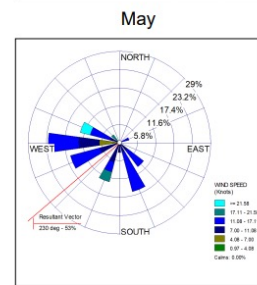
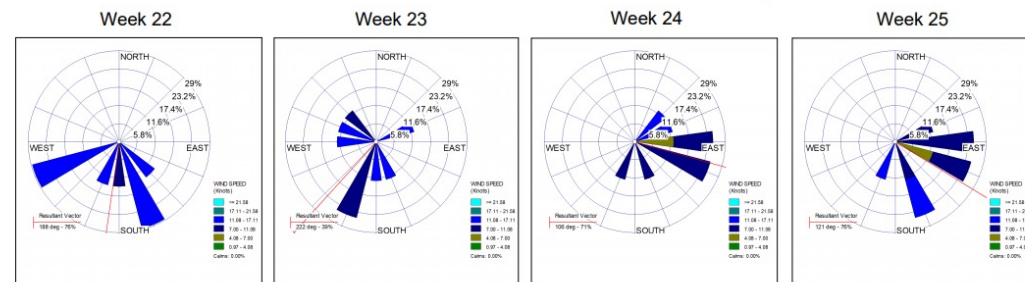
Images provided by the Ocean Colour atl-chi-L-L4 NRT-Observations-009-037dataset, courtesy of Copernicus.

Chlorophyll concentrations

Wind direction and speed

Shetland Bulletin on the status of harmful & toxic algae Week 25, 15th - 21st Jun 2020

Mean wind direction observed in Shetland for current and three preceding weeks



Status:
Over the past week the average wind direction has been from the South East

Mean wind direction and speed observed in Shetland over the past four weeks. Higher wind speeds are shown in lighter shades. The percentage of time the wind blew from any particular direction is shown by the length of the triangle. The resultant vector, represented by the red or blue line, shows the average wind direction for the week. It is based on wind direction only and includes periods of calm which are not indicated on the diagram. The data used is a combination of wind direction and speed taken from the weather stations at Sumburgh and Scatsa.

For information the mean wind direction for the month of May is also shown.

Predictions:
The risk of wind blown *Dinophysis* blooms in Shetland is **moderate** this week.
Why do we think this?
During the summer *Dinophysis* can bloom out at sea and at shelf fronts found off the West of Shetland. Westerly winds can then blow these blooms into shore. Westerly winds may also retain *Dinophysis* cells in Westerly facing voes and inlets where their numbers may increase. Wind for the past week has been predominantly from the South East it is very unlikely that there will be a wind blown bloom of *Dinophysis* this week. However *Dinophysis* numbers are on the increase and these winds can hold them in the eastern Voes allowing them to grow in situ.

Available online at: <https://www.habreports.org/>

HAB Reports
Harmful Algal Bloom, Biotoxin Monitoring and Risk Assessment

Select Map Gallery IFCB Data About Login

Map Dataset: SCOTLAND

Data Range Mode: Latest: By Specified Week:
2021 Wk 23 (Jun 07-Jun 13)

ASP (FSS-Toxin)

Reports show on map

Forecasts show on map

Sources: FSS-Phyto FSS-Toxin

Sites within current map extent: (**** indicates not on map for selected week/parameter)

zoom to site locate site

AB 029 008 04 [Not on map for selected week/parameter]
FSS TOXIN ALERT STATUS
Green
Week: 23/2021 [Mon Jun 07 - Jun 13]
No Action Required
NO DATA FOR SELECTED WEEK
NOT Latest week. Click button for Latest

8 Week history from current on map
(Click on parameter name for a long term chart history)

Parameter	year/wk ->	2021	2021	2021	2021	2021	2021	2021	2021	FSS Status
Karenia mikimotoi	16	17	18	19	20	21	22	23	2021	N/A
Pseudo-nitzschia_Sp	●	●	●	●	●	●	●	●	●	Green
Alexandrium_Sp	●	●	●	●	●	●	●	●	●	Green
Dinophysis_Sp	●	●	●	●	●	●	●	●	●	Green
Prorocentrum lima	●	●	●	●	●	●	●	●	●	N/A
Pseudo-nitzschia delicatissima group	●	●	●	●	●	●	●	●	●	N/A
Pseudo-nitzschia seriata group	●	●	●	●	●	●	●	●	●	N/A

United Kingdom

London

Aberdeen

Dundee

Newcastle upon Tyne

100 km

SAMS Food Standards Scotland Cefas SAIC Shetland Islands Council

Toxin concentrations provided courtesy of the Centre for Environment, Fisheries and Aquaculture Science
[Full list of funders/Contributors for this website](#)

Select Reports

Select Models

Alert level For site

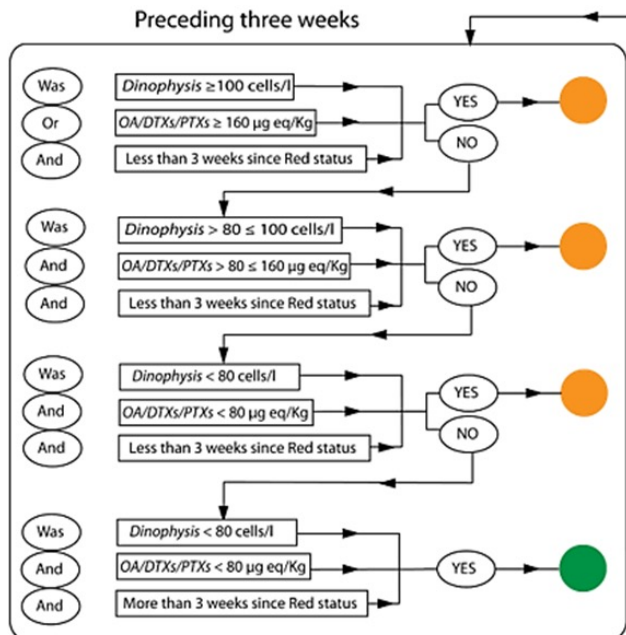
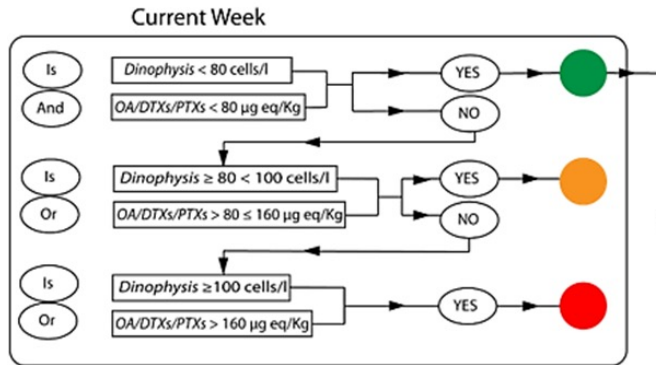
Select phytoplankton Or toxin For plot of historic events

Interactive map with several layers selected from drop down menus

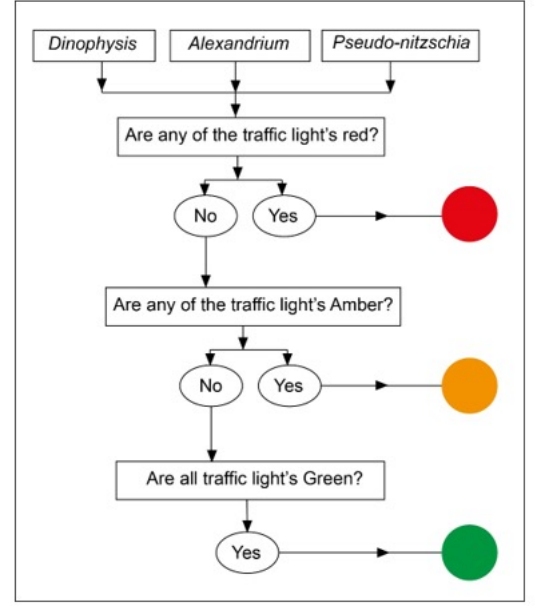
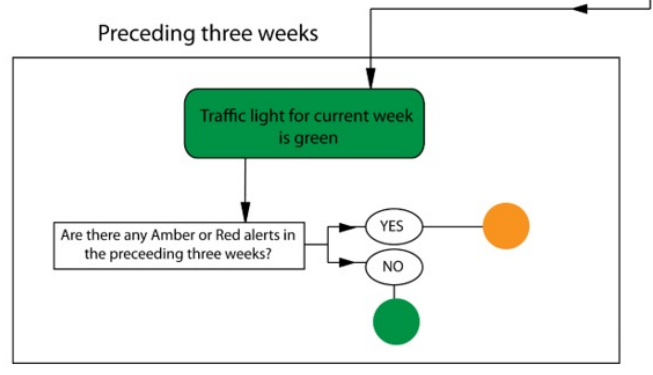
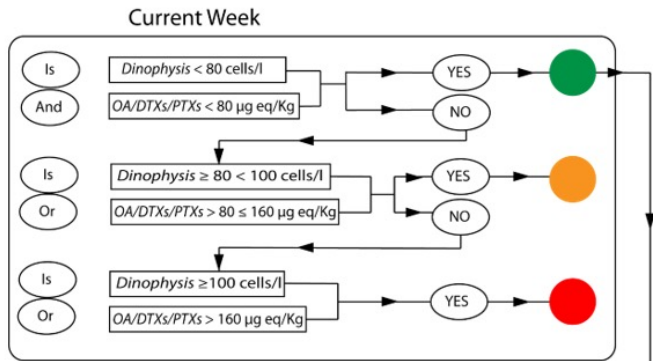
Available Model boundaries

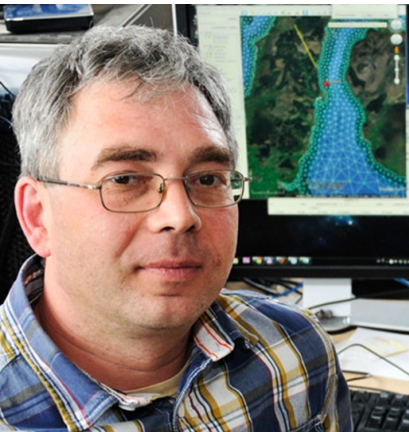
Appendix 2

Operational Instrument - Determining the traffic light status for a site.



Traffic Light Alert System





Dmitry Aleynik

Aleynik, D. Davidson, K., Dale A C., Porter, M. (2016) A high resolution hydrodynamic model system suitable for novel harmful algal bloom modelling in areas of complex coastline and topography. *Harmful Algae*, 53(3):102–117

West Scotland Coastal Ocean Modelling System (WeStCOMS)

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Harmful Algal Bloom, Biotoxin Monitoring and Risk Assessment

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Forecasts show on map | Karenia PML-03 [2/19/2021-2/24/2021]

Sites within current map extent:
AB 112 017 13: Inner Deep Site (Loch A Chumhainn: Inner Deep Site)

Karenia PML-03 03k
Fri Feb 19th 2021 12am to Wed Feb 24th 2021 12am
Total steps: 31 @ 4.0 hr(s) each

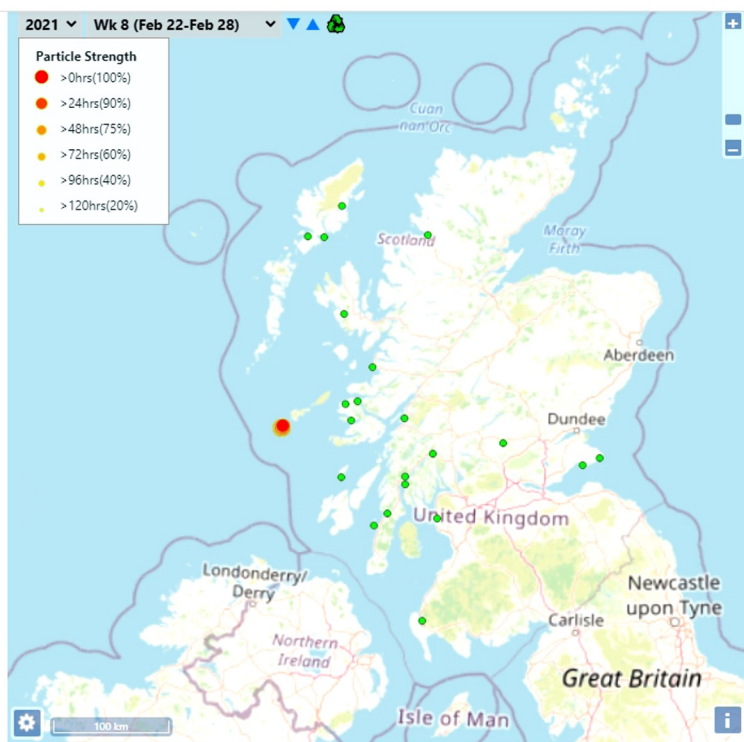
Run Forecast | Animation Speed: Fast

Fri Feb 19th 2021 12am [0 hrs]

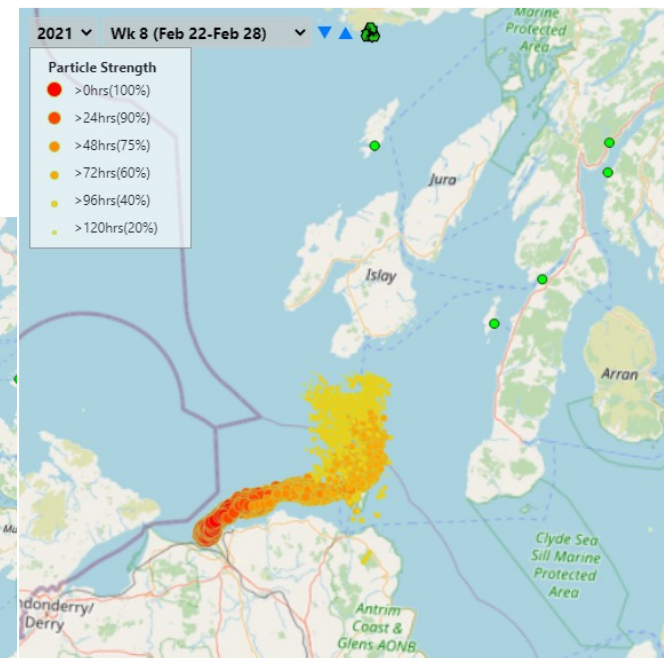
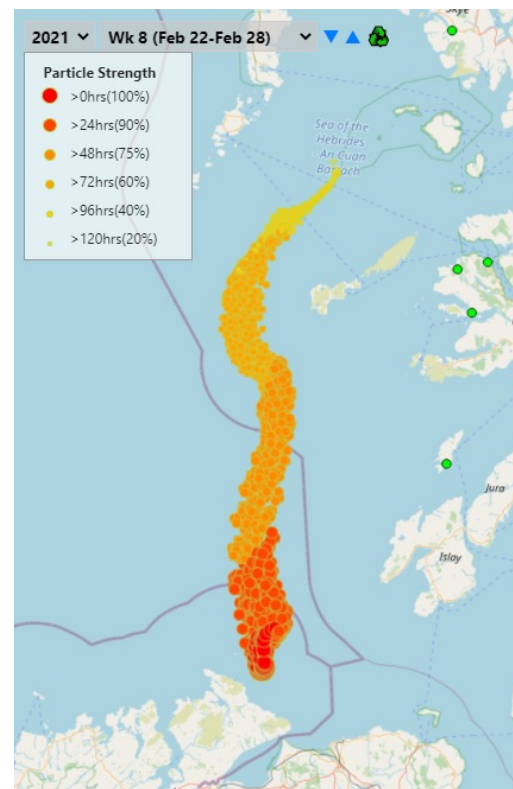
Zoom to Model

Test mode only:
 Show model trail (will slow down animation)
 Do NOT ignore points after hitting land
 Display ALL points (if on land or not)

Close

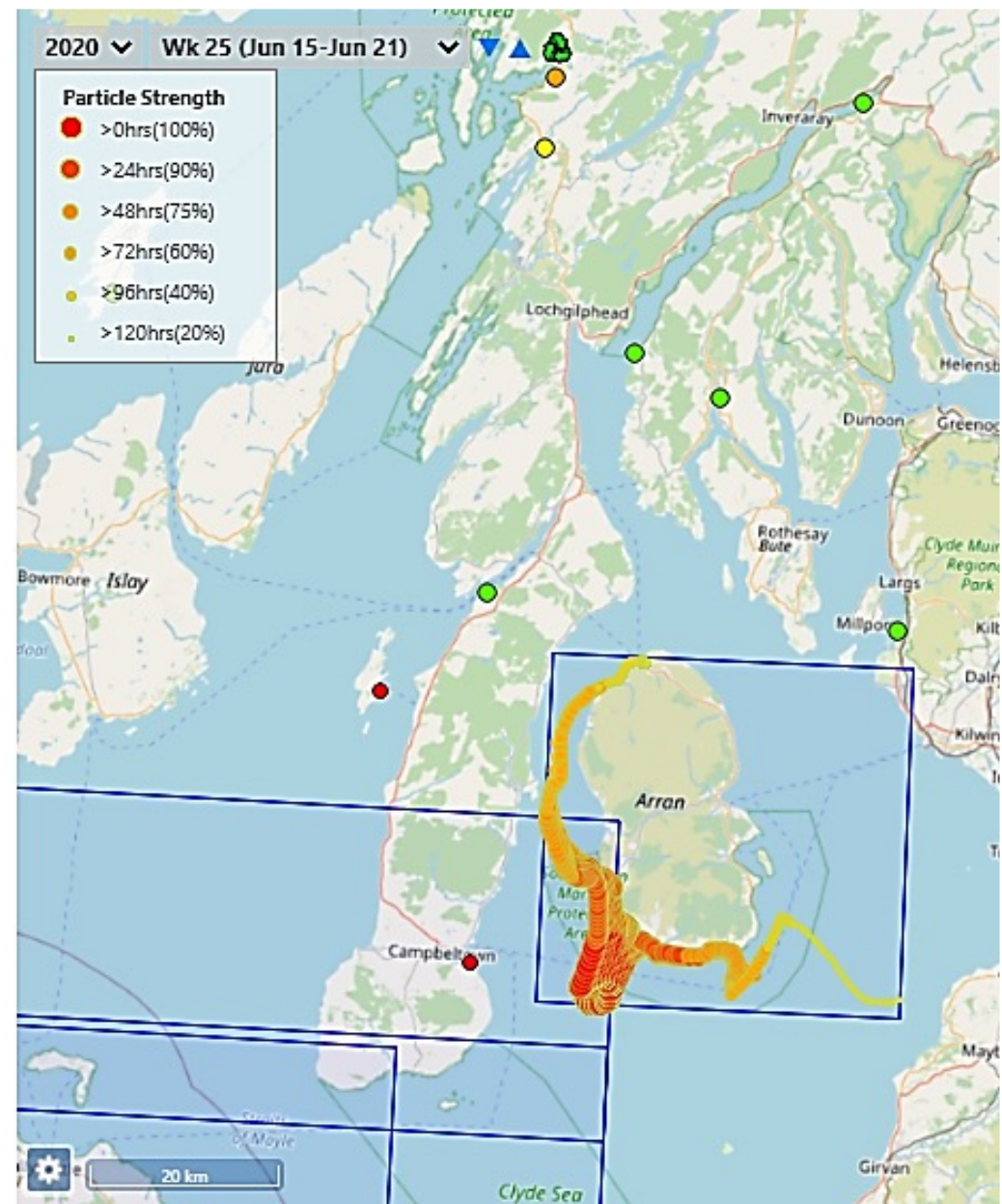
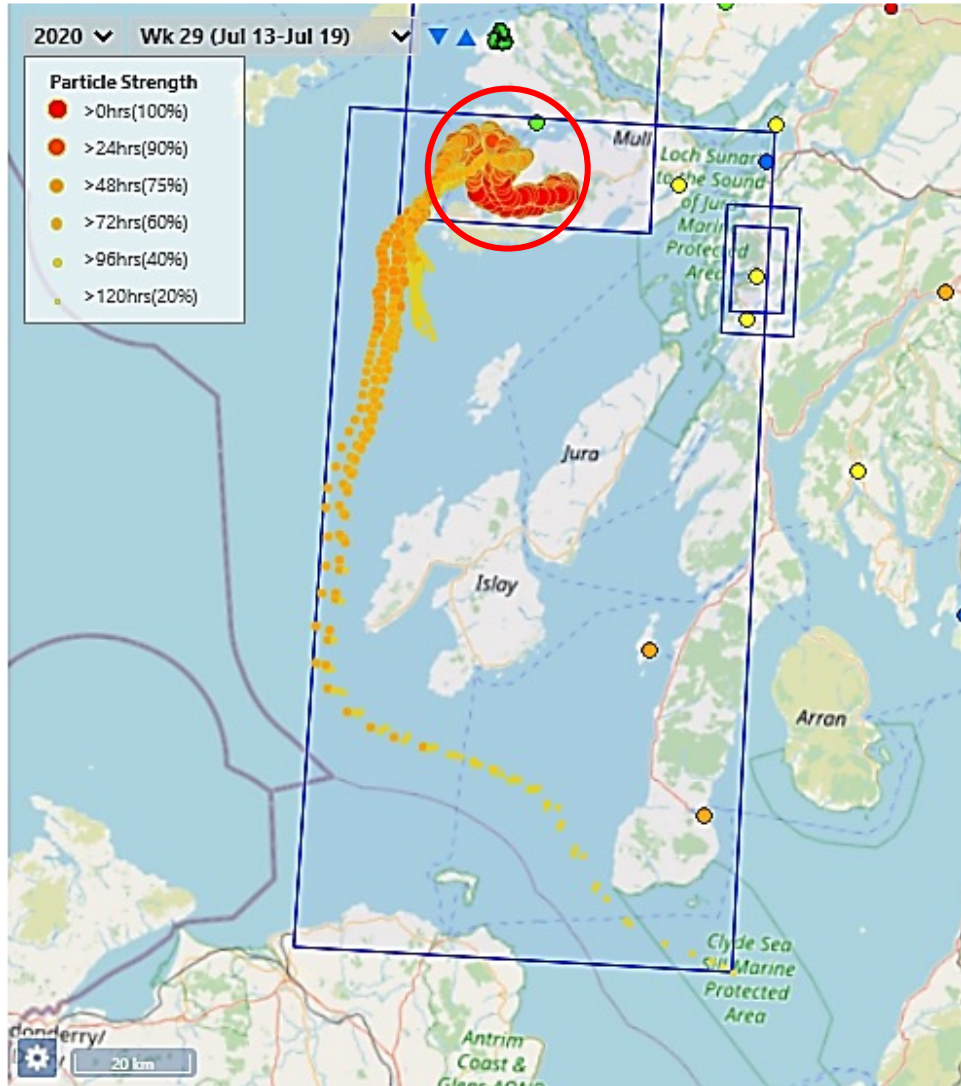


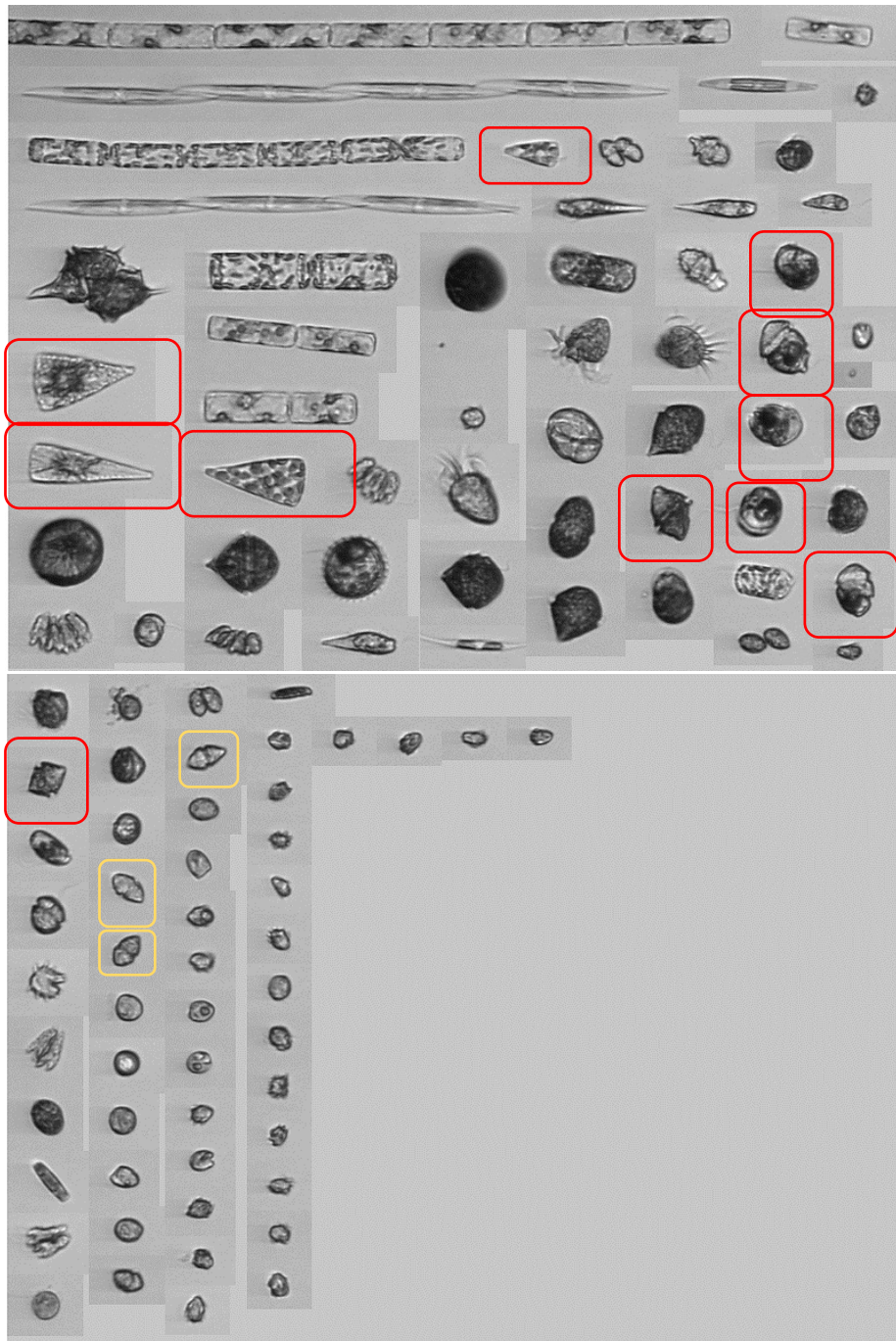
Particle trail left after model run



Colours change and size of points diminish with time

Model run triggered by high numbers of phytoplankton detected during official control monitoring





Heterocapsa triquetra

b'Heterocapsa_triquetra'	
0.643	
0	
0.02	
0.041	
0	
0	
0	
0.787	
0	
0.23	
0	
0.005	
0.198	
0	
0	
0.017	
0	
0	
0	
0.004	
0.692	
0	
0.003	
0.046	
0.001	
0	
0.002	
0.8	
0	
0.012	
0.8	
0.006	

Paola Arce



Proterothropsis

b'Proterothropsis_sp'	
0.001	
0	
0	
0.013	
0.007	
0.001	
0.016	
0	
0	
0.974	
0.001	
0.001	
0.005	
0.902	
0.079	
0	
0.877	
0	
0	
0.958	
0	
0.006	
0	
0.002	
0.003	
0	
0.003	
0.02	
0.854	

Licmophora

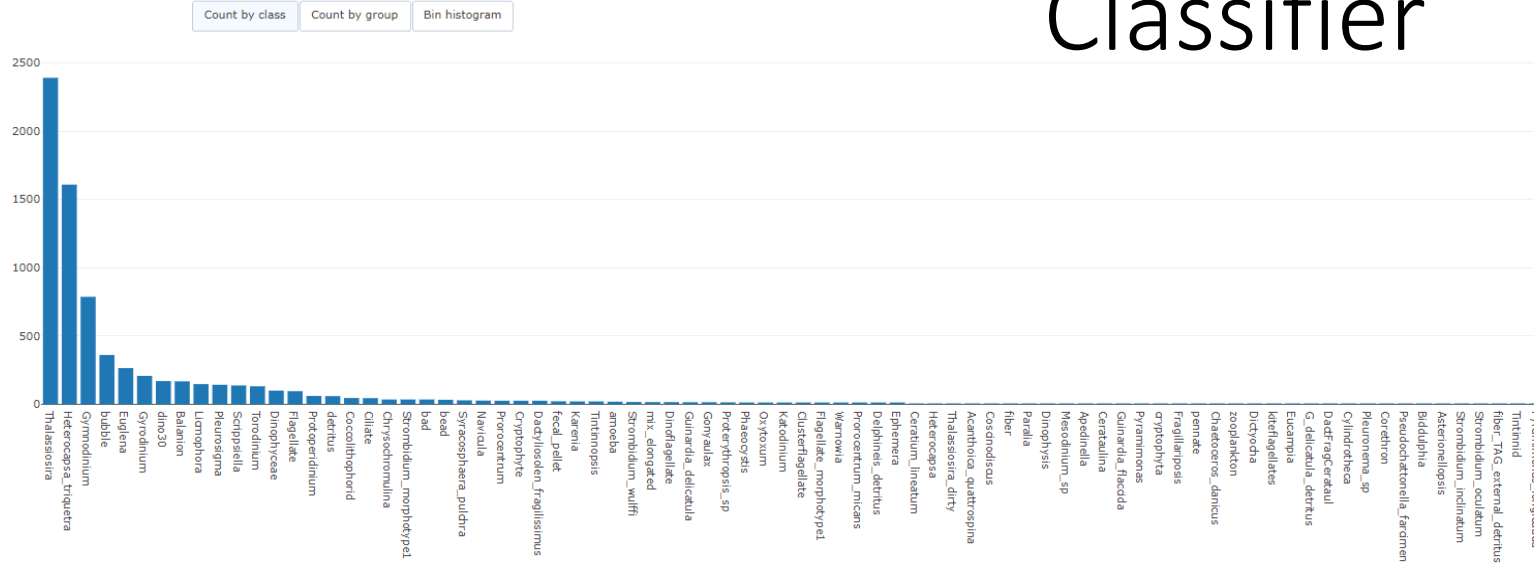
b'Licmophora'	
0.001	
0	
0	
0	
0	
0	
0	
0	
0.997	
0	
0	
0	
0	
0	
1	
0	
0.999	
0	
0.026	
0.003	
0.996	
0	

Top fig.: Total counts. Bottom fig.: Average count per ml analyzed.

Classifier



Dr Alan
MacDonald



CLASSIFIER RESULTS

Total species and group counts (aggregated)

DOWN

Start date
05/06/2022

End date
30/06/2022

FILTER

Species search... e.g. 'Cryptophyte'

- Select species classes FILTER
- Select all
 - Select all (excluding mix and unclassified)
 - Acanthoica_quattropsina
 - amoeba
 - Apedinella
 - Asterionellopsis
 - bad

CLASS	GROUP	TOTAL COUNT	Average count per ml
Thalassiosira	Diatom	2391	4.129
Thalassiosira	HAB Physical	2391	4.129
Heterocapsa_triquetra	Dinoflagellate	1609	2.913
Gymnodinium	Dinoflagellate	787	1.462
bubble	Flotsam	361	0.682
Euglena	Flagellate	265	0.608
Gyrodinium	Dinoflagellate	208	0.406
dino30	Dinoflagellate	170	0.469
Balanion	Ciliate/Tintinid	168	0.469
Licmophora	Diatom	148	0.372



HAB Reports

Harmful Algal Bloom, Biotoxin Monitoring and Risk Assessment

Select Map ▾

Gallery

IFCB Data ▾

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IFCB Data ▾

About

Shetland - Scalloway

Reports show on map

Forecasts

Sources: FSS-Phyto FSS-Toxin

Sites within current map extent: (**** indicates not on map for selected week/parameter)

SI 232 438 08: Parkgate (Olna Firth Inner)

SI 232 438 08

FSS TOXIN ALERT STATUS

Red

Week: 27/2022 [Mon Jul 04 - Jul 10]
ACTION REQUIRED



Pseudo-nitzschia Sp/ASP
Alexandrium Sp/PSP
OA/DTXs/PTXs/Dinophysis Sp

NOT Latest week. Click button for Latest

8 Week history from current on map

(Click on parameter name for a long term chart history)

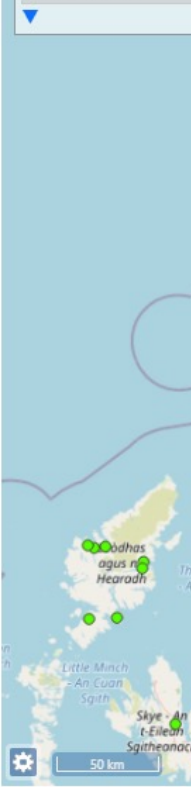
Parameter	year/wk ->	2020	2021	2022	2022	2022	2022	2022	2022	2022	FSS Status
Karenia mikimotoi	->	●	●	●	●	●	●	●	●	●	N/A
Pseudo-nitzschia Sp	->	●	●	●	●	●	●	●	●	●	Green
ASP	->	-	-	●	-	-	-	-	●	●	(Red)
Alexandrium Sp	->	●	●	●	●	●	●	●	●	●	Amber
PSP	->	-	●	●	●	●	●	●	●	●	(Green)
Dinophysis Sp	->	●	●	●	●	●	●	●	●	●	Amber
OA/DTXs/PTXs	->	-	-	-	-	-	-	-	-	-	(Green)
AZAs	->	-	-	-	-	-	-	-	-	-	(Green)
YTXs	->	-	-	-	-	-	-	-	-	-	(Green)
Prorocentrum lima	->	●	●	●	●	●	●	●	●	●	N/A

Map Dataset: SCOTLAND

Data Range Mode: Latest: By Specified Week:

2022 ▾ Wk 27 (Jul 04-Jul 10) ▾

ASP (FSS-Toxin)



HAB Reports

Harmful Algal Bloom, Biotoxin Monitoring and Risk Assessment

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EXPLORE DATA

DATA SIZE

TEMPERATURE

HEMIDITY

VOLUME ANALYZED

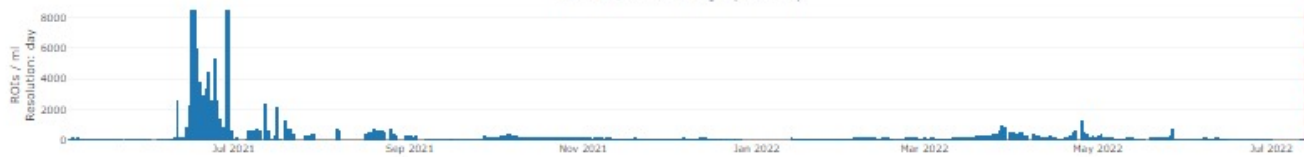
ROES / ML

TRIGGER COUNT

IMAGE COUNT

ROEs / ml
Resolution: day

16651 bins, 12934972 images (153.33 GB)



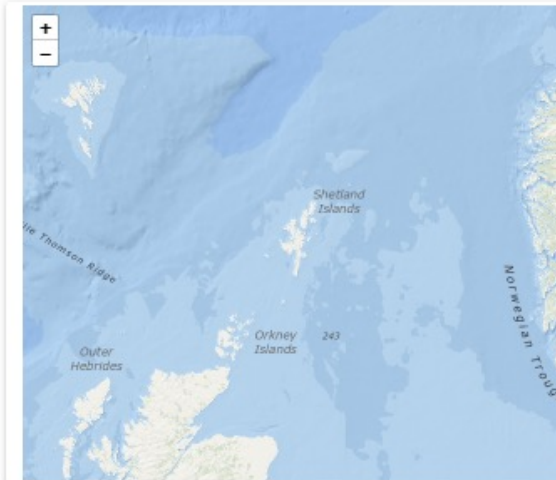
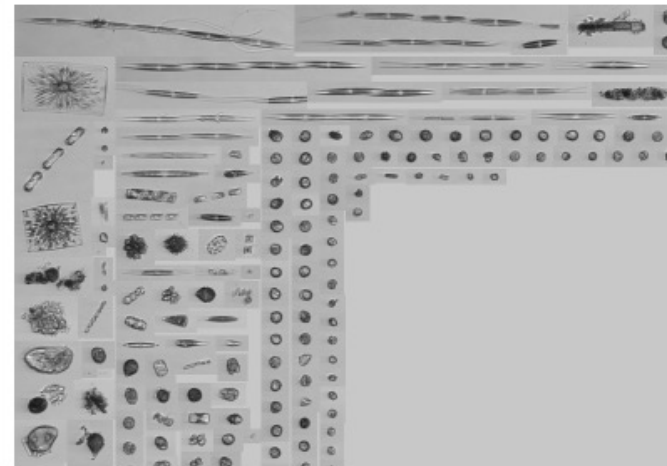
PREVIOUS BIN

Selected Bin: D20220713T092852_IFCB147

NEXT BIN

MAGNIFY

PLOT



Toxin concentrations provided courtesy of the Centre for Environ

[Full list of funders/Contributors](#)

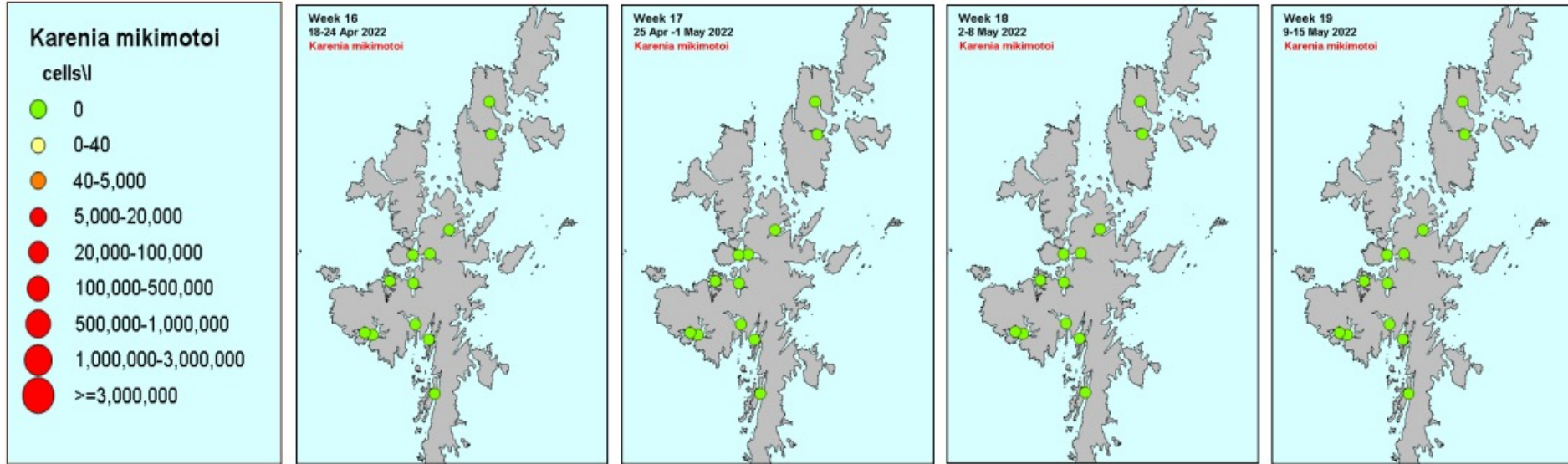


Toxin concentrations provided courtesy of the Centre for Government, Fisheries and Aquaculture Science

[Full list of funders/Contributors for this website](#)

Shetland Bulletin on the status of harmful & toxic algae Week 19, 9th - 15th May 2022

Karenia mikimotoi

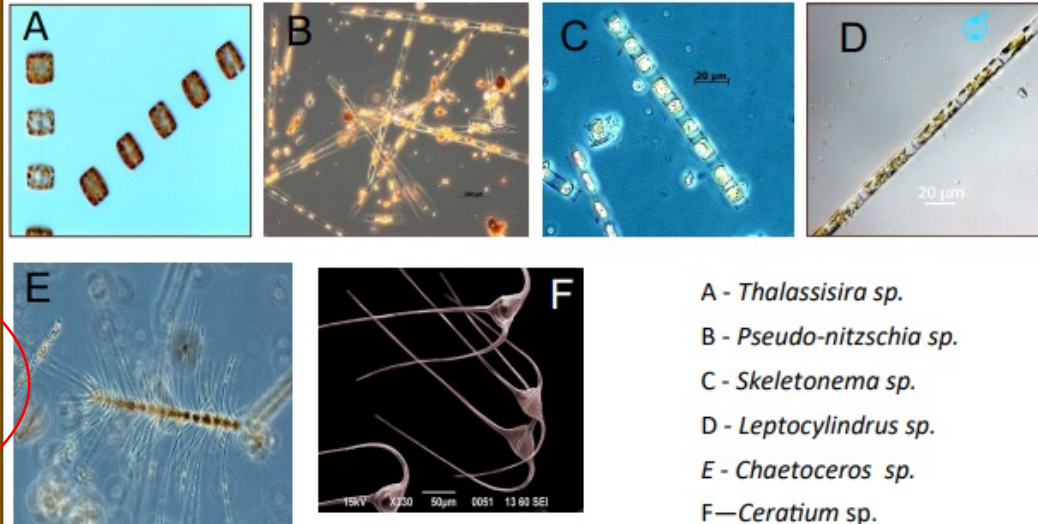


Chain forming Phytoplankton

High densities of chain forming diatoms including, but not limited to the genus, *Chaetoceros*, *Skeletonema*, *Leptocylindrus*, *Rhizosolenia*, *Thalassiosira*, *Corethron* and *Pseudo-nitzschia*, the centric species *Coscinodiscus wailesii*, and species with long spines such as *Ceratium* (*Tripes*) can cause debilitating damage to fish gills.

Status

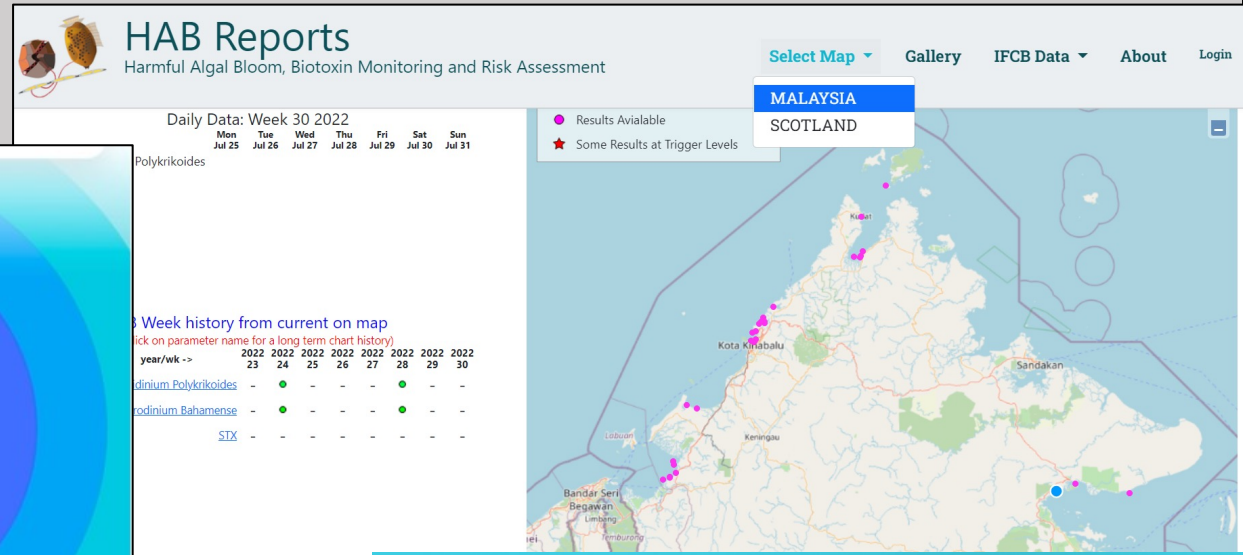
Twelve sites were sampled this week. *Karenia* was not detected. None of the sites were analysed for the presence of Chain forming algae. Images from the IFCB in Scalloway show that these diatoms have mostly disappeared and the community is still dominated by ciliates and small unidentified flagellates, although reports from local farms say they have seen large numbers of *Chaetoceros*, mainly *C. socialis*, in the water over the past two weeks, which may spread along the coast.



Work under way - Mobile Phone App



Professor LIM PO TEEN



Pyrodinium

2,100

Cells/L

Date of sample: 02/02/2021

TOXIN ALERT

Action required

All trading of seafood must cease immediately.

Contact the Department of Fisheries for further information

MalayHABS

MalayHABS App Concept

Observations of HABs in the Shetland Islands IFCB installation and operation

Callum Whyte and Keith Davidson

Callum.whyte@sams.ac.uk



A partner of



THE DATA LAB
value from data



Scottish Government
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UHI | SHETLAND

GlobalHAB symposium on automated in situ observations of plankton