

QUESTIONNAIRE

Harmful Algal Bloom and Microbial Contamination Forecasting in Ireland



This short questionnaire aims to gather opinions from shellfish and fin-fish producers to help to tailor the PRIMROSE Harmful Algal Blooms forecasting system and develop a microbial contamination early alert system to their needs.

The current HAB forecasting bulletin is maintained by The Marine Institute and is available on www.marine.ie/habs. The Marine Institute is currently developing a microbial contamination early alert system.

An example of the bulletin is available at the end of this questionnaire for any respondents unfamiliar with its current format.

1. The Marine Institute provides a weekly HAB forecast bulletin. Have you been accessing this information?

- ☐ Yes
- ☐ No

If **NO**, please give a reason why:

- ☐ Haven't heard of the bulletin before
- ☐ Do not find it useful
- ☐ Other

If **other**, please list reasons why:

2. How often do you consult the forecast bulletin?

- ☐ Daily
- ☐ Weekly
- ☐ Fortnightly
- ☐ Monthly
- ☐ Other; please specify _____

3. Have you been using the information in the forecasting bulletin to make decisions?

- ☐ Yes
- ☐ No

If **YES**, what kind of decisions?

4. In your opinion, does the forecast contain enough information to make it a useful tool?

- ☐ Yes
- ☐ No
- ☐ Not applicable

If **NO**, what additional information should be included?

5. Is there any information in the forecast which you do not find useful?

- ☐ Yes
- ☐ No

If **YES**, please provide details:

6. The HAB forecast bulletin currently covers *Dinophysis* sp (DSP), *Azadinium* (AZA), *Alexandrium* (PSP), *Pseudo-nitzschia* (ASP) and *Karenia* (fish-killing species). Would there be any other HAB species that you would be interested in?

☐ Yes

☐ No

If **YES**, please provide details:

7. Please rate usefulness of the following aspects of the bulletin (from 1 to 5):

a) Current conditions

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

1 = Very useful

2 = Quite useful

3 = Indifferent

4 = Of little use

5 = No use at all

b) Water movements (applicable to Bantry Bay, Killary and Erris Head)

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ N/A

c) Phytoplankton general observations from the previous week

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

d) Prediction of temperature, salinity and density

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

e) Satellite-derived sea surface temperature

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

f) Satellite-derived chlorophyll images

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

g) Historical trends

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

8. Currently, detailed models of Bantry Bay, Killary Harbour and Erris Head exist. What other regions/areas would you suggest detailed models be developed for?

9. Currently, if you receive an indication (either via the weekly bulletin or by other means) that a harmful event is imminent in the area where your stock animals are kept, do you have any strategies/protocols in place to mitigate stock damage/financial losses?

☐ Yes

☐ No

If **YES**, what strategies/protocols do you use, and are there any problems associated with them?

10. Once a HAB event has arrived where your stock animals are kept, do you have any strategies/protocols in place to mitigate damage/losses?

- ☐ Yes
- ☐ No

If **YES**, what strategies/protocols do you use, and are there any problems associated with them?

11. How frequently should the HAB forecasting bulletin ideally be updated?

- ☐ Daily
- ☐ Weekly
- ☐ Fortnightly
- ☐ Monthly
- ☐ Other; please specify _____

12. What is the minimum timeframe for a short-term forecast to be useful to you?

- ☐ Forecast available 72 hours in advance
- ☐ Forecast available 1 week in advance
- ☐ Forecast available 2 weeks in advance
- ☐ Other; please specify _____

13. Would a long-term (seasonal/monthly) projection be of help to you?

- ☐ Yes
- ☐ No

If **YES**, how would such a report affect any decisions you have to make?

14. Overall, how would you rate the current HAB forecast bulletin system?

☐ Excellent ☐ Very good ☐ Good ☐ Fair ☐ Poor

15. What would encourage you to consult the HAB forecast bulletin more often?

Please tick any that are applicable:

- ☐ Simplification of website bulletin
- ☐ Availability of a mobile app
- ☐ Automated alert system e.g. alert message sent directly to your mobile phone
- ☐ Other; please specify _____

16. Please provide any suggestions that would help improve the current HAB forecasting bulletin system:

17. The Marine Institute currently carries out microbial monitoring to provide information for shellfish classification, and more recently, has begun to look at viral contamination. Would a microbial contamination early alert system for certain bacterial/viral species be useful to you?

☐ Yes

☐ No

If **yes**, what information should it include? Which species would you be interested in?

YOUR INFORMATION

1. What is your main business activity? Please tick all applicable:

- ☐ Fin-fish producer (perch)
- ☐ Fin-fish producer (salmon)
- ☐ Fin-fish producer (other; please specify_____)
- ☐ Shellfish producer (abalone)
- ☐ Shellfish producer (mussels)
- ☐ Shellfish producer (oyster)
- ☐ Shellfish producer (scallops)
- ☐ Shellfish producer (hatchery)
- ☐ Shellfish producer (other; please specify_____)
- ☐ Seaweed producer
- ☐ Fin-fish processors
- ☐ Shellfish processors
- ☐ Aquaculture and seafood agency
- ☐ Seafood exporter
- ☐ Private research institute
- ☐ Public research institute
- ☐ University
- ☐ Other; please specify_____

2. Please provide the location of where most of your business activity takes place:

EXAMPLE OF A CURRENT HAB BULLETIN AVAILABLE IN IRELAND

Below are screenshots from the existing weekly Irish HAB Bulletin (available via the [Marine Institute](#)). These have been provided for any respondents that are unfamiliar with its current format. The current bulletin has a total of 13 pages.

HAB Bulletin [status of harmful and toxic algae]
Week 49 Nov 27th – Dec 3rd 2017
Week runs from Sunday to Saturday

Ireland: Predictions

ASP event: Low - steady

AZP event: **High** - weekly fluctuating

DSP event: Low - steady

PSP event: Low to very low - steady (site specific)

NMP Current closures			
ASP	AZP	DSP	PSP
0	0	0	0

ASP: Same as last week- No significant change in last 5 weeks - steady seasonal trend with no immediate issues indicated. No significant toxic species/toxin currently present .

AZP: **Highest precaution level** is still advised with this difficult species. Slight increase in some sites in toxin levels. Continued fluctuations in presence and levels of cells and toxins. This is the main historical occurrence period, suitable environmental conditions continue to prevail and the toxin is currently present and possibly increasing as warned . Issues with this toxin can occur suddenly and acutely .

DSP: same as last week -*Low caution , continued steady decline pattern in sites currently affected* . Cell levels continuing to decrease would be the expected trend with toxicity issue sites being dependant on sufficient levels of non toxic phytoplankton.

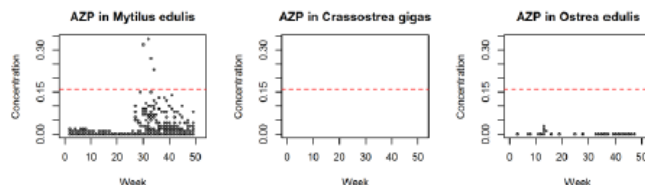
PSP: Stable seasonal pattern of very low cell levels and low likelihood of issues establishing .Current environmental conditions and patterns are not indicated to be favourable for bloom issues .

Blooms: **No current significant issues recorded with any of the historically occurring problematic species.** Any unusual water discoloration should be noted and regional labs contacted if concerned /regarding possible need for additional sampling. All feedback is welcome at Joe.Silke@Marine.ie .

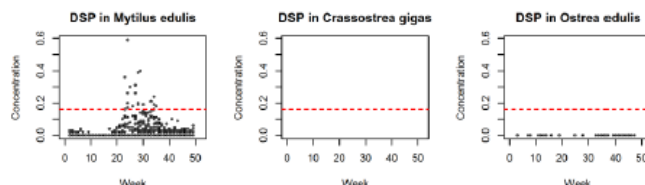
HAB Bulletin [status of harmful and toxic algae]

National Monitoring Programme

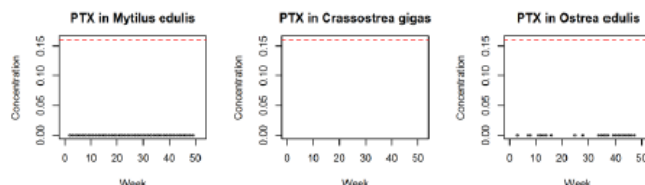
AZP



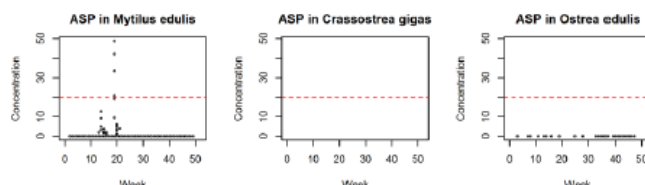
DSP



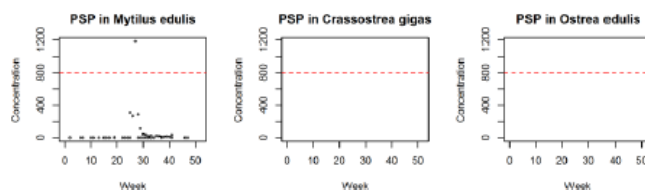
PTX



ASP



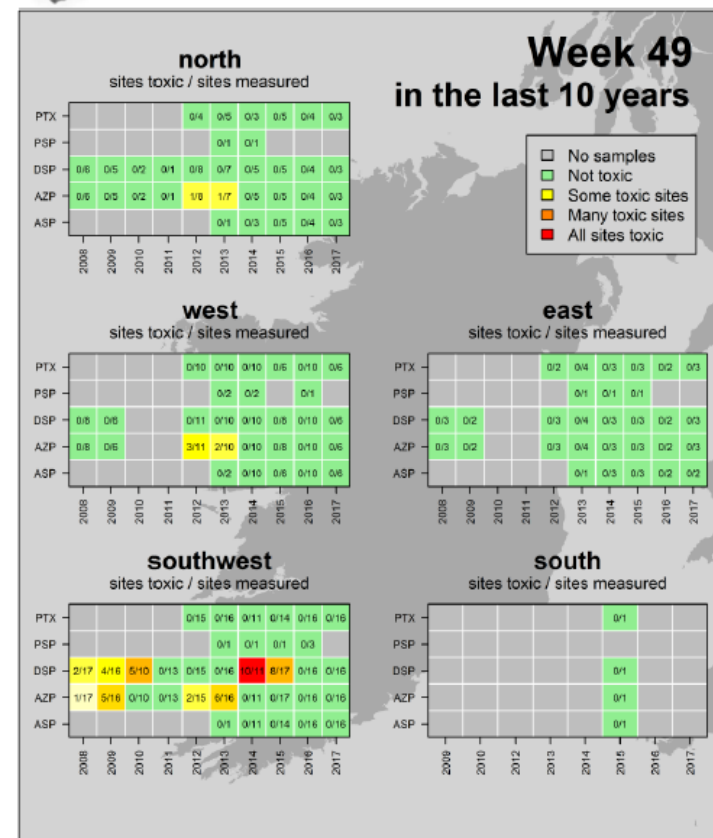
PSP



Levels from week 1 to present week. Regulatory limit -----



HISTORIC TRENDS



ASP events: mid-March to early May

AZP events: April to December

DSP events: May to December

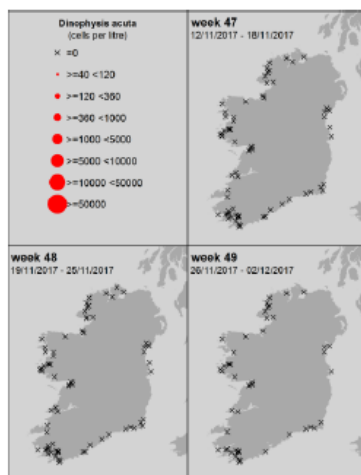
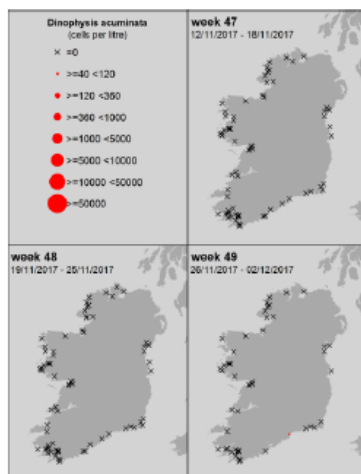
PSP events: June to mid-July and end September; only in Cork Harbour

Ireland HAB & Biotoxin Distribution maps

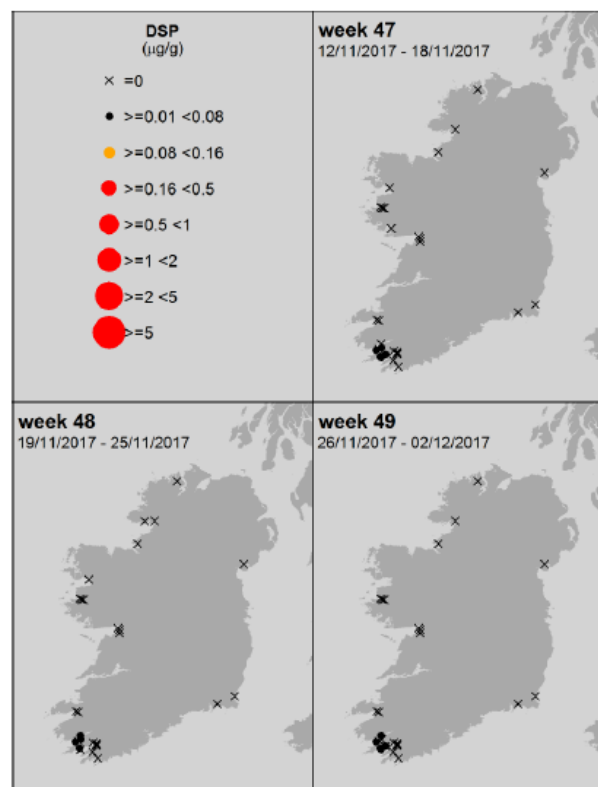
[current status of harmful and toxic algae]

DSP and Dinophysis sp. current trends

Phytoplankton species – 3 wks.



All levels of DSP biotoxin recorded- 3 wks.



Current closures levels
 \geq DSP 0.16 µg/g



Comment – Stable and decreasing - Levels continuing to decrease, in general, in affected areas. This trend would be expected to continue at this time of year. Slow rates of depuration and slight fluctuations in toxin levels, may be the main issue with this species at this time of year due to naturally decreasing levels of non toxic species of phytoplankton availability.

Ireland HAB & Biotoxin Distribution maps

[current status of harmful and toxic algae]

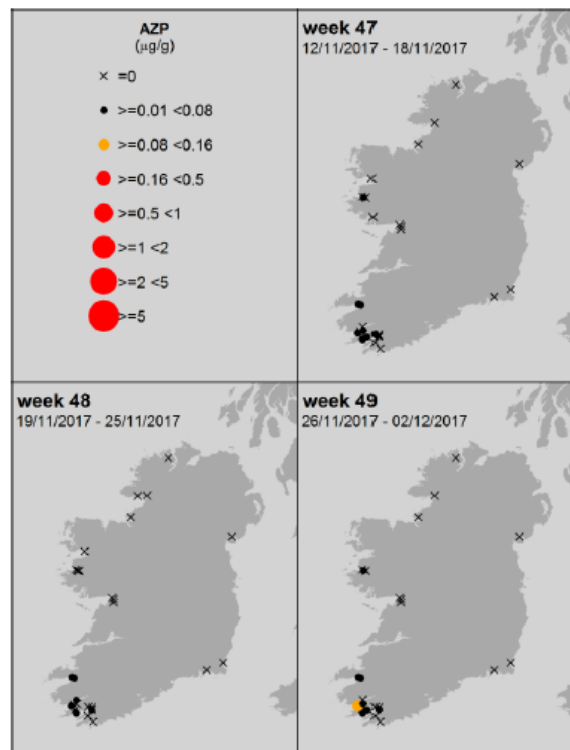
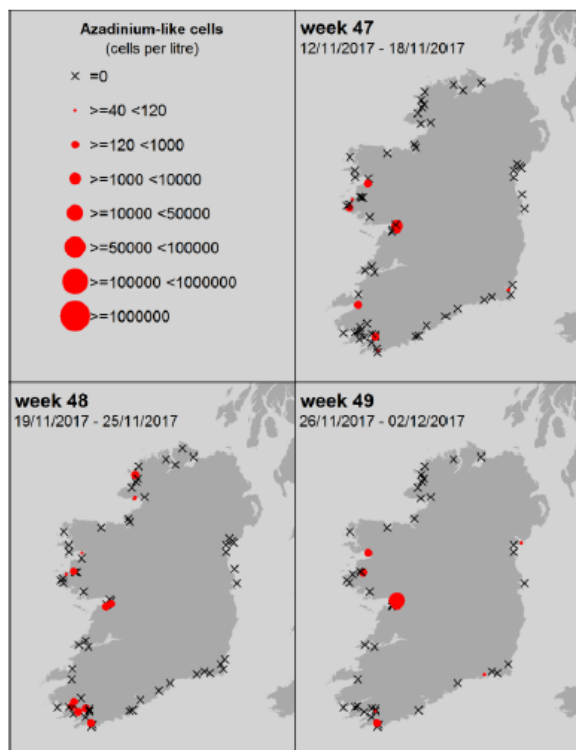
AZP and Azadinium like species current trends



Phytoplankton species – 3 wks.

All levels of AZP biotoxin recorded - 3 wks.

Current closures levels
≥ AZP 0.16 µg/g



Comments

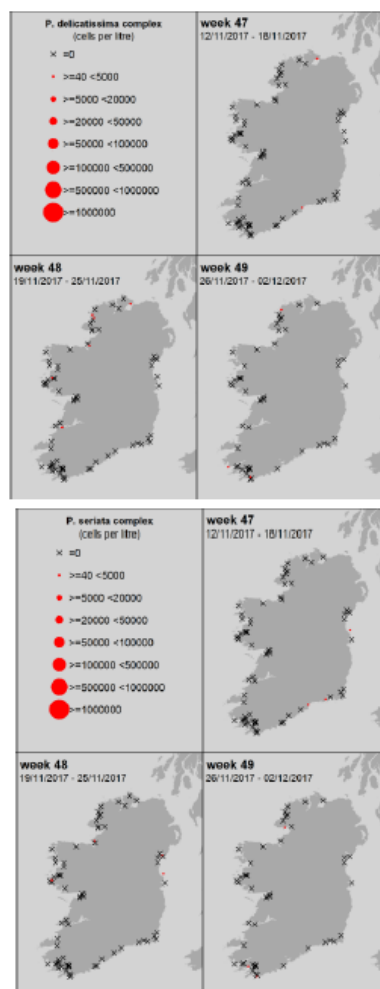
Slight increase in toxin levels in limited sites. Weekly fluctuations continuing with no stable predictable patterns. High caution must be continued as advise with this difficult species as this is the main season for occurrence, the causative species can 'come in' rapidly and cause acute toxic events and onshore water transportation pattern are predominant at this time of year.

Ireland HAB & Biotoxin Distribution maps

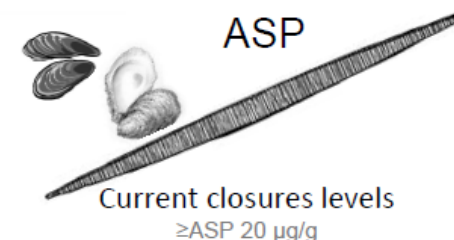
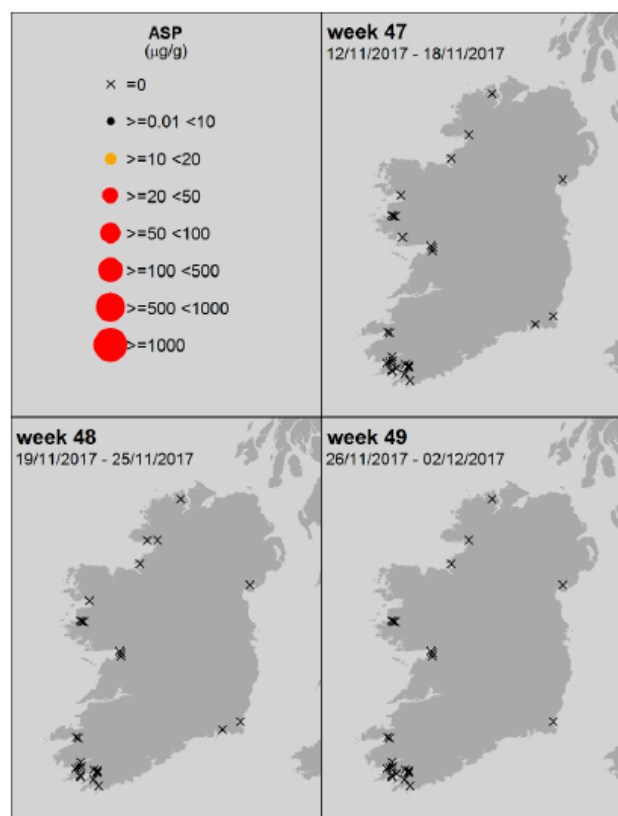
[current status of harmful and toxic algae]

ASP and *Pseudo nitzschia* sp. current trends

Phytoplankton species – 3 wks.



All levels of ASP biotoxin recorded - 3 wks.



Comments

Seasonal trend continuing steady - No significant toxin levels are currently present and no significant fluctuations in cell levels. Currently low caution levels.

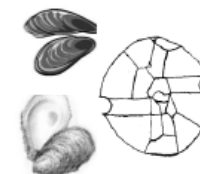
Ireland HAB & Biotoxin Distribution maps

[current status of harmful and toxic algae]

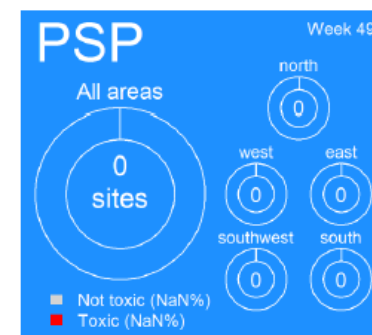
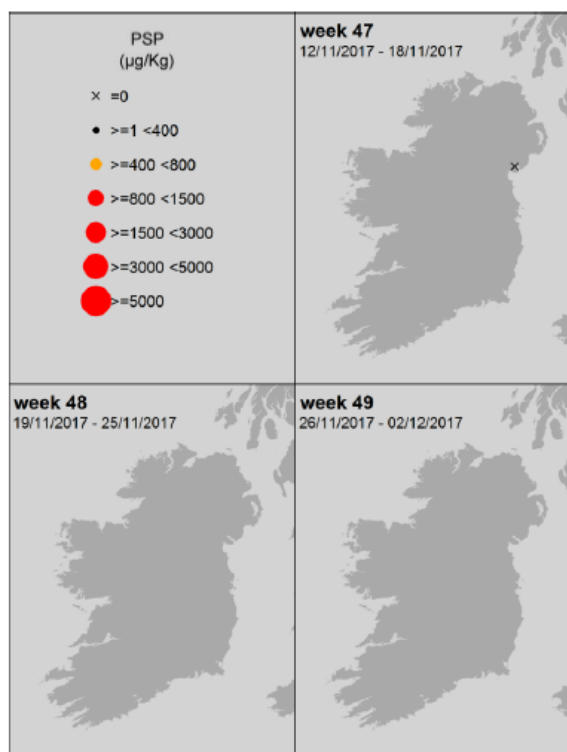
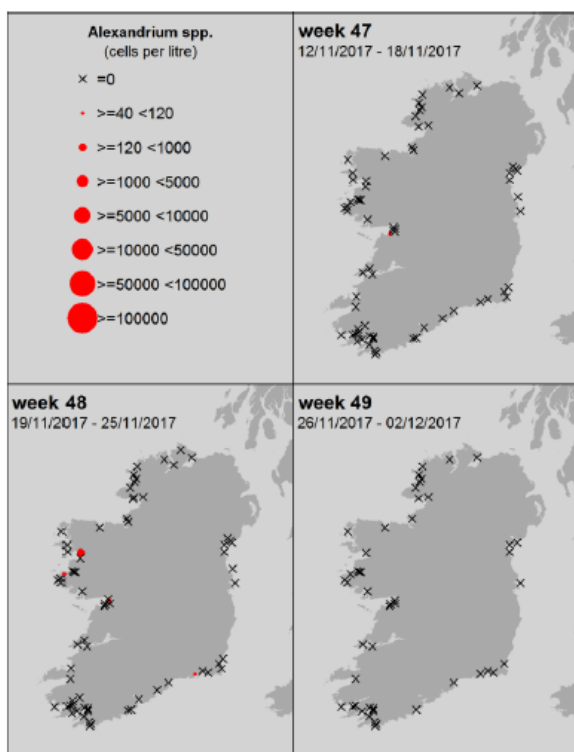
PSP and Alexandrium sp. current trends

Phytoplankton species – 3 wks.

All levels of PSP biotoxin recorded - 3 wks.



Current closures levels
 \geq PSP 800 $\mu\text{g/Kg}$

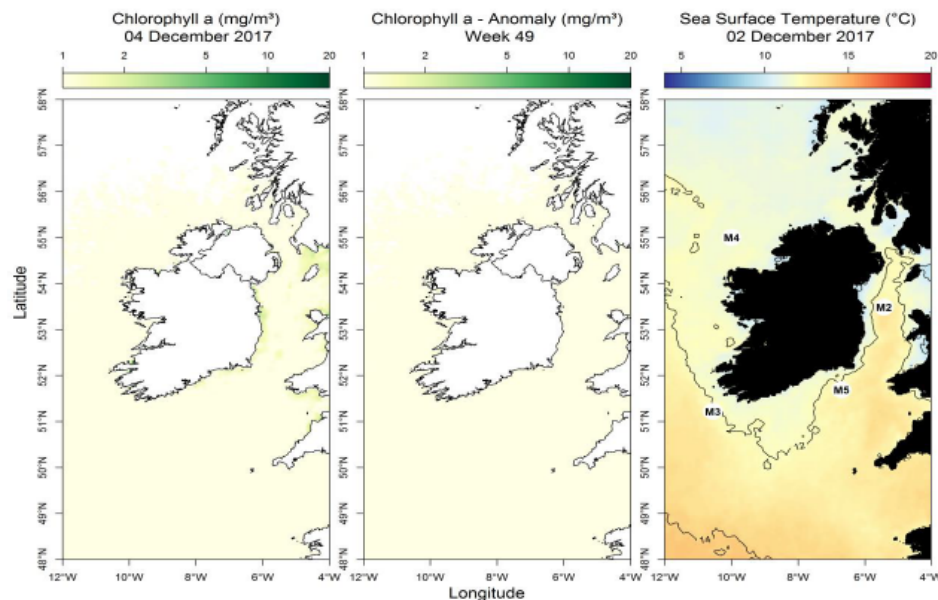


Comments

4 wks. plus pattern - Continued stable seasonal pattern - environmental conditions unlikely to be suitable to sustain growth of potential blooms and potential cell levels low. Low probability of sudden issues at this time of year.

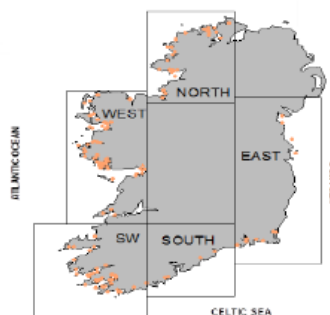
Ireland Satellite data: surface chlorophyll and temperature maps

Most up to date available satellite data



Stable seasonal pattern continuing with no significant chlorophyll levels above average, recorded around the coastline. Diatom species dominating the main phytoplankton biomass.

NW coast (M4) Below average by 0.09°C wk48
SW coast (M3) Unavailable wk48
SE coast (M5) Above average by 0.48°C wk48



What phytoplankton were blooming at inshore coastal sites last week?

Rank	Region	Species	Rounded Count
1	east	Pennate diatom	32000
2	east	Melosira spp.	3000
3	east	Thalassiosira spp.	2000
4	east	Skeletonema spp.	1000
5	east	Paralia sp.	1000
1	north	Pennate diatom	27000
2	north	Asterionellopsis spp.	6000
3	north	Akashiwo sanguinea	3000
4	north	Skeletonema spp.	2000
5	north	Cylindrotheca closterium/ Nitzschia longissima	1000
1	south	Pennate diatom	10000
2	south	Paralia sp.	3000
3	south	Centric Diatom	1000
4	south	Odontella spp.	>1000
5	south	Cylindrotheca closterium/ Nitzschia longissima	>1000
1	southwest	Pennate diatom	32000
2	southwest	Haptophytes	11000
3	southwest	Cylindrotheca closterium/ Nitzschia longissima	4000
4	southwest	Navicula spp. <25um	3000
5	southwest	Paralia sulcata	3000
1	west	Pennate diatom	63000
2	west	Euglena/Eutreptiella spp.	50000
3	west	Raphidophytes	26000
4	west	Azadinium/heterocapsa spp.	20000
5	west	Centric Diatom	14000

Ireland Fish killing phytoplankton Distribution maps

[current status of harmful and toxic algae]

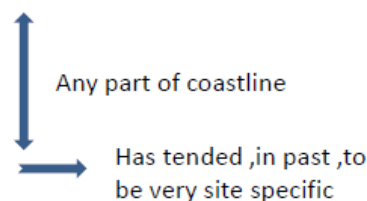


Karenia mikimotoi bloom warning level – very low

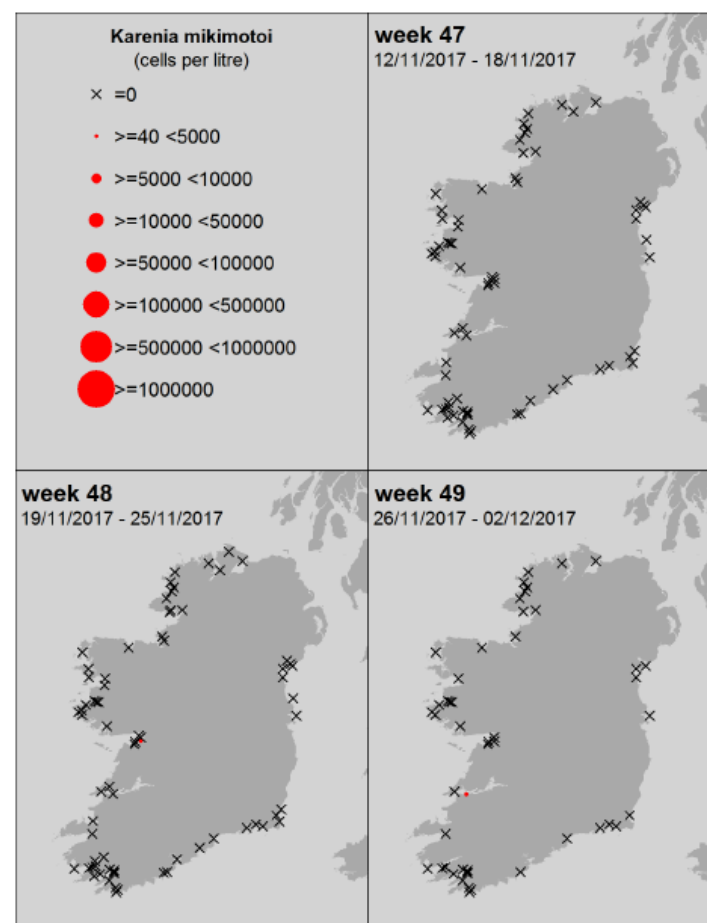
Current general bloom conditions:

Relatively steady seasonal decrease in phytoplankton growth now being traditionally affected by decreasing temperatures and light availability and increasing turbulence. There are currently no bloom threats indicated from traditionally species listed below.

Karenia mikimotoi
Heterocapsa spp.
Noctiluca scintillans
Alexandrium spp.



Karenia mikimotoi (old name: *Gyrodinium aureolum*)

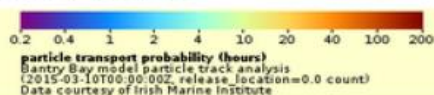


Ireland modelled data: Estimated Water Pathway

SOUTHWEST: Bantry Bay

The maps show the **most likely transport pathways** for the next 3 days of **phytoplankton** found along the **presented transects** (black lines off Mizen Head and the Mouth of Bantry Bay) and **water depths** (bottom, 20 metres and surface)

Reddish colours represent areas where phytoplankton remain longest
 Cooler colours represent areas where phytoplankton remain for shorter periods



Forecast for the next 3 days

Bottom water

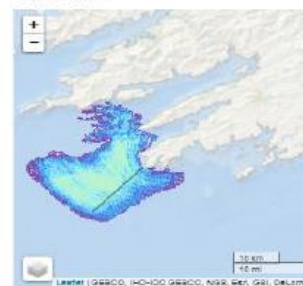
Water @ 20 metres

Surface water

Release 0 - Bottom



Release 1 - 20m

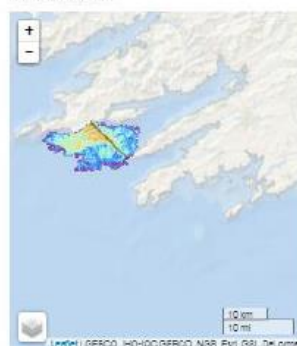


Release 2 - Surface



All depths indicating water movements in a predominantly mixed northerly direction particularly in surface waters.

Release 3 - Bottom



Release 4 - 20m



Release 5 - Surface

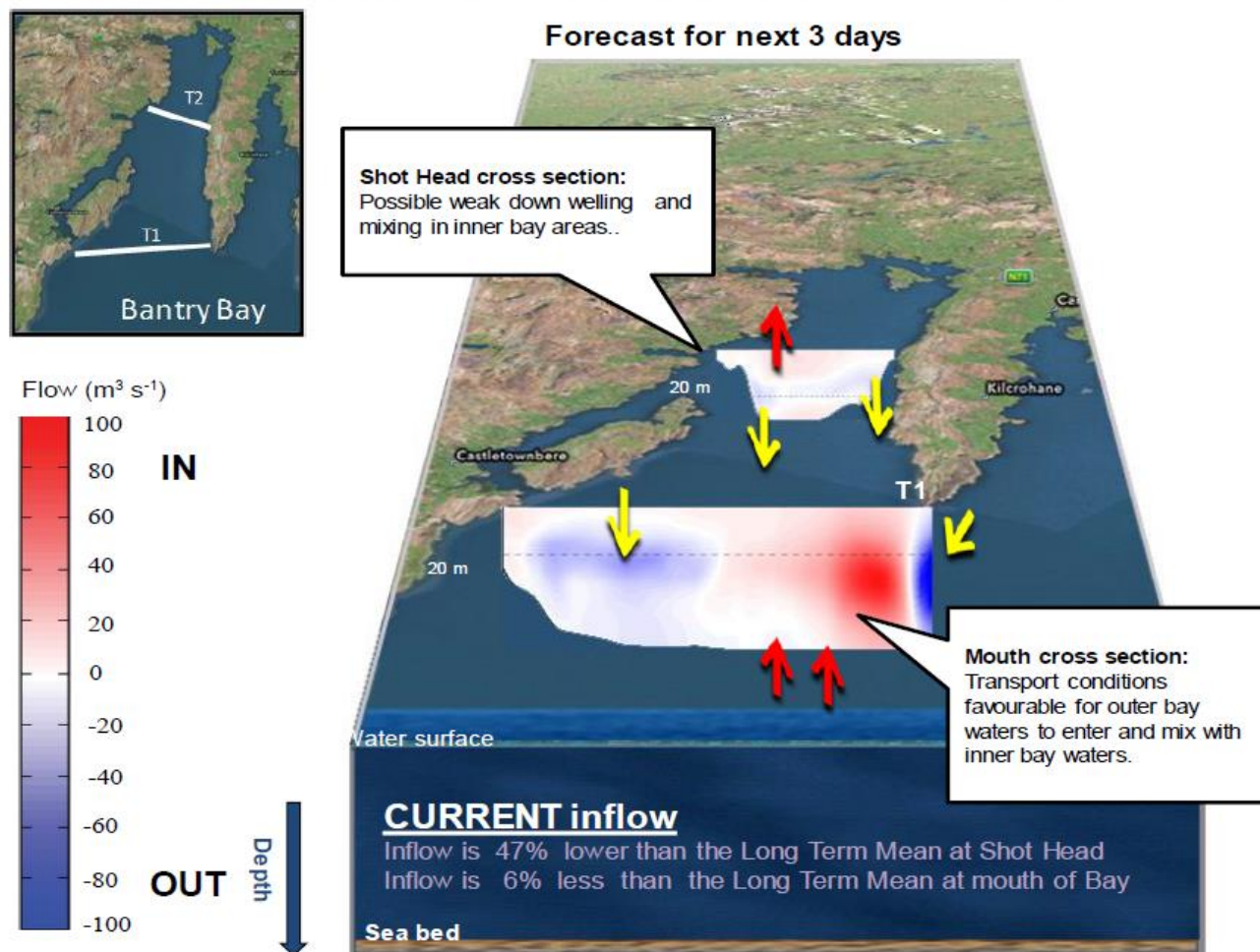


Surface and mid waters models indicating mixed westerly water movements dominating.
 Limited inner bay transport possible as deeper bottom waters enter bay.

Ireland modelled data: Estimated Water Pathway

Bantry Bay

3 day estimated water flows at the mouth and mid-bay sections of Bantry Bay

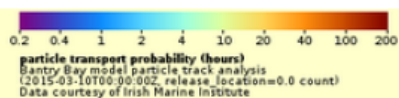


Ireland modelled data: Estimated Water Pathway

WEST: Killary Harbour

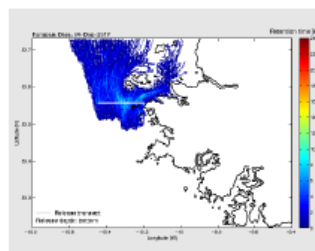
The maps show the **most likely transport pathways** for the next 3 days of **phytoplankton** found along the **presented transects** i.e. white lines off Aughrus Point and the Mouth of Killary Harbour, and **water depths** (bottom, 20 metres and surface)

Reddish colours represent areas where phytoplankton remain longest
 Cooler colours represent areas where phytoplankton remain for shorter periods

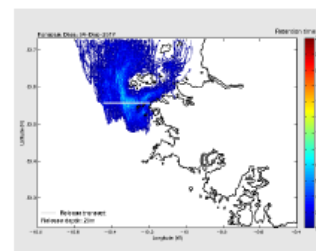


Forecast for the next 3 days

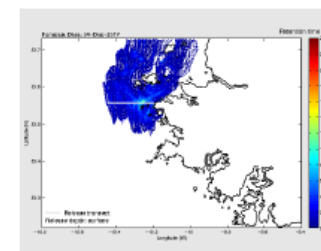
Bottom water



Water @ 20 metres

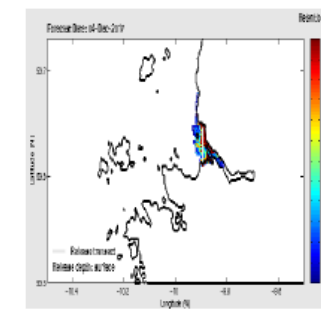
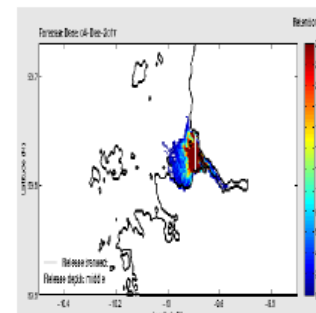
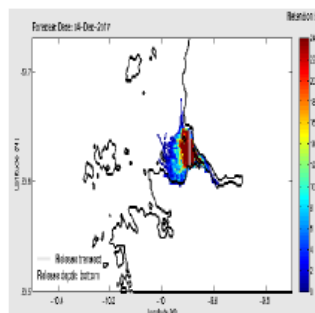


Surface water



Cleggan

Strong well mixed northerly movement of waters in offshore areas at all depths. Possibilities for offshore waters to be pushed onshore to inshore areas.

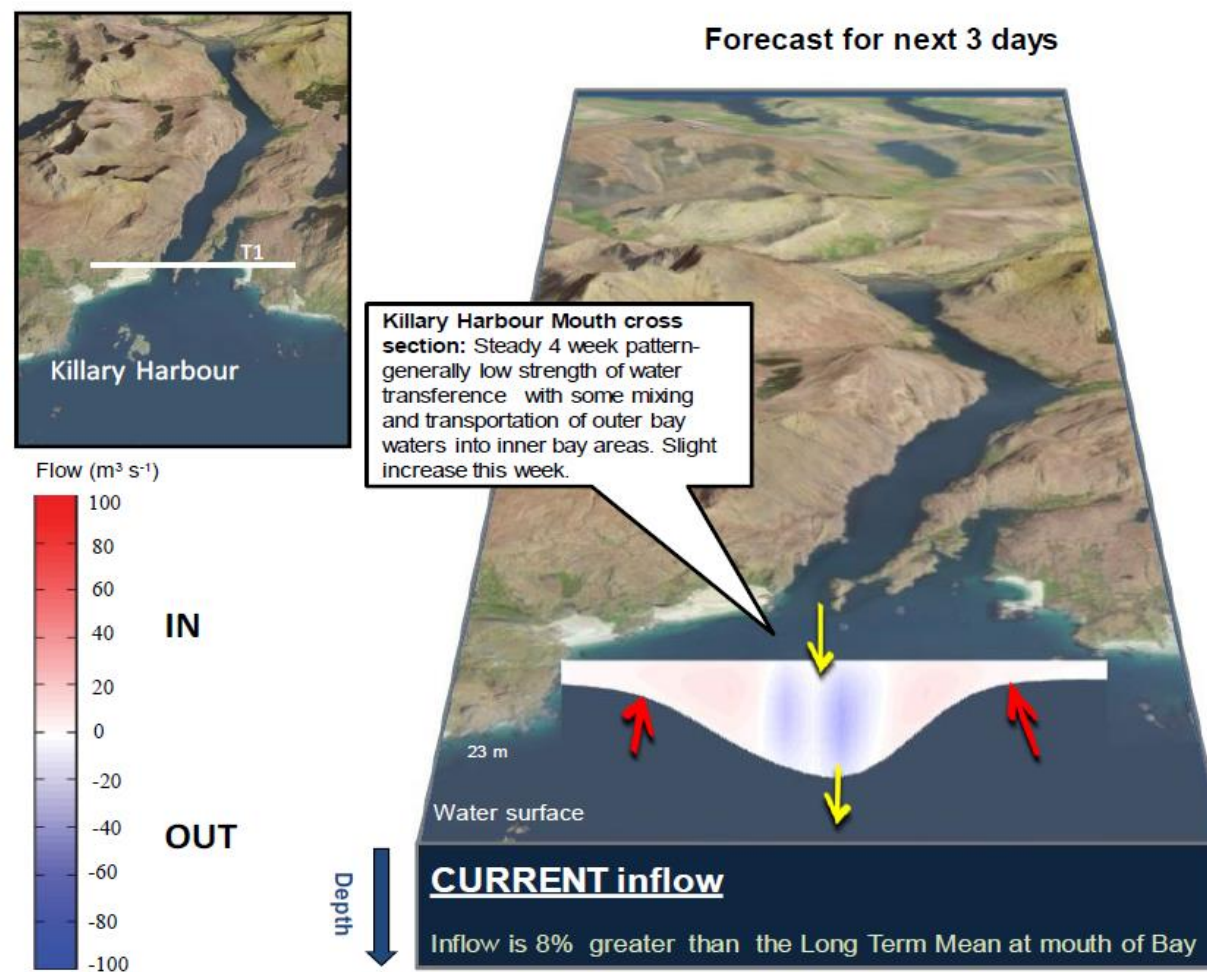


Killary

Bottom and deeper waters indicating moderate movements offshore. Decreased possibilities of strong down welling and mixing in inner bay areas.

Ireland modelled data: Estimated Water Pathway

Killary Harbour - 3 day estimated water flows at the mouth of Killary Harbour



Ireland modelled data: Estimated Water Pathway

West Coast - 3 day estimated water flows along a transect off Aughrus Point

