Update for the National Crayfish Plague Surveillance Programme (NCPSP)



13th Annual Workshop of the National Reference Laboratories for Crustacean Diseases

1st June 2022

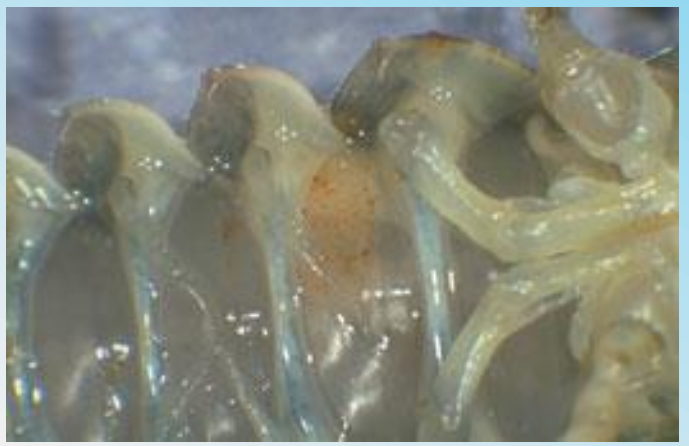
Marine Institute
Foras na Mara

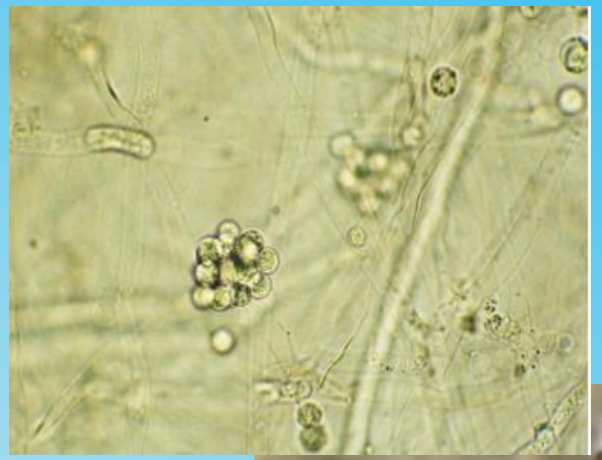
An tSeirbhís Páirceanna Náisiúnta agus Fiadhúlra
National Parks and Wildlife Service

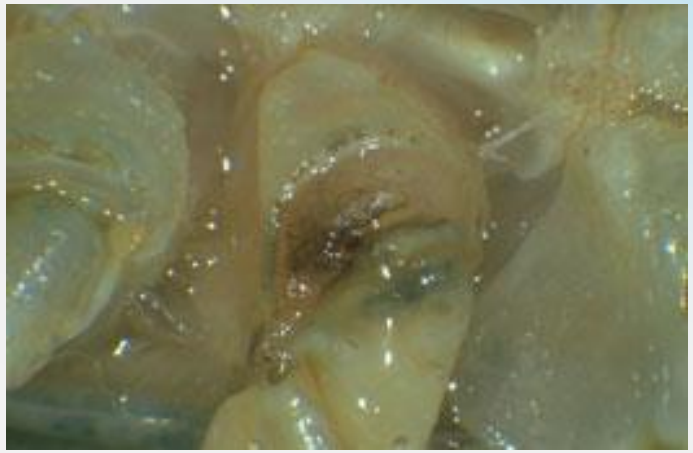
Dr. Fiona Swords; Team Lead Crustacean Health
Bogna Griffin; STO NCPSP

What is Crayfish Plague (CFP)? Why is it important to us?

https://invasives.ie/species-alerts/crayfish-plague-disease/







White clawed crayfish photo provided by Brian Nelson, NPWS

Crayfish plague infected crayfish D. Alderman
https://library.enaca.org/Health/FieldGuide/html/cp001cra.htm#

Hyphae in host cuticle and spore ball - Photo provided by Satu Viljamaa-Dirks, OIE Reference Lab

History of CFP in Ireland

1987	2015-2017	2018-2020	2020-2022
Microscopic diagnosis Boyne catchment	Multiple WCC mortalities	NCPSP 1st Established	NCPSP 2nd Programme

THE IRISH TIMES

River Suir crayfish plague 'extremely concerning' for species' future

Outbreak of crayfish plague in River Barrow confirmed

Large number of dead engangered species reported as biosecurity measures introduced

Tue, Sep 19, 2017, 20:34 | Updated: Tue, Sep 19, 2017, 20:48

Kevin O'Sullivan

National Parks & Wildlife Service

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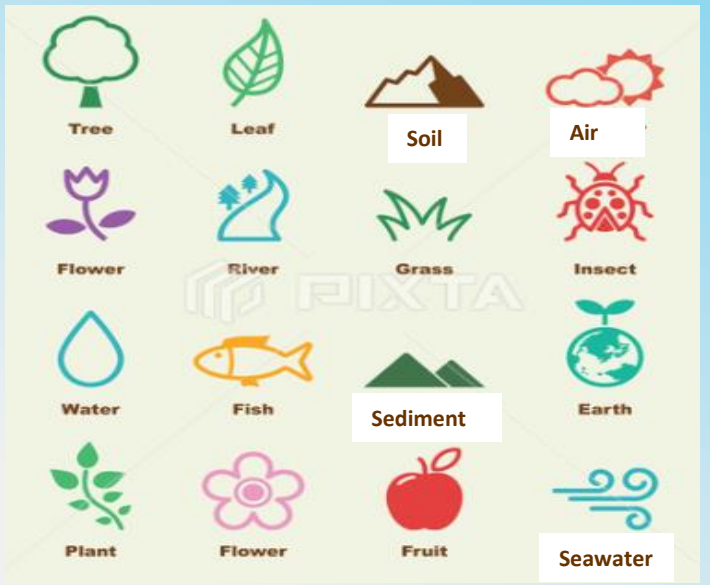
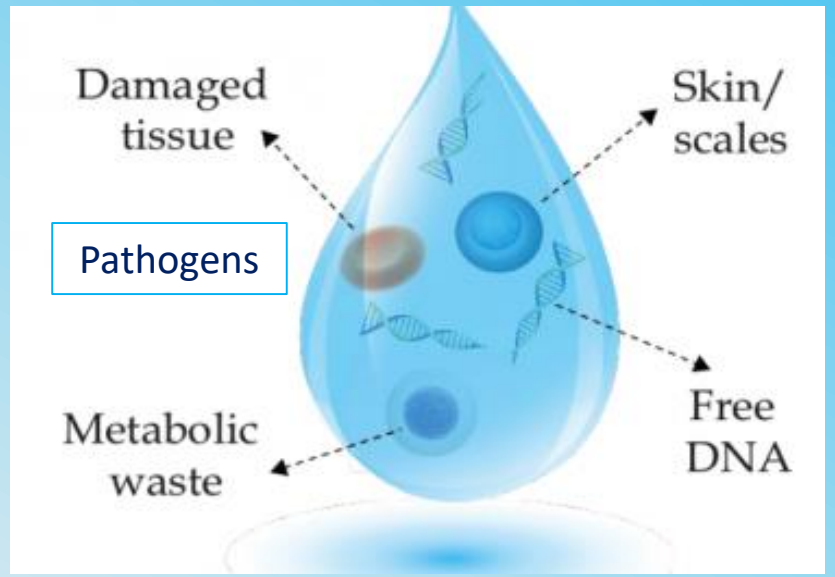
Environmental DNA: What is eDNA? Why is it useful?

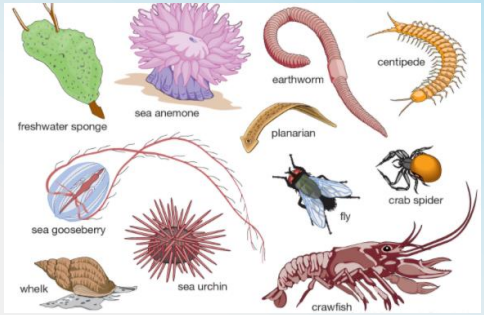




Tell me – is CFP there?

VS

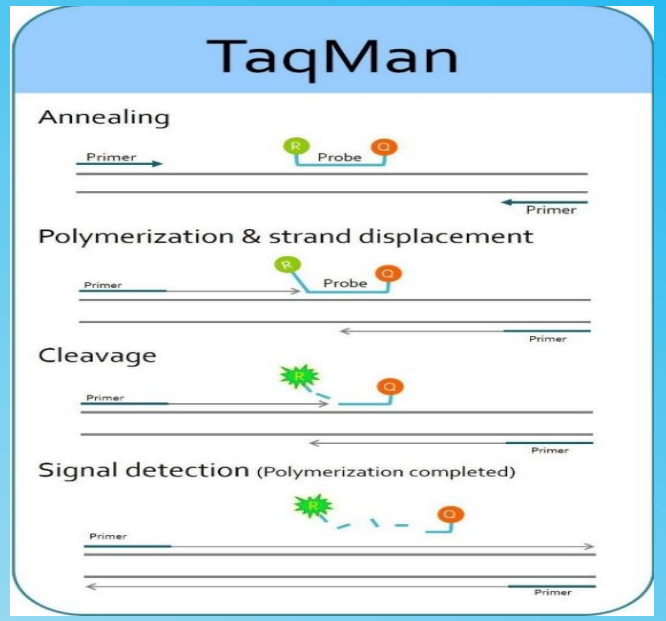
Tell me – who is there?



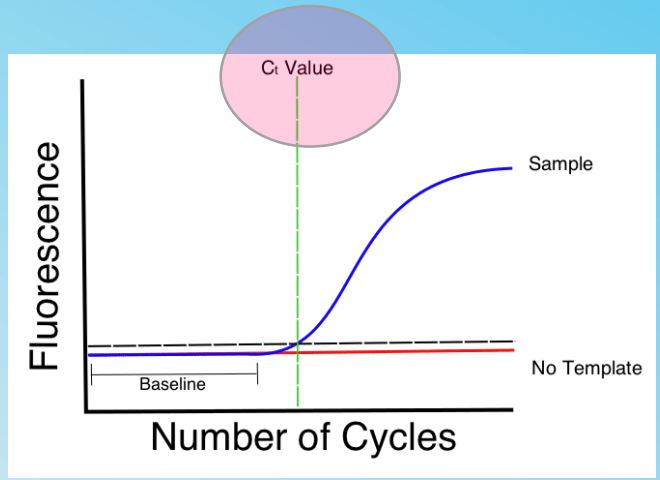
How do we gather our eDNA samples?

- 15 litres of water pumped through sterile 0.45um glass fibre filter to capture eDNA present
- Sterile transfer of filter to storage tube ready for eDNA to be selectively extracted from the filter and purified

Direct Detection: Crayfish Plague and WCC by rtPCR



qPCR to detect	Template type	Lowest dilution	Mean Ct (20)	StDev	Ct Cut-off
Crayfish Plague	Plasmid alone	10 -8 (1:2)	39.25	0.202	39.5
	CFP-Infected WCC tissue	10 -4 (1:2)	39.00	0.325	39.3
	Plasmid spiked filters	10 -4 (1:2)	38.36	0.282	38.6
WCC	Plasmid alone	10 -10 (1:2)	40.10	0.439	40.5
	WCC Tissue	10 -5 (1:2)	39.00	0.433	39.4
CFP and WCC duplex	CFP Infected WCC tissue	10 -4 (1:2)	CFP 37.91	0.232	38.1
	WCC tissue	10 -4 (1:2)	WCC 37.39	0.142	37.5



What does the NCPSP aim to do?

Prevalence of CFP in Ireland, focusing on known WCC habitats, using molecular detection methods

- Seasonal detection?
- Persistent infections?

Distribution of WCC populations

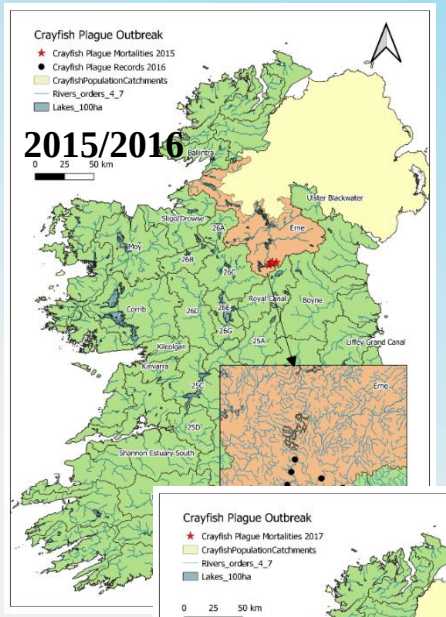
- Related to CFP detection?
- Comparable with field studies?

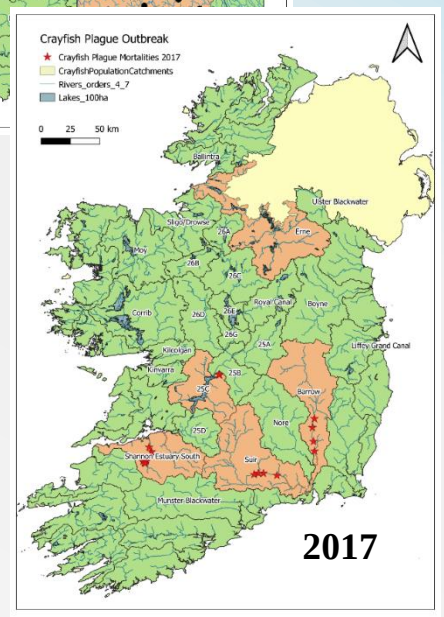
Non-Indigenous Crayfish Species (NICS) as possible vectors

Not detected

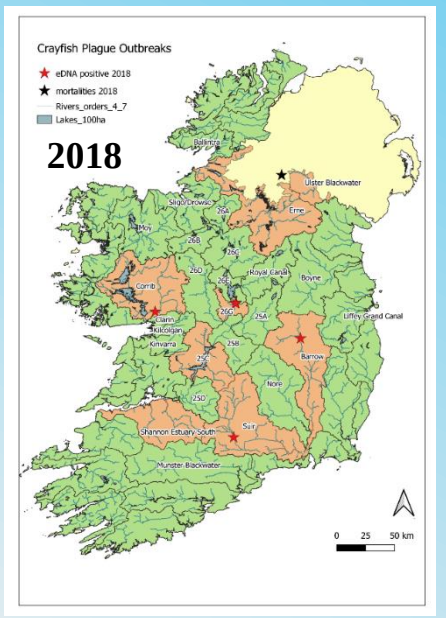
What did we find? - Prevalence of CFP

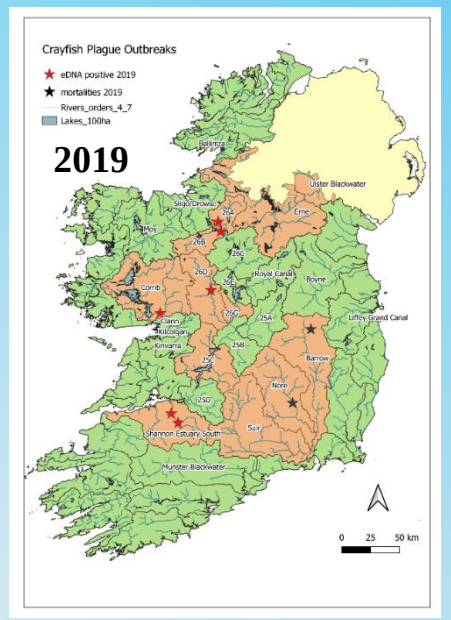
MORTALITY

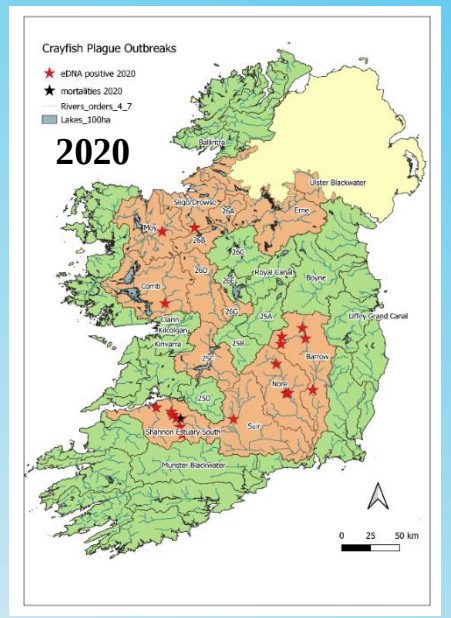


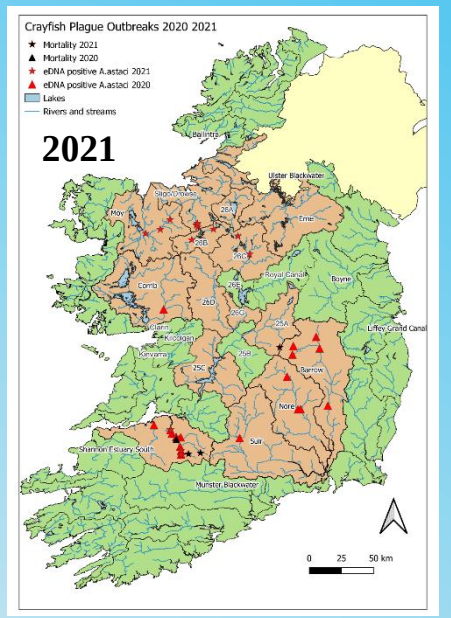


MORTALITY & eDNA



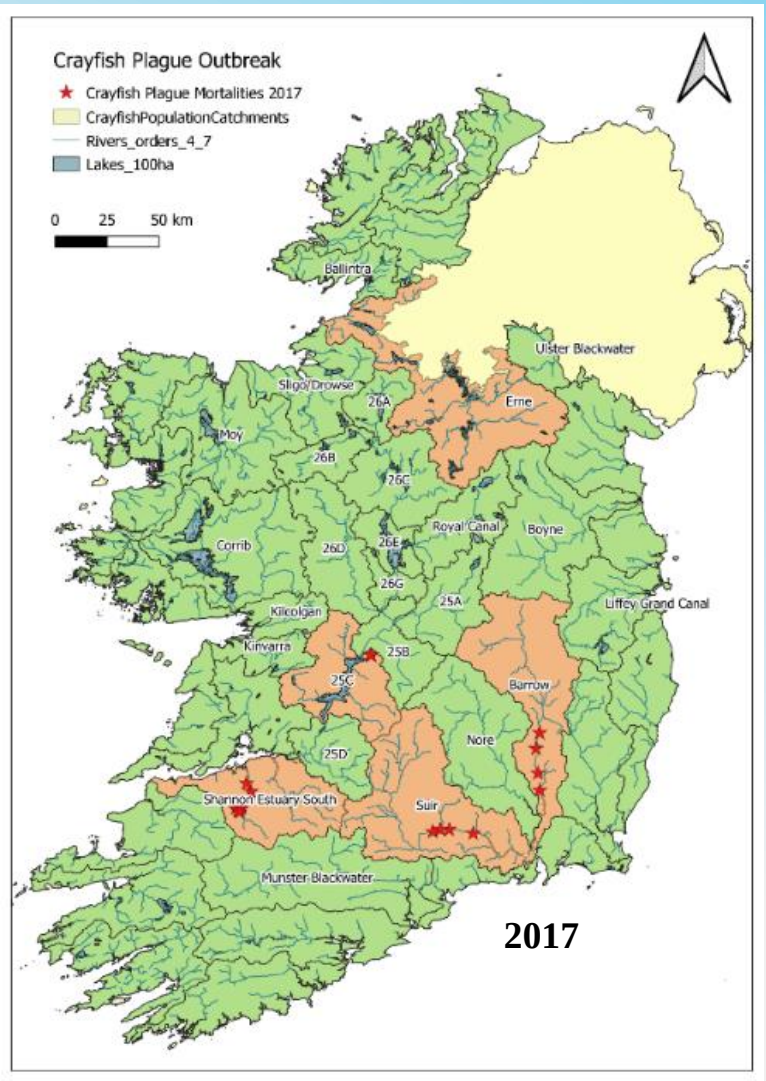






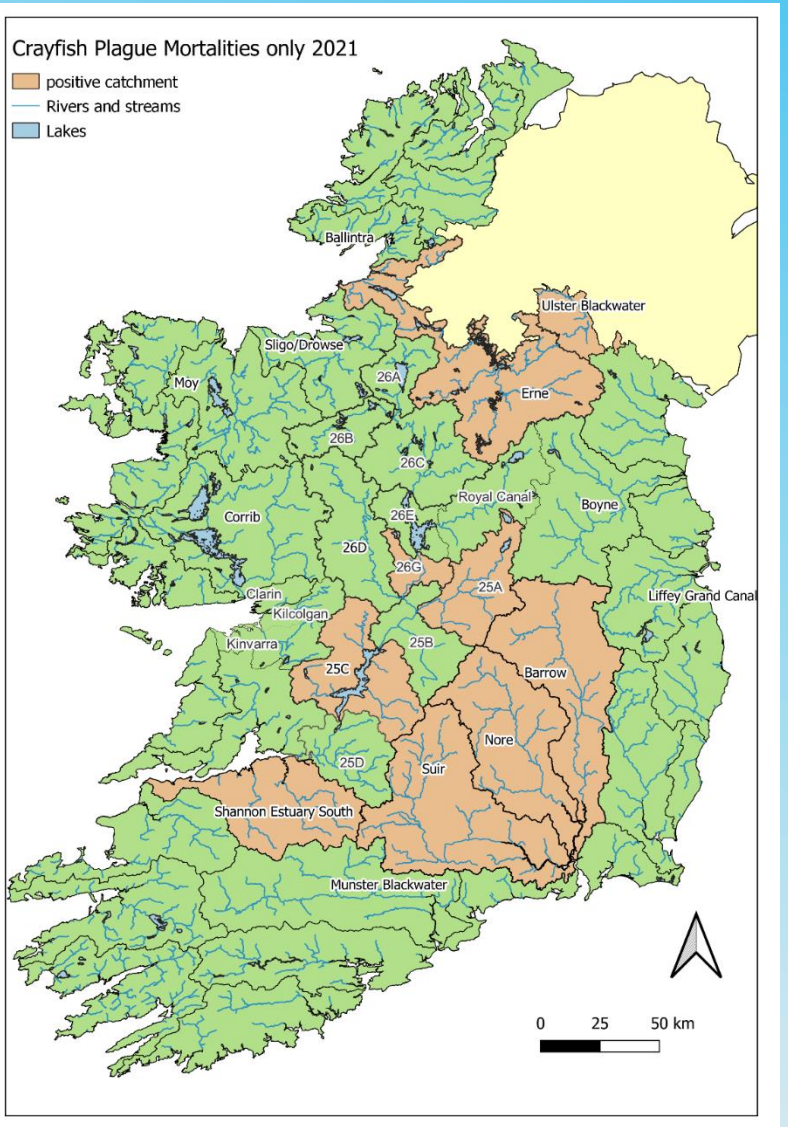
What did we find? - Prevalence of CFP

MORTALITY – PRE NCPSP

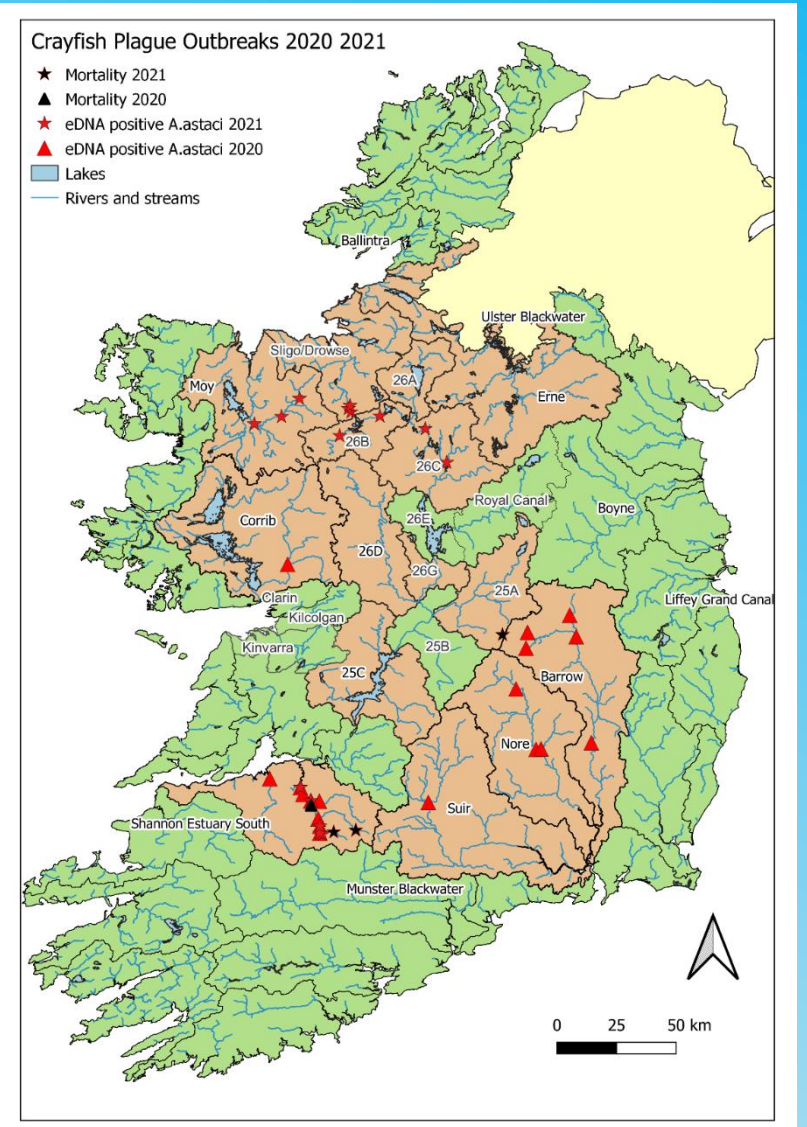


2017

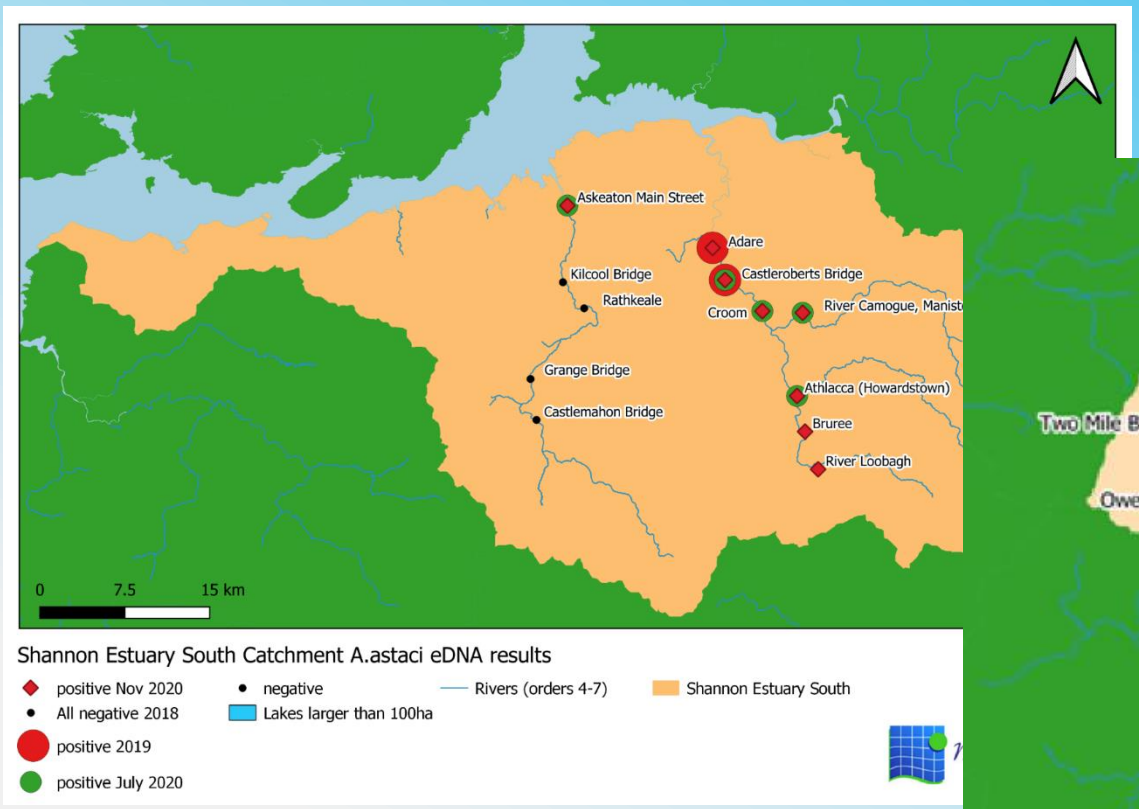
MORTALITY ALONE 31.12.21

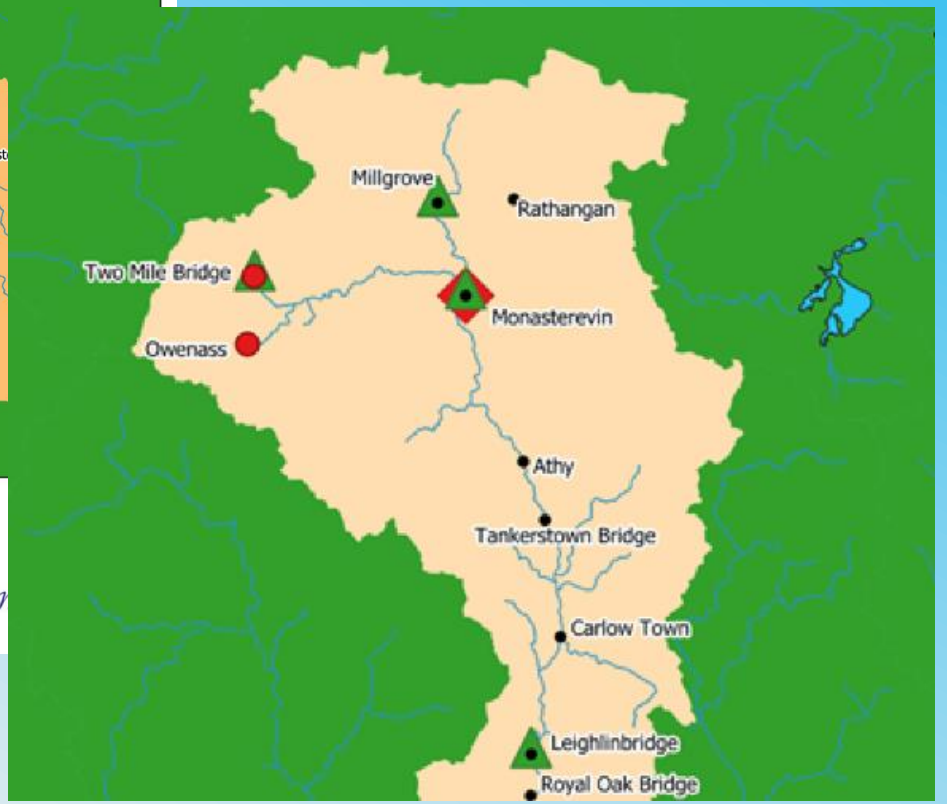


MORTALITY & eDNA



Does CFP remain in the environment?
Does the sampling season impact CFP detection?

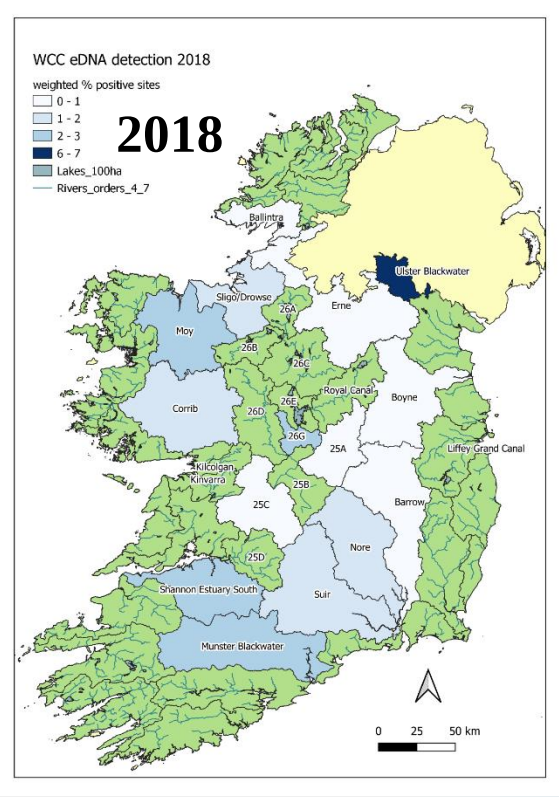


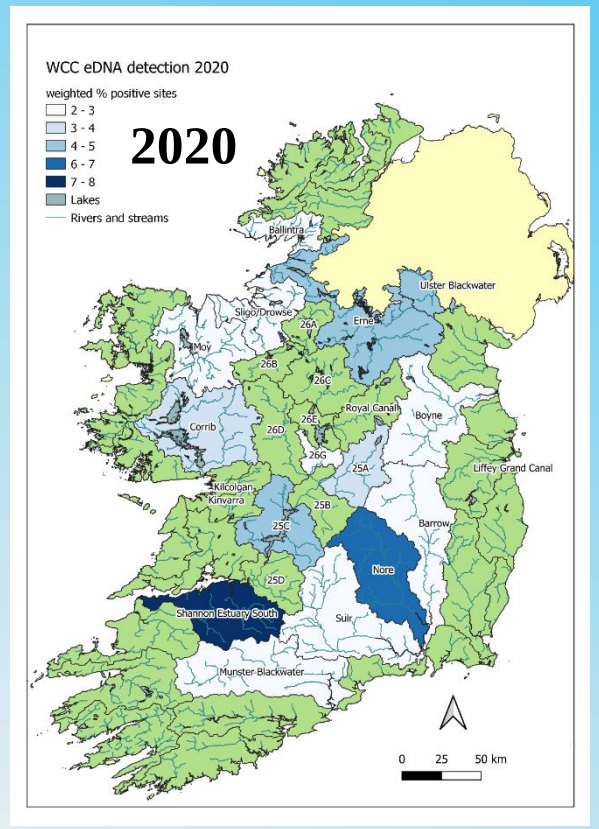


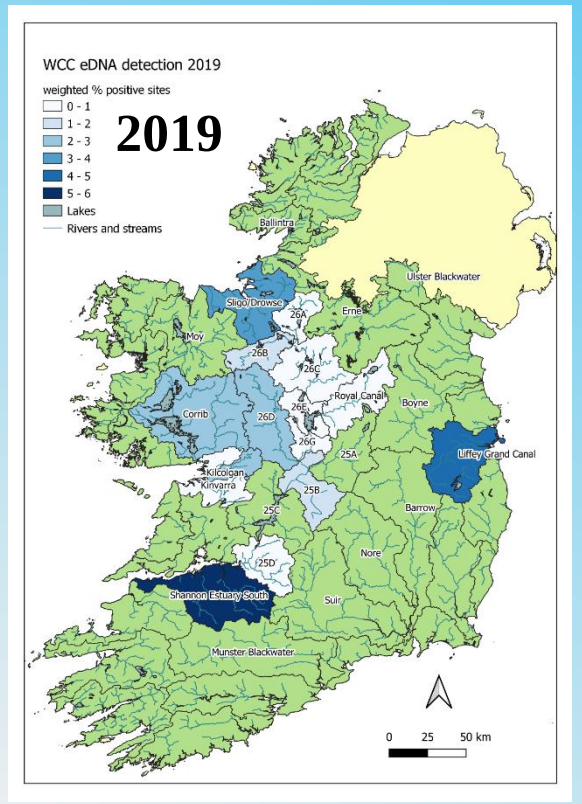
Persistence and Seasonality of CFP (and WCC) - Summary

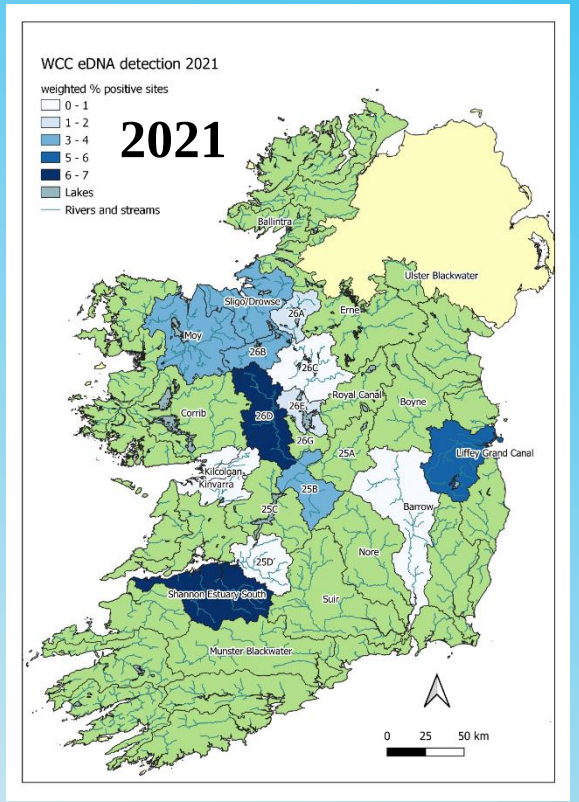
	2020		2021	
Crayfish Plague Detections				
	Shannon Estuary South	Barrow	Shannon Estuary South	Barrow
Total No. Positives - July	5	2	1	0
Total No. Positives - Nov	8	4	4	0
Positive (July) to negative (Nov) sites	0	1	0	0
Negative (July) to positive (Nov) sites	3	3	3	0
White-clawed crayfish Detections				
	Shannon Estuary South	Barrow	Shannon Estuary South	Barrow
Total No. Positives - July	9	1	2	0
Total No. Positives - Nov	9	3	6	0
Positive (July) to negative (Nov) sites	1	1	0	0
Negative (July) to positive (Nov) sites	1	3	4	0

What did we find? - Prevalence of WCC

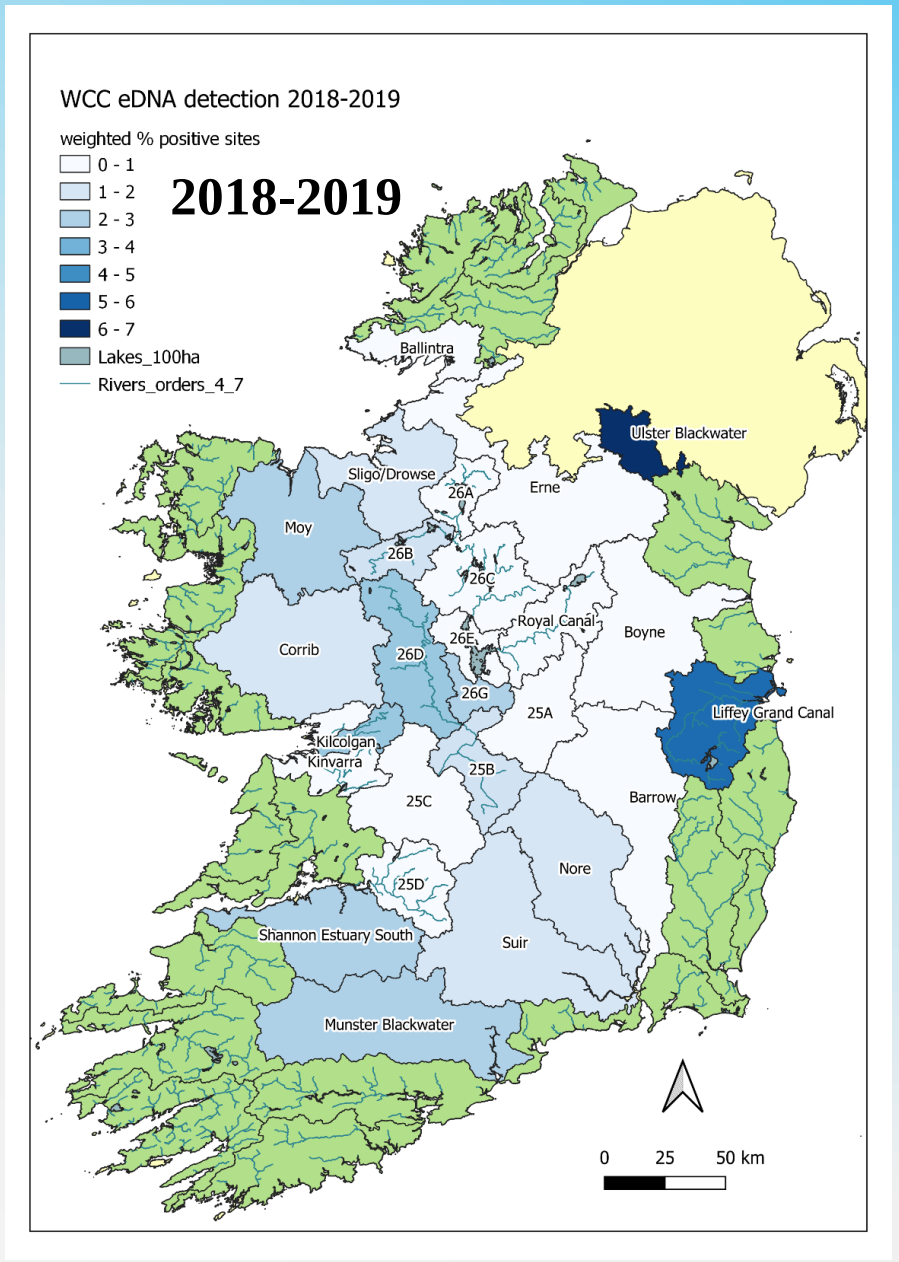


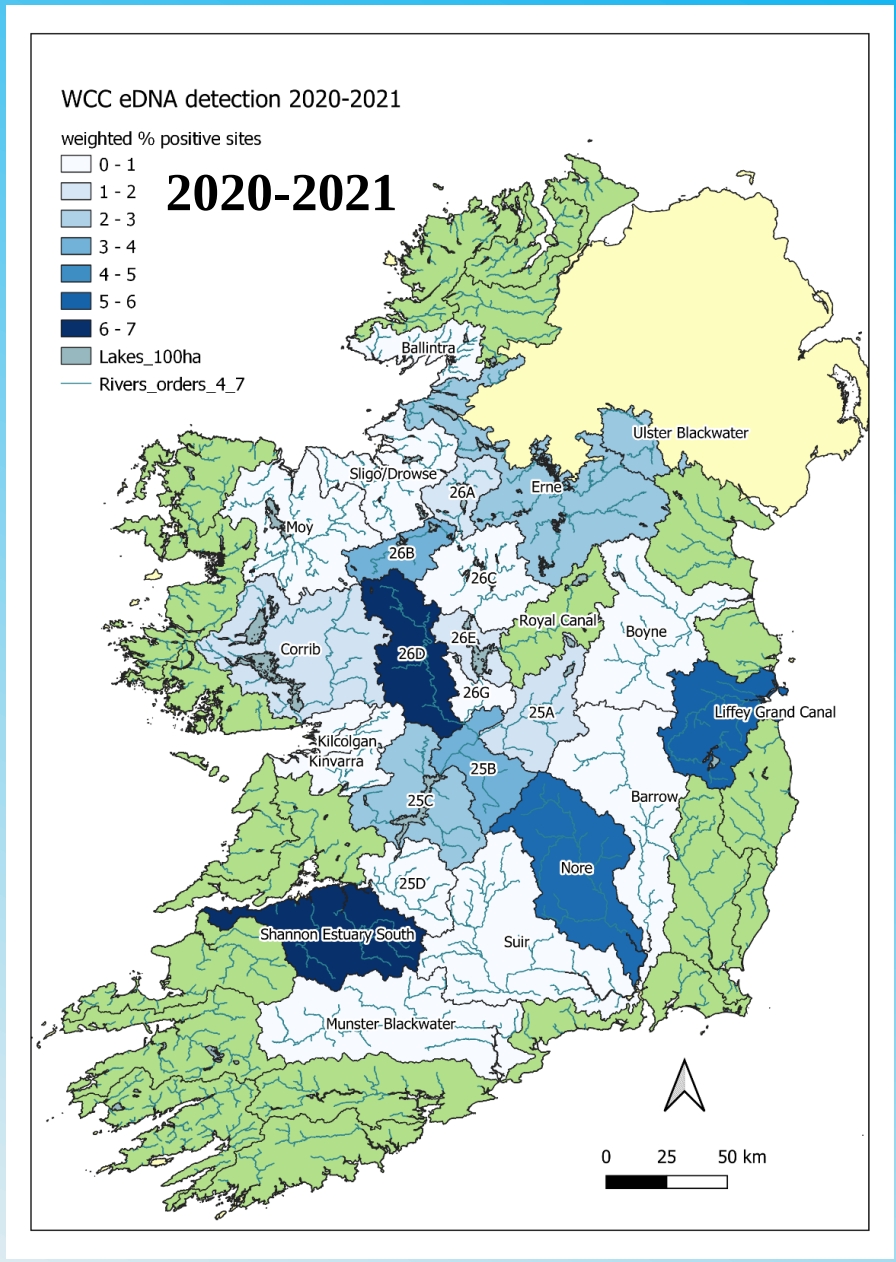






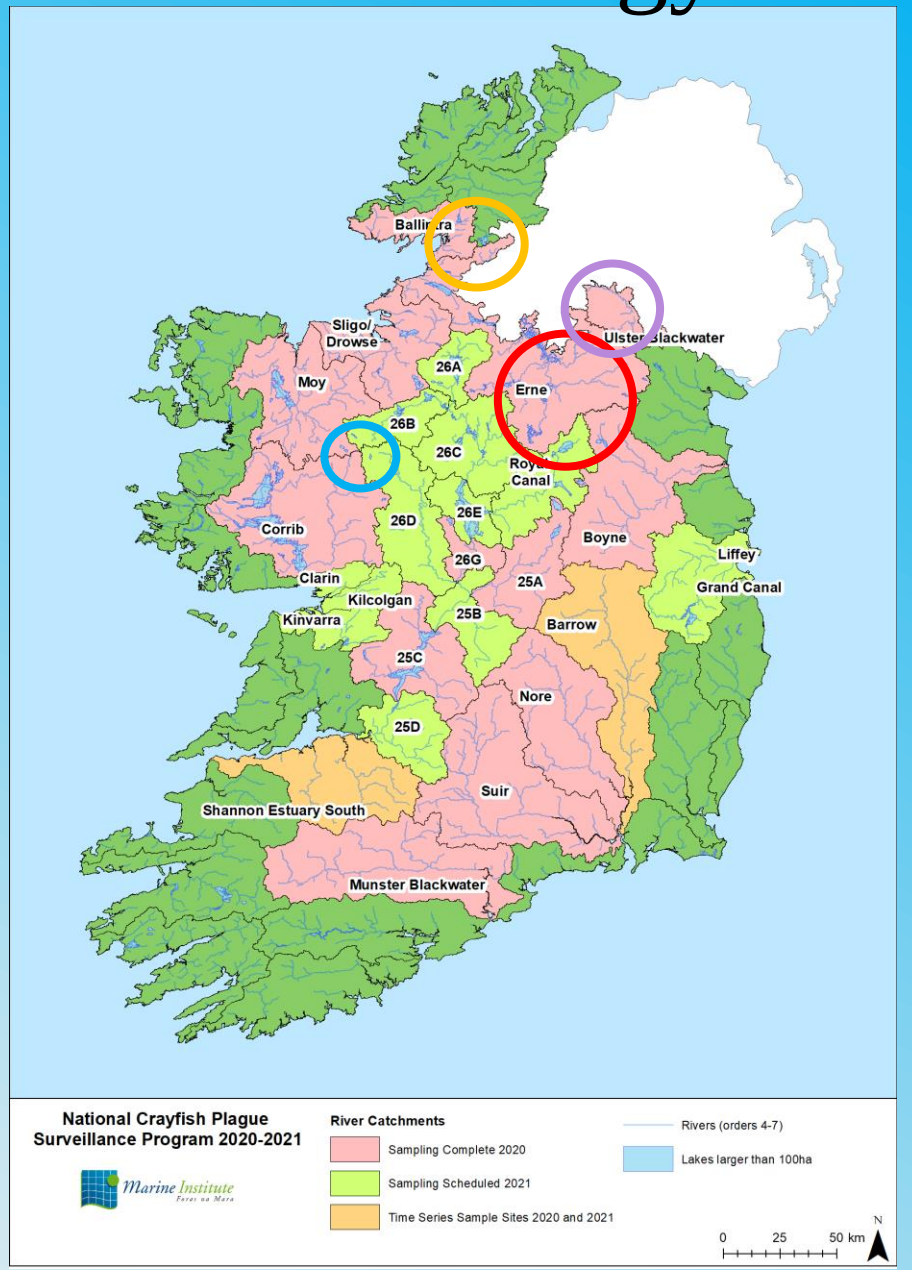
What did we find? - Prevalence of WCC

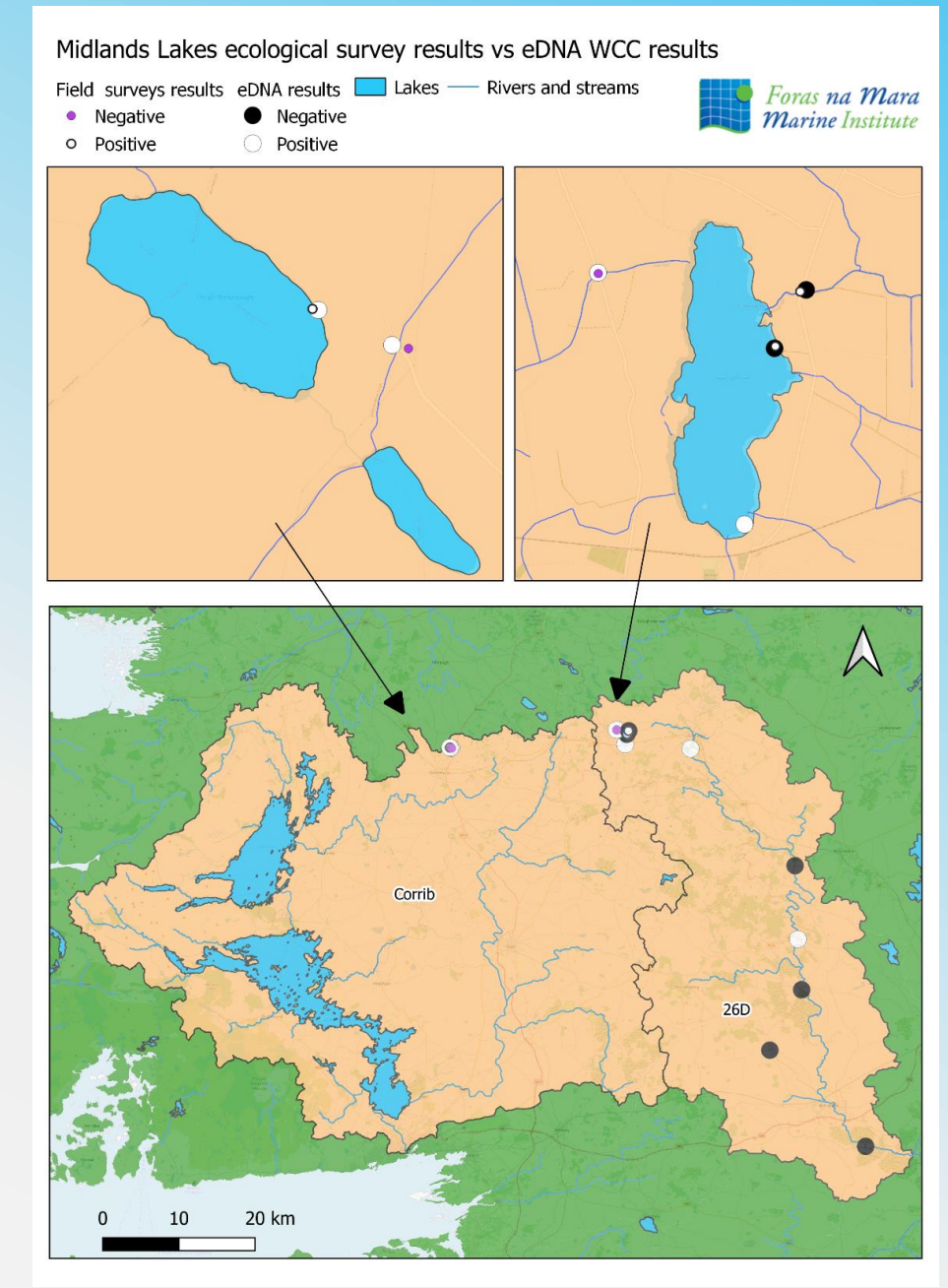


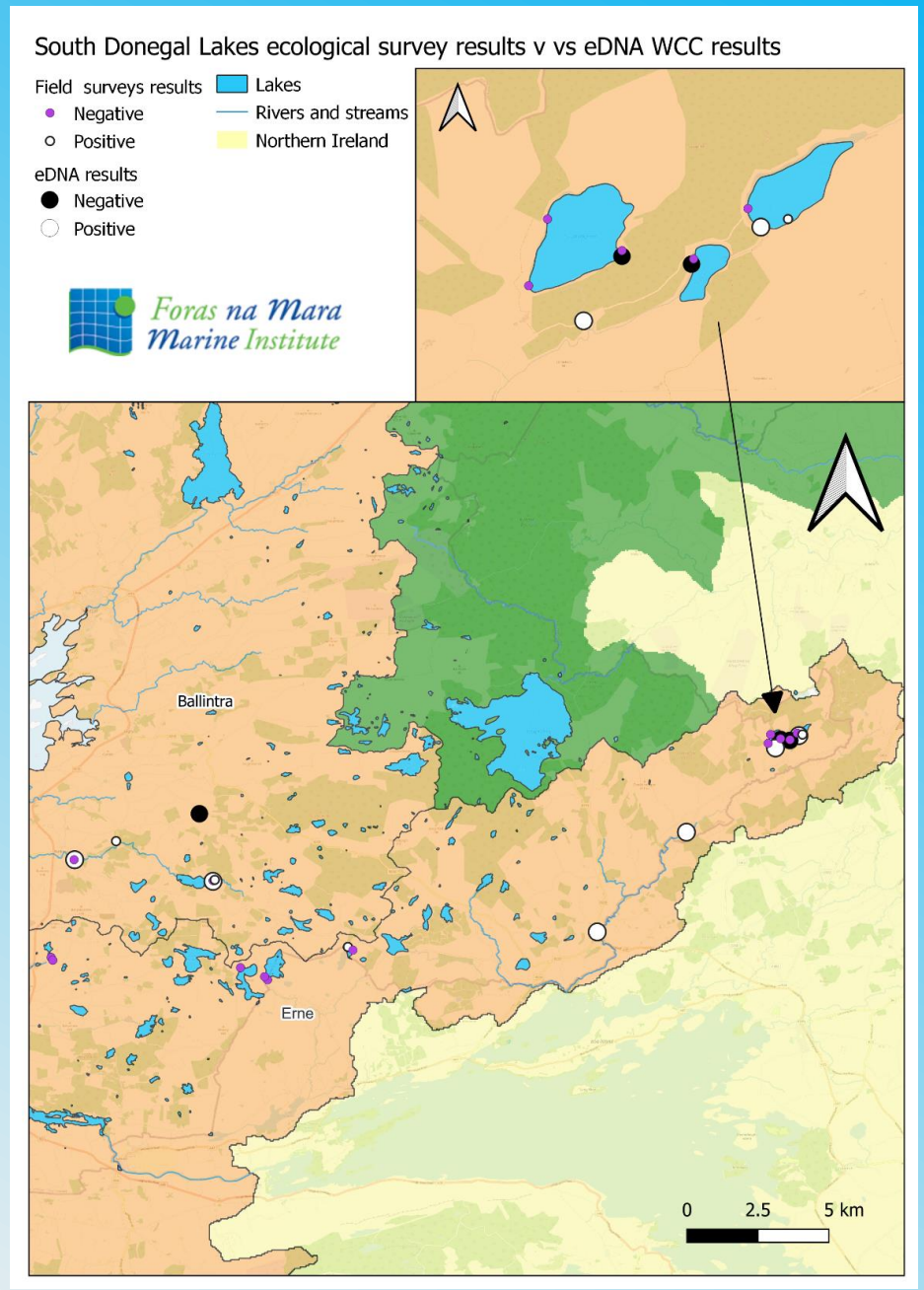


Prevalence of WCC – Comparison with field ecology

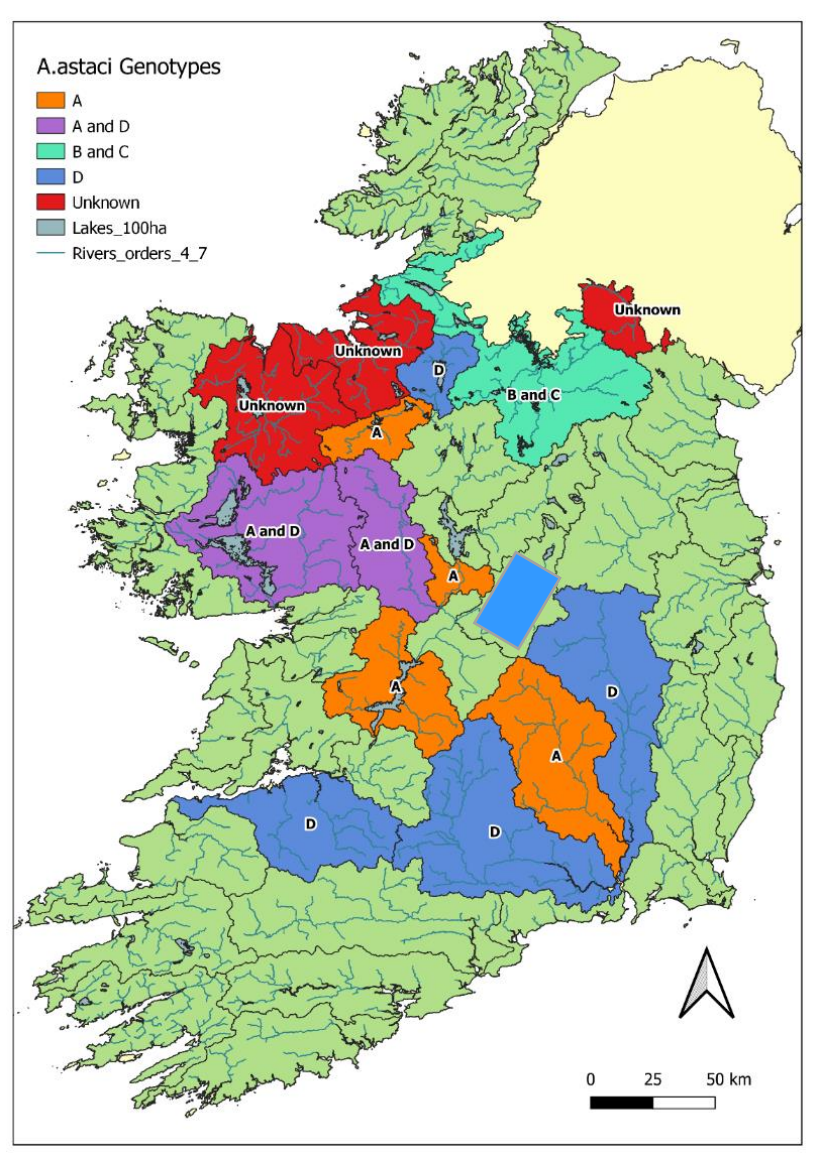
Region	Field Ecology Site	WCC found at site?	WCC eDNA found at site?	Comparable WCC eDNA site surveillance site
South Donegal Lakes				
Lough Nageage SAC	Lough Nageage Site 03	Negative	Negative	Lough Nageage
Lough Nageage SAC	Lough Naveane Site 01	Negative	Negative	Lough Naveane
Lough Nageage SAC	Lough Veenagreane Site 02	Positive	Positive	Lough Veenagreane
Ballintra				
Ballintra River	Aghadullagh Bridge Site 01	Negative	Positive	Aghadullagh
Ballintra River	Rath Lough Bridge Site 01	Negative	Positive	Lough Rath
Erne				
Erne	ANN01	Positive	Positive	Br SE of Fort William, Cootehill
Erne	DRO01	Negative	Negative	Ballynascarva Br
Erne	CAV01	Positive	Positive	Lisdam, Cavan Town
Ulster Blackwater				
Blackwater	MOU01	Positive	Positive	Bridge N/E of Golden
Blackwater	MOU02	Positive	Positive	Emyvale
Blackwater	BLA01	Positive	Positive	Scotstown
Blackwater	BLA02	Positive	Positive	Newmills Bridge
Midlands Lakes				
Lough Nanannagh	NAN_LNAN_01	Positive	Positive	Nannannagh Lough
Lough Nanannagh	NAN_STRE_02	Negative	Positive	Lough Nanannagh stream
Lough O'Flynn	OFL_LOFL_02	Positive	Positive	Lough O'Flynn 2B
Lough O'Flynn	OFL_RSUC_01	Negative	Positive	Lough O'Flynn 2C
Lough O'Flynn	OFL_RSUC_02	Positive	Negative	Lough O'Flynn 2D



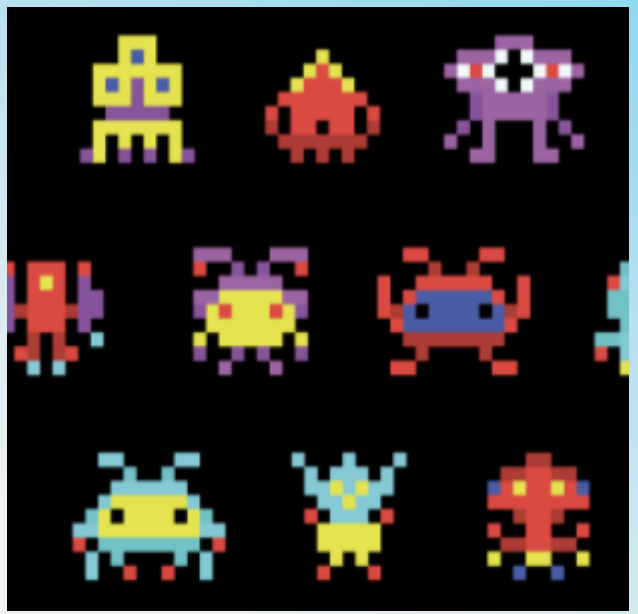

Midlands Lakes ecological survey results vs eDNA WCC results
Field surveys results
Negative
Positive
eDNA results
Negative
Positive
Lakes
Rivers and streams
Foras na Mara
Marine Institute
Corrib
26D
0
10
20 km


South Donegal Lakes ecological survey results v vs eDNA WCC results
Field surveys results
Negative
Positive
eDNA results
Negative
Positive
Lakes
Rivers and streams
Northern Ireland
Foras na Mara
Marine Institute
Ballintra
Erne
0
2.5
5 km

Genotypes and Collaborations



Environment Agency



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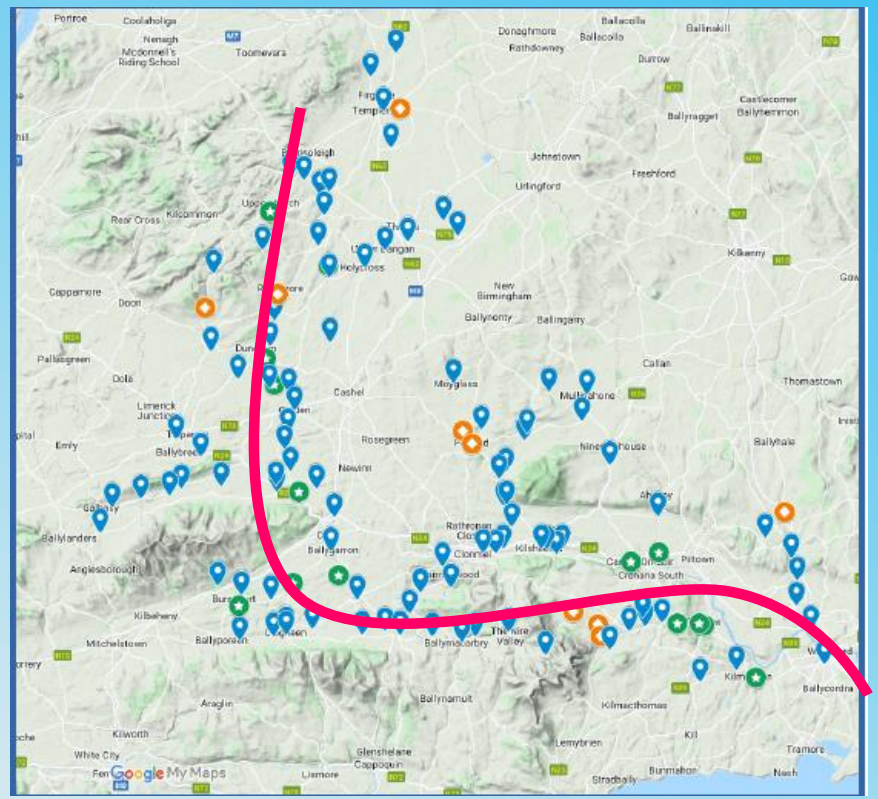
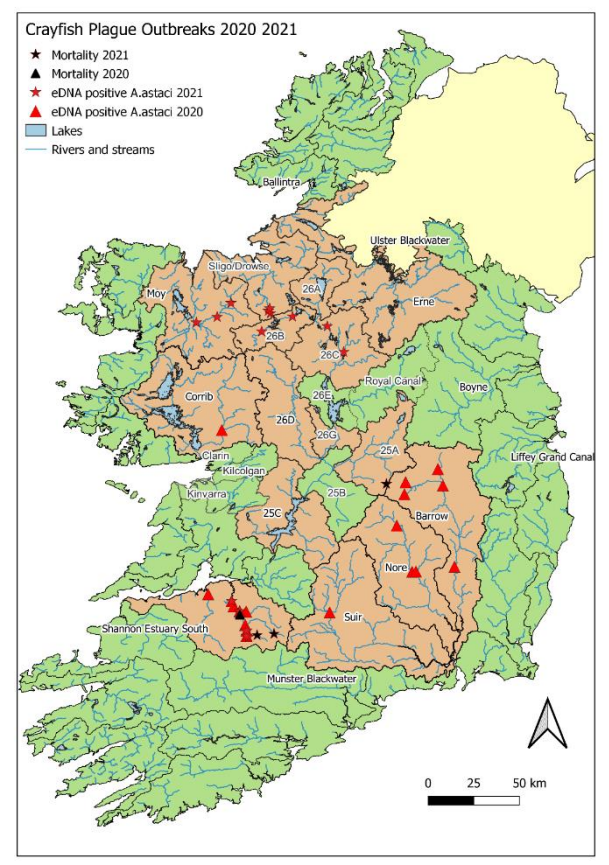


What do we know about CFP & WCC in Ireland?

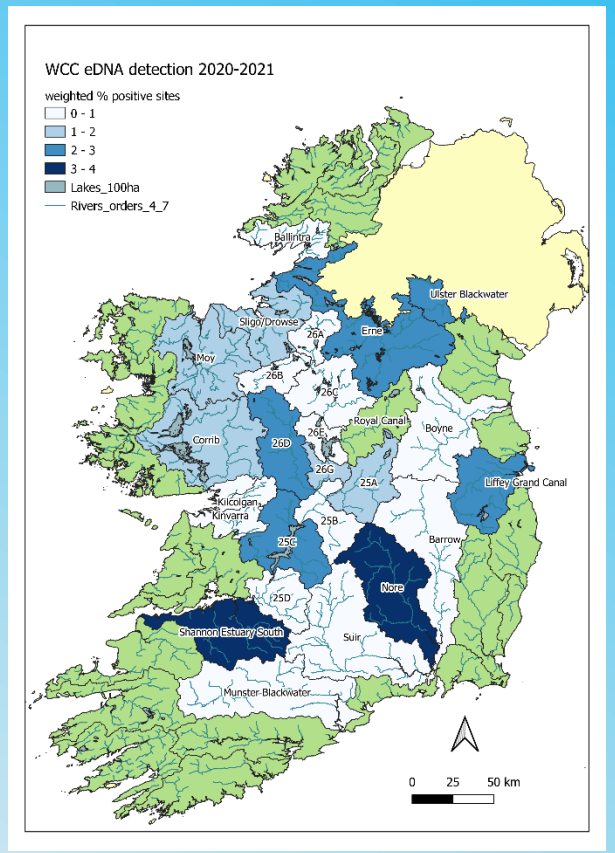
Prevalence of CFP in Ireland, focusing on known WCC habitats, using molecular detection methods

- Detection possible without mortality
- eDNA detection at mortality site (1)
- Potential seasonal impact
- Persistent infections
- Multiple subtypes found

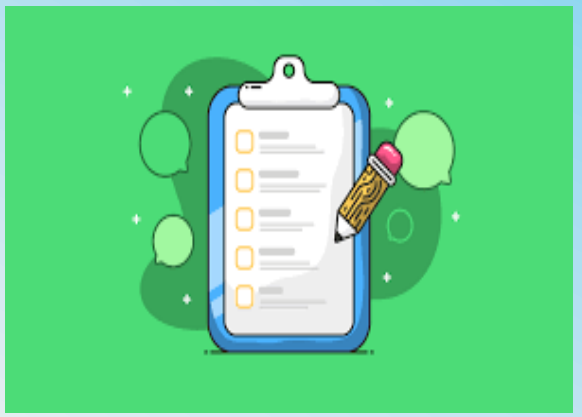


- No clear relationship between presence of CFP and WCC density
- Comparable with field studies
- Method to detect CFP & WCC in single real time PCR valid and fit for purpose

Distribution of WCC populations



More questions about CFP in Ireland?



Trends? Quantitative Ct values?

Passive surveillance an option?

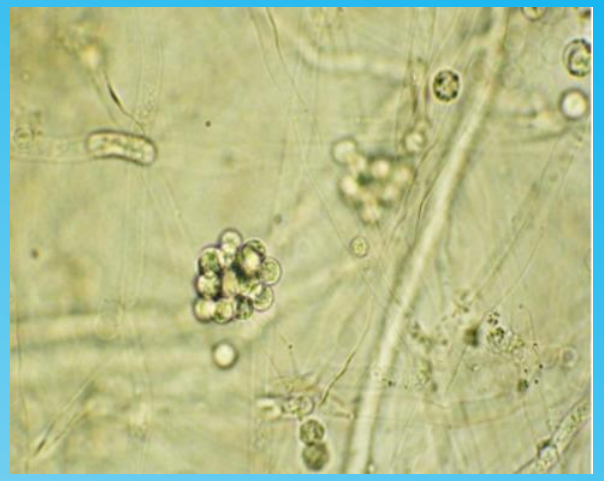
Within Catchment details?

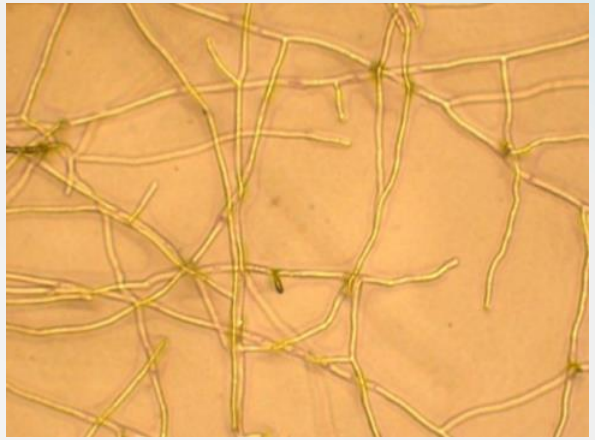
Unanswered Questions

eDNA during mortality events?

Impact of sample time points?

Subtype information from eDNA?

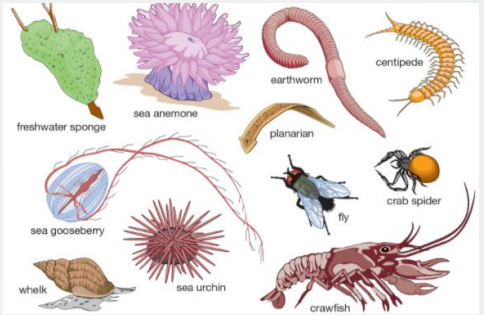




More questions about WCC/NICS in Ireland?

- Accuracy compared to field study?
- Biosecurity practices and impact?
- Trends within and between catchments?
- Unanswered Questions
- Wider biodiversity assessment?
- NICS assay fit for purpose?
- Extent of CFP impact and genotype related?

Tell me – who is there?



Thank you!

- STO Bogna Griffin
- The FHU team
- NPWS
- Maigue Trust & Inland Fisheries Ireland

Take home

We all need to play our part please remember:

Minimum Biosecurity Requirements:

Check *your equipment and clothing.*

Clean *off any visible dirt and organic material.*

Dry *off any water.*

Hang in there, baby!