

From Pesticide Sources to Water Quality:

Unravelling Pollution Pathways in Ireland for a Zero-Pollution, One Health Future

Fiona Regan

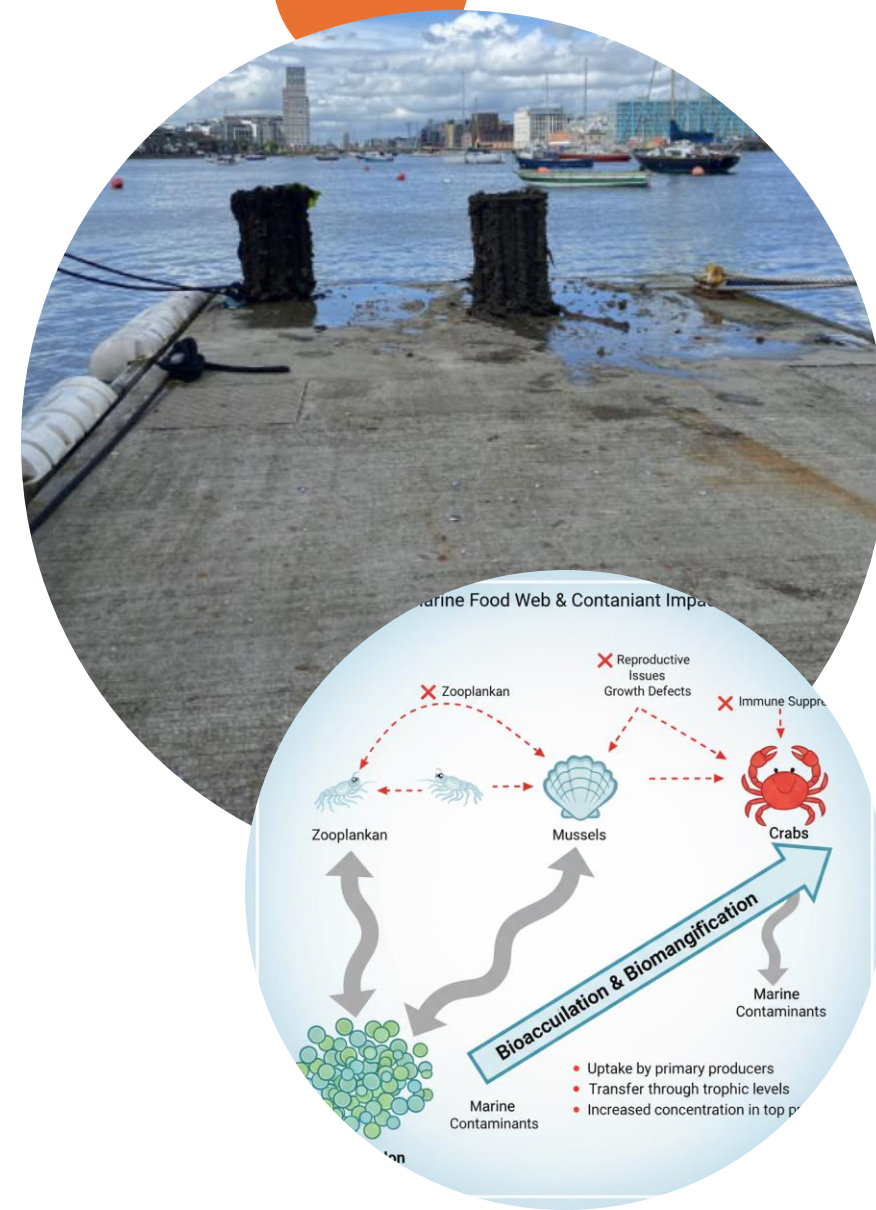
Dublin City University, School of Chemical Sciences

DCU Water Institute

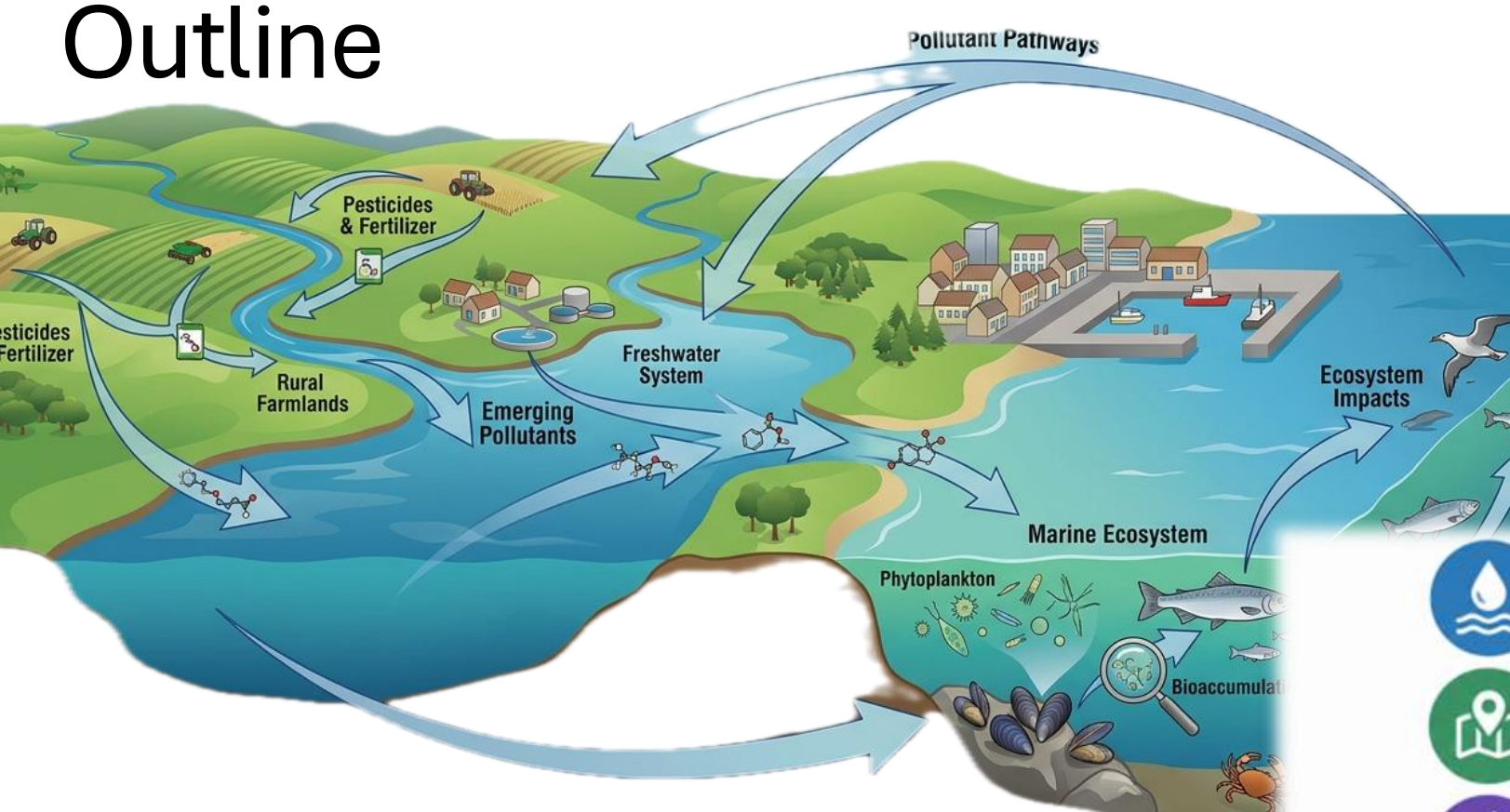


Protect our Health, Water &
Biodiversity from Pesticides

6 October 2026 at 10:00 (GMT+1)
Gibson Hotel, Dublin



Outline

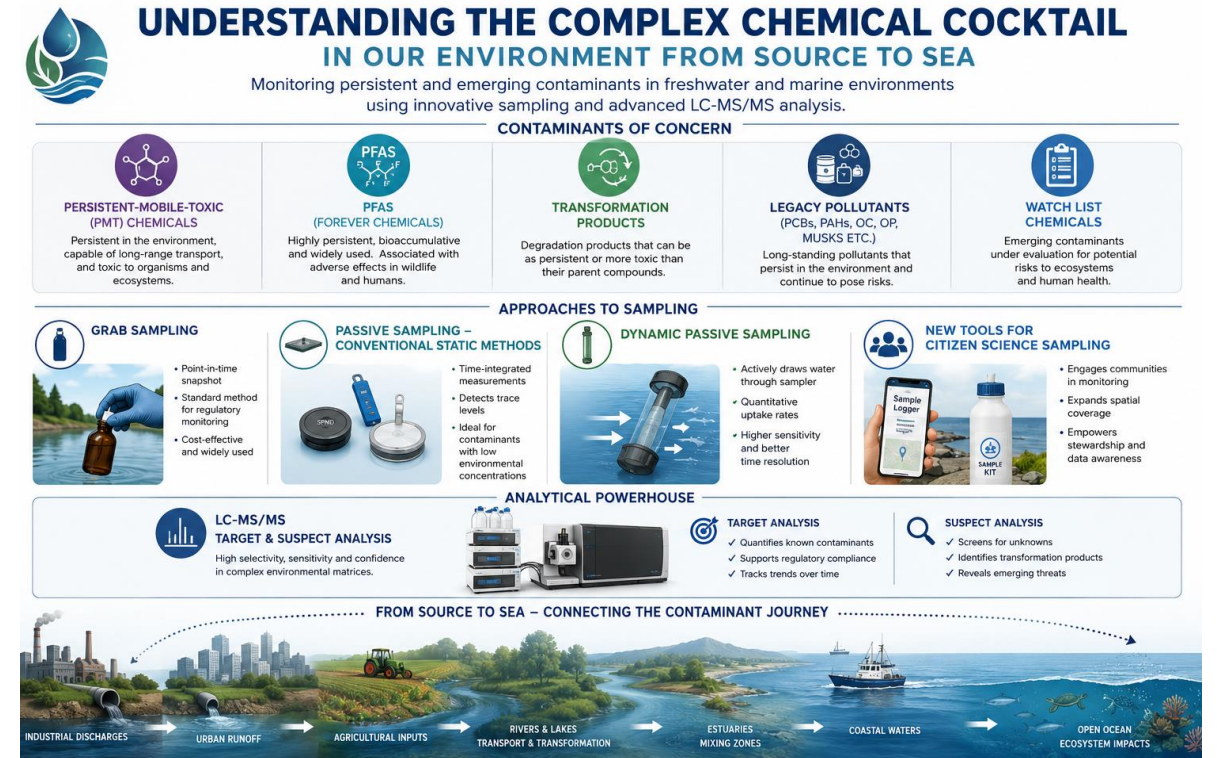


-  Tracking Anthropogenic Contaminants in Aquatic Environments
-  Spatial Snapshots of Pesticides in Ireland
-  Legacy and Emerging Pollutants
-  Soils, freshwater, marine, biota
-  Citizen Engagement
-  Emerging Threats

Tracking Anthropogenic Contaminants in Aquatic Environments

Introduction to emerging contaminants from wastewater, agriculture, and urban runoff.

Why chronic exposure to low-level concentrations matters for ecosystem health and biodiversity, below human safety thresholds.

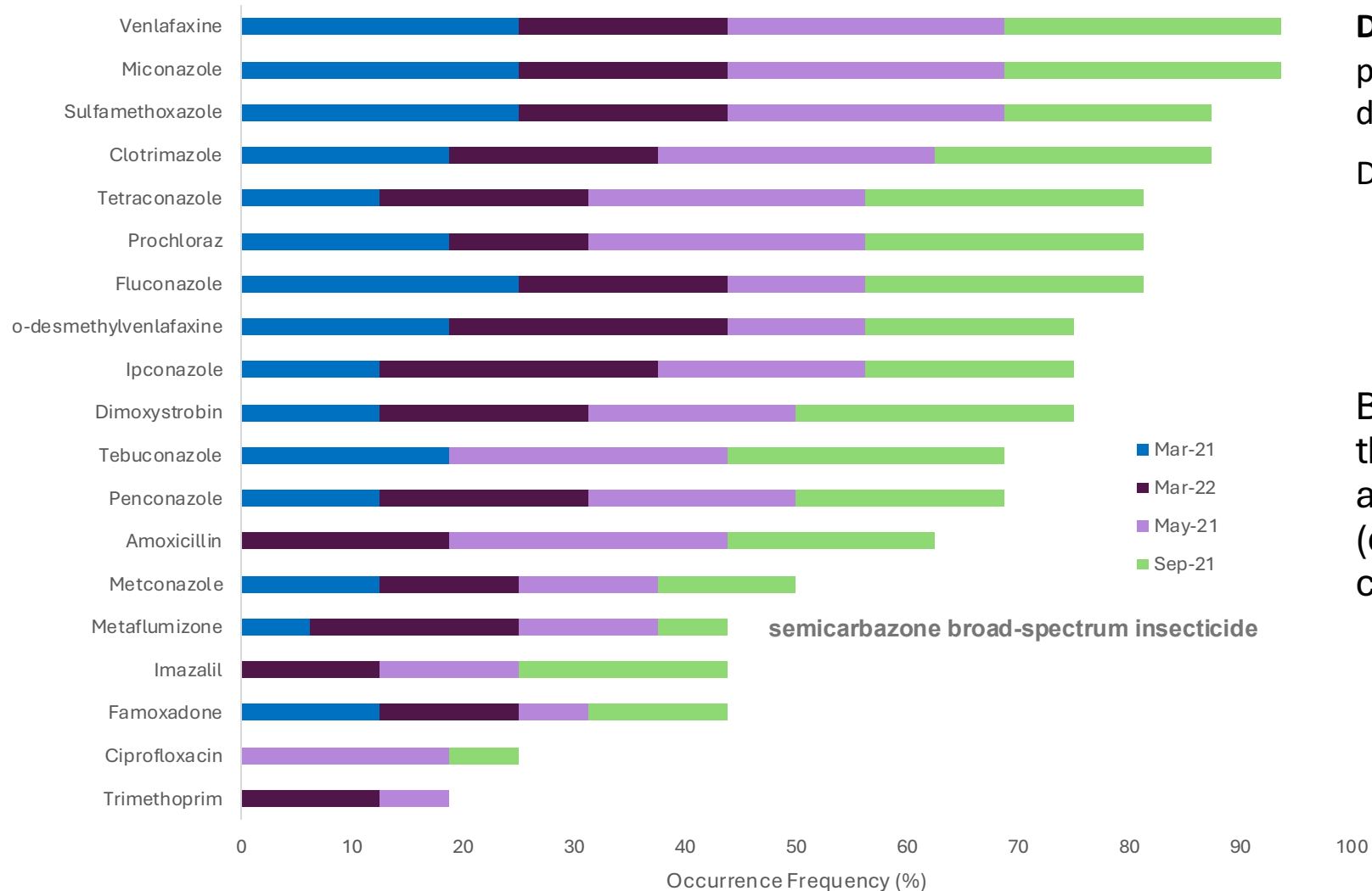


Summary of the concentrations of analysed pesticides in Irish soils within 24 h and one week after pesticide application ($n = 13$, that is, the number of sites where pesticides were recently applied).

Pesticides ($\mu\text{g}/\text{kg}$)	Sampling	Min	Max	Me	Med	SD	CoV	Detection rates (13 sites) (%)	Relative detection (Sites Detected: Sites Applied)
Acetamiprid	24 h	n.d.	<LOQ	<LOQ	<LOQ	–	–	31	4:0
	One week	n.d.	<LOQ	<LOQ	<LOQ	–	–	62	8:0
Azoxystrobin	24 h	n.d.	2.523	0.319	1.323	0.757	80.51%	23	2:2
	One week	n.d.	2.071	0.159	1.03	0.574	0.00%	8	1:2
Boscalid	24 h	n.d.	1.59	0.142	0.795	0.437	117.90%	23	3:0
	One week	n.d.	1.034	0.099	0.517	0.284	82.02%	23	3:0
Clothianidin	24 h	n.d.	<LOQ	<LOQ	<LOQ	–	–	31	4:0
	One week	n.d.	0.271	0.044	0.136	0.094	11.63%	23	3:0
Fluroxypyr	24 h	n.d.	<LOQ	<LOQ	<LOQ	–	–	31	4:9
	One week	n.d.	<LOQ	<LOQ	<LOQ	–	–	31	2:9
Imidacloprid	24 h	n.d.	<LOQ	<LOQ	<LOQ	–	–	23	3:0
	One week	n.d.	–	–	–	–	–	0	0:0
Prothioconazole	24 h	n.d.	45.66	3.851	0.44	12.563	256.50%	85	11:11
	One week	n.d.	5.02	1.06	0.44	1.468	98.84%	85	11:11
Thiacloprid	24 h	n.d.	0.24	0.086	0.08	0.051	72.74%	92	12:0
	One week	0.194	0.242	0.234	0.238	0.013	5.58%	100	13:0
Thiamethoxam	24 h	n.d.	1.465	0.872	1.376	0.719	3.70%	62	8:0
	One week	n.d.	1.489	0.91	1.469	0.749	0.60%	62	8:0

Notation. Min = minimum; Max = maximum; Me = mean; Med = median; SD = standard deviation; CoV = coefficient of variance; n.d. = not detected; and LOQ = Limit of Quantification.

Watch List monitoring (2018-2022)

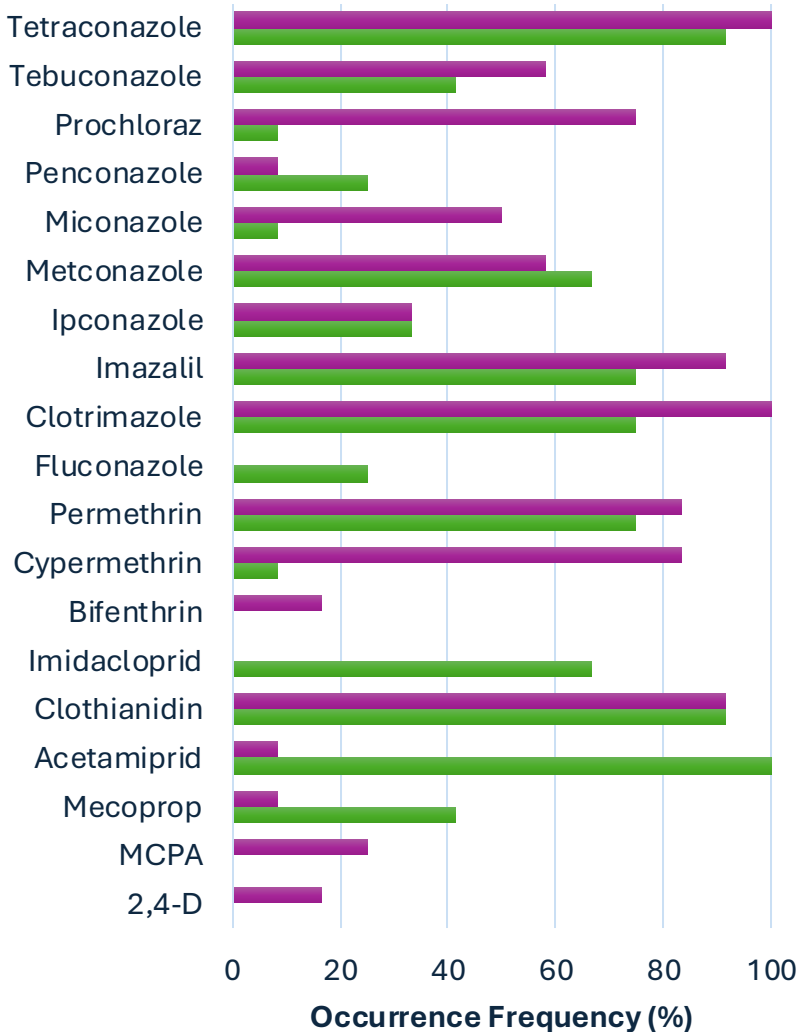


Despite being banned - neonicotinoid pesticides clothianidin and imidacloprid, was detected in all 5 samples taken during December 2018

Based on a **risk assessment** - thiamethoxam, methiocarb and acetamiprid – were moderate risk (occurrence frequency and concentration)

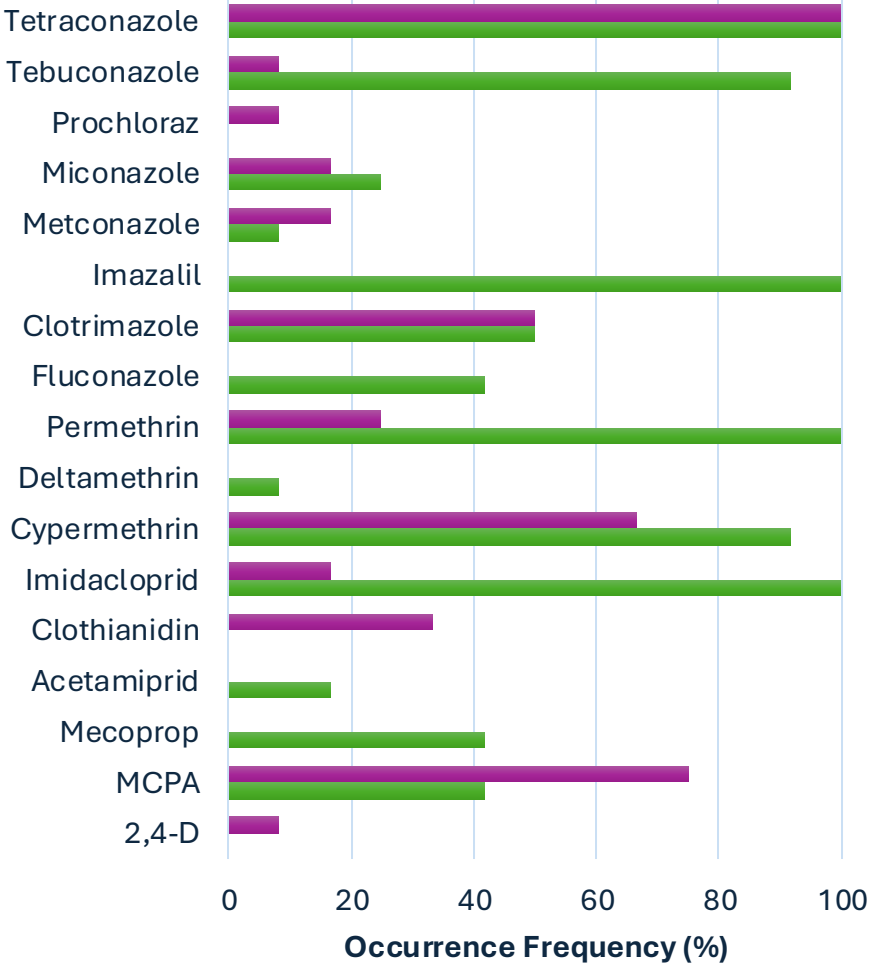
Snapshot: Pesticide Occurrences

Wastewater Influent



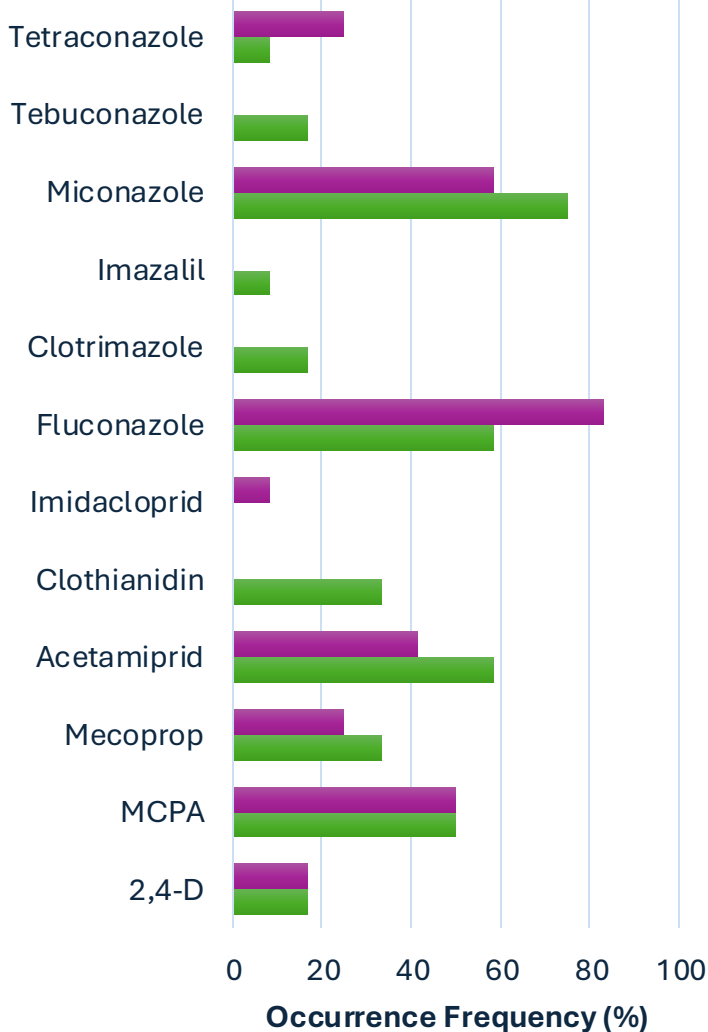
■ Rural Site ■ Urban site

Effluent



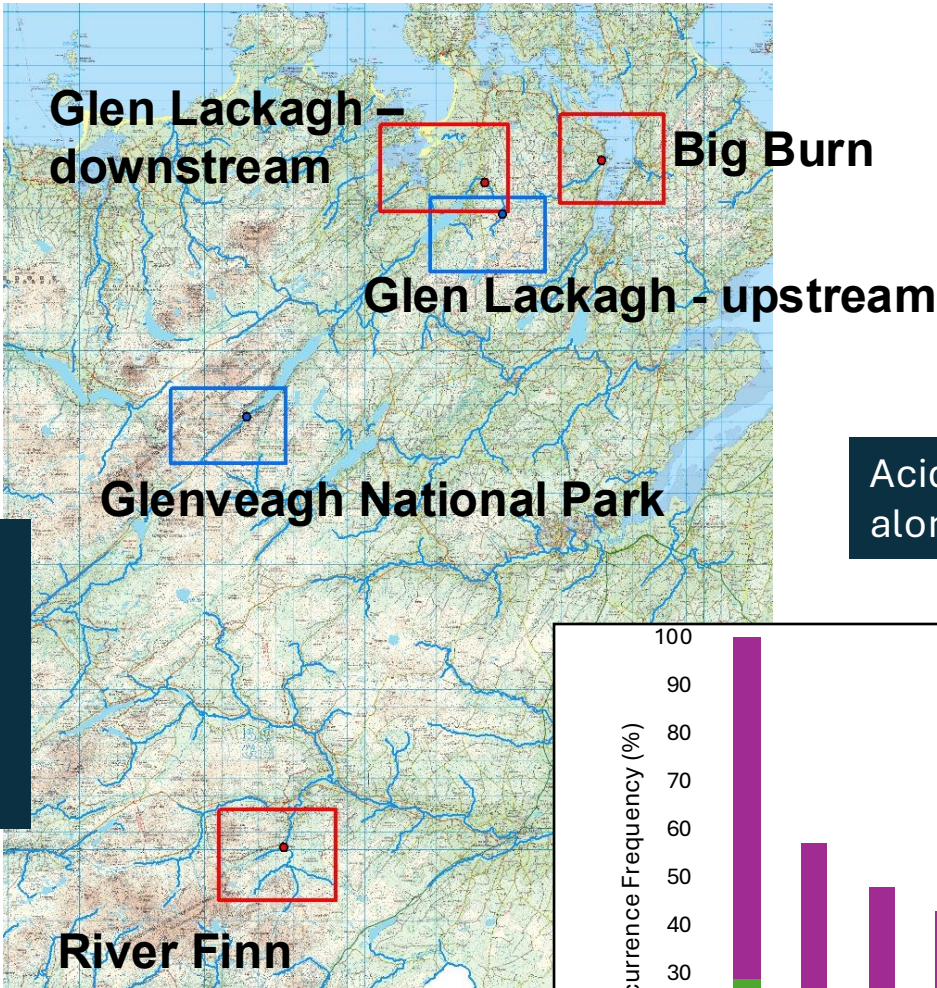
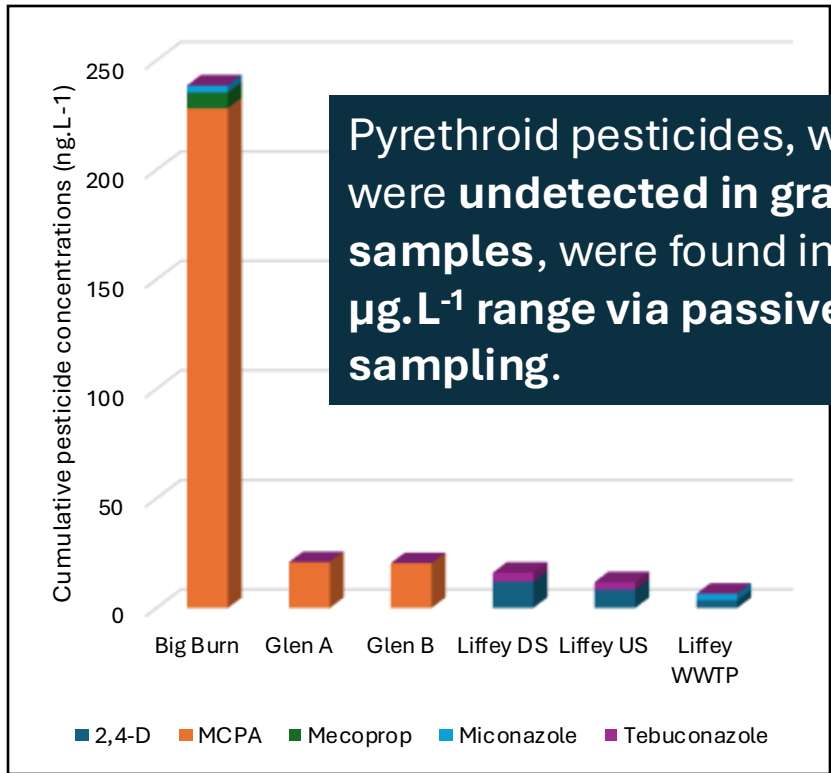
■ Rural Site ■ Urban site

Receiving Waters

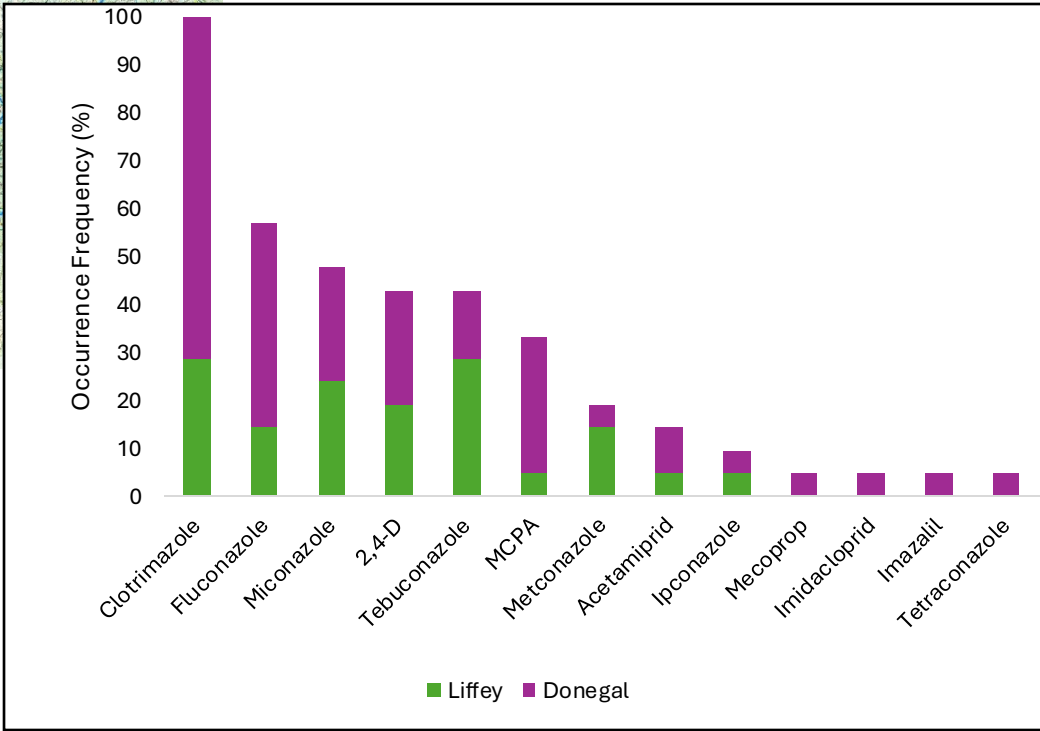


■ Rural Site ■ Urban site

Spatial Snapshots: Legacy and Emerging Pollutants

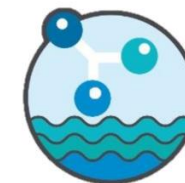
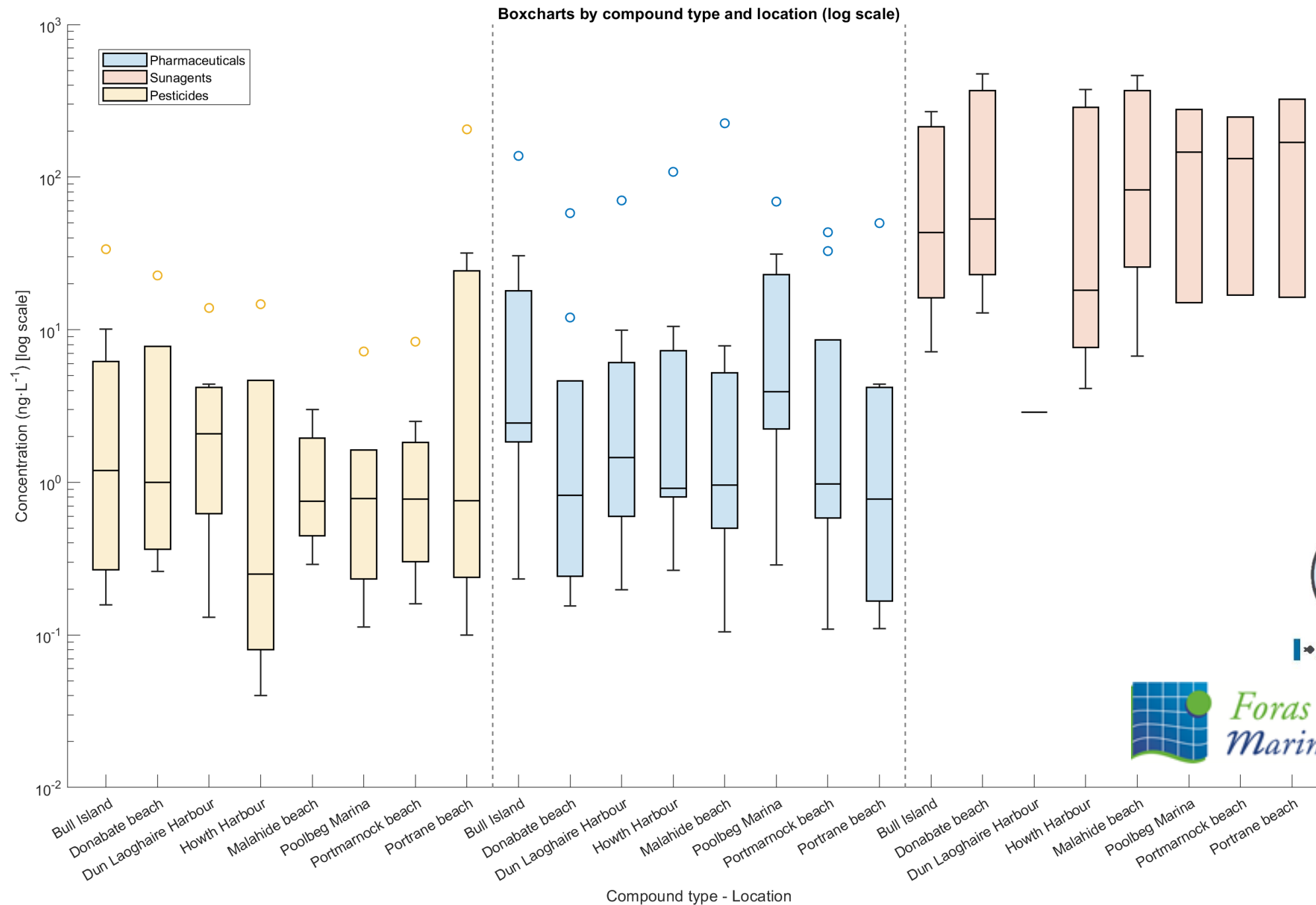


Acid herbicides found at every point along the Liffey,



Coastal marine environment – source to sea





I-SECURE



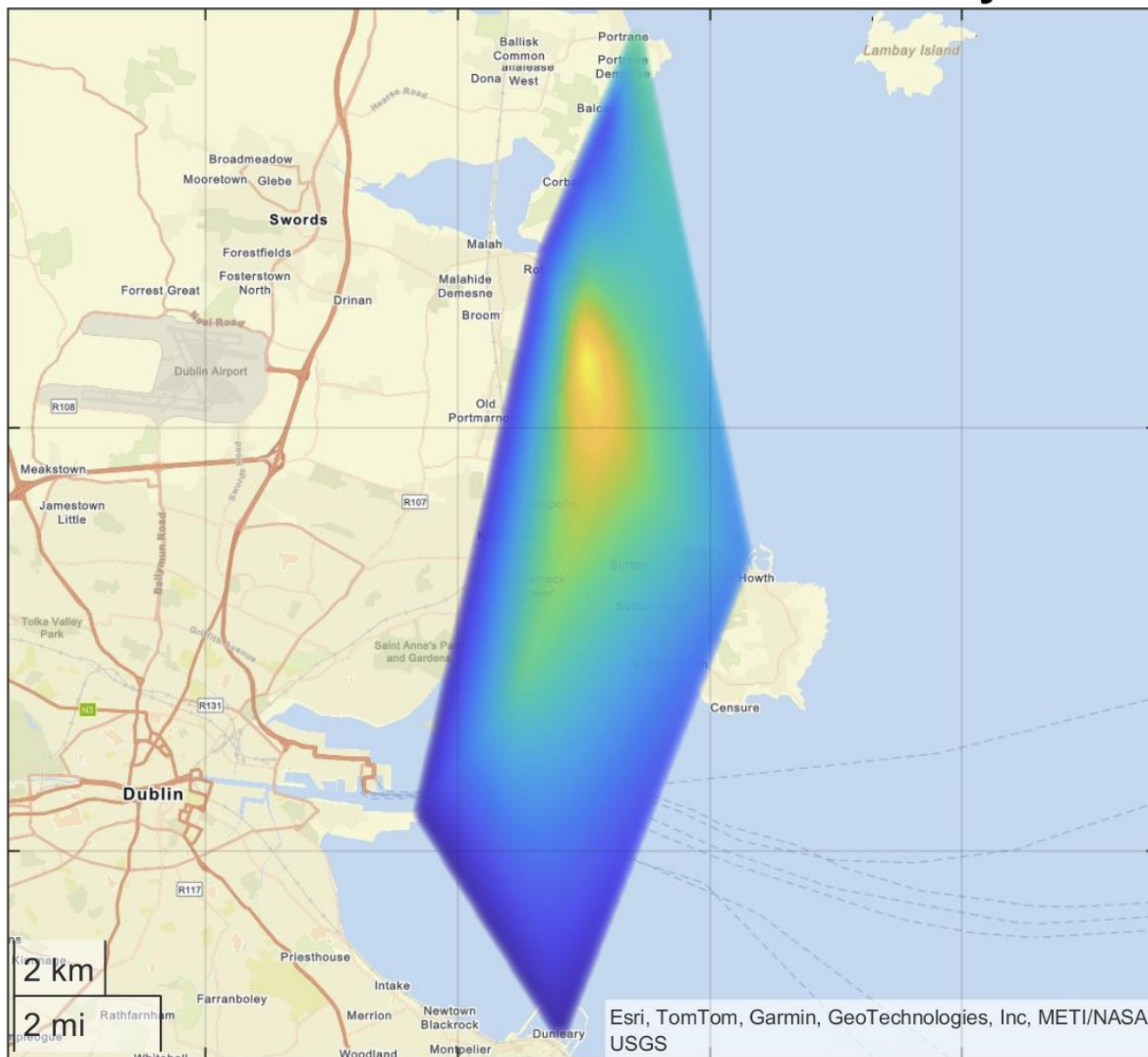
Foras na Mara
Marine Institute

Prochloraz concentration in Dublin Bay

Latitude

53°25'N

53°20'N



6°15'W

6°10'W

6°05'W

6°W

Longitude

Prochloraz concentration (ng·L⁻¹)

2.4

2.2

2

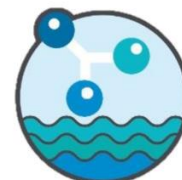
1.8

1.6

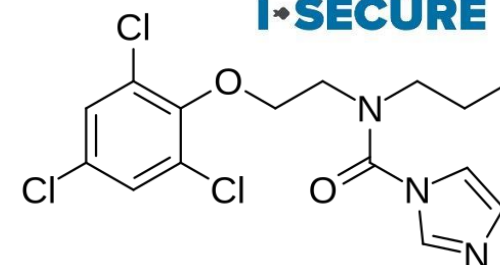
1.4

1.2

1



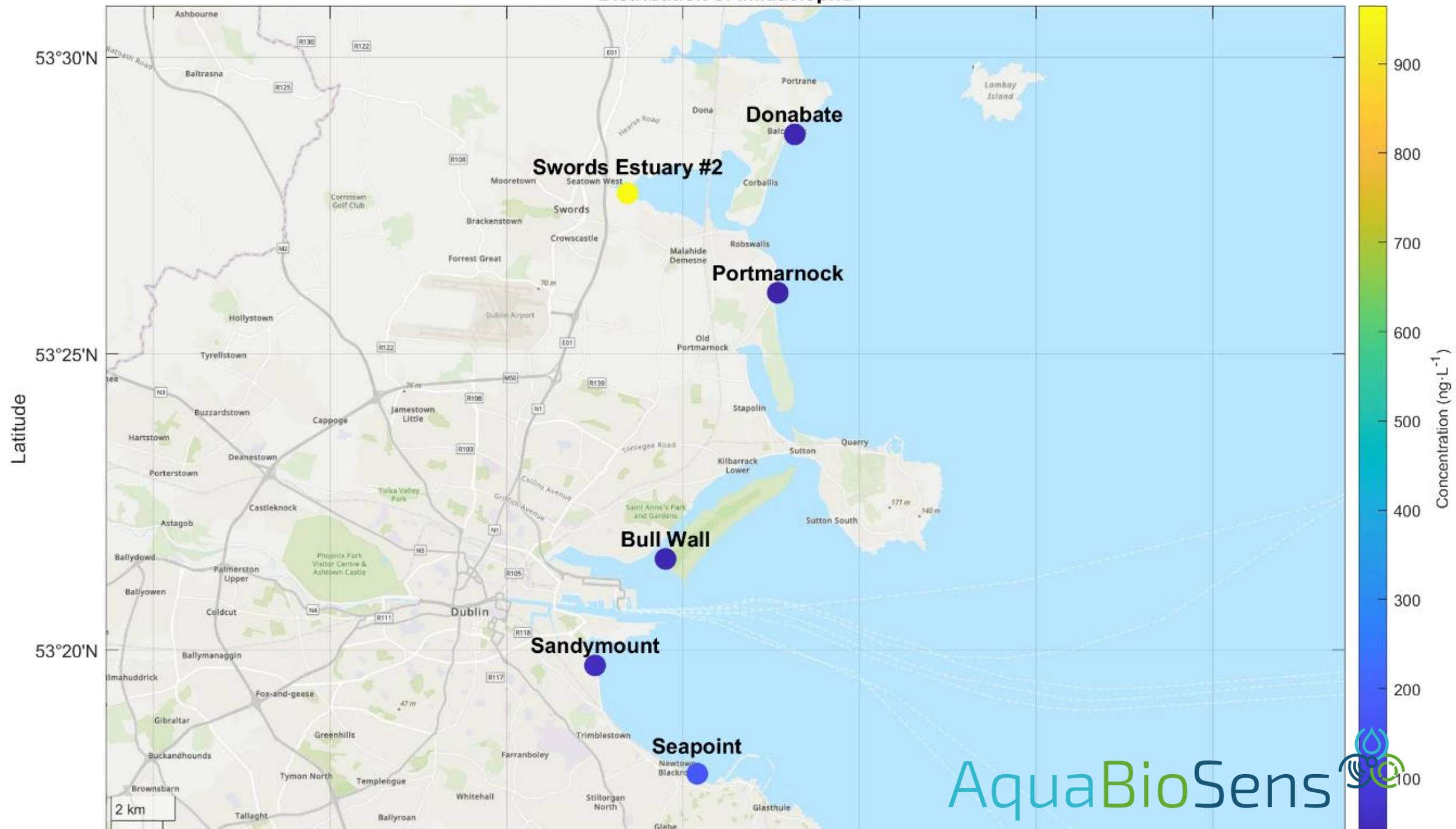
I-SECURE



Prochloraz is a broad-spectrum imidazole fungicide (CAS 67747-09-5) introduced in 1978, widely used in agriculture to control fungal diseases. It is known to possess anti-androgenic effects and is studied for its endocrine-disrupting potential. Used as a systemic fungicide on cereals, fruit, vegetables, and for post-harvest treatment.

Esri, TomTom, Garmin, GeoTechnologies, Inc, METI/NASA, USGS

Distribution of Imidacloprid



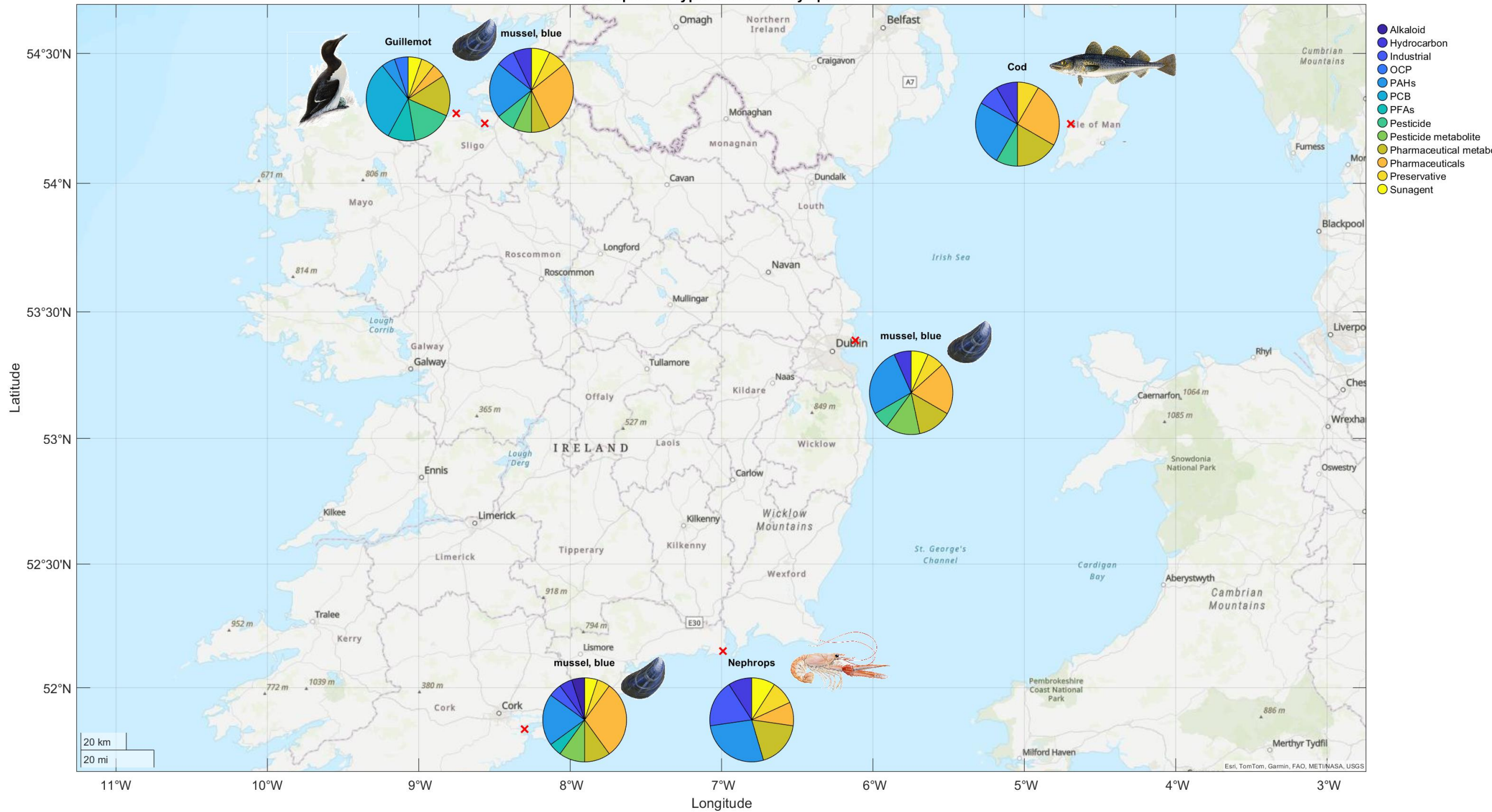


Pesticide concentration – 4 sampling sites in Dublin Bay

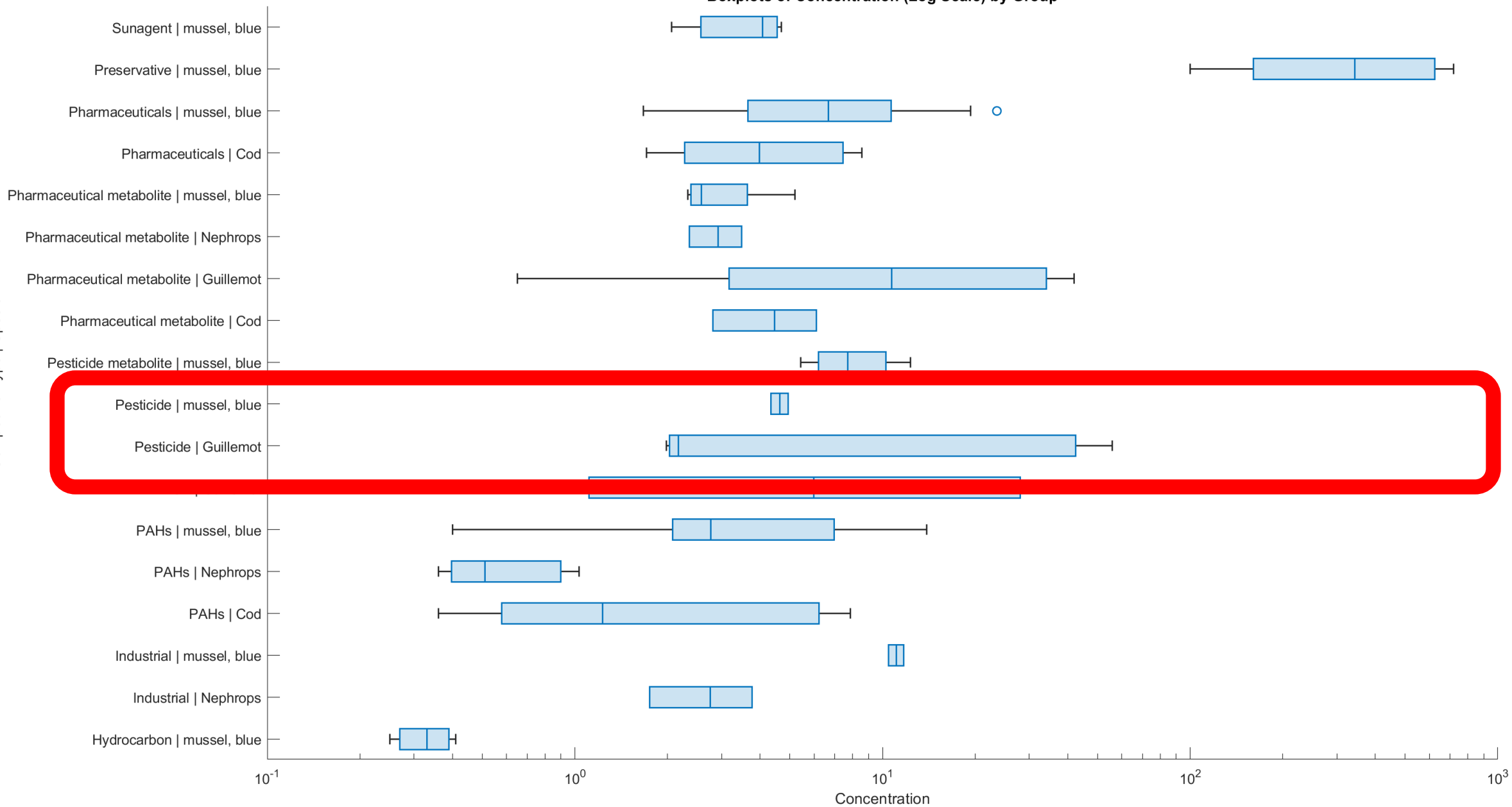
Compound name	Pesticide type	LOQ ($\mu\text{g}\cdot\text{L}^{-1}$)	DL2 ($\mu\text{g}\cdot\text{L}^{-1}$)	DL3 ($\mu\text{g}\cdot\text{L}^{-1}$)	DL5 ($\mu\text{g}\cdot\text{L}^{-1}$)	DL6 ($\mu\text{g}\cdot\text{L}^{-1}$)
2,4-D	Herbicide	0.5	nd	nd	nd	nd
Bifenthrin	Insecticide	0.05	nd	nd	nd	nd
Clothianidin	Insecticide	0.001	0.61 ± 0.05	<LOQ	<LOQ	<LOQ
Clotrimazole	Fungicide	0.001	nd	<LOQ	<LOQ	nd
Cypermethrin	Insecticide	0.01	nd	nd	nd	nd
Deltamethrin	Insecticide	0.5	nd	nd	nd	nd
Esfenvalerate	Insecticide	0.5	nd	nd	nd	nd
Fluconazole	Fungicide	0.001	0.47 ± 0.01	0.09 ± 0.01	0.28 ± 0.04	0.29 ± 0.01
Imazalil	Fungicide	0.05	nd	nd	nd	nd
Imidacloprid	Insecticide	0.01	0.33 ± 0.01	0.06 ± 0.01	0.08 ± 0.01	0.08 ± 0.01
Ipconazole	Fungicide	0.001	0.01 ± 0.00	0.02 ± 0.00	0.02 ± 0.00	0.01 ± 0.00
MCPA	Herbicide	0.01	2.47 ± 0.14	0.17 ± 0.01	0.29 ± 0.03	0.36 ± 0.02
Mecoprop	Herbicide	0.005	<LOQ	nd	nd	nd
Metconazole	Fungicide	0.5	nd	nd	nd	nd
Miconazole	Fungicide	0.05	nd	nd	nd	nd
Penconazole	Fungicide	0.001	0.02 ± 0.00	0.02 ± 0.00	0.02 ± 0.00	0.02 ± 0.00
Permethrin	Insecticide	0.5	nd	nd	nd	nd
Prochloraz	Fungicide	0.005	nd	nd	nd	nd
Tebuconazole	Fungicide	0.05	nd	nd	nd	nd
Tetraconazole	Fungicide	0.001	0.02 ± 0.00	nd	nd	0.02 ± 0.00
Thiabendazole	Fungicide / Anthelmintic	0.01	0.14 ± 0.00	0.11 ± 0.02	0.12 ± 0.01	0.11 ± 0.01
Thiacloprid	Insecticide	0.001	0.04 ± 0.00	0.01 ± 0.00	0.61 ± 0.05	0.02 ± 0.00
Thiamethoxam	Insecticide	0.1	0.23 ± 0.01	nd	0.21 ± 0.02	<LOQ

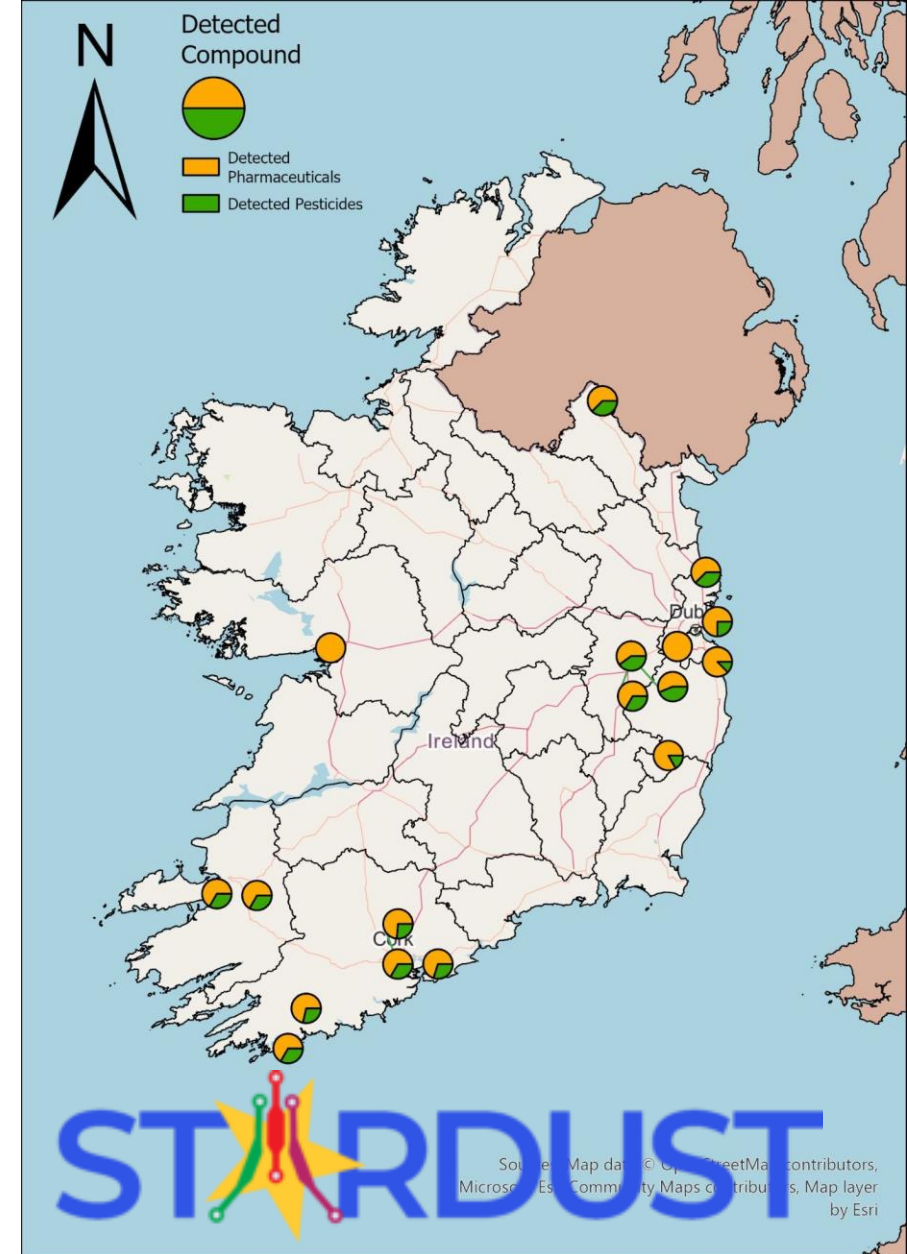
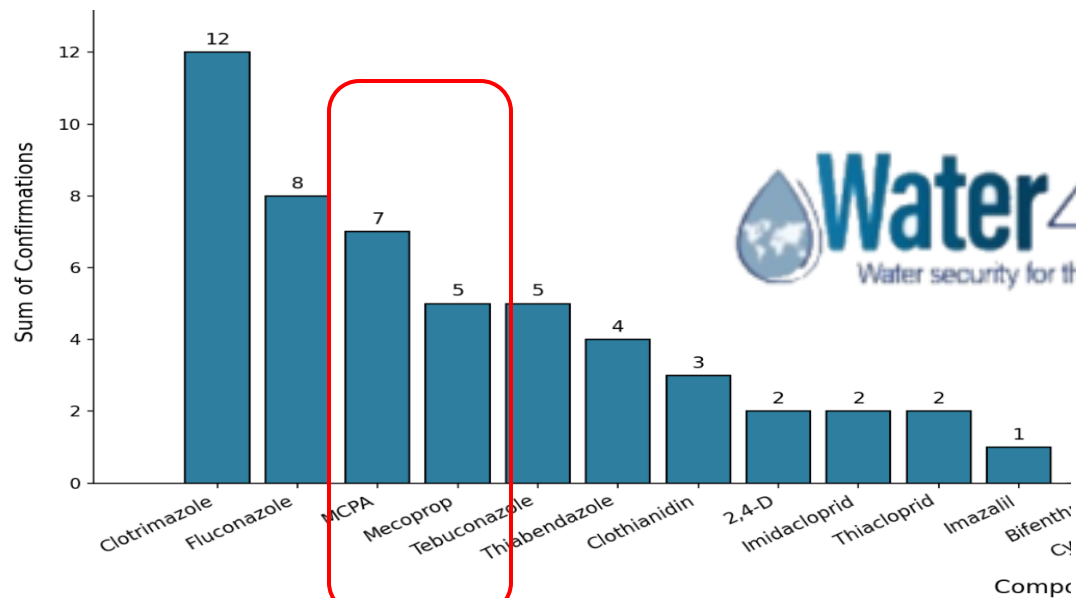
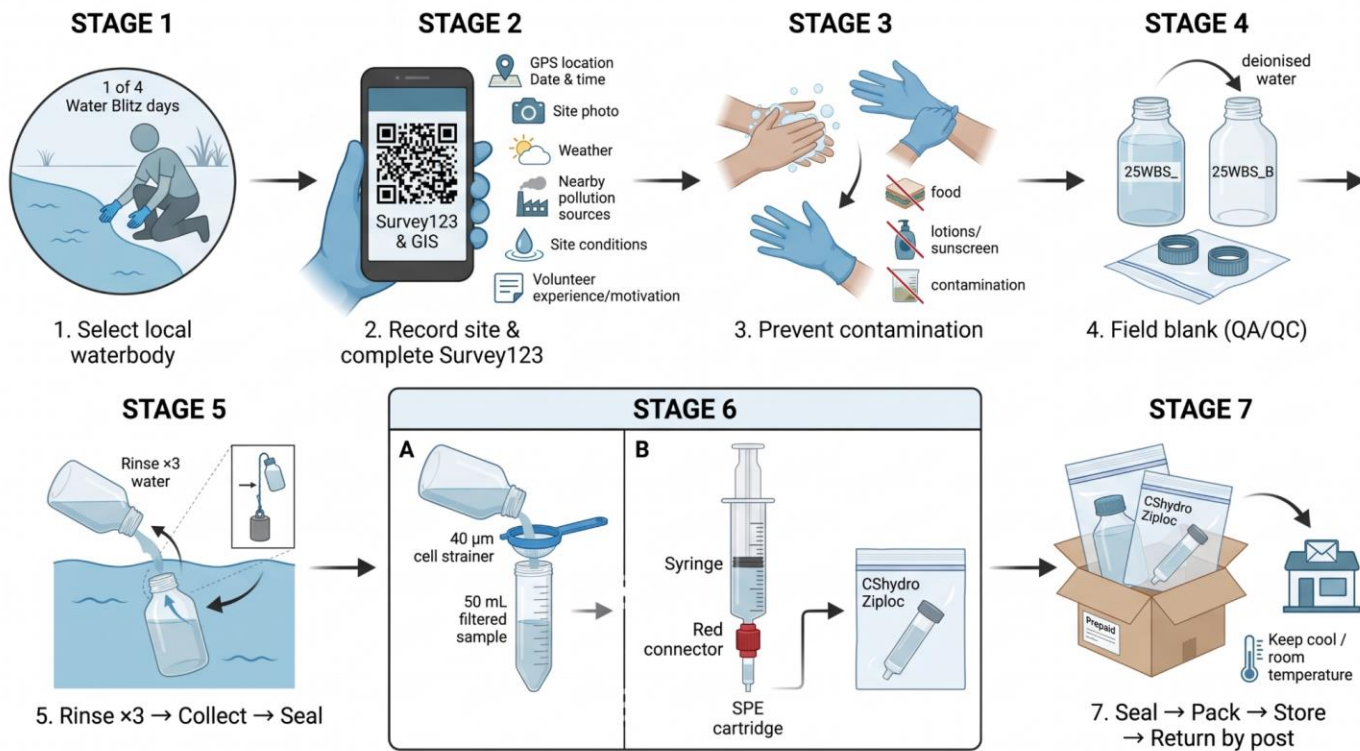


Compounds type distribution by species



Boxplots of Concentration (Log Scale) by Group





Citizen Science

Emerging threats

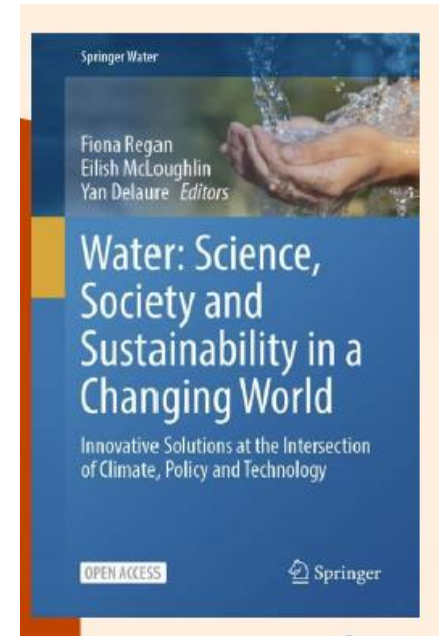
The DCU Water Institute - on the proposed **Omnibus X** legislative changes affecting plant protection product regulations and environmental governance across the European Union.

Our primary position is clear:

extending approval timelines or streamlining regulatory processes must not compromise the protection of water resources, public health, or aquatic ecosystems.

- **How to achieve effective regulation?**
 - **Monitoring pesticide transport, concentrations & impact**
 - **In relation to Omnibus X simplification package**

The regulatory system must remain capable of revisiting prior decisions in light of new scientific knowledge.



2026

Chapter 14
**Silent Pollutants: The Chemical Cocktail
in Our Water**

Fiona Regan

Go raibh míle maith agat

Acknowledgements

Isabel Cadena, Nicolette Sale, Belinda Huerta, Helen Burke, Patrick Sode, Nathan Marechal, Chloe Martin, Andrew Healy, Ciprian Briciu-Burghina, Chloe Richards, Adrian Delgado, Sean Power, Gavin Mc Ilreavy, Brendan McHugh, Branislav Vrana, Imogen Hands, Blanaid White, Jonathan Spencer, Marcus Chadha & Agilent colleagues

INVEST p **F** ASST

