Session 3 : Defining biosecurity measures

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VIVALDI
Preventing and mitigating farmed bivalve diseases

Biosecurity is defined by the OIE as

World Organisation for Animal Health

a set of management and physical measures designed to mitigate the *risk* of introduction of *pathogenic agents* into, or spread within, or release from, *aquatic animal* populations.

Management → husbandry + biosecurity

Cultures in open systems → use of either drugs or vaccination is not possible → disease prevention must rely on biosecurity and husbandry.

VIVALDI's approach :

- Interactions host vs environment vs pathogen (WP4) → provides information for risk assessment & models (**biosecurity)** and to improve **husbandry**
- **Implementation** of tools to improve biosecurity and husbandry (WP5) → Is the innovation component for transference (WP6).

Examples of husbandry & biosecurity measures:

- *Consequences of oyster mortality episodes on benthic-pelagic coupling of the Thau lagoon (FR)*, by Marion Richard (UMR MARBEC, FR)
- *Strategies to minimize risk of disease and to produce resilient quality oysters,* by Achim Janke (Global Prospects / TOPS Oysters Consulting Ltd, New Zealand)

Round Table

Husbandry strategies → Revision

REVIEWS IN Aquaculture

Reviews in Aquaculture, 1–21 doi: 10.1111/raq.12246

A literature review as an aid to identify strategies for mitigating ostreid herpesvirus 1 in *Crassostrea gigas* hatchery and nursery systems

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https://onlinelibrary.wiley.com/doi/abs/10.1111/raq.12246

Compartment factors	
Animal host	Age of bivalves, size, physiological state and growth rate, immunity to the pathogen, and selective breeding programmes
Husbandry	Production cycle, culture systems used, stocking densities, and presence of co-cultured bivalves
Pathogen	Life cycle, survival in the environment, pathogenicity and virulence
Environment	Temperature, reservoir populations, water pollution, and ecosystem compartments

Management control strategies
Surveillance
Biosecurity
Mitigation
Farm-based decisions
Integrated management
Traceability
Zoning/compartmentalisation

Husbandry strategies → Vivaldi cases

Investigate and define the optimal *C. gigas* husbandry practices to reduce mortalities.

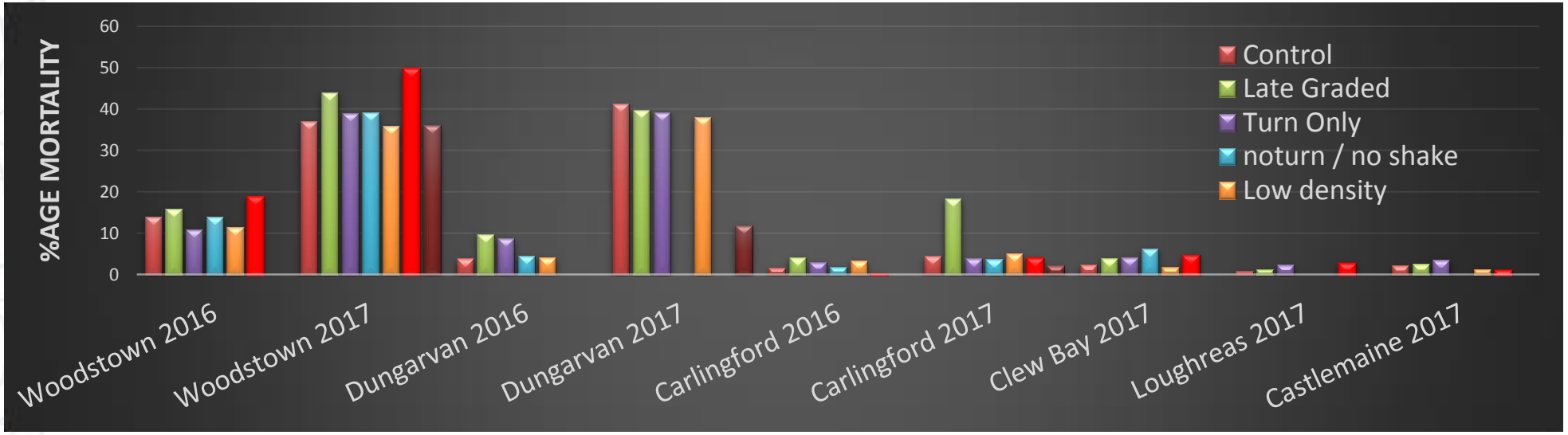
Spain→ Ebro Delta (Alfacs & Fangar bays) → OsHV vs *C. gigas* → Session 2.

France→ Thau Lagoon → OsHV & *V. aestuarianus* vs *C. gigas* → Session 3.

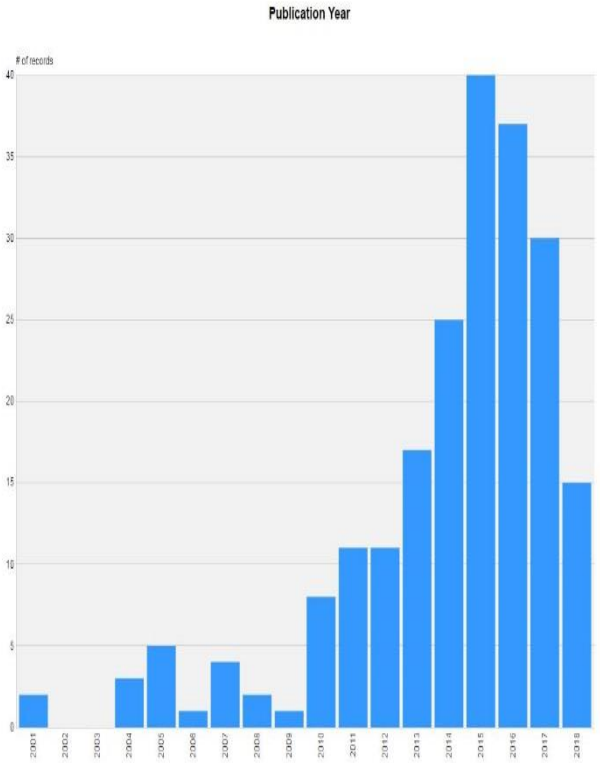
Ireland→ Dungarven, Woodstown & Carlingford → OsHV & *V. aestuarianus* vs *C. gigas* → Session 3_ introduction

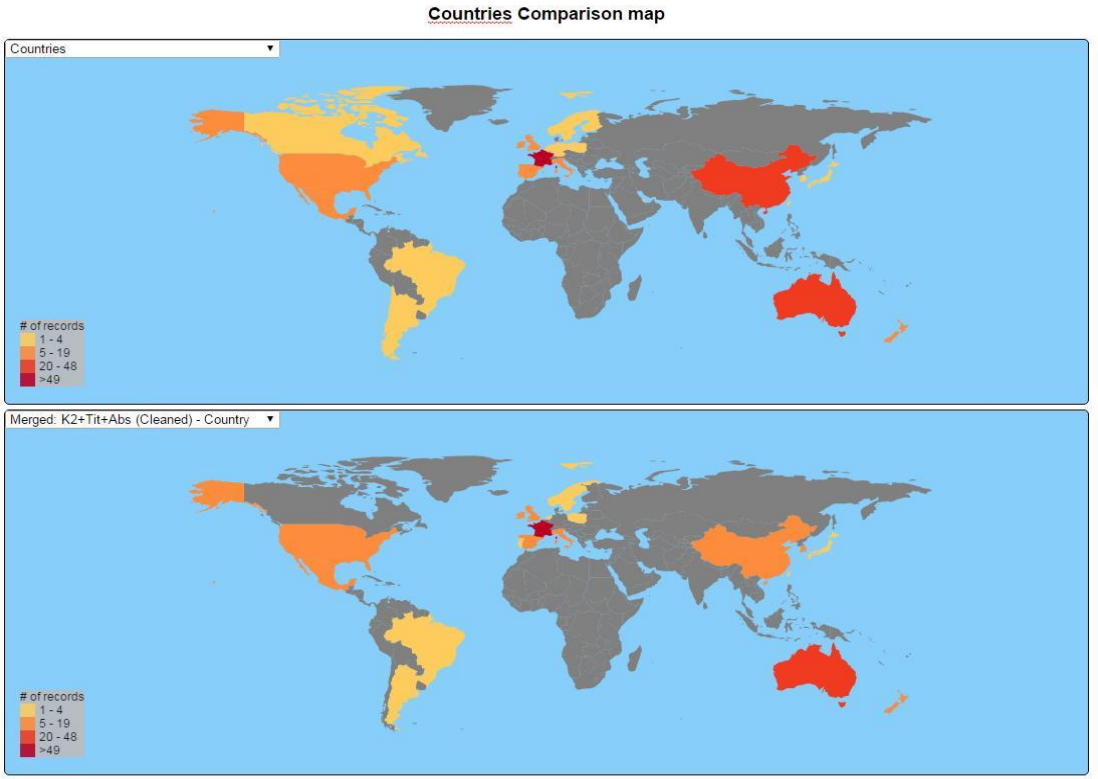
Irish Context – management of *C. gigas*

- Emerging problems with *C. gigas* in Ireland
- *V. aestuarianus* in France / Ireland
- management factors associated with increased mortality



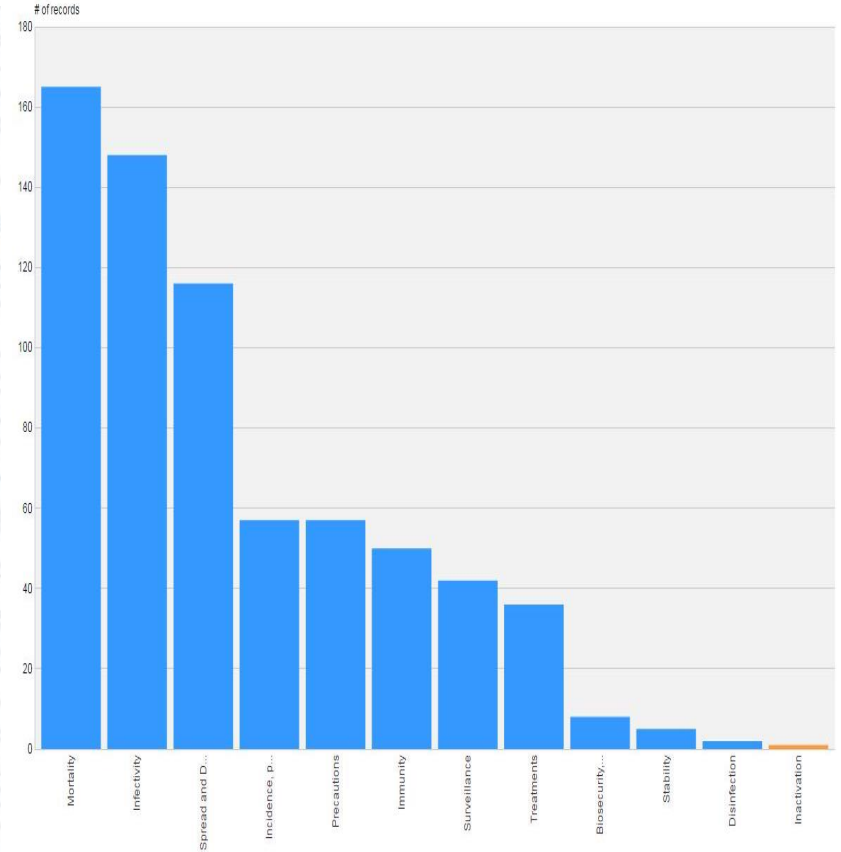
Biosecurity → bibliometric and semantic analysis





VantagePoint Search Technology. Accessed August 10, 2018.

Sanjuan-Vilaplana, Anna & Reverté, Carmen. IRTA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Spread and D...
Incidence, p...
Precautions
Immunity
Surveillance
Treatments
Biosecurity,...
Stability
Disinfection
Inactivation


Surveillance
Infectivity
Mortality
Inactivation
Stability
Disinfection
Incidence, persistance and recurrence
Spread and Distribution
Treatments
Biosecurity, Precaution, Prevention
Precautions
Immunity

Host vs Pathogen vs Environment interactions.

C. gigas (C.g) vs OsHV-1 and/or *V. aestuarianus* (V.a)

	Factor / stressor	Model	Approach	Outcomes	Partners
Abiotic	UVB	Field and lab C.g OsHV-1 & V.a	UV-B on pathogen and oyster	On going	UCC, Atlantium, IRTA
	Tº	Lab. C.g vs OsHV-1	High Tº on C.g survivors (OsHV-1)	On going + C.g to high Tº	IFREMER
	Tidal/High Tº	Lab. C.g vs OsHV-1	Survival and stress of seed & old C.g	On going Preliminary results	UCC
	pH	Lab. C.g with OA	Multi-stressor experiments	Not initiated	IFREMER
	SPM turbidity and low salinity	Lab. C.g vs OsHV-1 & V.a	Simulate estuarine/river	Low salinity, reduces OsHV-1 prevalence. SPM higher cumulative mortality	UCC
Biotic	Co-cultures	Lab. C.g vs OsHV-1	Filter feeders as a sink or a source	On going Decreased mortality risk	IFREMER
	Plankton & protists	Field and lab	Plankton vs V.a. Virulence expression	In press. On going	CNRS, UNIGE, CSIC

Biosecurity can be applied at the level of the farm, region and country

A set of management and physical measures designed to mitigate the *risk* of introduction of *pathogenic agents* into, or spread within, or release from, *aquatic animal* populations in

- Farms (compartments) → session 1
- Regions (zones)
- Countries

World Organisation for Animal Health

Biosecurity is an integral part of maintaining freedom from specified (listed) pathogens

Maintaining biosecurity – the role of surveillance

EC directive 2006/88

Member States should ensure that a risk-based animal health surveillance scheme is applied in all farms and mollusc farming areas aimed at the detection of increased mortality and listed diseases

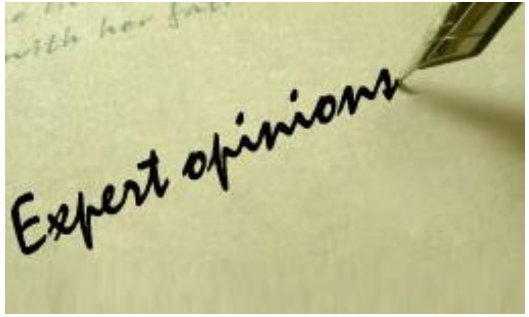
To achieve maintain disease freedom at country or zone level, basic biosecurity conditions have to be met including:

*'**an early detection system** : an efficient system for ensuring the rapid recognition of signs that are suspicious of a listed disease, or an emerging disease situation, or unexplained mortality, in aquatic animals in an aquaculture establishment or in the wild'*

Risk methods provide a robust defensible approach to ensuring resources for surveillance are efficiently targeted.

Risk ranking shellfish farms and farming areas – the approach

Introduction \ Spread	L	M	H
H	M	H	H
M	L	M	H
L	L	L	M

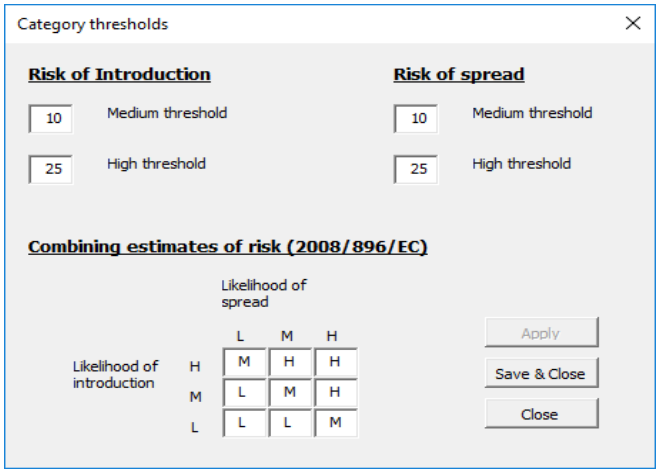


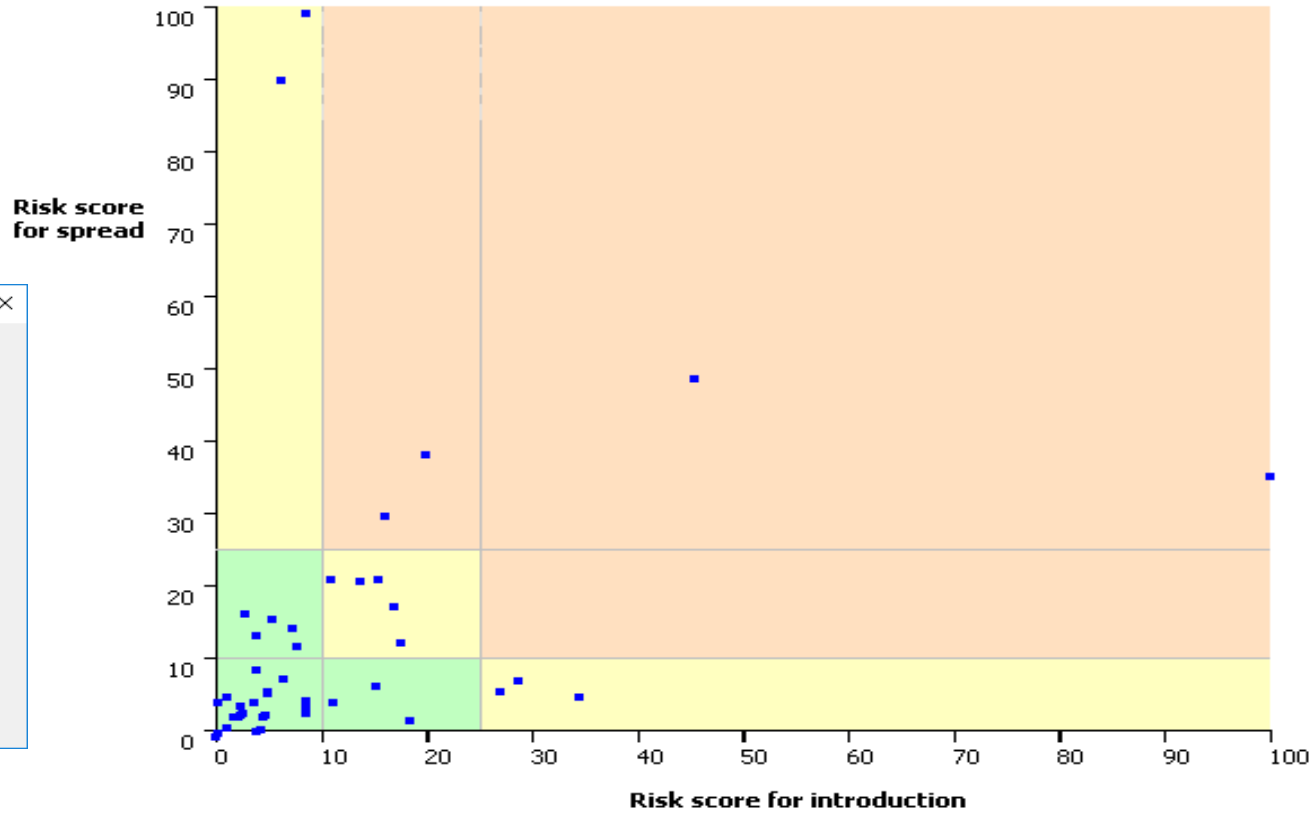
- Identify important routes of disease introduction and spread
- Collect farm level data to assess each route at farm level
- Weight routes based on expert opinion
- Risk rank farms within an area (using matrix)
- Aggregate farm level data to shellfish farming area level
- Rank farming areas (using matrix)
- Focus surveillance on high risk farms in high risk areas.

Routes of disease spread

Risk theme	Routes
Introduction of live animals	• Susceptible or non-susceptible species • Farmed or wild origin
Introduction via water from an infected source	• Shellfish farms • Purification centres • Holding facilities • Markets
Introduction by anthropogenic activities (long distance spread)	• Sharing equipment • Sharing personnel • Casual harvesting • Commercial fishing • Recreational pursuits • Commercial shipping
Introduction from wildlife (short distance spread)	• Seabirds • Predatory animals

Setting thresholds

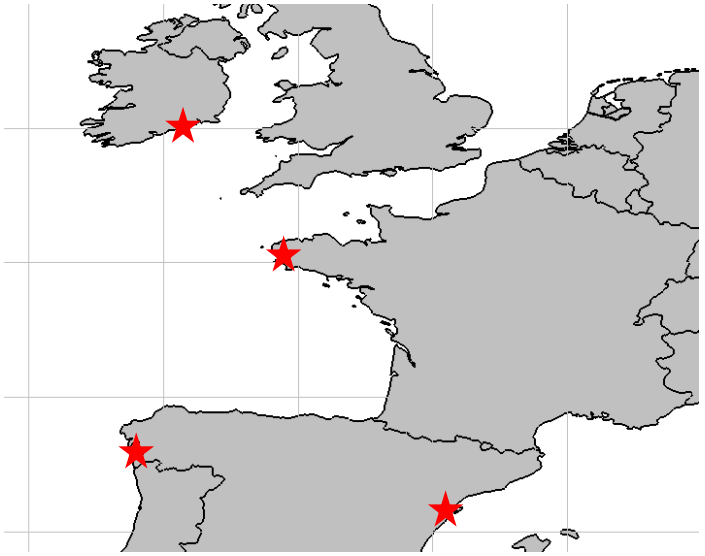




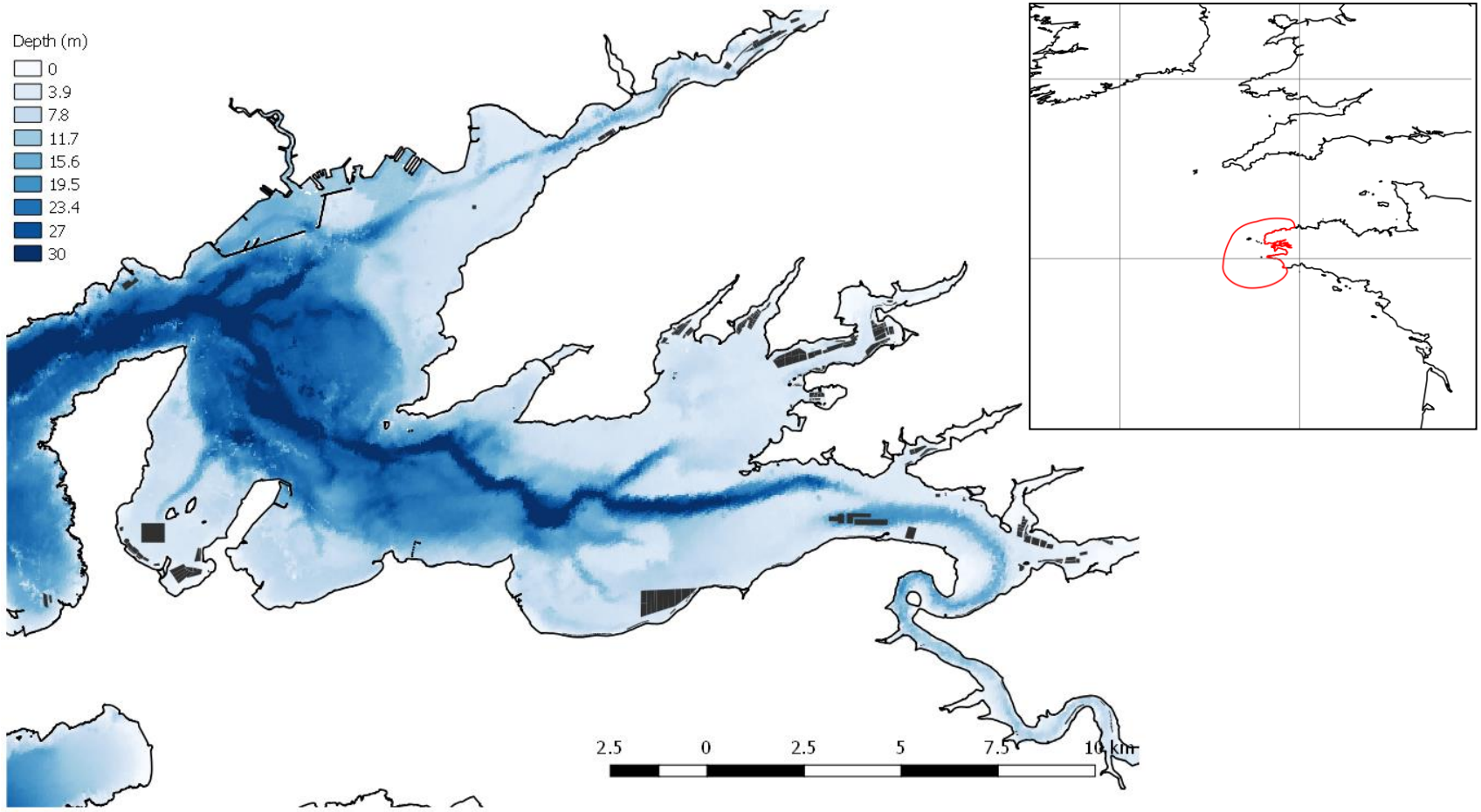
Hydrodynamic models of pathogen spread

- Hydrodynamic models of 4 shellfish farming areas have been constructed using TELEMAC © software
- Particle tracking simulations using the models will be run to assess the spread of a pathogen from the initial outbreak to sites within the same or adjacent bays
- High risk areas identified and can be targeted in surveillance
- Informs spatial planning

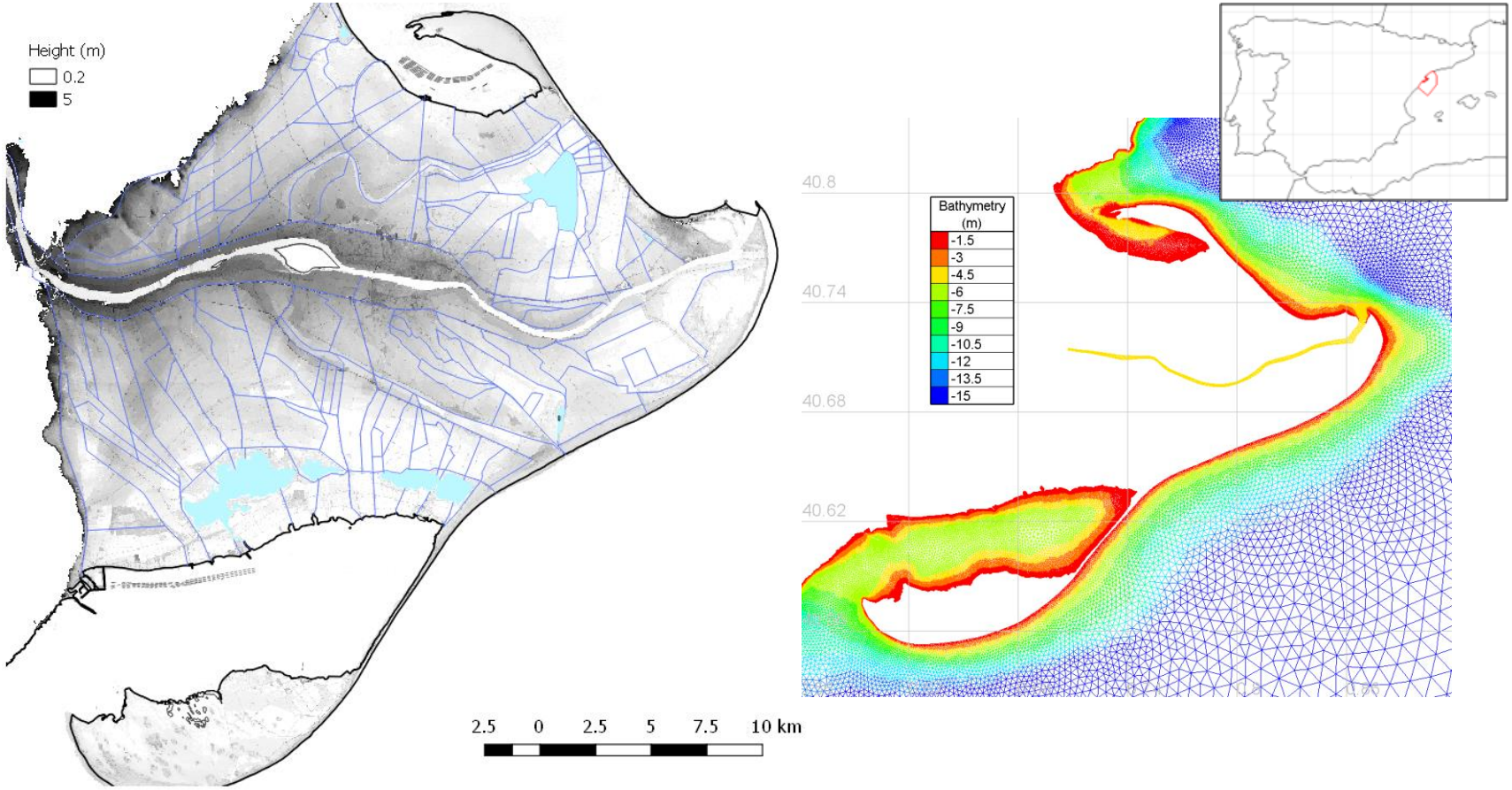
- Dungarvan Bay
- Bay of Brest
- Ebro Delta
- Rio de Vigo



Bay of Brest



Ebro Delta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Conclusions

- Risk based surveillance examines routes of spread into and out of farms and farming areas
- Hydrodynamic modelling focuses on spread within a shellfish farming areas
- Both sources of information can be used to focus surveillance efforts
- Sharing results with farmers will help them improve their own biosecurity practices

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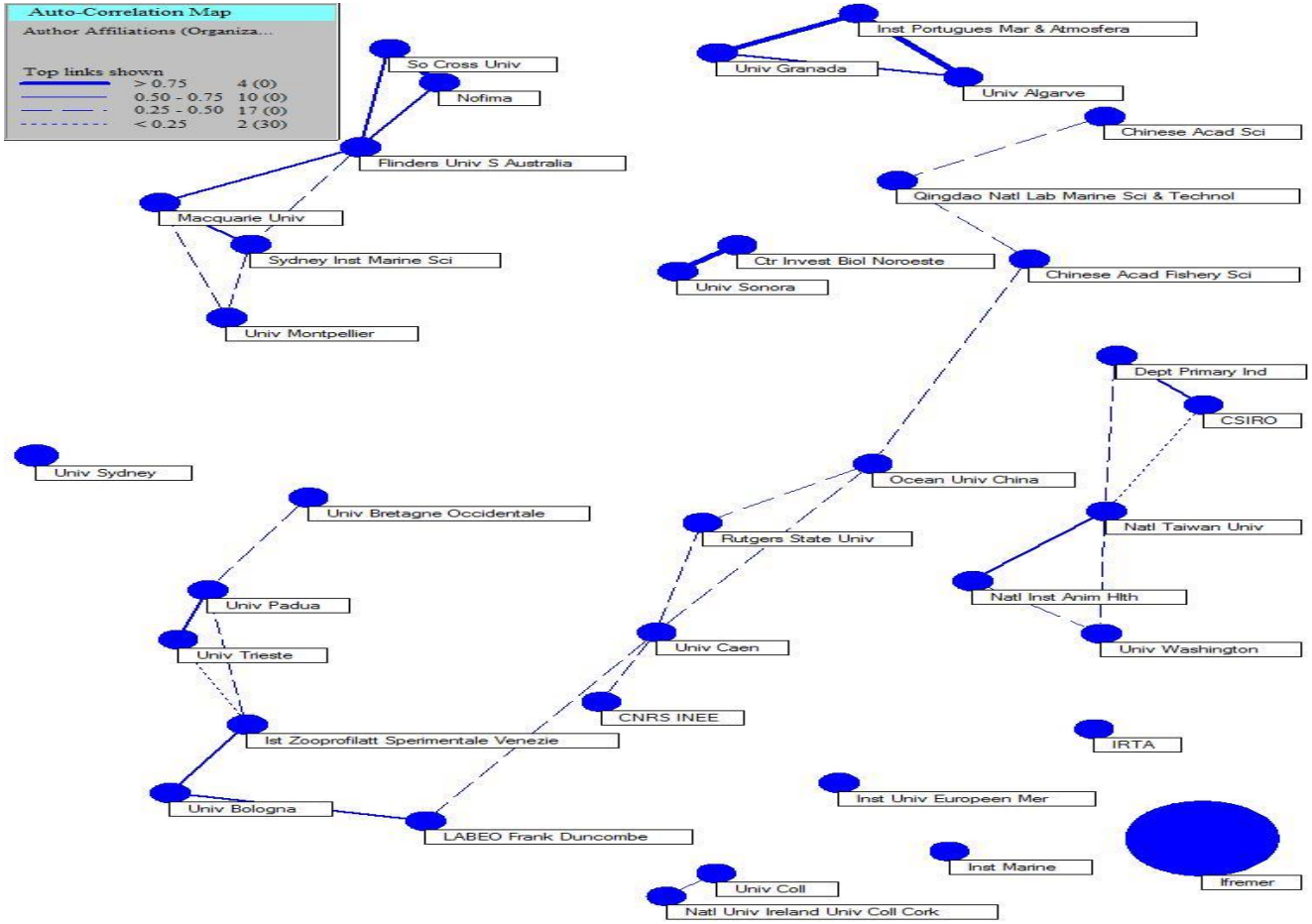
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