Introduction

Biosecurity: 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 (WOAH - *Aquatic Animal Health Code* - 6/09/2021)
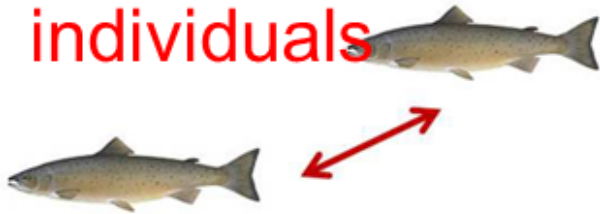
Identify the critical control points for disease introduction and spread in farmed seabass and seabream
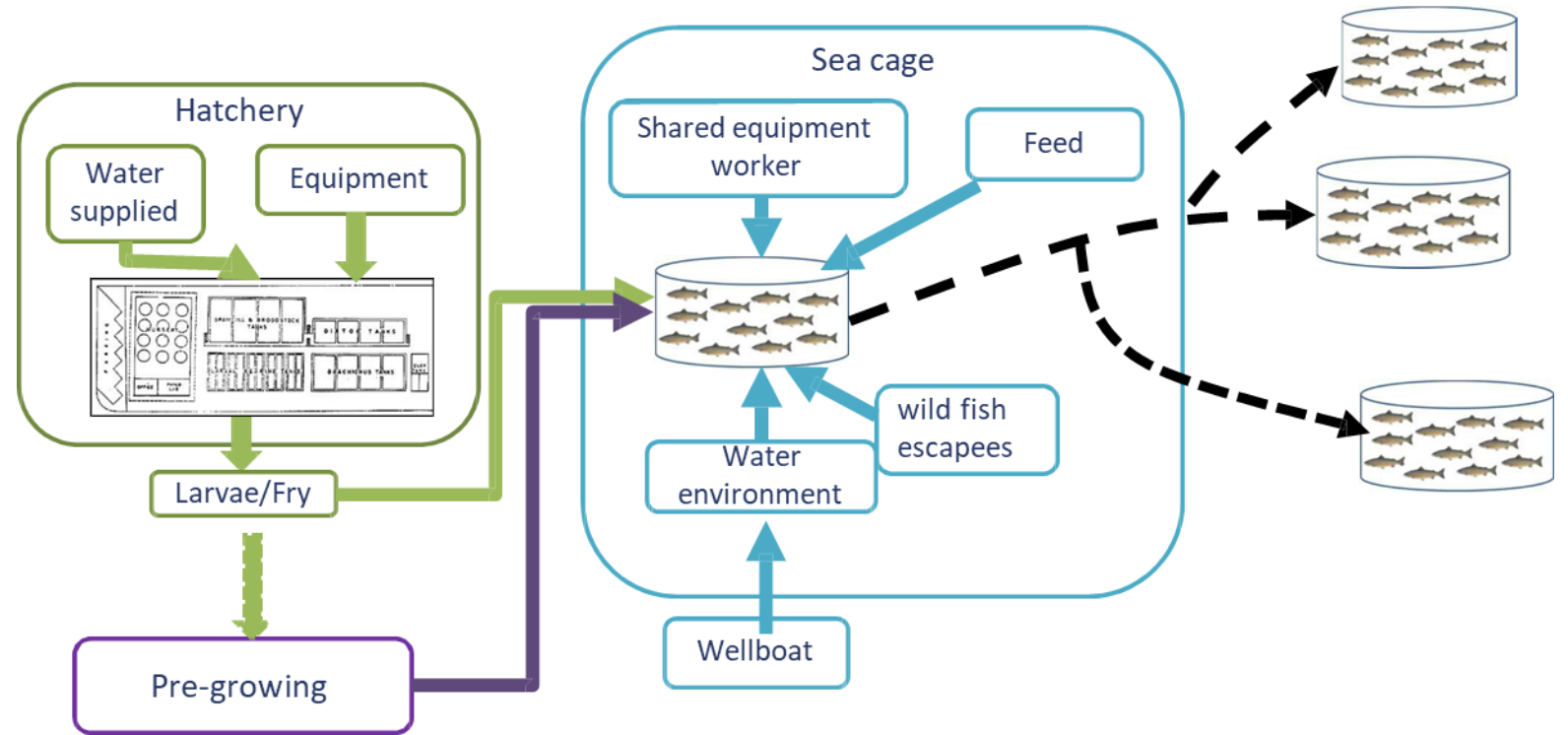
A schematic pathway of disease introduction and spread

Factors influencing disease spread in aquaculture

Between individuals

Host
- Species, age, size, life stage
- Immune status, stress

Pathogen
- Virulence
- Type of transmission (direct, indirect)
- Stability outside host

Within population
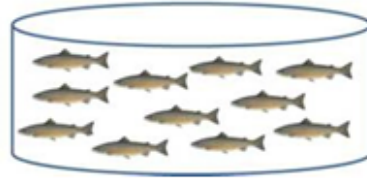
- Host density

- Contact structure: homogenous or heterogeneous

- Proportion susceptible and infected individuals

- Environmental condition, temperature, salinity

Between populations

https://en.wikipedia.org/wiki/Mariculture

- Connectivity between cages or sites (distance, water current, mechanical means)

Production flow, control points

- Hatchery (from eggs incubation to weaning)

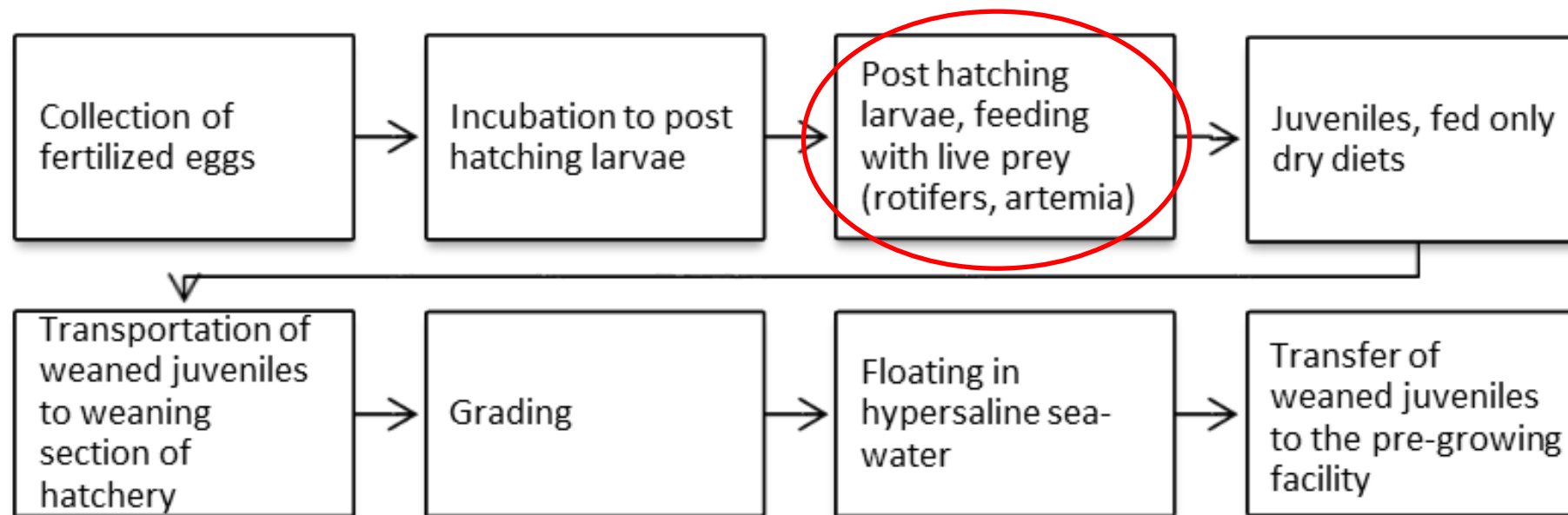The information was used to assess and minimize the risk and impact of diseases introduction and spread in the Mediterranean region

Production flow, control points

- Pre-growing
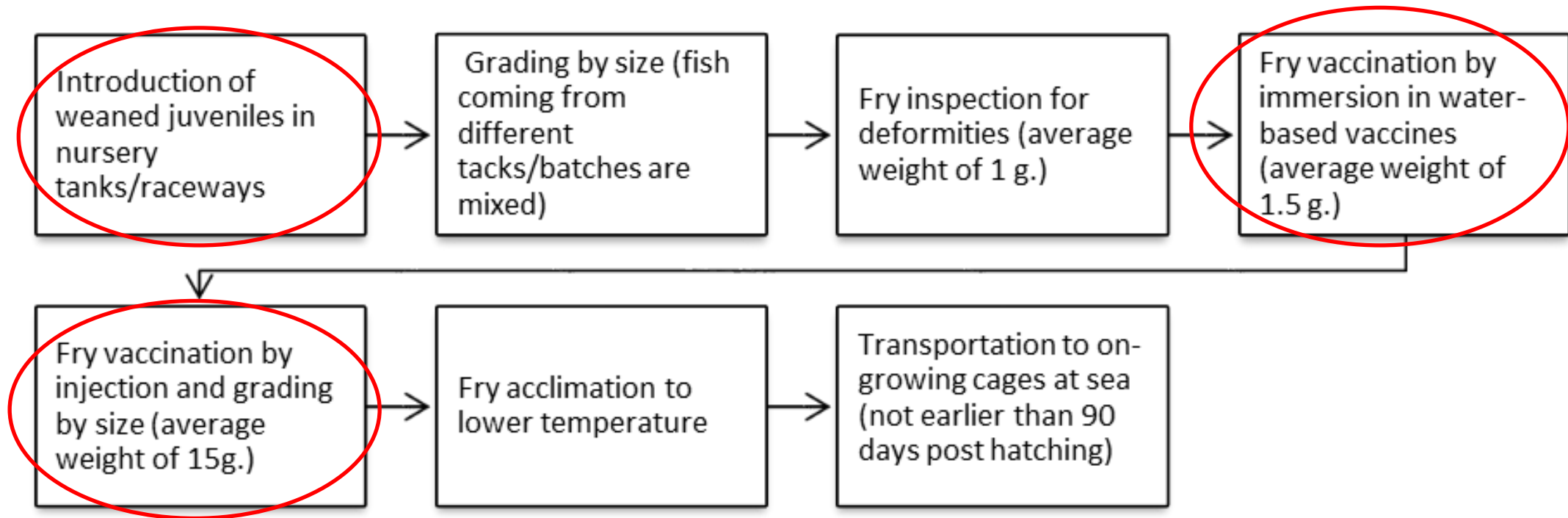
Production flow, control points

- On-growing

Fry are off-loaded in the net pens	Grading of small fish (up to 50g. weight) often coinciding with injection vaccination	Net changes (performed throughout the production cycle)	Antiparasitic treatments by means of baths
Final grading (up to 150 g. weight) Injection vaccination against prevail diseases	Fish are transferred to off-shore, large cages until harvest	Random sampling at various stages of growth by means of case nets	Harvesting and killing by cold shock in ice

Objectives

"*Being able to measure is to be able to improve*"

Measuring biosecurity provides a way to pinpoint biosecurity actions applied, evaluate and identify weaknesses and gaps, improve a farm´s overall biosecurity, and compare more objectively to others.

Background: Two connected research projects

MedAID Horizon 2020 project → to estimate the biosecurity risk associated with disease introduction and spread in *Mediterranean seabass production*, and to identify the control measures to manage the risks.
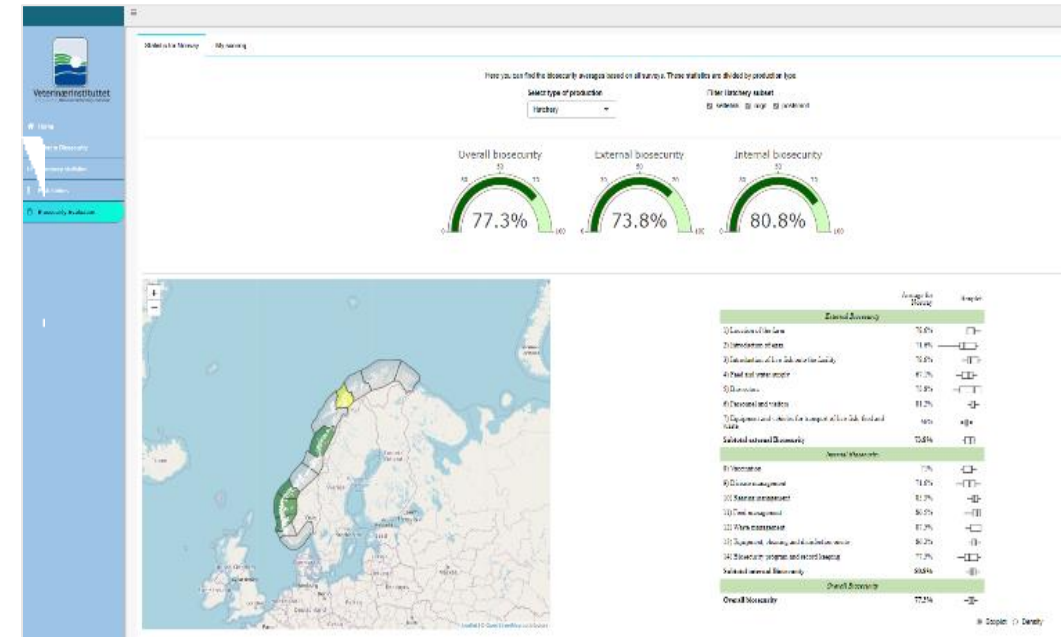
Digital tools for farm biosecurity → NFR funded project to quantitatively evaluate biosecurity measures in *Norwegian salmon production*, and create a dashboard.

WP4 Health management and Diseases and Welfare

Partner institutes

- NVI - Norway
- DTU - Denmark
- IZSVE - Italy
- IAMZ – CIHEAM - Spain
- CVI - Croatia
- INSTM – Tunisia
- Selarl Hippo Vet'eau
- EGE - Turkey
-
National Institute Of Oceanography and Fisheries - Alexandria
- Greece

**Egypt (n=7),
Tunisia (n=6)**

Map data ©2018 Google, INEGI

Methodology

From WP1.4 survey

Descriptive statistics

WP 4, Task 4.1
- Farm questionnaire + interview
- Expert opinion elicitation

Risk profiling model

- Scoring system
- Weight based on expert opinion
- Personalized risk profiling
  – Farm-specific
  – Disease-specific

Risk disease spread model

Interactive, web-based tool for visualization of the results
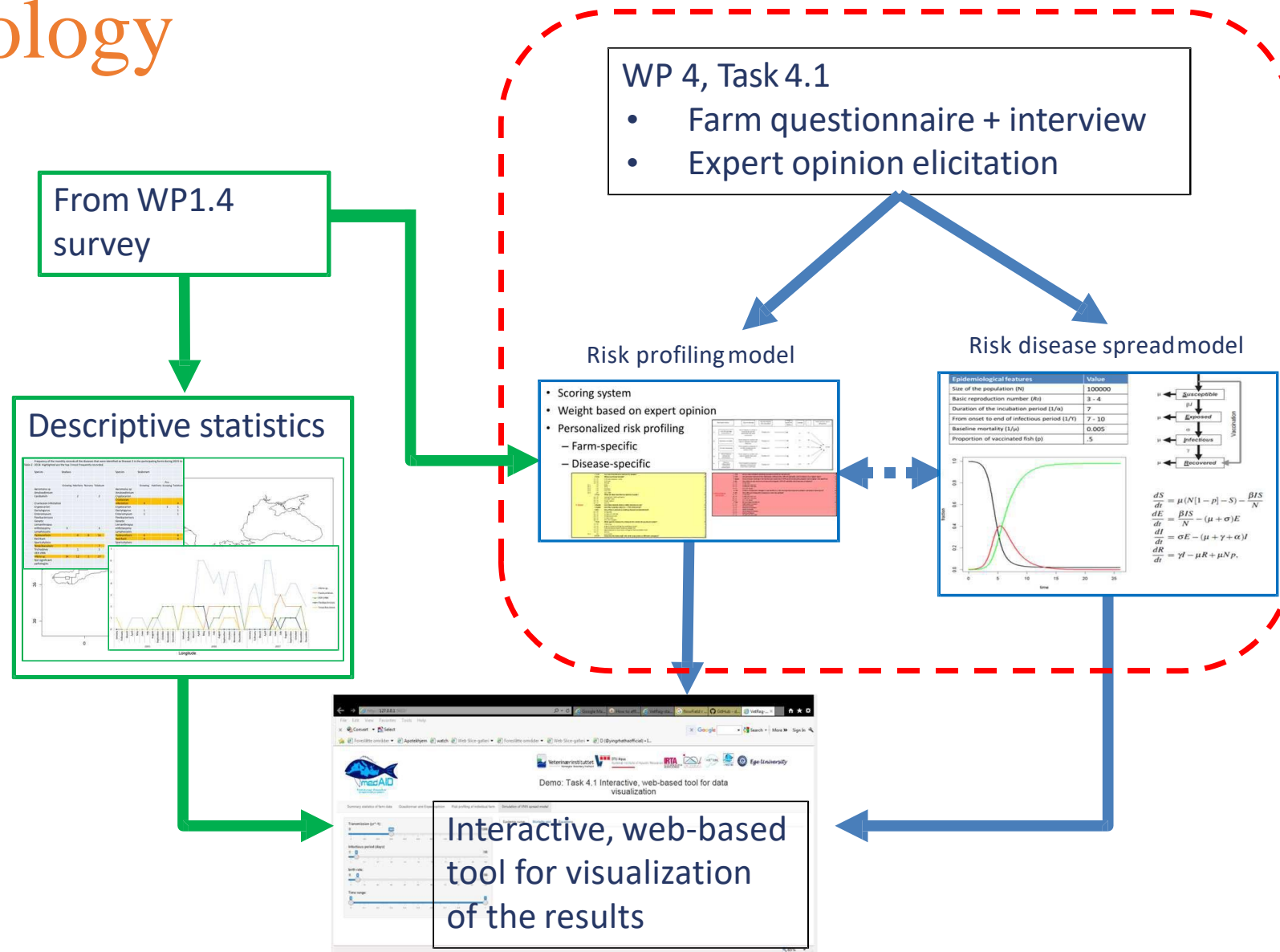
- The purpose of this questionnaire is to have *an overview of biosecurity measures, management practices, and health status* and *diagnostics capacities* of Mediterranean seabass, seabream farms

Farm questionnaire consists of questions on relevant aspect of biosecurity.

The survey data are used for forming a dataset containing questions relevant to external/internal biosecurity

1. General characteristics
2. Current Production statistics
3. Sources of live fish
4. Vaccine and vaccination procedures
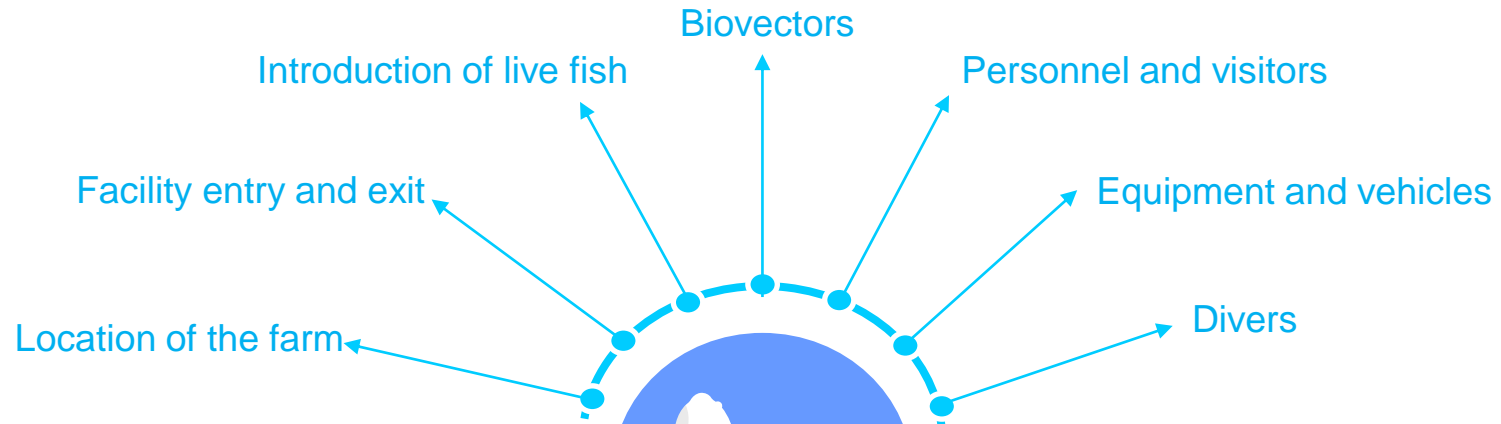5. Water sources and treatment
6. Introduction of live fish (all life stages) onto the facility
7. Rearing management
8. Feed
9. Harvesting (relevant to on-growing facility only)

10. Facility entry and exit (land-based operation facility)
11. Equipment & Vehicles (both land vehicles and sea vessels)
12. Vectors (Animals/Wildlife)
13. Vectors (People-on-site Personnel)
14. Vectors (People-Visitors)
15. Waste Management
16. Use of divers
17. Fish health monitoring and management
18. Diagnoses and reporting
19. Biosecurity program and record keeping

External biosecurity

Biovectors

Introduction of live fish

Personnel and visitors

Facility entry and exit

Equipment and vehicles

Divers

Location of the farm

Internal biosecurity

Biosecurity program and record Keeping

Vaccination

Harvesting

Rearing management

Waste management

Feed management

Equipment, Cleaning and Disinfection

A risk-based, weighted scoring system, is applied to quantify the level of farm biosecurity

A selected subset of data for biosecurity evaluation

↓

Subcategories (external, internal)

↓

Scoring
- Number of questions
- Farmer's answer

- Each question in the questionnaire is given a weight by the subject experts, for a general risk, and pathogen-specific risk

- The weight-adjusted sum of the total score a farm has will be divided the best score that the farm could have achieved, then will be used for profiling the risk

- Evaluate potential control strategies

Simulation modelling approach

Vbiocheck.ugent

MY BIOCHECK   START THE BIOCHECK   ABOUT BIOCHECK   NEWSLETTER   WORLDWIDE   AUDIT   RESEARCH   INFO & LINKS   CONTACT

GHENT UNIVERSITY

BIOCHECK.UGent, prevention is better than cure!

Welkom!

Biocheck.UGent is a risk-based scoring system to evaluate the quality of your on-farm biosecurity in an scientific and independent way.

Fill in the online **questionnaire** for free and receive valuable feedback about the biosecurity level of your farm. You get a summarizing and personal report with detailed results. These findings can help you to choose your own suitable biosecurity pathway.

Don't hesitate and get started to lift your farm to a higher biosecurity level!

Start the Biocheck.UGent!   How to use Biocheck.UGent?

The Biocheck.UGent was filled in **12577** times around the world to evaluate the on-farm biosecurity level!

8943   # 3006   # 628

Biocheck.UGent considers the data provided by you, after this referred to as your data, as confidential information. Filling in this questionnaire gives implicit permission to the Faculty of Veterinary Medicine of Ghent University to use your data, analyzed anonymously, for scientific cause. All services offered can be used without disclosing personal information (e.g. name and address) by using anonymized data or aliases. Your data will be saved for 10 years and will never be shared without your permission.

item and the website were developed by the unit for

In the spotlight

🔍 07-02-2018
"Biosecurity in animal production and veterinary medicine (from principles to practice)" now available for purchase!

🔍 20-11-2018
New presentation available about the Biocheck.UGent tool!

Agenda

SEPT 9-20 9th Basic Summer Course on Veterinary Epidemiology
Merelbeke, Belgium

SEPT 19 Post academic training on biosecurity in the framework of African Swine Fever control
Ghent university, Belgium

	My scoring	Average for Norway	Density
External Biosecurity			
1) Location of the farm	66.7%	78.6%	
2) Introduction of eggs	93.3%	71.6%	
3) Introduction of live fish onto the facility	100%	78.6%	
4) Feed and water supply	90%	67.1%	
5) Biovectors	100%	73.8%	
6) Personnel and visitors	84.2%	81.2%	
7) Equipment and vehicles for transport of live fish, feed and waste	66.7%	66%	
Subtotal external Biosecurity	**85.8%**	**73.8%**	
Internal Biosecurity			
8) Vaccination	77.3%	71%	
9) Disease management	100%	71.6%	
10) Rearing management	100%	85.3%	
11) Feed management	100%	86.5%	
12) Waste management	100%	87.5%	
13) Equipment, cleaning and disinfection onsite	76.9%	85.4%	
14) Biosecurity program and record keeping	100%	72%	
Subtotal internal Biosecurity	**93.5%**	**79.9%**	
Overall Biosecurity			
Overall biosecurity	**89.6%**	**76.9%**	

○ Boxplot ● Density

Results: *Mediterranean seabass production*

Not all biosecurity measures are equally relevant and depending on pathogen.

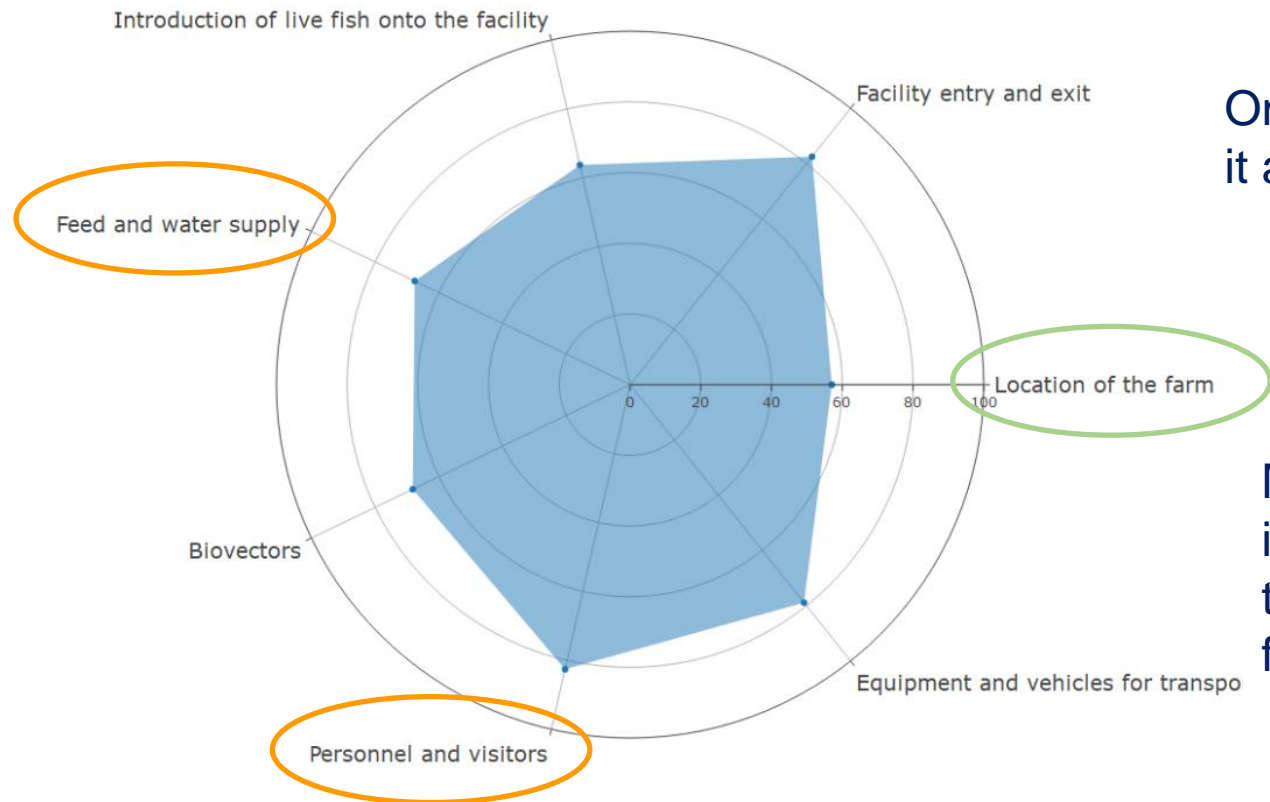Diversity in biosecurity scores between countries
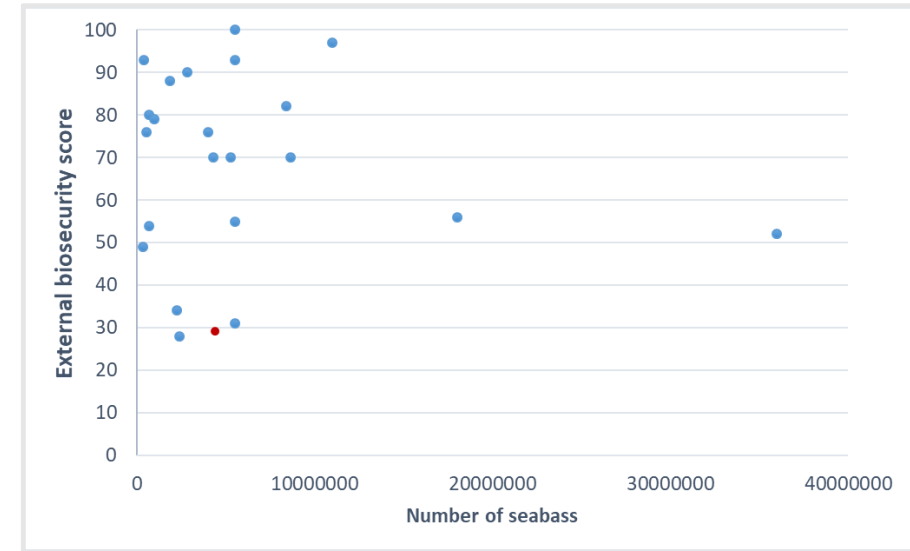
In general, internal biosecurity scores, for both land and open-sea farms, are higher than the external biosecurity scores, following the trend of the poultry industry but contrary to the pig livestock industry

Results: *Mediterranean seabass production*

Average *external* biosecurity score = 71%

Introduction of live fish onto the facility
Facility entry and exit
Feed and water supply
Location of the farm
Biovectors
Equipment and vehicles for transpo
Personnel and visitors

Many farms being very <u>cautious</u> about allowing visitors to enter their farms, requesting that both visitors and facility personnel follow all biosecurity measures to prevent entry of disease.

On-land farms are extremely careful with fish feed, storing it appropriately and conducting feed inspections regularly.

Highest scores

Mediterranean farms have a higher risk of disease introduction as a consequence of being more exposed to the environment and by the existence of other aquaculture facilities within a 10 Km radius.

Lowest scores

# Results: *Mediterranean seabass production*

Mediterranean farms located on the open-sea are very vulnerable to disease introduction and spread due to their exposure to the environment and the existence of other aquaculture farms in the vicinity, and by not purchasing vaccinated animals.

lowest scores = Vaccination

Booster vaccination is usually done on land-based, because injection of vaccines is very difficult to perform in off shore cages

Average *internal* biosecurity score = 74%
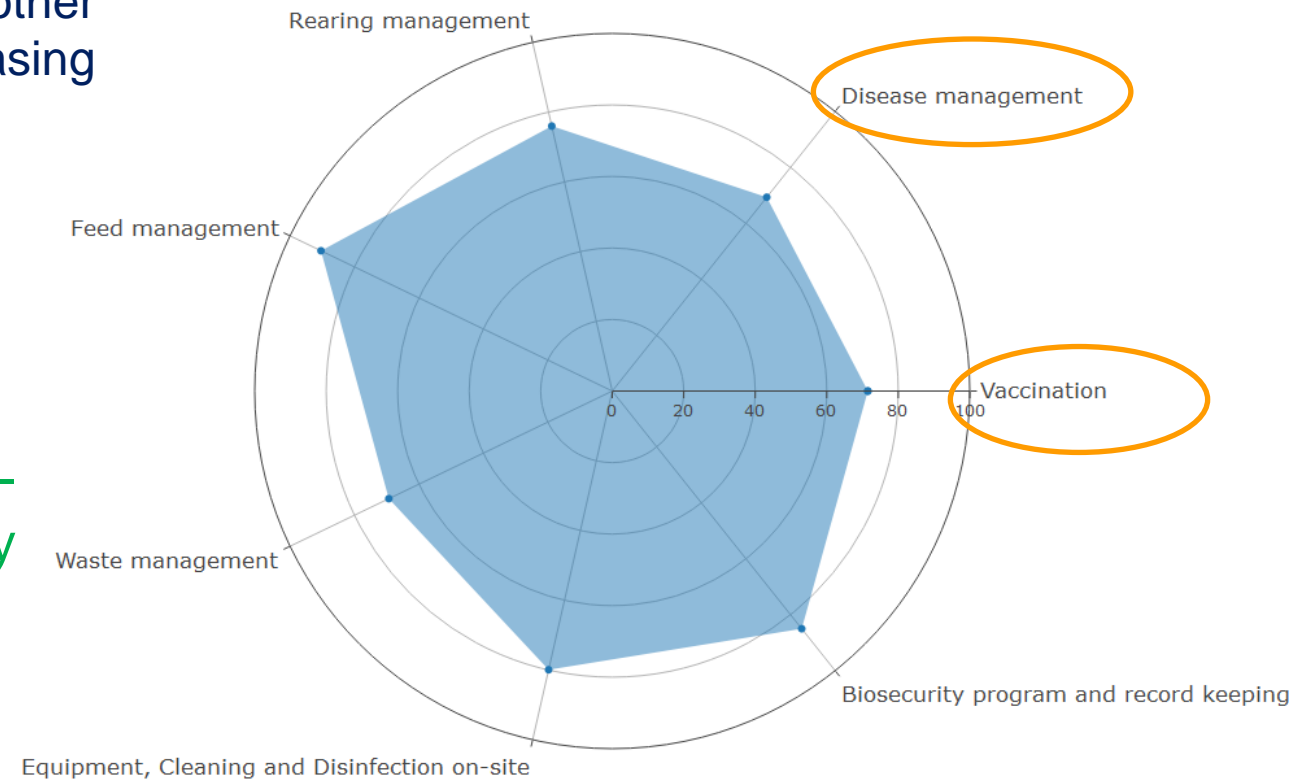
Conclusions/Discussion

The quantitative system developed for biosecurity:
- Allow farmers to systematically evaluate their biosecurity measures
- Identification of gaps or weakness in biosecurity
- Motivate farmers to enforce more management and biosecurity measures
- Benchmarking, permit the comparison between farms

Limitations: Data reliability, farmer's willingness to share and involve in the system

Conclusions/Discussion

- The system can be modified to fit various farm characteristics (e.g. productions of Atlantic salmon, tilapia), exposures (e.g. AMU), and for different disease agents.

- A farmer self assessment tool with a user friendly dashboard for stakeholders interested in an objective evaluation of farm/region biosecurity to have a secure access of their own information

Thank you for your Attention