Salmon Farming Priorities in Fish Health Research

Aquaculture Research and Equity Forum
University of Edinburgh, May 19, 2025

Alicia Gallardo
President Aquatic Animal Health Standards Commission (A3AHC)

World Organisation for Animal Health

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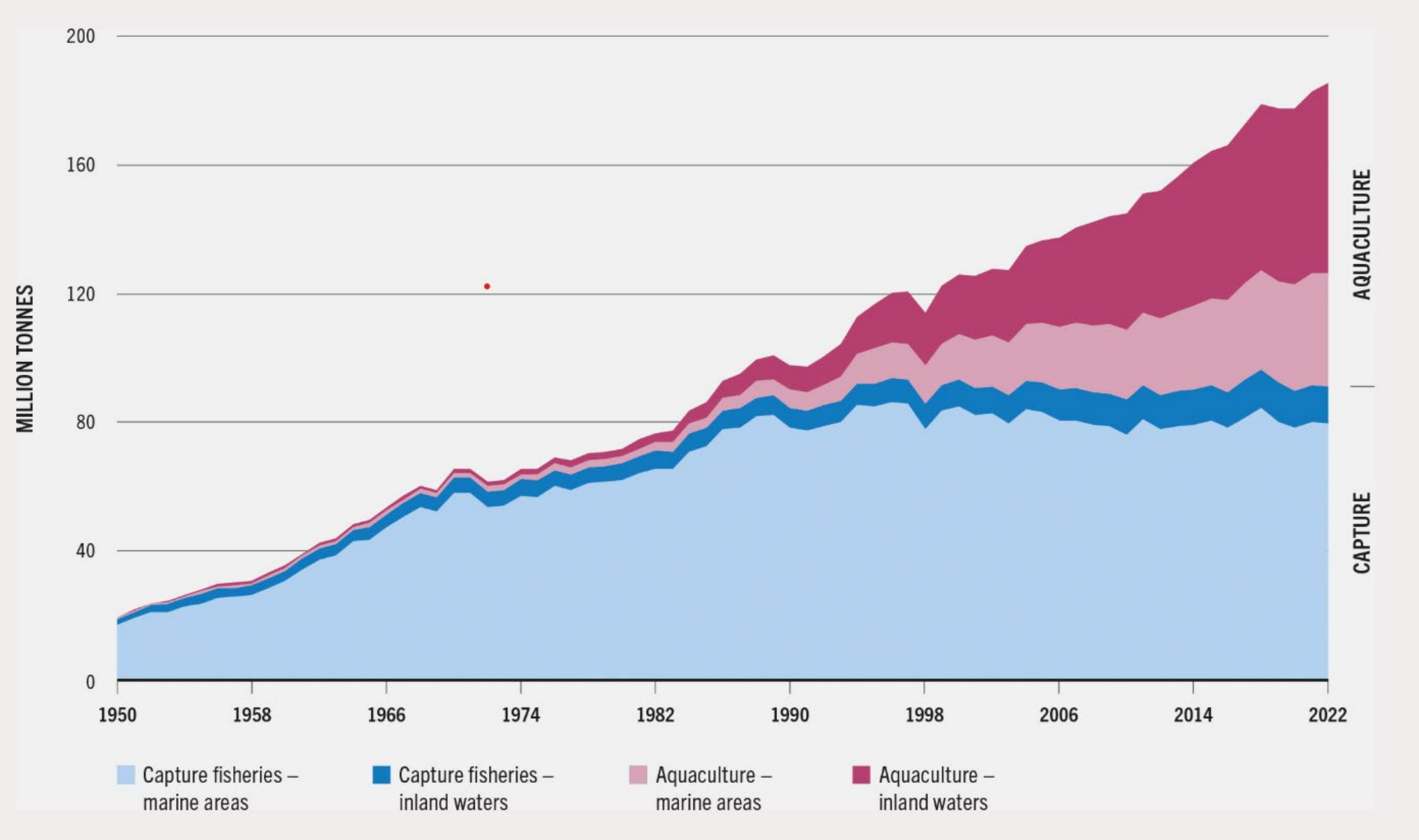
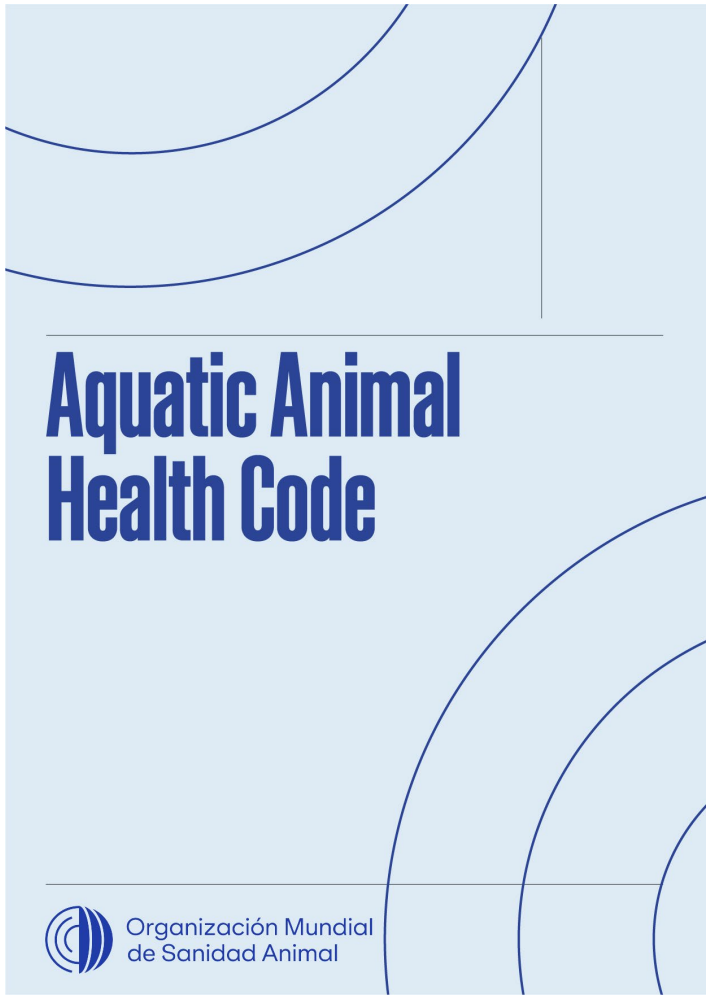
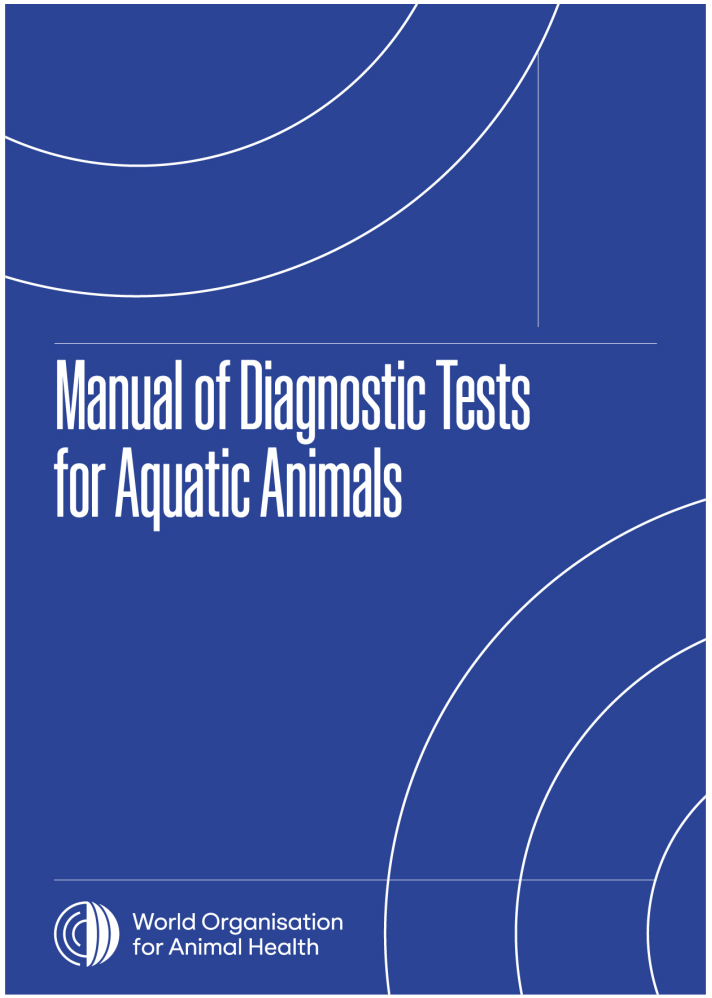


FAO. 2024. The State of World Fisheries and Aquaculture 2024 – Blue Transformation in action. Rome. https://doi.org/10.4060/cd0683en



Standards for safe trade



Standards for disease diagnosis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(South Africa)
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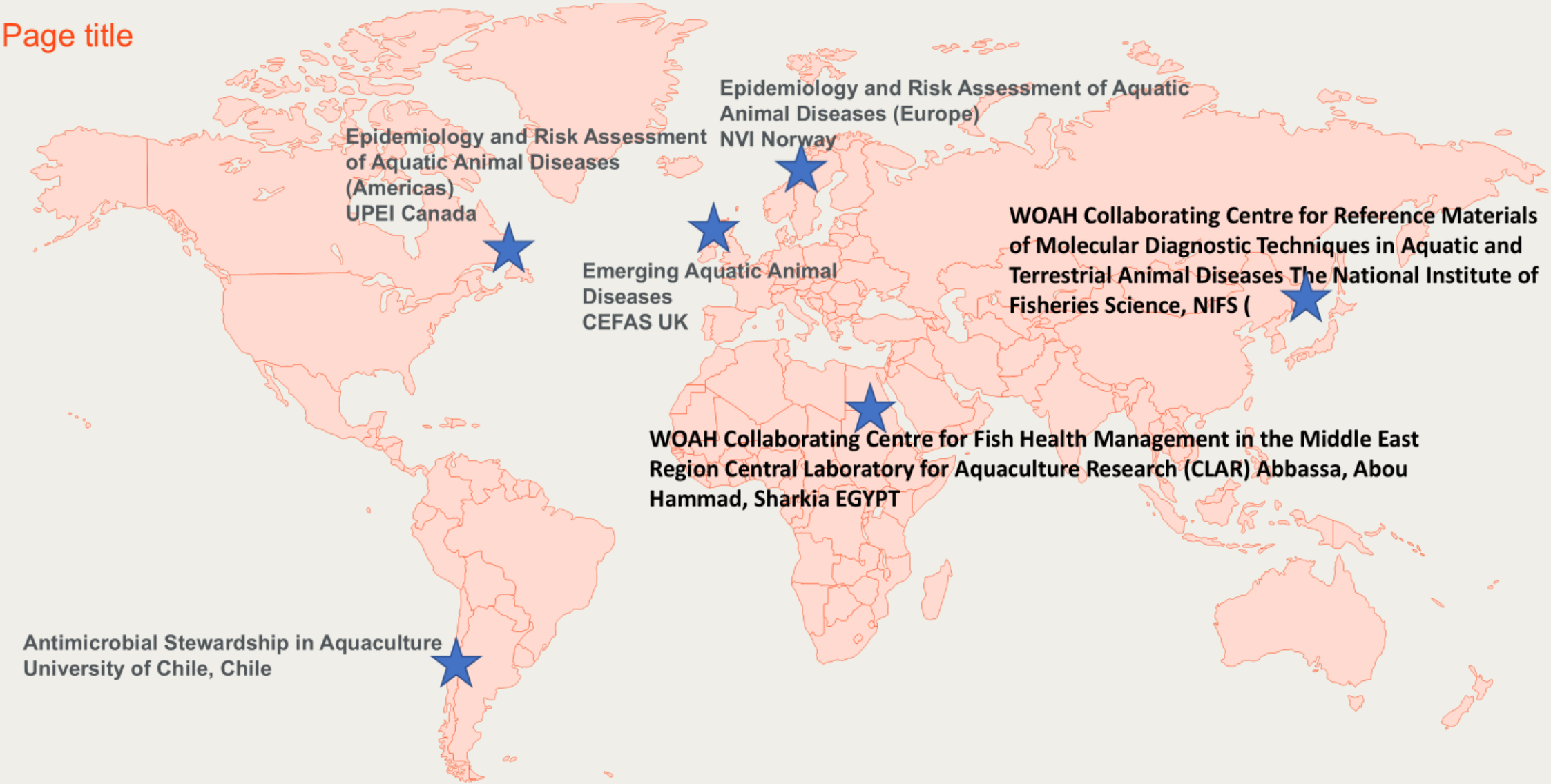
Page title



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OIE Aquatic Animal Health Strategy 2021–2025

Improved aquatic animal health and welfare worldwide

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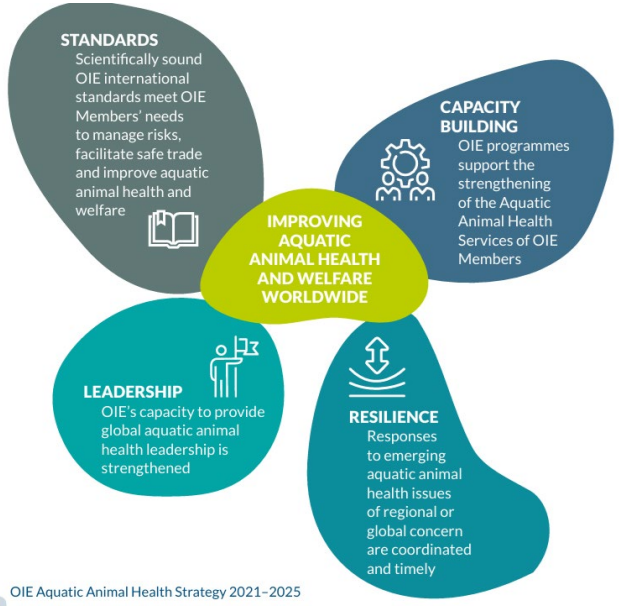

Activity 4.5
Identify the highest-priority research areas

This Activity will provide strategic prioritisation of research areas that are of importance to the OIE Community, specifically, the development and implementation of standards. Research is particularly important for aquatic animal diseases, because intensive aquaculture is relatively new; there is still much to learn about aquatic animal diseases, and the nature of aquatic animal production is rapidly evolving. Contemporary knowledge about disease is essential to all activities in this Strategy. This Activity will assist the research community and funders by identifying the highest-priority areas for research, i.e. those that will provide lasting benefit for global management of aquatic animal diseases. Collaboration with existing initiatives (e.g. STAR-IDAZ International Research Consortium on Animal Health) will also be ensured, where relevant.

WOAH & STAR IDAZ IRC (2025). Policy Brief: Highest Priority Research Areas for Finfish Health. Available online at: https://www.star-idaz.net/priority-topic/aquatic-diseases/#reports

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Global aquaculture survey

440
invitations distributed globally

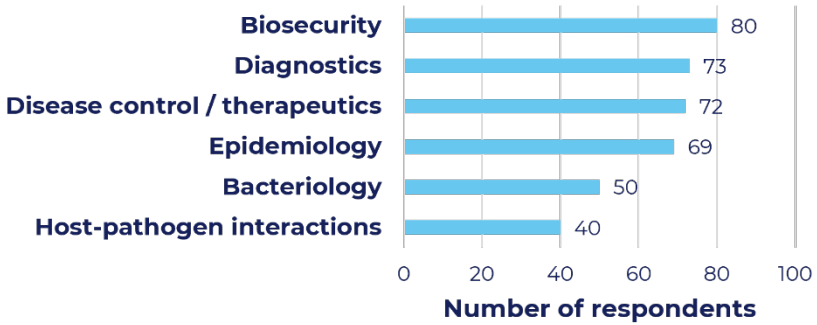
187
countries engaged

184
responses received from **89** countries

43%
overall response rate

51 m 21 s
average completion time

Respondents identified that they had **diverse expertise** across a range of topics relevant to aquaculture



Other areas of expertise cited include:

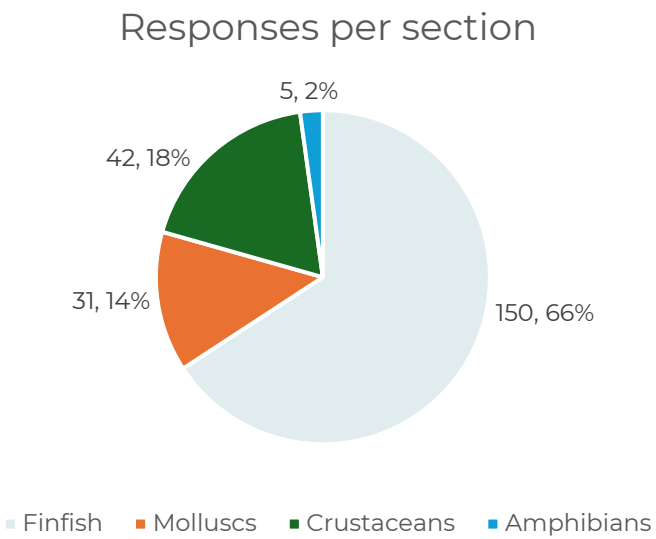
- Virology
- Vaccine development
- Welfare
- Parasitology
- Immunology

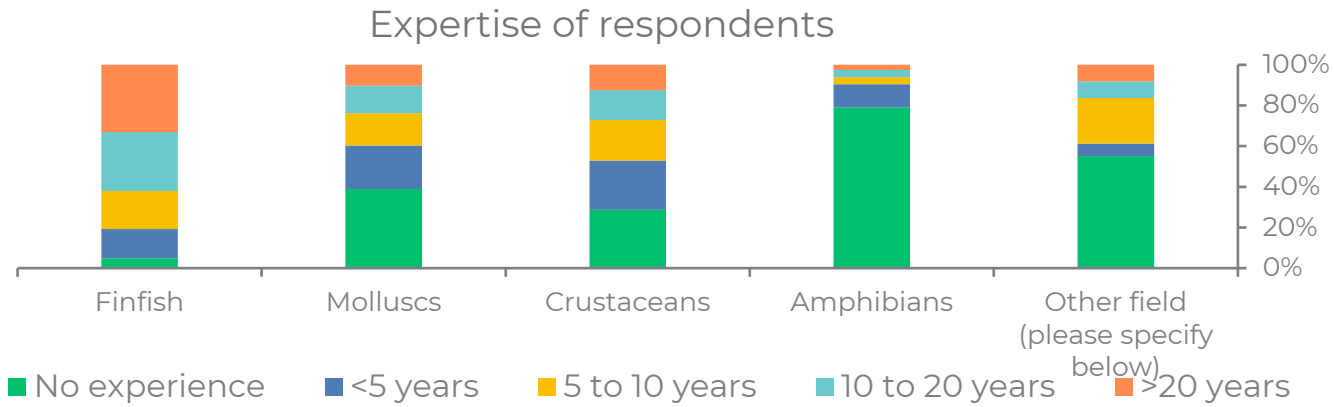
The survey had **global reach** with responses received from experts across the Americas, Europe, Africa & the Middle East, and Asia & Australasia

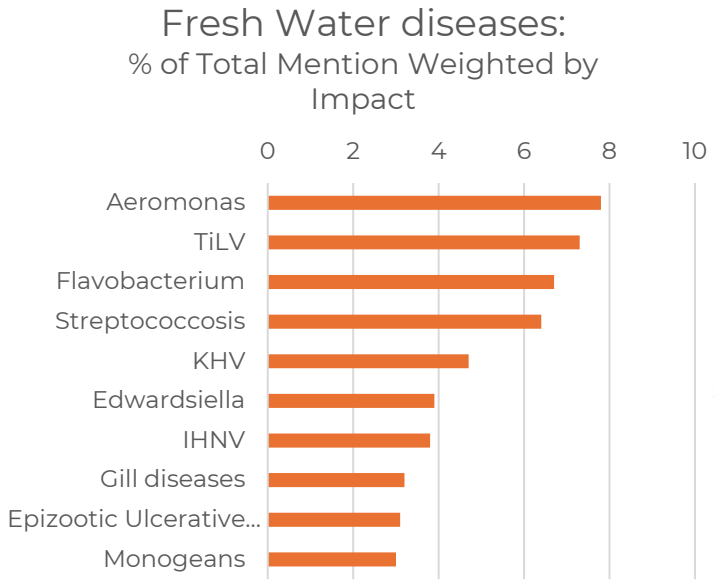
Highlights from survey

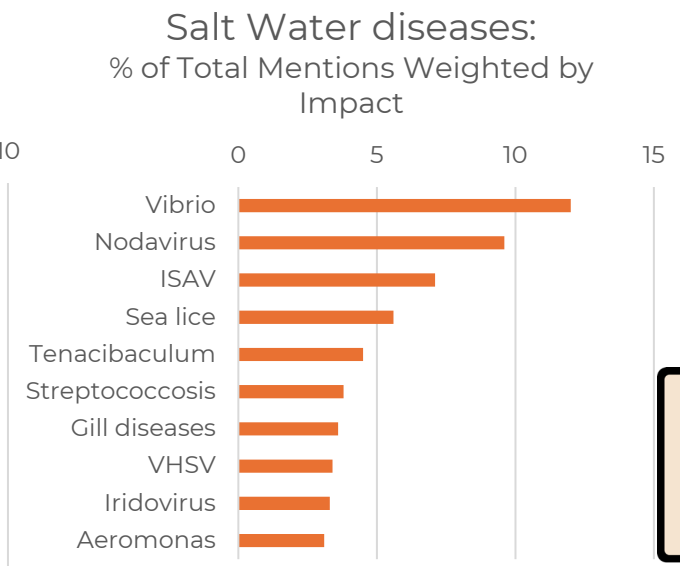
Structure: 20 questions ca./section:

- Introduction
- 4 main sections:
  - I. Finfish,
  - II. Molluscs,
  - III. Crustaceans,
  - IV. Amphibians
- Transversal issues









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Moritella spp.				 ¶
Nodular gill disease (NGD)				
Piscirickettsia salmonis (SRS)				
Renibacterium salmoninarum (BKD)				
				 ¶
Sea lice				
Spring viraemia of carp (SVC)				
Streptococcus spp.				
				 ¶
				
Tenacibaculum spp.				 ¶
				

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Key:			
	Most impactful disease		
	Freshwater		Saltwater
	Salmonids, freshwater		Vaccine (development or improvement)
	Tilapia		Improved isolation and cell culture methods
	Carp		Virulence characterization
	Catfish		Validated diagnostics
	Salmonids, saltwater		Improved molecular methods
	Others, saltwater		Non-lethal sample protocols

Workshop

Tentative agenda
Advancing Aquaculture Health Research

Workshop to Identify the Highest Priority Research Areas for Finfish Health

20-21 February 2025
WOAH HQ, Paris, France

Organised by: World Organisation for Animal Health

In collaboration with: STAR IDAZ International Research Consortium on Animal Health

The workshop has been possible thanks to sponsorship from:

IDRC · CRDI
Canada
Australian Government, Department of Agriculture, Fisheries and Forestry
DISCONTOOLS
Veterinærinstituttet, Norwegian Veterinary Institute
European Commission
GALVmed, Protecting Livestock – Improving Human Lives
Gates Foundation

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Highlights of agenda with objectives and outcomes

Welcome and Introduction

Objective : *Welcome participants and set the stage for the workshop by introducing the background that led to its organization, key objectives. Moreover, acknowledging the importance for international collaboration for research in aquatic animal health*
Desired Outcome: Participants are aligned on the purpose

Session 1: Challenges in aquatic health

Objective: *Identify key challenges facing aquatic health, including emerging diseases, AMR in aquaculture, diagnostic, and vaccine advancements.*
Desired Outcome: Participants understand the current landscape, challenges, and research gaps in aquatic animal health, setting the context for subsequent sessions.

Session 2: Overview on regional and global research network on aquatic health

Objective: *Showcase existing global and regional research efforts, fostering awareness and potential synergies among participants.*
Desired Outcome: Increased awareness of global research networks and research priorities identified, leading to strengthened collaboration and identification of complementary research activities.

Session 3: Workshop 1 - Control strategies research needs

Session 4: Workshop 2 - Diagnostic research needs

Session 5: Workshop 3 -Vaccine & Therapeutics research needs

Objective: *Facilitate in-depth discussions on research needs in aquatic animal health, using a World Café format for interactive engagement.*
Desired Outcome: List of priority research areas (e.g. priority diseases, short and long term research needs, particular research needed for standard setting) for each main finfish production species (salmonids, carp, catfish, tilapia, seabass) .

Session 6: Panel discussion on way forward

Objective: *Engage industry leaders and research program owners in a discussion on advancing finfish health research, examining pathways for enhanced collaboration for impactful outcomes.*
Desired Outcome: Establish actionable strategies for industry-research collaboration, fostering investment and support for sustainable aquatic health solutions.

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Epidemiology and control strategy: highest research priority areas

Most urgent:

Validation of diagnostic tools both for traditional testing of notifiable diseases, new test systems including rapid test for field diagnostics, eNA and biomarkers, and research for optimization of sample pooling (see diagnostic section below)

Increase understanding of host-pathogen-environment interaction

Research for sustaining control strategies of transboundary diseases and early warning (see table of most impactful diseases below)

Optimisation of biosecurity knowledge and implementation for control strategies, water management, fallowing - particularly for low value species, small scale production, and young fish not yet immunocompetent

Develop disease spread models, improving identification of risk factors, understanding pathogen transmission/dynamics, enhancing risk assessment for trade and considerations relating to antimicrobial use (AMU) and antimicrobial resistance (AMR) and application of zoning for disease control

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Other priority research areas:

- Research on how to optimise integrative control strategies including environmental pathobiome and chemical contamination
- Research to improve policy on climate change, use of vaccines, border control, and socioeconomic effects of diseases/disease prevention
- New product development – use of artificial intelligence (AI) - for prevention and control of Aquaculture diseases, with strategies adapted to local production systems (see vaccine and therapeutics sections below)
- Increase testing and understanding of susceptible species for pathogens
- Research for improving control strategies to reduce non-notifiable and complex diseases impact in different production systems - holistic approach to disease prevention and management (see impactful diseases table below)
- Improve genetics and breeding programmes for disease resistance
- Optimise data sharing, comply to the FAIR principles (findable, accessible, interoperable, and reusable), data collection methods (e.g. remote sensing AI-based data management to improve surveillance and control strategies
- Socio-economic - and cost-benefit studies to increase private-public partnership (PPP) engagement in disease management
- Increase understanding of nutrition, feed safety and agroecological practice effects on aquatic animal health and food safety
- Benchmarking and optimization of decontamination strategies for pathogen inactivation

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Diagnostic: highest research priority areas

Most urgent:

eNA:developing standardised protocols to associate data with infections

Advance Artificial intelligence tools for diagnostics (e.g. AI App for powered recognition of fish diseases by lesions in the field or for improving histopathology diagnosis)

Optimise effective sampling protocols (e.g. appropriate samples, non -invasive, non-lethal sampling-particularly for valuable broodstock, transportation techniques from field to lab...)

Development of Point of care tests

Validation of specific and sensitive screening tests, including for AMR (see table below)

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Other priority research areas:

- Biobank: improve access to reference isolates, antibodies, positive diagnostic control samples
- Quality genomics databases applying FAIR principles, particularly for notifiable diseases
- Develop serological tests/monoclonal antibodies
- Development of certified reference materials for Aquaculture and standard internal controls to test reagents
- Diagnostic tests for environmental contaminants causing diseases
- Study on biomarkers of stress
- Advanced NGS techniques (e.g., metagenomics) to advance diagnostics in unexplained increased mortalities
- Optimisation of in vitro models (e.g. cells lines, organoids)
- Advanced diagnostics for syndromic surveillance or multi pathogen high-throughput diagnostics (e.g., eNA, MALDI-TOF, sensors, and AI tools)
- Multiplex diagnostic tests for major host species and pathogens

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Vaccine: highest research priority areas

Most urgent:

Optimise vaccine delivery systems (e.g. oral, immersion, slow release adjuvant), particularly to boost mucosal immune response

Understand better immune response to vaccines to aid vaccine development and to develop the best method of intervention

Develop and license vaccine platform technologies to speed up vaccine development and use, especially for multivalent vaccines

Social and cost-benefit studies to increase vaccine uptake by end users (different tables)

Autogenous vaccine: studies to standardise production, quality testing framework, and usage

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Other priority research areas:

- Alternative methods to assess efficacy and effectiveness of vaccines (e.g. mathematical models, such as Susceptible-Infectious-Resistant (SIR) disease transmission models, serological panels for antigenic cross protection)
- Standardization of challenge models to ensure reproducibility, reliability and comparability of experimental results (e.g. i. define criteria for harmonized protocols for different pathogens, production systems, host and environmental conditions; ii. Determining the most appropriate route, dose and strain of pathogen; iii. Define models that mimic natural infections, iv. define safety for shedding of pathogens from vaccinated fish)
- Guidelines for registering vaccines/harmonisation of regulations
- Studies to reduce vaccine production costs and provide incentives for use of vaccines particularly in low- or middle-income countries (LMIC) (e.g., free vaccines for LMIC)
- Investigate regional needs and link with regional PPP initiatives for vaccine research/production
- Optimise field trials and randomized controlled trials to demonstrate vaccine efficacy

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Therapeutic: highest research priority areas

Most urgent:

Development of alternatives to antimicrobials and innovative methods to identify new compounds for treatment (including use of mathematical models, and AI approaches to target identification)

Methods and standardization for quantification of water environmental conditions to reduce the pathobiome

Investigate antimicrobials not used in humans but already used in other Food Animals

More research into alternative disease managements (e.g. heat treatment, feed supplements, phytomedicines...)

Other priority research areas:

- Development of more preventative products (e.g. probiotics, immunostimulants)
- Further development of phage therapy
- Studies on Knowledge, Attitudes and Practices (KAP) of farmers to adapt policy and intervention strategies and to guide capacity building activities to reduce antimicrobial use
- Studies to tailor biosecurity plans for different industries

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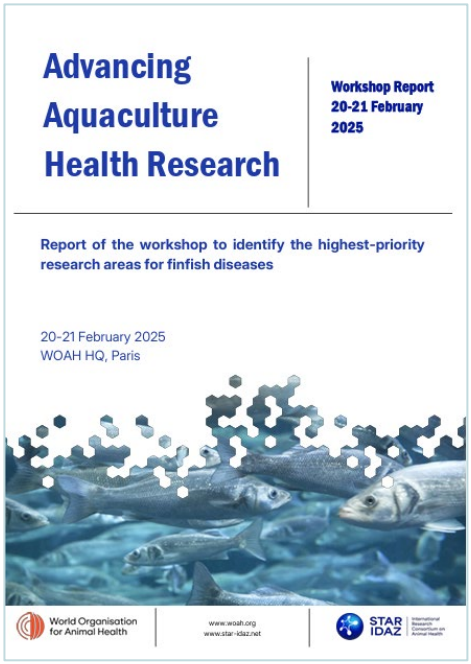

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Call for projects

Discussion at upcoming STAR IDAZ Executive Committee meetings

On-line survey → Gap analysis workshop → Executive summary → Uptake from STAR IDAZ Executive Committee

January 2025 — February 2025 — April 2025

Thank you

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