



World Organisation  
for Animal Health



# Training of National Focal Points for Aquatic Animal Health (Cycle IV)

2 - 4 October 2023 Kigali, Rwanda





Food and Agriculture  
Organization of the  
United Nations

## A 12-point checklist for surveillance for diseases of aquatic organisms: a novel approach to assist multidisciplinary teams in developing countries

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In order to respond effectively to disease outbreaks,  
a national disease surveillance system and means for a collation and  
analysis of epidemiological data (such as a national database system) is necessary.  
(FAO/NACA 2000, 2001)

## FAO Member Countries requests for assistance in designing surveillance systems for aquatic diseases.

### Challenging tasks:

- process of designing and implementing an aquatic surveillance programme, especially for personnel with limited knowledge of disease epidemiology and principles of surveillance.
- a methodological approach for good understanding of epidemiology, surveillance concepts and principles,
- practical application through simplified tools, and the involvement of a multidisciplinary team for effective implementation

The interactions of aquatic systems and environments present unique challenges requiring multidisciplinary and holistic approaches for addressing aquatic disease problems.  
(Georgiadis *et al.* 2001; Peeler & Taylor 2011)

# Development of the 12-point surveillance checklist

Surveillance and reporting are important elements of the Asia Regional Technical Guidelines on Health Management for the Responsible Movement of Live Aquatic Animals (FAO/NACA, 2000) and fundamental components of any aquatic animal health protection program or national strategy on aquatic animal health management (FAO, 2007).



# Reporting systems

- the **World Animal Health Information System (WAHIS)** of the WOAHA - Globally accepted as a disease information tool to facilitate the WTO's SPS agreement
- the **Emergency Prevention System for Animal Health (EMPRES-AH)** of FAO (<http://www.fao.org/ag/againfo/programs/en/empres/home.asp>)
- the **Animal Disease Notification System (ADNS)** of the European Union ([https://ec.europa.eu/food/animals/animal-diseases/not-system\\_en](https://ec.europa.eu/food/animals/animal-diseases/not-system_en))
- first-ever regional aquatic disease reporting system, **Quarterly Aquatic Animal Disease (QAAD) Reports (Asia and Pacific Region)** was NACA, FAO and WOAHA through an FAO (TCP) Project TCP/RAS 6714/ 9065 (<https://enaca.org/?start=80&id=8>)

# Responsibility for reporting

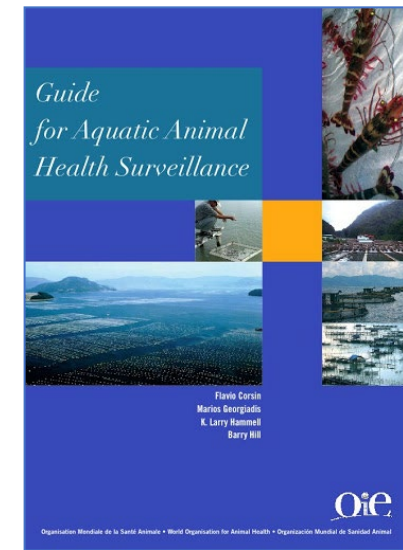
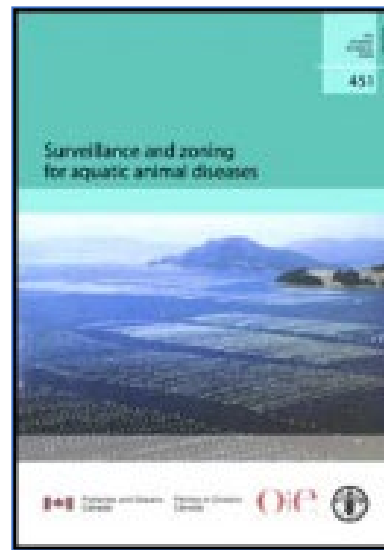
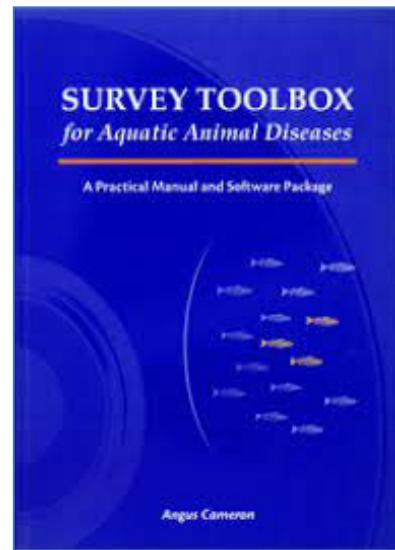
- It is well recognised that aquatic disease surveillance and reporting falls under the responsibility of the veterinary authorities; while in some countries, it is a task delegated, shared or historically undertaken by other administrative bodies. In most developing countries, aquatic disease surveillance responsibility is separate from veterinary services.
- This has been recognized by the WOAHA, as evidenced by their establishment of a country Focal Point for aquatic animal diseases.
- Reporting to the WOAHA, nonetheless, is through the country's Chief Veterinary Officer.

# 3 steps

- **Step 1:** a thorough review of available main references on surveillance for aquatic diseases
- **Step 2:** a review of available scientific literature specific to aquatic animal health surveillance
- **Step 3:** drafting of the 12-point surveillance checklist, validation, publication

# Steps in the development of the 12-point checklist

- **Step 1:** Thorough review of available main references on surveillance for aquatic animal diseases to understand the scope and key elements that need to be captured when designing a surveillance program. The main references examined included FAO/NACA (2000, 2001), Cameron (2002), Subasinghe *et al.* (2004), Corsin *et al.* (2009) and the WOAH Aquatic Animal Health Code (2019a)





## Steps in the development of the 12-point checklist

- **Step 2:** Review of available scientific literature specific to aquatic animal health surveillance to determine findings or recommendations from specific studies related to the practical application of surveillance principles in aquaculture (e.g., Baldock *et al.*, 2008; Peeler & Taylor, 2011; Oidtmann *et al.*, 2013).

Review | [Open Access](#) | Published: 11 August 2011

### The application of epidemiology in aquatic animal health -opportunities and challenges

[Edmund J Peeler](#) & [Nicholas GH Taylor](#)

*Veterinary Research* **42**, Article number: 94 (2011) | [Cite this article](#)



ELSEVIER

Contents lists available at [ScienceDirect](#)

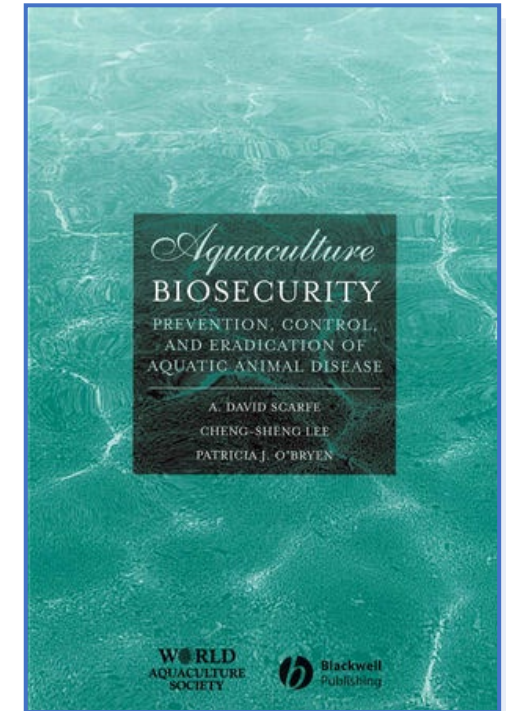
### Preventive Veterinary Medicine

journal homepage: [www.elsevier.com/locate/prevetmed](http://www.elsevier.com/locate/prevetmed)

Review

Risk-based methods for fish and terrestrial animal disease surveillance

Birgit Oidtmann<sup>a,\*</sup>, Edmund Peeler<sup>a</sup>, Trude Lyngstad<sup>b</sup>, Edgar Brun<sup>b</sup>,  
Britt Bang Jensen<sup>b</sup>, Katharina D.C. Stärk<sup>c</sup>



## Steps in the development of the 12-point checklist

- **Step 2:** Review of studies on aquatic animal diseases to which surveillance tools were applied.
  - estimation of component surveillance sensitivity using scenario tree modelling to demonstrate the freedom from viral haemorrhagic septicaemia (VHS) in farmed Atlantic salmon (*Salmo salar*) in Norway (Lyngstad *et al.* 2016);
  - Australia's national surveillance program to demonstrate national freedom from white spot disease (WSD) (Hood *et al.* 2019);

> *Prev Vet Med.* 2016 Feb 1;124:85-95. doi: 10.1016/j.prevetmed.2015.12.008. Epub 2015 Dec 19.

### Routine clinical inspections in Norwegian marine salmonid sites: A key role in surveillance for freedom from pathogenic viral haemorrhagic septicaemia (VHS)

Trude Marie Lyngstad <sup>1</sup>, Hege Hellberg <sup>2</sup>, Hildegunn Viljugrein <sup>2</sup>, Britt Bang Jensen <sup>2</sup>, Edgar Brun <sup>2</sup>, Evan Sergeant <sup>3</sup>, Saraya Tavornpanich <sup>2</sup>



Preventive Veterinary Medicine

Volume 167, 1 June 2019, Pages 159-168




### Biosecurity system reforms and the development of a risk-based surveillance and pathway analysis system for ornamental fish imported into Australia

Y. Hood <sup>a,\*,</sup> J. Sadler <sup>a,</sup> J. Poldy <sup>a,</sup> C.S. Starkey <sup>a,</sup> A.P. Robinson <sup>b</sup>

## Steps in the development of the 12-point checklist

- **Step 2:** review of studies on aquatic animal diseases to which surveillance tools were applied.
  - use of an active surveillance program to study risk factors of acute hepatopancreatic necrosis disease (AHPND) in shrimp in Bac Lieu province, Viet Nam (Nguyen *et al.*, 2019)
  - and the Mekong Delta, Viet Nam (Boonyawiwat *et al.*, 2018).
  - People matter in surveillance (Brugere *et al.*)

*Asian Fisheries Science* 31S (2018): 226–241  
©Asian Fisheries Society  
ISSN 0116-6514  
E-ISSN 2071-3720  
<https://doi.org/10.33997/j.afs.2018.31.S1.016>



The Journal of the Asian Fisheries Society

**Risk Factors Associated with Acute Hepatopancreatic Necrosis Disease (AHPND) Outbreak in the Mekong Delta, Viet Nam**

VISANU BOONYAWIWAT<sup>1,\*</sup>, NGUYEN THI VIET NGA<sup>2</sup> and MELBA G. BONDAD-REANTASO<sup>3</sup>



ELSEVIER

Contents lists available at ScienceDirect

**Aquaculture**

journal homepage: [www.elsevier.com/locate/aquaculture](http://www.elsevier.com/locate/aquaculture)

People matter in animal disease surveillance: Challenges and opportunities for the aquaculture sector

Cecile Brugere <sup>a,\*</sup>, Dennis Mark Onuigbo <sup>b</sup>, Kenton L. Morgan <sup>c</sup>

## Steps in the development of the 12-point checklist

- **Step 3:**
  - drafting of the 12-point checklist
  - presentation in regional workshops related to FAO projects in order to gain further perspectives and insights on their application to diseases in aquaculture systems, the utility for a multidisciplinary team.
  - finalize the paper and submission to a peer-reviewed journal

### REVIEWS IN Aquaculture



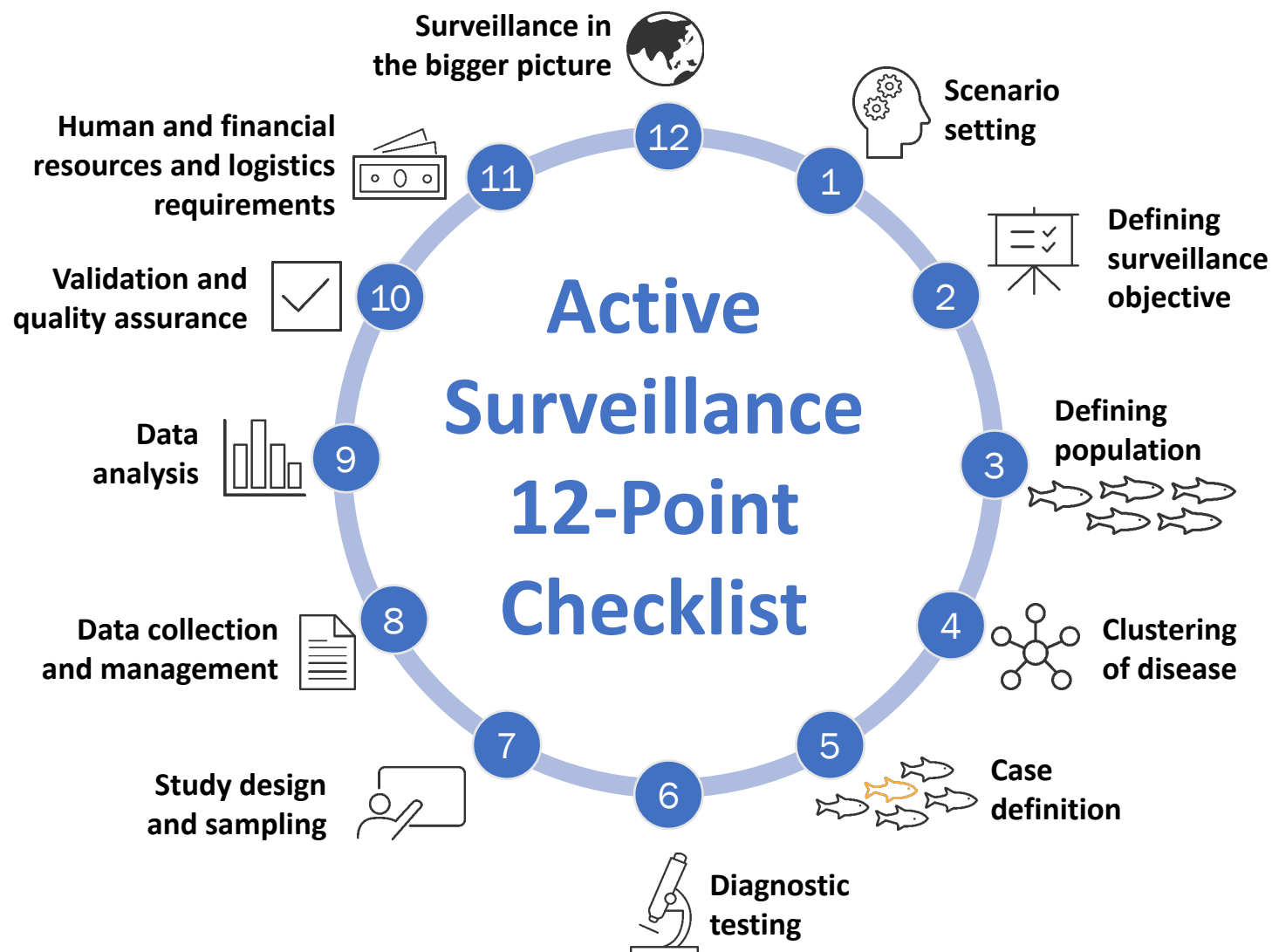
Review |  Open Access |  

#### **A 12-point checklist for surveillance of diseases of aquatic organisms: a novel approach to assist multidisciplinary teams in developing countries**

Melba G. Bondad-Reantaso ✉, Nihad Fejzic, Brett MacKinnon, David Huchzermeyer, Sabina Seric-Haracic, Fernando O. Mardones, Chadag Vishnumurthy Mohan, Nick Taylor, Mona Dverdal Jansen, Saraya Tavornpanich, Bin Hao, Jie Huang, Eduardo M. Leaño, Qing Li, Yan Liang, Andrea Dall'occo  
... See fewer authors ^

First published: 20 January 2021 | <https://doi.org/10.1111/raq.12530> | Citations: 18

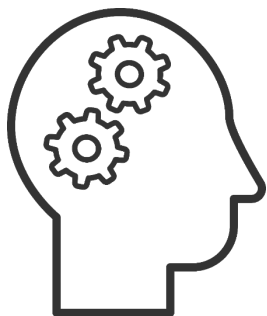




- Step-wise; pragmatic
- Model to build targeted surveillance competency (capacity/capability)
- Basic reference when starting surveillance or to improve existing surveillance programs.
- Educational tool for multidisciplinary groups involved in AAH efforts in developing countries to assist in the development and application of surveillance to manage and control diseases in aquaculture.

## CHECKLIST 1

### Scenario setting

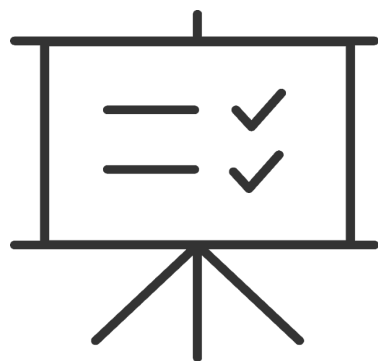


#### National status of the disease in question; including:

- health status of a specific pathogen in the country
- existence of surveillance activities
- health status of a specific pathogen in neighboring countries and/or trading partners
- health status of a specific pathogen in shared water sheds
- data sources

## CHECKLIST 2

### Defining surveillance objective



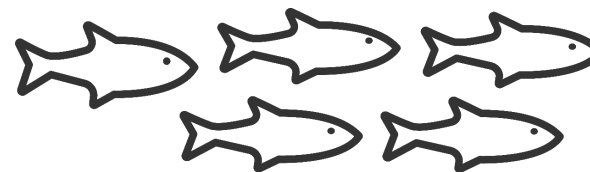
- Set with respect to the disease
- Set with respect to the disease presence
- Set with respect to the level of certification
- Set with respect to the timeframe

#### Populations of interest

- Definition of targeted populations
- Definition of studied populations (populations used for sampling)

## CHECKLIST 3

### Defining population

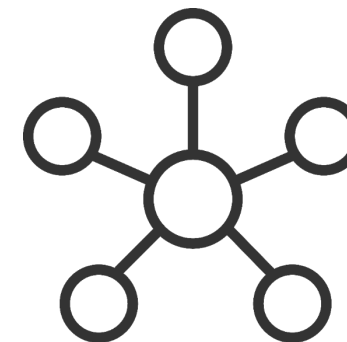


- Inclusion criteria set and described
- Inclusion criteria set and described

- Clustering effect of the disease: is considered and described
- Clustering effect of the disease is accounted for in sampling/survey design and data analysis

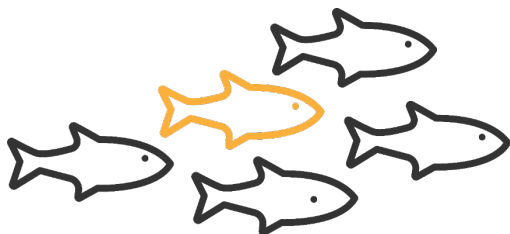
## CHECKLIST 4

### Clustering of disease



## CHECKLIST 5

### Case definition



#### Case definition including different levels:

- clinical,
- laboratorial, and
- epidemiological

## CHECKLIST 6

### Diagnostic testing

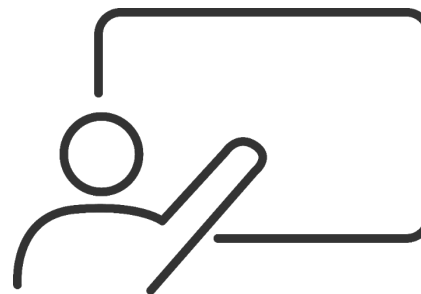


- Description of tests used (procedures, interpretation of results, sensitivity and specificity), and competent laboratories

- Description,
- Survey design,
- Sampling frame and

## CHECKLIST 7

### Study design and sampling



- Sample selection process:
  - units,
  - methods,
  - sample size,
  - sampling materials

- Data forms
- Database (design, entry, management)
- Other information technology (mapping GPS, etc.)

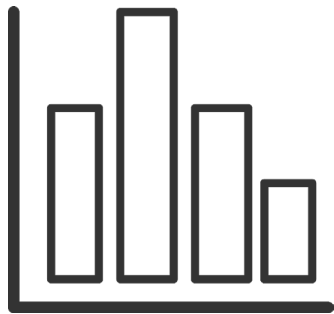
## CHECKLIST 8

### Data collection and management



## CHECKLIST 9

### Data analysis



Description survey design, sampling frame and sample selection process: units, methods, sample size, sampling materials

## CHECKLIST 10

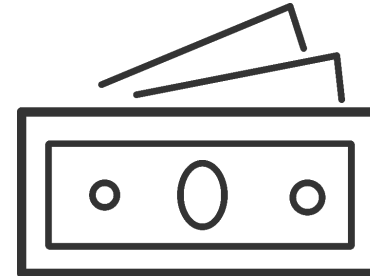
### Validation and quality assurance



- Statistical estimation of the level of confidence (sensitivity of surveillance program)
- Pilot trials, expert/external evaluation (peer review)
- Audit and corrective measures

## CHECKLIST 11

### Human and financial resources and logistics requirements



Requirements described, e.g. personnel, cost of materials and field sampling, and cost of laboratory tests and analysis of data, etc.

Producer sector engaged

Surveillance as an essential component of aquatic animal health/aquatic biosecurity strategies, disease management and control plans

One Health

## CHECKLIST 12

### Surveillance in the bigger picture





# Process

1 TRAINING

2 COURSE

3 CHECKLIST 11

4 CHECKLIST 7,8 & 9

5 FARMER FEEDBACK

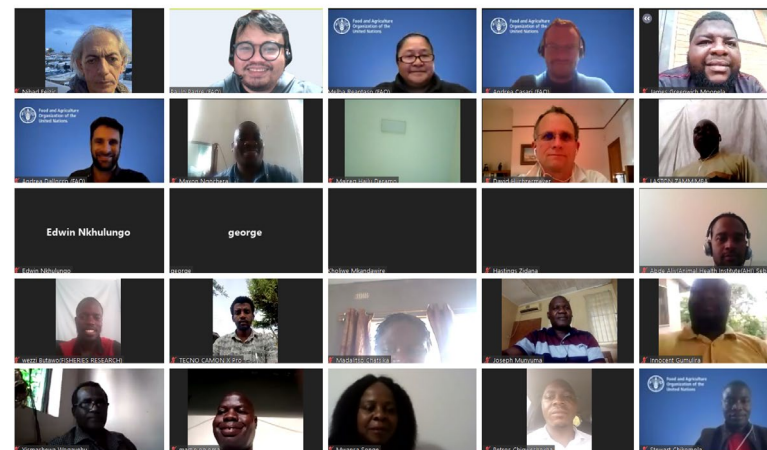
6 PUBLICATION

During the pandemic, we implemented virtual courses which consisted of 27 hours stretched through 3 weeks, 3 days per week and 3 hours per day.

The screenshot shows a presentation slide with the following content:

- Outline : TILV risk factors → Clustering of the cases
- Host : Susceptible species, Life stages, Stress
- Environment : Season, Climate, Contacts, Locations
- Agent : (Virulence, Survivability)

On the right side of the slide, there is a circular diagram with the text "Design of an Ache Surveillance for Tilapia Yellow TSV Disease and Beyond". A video feed of a man with glasses is overlaid on the right side of the slide.

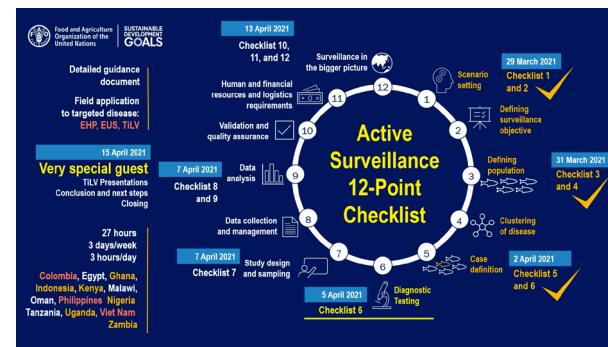
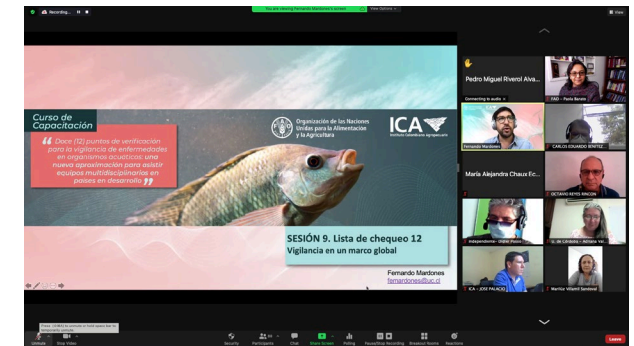


# Process

- 1 TRAINING
- 2 COURSE
- 3 CHECKLIST 11
- 4 CHECKLIST 7,8 & 9
- 5 FARMER FEEDBACK
- 6 PUBLICATION

Participants were expected to populate the 12-point checklist. The design will be finalized prior to implementation

DEFINING POPULATION	
CRITERIA	RESPONSE
POPULATION OF INTEREST	Tilapia ( <i>Oreochromis</i> spp.)
TARGETED POPULATION	Tilapia ( <i>Oreochromis</i> spp.)
POPULATION FOR SAMPLING (Study population)	Tilapia Hatcheries ( <i>Oreochromis</i> spp.) in Regions 3 & 4A Strains: Excel, i-BEST, GIFT derivatives
INCLUSION CRITERIA	Swim up Fry: 9-12 days old Fingerlings: 2 weeks size 24 3 weeks size 22 4 weeks size 17  Broodstocks: ≥4 months
EXCLUSION CRITERIA	Grow-out
FARMING SYSTEMS, REGISTRATION, DATA, APPROVAL OF FARMS	System: Modified-Intensive, Semi-Intensive, Hapa-based, Pond-based, Tank-based Registration & Approval: In-placed since 2005
WILD POPULATION	X



# Process

- 1 TRAINING
- 2 COURSE
- 3 CHECKLIST 11
- 4 CHECKLIST 7,8 & 9
- 5 FARMER FEEDBACK
- 6 PUBLICATION

Checklist number 11 provided guidance on the implementation plan including budget requirements.

CHECKLIST No.

# 11

**HUMAN AND FINANCIAL RESOURCES AND LOGISTICS REQUIREMENTS**

- Personnel Involved in the Surveillance
  - Field Teams
  - Laboratory Teams
  - Data Analysis Teams
  - Audit Teams – Cross-checking of processed data
- Budgetary Requirements
  - Co-sharing of resources (BFAR-FAO)
  - Overtime & hazard pay
  - Hiring of vehicle vs. Gov't vehicle
  - Travel Allowance
- Meeting with the hatcheries
- COVID-19 Restrictions
  - Swabbing of the team
  - Vaccination
- Timeline of Activities:

ACTIVITY	2020					2021								
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
<b>Field Sampling Schedule</b>														
Sensitization of farmers														
Pilot test and sampling map														
Field sampling (Pond farms)														
Field sampling (Cage farms)														
Field sampling (Hatcheries)														
Questionnaires administration														
<b>Laboratory Work Schedule</b>														
Data analysis (Lab 1)														
Data analysis (Lab 2)														
Data analysis (Lab 3)														
Update of progress of work														
Data entry and analyses														
Report writing and reporting														
<b>Other training required</b>														
Training on Data entry and analyses														
Training of farmers on biosecurity														
Training of extension staff of FC														

Activities (indicative)	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Training	x	x								
Finalise surveillance plan		x	x							
Work plan and budget		x	x							
Implement plan		x	x	x	x	x	x	x	x	x
Organise and training of teams		x	x	x						
Organise materials (field/laboratory checklists/forms, field equipment, etc)		x	x	x						
Pilot tests		x	x	x						
Communication to farmers and farmer sensitization		x	x	x						
Field work and laboratory tests			x	x	x	x				
Data entry and analysis (FAO)					x	x	x	x		
Feedback to farmers; drawing of risk management						x	x	x		
Feedback to CA, national consultation							x	x	x	
Report writing and reporting									x	x
Permissive temperature for EUS (18-22°C)										
Active fish farming operations (pond, hatchery)										

# Process

- 1 TRAINING
- 2 COURSE
- 3 CHECKLIST 11
- 4 CHECKLIST 7,8 & 9
- 5 FARMER FEEDBACK
- 6 PUBLICATION

We gave focus to Checklist numbers 7, 8 and 9; which required more guidance compared to the other points in the 12-point checklist.

7 April 2021 fao.org

**Checklist 7**  
Study design and sampling

Speaker  
**Dr. Fernando Mardones**

7 April 2021 fao.org

Sampling frame (using the Pivot Table in Excel)

Species	letter	letter	letter	Sampling
ocho	10	8	42	57
later	17	13	17	51
total	3	10	0	14
<b>Total</b>	<b>45</b>	<b>31</b>	<b>59</b>	<b>132</b>

Proportional allocation

Species	letter	letter	letter
ocho	12.5%	5.3%	16.3%
later	6.6%	19.8%	19.8%
total	2.2%	3.9%	5.4%

**Checklist 7**  
Study design and sampling

Speaker  
**Dr. Fernando Mardones**

9 April 2021 fao.org

**Checklist 8**  
Data collection and management

Speaker  
**Dr. Nihad Fejzic**

9 April 2021 fao.org

**Checklist 9**  
Data analysis

Speaker  
**Dr. Nihad Fejzic**

# Process

1 TRAINING

2 COURSE

3 CHECKLIST 11

4 CHECKLIST 7,8 & 9

5 FARMER FEEDBACK

6 PUBLICATION

Farmer feedback and CA authority consultations are essential part of the process in order to jointly draw risk management and other biosecurity measures needed at the farm and governance levels and their implementation



16 Jan 2023  
Clark, Philippines  
Surveillance  
Analysis, Farmer  
Feedback and  
Technical Seminar



# Process

- 1 TRAINING
- 2 COURSE
- 3 CHECKLIST 11
- 4 CHECKLIST 7,8 & 9
- 5 FARMER FEEDBACK
- 6 PUBLICATION

The final step is the presentation and publication of the outcome.

**Tilapia health: quo vadis?**  
3 December 2021

**TiLV active surveillance in Colombia**  
David Rodriguez

**Tilapia health: quo vadis?**  
3 December 2021

**TiLV active surveillance in the Philippines**  
Sonia Somga

**Tilapia health: quo vadis?**  
3 December 2021

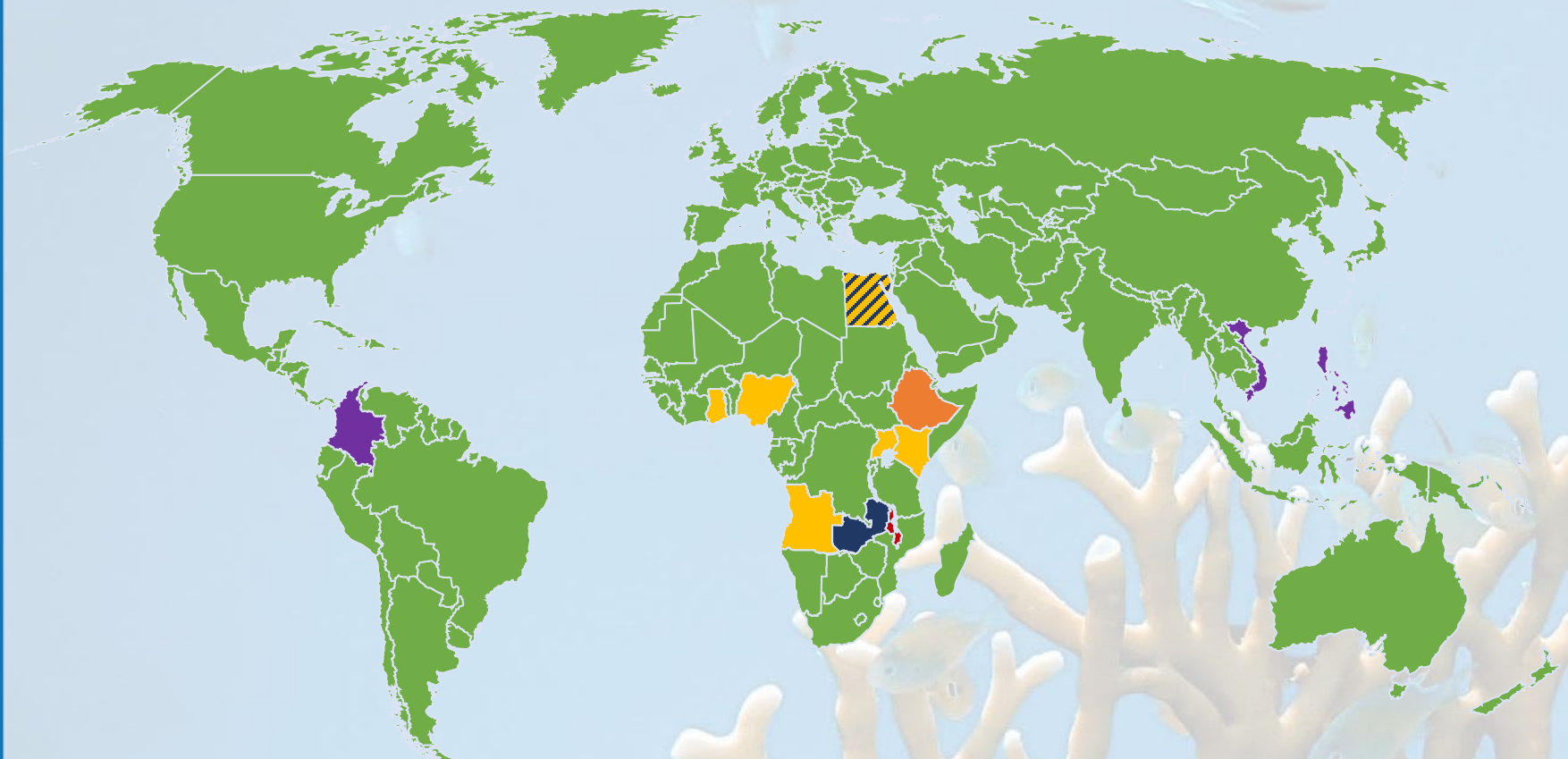
**TiLV active surveillance in Uganda**  
Peter Akoli

**11. Sampling schedule: surveillance in ponds, hatcheries and cages**







Activities	Jan 2021	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan 2022
Preparatory work: identification of waterbodies													
Identification, nomination staff and farmers													
Fish tank and equipment set-up													
Training, equipment and surveillance team													
Field sampling													
Data entry													
Recruitment & gender analysis													
Lab. Analysis													
Public. Final results													

**e. Response and contingency plan**  
In future there will include development of an emergency preparedness and response system in collaboration with all other stakeholders. Further, the team will design contingency plan for aquatic animal health pathogens for effective infection prevention and control of emergence and re-emergence.

# Operationalization of the 12-point checklist



## Countries related to different projects

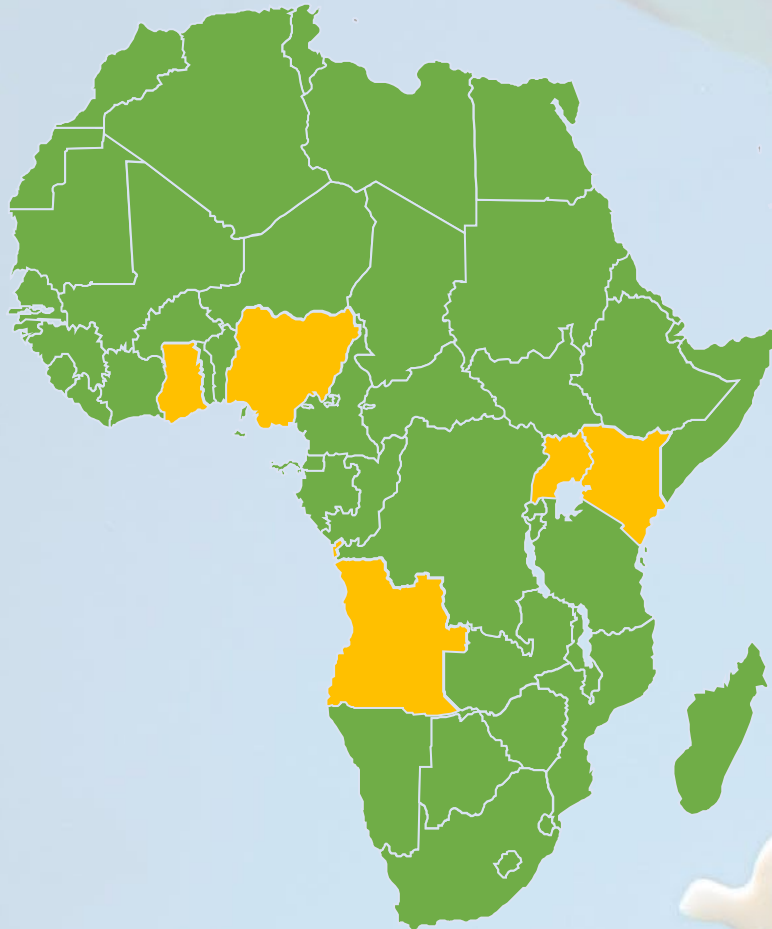
-  **GCP/RAF/510/MUL: Enhancing capacity/risk reduction of emerging Tilapia Lake Virus (TiLV) to African tilapia aquaculture**  
Angola, Ghana, Nigeria, Kenya, Uganda
-  **TCP/EGY/3705: Enhancing biosecurity governance to support sustainable aquaculture production in Egypt**  
Egypt
-  **TCP/ETH/3805 (709982): Technical assistance to strengthening fish disease diagnosis, surveillance and monitoring capacity**  
Ethiopia
-  **TCP/INT/3707: Strengthening biosecurity (policy and farm level) governance to deal with Tilapia lake virus (TiLV)**  
Colombia, Philippines, Viet Nam
-  **TCP/MLW/3804: Enhancing capacity to respond and manage the risk of Epizootic Ulcerative Syndrome (EUS) in Malawi**  
Malawi
-  **UTF/ZAM/077/ZAM: Technical Assistance to the Zambia Aquaculture Enterprise Development**  
Zambia

GCP/GLO/352/NOR: Responsible use of fisheries and aquaculture resources for sustainable development

## Operationalization of the 12-point checklist: ASTF-funded regional project

### ● GCP/RAF/510/MUL: Enhancing capacity/risk reduction of emerging Tilapia Lake Virus (TiLV) to African tilapia aquaculture

Angola, Ghana, Nigeria, Kenya, Uganda



60 delegates (governance authorities, industry and academe) from 11 countries



**Day 9**

- Review of the 12-point Checklist
- Principles of disease investigation

**Day 8**

- Checklist 10
- Checklist 11
- Checklist 12

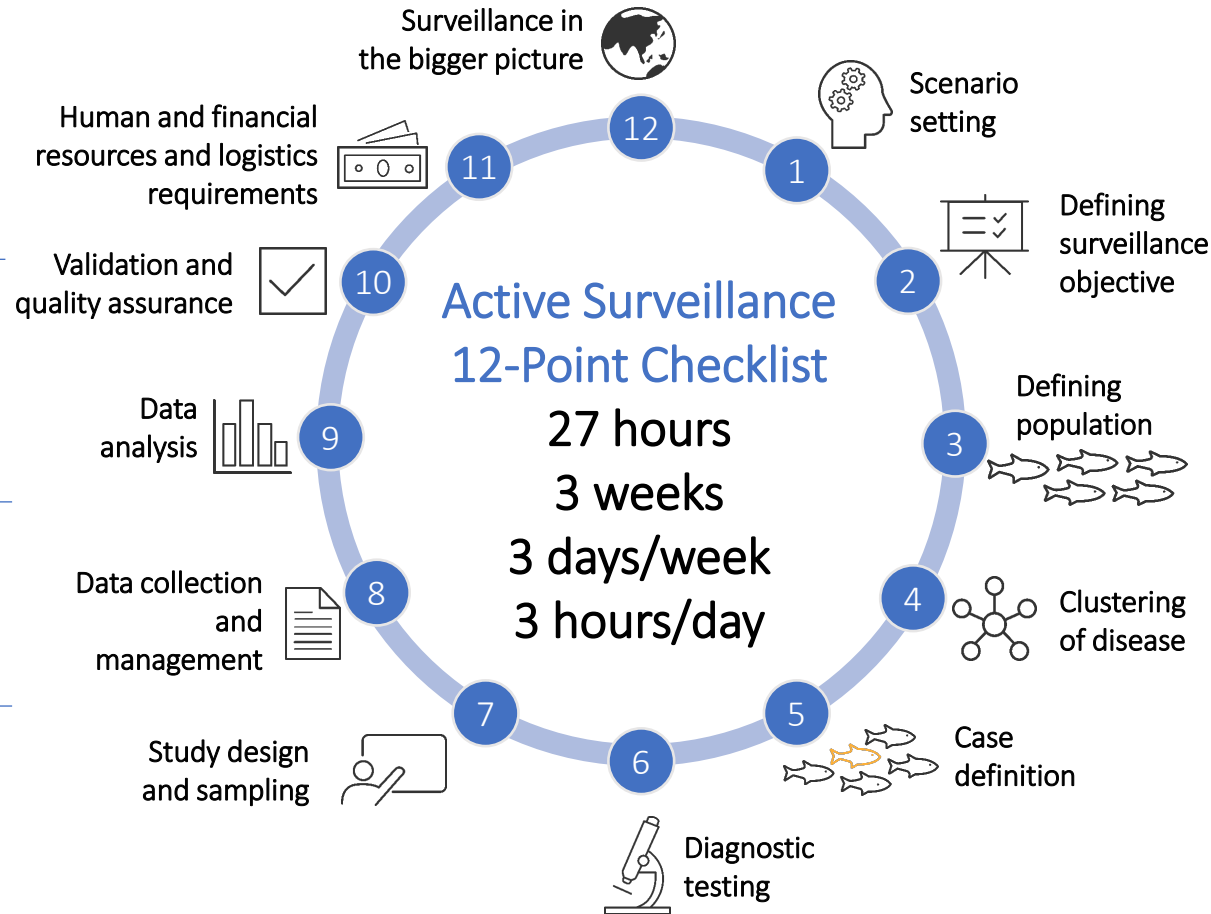
**Day 7**

- Checklist 8
- Checklist 9

**Day 5 & 6**

- Checklist 7

**Virtual course schedule**



**Day 1**

- Introduction to aquatic health management
- Introduction to epidemiology
- Country context

**Day 2**

- Introduction to the 12-point checklist
- Checklist 1
- Checklist 2
- Checklist 3
- Checklist 4

**Day 3**

- Checklist 5
- Checklist 6 (General diagnostics)

**Day 4**

- Checklist 6 (Specific disease)



**Virtual**

**Modalities of application**

**In-person**



**Day 6**

- Checklist 10
- Checklist 11
- Checklist 12
- Review of the 12-point Checklist
- Principles of disease investigation

**Day 5**

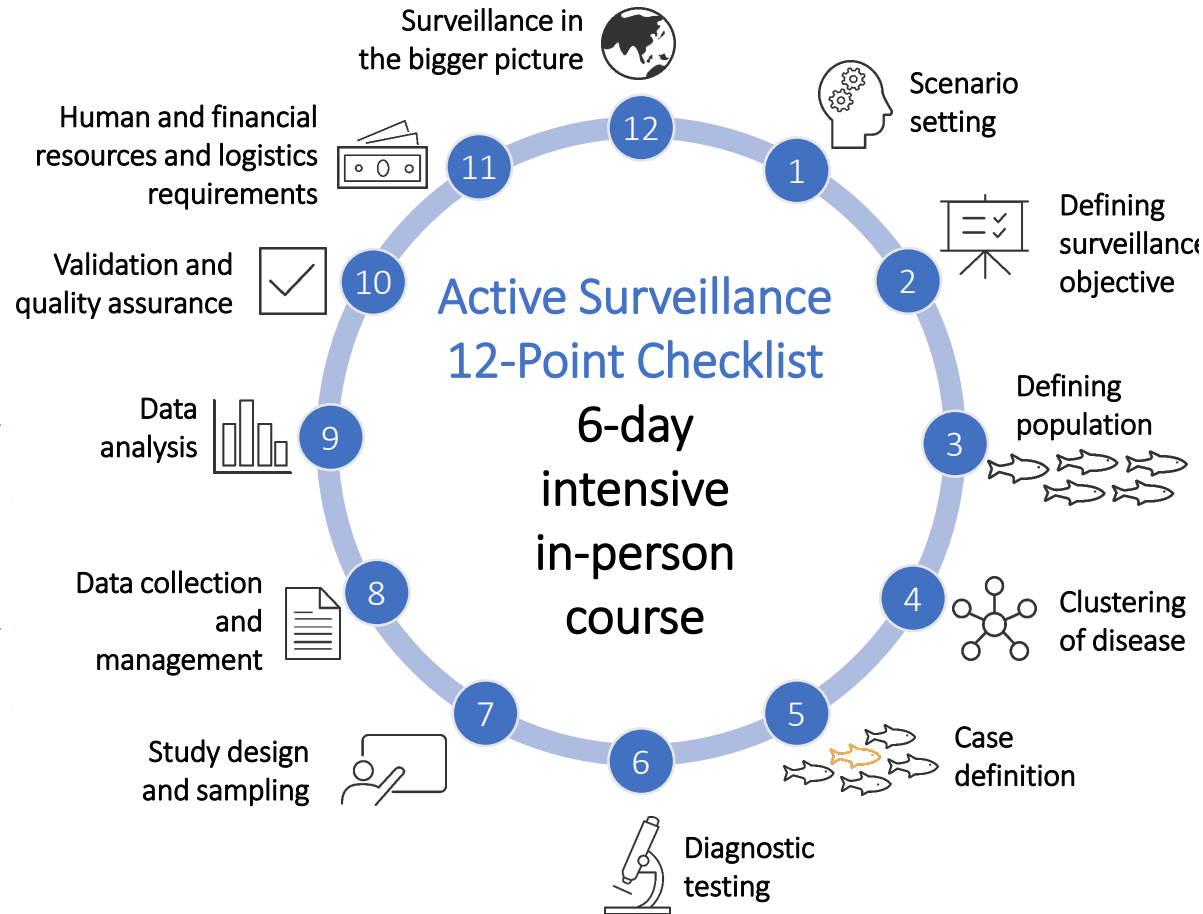
- Checklist 8
- Checklist 9

**Day 4**

- Checklist 7

**In-person course**

(The first in-person course was held in the Philippines)



**Day 1**

- Introduction to aquatic health management
- Introduction to epidemiology
- Country context

**Day 2**

- Introduction to the 12-point checklist
- Checklist 1
- Checklist 2
- Checklist 3
- Checklist 4
- Checklist 5

**Day 3**

- Checklist 6 (General diagnostics)

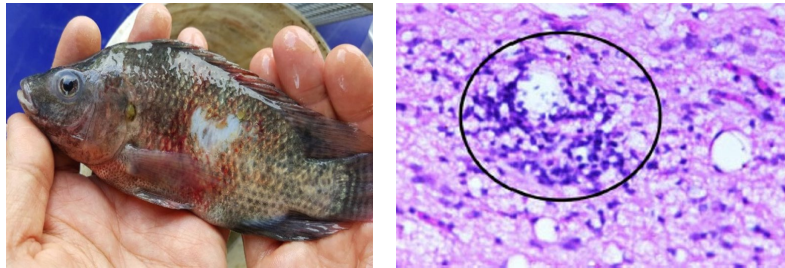
**< Virtual**

**Modalities of application**

**In-person >**

## Case studies

### Tilapia lake virus (TiLV): tilapia



Angola, Colombia, Ethiopia, Ghana, Nigeria,  
Philippines, Uganda, Viet Nam, Zambia

### Epizootic ulcerative syndrome (EUS): many finfish species



Malawi, Zambia

### *Enterocytozoon hepatopenaei* (EHP): shrimp



Philippines

### *Streptococcus agalactiae*: tilapia



Philippines

### Viral nervous necrosis (VNN): milkfish

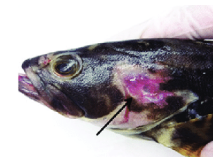
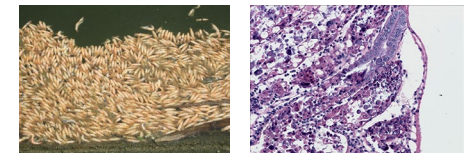


Photo by Aziz Abdullah

Philippines

### Acute hepatopancreatic necrosis disease (AHPND): shrimp



Philippines

# Since 2018,

Project	Countries	Participants
<b>GCP/RAF/510/MUL:</b> Enhancing capacity/risk reduction of emerging Tilapia Lake Virus (TiLV) to African tilapia aquaculture	<b>11</b>	<b>60</b>
<b>TCP/EGY/3705:</b> A Virtual Course on the Design of an Active Surveillance for Diseases of Aquatic Species using a 12-point Checklist for a Multidisciplinary Team	<b>13</b>	<b>154</b>
<b>TCP/ETH/3805 (709982):</b> Technical assistance to strengthening fish disease diagnosis, surveillance and monitoring capacity	<b>1</b>	<b>21</b>
<b>TCP/INT/3707:</b> Virtual Course on the Design and Implementation of an Active Surveillance for Tilapia Lake Virus (TiLV) using a 12-point Checklist for a Multidisciplinary Team (Philippines and Vietnam)	<b>5</b>	<b>310</b>
<b>TCP/MLW/3804:</b> Virtual Training Course on the Design of an Active Surveillance for Epizootic Ulcerative Syndrome (EUS) for Malawi using a 12-point checklist for a multidisciplinary team	<b>2</b>	<b>126</b>
<b>UTF/ZAM/077/ZAM:</b> Technical Assistance to the Zambia Aquaculture Enterprise Development	<b>1</b>	<b>49</b>
<b>In person:</b> Training Course on Designing and Implementing Surveillance for Selected Aquatic Animal Diseases of Important Cultured Species in the Philippines Using the FAO 12-Point Surveillance Checklist	<b>1</b>	<b>43</b>
<b>Total number of participants in the training courses</b>		<b>763</b>

**Seven draft manuscripts:** Colombia (1) | Ghana (1) | Kenya (1) | Nigeria (1) | Philippines (2) | Uganda (1)

# Way Forward

- Continue to provide training courses based on FAO member requests
- E-learning modules (e.g. [Pathway to aquaculture biosecurity: managing disease risks in the value chain](#))
- Preparedness and Contingency Planning
  - Prepare e-learning modules (end of 2023)
  - Finalise e-learning materials (2024)
  - Conduct in-person training course (2024)
- Evaluate the usefulness/impact and ground level application at a later stage for improvement

# Surveillance team



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Food and Agriculture  
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# Thank you for your kind attention!

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