Zoning and Compartmentalization

Regional Workshop for WOAH National Focal Points for Aquatic Animals V Cycle. Alesund, Norway September 3 - 5, 2025

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Reference Centre

World Organisation for Animal Health
Founded as OIE

Outline

Understand the **concepts** of zoning and compartmentalization

Explore **practical applications** in aquatic animal health

Link to **trade, disease control, surveillance , and biosecurity**

Concept → Application → Benefits

What is Zoning?

Zoning is a process of defining a **subpopulation** of aquatic animals based on **geographical boundaries** to facilitate **disease control** and support **international trade**

Disease-specific may be free for one disease bt restricted for another

Typically applied at **part of a country or regional level.** This subpopulation has a **distinct heath status.** The zone should be defined by the Competent Authority.

Controlled via **surveillance, biosecurity, and management measures**

Key elements for zone establishment and maintenance

1. Epidemiologically sound boundaries
   - Clear geographic boundaries and reflect epidemiological relevance, environmental factors, risk of pathogen introduction and establishment
2. Distinct and differentiation by health status
3. Surveillance, Movement control, and Biosecurity required
4. Verification & Auditing
5. Adaptive zoning & Flexibility
6. Communication and Stakeholder Engagement
7. Documentation and Record-Keeping
8. Legal/International Recognition
9. Emergency readiness

Definitions of zoning terms (WOAH Aquatic Code - Glossary)

Zone means an area in one or more countries containing an aquatic animal population with a specific aquatic animal health status with respect to a disease, in which *surveillance* and *control measures* and *basic biosecurity conditions* are applied. The zone should be defined by the Competent Authority.

Free zone: *a zone that fulfils the requirements for self-declaration of freedom from disease with respect to the disease(s) under consideration in accordance with the relevant chapter(s) in the Aquatic Code*

Infected zone: *a zone in which a disease has been diagnosed*

Protection zone: *a zone established to protect the health status of aquatic animals in a free country or free zone, from those in a country or zone of a different aquatic animal health status, using measures based on the epidemiology of the disease under consideration to prevent spread of the pathogenic agent into a free country or free zone. These measures may include, but are not limited to, vaccination, movement control and an intensified degree of surveillance*

Terminology:(EU AHL: Regulation 2016/429 article 4(42))

Zone: A clearly defined part of the territory of a Member State, comprising a continuous aquatic area with a homogeneous health status with regard to a specific listed disease of aquatic animals

Free Zone: An area where a listed disease is absent and measures are in place to maintain its disease-free status

Infected Zone: An area where a listed disease is present and has been confirmed.

Protection zone: An area around and including the location of an outbreak, where disease control measures are applied in order to prevent the spread of the disease from that zone

Surveillance Zone: An area surrounding infected/protection zone where enhanced monitoring and control measures are implemented to detect and prevent the spread of the disease from the protection zone

Restricted zone: An area with legal restrictions to control spread prevent the spread of the disease into areas where no restrictions are applied; when relevant, include protection and surveillance zones.

Self-declaration of free zone

World Organisation for Animal Health
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Member	Self-declared freedom from	Category	Publication date	Country/zone/ compartment
Argentina	Epizootic haematopoietic necrosis virus (Inf. with)	Aquatic	Monday, November 18, 2024	Zone
Argentina	Gyrodactylus salaris (Inf. with)	Aquatic	Monday, November 18, 2024	Zone
Argentina	Infectious haematopoietic necrosis virus (Inf. with)	Aquatic	Monday, November 18, 2024	Zone
Argentina	Infectious salmon anaemia virus (Inf. with) (HPR-deleted or HPR0 genotypes)	Aquatic	Monday, November 18, 2024	Zone
Argentina	Viral haemorrhagic septicaemia virus (Inf. with)	Aquatic	Monday, November 18, 2024	Zone
Colombia	White spot syndrome virus (Inf. with)	Aquatic	Monday, May 13, 2024	Zone
Colombia	Yellow head virus genotype 1 (Inf. with)	Aquatic	Monday, May 13, 2024	Zone

Argentina -- Pathway 1 – Absence of susceptible species
There are no *susceptible species* (as listed in Article X.X.2. of the relevant *disease*-specific chapter of the *Aquatic Code*) present in that country or *zone*.

Mapa 1. Zona autodeclarada libre, comprendida por todos los cuerpos de agua que constituyen la cuenca alta y media del río Limay hasta la represa hidroeléctrica del embalse Piedra del Águila.

Self-declaration of free zone

Figura 1: Ubicación Zona Libre autodeclarada como libre del Síndrome de las Manchas Blancas Colombia 2023

Fuente: ICA –Subgerencia de Protección Animal
Dirección Técnica de Vigilancia Epidemiológica 2023

Taxa / Family / Species / Vernacular Name	Established (Department)
Artemidae Artemia salina Artemia	(Guajira, Magdalena, Atlántico, Bolivar, Sucre, Cordoba, Antioquia, Valle, Cauca, Nariño)
Peneidae Farfantopenaeus duorarum Pink shrimp	(Atlantic)
Litopenaeus stylirostris White shrimp	(Atlantic, Bolivar, Sucre, Nariño)
Litopenaeus vannamei White shrimp	(Atlantic, Bolivar, Sucre, Nariño)
Penaeus monodon Giant shrimp	(Cordova)
Palemonidae Macrobrachium rosembergii Giant Malaysian Prawn	(Atlantic, Bolivar, Valley, Plains Eastern)
Portunidae Charybdis helleri Jaibita	(Guajira, Magdalena)

Table 1: Susceptible species found in natural environments

Colombia: Pathway 3 – Targeted Surveillance

Colombia self-declaration of zone free of infection by the Yellow Head Virus Genotype 1 (YHV1) and the White Spot Syndrome Virus (WSSV) is made considering implemented specific surveillance in the area, in accordance with Chapter 1.4 of the aquatic code, since 2009, without detecting the presence of the viruses, and basic biosecurity conditions have been in place since 2003.

Preconditions:

- Basic biosecurity measures must have been in place for a minimum period specified in the disease-specific chapter.
- No disease reports should exist despite the targeted surveillance conducted over the required period.

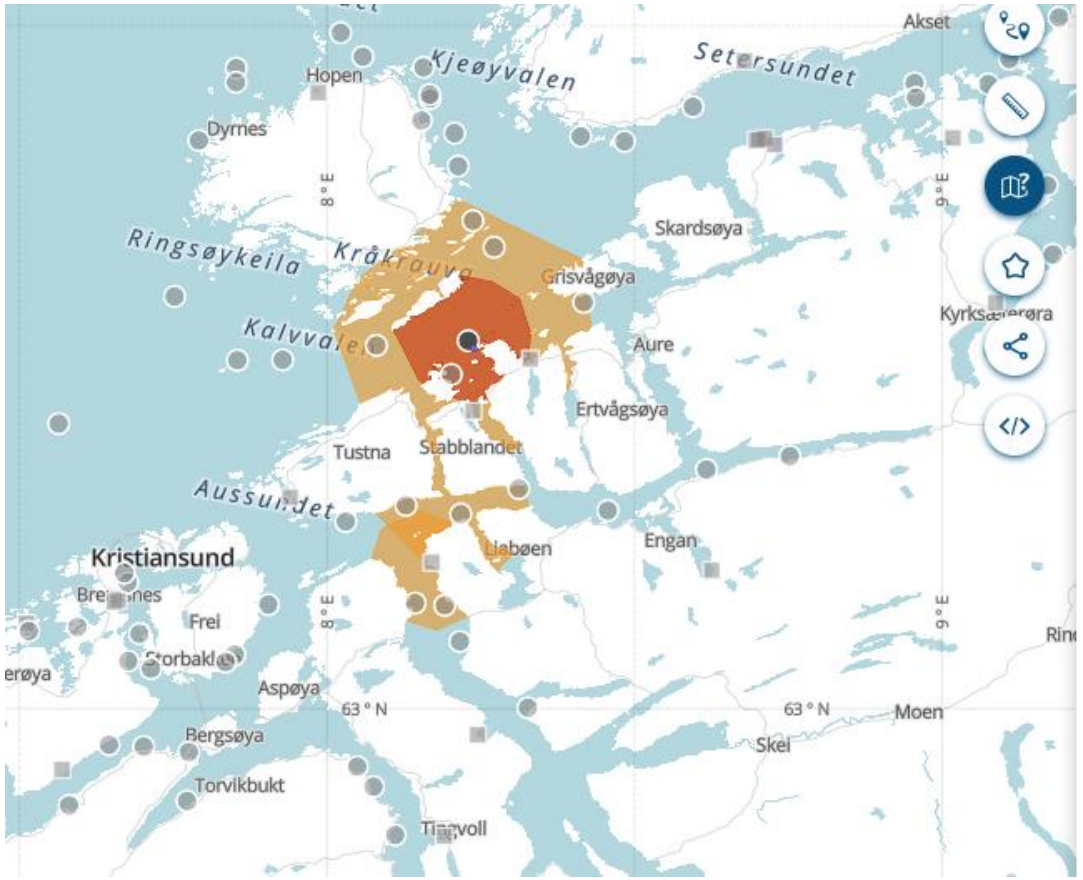
Disease control – Infectious Salmon Anemia (ISA) restricted zones

Protection Zone (Beskyttelsessone)

- Established immediately around a confirmed ISA outbreak site
  Usually at least 5 km from the infected site, but can be adjusted based on local geography, water currents, and epidemiological risk.
- Measures include:
  Restrictions on movements of live fish, eggs, and equipment.
  Enhanced biosecurity and disinfection measures.
  Mandatory disease surveillance and reporting.

Surveillance Zone (Overvåkingssone)

- Surrounds the protection zone, creating a wider buffer.
- Usually at least 10 km beyond the protection zone (so effectively up to 15 km from the outbreak site), again adjusted according to hydrodynamic and epidemiological considerations.
- Measures include:
  - Increased clinical inspections and sampling.
  - Movement restrictions, but somewhat less strict than in the protection zone.
  - Ongoing risk-based surveillance for early detection of spread.



Pancreas Disease (PD) zones in Norway

Long-term regulatory zones defined by the Norwegian Food Safety Authority

- **Endemisk sone (Endemic Zone)** – where PD is established.
  - Located mainly in the **southwest of Norway** (Rogaland, Vestland counties).
  - PD (caused by SAV2 or SAV3) is considered established here.
  - Focus is on **management and mitigation** rather than eradication.

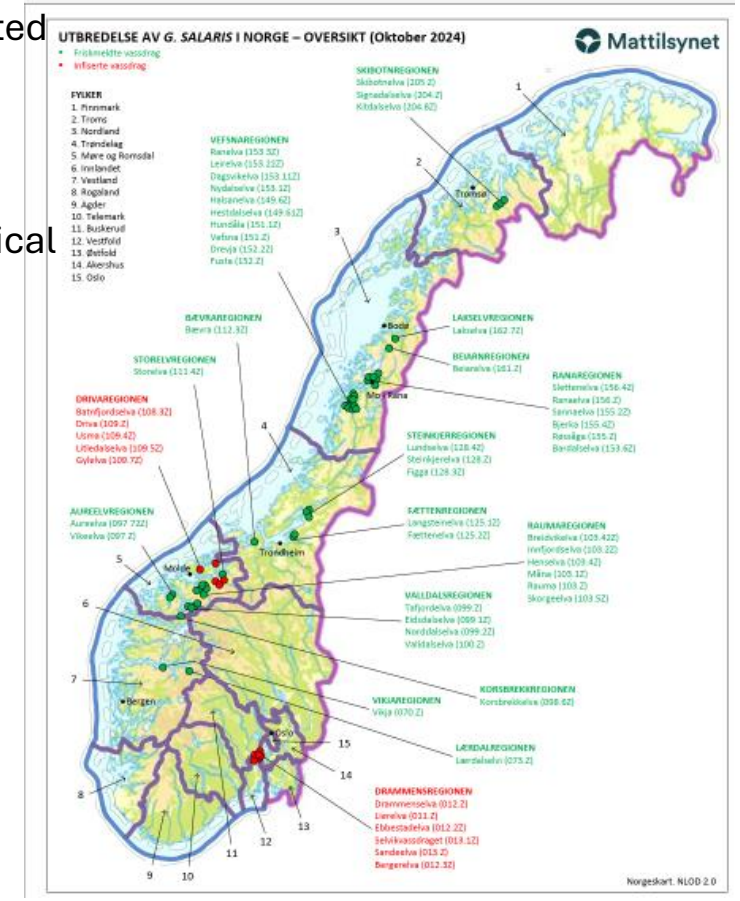
- **Overvåkingssone (Surveillance Zone)** – transitional areas north and south of the endemic zone, to monitor and prevent spread.
  - Strict surveillance, movement control, and stamping-out of outbreaks are applied.

- **PD-fri sone (PD-free Zone)** – areas the rest of the Norwegian coast further north where PD is absent and kept free.
  - Objective is prevention of introduction.
  - Strict biosecurity and fallowing measures apply if outbreaks occur, with an eradication strategy.

Zoning in Eradication of *Gyrodactylus salaris* in Norway

- **Classification of Zones by Health Status**: Rivers and watercourses were classified into categories:

Protection zone: watercourse where infection has been detected and treatment has been implemented or is to be implemented.
Surveillance zone: areas around the protection zone where either no infection has been detected, or where treatment has been completed and the area is being monitored.



- **Establishing Epidemiological Units:** Each **river system** was treated as a separate epidemiological unit.
- **Targeted Eradication Measures within Infected Zones**

Chemical treatments (e.g., rotenone, acid aluminium) applied within the infected zones.

After treatment, zones were kept under long-term surveillance before being reclassified as free.

- **Movement Control**

Strict prohibition of moving live fish, equipment, or water between zones.

Mandatory disinfection stations were placed between infected and free zones.

- **Stepwise Eradication Strategy**

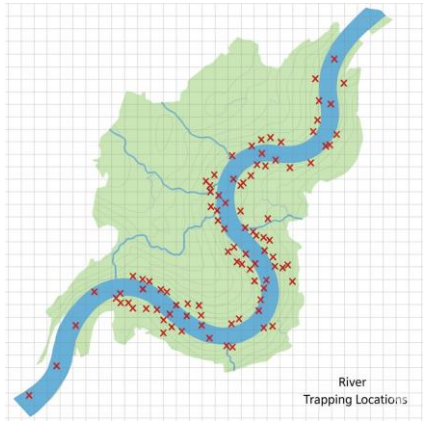
Zoning enabled a progressive approach: gradually shrinking the number of infected zones and expanding recognized free zones.

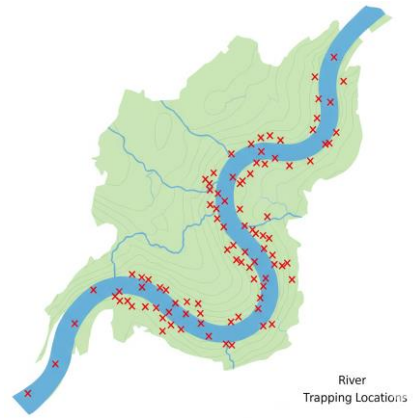
Production areas (POs) for salmon farming in Norway

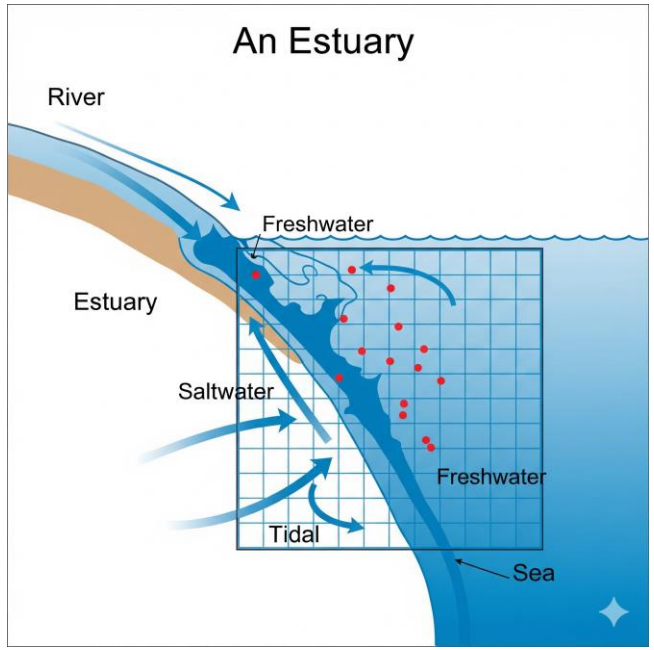
- Environmental sustainability control
  - To regulate aquaculture growth based on environmental impact
- Geographic management unit
  - To divide the long Norwegian coast into manageable zones that reflect biological and hydrodynamic conditions
- Predictable growth framework
  - To give the aquaculture industry a transparent, science-based system for expansion.
- Protecting wild salmon and trout
  - to reduce risks to wild salmonid populations from aquaculture-related pressures
- Encouraging innovation and cooperation
  - Farmers within the same production area are incentivized to work together on coordinated treatments and preventive measures

Spatial sampling

- Can be used when no sampling frame exists
- Population must be relatively stationary (e.g., farms, ponds, oysters)
- Involves selecting random locations in an area rather than individuals.
- may be either two-dimensional or three-dimensional.







eDNA sampling for aquatic surveillance

- Non-invasive method to detect pathogens in the environment (e.g., water, soil, air).
- Broad coverage Cost effective: can test multiple sites efficiently,
- Reduces stress and welfare concerns in animals
- Enhances sensitivity of early detection in open systems

Consideration

- Need for standardized protocols (collection, preservation, analysis)

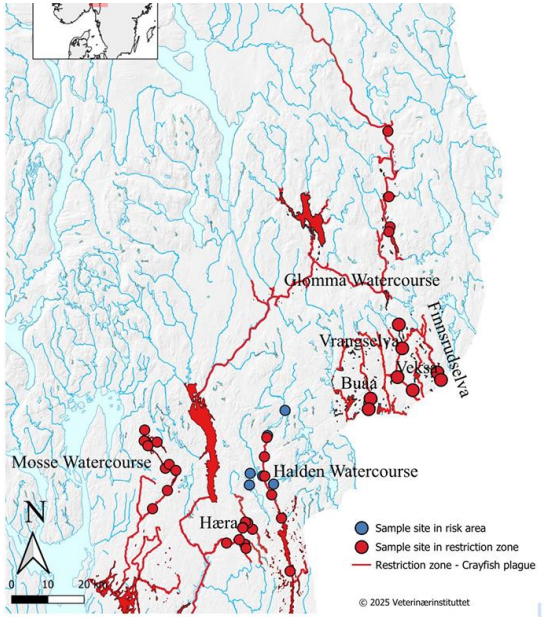


Figure 1. Surveillance sites in South-Eastern Norway 2024. Water samples (circles) were collected in June and August or September. Regulated areas (crayfish plague restriction zones) are marked in red. Note: For Glomma, the restriction zone is an approximation.

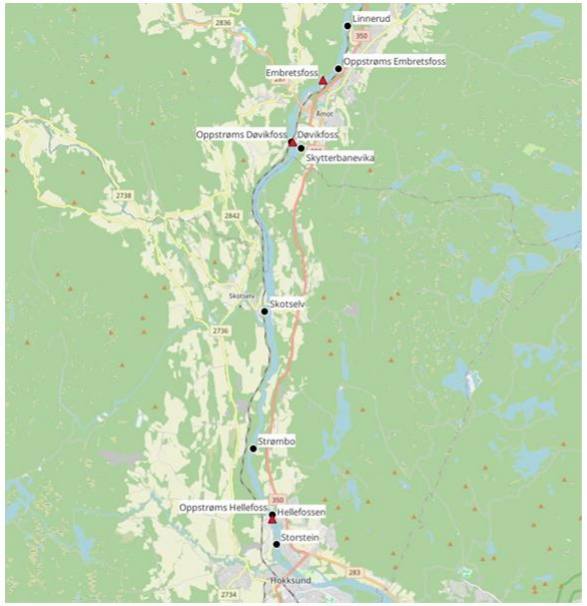


Figure 2. Sampling stations (black dots) for eDNA and electrofishing in the River Drammenselva in 2023 and 2024. The barriers for upstream migration of salmon, Hellefoss, Døvikfoss and Embretsfoss, are shown by red triangles. See also details in Table 1.

Compartment (WOAH, Aquatic Code)

means one or more aquaculture establishments under ***a common biosecurity management system*** containing an aquatic animal population with a distinct health status with respect to a specific disease or diseases for which required ***surveillance and control measures*** are applied and ***basic biosecurity conditions*** are met for the purpose of international trade.

Such must be clearly documented by the Competent Authority(ies).

Principles for Defining a Compartment

- A compartment may be established for a specific disease or group of diseases.
- Must be **clearly defined**, including:
  - Location of all components (broodstock, hatcheries, grow-out, slaughterhouses, processing plants)
  - Description of interrelationships among components
- Must demonstrate **epidemiological separation** from other populations with different health status.
- Definition should consider:
  - Disease-specific epidemiological factors
  - Aquatic animal species involved
  - Production systems and infrastructure
  - Biosecurity practices
  - Surveillance

Surveillance Requirements for a Compartment

Surveillance for compartment should address both **internal** and **external risks**

- **Internal Surveillance**
  - Collect and analyse disease data to demonstrate compliance with defined compartment status.
  - Ensure early detection if the pathogen enters the subpopulation.
  - Apply surveillance strategies tailored to the disease(s) of concern to achieve confidence in freedom.
- **External Surveillance**
  - Biosecurity measures must match the level of exposure risk.
  - Detect significant changes in exposure pathways for disease introduction.
  - Use a mix of targeted and passive surveillance.
  - Targeted surveillance should focus on high-risk epidemiological units near or linked to the compartment.

Achieving a Free Compartment of aquaculture production systems

- **Open Systems:** No control over water, environmental conditions, animals, or vectors. Examples include stocking wild populations.

- **Semi-open Systems:** Some control over animals and vectors, but no control over water or environmental conditions. Examples are net pens in natural water bodies.

- **Semi-closed Systems:** Partial control over water entry/exit and environmental conditions. Can prevent animals and vectors but not all pathogens. Examples include ponds or raceways.

- **Closed Systems:** Full control over water, environment, and all living organisms including pathogenic agents. Examples are recirculating systems with high-level water treatment.

Conclusion

- **Zones and compartments** support safe trade and facilitate disease control.
- Clear **definitions and principles** are essential for consistent application.
- Practical applications show their value (e.g. ISA zones, PD zones, self-declared free zones).
- Effective implementation requires strong **surveillance systems** and **biosecurity measures**.