2nd INTERNATIONAL AQUACULTURE BIOSECURITY CONFERENCE

Advances in Practical Disease Prevention, Control and Eradication

WORKBOOK

AQUACULTURE BIOSECURITY WORKSHOP

August 15-16 2011

Trondheim, Norway

www.iabconference.org

2nd INTERNATIONAL AQUACULTURE BIOSECURITY CONFERENCE AND WORKSHOP

Advances in Practical Disease Prevention, Control and Eradication

NORWEGIAN MINISTRY OF
FISHERIES AND COASTAL AFFAIRS

INSTITUTE FOR
INTERNATIONAL
COOPERATION IN
ANIMAL BIOLOGICS

an OIE collaborating center

Aquaculture Biosecurity Workbook

For use during the table-top and on-farm exercises during the 2011 International Aquaculture Biosecurity Conference & Workshop

Norway, August 15-16, 2011

Compiled by:

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The information and worksheets provided in this workbook are intended for the use of workgroups during tabletop and on-farm exercises. Each workgroup will be encouraged to use the worksheets to understand the concepts of each step of a biosecurity program, and for developing an outline of a site-specific biosecurity plan based on the provided scenario.

TABLE OF CONTENTS:

Dear Workshop Participant,

This workbook, together with copies of the Aquaculture Biosecurity Manual, current OIE Aquatic Animal Health Code, and OIE Manual of Diagnostic Tests for Aquatic Animals, will serve you in completing the set of practical table top and on-farm exercises.

The primary objective of these exercises is to introduce you to the current concepts of veterinary aquaculture biosecurity and allow you to apply the theoretical knowledge to a real-life scenario. The combination of direct contact with facilitators, table top exercises and on-farm visit and audit will provide you with hands-on experience in developing and implementation of a biosecurity plan for the selected epidemiological unit.

After completion of this workshop, the participant should:

1) Be familiar with general biosecurity concerns in the aquatic animal production systems, including biosecurity practices and proper handling of animals and equipment during site visits.
2) Understand the steps required to design and implement efficient and economical biosecurity program.
3) Be able to participate as member or leader of the team charged with biosecurity plan design and implementation in the role of a producer/owner, attending veterinarian or government official.

The Workshop facilitators look forward to work with you in a focused and interactive setting that will allow direct communication and instant feedback in order to maximize participants learning experience.

Best regards,

A. David Scarfe *PhD, DVM, MRSSAf*
Dušan Palić *DVM, MVSc, PhD*
Christopher I. Walster *BVMS, MVPH, MRCVS*
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2nd IABC Conference and Workshop Agenda:

Time	Saturday, August 13, 2011
14:00 – 17:00	Registration
	Sunday, August 14, 2011 (Conference)
09:30 – 10:00	**Introductions/ Welcome to IABC & Norway** Yngve Torgersen, Deputy Director General, Ministry of Fisheries and Coastal Affairs
10:00 – 10:45	**Integrating Components for Effective Veterinary Biosecurity in Aquaculture** *A. David Scarfe - AVMA, U.S.A.*
10:45 – 11:00	**Coffee/Tea (Poster session)**
11:00 – 11:45	**Determining/ Mitigating Critical Control Points & Risks of Disease Introduction** *Larry Hammell - CAHS, Canada*
11:45 – 12:30	**Surveillance, Monitoring & Determining Disease Status/Freedom** *Lori Gustafson - USDA, U.S.A.*
12:30 – 13:30	**Lunch**
13:30 – 14:15	**Diagnostic Testing, Veterinary & Farm Record Keeping** *Chris Walster – IVA, U.K.*
14:15 – 15:00	**Contingency Plans for the Control & Eradication of Disease** *Edgar Brun – NVI, Norway*
15:00 – 15:30	**Coffee/Tea (Poster session)**
15:30 – 16:00	**Immunoprophylaxis in Biosecurity Programs** *Roar Gudding - NVI, Norway*
16:00 – 16:30	**National & International Biosecurity Strategies** *Birgit Oidtmann - CEFAS, U.K.*
16:30 - 17:00	**Facility-specific Biosecurity Plans: Case Study in Bioexclusion and Biocontainment** *Grace Karreman – Western Chemical, Canada*
19:00 – 21:00	**IABC Banquet, Rockheim**
	Monday, August 15, 2011 (Conference/Workshop)
09:15 – 09:45	**Australian AQUAPLAN and AQUAVETPLAN** *Ingo Ernst – DAFF, Australia*
09:45 – 10:15	**Canadian National Aquatic Animal Health Program** *Kim Klotins – CFIA, Canada*
10:15 – 10:30	**Coffee/Tea (Poster session)**
10:30 – 11:00	**The Practical Implementation of Biosecurity on Fish and Shellfish Farms in England** *Richard Gardiner, CEFAS, U.K.*
11:00 – 11:15	**Development of (AquaFRAM) Tool for Salmon Farms** *Jan Mei Soon – RAC, U.K./FAINR, Malaysia*
11:15 – 11:45	**Practical Approach to Biosecurity in Atlantic Salmon Production** *Atle Lillehaug, NVI, Norway*
11:45 – 13:00	**Lunch**
13:00 – 17:30 (refreshments included)	**Biosecurity Manual: Step-by-Step Guide to Develop and Implement Practical, Effective and Economical Biosecurity Programs (Practical Exercise)** *Dušan Palić, ISU CVM, U.S.A., A. David Scarfe, AVMA, U.S.A., Chris Walster, IVA, U. K., Lori Gustafson, USDA, U.S.A., Atle Lillehaug, NVI, Norway, Larry Hammell, CAHS*
17:45 – 18:00	**IABC Closing ceremony**
18:30	Bus transportation to Baardshaug Hotel, Orkanger (Workshop participants)
19:30	Dinner at Baardshaug Hotel (Workshop participants)

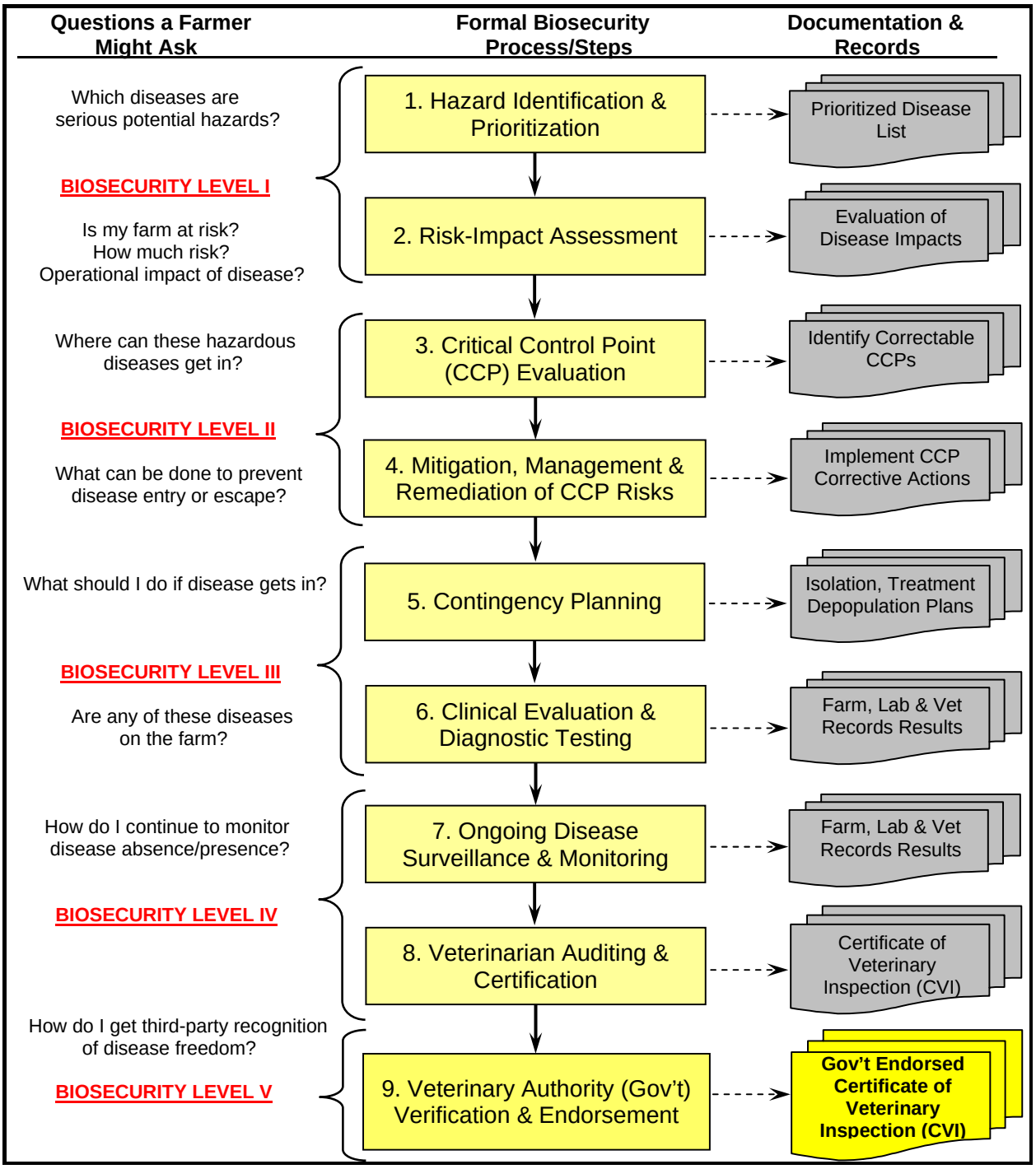
Aquaculture Biosecurity Workshop Schedule:

Monday, August 15, 2011		
13:00 – 17:30	**Table-top Exercises: Biosecurity Program Implementation**	**Instructor:**
13:00 – 14:15	Block 1: Introduction and definitions / record keeping	
10 min	Welcome / Introductions	Scarfe
25 min	• Table-top Exercise Objectives and Group Assignement • Using the Veterinary Aquaculture Biosecurity Manual & Workbook • Defining Epidemiological Units (EU)	Scarfe
40 min	Case work-up. Using Workbook do the following: 1) Define Epidemiological Units (use available maps/ facility information) 2) Prepare list of additional information you need about the operation 3) Fill in the Questionnaire 3) One group per farm presents the results (up to 5 min)	All (Scarfe, Palić, Walster, Gustafson, Hammell, Lillehaug)
14:15 – 15:15	Block 2: Hazards, Risks and Critical Control Point Management	
20 min	• Identifying & Prioritizing Disease Hazards • Evaluating Risks & Impacts • Economic Driving Forces behind building a biosecurity program • Identifying, Evaluating & Mitigating/Managing Critical Control Point in an Epidemiological Unit (Aquaculture Operation)	Walster/Palić
40 min	Case work-up. Using Workbook and case information do the following: 1) Identify and prioritize diseases on the identified EUs 2) Evaluate risks and impacts to the facilities 3) Prepare and propose CCP management plan for each EU 4) One group presents the results (up to 10 min)	All
15:15 – 15:30	Break: Coffee/Refreshments	
15:30 – 16:20	Block 3: Disease Evaluation, Surveillance and Monitoring	
10 min	• Determining Disease Presence or Absence; Diagnostic Sampling, Testing, and Surveillance	Gustafson
40 min	Case work-up. Using Workbook, record sheets from Block 1, and information from Block 2, do the following: 1) Propose sampling regimen for disease surveillance 2) Prepare template of the Surveillance/Monitoring record sheet 3) One group presents the results (up to 10 min)	All
16:20 – 17:20	Block 4: Contingency Plans, Audit and Certification of Biosecurity program	
10 min	• Building Contingency Plans	Hammell
10 min	• Auditing and Certifying Biosecurity Program/Plan	Scarfe
40 min	Case work-up. Use Workbook and information from Blocks 1-3 to: 1) Define possible problems and suggest contingencies 2) Prepare checklist for audit steps for selected certification level 3) One group presents the results (up to 10 min)	All
17:20 – 17:30	Closing remarks for the table top exercise session	All Facilitators and Groups
17:45 – 18:00	**IABC Closing ceremony**	
18:30	Bus transportation to Baardshaug Hotel, Orkanger (workshop participants)	
19:30	Dinner at Baardshaug Hotel (workshop participants)	

Tuesday, August 16, 2011		
09:00 – 17:30	**On-Farm Exercises:** **Evaluating Biosecurity on an Actual Aquaculture Operation**	**Instructor/ Facilitator**
09:00 – 09:30	Bus to Lerøy Midnor salmon smolt farm, Lensvik	
	Upon arrival, split in two groups: one group will tour the facilities; second group will sit in for the presentations.	
09:30 – 12:30	• Diseases facing Norwegian Salmon Production & Norwegian Approaches to Biosecurity • Introduction to Farm Operations • Breakout Team Farm Operation Biosecurity Evaluation (Audit)	Østvik, Farm Attending Veterinarians Scarfe, Lillehaug, Walster, Palić, Gustafson, Hammell
12:30 – 13:00	Bus Lensvik – Orkanger	
13:00 – 14:00	Lunch at Baardshaug Hotel, Orkanger	
14:00 – 16:30	Breakout Team Evaluation Reports / Open Panel Discussion: How could this Operation's Biosecurity Program be Improved	All participants & facilitators
16:30 – 17:30	Return to Trondheim by bus	
Evening 18:00-20:00	**AquaNor Reception at Byscenen**	

Workshop participants will utilize the OIE Aquatic Code and Manual, the Veterinary Aquaculture Biosecurity Manual and Workbook and additional publications provided, to develop procedures needed for each step of an effective and efficient biosecurity plan for specific aquaculture operation scenarios.

Steps for developing, implementing, auditing and certifying a biosecurity program are intended to prevent, control and possibly eradicate disease in any *epidemiological unit* (a defined population of animals, separated to some degree from other populations, in which infectious and contagious diseases can be transmitted – e.g. a tank/pond, farm, state/province, zone, region or country).



SCENARIO:

The scenario provides information about the aquaculture operation in need of a biosecurity plan/program. The members of six teams (workshop participants) will work together to develop basis for such a plan based on the provided information (description, maps, photographs, and facilitator input as requested).

Each team member will assume a role from one of the following categories:

1) Attending Veterinarian
2) Owner/Producer/Farm Manager
3) Government official

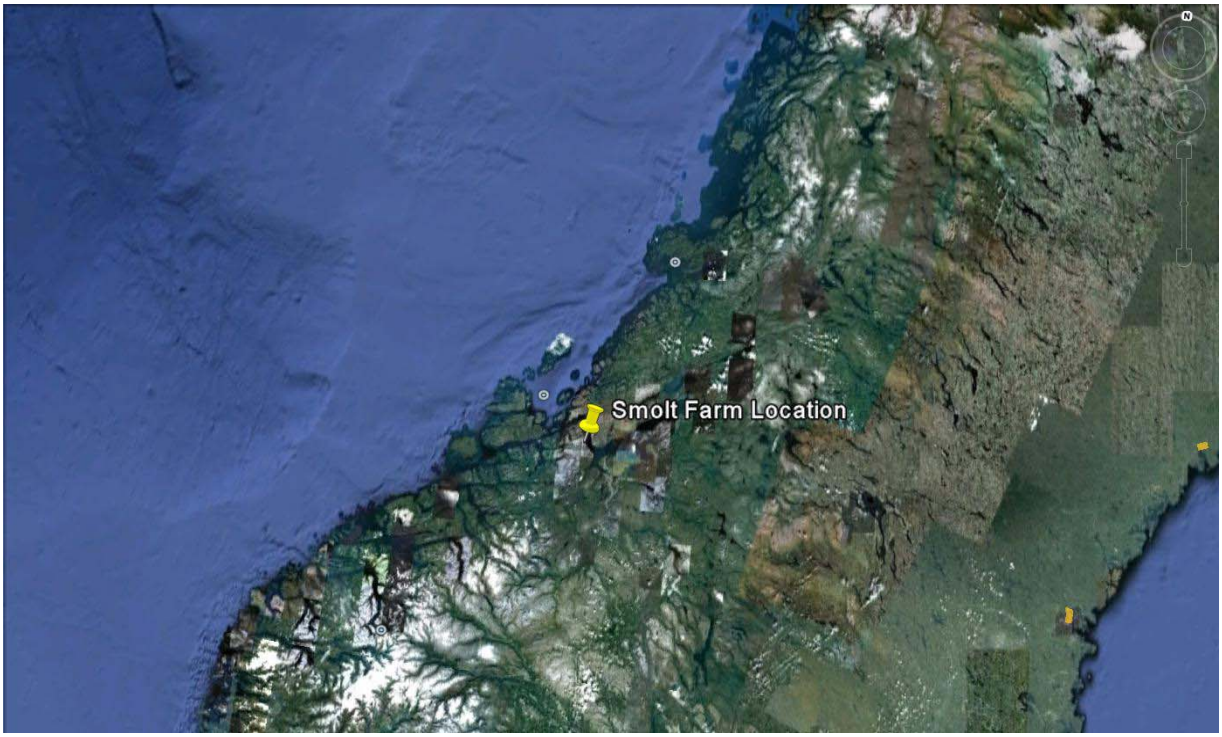
The team will use their collective exprience and professional judgement, together with information presented in the workbook and supplemental materials to complete the exercises assigned by the instructors/facilitators. Each exercise will have a brief introduction and will require team work in deciding what information needs to be used on provided forms or flow charts. At the end of each exercise, a representative from one of the scenario groups will be asked to briefly present their results and discuss the thought process that they used in completing the task.

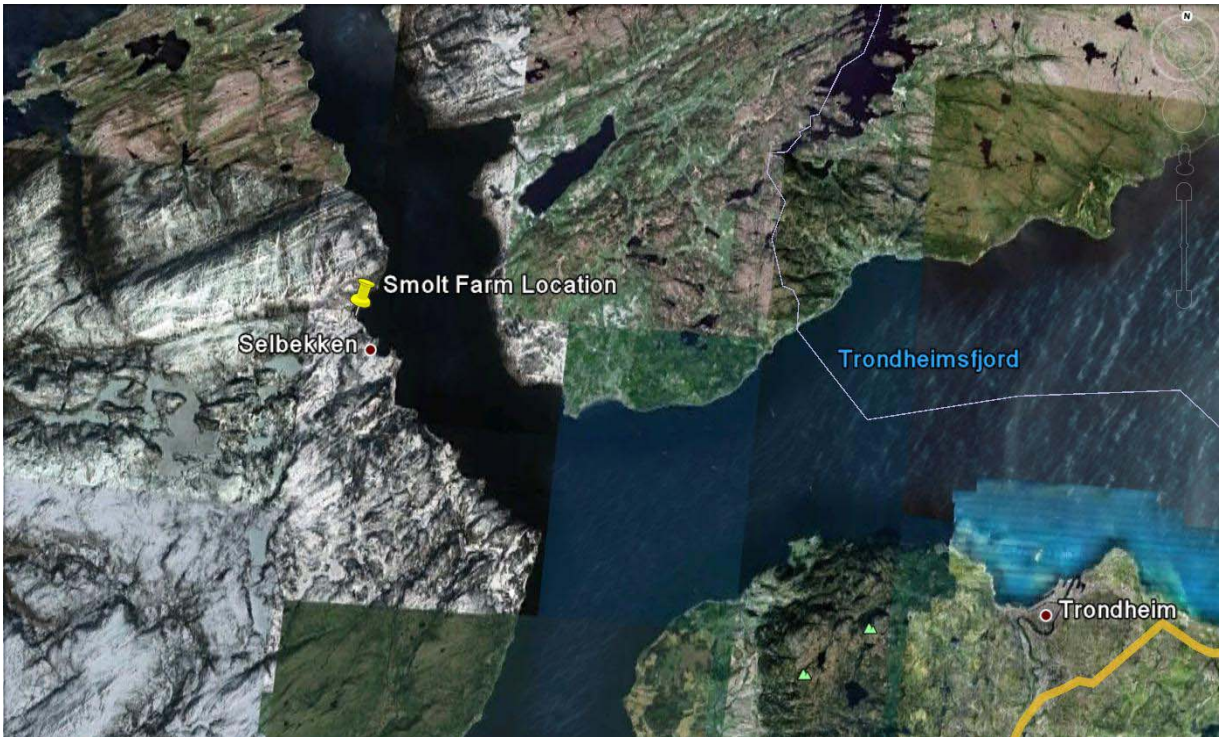
Although this particular scenario is based on real-life Atlantic salmon smolt production and hypothetical sea grow-out operation in the vicinity of Trondheim, Norway, specific details of the operation(s) may have been changed. The smolts produced on this farm are used in hypothetical net pen (sea cage) operation in the nearby geographical location. On the second day of the workshop, the participants will visit the actual smolt farm and will perform a biosecurity audit using the principles discussed during the table top exercises.

Smolt farm – production information

Name:	Lerøy Midnor, Lensvik department
License no:	STA 0001
Site no, name:	13179 Lensvik
Address:	N-7315 Lensvik
Owner:	Lerøy Midnor AS / Lerøy Seafood Group
Fish health service:	Havbrukstjenesten AS /Bjørnar Paulsen, fish health biologist
Staff:	Technical, fish care: 5 persons Administration, office: 30% of one position
Fish species:	Atlantic salmon
Production no of smolt:	Smolt, spring: 1.1 million Smolt, fall (0-years): 1.4 million Fry (~10g): 2.5 – 3.0 million
Eggs, source:	AquaGen, Hemne and Åkvik. Import, Iceland: 1,5 million eggs
Feed, source:	Skretting
Feed, amount:	100 – 150 tons/year, from start feed to 2.5 – 3 mm
Water, source:	Utnesvatnet Lake, 3 km distance, no anadromous fish Back up: Fjæringen Lake, no anadromous fish
Water, treatment:	No disinfection
Additional water source:	Sea-water supplements lake water at 1 ‰ (buffer) after start-feeding, start of on growth, ~3 g, and up to smolt. Last period prior to sea-transfer 20 ‰ (adaptation), full sea-water last weeks.
Sea-water, treatment:	UV-light

Geographical location (Map) of the smolt production facility:

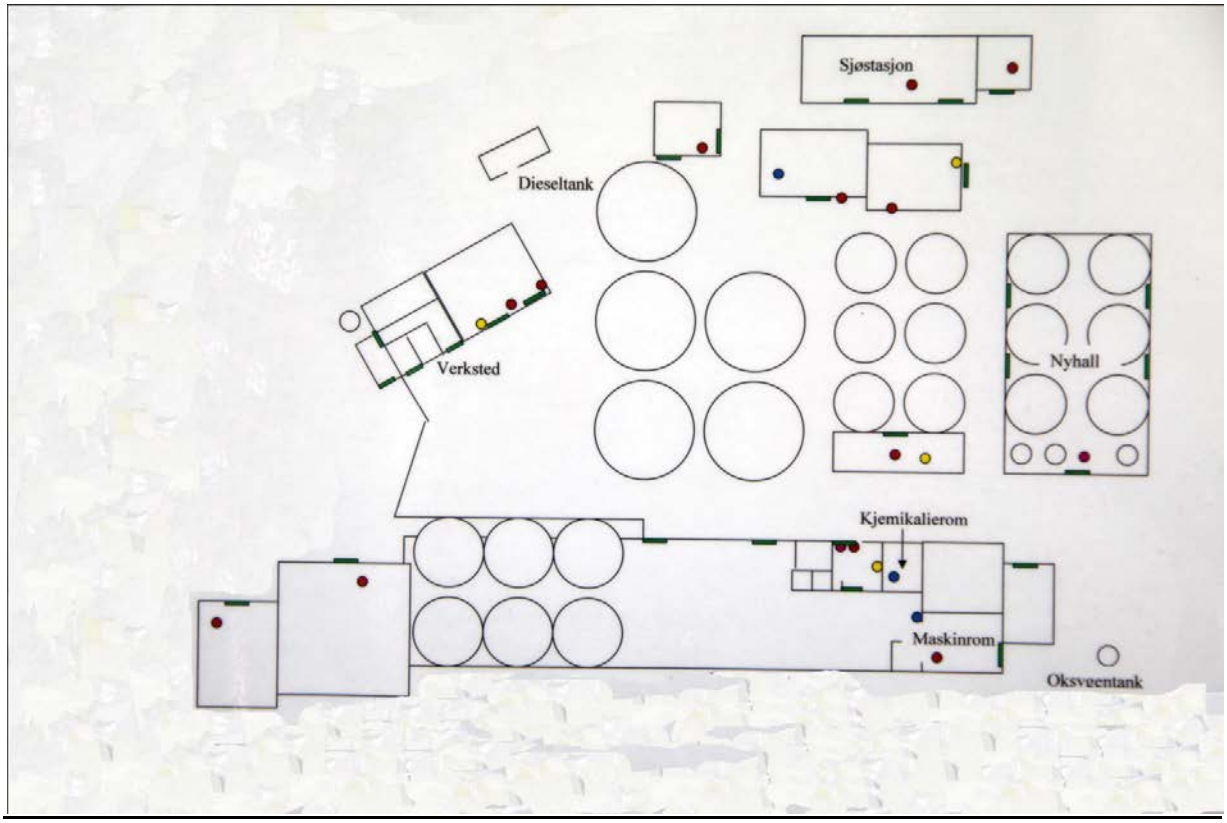





710
Lensvik


Image © 2011 DigitalGlobe
© 2011 Google
Imagery Date: 8/31/2002
Lensvik
2002
63°30'54.38" N 9°48'31.54" E elev 5 ft
©2010 Google
Eye alt 1107 ft

Photographs of the production facility and layout of the farm


Sjøstasjon
Dieseltank
Verksted
Nyhall
Kjemikalierom
Maskinrom
Oksygentank

Net Pen / Sea Cage production information

Name:	TypicalMarineFarm
License no:	MF 0002
Owner:	A.S. Owner Ltd.
Fish health service:	AquacultureVets & Co
Staff:	Technical, fish care: 6 persons Administration, office: part of 20 marine site company
Fish species:	Atlantic salmon
Production (market):	Aug-Nov harvest, expected 4600 tonnes
Smolt stocking:	Smolt, spring entry: 900,000 (May-June 2011 transfer); stocked into 7 cages (100m circle*20m deep) until Oct-Nov, then split into 14 cages.
Hatchery sources:	Lerøy Midnor, plus two other smolt suppliers in same region (other smolt suppliers: one supplier receives fry from an egg to early rearing hatchery, the other receives eyed eggs from brood stock facility and rears through to smolt stage).
Feed, source:	Skretting
Feed:	approx 7,500 tonnes/cycle, from 3 mm to 10 mm, fed through automated distribution from central feed barge.
Water/neighbors:	marine site, full salinity, closest neighbor is 2.5 km away, inlet has substantial wild populations of Atlantic salmon and sea trout; depth under cages is 40-60m at low tide.
Closest processing plant:	3.5 km away.
Net changing:	(as needed) 4-8 weeks during summer-autumn
Fish vaccination:	Smolt are vaccinated by smolt supplier against *Listonella anguillarum, Vibrio salmonicida, Aeromonas salmonicida, Moritella viscosa.*
Area Management:	Signatory to Area Management Agreement that includes 9 sites (3 owned by this company) within fjord area, all have same year class for smolt entry.
Fallowing policy:	minimum 3 months for this site, 2 months for entire Area Management Agreement.
Sea Lice treatment:	Count 5 fish /cage from 6 cages weekly (except when <5 ˚C; treatment uses in-feed (Emamectin) during first summer-autumn, then primarily hydrogen peroxide (80% of time) in well boats, except when water temperatures exceed 14 ˚C, then azamethiphos (10%) or deltamethrin (10%); well boat also used for smolt transfers; well boat is contracted to stay within company with disinfection policies when travelling between area management agreements.
Mortality collection:	Contract divers (do multiple sites) collect mortalities and inspect nets every week.
Regional disease concerns:	ISA, HSMI, sea lice EMB resistance.

Geographical location (Map) of the net pen/sea cage production facility:

Photographs of the production facility and layout of the net pen/sea cage farm

Smolt transfer (left) with well boats (right)

Weekly counts (left) and treatment (right) of sea lice

Mortality collection (diver) Feed barge

Preliminary Producer/Operation Biosecurity Questionnaire[1]

Some important risk considerations for introduction of catastrophic infectious and contagious diseases onto your farm include:

1. The movement of infected fish
2. Introduction of contaminated water or feed
3. Fomites including contaminated equipment, or vehicles
4. Vectors, such as fish-eating birds or wildlife

- Each farm or operation is unique because of species cultured, the location of the operation, the diseases of concern, the types of production, management styles, available personnel and their understanding of these diseases, financial constraints and many other variable factors. Consequently, every biosecurity program developed is unique and must be tailored to the specific farm or operation.
- This questionnaire is designed to help you begin to identify and evaluate the areas of risk, and the impact of an introduction and/or spread of a disease on your farm.
- Not all questions are equal in identifying the risk of disease introduction and severity; however, answers to the following questions begin to identify critical points or procedures that can be controlled and should be considered in developing a written biosecurity plan for this farm or operation.

Your Disease Concerns

What diseases do you feel are most important to your farm?

List these diseases:

1.

2.

3.

4.

5.

Or more:

[1] This questionnaire is modeled after a checklist of critical elements, developed by the Center of Food Security and Public Health, Iowa State University, intended to address viral haemorrhagic septicemia biosecurity

Identifying Your Critical Points

Check ☑ Yes or No for each question.

Fish Movement

Yes	No	
☐	☐	Have you restricted or stopped all fish movement on or off your farm to prevent entry or spread of any disease?
☐	☐	Have you implemented strict biosecurity measures for fish, water sources, equipment, vehicles, wildlife vectors and people on your farm?
☐	☐	Are you closely and frequently monitoring your fish for signs of disease?
☐	☐	Do you limit contact between your fish stock and wild fish stocks?
☐	☐	Do you limit the frequency and number of new introductions of fish onto your farm?
☐	☐	Do you limit purchases to a few sources with known and trusted fish health programs?
☐	☐	Do you know the health status and the source of the fish brought onto your farm?
☐	☐	Do you only bring animals that have been inspected onto your farm?
☐	☐	Do you request copies of treatment records (and vaccinations, if applicable) for all purchased fish?
☐	☐	Do you disinfect eggs upon arrival to the farm?
☐	☐	Do you require that newly acquired or returned fish for your farm are quarantined for at least 3 weeks upon arrival?
☐	☐	Are your quarantine facilities separate from all other fish areas?
☐	☐	Do prevent the sharing of water, facilities or equipment between newly acquired or returned fish and your currently stocked fish?
☐	☐	If equipment must be used elsewhere on the farm, do you clean and disinfect the item before removing it from one location and moving it to another?
____	____	Total Number of Yes and No answers

Farm Entrance

☐	☐	Do you limit access to your farm?
☐	☐	Do you have only one gated entrance to fish production areas on your farm to better control and monitor visitors and vehicles?
☐	☐	Do you keep the gate locked when not in use?
☐	☐	Have you posted signs at the farm entrance to inform visitors to stay off your farm unless they have received permission?
☐	☐	Is traffic on or off your farm closely monitored and recorded?
☐	☐	Do you maintain a log sheet to record any visitors or vehicles that come onto your farm?
☐	☐	Do you require delivery vehicles and visitors follow your farm biosecurity guidelines regarding parking and fish contact?
____	____	Total Number of Yes and No answers

Water Sources

☐ ☐ Do you use known pathogen-free water sources on your farm (e.g., well water, springs)?
☐ ☐ Do you avoid surface water sources on your farm?
☐ ☐ If surface waters are used, do you filter and disinfect water prior to using it with your fish stock to exclude unwanted aquatic species and pathogens?
☐ ☐ Do you take measures to prevent effluent from other locations from entering your operation?

____ ____ Total Number of Yes and No answers

Animal Management

☐ ☐ Do you maintain optimum stocking densities in efforts to minimize stress to your fish?
☐ ☐ Do you limit transfers of fish between units or locations to only those that are necessary?
☐ ☐ Do you gentle crowding and fish handling methods when working with fish?
☐ ☐ Do you maintain optimum water quality for fish species reared on your farm?
☐ ☐ Do you obtain live feed from reliable sources?
☐ ☐ Do you secure all feed storage areas and clean up spilled feed to minimize access by rodents or birds?
☐ ☐ Are you familiar with the diseases that you feel are important to your operation and the signs of infection?
☐ ☐ Have you educated your employees about these diseases and the clinical signs of infection?
☐ ☐ Do you closely monitor fish daily for signs of illness?
☐ ☐ Do you promptly remove any dead or dying fish?
☐ ☐ Do you promptly euthanize animals that are not going to recover?
☐ ☐ Do you submit dead or dying fish for diagnostic testing or necropsy to determine the cause of death?
☐ ☐ Do you immediately remove and isolate sick fish to minimize disease spread?
☐ ☐ Do you prevent direct contact between isolated fish and other fish on the farm?
☐ ☐ Do you maintain separate water sources for isolation areas?
☐ ☐ Do you use separate facilities, equipment, and staff to handle isolated fish?
☐ ☐ If it is not possible to use separate facilities, equipment and staff, do you handle or visit the isolated animals LAST?
☐ ☐ Do you clean and disinfect all equipment, clothing, boots, etc. that are exposed to other animals, particularly those that are sick or have been quarantined?
☐ ☐ Do you always wash or sanitize your hands after any contact with sick or dead fish to prevent disease spread to other animals?
☐ ☐ Do you require your employees to wash or sanitized their hands after contact with sick or dead fish?

____ ____ Total Number of Yes and No answers

Farm Records

☐ ☐ Do you maintain a written biosecurity plan?
☐ ☐ Do you maintain accurate records of fish brought onto your farm?
☐ ☐ Do you maintain thorough and accurate records of fish movements on your farm?
☐ ☐ Do you maintain thorough and accurate records of fish health issues (e.g., mortalities, treatments, vaccinations) for your fish?
☐ ☐ Do you maintain thorough and accurate records of fish production parameters (e.g., feed conversion efficiency, growth, etc.)?
☐ ☐ Do you monitor water quality parameters closely?
☐ ☐ Do you monitor water temperature parameters closely?
☐ ☐ Do you keep records on water quality, feeding, animal behavior, mortality?
☐ ☐ Has there been any history of disease on your farm?
☐ ☐ Has there been any history of disease on the farm or operation that supplies you with fish?

____ ____ Total Number of Yes and No answers

Equipment & Vehicles

☐ ☐ Do you clean and disinfect any non-disposable items that are exposed to urine, feces, reproductive fluids, mucus or other body fluids of fish?
☐ ☐ Do you clean and disinfect equipment or vehicles before reusing them with different lots of fish?
☐ ☐ Do you know the common disinfectants that will kill your diseases of concern?
☐ ☐ Do you clean isolation and quarantine areas regularly?
☐ ☐ Do you clean tanks or raceways after fish are removed?
☐ ☐ Do you lime ponds after fish are removed?
☐ ☐ Do you restrict the sharing of equipment or vehicles between farms?
☐ ☐ If equipment must be shared, do you clean and disinfect it before using it with animals from your farm?
☐ ☐ Do you place foot dips near the entrance of animal areas?
☐ ☐ Are foot dip solutions changed daily or when visibly soiled?
☐ ☐ Do you always wear clean clothes or coveralls when being exposed to animals?
☐ ☐ Do you change or clean boots (e.g., foot dips) when switching between fish groups with different health status?
☐ ☐ Do you change clothes and disinfect boots when moving between farms?

____ ____ Total Number of Yes and No answers

Vectors (Animals/Wildlife)

☐ ☐ Do you keep wildlife vectors (e.g., fish-eating birds or mammals) out of your farm?
☐ ☐ Do you have a predator management program on your farm?
☐ ☐ Do you have a rodent control program on your farm?
☐ ☐ Do you keep pets (e.g., dogs, cats) out of the farm?

Vectors (People-On-farm Personnel)

☐ ☐ Do you require that employees wear clean clothing/coveralls when working with fish?
☐ ☐ Do you require that employees wear clean boots when working with fish?
☐ ☐ Do you require employees to use foot dips when entering and leaving fish production areas?
☐ ☐ Do you require that employees wash or sanitized their hands before and after working with fish?

Vectors (People – Visitors)

☐ ☐ Do you require visitors to check-in with farm personnel upon their arrival?
☐ ☐ Do you require visitors to follow your farm's biosecurity procedures?
☐ ☐ Have you minimized traffic and visitors to only those essential for the continued operation of the farm?
☐ ☐ Do you require all visitors to park their vehicles in established parking areas away from all fish production areas?
☐ ☐ Are visitors accompanied by someone from the farm at all times?
☐ ☐ Do you require that visitors avoid fish production areas unless they are accompanied by farm personnel?
☐ ☐ Do you restrict close contact or handling of fish by visitors (unless necessary for the health of the animal)?
☐ ☐ Do you prevent your vehicles or trailers from coming in contact with any other fish stock that are not from your operation?

____ ____ Total Number of Yes and No answers

Conclusions

Total number of: Yes responses _____ No responses _____

- The number of Yes/No answers generally indicates areas or processes that need improvement on your farm.
- It is important to work with your aquatic veterinarian to develop biosecurity plans that include prevention, control and contingency measures addressing the biggest risks first. Once written, this becomes your biosecurity plan.

Identifying & Prioritizing Disease Hazards & Risk/Impact Worksheet

Instructions: Based on the general knowledge of the workgroup, or information in the OIE Code/Manual and or the Veterinary Aquatic Biosecurity Manual, use this worksheet to identify and list the infectious and contagious diseases the workgroup believes may be hazardous to the farm or operation *in the specific farm or operation your workgroup is considering*.

Disease	**Is this Disease Present in the area or region Farm? (Y/N)**	**Likelihood that this disease will be introduced on this farm? (Rank: 0=none low; 5=v. high)**	**What would be the impact of this disease on production? (Rank: 0=no impact; 5=devastating)**	**Describe the impacts (e.g. decreases production, high mortality, government depopulation, etc.)**	**For each disease: Likelihood x Impact**

Critical Control Point worksheets

Critical Control Point Step 1 – Description of the Activity

Activity Description	
Facility:	Site:
Project Coordinator:	Production activity for this facility*:
Site Manager:	
Attending Veterinarian:	
Address:	
Phone:	

*e.g. Aquaculture (broodstock, eggs, juvenile, grow-out etc); Research (biology, disease, husbandry etc); Species/production type (e.g. salmon/smolt and net pen; tilapia/grow-out; shrimp/slaughter…)

Critical Control Point Step 2 – Identify Potential Disease Hazards
Objective: Identify infectious diseases that are hazardous to this production
(to be transferred to column 2 of CCP Step 4 – Hazard Analysis Worksheet)

Hazards: Diseases which may potentially be moved or introduced
Disease 1:
Disease 2:
Disease 3:
Other important diseases:

Critical Control Point Step 3 – Production Stage Flow Diagram
Objective: List specific stages of the smolt production.

Flow diagram outlining sequential stages required to complete processes associated with production activity described in CCP Step 1 – Production Activity Description (to be transferred to column 1 of the CCP Step 4 – Hazard Analysis Worksheet)

Stage 1	Bringing the eyed Atlantic salmon eggs to the production facility.
⇓	
Stage 2	
⇓	
Stage 3	
⇓	
Stage 4	
⇓	
Stage 5	
⇓	
Stage 6	
⇓	
Stage 7	
⇓	
Stage 8	
⇓	
Stage 9	
⇓	
Stage 10	Shipping the smolt from the farm to the grow-out facilities.

Critical Control Point Step 4 - Hazard Analysis Worksheet

1 Stages (from CCP Step 3 - Flow Diagram)	2 Potential hazards identified in CCP Step 2	3 Are any potential hazards probable? (yes/no)	4 Justify evaluation for column 3	5 What control measures can be applied to prevent undesirable results?	6 Is this task a critical control point? (yes/no)
Stage 1	Disease 1				
	Disease 2				
	Disease 3				
	Others				
Stage 2	Disease 1				
	Disease 2				
	Disease 3				
	Others				

Hazard Analysis Worksheet (continued)

1 Tasks (from CCP Step 3 - Flow Diagram)	2 Potential hazards identified in CCP Step 2	3 Are any potential hazards probable? (yes/no)	4 Justify evaluation for column 3	5 What control measures can be applied to prevent undesirable results?	6 Is this task a critical control point? (yes/no)
Stage #	Disease 1				
	Disease 2				
	Disease 3				
	Others				
Stage #	Disease 1				
	Disease 2				
	Disease 3				
	Others				

For additional pages, select entire page and copy to a new page

Critical Control Point Step 5 – CCP Plan Form

CCP Plan Form (all CCP's or "yes's" from column 6 of CCP Step 4 – Hazard Analysis Worksheet)								
			Monitoring					
Critical Control Point (CCP)	Significant Disease Hazard(s)	Limits for each Control Measure	What	How	When	Who	Corrective Action(s) (if needed)	Supporting Documentation (if any)
Facility:					Activity:			
Address:								
Signature: CCP Plan was followed.					Date:			

Diagnostic Testing Worksheet

The circumstances that determine diagnostic testing needs of a facility are complex. The following checklist can be helpful in focusing on priorities and help filling the information required in the diagnostic testing worksheet.

The five principle reasons for carrying out diagnostic testing are:

1. Establishing a baseline of disease present on the farm
2. Establishing freedom from a specific disease
3. Monitoring/surveillance
4. Disease Outbreak
5. Screening new stock

Decision 1: What testing is required by the biosecurity plan?

1. Reliance on Official Services testing
2. Supplier's own testing – is there a risk?
3. Is there a requirement for external testing

Decision 2: Which laboratory/laboratories to use?

1. An OIE reference laboratory
2. Official Services laboratory
3. Private laboratory (including universities etc.)
4. Personal knowledge of laboratory
5. In-house laboratory
6. Accessibility of laboratory

Resources: The OIE Manual provides a list of the reference laboratories. www.aquavetmed.info provides a more general diagnostic laboratory list

Decision 3: What tests are available and their suitability (appropriateness)?

1. Sensitivity (Se) and Specificity (Sp)
2. Lethal/non-lethal sampling
3. Ease of sample collection
4. Cost

Resources: OIE Manual; V-ABC Manual Chapter 5 and Appendix

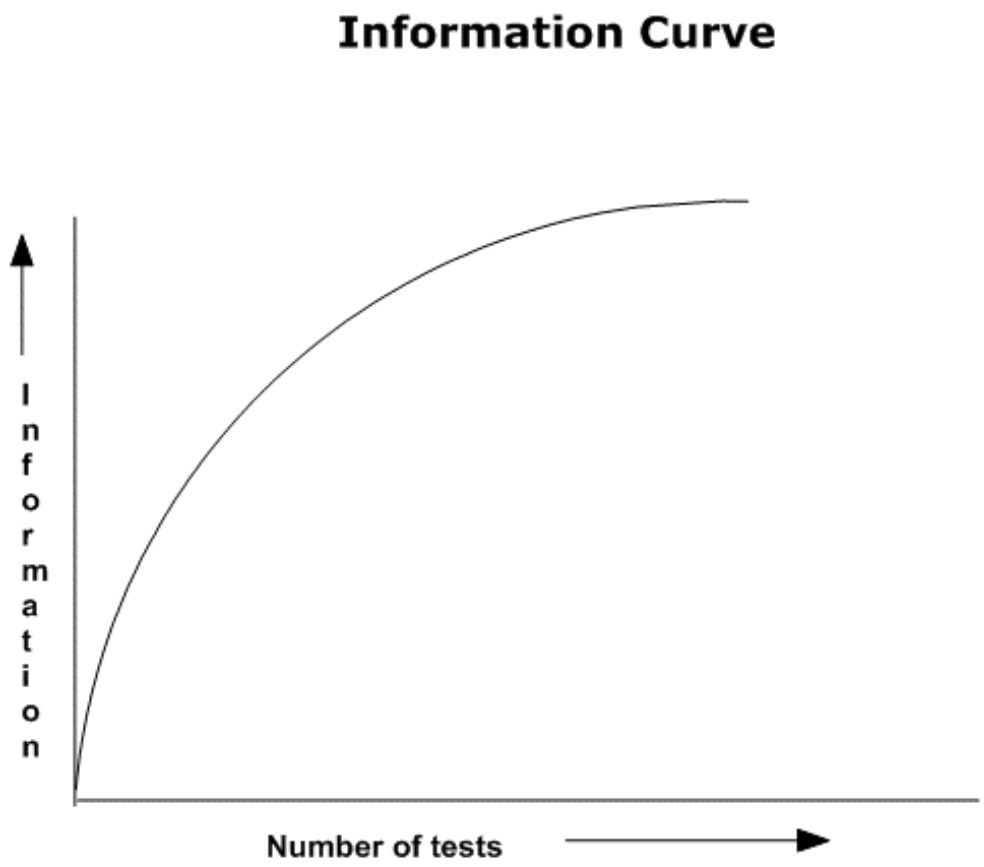
Decision 4: What number of animals should be tested and at what frequency?

1. Standard sampling
2. Risk based sampling
3. Scenario tree
4. Probability – risk of introducing disease from supplier
5. Monthly, fortnightly, annually
6. Establish freedom over time

Resources: OIE Manual; V-ABC Manual Chapter 5 and Appendix

Further considerations:

1. Current testing regime
2. Economic
3. Benefit
4. Training
5. Ability
6. Interpretation



Due to the initial steepness of the curve most information is gained at the start. As the curve levels out or even decreases we gain less information from each additional sample

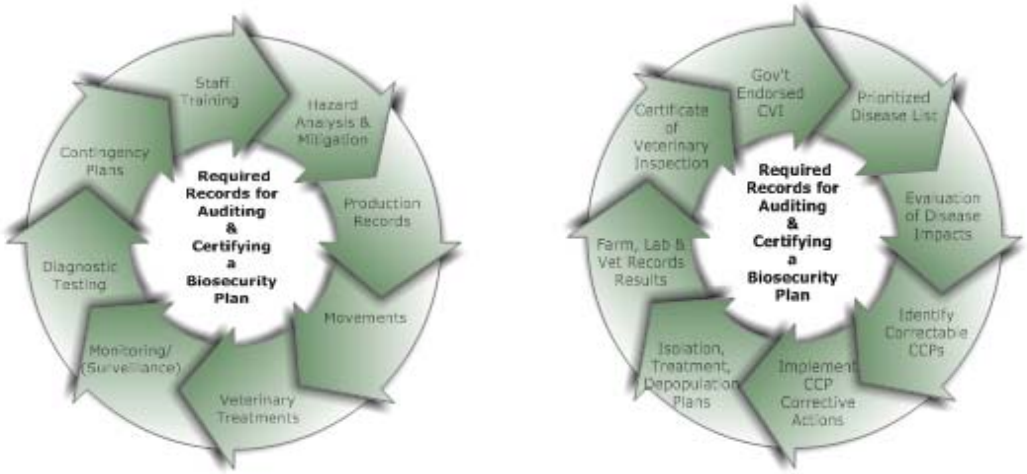
Diagnostic Testing Worksheet	**Disease 1:**	**Disease 2:**	**Disease 3:**
What diagnostic laboratory will be performing the testing?			
What is the available (or preferred) diagnostic test for this disease?			
Is there an acceptable alternative test if the preferred test is not available?			
What samples are required (whole fish, tissues, eggs, etc)?			
What is the expected frequency of sampling (weekly, annually)?			
Who will perform on-farm health assessment, evaluation and sample collection?			
Who will send the samples to the diagnostic laboratory?			
Who will receive the results of the diagnostic tests?			
Who will interpret the results of the diagnostic testing?			
Who will keep the records of the diagnostic testing? For how long?			

Farm Record Worksheets

In this exercise the presumption is “what are the necessary farm records, frequency of recording and updating them required to audit and certify the plan”.

General considerations for any farm records:

- The required Farm Records vary depending on the requirements of the biosecurity plan.
- Records should be designed and formatted to be consistent, contain the necessary information and be communicable to others.
- No one likes keeping records! Therefore try to avoid duplication, excessive amounts of data entry and the time spent to collate them.
- In essence maximize the data contained within the record whilst minimizing data input.
- You must be able to justify them.
- A member of the farm staff should be designated to ensure the records are correctly kept.
- Staff training maybe required to understand how to keep records and **the importance** of the records.
- The attending veterinarian should have access to all pertinent records and should review record keeping at all visits.



Cycle Diagram summaries of required records
Note: this is a continuous process

More specific considerations**:**

- Who is responsible for what, i.e. ensuring the plan is complied with/monitoring the plan?
- What information is required, i.e. water source disinfection (how, when, how monitored)?
- How to verify a process has occurred, i.e. countersignature required or lab report?
- Is it a production record, SOP or maintenance log, i.e. is there a template that can be used?
- Etc.

The diagram on the following pages will illustrate these steps:

Partial flow chart of potential information required and documented procedures

Document Title	Type of Document[1]	Format of Document[2]	Required Data[3]	Frequency of Recording[4]	Frequency of Review[5]	Who is responsible for Recording[6]	Who holds the Document[7]

[1] i.e. SOP, Log, Production Records, Test Result
[2] i.e. Word, Excel, Plan, Map, Photo, and the way the data is recorded
[3] Specifies what data should be recorded
[4] i.e. Hourly, Daily, Weekly, Monthly
[5] Should it be reviewed monthly, annually or as required
[6] To ensure that the record is completed you should specify who should fill it and whether it requires countersignatures for verification
[7] Where the document can be found and who has access to it

Document Title	Type of Document[1]	Format of Document[2]	Required Data[3]	Frequency of Recording[4]	Frequency of Review[5]	Who is responsible for Recording[6]	Who holds the Document[7]

Disease Surveillance and Monitoring

The goal of this exercise is to design a surveillance plan to demonstrate disease freedom for a disease and facility of your choosing. We'll construct a standard design, and then look for ways to improve it using information gained through biosecurity planning. This assessment will be qualitative, focused on identifying information sources and approaches that can improve confidence in disease freedom. But, keep in mind that quantitative methods are available to also revise sampling numbers and surveillance requirements accordingly. Select references for these methods are noted in the final section.

General Design

Objectives: What are the objectives of this surveillance? Who will use the results, and how?

Standards: What standards will you use to guide sample size and frequency? If disease-specific standards are not available, presume that your goal is 95% confidence that you'd detect disease if it were present in 2% or more of the fish on the facility, twice annually. Determine your baseline sample size, assuming perfect tests and a large population size. For example, the default 95%/2% standard equates to a random sample of 150 fish twice per year.

Population Organization: How are the fish arranged within the facility? Describe the natural groupings of fish. Are populations arranged by species, year-class and water source, or containment system, or other criteria? Name the groups that should be sampled as distinct populations. If there are multiple cages per group, describe how you'd distribute sampling effort in a representative fashion. (Note: targeting will be covered in a later section).

Modifications

Weaknesses: Describe problems with a standard (150 fish per lot per survey) sampling design.

Targeted sampling: The above described surveillance is based on random sampling: all animals have an equal chance of being selected. Are there subpopulations in the facility with a heightened probability of disease or its detection? If so, describe how you might target your sampling to improve disease detection and/or reduce sample size.

Probability of disease: Surveillance results give us the probability of detection, if disease is present. What additional information is needed to determine probability of disease? Where can we get this information? How might we formally record or validate this information?

Resilience: What time period do surveillance results cover? What supplementary evidence might help extend confidence into the future? At what point can we discontinue surveillance?

Select Surveillance Design References:

General design

Corsin, F., M. Georgiadis, K.L. Hammell, B. Hill. 2009. Guide for Aquatic Animal Health Surveillance. World Organization for Animal Health. Paris, France.

Targeted sampling

Cameron, A.R. 2009. Risk-based Disease Surveillance: a Manual for Veterinarians. The Food and Agriculture Organisation of the United Nations (FAO). Rome, Italy.

Williams, M.S., E.D. Ebel, S.J. Wells. 2009. Population inferences from targeted sampling with uncertain epidemiologic information. Preventive Veterinary Medicine 89, 25-33.

Probability of disease

Gustafson, L., K. Klotins, S. Tomlinson, G. Karreman, A. Cameron, B. Wagner, M. Remmenga, N. Bruneau, A. Scott. 2010. Combining surveillance and expert evidence of viral hemorrhagic septicemia freedom: a decision science approach. Preventive Veterinary Medicine 94, 140-153.

VHSV Expert Panel and Working Group. 2010. Viral hemorrhagic septicemia virus risk factors and association measures derived by expert panel. Preventive Veterinary Medicine 94, 128-139.

Temporal validity

Hadorn, D.C., J. Rufenacht, R. Hauser, K.D.C. Stark. 2002. Risk-based design of repeated surveys for the documentation of freedom from non-highly contagious diseases. Preventive Veterinary Medicine 56, 179-192.

Surveillance Design Worksheets:

General Design		
Objectives	What are the objectives of this surveillance? Who will use the results, and how?	
Standards	What standards will you use to guide sample size and frequency? Determine your baseline sample size, assuming perfect tests and a large population size. If numbers should be adjusted for imperfect test Se/Sp and small population size, note this need.	
Population Organization	Identify the groups that should be sampled as distinct populations. If there are multiple cages per group, describe how you'd distribute sampling effort representatively.	

Improvements		
Weaknesses	Describe the problems with this standard (150 fish per lot per survey) sampling design.	
Targeted Sampling	Describe how you might target your sampling to improve disease detection and/or reduce sample size. If targeting could reduce necessary sample size, note this potential savings.	
Probability of Disease	What additional information is needed to determine probability of disease (as opposed to detection)? How might we formally record or validate this information? If supplemental evidence exists that could reduce surveillance requirements, note this potential savings.	
Resilience	What type of supplementary evidence might help extend confidence into the future? At what point can we discontinue surveillance?	

Contingency Planning Exercises and Worksheet

Overview: The goal of Contingency Plans (often called *Contingency and Communication Plans* to emphasize the importance of communication between appropriate parties) is to detect and control selected pathogens. Contingency plans outline the "who" and "how" of immediate actions, particularly for a) communication, b) containment and c) disposal procedures.

Leadership Responsibilities and Initial Response

Producer - The role of the producer is to instigate a proper disease investigation whenever unexpected health changes occur, that should be based on pre-established relationships with health service providers (private or government). For most large companies/producers, they should have regular involvement of such professionals and immediate notification for occurrences (or suspicions) between regular consultations.

Veterinarians – When the attending site veterinarian (or anyone reporting to them) suspects a named disease (i.e. identified in the biosecurity planning stages), that veterinarian must notify the named contacts of their suspicion immediately.

Diagnostic laboratories – indicate what diagnostic laboratories should report, if anything, to farm veterinarian, site manager, or authorities. Most laboratories will have defined reporting protocols that always include the submitting veterinarian (+/- their client) and sometimes include regulatory authorities directly for detection of listed pathogens.

Regulatory authorities – there may be regional (state/ provincial) *and* federal regulations requiring official notification regarding detection for listed pathogens.

Reporting forms between parties must be formal records to avoid confusion of responsibilities or information. When reporting to regulatory authorities, these forms include all information required to enable index case definition and animal movement trace-back.

Once suspicion of a disease is reported, the contingency plans within each responsible organization address actions with respect to:

1) Agent confirmation, include test type and frequency of sampling.
2) Communication / notification requirements to others currently outside of investigation (who and how), including other producers and industry associations, and regional and federal authorities.
3) Inclusion of epidemiologists for specific plans of control, surveillance zones and risk assessment.
4) Plan for diagnostic sampling, containment, biosecurity measures and large scale disposal plans, including government and private diagnostic investigators.
5) Identify who is responsible for decisions on containment, communication, culling procedures, disposal and movement of personnel or traffic.

Emergency Movement Controls

For each system, contingency plans may vary depending upon openness of stock holding systems:

1) semi-open culture system (e.g. marine cages, river-side culture) in which effluent release is not stoppable,
2) semi-closed and closed culture systems (e.g. land-based tanks with backup quarantine potential, recirculation systems) in which effluent release is stoppable, at least for a reasonable time period.

For each situation, determine the area of detection and control implementation and identify (by area):

1. *Infected area* – determined by defining the potential exposure to infected case(s) and includes animal movement (farmed and wild), equipment and personnel movements, and water movement.
    a. This area will need to be contained for disease transmission purposes (i.e. some type of movement restriction level)
    b. Implement appropriate disease control procedures, e.g. depopulation, treatment
    c. Identify animal movements in and out of area over the defined time of examination
    d. Pursue initial exposure source for infection (if possible)
    e. Enforce movement restrictions within the defined area:
        i. No animals to leave the area except when directly to processing plant using approved slaughter meeting conditions set for disease agent (including location and transport containment conditions)
        ii. No biological products (specific tissues can be based on risk assessments) from potentially infected fish should leave the area
        iii. No movement of other potentially contaminated articles (e.g. boats, site equipment, personnel, etc) leave the area
    f. Establish disinfection protocols (and verification steps) for potential release of some of these conditions

2. *Buffer (Control) area* – area between the infected area and known disease-free area
    a. Diagnostic testing programme implemented to detect additional cases in area surrounding known infected areas
    b. Implement restrictions on fish harvests in the area
    c. Consider preventive treatments or vaccination, if warranted by pathogen

3. *Disease-free area*: Define the criteria based on a rigorous disease agent surveillance programme (and any contributing historical information)
    a. Define duration of vigilance for surveillance in area to maintain confidence of status

Depopulation and Carcass Disposal

Depopulation of infected and potentially infected fish is done to reduce the source of the pathogen. However, this removal and disposal of infective material also represents one of the greatest threats to containment and preventing further exposure of susceptible animals to this infective source. Animal welfare and human and infrastructure capacity to suddenly increase the speed and volume of culling and removal of infected livestock with no (or minimal) release of biological contamination must be anticipated and addressed. Processing plants must be able to decontaminate effluent and sufficient vessels must be available to address the needs while not moving between the different infection status areas. Wharf and vehicle logistics must not contaminate regular farm husbandry events (e.g. mortalities transported across different wharf than smolt transfer). All decisions must incorporate knowledge of disease transmission specifics for the pathogen being addressed.

Verification

All steps in the contingency plans must have verification (including documentation) built into the plan so that on-going reviews are based on appropriate evidence and policy adjustments can occur as needed

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Contingency Planning Worksheet		
Objectives	What are the objectives of the Contingency Plan? Who is responsible and what is each of their responsibilities?	
Area definitions	Select a disease of concern for each site, and define the infected area and three priority actions for this area	
	Using same disease of concern for each site, define the buffer area and three priority actions for this area	
Control considerations	Identify critical limitations for immediate control actions (i.e. surge capacity limits) that must be addressed prior to contingency plan implementation	

Biosecurity Auditing & Certifying Worksheet

Instructions: Based on the general knowledge of the workgroup, or information in the OIE Code/Manual and or the Veterinary Aquatic Biosecurity Manual, and what the work has identified as important in all previous exercises, use this worksheet to identify and list specific processes and procedures the workgroup believes will need to be audited. The audit is intended to provide complete information for the attending veterinarian (or government official) to be able to certify all required procedures in a written biosecurity plan have been implemented for each level of biosecurity, *in the specific farm or operation your workgroup is considering*. **Note**: certifying places a legal responsibility on the certifier that these processes exist and are implemented.

Specific Biosecurity Procedures Required to be in Place for Biosecurity Auditing & Certification					
ABC Level 1	**ABC Level 2**	**ABC Level 3**	**ABC Level 4**	**ABC Level 5**	
Priority Disease Hazards & Risk/Impact Determined	**Required Critical Control Points Evaluated & Addressed**	**Disease Clinical & Diagnostic Procedures Required**	**Surveillance, Monitoring & Contingency Actions Required**	**Government Endorsement Requirements (Regulations)**	**Comments**

Specific Biosecurity Procedures Required to be in Place for Biosecurity Auditing & Certification					
ABC Level 1	**ABC Level 2**	**ABC Level 3**	**ABC Level 4**	**ABC Level 5**	
Priority Disease Hazards & Risk/Impact Determined	**Required Critical Control Points Evaluated & Addressed**	**Disease Clinical & Diagnostic Procedures Required**	**Surveillance, Monitoring & Contingency Actions Required**	**Government Endorsement Requirements (Regulations)**	**Comments**

Biosecurity Plan Summary:

Using the information from previous exercises and available materials, summarize the principle points that you will require to be in a written biosecurity plan for your selected Scenario.

2nd INTERNATIONAL AQUACULTURE BIOSECURITY CONFERENCE AND WORKSHOP

Advances in Practical Disease Prevention, Control and Eradication