RISK FACTORS AFFECTING CLINICAL DISEASE

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Quantifying probabilities

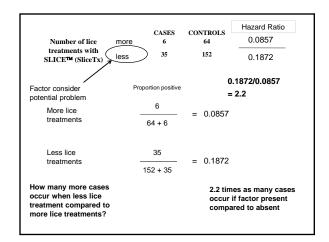
• Predicting probabilities for disease occurrence

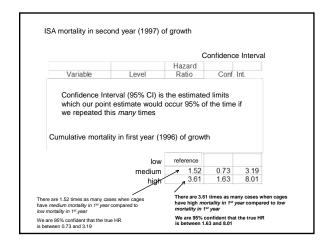
Risk Factor Studies

- Risk factor studies are observational studies
- · Significant risk factors
 - Are associated with an increase chance of fish having the disease
 - Can be used to recommend disease control protocols
 - May be used to form hypotheses for future research

Quantifying probabilities

- Straightforward in cross-sectional studies which take a snapshot of entire area / industry / or segment of industry
 - Important to avoid bias inclusion of factors or cases
- Quantify number of cases occurring when factor is <u>present</u> compared to when factor is absent





Case study – Infectious Salmon Anemia

- Information collected from
 - 83 of the 85 qualifying farms (97.6% participation)
 - 267 cages
- Information analyzed in groups
 - Site factors (74 different factors)
 - Cage factors (37)
 - Hatchery factors (14)

Cage risk factor data Results from 250 cages

Factor	level	Odds ratio
Number of lice treatments with SLICE™	>2 times	1
	≤2 times	2.67
Depth of cage	>9 m	1
	≤9 m	2.96
Meters underneath net at low tide	≤3 m	1
	>3 m	2.26

Cage risk factor data

Results from 206 cages

Factor	level	Odds ratio
Number of pollock farmer perceived to be in the cage	<1000	1
	≥1000	4.40
Depth of cage	>9 m	1
	≤9 m	3.51
Meters underneath net at low tide	≤3 m	1
	>3 m	3.34

Hatchery risk factor data

Results from 233 cages

Factor	Level	Odds ratio	
i actor	Level		
Juvenile weight	<99 g	1	
	≥99 g	2.40	

Combined risk factor data

Results from 260 cages

Factor	level	Odds ratio
Distance to processing	>1 km	1
boats traveling past site	≤1 km	9.43
Dry feed is delivered by feed	no	1
company	yes	4.03
Donth of come	>9 m	1
Depth of cage	≤9 m	3.34
Number of lice treatments	>2 times	1
with any product	≤2 times	3.31
Oleanat mainth an with 10 A	>0.5 km	1
Closest neighbor with ISA	≤0.5 km	2.41

Combined risk factor data

Results from 199 cages

Factor	level	Odds ratio
Number of cages with post	no cages	1
transfer mortalities greater than 5%	≥1 cage	4.52
Depth of cage	>9 m	1
	≤9 m	3.28
Smolt weight	<99 g	1
	≥99 g	2.95
Dry feed is delivered by feed company	no	1
	yes	2.68
•		

Survival analysis data Results from 83 sites

Factor	level	Odds ratio
Nearest neighbor with ISA categorized	≥5 km	1
	≥2 km but <5 km	1.17
	≥0.5 km but <2km	2.01
	<0.5 km	5.50
Distance to processing	>1 km	1
boats traveling past site	≤1 km	7.47
Dry feed is delivered by feed company	no	1
	yes	2.66

Objectives of Infectious Pathogen control practices

- 1. reduce new cases / new transmissions
- 2. Reduce infections becoming mortality cases

Exposure to live or dead infected fish

- Younger fish exposed to older fish
 - Year class separation for sites
 - Eliminated multiple YC sites
 - YC overlap problem for several years
 - Year class separation for areas
 - Area (or Bay) management areas

		Hazard		
Variable	Level	Ratio	Con	f. Int.
Propn. cages	<0.9			
96 year class	> 0.9	0.38	0.22	0.67
			Hammell & Dohoo, JFD, 2005	

Year class separation

- Reduce exposure to potentially infected (older) fish
 - Started in 1997 with most sites have 2-3 year classes
 - Now essentially 100% of sites are single YC
- Most BMAs are single YC

Practices to reduce potential for pathogen spread

- · Mortality collection
 - Frequent mortality collection through airlift system or frequent diving
 - Diving different bag (disinfected) for every cage
 - Divers inspect high mortality cages last
 - Disinfect between cages, at least between groups of cages
 - Separate dive suits for each site
 - Better than disinfect between sites



Sites at which divers worked at multiple sites were more likely to become problem sites (RR = 3.3) Hammell, DobooJFD 2005

- Transmission of virus by diver likely occurring
- (Could not examine difference between divers who disinfect and divers who do not)

Mortality disposal

- "certify" mort collection practices/companies
- Restrict use of morts
- Restricted handling practices (bagging, transport, etc)
 - Covered on site
 - Taken to shore on regular basis
 - Neutralized (e.g. acidification)



Harvest practices

- Containment of all blood materials
 - Regular audits of harvest vessels
- Separate vessels for ISA positive sites / BMA
- Altered boat traffic to processing plant
- Processing plants
 - ISA biocontainment (acidification, heat, other)
 - Decontamination audited (testing effluent included)

Early depopulation of positive fish

- Frequency (depends on zone: suspect vs free)
- Testing of all suitable mortalities (to a limit)
- Early detection and then rapid depopulation
 - False positives contribute to success of depopulations ... but they are costly!
 - False negatives contribute to transmission (within and between sites)

Summary

- Reduce Introductions
 - Exposure to live or dead infected fish
 - Exposure to virus contaminated water
 - Exposure to contaminated equipment
 - Exposure to contaminated people
- Reduce infections becoming clinical cases