

Integrated pest management to control sea lice

- Are we there yet?

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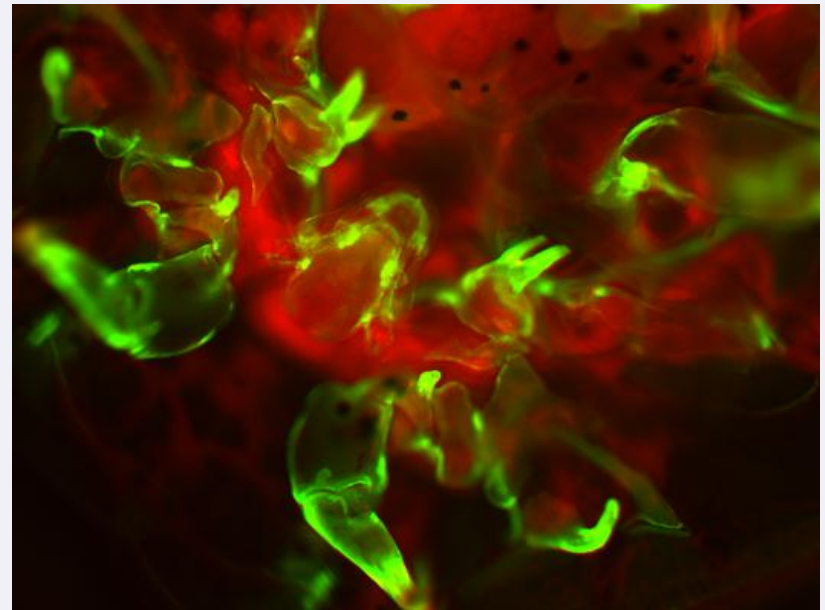


Photo: Sussie Dalvin, Institute of Marine Research



Veterinærinstituttet
Norwegian Veterinary Institute

Pests globally consume food
estimated to feed an additional
one billion people (Birch et al 2011)



Veterinærinstituttet
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Main areas of concern

- Crop protection
- Sustainable growth
- Pesticides use



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IPM and definitions (agriculture)

- A consensus on IPM definition is yet to be reached
 - Survey in 1996 recorded 64 definitions of integrated control, pest management or integrated pest management.
(Bajwa and Kogan 1996)

IPM is a decision support system for the selection and use of pest control tactics, singly or harmoniously coordinated into a management strategy, based on cost/benefit analyses that take into account the interests of and impacts on producers, society, and the environment.

(Kogan 1998)



Field-to-field management approaches

- Addresses only small fractions of a pest population at any give time
- Allows producers to control pests independently
- Do not take into account migrating pest individuals into the treated area from infestations in untreated areas
- Relies on remedial interventions triggered by a certain pest threshold
- An insufficient approach against mobile pests



Area wide management approaches

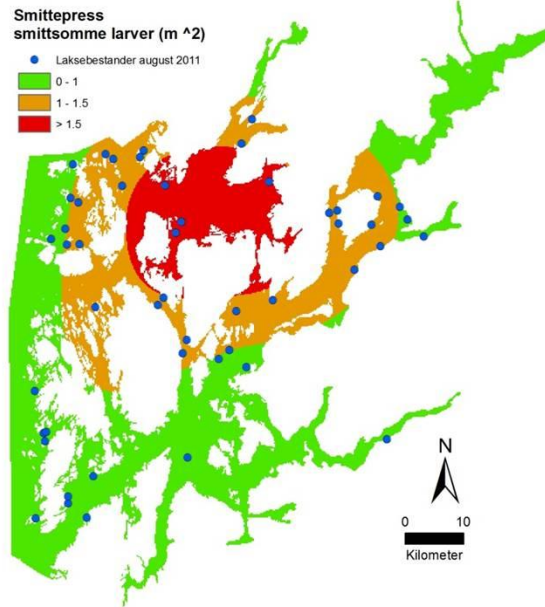
- IPM applied against an entire pest population within a delimited geographic area

- Requires:
 - Planning
 - Ecological understanding
 - Spatial distribution of the pest population
 - Longer-term commitment
 - Coordinated implementation by farmers and all other stakeholders

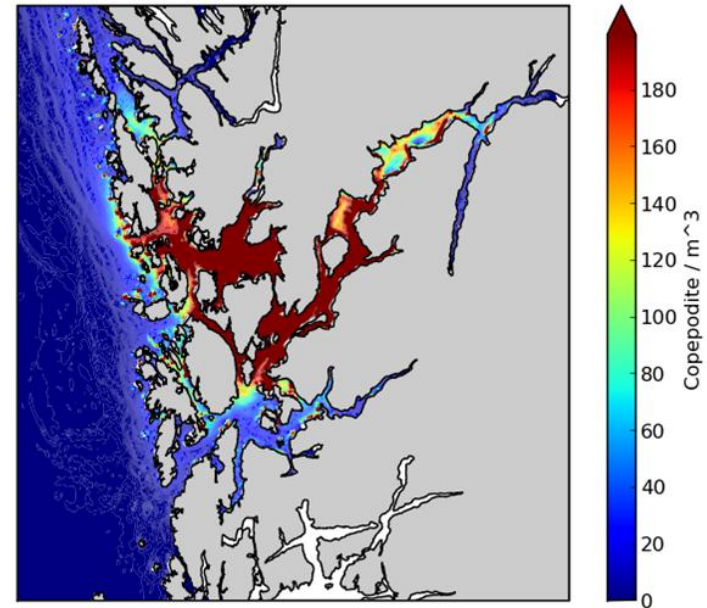
- Success or failure of AW-IPM programs?
 - Effective management an critical issue



Dispersion of sea lice larva, a key element in the definition of an area



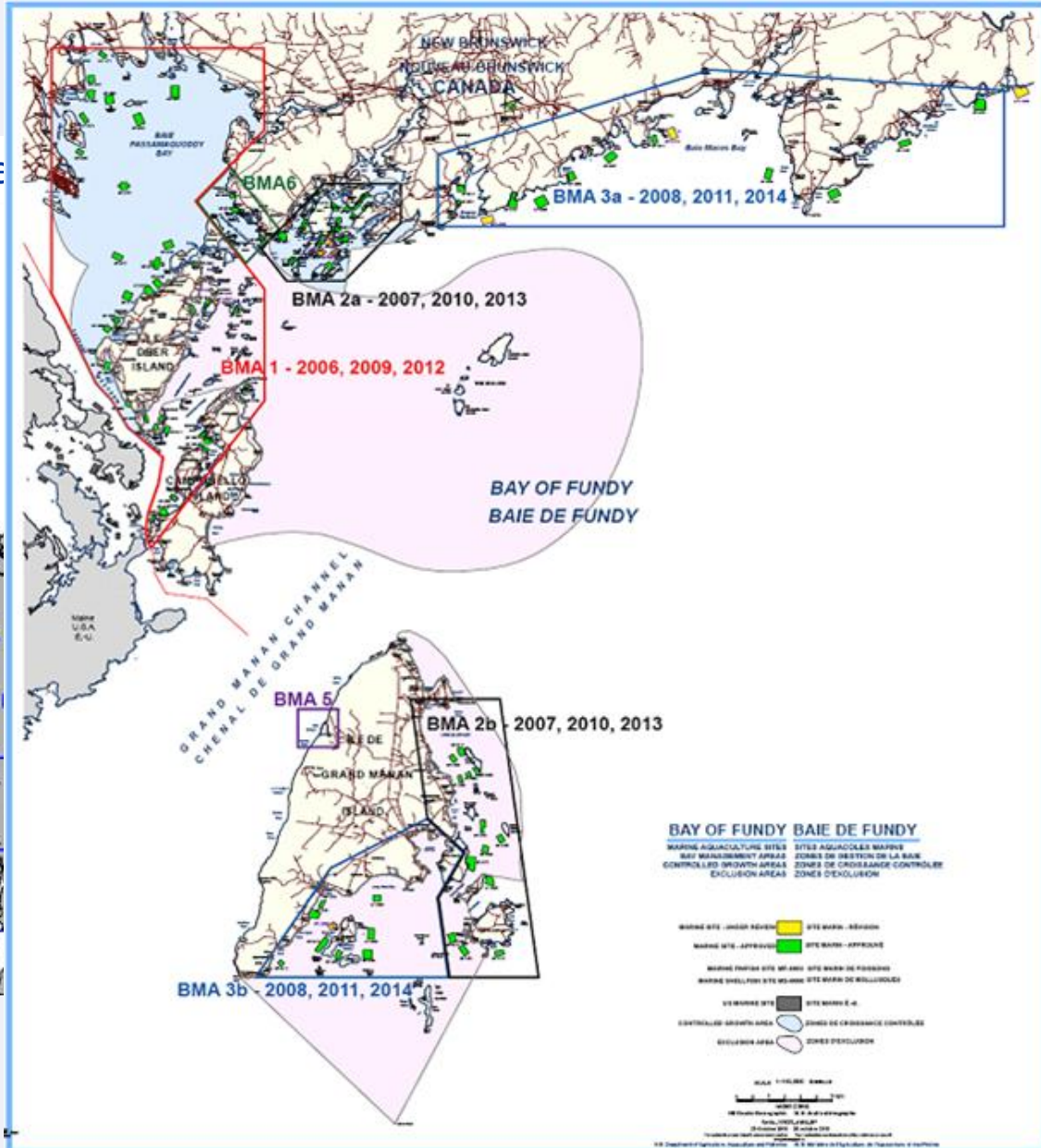
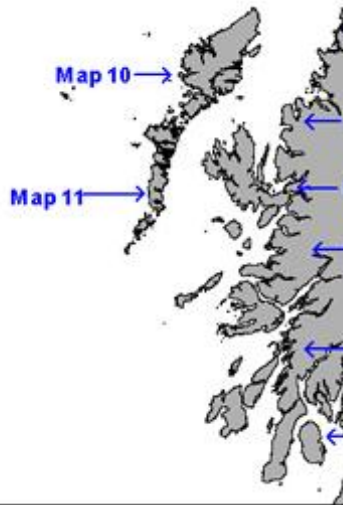
Peder A Jansen, Norwegian Veterinary Institute



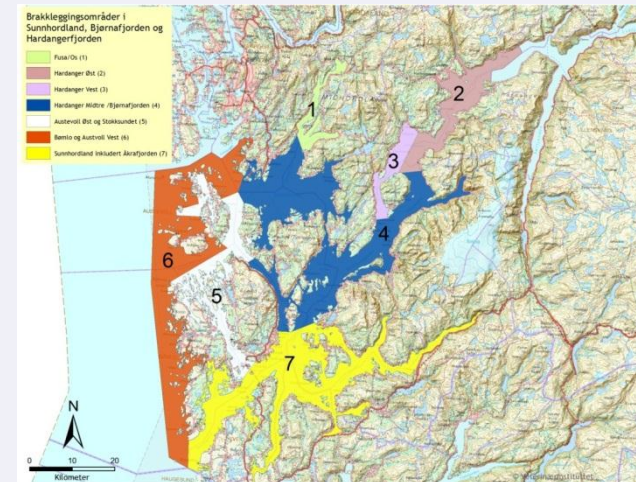
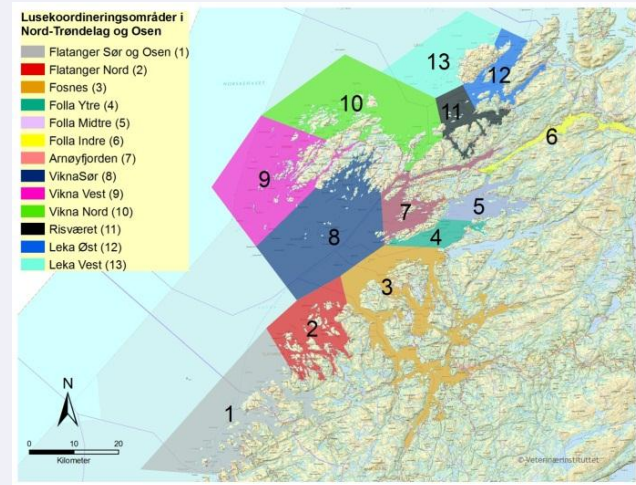
Lars Asplin, Institute of Marine Research

Management areas in Salmon producing countries

Farm Management Area



Sea lice and management areas in Norway



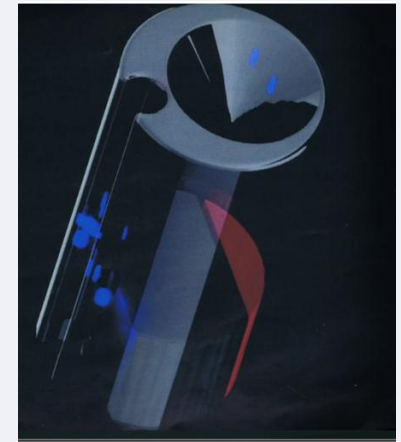
The toolbox against sea lice

- Medicines
- Year class stocking/fallowing
- Other non-medical measures:
 - Cleaner fish
 - Health feed/supplements
 - Breeding
 - Tarpaulin/plankton net for shielding

- In development:
 - Copepods traps
 - Electric current field
 - Laser
 - Mechanic delousing
 - Thermal delousing
 - Vaccine



Photo: A. Ingvarsdottir



L. Salmonis trap
(Bowman and Skiftesvik)



Seafarm Pulse Guard

Medicines available in Norway

- For use in topical treatments:
 - Pyrethroids (ALPHAMAX[®] and BETAMAX VET.)
 - Organophosphorus compound (Salmosan[®])

- For use as oral treatments:
 - Avermectin (SLICE[®])
 - Chitin inhibitors (Ektobann vet. and Releeze)

- In addition:
 - Hydrogen peroxide



Cleaner fishes

- Sales registered (2010 Norway):
 - 535 tonnes
 - 11 mills of cleaner fishes
- Used in about 50% of Norwegian salmon and trout farming (2010)
- Dependent on wild catch
- Commercial production ongoing:
 - 3 production sites of wrasses
 - 3-4 production sites of lump sucker



Plankton net for protection against sea lice larvae

- Net mesh (100 μ m)
- Significant difference in sea lice numbers (shielded vs non shielded cages)

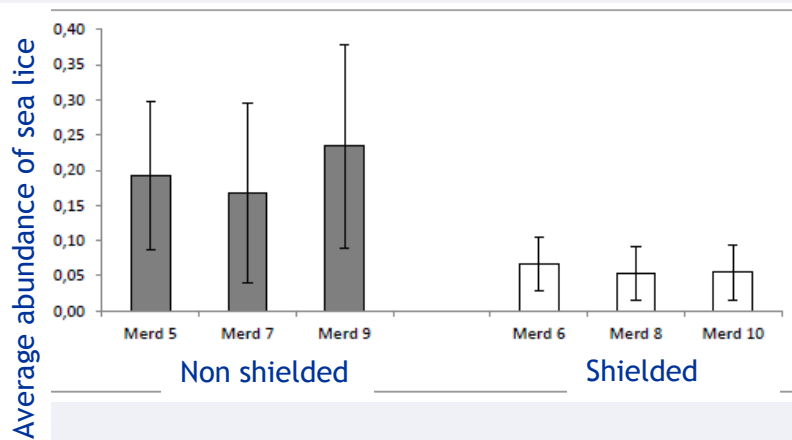
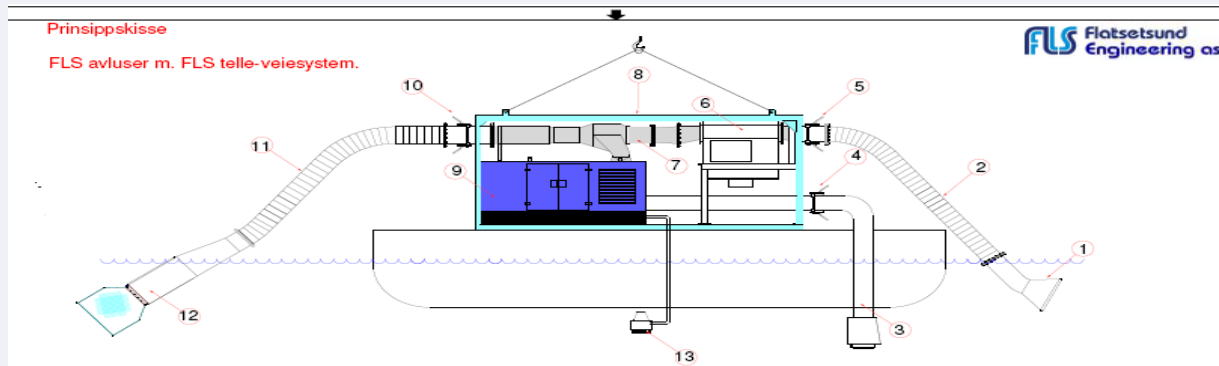


Photo: T.Larsen, Calanus AS

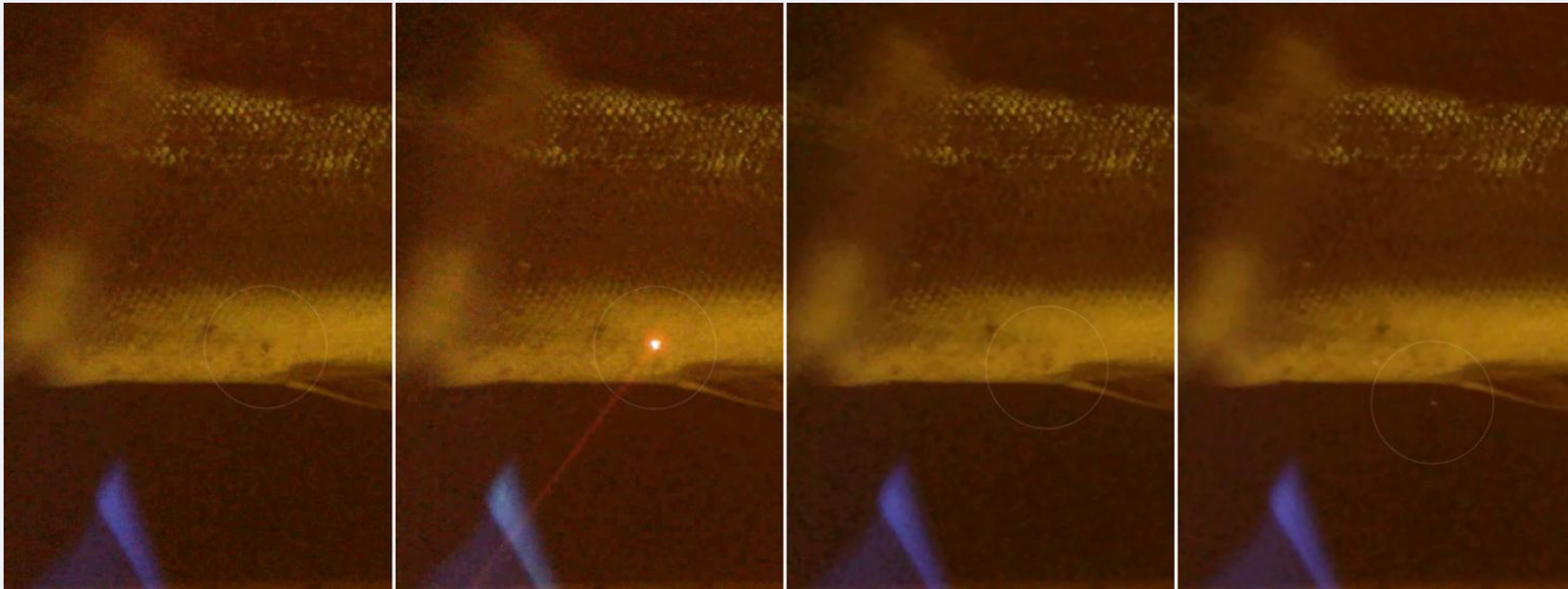
Mechanical removal of sea lice

- Removes mobiles by water flush
- Need for further development and higher capacity



Star wars against sea lice

- Promising method for continuous control of settled sea lice



- Laser - to control sea lice infections
- Development project, Beck engineering in cooperation with Marine Harvest, Lerøy Seafood Group and SalMar.

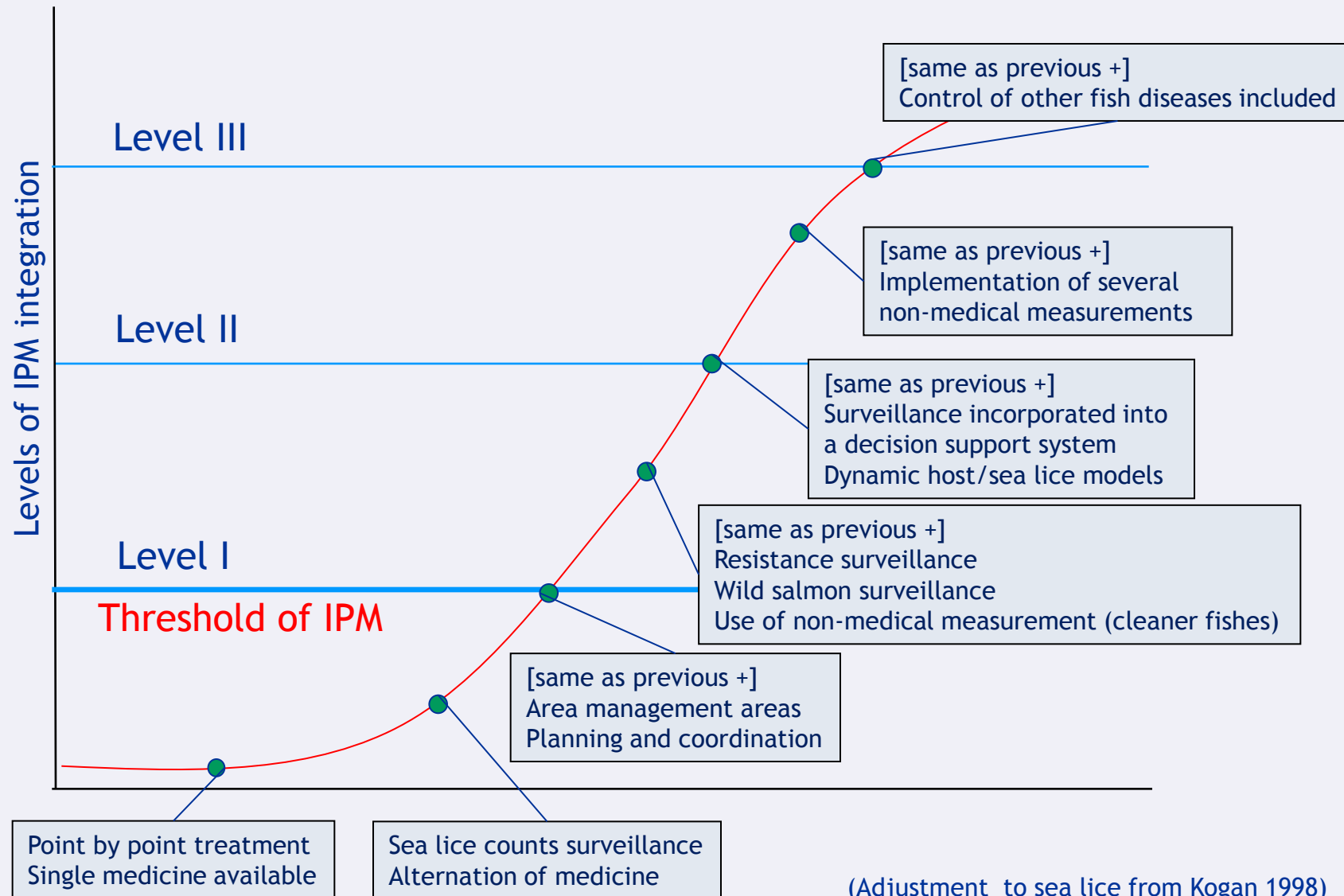
Goal - development of a true aquatic IPM

From the definition:

- *decision support system*
- *pest control tactics*
- *coordination into a management strategy,*
 - *based on cost/benefit analyses that take into account the interests of and impacts on producers, society, and the environment.*



Continuum from conventional sea lice control to level III IPM



Are we there yet?

- Bottlenecks:
 - Surveillance and epidemiological understanding
 - Development and implementation of non-chemical measurements
 - Coordination and agreement of IPM strategy
- Need for a coordinated research program to enhance implementation of integrated sea lice control



Thanks to all who has contributed with information

See you for the 4th Sea lice multination workshop in 2013

Recommended for more information on IPM:

Marcos Kogan: Annu. Rev. Entomol. 1998.43:243-70

Brewer and Goodell: Annu. Rev. Entomol. 2012.57:41-59

Birch et al: Journal of Experimental Botany. 2011. 62:3251-3261

<http://www.namdalakvasenter.no/?side=97&nyhet=269>

