

Background and rationale for the sea lice multinational initiative workshop with summarised remarks and proposals going forward.

Sea lice, and their control, are currently one of the biggest challenges facing the global salmonid aquaculture industry. *Lepeophtheirus salmonis* in the Northern hemisphere and *Caligus rogercresseyi* in Chile continue to exert an impact on production cost and pose a risk to wild salmonids. In addition, during the last few years, development of drug resistance has been identified and poses a significant threat to effective control.

Many lice related processes and initiatives are underway in Norway, Scotland, Ireland, Canada and Faroe Islands to improve lice control and manage such threats, and which to a large extent are duplicated. In addition, there is a broad and active communication flow both within and between countries. Consequently, there is an opportunity for sharing information, practices, procedures, R&D results and process developments. Coordination of such efforts and synchronisation of processes and initiatives can be achieved by facilitating communication and addressing particular topics on a multinational basis. Such a multinational initiative would also concentrate the efforts of the participating countries and focus on common tasks and problems.

The Multinational Initiative Workshop (10-11 Feb) was accomplished with participants from Canada, Faroe Islands, UK, Ireland and Norway representing both industry and research. Three main goals were presented as an opening and introduction for the workshop:

- Identify main knowledge gaps and suggest R&D pathways for closing them
- Identify cross territory synergies/links
- Identify specific areas for sharing SOP/BMP`s on operational issues and mechanisms and responsibilities to do so

As an introduction a brief presentation of the well recognised IPM strategy was given, with the main question being asked; “What is the way forward, and how do we develop a sustainable IPM strategy?” Following were representatives from the participating countries who each gave a country overview with focus on; the sea lice situation, trends and management, ongoing and planned research initiatives and strategies, and regulatory and working group’s processes. After the country-by-country overview feed and medicine companies each gave a 5 minute update on respective R&D activities. All presentations are available at:

http://www.fiskerifond.no/index.php?current_page=prosjekter&subpage=archive&detail=1&id=1005&qid=1

Subsequent working sessions in plenum and groups focused on synergies, industry challenges and research/knowledge gaps, with proposals on potential research platforms.

It is evident that all countries producing Atlantic salmon face challenges with salmon sea lice (*Lepeophtheirus salmonis*) developing resistance against one or

more medicines and there is a need for a paradigm shift in the way to control sea lice.

The overall agreement from presentations and discussions was that there is a common knowledge on IPM strategies and the comprising elements, and that this knowledge needs to be implemented to a greater degree in the industry as a long term effort to control sea lice. Herein lays implementation and validation of every available measurement, with subsequent needs for R&D activities and developments of standard operating procedures (SOP) for the industry.

The overall message from presentations and subsequent discussions was that many concurrent R&D`s activities exist on several topics and the general need for SOP`s was highlighted. The following is a summary of cross territory R&D and potential SOP synergies for the different topics raised in the presentations and discussions.

1. In all countries, there is ongoing focus to define management areas based on hydrological, seasonal and sea lice biological factors to include measurements like treatment synchronization, stocking and fallowing. During the process to establish management areas a need for communication of information between countries is evident. Key elements are current knowledge and knowledge building on dispersion modelling, experience on implementation and effects of management areas and management agreements. There is a general need of refining for dispersion modelling to be used as an objective tool in establishment of management areas.
2. The use of wrasse to control sea lice is widespread in Norway and the farming companies and areas using wrasse are increasing. Currently the use is based on wild-catch of the three species ballan, goldsinny and corkwing wrasse. To further supply the needs of the salmon farming, commercial farming of ballan wrasse is commencing in Norway, with several R&D needs. No other countries are presently using wrasse as an implemented measure against sea lice, but some R&D projects are ongoing in Ireland and Scotland. The presence and availability of suitable wrasse species in nature are varying in different countries. However, the interest in applying the wrasse as a control measure and further development into commercial farming is evident among the different countries. The potential for use of lumpsucker is also under consideration.
3. Development activities of preventive measures such as vaccines, breeding and fish health feeds, to strengthen the salmon against sea lice attack are ongoing in several countries. Included in this topic is knowledge building on the sea lice molecular biology regarding interaction gateways/points between salmon and lice and specific and non-specific immune reactions between the host and parasite. In addition several molecular approaches to generally reveal knowledge on the genetics and transcriptomics of the sea lice are carried out. The possibility to identify some Achilles' heel of the sea lice should be utilized, and information communication between countries and research institutes would be an advantage.

4. There is clearly a need to improve the way to use medications. Included in this topic are both treatment methods, optimisation of bath and oral medicines and how the use of medication should be alternated and synchronized related to sensitivity status of the specific area. Preliminary R&D projects to increase the knowledge on use of bath treatments against sea lice are accomplished in both Norway and Canada, but there is generally a further need of methodology, knowledge and especially in how to secure a sufficient uptake of medication given orally. Moreover, there is a need for technology development of both farming equipment and possibly specialised delousing equipment for easier and efficient treatment performances. Alternation of medications and knowledge of sensitivity status of a specific area is closely coupled with knowledge of resistance mechanisms and further development and use of bioassays. During presentations and discussions an obvious multinational link between all these activities related to medication and the need for establishment of SOP's was revealed.

5. Surveillance is a key element in an IPM strategy, and probably should include observation of sea lice numbers both of farmed fish and wild fish. The topic surveillance should possibly also include methods to align sensitivity/resistance status throughout regions/countries. R&D and governmental projects related to routine counting and counting for evaluation of treatment efficiencies of farmed salmon are carried out in different countries. Investigations of sea lice numbers on wild salmonid fish in surveillance programs should be strengthened and actively used to evaluate the measures taken in the farming industry. Together, sea lice numbers on farmed fish and wild fish are closely linked with discussions on trigger levels.
The topic of surveillance was only briefly discussed during the workshop, but there is clearly a need to establish statistically secure methods to monitor the sea lice status both on farmed and wild fish. Finally, SOPs for lice counting in farming companies should be further developed and implemented.

6. Novel technologies are versatile and the needs for new alternative measurements to control sea lice are significant. This topic could include traps, pumps, underwater feeding etc. and could if efficient; contribute as important elements in an IPM strategy to control sea lice.

Based on the knowledge gained from the group work and discussions, six Working Groups or platforms are proposed. Institutes and industry with activities in the platforms should be included as members.

	Topic	Suggested working group leaders
1	Structural measures and dispersion modelling	Coordinator/s: Rob Raynard Facilitator/s: To be decided
2	Farming and use of wrasse	Coordinator/s: To be decided Facilitator/s: To be decided
3	Biological measures and molecular knowledge building	Coordinator/s: Frank Nilsen Facilitator/s: To be decided

4	Use of medication and resistance	Coordinator/s: Tor Einar Horsberg Facilitator/s: Gordon Ritchie
5	Surveillance (farmed and wild fish)	Coordinator/s: To be decided Facilitator/s: To be decided
6	Novel technologies	Coordinator/s: To be decided Facilitator/s: To be decided

Members of each proposed platform should consist of research, industry and regulatory representatives. It will be the responsibility of the platform coordinators to develop a matrix of representatives.

For each proposed platform/Working Group, the suggested mandate is:

1. Establish updated overviews of ongoing activities related to the platform topic at each Multinational sealice meeting
2. Define and agree on R&D gaps based on needs for improvements in current practises in the industry and define routes and activities to close such gaps
3. Facilitate future coordinated research activities, involving academia, industry and regulators in multiple countries.

Follow-up and Action plans

Topic	Responsible	Deadline
Finalise meeting summary and conclusions; distribute summary to participants + other	Steering Committte	21.04.
Feedback from proposed candidates for “leadership” on platforms and evnt other suggestions	Steering Committte	During Sea lice 2010 and by 15.05.
Finalise platforms and respective representatives	Steering Committte	25.05
Proposal for next meeting coordinator meeting?	Aberdeen? Rob Raynard?	25.05.
Next Multi-national meeting workshop (proposedal Oct-2010); preliminary notificationinvitation	Steering Committte	15.06.
Next Multi-national workshop (proposed	Steering Committte	

Oct-2010); draft agenda and layout Draft agenda next meeting incl layout for working groupplatform reports reports / sessions		30.06.
Next Multinational sealice workshop		Oct-2010