

Antibiotics Stewardship Roadmap

Agreements on approach

- **Agree** to the stepwise process of the road map proposed in this paper that will form a “SeaBOS Antibiotics Code of Conduct” by October 2022
- **Agree** that the scope of the SeaBOS Antibiotics Code of Conduct includes members’ own operations and to extend that into their supply chains engaged in aquaculture and feed production
- **Agree** to cease the use of HPCIA and CIA* in all areas of aquaculture production where their use is not specifically enabled through national legislation**
- **Agree** to a virtual workshop in February 2022 to refine the actions required and the metrics to demonstrate progress
- **Agree** to engage with annual SRC surveys on antibiotics stewardship in our own aquaculture operations, including from supply chains engaged in aquaculture production, to monitor and measure progress

* HPCIA and CIA = High Priority Critically Important Antimicrobial and Critically Important Antimicrobial for human health, as defined by the World Health Organisation (WHO).

** Where region-specific national legislation does exist providing for the use of HPCIA or CIA, members will work collaboratively with a range of appropriate experts, such as pharmaceutical companies, veterinarians, intergovernmental agencies, or governmental departments, to determine or develop effective alternatives such as vaccines or lower category antimicrobials, to ensure the health and wellbeing of those seafood products and reduce the use of HPCIA and CIA. We will report back in October 2023 on progress towards this goal.

Executive Summary

The threat of anti-microbial resistance (AMR) to human, animal and environmental health is high and growing. Anti-microbial residues are found in some farmed products and in the local environment around some aquaculture operations. Globally, inappropriate use of antibiotics in human medicine and animal health increases the risk of organisms becoming resistant to the key medications that we have. Whilst antibiotics are important tools to protect the health of humans and animals, it is essential that good stewardship is applied to their use, so that the risk of AMR is reduced, and the most critically important antibiotics are used in the most appropriate ways. The “One Health” concept, which shows that environmental health, human health, and animal health are all inter-related, should be applied, and through improved management of animal health, we can improve human and environmental health as well. This sets up the challenge to SeaBOS.

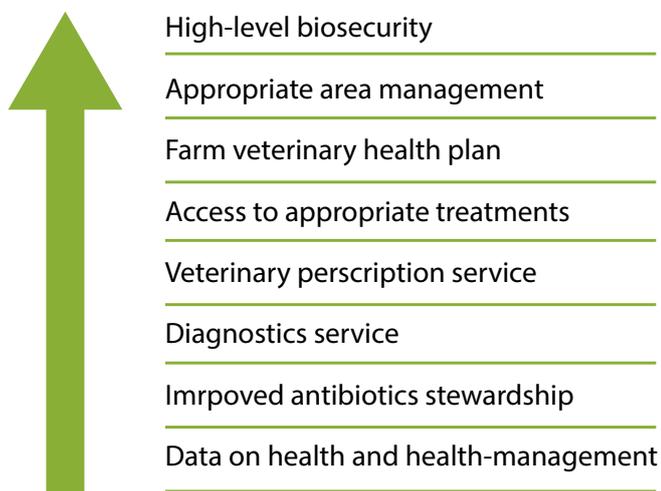
Aquaculture is flagged as a major user of antibiotics and whilst sectors of the industry are working towards reducing their use, the general lack of data on antibiotic use in some parts of the industry hampers efforts to demonstrate progress or refute broad allegations. However, there is also a real concern on health management in aquaculture, where the species, farming conditions and the diseases are so diverse that appropriate treatments are not always available.

A survey of SeaBOS members showed the need for tracking antibiotic use in aquaculture operations. There are differences in use between species and geographies. Working with suppliers increases the complexity.

The sensitivity of this work has highlighted the need for trust when conducting such surveys, and also the need to recognise and reward transparency where best practices may not yet be in place. Only by building such trust, can we identify where and how improvements can be made. Future surveys will be required to track progress from the baseline.

Discussions with various experts and organisations showed the urgency to address this issue, as an increasing number of studies have raised public, industry and government awareness. The discussions also highlighted the complexity of finding a common approach across diverse aquaculture operations and guided us to the concept of a high-level approach to the issue for SeaBOS. This led to a proposal for a SeaBOS Antibiotics Code of Conduct which can enable our members and other operations identify the pathway to improved antibiotic stewardship to reduce the risk of AMR. We had hoped to propose a roadmap and timeframe for improvement by October 2021, but the complexity of the issue has delayed this, and we hope to be able to address this further in a dedicated virtual workshop in February 2022.

The proposed SeaBOS Antibiotics Code of Conduct commits members to the Principles of Aquaculture Health Stewardship. These show a progression (see figure) from obtaining and managing data on stock health and health management, through improved antibiotic stewardship and developing a diagnostics service and obtaining access to appropriate treatments. Going beyond this, building capacities for a veterinary prescription service and detailed health plans on a site-by-site basis which leads up to appropriate area management strategies in collaboration with other local and regional aquaculture operations. Together this will lift aquaculture production up to a higher state of biosecurity management. The details of each level and measurable outcomes to verify the level has been achieved will be confirmed in the February 2022 workshop, together with details of how the Extended Producer Responsibility (EPR) of suppliers and subsidiaries will be addressed.



A critical part of SeaBOS membership is to demonstrate change towards our goals. Through regular surveys, members will be able to show progression against the proposed Principles over time. We will incorporate an annual on-line (confidential) survey, using a simpler format once the baseline data are established. We are proposing a three-tier system recognising basic, medium and high level progress on biosecurity, which will be substantiated by the survey data.

Workstream Activities and Proposals for 2022

Data

Since October 2020, we worked with companies individually to complete a survey of antimicrobial use based on each company and their subsidiaries. The survey on antimicrobial use in aquaculture highlighted many areas where we could make improvements, but more resolution is needed to identify the right interventions. We thus aim to reach out to companies during the remainder of this year for complementary data. This will provide an excellent opportunity to draw up trends in antibiotics use and verify the success of future interventions. We will also identify opportunities for members to share knowledge on a pre-competitive basis, to help each other to progress.

Whilst data were provided by all, the SRC team need to work with some of the companies to get increasingly detailed, quality data. It was also clear that it is essential to extend data collection to both subsidiaries and suppliers, to achieve a clear understanding of the challenges and possible solutions.

Access to the supply chain data is critical if we are to show progression and SeaBOS leadership in this area, and also in order to best guide the remainder of the work that needs to be carried out by the working group. We understand the contextual importance of how data is presented to accurately reflect the situation in production. However, in order to better demonstrate the context, we need higher resolution data of good quality. If we do not have good quality data, our work will not appropriately reflect the overall situation in SeaBOS, nor allow us to benchmark improvements and share learnings with others towards transformation.

Whilst we recognise that companies carry out export controls on aquaculture products, demonstrating that these products have antibiotic residues within legal limits, it is critical to have data also covering the on-farm use. Over-use, inappropriate use (such as using the wrong active ingredient or using antibiotics on diseases which do not respond to antibiotics), and not completing the appropriate dose are all examples of poor antibiotic stewardship. If stewardship is currently good, we should be able to report this – if it not good, we can work together to find solutions to improve it.

During early 2022 SRC will have completed the survey of

existing legislation and third party certification schemes in the countries where members have aquaculture operations, or aquaculture producing supply chains. This covers at least 24 countries and multiple languages, but it will be an important step to understanding the context of how the SeaBOS Antibiotics Code of Conduct will have to be applied. It will also enable us to identify legislative opportunities and potential barriers to good antibiotic stewardship and aquaculture health management. These innovations can then be addressed with the relevant governments as part of the work of Task Force III.

Collaborations

We have been engaging with a broad network of experts on antimicrobials in aquaculture as well as international organisations working towards improved understanding about the problem and potential solutions through multi-stakeholder dialogues. We have identified key experts in Australia and Hong Kong who can help identify the best ways to use antibiotics if and when they are required, but who are also looking at alternative options, particularly vaccines for fish.

We have had similar discussions with ASC (Aquaculture Stewardship Council) and BAP (Best Aquaculture Practice) initiatives who both promote good antibiotic stewardship through their certifications. Meetings have also been held with WorldFish, IDH, and Monterey Bay Aquarium who all have programs to reduce antibiotic use in aquaculture in different regions, with WorldFish and IDH particularly focussing on small scale farmers who are the least supported in terms of health support. From these discussions, we feel that we have generated a good network who SeaBOS can collaborate with, to support us develop towards our commitments.

SeaBOS Antibiotics Code of Conduct

We have reviewed a variety of options for the SeaBOS Antibiotics Code of Conduct, from very detailed and prescriptive to very high level. We have agreed that a high-level approach is best for SeaBOS, given the variety of interests and activities the members have. Our aim to create a framework which can be applied by all members, to their own activities and to subsidiaries and suppliers engaged in aquaculture production. This will provide a series of developmental steps required, not just for good antibiotic stewardship, but ultimately good animal health – which of course is good for the farmers and for sustainable aquaculture. This supports the “One Health” concept, whereby improved animal health will also support environmental and human health.

Our approach to this has been to develop a “ladder” of improved aquaculture health stewardship, building up core units as Principles. This is based on expectations from a broad range of existing third-party standards and expert opinions. Each step helps improve the overall aquaculture health stewardship, reducing the need for antibiotics and ensuring that where they are used, they should be used appropriately.

The ladder concept is summarised in the Executive Summary, but in Table 1, we show the concepts behind each step that must be put in place. A more detailed version will be developed with members to detail the type of actions required to achieve each Level. These can be documented and provided as evidence to support the progress up the ladder, which can be measured in direct operations and in suppliers as appropriate.

The details of the actions and supporting metrics ideally required to demonstrate the achievement of each level will be resolved with members and external experts in a workshop for this workstream. The plan is to hold a virtual workshop in February 2022, with an option to follow up with another workshop at the SeaBOS annual Working Meeting in Stockholm in May 2022.

As the ladder has many steps, we are proposing to simplify demonstration of progress into 3 levels, for example as suggested in Table 2. This will make communication on the degree of progress clearer. Using such a system, we can envisage engagement with key stakeholders such as retailers on this topic. Retailer support and pull for improvement will be essential for the long-term success of anti-microbial reductions. This approach will enable greater clarity for retailers and consumers on the use of antimicrobials in the seafood they purchase. A similar recognition is sought through Task Force I for progress on reducing IUU fishing and improving labour conditions.

Retailer engagement will provide a clear incentive for members and their supply chains to demonstrate progress against the SeaBOS Antibiotics Code of Conduct. But it is clear that other incentives for progress should be investigated through the SeaBOS work.

A key early step in the ladder will be to agree to exclude the use of HPClAs and ClAs for human health as defined by the WHO, where they are not already provided for in national legislation. Where region-specific national legislative provisions do exist providing for the use of HPClAs or ClAs, we will work collaboratively with a range of appropriate experts, such as pharmaceutical companies, veterinarians, intergovernmental agencies, or governmental departments, to determine effective alternatives such as vaccines or lower category antimicrobials, to ensure the health and wellbeing of those seafood products and reduce the use of HPClAs and ClAs. This workstream will report back in October 2023 on progress towards this goal.

Through the SeaBOS Antibiotics Code of Conduct, SeaBOS members will support farm operations in their supply chains to apply standards at least equivalent to the SeaBOS Principles of Aquaculture Health Management and move through the ladder towards the top. In the first year, members will be provided with feedback from SRC on the current positions on the ladder for their own and supply chain production from the data provided. In subsequent years, the aim is to support and

Table 1: Description of the suggested status achieved at each level by a company in both their own operations and in their supply chains.

Levels	Description of preferable status
Basic-level for health and health management	Complete data on stock health and health management for each farm site in place
Improve antibiotic stewardship	Antibiotic use is carefully managed and are used in accordance with recommendations and in responsible ways.
Diagnostics service	Capacity for rapid diagnoses of diseases exist on farm or are readily available within company, which enables recommendations for appropriate treatments.
Access to appropriate treatments	Correct treatments are ensured through knowledge and access to appropriate and good quality antibiotics.
Veterinary prescription service	A professional health care system is in place, ensuring that all medical treatments are prescribed by trained practitioners.
Farm veterinary health plan (VHP)	Annual health plan is in place for each farm, and this has been established in consultation with the associated veterinarian.
Appropriate area management	Health plan across neighbouring farms is in place and been established through collaboration between companies/farms.
High-level biosecurity	Area management considering farm connectivity is in place and this is being complemented by also considering risks from environmental quality changes.

Table 2 Suggested three tier approach to recognizing progress

Achievement	Basic	Intermediate	High
Data on health and health management	✓	✓	✓
Improved antibiotics stewardship	✓	✓	✓
Diagnostics service	✓	✓	✓
Veterinary prescription service	✓	✓	✓
Access to appropriate treatments	✓	✓	✓
Farm veterinary health plan (VHP)			✓
Appropriate area management			✓
Biosecurity Assessment	Basic	Intermediate	High

encourage members to move up the ladder steadily, importantly applying good antibiotic stewardship at an early point. We recommend establishing milestones in 2023 and 2025 for supply chains, to give members time to engage effectively with them.

Next Steps

With the agreement on the proposed Principles of Aquaculture Health Management and support for development of a SeaBOS Antibiotics Code of Conduct, the next step is to determine the starting position of each company and their supply chains. A road map can then be determined on how to progress through the next steps.

A virtual workshop will be convened in February 2022 with aquaculture health experts from the members and external experts on aquaculture health, focused on developing a systematic approach to its improvement.

The outcomes from the survey data already provided by the members will be reviewed, maintaining confidentiality but enabling the current situation to be demonstrated. Options for progression will be discussed in more detail at this workshop, enabling members to explore these in more detail later. Before the workshop, further work with members will be carried out to improve on the existing data, to ensure the full scope of operations including supply chain production are covered, and that the data are suitably granular to show the members' performance against the various proposed criteria. SRC will also conduct a review of relevant national legislation on use of antimicrobials in aquaculture production, with support and input from companies.



This strategy was developed by SeaBOS Task Force III, with scientific support from the **Stockholm Resilience Centre** at Stockholm University, the **Beijer Institute of Ecological Economics** and the **Global Economic Dynamics and the Biosphere program** at the Royal Swedish Academy of Sciences, **University of Lancaster** and the **Stanford Center for Ocean Solutions** and financial support from the **Walton Family Foundation**, the **David and Lucile Packard Foundation**, and the **Gordon and Betty Moore Foundation**.