PROGRESS TOWARDS DEVELOPMENT OF THE PROGRESSIVE MANAGEMENT PATHWAY FOR IMPROVING AQUACULTURE BIOSECURITY (PMP/AB): HIGHLIGHTS OF 2019 ACTIVITIES
PROGRESS TOWARDS DEVELOPMENT OF THE PROGRESSIVE MANAGEMENT PATHWAY FOR IMPROVING AQUACULTURE BIOSECURITY (PMP/AB): HIGHLIGHTS OF 2019 ACTIVITIES

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 2020
This document focuses on the development of the Progressive Management Pathway for Improving Aquaculture Biosecurity (PMP/AB) and presents the main highlights of the Second Multi-Stakeholder Consultation on the Progressive Management Pathway for Improving Aquaculture Biosecurity (PMP/AB2), which was held at the Headquarters of the World Organisation for Animal Health (OIE), Paris, France, from 29–31 January 2019; the Progressive Management Pathway for Improving Aquaculture Biosecurity (PMP/AB): First Technical Working Group Meeting (TWG1), held at FAO Headquarters, Rome, Italy from 20–22 March 2019; and the Roundtable Discussions on Aquaculture Biosecurity, held at the FAO Liaison Office for North America (FAOLOW), Washington D.C., United States of America, 22–26 July 2019. The report was prepared by Drs Melba B. Reantaso (FAO, Rome), J. Richard Arthur (FAO Consultant, Canada), Brett MacKinnon (FAO Consultant, Rome) and Bin Hao (FAO, Rome).

It is intended that this document will be circulated to interested stakeholders (i.e. competent authorities and other relevant government agencies, aquaculture producers and academia, including relevant fora) to provide information, raise awareness and build consensus on the PMP/AB approach towards dealing with aquatic animal disease challenges in aquaculture and to promote its further development and support for its implementation.
ABSTRACT

This report highlights the accomplishments of the Food and Agriculture Organization of the United Nations (FAO) consultations and round-table discussions on the PMP/AB that were held during 2019. These include the following: (i) the Second Multi-Stakeholder Consultation on the Progressive Management Pathway for Improving Aquaculture Biosecurity (PMP/AB2) (29–31 January 2019); (ii) the Progressive Management Pathway for Improving Aquaculture Biosecurity (PMP/AB): First Technical Working Group Meeting (TWG1) (20–22 March 2019); and (iii) the Roundtable Discussions on Aquaculture Biosecurity (22–26 July 2019). It reports on the progress made towards formulating, planning and developing implementation mechanisms for the PMP/AB, based on the comments and recommendations provided by the wide range of stakeholders and experts who participated in these events.

The PMP/AB is a pathway that builds on existing frameworks, supported by appropriate tools (via the “PMP/AB toolkit”). The PMP/AB focuses on aquaculture biosecurity, which includes health management and reduction of antimicrobial resistance (AMR) and defined as the cost-effective management of risks posed by infectious agents to aquaculture through a strategic approach at enterprise, national and international levels with shared public-private responsibilities”.

The Tenth Session of the Committee on Fisheries (COFI) Sub-Committee on Aquaculture, held in Trondheim, Norway endorsed the PMP/AB and the development of a multidonor-assisted, long-term aquaculture biosecurity component of an aquaculture programme, including its five pillars. Therefore, the FAO, through its Fisheries Division, now has a mandate for the further development and implementation of the PMP/AB.

Future activities include the establishment of an official Technical Working Group (TWG) that will drive the further development of the technical aspects of the PMP/AB, wider consensus building, initial application (pilot testing) and refinement of the PMP/AB tools, and resource mobilization for the aquaculture biosecurity programme. Guidance documents and resources for advocacy and training on the PMP/AB are currently in development to facilitate adoption at the national level.
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The participants represented the competent authorities, intergovernmental organizations, the aquaculture industry, academe, service providers, research institutions and donor organizations. They are thanked for their contributions to these successful consultations and for their expressions of interest to support follow-up activities on the further development and implementation of the PMP/AB.

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## ABBREVIATIONS AND ACRONYMS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AFS</td>
<td>American Fisheries Society</td>
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<tr>
<td>AMR</td>
<td>Antimicrobial resistance</td>
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<tr>
<td>APVAA</td>
<td>Assistant Practicing Veterinarian for Aquatic Animals</td>
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<tr>
<td>CertAQV</td>
<td>Certified Aquatic Veterinarian</td>
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<td>COFI</td>
<td>Committee on Fisheries (of the FAO)</td>
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<td>EEA</td>
<td>European Economic Area</td>
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<tr>
<td>FAO</td>
<td>Food and Agriculture Organization of the United Nations</td>
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<td>FAOLOW</td>
<td>FAO Liaison Office for North America</td>
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<td>FHS</td>
<td>Fish Health Section (of the AFS)</td>
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<td>FMD</td>
<td>Foot and mouth disease</td>
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<td>GAA</td>
<td>Global Aquaculture Alliance</td>
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<td>GARC</td>
<td>Global Alliance for Rabies Control</td>
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<tr>
<td>GF-TADS</td>
<td>Global Framework for the Progressive Control of Transboundary Animal Diseases</td>
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<td>MSU</td>
<td>Mississippi State University</td>
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<td>NACA</td>
<td>Network of Aquaculture Centres in Asia-Pacific</td>
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<tr>
<td>NGO</td>
<td>Non-governmental organization</td>
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<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
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<td>OIE</td>
<td>World Organisation for Animal Health (formerly Office International des Épizooties)</td>
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<tr>
<td>PCP</td>
<td>Progressive Control Pathway</td>
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<td>PCP-FMD</td>
<td>Progressive Control Pathway for Foot and Mouth Disease</td>
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<td>PMP/AB</td>
<td>Progressive Management Pathway for Improving Aquaculture Biosecurity</td>
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<tr>
<td>PMP/AB1</td>
<td>First Multi-Stakeholder Consultation on a Progressive Management Pathway to Improve Aquaculture Biosecurity</td>
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<td>PMP/AB2</td>
<td>Second Multi-Stakeholder Consultation on the Progressive Management Pathway for Improving Aquaculture Biosecurity</td>
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<tr>
<td>PVAA</td>
<td>Practicing Veterinarian for Aquatic Animals</td>
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<tr>
<td>PVS Tool-Aquatic</td>
<td>OIE Evaluation of the Performance of Veterinary Services and/or Aquatic Animal Health Services</td>
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<tr>
<td>SARE</td>
<td>Stepwise Approach towards Rabies Elimination</td>
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<tr>
<td>TWG1</td>
<td>First Technical Working Group Meeting on the Progressive Management Pathway for Improving Aquaculture Biosecurity (PMP/AB)</td>
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<tr>
<td>WAS</td>
<td>World Aquaculture Society</td>
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<td>WAVMA</td>
<td>World Aquatic Veterinary Medical Association</td>
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<td>WB</td>
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<td>WHO</td>
<td>World Health Organization</td>
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1. **BACKGROUND**

1.1. **Introduction**

1. The Food and Agriculture Organization of the United Nations (FAO), through its Fisheries Division and with the endorsement of the Tenth Session of the Committee on Fisheries (COFI) Sub-Committee on Aquaculture (FAO, 2019c), held in Trondheim, Norway from 23–27 August 2019 and with the participation of key partner agencies, is currently implementing a major initiative to improve global aquaculture biosecurity management, the Progressive Management Pathway for Improving Aquaculture Biosecurity (PMP/AB). The PMP/AB is an extension of the Progressive Control Pathway (PCP) used to promote development and self-monitoring of national strategies for foot and mouth disease (FMD). The approach is risk-based, collaborative and progressive in nature.

2. Formulation of the PMP/AB concept was initiated in April 2018 when the FAO Headquarters and FAO Liaison Office for North America (FAOLOW) with the support of Mississippi State University (MSU) and the World Bank (WB), convened the *First Multi-Stakeholder Consultation on a Progressive Management Pathway to Improve Aquaculture Biosecurity (PMP/AB)* (hereafter referred to as “PMP/AB1”) at the WB headquarters in Washington, D.C. (FAO, 2019a). The PMP/AB1 sought feedback and consensus from stakeholders on the application of a proposed framework for the PMP/AB, its adaptability to the diversity of aquaculture production systems across countries and regions, and its potential to make a significant difference in reducing the emergence and/or re-emergence diseases that threaten sustainable aquatic production. This initial meeting brought together some 45 experts from 19 countries representing the competent authorities, intergovernmental organizations, aquaculture industry, academe, service providers, research institutions and donor organizations to take stock of the current aquatic animal health and biosecurity situation in aquaculture; introduce the PMP/AB as new concept to address aquatic animal disease problems and build consensus on the PMP/AB.

3. The major outputs of the PMP/AB1 meeting were: a broad consensus among participants as to the value of the proposed PMP/AB and their desire to participate further in its development and implementation; the review and refinement of the draft PMP/AB to achieve active engagement by governance authorities and industry stakeholders and a best-fit for country; and the initial identification and planning of further implementation activities, including the development of the technical aspects of the PMP/AB, wider consensus building, initial application and refinement, and resource mobilization.

4. The consensus achieved during the PMP/AB1 led directly to the planning and completion of the three 2019 activities featured in this report. This document presents the highlights for the following FAO consultations towards advancing the PMP/AB, namely:


- the *Progressive Management Pathway for Improving Aquaculture Biosecurity (PMP/AB): First Technical Working Group Meeting (TWG1)*, held at FAO Headquarters, Rome, Italy, from 20–22 March 2019; and

- the *Roundtable Discussions on Aquaculture Biosecurity*, held at the FAOLOW (Washington D.C., United States of America), 22–26 July 2019. Annex 1 presents the programme, list of participants and group photographs for the roundtable discussions.
1.2. Purpose

5. The objective of the series of activities was to further develop the PMP/AB concept, increase stakeholder participation and build consensus, and plan future activities leading to PMP/AB implementation.

6. The overall objective of the PMP/AB2 consultation was to seek feedback from stakeholders on the application of the proposed PMP/AB, its adaptability to the diversity of aquaculture production systems across countries and regions, and its potential to make a significant difference in reducing the emergence and/or re-emergence of diseases that threaten sustainable aquatic production. The main product of the PMP/AB2 is the Report of the Second Multi-Stakeholder Consultation on the Progressive Management Pathway for Improving Aquaculture Biosecurity (PMP/AB) (FAO, 2020a), which presents a narrative of the consultation, the major highlights of discussions, and a summary of the decisions that were reached.

7. The general objective of the TWG1 was to further discuss the overall concept, background documents, and roll-out of the PMP/AB in pilot countries and regions. The specific objectives were to:
   - discuss and agree on some of the issues and concerns raised during the PMP/AB2 (i.e. whether the PMP/AB is a framework, a pathway as the name suggests, a tool or a road map; whether the approach will be step-wise or parallel/matrix or a combination of both, etc.);
   - build on the PMP/AB background document (checklist of requirements, indicators, etc.) and discussions in Paris; discuss and agree on the final form and main contents of the Guidelines of Application of the PMP/AB; draw up a tentative plan (timetable for the initial application and testing of the PMP/AB), including preliminary reporting of outcomes; and
   - determine the next steps to be taken, as detailed in the report of the meeting (FAO, 2020b).

8. The main product of the TWG1 is the Report of Progressive Management Pathway for Improving Aquaculture Biosecurity (PMP/AB): First Technical Working Group Meeting (FAO, 2020b) where a consensus was reached on the definition of the PMP/AB and aquaculture biosecurity, defined the scope and objectives, and finalized the PMP/AB stage descriptions.

9. The objectives of the Roundtable Discussions on Aquaculture Biosecurity related to the PMP/AB included:
   - finalizing the contents of the proposed review paper on aquatic animal disease emergence in aquaculture and the next steps towards its completion;
   - finalizing the indicators/self-assessment checklist/requirements for rolling out of the PMP/AB;
   - discussing PMP/AB governance; and
   - understanding what “certification schemes for aquatic animal health professionals” are available, their objectives and processes and discussing what options are useful and appropriate in terms of addressing requests for a similar scheme from FAO members.

1.3. Process

10. The three meetings followed the following processes:
   - The PMP/AB2 ran for three days and consisted of seven sessions.
   - The TWG1 was held for three days, with three main agenda items.
   - The Roundtable Discussions on Aquaculture Biosecurity ran for five days and addressed four objectives. Specifically, days 1–3 and day 5 focused on the development of the PMP/AB.
1.4. Participation

11. The three events included stakeholders, experts and organizations that contributed to the development and implementation of the PMP/AB:
   - For the PMP/AB2, a total of 41 participants representing government, regional and international intergovernmental organizations, industry, academe and development and aid agencies and foundations attended the meeting. Participants included experts from multiple aquaculture sectors, including the highly important seaweed production sector.
   - For the TWG1, a total of 13 experts representing government, intergovernmental organizations, industry, and academe attended the meeting.
   - For the Roundtable Discussions on Aquaculture Biosecurity, a total of 11 experts representing government and academe participated in the meeting.

2. SUMMARY OF PLENARY DISCUSSIONS ON PMP/AB

12. The following sections summarize the results of the discussions held during the PMP/AB2, TWG1 and the PMP/AB-related discussions during the roundtable event.

2.1. PMP/AB2 (Paris, France)

13. The PMP/AB2 significantly increased the applicability of the PMP/AB to global aquaculture by including the participation of experts from the highly important seaweed production sector. The recent developments in various aquaculture sectors, aquaculture biosecurity and ongoing (or future) work being done in the aquatic animal health field were highlighted.

14. The main background document describing the four stages of the PMP/AB was presented and served as a basis of great discussion to provide clarity on the pathway’s approach and the supporting tools that would be required. The approach (including stage descriptions) and objectives of the PMP/AB need to be better defined and revised. Technical aspects of the PMP/AB (i.e. guidance documents, glossary, training, self-assessment tool) will need to be developed. It was agreed that the PMP/AB will be applicable to improve biosecurity for all forms of aquaculture production – small-holders to large enterprises; local to international traders.

15. The feedback received from stakeholders will lead to a more detailed development of the principles and methods of application of the PMP/AB and the benefits that are likely to result from its adoption.

16. Overall perspectives and general recommendations arising from the PMP/AB2 include the following:
   - Systematic, risk-based approach for the PMP/AB to focus on key drivers and biosecurity vulnerabilities.
   - PMP/AB development to include seaweed, a major aquatic food producing sector.
   - PMP/AB assessment process to involve a third party or international body.
   - PMP/AB implementation to be flexible and conducted as a joint effort (sector, national, and enterprise levels).
   - FAO to coordinate and lead the PMP/AB pilot phase.
   - Incentives for participation to be ongoing to sustain efforts and identified at both the national and enterprise levels.
   - PMP/AB projects and funding to be long-term.
   - Training for the PMP/AB to target the international, national and farm levels, with training of trainers.
2.2. **TWG1 (Rome, Italy)**

17. The TWG1 meeting addressed all the questions and issues raised by participants in the PMP/AB1 and PMP/AB2 consultations. The meeting resulted in improved clarity of the objectives and approach of the PMP/AB, and highlighted the steps needed to further its development.

18. It was determined that the PMP/AB is a *pathway* that builds on existing *frameworks*, supported by appropriate *tools* (via the “PMP/AB toolkit”). The PMP/AB focuses on aquaculture biosecurity, which includes health management and reduction of antimicrobial resistance (AMR). The PMP/AB will not directly focus on food safety; however, it will promote sustainable aquaculture production through good husbandry practices, improved environmental practices, and prudent treatment or antimicrobial use.

19. The overall objective of the PMP/AB was defined as enhancing aquaculture biosecurity capacity by building on: (i) existing frameworks, capacity and appropriate tools; (ii) using risk-based approaches; and (iii) forming public-private partnerships. The PMP/AB should result in: (1) sustainable reduction of global burden of disease; (2) improvement of health at the farm and national levels; (3) minimization of global spread of diseases; (4) optimization socio-economic benefits from aquaculture; (5) attraction of investment opportunities into aquaculture; and (6) achievement of One Health goals.

20. The recommendations arising from the TWG1 include the following:

- Create PMP/AB implementation guidelines.
- Revise PMP/AB stage description and indicators document based on round-table discussions.
- Prioritise development of PMP/AB guidance documents and/or training courses to support implementation in pilot countries.
- Organise technical consultations with governments and relevant stakeholders to reach consensus and report on the outcomes of the PMP/AB pilot tests.
- Build partnerships for resource mobilization to support PMP/AB implementation.

2.3. **Roundtable Discussions on Aquaculture Biosecurity (Washington, D.C.)**

21. The *Roundtable Discussions on Aquaculture Biosecurity* included several agenda items related to the further advancement of the PMP/AB. These include:

(i) finalizing the contents of the proposed review paper on aquatic animal disease emergence in aquaculture and the next steps towards its completion;
(ii) finalizing the indicators/self-assessment checklist/requirements for rolling out of the PMP/AB;
(iii) discussing PMP/AB governance; and
(iv) understanding what “certification schemes for aquatic animal health professionals” are available, their objectives and processes and discussing what options are useful and appropriate in terms of addressing requests for a similar scheme from FAO members.

22. The results of these discussions are presented below, organized by objective.

2.3.1. **Factors, drivers and pathways to aquatic animal disease emergence in aquaculture**

23. Building on the discussions and recommendations made during the PMP/AB1, PMP/AB2 and TWG1, the experts discussed the preparation of a review paper, to be part of the PMP/AB toolkit, that would summarize the factors, drivers and pathways to aquatic animal disease emergence in aquaculture.
There are many known drivers, factors and pathways to aquatic animal disease emergence, which can be categorized into four major areas: (i) trade in and movement of live aquatic animals and products; (ii) knowledge of pathogens and their hosts; (iii) aquatic animal health management; and (iv) ecosystem changes (FAO, 2019b).

To organize the paper, the participants agreed upon a causal diagram of disease emergence in aquaculture (see Figure 1). The diagram highlights the exposure pathways for the introduction of a new or exotic disease into farms and the various stress-related factors leading to the increased impact of diseases that are already present (endemic diseases). Potential exposure pathways in farmed aquatic animal populations include the introduction of internationally imported live aquatic animals, seed, or their products; new pathogen emergence (e.g. mutation) on farms; risky husbandry practices (e.g. using live feed that has not been health-certified); and contact with infected wild populations. Stress-related factors that may increase the impact of endemic diseases in aquaculture include changes in management practices (e.g. increased stocking density); poor water quality; rearing species outside of their optimal or native range; selecting species strains for growth over disease resistance; weather events or changes in water temperature (due to climate change); and a stress-induced increase in pathogen virulence. These pathways and/or stress-related factors may lead to the outbreak of an emerging disease in aquaculture. The consequences of an emerging disease are dependent on the time of detection and effectiveness of response to the disease, which rely on sufficient capacities in surveillance, diagnostics, institutional coordination, research infrastructure, biosecurity, and disease control measures. The various topics highlighted in Figure 1 are expected to be addressed as major sections of the review paper, with possible contributors to the document’s preparation to be identified during a future meeting of the TWG.

Figure 1. Pathways, factors and/or drivers for disease emergence in aquaculture.
2.3.2. PMP/AB draft stage descriptions, checklist and indicators

25. As a follow-up to the initial draft version of the PMP/AB Stage Descriptions document that was presented and reviewed at the PMP/AB2, Drs Brett MacKinnon and Melissa McLaws presented a revised draft of the PMP/AB Stage Descriptions to the group, including the PMP/AB stage indicators and self-assessment checklist. The experts then discussed the documents and made the following recommendations, which will be addressed in a subsequent revision of the PMP/AB document:

- Draft national aquatic pathogen list (NAPL) to be enhanced in PMP/AB Stage 2 and reviewed/updated in Stages 3 and 4.
- Stage requirements for farm and country-level contingency plans to be determined.
- Requirements for laboratory certification (national reference laboratory?) to be included.
- Diagnostic capabilities to be in place by Stage 3, with qualified aquatic animal health professionals for the diagnosis of priority pathogens and response to emerging or exotic diseases.
- PMP/AB Stage 3 to include enhanced research capabilities, including the development or approval of vaccines/treatment options in addition to antimicrobials and chemicals.
- The requirement for an environmental impact assessment to be removed or revised in Stage 3.
- Formation of the public-private PMP/AB taskforce to involve contact between farmers, government and aquaculture biosecurity experts.
- The OIE Tool for the Evaluation of the Performance of Veterinary Services and/or Aquatic Animal Health Services (PVS Tool-Aquatic) to be used to assess the performance of veterinary/aquatic animal health services. The level of training required to be “adequately trained” to be more clearly specified.
- PMP/AB Stage 1 to require a diagnostic laboratory with microscope and bacteriological capabilities. Stage 1 to include the requirement of an existing laboratory and Stage 2 to require enhancement of laboratory capacity. Manager of the diagnostic laboratory to be identified in Stage 1.
- Stage 4 checklist to be separate from Stages 1–3, since it is the ongoing maintenance of all activities. Stage 4 to include a time-period for reassessment to ensure the country still remains in the stage (i.e. every 5 years).
- Guidelines for sustaining all activities to be included for Stage 4.
- “Gateway Pass” at the end of each Stage brings all outcomes together to summarize everything.

2.3.3. PMP/AB governance

26. The round-table discussion on PMP/AB governance began with a presentation by Dr Melissa McLaws on the governance of other FAO stepwise approaches/pathways (i.e. the Progressive Control Pathway for Foot and Mouth Disease, PCP-FMD), because a similar mechanism for the PMP/AB may potentially be used. These FAO initiatives include:

- **FMD**: PCP-FMD. The Global Framework for the Progressive Control of Transboundary Animal Diseases (GF-TADS) is a governing body, under which FAO and OIE have a joint working group.
- **Rabies**: Stepwise Approach towards Rabies Elimination (SARE). SARE is governed by a non-governmental organization (NGO), the Global Alliance for Rabies Control (GARC). This tool was developed by experts; contributors include international organizations (FAO, the World Health Organization (WHO), OIE), governments, universities and industry (vaccine producers). Regional networks are using the SARE tool to self-assess the status of the rabies prevention and control programmes in each country, as well as to identify gaps and challenges. GARC acts as secretariat.
- **African trypanosomiasis**: The PCP for African animal trypanosomiasis is led by FAO, with several partnerships at the institutional, technical and scientific levels and consultation with OIE and WHO. To move from one stage to the next, a set of minimum requirements must be
met and a detailed plan to be implemented in the following stages must be prepared. Independent validation is required.

27. The main objectives of PMP/AB governance with recommendations towards achieving each were listed as follows:

1. **Provide technical expertise for pathway development**
   - Led by FAO, partnership with others including OIE.
   - OIE to potentially provide an advisory role and resources that are complementary (i.e. PVS Tool-Aquatic).
   - Pilot the PMP/AB with a mechanism for feedback.

2. **Review self-assessment of Stage progression**
   - FAO can have technical guidelines for the PMP/AB self-assessment review process and facilitate a committee to review the self-assessment in a standardized process (with technical leadership). FAO to include qualified people from each region (geographical representation) to help with this review.
   - Peer-review process of PMP/AB Stage progression by leaders of other countries.
   - The PMP/AB to have living guidance that changes over time once the programme is piloted. Mechanisms to collect feedback and incorporate revisions to be used.
   - FAO can partner with other global aquaculture groups (i.e. Global Aquaculture Alliance, GAA).
   - PMP/AB can have an application fee for certification to pay for the board to certify/review self-assessment.

3. **Regional networks, meetings to share experiences/challenges, peer-review**
   - The Network of Aquaculture Centres in Asia-Pacific (NACA) or other networks/organizations can incorporate reporting of the PMP/AB progress or results in their meetings.

2.3.4. **Aquatic animal health training**

28. Dr Mark Lawrence led the round-table discussion on pre-existing aquatic animal health certification and training programmes that may be used by countries to progress through the PMP/AB stages.

29. Several questions were posed to facilitate the discussion:
   1. What do countries that are requesting guidance on certification schemes need?
   2. What level of competencies do they need?
   3. What do they need to be authorized to do?
   4. What do countries want?

30. The following is a list of competencies/technical services that should be required by certified aquatic animal health practitioners:
   - Disease diagnostics
   - Prescribing drugs
   - Signing health certificates
   - Conducting investigation of disease or mortality events
   - Providing training or capacity/skills development on aquatic animal health or aquaculture biosecurity
   - Providing advice on biosecurity action plans
31. The following are recommendations for FAO to facilitate aquatic animal health certification:

- Third-party certification process for countries (e.g. based on the OIE PVS Tool-Aquatic?).
- Third-party evaluation for private industry, with no requirement to share results.
- Pre-existing training modules to supplement aquatic animal health certifications (i.e. University of Wisconsin Basic Fish Health Medicine course or future courses developed by FAO).

32. There are many aquatic animal health certification programmes/schemes available. Further discussion on this should occur in future TWG meetings. Existing certification programmes/schemes include the following (see Annex 5 for further details on each):

- **The American Fisheries Society (AFS) – Fish Health Section (FHS) fish pathologist and aquatic animal health inspector certification.** They both require passing an examination, and there is a five-year renewal to show that you are still active and have completed continuing education. Fish health inspector certification recognizes trained individuals who possess the technical skills, knowledge and experience to conduct surveillance testing and/or health inspections of aquatic animal populations for specific aquatic animal pathogens regulated by domestic and foreign agencies, according to high ethical standards. Fish pathology certification recognizes expertise in aquatic animal health science and diagnostics.
  - The exam is cold-water species oriented and thus may not be useful within the international context.
  - Dr Lawrence reviews applications submitted and chairs the committee.
  - AFS membership is required, which is not cheap and may not be possible for aquatic animal health practitioners from many countries.
  - The Asian Fisheries Society does not have a similar certification programme.

- **The World Aquatic Veterinary Medical Association (WAVMA) certified aquatic veterinarian (CertAqV) program** seeks to identify the core competency areas or subject matter needed to practice aquatic veterinary medicine, and to recognize those veterinarians that have acquired the necessary knowledge, skills and experience through a variety of sources. To be credentialed by WAVMA as a Certified Aquatic Veterinarian and utilize the CertAqV honorific, individuals must be a WAVMA member, have a veterinary degree from a nationally recognized veterinary school, college or university and have demonstrated general knowledge and competency in core subject areas that are currently considered necessary to practice aquatic veterinary medicine.
  - As WAVMA certification is purely for highly trained veterinarians, this model is not very useful for us in creating a hybridized certification scheme that has the potential for success in countries with different aquaculture industries, levels of education, and opportunities for education.

- **People’s Republic of China: aquatic animal health practitioner certification.** Objectives include recognizing expertise, comprehensive knowledge and clinical skills in the diagnosis, prevention, control and eradication of major aquatic animal diseases, following the relevant regulations and laws on aquatic animal health. Aquatic animal health professionals in P. R. China do not need to be veterinarians. They are required to be biologists with special training in aquatic animal health and are authorized to diagnose, prescribe treatments, sign health certificates etc. A veterinarian in P. R. China cannot treat aquatic animals without training/education in aquatic animal health and aquaculture. There are both private and government aquatic veterinarians: Practicing Veterinarian for Aquatic Animals (PVAA) (private), Assistant Practicing Veterinarians for Aquatic Animals (APVAA) (private), Registered Village Veterinarian for Aquatic Animals (not certified) and Official Veterinarians (government).

- **Norway: aqua medicine biologist certification.** The objectives of this certification programme include addressing the high demand for experts in aquatic animal health (i.e. to
supply the required number of veterinarians). An academic degree (5-years long) at the University of Bergen and University of Tromsø is authorized by the Norwegian Food Safety Authority. Any person wishing to practice as a veterinarian, an aqua medicine biologist or a veterinary nurse in Norway must be authorized by or hold a license issued by the Norwegian Food Safety Authority.

- **Thailand: aquatic animal health certification.** The process for aquatic animal health certification in Thailand is shifting to be similar to that in the United States of America and Canada. A veterinary degree takes six years and includes courses related to aquatic animal medicine. Upon graduation, veterinarians have the option to gain further experience and specialization in aquatic animal health (no formal training is required).

33. The following general comments were made on aquatic animal health training and/or certification during the round-table discussion:

34. For countries with no training or educational capacity, links/sources of training courses and education can be provided, or modules created.

35. There should be an option whereby non-veterinarians with training and background education in aquatic animal health management and aquaculture can be certified/authorized to work (i.e. as in China).

36. A self-assessment questionnaire (i.e. the OIE PVS Tool-Aquatic or the FAO self-assessment survey) could be used to determine what type of aquatic animal health certification scheme and/or training should be used.

37. The FAO self-assessments have been done by 80 countries (coordinated by Drs Melba Reantaso and Richard Arthur). This questionnaire could be included as a tool for the PMP/AB to assess the current national situation in PMP/AB Stage 1.

38. Drs Larry Hansen and Mark Lawrence have spoken with AFS about the potential for collaboration with another professional organization to develop a more general examination or even a regionally specific certification scheme and examination for countries.

39. Models options: P.R. China (more control to non-veterinarians); the United States of America (control to veterinarians; limited control to non-veterinarians); Norway (similar to the United States of America, but a bit more in the middle).

40. Usually what can drive things is having one or two implementers with pilot countries/test cases; Dr Lawrence can facilitate this with the committee.

- Qualified fish health experts can create region-specific examinations.
- The AFS-FHS Blue Book may be useful.
- Possible partners include the World Aquaculture Society (WAS), which has a new African chapter. Countries where competent authorities are only veterinarians with no aquatic animal health experience run into problems; thus, communication and coordination between veterinarians and fisheries/competent authorities needs to be at a high level.

3. **RESULTS OF THE COFI SUB-COMMITTEE ON AQUACULTURE**

41. As recommended in the PMP/AB2, the PMP/AB was an agenda item at the Tenth Session of the COFI Sub-Committee on Aquaculture in Trondheim, Norway (23–27 August 2019) (FAO, 2019b). The PMP/AB was presented, and its concept, principles and benefits were described. A multidonor
assisted, long-term programme towards improving aquaculture biosecurity at all levels was proposed, consisting of five major pillars:

i. Strengthening disease prevention at farm level through responsible fish farming (including reducing antimicrobial resistance (AMR) in aquaculture and application of suitable alternatives to antimicrobials) and other science-based and technology-proven measures;

ii. Improving aquaculture biosecurity governance through implementing the PMP/AB, enhancing interpretation and implementation of international standards and strengthening the One Health approach by bringing together state and non-state (producers and value chain stakeholders) actors, international and regional organizations, research, academe, donor and financial institutions to design and implement mandated biosecurity measures;

iii. Expanding understanding of aquaculture health economics (burden and investments);

iv. Enhancing emergency preparedness (early warning and forecasting tools, early detection, early response) at all levels; and

v. Actively supporting pillars 1-4 with several cross-cutting issues (e.g. capacity and competence development, disease intelligence and risk communication, education and extension, targeted research and development and innovation).

42. The Sub-Committee formally endorsed the development of a multidonor-assisted long-term programme towards improving aquaculture biosecurity, including its five pillars, as a component of a global aquaculture programme (FAO, 2019c). With this endorsement, the FAO now has a mandate to implement the PMP/AB programme.

4. CONCLUSIONS AND THE WAY FORWARD

43. The PMP/AB2 resulted in further consensus that the PMP/AB can be a way forward to addressing biosecurity challenges in aquaculture. The feedback received from stakeholders during the consultation led to a better understanding of the principles, application and benefits of the PMP/AB. Building upon what was learned, TWG1 further developed the pathway and its supporting tools, which included clearly defining the approach and objectives, and highlighted the steps needed for implementation.

44. The Roundtable Discussions on Aquaculture Biosecurity, highlighted how aquatic animal disease emergence in aquaculture is an important aspect of the PMP/AB. Guidance on this will be incorporated as part of the PMP/AB toolkit in the future. Other important products of the roundtable discussions were the revision of the PMP/AB draft stage descriptions, indicators and self-assessment checklist, based on comments and recommendations of the participants. Governance of the PMP/AB was discussed and may be based on a similar mechanism used by other FAO stepwise approaches. The potential need for a certification scheme for aquatic animal health professionals was also a large topic of discussion. A certification scheme will assist with capacity building of veterinary and/or aquatic animal health professional services in a country and ensure that there is consistency with expertise. Future discussions will be needed to determine the application of governance and aquatic animal health certification.

45. The Tenth Session of the Committee on Fisheries (COFI) Sub-Committee on Aquaculture endorsed the PMP/AB and the development of a multidonor-assisted, long-term aquaculture biosecurity component of an aquaculture programme, including its five pillars. Therefore, the FAO, through its Fisheries Division, now has a mandate for the further development and implementation of the PMP/AB.

46. Actions required to further the development and implementation of the PMP/AB are:

- Continue developing the PMP/AB and its supporting tools, including, for example:
  - Risk analysis courses
  - An aquatic animal bacterial diseases diagnosis and treatment manual
  - A diagnostic guide for aquatic animal diseases
  - An introduction to aquatic epidemiology and surveillance course
- a 12-point checklist for aquatic animal disease surveillance
- case studies to understand disease burden (aquaculture health economics)
- a PMP/AB training course
- emergency preparedness guidance

- Establish an official PMP/AB Technical Working Group (TWG), based on clear terms of reference and criteria for selecting members.
  - Convene an introductory TWG meeting in 2020 to develop a clear work plan towards implementing the PMP/AB including technical guidance/tools that will support PMP/AB Stages 1–4.
- Pilot the PMP/AB in several participating countries over the next year or so, including:
  - countries where proponents are involved in PMP/AB development.
  - countries where proponents have not been involved; this will require capacity building and thorough training on the PMP/AB.
- Organize a “Collaboration Meeting” to bring together fisheries and aquaculture authorities and veterinary services, whose objective is to share information on respective mandates, provide updates on the PMP/AB and create functional linkages towards sharing responsibilities for addressing aquaculture biosecurity especially at the national level.

5. REFERENCES


# ANNEX 1

**Roundtable discussions on aquaculture biosecurity: draft programme, list of participants, and group photographs**

FAO Liaison Office for North America, Washington D.C.

22–26 July 2019

## A. Programme

<table>
<thead>
<tr>
<th>Date/time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 July (Sun)</td>
<td>Arrival of participants</td>
</tr>
<tr>
<td><strong>Day 1: 22 July (Mon)</strong></td>
<td></td>
</tr>
<tr>
<td>9.00-9.30</td>
<td>Welcome</td>
</tr>
<tr>
<td></td>
<td>Self-introduction of participants and group photo</td>
</tr>
<tr>
<td></td>
<td>Introduction of agenda (J.R. Arthur on behalf of M. Reantaso)</td>
</tr>
<tr>
<td>9.30–16.30</td>
<td><strong>Roundtable discussion:</strong> Factors, drivers and pathways to aquatic animal disease emergence in aquaculture</td>
</tr>
<tr>
<td></td>
<td><strong>Lead:</strong> J.R. Arthur, M. Lawrence</td>
</tr>
<tr>
<td></td>
<td><strong>Objective:</strong> To finalize the contents of the proposed review paper on aquatic animal disease emergence in aquaculture and the next steps for completing the review paper.</td>
</tr>
<tr>
<td></td>
<td>- Discuss the 4 major categories and the issues/consideration under each category (see Annex 1)</td>
</tr>
<tr>
<td></td>
<td>- Based on individual expertise, identify who will write the narrative for each of the issues. The narrative should elaborate on why such issue is a factor/driver/pathway to aquatic animal disease emergence in aquaculture and supported by concrete example/s.</td>
</tr>
<tr>
<td></td>
<td>- Based on expert knowledge, identify other contributors who may be more knowledgeable on other issues.</td>
</tr>
<tr>
<td></td>
<td>- The next steps (timeline and responsibilities)</td>
</tr>
<tr>
<td>10.00–10.20</td>
<td>Morning coffee</td>
</tr>
<tr>
<td>12.00–13.00</td>
<td>Lunch</td>
</tr>
<tr>
<td>14.50–15.10</td>
<td>Afternoon coffee</td>
</tr>
<tr>
<td>16.45–17.00</td>
<td>Wrap up and Day 2 schedule</td>
</tr>
<tr>
<td><strong>Participants</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Canada/CFIA:</strong></td>
<td>J.R. Arthur, B. MacKinnon, M. McLaws</td>
</tr>
<tr>
<td><strong>B H. Bin, O. Elhassan; FAOLOW:</strong></td>
<td>F. Doerr</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day 2: 23 July (Tues)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8.30–8.35</td>
<td>Tasks for Day 2</td>
</tr>
<tr>
<td>8.35–12.00</td>
<td><strong>Roundtable discussion:</strong> Factors, drivers and pathways to aquatic animal disease emergence in aquaculture (continued)</td>
</tr>
<tr>
<td>9.40–10.00</td>
<td>Morning coffee</td>
</tr>
<tr>
<td>12.00–13.00</td>
<td>Lunch</td>
</tr>
<tr>
<td>13.00–13.30</td>
<td>Travel to US Congressional Briefing venue</td>
</tr>
<tr>
<td>13.30–15.00</td>
<td><strong>US Congressional Briefing:</strong> Antimicrobial Resistance in Aquaculture</td>
</tr>
<tr>
<td><strong>Lead:</strong> M. Lawrence, F. Doerr</td>
<td></td>
</tr>
<tr>
<td><strong>Participants</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Canada/CFIA:</strong></td>
<td>J.R. Arthur, B. MacKinnon, M. McLaws</td>
</tr>
<tr>
<td><strong>China/NACA:</strong></td>
<td>J. Huang</td>
</tr>
<tr>
<td><strong>USA/MSU:</strong></td>
<td>M. Lawrence, L. Hanson, P. Gaunt, S. Aarattuthodiyl</td>
</tr>
<tr>
<td><strong>FAOHQ:</strong></td>
<td>H. Bin, O. Elhassan; FAOLOW; F. Doerr</td>
</tr>
</tbody>
</table>
Day 3: 24 July (Wed)

8.30–8.35  Tasks for Day 3

**Roundtable discussion:** PMP/AB Toolkit  
**Lead:** M. McLaws, B. MacKinnon

**Objective:** To finalize two PMP/AB toolkits, namely: (1) Indicators/self-assessment checklist/requirements for rolling out of PMP/AB; and (2) PMP/AB governance

- Review and finalize the indicators/self-assessment checklist discussed during the 2nd PMP/AB consultation (Jan 2019, Paris) taking into consideration the final discussions in Rome (March 2019) in terms of definition of PMP/AB and the issues/considerations in each of the final 4 Stages  
- PMP ppt for DC meeting (separate attachment)
- Further discussion on PMP/AB governance based on initial discussions in Washington DC (April 2018); use as reference the Washington DC PMP/AB 1 report  
- The next steps (timeline and responsibilities)

Additional relevant documents to be provided by B. MacKinnon/M. McLaws

8.35–16.45

9.40–10.00  Morning coffee
12.00–13.15  Lunch
14.50–15.10  Afternoon coffee
16.45–17.00  Wrap up and Day 4 schedule

Participants

**Canada/CFIA:** J.R. Arthur, B. MacKinnon, M. McLaws  
**China/NACA:** J. Huang  
**USA/MSU:** M. Lawrence, L. Hanson, P. Gaunt, G. Kumar  
**FAO/HQ:** H. Bin, O. Elhassan; **FAOLLOW:** F. Doerr

Day 4: 25 July (Thurs)

8.30–8.35  Tasks for Day 4

**Roundtable discussion:** Aquaculture health economics  
**Lead:** G. Kumar

**Objective:** To understand the need for assessing the socio-economic impacts of diseases in aquaculture and future engagement with the Global Burden of Animal Health (GBAD)

- Familiarize with the objectives and scope of GBAD
- What data/information available on socio-economic impacts of aquatic animal diseases
- How can the FAO consultation (November 2019, Rome) on emergency response to aquatic animal disease emergencies contribute to generating information/data on costs of response actions and their impacts
- Discuss the way forward towards including aquaculture health economics in the GBAD
- The next steps (Timeline and responsibilities)

9.40–10.00  Morning coffee
12.00–13.15  Lunch
14.50–15.10  Afternoon coffee
<table>
<thead>
<tr>
<th>Date/time</th>
<th>Activity</th>
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</thead>
<tbody>
<tr>
<td>16.45–17.00</td>
<td>Wrap up and Day 5 schedule</td>
</tr>
<tr>
<td>Participants</td>
<td><strong>Participants</strong></td>
</tr>
<tr>
<td></td>
<td>Canada/CFIA: J.R. Arthur, B. MacKinnon</td>
</tr>
<tr>
<td></td>
<td>China/NACA: J. Huang</td>
</tr>
<tr>
<td></td>
<td>USA/MSU: M. Lawrence, G. Kumar, L. Hanson</td>
</tr>
<tr>
<td></td>
<td>FAO: H. Bin, O. Elhassan; FAOLOW: D. Florian</td>
</tr>
</tbody>
</table>

**Day 5: 26 July (Fri)**

| 8.30–8.35   | Tasks for Day 5                              |
|            | **Roundtable discussion:** Certification scheme of aquatic animal health practitioners/professionals |
|            | **Lead:** J.R. Arthur, M. Lawrence, L. Hanson |
|            | **Objectives:** To understand what “certification schemes for aquatic animal health (AAH) professionals”, are available, their objectives and processes and discuss what is useful/appropriate or what options are available in terms of addressing requests for a similar scheme from FAO members. |
|            | **Background:** It is recognized that because of the diversity of the aquaculture sector in terms of species, systems, environment and management in addition to the complexity of the water quality parameters that are need to be maintained for a successful farming/ husbandry, addressing aquatic animal health/aquaculture biosecurity (which represents the biggest challenge in sustainable aquaculture) needs a combination of skills that include strong knowledge of aquaculture and health management. |
| 8.35–16.15 | It is also well known that there are groups of professionals involved in providing AAH/AB services to the sector. Such groups have different approaches and possess different skill sets. A good certification scheme should enable the development of the required competence (conceptual level, field and laboratory as well as research skills) that will enable a “certified professional” to provide a range of technical services that may include, but not limited to the following: (i) disease diagnosis; (ii) signing of health certificates; (iii) conducting investigation of disease or mortality events; (iv) providing training or capacity/skills development on AAH/AB; (v) providing advice on biosecurity action plans; etc. |
|            | The range of technical skills that a “certified professional” can offer will provide opportunity for the government and aquaculture stakeholders options to select the appropriate “certified professionals” that can deliver the best service that is needed by the sector. |
| 9.40–10.00  | Morning coffee                               |
| 12.00–13.00 | Lunch                                        |
| 14.50–15.10 | Afternoon coffee                             |
| 16.15–17.00 | Conclusions and next steps                   |

**Participants**

| Canada/CFIA: J.R. Arthur, B. MacKinnon |
| China/NACA: J. Jie                     |
| USA/MSU: M. Lawrence, L. Hanson (halfday) |
| FAO: H. Bin, O. Elhassan; FAOLOW: D. Florian |
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FAO  
Viale delle Terme di Caracalla  
Rome 00153, Italy
C. Group photographs


Group photo of US Congressional Briefing on AMR in Aquaculture during the FAO Roundtable Discussions on Aquaculture Biosecurity, held at the U.S. Senate, Washington D.C., United States of America, 23 July 2019.

Certification schemes for aquatic animal health practitioners

1. AMERICAN FISHERIES SOCIETY (AFS) – FISH HEALTH SECTION (FISH HEALTH INSPECTOR)

1.1. Title of certification scheme: Fish Health Inspector

1.2. Originator of certification scheme (e.g. the government, professional organizations, specialist groups, etc.) and start date of scheme: Professional organization – American Fisheries Society-Fish Health Section. Since late 1980s.

1.3. Purpose and short description: Recognize trained individuals who possess the technical skills, knowledge and experience to conduct surveillance testing and/or health inspections of aquatic animal populations for specific aquatic animal pathogens regulated by domestic and foreign agencies, according to high ethical standards.

1.4. Application process (mentorship, written exam, oral interview, etc.) and certification requirements (academic qualifications and level; number of years of field experience; certified trainings; professional licenses) including supporting documents:

A. Basic academic education (either No. 1 or No. 2 below)
   1. Bachelor’s degree (or higher degree) from an accredited university with a major or minor in biological science and/or wildlife and fisheries with the following academic/experience requirements; a. Minimum of thirty (30) quarter or twenty (20) semester hours of college level courses, including microbiology, parasitology, virology and molecular biology, or five (5) years experience in an occupation routinely using microbiological methods or a combination of both totalling thirty (30) quarter or twenty (20) semester hours when six (6) quarter or four (4) semester hours are allowed per year of work.

   2. Doctoral degree in veterinary medicine with a minimum of 30 Continuing Education hours in subjects related to aquatic animal health, such as sampling, new pathogen detection, and bio-legal and regulatory-related subjects.

B. Professional work experience
   1. Definition: Conduct or direct supervision of aquatic animal health inspections and surveillance testing. An aquatic health inspection involves the examination and testing of cultured or wild aquatic animal populations, using methods approved by the Fish Health Section of the American Fisheries Society or as specified by legally authorized regulatory agencies, to determine the presence or absence of specific pathogens. This may include travel to field sites, collection of samples, laboratory testing of samples, report writing, as well as the training and/or supervision of others to conduct these activities.

   2. Requirements a. At least ten (10) percent of the applicant’s professional duties, during the year preceding application and at the time of application, should be involved in aquatic animal health inspection and/or surveillance testing. This work experience is in addition to any work experience mentioned.

C. Letters of Recommendation 1. A total of three letters of recommendation must be submitted directly to the Professional Standards Committee Executive Secretary, to include the applicant’s supervisor, at least one certified Aquatic Animal Health Inspector or Fish Pathologist (http://www.fisheries.org/units/fhs/certific.htm) who is familiar with the applicant and his/her work, and one additional aquatic animal health professional.
D. All applicants, who have fulfilled the qualification requirements stated in A through C above shall be required to take a written examination administered by a member of the Professional Standards Committee or an agent appointed by the Committee. The examination will cover topics surrounding the proper conduct of aquatic animal health inspections as specified in Section 2 (Standard procedures for aquatic animal health inspections) of the most recent version of the AFS-FHS Blue Book: suggested procedures for the detection and identification of certain finfish and shellfish pathogens and the OIE Manual of Diagnostic Tests for Aquatic Animals. A list of additional study material is provided below. A minimum score of 70% will be required to pass the written examination.

1.5. Authorizations (tasks that they are allowed/authorized to do) of a certified aquatic animal health practitioner (e.g. performing diagnoses; signing fish health certificates; prescribing and/or administering drugs; investigating disease outbreaks; inspecting premises; preparing diagnostic reports; conducting surveillance; etc.): Sampling, performing diagnostics, preparing diagnostic reports.

1.6. What entities recognize the validity of the scheme (e.g. competent authorities (federal and/or state); professional organizations; scientific community; producer organizations) and how long is certification valid: Federal (USFWL), State, producer organizations, 5 years. Renewal requires 2 letters of reference (1 from supervisor and another professional in the discipline) attesting to ethics and continued activity in aquatic animal health diagnostics. Applicant must maintain at least 10% activity in aquatic animal diagnostic activity, be a member of the AFS and have taken 60 hours of continuing education activities in aquatic animal health in the past 5 years.

1.7. Current status and number of certified aquatic animal health practitioners as of 2019: 33

1.8. “Call for Information” document prepared by: Larry Hanson

1.9. Links for further information (websites; documents; etc.)
https://units.fisheries.org/fhs/certification/aquatic-animal-health-inspector/

2. AMERICAN FISHERIES SOCIETY (AFS) – FISH HEALTH SECTION (FISH PATHOLOGIST)

2.1. Title of certification scheme: Fish Pathologist

2.2. Originator of certification scheme (e.g. the government, professional organizations, specialist groups, etc.) and start date of scheme: Professional organization – American Fisheries Society-Fish Health Section. Since late 1980s.

2.3. Purpose and short description: Recognize expertise in aquatic animal health science and diagnostics.

2.4. Application process (mentorship, written exam, oral interview, etc.) and certification requirements (academic qualifications and level; number of years of field experience; certified trainings; professional licenses) including supporting documents:

A. Basic academic education

1. Bachelor's Degree, or advanced degree, in a biological science from an accredited college or university. Applicant must provide documentation of degree earned.

2. A minimum of 12 quarter or 8 semester hours of fisheries courses at an accredited college or university. Course work must include fish anatomy and physiology (laboratory required), ichthyology or fish biology, and fish culture.
B. Specialized training

1. Fish Health: A minimum of 5 quarter or 3 semester hours at an accredited college or university; or 100 lecture hours at a Professional Standards Committee approved or accredited training center. Laboratory required. Credit may be calculated on the basis of 3 quarter hours or 2 semester hours earned for each 40 hours of formal lecture-laboratory training. (NOTE: Each hour of laboratory training counts as 1/2 hour for calculation purposes.) Applicant must submit certified transcripts and document course content.

2. Academic Science: The applicant must have taken a minimum of 29 semester hours or 40 quarter hours in the following general course areas at an accredited college or university.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Lab Required?</th>
<th>Minimum Hours:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pathogenic Bacteriology</td>
<td>Yes</td>
<td>3 (4)</td>
</tr>
<tr>
<td>Parasitology</td>
<td>Yes</td>
<td>3 (4)</td>
</tr>
<tr>
<td>Virology</td>
<td>Yes</td>
<td>3 (4)</td>
</tr>
<tr>
<td>Immunology</td>
<td>Yes</td>
<td>3 (4)</td>
</tr>
<tr>
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<tr>
<td>Nutrition</td>
<td>No</td>
<td>2 (3)</td>
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<tr>
<td>Biochemistry</td>
<td>No</td>
<td>4 (6)</td>
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<tr>
<td>Vertebrate Physiology</td>
<td>Yes</td>
<td>3 (4)</td>
</tr>
<tr>
<td>Pharmacology</td>
<td>No</td>
<td>3 (4)</td>
</tr>
<tr>
<td>Water Quality/Pollution Biology/Limnology</td>
<td>No</td>
<td>2 (3)</td>
</tr>
</tbody>
</table>

C. Stipulations and Considerations

1. A grade of "C" or greater is required in all course work. Courses taken "Pass/Fail" are not acceptable.

2. Academic science requirements 1 through 9 (III.,B.,2.) are considered satisfied by graduates of accredited veterinary schools.

3. College accredited or Professional Standards Committee approved correspondence or training courses may be used to fulfill fisheries (III.,A.,2.) and academic science (III.,B.,2.) course requirements.

D. Professional work experience

1. Definition: Full-time fish health work experience is defined as a minimum of 75% of the applicant's professional work time during a 12-month period engaged in fish health activities which may include: (1) disease diagnostics and control; (2) fish disease/health research; (3) fish disease/health instruction at the university level or its equivalent; or (4) administrative work directly related to fish disease diagnostics and control.

2. Requirement: The applicant must have a minimum of 3 years of professional level fulltime fish health work experience during the 5 years preceding application.

3. Restriction: Work experience gained prior to meeting the Basic Academic Education requirement III.,A.,1. (i.e., Bachelor’s Degree) does not qualify as professional work experience.
All other educational requirements (III.,A.,2., and III.,B.,1.& 2.) must be completed at least one year prior to applying for certification.

E. Work status at time of application

The applicant must be engaged in fish health activities at the minimum rate of 75% of the total work time.

F. The applicant must have 3 letters of support validating work quality, ethics and effort in aquatic animal health.

G. Applicant must pass an examination affirming knowledge in aquatic animal health.

2.5. Authorizations (tasks that they are allowed/authorized to do) of a certified AAH practitioner (e.g. performing diagnoses; signing fish health certificates; prescribing and/or administering drugs; investigating disease outbreaks; inspecting premises; preparing diagnostic reports; conducting surveillance; etc.): Recognized by state and federal government (USFWL) for inspections, investigating disease outbreaks, reporting and conducting surveillance.

2.6. What entities recognize the validity of the scheme (e.g. competent authorities (federal and/or state); professional organizations; scientific community; producer organizations) and how long is certification valid: Federal (USFWL), State, producer organizations, 5 years. Renewal requires 3 letters of reference from other professionals in the discipline attesting to ethics and continued activity in aquatic animal health activity. Applicant must maintain at least 50% activity in aquatic animal health activity, be a member of the AFS and have taken 100 hours of continuing education activities in aquatic animal health in the past 5 years.

2.7. Current status and number of certified aquatic animal health practitioners as of 2019: 28

2.8. “Call for Information” document prepared by: Larry Hanson

2.9. Links for further information (websites; documents; etc.): https://units.fisheries.org/fhs/certification/certified-fish-pathologist/

3. WORLD AQUATIC VETERINARY MEDICAL ASSOCIATION (WAVMA)

3.1. Title of certification scheme: Certified Aquatic Veterinarian (CertAqV)

3.2. Originator of certification scheme (e.g. the government, professional organizations, specialist groups, etc.) and start date of scheme: World Aquatic Veterinary Medical Association (WAVMA)

3.3. Purpose and short description: The WAVMA Aquatic Veterinarian Certification Program seeks to identify the core competency areas or subject matter needed to practice aquatic veterinary medicine, and to recognize those veterinarians that have acquired the necessary knowledge, skills and experience through a variety of sources.

3.4. Application process (mentorship, written exam, oral interview, etc.) and certification requirements (academic qualifications and level; number of years of field experience; certified trainings; professional licenses) including supporting documents: To be credentialed by WAVMA as a Certified Aquatic Veterinarian and utilize the CertAqV honorific, individuals must be a WAVMA member, have a veterinary degree from a nationally recognized veterinary school, college or university and have demonstrated general knowledge and competency in core subject areas noted below that are currently considered necessary to practice aquatic veterinary medicine. Students of a nationally recognized veterinary institution of higher education can register for the program, but will not be certified or entitled to utilize the CertAqV honorific until they graduate.
Individuals that desire to participate in the WAVMA CertAqV Credentialing Program are required to:

- Be a current member of the World Aquatic Veterinary Medical Association
- Register for the Program (application at www.wavma.org or contact the WAVMA Administrators).
- Identify a mentor to assist the registrant through the Program. The potential mentors would be any available WAVMA Certified Aquatic Veterinarians (see Appendix I).
- Provide the mentor with written evidence of satisfactory completion of each of the core Knowledge, Skills and Experience (KSE) subject areas.
- Petition the Credentialing Committee for recognition of completion of all KSE requirements after the mentor has approved the documentation.

Core Knowledge, Skills & Experience (KSE) Requirements:
In order to be certified as a WAVMA Certified Aquatic Veterinarian (CertAqV), applicants will need to demonstrate the Knowledge, Skills and Experience (KSE) using WAVMA approved programs or processes. The participating candidate’s KSE will include, but not be limited to the theory, clinical significance, and practical experience in the following areas that are unique to aquatic mammals, amphibians, reptiles, finfish, crustaceans, or molluscs. CertAqV candidates are required to be familiar with, and be able to, describe the normal and abnormal aspects of each specific subject that are encountered in general aquatic veterinary practice, and know where to locate additional information on the subject. Each specific area is assigned a minimum number of KSE credits needed in brackets [ ], for a total of at least 150 credits.

PRE-CLINICAL KSE:

1. Aquatic Environment and Life Support Systems [25 credits minimum] – Water quality includes all the physical, chemical and biological characteristics of water that regulate its suitability for the health of aquatic organisms and their ecosystem. Poor water quality is often the cause of morbidity and mortality in aquatic animals. Knowledge, skills and experience in this subject matter are critical for practicing aquatic veterinary medicine. Given the intimate relationship that aquatic organisms have with the surrounding environment, a candidate should demonstrate thorough understanding of this environment. Examples are:
   a. Chemical stressors and their effect on aquatic animal health/environment
   b. Physical stressors in the aquatic environment and their effect on aquatic animal health/environment. Including: stocking density, improper husbandry/life-support system, tank/pond design, inter/intra-species aggression, handling and transport
   c. Biological stressors in the aquatic environment and their effects on aquatic animal health
   d. Environmental factors that affect the development of disease

2. Taxonomy, Anatomy and Physiology [10 credits minimum] – Candidate should demonstrate knowledge, skills and experience necessary for the practice of aquatic veterinary medicine and surgery of the basic anatomy and physiology of major aquatic animal taxa. Examples are:
   a. Taxonomic relationship of aquatic Phyla
   b. Scientific and common names of significant aquatic animal species
   c. Anatomy and physiology of organ systems

3. Husbandry and Industries [25 credits minimum] – Candidate should demonstrate an understanding of the key industry sectors, economics, health issues and husbandry practices associated with the captive maintenance of aquatic animals (e.g., aquaculture, ornamental pet
trade, public aquaria exhibits) and with wild harvest of aquatic animals for food and pets. Examples are:

a. Aquaculture Industry – Food sector and Ornamental sector
b. Wild Harvest – Food and Ornamental Sectors
c. Public Aquaria and Zoo Aquatic Animal Exhibition
d. Conservation/Resource management captive breeding programs
e. Animal Handling Techniques
f. Animal Holding System Design and General Management
g. Collection, Transport, Acclimation
h. Biosecurity/Quarantine
i. Life-Support System Components, Function and Management
j. Water Quality Assessment and Interpretation
k. Nutrition and Feeding
l. Record Keeping and Standard Operating Procedures

CLINICAL KSE:

4. Pathobiology and Epidemiology of Aquatic Animal Diseases [25 credits minimum] – Candidate should demonstrate an understanding of environmental conditions and pathogens that cause diseases in aquatic animals, the pathological changes that occur in the animals, and the clinical signs of important aquatic animal diseases in order to determine the cause of the disease and the course of action or treatment, and assess the risk of contagion. Examples are:

a. Disease identification, prevention, control, treatment, eradication decisions.
b. Non-infectious diseases
c. Infectious diseases
d. Parasitic diseases
e. Epidemiology
f. Biosecurity, pathogen exclusion or containment methods

5. Diagnostics and Treatment of Aquatic Animal Diseases [25 credits minimum] – Candidate should demonstrate a good understanding of the diagnostic procedures and treatments, including fundamental theoretical knowledge, as well as practical experience with clinical and laboratory disease diagnosis and treatment of infectious diseases and pathological conditions. Examples are:

a. Principles of laboratory diagnosis
b. Principles of prophylaxis and disease control
c. Therapeutics, biologics, vaccines and other treatment approaches

6. Clinical Veterinary Experience and Client Communications [25 credits minimum] – Candidate should demonstrate competency with basic clinical procedures, diagnostic tools and techniques, and with client or industry communication. Examples are:

a. Clinical examination, including
b. Sedation/anesthesia
c. Basic imaging techniques
d. Basic surgical procedures
e. Common therapeutic approaches
f. General case management
g. Client communications with aquarists, aquaculture producer/farmers, wild animal collectors, facility managers, exporters/importers/wholesalers, retailers and hobbyist/pet owners.

7. Public Health, Zoonotics and Seafood Safety [5 credits minimum] – Candidate should demonstrate knowledge of aquatic zoonotic diseases pertinent to their field of practice. Candidate should also demonstrate understanding of the role of the veterinarian in public health
through education and knowledge of the food-chain and seafood safety methodology. Examples are:

a. The etiology, transmission, treatment and control of aquatic zoonotic diseases
b. Benefits and disadvantages of aquatic animals in public health
c. Food-chain practices and legislation pertinent to their locality (including methods used to ensure product safety from the source to the consumer).

8. Legislation, Regulations, and Policies [5 credits minimum] – Candidate should demonstrate a good understanding of the laws, regulations and policies that directly impact the practice of aquatic veterinary medicine in areas relevant to the candidate. Examples are:

a. International bodies and guidance, codes or standards that address aquatic animal health and welfare, public health and seafood safety
b. National and state/provincial/local governmental authorities responsible for, and statutory and non-statutory legislation, regulations and/or policies
c. National and state/provincial/local veterinary organizations, their policies and codes or principles of veterinary medical ethics
d. Development of a regional, national, or international health plan that includes list of reportable diseases, certification, zoning, risk assessment, and quarantine

9. Principles of Aquatic Animal Welfare [5 credits minimum] – Candidate should demonstrate knowledge of current issues related to aquatic animal welfare and an ability to assess the welfare status of key aquatic species. Examples are:

a. General topics in aquatic animal welfare that are of concern to aquaculture industry, ornamental industry and hobbyists, research, resource management, zoos and aquariums
b. Key legislation, regulations, policies, and professional societies’ statements about aquatic animal welfare
c. Humane handling and euthanasia methods of aquatic animal species associated with the fishing industry, wildlife, aquaculture, ornamental trade, zoos, public aquaria and research

Summary of KSE Sources and their Credits:

A. Continuing Education and Professional Development (CEPD) classes/lectures
   Veterinary Conferences; University-based short courses; 1 hour = 1 credit

B. Academic Programs or Courses (University Level)
   Full-time clinical academic veterinary externship rotation
   WAVMA recognized extensive course in aquatic animal medicine
   2 class hours = 1 credit; or 20 points per week (e.g., 40 hour week = 20 credits)

C. Post-Veterinary Academic Training (Degrees, Internships, Residencies, Certification)
   Intern/Residency = up to 50; MS = up to 75; PhD/Board Certification = up to 100 credits

D. Journal/Literature Self-Study and Online Education
   Journal Article/Webcast lecture = 1 credit; Book = 1 credit/chapter up to 10 credits/book

E. Clinical Experience & Case Logs
   Case Report = 5 credits per case
   Documentation/Letter of Clinical Experience = up to 50 credits (evaluate with mentor)

F. Publications & Presentations in Professional Meetings
   Published article = 5 credits; Published Peer-reviewed article = 10 credits; Published case report
   or review = 5 credits
   Editing a multi-author book = 10 credits; Writing a Book Chapter = 10; Writing a Complete
   Book = 10 per chapter up to 40 credits;
   Short oral presentations at professional meetings = 1 point per 15 minutes
   Long oral presentations at professional meetings = 5 points per lecture hour
   Teaching university-level academic classes = 5 credits per lecture hour
3.5. Authorizations (tasks that they are allowed/authorized to do) of certified aquatic animal health practitioners (e.g. performing diagnoses; signing fish health certificates; prescribing and/or administering drugs; investigating disease outbreaks; inspecting premises; preparing diagnostic reports; conducting surveillance; etc.): Specific information not found

3.6. What entities recognize the validity of the scheme (e.g. competent authorities (federal and/or state); professional organizations; scientific community; producer organizations) and how long is certification valid: The CertAqV credentials are limited to 5 years from the date of issuance. The certified veterinarian must submit a renewal form every 5 years along with a recertification fee of $50.00 US. To renew the CertAqV credentials, evidence of at least 50 credit hours of aquatic veterinary Continuing Education and Professional Development (CEPD) over 5 years is required (i.e. an average of 10 hours per year). Continued WAVMA membership is also a requirement to maintain the CertAqV status.

3.7. Current status and number of certified aquatic animal health practitioners as of 2019: 95

3.8. “Call for Information” document prepared by: Omar Elhassan

4. PEOPLE’S REPUBLIC OF CHINA: AQUATIC ANIMAL HEALTH CERTIFICATION

4.1. Title of certification scheme:

Practicing Veterinarian for Aquatic Animals – private

Assistant Practicing Veterinarian for Aquatic Animals

Registered Village Veterinary for Aquatic Animal (not certified) can serve aquatic animal health in village – Official Veterinarian (must be official in government or government agency).

Veterinarians without aquaculture background cannot be veterinarians for aquatic animals.

4.2. Originator of certification scheme (e.g. the government, professional organizations, specialist groups, etc.) and start date of scheme: Ministry of Agriculture and Rural Affairs (MARA) of the People’s Republic of China. MARA started the PVAA examination in 2011 according to the “Administrative Method for Practicing Veterinarian” issued by MARA in 2008. The first issuance of certifications for aquatic animal health were given to 290 PVAAs and 251 APVAAs in 2011. By 2018, a total 2 392 PVAAs and 1 610 APVAAs had been issued.

MARA has established the National Veterinary Qualification Examination Committee. The examination committee is responsible for examining and approving examination subjects, examination syllabus and examination questions; supervising, and guiding and determining qualified standards for examination work. The specialist group for aquatic animal health is designated to work in the National Veterinary Qualification Examination Committee.

The National Extension Center for Fishery Technologies is responsible for the organizing of detailed technological works for the examination under the lead of the National Veterinary Qualification Examination Committee.

Provincial veterinary authorities establish the Practicing Veterinarian Qualification Examination Leading Groups which are responsible for the administration of the examination in the relevant provinces.

4.3. Purpose and short description: Recognize expertise, comprehensive knowledge and clinical skills in aquatic animal health diagnosis, prevention, control, and the extermination of major aquatic animal diseases, following relevant regulations and laws on aquatic animal health.
4.4. Application process (mentorship, written exam, oral interview, etc.) and certification requirements (academic qualifications and level; number of years of field experience; certified trainings; professional licenses) including supporting documents:

A. Application process:
Candidates are required to learn assigned documents and attend the veterinarian qualification examination in order to be licensed as an Assistant Practicing Veterinarian or a Practicing Veterinarian for Aquatic Animals.

B. Certification requirements:
(1) Academic qualifications and level:
College degree or above in aquaculture, aquatic animal science, marine biology and other related majors.

(2) Number of years of field experience: Not specified.

(3) Main contents of examination:
The examination is divided into four subjects: basic, prevention, clinical and comprehensive application. The total number of questions is 300 and the total score is 300. Basic subjects include veterinary laws and regulations and professional ethics, aquatic animal anatomy and histoe-embryology, animal biochemistry and aquatic animal physiology. The subjects of prevention include animal immunology, aquatic pathogenic biology and aquatic animal public health. Clinical subjects include aquatic pharmacology, aquatic animal pathology and aquatic animal diseases. Comprehensive application subjects include aquaculture environment, feed and nutrition.

(4) Certified trainings: Certified trainings are required and there are also regular trainings in veterinary expertise and related policies and regulations.

(5) Professional licenses: Licensed Certificate (Assistant Practicing Veterinarian for Aquatic Animals and Practicing Veterinarian for Aquatic Animals) are issued by MARA.

4.5. Authorizations (tasks that they are allowed/authorized to do) of a certified AAH practitioner (e.g. performing diagnoses; signing fish health certificates; prescribing and/or administering drugs; investigating disease outbreaks; inspecting premises; preparing diagnostic reports; conducting surveillance; etc.): Practicing Veterinarians for Aquatic Animals are recognized for performing diagnoses, signing fish health certificates, prescribing and/or administering drugs, preparing diagnostic reports conducting surveillance, reporting to the governments etc.

Assistant Veterinarians are recognized for carrying out practice activities under guidance of a Veterinarian, but shall not issue prescriptions, fill in diagnostic papers or issue relevant certificates.

4.6. What entities recognize the validity of the scheme (e.g. competent authorities (federal and/or state); professional organizations; scientific community; producer organizations) and how long is certification valid: The scheme is recognized by government at all levels, professional organizations, scientific community; producer organizations etc. The Certificate will be cancelled after two years of suspension of veterinary practice.

4.7. Current status and number of certified aquatic animal health practitioners as of 2019:
According to the 2017 Report on Aquatic Animal Health in P. R. China issued by MARA, by the end of 2018, there were a total of 2 392 licensed Practicing Veterinarians for Aquatic Animals and 1 610 licensed Assistant Practicing Veterinarians for Aquatic Animals.

4.8. “Call for Information” document prepared by: Bin Hao and Jie Huang

4.9. Links for further information (websites; documents; etc.):
5. **NORWAY: AQUA MEDICINE BIOLOGIST CERTIFICATION**

5.1. **Title of certification scheme:** Authorization and licenses to practice as an aqua medicine biologist.

5.2. **Originator of certification scheme (e.g. the government, professional organizations, specialist groups, etc.) and start date of scheme:** A study and an academic degree authorized by the Norwegian Food Safety Authority. The study is given at the University of Bergen and University of Tromsø.

5.3. **Purpose and short description:** To cope with the high demand for experts in aquatic animal health – to supply the needed number of veterinarians. Aqua medicine biologists study aquatic animal health including complementary aspects such as physiology, pharmacology, environmental issues etc.

Any person wishing to practice as a veterinary surgeon, aqua medicine biologist or veterinary nurse in Norway must be authorized by or hold a license issued by the Norwegian Food Safety Authority.

Duties of animal health personnel within their professional field:

- to promote the welfare and health of animals, including stocks of animals living in the wild
- to contribute to ethical and environmentally sound animal husbandry
- to protect society against hazards and damage caused by animal diseases or by food and products of animal origin

5.4. **Application process (mentorship, written exam, oral interview, etc.) and certification requirements (academic qualifications and level; number of years of field experience; certified trainings; professional licenses) including supporting documents:** This is a university program of 5 years. Anyone can apply and as far as I know, all applicants qualifying for a university study are accepted. No demands of any field experience before starting the study.

All copies must be certified by a public official or a printing office confirming that they are true copies of the original document. If one or more of the required documents is not enclosed or is not in order, your application will not be processed until you have provided the correct documentation.

**Authorization:**

- Any person who can provide documentary proof of having taken a relevant degree at a Norwegian university or university college of science is entitled to authorization to practice as a veterinarian or an aqua medicine biologist.
- Authorization is granted upon application. The applicant must be less than 75 years old and be qualified in all other ways.

**Application for authorization:** Aqua medicine biologist

- Applicants who have received their education as aqua medicine biologists at the University of Bergen or University of Tromsø will usually be given authorization.
- Applicants who have received their education as aqua medicine biologists in European Economic Area (EEA) countries can also be given authorization. One of the conditions for authorization is that the applicant is a citizen of an EEA country. This is stipulated in Regulations No. 77 of 19 January 2009.

**License:**

- Any person who does not satisfy the conditions for authorization may, upon application, instead be granted a license. The Ministry may prescribe that a license shall be issued for a limited period of time, for a specific position, for the performance of practical service as
mentioned in Section 4, last paragraph, for certain methods of examination or treatment, or be subject to other conditions and limitations.

- Authorized animal health personnel who provide proof that they are qualified to continue to practice their profession properly after reaching the age limit may be granted a license.

Application for a license:

- Animal health personnel lose their authorization when they reach the age of 75. Persons wishing to continue to work as animal health personnel after the age of 75 must obtain a medical certificate which confirms that the applicant’s health is suitable for justifiable activity. These licenses may be limited to certain fields of work and are usually granted for two or three years at a time. This is stipulated in the act relating to veterinarians and animal health personnel.
- Medical certificate (only required for animal health personnel after the age of 75) which confirms that the applicant’s health is adequate for justifiable practice.

5.5. Authorizations (tasks that they are allowed/authorized to do) of a certified aquatic animal health practitioner (e.g. performing diagnoses; signing fish health certificates; prescribing and/or administering drugs; investigating disease outbreaks; inspecting premises; preparing diagnostic reports; conducting surveillance; etc.):

Emergency assistance: Animal health personnel have a duty to provide, as soon as possible, such help as the person concerned can – personally or by means of a deputy – when, on the basis of the information available, it must be assumed that immediate assistance is urgently required. This duty ceases to apply when the person concerned has a legitimate excuse or when help is provided in time by other animal health personnel.

When finishing the study, this training fully qualifies to do all kinds of diagnostic work regarding aquatic animal health, similar to veterinarians. Veterinarians and AAHBs had equal rights, authority and responsibility. They work in all levels of the industry, private as well as in governmental jobs.

Since the mid-1990s aquatic animal health biologists have had an equal right to veterinarians to prescribe/administer drugs to aquatic animals. The right for AAHBs to prescribe drugs is now under revision by the European Union (EU) and will probably be withdrawn in the new animal health law as a means to reduce the use of antibiotics by reducing the number of different professionals who can prescribe drugs. This may reduce interest for the study, as the candidates become secondary to veterinarians.

5.6. What entities recognize the validity of the scheme (e.g. competent authorities (federal and/or state); professional organizations; scientific community; producer organizations) and how long is certification valid:

International agreements: Authorizations, licenses and other certification may be granted pursuant to a reciprocal agreement with a foreign State. The Ministry may by regulation issue further rules regarding the authorization, licensing and certification of animal health personnel on the basis of foreign education.

Cross-border practice: Authorized veterinarians who practice in Sweden and Finland in veterinary districts that border on Norway may in special cases provide veterinary services in adjoining Norwegian veterinary districts without an authorization or a license issued by the Ministry.

The need for AAHBs was huge when the industry started industrializing during the 1990s and the combination of veterinarians and AAHBs (plus others with complementary competence) has since been a necessity to comply with the health requirements set both by national authorities and industry itself.
5.7. Current status and number of certified aquatic animal health practitioners as of 2019: N/A

5.8. “Call for Information” document prepared by: Edgar Brun and Omar Elhassan

6. THAILAND: AQUATIC ANIMAL HEALTH CERTIFICATION

6.1. Title of certification scheme: Not available (N/A)

6.2. Originator of certification scheme (e.g. the government, professional organizations, specialist groups, etc.) and start date of scheme: N/A

6.3. Purpose and short description: N/A

6.4. Application process (mentorship, written exam, oral interview, etc.) and certification requirements (academic qualifications and level; number of years of field experience; certified trainings; professional licenses) including supporting documents: In Thailand, a veterinary degree takes a total of 6 years with 2-4 courses (3–9 credits) related to aquatic animal medicine, pharmacology, pathology and anatomy. Upon graduation, veterinarians have the option to work in the aquatic animal field and gain experience by themselves. No formal training is available. Recently, the Department of Fisheries (DOF), Government of Thailand became more aware of the role of veterinarians in aquatic animal health by appointing 10 veterinarian positions in the DOF. Thus, we should see the role of veterinarians increase in aquatic animal health in Thailand in the near future.

6.5. Authorizations (tasks that they are allowed/authorized to do) of a certified aquatic animal health practitioner (e.g. performing diagnoses; signing fish health certificates; prescribing and/or administering drugs; investigating disease outbreaks; inspecting premises; preparing diagnostic reports; conducting surveillance; etc.): Most of the training is available by a short-course (half day or one day) training made available by the university. We hope to receive cooperation in organizing such training for aquatic veterinarians in Thailand and in the region.

6.6. What entities recognize the validity of the scheme (e.g. competent authorities (federal and/or state); professional organizations; scientific community; producer organizations) and how long is certification valid: N/A

6.7. Current status and number of certified aquatic animal health practitioners as of 2019:

Recently, a working group of aquatic veterinarians gathered together and formed an idea to start an aquatic veterinarian organization in Thailand. We have around 100 veterinarians in Thailand who have joined the group. The group has created a social network for rapid communication and message distribution. Future opportunity for training and short course should be made for the group and should receive good cooperation.

6.8. “Call for Information” document prepared by: Win Surachetpong

6.9. Links for further information (websites; documents; etc.): Please contact fvetwsp@ku.ac.th for more available information or suggestions.