



**Food and Agriculture
Organization of the
United Nations**

FIAA/ C1149 (En)

**FAO
Fisheries and
Aquaculture Circular**

ISSN 2070-6065

DEVELOPMENT OF A REGIONAL AQUATIC BIOSECURITY STRATEGY FOR THE SOUTHERN AFRICAN DEVELOPMENT COMMUNITY (SADC)

**DEVELOPMENT OF A REGIONAL AQUATIC BIOSECURITY STRATEGY
FOR THE SOUTHERN AFRICAN DEVELOPMENT COMMUNITY (SADC)**

Required citation:

FAO. 2018. *Development of a Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC)*
FAO Fisheries and Aquaculture Circular No. C1149. Rome. 344 pp.

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ISBN 978-92-5-131184-4
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PREPARATION OF THIS DOCUMENT

This document presents the actions and activities that were undertaken by the Food and Agriculture Organization of the United Nations and its partner regional and international agencies to support the development of the *Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC)*. The first step in this process began in October 2014 with the completion of a *Southern African Development Community (SADC) Regional aquatic animal health capacity and performance survey* by 14 of the 15 SADC member countries. The purpose of this self-assessment survey was to allow FAO, the 14 participating countries, and the participating international and regional agencies to understand the current status of aquatic animal health in the region and to identify areas of strengths and weaknesses. Following completion of the self-assessment survey¹, the FAO and participating partner agencies (the Department of Agriculture, Forestry and Fisheries of South Africa (DAFF), the Africa Union Inter-African Bureau for Animal Resources (AU-IBAR) and SADC), then convened the FAO/DAFF/AU-IBAR/SADC Regional Workshop on Improving Aquatic Animal Health Management and Strengthening Biosecurity Governance in Africa, which was held in Durban, South Africa, from 5–7 November 2014 (the "Durban Workshop"). The Durban Workshop brought together a total of 117 delegates from 27 African countries, including representatives from all 15 SADC member countries to review the results and analysis of the FAO self-assessment survey and to discuss and approve the framework and contents for a regional strategy for aquatic biosecurity². The third step in the process was the drafting of the *Regional Aquatic Biosecurity Strategy for the Southern African Development Community*, which was prepared based on the consensus reached during the Durban Workshop. The finalized Regional Strategy was prepared by an FAO team under the technical supervision of Dr Melba B. Reantaso of the FAO Fisheries and Aquaculture Department (FAO FI) and led by Dr J. Richard Arthur (FAO Consultant) with contributions from Dr Rohana P. Subasinghe (FAO FI) and Mr Blessing Mapfumo (FAO Consultant). The draft strategy was then circulated for further comment to key experts and to all participants of the Working Group Session on Development of a SADC Regional Framework for an Aquatic Biosecurity Strategy for their comment and approval. The final step involved submission of the finalized Regional Aquatic Biosecurity Strategy for the Southern African Development Community³ to the SADC Fisheries Technical Committee Meeting that was held in April 2015 for further review and endorsement. The SADC Aquatic Animal Health Strategy (2016–2026) was approved and launched at the SADC Council of Ministers meeting on 14th August 2017.

¹ The results and analysis of the *Southern African Development Community (SADC) Regional aquatic animal health capacity and performance survey* are presented as Annex I of this report.

² The report of the Durban Workshop, entitled *Report of the FAO/DAFF/AU-IBAR/SADC Regional Workshop on Improving Aquatic Animal Health Management and Strengthening Biosecurity Governance in Africa* is presented as Annex II of this report.

³ The *Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC)* is presented as Annex III of this report.

ABSTRACT

This document details the activities that were undertaken by the Food and Agriculture Organization of the United Nations (FAO) and cooperating agencies (the Department of Agriculture, Forestry and Fisheries of South Africa (DAFF), the Africa Union Inter-African Bureau for Animal Resources (AU-IBAR) and the Southern Africa Development Community (SADC)) leading to the production of a *Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC)* and its subsequent adoption by SADC and incorporation into SADC programmes. These activities include: (1) assessment of national aquatic animal health performance and capacity for 14 of the 15 SADC member countries through the conducting of a *Southern African Development Community (SADC) regional aquatic animal health capacity and performance survey*; (2) the convening of the FAO/DAFF/AU-IBAR/SADC Regional Workshop on Improving Aquatic Animal Health Management and Strengthening Biosecurity Governance in Africa, held in Durban, South Africa, from 5–7 November 2014, with one of the specific objectives being to develop a SADC Regional Framework for an Aquatic Biosecurity Strategy; (3) the finalization of the draft *Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC)* by the FAO team; (4) the submission of the strategy to the SADC Fisheries Technical Committee (April 2015) and its submission to SADC for official approval by the SADC Council of Ministers (April 2017). Included as annexes to the report are: Annex I. the *Southern African Development Community (SADC) Regional aquatic animal health capacity and performance survey: Summary of survey results and analysis*; Annex II. the *Report of the FAO/DAFF/AU-IBAR/SADC Regional Workshop on Improving Aquatic Animal Health Management and Strengthening Biosecurity Governance in Africa*; and Annex III. the *Regional aquatic biosecurity strategy for the Southern African Development Community (SADC)*. The process was long but the most important is that it was done using a systematic approach that lead to good understanding leading to better consensus building, wide ownership and strong government commitment.

CONTENTS

PREPARATION OF THIS DOCUMENT	iii
ABSTRACT	iv
ACKNOWLEDGEMENTS	vi
 1.0 Introduction.....	 1
 2.0 Major activities leading to the finalization of the Regional Biosecurity Strategy	 1
2.1 Assessment of national aquatic animal health performance and capacity	2
2.2 Convening of the Durban Workshop.....	3
2.3 Finalization of the Regional Aquatic Biosecurity Strategy	4
 3.0 Conclusions	 4
 ANNEX I: Southern African Development Community (SADC) regional aquatic animal health capacity and performance survey: Summary of survey results and analysis.....	 6
 ANNEX II: Report of the FAO/DAFF/AU-IBAR/SADC Regional Workshop on Improving Aquatic Animal Health Management and Strengthening Biosecurity Governance in Africa	 193
 ANNEX III: Draft regional aquatic biosecurity strategy for the Southern African Development Community (SADC).....	 289

ACKNOWLEDGEMENTS

The *Southern African Development Community (SADC) regional aquatic animal health capacity and performance survey* which underpins this document, the compilation and analysis of the resulting survey data, and the preparation of the final survey report (see Annex I) was undertaken by an FAO team comprised of Dr J. Richard Arthur (FAO International Consultant), Mr Blessing Mapfumo (Fisheries and Aquaculture Advisor, FAO, Pretoria), Dr Melba B. Reantaso (Aquaculture Officer, Aquaculture Branch (FIAA), FAO, Rome), and Ms Elena Irde (Aquaculture Project Consultant, Rome). FAO gratefully acknowledges the many contributions of the National Focal Points (NFPs) of the 14 SADC member countries that participated in the survey.

FAO gratefully acknowledges the Department of Agriculture, Forestry and Fisheries of South Africa (DAFF) for hosting the Durban Workshop and for the financial support provided under the auspices of the FAO/DAFF Capacity Building Programme. The Africa Union Inter-African Bureau for Animal Resources (AU-IBAR), in partnership with the European Union (EU), the Southern African Development Community (SADC), the World Organisation for Animal Health (OIE) and the Standards and Trade Development Facility (STDF) are also acknowledged and appreciated for their technical and financial support to the Durban Workshop. The active participation of some 117 officials and delegates from 27 countries is highly appreciated. The report of the workshop (Annex II of this document) was prepared by an FAO team that included Drs Melba B. Reantaso, J. Richard Arthur and Rohana P. Subasinghe (FAO FI) and Mr Blessing Mapfumo.

The finalized *Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC)* (Annex III of this document) was prepared by an FAO team under the technical supervision of Dr Melba B. Reantaso and led by Dr J. Richard Arthur, with contributions from Dr Rohana P. Subasinghe and Mr Blessing Mapfumo. The review of the finalized draft strategy by Drs Mark Crane (Australia), Marc Le Groumellec (Madagascar), David Huchzermeyer (South Africa) and Hang`ombe Bernard Mudenda (Zambia) and the constructive comments and approval provided participants in Working Group Session on Development of a SADC Regional Framework for an Aquatic Biosecurity Strategy is gratefully acknowledged.

1.0 Introduction

The incursion of a serious finfish disease previously unknown in Africa, epizootic ulcerative syndrome (EUS), in the Chobe-Zambezi River in 2006¹, and more recent outbreaks in Botswana, Namibia and Zambia, revealed the serious weaknesses in aquatic biosecurity existing in the Southern African Region. In April 2008, the Food and Agriculture Organization of the United Nations (FAO) thus convened a Workshop on the Development of an Aquatic Biosecurity Framework for Southern Africa, which was held in Lilongwe, Malawi. This workshop was part of the FAO's continuing assistance to the region to understand the current disease situation, prepare a regional framework and identify capacity building needs to address aquatic biosecurity concerns which present potential risks to communities who are dependent on fisheries and aquaculture for food and livelihood.

Robust biosecurity systems are an essential pillar to a healthy aquaculture production, protecting producers and emerging aquaculture sectors from the risks and threats of aquatic pathogens and diseases. National governments thus need to adopt and implement long-term preventive and pro-active biosecurity strategies, rather than reactive measures as seen in many developed aquaculture regions.

This document is the product of a systematic process which was initiated by an initial brainstorming session held from 9–10 April 2014 at the FAO Office in Pretoria that was attended by representatives from the Department of Agriculture, Forestry and Fisheries of South Africa (DAFF) (Dr Motseki Hlatshwayo), the New Partnership for Africa's Development (NEPAD) (Dr Sloans Chimatiro), the World Organisation for Animal Health (OIE) (Dr Neo Joel Mapitse), Rhodes University (Mr Rouhani Qurban) and the Food and Agriculture Organization of the United Nations (FAO) (Dr Tobias Takavarasha, Mr Madima Tshifhiwa and Mr Lot Mlati from the Pretoria office and Dr Melba B. Reantaso from the Rome office). The April 2013 brainstorming session recognized the need to develop a robust and long-term regional framework that will guide the Southern African Development Community (SADC) member countries in strengthening biosecurity governance at the regional and national levels that will support the sustainable development of the region's growing aquaculture sector.

2.0 Major Activities Leading to the Finalization of the Regional Biosecurity Strategy

The pathway leading to the finalization of the regional biosecurity strategy comprised three steps or activities, as follows:

- assessment of national aquatic animal health performance and capacity for the SADC member countries through the conducting of a *Southern African Development Community (SADC) regional aquatic animal health capacity and performance survey* (the FAO self-assessment survey);
- convening of the FAO/DAFF/AU-IBAR/SADC Regional Workshop on Improving Aquatic Animal Health Management and Strengthening Biosecurity Governance in Africa, held in Durban, South Africa, from 5–7 November 2014, with one of the

¹ <http://www.fao.org/docrep/012/i0778e/i0778e00.htm>

specific objectives being to develop a SADC Regional Framework for an Aquatic Biosecurity Strategy; and

- finalization of the *Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC)* by the FAO and its submission to SADC for official adoption and implementation.

2.1 Assessment of National Aquatic Animal Health Performance and Capacity

The first step leading towards the development of a *Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC)* was to obtain detailed information on national capacity and the agencies mandated to implement aquatic animal health programmes. To accomplish this, a national self-assessment survey, the *Southern African Development Community (SADC) regional aquatic animal health capacity and performance survey*, was completed by 14 of the 15 SADC member countries (SADC)². In addition to collecting information needed to summarize and analyze regional aquatic animal health performance and capacity, the survey also gathered information essential to support the development of the region's aquaculture sector through healthy aquatic production and sought opinions on the components and activities that might be included in a SADC Regional Aquatic Biosecurity Strategy.

The survey questionnaire was based on previous FAO Aquatic Animal Health Capacity and Performance Surveys conducted in other regions that were jointly developed by the FAO Aquaculture Service (M. Reantaso, R. Subasinghe and A. Lovatelli) and International Consultant J.R. Arthur and modified to the regional situation. The distribution of the finalized survey questionnaire to the 15 SADC member countries was coordinated by Mr Blessing Mapfumo, the survey form being sent by email to the National Focal Points (NFPs) for each country in early October 2014, with instructions that it should be completed by the national Competent Authority or other senior government officer with primary responsibility for national aquatic animal health issues, with the assistance of national aquaculture experts and concerned laboratory personnel.

The survey questionnaire contained 18 sections pertaining to: (1) international trade in live aquatic animals and national border controls, (2) control of domestic movement of live aquatic animals and other domestic activities that may spread pathogens, (3) policy and planning, (4) legislation, (5) disease surveillance/monitoring, (6) disease diagnostics, (7) emergency preparedness and contingency planning, (8) extension services, (9) compliance/enforcement, (10) research, (11) training, (12) expertise, (13) infrastructure, (14) linkages and cooperation, (15) funding support, (16) current challenges, (17) constraints and (18) additional information.

Following initial data compilation and checking of the responses for accuracy and completeness, the edited draft tables summarizing the Survey Results were returned to the NFPs by e-mail to obtain any missing responses and/or clarifications. The revised Survey

² Botswana, Democratic Republic of Congo (DRC), Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe completed the survey; Angola did not.

Results were then used by FAO to prepare the Summary and Analysis sections and the completed draft document returned to all NFPs in early 2015 for their final checking and approval.

Annex I presents the document *the Southern African Development Community (SADC) Regional aquatic animal health capacity and performance survey: Summary of survey results and analysis*. In this document, the compiled and edited results of the survey are presented in tabular form, the sequence of presentation of information following the sequence of sections and questions used in the SADC Regional Aquatic Animal Health Capacity and Performance Survey form (see Annex I.a). For each of the 18 Sections of the Survey Questionnaire, a written **Summary of results** detailing important features of the results is presented, which is followed by an **Analysis** of the significance of the results with regard to current and future development of aquatic animal health capacity in the SADC region. For further information on the survey, its results and the subsequent analysis, readers are referred to Annex I.

2.2 *Convening of the Durban Workshop*

The FAO/DAFF/AU-IBAR/SADC Regional Workshop on Improving Aquatic Animal Health Management and Strengthening Biosecurity Governance in Africa, held in Durban, South Africa, from 5–7 November 2014, was convened with two specific objectives: (1) to develop a SADC Regional Framework for an Aquatic Biosecurity Strategy that will support the growth of its aquaculture industry through a long-term, enabling policy environment and a framework for a cooperative programme on aquatic animal health management and biosecurity governance at the regional and national levels; and (2) to identify, discuss and build consensus on the elements to be included and procedures to be followed for responding to the call from the World Trade Organization (WTO)/Standards and Trade Development Facility (STDF) for the proposed TILAPIA (Trade and Improved Livelihoods in Aquatic Production in Africa) Project (the results of the latter objective are not discussed further here, but can be found in Annex II).

The Durban Workshop successfully achieved its objectives with the active participation and contribution of some 117 delegates from 27 countries. All the 15 SADC member countries were represented. Experts, representatives from Regional Fisheries Bodies and delegates from nine other African states under the auspices of the Africa Union Inter-African Bureau for Animal Resources (AU-IBAR) also attended.

The participants in the Regional Workshop agreed on a draft framework for a broad yet comprehensive strategy to build and enhance capacity for the management of regional aquatic biosecurity and aquatic animal health. It contains the regional action plans at the short, medium and long term using phased implementation based on regional needs and priorities. It also outlines the programmes and activities that will assist in developing a regional approach to overall management of aquatic animal health in SADC. The framework for the Strategy includes the following sections: Summary, Background, Current status of aquaculture development and aquatic animal health management in SADC, Purpose, Vision, 10 Guiding Principles and Programme Components and Implementation. The Strategy accepts and incorporates relevant international aquatic animal health standards to ensure harmonization, transparency and equivalence in the region so that the region will be internationally recognized with respect to aquatic animal health status. The Programme Components consist of 12 broad thematic areas: (1) Policy, legislation and institutional framework; (2) Risk

analysis; (3) Diagnostics and health certification; (4) Import controls and quarantine; (5) Pathogen list; (6) Surveillance, monitoring and reporting; (7) Emergency preparedness, contingency planning and zoning; (8) Capacity building and human resources; (9) Research and development; (10) Infrastructure; (11) Regional and international cooperation; and (12) Information and communication. Annex II presents the full report of the Durban workshop,

2.3 *Finalization of the Regional Aquatic Biosecurity Strategy*

Based on the consensus reached during the Regional Workshop, an FAO team comprised of Dr J. Richard Arthur (International Consultant, Canada), Dr Melba B. Reantaso (FAO, Rome), Dr Rohana P. Subasinghe (FAO, Rome) and Mr Blessing Mapfumo (FAO, Pretoria) prepared a draft *Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC)*. This draft document was circulated, in March 2015, to Drs Mark Crane (Australia), Marc Le Groumellec (Madagascar), David Huchzermeyer (South Africa) and Hang'ombe Bernard Mudenda (Zambia) – key invited experts on aquatic animal health during the Regional Workshop, for comment, and to all participants of the Working Group Session on Development of a SADC Regional Framework for an Aquatic Biosecurity Strategy for their comment and approval. The resulting document is the finalized *Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC)*, which is presented in Annex III.

The finalized Regional Strategy was submitted to DAFF and presented during the SADC Fisheries Technical Committee meeting (16–17 April 2015) and then to the SADC Council of Ministers for approval and action.

3.0 *Conclusions*

The purpose of the *Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC)* is:

“To support the improvement of aquatic biosecurity; the development of aquatic animal health management capacity; the preservation of aquatic biodiversity; the improvement of food security, nutrition and safety; and sustainable management of aquatic resources in the SADC Region, through such actions as improved awareness of and risk mitigation for OIE-listed and other serious diseases transmitted by live aquatic animals and their products and enhanced coordination between key role players involved in aquatic animal health”

It is expected that with good implementation of the strategy, there will be:

- improved regional management of aquatic animal health and welfare.
- improved awareness among aquatic animal health experts, aquaculturists and other stakeholders of the responsible and scientifically justifiable practices necessary to optimize aquatic animal health management.
- improved technical capacity at different levels of expertise among Competent Authorities and other agencies responsible for the management of aquatic animal health.
- improved collaborative efforts among SADC Member Countries resulting in improved confidence of the aquaculture sector and other stakeholders in national Competent Authorities, state veterinary services and relevant extension services.

This strategy document will provide guidance to the SADC region in improving national and regional aquatic biosecurity and aquatic animal health, facilitating regional aquaculture development for the well-being of the people of the SADC Region through increased employment, availability of inexpensive, protein-rich food, and increased foreign exchange earnings through regional and international trade in live aquatic animals and their products.

The process taken was long but the most important is that it was done using a systematic approach that lead to good understanding and resulted to better consensus building, wider ownership and strong government commitment.

The processes taken and lessons learned can used when developing similar strategies in other African regional economic communities.

**Southern African Development Community (SADC)
regional aquatic animal health capacity and performance survey:
Summary of survey results and analysis**

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CONTENTS

BACKGROUND	10
PURPOSE.....	10
SURVEY STRUCTURE AND PROCESS	10
PREPARATION OF THE SURVEY SUMMARY AND ANALYSIS	11
SECTION 1. INTERNATIONAL TRADE IN LIVE AQUATIC ANIMALS AND NATIONAL BORDER CONTROLS	12
SECTION 2. CONTROL OF DOMESTIC MOVEMENTS OF LIVE AQUATIC ANIMALS AND OTHER DOMESTIC ACTIVITIES THAT MAY SPREAD PATHOGENS	41
SECTION 3. POLICY AND PLANNING	47
SECTION 4. LEGISLATION	64
SECTION 5. DISEASE SURVEILLANCE AND MONITORING/INFORMATION SYSTEMS	68
SECTION 6. DISEASE DIAGNOSTICS	77
SECTION 7. EMERGENCY PREPAREDNESS/CONTINGENCY PLANNING.....	91
SECTION 8. EXTENSION SERVICES	98
SECTION 9. COMPLIANCE/ENFORCEMENT	103
SECTION 10. RESEARCH.....	113
SECTION 11. TRAINING	117
SECTION 12. EXPERTISE	120
SECTION 13. INFRASTRUCTURE	125
SECTION 14. LINKAGES	129
SECTION 15. FUNDING SUPPORT	133
SECTION 16. CURRENT CHALLENGES.....	137
SECTION 17. ADDITIONAL INFORMATION	149

Annexes

Annex I.a	Questionnaire survey form
Annex I.b	List of people completing the survey questionnaire
Annex I.c	List of competent authorities

ACRONYMS AND ABBREVIATIONS

AAH	Aquatic animal health
AHPNS	Acute hepatopancreatic necrosis syndrome
AIS	Aquatic invasive species
BMPs	Better management practices
BPVL	Bulawayo Provincial Veterinary Laboratory (Zimbabwe)
BSE	Bovine spongiform encephalopathy
CASF	Competent Authority Seafood (Mauritius)
CBPP	Contagious bovine pleuropneumonia
CITES	Convention on International Trade in Endangered Species
COMESA	Common Market for Eastern and Southern Africa
CVL	Central Veterinary Laboratory (Zimbabwe)
CVRI	Central Veterinary Research Institute (Zambia)
DAFF	Department of Agriculture, Forestry and Fisheries of South Africa
DAHLD	Department of Animal Health and Livestock Production (Malawi)
DARD	Directorate: Aquaculture Research and Development (of DAFF)
DoE	Department of Environment (Seychelles)
DPSA	Service de la Production & de la Santé Animale (DRC)
DRC	Democratic Republic of Congo
DLVS	Department of Livestock and Veterinary Services (Swaziland, Zimbabwe)
DVS	Department of Veterinary Services (Tanzania)
EAC	East African Community
EIA	Environmental Impact Assessment
ELISA	Enzyme-linked immunosorbant assay
EMS	Early mortality syndrome
EU	European Union
EUS	Epizootic ulcerative syndrome
FAO	Food and Agriculture Organization of the United Nations
FD	Fisheries Division (Tanzania)
FIRA	Aquaculture Service (of the FAO)
FMD	Foot and Mouth Disease
GATT	General Agreement on Tariffs and Trade
GFHNV	Goldfish haematopoietic necrosis virus
GMOs	Genetically modified organisms
HACCP	Hazard analysis and critical control points
HC	Health certificate
IHHNV	Infectious hypodermal and hematopoietic necrosis virus
INIP	National Fisheries Inspection Institute (Mozambique)
IRA	Import risk analysis
JICA	Japanese International Cooperation Agency
KHV	Koi herpes virus
LHDA	Lesotho Highlands Development Authority
MAMID	Ministry of Agriculture, Mechanization and Irrigation Development (Zimbabwe)
MFLD	Ministry of Livestock and Fisheries Development (Tanzania)
MFMR	Ministry of Fisheries and Marine Resources (Namibia)
NALEIC	National Livestock Epidemiology and Information Centre (Zambia)
NARDEC	National Aquaculture Research and Development Centre (Zambia)
NFPs	National Focal Points

NGOs	Non-governmental organizations
NORAD	Norwegian Agency for Development Cooperation
NRCS	National Regulator for Compulsory Specifications (South Africa)
OIE	World Organisation for Animal Health (formerly Office International des Épizooties)
ONGD	Associations des Pisciculteurs (DRC)
PCR	Polymerase chain reaction
PRA	Pathogen risk analysis
PVS	Performance of the Veterinary Services
PWLMA	Parks and Wildlife Management Authority (Zimbabwe)
SADC	Southern African Development Community
SARNISSA	Sustainable Aquaculture Research Networks for Sub-Saharan Africa
SEAFDEC	Southeast Asian Fisheries Development Centre
SENAQUA	Ministry of Agriculture/ National Aquaculture Service (DRC)
SPF	Specific pathogen free
SPR	Specific pathogen resistant
SPS	Sanitary and Phytosanitary (Agreement)
SVCV	Spring viraemia of carp virus
TAADs	Transboundary aquatic animal diseases
TRACES	Trade Control and Export System (of the EU)
TSV	Taura syndrome virus
UNZA	University of Zambia
USA	United States of America
UZ	University of Zimbabwe
WAHIS	World Animal Health Information System (of the OIE)
WSD	White spot disease
WSSV	White spot syndrome virus
WTO	World Trade Organization
WWF	Worldwide Fund for Nature
YHV	Yellow head virus

BACKGROUND

This document, the *Southern African Development Community (SADC) Regional aquatic animal health capacity and performance survey: summary of survey results and analysis*, presents the finding of a regional survey that was carried out in October 2014 with the express purpose of informing The Working Group Session on Development of a SADC Regional Framework for an Aquatic Biosecurity Strategy. The Working Group Session was held 6–7 November 2014 during the Regional Workshop on Improving Aquatic Animal Health Management, and Strengthening Biosecurity Governance in Africa, held in Durban, South Africa. The Session was attended by at least two representatives from each of the 15 Member States of SADC and by technical experts on aquatic animal health and was facilitated by the Food and Agriculture Organization of the United Nations (FAO). The results of the survey were presented to the participants of the Working Group Session to serve as a gap analysis, facilitating the development of the SADC Regional Framework for an Aquatic Biosecurity Strategy.

PURPOSE

The purpose of this survey was to obtain information on national capacity and the agencies mandated to implement aquatic animal health programmes for the 15 members of the Southern African Development Community (SADC)¹. The survey also collects information essential to support the development of the aquaculture sector through healthy aquatic production and seeks opinions on the components and activities that might be included in a SADC Regional Aquatic Biosecurity Strategy. The results of this survey will help guide regional and national strategic planning for improving aquatic animal health and biosecurity and assuring adequate and rational support services to achieve sustainable aquaculture development.

SURVEY STRUCTURE AND PROCESS

The survey questionnaire is based on previous FAO Aquatic Animal Health Capacity and Performance Surveys conducted in other regions that were jointly developed by the FAO Aquaculture Service (FIRA) (M. Reantaso, R. Subasinghe and A. Lovatelli) and International Consultant J.R. Arthur and modified to the regional situation.

The distribution of the finalized survey questionnaire to the 15 SADC member countries was coordinated by Mr Blessing Mapfumo, the survey form being sent by email to the National Focal Points (NFPs) for each country in early October 2014, with instructions that it should be completed by the national Competent Authority or other senior government officer with primary responsibility for national aquatic animal health issues, with the assistance of national aquaculture experts and concerned laboratory personnel. The completed survey was to be returned to FAO by 31 October 2014.

The survey questionnaire contains 18 sections pertaining to: (1) international trade in live aquatic animals and national border controls, (2) control of domestic movement of live aquatic animals and other domestic activities that may spread pathogens, (3) policy and planning, (4) legislation, (5) disease surveillance/monitoring, (6) disease diagnostics, (7) emergency preparedness and contingency planning, (8) extension services, (9)

¹ Angola, Botswana, Democratic Republic of Congo (DRC), Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe.

compliance/enforcement, (10) research, (11) training, (12) expertise, (13) infrastructure, (14) linkages and cooperation, (15) funding support, (16) current challenges, (17) constraints and (18) additional information (a blank Survey Questionnaire is appended as Annex I.a).

PREPARATION OF THE SURVEY SUMMARY AND ANALYSIS

Survey forms were returned by the NFPs from all but one of the SADC countries (Angola). A list of people completing the Survey Questionnaire is given as Annex I.b. Initial data compilation was completed by Mr Blessing Mapfumo, FAO, Pretoria. Checking of the responses for accuracy and completeness was carried out by Dr J. Richard Arthur (International Consultant). During checking of the survey results, missing or incomplete data for some questions were encountered and responses occasionally required further clarification. The edited draft tables summarizing the Survey Results were then returned to the NFPs by e-mail to obtain any missing responses and/or clarifications. The revised Survey Results were then used to prepare the Summary and Analysis sections and the completed draft document returned to all NFPs in early 2015 for their final checking and approval.

The results of the survey are presented in this document in tabular form, the sequence of presentation of information following the sequence of sections and questions used in the SADC Regional Aquatic Animal Health Capacity and Performance Survey form (see Annex I.a). During preparation of this summary, responses have been edited for English language and to reduce length; however, all significant information provided in the original survey forms has been retained. For each of the 18 Sections of the Survey Questionnaire, a written **Summary of results** detailing important features of the results is presented, which is followed by an **Analysis** of the significance of the results with regard to current and future development of aquatic animal health capacity in the SADC region. Original survey forms as completed by the NFPs for each country are retained by FAO.

Results of the Survey Questionnaire have been summarized in tabular form and are cross-referenced to the original survey questionnaires, with each table caption providing a reference to the sections of the questionnaire covered by that table. Additionally, where relevant, individual table column headings are accompanied by numbers (given in parentheses) indicating the precise question for which results are summarized.

The following abbreviations are used throughout the summary tables (also see Acronyms and abbreviations):

- AAH = aquatic animal health
- DRC = Democratic Republic of Congo
- HC = health certificate
- n/a = not applicable (question or portion of question was not applicable to the country situation or not applicable due to a previous answer)
- n/r = no response (question was applicable to the country situation but was not answered by the NFP)

SECTION 1. INTERNATIONAL TRADE IN LIVE AQUATIC ANIMALS AND NATIONAL BORDER CONTROLS

A. *Relevant international memberships and legislation*

Summary of results

Table 1A summarizes the status of SADC countries with regard to membership in the World Organization for Animal Health (OIE) and the World Trade Organization (WTO) (survey questions 1.1–1.3) and provides a brief indication of the existence of national legislation supporting government control of imports and exports with respect to aquatic animal health (Survey questions 1.4–1.5). The key findings are as follows:

- All 15 SADC countries (the 14 responding countries and Angola) are members of the OIE.
- Of the 15 countries, 13 are members of the WTO, the non-members being the Democratic Republic of Congo (DRC) and Seychelles.
- Eleven of the 14 responding countries (exceptions: DRC, Mozambique, Swaziland) indicated the existence of some national legislation relevant to the regulation of exports and imports of live aquatic animals.

Analysis

Membership of countries in international bodies such as the OIE, WTO, etc. requires that countries abide with the conditions of membership, thus placing obligations upon the Competent Authorities in terms of implementation and compliance with the provisions embodied in those agreements and memberships.

The World Organisation for Animal Health (<http://www.oie.int>), created in 1924 as the Office International des Épizooties (OIE), is the intergovernmental organization responsible for improving animal health worldwide. As of December 2014, the OIE had a total of 180 member countries and territories. The OIE maintains permanent relations with 45 other international and regional organizations and has regional and sub-regional offices on every continent. Worldwide aquatic animal health is protected and maintained through its *Aquatic Animal Health Code* (the “Code”) and *Manual of Diagnostic Tests for Aquatic Animals* (the “Manual”) (both available at: <http://www.oie.int>). The OIE Aquatic Animal Health Standards Commission prepares these standards with the assistance of internationally renowned experts and also oversees OIE’s activities on aquatic animal health (<http://www.oie.int/en/international-standard-setting/overview/introduction-to-specialist-commissions/>).

One of the main objectives of the OIE, within its mandate under the World Trade Organization’s *Agreement on the Application of Sanitary and Phytosanitary Measures* (SPS Agreement) is to safeguard the world trade by publishing health standards for international trade in animals and animal products. OIE’s main normative work on aquatic animals is articulated through the Code and Manual, which provide a range of tools that assist OIE member countries in preventing and controlling aquatic animal diseases. OIE’s programme is based on a broad combination of activities, including listing of serious diseases of international importance; disease surveillance, monitoring, and reporting; contingency planning; disease zoning; standardized diagnostics testing; use of international health certificates; risk analysis; designation and evaluation of Competent Authorities; etc.

OIE member countries are obligated to apply the various standards and procedures as outlined in the Code and Manual. In addition to other monthly and annual reporting responsibilities to the OIE, the National Veterinary Services of OIE member countries are obligated to immediately report (within 24 hours):

- for OIE-listed diseases, (i) the first occurrence or re-occurrence of a disease in a country or zone or compartment of the country, if the country or zone or compartment of the country was previously considered to be free of that particular disease; or (ii) if the disease has occurred in a new host species; or (iii) if the disease has occurred with a new pathogen strain or in a new disease manifestation; or (iv) if the disease has a newly recognized zoonotic potential; and
- for diseases not listed by the OIE, if there is a case of an emerging disease or pathogenic agent should there be findings that are of epidemiological significance to other countries.

The World Trade Organization (WTO) (<http://www.wto.org/>) is an international organization with headquarters in Geneva, Switzerland, designed to supervise and liberalize international trade. The WTO was established on 1 January 1995 and is the successor to the General Agreement of Tariffs and Trade (GATT). The WTO deals with the rules of trade between nations at a near-global level. It is responsible for negotiating and implementing new trade agreements and is in charge of policing member countries' adherence to all WTO agreements.

The WTO is concerned with aquatic animal health to the extent that the occurrence of aquatic animal diseases may be used to restrict trade in aquatic animals and their products between WTO member countries. Rules for the application of sanitary measures to protect member countries from serious diseases that may be spread via international trade are outlined under the *Agreement on Sanitary and Phytosanitary Measures* (the SPS Agreement, available at: http://www.wto.org/english/docs_e/legal_e/15-sps.pdf). The WTO has recognized the OIE as the reference organization for aquatic animal health issues. In general, sanitary measures above those specified in the OIE Code must be justified by risk analysis.

The membership of all SADC member countries in the OIE and of 12 countries in the WTO provides them with a common, agreed-upon formal methodology and structure (as outlined in the OIE Code and Manual) for conducting trade in live aquatic animals and which can be used in developing national and regional aquatic animal health programmes.

Table 1A. Relevant international memberships (survey questions 1.1–1.5)

Country	(1.1) OIE member	(1.2) OIE official delegate	(1.3) WTO member	(1.4) Relevant legislation exists?	(1.5) If “Yes”, brief description of the legislation and indicate which specific directives
Botswana	Yes	Dr Letlhogile Modisa Director Veterinary Services Ministry of Agriculture Private Bag 0032 Gaborone	Yes	Yes	<ul style="list-style-type: none"> • Diseases of Animals Act • Botswana Meat Commission Act
DRC	Yes	Dr Honoré Robert N'lemba Mabela Directeur et Chef de Service Service de la Production & de la Santé Animale (DPSA) Ministère de l'Agriculture et du Développement Rural Bvd 30 juin Av Batetela, Kinshasa-Gombe Kinshasa 1	No	No	n/a
Lesotho	Yes	Mr Dihonga: OIE Focal Point for AAH Dr Marosi Molomo President of the OIE Regional Commission for Africa Director Department of Livestock Services Ministry of Agriculture and Food Security Private Bag A 82 Maseru 100	Yes	Yes	Note: Following the OIE Mission on Veterinary Legislation, Lesotho will be in a position to review the old, still-functioning veterinary legislation (including fisheries legislation).

Madagascar	Yes	Dr Marcellin Biarmann Directeur Direction des Services Vétérinaires Ministère de l'Elevage et de la Protection Animale BP 291 Antananarivo 101	Yes	Yes	Decree n°2004-041 of April 16 th 2004 « Laying down applied regimes to the import and export of animals, animal products and products of animal origin and seeds, fodder and products for animal feed »
Malawi	Yes	Dr Bernard Chimera Director of Veterinary Services Department of Animal Health & Livestock Development Ministry of Agriculture and Food Security P.O. Box 2096 Lilongwe	Yes	Yes	Fisheries Conservation and Management Act of 1997 (Section 41, Prohibition of transfer of live fish from one water body to the other, where the fish is not indigenous)
Mauritius	Yes	OIE aquatic animal health focal point Dr Gilson Robin Njunga Dr Deodass Meenowa Principal Veterinary Officer Division of Veterinary Services Ministry of Agro-Industry and Food Security Reduit Competent Authority Seafood Dr V.B. Groodoyal	Yes	Yes	<ul style="list-style-type: none"> • Fisheries and Marine Resources Act 2007 (the main legislation governing the fisheries and aquaculture sectors) • The Draft Aquatic Animal Farming Regulation (2014) (being vetted by the State Law Office) • The Environmental Protection Act (EPA) 2002 and Regulations.

Mozambique	Yes	Dr José Libombo Jr. National Director Veterinary Services Ministry of Agriculture Praça dos Heróis Moçambicanos PO Box 1406 Maputo	Yes	No	n/a
Namibia	Yes	Dr Albertina Shilongo Deputy Chief Veterinary Officer Division of Epidemiology, Import/Export Control and Training Ministry of Agriculture, Water and Forestry Park. Luter Street Private Bag 12022 Windhoek	Yes	Yes	<ul style="list-style-type: none"> • Animal Health Act No. 1 of 2011 (to provide for the prevention, detection and control of animal disease; to provide for the maintenance and improvement of animal health; and to provide for incidental matters. (Department of Veterinary Services)) • Biosafety Act 7 of 2006 (to provide for measures to regulate activities involving the research, development, production, marketing, transport, application and other uses of genetically modified organisms and specified products derived from genetically modified organisms (Minister responsible for science and technology)) • Environmental Management Act 7 of 2007 (to promote the sustainable management of the environment and the use of natural resources by establishing principles for decision making on matters affecting the environment; to establish the Sustainable Development Advisory Council; to provide for the appointment of the Environmental Commissioner and environmental officers; to provide for a process of assessment and control of activities which may have significant effects on the environment; and to provide for incidental matters (Ministry of Environment and Tourism)).

Namibia
(continued)

- Environmental impact assessment regulations: Environmental Management Act, 2007
- Aquaculture Act 2002 (to regulate and control aquaculture activities; to provide for the sustainable development of aquaculture resources; and to provide for related matters (Ministry of Fisheries and Marine Resources))
- Regulations relating to import and export of aquatic organisms and aquaculture products: Aquaculture Act, 2002
- Aquaculture (licensing) regulations: Aquaculture Act, 2002

Seychelles

Yes

Dr Jimmy G. Melanie
 Principal Veterinary Officer
 Veterinary Services
 Seychelles Agriculture Agency
 Ministry of Natural Resources and
 Industry
 P.O. Box 166, Victoria
 Mahe

No

Yes

Animal and Plants Biosecurity Act 2014 and its subsidiary
 legislation – lays down the health requirements for
 biosecurity import and export controls

South Africa	Yes	Dr Botlhe Michael Modisane Vice-President of the Assembly of the OIE Chief Director Agriculture Department of Animal Health Ministry of Agriculture, Forestry and Fisheries 30 Hamilton Street Private Bag X 250, Pretoria 0001	Yes	Yes	Animal Diseases Act, Act 35 of 1984. This act, however, is only applicable to vertebrate animals and consequently no legislation for aquatic invertebrate animals exists to control imports and exports from an animal health perspective. Currently, invertebrate health management is predominantly achieved through permitting under the Marine Living Resources Act, Act 18 of 1998.
Swaziland	Yes	Dr Roland Xolani Dlamini Director Veterinary and Livestock Services Ministry of Agriculture and Cooperatives P.O. Box 162 Mbabane H100	Yes	No	n/a Note: At the moment, Swaziland does not have any legislation to deal with AAH issues, as aquatic animals are not mentioned in the Animal Disease Act, which controls terrestrial animal diseases. However in collaboration with the Fisheries Department there is an attempt to control imports of aquatic animals and their products through a veterinary import permit.

Tanzania	Yes	Dr Abdu A. Hayghaimo Director Veterinary Services Ministry of Livestock and Fisheries Development Mandela Road PO Box 9152 Dar Es Salaam	Yes	Yes	<ul style="list-style-type: none"> • Animal Disease Act No. 17 of 2003 • Fisheries Act No. 22 of 2003 • The Fisheries Regulations, 2009 • Medium Term Strategic Plan 2012/2013-2016/2017 of the Ministry of Livestock and Fisheries • National Fisheries Sector Policy and Strategy Statement 1997 • National Livestock Policy 2006 • National Aquaculture Development Strategy 2009 • Veterinary Act No. 16 of 2003 • EAC Sanitary and Phytosanitary 2014
Zambia	Yes	Dr Joseph Mubanga Director Department of Veterinary and Livestock Development Ministry of Livestock and Fisheries Development Mulungushi House, P.O. Box 50060, Lusaka NALEIC, OIE Contact person	Yes	Yes	<ul style="list-style-type: none"> • Animal Health Act No. 22 of 2010 • Fisheries Act No. 22 of 2011
Zimbabwe	Yes	Dr Unesu Ushewokunze-Obatolu Principal Director Livestock and Veterinary Services Ministry of Agriculture, Mechanisation and Irrigation Development Bevan Building, 18 Borrowdale Road, Bag CY 66, Causeway, Harare	Yes	Yes	<ul style="list-style-type: none"> • Animal Health Act • Foods and Food Standards Act • Public Health Act • Produce Export Act • Statutory Instrument 369 of 1998- Produce export (production of chilled and frozen fish and frozen fish products) Regulations 1998

¹Information taken from the OIE Website (<http://www.oie.int/about-us/our-members/delegates-new/>) is first presented for each country. In cases where differing information was provided by the NFP, this follows.

B. Trade in live aquatic animals and use of health certification

B.1 Exportations and export health certification

Summary of results

Survey results relating to the export of live aquatic animals by 14 SADC member countries are presented in Table 1B (survey questions 1.6–1.7). Available data indicate that eight of 14 countries export live aquatic animals. There is limited export of live “foodfishes”, the exporting countries being Madagascar, Namibia, South Africa, Tanzania and Zimbabwe. Madagascar exports large numbers of mud crab (*Scylla serrata*) to Asia and Europe, and much lesser numbers of eels (*Anguilla* sp. and glass-eel), tiger shrimp (*Penaeus monodon*) and lobster (*Panulirus* sp.). Namibia exports live giant cupped oyster (*Crassostrea gigas*) and abalone (*Haliotis midae*) to South Africa and to Asian markets, while South Africa also exports live abalone to Asian markets, and oysters and mussels (*Mytilus galloprovincialis* and *Choromytilus meridionalis*) to Asian and/or African markets. Tanzania exports limited numbers of live mud crabs, lobsters and prawns to Asia and the European Union (EU), as well as to Turkey and the United States of America (USA). Zimbabwe exports large numbers of Nile tilapia fingerlings (*Oreochromis niloticus*) to Zambia for aquaculture development. Marine and/or freshwater ornamentals also exported by Malawi, Mauritius, Tanzania and Zambia. Malawi exports Lake Malawi Mbuna cichlids to global markets, while Tanzania exports cichlids from lakes Tanganyika and Naysa to global markets and Zambia exports small numbers of native cichlids to Europe. Mauritius is the only SADC country reporting the export of a small quantity various marine finfishes for the aquarium trade.

Survey data on the use of health certificates (HCs) for exports of live aquatic animals by SADC member countries are presented in Table 1C (questions 1.8–1.9). Of the eight countries reporting exports, seven issue some sort of HC, while one country (Malawi) relies on export licenses. The HCs are generally issued to the standards demanded by the market, and include:

- EU certification/non-EU attestation for aquarium fish as pets
- Certificates through TRACES (Trade Control and Export System) for the EU
- International Sanitary Certificate/OIE Model International Certificate
- Certificate to importing country specification
- Zimbabwe Aquatic Animal Health Export Certificate

Analysis

Exportation of live aquatic animals by SADC member countries is currently directed mainly at the live restaurant trade, and involves animals originating from both aquaculture (abalone, oysters, mussels) and collected from the wild (mudcrabs, lobsters). There is a limited production for aquaculture development, oyster spat and juveniles being exported by South Africa, and tilapia fingerlings by Tanzania. Exportation of wild African cichlids is important to several countries, as is the exportation of wild marine reef fishes by at least one country. There were no reports of cultured aquatic animals (either freshwater or marine) being exported by SADC countries for the aquarium trade. Better record keeping by some SADC countries on exports of live aquatic animals is clearly needed to fully understand trading patterns and the demands placed on competent authorities for issuance of HCs. Information on species compositions, life history stages, numbers of animals by species, origins, health status, destinations, etc. should be systematically collected and stored in national databases in a format that is easily retrievable for use by policy planners. In many cases, data on quantities and values of exported live aquatic animals appear to be incompletely known and/or not

collected in a way that is easily accessible to aquatic animal health experts and policy-makers.

Health certification for exported live aquatic animals does not appear to be a major issue, as exporting countries are generally able to meet the requirements of their trading partners. However, more stringent health certification for exports of freshwater (e.g. tilapias) and marine species (e.g. penaeid shrimp) destined for use in aquaculture development (i.e. freedom from specified diseases) can be expected and will have to be met if SADC countries are to further develop aquaculture industries catering to these markets. To access international markets fully, countries will need to be able to provide HCs based on testing for pathogens as specified by importing countries to the standards given in the OIE *Aquatic Animal Health Code* and *Manual of Diagnostic Tests for Aquatic Animals*. Issuance of such international HCs requires a high level of diagnostic capability. A more detailed review of current health certification practices and future needs is thus needed.

Table 1B. Export of live aquatic animals (survey questions 1.6–1.7)

Country	(1.6) Export aquatic animals?	(1.7) If “Yes”, principal species exported				
		Species	Destination	Volume (units or weight)	Value (USD)	Year
Botswana	No	n/a	n/a	n/a	n/a	n/a
DRC	No	n/a	n/a	n/a	n/a	n/a
Lesotho	No	n/a	n/a	n/a	n/a	n/a
Madagascar	Yes	<i>Anguilla</i> sp.	Asia-Europa	1 411 kg	USD44 897	2013
		<i>Penaeus monodon</i>	Malaysia	67.85 kg	8 436	
		<i>Panulirus</i> sp.	Hong Kong SAR	1 338 kg	3 155	
		Glass-eel	Asia	2 620.2 kg	64 575	
		<i>Scylla serrata</i>	Asia-Europa	880 789.56 kg	1 470 790	
Malawi	Yes	<i>Ornamentals:</i>	United Kingdom	8 000	29 000 000	2013–2014
		Lake Malawi Mbuna	USA	7 500	23 000 000	
		cichlids	Germany	6 000	16 000 000	
			Japan	4 300	13 500 000	
			China	6 200	16 400 000	
Mauritius	Yes	<i>Ornamentals:</i>			No data	2009-mid 2014
		Wrasse	No data	7 523 pcs		
		Anthias/basslets		4 843 pcs		
		Chromis		2 516 pcs		
		Butterflyfish		2 068 pcs		
		Tang		1 911 pcs		
Mozambique	No	n/a	n/a	n/a	n/a	n/a

Namibia	Yes	Giant cupped oyster (<i>Crassostrea gigas</i>)	Hong Kong SAR	80 913.67 kg	USD362 695.00	2013
			PR China	43 626.38 kg	420 911.05	
			South Africa	200 929.35 kg	1 161 568.98	
		Abalone (<i>Haliotis midae</i>) exported as flesh	Hong Kong SAR	10 000 kg	316 200.00	
Seychelles	No	n/a	n/a	n/a	n/a	n/a
South Africa¹	Yes	<i>Haliotis midae</i> (adult)	PR China, Hong Kong SAR, Japan, Thailand, Taiwan POC, Singapore, Malaysia	1 036 tonnes	ZAR357 000 000	2011
		<i>Crassostrea gigas</i> (spat, juvenile and adult)	Hong Kong SAR, Malaysia, PR China, Singapore, Mozambique, Zambia, Zimbabwe, Mauritius, Angola, St. Helena	78 tonnes	ZAR3 700 000	
		<i>Mytilus</i> <i>galloprovincialis</i> , <i>Choromytilus</i> <i>meridionalis</i>	Zambia, Zimbabwe, Mozambique, PR China, Angola, Ghana, Mauritius, Hong Kong SAR, Uganda, Congo, Malawi, Nigeria	27 tonnes	ZAR702 708	
Swaziland	No	n/a	n/a	n/a	n/a	n/a

Tanzania	Yes	Ornamentals (from Lake Tanganyika) <i>Tropheus duboisi</i> <i>T. ikola</i> <i>T. illangi</i> <i>T. mpimbwe</i> <i>Cyphotilapia</i> <i>frontosa</i> <i>Ophthalmotilapia</i> <i>boops</i> <i>Petrochromis moshi</i> <i>P. giant</i> <i>Cyprichromis</i> <i>leptosoma</i> <i>Xenotilapia</i> <i>ochrogenys</i>	Turkey, USA, Hong Kong SAR, Japan, Germany	40 336 pcs	USD179 818.40	2013 ²
		<i>Ornamentals</i> (from Lake Naysa) <i>Tyrann. nigiventer</i> Cop blue chilumba	Turkey, USA, Hong Kong SAR, Japan, Germany	3 925 pcs		
		Live crabs (<i>Scylla serrata</i>)	Turkey, USA, Hong Kong SAR, Japan, Germany	249.7		
		Live lobster (<i>Panulirus ornatus</i>)	Turkey, USA, Hong Kong SAR, Japan, Germany	121.0		
		Live prawns	European Union	0.1		

Zambia	Yes	<i>Ornamentals:</i>	Europe	120 pcs	6 000	June –Oct 2014
		<i>Cyprichromis</i>		50 pcs	2 500	
		<i>Altolamprologus</i>		50 pcs	5 000	
		<i>Xenotilapia</i>		30 pcs	12 000	
		<i>Tropheus</i>				
Zimbabwe	Yes	<i>Oreochromis</i>	Zambia	2 526 700 pcs	USD75 801	July–Dec 2013
		<i>niloticus</i> (1 g fingerlings)	Zambia	4 481 700 pcs	130 619	Jan–Sep 2014

¹Data noted to be incomplete; there are other commodities exported. Only 2011 data was available; more recent data are still being collated. The freshwater and ornamental sectors has been left out.

²Similar data from 2008–2012 submitted by NPC but not reproduced here.

Table 1C. Aquatic Animal Health (AAH) certificates for export of live aquatic animals (survey questions 1.8–1.9)

Country	(1.8) Associated AAH certification?	(1.9 a) Certificate done for freedom from specified pathogens?	(1.9 b) Certificate done to whatever standards the importing country requires?	(1.9 c) Certificate done to other standards based on general appearance of health (e.g. by visual inspection) or using testing protocols devised by agencies within your country?	Notes
Botswana	n/a	n/a	n/a	n/a	Department of Veterinary Services is competent authority and thus would provide certificates
DRC	n/a	n/a	n/a	n/a	n/a
Lesotho	n/a	n/a	n/a	n/a	n/a
Madagascar	Yes	Yes	Yes	No	Autorité Sanitaire Halieutique issues Certificates through TRACES for EU exportation; others models according to the importing country
Malawi	No ¹	No	No	Yes	Department of Fisheries
Mauritius	Yes	No	No	Yes	EU certification and non-EU Attestation for aquarium fish as pets. Competent authority: Seafood Mer Rouge Mauritius; caseafood@govmu.org
Mozambique	n/a	n/a	n/a	n/a	n/a

Namibia	Yes	Yes	Yes	No	Ministry of Fisheries and Marine Resources (MFMR) issues a health certificate conforming to the format of the appropriate OIE model certificate for aquatic animal species
Seychelles	n/a	n/a	n/a	n/a	n/a
South Africa	Yes	Yes	Yes	Yes	HCs are issued by National Regulator for Compulsory Specifications (NRCS). DAFF provides animal health assurances to NRCS biannually for export certification purposes. Animal health assurances generally state that products originate from a farm or sea-fishing area that is under an official animal health surveillance programme, and that examination and/or diagnostic testing found no evidence of infectious animal diseases as listed by the OIE.
Swaziland	n/a	n/a	n/a	n/a	
Tanzania	Yes	No	No	Yes	Competent authority
Zambia	Yes	Yes	Yes	Yes	International Sanitary Certificate issued by NALEIC on behalf of the Director of Veterinary Services

Zimbabwe	Yes	No	Yes	Yes	Zimbabwe Aquatic Animal Health Export Certificate for the export of live aquatic animals. DLVS, Regulatory
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¹Exporters have export licences which are obtained from the Department of Fisheries.

B.2 Importations

Summary of results

Survey results relating to the import of live aquatic animals by SADC member countries are presented in Table 1D (survey questions 1.10–1.11). Eleven of the 14 countries report imports live aquatic animals (no imports were reported for DRC, Malawi, and Tanzania). Eight countries import some live aquatic animals destined for aquaculture development. The species imported and the importing countries include:

- Oysters (e.g. giant cupped oyster, *Crassostrea gigas*) (mainly spat), imported by Mauritius, Namibia and South Africa
- Adult mussels, imported by South Africa
- Red drum (*Sciaenops ocellatus*) larvae, imported by Mauritius
- European seabass (*Dicentrarchus labrax*) larvae, imported by Mauritius
- Rainbow trout (*Oncorhynchus mykiss*) eggs, imported by Lesotho, Madagascar and Swaziland
- Atlantic salmon (*Salmo salar*), imported by South Africa
- Mozambique tilapia (*Oreochromis mossambicus*), imported in by Botswana and Swaziland
- Sea cucumber, imported by Namibia
- Wild shrimp broodstock, imported by Mozambique

Seven SADC countries (Botswana, Mauritius, Namibia, Seychelles, Swaziland, Zambia, Zimbabwe) indicate importation of small quantities of freshwater ornamental finfish (e.g. mollies, tetras, guppies, koi carp) that are obtained from international markets (i.e. Hong Kong SAR, Singapore, Thailand, etc.). Information on species composition, volumes and values are not readily available (and in some cases may not be required of importers).

Information on the nature of any health certificates (HCs) demanded by SADC countries from their trading partners is summarized in Table 1E (summary questionnaire part 1.12). Nine of 14 countries indicated that importation of live aquatic animals requires that shipments be accompanied by some form of HC from exporters. Five countries require certification of freedom from relevant OIE-listed diseases (Madagascar, Mauritius, Namibia, Seychelles, South Africa), one country (Lesotho) indicated that "knowledge of disease status is required", and one country (Zimbabwe) requires certification to a national pathogen list several countries require other official controls (risk management measures) (Table 1E, summary questionnaire part 1.13). These include: issuance of import permits, traceability, presence of acceptable legislation and sanitary policy, knowledge of health status of the exporting country, analysis for some specified diseases by an OIE Reference Laboratory, visual inspection upon arrival and/or at importer's premises, quarantine, safe disposal of transport water and packing materials, and restrictions on release of imported aquatic animals.

Analysis

As is the case with exportations of live aquatic animals, more detailed information on importations is needed to fully understand trading patterns and identify "risky" practices. It appears that for most SADC countries, a review of the information that the Competent Authority requires from importers is needed so that procedures for collection of more accurate and complete data on species compositions, life history stages, numbers of animals by species, origins, health status, destinations, etc. are available. This information should be

systematically collected and stored in a national database in a format that is easily retrievable for use by risk analysts and policy-makers.

It appears that procedures for import HCs and other risk mitigation measures that are currently applied by some SADC countries can be improved so as to be more effective in preventing the entry of serious diseases and pathogens. However a more detailed review of the HC requirements and border quarantine and testing requirements and procedures is needed before firm conclusions can be drawn. Use of risk analysis can assist in identifying practices in need of detailed examination and help target application of risk management measures to those species/practices considered to pose a high or unacceptable risk.

Table 1D. Summary of importations by participating countries (survey questions 1.10–1.11)

Country	(1.10) Live aquatic animals imported?	Species imported	Countries of origin	(1.11) Volume (number live animals or weight)	Value	Dates covered
Botswana	Yes	Ornamental fish	South Africa	750 per month	200	Since 2008
		<i>Oreochromis mossambicus</i>	South Africa	7 000	900	2013
DRC	No	n/a	n/a	n/a	n/a	n/a
Lesotho	Yes	Rainbow trout (<i>Oncorhynchus mykiss</i>) eggs &/or fingerlings	Denmark	3 000 000	USD1 002.00	Annually
Madagascar	Yes	<i>Oncorhynchus mykiss</i> eggs	Poland	20 000 eggs	Donation from Government of Poland	2008
Malawi	No	n/a	n/a	n/a	n/a	n/a
Mauritius	Yes	<i>Freshwater</i>	Singapore	911 798	USD145 888	2013
		<i>Ornamentals</i>	Malaysia, PR	1 008 449	USD161 352	2010
		(combined - tetra, koi, guppy, goldfish, molly)	China, Hong Kong SAR	931 767	USD149 082	2009
		Giant cupped oyster (<i>Crassostrea gigas</i>) triploid larvae	France	5 597 000 pcs	USD31 803	2012–2014

Mauritius (continued)		Red drum (<i>Sciaenops ocellatus</i>) larvae	Reunion (France)	5 400 000 pcs	USD 37 632	2011–2014
		European seabass (<i>Dicentrarchus labrax</i>) larvae	France	3 750 000 pcs	USD 28 350	2011–2014
Mozambique	Yes	Wild shrimp broodstock	Malaysia Singapore Thailand Viet Nam	23 kg 66 kg 23 kg 8 kg	n/r	2013
Namibia	Yes	Ornamental aquarium fish	Viet Nam, South Africa, Sri Lanka, Thailand	No data	No data	No data
		<i>Crassostrea gigas</i> (spat)	United Kingdom, Chile			
		Sea cucumbers (one farm in quarantine)	PR China			
Seychelles	Yes	Mainly aquarium fish (e.g. goldfish, koi) by hobbyists	Mauritius South Africa United Arab Emirates	300–500 pcs	n/a	2014

South Africa¹	Yes	<i>Salmo salar</i>	Norway, Chile, United Kingdom	336 tonnes	ZAR12 209 389	2011
		Oysters (no species names available) (seed/spat /mature, value- added products)	Namibia, PR China, Chile, France, Taiwan POC, USA, Mozambique	4 tonnes	ZAR40 000	
		Mussels - no species names available (adult)	New Zealand, China, Chile, UK, Denmark	222 tonnes	ZAR5 380 185	
Swaziland	Yes	Ornamental fish	South Africa	10 000 pcs	USD74 074.07	2014
		<i>Oncorhynchus mykiss</i>	South Africa	200 hatchlings	Unknown	
		<i>Oreochromis mossambicus</i>	South Africa	250 fingerlings	Unknown	
Tanzania	No	n/a	n/a	n/a	n/a	n/a
Zambia	Yes	Ornamentals (not specified)	Sri Lanka	No data	No data	01/01/2014 to 30/09/2014
Zimbabwe	Yes	Ornamentals (many species)	Thailand South Africa	5 545 78	USD2 594-14 1 000	March–Sept 2014 Jan–Sept 2014

¹Data noted to be incomplete; there are other commodities imported. Only 2011 data was available; more recent data are still being collated. The freshwater and ornamental sectors has been left out.

Table 1E. Health certificates for exporting country (survey questions 1.12–1.13)

Country	(1.12) Describe any associated AAH certification that you require to be provided by the exporting country	(1.13) Describe any other official controls or risk management measures to which imported aquatic animals or aquatic animal products are subject
Botswana	None An import permit is issued by the Botswana Department of Veterinary Services	Release of imported aquatic organisms into natural environments is not allowed.
DRC	n/a	n/a
Lesotho	Knowledge of disease status is required	Routine inspection upon arrival.
Madagascar	OIE certificate; the following are also required: traceability, legislation and sanitary policy, health status of the exporting country towards aquatic diseases, complementary analysis for some diseases in OIE Reference Laboratories	Veterinary inspection at the port of entry; quarantine, wastewater treatment, measures to prevent release of animals.
Malawi	n/a	n/a
Mauritius	Sanitary certificates signed by veterinary officers from the exporting country confirm that the products originate from a fish farm that has been clear of clinical diseases for the previous 12 months. OIE's <i>Aquatic Animal Health Code</i> (in particular Section 5 (trade measures, importation/ exportation procedures and health certification) is also used for reference.	<ul style="list-style-type: none"> • Visual inspections at airport and at aquatic animal farm/ornamental importer's quarantine and premises. • Obligatory quarantine period for a minimum of two weeks. • Verification that packing water is treated with chlorine and disposed of into septic tanks.
Mozambique	n/a	n/a
Namibia	Aquatic animal HC, certified by the exporting country's competent authority, certifying freedom from OIE-listed diseases; certificate of origin; proof of diagnostic test results	Veterinary inspections (aquarium fish); quarantine (new exotic aquatic species); HCs for OIE-listed diseases from the competent authority of the exporting country; environmental clearance certificates, import permits, aquaculture licensing, transfer permits.
Seychelles	Certificate of good health and attestation re: freedom from OIE-listed diseases	Control at borders and prohibitions on the release of live aquatic animals into natural waters.

South Africa	Health (sanitary) certificates or animal health certificates in the format of the suggested model certificates given by the OIE <i>Aquatic Animal Health Code</i>	South Africa is in the process of developing official controls and disease risk management measures for imported marine aquatic animals and products. There is veterinary inspection at the port of entry for imported live ornamental fish. Not much is being implemented at the moment concerning import control. Areas that need to be addressed include: additional employment of or training of animal health inspectors/ veterinarians to undertake clinical examination of live animal imports. For HCs, South Africa will request that animals originate from a farm or area free of OIE-listed diseases relevant to the species being imported. There are no official quarantine stations for aquatic animals, thus quarantine is undertaken at destination under the supervision of a veterinarian. Farmers maintain a log of animals imported into the farm. There are no document end use controls specific to aquatic animals, however this is being addressed through the aquatic animal health working group.
Swaziland	Importation is granted by the fisheries section officers and as such, an aquatic animal HC is not requested from the exporting country	None
Tanzania	n/a	n/a
Zambia	Sanitary HC issued by the competent authority in country of origin	Quarantine and veterinary inspection at port of entry.
Zimbabwe	Importer must certify that the premises from which the fish to be imported originate are free from specified parasites, bacterial, fungal and viral infections, and that the fish included in the shipment are healthy and free from external signs of disease, conformational abnormalities and emaciation.	Veterinary inspection is done at the port of entry. The Department of Parks and Wildlife prohibits the release of live aquatic animals into natural waters.

C. Risk analysis capacity

Summary of results

The current capacity of SADC member countries to undertake pathogen risk analysis is summarized in Table 1F (summary questions 1.14–1.17). Only five of 14 countries (Madagascar, South Africa, Swaziland, Zambia and Zimbabwe) indicated the existence of some risk analysis capacity for proposed movements of live aquatic animals, while only two countries reported that actual risk analyses had been completed. Several countries responded that there is some linkage of pathogen risk analysis with evaluation of other risks associated with the movement of live aquatic animals; however, of these, only South Africa clearly showed that such linkages exist.

Analysis

Governments must often make decisions having far-reaching social, environmental and economic consequences based on incomplete knowledge and a high degree of uncertainty. Risk analysis is a structured process that provides a flexible framework within which the risks of adverse consequences resulting from a course of action can be evaluated in a systematic, science-based manner. The risk analysis approach permits a defensible decision to be reached on whether the risk posed by a particular action is acceptable or not, and provides the means to evaluate possible ways to reduce an unacceptable risk to one that is acceptable.

A pathogen risk analysis (termed import risk analysis or IRA when applied to international trade) analyses the risks of introducing and/or spreading exotic pathogens or strains into new geographic areas along with the international or domestic movement of aquatic animal commodities. With the adoption of the *Agreement on the Application of Sanitary and Phytosanitary Measures* (the SPS Agreement) in 1994, WTO member countries are required to use risk analysis as a means to justify any restrictions on international trade in live aquatic animals or their products based on risk to human, animal or plant health, including the application of sanitary measures beyond those outlined in the OIE Code. As a result, risk analysis is now an internationally accepted method for deciding whether trade in a particular commodity poses a significant risk to human, animal or plant health and, if so, what measures could be applied to reduce that risk to an acceptable level.

A key problem with conducting pathogen risk analysis is the large amount of uncertainty that is often encountered due to a general lack of basic knowledge on pathogens of aquatic animals, including their identities, life cycles, ecology, host specificity, pathogenicity, etc. Thus along with the development of risk analysis expertise, countries also need to establish the appropriate supporting activities such as disease information databases, targeted research, diagnostics capability, surveillance and monitoring, etc.

There appears to be little capability or experience with pathogen risk analysis in the SADC Region. Although several regional workshops conducted by the FAO have provided basic training in risk analysis to regional participants, risk analysis capacity in most countries remains low. There is thus a need to increase capacity through regional and national training programmes in pathogen risk analysis, to develop appropriate regional or national structures for conducting risk analyses for key aquatic species and, as part of regional and national strategies, to develop capacity in other areas of AAH to support risk analysis. There is also a need to coordinate pathogen risk analyses with ecological and genetic risk analyses where proposals to introduce new species for aquaculture development are received.

As a priority activity, risk analyses should be commissioned for the most frequently traded aquatic animal commodities destined for use in aquaculture (e.g. tilapias, penaeid shrimp, abalone, oyster spat), as this will allow a preliminary determination of the “riskiness” involved in the movements of these species. Such risk analyses will also assist with regional and national planning exercises for the allocation of resources and the development of associated AAH capacity.

Table 1F. Import risk analysis (survey questions 1.14–1.17)

Country	(1.14) Expertise in your country for import risk analysis (IRA) for aquatic animal pathogens?	(1.15) Contact details of the agency/ies with this expertise and provide examples (and where applicable, citations for published IRAs	(1.16) Is evaluation of risks for aquatic animal pathogens linked with evaluation of other risks?	(1.17) Briefly describe how is this accomplished
Botswana	No	n/a	Yes	There is surveillance and monitoring of boat movement and regulations to minimize the introduction and spread of aquatic invasive species.
DRC	No	n/a	No	n/a
Lesotho	No	n/a	Yes	n/r
Madagascar	Yes (but insufficient implementation)	Veterinary services; Application of Sanitary and Phytosanitary Measures (SPS), and Aquatic Code for IRA	No	n/a
Malawi	No	n/a	n/a	n/a
Mauritius	No	n/a	Yes	Risk evaluation studies for aquatic invasive species (in port area) are being conducted by the Mauritius Oceanography Institute in collaboration with the Mauritius Port Authority
Mozambique	No	n/a	No	n/a

Namibia	No	n/a	Yes	Although there is no interagency committee, EIAs are required according to the Ministry of Environment's Act and regulations
Seychelles	No	n/a	Yes	All applications for importation of aquarium species are sent to the Ministry of Environment for approval prior to issuing of veterinary import permit.
South Africa	Yes	<p>DAFF, Directorate Animal Health, Subdirectorates Import Export Policy Unit conducts import risk assessments.</p> <p>DAFF: Branch Fisheries D:ARD, D:SAM has the expertise to conduct IRAs for aquatic animals.</p> <p>Only two risk assessments have been conducted for aquatic animal disease management. Neither has been published: Christison, K.W. & Mouton, A. 2008. <i>Qualitative Disease Risk Assessment with respect to Irvin & Johnson's proposed sea-cage aquaculture project in Mossel</i></p>	Yes	In most cases, biosecurity risks or risks associated with aquatic animal pathogens are associated with general environmental management plans which incorporate all environmental risks, including diseases, ecological and genetic impacts.

		<p>Bay. Prepared for CCA Environmental (Pty) Ltd. Semoli, B., Christison, K., De Kock, N., Ismael, I., Macey, B., Resoort, D., & Sanden, J. 2008. <i>Qualitative risk assessment and analysis in accordance with OIE guidelines – Blue cap General Trading (Pty) Ltd. Trading as Abatech, Paternoster.</i></p>		
Swaziland	Yes	<p>Department of Veterinary and Livestock Services, Epidemiology unit. Phone +268 2505 2270.</p> <p>An IRA was done by a committee appointed by the Director of Veterinary and Livestock Services in response to a request by an importer to import fresh fish from Mozambique for human consumption.</p>	No	n/a
Tanzania	No	n/a	n/ a	n/a
Zambia	Yes	Usually checking on the World Animal Health Interface Database of the OIE	No	n/a
Zimbabwe	Yes	n/r	No	n/a

SECTION 2. CONTROL OF DOMESTIC MOVEMENTS OF LIVE AQUATIC ANIMALS AND OTHER DOMESTIC ACTIVITIES THAT MAY SPREAD PATHOGENS

Summary of results

A summary of the status of regulations present in the 14 surveyed SADC member countries pertaining to activities that may prevent the domestic spread aquatic animal pathogens is given as Table 2A (questions 2.1–2.4). Ten of 14 countries have regulations for the control of domestic movement of live aquatic animals (no regulations in DRC, Lesotho, Mauritius, Mozambique). Seven countries (Botswana, Lesotho, Madagascar, Mauritius, South Africa, Tanzania, Zimbabwe) indicated capacity to regulate the disposal of waste products from processing plants.

Analysis

The ability to regulate the domestic movement of live aquatic animals can be an important tool for risk management and can be used, for example, to limit the use and distribution of new and exotic aquaculture species until their health status and the absence of any unpredicted ecological impacts are confirmed. It is also an essential component of contingency planning to restrict pathogen spread during a major disease outbreak, and is required for zoning, to help countries maintain the disease-free status of uninfected zones.

The question of whether or not to develop capacity to regulate domestic movements of live aquatic animals used in aquaculture must be considered individually by each country. In some instances, the current absence of any importations may make such capacity unnecessary (e.g. DRC, Malawi, Tanzania) or the lack of industrial-scale fish processing may allow informal methods to provide adequate safeguards against the domestic spread of pathogens.

The unsafe disposal of aquatic animal wastes (including processing water) from fish and shellfish processing plants represents a potential source for transmission of viruses and other aquatic animal pathogens. In those SADC countries where commercial processing takes place, the governmental agencies charged with regulating processing plants should be identified and current regulations and procedures (e.g. hazard analysis and critical control points, HACCP; better management practices, BMPs) should be reviewed to confirm that there are adequate safeguards to ensure that wastes and waste waters are properly treated or disposed of in a manner that will prevent the release of any viable pathogens into the environment.

Table 2: Summary of status of regulations pertaining to activities that may prevent domestic spread of aquatic animal pathogens by participating countries (survey questions 2.1–2.4)

Country	(2.1) Regulations on in-country movement of aquatic organisms?	(2.2) If “Yes”, brief description of controls, contact details of responsible agencies, legislation providing authority for control	(2.3) Regulations on waste disposal from seafood processing plants?	(2.4) If “Yes”, brief description of controls, contact details of responsible agencies, legislation providing authority for control
Botswana	Yes	Department of Wildlife and National Parks regulates movement of live fish between waterbodies via issuance of permits to move live fish as provided in the Fish Protection Regulations of 2008	Yes	Department of Environmental Affairs within the Ministry of Environment Wildlife and Tourism is the responsible agency
DRC	No	n/a	No	n/a
Lesotho	No	n/a	Yes	Environment Act of 2008 administered by Department of Environment
Madagascar	Yes	Veterinary Services, Regional Veterinary Services conducts visual inspections and issues interior health certificates	Yes	Interministerial, Order n°6812/2013 of 27 th March 2013 specifies the incineration of organic wastes and the chlorination of wastewater. The responsible authority is the Autorité Sanitaire Halieutique
Malawi	Yes	<i>No person shall, without a permit granted by the Director of Fisheries, transfer fish from an aquacultural establishment or any other water to any different aquacultural establishment or water</i>	No	n/a

Mauritius	No	n/a	Yes	<ul style="list-style-type: none"> • Environmental Protection Act (2002) • Government Notice No 209 of 2012 (Chapter IX) • Ministry of Health Food and Drugs Act 1998
Mozambique	No	n/a	No	n/a
Namibia	Yes	<ul style="list-style-type: none"> • Control via act and regulations by issuing licenses and permits: • Aquaculture Act 2002 (To regulate and control aquaculture activities; to provide for the sustainable development of aquaculture resources; and to provide for related matters (MFMR) • Regulations relating to import and export of aquatic organisms and aquaculture products: Aquaculture Act, 2002 • Aquaculture (Licensing) Regulations: Aquaculture Act, 2002 • Animal Health Act No. 1 of 2011 (to provide for the prevention, detection and control of animal disease; to provide for the maintenance and improvement of animal health; and to provide for incidental matters. (Department of Veterinary Services)) 	No	n/a

Seychelles	Yes	Animal and Plants Biosecurity Act 2014 – Biosecurity Agency drafting protocol in accordance with Biosecurity Operation Manual for the inter-island transportation of regulated articles	No	n/a
South Africa	Yes	Notification must be given for all movements of live marine aquaculture animals. For abalone, there are three disease zones which roughly correlate with the East, South and West Coast zoogeographical provinces for the South African coastline. Notification accompanied by disease testing has to be provided to DAFF ~72 hrs prior to movement of animals between these disease zones.	Yes	The marine aquaculture permit conditions for marine aquaculture fish processing establishment makes provision pertaining to waste disposal. Section 2.5 of the Marine Aquaculture Permit Conditions: Marine Aquaculture Fish Processing Establishments states “Processing effluent shall be treated prior to discharge into the marine environment or discharged directly into the local municipal sewage system. Solid wastes shall be screened from effluent and disposed of at an authorized landfill site.”
Swaziland	Yes	The Protection Of Fresh Water Act 1938 reads thus: no one is authorized to move fish from any water source in the country without a permit. The governing regulations are administered by the Fisheries Section in the Ministry of Agriculture.	No	n/a

Tanzania	Yes	<ul style="list-style-type: none"> • Section 53 of the Fisheries Regulation states: person shall not move infested fish or fishery products from one water body to another. Fisheries Division is the responsible agency and is regulated by The Fisheries Regulation 2009. • Section No. 60 (a)-(c) of the Animal Disease Act No. 17 of 2003 states: “The Minister shall after consultation with the Minister responsible for Fisheries, make regulations for- <ul style="list-style-type: none"> (a) Assessment of fish health status in the production sites through inspections and standardized procedures; (b) Eradication of fish diseases by slaughtering of infected stocks, and restocking with fish from approved disease free resources; (c) Regulating and monitoring the introduction and transportation of fish”. • Section 15 (1) – (3) of the Fisheries Act No. 22 of 2003 contains a provision for monitoring and control of disease in fish • National Fisheries Sector Policy and Strategy Statement (11) states “To promote effective farm and fish health management practices hygienic measures and vaccines”. • EAC Sanitary and Phytosanitary 2014 	Yes	<ul style="list-style-type: none"> • Submission of factory layout plan with a minimum scale of 1:200 indicating the waste disposal system, the soil disposal system and EIA report approved by relevant authority to the Director of Fisheries. Regulated by the Fisheries Regulation, 2009 • Environmental Management Act of 2004 Part ix contains a statement on waste management
Zambia	Yes	Fisheries Department	No	n/a

Zimbabwe	Yes	Ministry of Water and Climate, PWLMA, The Parks and Wildlife Act (Chapter 20: 14 of 1996 as amended)	Yes	The Environmental Management Act (Chapter 20:27)
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SECTION 3. POLICY AND PLANNING

Summary of results

A summary of the current status of policy and planning for AAH in 14 SADC countries is presented in Table 3A (survey questions 3.11–3.2) and Table 3B (survey questions 3.3–3.7). Eight of 14 countries have a specific agency(ies) or department(s) responsible for national AAH matters (no for Botswana, DRC, Lesotho, Mozambique, Namibia, Seychelles and Swaziland). Only one country (South Africa) indicated that AAH policy is expressed in the form of a national AAH plan, strategy, legislation or other document (a draft “Strategic Framework for Aquatic Animal Health and Welfare in South Africa”). Five countries indicated that AAH is considered in national fisheries &/or aquaculture strategies (DRC, Lesotho, Madagascar, South Africa, Zambia). With regard to the involvement of subnational entities in the setting of national AAH policy, nine countries indicated that this occurs, and of these, four reported that this is accomplished via stakeholder consultation (Mauritius, Mozambique, Tanzania, Zimbabwe), one (South Africa) reported that this was accomplished by inclusion of the Provincial Directors of Aquatic Animal Health on the Subcommittee for Aquatic Animal Health, and one (Zambia) reported that this was accomplished via a multidisciplinary Aquaculture Advisory Group.

Table 3C presents summary information on estimates of the effectiveness of current policy (survey questions Part 3.8 (a-c)). Respondents for only two of the 14 SADC countries surveyed (Madagascar, Tanzania) indicated that current policy and planning was thought to be adequate in preventing the entry and spread of pathogens, adequate for the domestic control of serious diseases, and effectively implemented. All other countries except Malawi (for which the response was incomplete) felt that national policy and planning was inadequate in all three areas.

Table 3D summarizes for each country, the specific areas addressed by national policy (survey questions Part 3.9). Data for this section remains incomplete, with two countries not responding (Malawi, Seychelles). NFPs from only four countries (Botswana, Lesotho, Madagascar, Mozambique, and Tanzania) indicated that all or almost all of the main policy areas are addressed in their national policy.

Table 3E summarizes responses concerning the current priorities for national aquatic animal health policy in SADC countries (survey questions 3.10). The most frequently mentioned priorities were for development of a national strategy or policy (seven countries); development and/or review of legislation (five countries); improvement of infrastructure and associated expertise for disease diagnostics (five countries) and for laboratories in general (three countries); improvement of disease surveillance and reporting capacity and the collection of associated baseline data and research (four countries); and improvement of enforcement (two countries).

Analysis

In the SADC Region, the agencies responsible for ensuring AAH are generally the national Veterinary Services, typically in cooperation with the national Fisheries or Aquaculture Agency. The fact that five countries have no agency designated as responsible national aquatic animal health policy and planning indicates a serious weakness that is reflected in the absence of a coherent national AAH policy, strategy, legislation or other document nine of the 14 countries. The handling of AAH issues on an "ad hoc" basis may reflect a lack of vision and commitment on the part of government to the development of the aquaculture

sector, as well as the protection of national biodiversity and ecosystems. The development of a SADC regional framework for policy and strategy would be a useful starting point for the development of national policy and strategy for aquatic biosecurity.

With regard to the effectiveness of current policy, it is clear (with the exception of Madagascar and Tanzania) that many respondents felt that current national policy was not effective in preventing the entry and spread of pathogens, not effective for the domestic control of serious diseases, and was not being effectively implemented. This strong response is a clear message that most SADC countries need to strengthen their AAH policy and particularly, improve its implementation.

Development of a national strategy on AAH within the broader framework of biosecurity policies or aquaculture development plans is being promoted by FAO. A national strategy contains a comprehensive framework that will allow countries to protect AAH, ensure healthy aquatic production, comply with international obligations, etc. A national strategy contains many of the essential elements for a successful AAH protection programme. These include national coordination and priority setting, legislation and policy, pathogen list, institutional resources, diagnostics, disease zoning, surveillance and reporting, health certification and quarantine, contingency planning, pathogen risk analysis, capacity building, communication, farmer/private sector engagement, financial resources, surveillance and monitoring, and evaluation and regional and international cooperation.

The development of formal strategies, policies and plans for AAH in SADC member countries should be a priority. In only one instance (South Africa) did any of the survey responses cite the existence of national policy expressed in a single coherent national plan or strategy setting out a national programme and vision for development of AAH. For most countries, formulation of a clear national policy that states a vision for national AAH and outlines the means of achieving it would be desirable. The development of national strategies and plans can be accomplished either as a separate activity or as part of national plans for biosecurity or aquaculture development. The incorporation of aquatic animal health issues related to international and domestic disease control and prevention into broader programmes of national biosecurity that include components for terrestrial animals and plants has many advantages, including development of standardized procedures and methods across all commodities and cost effectiveness with regard to shared expertise and facilities.

The current priorities of SADC countries for national AAH indicate a shared need to develop effective planning and associated technical capacity. The inability of a few countries to identify national AAH priorities at a time when increasing aquaculture development, more stringent requirements by trading partners, increased trade in live aquatic animals and the increased occurrence of epizootic diseases probably indicates a need for senior governmental authorities to undertake long-term planning exercises and develop strategies to maintain good national AAH status.

Table 3A. Summary of status of policy and planning for aquatic animal health (AAH) in participating countries (survey questions 3.1–3.2)

Country	(3.1) Agency or agencies designated as responsible for national AAH policy and planning?	If “Yes”, indicate agency(ies) or department(s)	(3.2) Responsibilities
Botswana	No	n/a	No
DRC	Yes	Ministry of Agriculture/ National Aquaculture Service (SENAQUA)	n/r
Lesotho	No	n/a	n/a
Madagascar	Yes	Autorité Sanitaire Halieutique	<ul style="list-style-type: none"> • Develop health protection policy for fisheries and aquaculture and ensure its implementation • Develop regulations on traceability and safety of fishery products and aquaculture and monitor their implementation • Develop rules on hygienic conditions of production, processing, transport, storage and distribution of fishery and aquaculture products and ensure their implementation • Develop, in collaboration with the responsible ministry, regulations on veterinary public health in areas other than those covered by the above three points as they apply to fisheries and aquaculture, including: animal health, veterinary medicine, feed, laboratories and official methods of analysis and professional veterinary activities and ensure their implementation • Participate in defining regulations, standards and requirements for the production, preparation and presentation of food and agricultural products, and that apply to fishery products and aquaculture

			<ul style="list-style-type: none"> • Participate in the definition and policy direction of vocational training, including for veterinary staff and quality experts in food processing, food safety of fishery products and aquaculture • Provide guidance and support to research and policy development in the health field for fishery products and aquaculture • Participate as regards to the safety of fishery products and aquaculture, in the National Council for Standardization, the National Codex Alimentarius Committee, the National Committee on Chemicals Management at the National Commission of Feed, and the Bureau of Food Safety and Animal; and collaborate with regard to the <i>Aquatic Animal Health Code</i>, in the activities of the national focal point of OIE
Malawi	Yes	Department of Animal Health and Livestock Production (DAHLD)	<ul style="list-style-type: none"> • Carry out sanitary/health certification • Carry out risk analysis, negotiating animal health and assessing foreign Competent Authorities • Provide guidelines for aquatic animal disease pharmaceuticals • Conduct disease surveillance and reporting to OIE and other regional bodies • Issue HCs and laboratory testing • Provide veterinary diagnostic services
Mauritius	Yes	Competent Authority Seafood (CASF)	Note: A draft AAH strategy is being prepared and will be forwarded to the Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Island for approval. The purpose of this strategy is to reduce the risk of aquatic animal diseases.
Mozambique	No	n/a	n/a
Namibia	No	n/a	n/a
Seychelles	No	n/a	n/a

South Africa	Yes	Directorate: Sustainable Aquaculture Management and Directorate: Animal Health (of the DAFF)	<ul style="list-style-type: none"> • The two directorates have assumed dual responsibility for national aquatic animal health policy and planning and have constituted a subcommittee on Aquatic Animal Health which is a subcommittee of the MIN TEC veterinary working group, to oversee the implementation of a national AAH programme.
Swaziland	No	n/a	n/a
Tanzania	Yes	The Fisheries Division and the Department of Veterinary Services	<ul style="list-style-type: none"> • The FD is responsible for developing fisheries policy, Fisheries Act and Fisheries Regulations • The DVS is responsible for developing the Veterinary Act and Animal Disease Act and their respective regulations
Zambia	Yes	Fisheries and Veterinary Services	<ul style="list-style-type: none"> • Fisheries and Veterinary Services suggests policy direction through the Department of Policy and Planning of the Ministry of Agriculture and Livestock
Zimbabwe	Yes	Ministry of Agriculture, Mechanization and Irrigation Development (MAMID), DLVS Agricultural Livestock Development Policy Draft in process	<ul style="list-style-type: none"> • Mandated through the Animal Health Act to prevent the entry, establishment and spread of animal diseases and pests. Conducts surveillance, control and prevention activities including import controls. Also is the Competent Authority for purposes of linkages with the international bodies

Table 3B. Summary of status of policy and planning for aquatic animal health (AAH) in participating countries (survey questions 3.3–3.7)

Country	(3.3) Official policy expressed in a national AAH plan, strategy, legislation or other document?	(3.4) If “Yes”, provide citation for document	(3.5) If no, briefly describe how issues impacting national AAH are currently being handled	(3.6) Do subnational entities play a role in setting national AAH policy?	(3.7) If yes, briefly describe their role(s)
Botswana	No	n/a	<i>Salvinia molesta</i> control measures which involve the control of interzonal movement of boats and fishing equipment. The boats and fishing equipment are spread before they are moved to other zones.	No	n/a
DRC	Yes	<ul style="list-style-type: none"> • National Strategy for the Development of Aquaculture • National Plan for the Development of Aquaculture • Fisheries and Aquaculture Act 	n/a	Yes	<ul style="list-style-type: none"> • Supervision of aquaculture operators • Popularization of modern technologies for aquaculture development • Recycling and training of farmer farmers
Lesotho	Yes	Fisheries and Aquaculture Strategic Framework	n/a	Yes	Support and own adopted policy for control and coordination purpose

Madagascar	Yes	<p>Act n°2001-20 of 12 December 2001 « Development of responsible and sustainable shrimp aquaculture »</p> <p>Act n°2006-30 of 24 November 2006 « On livestock Madagascar »</p> <p>Decree n°2004-041 of 16 April 2004 « Laying down applied regimes to the import and export of animals, animal products and products of animal origin and seeds, fodder and products for animal feed »</p> <p>Decree n°2005-187 of 22 April 2005 « Nomenclature of contagious animal diseases deemed to Madagascar »)</p>	n/a	Yes	<p>Interministerial Order n°960/98 of 11 February 1998 « Definition and codification of sanitary measures to be taken in case of contagious diseases »</p> <p>Order n° 33423 / 2010 of 13 September 2010 « Related to crustacean animal health and products thereof . Article 17: The competent authority shall be informed immediately of any suspected and/or any confirmation of the presence of disease in crustaceans, whatever the reasons, listed in Annex IV, Part II of this order, which necessarily must notify: the owner of aquatic animals and any person appointed to deal with; veterinarians and other professionals involved in services related to the health of aquatic animals; official</p>
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**Madagascar
(continued)**

Interministerial Order
n°960/98 of 11 February
1998 « Definition and
codification of sanitary
measures to be taken in case
of contagious diseases »

Order n°12198/2005 of 12
August 2005 « Establishing
a zoning system based on
epidemiological criteria in
some parts of the country »

Order n° 33423 / 2010 of
13 September 2010
« Related to crustacean
animal health and products
thereof »

and the responsible
official or private
veterinary laboratories;
any other person related,
through their work with
aquatic animals. Any
increase in mortality in
shellfish must be
immediately notified to
them for further
investigations

Malawi

No

n/a

Currently handled on an *ad hoc* No
basis and treated case by case

n/a

Mauritius

No

n/a

AAH issues on registered Yes
farms are dealt with by the
CASF as they arise
Current practice in the Ministry
of Fisheries involves the
issuing of permits, conducting
inspections and the assessment
of quarantine facilities.

Public and private-sector
consultation on issues as
they arise

Mozambique	No	n/a	AAH issues are handled by both the Ministry of Agriculture through the National Directorate of Veterinary Services and the Ministry of Fisheries through the National Fisheries Inspection Institute (INIP).	Yes	In the development of a national policy or strategy the key stakeholders are involved in extensive consultation. However, Mozambique currently lacks a specific strategy for AAH
Namibia	No	n/a	Directorate of Aquaculture collects fish samples with potential EUS on a quarterly basis in the Kavango and Zambezi Region. Specimens are preserved in 10% formalin and sent to the University Of Zambia for analyses. Shellfish health monitoring: Once a year, shellfish specimens are sent to Amanzi Biosecurity in South Africa for histopathology and polymerase chain reaction (PCR) testing for OIE-listed shellfish diseases, and costs of tests are paid by the MFMR. The specimens represent different regions.	No	n/a

Namibia (continued)			Ministry of Fisheries and Marine Resources, Directorate of Aquaculture, Research, Monitoring, Disease and Quality Control Division, P.O. Box 912, 1 Strand Street, Swakopmund		
Seychelles	No	n/a	On an <i>ad hoc</i> basis, but there are plans to draft an animal health plan/strategy based on the recent OIE Performance of the Veterinary Services (PVS) Gap analysis taking also into consideration the Mariculture Masterplan	No	n/a
South Africa	Yes	A “Strategic Framework for Aquatic Animal Health and Welfare in South Africa” has been drafted as the departure point for further development of an AAH Policy which will be implemented by the Sub-Committee on Aquatic Animal Health	n/a	Yes	The Provincial Directors of Animal Health are all represented on the Sub-committee for Aquatic Animal Health.

Swaziland	No	n/a	These consignments are allowed entry only after border officials are shown the requested documents. The importation of live fish is done by the Fisheries Section, which is not under the Veterinary Department. The import permit issued does not require an HC. However there is plan to develop a veterinary import permit that will include consideration of health issues.		n/a
Tanzania	No	n/a	<p>Handled based on the relevant legislation, such as:</p> <ul style="list-style-type: none"> • Animal Disease Act No. 17 of 2003 • Fisheries Act No. 22 of 2003 • The Fisheries Regulations of 2009 • Medium Term Strategic Plan 2012/2013-2016/2017 of the Ministry of Livestock and Fisheries National Fisheries Sector Policy and Strategy Statement 1997 • National Livestock Policy 2006 • National Aquaculture Development Strategy 2009 	Yes	Stakeholders review the draft documents and contribute their ideas before approval of the document by the Parliaments.

Tanzania (continued)			<ul style="list-style-type: none"> • Veterinary Act No. 16 of 2003 		
			EAC Sanitary and Phytosanitary 2014		
Zambia	Yes	The National Aquaculture Strategy, draft Aquaculture Regulations, and under the Animal Health Act No.22 of 2010	n/a	Yes	Through the multi-disciplinary Aquaculture Culture Advisory Group, the private sector participates in setting the policy direction for particular issues, including aquatic health
Zimbabwe	No	n/a	<ul style="list-style-type: none"> • AAH issues are dealt with by passive surveillance • Immediate response to disease outbreaks • Public awareness and notification • Stakeholder participation in policy review and strategy formulation • Aquanurture and World Vision- Fisheries Policy Review and Gap Analysis in process 	Yes	<ul style="list-style-type: none"> • Stakeholder consultation on agriculture livestock development policy • Review of the regulatory environment

Table 3C. Effectiveness of current policy and planning for aquatic animal health (AAH) in participating countries (survey questions 3.8a-c)

Country	(3.8)		
	Adequate for preventing entry and spread of pathogens?	Adequate for domestic control of serious diseases?	Effectively implemented?
Botswana	No	No	No
DRC	No	No	No
Lesotho	No	No	No
Madagascar	Yes	Yes	Yes
Malawi	No	n/r	n/r
Mauritius	No	No	No
Mozambique	No	No	No
Namibia	No	No	No
Seychelles	No	No	No
South Africa	No	No	No
Swaziland	No	No	No
Tanzania	Yes	Yes	Yes
Zambia	No	No	No
Zimbabwe	No	No	No

Table 3D. Areas addressed in national policy by participating countries (survey questions 3.9)

Country	Botswana	DRC	(3.9) Lesotho	Madagascar	Malawi	Mauritius	Mozambique
National diagnostics services	Yes	Yes	Yes	Yes	n/r	No	Yes
Risk analysis	Yes	Yes	Yes	Yes	n/r	No	Yes
Farm-level treatment and prevention	Yes	No	Yes	Yes	n/r	Yes	Yes
Emergency preparedness and disease control	Yes	No	Yes	Yes	n/r	Yes	Yes
Zoning compartmentalization	n/r	No	n/r	Yes	n/r	No	n/r
Use of veterinary drugs	n/r	Yes	n/r	Yes	n/r	Yes	n/r
Manpower requirements	Yes	No	Yes	Yes	n/r	No	Yes
Training requirements	Yes	Yes	Yes	Yes	n/r	No	Yes
Infrastructural requirements	Yes	No	Yes	Yes	n/r	Yes	Yes
Financial requirements and planning	Yes	No	Yes	Yes	n/r	No	Yes
International treaties, memberships and linkages	Yes	No	Yes	Yes	n/r	No	Yes
Communication (interagency, stakeholder)	Yes	No	Yes	Yes	n/r	No	Yes

Country	Namibia	Seychelles	South Africa ¹	Swaziland	Tanzania	Zambia	Zimbabwe
National diagnostics services	No	n/r	No	No	No	No	Yes
Risk analysis	No	n/r	No	No	No	No	No
Farm-level treatment and prevention	No	n/r	No	No	Yes	No	Yes
Emergency preparedness and disease control	No	n/r	No	No	No	No	No
Zoning compartmentalization	No	n/r	No	No	Yes	No	No
Use of veterinary drugs	No	n/r	No	No	Yes	Yes	No
Manpower requirements	No	n/r	No	No	Yes	No	No
Training requirements	No	n/r	No	No	Yes	No	No
Infrastructural requirements	No	n/r	No	No	Yes	No	No
Financial requirements and planning	No	n/r	No	No	Yes	No	No
International treaties, memberships and linkages	No	n/r	No	No	Yes	No	Yes
Communication (interagency, stakeholder)	Yes	n/r	Yes	No	Yes	No	Yes

¹These responses for South Africa reflect the current situation and also the need for incorporation into a broader policy. Most of these issues have not been addressed in the marine aquaculture policy, but are being addressed through an implementation plan for an AAH programme. There has been limited progress here. All of the listed topics will be covered in this implementation plan. South Africa is in the process of drafting an aquaculture bill that will cover these topics too. South Africa currently has disease zones only for abalone. The national policy for marine animals does cover zoning but is not specific to animal health and disease management. There are no approved veterinary drugs for aquatic animals, however drugs can be used off label by veterinarians, so are not addressed in the policy.

Table 3E. Current priorities with regard to national AAH policy in participating countries (survey questions 3.10).

Country	(3.10)
	Current priorities for your country
Botswana	Fisheries sector in Botswana is not yet developed, and therefore there are no priorities with regard to national AAH policy
DRC	<ol style="list-style-type: none"> 1. Alimentation (food fishing) 2. Ecloseries modernes [modern hatcheries] 3. Laboratoires divers [various laboratories]
Lesotho	<ol style="list-style-type: none"> 1. Fisheries policy and legislation 2. Trained personnel 3. Infrastructure (laboratory)
Madagascar	<ol style="list-style-type: none"> 1. Biosecurity measures 2. Aquaculture management 3. Risk analysis
Malawi	<ol style="list-style-type: none"> 1. To establish a National Aquatic Animal Health Centre (NAAHC) 2. To build capacity of officers manning the NAAHC
Mauritius	<ol style="list-style-type: none"> 1. Drafting legislation 2. Capacity building 3. Base-line surveys (existing pathogens) 4. Training to include research and development, local expert 5. Enforcement, implementation 6. Setting up of diagnostic facilities 7. Contingency plans 8. Extension services 9. Informing stakeholders
Mozambique	<ol style="list-style-type: none"> 1. Set the national legislation for AAH 2. Develop the national prevention and control strategy for aquatic animal diseases 3. Identify the main AAH threats and prioritize interventions
Namibia	Priorities unknown because an AAH policy has not been developed,
Seychelles	<ol style="list-style-type: none"> 1. Maintenance of current aquatic animal disease status 2. Surveillance and reporting obligations

South Africa	<ol style="list-style-type: none"> 1. Export certification 2. Development of diagnostic and clinical capacity, both in terms of human resources and infrastructure 3. Disease surveillance
Swaziland	<ol style="list-style-type: none"> 1. Policy making and drafting of legislation for disease control and prevention in aquatic animals 2. Having qualified veterinarians and allied professionals to manage AAH in the country 3. To equip the laboratory to be able to diagnose aquatic diseases
Tanzania	<ol style="list-style-type: none"> 1. Increase human resources to handle AAH issues by training of available staff 2. Import risk analysis 3. Surveillance and monitoring of aquatic animal diseases
	<p>Note: the country is currently undertaking reviews of the following to incorporate AAH issues: (i) Fisheries Policy statements of 1997; (ii) Fisheries Regulations; and (iii) the National Aquaculture Development Strategy and National Aquaculture Development Plan. The main reason for these reviews is to ensure that AAH issues are considered a priority undertaking.</p>
Zambia	<ol style="list-style-type: none"> 1. Address policy issues 2. Diagnostics (equipment, infrastructure and training) 3. Research 4. Enforcement of aquaculture regulations
Zimbabwe	<ol style="list-style-type: none"> 1. Control of transboundary aquatic animal diseases (TAADs) 2. Public health and food safety 3. Mainstreaming of trade standards 4. Infrastructure 5. Animal welfare 6. Invasive species and biodiversity conservation 7. Exotic diseases 8. Development of national strategies 9. Development of national policy

SECTION 4. LEGISLATION

Summary of results

Development of essential enabling legislation is a key component of a national AAH strategy. Table 4A summarizes the status of national legislation dealing with AAH policy for (survey questions 4.1–4.4). The majority of responding countries (10 of 14) reported that there is no specific legislation dealing with AAH. Four countries indicated that specific legislation supporting policy exists (although legislation specific only to AAH was cited only by Madagascar). The results thus indicate that, where AAH issues are considered in national legislation, this is typically via their inclusion in broader legislation promulgated to regulate general veterinary or fisheries matters. Eleven countries clearly indicated that their legislation was in need of major review or revision (and tellingly, no country responded "No" to this question).

Analysis

The survey results indicate that the formulation of legislation and regulations to support AAH management or, in the case where legislation exists, its review and revision, is needed by all (or almost all) SADC member countries. For most countries, once a review of the effectiveness of existing legislation has been accomplished and long-term policy and planning exercises have been undertaken, national legislation should be reviewed to ensure that the legal mechanisms are in place to support AAH activities. The FAO Legal Department may provide FAO member countries with assistance in the review and revision of national fisheries and aquaculture legislation, including laws and regulations supporting national AAH.

Table 4A. Status of legislation dealing with aquatic animal health in participating countries (survey questions 4.1–4.4)

Country	(4.1) Is there specific legislation in place dealing with AAH?	(4.2) Give a name of legislation related to AAH if such legislation/sub-legislation exists as separate act	Indicate if AAH legislation is by separate act or regulation	(4.3) Indicate if AAH legislation is part of broader veterinary, aquaculture, environmental protection or conservation legislation or regulations	(4.4) If yes, is existing legislation in need of major review and/or revision?
Botswana	No	n/a	No	Yes	Yes
DRC	No	n/a	Yes	Yes	Yes
Lesotho	No	n/a	No	Yes	n/r
Madagascar	Yes	<ul style="list-style-type: none"> • Interministerial Order n°960/98 of 11 February 1998 « Definition and codification of sanitary measures to be taken in case of contagious diseases » • Order n° 33423 / 2010 of 13 September 2010 « Related to crustacean animal health and products thereof » 	Yes	No	Yes
Malawi	Yes	Control and Animal Diseases Act, which is general for all animals	n/r	Yes	Yes
Mauritius	No	<ul style="list-style-type: none"> • Fisheries and Marine Resources Act (2007) • Environment Protection Act (EPA) 2002 	n/a	n/a	n/a

Mozambique	No	n/a	No	Yes	Yes
Namibia	No	n/a	No	Yes	Yes
Seychelles	Yes	<ul style="list-style-type: none"> • Animal and Plants Biosecurity Act 2014 • Animal (Diseases and Imports) Regulations 	Yes	Yes	Yes (Partly)
South Africa	No	n/a	No	Yes	Yes
Swaziland	No	n/a	n/a	n/a	n/a
Tanzania	No	<ul style="list-style-type: none"> • Animal Disease Act No. 17 of 2003 • Fisheries Act No. 22 of 2003 • The Fisheries Regulations, 2009 • Medium Term Strategic Plan 2012/2013-2016/2017 of the Ministry of Livestock and Fisheries • National Fisheries Sector Policy and Strategy Statement 1997 • National Livestock Policy 2006 • National Aquaculture Development Strategy 2009 • Veterinary Act No. 16 of 2003 • East African Community (EAC) Sanitary and Phytosanitary 2014 	No	Yes	Yes

Zambia	No	<ul style="list-style-type: none"> • Animal Health Act No. 22 of 2010 • Fisheries Act No. 22 of 2011 	Yes	Yes	Yes
Zimbabwe	Yes	Legislation is covered under general provisions of the: <ul style="list-style-type: none"> • Animal Health Act • Public Health Act • Environmental Act • Biotechnology Act 	No	Yes	Yes

SECTION 5. DISEASE SURVEILLANCE AND MONITORING/INFORMATION SYSTEMS

Summary of results

The current status of surveillance and monitoring programmes for plant and animal diseases in the 14 responding SADC member countries is summarized in Table 5A (survey questions 5.1–5.3), while the status of national AAH information systems is given in Table 5B (survey question 5.4). Most countries (12 of 14) indicate that some form of official surveillance or monitoring programme exists (exceptions: DRC, Seychelles). Official programmes for surveillance and monitoring of diseases of terrestrial animals are reported for 12 countries, while similar programmes for surveillance of diseases of plants are reported for seven countries. Official surveillance and monitoring programmes for aquatic animal diseases are indicated to be present in nine countries: Botswana (disease(s) not indicated); Malawi (for epizootic ulcerative syndrome, EUS); Madagascar (disease(s) not indicated; surveillance in aquaculture and fishing areas); Mozambique (passive surveillance in the main fisheries center and in aquaculture stations country wide); Namibia (for EUS and for OIE-listed shellfish diseases); Seychelles (limited passive surveillance); Tanzania (active surveillance for OIE listed-diseases); Zambia (type of surveillance not described); and Zimbabwe (passive surveillance and specific surveys - types of pathogens not indicated). In addition, South Africa is planning to implement a surveillance programme for diseases of marine invertebrates.

With regard to AAH information systems, only seven countries indicated their existence, and of these, most referred to the use of the World Animal Health Information System (WAHIS) of the OIE. No country clearly indicated that an extensive national AAH information system existed, although Malawi reported that such a system had been designed but not implemented.

Analysis

Disease surveillance is a fundamental component of any official AAH protection programme. Surveillance and monitoring programmes for aquatic animal diseases are essential to detection and rapid emergency response to serious disease outbreaks and form the basis for early warning of emerging disease outbreaks. They are also increasingly demanded by trading partners to support statements of national disease status and are the basis for disease zonation. Surveillance also provides the building blocks of information necessary to have an accurate picture of the distribution and occurrence of diseases relevant to disease control and international movement of aquatic animals and their products.

There appears to be a need to establish surveillance and monitoring programmes for SADC countries where these are lacking, and to review and improve these programmes where they are already established. Surveillance can be passive (reactive and general in nature) or active (proactive and targeted). In both cases, there must be adequate reporting mechanisms so that suspected cases of serious disease are quickly brought to the attention of the lead agency. Surveillance and monitoring efforts must be supported by adequate diagnostics capability (including appropriately trained expertise, suitably equipped laboratory and rapid-response field diagnostics, and standardized field and laboratory methods), information system management (i.e. a system to record, collate and analyze data and to report findings), legal support structures, transport and communication networks and linked to national and international (OIE) disease reporting systems (e.g. pathogen list or list of diseases of concern, disease notification and reporting procedures). Surveillance to demonstrate freedom from a

specific disease requires a well designed active sampling programme that meets the standards outlined in the OIE *Aquatic Animal Health Code*.

SADC countries should develop individual national AAH databases and a regional AAH information system. While the OIE's WAHIS is extremely useful, it contains only records for OIE-listed diseases (including diseases of terrestrial animals) and not detailed information on the geographic distributions (e.g. by aquaculture facility or drainage basis) of individual aquatic pathogens within each country. Countries thus need to develop databases and associated information systems for tracking of pathogens (both OIE-listed and other pathogens) within their national boundaries.

Table 5A. Current status of surveillance and monitoring programmes for plant and animal diseases in participating countries (survey questions 5.1–5.3)

Country	(5.1)	If yes, do these programmers deal with:		If yes, do these programmers deal with:		(5.3) Brief description of programmes for aquatic animal diseases and name and contact details for responsible agencies
(5.1) Are there any official surveillance or monitoring programmes for plant or animal diseases in your country?	plants?	terrestrial animals?	aquatic animals?			
Botswana	Yes	No	Yes	Yes	Trans-boundary Fisheries Management Plan of the Okavango/ Kavango/Cubango Basin was formulated under the auspices of the Joint Permanent Commission of Cooperation between Botswana and Namibia There no longer exists a surveillance programme for diseases of aquatic organisms n/a Halieutic Health Authority has passive and active surveillance in aquaculture and fishing areas	
DRC	No	n/a	n/a	n/a		
Lesotho	Yes	No	Yes	No		
Madagascar	Yes	Yes	Yes	Yes		

Malawi	Yes	No	Yes	No	Active surveillance for EUS was done in 2007. Plans are underway for a second round of surveillance which will involve the Fisheries and Veterinary departments.
Mauritius	Yes	Yes	Yes	No	A monitoring programme (questionnaire) to manage the risk of introducing invasive plant or animal species carried by ballast has been developed and is being used by the Mauritius Port Authority for arriving merchant vessels.
Mozambique	Yes	Yes	Yes	Yes	The disease surveillance programme for aquatic animals is general surveillance and is based on the observations of health events in the main fisheries center and aquaculture stations existing countrywide.

Namibia	Yes	No	Yes	Yes	<p>EUS monitoring: Directorate of Aquaculture collects fish samples with potential EUS on a quarterly basis in the Kavango and Zambezi Region. Fish are preserved in 10% formalin and sent to the University of Zambia for analyses.</p> <p>Shellfish health monitoring: once a year, shellfish specimens are sent to Amanzi Biosecurity in South Africa for histopathology and PCR testing for OIE-listed shellfish diseases, and costs of tests are paid by the MFMR. The specimens represent different regions.</p> <p>Ministry of Fisheries and Marine Resources, Directorate of Aquaculture, Research, Monitoring, Disease and Quality Control Division, P.O. Box 912, 1 Strand Street, Swakopmund</p>
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Seychelles	No	No	No	No	There is some ongoing passive surveillance which falls under the responsibility of the Veterinary Services
					Veterinary Services Seychelles Agriculture Agency Ministry of Natural Resources P.O. Box 166 Union Vale Mahe, Seychelles
South Africa	Yes	Yes	Yes	No	DAFF, Directorate Sustainable Aquaculture Management is currently developing and implementing a disease surveillance and monitoring programme for marine and wild-caught invertebrates. Any other surveillance or monitoring is done at the research level predominantly by higher educational facilities.
Swaziland	Yes	No	Yes	No	n/a

Tanzania	Yes	Yes	Yes	Yes	<p>The programme for surveillance and monitoring has been integrated into the Ministry's 2014/2015 plan and budget. The programme covers:</p> <ul style="list-style-type: none"> • Sampling of aquatic animals and aquatic environment country wide in seven zones (east, west, lake, southern, central and northern zone) for OIE-listed diseases; • Sample analysis using the OIE- described diagnostic techniques; • Reporting to the higher authorities at national and international levels, including OIE; • Implementing AAH biosecurity measures in hatcheries, aquaculture and aquatic animal processing facilities. <p>The responsible agency is the Ministry of Livestock and Fisheries Development.</p>
Zambia	Yes	Yes	Yes	Yes	<p>University of Zambia, School of Veterinary Medicine, Fisheries Department</p>

Zimbabwe	Yes	Yes	Yes	Yes	<ul style="list-style-type: none"> • Passive surveillance programme following FAO guidelines. DLVS, OIE-AAH Focal Point in Response to Disease Outbreaks • Specific surveys by University of Zimbabwe Biological Science Department
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Table 5B. Existence of aquatic animal health (AAH) information system (for storing, retrieval and analysis of disease diagnostics and surveillance data/information) (survey question 5.4)

Country	AAH information system exists?	(5.4) If Yes, responsible institution and facilities
Botswana	No	n/a
DRC	Yes	n/r
Lesotho	Yes	DLS as OIE Delegate using the World Animal Health Information System (WAHIS)
Madagascar	Yes	Surveillance data/information, results of retrieval and analysis of disease diagnostics for AAH are stored within the Autorité Sanitaire Halieutique. The Aquatic Animal Health Information System is functional within the Veterinary Service (Ministry of Livestock and Animal Protection).
Malawi	Yes	System exists on paper but has not been implemented. Responsible person is Gilson Njunga, Department of Animal Health and Livestock Development
Mauritius	No	n/a
Mozambique	No	n/a
Namibia	No	n/a
Seychelles	No	n/a
South Africa	No	No such information system currently exists, however, a system is being developed and implemented as part of a disease surveillance and monitoring programme.
Swaziland	No	n/a
Tanzania	Yes	Ministry of Livestock and Fisheries Development. Facility is through WAHIS software.
Zambia	Yes	Mainly by NALEIC via access to WAHIS
Zimbabwe	Yes	DLVS, DVS-Epidemiology Unit

SECTION 6. DISEASE DIAGNOSTICS

Summary of results

A summary of disease diagnostics capability in the 14 responding SADC member countries is presented in Tables 6A and 6B. Table 6A indicates the ability to diagnosis those diseases listed by the OIE (survey questions 6.1–6.2). According to the survey responses, only three countries (Madagascar, South Africa and Zimbabwe) currently have adequate capacity to diagnose the OIE-listed diseases of national concern. No country has capacity to diagnose all OIE-listed diseases; Madagascar can diagnose all crustacean diseases and some finfish diseases, South Africa can diagnose all molluscan diseases, some crustacean diseases and some finfish diseases, while Zambia and Zimbabwe can both diagnose some finfish diseases.

Table 6B summarizes the status of diagnostic laboratories in 14 SADC countries, indicating whether they are officially designated national laboratories, laboratories accredited as international or national reference centers, or other public or private-sector laboratories (summary questions 6.3–6.8). Two countries (Madagascar and Zimbabwe) indicated that national laboratories have been designated. No country has an accredited laboratory, while seven countries that some private laboratory services were available that could be accessed to assist with aquatic animal disease diagnostics (Malawi, Mauritius, Mozambique, Namibia, South Africa, Tanzania, Zambia and Zimbabwe). Of these, Mauritius and Mozambique allow the use of overseas laboratories, while other countries rely on laboratories in government, university or and/or the private sector.

Table 6C summarizes the status of national pathogen lists for the SADC member countries (survey questions 6.9–6.10). Only five of the 14 countries surveyed (Lesotho, Madagascar, Namibia, Tanzania, and Zimbabwe) indicate that national pathogen lists exist or are in progress. Madagascar and Namibia base their pathogen lists on the OIE disease list, while other countries use criteria such as potential zoonotic, economic and/or ecological impact.

Analysis

Disease diagnostics plays two significant roles in health management and disease control. The first role of diagnostics is to ensure that stocks of aquatic animals that are intended to be moved from one area or country to another are not carrying infection by specific pathogens at subclinical levels and is accomplished through screening of healthy animals. The second equally important role of diagnostics is to determine the cause of unfavourable health or other abnormalities in order to recommend measures appropriate to a particular situation. Disease diagnostics is also an important supporting component of surveillance and monitoring programmes, contingency planning and emergency response.

The capacity to provide rapid, accurate diagnosis of aquatic animal diseases is an important part of a national AAH plan. Issuance of international HCs based on the demonstrated ability to diagnose diseases using the standards and diagnostics tests specified by the OIE Code and Manual for OIE-listed molluscan, crustacean and finfish diseases is increasingly required by importing countries.

There are few aquatic animal disease diagnostic laboratories present in the SADC Region, and only three have capability to diagnose relevant OIE-listed diseases to OIE standards. There is no regional AAH laboratory and none of the existing national laboratories is an OIE reference center for aquatic animal disease diagnosis.

National pathogen lists should include only those diseases that meet a stringent set of criteria (see FAO/NACA 2000).² These are:

- Presence or absence of the disease or pathogen in the importing country – The disease or pathogen should be:
 - exotic to the entire country, or
 - occurring in parts of the country, but there are zones that are officially recognized as free and that need to be protected, or
 - occurring in parts of the country, and the country is running a control programme to minimize spread of the disease and/or to eradicate it.
- Pathogenicity – The disease or pathogen has a significant adverse affect on host health.
- Infectious etiology – The disease is caused by an infectious agent that is transmissible horizontally and/or vertically, as well as directly or indirectly (via carriers or intermediate hosts existing in the receiving waters).
- Adverse socio-economic, public health or ecological impacts – The disease or pathogen is known or likely to cause significant adverse socio-economic, public health or ecological impacts.

Importantly, a pathogen should not be listed if it:

- occurs widely within the region with no infectious mortality or
- has no socio-economic impact, or
- is controlled through improved husbandry handling (nonchemotherapeutic intervention).

The results of the survey show that there is a clear need to increase national disease diagnostics capability in most SADC countries. This can be accomplished in several ways, depending on (i) the demand for international HCs by exporters, (ii) the need to confirm health status of imported live aquatic animals during quarantine, (iii) the need for diagnostics support to disease surveillance and monitoring programmes, and (iv) the need for diagnostics services to support AAH in aquaculture facilities. In some cases these needs might be met by use of foreign or private-sector laboratories, while routine diagnostic service to the private sector can often be adequately delivered by private-sector laboratories. In general, some national diagnostics capacity is desirable, and each country should consider its need for diagnostics capacity based on the current situation and future plans for aquaculture development and increased trade in live aquatic animals.

Each SADC country should also consider establishing a national pathogen list that can be used when demanding HCs from exporting countries. OIE-listed diseases that are relevant to national conditions (including consideration of trading patterns) form a good starting point; however, national disease lists need to be founded on a thorough knowledge of national disease status, which can only be obtained through passive and active disease surveillance programmes, generalized disease/pathogen surveys, adequate disease record keeping and reporting, and a national disease database. The possibility of establishing a regional pathogen list should also be considered. In the same manner, designating a regional aquatic animal disease reference center should also be considered. The role and specific tasks of this reference center can be defined based on an assessment of the needs for such a center at the regional level. Countries already having a national pathogen list should review the criteria for

² FAO/NACA. 2000. *Asia regional technical guidelines on health management for the responsible movement of live aquatic animals and the Beijing consensus and implementation strategy*. FAO Fisheries Technical Paper No. 402, 53 pp., Rome, FAO.

disease listing and the diseases currently listed to ensure that the listing criteria meet those of the OIE. It is clear that some countries have disease lists containing pathogens that would not meet OIE criteria. In some instances separate lists may be warranted, one for OIE-listed pathogens, and a second for non-OIE listed diseases that are nationally important.

Table 6A. Summary of ability to diagnose OIE-listed diseases (survey questions 6.1 and 6.2)

Country	(6.1)	(6.2)		
	All diseases	Molluscan diseases	Crustacean diseases	Finfish diseases
Botswana	No	n/a	n/a	n/a
DRC	No	n/a	n/a	n/a
Lesotho	No	n/a	n/a	n/a
Madagascar	Yes	No	Yes (all)	Yes (some)
Malawi	No	n/a	n/a	n/a
Mauritius	No	n/a	n/a	n/a
Mozambique	No	n/a	n/a	n/a
Namibia	No	n/a	n/a	n/a
Seychelles	No	n/a	n/a	n/a
South Africa	Yes	Yes (all)	Yes (some)	Yes (some)
Swaziland	No	n/a	n/a	n/a
Tanzania	No	n/a	n/a	n/a
Zambia	No	No	No	Yes (some)
Zimbabwe	Yes	No	No	Yes (some)

Table 6B. Summary of diagnostic capacity for aquatic animal diseases in participating countries (survey questions 6.3–6.8)

Country	(6.3) National laboratories officially designated?	(6.4) If yes, contact information	(6.5) Laboratories accredited as international or national reference centres?	(6.6) If “Yes”, laboratory(s), accrediting body and type of accreditation	(6.7) Other public or private- sector laboratories exist?	(6.8) If yes, briefly describe the services, and contact details
Botswana	No	n/a	No	n/a	No	n/a
DRC	No	n/a	No	n/a	No	n/a
Lesotho	No	n/a	No	n/a	No	n/a
Madagascar	Yes	Dr Iony Manitra Razanajatovo, Head of the Laboratory of Epidemio-surveillance of Shrimp Diseases, Pasteur Institute of Madagascar Email: ionyr@pasteur.mg Phone: +261 20 22 412	No	n/a	No	n/a
Malawi	No	n/a	No	n/a	Yes	<ul style="list-style-type: none"> • Skin scrapings for microscopic examination • General bacteriology/ mycology - culture and bacterial isolation and typing • Water quality analysis - culture and toxicological analysis

Mauritius	No	n/a	No	n/a	Yes	<p>Overseas diagnostic services: Agri-Food and Veterinary Authority Animal Health Laboratory Department, Aquatic Animal Health Section, 6 Perahu Road, Singapore 718827 Phone: (65) 6316 5188 Fax: (65) 6316 1090</p> <p>Services provided:</p> <ul style="list-style-type: none"> • Parasitology • Histopathology • General bacteriology/mycology • General virology • Electron microscopy • Molecular diagnostics (e.g. PCR) • Immunoassay • Water quality analysis <p>Silliker Labs. Prato, Italy Via Fratta 25 - 31023 Resana (TV) Italy Phone: +39 0423 7177³</p>
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³ Silliker Labs fulfills all of the Competent Authority's sampling requirements under the EU's Residue Monitoring Programme for fish products derived from aquaculture (EU Council Directive 96/23/EC).

Mozambique	No	n/a	No	n/a	Yes	The farmers and public services are authorized to contract specialized diagnostic services from third countries according to their needs. Budgets are allocated yearly for disease investigations.
Namibia	No (Note: laboratories need to be equipped)	n/a	No	n/a	Yes	<p>Histopathology and PCR services done for OIE-listed shellfish diseases by Amanzi Biosecurity. Contact: Dr Anna Mouton, Private Bag X15, Suite 190, Hermanus 7200, South Africa Tel +27 28 313 2411 Fax +27 86 536 5533</p> <p>Person and Laboratory responsible for EUS: Dr Hang`ombe Bernard Mudenda, Microbiology Unit School of Veterinary Medicine, University of Zambia, P. O. Box 32379, Lusaka, Zambia. Phone: 260 977326288/ 260 - 1-293673, Fax: 260-1-293727</p>
Seychelles	No	n/a	No	n/a	No	n/a

South Africa	No	n/a	No	n/a	Yes	All these services exist for general veterinary diagnostics and are available to the aquaculture sector, however only one specialist aquatic animal diagnostic lab exists (Amanzi Biosecurity), who predominantly provide the following services: histopathology, general bacteriology, mycology and site inspections.
Swaziland	No	n/a	No	n/a	No	n/a
Tanzania	No	n/a	No	n/a	Yes	University of Dar es salaam (parasitology, general bacteriology/ mycology, electron microscopy. Sokoine University of Agriculture (parasitology, histopathology, general bacteriology /mycology, general virology, electron microscopy, tissue culture molecular diagnostics, immunoassay).

Tanzania (continued)						<p>Ministry of Livestock and Fisheries Development (parasitology, histopathology, general bacteriology /mycology, general virology, molecular diagnostics, immunoassay, water quality analysis, chemotherapy, health certification, facility inspection.</p> <p>Chief government chemists (tissue culture, molecular diagnostics, immunoassay, water quality analysis).</p>
Zambia	No	n/a	No	n/a	Yes	<p>School of Veterinary Medicine: parasitology, histopathology, general bacteriology/ mycology, general virology, tissue culture, molecular diagnostics, immunoassay.</p> <p>Ministry of Agriculture and Livestock (NALEIC): health certification</p> <p>Fisheries Department and Veterinary Services: facility inspection</p>

Zimbabwe	Yes	<p>Central Veterinary Laboratory (CVL) - for the diagnosis of non-OIE listed diseases, parasitology, bacteriology, mycology CVL- Toxicology for residues analysis and water quality</p> <p>Central Veterinary Laboratory, Box CY 551, Causeway, Harare, ZIMBABWE</p> <p>Bulawayo Provincial Veterinary Laboratory (BPVL) – for the diagnosis of non- OIE listed diseases, parasitology, bacteriology, mycology.</p> <p>BPVL, P O Box RY 41, Raylton, Bulawayo</p>	No	n/a	Yes	<p>Parasitology: DLVS, D&R Branch, CVL, BPVL, University of Zimbabwe (UZ) - Biological Science Department.</p> <p>General bacteriology/ mycology: DLVS, D&R Branch, CVL, BPVL General virology: CVL Electron microscopy: UZ Tissue culture: CVL Molecular diagnostics: CVL, Tobacco Research Board Immunoassay: CVL Water quality analysis: CVL- Toxicology, EMA, Govt Analysts, TRB, UZ-</p> <p>Biological Science Department Chemotherapy, Residues analysis: CVL Health certification: DLVS Facility inspection: DVS, Ep & VPH</p>
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Table 6C. Summary of status of national pathogen list for participating countries (survey questions 6.9– 6.10)

Country	(6.9) Is there a national pathogen list for aquatic animal diseases?	(6.10) If yes, list the criteria for inclusion of a pathogen in the national list and give those aquatic animal diseases/pathogens that are listed
Botswana	No	n/a
DRC	No	n/a
Lesotho	Yes	Bacterial infection (<i>Streptococcus</i> spp.)
Madagascar	Yes	<p>The only documented diseases are: vibriosis, rickettsiosis and microsporidiosis. The country had historical freedom from OIE-listed diseases until the WSSV outbreak in April 2012.</p> <p>The main criteria are those required for disease listing by the OIE, when the disease threatens the economy, such as posing significant threat of causing disease and production losses. Those aquatic animal diseases/pathogens listed are provided by Decree n°2005-187 on April 22th 2005 « Nomenclature of Contagious Animal Diseases deemed to Madagascar », such as:</p> <ul style="list-style-type: none"> • Diseases of fish: Epizootic haematopoietic necrosis, infectious haematopoietic necrosis, infectious salmon anaemia, spring viraemia of carp, viral haemorrhagic septicaemia. • Diseases of molluscs: Infection with <i>Bonamia exitiosus</i>, <i>B. ostreae</i>, <i>Haplosporidium costale</i>, <i>H. nelsoni</i>, <i>Marteilia refringens</i>, <i>M. roughleyi</i>, <i>Perkinsus marinus</i>, <i>P. olseni</i>. • Diseases of crustaceans: Taura syndrome, white spot disease, yellowhead disease.
Malawi	No	n/a
Mauritius	No	n/a
Mozambique	No	n/a (note: although the country does not have its own official list of notifiable diseases, Mozambique considers the OIE disease list as the official list)

Namibia	Yes	<p>1. Diseases of fish</p> <p>Epizootic haematopoietic necrosis</p> <p>Infectious haematopoietic necrosis</p> <p><i>Oncorhynchus masou</i> virus disease</p> <p>Spring viraemia of carp</p> <p>Viral haemorrhagic septicaemia</p> <p>Channel catfish virus disease</p> <p>Viral encephalopathy and retinopathy</p> <p>Infectious pancreatic necrosis</p> <p>Infectious salmon anaemia</p> <p>Epizootic ulcerative syndrome</p> <p>Bacterial kidney disease (<i>Renibacterium salmoninarum</i>)</p> <p>Enteric septicaemia of catfish (<i>Edwardsiella ictaluri</i>)</p> <p>Piscirickettsiosis (<i>Piscirickettsia salmonis</i>)</p> <p>Gyrodactylosis (<i>Gyrodactylus salaris</i>)</p> <p>Red sea bream iridoviral disease</p> <p>White sturgeon iridoviral disease</p> <p>2. Diseases of molluscs</p> <p>Bonamiosis (<i>Bonamia exitiosus</i>, <i>B. ostreae</i>, <i>Mikrocytos roughleyi</i>)</p> <p>MSX disease (<i>Haplosporidium nelsoni</i>)</p> <p>Marteiliosis (<i>Marteilia refringens</i>, <i>M. sydneyi</i>)</p> <p>Mikrocytosis (<i>Mikrocytos mackini</i>)</p> <p>Perkinsiosis (<i>Perkinsus marinus</i>, <i>P. olseni/atlanticus</i>)</p> <p>SSO disease (<i>Haplosporidium costale</i>)</p> <p>Withering syndrome of abalones (<i>Candidatus Xenohalictis californiensis</i>)</p> <p>3. Diseases of crustaceans</p> <p>Taura syndrome</p> <p>White spot disease</p> <p>Yellowhead disease</p> <p>Tetrahedral baculovirosis (<i>Baculovirus penaei</i>)</p> <p>Spherical baculovirosis (<i>Penaeus monodon</i>-type baculovirus)</p> <p>Infectious hypodermal and haematopoietic necrosis</p>
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Namibia
(continued)

Crayfish plague (*Aphanomyces astaci*)
 Spawner-isolated mortality virus disease

Regulations relating to import and export of aquatic organisms and aquaculture products: Aquaculture Act, 2002, Annexure J: Category I: Ornamental species that may be imported under certain health conditions:

1. *Cyprinus carpio* (Koi carp, colored carp)

Restriction: the species must originate from a country, area or stock certified as free from koi herpes virus (KHV).

2. *Carassius auratus* (Goldfish)

Restrictions:

An international health certificate must be obtained from the exporting country attesting that the species is free from spring viraemia of carp virus (SVCV), goldfish haematopoietic necrosis virus (GFHNV) and *Aeromonas salmonicida*.
 (ii) Goldfish must be treated with an effective parasiticide (e.g., Trichlorfon, formaldehyde, sodium chloride) during the 7 days prior to it being exported to Namibia to eliminate infestation by the gill flukes *Dactylogyrus vastator* and *Dactylogyrus extensus*.

Seychelles Yes

Seychelles has adopted the OIE-listed diseases as the list of notifiable diseases

South Africa No

n/a

Swaziland No

n/a

Tanzania	Yes	<p>Listing is based on potential for significant spread within naïve populations.</p> <ul style="list-style-type: none"> • Lymphocystis (iridovirus-DNA viruses) • Vibriosis (<i>Vibrio anguillarum</i>) • Haemorrhagic septicaemia (<i>Aeromonas hydrophila</i>, <i>Pseudomonas fluorescens</i>) • <i>Staphylococcus</i> infections (<i>Staphylococcus</i> spp.) • Saprolegniasis (<i>Saprolegnia parasitica</i>) • Trypanosomoses (<i>Trypanosoma</i> spp.) • Trichodiniasis (<i>Trichodina</i> spp.) • Monogenean flukes (<i>Gyrodactylus</i> spp., <i>Dactylogyrus</i> spp.) • Coccidiosis (<i>Eimeria</i> spp.) • Diplostomum infection (<i>Diplostomum</i> spp.) • Posthodiplostomum (<i>Posthodiplostomum</i> spp.) • Neodiplostomum (<i>Neodiplostomum</i> spp.) • Louse infection (<i>Argulus</i> spp.) • Amirthalingamiasis (<i>Amirthalingamia macracantha</i>)
Zambia	No	n/a
Zimbabwe	Yes	n/a (note: pathogen listing is in progress, with criteria for inclusion based on zoonotic, economic and biodiversity importance)

SECTION 7. EMERGENCY PREPAREDNESS/CONTINGENCY PLANNING

Summary of results

A summary of the current status of emergency preparedness and contingency planning for outbreaks of aquatic animal disease in 14 SADC member countries is presented in Table 7 (survey questions 7.1–7.3). Only one country (Madagascar) clearly indicated that such contingency planning exists, while several other countries (DRC, Lesotho, Madagascar, Zambia) indicated that some consideration had been given to emergency response to outbreaks of aquatic animal disease. Eight of the SADC countries not having emergency response plans for aquatic animal disease outbreaks (Botswana, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zimbabwe) were able to cite similar contingency plans for terrestrial animal diseases (e.g. Rift Valley fever, swine fever, foot and mouth disease, avian influenza, etc.) or a plant pests, while two other countries cited more general legislation related to biosecurity response (Mauritius, Seychelles).

Analysis

Emergency preparedness is the ability to respond effectively (via early detection) and in a timely fashion (rapid response) to disease emergencies (e.g. disease outbreaks, mass mortalities). The capability to deal with emergency diseases requires a great deal of planning and coordination (including establishing operational, financial and legislative mechanisms) and making available required resources (i.e. skilled personnel and essential equipment).

As long as there is importation of live aquatic animals, there exists the possibility of a serious disease outbreak due to an exotic pathogen or strain. Risk analysis and risk mitigation measures help to reduce the likelihood of a serious disease event occurring, but even under the best circumstances, pathogens will occasionally escape detection, breach national barriers, become established, spread and cause major losses. The extent to which losses occur often depends of the quickness of detection (which depends on the effectiveness of disease surveillance, diagnostics and reporting programmes) and the rapidity and effectiveness with which governments recognize and react to the first reports of serious disease. As quick and effective reaction is largely dependent upon contingency planning, SADC countries need to develop such plans for key cultured species and diseases. Due to the presence of shared watersheds, it is also possible that diseases introduced to the waters of one country will eventually spread naturally to neighboring countries (e.g. EUS). Surveillance programmes for these diseases may allow rapid emergency response, where this is feasible.

Table 7. Current status of emergency preparedness/contingency planning for outbreaks of aquatic animal disease in participating countries (survey questions 7.1–7.3)

Country	(7.1) Does your country have any contingency or emergency response plans for containment or eradication of serious aquatic animal diseases?	(7.2) If yes, briefly describe these plans, including the name and contact details of the responsible agency/ies and any legislation that supports emergency response activity	(7.3) If no, briefly describe any emergency response plans for terrestrial animal diseases or terrestrial plant pests or invasive pest species in your country
Botswana	No	n/a	Foot and Mouth Disease Emergency Response supported by Foot and Mouth Contingency Plan and the Disease of Animals Act. Contact is the Department of Veterinary Services.
DRC	Yes	n/r	n/a
Lesotho	Yes	MAFS-DLS	n/a
Madagascar	Yes	Agency : Autorité Sanitaire Halieutique Interministerial Order n°960/98 of 11 February 1998 « Definition and codification of sanitary measures to be taken in case of contagious diseases » Legislation: Order n° 33423 / 2010 of 13 September 2010 «Related to crustacean animal health and products thereof. Minimum control measures in case of confirmation of disease in exotic shellfish: Article 21: In case of confirmation from the crustaceans an exotic disease listed in Annex IV, Part II of this Order:	n/a

**Madagascar
(continued)****Article 23:**

1. The dead and the living crustaceans showing clinical signs of disease must be removed and disposed of as soon as possible under the supervision of the Competent Authority crustaceans.
2. The removal or disposal of shellfish that have not reached commercial size and show no symptoms of disease are carried out under the supervision of the competent authority, depending on the type of production and the risk posed by these animals in terms of spread of the disease, in accordance with Article 12 of Decree No. 92-285 of 26 February 1992 on the animal health policy.

Article 24: To the extent possible, any infected fish farm undergoes a period of fallowing in line with international standards and depending on the type of production

Article 25: The measures provided for in this Section shall be maintained until:

- (a) the eradication measures provided have been carried out;
 - (b) sampling and monitoring operations appropriate for the disease in question and the type of affected fish farms that are carried out in the containment area produce negative results.
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Malawi	No	n/a	<p>Emergency response plans are available for Foot and Mouth Disease and Avian Influenza. The responsible agency is the Department of Animal Health and Livestock Development, whose contact is the Director, P.O Box 2096, Lilongwe.</p> <p>Supporting legislation is the Control and Animal Diseases Act.</p>
Mauritius	No	n/a	<p>No emergency response plans are currently in place for containment or eradication of aquatic diseases. These plans are included in the Aquatic Animal Health Strategy for Mauritius.</p> <p>For terrestrial animal diseases/terrestrial plant pests/invasive pest species, the responsible agency is the Division of Veterinary Services at the Ministry of Agro-Industry and Food Security.</p> <p>Legislation supporting emergency response activity includes the Animal Welfare Act 2013 and the Animal Diseases Act 1925.</p>

Mozambique	No	n/a	The emergency response plan for terrestrial transboundary animal diseases is a compact document which lists all the relevant institutions to be involved in the response to any animal disease outbreak and their roles. It clearly identifies the coordination mechanism, the flow of information, and the resources needed. The document provides a guideline and structural organization to fight the challenge. The basic elements can be applied to aquatic animal diseases with small modification.
Namibia	No	n/a	The Directorate of Veterinary Services has contingency plans for Foot and Mouth Disease (FMD), Contagious Bovine Pleuropneumonia (CBPP) and Bovine Spongiform Encephalopathy (BSE). The official responsible is Dr Albertina Shilongo, Deputy Chief Veterinary Officer, for the Division of Epidemiology, Import/Export Control and Training, Directorate of Veterinary Services.

Seychelles	No	n/a	There is provision under the Animal and Plant Biosecurity Act for biosecurity emergencies and response.
South Africa	No	n/a	Controlled measures relating to controlled animal diseases are detailed in the Animal Diseases Act, Act 35 of 1984 in respect of susceptible animals, contact animals and infected animals. Director of Animal Health, Dr M Maja, phone: (012) 319 7615.
Swaziland	No	n/a	Emergency preparedness plans exist for FMD and Avian Influenza (AI). These detail the actions to be taken by the Veterinary Department in conjunction with other stakeholders on how the diseases can be contained in case of an outbreak. It is a multisectorial document cutting through many government agencies. It is supported by the Animal Disease Act 7 of 1965 and is managed in the office of the Director of Veterinary and Livestock Services, phone +268 2404 2731

Tanzania	No	n/a	Terrestrial animal diseases: <ul style="list-style-type: none"> • Rift Valley fever • Swine fever • Avian influenza
Zambia	Yes	Ministry of Agriculture and Livestock using the Animal Health Act and Fisheries Act and it is mainly reactive	n/a
Zimbabwe	No	n/a	Emergency response plans for terrestrial animal diseases: DLVS- Epidemiology Unit. Animal disease response plans available for HPAI, FMD, in development is the for PPR. Plant emergency response plans are available for quelea bird, red-locust, army worm under the Plant Protection Research Institute (DR&SS) – Dr C. Mguni.

SECTION 8. EXTENSION SERVICES

Summary of results

A summary of the current status of extension services that support the prevention of aquatic animal diseases in aquaculture facilities in 14 SADC member countries is presented in Table 8 (survey questions 8.1–8.3). According to respondents, extension services exist in only six countries (Botswana, DRC, Madagascar, Tanzania, Zambia and Zimbabwe). Such services are provided by the national fisheries agency or the official veterinary services.

Analysis

Individual SADC countries should consider the need for extension services to the aquaculture industry and the best methods of delivering these services. Often, where the aquaculture sector is well developed, it can deliver its own extension services; however, in some cases, government extension services, either by training of fisheries or veterinary extension officers in the basics of AAH, or through specific health-related extension and diagnostic services can be considered. Extension officers can also serve to monitor basic health conditions in aquaculture facilities and provide a basis for passive disease surveillance by serving as a liaison with aquaculturists.

Table 8. Summary of current status of extension services that support the prevention of aquatic animal diseases in aquaculture in participating countries (survey questions 8.1–8.3)

Country	(8.1) Does your country have any extension services that support the prevention of aquatic animal diseases in aquaculture?	(8.2) If yes, briefly describe this service, including the name and contact details of the responsible agency/ies, the number of staff involved and specific areas of involvement	(8.3) If no, indicate what agency, if any, is mandated to fulfil this function and provide contact details
Botswana	Yes	Fisheries staff within the Department of Wildlife and National Parks based at various extension areas throughout the country give advice to potential fish farmers on best management practices.	n/a
DRC	Yes	SENAQUA, Dr Gabriel Kombozi Limbeya Bolomo Tel: +243 89 89 51 567 Email: gabrielkombozi@gmail.com	n/a
Lesotho	No	n/a	MAFS, DFS and DLS
Madagascar	Yes	Export Inspection Post of Autorité Sanitaire Halieutique (10 areas) Number of staff involved: 21 FBOs: 3	n/a
Malawi	No	n/a	Department of Animal Health and Livestock Development, P.O. Box 2096, Lilongwe

Mauritius	No	n/a	<p>The Albion Fisheries Research Centre has been mandated to fulfil this function.</p> <p>Contact: Assistant Director Fisheries Albion Fisheries Research Centre Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Island Albion, Petite Rivière Tel.: +(230) 238 4100</p>
Mozambique	No	n/a	<p>The National Directorate of Veterinary Services is the national authority responsible for the surveillance and control of animal diseases.</p> <p>Contact: Direcção Nacional dos Serviços de Veterinária, Phone: +25821415636</p>

Namibia	No	n/a	No agency mandated
Seychelles	No	n/a	Seychelles Veterinary Services P.O. Box 166, Victoria, Mahe, Seychelles Phone: +248 4285 950 Email: seyvet@seychel les.net
South Africa	No	n/a	No agency is currently mandated to fulfil this function specifically for aquatic animal diseases.
Swaziland	No	n/a	The DVLS in collaboration with the Fisheries Section is mandated to look at aquatic animal health issues. Phone: +268 404 2731 for both agencies as they are in the Ministry of Agriculture. Director of VLS, Phone: +268 7606260; Head of Fisheries Section, Phone: +268 76072195

Tanzania	Yes, however, most of the aquaculture field staff need basic knowledge on disease biology and handling	Ministry of Livestock and Fisheries Development Prime Minister's Office- Regional Administration and Local Government	n/a
Zambia	Yes	Fisheries Department	n/a
Zimbabwe	Yes	DLVS, DVS –Veterinary Field Extension Service	n/a

SECTION 9. COMPLIANCE/ENFORCEMENT

Summary of results

A summary of the current status of capacity for compliance/enforcement of regulations on AAH in the 14 SADC member countries surveyed is presented in Table 9 (Survey Questions 9.1–9.6). Almost all countries (10 of 14) have compliance services that monitor and enforce international trade in live aquatic animals, including AAH regulations (Botswana, DRC, Malawi and Swaziland do not, and of these, Botswana stated that it is implied in the Fish Protection Act). A majority of countries (nine of 14; Botswana, DRC, Lesotho, Madagascar, Mozambique, South Africa, Tanzania, Zambia, Zimbabwe) have compliance services that monitor and enforce domestic trade in live aquatic animals, including AAH regulations; while nine countries (Botswana, Lesotho, Madagascar, Mozambique, Seychelles, South Africa, Tanzania, Zambia, Zimbabwe) have regulations related to disease prevention and control in aquaculture facilities.

Analysis

Capacity to enforce AAH regulations is an essential component of a national AAH plan. This includes ensuring border compliance with regard to import and export of live aquatic animals (usually done by quarantine officers and customs officials located at points of entry) and enforcement of regulations pertaining to an array of domestic concerns, including use of drugs and chemicals for disease treatment, control of domestic movements, enforcement of zoning regulations, inspection of aquaculture premises, etc. Such activities are usually conducted by fisheries, AAH or veterinary officers who may have special training and powers of enforcement.

SADC member countries should review the effectiveness of current compliance and enforcement capacity and where warranted, incorporate planning for staffing, training and regulatory support to ensure adequate compliance. Self-enforcement by aquaculture producers groups through use of BMPs and HACCP can be effective in improving compliance with regulations, as are communication programmes targeting risky practices by aquaculturists and the general public.

Table 9. Current status of capacity for compliance/enforcement of regulations on aquatic animal health (AAH) in participating countries (survey questions 9.1–9.6)

Country	Does your country have any compliance services that monitors and enforces:					
	(9.1) International trade in live aquatic animals (imports and exports), including AAH regulations?	(9.2) If yes, briefly describe this service, including the name and contact details of the responsible agency/s, the number of staff involved and the legislation that supports compliance activity	(9.3) Domestic movements of live aquatic animals, including AAH regulations?	(9.4) If yes, briefly describe this service, including the name and contact details of the responsible agency/s, the number of staff involved and the legislation that supports compliance activity	(9.5) Regulations related to disease prevention, management and control in aquaculture facilities?	(9.6) If yes, briefly describe this service, including the name and contact details of the responsible agency/ies, the number of staff involved and the legislation that supports compliance activity
Botswana	No (however, it is implied in the Fish Protection Act)	n/a	Yes	Department of Wildlife and National Parks regulates movement of live fish between waterbodies via issuance of a permit to move live fish as provided in the Fish Protection Regulations of 2008. Fisheries staff are based at various extension areas.	Yes	Department of Wildlife and National Parks regulates movement of live fish between waterbodies via issuance of a permit to move live fish as provided in the Fish Protection Regulations of 2008. Fisheries staff are based at various extension areas.

DRC	No	n/a	Yes	SENAQUA, Dr Gabriel Kombozi Limbeya Bolomo Tél : +243 89 89 51 567 Email: gabrielkombozi@gmail.com.	No	No
Lesotho	Yes	Ministries of Environment, Water Energy and Meteorology, and Agriculture.	Yes	The Lesotho Highlands Water Project Aquaculture Division (LHDA) is the responsible agency. DLS monitors and provides HC.	Yes	DLS and LHDA
Madagascar	Yes	Autorité Sanitaire Halieutique (Ralaimarindaza Luc Josue , (ralai.luc@ash.mg) Department of Veterinary Services (Marcellin Biarmann , mbiarmann@yahoo .fr)	Yes	Autorité Sanitaire Halieutique (Ralaimarindaza Luc Josue, ralai.luc@ash.mg) Number of staff involved: 30 Legislation Order n° 33423 / 2010 of 13 September 2010 Related to crustacean animal health and products thereof.	Yes	Autorité Sanitaire Halieutique: (Ralaimarindaza Luc Josue , e-mail: ralai.luc@ash.mg) Number of staff involved: 30 (See 9.4)

Malawi	No	n/a	No	n/a	No	n/a
Mauritius	Yes	Competent Authority – Seafood (17 staff) Imports: Government Notice No 27 of 2012 Exports: Government Notice No. 147 of 2009; The Fisheries and Marine Resources Act 2007	No	n/a	No	n/a

Mozambique	Yes	The country has in its main entrance points (border posts, ports and hubs) the veterinary border post control. Any live animals or products of animal origin entering or leaving the country are inspected and the import permit and certificates verified for compliance to the requirements. Because of the reduced number of personnel, these services are limited to certain border posts where the trade volume is significant.	Yes	The Animal Health Regulation sets the conditions that animals and products of animal origin must observe in respect to sanitary status and that the veterinary personnel of the public service have to apply. The law enforcement and monitoring mechanisms are based on the disciplinary procedures stated in the statutory body for public servants.	Yes	The main regulation for prevention and disease control is the Regulamento de Sanidade Animal, approved by Decree Number 26/2009.
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Namibia	Yes	<p>Veterinary inspections at the border/ international airports. Directorate of Veterinary Service, Ministry of Agriculture, Water and Forestry, Tel +264 61 2087513</p> <p>The legislation is the Animal Health Act No. 1 of 2011.</p>	No	n/a	No	n/a
Seychelles	Yes	<p><i>1. Import health conditions</i> – Seychelles Veterinary Services, P.O. Box 166, Victoria, Mahe, Seychelles, Phone: +248 4285 950, Email: seyvvet@seychell</p>	No (note: in preparation under the protocol for inter-island transportation of regulated articles).	To be administered by SVS under the Animal and Plants Biosecurity Act.	Yes	SVS under the Animals (Diseases and Imports) Regulations; 3 veterinarians.

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Seychelles (continued)		Animal and Plants Biosecurity Act 2014 and Animal (Diseases and Imports) Regulations <i>2. Internal movement –</i> Dept. of Environment, Botanical Gardens, Mont Fleuri, Mahe, Seychelles Wildlife Act SFA – Fisheries Act.				
South Africa	Yes	Importation of animals, including aquatic vertebrates is regulated at the national level by the Directorate: Animal Health (DAFF).	Yes	Importation of animals, including aquatic vertebrates is regulated at the national level by the Directorate: Animal Health (DAFF).	Yes	n/a

South Africa (continued)	Export and domestic movement of animals, including aquatic vertebrates, is regulated by the provincial state veterinary departments.	Export and domestic movement of animals, including aquatic vertebrates, is regulated by the provincial state veterinary departments.
	Import, export and domestic movement of marine aquatic invertebrates is regulated at the national level by the Directorate: Sustainable Aquaculture Management (DAFF) for aquaculture products and Directorate: Marine Resources Management (DAFF) for wild-caught commodities.	Import, export and domestic movement of marine aquatic invertebrates is regulated at national level by the Directorate: Sustainable Aquaculture Management (DAFF) for aquaculture products and Directorate: Marine Resources Management (DAFF) for wild-caught commodities.

Swaziland	No	n/a	No	n/a	No	n/a
Tanzania	Yes	<p>Ministry of Livestock and Fisheries Development (MFLD) issues export/ import HCs</p> <p>The relevant legislative acts are:</p> <ul style="list-style-type: none"> • Fisheries Act No. 22 of 2003 and its Regulations of 2009 • EAC Sanitary and Phytosanitary 2014 • Animal Disease Act No. 17 of 2003 	Yes	<p>MFLD issues Movement Permit.</p> <p>The relevant legislative acts are:</p> <ul style="list-style-type: none"> • Fisheries Act No. 22 of 2003 and its Regulations of 2009 • EAC Sanitary and Phytosanitary 2014 • Animal Disease Act No. 17 of 2003. 	Yes	<p><i>Type of service:</i></p> <p>Assessment of fish health status in the production sites through inspections and standardized procedures; eradication of fish diseases by slaughtering of infected stocks and restocking with fish from approved disease-free resources; regulating and monitoring the introduction and transportation of fish.</p> <p>MFLD is responsible for offering these services</p> <p>The relevant legislative acts are:</p> <ul style="list-style-type: none"> • Fisheries Act No. 22 of 2003 and its Regulations of 2009 • EAC Sanitary and Phytosanitary 2014 • Animal Disease Act No. 17 of 2003

Zambia	Yes	NALEIC in consultation with Fisheries Department. The relevant acts are Fisheries Act, Animal Health Act and the Agriculture Commodity Act	Yes	Fisheries Department using the Fisheries Act. This is monitored and enforced through certification of origin and inspections.	Yes	Aquaculture extension services with about 200 staff and enforcing the Aquaculture Regulations
Zimbabwe	Yes	DLVS, Import and Export Certification; 3 staff + Port Health Inspection and Veterinary Public Health staff for Release Certification (4 veterinarians who report to the Deputy Director Veterinary Public Health are involved in signing Release Certificates <ul style="list-style-type: none"> • International surveillance • Port Health Inspection & Release Certification 	Yes	Ministry of Tourism, PWLMA, The Parks and Wildlife Act (Chapter 20: 14 of 1996 as amended)	Yes	DLVS, DVS Extension

SECTION 10. RESEARCH

Summary of results

The status of current research activity for AAH in aquaculture in the 14 SADC member countries surveyed is summarized in Table 10 (Survey Questions 10.1–10.2). Least six countries (Madagascar, Mozambique, South Africa, Tanzania, Zambia, Zimbabwe) report the existence of related research. Six of 14 countries reported research capacity in AAH (Madagascar, Mozambique, South Africa, Tanzania, Zambia, Zimbabwe). Research related to AAH includes:

- development of specific pathogen resistant (SPR) *Penaeus monodon* in Madagascar;
- research on the prevalence of white spot disease in Mozambique;
- research on EUS in Zambia;
- studies on diagnostic methods and the characterization of new and emerging pathogens in South Africa;
- development of preventative and treatment strategies in South Africa;
- generation of epidemiological data for important diseases in South Africa;
- other unspecified research topics in South Africa and Tanzania.

Analysis

Research capacity in AAH is necessary to the successful expansion of aquaculture development. Targeted and basic research can lead to better disease management, better understanding of national AAH status, support to risk analysis, improved diagnostic methods, etc.

The general lack of specific research capacity in most SADC member countries means that countries must rely, to a large extent, on research conducted by scientists in other nations. Often, such “borrowed” research may not be directly applicable to local situations and experimental testing must be undertaken to adapt these findings. In other cases, little or no relevant information on the specific problem may be available.

It should be noted that there is additional AAH research is being conducted by scientists at universities in South Africa that was not captured during this survey.

There are many mechanisms to improve access to research capacity. These include development of national AAH research laboratories, supporting linkages and research programmes within universities and the private sector, contracting of targeted research with foreign institutions, and development of a regional AAH center. Each country should develop its individual strategy to ensure adequate access to research to support national priorities in AAH. As some countries may not be able to justify substantial support to research, joint support to a regional research institute to develop specific AAH research capacity may be worth exploring.

Table 10. Summary of current research activity in aquatic animal health (AAH) in aquaculture in participating countries (survey questions 10.1–10.2)

Country	(10.1) Does your country have any research activity that includes AAH in its scope?	(10.2) Briefly describe this research, including the name and contact details of the responsible institutes, the number of staff and students involved and specific areas of involvement
Botswana	No	n/a
DRC	No	n/a
Lesotho	No	n/a
Madagascar	Yes	<ul style="list-style-type: none"> • Genetic amelioration of tilapia (Japanese cooperation) • Specific pathogen resistance of <i>Penaeus monodon</i> (Taiwan Institute)
Malawi	No	n/a
Mauritius	No	n/a
Mozambique	Yes	The only activity is related to prevalence of white spot disease. In this programme about 8 people are involved.
Namibia	No	n/a
Seychelles	No	n/a
South Africa	Yes	<p>Within DAFF the Directorate: Aquaculture and Development we have a research focus area in AAH. This group is comprised of two Specialist Scientists (Dr Kevin Christison and Dr Brett Macey). Their research can be summarized into three smaller focal areas of research, namely: 1. the development of novel methods for the diagnosis and characterization of new and emerging pathogens in aquaculture; 2. effective preventative and treatment strategies for existing and emerging marine aquaculture diseases; and 3. the generation of epidemiological data for significant animal diseases in Southern Africa to inform management and contingency interventions. Furthermore, considerable research capacity with regard to AAH topics exists at various higher education facilities within South Africa.</p>
Swaziland	No	n/a

Tanzania	Yes	<p>Research is conducted at:</p> <ul style="list-style-type: none"> • Tanzania Fisheries Research Institute • Sokoine University of Agriculture Morogoro Tanzania • University of Dar es salaam <p>Topics include:</p> <ul style="list-style-type: none"> • Prevalence of potential bacterial pathogens in farmed Nile tilapia (<i>Oreochromis niloticus</i>), fish ponds and freshwater environments in Southern and Eastern zones of Tanzania (H.L. Nikuli.: 2 staff) • Prevalence of antibiotic resistance genes in the bacterial flora of integrated fish environments of Tanzania; 2012 (H.L. Nikuli: 2 staff) • Antimicrobial susceptibility study of the potential aquatic bacterial pathogens of Tanzania (H.L. Nikuli : 2 staff) • Side effects of sodium chloride (antifungal) used in the treatment of saprolegniasis (fungal disease) in African catfish (<i>Clarias gariepinus</i>) (H. L. Nikuli: 3 staff) • Molecular characterization (genetic engineering) of the selected potential aquatic bacterial pathogen in the eastern and southern Tanzania (H. L. Nikuli: 3 staff) • Research on fish biomarkers for assessment of levels and impact of pollution in aquatic ecosystems in Tanzania - May 2002 (R. Mdegela: 1 staff) • Evaluation of gill filament-based EROD assay in African sharptooth catfish (<i>Clarias gariepinus</i>) as a monitoring tool for water-borne PQH-type contaminants (R. Mdegela: 3 staff) • Influence of 17 alpha-ethynylestradiol on CYP1A, GST and biliary FACs responses in male African sharptooth catfish (<i>Clarias gariepinus</i>) exposed to waterborne benzo[a]pyrene. Ecotoxicology ogein in African sharptooth catfish (<i>Clarias gariepinus</i>): purification, characterization, and ELISA development (R. Mdegela: 3 staff) • Metals and organochlorine residues in water, sediments and fish in aquatic ecosystems in urban and peri-urban areas in Tanzania (R. Mdegela: 3 staff)
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Zambia	Yes	The University of Zambia so far has trained one or two students in the dynamics of EUS at Master's Degree level.
Zimbabwe	Yes	UZ, Biological Science Department, Dr M. Barson

SECTION 11. TRAINING

Summary of results

Survey results summarizing the existence of formal training programmes in AAH in the 14 SADC member countries are presented in Table 11 (questions 11.1–11.4). The results indicate that postgraduate-level training (M.Sc./Ph.D.) is available only in three countries (South Africa, Zambia, Zimbabwe). However, this training is generally not directly in AAH, but in allied or supporting areas (e.g. parasitology, microbiology, virology, molecular biology). Occasional formal non-degree training in AAH is available in only three countries (DRC, South Africa, Zimbabwe).

Analysis

There is presently little opportunity for formal AAH training within the SADC Region. Consideration of training needs is a key component of a national AAH strategy. For the near future, postgraduate training is probably best accomplished by programmes for national staff in universities having internationally recognized programmes and expertise in AAH (examples include University of Stirling in Scotland and the University of Arizona in the USA).

There is much potential for targeted short-term training. This may include established courses given outside the region, such as the Shrimp Pathology Short Course given by the University of Arizona and the on-line training course given by the Southeast Asian Fisheries Development Centre (SEAFDEC), Iloilo, Philippines. Short-term regional training exercises can be easily organized and held in the SADC Region on such topics as national strategy development, risk analysis, biosecurity, diagnostics, shrimp health management, aquatic epidemiology, disease surveillance, histopathology, etc. through the offices of FAO, OIE, SADC, AU-IBAR or other regional or international bodies. Examples of recent short-term trainings held in the region are:

- Training course on “Introduction to the Use Risk Analysis in Aquaculture”, Lusaka, Zambia, February 2009 (FAO)
- FAO/OIE/MFMR Training/Workshop on Aquatic Biosecurity. Kamutjonga Inland Fisheries Institute, Divundu, Kavango Region, October 2009
- “Workshop on Risk Assessment Methodologies and Tools for Aquaculture in Sub-Saharan Africa”, Siavonga, Zambia, July 2010 (WorldFish and FAO)

Table 11. Summary of current status of training that supports aquatic animal health (AAH) in participating countries (survey questions 11.1–11.4).

Country	(11.1) Does your country have any formal post-graduate training programmes (M.Sc. or Ph.D.) in areas related to AAH?	(11.2) If yes, briefly describe these programmes, including the name and contact details of the responsible institutes, the number of staff and students involved and specific areas of involvement	(11.3) Does your country have any formal non-degree training programmes (short courses, work study programmes etc.) in areas related to AAH?	(11.4) If yes, briefly describe these programmes, including the name and contact details of the responsible institutes, the number of staff and students involved and specific areas of involvement
Botswana	No	n/a	No	n/a
DRC	No	n/a	Yes	Professeur Mutambwe Phone: +243 81 58 30 347
Lesotho	No	n/a	No	n/a
Madagascar	No	n/a	No	n/a
Malawi	No	n/a	No	n/a
Mauritius	No	n/a	No	n/a
Mozambique	No	n/a	No	n/a
Namibia	No	n/a	No	n/a
Seychelles	No	n/a	No	n/a
South Africa	Yes	Apart from the short courses presented by Rhodes University, no official post-graduate training programme exists specifically for AAH. Numerous higher educational institutions, however provide post-graduate training in specialist areas (parasitology, microbiology, molecular biology, virology, etc.) which often are applicable to aquatic animal hosts.	Yes	Rhodes University provides some short training courses in AAH for state veterinarians and regional OIE focal points. These courses are coordinated through Mr Q. Rouhani

Swaziland	No	n/a	No	n/a
Tanzania	No	n/a	No	n/a
Zambia	Yes	The University of Zambia so far has trained one or two students in the dynamics of EUS at the M.Sc. level. So far one officer has been trained.	No	Occasional trainings done under the OIE and FAO programmes
Zimbabwe	Yes	UZ, Biological Science Department, Dr M. Barson	Yes	UZ, Biological Science Department, Drs M. Barson and T. Nhwatiwa
				Tertiary education in aquatic health is provided for extension staff by a number of colleges country wide

SECTION 12. EXPERTISE

Summary of results

A summary of results obtained by the survey questionnaire (section 12) with regard to the numbers of individuals actively employed in areas of direct relevance to AAH in the 14 SADC member countries for which information was collected is presented in Table 12. Information received from respondents was incomplete, with one country (South Africa) unable to provide this information. Six countries have significant post-graduate (M.Sc., Ph.D.) expertise in AAH (Madagascar, Malawi, Mozambique, Tanzania, Zambia, and Zimbabwe), with Madagascar (1 Ph.D., 31 M.Sc.) and Zimbabwe (3 Ph.D., 2 M.Sc.) being particularly strong. Four countries (DRC, Lesotho, Mauritius, Seychelles), although lacking post-graduate degree holders, noted the presence of veterinarians (DVM) having some expertise in the relevant areas. Only two countries (Namibia and Swaziland) reported no expertise in AAH.

Analysis

Sufficient specialized expertise in AAH is essential to the implementation of a national AAH strategy. Such expertise is clearly lacking in the majority of SADC member countries. All countries should evaluate their current and future needs and their existing expertise to determine if it is adequate and appropriately utilized.

The SADC Region is particularly weak in the key area of aquatic animal disease diagnostics (both molecular and traditional histopathological methods) and in the supporting areas of expertise (parasitology, bacteriology, mycology, virology, water quality analysis). Expertise is also insufficient in other key areas such as aquatic epidemiology, risk analysis and fish medicine.

A more detailed analysis of regional expertise is needed to determine the regions strengths and weaknesses. It should be noted that South Africa (which did not answer this section of the survey) has significant expertise in AAH in government and university which might be utilized to assist the weaker countries in the region.

Table 12. Summary of estimated number of individuals with tertiary qualifications in fields related to aquatic animal health in participating countries (only individuals actively employed in a capacity with direct relevance to the field of expertise are listed) (survey question 12).

Country		Doctorate	Masters degree	(12)		
				Veterinary degree	Bachelors degree	Other (specify)
Botswana	Aquatic veterinary medicine		1			
DRC	Parasitology (experimental)			+ ¹		
	Parasitology (taxonomy/systematics)			+		
	Virology			+		
	Bacteriology			+		
	Mycology			+		
	Epidemiology			+		
	Histopathology			+		
	Toxicology/water quality			+		
	Electron microscopy			+		
	Aquatic biosecurity (e.g. risk analysis)			+		
	Aquatic veterinary medicine			+		
	Fish medicine/pharmacology			+		
	AAH information systems			+		
Lesotho	AAH information systems			1		
Madagascar	Parasitology (experimental)	1				
	Parasitology (taxonomy/systematics)		1			
	Virology		4			
	Bacteriology		12	1	6	
	Histopathology		2			
	Toxicology/water quality		1			
	Molecular diagnostics (e.g. PCR, ELISA)		5			

Madagascar (continued)	Electron microscopy		1			
	Aquatic biosecurity (e.g. risk analysis)	1	6	6		
	Aquatic veterinary medicine			1		
	Fish medicine/pharmacology			1		
	AAH information systems			1		
	Physiology					7
Malawi	Parasitology (experimental)					1
	Bacteriology			3		
	Toxicology/water quality				1	
	Aquatic biosecurity (e.g. risk analysis)		1			
	Aquatic veterinary medicine		1			
	Fish medicine/pharmacology		1			
	AAH information systems		1			
	Parasitology (experimental)	1				
	Parasitology(taxonomy/systematics)		1			
	Virology		4			
Mauritius	Parasitology (experimental)			+ ¹		
	Parasitology (taxonomy/systematics)			+		
	Virology			+		
	Bacteriology			+		
	Mycology			+		
	Epidemiology			+		
	Histopathology			+		
Mozambique	Parasitology (experimental)		2			3
	Bacteriology		1			
	Mycology		1	1		2
	Histopathology	1		2		
	Molecular diagnostics (e.g. PCR, ELISA)		1	3		

Namibia		None		
Seychelles	Parasitology (taxonomy/systematics)		4 in public service	
South Africa	"This is not known and will require a formal country wide survey to even get a semi-accurate estimate. There is not enough time before this questionnaire is due to complete such a survey."			
Swaziland		None		
Tanzania	Parasitology (experimental)	1	1	4
	Parasitology (taxonomy/systematics)		1	
	Virology		1	1
	Bacteriology		1	2
	Mycology		1	
	Epidemiology		1	
	Histopathology		1	2
	Toxicology/water quality		1	2
	Molecular diagnostics (PCR, ELISA)		1	
	Electron microscopy		1	
	Aquatic biosecurity (e.g. risk analysis)		1	
Zambia	Parasitology (experimental)	1		
	Electron microscopy			2
Zimbabwe	Parasitology (experimental)	1		
	Parasitology (taxonomy/systematics)	1		
	Bacteriology			2
	Mycology			2
	Histopathology	1		
	Molecular diagnostics			1

Electron microscopy		1
Aquatic veterinary medicine	1	
AAH information systems	1	

¹For Mauritius, although the government currently employs no AAH experts in these fields, there are Veterinary Officers attached to the Competent Authority-Seafood who have taken undergraduate and postgraduate courses in these fields; a similar situation appears to exist in DRC.

SECTION 13. INFRASTRUCTURE

Summary of Results

Survey results on current infrastructure (laboratories, office space, and other) dedicated solely to AAH activities or shared with other groups are summarized in Table 13 (survey questions 13.1–13.2). Only five countries (Madagascar, Mozambique, Namibia, South Africa, Tanzania) indicated the existence of dedicated infrastructure for AAH. Madagascar reported the presence of offices and some laboratory space dedicated to disease diagnostics (both histopathology and molecular diagnostics), as well as aquaculture ponds and tank rooms for holding of aquatic animals. Mozambique has three mobile laboratories equipped for the diagnosis of white spot disease (WSD). Namibia has dedicated office space and infrastructure for histopathology and molecular diagnostics, although these labs require equipping. South Africa (perhaps the country best equipped with infrastructure for AAH) was unable to provide detailed information. Tanzania has dedicated research sites and fish ponds at Sokoine University of Agriculture. Several SADC countries reported the presence of shared infrastructure that was available for AAH use. These include such items as electron microscopes (Botswana), state or private laboratories (Madagascar, Malawi, Mozambique, Swaziland, Tanzania, Zambia, Zimbabwe), office space (DRC, Seychelles, Swaziland, Tanzania, Zambia, Zimbabwe), quarantine facilities (Mauritius) and ponds and/or commercial aquaculture farms (Tanzania, Zambia).

Analysis

Few if any SADC member countries have adequate infrastructure to meet current and future AAH needs, including implementation of national and regional AAH and aquatic biosecurity strategies. Individual countries need to more thoroughly assess current and future infrastructure needs and develop detailed plans to address critical areas. Significant funds will need to be dedicated to laboratory infrastructure, particularly for disease diagnostics and supporting expertise. To some extent use of regional and/or international infrastructure may be possible to meet short-term needs (e.g. reference laboratories). The development and/or designation of national AAH centers may be justified in for many countries. Likewise a SADC Regional Aquatic Animal Health Laboratory should be considered. In any case, infrastructure development must be given high priority by national governments and regional agencies and adequate funding provided.

Table 13. Summary of infrastructure dedicated to aquatic animal health (AAH) in participating countries (survey questions 13.1–13.2)

Country	(13.1) Infrastructure dedicated solely to AAH			(13.2) Infrastructure available for AAH activities but shared with other groups		
	(a) Laboratories (type)	(b) Office space	(c) Other	(a) Laboratories (type)	(b) Office space	(c) Other
Botswana	No	No	Fish ponds (1 000 m ²)	No	No	3 electron microscopes
DRC	No	SENAQUA	None	No	SENAQUA and Associations des Pisciculteurs (ONGD)	None
Lesotho	No	n/a	n/a	n/r	n/r	n/r
Madagascar	A total of 126 m ² (office space included). Includes space for: <ul style="list-style-type: none"> • specimen or sample reception • histopathology • molecular diagnostics • microbiology “booth” • laboratory materials/ tools cleaning space • space for storage of analyzed samples 	Office space: In the laboratory, includes space for: <ul style="list-style-type: none"> • head of laboratory biologist • engineering 3 technicians In the Autorité Sanitaire Halieutique, space for: <ul style="list-style-type: none"> • 8 technicians • storage of samples 	<ul style="list-style-type: none"> • aquaculture ponds: about 397 • tank rooms: about 136 	<ul style="list-style-type: none"> • Private laboratory of Aqualma • Private laboratory of OSO farming 	No	No

Malawi	No	n/a	n/a	Biosecurity level 2 Total laboratory space: 1 113.559 m ²	n/r	No
Mauritius	No	No	No	No	No	Yes (official quarantine facilities)
Mozambique	3 mobile laboratories equipped for diagnosis of WSD	n/r	n/r	Central Veterinary Laboratory and Center of Biotechnology of Eduardo Mondlane University	n/r	n/r
Namibia	Histopathology and real-time PCR (both need to be equipped)	Office space : 1	No	No	No	No
Seychelles	No	Existing office is shared by all SVS activities	No	No	4 offices	n/a
South Africa	This is not known and will require a formal country-wide survey get a semi-accurate estimate. The number of national and provincial facilities is two.					
Swaziland	No	No	No	1	1	No

Tanzania	No	No	Research sites for AAH at Sokoine University of Agriculture and also fish ponds	Ministry Laboratories (2), Sokoine University of Agriculture (1), Tanzania Fisheries Research Institute (1)	Ministry office (1)	Sokoine University of Agriculture - aquaculture ponds
Zambia	No	No	No	<ul style="list-style-type: none"> • University of Zambia (UNZA) • National Aquaculture Research and Development Centre (NARDC) • Central Veterinary Research Institute (CVRI) 	<ul style="list-style-type: none"> • UNZA • NARDC • CVRI 	Commercial aquaculture farms
Zimbabwe	No	No	No	CVL and BPVL, UZ Biological Science Department	Shared	Shared among the private sector and NGOs

SECTION 14. LINKAGES

Summary of results

A summary of current international and domestic linkages and cooperation related to AAH in the 14 SADC member countries that were surveyed is given in Table 14 (questions 14.1–14.2). Although not mentioned by all respondents, all countries have regional linkages via AU-IBAR and SADC, and international linkages via their memberships in the FAO and the OIE (see Section 1). Several countries were able to list additional linkages, among them: Lesotho (IBAR-Vet-Gov Program), Madagascar (Worldwide Fund for Nature (WWF), Japanese International Cooperation Agency, JICA), Mauritius (Norwegian Agency for Development Cooperation, NORAD, Rhodes University) Mauritius (NORAD, Rhodes University), South Africa (Unilateral Trust Fund with FAO, unspecified collaborative projects between universities) and Zambia (Convention on International Trade in Endangered Species (CITES), World Trade Organization (WTO), Common Market for Eastern and Southern Africa (COMESA)), although some of these linkages are probably not directly related to AAH. Six countries (Botswana, Lesotho, Mauritius, Seychelles, South Africa, Zambia, Zimbabwe) noted some form of formal or informal domestic cooperation among government agencies or between government and university or private sector, although again, some of the linkages cited may not be directly related to improving AAH.

Analysis

Developing international regional and domestic linkages and cooperation is clearly an area that offers great potential to increase AAH capacity among SADC member countries. Cooperation in research and training is possible via international agencies such as the FAO and OIE and with foreign universities and experts. There is a great potential for regional cooperation and networking in almost all areas of AAH. Examples include the development of standardized procedures for import and export of live aquatic animals, harmonization of legislation, shared communication structures (websites, newsletters), development of a regional AAH information system (pathogen database, regional disease diagnostic and extension manuals), linkage of experts, cooperative research programmes, development of regional strategy and policy, regional disease reporting, a regional emergency response system, regional reference laboratory, regional risk analysis case studies for specific commodities, coordinated training efforts, etc. Mutual areas of concern need to be identified and prioritized on a regional basis and mechanisms for funding identified. Domestically, linkages between agencies, particularly those agencies responsible for fisheries and aquaculture, veterinary services, biosecurity and environmental/conservation issues, should be promoted to develop standardized procedures. Cooperation between government, universities and the private sector should also be explored.

Table 14. Summary of current international and domestic linkages and cooperation related to aquatic animal health (AAH) in participating countries (survey questions 14.1–14.2)

Country	(14.1) List any international, regional or bilateral linkages, cooperation or joint projects related to AAH that your country has, indicating their nature and the participating agencies	(14.2) List any domestic linkages, projects or cooperation between government agencies, universities and/or private sector (e.g. farmer associations, NGOs, other civil society groups), indicating their nature and the participating parties
Botswana	Surveillance and monitoring of boat movement and regulations to minimize the spread of invasive aquatic species (AIS) both within country and from neighbouring countries	<ul style="list-style-type: none"> • Okavango Research Institute of the University of Botswana – information sharing • Okavango Fishers Association – partnership • Southern Africa Regional Environmental Program – technical support
DRC	n/r	n/r
Lesotho	FAO, OIE and AU-IBAR under VET-GOV PROGRAM to support strengthening of veterinary services including livestock policy review	Lesotho Highlands Development Authority (LHDA)
Madagascar	<ul style="list-style-type: none"> • OIE - aquaculture in Southern Africa • WWF – sustainable aquaculture • JICA – Japanese cooperation in the field of aquaculture 	None
Malawi	None	None
Mauritius	<ul style="list-style-type: none"> • Aquatic animal health workshop in collaboration with Rhodes University, Grahamstown, South Africa (September 2014) • Bilateral cooperation with NORAD (Norway) (2008 – 2014) 	Competent Authority Seafood has established protocols with one aquaculture facility for the use of authorized veterinary medicines
Mozambique	None	None
Namibia	None	None

Seychelles	n/r	<p>Department of Environment (DoE):</p> <ol style="list-style-type: none"> 1. joint disease investigation 2. fish medicine 3. import health requirements <p>Marine Conservation Society Seychelles: Management of turtle-human interactions & turtle rehabilitation (conservation-veterinary medicine initiative)</p>
South Africa	<ul style="list-style-type: none"> • South Africa and China joint project concerning the development of a national hatchery at Gariep Dam in Bloemfontein, Free State Province • Unilateral Trust Fund with FAO to improve and develop AAH in South Africa • Numerous international collaborative projects exist at the higher education institution level (details unavailable) 	<p>DAFF, Directorate: Aquaculture Research and Development (DARD) has collaborative research agreements with the University of the Western Cape, University of Cape Town, University of KwaZulu Natal and the University of the Free State for collaborative research projects pertaining to AAH. Further collaborations between higher education institutions and other government departments probably exist.</p>
Swaziland	None	<p>There is cooperation between the Department of Veterinary and Livestock Services (DVLS) and the Fisheries Section</p>
Tanzania	None	None
Zambia	<ul style="list-style-type: none"> • OIE – Deals with both terrestrial and AAH • FAO – Technical assistance to member countries in AAH • CITES – Regulates trade in endangered species • WTO – Ensures fair but safe international trade • SADC – Mobilizes member countries to respond to AAH emergencies • COMESA – Ensures safe regional trade in aquatic products. 	<ul style="list-style-type: none"> • Local government health inspectors ensure safe consumption of aquatic products • Zambia Environmental Agency conducts EIAs that include bio-food security in aquatic production systems • Zambia Police helps in law enforcement. • Ministry of Health helps in ensuring nutritional and safe aquatic food consumption • Zambia National Farmers Union, Civil and other advocacy groups help

Zambia (continued)	Joint projects:	
	<ul style="list-style-type: none"> • Lake Tanganyika Authority (cage culture projects) 	
Zimbabwe	<ul style="list-style-type: none"> • Lake Kariba (cage culture projects) • EU-Smart fish project • FAO and OIE – AAH biosecurity initiatives and programmes for SADC countries 	UZ, PWLMA, DR&SS, Henderson Research Institute, LPD University of Zambia – Reference Laboratory

SECTION 15. FUNDING SUPPORT

Summary of results

Thirteen of the 14 SADC countries surveyed were able to provide answers with regard to national levels of funding (Table 15). Four countries indicated that some dedicated funds were available from regular programme budgets:

- Madagascar: USD350 000 from regular programme
- Namibia: N\$200 000 (for shellfish disease testing)
- South Africa : R 1 500 000 (roughly USD150,000) (this is only the funding dedicated to aquatic animal disease research from DAFF:DARD)
- Tanzania: USD8 000 from regular programme

Eight of the remaining countries reported that there was no funding under the current regular budget, while one country did not reply to this question. Most of these instances, funding for AAH (however limited) may be integrated into the broader budgets of fisheries and/or veterinary departments. None of the respondents indicated that any funding was available through special funding/projects or from foreign-assisted projects. All NFPs also consider that the current level of national funding for AAH is inadequate to meet minimum needs.

Analysis

All countries appear to have insufficient funding dedicated to meet their basic AAH needs. Within the SADC Region, government agencies in Madagascar and South Africa appear to the highest levels of support, with South Africa having additional, unestimated funding dedicated to AAH research at its universities. Access to adequate dedicated funding is clearly an important issue, as without sufficient budget, little improvement in capacity can be achieved. Each country will have to address its specific funding needs.

Table 15. Estimated total annual budget dedicated specifically to aquatic animal health (AAH) activities in participating countries (survey questions 15.1–15.3)

Country	(15.1)				(15.2)	(15.3)
	Indicate the estimated total annual budget dedicated specifically to AAH activities for your country:				Is this amount considered adequate to meet current and future needs in AAH?	If no, indicate percentage increase required over next 5 years?
	(a) Amount from regular programmes	(b) Amount from special funding/projects	(c) Amount from foreign-assisted projects	Total		
Botswana	None	None	None	None	n/a	n/r
DRC	n/r	n/r	n/r	n/r	n/r	n/r
Lesotho	None	None	None	None	No	n/a
Madagascar	USD350 000	None	None	USD350 000	No	15%
Malawi	None	n/r	n/r	n/r	n/r	n/r
Mauritius	None	None	None	None	No	Full funding required (100%)
Mozambique	None	None	None	None	No	n/r (note: Since this is a new area, we have not yet received dedicated funds)
Namibia	N\$200 000 (testing for OIE-listed shellfish diseases)	None	None	Total: N\$200 000	No	500%

Seychelles	Any activity must be catered under the yearly budget (approx. SR 3M = USD207 000, with the bulk (SR 2.3 M) being for wages and salaries) (Note: SR 14.00 = USD1.00)	n/a	None	n/a	No	Impossible to quantify for the moment, but if the country is to push with mariculture/ aquaculture development as part the “Blue Economy” initiative, significant funding will have to be made available.
South Africa	D: ARD Annual Budget = ~ R1 500 000. This includes funding for university research collaborative projects in AAH	None	None	Total:R1 500 000 This is only the funding dedicated to aquatic animal disease research from DAFF, D:ARD. Higher educational institutions conducting research in AAH will have their own dedicated funding.	No	The current budget essentially represents the running budget for two specialist scientists with some associated university projects. It does not include student support or human resources costs and consequently can be substantially increased to accommodate the increase of human capacity needed to address current and future research needs.

Swaziland	None	None	None	None	No	n/a
Tanzania	USD 8 000	None	None	USD 8 000	No	USD1 500 000
Zambia	None	None	None	None	No	Min. USD100 000
Zimbabwe	None	None	None	None	No	Budget required from Fiscus

SECTION 16. CURRENT CHALLENGES

Summary of results

Respondents for almost all SADC member countries surveyed provided detailed information on the current challenges that their countries are facing in their efforts to improve AAH capacity (Table 16A; question 16.1). Frequently cited challenges related to all five areas (preventing entry and spread of exotic pathogens, preventing domestic spread of serious pathogens, meeting international and trading partner standards for health certification, controlling mortalities and losses due to pathogens in aquaculture, and use of antibiotics and other chemotherapeutants) include:

- Preventing entry of exotic pathogens (e.g. TSV, YHV, WSSV, IHHNV)
- Lack of policy
- Lack of political will
- Lack of legislation
- Lack of expertise
- Lack of knowledge or awareness
- Lack of emergency preparedness
- Lack of risk management
- Lack of diagnostic capacity
- Lack of human resources
- Lack of financial resources
- Lack of infrastructure
- Lack of coordination between government agencies
- Lack of baseline knowledge on health status of aquatic animals
- Lack of disease surveillance
- Inadequate extension services and farm inspection capacity
- Lack of drugs available for treatment
- Lack of public awareness
- Lack of quarantine facilities
- Lack of control over internal movements of aquatic animals
- Lack of guidelines

Country-specific challenges for preventing the entry and spread of exotic pathogens include limited capacity (Botswana); lack of expertise (Lesotho); disease-specific problems (Taura syndrome (TS), yellowhead disease (YHD)) (Madagascar); lack of staff capacity and diagnostic capacity (Malawi); preventing entry and spread of exotic pathogens via shared waterways (Mozambique); lack of an officially dedicated veterinarian (Namibia); lack of enforcement, diagnostic capacity, personnel and resources (Seychelles); inadequate and fragmented legislation (South Africa); lack of coordination between national veterinary services and Fisheries Department, importations occurring without necessary documentation and checking, and thus unknown health status of imported aquatic animals (Swaziland); inadequate legislation and lack of specific legislation for AAH (Tanzania); weak policy, domestic lack of improved aquatic organisms for aquaculture, inadequate risk analysis capacity, lack of equipment, infrastructure and expertise (Zambia); and lack of implementation of a surveillance programme and AAH plans, lack of capacity for risk analysis, diagnostics, and disease control (Zimbabwe).

Country-specific challenges related to preventing the domestic spread of serious pathogens include inadequate legislation or protocols and/or associated capacity to prevent movements

of live aquatic animals and the domestic spread of pathogens (Botswana, Malawi, Mozambique, Seychelles, Swaziland, Tanzania, Zambia); lack of expertise (Lesotho); disease-specific problems (Madagascar); lack of public awareness of risks associated with movements of live aquatic animals (Malawi), lack of an enforcement health surveillance programme for fresh water (Namibia); inadequate surveillance and monitoring and associated dedicated diagnostic capacity (South Africa); and lack of implementation of a surveillance programme and AAH plans, lack of capacity for diagnostics, and field services (Zimbabwe).

Country-specific challenges related to meeting international and trading-partner standards for health certification include lack of collaboration (Botswana); lack of expertise (Lesotho); difficulty in meeting OIE standards (Madagascar); lack of infrastructure (Malawi), difficulty in meeting international standards for trade, lack capacity for risk analysis and border control (Mozambique), lack of expertise and laboratory testing (Namibia); lack of risk analysis capacity and an import/export health protocol (Seychelles); inadequate diagnostic capacity (South Africa); lack of knowledge of national AAH status (Swaziland); lack of laboratory tests for pathogens before exportation (Tanzania); lack of policy on the use of chemotherapeutics in aquaculture (Zambia); and lack of regional AAH standards (Zimbabwe).

Country-specific challenges related to controlling mortalities and losses due to pathogens in aquaculture operations include law enforcement limitations (Botswana); lack of infrastructure (Lesotho); disease-specific problems (e.g. whitespot disease, rickettsiosis, microsporidiosis) (Madagascar); challenges related to disease management in aquaculture systems, including disposal of effluent waters (Mozambique); problems associated with health surveillance programme, expertise and testing laboratory (Namibia); lack of diagnostic capacity and resources (Seychelles); difficulties related to extension services and farm inspection capacity (South Africa); lack of resources (Swaziland); limited biosecurity measures taken throughout the aquaculture production chain (Tanzania); and lack of expertise and capacity to undertake health certification of live animals (Zimbabwe).

Country-specific challenges related to the use of antibiotics and other chemotherapeutants for disease prevention and/or treatment include lack of proper aquaculture facilities (Botswana); lack of expertise (Lesotho); challenges related to chlorination (Madagascar); lack of approved guidelines (Mozambique); challenges related to inspections and testing laboratories (Namibia); lack of legislation and human and financial resources (Seychelles); absence of drugs and therapeutants registered for use in aquatic animals (South Africa); lack of trained personnel (Swaziland); and lack of diagnostics capacity (Zimbabwe).

Other serious challenges related to AAH that are likely to rise in the next five years include lack of resources (Botswana); challenges related to emergency preparedness and risk management for aquatic animals (Lesotho); disease-specific challenges (e.g. TS, YHD) (Madagascar); lack of knowledge on emerging pathogens, weak legislation and lack of political will (Malawi); testing for OIE-listed diseases, lack of laboratory equipment and expertise (Namibia); challenges related to disease prevention and control (Seychelles); invasion of diseases (especially EUS) due to poor controls on importation of live aquatic animals (Swaziland); introduction and spread of exotic pathogens (Tanzania); and lack funding for research and lack of capacity for regulation and oversight (Zimbabwe).

The major constraints to implementing an effective AAH programme, as identified by the respondents (Table 16 B, survey question 16.2) generally mirror the challenges listed above.

Analysis

The current challenges to improving AAH capacity in SADC member countries touch on almost all major areas of a national AAH strategy. These include the need for improved policy and planning, improved specialist expertise, and specialized infrastructure for diagnostics and quarantine, better monitoring and control, improved diagnostics techniques, improved legislation and better extension programmes. These are all areas that should be given high priority in preparing a regional approach to improving AAH capacity.

If the major constraints listed in Table 16B and ranked by the NFPs, are given scores ranging from 5 (for highest relative importance), to 1 (for lowest relative importance) the top four constraints can be ranked across the entire SADC Region as follows:

1. Lack of training, capacity and/or expertise
2. Financial constraints/lack of dedicated budget
3. Inadequate legislation
4. Lacking or inadequate policy

Table 16A. Summary of current challenges related to improving aquatic animal health (AAH) capacity in participating countries (survey question 16.1)

Country	(a) Preventing the entry and spread of exotic pathogens	(b) Preventing the domestic spread of serious pathogens	(c) Meeting international/trading partner standards with regard to health certification of live aquatic animals	(16.1) (d) Controlling mortalities/ losses due to pathogens in aquaculture establishments	(e) Use of antibiotics and other chemo-therapeutants for disease prevention and/or treatment	(f) Any other serious challenges related to AAH that your country is facing or is likely to face in the next 5 years?
Botswana	Limited capacity	Inadequate legislation	Lack of collaboration	Law enforcement limitations	Lack of proper aquaculture facilities	Lack of resources
DRC	n/r	n/r	n/r	n/r	n/r	n/r
Lesotho	No expertise	No expertise	No expertise	No infrastructure	No expertise	Emergency preparedness and risk management of aquatic animals
Madagascar	<ul style="list-style-type: none"> • Taura syndrome • Yellowhead disease 	<ul style="list-style-type: none"> • WSD • IHHNV • Rickettsiosis • Microsporidiosis • Vibriosis (EMS/AHPNS) 	OIE international standards	<ul style="list-style-type: none"> • WSD • Rickettsiosis • Microsporidiosis 	Chlorination	<ul style="list-style-type: none"> • Taura syndrome • Yellowhead disease

Malawi	<ul style="list-style-type: none"> • Staff capacity • Diagnostic capacity 	<ul style="list-style-type: none"> • Lack of legislation regarding movement of aquatic animals • Lack of public awareness of risks associated with aquatic animal movement 	<ul style="list-style-type: none"> • Lack of infrastructure (human and diagnostic) 	Knowledge gap	Knowledge gap	<ul style="list-style-type: none"> • Lack of knowledge on emerging pathogens • Weak legislation • Lack of political will
Mauritius	<ul style="list-style-type: none"> • Lack of legislation that would enable officers enforce measures preventing aquatic animal diseases • Lack of capacity (skills, knowledge, action plans) for: <ul style="list-style-type: none"> ▪ setting up of surveillance plans, emergency response and contingency plans in the event of an aquatic animal disease outbreak ▪ establishing disease control or eradication programmes ▪ establishing Competent Authority's aquatic animal quarantine facilities ▪ improving awareness of responsible health management practices and their communication to the aquaculture and ornamental aquatic animal industry ▪ establishing an aquatic animal internal movement control scheme • Lack of diagnostic capabilities for aquatic animal diseases (the ministry should provide a lab with diagnostic capabilities for early detection and treatment of aquatic animal diseases) 					

Mozambique	Due to major waterways shared with neighbouring countries, disease can easily enter Mozambique. Taking into consideration the extent of these rivers, monitoring animal health status is a great challenge.	The internal movement of live aquatic animals, particularly for upscaling of aquaculture in inland waters poses a great risk of spreading aquatic animal diseases, since no effective control is in place.	The country is struggling to meet international standards for trade with partners (i.e. their health requirements to export live animals and products), while for imports, the strengthening of capacity for risk analysis and border control inspection is needed.	The management of aquaculture production systems, particularly their biosecurity, is a great challenge, including the disposal of effluent waters.	Since there is no approved guidelines for the use of veterinary medicines for aquatic animals, the challenge is to develop these guidelines. A main challenge is to approve the regulations on use of veterinary medicines and to establish rules to prevent resistance and residues.	n/r
Namibia	The Directorate of Veterinary Services only deals with import of fresh-water and ornamental fish and import and export of fishmeal, fish oil and seal oil. There is no official veterinarian responsible for AAH.	Enforcement, health surveillance programme for fresh water	Expertise, laboratory testing	Health surveillance programme, expertise, testing laboratory	Inspections, testing laboratories	Testing for OIE-listed diseases, lack of laboratory equipment and expertise

Seychelles	Enforcement Local diagnostic capacity Personnel and resources	Protocol for internal (inter-island) control/movement)	Risk analysis import/export health protocol	Local diagnostic capacity resources	Legislation resources (human and financial)	Disease prevention and control, especially now that there are new pathogens in the region and the country is planning to develop aquaculture
South Africa	Legislation governing the import and export of aquatic animals is inadequate and fragmented between two acts. This has resulted in a general lack of responsibility and accountability with regard to the regulation and certification for imports and exports, particularly for aquatic invertebrates which form the bulk of the exported aquaculture commodity.	Currently there is inadequate surveillance or monitoring for aquatic animal diseases, and hence a shortage of dedicated diagnostic capacity with respect to both human resources and infrastructure	Dedicated diagnostic capacity in terms of human resources and infrastructure remains a challenge to meet international partner trading standards.	Extension services and farm inspection capacity is the biggest challenge	Currently no drugs or therapeutants are registered for use in aquatic animals in this country	n/r

Swaziland	Lack of co-ordination between the DVLS and the Fisheries Section; hence, importation of live aquatic animals without the necessary veterinary import permits and certification. Health status of imported aquatic animals is unknown.	No legislation regulating the movement of aquatic animals within the country	No knowledge of the current health status of the aquatic animals in the country	Lack of resources	Lack of personnel trained to monitor and control the use of such	Invasion of diseases, especially EUS, due to poor controls on the importation of live aquatic animals
Tanzania	Both Fisheries Act, 2003 and Fisheries Regulations 2009 do not critically address aquatic animal health issues, particularly pathogens, although there is no importation of live aquatic animals now. Absence of specific AAH legislation	Existing legislation does not consider the pathogen issues of AAH; therefore, prevention of domestic spread is difficult because there are no measures in place to prevent spread of serious pathogens.	This is a big challenge, although all live-keeping establishments are inspected by Fisheries Inspectors for compliance with Regulation 2009 on hygienic conditions before issuance of licenses. However there are no laboratory tests for pathogens before exportation.	As per Fisheries Regulations 2009, it is the owner's responsibility to ensure that there are no mortalities by maintaining water quality and other necessary parameters for survival.	This is not a challenge in aquaculture, since antibiotics and other chemotherapeutants are not in use at the moment.	Control of genetically modified organisms (GMOs) and introduction and spread of exotic pathogens once there is any interested importer of live aquatic animals in the coming years.

**Tanzania
(continued)**

The CA takes samples of water and feeds for laboratory analysis on a regular basis. No big challenge, as the establishments are in pollution-free areas. There is limited biosecurity measures taken at different levels of the aquaculture production chain.

Zambia	Weak or unclear policy Lack of improved local aquatic organisms of commercial viability to curtail importations Inadequate risk analysis capacity to recognize and diagnose aquatic health concerns Lack of equipment, infrastructure and expertise	Inadequate field staff to enforce regulations Duo roles of extension and enforcement by extension officers Weak legislation	No proper policy direction in the use of chemo-therapeutics in aquaculture which also takes care of environ-mental issues	Lack of expertise and capacity to undertake health certification of live animals	Lack of capacity to diagnose aquatic diseases	The country is likely to have a scale up of production due to intensification and hence an increase in disease. (preparedness for this is inadequate)
Zimbabwe	Implementation of surveillance programme and AAH plans Capacity building for risk analysis Diagnostic capacity building in specific areas Disease control by Field Services Control of TAADs	Implementatio n of surveillance programme and AAH plans Capacity building of diagnostic and field services	Development of regional aquatic standards	Better cooperation among stake-holders, private sector, PWLMA and DLVS on disease reporting	Capacity building among veterinarians on use of chemotherapeutants	Lack of funding for AAH research, and lack of capacity for regulatory services and for oversight of the informal sector

Table 16B. Summary of the major constraints to implementing an effective aquatic animal health (AAH) programme, in order of importance, as identified by the respondents (survey question 16.2)

Country	(16.2) List the major constraints to implementing an effective AAH programme for your country, in order of importance
Botswana	<ul style="list-style-type: none"> • Lack of experts • Inadequate legislation
DRC	n/r
Lesotho	<ul style="list-style-type: none"> • No policy direction
Madagascar	<ul style="list-style-type: none"> • Financial constraints • Lack of specialists in AAH and aquaculture with respect to the evolution of farming systems in the presence of disease
Malawi	n/r
Mauritius	<ul style="list-style-type: none"> • Absence of legislation • Lack of funding for extension services • Training to be provided for all officers; recruitment of trained experts a priority • Acceptance by stakeholders of policy/codes of practice/protocols • Enforcement levels
Mozambique	n/r
Namibia	<ul style="list-style-type: none"> • Funding • Laboratory equipment • Expertise • Training in AAH

Seychelles	<ul style="list-style-type: none"> • Capacity (training and diagnostics) • Legislation (residue monitoring) • Human and financial resources • Staff
South Africa	<ul style="list-style-type: none"> • Fragmented institutional and legislative structure; AAH management should either be more coordinated, or preferably integrated to a single accountable institutional structure or department. • The restricted AAH expertise in the country, veterinarians and paraveterinarians, is an additional challenge
Swaziland	<ul style="list-style-type: none"> • Lack of legislation and policy • Shortage of human resources • Shortage of resources (i.e. transport) • No allocated budget for AAH programme
Tanzania	<ul style="list-style-type: none"> • AAH issues are not well stipulated in legislation • Inadequate financial and human resources for handling AAH issues • Absence of an AAH reference laboratory (specified diseases) within SADC countries
Zambia	<ul style="list-style-type: none"> • Unclear national policy to address AAH issues • No budget line specifically for AAH issues • Lack of capacity building in veterinarians to handle aquatic diseases • Lack specific equipment and infrastructure for aquatic diseases
Zimbabwe	<ul style="list-style-type: none"> • Capacity building in terms of field and laboratory services • Capacity building in terms of extension services • Financial support • Hierarchy support • Work on regulatory framework • Information management • Support from NGOs on research projects

SECTION 17. ADDITIONAL INFORMATION

In Section 17 of the survey questionnaire respondents were asked to provide any additional information about their country or territory's capacities or capabilities with respect to managing aquatic biosecurity that is not mentioned in the responses to the survey questions (see Table 17A, survey question 17.1) and to provide any additional information on national aquaculture development that they felt relevant (see Table 17B, survey question 17.2). Ten countries provided additional comments on the former, while ten countries responded to the latter.

Table 17A. Any additional information about your country's capacities or capabilities with respect to managing aquatic biosecurity that is not mentioned in the responses to the above questions: (survey questions 17.1)

Country	(17.1) Provide any additional information about your country's capacities or capabilities with respect to managing aquatic biosecurity that is not mentioned in the responses to the above questions
Botswana	Aquaculture development in Botswana is still at an infancy stage
DRC	n/r
Lesotho	Capacity building for the laboratories and certification processes is required
Madagascar	<ul style="list-style-type: none"> • To enhance aquatic biosecurity management, there are some farm-level biosecurity measures that need to be implemented: <ul style="list-style-type: none"> ○ Implementation of a surveillance programme for wild populations surrounding the farm, for early detection of pathogens so that farmers can apply an appropriate contingency plan ○ Development of a breeding programme for specific pathogen free (SPF) or specific pathogen resistant (SPR) stocks ○ Reduction of water exchange by adding additional aerators to ponds ○ Exclusion of horizontal transmission by performing water filtration down to 200 µm and by using carrier fencing such as crab fences and birds nets; draining the water supply channel ○ Not stocking during the cold season
Malawi	n/r
Mauritius	n/r
Mozambique	n/r
Namibia	No additional information

Seychelles	Biosecurity in the broad sense is a new concept. All along we have been working with aquatic animals in the wild, though there was some aquaculture activity (prawns) until mid-2000. The country is now planning to introduce mariculture.
South Africa	<ul style="list-style-type: none"> • DAFF previously made use of an external service provider (Amanzi Biosecurity) to undertake on-farm biosecurity audits and training on marine aquaculture farms. • Ongoing biosecurity audits will be undertaken by DAFF on marine aquaculture farms as part of an official farm export registration process. • Biosecurity at ports of entry and exit and at fish processing establishments has not been officially addressed concerning aquatic animals, and will be addressed either by DAFF and/or provincial departments of agriculture.
Swaziland	<ul style="list-style-type: none"> • Aquaculture is still at a subsistence level in Swaziland; therefore, there is limited activity concerning aquatic animals. • In the rivers, fishing is controlled by the issuance of fishing permits only to anglers.
Tanzania	<ul style="list-style-type: none"> • There is limited personnel for managing aquatic biosecurity (more recruitment of veterinarians and fisheries officers is needed) • There are no accredited laboratories solely for handling AAH (samples testing)
Zambia	<ul style="list-style-type: none"> • There are no standards set in the aquaculture facilities for purposes of prevention of aquatic health concerns • Waste management for aquatic systems is unclear • There is no system for preventing the transfer of pathogens and parasites from one farm to another through movement of media and equipment (nets)
Zimbabwe	Given the more than 11 000 waterbodies, there is scope for increased aquaculture production,; more needs to be done on managing aquatic biosecurity

Table 17B. Provide additional information on aquaculture trends, resources and production data: (survey questions 17.2)

Country	(17.2) Provide additional information on aquaculture trends, resources and production data
Botswana	n/r
DRC	n/r
Lesotho	<ul style="list-style-type: none"> • Length and tradition of aquaculture: During the 1960s only common carp was farmed • Production systems and species: Pond and cage culture systems • Total production: Production from aquaculture increased from 130 tonnes in 2007 to 500 tonnes in 2013. <ul style="list-style-type: none"> ▪ Common carp: 0.5 tonnes (2013) ▪ Rainbow trout: 500 tonnes (2013) • Breakdown of production: 95% of annual production is exported, while 5% is consumed locally • Water resources used for aquaculture: fresh water • Number of aquaculture farms: 2 commercial farms • Processing plants for aquaculture products: 1
Madagascar	<ul style="list-style-type: none"> • Production systems and species: 5-10 ha, semi-intensive culture of <i>Penaeus monodon</i> • Total production: 4 255 tonnes (2013) • Water resources used for aquaculture: brackish and costal seawater • Number of aquaculture farms: 3 • Processing plants for aquaculture products: 3

Malawi

- **Length and tradition of aquaculture:** 1956 to date
- **Production systems and species:** Low-input integrated aquaculture using polyculture (*Oreochromis shiranus*, *O. karongae*, *Tilapia rendalli*, catfish, common carp)
- **Total production:** 900 to 1400 tonnes per year, but difficult to categorize production by region because of poor data collection
- **Break down of production:** Less than 5% for stocking and over 90% for consumption
- **Water resources used for aquaculture:** fresh water
- **Number and sizes of aquaculture farms:** 9 500 ponds with wide variation in size, ranging from 10 x 10 m to 40 x 40 m
- **Processing plants for aquaculture products:** None

Mauritius

- **Length and tradition of aquaculture:** Recently small cages have been placed around the island (Cordonnier). One aquaculture facility has been based in Mauritius since 2004.
- **Production systems and species:**
 - Marine systems: barachois and cages in the lagoon area (total area 243 km²)
 - Freshwater systems: small recirculating systems, cages, traps
 - Species: channel bass, seabass, red drum, cordonnier, shellfish
- **Total production, based on latest available statistics, with a breakdown by main species and by regions:**
One commercial aquaculture farm (Eastern region):

Farm Production (tonnes)

Species	2011	2012	2013	2014 (projected)
Seabass, red drum	321	470	395	450

Total aquaculture production in Mauritius (2010) consisting of ponds, barachois and cages was 566 tonnes of which 498 tonnes was produced in cages (source: Ministry of Fisheries)

- **Breakdown of aquaculture farm production:** 30% sales Mauritius (local consumption) remainder sold to USA, Europe, South Africa, Middle East and Singapore
 - **Water resources used for aquaculture:** coastal/brackish
 - **Number and sizes of aquaculture farm:** only one aquaculture farm in production: consists of 2 sites at sea, each site with 10 circular floating, submersible cages ranging from 8 m, 16 to 2 m in diameter and in depth from 5 to 8 m
 - **Processing plants for aquaculture products:** 1 plant at farm produces chilled fish fillets according to EU food hygiene legislation and is registered with the Competent Authority-Seafood.
-

Mozambique	n/r
Namibia	<p>Length and tradition of aquaculture: no traditional aquaculture</p> <ul style="list-style-type: none"> • Production systems and species: see 1.7 and below • Total production: no data available <p>Water resources used for aquaculture: (i) freshwater: subsistence farming of finfish in ponds and 3 small-scale farmers for fish in ponds; (ii) marine: commercial farming of oysters and mussels in open waters; abalone cultured in confined tanks with water circulated from the sea</p> <ul style="list-style-type: none"> • Number of aquaculture farms: freshwater subsistence farming – no data available; 3 small-scale tilapia farms; 2 oyster farms and 1 abalone farm in Ludertiz; 3 oyster farms and 1 mussel farm in Walvis Bay; 1 oyster hatchery in Swakopmund • Processing plants for aquaculture products: None
Seychelles	Currently there is no aquaculture activity going on.
South Africa	<p>Below are the more significant species that are produced on a commercial scale:</p> <ul style="list-style-type: none"> ▪ Abalone (<i>Haliotis midae</i>): tanks on a land-based system (recirculating aquaculture system) and ranches ▪ Oysters (<i>Crassostrea gigas</i>): baskets in sea-based system ▪ Mussels (<i>Mytilus galloprovincialis</i>, <i>Choromytilus meridionalis</i>): open sea-based system ▪ Pacific white shrimp (<i>Litopenaeus vannamei</i>): not sure ▪ East coast rock lobster (<i>Panuliris homarus</i>): not sure ▪ Crayfish (<i>Cherax tenuimanus</i>): not sure ▪ Dusky kob (<i>Arygyrosomus japonicus</i>): land-based pond system ▪ Trout (<i>Oncorhynchus mykiss</i>, <i>Salmo trutta</i>): land-based raceway and pond systems ▪ Tilapia (<i>Oreochromis niloticus</i>, <i>Tilapia rendalli</i>): land-based pond systems ▪ Ornamental fish (<i>Cyprinus carpio</i>, cichlids, <i>Carassius</i> spp., <i>Poecilia</i> spp.): land-based pond systems <ul style="list-style-type: none"> • Total production: no current data available • Breakdown of production: no current data available • Water resources used for aquaculture: coastal aquaculture establishments use coastal marine water sources and inland aquaculture establishments use fresh water. No information on production areas. • Number and sizes of aquaculture farms: approximately 19 abalone farms, 11 oyster and mussel farms, 5 finfish farms for the marine aquaculture sector. No statistics available for freshwater sector. • Processing plants for aquaculture products: registered fish processing establishments for aquatic vertebrates and invertebrates are available, no data available on quantity.

Swaziland	<ul style="list-style-type: none"> • Length and tradition of aquaculture: aquaculture has been in existence since the 1970s as subsistence farming • Production systems and species: ponds stocking mainly <i>Oreochromis mossambicus</i> • Total production: 400 kg per pond • Breakdown of production: personal consumption • Water resources used for aquaculture: fresh water stocked with finfish • Number and sizes of aquaculture farms: 200 m² fish ponds • Processing plants for aquaculture products: None
Tanzania	<ul style="list-style-type: none"> • Length and tradition of aquaculture: Tanzania has a tradition of “culture based fisheries”. Notably this was in the form of “brushparks” practiced as fish aggregating devices (FADS) in estuaries in Pangani (Balarin, 1985), and MLFD (2009) mentions “drain-in ponds” or “fish holes” excavated in floodplains to retain fish, as being “traditional aquaculture”. More conventional fish farming, such as pond farming, was introduced in 1927 with the introduction of trout farming. This heralded the beginnings of modern aquaculture. Today, although only a few individuals farm trout commercially, producing about 7 tonnes/year, in total, the concept of fish farming has caught on. • In the 1950s, experimental tilapia farming started in ponds (i.e. man-made excavations filled with water) and with the stocking of man-made water reservoirs or dams. The latter is a form of “culture based fishery” or “fish ranching”. Balarin (1985), at that time, reported over 1,000 charco dams that were built for cattle watering and that had been stocked with fish. In addition, this included stocking of man-made lakes. Stocking of Nile perch and Nile tilapia in Lake Victoria in the 1970s can also be classed as a form of “fish ranching”. • Water resources used of aquaculture: Total inland water area is 61 500 km², marine territorial sea of about 64 000 km² and a coastline of 1 424 km that has potential for aquaculture production • Number and sizes of aquaculture farms: average fish pond size is 150 m² • Processing plants for aquaculture products: Considering that aquaculture is a growing industry, there is limited aquaculture products for processing. However, there are processing plants for capture fisheries products and farmed shrimp.

Zambia

- **Length and tradition of aquaculture:** Subsistence production using the traditional manure system has been practiced for the past 45 years, but the development of commercial aquaculture using intensive systems has been pronounced in the past five years. The national strategy is to speed up aquaculture production by shifting from traditional subsistence farming to small and medium-scale enterprises by application of more semi-intensive and extensive systems. The approaches include use of commercial feeds, improved intensive pond production, cage and pen aquaculture systems. This entails high stocking densities, aeration or recirculation systems, indoor hatcheries and nurseries.
 - **Production systems and species:** The major production systems are pond, dam and tanks as land-based systems. The other are cage and pen aquaculture as water-based systems. The major cultured species include *Oreochromis andersonii*, *O. machrochir*, *O. tanganyikae* and *Tilapia rendalli* among the indigenous species, and *O. niloticus*, *Cyprinus carpio* and crayfish among the exotic species.
 - **Total production, based on latest available statistics, with a breakdown by main species and by regions:** The disaggregation of production is mainly based on land-based and water-based culture systems. The production in this respect is estimated as 10 000 tonnes coming from land-based culture in 2013, while water-based production is reported as 12 000 tonnes in the same year but growing at a very fast rate. Almost all the ten provinces practice land-based aquaculture, but the major water-based aquaculture provinces since 2010 are the Southern Province with 80% production and the Northern Province with 20%. The species reared in land-based culture include all of the above, but water-based culture is dominated by *O. niloticus* in Southern Province and by *O. tanganyikae* in Northern Province.
 - **Breakdown of production (e.g. for consumption, export, stocking, etc.):** Almost all farmed fish is consumed locally and no official export from Zambia in terms of fish has been reported.
 - **Water resources used for aquaculture:** Zambia has close to 40% of the water resources in the SADC Region and this is all fresh water from lakes, streams, rivers, springs, dams and even dambo-collected water from rainfall. The potential production from land-based aquaculture is estimated to be 260 000 tonnes, but only 10 000 tonnes is realized, while water-based aquaculture has the potential to produce 900 000 tonnes but only 12 000 tonnes is realized.
 - **Number and sizes of aquaculture farms:** There are about 12 commercial land-based producers, covering 120 ha of ponds, and more than 10 000 small-scale producers with a total of 2 500 ha pond area. There are about 5 pen and cage-culture commercial operations, each farm having not less than 12 cages of 20 m diameter x 6 m depth.
 - **Processing plants for aquaculture products:** Only four big commercial operators have cleaning and packaging plants, as most fish is sold whole to specific markets.
-

Zimbabwe	<ul style="list-style-type: none"> • Length and tradition of aquaculture: Lake Harvest Aquaculture Establishment started production in 1997 • Production systems and species: Cage culture with tilapia (<i>Oreochromis niloticus</i>) by Lake Harvest • Total production: Lake Kariba, Lake Harvest production in 2011 was at 7 500 tonnes and was expected to reach 8 000 tonnes in 2012 • Breakdown of production: Lake Harvest- 40% exported regionally and internationally, and 60% sold locally as value-added products, frozen fillets, frozen eviscerated, and frozen whole fresh fish. • Water resources used for aquaculture: Fresh water on Lake Kariba; aquatic species produced: tilapia, other finfish • Number and sizes of aquaculture farms: 1, the biggest producer in Sub-Saharan Africa (Lake Harvest), other smaller farms also exist whose production levels have not been captured statistically. Inyanga Trout Farm produces rainbow trout (<i>Onchorhynchus mykiss</i>) • Processing plants for aquaculture products: EU- accredited Lake Harvest Abattoir
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ANNEX I.a

Questionnaire survey form

Southern Africa regional aquatic animal health capacity and performance self-assessment survey

Background

This regional survey of aquatic animal health capacity and performance was recommended following the recent Aquatic Animal Health (AAH) Training for SADC Veterinarians that was held at Rhodes University, Grahamstown, South Africa from 14-21 July 2014. The training was funded by the South Africa Government through its Department of Agriculture, Forestry and Fisheries (DAFF) and implemented by FAO in partnership with the, Rhodes University, the World Animal Health Organisation (OIE) and NEPAD. The training targeted participants from the 15 SADC countries, most of whom are veterinarians. The countries which participated include **Angola, Botswana, DRC, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe.**

The regional survey will provide background information for assessing the current status and future needs on aquatic animal health management of countries in Southern Africa and can be used as basis for formulating national strategies and regional priorities and management frameworks on AAH. The fifteen SADC countries have in recent years given increased attention to aquaculture development. These countries, through the SADC Secretariat are in the process of developing a Regional Aquaculture Development Strategy following the ratification of the SADC Protocol on Fisheries in 2008. Implementation strategy for this Protocol was approved in 2010, and it prioritizes three regional programmes; aquaculture development, management of shared fisheries resources; and combating illegal, unregulated and unreported fishing. It is therefore expected that a regional aquaculture strategy will provide guidance in developing aquaculture that is meaningful for national food fish security as well as socio-economic growth. The region has an advantageous situation with regard to aquaculture development, having large areas of high-quality fresh waters, pristine marine environment, proven fish production technologies, good domestic and regional markets for farmed fish products.

Disease outbreaks have cost the global aquaculture industry tens of billions of dollars over the last 20 years and represent the major firm-level risk. The shrimp industry alone has suffered losses on the order of USD10 billion since 1990 and new diseases are appearing every year. Vietnam alone reports losing an average of USD1 billion per year to disease. The Chilean salmon farming industry is in the process of recovering from a severe outbreak of infectious salmon anemia virus (ISAv) which began in 2007 and cost 350,000 to 400,000 tonnes of fish, worth USD2 billion and 30,000 jobs.

Africa was not spared, as the region's aquaculture sector recently suffered a huge setback i.e. the incursion of two very significant aquatic diseases (Epizootic ulcerative syndrome or EUS) of cultured and wild finfish in the Chobe-Zambezi River and (white spot disease or WSD) of cultured shrimp in Mozambique and Madagascar which served as a wake call to the SADC region and continent. EUS and WSD are two examples of serious trans-boundary aquatic

animal diseases or pathogens that calls for serious, urgent and concerted actions for improving biosecurity.

Virtually all of these catastrophes have occurred in developing countries where over 90% of aquaculture takes place, reducing revenues, eliminating jobs and threatening food security. While the basics of farm-level disease management are known, the interconnectedness of aquaculture installations means that a few careless farms can ruin an industry. Biosecurity and response planning need to be both at the governance and at the farm level. Farmers, extension personnel, aquatic animal health services and government regulators all have a role to play.

With the increasing expansion and intensification of aquaculture, it is clearly evident that new diseases are emerging and many pathogens are moved through trans-boundary movement of fish, causing disease outbreaks in many parts of the world. Most of the recent disease outbreaks are linked to movement of live aquatic animals. It is therefore important that aquatic biosecurity is strengthened through appropriate policy and regulatory frameworks.

To realize this potential, SADC countries need to develop the capacity to meet international standards for trade in live aquatic animals (fish, crustaceans and molluscs) and their products. Primary among these are the standards of the World Organisation for Animal Health (formerly the Office International des Epizooties, OIE) as expressed in the OIE *Aquatic Animal Health Code* and the *Manual for Diagnosis of Aquatic Animal Diseases*, the Sanitary and Phytosanitary Agreement (SPS Agreement) of the World Trade Organization (WTO), and the general standards for market access as required by the countries of the region. Achieving these goals requires meeting high standards for aquaculture production, including a high level of capacity to address issues related to the prevention, management and control of aquatic animal diseases.

Purpose

The purpose of this survey is to obtain information on national capacity and the agencies mandated to implement aquatic animal health programmes for the fifteen countries of Southern Africa. The survey also collects relevant information essential to support the development of the aquaculture sector through healthy aquatic production and seeks opinions on the components and activities that might be included in a regional aquatic animal health strategy. The results of this survey will help guide regional and national strategic planning for improving aquatic animal health and assuring adequate and rational support services to achieve sustainable aquaculture development.

The FAO questionnaires on aquatic animal health capacity and performance is a self-assessment survey that **contains 17 sections** pertaining to: (1) international trade in live aquatic animals and national border controls, (2) control of domestic movement of live aquatic animals and other domestic activities that may spread pathogens, (3) policy and planning, (4) legislation, (5) disease surveillance/monitoring, (6) disease diagnostics, (7) emergency preparedness and contingency planning, (8) extension services, (9) compliance/enforcement, (10) research, (11) training, (12) expertise, (13) infrastructure, (14) linkages and cooperation, (15) funding support, (16) current challenges and constraints and (17) additional information.

Participation

All 15 SADC states are expected to participate in the process. These are Angola, Botswana, DRC, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe.

Process

The FAO survey will be conducted between September and October 2014. **This survey should be completed by the national competent authority or other senior government officer with primary responsibility for national aquatic animal health issues, with the assistance of national aquaculture experts and concerned laboratory personnel.** FAO will summarize and analyze the survey returns and presented to participants at a Biosecurity Governance Workshop to be held in Durban, South Africa in early November 2014.

Product

A summary and critical analysis of the survey returns will be prepared and will form the basis for the development of draft Regional Project Proposal that will be presented, discussed, revised and endorsed during the Governance Workshop on AAH.

Details of person completing the survey questionnaire

Country:

Contact information for person completing this survey:

Name:

Title:

Institution:

Mailing address:

Telephone:

Facsimile:

Email:

Signature of completing official:

Date:

Description of Competent Authorities on various aspects of aquatic animal health responsibilities

Responsibility	Agency/Ministry	Mandate/Authority
Aquatic animal health with regard to export and import matters		
Development of biosecurity policies, for example conduct of risk analysis, negotiation of export protocols for animal health and for assessing foreign Competent Authorities		
Control of aquatic animal diseases and pharmaceutical product residues		
Inspection, surveillance and reporting		
Health certificates and quarantine, laboratory testing		
Diagnostics		
Research		
Extension		
Training		
Education		
Others		

SECTION 1. International trade in live aquatic animals and national border controls

e.g. Is your country a member of the **World Organisation for Animal Health** (OIE, Office International des Epizooties)?

☐ Yes

☐ No

1.2 If **yes**, please indicate the government agency/person that is recognized by the OIE as your country's competent authority for purposes of reporting aquatic animal health's status? (If the Chief Veterinary Officer, please indicate):

1.3 Is your country a member of the **World Trade Organization** (WTO)?

☐ Yes

☐ No

1.4 Does your country have **legislation** that supports or strengthens government control of imports and exports with respect to aquatic animal health?

☐ Yes

☐ No

1.5 If **yes**, name and briefly describe all legislation and where applicable, indicate which specific directives or decisions the legislation conforms to e.g. *Animal Diseases and Parasites Act (Act 13 of 1956 – Namibia or Fisheries and Marine Resources (Import of Fish and Fish Products) Regulations 2012 – Mauritius*.

1.6 Does your country export live **aquatic animals** to other countries?

☐ Yes

☐ No

1.7 If **yes**, please briefly list the principal species exported, their life cycle stage(s), the destination country(ies), volumes (please indicate clearly as e.g. kgs, number of live animals, etc.), estimated values (please indicate in USD) and the time period. Please provide separate information for commercial aquaculture and the ornamental fish trade. You can use a table like the one below:

Species (life cycle stage)	Country of destination	Volume (units)	Value (USD)	Date Covered

1.8 If **yes**, please describe any associated aquatic animal health certification that you provide to the importing country, including the name and contact details of the government agency/ies that provides this certification:

1.9 If **yes**, is certification done:

(a) for **freedom from specified pathogens** using the methods outlined in the OIE aquatic animal disease diagnostics manual
http://www.oie.int/eng/normes/en_amanual.htm?e1d10

☐ Yes ☐ No

(b) to whatever **standards the importing country requires**:

☐ Yes ☐ No

(c) to other standards based on general appearance of health (e.g. by visual inspection) or using testing protocols devised by agencies within your country

☐ Yes ☐ No

1.10 Are live aquatic animals **imported** to your country from other countries?

☐ Yes ☐ No

1.11 If **yes**, please briefly list the principal species imported, their life cycle stage(s), the countries of origin, volumes (please indicate clearly as e.g. kgs., number of live animals, etc.), and estimated values (please indicate in USD). Please provide separate information for commercial aquaculture and the ornamental fish trade. You can use a table like the one below:

Species (life cycle stage)	Country of origin	Volume (units)	Value (USD)	Date covered

1.12 If **yes**, describe any associated aquatic animal health certification that you require to be provided by the exporting country.

1.13 If **yes**, describe any other official controls or risk management measures to which imported aquatic animals or aquatic animal products are subject (e.g. veterinary inspection at the port of entry, quarantine, or end-use controls such as prohibitions on the release of live aquatic animals into natural waters):

1.14 Is there expertise in your country for **Import Risk Analysis (IRA)** for aquatic animal pathogens?

☐ Yes ☐ No

1.15 If **yes**, provide contact details of the agency/ies with this expertise and provide examples (and where applicable, citations for published documents) of the import risk analyses that have been undertaken:

1.16 Is evaluation of risks for aquatic animal **pathogens linked with evaluation of other risks?**

(e.g. ecological, pest, aquatic invasive species, genetic risks, food safety)?

☐ Yes

☐ No

1.17 If **yes**, briefly describe how is this accomplished (e.g. by interagency committee)

SECTION 2. Control of domestic movements of live aquatic animals and other domestic activities that may spread pathogens

2.1 Does your country have any **regulations controlling the in-country movement** of live aquatic organisms?

☐ Yes

☐ No

2.2 If **yes**, briefly describe these controls, including the name and contact details of the responsible agency/ies and the legislation that provides authority for this control:

2.3 Does your country have any regulations **pertaining waste disposal from inland/seafood processing** plants in relation to preventing the spread of aquatic animal pathogens?

☐ Yes

☐ No

2.4 If **yes**, briefly describe these controls, including the name and contact details of the responsible agency/ies and the legislation that provides authority for this control:

SECTION 3. Policy and planning

3.1 Has an agency or agencies been designated as responsible for national aquatic animal health policy and planning for your country?

☐ Yes

☐ No

3.2. If **yes**, indicate agency(ies) or department(s) and please indicate their responsibilities.

3.3 Has official policy been expressed in a **National Aquatic Animal Health Plan**, strategy, legislation or other document?

☐ Yes

☐ No

- 3.4 If **yes**, provide citation for document:
- 3.5 If **no**, briefly describe how issues impacting national aquatic animal health are currently being handled:
- 3.6 Do **subnational entities** (state, provincial, local government, private sector) play a role in setting national aquatic animal health policy?
- ☐ Yes ☐ No
- 3.7 If **yes**, briefly describe their role(s):
- (e) 3.8 Is current policy for aquatic animal health **adequate for preventing the entry and spread** of exotic aquatic animal pathogens?
- ☐ Yes ☐ No
- (b) **adequate for controlling serious diseases** within country?
- ☐ Yes ☐ No
- (c) **effectively implemented**?
- ☐ Yes ☐ No
- 3.9 Which of the following areas are **addressed in national policy**?
- | | | |
|---|------------------------------|-----------------------------|
| national diagnostics services: | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| risk analysis: | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| farm-level treatment and prevention: | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| emergency preparedness and disease control: | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| zoning/compartimentalization: | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| use of veterinary drugs: | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| manpower requirements: | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| training requirements: | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| infrastructural requirements: | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| financial requirements and planning: | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| international treaties, memberships and linkages: | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| communication (interagency, stakeholder): | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
- 3.10 What are the **current priorities for your country** with regard to national aquatic animal health policy (list in order of importance)?

SECTION 4. Legislation

4.1 Is there **specific legislation** in place dealing with aquatic animal health?

☐ Yes

☐ No

4.2. Please, give a name of legislation related with aquatic animal health if such legislation/sub-legislation exist as separate act.

4.3 If **yes**, indicate if aquatic animal health legislation is:

By separate act or regulation:

☐ Yes

☐ No

As part of broader veterinary, aquaculture,
environmental protection or conservation legislation
or regulation:

☐ Yes

☐ No

4.4 If **yes**, is existing legislation/regulations in need of major review and/or revision?

☐ Yes

☐ No

SECTION 5. Disease surveillance/monitoring

5.1 Are there any **official surveillance or monitoring programmes** for plant or animal diseases in your country?

☐ Yes

☐ No

5.2 If **yes**, do these programmers deal with:

plants:

☐ Yes

☐ No

terrestrial animals:

☐ Yes

☐ No

aquatic animals:

☐ Yes

☐ No

5.3 Briefly describe any **programmers for surveillance or monitoring of aquatic animal diseases**, including the name and contact details of the responsible agency/ies:

5.4 Does **aquatic animal health information system** (for storing, retrieval and analysis of disease diagnostics and surveillance data/information) exist in your country? If yes, who is the responsible institution and what facilities exist?

SECTION 6. Disease diagnostics

6.1 Is there adequate national capacity to **diagnose those diseases listed by the World Organisation for Animal Health** to the specifications listed in the OIE manual?

☐ Yes

☐ No

6.2 If yes, indicate **capacity to diagnosis disease using OIE standards** for the following groups:

- (a) OIE-listed **molluscan** diseases: ☐ Yes (all) ☐ Yes (some) ☐ No
 (b) OIE-listed **crustacean** diseases: ☐ Yes (all) ☐ Yes (some) ☐ No
 (c) OIE-listed **finfish** diseases ☐ Yes (all) ☐ Yes (some) ☐ No

6.3 Does your country have an **officially designated national laboratory(ies)** for aquatic animal health diagnostics?

- ☐ Yes ☐ No

6.4 If **yes**, please provide contact information:

6.5 Are any laboratories in your country accredited as **international or national reference centers** for aquatic animal disease diagnosis?

- ☐ Yes ☐ No

6.6 If **yes**, please indicate laboratory(ies), accrediting body and type of accreditation:

6.7 Does your country's government and private aquaculture sector have access to other public or private-sector laboratory-based disease diagnostic services?

- ☐ Yes ☐ No

6.8 If **yes**, briefly describe this service/s, including the name and contact details of the responsible institutes/companies and the range of services available, including:

Parasitology
 Histopathology
 General bacteriology/mycology
 General virology
 Electron microscopy
 Tissue culture
 Molecular diagnostics (e.g. PCR)
 Immunoassay (e.g. ELISA)
 Water quality analysis
 Chemotherapy
 Health certification
 Facility inspection
 Other services??

6.9 Is there a **national pathogen list** for aquatic animal diseases?

- ☐ Yes ☐ No

- 6.10 If **yes**, list the criteria for inclusion of a pathogen in the national list and give those aquatic animal diseases/pathogens that are listed:

SECTION 7. Emergency preparedness/contingency planning

- 7.1 Does your country have any **contingency or emergency response plans** for containment or eradication of serious aquatic animal diseases?

☐ Yes

☐ No

- 7.2 If **yes**, briefly describe these plans, including the name and contact details of the responsible agency/ies and any legislation that supports emergency response activity:

- 7.3 If **no**, briefly describe any emergency response plans for terrestrial animal diseases or terrestrial plant pests or invasive pest species in your country, including the name and contact details of the responsible agency/ies and any legislation that supports emergency response activity:

SECTION 8. Extension services

- 8.1 Does your country have any **extension services** that support the prevention of aquatic animal diseases in aquaculture?
- ☐ Yes ☐ No
- 8.2 If **yes**, briefly describe this service, including the name and contact details of the responsible agency/ies, the number of staff involved and specific areas of involvement:
- 8.3. If **no**, indicate what agency, if any, is mandated to fulfil this function and provide contact details:

SECTION 9. Compliance/enforcement

- 9.1 Does your country have any compliance services that monitors and enforces
- (e) (a) **international trade in live aquatic animals** (importations and exports), including aquatic animal health regulations?
- ☐ Yes ☐ No
- 9.2 If **yes**, briefly describe this service, including the name and contact details of the responsible agency/ies, the number of staff involved and the legislation that supports compliance activity:
- 9.3 Does your country have any compliance services that monitors and enforces:
- (b) **domestic movements** of live aquatic animals, including aquatic animal health regulations?
- ☐ Yes ☐ No
- 9.4 If **yes**, briefly describe this service, including the name and contact details of the responsible agency/ies, the number of staff involved and the legislation that supports compliance activity:
- 9.5 Does your country have any compliance services that monitors and enforces
- (c) **regulations related to disease prevention**, management and control in aquaculture facilities?
- ☐ Yes ☐ No
- 9.6 If **yes**, briefly describe this service, including the name and contact details of the responsible agency/ies, the number of staff involved and the legislation that supports compliance activity:

SECTION 10. Research

10.1 Does your country have **any research activity** that includes aquatic animal health in its scope?

☐ Yes

☐ No

10.2 If **yes**, briefly describe this research, including the name and contact details of the responsible institute/s, the number of staff and students involved and specific areas of involvement:

SECTION 11. Training

11.1 Does your country have any formal **post-graduate training** programmes (M.Sc. or Ph.D.) in areas related to aquatic animal health?

☐ Yes

☐ No

11.2 If **yes**, briefly describe these programmes, including the name and contact details of the responsible institute/s, the number of staff and students involved and specific areas of involvement:

11.3 Does your country have any **formal non-degree training** programmes (short courses, workstudy programmes etc.) in areas related to aquatic animal health?

☐ Yes

☐ No

11.4 If **yes**, briefly describe these programmes, including the name and contact details of the responsible institute/s, the number of staff and students involved and specific areas of involvement:

SECTION 12. Expertise

Summarize the estimated total numbers of individuals in the country with particular levels of tertiary qualifications in each of the stated fields related to aquatic animal health – only those actively employed in a capacity with direct relevance to the field of expertise should be included:

Field of Expertise in Aquatic Animal Health	Level of Qualification				
	Doctorate	Masters degree	Veterinary degree	Bachelors degree	Other (specify)
Parasitology (experimental)					
Parasitology (taxonomy/systematics)					
Virology					
Bacteriology					
Mycology					
Epidemiology					
Histopathology					
Toxicology/water quality					
Molecular diagnostics (e.g. PCR, ELISA)					
Electron microscopy					
Aquatic biosecurity (e.g. risk analysis)					
Aquatic veterinary medicine					
Fish medicine/ Pharmacology					
Aquatic animal health information systems					
Other (specify):					

SECTION 13. Infrastructure

- 13.1 Summarize the available **infrastructure dedicated solely to aquatic animal health**:
- (a) Laboratories (type):
 - (b) Office space :
 - (c) Other: (e.g., aquaculture ponds, tank rooms) :
- 13.2 Summarize the available infrastructure available for aquatic animal health activities but **shared with other groups**:
- (a) Laboratories (type):
 - (b) Office space:
 - (b) Other: (e.g., aquaculture ponds, tank rooms, electron microscope etc.)

SECTION 14. Linkages and Cooperation

- 14.1 List any **international, regional or bilateral linkages, cooperation or joint projects** related to aquatic animal health that your country has, indicating their nature and the participating agencies:
- 14.2 List any **domestic linkages, projects or cooperation** between government agencies, universities and/or private sector (e.g. farmer associations, NGOs, other civil society groups), indicating their nature and the participating parties.

SECTION 15. Funding support

- 15.1 Indicate the **estimated total annual budget** dedicated specifically to aquatic animal health activities for your country:
- (a) Amount from regular programmes :
 - (b) Amount from special funding/projects:
 - (c) Amount from foreign assisted projects:
 - (c) Total:

15.2 Is this amount considered **adequate** to meet current and future needs in aquatic animal health?

☐ Yes

☐ No

15.3 If **no**, indicate percentage increase required over next 5 years?

SECTION 16. Current challenges and constraints

16.1 List the **main aquatic animal health challenges** that currently face your country with respect to:

- (a) preventing the entry and spread of exotic pathogens:
- (b) preventing the domestic spread of serious pathogens:
- (c) meeting international/trading partner standards with regard to health certification of live aquatic animals:
- (d) controlling mortalities/losses due to pathogens in aquaculture establishments:
- (d) use of antibiotics and other chemotherapeutants for disease prevention and/or disease treatment:
- (e) any other serious challenges related to aquatic animal health that your country is facing or is likely to face in the next 5 years:

16.2 List the **major constraints** to implementing an effective aquatic animal health programme for your country, in order of importance:

SECTION 17. Additional information

17.1 Provide any additional information about your country's capacities or capabilities with respect to managing aquatic biosecurity that is not mentioned in the responses to the above questions:

17.2 Provide additional information on **aquaculture trends, resources and production data**:

- length and tradition of aquaculture;
- production systems and species;
- total production, based on latest available statistics, with a breakdown by main species and by regions;
- breakdown of production (e.g., for consumption, export, stocking, etc.);

- water resources used for aquaculture (resource availability by water type – fresh, coastal/brackish, etc.; area utilised/unutilised; production areas used for finfish, molluscs, crustaceans);
- number and sizes of aquaculture farms;
- processing plants for aquaculture products.

ANNEX I.b**List of persons completing the survey questionnaire****BOTSWANA**

Bernard MBEHA
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DEMOCRATIC REPUBLIC OF CONGO

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LESOTHO

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MALAWI

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NAMIBIA

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SWAZILAND

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TANZANIA

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ZAMBIA

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ZIMBABWE

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 newazvo@hotmail.

ANNEX I.c**List of competent authorities for SADC member countries for various aspects of aquatic animal health****BOTSWANA**

Responsibility	Officially mandated agency/ministry	Mandate/authority
Aquatic animal health with regard to export and import matters	Department of Fisheries, Ministry of Environment, Wildlife and Tourism	Import/export regulation
Development of biosecurity policies, for example conduct of risk analysis, negotiation of export protocols for animal health and for assessing foreign competent authorities	Department of Fisheries, Ministry of Environment, Wildlife and Tourism Ministry of Agriculture	Department of Fisheries does most and Ministry of Agriculture assists with assessment
Control of aquatic animal diseases and pharmaceutical product residues	Department of Fisheries, Ministry of Environment, Wildlife and Tourism	Disease control is both ministries Pharmaceutical products is by Fisheries Department
Inspection, surveillance and reporting	Department of Fisheries Ministry of Environment, Wildlife and Tourism Ministry of Agriculture	Inspection by Department of Fisheries Surveillance by both ministries Reporting of animal health events by Ministry of Agriculture
Health certificates and quarantine, laboratory testing	Department of Fisheries Ministry of Environment, Wildlife and Tourism	Both ministries
Diagnostics	Ministry of Agriculture	Ministry of Agriculture houses the Laboratory for testing
Research	Department of Fisheries Ministry of Environment, Wildlife and Tourism	Department of Fisheries responsible for research
Extension	Department of Fisheries Ministry of Environment, Wildlife and Tourism	Department of Fisheries carries out all extension work
Training	Department of Fisheries Ministry of Environment, Wildlife and Tourism	Department of Fisheries does any necessary training and Agriculture is a stakeholder
Education	Department of Fisheries Ministry of Environment, Wildlife and Tourism	Department of Fisheries does any necessary training and Agriculture is a stakeholder

DEMOCRATIC REPUBLIC OF CONGO (DRC)

Responsibility	Officially mandated agency/ministry	Mandate/authority
Aquatic animal health with regard to export and import matters	Ministry of Agriculture	Minister
Development of biosecurity policies, for example conduct of risk analysis, negotiation of export protocols for animal health and for assessing foreign Competent Authorities	Ministry of Agriculture	Director of Laboratory
Control of aquatic animal diseases and pharmaceutical product residues	Ministry of Agriculture	Director of Laboratory
Inspection, surveillance and reporting	Agency (OCC)	Mandate
Health certificates and quarantine, laboratory testing	Ministry of Agriculture	Director of Laboratory
Diagnostics	Veterinary Laboratory	Director of Laboratory
Research	Agency (INERA)	Mandate
Extension	Province	Inspector provincially
Training	University	Mandate
Education	Ministry of Agriculture	Government

LESOTHO

Responsibility	Officially mandated agency/ministry	Mandate/authority
Aquatic animal health with regard to export and import matters	Ministry of Agriculture and Food Security (MAFS)	Department of Livestock Services (DLS)
Development of biosecurity policies, for example conduct of risk analysis, negotiation of export protocols for animal health and for assessing foreign competent authorities	MAFS, Ministry of Trade, Industry , Cooperatives and Marketing (MTICM)	DLS
Control of aquatic animal diseases and pharmaceutical product residues	MAFS	DLS
Inspection, surveillance and reporting	MAFS, Ministry of Energy and Water Affairs	DLS and Lesotho Highlands Development Authority (LHDA)
Health certificates and quarantine, laboratory testing	MAFS	DLS
Diagnostics	MAFS	DLS
Research	MAFS	DLS, Department of Research (DAR)
Extension	MAFS	DLS, Department of Field Services (DFS)
Training	MAFS	DLS
Education	MAFS	Lesotho Agricultural College (LAC)
Others	NGOs	DLS

MADAGASCAR

Responsibility	Officially mandated agency/ministry	Mandate/authority
Aquatic animal health with regard to export and import matters	Ministry Fishery Resources and Fisheries	Halieutics Health Authority
Development of biosecurity policies, for example conduct of risk analysis, negotiation of export protocols for animal health and for assessing foreign Competent Authorities	Ministry Fishery Resources and Fisheries / Ministry of Livestock and Animal Protection	Halieutics Health Authority/ Department of Veterinary Services
Control of aquatic animal diseases and pharmaceutical product residues	Ministry Fishery Resources and Fisheries	Halieutics Health Authority
Inspection, surveillance and reporting	Ministry Fishery Resources and Fisheries	Halieutics Health Authority
Health certificates and quarantine, laboratory testing	Ministry Fishery Resources and Fisheries	Halieutics Health Authority
Diagnostics	Ministry Fishery Resources and Fisheries	Laboratory of Epidemio-surveillance of shrimp Diseases
Research	Ministry of Scientific Research	Fisheries Institute of Marine Science
Extension		
Training	Ministry of Scientific Research	Fisheries Institute of Marine Science
Education		

MALAWI

Responsibility	Officially mandated agency/ministry	Mandate/authority
Aquatic animal health with regard to export and import matters	Department of Animal Health and Livestock Production (DAHLD).	Sanitary/Health certification
Development of biosecurity policies, for example conduct of risk analysis, negotiation of export protocols for animal health and for assessing foreign competent authorities	DAHLD	Risk analysis, negotiating animal health and assessing foreign competent authorities
Control of aquatic animal diseases and pharmaceutical product residues	DAHLD, Pharmacy, Medicines and Poisons Board (PMPB), Malawi Bureau of Standards (MBS)	DAHLD/PMPB-provision of guidelines for aquatic animal disease pharmaceuticals. MBS-Product residue monitoring
Inspection, surveillance and reporting	DAHLD	Conduct disease surveillance and reporting to OIE and other regional bodies.
Health certificates and quarantine, laboratory testing	DAHLD	Issuing of health certificates and laboratory testing.
Diagnostics	DAHLD	Provision of veterinary diagnostic services.
Research	DAHLD and Department of Fisheries (DoF)	Conducting research
Extension	DoF	Community outreach
Training	DAHLD and DoF	Capacity building
Education	DAHLD, DoF and Lilongwe University of Agriculture and Natural Resources (LUANAR – Bunda College)	Capacity building

MAURITIUS

Responsibility	Officially mandated agency/ministry	Mandate/authority
Aquatic animal health with regard to export and import matters	Ministry of Fisheries (MOF)	Competent Authority Seafood (CASF)
Development of biosecurity policies, for example conduct of risk analysis, negotiation of export protocols for animal health and for assessing foreign competent authorities	MOF	Competent Authority Seafood (CASF)
Control of aquatic animal diseases and pharmaceutical product residues	MOF and Ministry of Agro Industry and Food Security	CASF and Veterinary Services
Inspection, surveillance and reporting	MOF	Competent Authority Seafood (CASF)
Health certificates and quarantine, laboratory testing	MOF	Competent Authority Seafood (CASF)
Diagnostics	Ministry of Fisheries(MOF)	Competent Authority Seafood (CASF)
Research	MOF Prime Minister's Office	Albion Fisheries Research Centre Mauritius Oceanography Institute
Extension	MOF	Albion Fisheries Research Centre
Training	MOF	Competent Authority Seafood (CASF) Albion Fisheries Research Centre
Education	MOF	CASF Albion Fisheries Research Centre
Others	MOF	CASF

MOZAMBIQUE

Responsibility	Officially mandated agency/ministry	Mandate/authority
Aquatic animal health with regard to export and import matters	Ministry of Fisheries	INIP
Development of biosecurity policies, for example conduct of risk analysis, negotiation of export protocols for animal health and for assessing foreign competent authorities	Ministry of Fisheries	INIP
Control of aquatic animal diseases and pharmaceutical product residues	Ministry of Agriculture/ Ministry of Fisheries	DNSV and INIP
Inspection, surveillance and reporting	Ministry of Agriculture	DNSV
Health certificates and quarantine, laboratory testing	Ministry of Agriculture	DNSV
Diagnostics	Ministry of Agriculture	DNSV
Research	Ministry of Fisheries	INAQUA/INIP
Extension	Ministry of Fisheries	INAQUA
Training	Ministry of Fisheries	INAQUA
Education		

NAMIBIA

Responsibility	Officially mandated agency/ministry	Mandate/authority
Aquatic animal health with regard to export and import matters	Ministry of Fisheries & Marine Resources (MFMR)	
Development of biosecurity policies, for example conduct of risk analysis, negotiation of export protocols for animal health and for assessing foreign competent authorities	MFMR	
Control of aquatic animal diseases and pharmaceutical product residues	MFMR, DVS Directorate of Veterinary Services (DVS) is responsible for reporting aquatic animal disease to the OIE, but obtaining information from the Ministry of Fisheries and Marine Resources. Inspection and surveillance are the responsibilities of MFMR.	
Inspection, surveillance and reporting	MFMR DVS certify export of fish meal and fish oil and the laboratory testing is done by NSI.	
Health certificates and quarantine, laboratory testing	MFMR, DVS	
Diagnostics	MFMR	
Research		
Extension		
Training		
Education		

SEYCHELLES

Responsibility	Officially mandated agency/ministry	Mandate/authority
Aquatic animal health with regard to export and import matters	FIQCU and SVS	FIQCU – export certification SVS – import
Development of biosecurity policies, for example conduct of risk analysis, negotiation of export protocols for animal health and for assessing foreign competent authorities	FIQCU and SVS	FIQCU - assessing foreign CAs SVS - biosecurity policies & RA
Control of aquatic animal diseases and pharmaceutical product residues	Disease control –SVS Residues - FIQCU	SVS – diseases control & prevention FIQCU – residue monitoring in exports
Inspection, surveillance and reporting	SVS	
Health certificates and quarantine, laboratory testing	FIQCU and SVS	FIQCU - export health certificates SVS – quarantine and testing
Diagnostics	SVS	
Research	SFA	
Extension		
Training		
Education		
Others	SFA	

SOUTH AFRICA

Responsibility	Officially mandated agency/ministry	Mandate/authority
Aquatic animal health with regard to export and import matters	DAFF	<p>Branch Fisheries, Directorate Sustainable Aquaculture Management (D:SAM) : invertebrates and vertebrates (marine only)</p> <p>Branch Agriculture, Directorate Animal Health (D:AH): vertebrates (freshwater only)</p> <p>Provincial Departments of Agriculture: vertebrates (freshwater)</p> <p>Please note that legislation regulating animal health is complicated. Animal Diseases Act applicable to “fish” does not differentiate between freshwater and marine, although regulation is divided as such between the above mentioned directorates.</p>
Development of biosecurity policies, for example conduct of risk analysis, negotiation of export protocols for animal health and for assessing foreign competent authorities	DAFF	<p>Branch Fisheries, D:SAM: invertebrates and vertebrates (marine only)</p> <p>Branch Agriculture, D:AH: vertebrates (freshwater only)</p>
Control of aquatic animal diseases and pharmaceutical product residues	DAFF	<p>Branch Fisheries, D:SAM: invertebrate diseases; (no current inclusion of pharmaceutical residues as part of the Food Safety Programme)</p> <p>Branch Agriculture, D:AH: vertebrate diseases and pharmaceutical residues</p>
Inspection, surveillance and reporting	DAFF	<p>Branch Fisheries, D:SAM: invertebrates and vertebrates (marine only).</p> <p>Branch Agriculture, D:AH: vertebrates (freshwater only)</p>

Health certificates and quarantine, laboratory testing	DAFF	Branch Fisheries, D:SAM: invertebrates and vertebrates (marine only). Branch Agriculture, D:AH: vertebrates (freshwater only)
Diagnostics	Private Labs Government	Amanzi Biosecurity Molecular Diagnostic Services (Pty) Ltd. Onderstepoort Veterinary Institute Stellenbosch State Veterinary laboratory
Research	DAFF Higher Education Institutions	University of the Western Cape, Cape Peninsula University of Technology University of Cape Town University of Stellenbosch Rhodes University Fort Hare University University of Limpopo University of Venda Nelson Mandela Metropolitan University Walter Sisulu University University of Johannesburg University of Pretoria University of Witwatersrand University of the Free State University of Kwazulu Natal
Extension	Private Labs	See above
Training	Higher Education Institutions	Rhodes University
Education	Higher Education Institutions	University of the Western Cape Cape Peninsula University of Technology University of Cape Town University of Stellenbosch Rhodes University Fort Hare University University of Limpopo University of Venda Nelson Mandela Metropolitan University Walter Sisulu University University of Johannesburg University of Pretoria University of Witwatersrand University of the Free State University of Kwazulu Natal

SWAZILAND

Responsibility	Officially mandated agency/ministry	Mandate/authority
Aquatic animal health with regard to export and import matters	Ministry of Agriculture/ Department of Veterinary and Livestock Services	Ministry of Agriculture
Development of biosecurity policies, for example conduct of risk analysis, negotiation of export protocols for animal health and for assessing foreign competent authorities	Ministry of Agriculture/ Department of Veterinary and Livestock Services	Ministry of Agriculture Director of Veterinary Services
Control of aquatic animal diseases and pharmaceutical product residues	Ministry of Agriculture/ Department of Veterinary and Livestock Services	Director of Veterinary Services
Inspection, surveillance and reporting	Ministry of Agriculture/ Department of Veterinary and Livestock Services	Director of Veterinary Services
Health certificates and quarantine, laboratory testing	None	
Diagnostics	None	
Research	None	
Extension	Ministry of Agriculture Fisheries Section	Fisheries section
Training	None	
Education	None	

TANZANIA

Responsibility	Officially mandated agency/ministry	Mandate/authority
Aquatic animal health with regard to export and import matters	Ministry of Livestock and Fisheries Development	Director of Fisheries
Development of biosecurity policies, for example conduct of risk analysis, negotiation of export protocols for animal health and for assessing foreign Competent Authorities	Ministry of Livestock and Fisheries Development	Director of Aquaculture
Control of aquatic animal diseases and pharmaceutical product residues	Ministry of Livestock and Fisheries Development	Director of Aquaculture and Director of Veterinary Services
Inspection, surveillance and reporting	Ministry of Livestock and Fisheries Development	Director of Aquaculture and Director of Veterinary Services
Health certificates and quarantine, laboratory testing	Ministry of Livestock and Fisheries Development	Director of Fisheries
Diagnostics	Ministry of Livestock and Fisheries Development	Director of Aquaculture and Director of Veterinary Services
Research	Ministry of Livestock and Fisheries Development	Director of Research Training and Extension
Extension	Ministry of Livestock and Fisheries Development	Director of Research Training and Extension
Training	Ministry of Livestock and Fisheries Development	Director of Research Training and Extension
Education	Ministry of Livestock and Fisheries Development	Director of Research Training and Extension

ZAMBIA

Responsibility	Officially mandated agency/ministry	Mandate/authority
Aquatic animal health with regard to export and import matters	Ministry Of Agriculture and Livestock	Veterinary Services
Development of biosecurity policies, for example conduct of risk analysis, negotiation of export protocols for animal health and for assessing foreign competent authorities	Ministry of Agriculture and Livestock	None
Control of aquatic animal diseases and pharmaceutical product residues	Ministry of Agriculture and Livestock	None
Inspection, surveillance and reporting	Ministry of Agriculture and Livestock	National Livestock Epidemiology and Information Centre (NALEIC)
Health certificates and quarantine, laboratory testing	Ministry of Agriculture and Livestock	NALEIC and Central Veterinary Research Institute (CVRI)
Diagnostics	Ministry of Agriculture and Livestock	University of Zambia
Research	Ministry of Education	University of Zambia, School of Veterinary Medicine
Extension	Ministry of Agriculture and Livestock	Fisheries Department (mainly on aquaculture)
Training	Ministry of Education	School of Veterinary Medicine
Education	University of Zambia	School of Veterinary Medicine

ZIMBABWE

Responsibility	Officially mandated agency/ministry	Mandate/authority
Aquatic animal health with regard to export and import matters	DVLS MAMID	Animal Health Act (AHA), WTO/SPS Agreements, Control of Goods Act
Development of biosecurity policies, for example conduct of risk analysis, negotiation of export protocols for animal health and for assessing foreign competent authorities	DLVS	Animal Health Act
Control of aquatic animal diseases and pharmaceutical product residues	DLVS/DVS, MCAZ	Animal Health Act, Medicines and Allied Substances Act, OIE Standards
Inspection, surveillance and reporting	DLVS, Ministry of Environment, Water & Climate/ Parks and Wildlife Management Authority (PWMA)	AHA, Environment Act
Health certificates and quarantine, laboratory testing	DLVS	AHA/OIE Standards
Diagnostics	DLVS	AHA/OIE Standards; ISO 17025
Research	DLVS, DR&SS, Parks and Wildlife Management Authority (PWMA)	Agric Research Act, Parks & Wildlife Act, Science and Technology Policy, Research Council of Zimbabwe Act
Extension	DLVS	AHA
Training	Ministry of Higher & Tertiary Education, Universities, Agric Education	Education Act
Education	Min Of Higher Tertiary Education, Universities, Agric Education, Mazowe College	Education Act
Others: Veterinary Food controls	Veterinary Public Health (DLVS)	Public Health Act; OIE standards; ISO 17020

ANNEX II

**REPORT OF THE FAO/DAFF/AU-IBAR/SADC REGIONAL
WORKSHOP ON IMPROVING AQUATIC ANIMAL HEALTH
MANAGEMENT AND STRENGTHENING BIOSECURITY
GOVERNANCE IN AFRICA**

Durban, South Africa, 5–7 November 2014

PREPARATION OF THIS DOCUMENT

The preparation of Annex II was technically supervised by Dr Melba B. Reantaso of the FAO Fisheries and Aquaculture Department (FAO FI) and was led by Dr J. Richard Arthur (FAO Consultant) with contributions from Dr Rohana P. Subasinghe (FAO FI) and Mr Blessing Mapfumo (FAO Consultant).

ABSTRACT

The FAO/DAFF/AU-IBAR/SADC Regional Workshop on Improving Aquatic Animal Health Management and Strengthening Biosecurity Governance in Africa, held in Durban, South Africa, from 5–7 November 2014, was convened with two specific objectives: (1) to develop a SADC Regional Framework for an Aquatic Biosecurity Strategy that will support the growth of its aquaculture industry through a long-term, enabling policy environment and a framework for a cooperative programme on aquatic animal health management and biosecurity governance at the regional and national levels; and (2) to identify, discuss and build consensus on the elements to be included and procedures to be followed for responding to the call from the World Trade Organization (WTO)/Standards and Trade Development Facility (STDF) for the proposed TILAPIA (Trade and Improved Livelihoods in Aquatic Production in Africa) Project.

The Durban Workshop successfully achieved its objectives with the active participation and contribution of some 117 delegates from 27 countries. All the 15 Member States of the Southern African Development Community (SADC) were represented. Experts, representatives from Regional Fisheries Bodies and delegates from nine other African states under the auspices of the Africa Union Inter-African Bureau for Animal Resources (AU-IBAR) also attended.

A draft *SADC Regional Framework for an Aquatic Biosecurity Strategy* was prepared. The framework presents a broad yet comprehensive strategy to build and enhance capacity for the management of regional aquatic biosecurity and aquatic animal health. It contains the regional action plans at the short, medium and long term using phased implementation based on regional needs and priorities. It also outlines the programmes and activities that will assist in developing a regional approach to overall management of aquatic animal health in SADC. The framework for the Strategy includes the following sections: Summary, Background, Current status of aquaculture development and aquatic animal health management in SADC, Purpose, Vision, 10 Guiding Principles and Programme Components and Implementation. The Strategy accepts and incorporates relevant international aquatic animal health standards to ensure harmonization, transparency and equivalence in the region so that the region will be internationally recognized with respect to aquatic animal health status. The Programme Components consist of 12 broad thematic areas: (1) Policy, legislation and institutional framework; (2) Risk analysis; (3) Diagnostics and health certification; (4) Import controls and quarantine; (5) Pathogen list; (6) Surveillance, monitoring and reporting; (7) Emergency preparedness, contingency planning and zoning; (8) Capacity building and human resources; (9) Research and development; (10) Infrastructure; (11) Regional and international cooperation; and (12) Information and communication.

The TILAPIA Project Way Forward tackled major issues and discussed the current status, future needs and actions needed under three major output headings: (1) *Improved institutional and human resources capacity to prevent, early detect and respond to aquatic animal diseases of economic or public health importance* – areas of aquatic animal health that require attention include: awareness, human capacity building, infrastructure development, disease surveillance, research and coordination; (2) *Developed/improved policy/legal frameworks aimed at promoting good governance of fisheries and aquaculture through trade-related measures which address unregulated international trade and encourage investments in domestic production of safe aquatic commodities for human consumption* – activities that

require specific attention include: supporting the empowerment of small and medium-sized enterprises (SMEs) (e.g. through incentives, investment promotion council and credit facilities), elaborating harmonized trade policies and legal frameworks, supporting the establishment of a single window (one-stop shop) for trade formalities, conducting value-chain analysis for aquaculture products, and supporting establishment of a regional market and trade information system; and (3) *Enhanced private-sector investment in aquaculture, with support services being developed along the value chain (animal health practitioners, feed suppliers, transporters, processors, cold chain, hazard analysis and critical control points (HACCP), etc.), leading to spill-over effects benefiting the small-scale producers* – areas that require attention include: production inputs, marketing, producer associations, aquaculture zones, processing, infrastructure, legislation and policy, finance and biosecurity.

These two parallel initiatives represent a strong road map for building aquatic animal health infrastructure to support responsible aquaculture development in Africa.

ACKNOWLEDGEMENTS

FAO gratefully acknowledges the Department of Agriculture, Forestry and Fisheries of South Africa (DAFF) for hosting the Durban Workshop and for the financial support provided under the auspices of the FAO/DAFF Capacity Building Programme. The Africa Union Inter-African Bureau for Animal Resources (AU-IBAR), in partnership with the European Union (EU), the Southern African Development Community (SADC), the World Organisation for Animal Health (OIE) and the Standards and Trade Development Facility (STDF) are also acknowledged and appreciated for their technical and financial support to the Durban Workshop. The active participation of some 117 officials and delegates from 27 countries is highly appreciated.

CONTENTS

ABBREVIATIONS AND ACRONYMS	200
BACKGROUND.....	202
1.1 Introduction.....	202
1.3 Process	203
1.4 Participants.....	204
1.5 Products.....	205
2. INTRODUCTORY PRESENTATIONS.....	205
2.1 Welcoming Statements	205
2.2 General Background and Objectives of the Regional Workshop	207
2.3 The SADC Regional Framework for an Aquatic Biosecurity Strategy	208
2.4 The TILAPIA (Trade and Improved Livelihoods in Aquatic Production in Africa) Project	209
3.1 Presentation 1. Trends in Global Aquaculture	210
3.1 Presentation 2. Trends in SADC Regional Aquaculture.....	211
3.3 Presentation 3. Trends in Biosecurity and Aquatic Animal Health	212
3.4 Presentation 4. Aquatic Animal Biosecurity Projects in SADC	213
3.5 Presentation 5. Epizootic Ulcerative Syndrome in Zambia and the Risk of Further Spread in other Parts of Africa.....	214
3.6 Presentation 6. Industry Practice: On-farm Biosecurity Case Study of Lake Harvest Fish Farm	215
3.7 Presentation 7. Biosecurity in Shellfish in Southern Africa	216
3.8 Presentation 8. Diseases of Finfish Relevant to Africa.....	216
3.9 Presentation 9. Diseases of Molluscs	217
3.10 Presentation 10. Crustacean Diseases in Southern Africa: White Spot Disease, Current Status in Indian Ocean	218
3.11 Presentation 11. Regional Aquatic Animal Health Management and the role of OIE	219
3.12 Presentation 12. Regional Animal Health Management and the Role of AU-IBAR.	219
3.13 Presentation 13. Aquatic Animal Health in South Africa.....	220
3.14 Wrap-up and Tasks for Day 2	220
4. DAY 2: SPECIAL PRESENTATIONS.....	221
Presentation 14: Current situation of Aquaculture in Egypt.....	221
Presentation 15: Aquaculture Development in Nigeria	221
5. SESSION 2: PARALLEL SESSIONS.....	222
5.1 Session 2.1: SADC Regional Framework for an Aquatic Biosecurity Strategy.....	222
5.1.1 Objectives of the Working Group Session	222
5.1.2 Introduction to the SADC Strategy Session on Human Resource Development, Institutional Structure (including infrastructure) and Research	222
5.1.3 Southern African Development Community (SADC) Regional Aquatic Animal Health Capacity and Performance Survey	224
5.1.4 Introduction to SWOT Analysis (Aquaculture and Aquatic Biosecurity) and Preliminary SWOT Analysis for SADC.....	225
5.1.5 Draft Framework for the SADC Regional Aquatic Biosecurity Strategy	226
5.2 Session 2.2: The TILAPIA Project	227
5.2.1 Working Group Activities: Part 1– Current Status and Future Needs and Part 2 – Activities of TILAPIA and Implementation Plan.....	227
6. SESSION 3: PLENARY SESSION AND DISCUSSIONS	235

6.1 Presentation from Session 2.1: SADC Regional Framework for an Aquatic Biosecurity Strategy and Summary of Discussion	235
6.2 Presentation from Session 2.2: The TILAPIA Project and Discussion	236
7. CONSENSUS BUILDING AND THE WAY FORWARD.....	237
7.1 Consensus Building	237
7.2 The way forward	238
8. CLOSING OF THE WORKSHOP	239

Annexes

Annex II.a:	Workshop Programme
Annex II.b:	Guidelines for the Preparation of a National Aquatic Animal Health Strategy
Annex II.c:	List of Participants
Annex II.d:	Workshop Group Photograph
Annex II.e:	Opening Statements
Annex II.f:	Members of the Working Groups
	A: SADC Working Group Members
	B: TILAPIA Working Group Members
Annex II.g:	Workshop Evaluation Summary

ABBREVIATIONS AND ACRONYMS

AAHRI	Aquatic Animal Health Research Institute
AASA	Aquaculture Association of Southern Africa
AHPND	Acute hepatopancreatic necrosis disease
AIS	Aquatic invasive species
ARS	Animal Resource Information System
AUC-DREA	African Union Commission Department of Rural Economy and Agriculture
AU-IBAR	Africa Union Inter-African Bureau for Animal Resources
CAADP	Comprehensive Africa Agriculture Development Programme (of NEPAD)
CEN-SAD	Community of Sahel-Saharan States
COMESA	Common Market for Eastern and Southern Africa
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAFF	Department of Agriculture, Forestry and Fisheries of South Africa
DDG	Deputy Director General
DO	Dissolved oxygen
DRC	Democratic Republic of Congo
EAC	East African Community
EC	European Community
ECOWAS	Economic Community Of West African States
EEZ	Exclusive economic zone
ES	Emergency services
EU	European Union
EUS	Epizootic ulcerative syndrome
FAO	Food and Agriculture Organization of the United Nations
FAOR	FAO Country Representative
FAOZA	FAO South Africa
FCR	Food conversion ratio
GDP	Gross domestic product
HACCP	Hazard analysis and critical control points
IGAD	Intergovernmental Authority on Development
IHHN	Infectious hypodermal and hematopoietic necrosis
IMN	Infectious myonecrosis
IRCM	Integrated Regional Coordination Mechanism,
KHV	Koi herpesvirus
MDG	Millennium Development Goals (of the UN)
MoU	Memorandum of Understanding
NAAHP	National Aquatic Animal Health Programme
NASF	National Aquaculture Strategic Framework (South Africa)
NEPAD	New Partnership for Africa`s Development
NFPs	National Focal Points
NHP	Necrotizing hepatopancreatitis
NPCA	NEPAD Planning and Coordinating Agency
NRCS	National Regulator for Compulsory Specifications (South Africa)
OIE	World Organisation for Animal Health (formerly Office International des Épizooties)
PPPs	Public – Private Partnerships
RAF	Responsible Aquaculture Foundation
RAS	Recirculating aquaculture systems
R&D	Research and development

REC	Regional Economic Community
SADC	Southern African Development Community
SARNISSA	Sustainable Aquaculture Research Networks for Sub-Saharan Africa
SCAAH	Subcommittee on Aquatic Animal Health (South Africa)
SMEs	Small and medium-sized enterprises
SPF	Specific pathogen free
SOPs	standard operating procedures
SPS	Sanitary and Phytosanitary (Agreement)
SWOT	Strengths, weaknesses, opportunities and threats (analysis)
STDF	Standards and Trade Development Facility
TAADs	Transboundary aquatic animal diseases
TADs	Transboundary animal diseases
TBT	Technical Barriers to Trade
TILAPIA	Trade and Improved Livelihoods in Aquatic Production in Africa
TS	Taura syndrome
UMA	Union du Maghreb Arabe
UN	United Nations
USD	United States dollar
WFC	WorldFish Center
WSD	White spot disease
WSSV	White spot syndrome virus
WTD	White tail disease
WTO	World Trade Organization
YHD	Yellow head disease

BACKGROUND

1.1 Introduction

As the most internationally traded commodity, fish and shellfish is an important but often overlooked component of global food security. It provides essential local food, livelihoods and foreign earnings through exports, and in many developing countries and regions such as Africa, it is the most important source of protein in peoples' diets. Since global capture fisheries are unlikely to increase production to meet the needs of population growth, and already half of the world's fish production comes from aquaculture, aquaculture production will continue to increase, and is projected to contribute two-thirds of the world's fish production by 2030.¹ Globally, the average per capita consumption of fish is expected to increase by 2030; however, the per capita fish consumption in Africa is projected to decrease from the current 7.5 kg per year to 5.6 kg per year by 2030. This situation can be averted through increasing aquatic food production. Africa's aquaculture is emerging, and the potential is significant; however, fish health infrastructure is typically not established to support rapidly growing aquaculture industries and meet biosecurity needs in fisheries. This situation can have devastating consequences.

The incursion of three significant aquatic diseases (epizootic ulcerative syndrome or EUS) of cultured and wild finfish in the Chobe-Zambezi River, white spot disease (WSD) of cultured shrimp in Mozambique and Madagascar and abalone viral disease in South Africa should serve as a wake-up call to Africa. As experienced in other regions, it is only a matter of time before a rapidly emerging and previously unknown transboundary aquatic animal disease (TAAD) threatens Africa's growing aquaculture sector and its wild aquatic animal populations. New, highly pathogenic diseases often emerge in dynamic situations involving a combination of rapid aquaculture intensification, the ill-considered and/or illegal movement of live aquatic animals, and an absence of adequate expertise and infrastructure to support rigorous aquatic biosecurity. Robust biosecurity systems safeguard a healthy aquaculture production and protect the emerging aquaculture sector and natural biodiversity from the threats posed by aquatic pathogens and diseases. The over-all goal of national governments should be to use long-term preventive and pro-active strategies, rather than the reactive and often ineffective measures used in the past in many developed aquaculture regions.

Effective, coordinated and proactive biosecurity systems are the product of science-based knowledge and practices used within effective regulatory frameworks that are backed by sufficient resources for effective enforcement. As aquaculture becomes more intensive, new diseases and other problems will to emerge, and old diseases will appear in new locations. Aquaculture biosecurity operates at three levels: a) internationally, as recognized in the Bangkok Declaration²; b) regionally; and c) nationally, on a small scale, where variables (e.g. environment, species cultured, funding, training, economics) differ within countries in a region. A crucial consideration is how to deal with "unknowns". Regional and international cooperation, pooling of resources and sharing expertise and information are essential in this

¹ *Fish to 2030: Prospects for fisheries and aquaculture*. World Bank Report #83177-GLB.

² see Subsinghe, R.P., P.B. Bueno, M.J. Phillips, C. Hough, S.E. McGladdery & J.R. Arthur. (eds.) 2001. Part V. The Bangkok Declaration and *Strategy for Aquaculture Development Beyond 2000*, pp. 463- 471. In *Aquaculture in the Third Millennium*. Technical Proceedings of the Conference on Aquaculture in the Third Millennium, Bangkok, Thailand, 20-25 February 2000. NACA, Bangkok and FAO, Rome.

regard. Globally, regionally and nationally, biosecurity agencies should make emergency preparedness with advanced financial planning one of their core functions.

1.2 Purpose

The general objective of the *Regional Workshop on Improving Aquatic Animal Health Management and Strengthening Biosecurity Governance in Africa* (hereafter, the Regional Workshop) was to support sustainable aquatic food security for dietary animal protein and livelihoods in the Southern African Development Community (SADC) and the African continent in general, through responsible aquaculture that is supported by effective biosecurity governance and aquatic animal health management. The specific objectives were:

1. to develop a SADC Regional Framework for an Aquatic Biosecurity Strategy that will support the growth of its aquaculture industry through a long-term, enabling policy environment and a framework for a cooperative programme on aquatic animal health management and biosecurity governance at the regional and national levels; and
2. to identify, discuss and build consensus on the elements to be included and procedures to be followed for responding to the call from the World Trade Organization (WTO)/ Standards and Trade Development Facility (STDF) for the proposed TILAPIA (Trade and Improved Livelihoods in Aquatic Production in Africa) Project.

1.3 Process

The Regional Workshop was organized by the Food and Agriculture Organization of the United Nations (FAO) in co-operation with the Department of Agriculture, Forestry and Fisheries of South Africa (DAFF) (under the auspices of the FAO/DAFF Capacity Building Programme) and the Africa Union Inter-African Bureau for Animal Resources (AU-IBAR), in partnership with the European Union (EU), the Southern African Development Community (SADC), the World Organisation for Animal Health (OIE) and the Standards and Trade Development Facility (STDF). The Workshop Programme is presented as Annex II.a.

The Regional Workshop was held under the current scenario of recognizing the good potential for aquaculture development in Africa, while at the same time acknowledging the need to address aquatic animal health management and biosecurity issues proactively following the recent aquatic animal health problems experienced in the region.

The three-day Regional Workshop was officially opened by Mr Mortmer Mannya, DAFF Deputy Director General (DDG) responsible for Fisheries Management, Dr Tobias Takavarasha, FAO Country Representative for South Africa, and Dr Mohamed Seisay, Senior Fisheries Officer, AU-IBAR.

During Day 1 of the three-day Regional Workshop, participants were informed by a number of technical presentations, including reviews on the status of global and regional aquaculture; the status of global and regional aquatic animal health; recent aquatic animal health initiatives and activities in Africa; the status of finfish, crustacean and molluscan diseases of importance to Africa; and presentations on commodity-specific industry biosecurity practices, an example of a national aquatic animal health strategy (South African case), and the roles of regional and international organizations. The presentations were made by international experts from AU-

IBAR, FAO, OIE, private-sector operators and other regional and international resource persons, as well as local South African technical experts.

On Day 2 and the morning of Day 3, two parallel sessions (comprising 1.5 days each) followed, focusing on achieving the two main objectives of the Regional Workshop, namely: (1) development of an SADC Regional Framework for an Aquatic Biosecurity Strategy; and (2) identification, discussion and building consensus on the elements to be included and procedures to be followed for responding to the call from the STDF for the proposed TILAPIA Project. During the parallel sessions, Working Group discussions were used to develop the detailed plans for each of the activities.

The parallel session on development of a SADC Regional Framework for Aquatic Biosecurity Strategy was informed by the results of an FAO Aquatic Animal Health Performance and Capacity Survey that was carried out in October 2014 (see Annex I). The 14 SADC Member States surveyed included Botswana, DRC, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. The results of this process served as a gap analysis, facilitating the development of the SADC Regional Framework for an Aquatic Biosecurity Strategy. To facilitate discussion of the possible contents of the draft regional framework, working group participants were provided with a set of *Guidelines for the Preparation of a National Aquatic Animal Health Strategy* that was prepared by Drs J. Richard Arthur (FAO International Consultant) and Melba B. Reantaso (FAO Aquaculture Officer) (see Annex II.b)

The parallel session on the TILAPIA Project discussed the current status, future needs and activities and implementation plan, focusing on three themes, namely:

- 1) institutional and human resources capacity to prevent, detect and respond to aquatic animal diseases of economic or public health significance;
- 2) policy/legal frameworks aimed at promoting legal trade, addressing unregulated international trade and encouraging investments in domestic production of safe aquatic commodities for human consumption; and
- 3) private-sector investment in aquaculture, with support services being developed along the value chain, leading to spill-over effects benefiting the small-scale producers (i.e. health services, feed suppliers, seed suppliers, processors, traders, etc.).

The afternoon of Day 3 was devoted to a general plenary session during which all the delegates were informed (by presentations) of the outcomes of the two parallel sessions for consensus building and discussion of the Way Forward.

1.4 Participants

Some 117 participants from 27 countries attended the Regional Workshop, out of a total of 135 originally invited, a turn-out of 86 percent (Annex II.c). The DAFF was well represented with 32 participants, mainly aquaculture specialists and veterinarians from all of South Africa's provinces. All the 15 SADC Member States were represented, with the majority managing to send three delegates; a policy/decision-maker, a technical officer responsible for aquaculture or fish health, and a veterinarian (preferably having knowledge on aquatic animal health). Experts, Regional Fisheries Bodies and Delegates from nine other African states under the AU-IBAR auspice also attended, including representatives from Burkina-Faso,

Cameroon, Egypt, Gabon, Ghana, Ivory Coast, Kenya, Nigeria and Senegal. There was strong representation from partner organizations (AU/IBAR, FAO, OIE, SADC, WorldFish Center), as well as the private sector. The workshop group photograph is presented in Annex II.d.

1.5 Products

Three main documentation outputs of the Regional Workshop are:

- The SADC Regional Framework for an Aquatic Biosecurity Strategy, which will be further developed by the FAO as the *Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC)*. The finalized Strategy will serve as a package that can be submitted to DAFF and other potential donors.
- The TILAPIA Project Way Forward
- The Workshop Report (this document)

2. INTRODUCTORY PRESENTATIONS

2.1 Welcoming Statements

Mr Mortimer Mannya, Deputy Director General for Fisheries Management

On behalf of the Director General of DAFF, Mr Mannya welcomed all participants to the event. He began by acknowledging the importance of aquaculture, noting that it is the fastest-growing agricultural sector globally and that it presents an enormous opportunity to supplement the shortage in fish supply due to declining wild stocks and an increasing global population. He stated that the Government of South Africa recognizes the potential contributions of a growing aquaculture sector towards food security, increased gross domestic product (GDP), job creation and rural development. As such, the government has recently embarked on an initiative that aims to unlock the potential of South Africa's ocean economy, including aquaculture. The approach is based on the "Big Fast Results Approach" which has been successfully implemented in Malaysia. The five-year target is to increase aquaculture production fivefold from the current 4 000 tonnes to 20 000 tonnes, thereby creating 15 000 jobs and increasing the sector's contribution to GDP by six-fold from R0.5 billion to R3 billion. He went on to appreciate the importance of aquatic animal health in proactively addressing threats to the sustainable development of this sector. He then highlighted some of the latest aquatic animal health developments in South Africa and the progress made towards the development of the National Aquaculture Strategic Framework (NASF) and the formation of a Subcommittee on Aquatic Animal Health (SCAAH). A Draft Implementation Plan for an Aquatic Animal Health Programme is awaiting endorsement. He then highlighted a few of the more important objectives that DAFF is trying to accomplish through this programme and through working groups, such as:

- addressing legislative challenges related to the divided regulation of aquatic animal health in South Africa (i.e. vertebrates vs. invertebrates and freshwater vs. marine environments);
- creating a more holistic regulation of aquatic animal health by integrating and harmonizing efforts and activities by provincial Departments of Agriculture and the different directorates of DAFF;
- addressing aquatic animal health issues not only for aquaculture, but for wild capture fisheries, the ornamental fish sector and recreational fisheries;

- Enabling responsible international trade in aquaculture products, as well as preserving and expanding export markets while advancing the local economy; and
- enabling South Africa to fulfil the objectives of international agreements and organizations to which South Africa is a party (OIE, FAO, WTO, etc).

He also emphasized that DAFF is aligning its aquatic animal health standards with those of the OIE and that it has taken the lead in the process of developing a National Aquatic Disease Surveillance Programme (which is a component of the National Aquatic Animal Health Programme) for aquatic invertebrates, to facilitate export certification, monitor the health status of national stocks and fulfil reporting requirements to the OIE. In conclusion, he thanked DAFF, FAO, AU-IBAR, SADC, OIE, the New Partnership for Africa's Development (NEPAD) and other partners for attending this important regional workshop, as it is well in line with the government priorities on aquaculture development and aquatic animal health management.

Dr Tobias Takavarasha, FAO Country Representative (FAOR) for South Africa

Dr Takavarasha opened the Regional Workshop on behalf of FAO by thanking the organizers and the host country (South Africa) for their successful preparations. He reiterated the importance of the workshop in building the capacity of the African fisheries and aquaculture sectors and noted that this was in line with FAO's mandate to eradicate hunger and malnutrition, fight poverty and ensure the sustainable and economic use of natural resources. He informed participants that the workshop was under the auspices of FAO South Africa's (FAOZA) cooperation agreement with the Government of South Africa, through DAFF, to develop policies, programmes and projects to reduce hunger and malnutrition; to help develop the agricultural, fisheries and forestry sectors to use their environmental and natural resources in a sustainable way; and to provide technical support to ensure food security and rural development. Dr Takavarasha noted that several sector-specific capacity-building initiatives are already in place in the country to this effect, including a recently conducted aquatic animal health training programme for veterinarians, held in July 2014 at Rhodes University. He acknowledged such a training event as another product of the good collaboration between FAO, DAFF, SADC, NEPAD, OIE and Rhodes University. He also thanked the AU-IBAR for leading the process to identify, discuss and build consensus on the elements and procedures to be followed for responding to the call from STDF for the proposed TILAPIA Project, which was to be discussed during the workshop. He stressed that FAO was open to further collaboration on such initiatives and on other future fisheries and aquaculture programmes in the country and region.

Dr. Mohamed Seisay, Senior Fishery Officer, AU-IBAR

The Senior Fishery Officer of AU-IBAR provided opening remarks on behalf of the Director of AU-IBAR, Professor Ahmed El-Sawalhy. He thanked the Government and people of South Africa for hosting the continental event as a significant manifestation of the spirit of collaboration and cooperation by African Union member states. He acknowledged the presence of the representatives of African Union member states and the Regional Economic Communities (REC) across the continent. Based on the recent experience of AU-IBAR during the process of formulating a policy framework and reform strategy for fisheries and aquaculture in Africa, he noted that such high-level participation is crucial when it comes to the political issues of endearing ownership of the eventual outcome of such deliberations.. He informed the participants that AU-IBAR remains fully supportive of any activity on the

continent that is fully aligned with its vision of ensuring that resources contribute significantly to the reduction of poverty and hunger. As such, he viewed the workshop as a major strategic action towards implementing the key pillars of the AU-IBAR strategic plan, as well as the policy framework and reform strategy for fisheries and aquaculture in Africa. He lamented the current status of exploited fish populations in inland waters and large marine ecosystems in Africa which has become a tremendous cause for concern at the highest levels. Reviews by FAO Working Groups have shown that a significant number of commercially exploited fish and shellfish species are either overexploited or fully exploited. He warned that if the situation continues unabated, it will have far-reaching implications for food security and other social factors. He then went on to inform the Regional Workshop that, in recognition of this situation, the African Heads of States and Governments in June 2014 endorsed a resolution charging the African Union to increase agricultural productivity, including aquaculture, on the continent towards zero hunger. The sustainable development of aquaculture is therefore regarded as an alternative fish-production technology to augment supplies from dwindling capture fisheries. He expressed concern at the environmental and fish health issues that have recently affected the continent, citing the outbreaks of white spot disease in Mozambique as an example. He admitted that the lack of capacity in fish health and biosecurity on the continent is a huge gap, and noted that Africa should endeavour to avoid the Asian experience where aquaculture expansion preceded the development of fish health capabilities, resulting in huge economic losses to the industry. Fish health services thus need to be put in place in parallel with the development of the aquaculture industry to ensure that growth is sustainable and that the economic interests of the farmers are safeguarded. He introduced the proposal for the formulation of the TILAPIA Project, with a goal of building capacity on fish health and aquatic biosecurity to sustain and develop aquaculture and fisheries in Africa. In conclusion, he thanked the WTO and the European Union (EU) for their valuable support to AU-IBAR's component of the workshop, lauding the excellent collaboration between AU-IBAR, NPCA, FAO and OIE.

The full texts of welcoming statements by Mr Mortimer Mannya (DAFF), Dr Tobias Takavarasha (FAO) and Dr Mohamed Seisay (AU-IBAR) are given in Annex II.e.

2.2 General Background and Objectives of the Regional Workshop

The background to the Regional Workshop and its objectives were then presented by Dr Melba Reantaso (FAO Headquarters, Rome). Based on the Prospectus, Dr Reantaso depicted the "four Ps" of the workshop: purpose, process, participants and products. She stated that the workshop's purpose was: (i) to develop a SADC Regional Framework for an Aquatic Biosecurity Strategy that will support the growth of a regional aquaculture industry through a long-term enabling policy environment and a cooperative programme on aquatic animal health management and biosecurity governance; (ii) to identify, discuss and build consensus on the elements to be included and procedures to be followed for responding to the call from STDF for the proposed TILAPIA Project; and (iii) to identify areas for cooperation and synergies between these two initiatives and the Way Forward. She also informed participants of the processes and procedures that would lead the workshop: (i) Day 1: Setting the scene - participants will be informed by plenary presentations; (ii) Day 2 - two parallel sessions to address the two key components of the workshop separately (i.e. the SADC Biosecurity Strategy and the TILAPIA Project); (iii) Day 3: the morning session will continue with the parallel sessions while (iv) the afternoon session will include presentations on the results of the parallel sessions, consensus building, identification of areas for cooperation and the Way Forward. She then informed the meeting that there were over 100 participants and that all of

the 15 SADC Member States were represented (three participants per country, comprising a policy/decision-maker, a technical officer responsible for aquaculture or aquatic animal health, and veterinarian (preferably with knowledge on aquatic animal health)). She noted that there were also participants from Burkina-Faso, Cameroon, Egypt, Gabon, Ghana, Ivory Coast, Kenya, Nigeria and Senegal, as well as from the private sector and from partner organizations, including AU-IBAR, DAFF, FAO, NEPAD, OIE, Rhodes University, SADC and WorldFish Center (WFC). She concluded by outlining the expected outcomes of the Regional Workshop, which included: (i) the SADC Regional Framework for an Aquatic Biosecurity Strategy, (ii) the TILAPIA Project Way Forward, and (iii) the Workshop Report.

2.3 The SADC Regional Framework for an Aquatic Biosecurity Strategy

Dr Motseki Hlatshwayo (Programme Officer: Fisheries and Aquaculture, SADC Secretariat) then presented the background of the SADC Regional Framework for an Aquatic Biosecurity Strategy, which he stressed was being formulated against a backdrop of the expansion and rapid development of aquaculture in Africa and an accompanying increase in the risk of aquatic animal disease outbreaks. He also acknowledged the rising demand for fish products in Africa, leading agencies such as AU-IBAR, SADC, FAO and NEPAD to promote aquaculture strongly. However, he warned that with an increase in disease risk, the probability that outbreaks in fish farms will spill over into natural aquatic systems is equally high, and that in a continent such as Africa where inland fisheries play a critical role in food production and livelihoods security, a large-scale disease outbreak can have dire consequences. He then stated that a lack of awareness on the part of decision-makers can impact the way budgets and resources are allocated to aquatic animal health services. If there is no policy with regard to fish health, then the effects can be widespread. For example, this can impact the curricula of veterinary schools, the resources and training of officers at international border points who regulate the international trade in aquatic animals, the training and resources available to staff at state laboratories, and the surveillance of animal diseases in a country. He pointed out that that senior government officials are not always fully aware of the role and functions of international and regional organizations such as AU-IBAR, SADC, FAO, OIE, NEPAD, etc. with regard to aquatic animal health. Dr Hlatshwayo noted that the FAO has collaborated with these partners and with DAFF to provide assistance to the region in building capacity towards the process of developing a regional biosecurity framework. This was a follow-up to the OIE meeting of 2008 in Mozambique, following the outbreak of epizootic ulcerative syndrome (EUS), the white spot disease (WSD) outbreak, and subsequent activities (e.g. training courses at Rhodes University, FAO and OIE workshops). He informed the participants of the April 2014 planning meeting held in South Africa that took the momentum forward, aligned to the development of the SADC Regional Aquaculture Strategy and the Pan African Fisheries and Aquaculture Policy and Reform Strategy. A training programme was agreed upon for veterinarians from SADC Member States and was conducted in July 2014 at Rhodes University, where it was further agreed to conduct this current workshop. He identified the objectives of the Regional Workshop as: (i) to highlight the growing importance of aquaculture and inland fisheries in Africa in contributing to a sustainable fish supply; (ii) to present the risks of unmanaged aquatic animal health to the development of this sector and the possible negative impacts this could have on food production and livelihoods; (iii) to present the roles, functions and services of the relevant players, such as AU-IBAR, SADC, FAO, OIE and NEPAD; (iv) to identify the gaps in developing aquatic animal health capacity in the region (e.g. lack of funding, policy and skilled people); (v) to identify possible actions, plans, and resolutions that could come of this workshop; (vi) to identify possible institution-building and networking strategies, so that resources can be shared effectively in the region; and (vi) to

mobilize the aquatic animal health tools and mechanisms already developed by the FAO and OIE (e.g. aquatic animal disease reporting and surveillance). He also highlighted some of the key issues to be discussed at the workshop: (a) capacity building of regional public-sector officials responsible for aquatic animal health, including state veterinarians and other senior government managers; (b) development of regional aquatic animal health biosecurity governance arrangements (including reporting) that are aligned with existing protocols and conventions (e.g. the OIE protocols for disease surveillance and reporting and the SADC Protocol on Fisheries); (c) institutional strengthening, including regional collaboration, communication and networking of information and shared resources; (d) prevention and management of risks from exotic, emerging and unknown pathogens; and (e) stocktaking and analysis of regional institutional arrangements for aquatic animal biosecurity, including national institutions and plans, human resource capacity, facilities, disease surveillance and reporting, information sharing, international linkages and support, regional cooperation, institutions and networks. In conclusion, he emphasized the expected outcomes of the Regional Workshop as: (i) elevation of aquatic animal health issues; (ii) an increased profile of what that national, regional, continental and international role players are doing in aquatic animal health; (iii) the development of a “resolution” that can then be used as a platform from which to write proposals to donors to continue this process; (iv) for SADC, the development of a Regional Framework for an Aquatic Biosecurity Strategy that will support the growth of its aquaculture industry; and (v) the formation of linkages with the TILAPIA Project under the auspices of AU-IBAR and other partners,

2.4 The TILAPIA (Trade and Improved Livelihoods in Aquatic Production in Africa) Project

Dr Mohamed Seisay, Senior Fishery Officer at AU-IBAR introduced the participants to the TILAPIA Project, which is aimed at building capacity on fish health and aquatic biosecurity to sustain and develop aquaculture and fisheries in Africa. He gave some brief trends in aquaculture development in Africa, stressing the increasing prospects for large-scale investment in the sector. However, in recent years, environmental and fish health issues have been a major concern. He thus emphasized the importance of putting in place fish health services in parallel with the development of the aquaculture industry to ensure that growth is sustainable and that the economic interests of the aquafarmers are safeguarded. He lamented the dearth of capacity on the continent in the area of fish diseases and the lack of biosecurity measures on fish farms. Addressing such inadequacies will require capacity building, strengthened policies and improved legislative frameworks and should be consistent with overarching developmental recommendations and strategies for the continent and other relevant regional initiatives. He stated that the TILAPIA Project intends to address aquatic animal health issues in the emerging aquaculture sector in Africa by improving animal health and biosecurity management in aquaculture operations and inland fisheries systems, both small-scale and commercial. The project will provide a conducive environment for increased production, food safety and regional trade in aquatic animals and their products, while securing rural livelihoods, fostering investment in the sector, and sustaining production through environmentally sound practices. The specific objectives of the TILAPIA Project are: (i) to secure rural livelihoods and increase commercial production for regional food security through improved public and private-sector management of, and investment in aquaculture and fisheries production in Africa; (ii) to increase the output of the market-oriented aquaculture sector and foster regional trade in aquatic animals and their products through improved aquatic animal health management, biosecurity and food safety; (iii) to improve rural livelihoods of fishing communities and aquafarmers through public-sector interventions

in aquatic animal health, aquatic biosecurity and policy and legal frameworks; and (iv) to provide an enabling environment in the aquatic sector through appropriate policy and legal frameworks. Key result areas for the project will include: (i) improved institutional and human resources capacity to prevent, detect and respond to aquatic animal diseases of economic or public health importance; (ii) developed and improved policy and legal frameworks aimed at promoting good governance of fisheries and aquaculture through measures which address unregulated international trade and encourage investments in domestic production of safe aquatic commodities for human consumption; (iii) enhanced private-sector investment in aquaculture, with support services being developed along the value chain, leading to spill-over effects benefiting the small-scale producers; and (iv) a policy framework that creates an enabling environment. The expected outcomes of the TILAPIA Project are to secure investments from threats of aquatic diseases and pests; provide safe aquatic commodities for human consumption; improve market access and trade in aquatic commodities; improve systems capacity for the prevention, early detection and response to aquatic diseases and other threats; and to provide increased and more effective participation of African Member Countries in the international standard-setting process. Implementation agencies for the project are expected include AU-IBAR, FAO, OIE and the NEPAD Planning and Coordinating Agency (NPCA). Development of the full project proposal has been funded by the WTO. Beneficiary countries will be all the 54 AU member states, eight Regional Economic Communities (RECs) (the Common Market for Eastern and Southern Africa (COMESA), the East African Community (EAC), SADC, the Economic Community Of West African States (ECOWAS), the Union du Maghreb Arabe (UMA), the Intergovernmental Authority on Development (IGAD), and the Community of Sahel-Saharan States (CEN-SAD)) and the private sector. In concluding, Dr Seisay informed the participants that the objective of the TILAPIA Session was thus to identify, discuss and build consensus on the elements to be included and procedures to be followed for responding to the call from STDF for the proposed TILAPIA Project.

There then followed the taking of the group photograph (Annex II.d).

3. SESSION 1: INTRODUCTORY PLENARY SESSION

3.1 Presentation 1. Trends in Global Aquaculture

Dr Rohana Subasinghe (FAO, Rome) began his presentation on *Trends in Global Aquaculture* by emphasizing the many important characteristics of fish consumption and that fish provides many valuable nutrients. He compared aquaculture to capture fisheries, noting that aquaculture has become the fastest-growing food-producing sector, with a total global production of 66 million tonnes per annum as compared to a capture fisheries, which is stagnating at around 91 million tonnes. Total fishery and aquaculture production currently stands at about 158 tonnes per annum and is expected to reach 185 tonnes by 2020. The People's Republic of China, with about 61 percent of global aquaculture production, is by far the world's biggest producer. Asia (including PR China) produces about 91 percent of the total global aquaculture production. The Americas, Europe, Africa and Oceania combined contribute only 9 percent. Except in a few countries, aquaculture in Sub-Saharan Africa has not recorded impressive growth over the last decade, the bulk of the fish still coming from capture fisheries. In 2012, the top-ten aquaculture producers in Africa were: Nigeria, Uganda, Ghana, Kenya, Zambia, Madagascar, Tunisia, Zimbabwe and South Africa, with impressive growth recorded by the first three countries over the last decade. About 63 percent of farmed aquatic animals in Africa are finfish, followed by crustaceans (22 percent), molluscs (12

percent) and other species (2.5 percent). Globally, the relative contribution of aquaculture to food fish consumption is expected to reach 50 percent by 2030. Aquatic animals have also become the largest exported commodity, leading other agro-based commodities such as coffee, natural rubber, cocoa etc. Dr Subasinghe reported that to maintain baseline consumption in every country (i.e. globally), 159 million tonnes of fish will be needed to feed the world population in 2030. The demand for fish in 2030 is expected to exceed the supply by some 50.6 million tonnes. Reducing this gap can only be achieved by improving and better managing fisheries, sustaining and increasing aquaculture growth, and reducing fish wastage. Dr Subasinghe noted that aquaculture faces many issues, challenges and opportunities. Biosecurity and health management should be considered as one of the top priorities to be addressed for sustaining sectoral growth. Improved technology and new innovations are required for genetics, disease management, fishmeal and fish oil replacements, improved food conversion ratios (FCRs), reduced carbon emissions, increased use of renewable energy, etc. In concluding, he stressed the importance for Africa to grow its aquaculture sector to improve supplies of fish on the continent.

3.1 Presentation 2. Trends in SADC Regional Aquaculture

The presentation on *Trends in SADC Regional Aquaculture* was given by Drs Nyambe Harsen Nyambe and Motseki Hlatshwayo on behalf of the SADC Secretariat. The presentation highlighted the SADC Vision as "one of a common future, a future in a Regional Community that will ensure economic wellbeing, improvement of the standards of living and quality of life, ...for the peoples of Southern Africa". The region has 15 countries with an estimated population of 285 million people and an average per capita GDP of USD3 873 (2013). The SADC Treaty calls for sustainable utilization of natural resources and effective protection of the environment. The SADC Protocol on Fisheries aims to ensure that the region's fisheries and aquaculture sector contributes significantly to the GDP of Member States, thus significantly impacting on food security, poverty alleviation, employment creation and regional integration. Fisheries and aquaculture contribute to the realization of the aims of SADC as enshrined in the SADC Treaty and to that of the United Nations (UN) Millennium Development Goals (MDG). The presentation went on to highlight the status of aquaculture in the SADC Region. According to FAO, the total aquaculture production in Sub-Saharan Africa has grown from 55 800 tonnes in year 2000 to about 615 000 tonnes in 2012, with an estimated value of USD1.3 billion. Due to high local demand, the vast majority of farmed fish in Africa are freshwater species, mainly Nile tilapia (*Oreochromis niloticus*) and African sharptooth catfish (*Clarius gariepinus*), species that are relatively easy to culture in ponds, cages and advanced technologies like recirculating aquaculture systems (RAS) and aquaponics. There is also growth in the mariculture of shellfish in countries such as South Africa and Namibia where high-value species like abalone, oysters and mussels are produced for export markets. Seaweed aquaculture happens largely in Tanzania. Shrimp aquaculture had been developing modestly in Mozambique and Madagascar before the industry was recently devastated by white spot disease. The top-five aquaculture-producing SADC Member States by volume (2012) are Zambia, Madagascar, Tanzania, Zimbabwe and South Africa which produced a total of 47 000 tonnes. The rest of the SADC Member States produced a total of 8 900 tonnes. In order for the region to realize its potential, there is a need for: (i) governments to create an enabling environment; (ii) capacity development, especially human resources for extension; (iii) research and development (R&D) to address technical challenges such as genetics; (iv) strengthening of data collection mechanisms for monitoring purposes; (v) production of high-quality seed stocks and fish feeds; (vi) mechanisms for maintaining aquatic animal health; and (vii) promotion of regional and continental trade in

aquaculture products. The presenters went on to describe the SADC Regional Aquaculture Programme, 2010, which is based on the aquaculture provisions of the SADC Protocol on Fisheries (2001). The programme aims to improve the region's capacity for aquaculture, covering issues such as the development of hatcheries, feed production and aquatic animal health. This gave birth to the SADC Aquaculture Strategy, which is being finalized. Its objectives are: (i) to increase the current levels of annual aquaculture production in the region while ensuring environmental sustainability; (ii) to promote the responsible, equitable and sustainable development of aquaculture in order to improve food, income and nutritional security in the SADC Region; (iii) to improve market access, efficiency of supply chains and product diversification in the region; (iv) to enhance resilience to climate change; and (v) to establish an institutional framework for effective governance and best practices management of aquaculture and to mainstream cross-cutting issues in the SADC Region. In conclusion, the presenters stated that the SADC Aquaculture Strategy will facilitate sustainable growth of the aquaculture sector and the mitigation of risks, including aquatic animal diseases.

3.3 Presentation 3. Trends in Biosecurity and Aquatic Animal Health

Dr Melba Reantaso (FAO, Rome) began her presentation on *Trends in Biosecurity and Aquatic Animal Health* by defining biosecurity as a strategic and integrated approach that encompasses both policy and regulatory frameworks and is aimed at analyzing and managing the risks of the sectors dealing with food safety, animal life and health (including aquatic animals), plant life and environmental health. She went on to define transboundary aquatic animal diseases (TAADs) as those diseases that are highly transmissible, have the potential for very rapid spread irrespective of national borders, and can cause serious socio-economic and possibly health consequences. The OIE lists more than 30 aquatic pathogens/diseases which fit established criteria for listed diseases in terms of consequence, spread and diagnosis. She stressed the need for more attention to aquatic animals in order to monitor their health, as problems are not readily visible except in tank-holding conditions. Fish live in a complex and dynamic environment. The range of diseases also varies (viruses, bacteria, parasites, fungi etc.), with some diseases having low or unknown specificity and many with non-specific clinical signs. The complexity of aquatic systems makes distinction between health, suboptimal performance and disease obscure. In aquaculture, avoidance of stress is an important factor. She went on to highlight some of the factors contributing to the current disease problems in aquaculture: (i) intensification of aquaculture through translocation of broodstock, postlarvae, fry and fingerlings; (ii) development and expansion of the ornamental fish trade; and (iii) misunderstanding and misuse of specific pathogen free (SPF) stocks in hatcheries. She depicted some case studies on the global distribution of shrimp diseases, koi herpesvirus (KHV) and other viruses and pathogens. She highlighted some of the factors contributing to the current disease problems in aquaculture as slow awareness on emerging diseases, inadequate or poorly implemented biosecurity measures, unanticipated negative interactions between cultured and wild fish populations, and enhancement of marine and coastal areas through stocking of aquatic animals reared in hatcheries. She stressed the importance of devising programmes for reducing the risks of aquatic animal diseases that are in compliance with international treaties and are accomplished through national strategies. National strategies should cover issues such as: (i) biosecurity awareness (in aquaculture); (ii) meaningful health certification and quarantine; (iii) disease surveillance and diagnosis; (iv) risk analysis; (v) border controls; (vi) farm-level biosecurity; (vii) farmer empowerment; and (viii) scientific research and advice. This applies at the national, subregional, regional and international levels, with institutions clearly identified with clear mandates and competence. With regard to the transboundary nature of aquaculture diseases, Dr Reantaso stated the

importance of focusing on fish as the most-traded commodity and aquaculture as the future of fisheries. There is therefore a strong need to assist countries in reducing the risks of TAAD introduction and spread in a constantly changing global situation that includes rapid development of the sector, increasing knowledge on diseases, better understanding of the dynamics and epidemiology of disease; improved diagnostic and detection methods; emergence of unknown diseases; and changing trade patterns (shifting political, social, industrial and economic environments). A national strategy contains the government's action plans at the short, medium and long-term using phased implementation based on national needs and priorities. There is a need to build capacity for timely assessment of the threats from new or expanding species; the ability for rapid response to eradicate new pathogens before they establish and spread; and a strong focus on prevention (e.g. proactive actions such as risk analysis, vaccination, efficient farm-level biosecurity, and robust biosecurity governance at the policy level). In conclusion, she emphasized some of the benefits of improved biosecurity, stating that it: (i) safeguards animal and human health, protects biodiversity, promotes environmental sustainability and enhances food safety; (ii) stimulates increased market supply and private investments, enabling farmers to produce healthy products that can be highly competitive in the market and that make a country a responsible trading partner; and (iii) enables developing countries to grow more food efficiently, increase their incomes and thus improve their resilience, reduce their vulnerability and enhance their capacity to respond effectively to the impacts of higher food prices and other food-production risks.

3.4 Presentation 4. Aquatic Animal Biosecurity Projects in SADC

Dr Richard Arthur (FAO International Consultant) gave a brief overview of some of the past projects and activities on aquatic animal health that have lead to the present Regional Workshop. He stated that little work was done in SADC prior to the outbreak of epizootic ulcerative syndrome (EUS), which first appeared in Africa in October 2006. Dr Arthur noted that the discovery of EUS in Botswana led to the *International Emergency Disease Investigation Task Force on a Serious Finfish Disease in Southern Africa*, in response to a request from the national government. In response, the FAO launched TCP project *TCP/RAP/3111 Emergency Assistance to Combat EUS in the Chobe-Zambesi River* in 2007. This was followed by another FAO project aimed at *Strengthening Aquatic Biosecurity in Southern Africa*. This comprised a series of multilateral technical and educational activities (including workshops) directed towards improving awareness and capacity for aquatic animal biosecurity and targeting seven participating countries (Angola, Botswana, Malawi, Mozambique, Namibia, Zambia and Zimbabwe). This was preceded by a *Workshop on the Development of an Aquatic Biosecurity Framework for Southern Africa* held in Lilongwe, Malawi in April 2008, with the participation of nine countries (seven from SADC, as well as Kenya and Uganda) and the sponsorship of FAO and OIE. Following that, the *Aquatic Biosecurity Framework for Southern Africa Scoping Meeting of Regional Fisheries and Veterinary Authorities* was held in October 2009 in Namibia (jointly with the OIE). This was followed by a high-level scoping meeting of regional fisheries and veterinary authorities, attracting 32 participants from eight SADC Member Countries and two members of the EAC. The major output of the meeting was the Windhoek Declaration on *An Aquatic Biosecurity Framework for Southern Africa* and a *Regional Training Seminar for OIE Focal Points on Aquatic Animal Diseases in Africa*. In June 2010, a regional training workshop on biosecurity was held in Swakopmund, Namibia. This attracted 80 specialists and focal points on aquatic animal diseases from 36 African countries, with representatives from the FAO OIE, the European Community (EC), the Sustainable Aquaculture Research Networks for Sub-Saharan

Africa (SARNISSA), national veterinary institutes and the Aquatic Animal Health Research Institute (AAHRI, Bangkok). The purpose of the training workshop was to improve participant knowledge of the OIE and its activities in general terms, and more specifically with regard to aquatic animal diseases. More recently, an *FAO Technical Workshop on the Development of a Strategy for Improving Biosecurity in the Subregional Countries of the Mozambique Channel (Madagascar, Mozambique and Tanzania)* was conducted in Maputo, Mozambique in April 2013. This was again convened by FAO with financial support from the World Bank. The purpose of the workshop was to: (i) present the outcomes of the survey on national aquatic animal biosecurity capacity; (ii) provide a platform to discuss an aquatic biosecurity framework for southern Africa based on survey findings and ensuing workshop discussions; and (iii) identify regional capacity-building needs to address aquatic biosecurity gaps in the region. Dr Arthur also noted that in 2013, South Africa began the process of developing its own *Draft Strategic Framework for Aquatic Animal Health and Welfare in South Africa*. This integrated existing aquatic animal health frameworks from both the freshwater and marine sectors to provide an outline of an amalgamated national aquatic animal health plan and detailed implementation plans for each action. The case studies of the *Outbreak of White Spot Syndrome Virus at Shrimp Farms in Mozambique and Madagascar: Impacts and Management Recommendations* followed. WSD first appeared in Madagascar in October 2012. Field visit to Mozambique and Madagascar took place in May 2013, conducted by the Responsible Aquaculture Foundation (RAF) and funded by the World Bank, with contributions from OIE, FAO and others. The team, which was comprised of seven experts, produced a series of recommendations for combating WSD and for strengthening aquatic biosecurity at both the farm level and regionally. Dr Arthur emphasized that all these efforts have finally led to the current Regional Workshop. In conclusion, he summarized the current situation by stating that the many task forces, case studies and workshops have considered the issues related to improving aquatic animal health management and aquatic biosecurity in SADC and have recommended many actions. He noted that the following-day sub-session on developing an aquatic biosecurity framework for SADC will build upon and extend the results of the Lilongwe Workshop (2008) to the wider SADC Region, that the Lilongwe Strategy can be modified to be relevant to the entire SADC Region, and that the many actions and recommendations made by previous efforts can be reviewed, organized and prioritized into a single coherent strategy and implementation plan.

3.5 Presentation 5. Epizootic Ulcerative Syndrome in Zambia and the Risk of Further Spread in other Parts of Africa

Dr Hang'ombe Bernard Mudenda (University of Zambia, School of Veterinary Medicine) in his presentation on *Epizootic Ulcerative Syndrome in Zambia and the Risk of Further Spread in Other Parts of Africa* began by defining EUS, which is an infection with an oomycete fungus known as *Aphanomyces invadans*. It is "a seasonal epizootic condition of freshwater and estuarine warmwater fish of complex infectious etiology characterized by the presence of invasive *Aphanomyces* infection and necrotizing ulcerative lesions leading to a granulomatous response". It can lead to mass mortality of wild and cultured fish and is noticeable through deep, reddened, haemorrhagic ulcers with fungal mycelia on the surface. It can also lead to skull erosion and loss of eyes and part of the brain. In 2006, fish from the Chobe-Zambezi River were found with clinical signs that included ulcers and focal areas of skin inflammation that were later confirmed as due to EUS. As of 2007, the disease has been present in Zambia, affecting the wild fisheries sector. By 2008 and 2009, the entire Zambezi river system in Zambia was affected, along with its upper tributaries. In 2010, the disease was reported in the Kafue River (a tributary of the Zambezi River) and in 2011, it was confirmed in the Chongwe

River (also a tributary of the Zambezi River). In 2012 and 2013, isolated cases of EUS were observed in the upper part of the Kafue River and in lagoons in the Zambezi plains. Recently (2014), a new basin has been affected, the Bangweulu wetlands in the northern part of Zambia. Dr Mudenda cautioned on the risk of EUS further spreading to other parts of Africa. The disease has now been documented in Botswana, Namibia, South Africa and Zimbabwe. He depicted EUS occurrence by major river systems in Africa and noted that the drainage system of Africa is contributing to its spread. The risk of further spread is high because of heavy rainfall and flooding that may interlink the drainage basins of river systems, human activities that do not conform to good biosecurity, and possibly, transmission by birds.

3.6 Presentation 6. Industry Practice: On-farm Biosecurity Case Study of Lake Harvest Fish Farm

Mr Paul Mwera, Technical Manager at Lake Harvest Aquaculture in Zimbabwe began his presentation on *Industry Practice: On-farm Biosecurity Case Study of Lake Harvest Fish Farm* with a profile of Lake Harvest Aquaculture, the largest freshwater fish farm in Africa. The fish farm produced about 9 500 tonnes of fish in 2014 and is expecting to produce about 11 000 tonnes in 2015 for its regional and international markets. Its prime products are whole and gutted tilapia (sold as fresh or frozen) and fillets (fresh and frozen). The company's biosecurity objectives include: (i) reducing the risk of pathogen introduction; (ii) reducing or limiting the spreading of pathogens throughout the system; (iii) reducing conditions that increase fish susceptibility to infections; and (iv) reducing the risk of pathogen introduction. Some of the measures applied by Lake Harvest include disinfection of fish eggs before introducing them into the hatchery; not allowing animals into the farm; collecting the history of people at the main gate; screening people; making a foot bath available at the farm entrance; only allowing access of farm vehicles to the ponds and Lake Harvest boats/vessels in the case of the lake; only processing and handling fish produced by Lake Harvest; and ensuring that screens are placed at inlets to stop ingress of wild fish. The company also has measures in place to reduce the risk of pathogen introduction, including disinfection, cleaning rosters (hygiene), barriers (fences), use of bird nets and fallowing of cage sites. They also manage conditions that increase fish susceptibility to infections by actions such as stress reduction measures, managing stocking densities in holding units, managing fish environment (dissolved oxygen (DO), temperature, ammonia, etc.), conducting fish health surveillance (gross microscopic examinations), providing good nutrition (correctly balanced nutrients), implementing good feeding practices (e.g. managing aggressive feeding frenzies), and implementing biosecurity measures on the lake cages. The challenges faced on the lake stem from the fact that it is an open-access resource, and it is thus difficult to exercise exclusivity. Quarantine principles are also difficult to apply completely. The water is a host to many opportunistic pathogens. Lake Harvest has a Fish Health Monitoring and Surveillance Programme that entails: (i) checking for parasites in fingerlings, juveniles and production fish; (ii) documenting fish health data; (iii) checking fish condition factor; (iv) recording the types of pathogens isolated; and (v) monitoring DO, temperature and other general water quality parameters. At the end his presentation, Mr Mwera highlighted some of the major issues threatening aquaculture farms. These include: (i) disease threat – there is little information moving around on fish disease (poor reporting system); (ii) shared waterbodies – absence of protocols or management agreements binding operators on each side of the lake; (iii) the need to conduct carrying capacity studies of the lake to avoid overloads and over-intensification of production; (iv) the threat of disease importation through fingerling imports (country preparedness on screening of fish for pathogens); (v) inadequate laboratories for fish pathogen examinations; and (vi) a shortage of fish specialists and veterinarians.

3.7 Presentation 7. Biosecurity in Shellfish in Southern Africa

Dr Graeme Hatley (Amanzi Biosecurity (Pvt) Ltd, South Africa) presented a case study on *Biosecurity in Shellfish in Southern Africa*. He focused on the progress made in the implementation of on-farm biosecurity for shellfish. For oysters, there has been minimal progress, but increased awareness. For abalone, there has been some progress across most of the industry, although this varies from farm to farm and is dependent on the stage of development of the farm, the attitude to risk, the economics, etc. The shellfish industry in South Africa was minimally aware of biosecurity and disease risk prior to 2006/2007. The occurrence of abalone tubercle mycosis and abalone viral ganglioneuritis led to the basic evaluation of some farms and the development of a Biosecurity Standard. This is adaptable to other industries. The challenges that the industry faces include the involvement of multiple players, (e.g. farms, wild harvesting, processors), the close proximity of farms, the varying attitudes to risk, misconceptions about biosecurity, a focus on infrastructure vs. principles, and the retrofitting of existing farms. However, the sector continues to develop its programme, focusing on on-farm training at various levels: (i) farm workers (signs of disease, disease basics) and (ii) management (areas of risk, mitigation procedures). Going forward, Amanzi will focus on continual application and training, iterative processes and engaging with all parties involved.

3.8 Presentation 8. Diseases of Finfish Relevant to Africa

Dr David Huchzermeyer (Rhodes University, South Africa) began his presentation on *Diseases of Finfish Relevant to Africa* by highlighting the fact that fish represent by far the most species-rich group of vertebrate animals, with 32 949 species currently described, of which 7 389 species are in some way exploited by humans and 360 are used in aquaculture. About 3 229 species are traded as ornamental fish, and some 911 species have been introduced and become established in other countries. He went on to depict the multifactorial etiology of fish disease. This is largely influenced by the fish's immune system, the host, the disease, the environment and the pathogen. He then gave a brief overview of infectious aquatic diseases, noting that pathogens can be transmitted more easily through water than through air. Some serious pathogens can be transmitted vertically through the gametes, and carrier states in which no clinical signs occur exist for the majority of fish pathogens. The interface between wild and farmed fish has also influenced pathogen transfer (i.e. pathogen transfer from farmed fish to wild fish or from wild fish to farmed fish). EUS was cited as an example on this. There are known serious implications in instances where exotic diseases have become established in wild populations. Exotic fish have been introduced into Africa since the days of the early settlers, and many parasitic diseases were introduced with these imports. Many of these parasites impact on wild and farmed populations of fish; however, most of them are now regarded as ubiquitous. They are important, but most are less relevant to transboundary control measures, beyond a requirement that fish should be free from visible parasites and lesions. Dr Huchzermeyer then gave examples of some finfish diseases common to Africa, including EUS (a disease previously exotic to Africa), and KHV (a recently emerged viral disease of common carp (*Cyprinus carpio*) in all of its varieties that was first officially identified in 1998). KHV has a worldwide distribution that includes Africa and can easily be transferred across nations through unregulated international trade of ornamental carp (koi). International movement of salmonids is tightly regulated based on standards set by the OIE. In South Africa, adherence to strict import regulations and disease surveillance testing has prevented the introduction of serious salmonid diseases despite the annual importation of

significant numbers of eyed trout ova. Effective diagnostic and regulatory capacity has enabled South African farmers to export certified disease-free salmonid ova to lucrative northern hemisphere markets. He then provided some examples of bacterial disease – many of which involve opportunistic bacteria from the aquatic environment. These include streptococcal septicaemia (first described from rainbow trout in South Africa in 1975); streptococcosis of tilapia (an emerging and serious disease of intensive tilapia culture in many countries); and *Flavobacterium psychrophilum* (a serious pathogen causing losses among farmed salmonids). Numerous pathogenic viruses of fish have also been described. These may cause disease in one or more fish species and represent some of the most serious diseases challenging the sustainability of aquaculture. Many cause very high morbidity and mortality in juvenile fish. Viral diseases make up the majority of OIE-listed finfish diseases. Intensive fish production systems provide ideal conditions for epidemic outbreaks of disease. In conclusion, he highlighted that the outbreaks of EUS and KHV illustrate that Africa is not isolated from the rest of the world. Africa is home to a rich fish fauna, and many of these species are suitable for aquaculture. As new farming systems develop, new disease challenges will emerge, particularly in the marine finfish farming environment. The risk of pathogen introduction from other countries and continents will remain as long as live fish are shipped around the world. In this respect, the ornamental fish trade poses a significant risk of serious pathogen transfer.

3.9 Presentation 9. Diseases of Molluscs

Dr Mark Crane (Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia) presented on *Diseases of Molluscs* (abalone, oysters, mussels) and their host range. The major elements covered included laboratory diagnostic methods, required competencies, aquatic animal health services, on-farm biosecurity plans and diagnostic capacity and laboratory accreditation. He went on to list and briefly describe some of the OIE-listed molluscan pathogens, which include abalone herpesvirus, *Bonamia exitiosa*, *B. ostreae*, *Marteilia refringens*, *Perkinsus marinus*, *P. olseni*, *Xenohaliotis californiensis*, *Mikrocytos mackini*, ostreid herpesvirus, and many others. The presentation showcased the diagnostic methods for OIE-listed pathogens, highlighting targeted surveillance, presumptive diagnosis and confirmatory diagnosis, and then summarized some of the diagnostic methods used, including histopathology, bacteriology, molecular techniques and epidemiology. The importance of on-farm biosecurity was emphasized, with the following elements to be carefully managed: (i) movement restrictions (people, equipment, water, etc.); (ii) disinfection and other hygienic practices (people, equipment, water, disposal of mortalities, etc.); (iii) daily stock monitoring (for clinical signs, abnormal behaviour, mortalities); (iv) record keeping (stocking rates, mortalities, feeding rates, stock movements); (v) reporting of unusual or unexplained mortalities; (vi) quarantine facilities (for in-coming stock, with the placement of sentinel animals at water outlets); (vii) all-in/all-out policy with cleaning and disinfection between batches; (viii) effluent treatment; (ix) surveillance (pretranslocation); (x) response plans (standard operating procedures (SOPs) for reporting, sample collection and storage, movement restrictions, disposal and decontamination, etc.); (xi) post-outbreak actions (fallowing and use of sentinel animals prior to restocking); (xii) SOPs (e.g. hand-washing; footbaths); (xiii) staff training (including managers); and (xiv) use of a quality system (i.e. Quality Assurance Manual (ISO17025 Veterinary Testing)).

3.10 Presentation 10. Crustacean Diseases in Southern Africa: White Spot Disease, Current Status in Indian Ocean

Dr Marc Le Groumellec, a crustacean disease expert from Madagascar, began his presentation by outlining the history and evolution of shrimp diseases, i.e. the viral pandemics in shrimp culture that began in the 1980s through to the latest viruses of the 2000s. These viral diseases have forever changed the way shrimp are farmed. The estimated economic losses caused by shrimp diseases from their discovery in the 1980s to 2006 ran from several millions to billions of dollars worldwide. He went on to mention some of the OIE-listed crustacean diseases (as of November 2014). These include: infectious hypodermal and hematopoietic necrosis (IHHN), yellow head disease (YHD), Taura syndrome (TS), white spot disease (WSD), necrotizing hepatopancreatitis (NHP), infectious myonecrosis (IMN), acute hepatopancreatic necrosis disease (AHPND), crayfish plague (*Aphanomyces astaci*), and white tail disease (WTD). Dr Le Groumellec emphasized WSD, its occurrence and spread. White spot syndrome virus (WSSV) severely affected shrimp aquaculture in the Indian Ocean. The main objectives for recently implemented biosecurity programmes are to stop replication of WSSV immediately in affected farms through: (i) early detection and high reactivity; (ii) contingency planning (including quarantine and emergency harvests); (iii) complete fallowing, permitting a quick restart; and (iv) restarting with full biosecurity equipment and procedures, active management and taking advantage of the SPF-domesticated stock developed over the past 15 years. A World Bank-funded project recommended 11 measures, including, regional-level cooperation and governance and preparedness/response and contingency planning for shrimp disease emergencies, among many others. A strategic framework for improving aquatic biosecurity for the Mozambique Channel subregional countries has been developed. The eight programme components address the broad themes of: (i) biosecurity governance; (ii) subregional preparedness/response and contingency planning for shrimp disease emergencies; (iii) diagnostics, surveillance and reporting; (iv) prevention and management of risks from exotic, emerging and unknown aquatic pathogens; (v) promotion of sustainable aquaculture development and responsible investment in shrimp aquaculture; (vi) assessment of socio-economic benefits/potential and risks, technical feasibility and environmental impacts of further shrimp aquaculture development in the Mozambique Channel Subregion; (vii) institutional strengthening and targeted capacity building on aquatic biosecurity; and (viii) regional collaboration, communication and networking on information and shared resources. In conclusion, Dr Le Groumellec pointed out that after the WSSV crisis, recommendations were made and the region now has a clear road map to follow for the public sector to deal with this disease. Because of the high costs of production and specific constraints and markets in the Indian Ocean shrimp industry, none of the Latin American or Asian models are directly applicable. The challenge for the Indian Ocean private sector is to invent a new model adapted to their constraints while keeping the quality and specificity of their finished products. One possible strategy has been functional and successful since December 2012. There might be other valuable options. As long as they do not allow WSSV replication in the cultured stocks and maintain low WSSV prevalence in the wild crustacean populations, the industry will be safe. The presence of WSSV in the subregion is not only important to shrimp farms, but should also be taken into consideration by other crustacean aquaculture systems, such as crab or lobster culture. However, more regional cooperation among all stakeholders involved in diseases of crustaceans is needed to mitigate existing diseases and prevent new ones.

3.11 Presentation 11. Regional Aquatic Animal Health Management and the role of OIE

The presentation was prepared by Dr Moetapele Letshwenyo, with contributions from Dr Patrick Bastiaensen, Gillian Mylrea and Dr Neo Mapitse, all from the OIE. Dr Letshwenyo began by giving some background information on aquaculture as a fast-growing sector due to the ever-increasing demand for good quality protein. As a result, aquatic animal health and public health (zoonoses) issues have become critical. The OIE plays an important role in aquatic animal health, just as in the health of terrestrial animals. He went on to outline the general mandate of the OIE as: (i) scientific information; (ii) transparency; (iii) promotion of veterinary services; (iv) sanitary safety; (v) international solidarity; (vi) food safety and animal welfare; and (vii) protecting animals, preserving our future. He noted that the OIE's *Aquatic Animal Health Code* includes sections on: criteria for disease freedom, conditions for trade, quality of aquatic animal health services, transport of farmed fish, zoning and compartmentalization, procedures for aquatic animal waste disposal, stunning and killing of farmed fish for human consumption, guidelines for risk analysis, model export certificates, disease reporting obligations, and responsible and prudent use of antimicrobial agents. In the WTO Sanitary and Phytosanitary (SPS) Agreement, the rules-based framework for international trade, the OIE is the reference standard-setting organization for animal diseases, including zoonoses. If countries apply OIE standards, their WTO obligations (if members) under the SPS Agreement are met. The application of OIE standards helps to facilitate safe trade by avoiding the imposition of unjustified trade barriers and at the same time, prevents the spread of diseases globally. The OIE standards are a country's legal weapon for fair trade in aquatic animal health and welfare. While the recommendations are the same for all countries, the internal coordination is each country's responsibility.

3.12 Presentation 12. Regional Animal Health Management and the Role of AU-IBAR

Drs Hiver Boussini, Zelalem Tadesse and Mohamed Seisay (AU-IBAR) began their presentation on *Regional Animal Health Management and the Role of AU-IBAR* by looking at the history and developments at AU-IBAR from 1951 to 2003. They highlighted that AU-IBAR became the specialized technical office of the African Union Commission Department of Rural Economy and Agriculture (AUC-DREA) in 2003 and went on to outline its vision, mission and mandate. Its mandate, as an implementing organization of the African Union, is to support and coordinate the utilization of animals (livestock, fisheries and wildlife) as a resource for human wellbeing in the Member States, and to contribute to economic development, particularly in rural areas. AU-IBAR's main clients are the AU Member States and RECs. Its implementation strategy is through the RECs. The Strategic Programs of AU-IBAR for 2014-2017 are as follows: (1) Animal Health, Disease Prevention and Control Systems; (2) Animal Resource Production Systems and Ecosystem Management; (3) Access to Inputs, Services and Markets for Animals and Animal Products; and (4) Animal Resources Information and Knowledge Management. AU-IBAR's Strategic Support to Control TADs and Zoonoses is enshrined in 11 elements: (i) improve surveillance and animal health information system; (ii) policy and institutional capacity; (iii) promote regional harmonization of animal health actions; (iv) enhance compliance of Member States with international standards; (v) enhance trade and competitiveness of African livestock and commodities; (vi) coordinate the prevention and control of priority diseases; (vii) enhance African capacity for vaccine production and quality control; (viii) support to cross-border initiatives; (ix) promote the "One Health" approach in the management of zoonoses (Integrated Regional Coordination Mechanism, IRCM); (x) improve bee health, honey production and pollination services; and (xi) improve fish disease control and biodiversity across the continent. The presentation also

emphasized that AU-IBAR, in collaboration with NPCA, is presently implementing a fisheries governance project aimed at strengthening institutional capacity for improved fisheries management on the continent. Key activities pertinent to the current Regional Workshop include enhancement of capacities for fish disease surveillance and control, and the timely collection, analysis and sharing of accurate sanitary information. The subactivities include: (i) strengthening the capacity of national veterinary services for early detection, timely notification/reporting, prevention and control of fish diseases, including reporting of fish diseases through the Animal Resource Information System (ARS); and (ii) building capacity in Member States for biosecurity and safety measures in aquaculture practices. Such activities will be implemented with AU-IBAR partners, including WorldFish Center, NPCA and national member state government services. In conclusion, the presenters highlighted AU-IBAR's leadership role in the development of animal resources in Africa (livestock, wildlife, fisheries and bees). It has been involved in addressing the impacts of TADs and zoonoses in partnership with other organizations for about 60 years and plays a role in strengthening the main functions of the veterinary services, such as emergency services (ES), diagnostics and governance. It recognizes the importance of regional approaches in addressing priority TADs and zoonoses and embraces the principles of the "One Health" approach in tackling zoonoses.

3.13 Presentation 13. Aquatic Animal Health in South Africa

Dr Sasha Saugh (DAFF, South Africa) gave a brief overview of *Aquatic Animal Health in South Africa*. She began by depicting DAFF's institutional structures. DAFF has nine provincial departments which work in collaboration with the National Regulator for Compulsory Specifications (NRCS). Aquatic animal health issues are administered under two units of DAFF, namely the Branch of Agriculture Production, Health and Food Safety and the Fisheries Management Branch. She went on to depict the marine aquaculture farms around the entire coastline of South Africa, as well as freshwater aquaculture farms in all provinces inland. She then described some elements of South Africa's National Aquatic Animal Health Programme (NAAHP). The overall objectives of the programme are to: (i) integrate different role-players in the government and private sector to provide a holistic management of aquatic animal health in South Africa; (ii) develop proficiency in the diagnosis, treatment, prevention and control of aquatic animal disease in South Africa; (iii) safeguard the aquaculture industry (and other users of aquatic resources) from the effects of aquatic animal diseases; and (iv) promote safe and responsible trade in aquatic animals and their products. She stated the five elements of the NAAHP, which are: (a) policy and legislation, (b) working group, (c) aquatic animal health services and facilities, (d) human resources and capacity development, and (e) R&D. For each of the elements, she emphasized the objectives, subelements and activities thereof (i.e. what the government is doing). In closing, she mentioned that South Africa has a national pathogen list for invertebrates that comprises six pathogens of molluscs and seven pathogens of crustaceans.

3.14 Wrap-up and Tasks for Day 2

A representative from the Aquaculture Association of Southern Africa (AASA) announced of an upcoming AQUACULTURE CONFERENCE 2015. This 12th AASA Conference will be held from 27 September – 3 October 2015 at the University of Limpopo, Polokwane, South Africa. The conference is being organized by AASA in partnership with DAFF and other parties under the conference theme of "*Sustainable Aquaculture - Farm to Fork*". Participants at the Durban Workshop were urged to diarize the dates of this important conference. More

details, including registration formalities for the conference are available at <http://www.aasa-aqua.co.za/conferences/>.

4. DAY 2: SPECIAL PRESENTATIONS

At the request of the presenters and with the approval of the workshop participants, two special presentations on aquaculture development in Africa were given.

Presentation 14: Current situation of Aquaculture in Egypt

Dr. Adel A. Shaheen, Benha University, Egypt gave a presentation on the *Current Situation of Aquaculture in Egypt*. The main aquaculture production sites, which are mostly freshwater, occur along the Nile River and are highly concentrated on the Delta of the Mediterranean Sea. Egypt is the top aquaculture producer in Africa and number ten in the World, according to 2011 data by the FAO. The country currently produces close to 1 million tonnes of fish, mainly tilapias. Like anywhere else in the world, capture fisheries in Egypt are either poor or suffering from deterioration and continuing decline. Other negative factors affecting Egypt's capture fisheries include overfishing; pollution; illegal, unplanned or unreported fishing; relaxation in the implementation of laws and regulations; lack of interest in clearing straits and waterways; and poor and/or unsustainable management of fisheries and aquaculture. That is why aquaculture in Egypt became inevitable and not a matter of choice. The preferred fish for aquaculture in Egypt is tilapia, which has several favorable characteristics, including being a hardy fish that is rich in nutrients and which can be fed on grains. Tilapia aquaculture is done using a range of production systems, including intensive, semi-intensive and extensive systems (e.g. in rice paddies). Egypt has also seen the emergence of intensive systems of rearing fish in the desert and other arid lands. Pollution still remains a challenge leading to the death and disease of many fish. Other problems include poor water quality in some places, unhygienic disposal of dead fish, and a lack of capacity to manage fish diseases. In closing, Dr Shaheen then depicted some diseases of tilapia and some aquaculture practices and systems in Egypt.

Presentation 15: Aquaculture Development in Nigeria

Professor A. Eyiunmi Falaye, University of Ibadan, Nigeria, gave a presentation entitled *Aquaculture Development in Nigeria*. He began by stating that fish occupies a unique position in the agricultural subsector of the national economy, providing a most affordable source of animal protein and accounting for about 40 percent of total dietary protein. He noted that Nigeria is endowed with numerous aquatic resources with huge potential for fisheries and aquaculture development. These include a coastline of 853 km with an exclusive economic zone (EEZ) of 200 nautical miles covering some 210 900 km². The inland aquatic resources include numerous freshwater lakes, rivers, reservoirs and floodplains, with a total water surface area of 12.5 million ha and with over 1.75 million ha being identified as suitable for aquaculture development. Unfortunately, the country's great potential has not yet been realized; current aquaculture production is between 200 000 and 250 000 tonnes of fish per year. Prof. Falaye stated that Nigeria is a fish-consuming country and is thus the largest market for fish and fisheries products in Africa. The current annual demand for fish is 2.5 million tonnes, whereas only about 0.8 million tonnes are produced locally, leaving a huge deficit. This gap is filled through frozen fish importation, making the country the largest importer of frozen fish in Africa. The high import bill (which exceeded USD241.1 million in year 2000 alone) is affecting the growth of the local fishing industry and negatively impacting the country's balance of trade. Prof. Falaye then went on to describe the aquaculture systems

practiced in Nigeria. There are thousands of fish farms, many of which are privately owned commercial ventures; however, most are poorly managed, and thus investment in good management would greatly increase their fish production. Over 80 percent of aquaculture production in Nigeria is obtained from commercial fish farms. Usually, these farms include both extensive and semi-intensive production systems, which involve unsophisticated production methods and rely on natural food organisms. As production intensity increases, fish are purposely stocked and the natural food supply is enhanced by the use of fertilizers and low-cost supplemental feeds. He then went on to describe several intensive, closed recirculating systems, noting that one such system in Ibadan, Oyo State is producing 2.0 tonnes of catfish per week and 200 000–250 000 fingerlings per month. He stated that *Clarias gariepinus* is the major species farmed commercially in Nigeria. Higher yields are derived from intensive aquaculture systems which have well-designed facilities that operate with higher stocking densities and use compound manufactured feeds and chemical prophylactics regularly. He listed the challenges to aquaculture in Nigeria as being: (i) inadequate supply and high cost of fish fingerlings; (ii) lack of credit and insurance for fish-farming enterprises; (iii) a shortage of competent technical manpower; (iv) an inadequate supply of quality fish feeds; (v) lack of access to information on improved production technologies; (vi) inadequate facilities for genetic improvement, disease identification and control; (vii) the high cost of fish-farm construction equipment; (viii) inadequate research extension backup to aquaculture and fish-farming development; (ix) the destruction of coastal resources suitable for aquaculture by oil prospecting companies; (x) lack of baseline data for planning and research industrialization; (xi) poor postharvest processing and storage technology; and (xii) poor market. In reviewing the prospects and strategies for aquaculture transformation in Nigeria, he stated that the greatest prospects exist for substantially increasing domestic fish production. In conclusion, Prof. Falaye stated that aquaculture has an abundant potential to increase domestic fish supply in Nigeria. However, necessary infrastructure, policies and an enabling environment are required to attain this goal.

5. SESSION 2: PARALLEL SESSIONS

5.1 Session 2.1: SADC Regional Framework for an Aquatic Biosecurity Strategy

The Working Group Session on development of a SADC Regional Framework for an Aquatic Biosecurity Strategy was facilitated by Drs Melba Reantaso, Richard Arthur, Mark Crane, David Huchzermeyer, Marc Le Groumellec and Mr Blessing Mapfumo. A list of Working Group members is given as Annex II.f(A).

5.1.1 Objectives of the Working Group Session

The objective of the Working Group Session was to develop a SADC Regional Framework for an Aquatic Biosecurity Strategy that will support the growth of its aquaculture industry through a long-term, enabling policy environment and a framework for a cooperative programme on aquatic animal health management and biosecurity governance at the regional and national levels.

5.1.2 Introduction to the SADC Strategy Session on Human Resource Development, Institutional Structure (including infrastructure) and Research

To introduce the Working Group Session, Dr David Huchzermeyer (Rhodes University), noted that the FAO Code of Conduct for Responsible Fisheries addresses the need for

responsible fisheries and aquaculture development, international trade, and the protection of the natural environment and aquatic biodiversity. He stated that this encompasses the need to reduce the risks posed by transboundary aquatic animal diseases (TAADs), as well the international pathways of disease transmission, such as via the ornamental fish trade. Dr Huchzermeyer then went on to mention the FAO programmes that have been implemented to provide emergency assistance to combat EUS in the Chobe-Zambezi River system. He noted that this was a subregional effort involving seven southern African countries (Angola, Botswana, Malawi, Mozambique, Namibia, Zambia and Zimbabwe), and that the programme stressed the need for enhancing surveillance and diagnostics capacity, formulating a regional emergency response strategy, increasing education and awareness, and promoting responsible trade in live aquatic animals. He stressed the need to develop adequate human resources to support the safe movement of live aquatic animals and noted that this includes the need for skilled policy-makers and senior management, researchers, quarantine officers, veterinarians, diagnosticians, risk analysts, epidemiologists, extension officers and private-sector aquaculturists. He emphasized that training should be clearly matched against identified national requirements and priorities, and that as a lack of skilled scientists is a major constraint to research in developing countries, countries should support the advanced training of researchers in key areas related to problem solving for aquatic animal health. With regard to emergency preparedness, Dr Huchzermeyer stated that as extension services and integrated networks for disease surveillance, monitoring, reporting and diagnostics are particularly important to achieving adequate emergency preparedness, training of staff in these areas should be given high priority. He noted that countries should recognize the importance and cost effectiveness of ensuring that adequate professional and financial incentives are available to retain key professionals, and that keeping competent staff over prolonged periods of time was essential, as retaining such experience is invaluable in maintaining a consistent health management programme and in “in-house” training of junior staff. He then provided a few examples of capacity building challenges and successes in South Africa, where there are two universities with interest in developing aquatic animal health capacity, Rhodes University in Grahamstown, and the University of Pretoria, Faculty of Veterinary Science. He observed that there was a Memorandum of Understanding (MoU) for collaboration in providing elective training courses for veterinary students, but that an application for funding was unsuccessful and a proposal to include aquatic animal health within the graduate curriculum as rejected/put on hold because the curriculum was “too full”. He said that Rhodes University has partnered with OIE, DAFF and FAO to further aquatic animal health training in the region. This partnership has created a promising nucleus from which capacity can be up-scaled and out-scaled, and that as this grows, Rhodes University is looking for further partnerships with other organizations such as SADC and AU-IBAR. With regard to appropriate institutional structure, Dr Huchzermeyer stated that countries need to develop and enact the legislation and supporting regulations necessary to support the safe international and domestic movement of live aquatic animals; ensure that aquatic animal health legislation is harmonized with similar national and state legislation dealing with terrestrial animals and plants, general food safety and relevant national environmental and conservation acts; and in accordance with international and regional agreements and memberships, such as WTO and OIE, develop adequate infrastructure to support the safe movement of live aquatic animals. This includes inspection facilities, quarantine centres, diagnostics laboratories, field offices and laboratories, research laboratories, enforcement facilities, etc. He further stated that countries need to identify their capacity and needs, and thus may benefit from activities such as: (i) conducting national institutional assessments; (ii) analyzing cost-benefits from investments in infrastructure and training; (ii) undertaking adequate planning to ensure that physical infrastructure and technical capacity are adequate to meet national needs; (iii)

considering coordination with existing state and private-sector veterinary laboratories, universities and research centres at both the national and regional levels; and (v) ensuring that infrastructure is clearly matched to requirements in terms of the pathogens likely to be of importance and their potential socio-economic significance. In considering the need for targeted research, he noted that the knowledge base for aquatic animal diseases is much less extensive than that for diseases of terrestrial animals; that the knowledge of the diseases of key cultured species is still incomplete; that for developing countries, information on the pathogens and parasites occurring in their national waters is lacking; and that as a priority, baseline surveys of the pathogens of key cultured and traded species are needed. He stated that countries need to have a broad understanding of their national disease status. To address critical information gaps, targeted surveillance for listed diseases is needed, as well as general surveys of the pathogens infecting native aquatic animal stocks. In closing, Dr Huchzermeyer stressed that funding is also needed for targeted research to support key information gaps identified during the risk analysis process, and that coordination and sharing of costs and research effort and results on a regional basis should be considered to speed research, avoid duplication of effort and reduce research costs.

5.1.3 Southern African Development Community (SADC) Regional Aquatic Animal Health Capacity and Performance Survey

The results of the SADC Regional Capacity and Performance Survey were briefly presented by Dr Richard Arthur (FAO consultant) on behalf of the FAO team. The presentation was based on the findings of a survey³ carried out in October 2014 with the express purpose of informing the current Working Group Session. Dr Arthur stated that the purpose of the survey was to obtain information on national capacity and the agencies mandated to implement aquatic animal health programmes for the 15 SADC Member States. The survey also collected information essential to support the development of the aquaculture sector through healthy aquatic production and sought opinions on the components and activities that might be included in a SADC Regional Aquatic Biosecurity Strategy. The survey questionnaire, which was based on previous FAO Aquatic Animal Health Capacity and Performance Surveys conducted in other regions of the world, was sent by e-mail to the National Focal Points (NFPs) for each country in early October 2014, with instructions that it should be completed by the national Competent Authority or other senior government officer with primary responsibility for national aquatic animal health issues, with the assistance of national aquaculture experts and concerned laboratory personnel. The survey questionnaire contained 18 sections pertaining to: (1) international trade in live aquatic animals and national border controls, (2) control of domestic movement of live aquatic animals and other domestic activities that may spread pathogens, (3) policy and planning, (4) legislation, (5) disease surveillance/monitoring, (6) disease diagnostics, (7) emergency preparedness and contingency planning, (8) extension services, (9) compliance/enforcement, (10) research, (11) training, (12) expertise, (13) infrastructure, (14) linkages and cooperation, (15) funding support, (16) current challenges, (17) constraints and (18) additional information. Survey forms were returned by the NFPs from all but one of the SADC Member States (Angola). The results of this survey will help guide regional and national strategic planning for improving aquatic animal health and biosecurity and assuring adequate and rational support services to achieve sustainable aquaculture development.

³ Full survey results and analysis can be found in Arthur, J.R., B. Mapfumo. & M.B. Reantaso. 2015. *Southern African Development Community (SADC) Regional Aquatic Animal Health Capacity and Performance Survey: Summary of Survey Results and Analysis*. Rome, FAO. 168 pp. (In press).

5.1.4 Introduction to SWOT Analysis (Aquaculture and Aquatic Biosecurity) and Preliminary SWOT Analysis for SADC

During the Working Group Session on Development of a SADC Regional Framework for Aquatic Biosecurity Strategy a SWOT (strengths, weaknesses, opportunities, threats) analysis was conducted to assist in formulating the Regional Strategy. The results were as follows:

STRENGTHS

- A SADC regional aquaculture strategy is being finalized
- 12 countries have aquaculture strategies
- Management authorities are in place
- Surveillance for shrimp diseases is taking place in some countries
- Disease reporting mechanisms exist through OIE Aquatic Animal Focal Points and for disease notification in general
- Shared rivers/waterbodies (Chobe/Zambezi, Mozambique, Limpopo, Orange River, Kunene)
- Diagnostic services are available in Madagascar, South Africa, Zambia and Zimbabwe
- Aquaculture associations are established in Madagascar, Mozambique, Namibia, South Africa, Zambia and Zimbabwe

WEAKNESSES

- Pollution, environmental degradation
- Only three countries have aquatic animal health strategies
- Lack of competence and personnel for aquatic animal health
- Lack of complete political will
- Lack of legal support for aquatic animal health in some countries
- Risk pathways factors are not well known
- Insufficient communication results in slow response to emergencies

OPPORTUNITIES

- South Africa, Zambia and Zimbabwe can form a consortium of universities
- Continuing refresher courses are possible
- Funding is available from external donors
- Regional networks exist and can be further developed
- Aquatic animal health services are available and can be enhanced (Zambia (EUS), South Africa (molluscs), Zimbabwe and South Africa (tilapia), Madagascar (shrimp))

THREATS

- Serious transboundary aquatic animal diseases (TAADs) are now present in the region (KHV, EUS, WSSV)
- Mechanisms for the control of importations of live aquatic animals and any diseases or pathogens they may carry are often weak
- Ornamental fish imports represent an unknown risk of introducing diseases
- Aquaculture poses the risk of spreading diseases to wild fish populations, introducing aquatic invasive species (AIS) and genetic harms
- The spread of diseases from aquafarms to wild fish populations is possible

5.1.5 Draft Framework for the SADC Regional Aquatic Biosecurity Strategy

Dr Melba Reantaso presented the Working Group with a possible framework for the Regional Strategy as follows:

- Table of Contents
- Summary
- Background
 - Current status of aquaculture development and aquatic animal health management in SADC (including SWOT analysis of the sector in SADC)
- Purpose
- Vision
- Guiding Principles
- Programme Components
 1. Policy and Legislation
 2. Risk Analysis
 3. Pathogen List
 4. Diagnostics
 5. Border Inspection and Quarantine
 6. Surveillance, Monitoring and Reporting
 7. Emergency Preparedness and Contingency Planning
 8. Research and Development
 9. Human Resources and Institutional Capacity Development
 10. Infrastructure
 11. Regional and International Cooperation
- Implementation
- References
- List of Appendices

She then outlined the possible structure for each of the Programmes as follows:

- Programme Name
- Description : a brief description/definition of the Programme
- Current status in SADC: a background summary of the current status of activities related to the programme, based on the outcomes of the FAO self-assessment survey
- Objectives: a brief statement of what the programme will achieve
- Projects/Activities: list of projects/activities including time-frame, priority, and responsibility needed to achieve the objectives of the Programme
- Priority:
 - Low (desirable but not essential)
 - Medium (important and essential, but less urgent)
 - High (urgent, requires immediate action)
- Time-Frame:
 - Short (1–2 yrs)
 - Medium (3–5 yrs)
 - Long (5–10 yrs)
- Responsibility:
 - National
 - Regional
 - Both

To complete her presentation, Dr Reantaso gave examples of possible contents for three Programmes: Policy and Legislation, Risk Analysis and Pathogen List.

5.2 Session 2.2: The TILAPIA Project

The TILAPIA Project Session was facilitated by Dr Rohana Subasinghe, Mr Qurban Rouhani, Dr Moetapele Letshwenyo and Dr Simplicie Nouala. A list of Working Group members is given as Annex II.f(B).

5.2.1 Working Group Activities: Part 1– Current Status and Future Needs and Part 2 – Activities of TILAPIA and Implementation Plan

The Session on the TILAPIA Project Way Forward Plan discussed the overall goal, specific objectives, and expected outcomes and outputs of the TILAPIA Project. This was followed by division of the participants into three Working Groups which tackled major issues and discussed current status, future needs and actions under three major output headings: (i.) capacity building, (ii.) policy and regulatory frameworks, and (iii.) private-sector investments.

The Working Group Session defined the goals of the TILAPIA Project as to:

- secure rural livelihoods and increase commercial production for regional food security through improved public and private-sector management of, and investment in aquaculture and fisheries production in the African region;
- contribute to the Millennium Development Goals (MDG) of eradicating extreme poverty and hunger, ensuring environmental sustainability, and developing a global partnership for development; and
- contribute to the relevant Comprehensive Africa Agriculture Development Programme (CAADP) pillars related to land and water management, market access, and improved food supply and reduction of hunger.

The Specific Objectives of the project are to:

- increase the output of the market-oriented aquaculture sector and foster regional trade in aquatic animals and their products through improved animal health management, biosecurity and food safety;
- improve rural livelihoods of fishing communities and fish farmers through public-sector interventions in animal health, aquatic biosecurity and policy and legal frameworks; and
- provide an enabling environment in the aquatic sector through appropriate policy and legal frameworks.

The Specific Outcomes of the project were identified as:

- policy framework that creates an enabling environment;
- secure investments from threats of aquatic diseases and pests;
- safe aquatic commodities for human consumption;
- improved market access and trade in aquatic commodities;
- improved systems capacity for the prevention, early detection and response to aquatic threats, including diseases; and
- increased and effective participation of African Member Countries/States in the international standard-setting process.

The Expected Outputs are:

- improved institutional and human resources capacity to prevent, early detect and respond to aquatic animal diseases of economic or public health importance;
- developed/improved policy/legal frameworks aimed at promoting good governance of fisheries and aquaculture through trade-related measures which address unregulated international trade and encourage investments in domestic production of safe aquatic commodities for human consumption; and
- enhanced private-sector investment in aquaculture, with support services being developed along the value chain, leading to spill-over effects benefiting the small-scale producers (animal health practitioners, feed suppliers, transporters, processors, cold chain, hazard analysis and critical control points (HACCP)).

The participants in the TILAPIA Session were then divided into three Working Groups that were given the following topics for consideration:

- **Working Group 1:** Institutional and human resources capacity to prevent, detect and respond to aquatic animal diseases of economic or public health significance
- **Working Group 2:** Policy/legal frameworks aimed at promoting legal trade, addressing unregulated international trade and encouraging investments in domestic production of safe aquatic commodities for human consumption
- **Working Group 3:** Private-sector investment in aquaculture, with support services being developed along the value chain, leading to spill-over effects benefiting the small-scale producers (health services, feed suppliers, seed suppliers, processors, traders, etc.)

Each Working Group was asked to consider the Current Status, Future Needs and the Activities required to meet the identified needs, along with an implementation plan.

Outputs of the Working Groups

Working Group 1 on Institutional and human resources capacity to prevent, detect and respond to aquatic animal diseases of economic or public health significance was chaired by Prof. E. Falaye, with Dr L. Squires acting as Rapporteur.

The Working Group first considered the Current Status, noting that:

- Relevant national institutional capacities are inadequate to serve the emerging aquaculture industry and the aquatic animal health sector.
- Relevant infrastructure and trained human capacity is seriously lacking.
- There is no active surveillance, emergency preparedness, information sharing and coordination.
- There is inadequate planning for an emerging industry.
- There is no regional aquatic animal health management plan.
- There is no priority disease list.
- There is poor public health awareness.

They then went on to identify the Future Needs for their areas of consideration as:

- workshops and training courses (formal and informal) for creating better awareness and knowledge on aquatic animal health;
- training of veterinarians, farmers and relevant technicians on aquatic animal health;
- reference laboratories and resource centres at national and regional levels with trained personnel;
- regional and national aquatic animal health strategies and plans;
- regular targeted surveillance and sharing of data and information;
- improved coordination among relevant national institutions, countries and RECs;
- veterinary-fisheries dialogue;
- appropriate research towards reducing the risk of diseases; and
- national and international resources for targeted research.

In closing, they presented the following Action Plan:

Component	Activities	Action Plan					Implementing Agency Regional (R) or National (N)
		1	2	3	4	5	
Awareness	Sensitization of stakeholders	x	x	x	x	x	N
	Sensitization of governments to prioritize aquaculture & give more funding for aquatic animal health	x	x	x			N
Human capacity building	Provision of 20 scholarships & incentives	x	x	x	x	x	N/R
	Training of veterinarians & fisheries officers	x	x	x	x	x	R/N
	Training of para-veterinarians		x	x	x	x	N
	Training of farmers		x	x	x	x	N
	Training programme for staffing diagnostic laboratories	x	x	x	x	x	R/N
	Support to a subregional twinning programme as recommended by OIE	x	x	x	x	x	R
	Improve the curricula of veterinary students by including aquatic animal diseases	x	x	x	x	x	R/N
Infrastructure Development	Assess the current level of laboratories in Africa region	x					R
	Upgrade/establish well-funded laboratories & diagnostic centres in high priority aquaculture countries/subregion			x	x	x	R/N
	Strengthen relevant agencies (veterinary & fisheries services) in terms of equipment to carry out various responsibilities			x	x	x	N
Disease Surveillance	Create a regional aquatic animal health strategic plan		x	x			R
	Produce a list of diseases that require regular surveillance, capture data & communicate this data with other national centres		x				N

Working Group 2 on Policy/legal frameworks aimed at promoting legal trade, addressing unregulated international trade and encouraging investments in domestic production of safe aquatic commodities for human consumption was chaired by Dr Steve Donda, with Ms Hellen Moepi acting as Rapporteur.

The Working Group first considered the Current Status, noting that that there existed:

- obsolete, fragmented and weak policies and regulatory frameworks;
- overlapping and conflicting mandates among responsible agencies;
- ineffective penalties and weak law enforcement;
- high tariffs;
- lack of support and incentives for the development of aquaculture small and medium-sized enterprises (SMEs); and
- lack of investment promotion agencies and business promotion councils

They then went on to identify the Future Needs for their areas of consideration as:

- review, updating and alignment of policy and legal frameworks to the regional and international instruments (specifically, the WTO SPS agreement);
- policy reform and trade facilitation (harmonizing, simplifying and standardizing);
- rationalization of work of agencies and creation of a single competent authority; and
- promotion of SMEs

The Working Group then identified the activities that should be considered as:

- Elaborate harmonized policies and legal frameworks consistent with the WTO to create an enabling environment for aquaculture products trade.
- Put in place harmonized, simplified and standardized trade legislation.
- Establish a single window (one-stop shop) for trade formalities.
- Promote SMEs (incentives, investment promotion council and credit facilities).
- Organize new skills-based training for entrepreneurship development, business management and gender balance for business women and youth (environmental protection and eco-labelling).
- Conduct training on trade facilitation.
- Conduct value-chain analysis for aquaculture products.
- Promote product and market diversification.
- Participate in aquaculture products trade exhibitions.
- Set up at the regional level an observatory for market and trade information to facilitate trade intelligence.

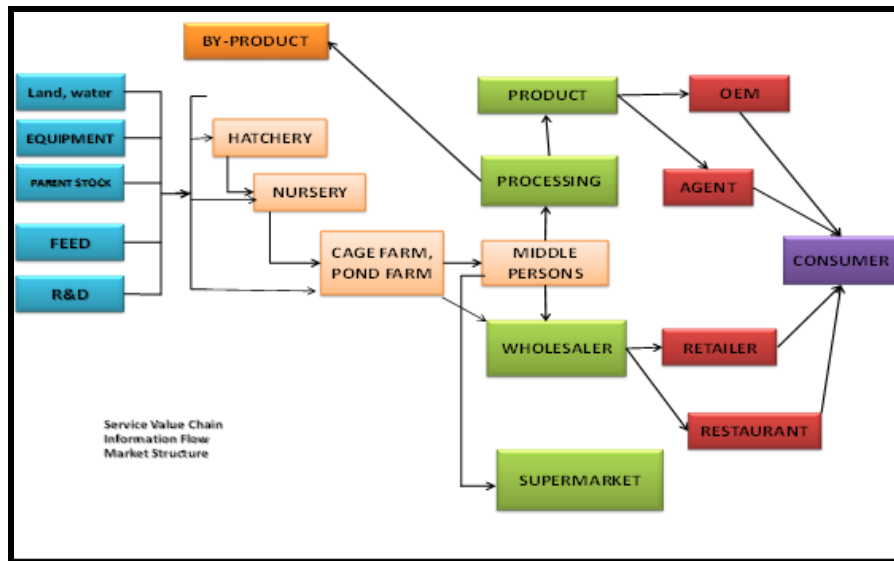
In closing, Working Group 2 outlined the following activity and implementation table:

Activity	Subactivities	Period		
		Short term	Medium term	Long term
Elaborate harmonized trade policies & legal frameworks	Review national policies & align with RECs		x	
	Draft national trade policy & legislation consistent with WTO/SPS & Technical Barriers to Trade (TBT) with focus on biosecurity			x
	Organize a validation session of a draft trade policy & legislation			x
Support establishment of a single window (one-stop shop) for trade formalities	Conduct a consultative workshop on harmonizing aquaculture sector development & trade formalities for stakeholders Public Private Partnerships (PPPs) and develop guidelines	x		
	Disseminate guidelines & recommendations	x		
Conduct value-chain analysis for aquaculture products	Carry out a value-chain mapping for tilapia and catfish	x		
	Support product development and market diversification		x	
Support establishment of regional market and trade information observatory	Support the development of marketing & trade observatory		x	
	Publish a monthly trade news		x	

Working Group 3 on Private sector investment in aquaculture, with support services being developed along the value chain, leading to spill-over effects benefiting the small-scale producers (health services, feed suppliers, seed suppliers, processors, traders, etc.) was chaired by Jacob Ainoo-Ansah, with Vasco Schmidt acting as Rapporteur.

The Working Group first outlined the Value Chain Information as follows:

Figure 1. Value chain information



Taking a slightly different approach from the other Working Groups, Working Group 3 outlined the current status, future needs and actions for nine different areas as follows:

1. *Production inputs*

Current status

Seed: availability; quality; cost

Activities/Solutions

Research and Development (R&D), capacity building, development of hatcheries, quality broodstock, certification of hatcheries

Current status

Appropriate technology: lack of technology

Activities/Solutions

Appropriate technology for different production scales; market oriented, including information on economic performance

Current status

Technical Services; R&D and training of extension personnel to provide business-oriented training and advice

Activities/Solutions

Increased capacity of extension services: availability and quality of technical and business-oriented services

Current status

Equipment for monitoring water quality, nets, and other materials: availability; cost; training on use and maintenance

Activities/Solutions

Possibility to hire and learn to operate equipment through the farmers associations

2. Marketing*Current status*

Lacking information on market requirements; lack of producer clusters (isolated producers); competitiveness

Activities/Solutions

Set up associations to aid marketing

3. Producer Associations*Current status*

Weak associations; strategy to develop business-oriented associations; synergies between marketing and production; lobbying and advocacy

Activities/Solutions

A more coordinated approach; improved capacity to deliver services

4. Aquaculture zones*Current status*

Lack of existing zones for aquaculture

Activities/Solutions

Identify best areas for production; environmental considerations, including climate change adaptation; suitable production systems and best management practices

5. Processing*Current status*

Little processing; not organized; not standardized

Activities/Solutions

Focus on value addition targeting markets; developing of the value chain addressing processing and traceability; cottage industries

6. Infrastructure*Current status*

Inadequate development targeting aquaculture

Activities/Solutions

Water harnessing; water quality monitoring and control; farm development; road networks, utilities

7. Legislation and policy*Current status*

Cost of compliance should not impede or burden farmers; lack of support for vulnerable groups

Activities/Solutions

Systematic approach and simplified bureaucracy (one-stop shop); input and technical support for vulnerable groups for aquaculture enterprise development

8. Finance*Current status*

Poor record keeping; lack of financial resources

Activities/Solutions

Credit services from government or private sector; exemptions and incentives; available data and profiles; government funding channelled through financial institutions; encourage PPPs

9. Biosecurity

Current status

No traceability and quality control, quality standards across the chain

Activities/Solutions

Establish HACCP across the value-chain; capacity building to ensure appropriate implementation; appropriate and cost-effective procedures

6. SESSION 3: PLENARY SESSION AND DISCUSSIONS

6.1 Presentation from Session 2.1: SADC Regional Framework for an Aquatic Biosecurity Strategy and Summary of Discussion

The Working Group Session on Development of a SADC Regional Framework for Aquatic Biosecurity was informed by the results of an FAO Aquatic Animal Health Performance and Capacity Survey that was carried out in October 2014, prior to the Regional Workshop. The 14 SADC Member States that completed the survey included Botswana, Democratic Republic of the Congo (DRC), Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. The results of this process served as a gap analysis, facilitating the development of the *Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC)*.

The Working Group Session was attended by at least two representatives from each of the 15 Member States of SADC and by technical experts on aquatic animal health and was facilitated by FAO. The session participants agreed on a draft framework for a broad yet comprehensive strategy to build and enhance capacity for the management of regional aquatic biosecurity and aquatic animal health. It contains the regional action plans at the short, medium and long term using phased implementation based on regional needs and priorities. It also outlines the programmes and activities that will assist in developing a regional approach to overall management of aquatic animal health in SADC.

The framework for the Strategy as agreed during the Regional Workshop includes the following sections: Summary, Background, Current status of aquaculture development and aquatic animal health management in SADC, Purpose, Vision, Guiding Principles and Programme Components and Implementation.

The purpose of the Strategy is to:

“To support the improvement of aquatic biosecurity; the development of aquatic animal health management capacity; the preservation of aquatic biodiversity; the improvement of food security, nutrition and safety; and sustainable management of aquatic resources in the SADC region, through such actions as improved awareness of and risk mitigation for OIE-listed and other serious diseases transmitted by live aquatic animals and their products and enhanced coordination between key role players involved in aquatic animal health”

The Strategy contains ten Guiding Principles that provide guidance in all circumstances, irrespective of changes in goals, strategies, work plan, structure or management. The Strategy accepts and incorporates relevant international aquatic animal health standards to ensure harmonization, transparency and equivalence in the region so that the region will be internationally recognized with respect to aquatic animal health status.

The Programme Components consist of 12 broad thematic areas:

1. Policy, legislation and institutional framework
2. Risk analysis
3. Diagnostics and health certification
4. Import controls and quarantine
5. Pathogen list
6. Surveillance, monitoring and reporting
7. Emergency preparedness, contingency planning and zoning
8. Capacity building and human resources
9. Research and development
10. Infrastructure
11. Regional and international cooperation
12. Information and communication

The Programmes are in no particular order and are all inter-related. Each Programme contains a brief description, the current status (based on the FAO self-assessment survey/gap analysis), objectives and two to five key activities (or projects) that are prioritized as low, medium or high; an implementation time-frame targeted at the short, medium, or long term; and identified responsibilities at the national and/or regional levels.

6.2 Presentation from Session 2.2: The TILAPIA Project and Discussion

The Working Group Session on the TILAPIA Project Way Forward Plan discussed the overall goal, specific objectives, and expected outcomes and outputs of the TILAPIA Project, followed by three working group discussions which tackled major issues and discussed current status, future needs and actions under three major output headings: i. capacity building, ii. policy and regulatory frameworks and iii. private-sector investments.

The overall goal of the TILAPIA Project is to secure rural livelihoods and increase commercial production for regional food security through improved public and private-sector management of, and investment in aquaculture and fisheries production in the African region; and to contribute to: Millennium Development Goals (MDGs, eradicate extreme poverty and hunger, ensure environmental sustainability, develop a global partnership for development) and relevant New Partnership for Africa's Development (NEPAD) Comprehensive Africa Agriculture Development Programme (CAADP) pillars (land and water management, market access, improved food supply and reduction of hunger). The project has the following specific objectives: (i) to increase the output of the market-oriented aquaculture sector and foster regional trade of aquatic animals and their products through improved animal health management, biosecurity and food safety; (ii) to improve rural livelihoods of fishing communities and fish farmers through public-sector interventions in animal health, aquatic biosecurity and policy and legal frameworks; and (iii) to provide an enabling environment in the aquatic sector through appropriate policy and legal frameworks.

The project has the following expected outcomes:

- policy framework that creates an enabling environment;
- protection of investments from aquatic diseases and pests;
- safe aquatic commodities for human consumption;
- improved market access and trade in aquatic commodities;
- improved systems capacity for the prevention, early detection and response to aquatic threats including diseases; and
- increased and effective participation of African Member Countries/States in the international standard-setting process.

In order to achieve the above objectives and outcomes, the Working Group Session on TILAPIA Project Way Forward facilitated by AU-IBAR and attended by 41 participants tackled major issues and discussed current status, future needs and actions under three major output headings:

1. *Improved institutional and human resources capacity to prevent, early detect and respond to aquatic animal diseases of economic or public health importance.* The Working Group identified the following areas of aquatic animal health that require attention: awareness, human capacity building, infrastructure development, disease surveillance, research and coordination.
2. *Developed/improved policy/legal frameworks aimed at promoting good governance of fisheries and aquaculture through trade-related measures which address unregulated international trade and encourage investments in domestic production of safe aquatic commodities for human consumption.* The Working Group identified the following activities that require specific attention: support empowerment of small and medium-sized enterprises (SMEs) (incentives, investment promotion council and credit facilities), elaborate harmonized trade policies and legal frameworks, support establishment of a single window (one-stop shop) for trade formalities, conduct value-chain analysis for aquaculture products, and support establishment of a regional market and trade information system.
3. *Enhanced private-sector investment in aquaculture, with support services being developed along the value chain (animal health practitioners, feed suppliers, transporters, processors, cold chain, HACCP, etc.), leading to spill-over effects benefiting the small-scale producers.* The Working Group identified a number of key activities under nine areas that require attention: production inputs, marketing, producer associations, aquaculture zones, processing, infrastructure, legislation and policy, finance and biosecurity.

7. CONSENSUS BUILDING AND THE WAY FORWARD

7.1 Consensus Building

The Regional Workshop successfully achieved its two main objectives, i.e. (i) to prepare a SADC Regional Framework for an Aquatic Biosecurity Strategy; and (ii) to build consensus on the TILAPIA Project Way Forward Plan.

There was strong consensus on the need to work together at all levels and to involve all players (competent authorities, producers, researchers and academia, input/service providers,

development partners, donors, etc.) in the value chain in supporting aquaculture development in Africa. The Workshop provided a strong neutral platform for initiating and strengthening networking among the different stakeholders and decision-makers involved in aquaculture development and aquatic animal health management, particularly in SADC and other regional economic communities (RECs) in the African continent. This Workshop also proved how cooperation by different stakeholders, coordination and alignment of approaches and rationalization of resources can improve development in Africa to sustain efforts to find solutions to support food production, livelihoods support and economic development in the continent.

The outcomes of the two parallel sessions identified a number of important elements and considerations required to support enabling policies for aquaculture development and robust aquatic animal health protection programmes and systems for Africa, an essential pillar to healthy aquaculture production that protects producers and the emerging aquaculture sector from the risks of aquatic pathogens and diseases. There are a lot of synergies, a good indication that although different processes are involved, the final outcomes and aspirations are complementary and there are great opportunities to build on each other. The systematic approach that SADC used in developing a framework for a regional biosecurity strategy, in particular, is a process that can be used by the other four RECs.

These two parallel initiatives represent a strong road map for building aquatic animal health infrastructure to support responsible aquaculture development in Africa. There is a good momentum for this road map to be effectively achieved with strong political will of Member States and complementary technical support from partner organizations. There are also indications of immediate positive support from partner organizations in implementing a number of identified activities.

The active participation of all country participants, experts and partner organizations was instrumental in the success of the Regional Workshop.

7.2 The way forward

The following follow-up activities were agreed upon by the Workshop participants:

- The Workshop Report (this document) will be finalized and circulated to all participants on or before 31 January 2015 for comment before its publication.
- The FAO will oversee the further development of the Draft Framework for the SADC Regional Aquatic Biosecurity Strategy into a more comprehensive document, the *Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC)*, which will be circulated first to international experts and then to the participants of the SADC Working Group on or before 31 January 2015 for their comments before its finalization.
- The finalized draft *Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC)*, (as well as the Draft SADC Aquaculture Strategy) will be tabled during the SADC Ministerial Meeting to take place in 2015. The process for approval of both documents will follow the SADC process, i.e. review by the SADC Technical Working Group prior to submission to the SADC Ministerial Meeting.

- The TILAPIA Way Forward Plan will be further developed by AU-IBAR and FAO and will be presented at a planned donor meeting to be held in early 2015.

At the end of the Durban Workshop, the participants were asked to provide an evaluation on the technical aspects of the workshop and their comments on its arrangements and organization (Annex II.g). They considered the technical aspects of the workshop to be quite good, at least 80 percent of the participants ranking the presentations, facilitation, plenary discussions, knowledge gained and overall achievement of the workshop objectives as above average or excellent. With regard to the workshop's logistical aspects, 100 percent of the participants ranked the length of the workshop as being average or better, while 88 percent and 96 percent of the participants, respectively, considered their travel arrangements and the meeting venue and facilities as being average or better.

8. CLOSING OF THE WORKSHOP

The Workshop organizers (AU-IBAR, DAFF and FAO) sincerely thank each and every attendee for their active participation and support during the three hectic days in Durban. The valuable contributions of the EU, SADC, the OIE and the STDF are also acknowledged and appreciated.

ANNEX II.a



WORKSHOP PROGRAMME

Improving Aquatic Animal Health Management and Strengthening Biosecurity Governance in Africa

The Square Hotel and Boutique Hotels and Spa (Umhlanga)
Durban, South Africa, 5 – 7 November 2014

Date	Activities
4 November, Tues	Arrival of participants
DAY 1 : 5 November, Wednesday	
0830 - 0900	Registration
0900 - 0920	Opening Session Welcome remarks by: <ul style="list-style-type: none"> • DAFF (Director-General of DAFF) • FAO (Dr Tobias Takavarasha) • AU-IBAR (Dr Mohamed Seisay)
0920 - 0940	General background and objectives of the Workshop (based on prospectus) 5 minute presentation on: <ul style="list-style-type: none"> ○ The SADC Regional Framework for Aquatic Biosecurity Strategy (Dr Motseki Hlatshwayo) ○ The TILAPIA (Trade and improved livelihoods in aquatic production in Africa) Project ((Dr. Mohamed Seisay, AU-IBAR)
0940-1030	Group photograph and Tea/Coffee
Session 1: Introductory Plenary Session Chairperson:	
1030 - 1050	Trends in global aquaculture (Dr Rohana Subasinghe)
1050 - 1110	Trends in SADC regional aquaculture (Dr Nyambe Nyambe)
1110 - 1130	Trends in global aquatic animal health (Dr Melba Reantaso)
1130 - 1150	Review of aquatic animal health management activities in Africa (Dr Richard Arthur)
1150 - 1210	Epizootic ulcerative syndrome in Zambia and the risk of further spread in other parts of Africa (Dr Bernard Mudenda)
1210 - 1230	Industry practice: On-farm biosecurity management systems for tilapia (Mr. Paul Mwera)
1230 - 1400	Lunch
1400 –1420	Industry practice: On-farm biosecurity management systems for catfish (Mr Chris Abir)
1420 - 1440	Diseases of finfish (Dr David Huchzermeyer)
1440 - 1500	Diseases of molluscs (Dr Mark Crane)

1500 - 1520	Diseases of crustaceans (Dr Marc Le Groumellec)
1520-1600	Tea/Coffee
1600 - 1620	Regional aquatic animal health management and the role of OIE (Dr Moetapele Letshwenyo)
1620-1640	Regional animal health management and the role of AU-IBAR (Dr Hiver Boussini)
1640-1700	The role of SADC and plans for regional aquatic animal health management (Dr Motseki Hlatshwayo)
1700-1720	South Africa's National Strategy on Aquatic Animal Health (Dr Sasha Saugh)
1720-1730	Wrap-up and Tasks for Day 2

DAY 2 (6 November, Thursday, whole day) until DAY 3 (7 November, Friday, morning session)

Session 2: Parallel sessions

Session 2.1 SADC Framework for Aquatic Biosecurity Strategy

Session 2.2 The TILAPIA Project

Session 2.1: SADC Framework for Aquatic Biosecurity Strategy

08:30-17:30 (6 November); 08:30-12:00 (7 November)

Facilitators: Dr Melba Reantaso/Dr Richard Arthur/Dr Mark Crane/Dr David Huchzermeyer/Dr Marc Le Groumellec/Mr Blessing Mapfumo

08:30-17:30 (6 November); 08:30-12:00 (7 November)	Objectives of this session
	Importance of national strategies/regional framework for aquatic biosecurity
	Summary and analysis of the Regional Aquatic Animal Health Capacity Survey
	Introduction to SWOT Analysis (Aquaculture and Aquatic Biosecurity) and Preliminary SWOT Analysis for SADC
	Possible SADC Framework for Aquatic Biosecurity Strategy
	Working Group Exercise Guidelines Working Group 1: SWOT Analysis for SADC Working Group 2: Purpose, Vision, Guiding Principles Working Group 3: Thematic Programmes (e.g. policy, legislation and institutional framework; risk analysis and quarantine; diagnostics and health certification; surveillance, monitoring and reporting; emergency preparedness and contingency planning; capacity building; research and development; regional and international cooperation, etc.)
	<ul style="list-style-type: none"> • Activity time-frame (short-, medium-, long-term) • Priority (low, medium, high) • Responsibility (national/regional)
	Working Group Presentations and discussions
	Plenary discussions on implementation mechanism
	<ul style="list-style-type: none"> • SADC • DAFF • GCP/SFS/001/MUL: Strengthening controls of food safety threats, plant and animal pests and diseases for agricultural productivity and trade in Southern Africa (FAO)
	The Way Forward (what will be presented during Day 3 afternoon)

DAY 2 (6 November, Thurs, whole day) until DAY 3 (7 November, Fri, morning session)

Session 2: Parallel sessions	
Session 2.1 SADC Framework for Aquatic Biosecurity Strategy	Session 2.2 The TILAPIA Project
Session 2.2: The TILAPIA Project 08:30-17:30 (6 November); 08:30-12:00 (7 November) Facilitators: Dr Rohana Subasinghe/Mr Qurban Rouhani/Dr Moetapele Letshwenyo/Dr Simplicie Nouala)	
08:30-17:30 (6 November) 08:30-12:00 (7 November)	Objectives of this session (Dr. Mohamed Seisay)
	The TILAPIA (Trade and improved livelihoods in aquatic production in Africa) Project (Mr Qurban Rouhani and Dr Moetapele Letshwenyo)
	Background, past, present and future aspirations of the TILAPIA project (Dr. Simplicie Nouala)
	Aquatic animal health capacity and biosecurity in Africa: Experience based on previous work in the region (Dr. Rohana Subasinghe)
	<u>Part 1 Working Group Discussions – Current Status and Future Needs</u> Working Group 1: Institutional and human resources capacity to prevent, detect and respond to aquatic animal diseases of economic or public health significance Working Group 2: Policy/legal frameworks aimed at promoting legal trade, addressing unregulated international trade and encouraging investments in domestic production of safe aquatic commodities for human consumption Working Group 3: Private sector investment in aquaculture, with support services being developed along the value chain, leading to spill-over effects benefiting the small scale producers (health services, feed suppliers, seed suppliers, processors, traders, etc.)
	<u>Part 2 Working Group Discussion – Activities of TILAPIA and Implementation Plan</u> Working Group 1: Institutional and human resources capacity to prevent, detect and respond to aquatic animal diseases of economic or public health significance Working Group 2: Policy/legal frameworks aimed at promoting legal trade, addressing unregulated international trade and encouraging investments in domestic production of safe aquatic commodities for human consumption Working Group 3: Private sector investment in aquaculture, with support services being developed along the value chain, leading to spill-over effects benefiting the small scale producers (health services, feed suppliers, seed suppliers, processors, traders, etc.)

DAY 3 (7 November, Fri)	
08:30-12:00	Continue Parallel Sessions 2.1 and 2.2
12:00-13:30	Lunch
Session 3 – Plenary Presentations and Discussion	
13:30-14:00	Plenary Presentation from Session 2.1 SADC Framework for Aquatic Biosecurity Strategy
14:00-14:45	Discussion
14:45-15:15	Tea/Coffee
15:15-16:00	Presentation from Session 2.2 The TILAPIA Project
16:00-16:45	Discussion
16:45-17:15	Consensus Building and The Way Forward
17:15-17:45	Closing Remarks DAFF, FAO, AU-IBAR
8 November, Sat	Departure of Participants

Annex II.b

Guidelines for the preparation of a National Aquatic Animal Health Strategy⁴

prepared by

J. Richard Arthur and Melba B. Reantaso

Countries should develop and formalize national aquatic animal health strategies and health management procedures. Such strategies and procedures should adhere to international and regional standards and be important for countries within a region, particularly those sharing transboundary waterways. (FAO, 2007)⁵

1. WHAT IS A NATIONAL AQUATIC ANIMAL HEALTH STRATEGY?

A National Aquatic Animal Health Strategy (NAAHS) is a broad yet comprehensive strategy to build and enhance capacity for the management of national aquatic biosecurity and aquatic animal health. It contains the national action plans at the short-, medium- and long-term using phased implementation based on national needs and priorities; outlines the programmes and projects that will assist in developing a national approach to overall management of aquatic animal health; and includes an Implementation Plan that identifies the activities that must be accomplished by government, academia and the private sector. The NAAHS should be a short (20–25 page) document clearly articulating a strategy for national aquatic biosecurity and aquatic animal health. The draft framework should be discussed in stakehold consultation and approved in principle by them. The final document should be distributed to national policy-makers, aquaculturists, other stakeholders and the general public; and the NAAHS should be formally adopted by the national government as an official policy document.

⁴ The FAO's involvement in encouraging and assisting FAO member countries to develop National Aquatic Animal Health Strategies dates back to 1998 with the funding under FAO's Technical Cooperation Programme (TCP) of regional project TCP/RAS/6714 "Assistance for the Responsible Movement of Live Aquatic Animals", with the participation of 21 member countries in the Asia-Pacific Region in the development of regional and national strategies for aquatic animal health management (FAO/NACA. 2000. *Asia regional technical guidelines on health management for the responsible movement of live aquatic animals and the Beijing consensus and implementation strategy*. FAO Fisheries Technical Paper No. 402. Rome, FAO. (available at: <ftp://ftp.fao.org/docrep/fao/005/x8485e/x8485e00.pdf>)). A number of subsequent activities by FAO and international, regional and national partners have lead to the preparation of regional strategies (e.g. for Middle Eastern countries, *Proposal for a regional programme for improving aquatic animal health in RECOFI member countries*; (Appendix H of FAO Fisheries and Aquaculture Report No. 876, available at: <ftp://ftp.fao.org/docrep/fao/011/i0572e/i0572e00.pdf>), and for southern African countries, the *Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC)*). Examples of completed national strategies include those for Bosnia and Herzegovina (Government of Bosnia and Herzegovina. 2009. *Draft national aquatic animal health strategy for Bosnia and Herzegovina*, Rome, FAO (available at: <http://www.fao.org/docrep/012/al088b/al088b00.htm>) and Ministerie van Landbouw, Veeteelt en Visserij. 2016. *Draft National Aquatic Animal Health Strategy for the Republic of Suriname*. Rome, FAO, among others.

⁵ FAO. 2007. *Aquaculture development. 2. Health management for the responsible movement of live aquatic animals*. FAO Technical Guidelines for Responsible Fisheries. No. 5, Suppl. 2. Rome, FAO. (available at: <http://www.fao.org/3/b92359f0-8fc7-50cf-882e-8c0c9ebd3d59/a1108e00.pdf>)

2. WHY COUNTRIES NEED TO HAVE A NATIONAL AQUATIC ANIMAL HEALTH STRATEGY

The development of a NAAHS will provide a country with a comprehensive plan of action for a clearly elaborated and agreed upon programme to achieve national objectives for aquatic animal health and biosecurity. It will provide clear objectives for all relevant activities, define the activities that need to be accomplished to reach these objectives, and give an indicative time frame and priority for each activity. The development of a NAAHS involves an extensive process during which the current national aquatic animal health capacity and future goals are assessed and policies, priorities and needs are identified. It is an iterative process involving the national Competent Authority and extensive consultation with key stakeholders from other government agencies, academia and the private sector. National strategic planning for aquatic animal health and biosecurity is a proactive measure. Without such advance planning, a country can only react in a piecemeal fashion to new developments in international trade and the global situation with regard to serious transboundary aquatic animal diseases (TAAADs), and its aquaculture and fisheries sectors will remain highly vulnerable to new and emerging diseases that may severely affect capture fisheries and aquaculture production, leading to major social and economic impacts.

3. RELATIONSHIP OF THE NAAHS TO THE REGIONAL STRATEGY

Where a regional aquatic animal health strategy has already been formulated, as for the Southern African Development Community (SADC), countries within the region will need to take into consideration the considerable relevant work that has already been accomplished at the regional level. In the case of SADC, in 2015 a *Regional Workshop on Improving Aquatic Animal Health Management and Strengthening Biosecurity Governance in Africa* was organized by the Food and Agriculture Organization of the United Nations (FAO) in cooperation with the Department of Agriculture, Forestry and Fisheries of South Africa (DAFF) (under the auspices of the FAO/DAFF Capacity Building Programme) and Africa Union Inter-African Bureau for Animal Resources (AU-IBAR), in partnership with the European Union (EU), SADC, the World Organisation for Animal Health (OIE) and the Standards and Trade Development Facility (STDF). This workshop, held in Durban, South Africa, led to the approval by participants of a regional framework that FAO would subsequently lead in developing into the draft *Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC)*. This regional strategy, renamed the *SADC Aquatic Animal Health Strategy 2015-2020* (SADC-AAHS 2015-2020) was endorsed and recommended for Ministerial approval during the 34th meeting of SADC's Technical Committee on Fisheries (FTC) that was held on April 2015 in Johannesburg, South Africa.

4. WHAT ARE THE ESSENTIAL ELEMENTS NEEDED TO DEVELOP A NAAHS?

The factors essential to the development of a NAAHS include: a good driver of the process (i.e. Competent Authority, committee, commission, task force, focal person), with clear terms of reference (TOR); stakeholder consultation; approval from the highest authority; a detailed implementation strategy; monitoring and review; proposal development; and sufficient funding.

5. OVERVIEW OF RECOMMENDED STEPS IN DEVELOPING A NAAHS

The following are the key steps recommended by FAO that member countries should follow in developing a NAAHS:

1. Form a national working group or committee within the Competent Authority with clear mandates and responsibilities for developing the NAAHS.
2. Conduct a strengths, weaknesses, opportunities and threats (SWOT) analysis
3. Conduct a gap analysis to assess existing national capacity and needs (e.g. the FAO National Aquatic Animal Health Capacity and Performance Survey)
4. Develop a National Pathogen List (NPL) and, if possible determine the national appropriate level of protection (ALOP).
5. Develop a framework for the NAAHS (i.e. select the major programmes to be included within the NAAHS)
6. Develop the contents of the NAAHS (e.g. background, purpose, vision, guiding principles and programmes.
 - a. For each programme, develop the following sections: programme title, objectives and projects.
 - b. For each project, outline the activities that need to be conducted to accomplish the project, their national priority (e.g. high, medium, low) their time frame (e.g. short- , medium- or long-term), and the responsible agencies.
7. Once a draft NAAHS has been prepared and agreed upon within the national Competent Authority, hold a stakeholder meeting(s) to receive inputs, suggestions and consensus.
8. Make final revisions to the NAAHS and present to the approving authority (typically the Minister) for official approval.
9. Develop a detailed implementation strategy for the NAAHS, including identification of key personnel, infrastructure and a detailed budget and time frame, including provisions for regular review and updating.

6. DETAILED GUIDANCE

1. National Working Group

It is important that the national Competent Authority appoint a national working group (NWG), committee or task force that will be charged with developing the NAAHS and guiding progress towards its completion and implementation. The number of members can vary depending of the national situation, but might include three members with main responsibility for drafting the NAAHS and several others who will provide regular guidance and feedback. The members should be assigned to the committee by the head of the Competent Authority (Chief Veterinary Officer , Deputy Minister, etc.) and have clearly defined positions, terms of reference and responsibilities. The NWG should have a clear time table for development of the NAAHS and regularly scheduled meetings to report on progress and resolve any issues. An example of such a committee is attached as Annex II.b(A).

2. SWOT Analysis

Early on, a strengths, weaknesses, opportunities and threats (SWOT) analysis should be conducted to provide some initial critical insights into the key national factors that could

influence the contents of the framework for the NAAHS. A SWOT analysis is an informal "brainstorming" session and can be conducted by the members of the NWG or during a national stakeholders' workshop. It will be useful to circulate the results of the SWOT analysis to several key stakeholders (e.g. aquaculturists, academics, experts in other government agencies) for their comments. SADC Member Countries should take into consideration the results of the regional SWOT analysis that was conducted during the *Regional Workshop on Improving Aquatic Animal Health Management and Strengthening Biosecurity Governance in Africa*, given in Annex II.b(B).

3. Gap Analysis

Before deciding where your country is headed, in terms of aquatic animal health and biosecurity, you need to determine and concisely summarize exactly where your country currently stands with regards to expertise, capacity, infrastructure etc. in the various relevant areas. To assist national governments in establishing this reference point, the FAO has developed the *National Aquatic Animal Health Capacity and Performance Survey* (the FAO Self-assessment Survey). This self-assessment survey should be completed by the Competent Authority, with the assistance of other government agencies, academia and the private sector, as required. Its purpose is:

- to obtain information on national capacity and the agencies mandated to implement aquatic animal health programmes and support aquaculture through healthy production;
- to seek opinions on the components and activities that might be included in a national aquatic animal health strategy; and
- to help guide /or national strategic planning for improving aquatic animal health and assuring adequate and rational support services

The FAO Self-assessment Survey is divided into 17 sections, as follows:

1. International trade in live aquatic animals and national border controls
2. Control of domestic movement of live aquatic animals and other domestic activities that may spread pathogens
3. Policy and planning
4. Legislation
5. Disease surveillance
6. Disease diagnostics
7. Emergency preparedness and contingency planning
8. Extension services
9. Compliance and enforcement
10. Research
11. Training
12. Expertise
13. Infrastructure
14. Linkages and cooperation
15. Funding support
16. Current challenges and constraints
17. Additional information

Detailed and accurate completion of the FAO Self-assessment Survey will allow NWG to identify the key areas that need to be addressed in the NAAHS and to focus on those areas that need to be addressed by specific projects and activities.

In 2015, the FAO Self-assessment Survey was completed by 14 of the 15 SADC Member Countries, and the results are summarized in the following FAO document: Arthur, J.R., Reantaso, M.B. & Mapfumo, B. *Southern African Development Community (SADC) Regional Aquatic Animal Health Capacity and Performance Survey: Summary of Survey Results and Analysis*. SADC Member Countries should update the information provided in this document before developing their NAAHS. Countries that have not completed a gap analysis may do so using the blank form attached as Annex I in the above document.

4. National Pathogen List and ALOP

Countries should establish lists of serious pathogens of national concern. Such lists should include those serious pathogens and diseases that are established in national territory but which have not yet spread to all geographical areas, those that are under national control and/or eradication programme, and those pathogens that are exotic but whose entry and spread are judged to pose serious risks to national aquatic resources. National pathogen lists should include, as appropriate, those pathogens and diseases listed by the World Organisation for Animal Health, as well as other pathogens of national significance. (FAO, 2007)⁶

Diseases which are included on a national list of significant pathogens should merit the effort which will be required to control their entry, establishment or spread within the country and Region. Although this usually means that diseases of commercially important species are given priority, diseases of other species that may be of socio-economic importance (e.g., those affecting artisanal fisheries) should not be overlooked. (FAO/NACA. 2002)⁷

Having a national pathogen list (NPL) is important in that it will help to identify the diseases of national concern, allowing the formulation of programmes to identify infected aquatic animals (disease diagnostics) and measures to prevent their entry and/or spread into the country. The listed diseases, along with the national appropriate level of protection (ALOP, see below) will allow the Competent Authority to better define specific needs with regards, to biosecurity, including needs for specialized expertise, training, infrastructure, disease diagnostics, surveillance, etc.

Another important consideration is the country's appropriate level of protection (ALOP), which is a political statement as to the level of pathogen risk that the country considers acceptable when considering importations of live aquatic animals and their products. A high ALOP will mean a low acceptable level of risk (ALOR), which may require a higher level of biosecurity measures. Countries within the same region or having shared river basins or coastlines should attempt to harmonize their national ALOPs and pathogen lists, as weak biosecurity by one country may place neighbouring countries at risk of incursions by TAADs.

A separate set of *Guidelines for the Preparation of National Aquatic Pathogen Lists* has been

⁶ FAO. 2007. *Aquaculture development. 2. Health management for the responsible movement of live aquatic animals*. FAO Technical Guidelines for Responsible Fisheries. No. 5, Suppl. 2. Rome, FAO. (available at: <http://www.fao.org/3/b92359f0-8fc7-50cf-882e-8c0c9ebd3d59/a1108e00.pdf>)

⁷ FAO/NACA. 2002. *Manual of procedures for the implementation of the Asia Regional Technical Guidelines on Health Management for the Responsible Movement of Live Aquatic Animals*. FAO Fisheries Technical Paper No. 402/1. Rome, FAO. (available at: <ftp://ftp.fao.org/docrep/fao/005/x8485e/x8485e00.pdf>).

prepared by FAO to assist you in drafting or revising a NPL.

5. NAAHS Framework

The core of the framework for the NAAHS is the list of Programmes (these are sometimes also termed the "Elements") that will be included. The initial list of Programmes can be determined by the NWG, based on the results of the SWOT analysis, the Gap Analysis and the NPL. The following is a listing of the possible Programmes that could be included within a NAAHS framework, along with a brief description of each. It should be noted that the contents of a NAAHS will vary depending on an individual country's situation, and thus may not include all the Programmes listed below (alternatively, additional Programmes may be identified as having national importance and thus need to be included):

1) Policy, Legislation and Enforcement

Policy refers to a national long-term (typically >20 years) government programme outlining **what** is to be achieved in broad terms. It includes the government's major goals and objectives for the sector and recommendations for its sustainable development. In contrast, a *strategy* is typically a mid-term (5–15 year) plan and outlines **how** the national policy is to be achieved. It contains specific objectives and outputs, a time frame, indicators of performance, and provision for monitoring and review. *Legislation* is, of course, the sum total of laws, regulations, and other legally binding documents issued by the government to enforce its policies. The inclusion of a NAAHS as a component of national biosecurity policy and aquaculture development may be new to some authorities, and policy-makers may not realize the urgency of formulating effective regional and national aquatic biosecurity strategies and acting on the respective programme activities needed to implement them. To have an effective national policy for aquatic animal health and biosecurity, identification of the Competent Authority on aquaculture and aquatic animal health is essential. The advantages of harmonizing aquatic animal health policy among countries belonging to the same region or subregion are many and include facilitated trade in live aquatic animals and their products and increased aquatic biosecurity for all countries. To address aquatic biosecurity adequately and to support improved national aquatic animal health policy, the national legislation should be reviewed and where necessary, updated and/or revised. In some cases, new legislation should be drafted to support aquatic animal health and aquatic biosecurity.

2) Risk Analysis

Risk analysis is a structured process that provides a flexible framework within which the risks of adverse consequences resulting from a course of action can be evaluated in a systematic, science-based manner. Import risk analysis (IRA) is an internationally accepted method for deciding whether trade in a particular commodity (a live aquatic animal or its product) poses a significant risk to human, animal or plant health and, if so, what measures, if any, can be applied to reduce that risk to an acceptable level. All countries having international trade in live aquatic animals should have a minimum level of capacity to assess possible risks due to pests (invasive aquatic alien species) and pathogens.

3) Pathogen List

National pathogen lists (NPLs) are essential for health certification, disease surveillance and monitoring, emergency response planning, prevention and control of diseases in aquaculture facilities, etc. Clearly established criteria for listing/delisting of diseases (based on internationally accepted methods) should be established. OIE-listed diseases that are relevant to national conditions form a good starting point; however, the OIE-listed diseases are those of internationally traded commodities, while NPLs must also consider other serious diseases of national concern. NPLs need to be founded on a thorough knowledge of a country's disease status, which can only be obtained through passive and active disease surveillance programmes, generalized disease/pathogen surveys, adequate disease record keeping and reporting, and a national disease database.

4) Border Inspection and Quarantine

Border inspection includes all those activities regulating the importation and exportation of live aquatic animals and their products that are conducted by the national Competent Authority and national customs officers at international airports, land border posts and sea ports of international entry. *Quarantine* is the holding of aquatic animals under conditions that prevent their escape, and the escape of any pathogens or "fellow travellers" they may be carrying, into the surrounding environment. Quarantine may be conducted preborder (in the exporting country), border (at the border post of the importing country) or postborder (at a quarantine facility operated directly by the Competent Authority or by the private sector, under the standards and supervision of the Competent Authority). Quarantine is one of a number risk mitigation measures that may be applied to shipments of live aquatic animals to reduce the risk of introducing serious pathogens and pests.

5) Disease Diagnostics

Adequate disease diagnostic capability is an essential component of any national or regional aquatic biosecurity programme. Disease diagnostics plays two significant roles in health management and disease control. The first role of diagnostics is to ensure that stocks of aquatic animals that are intended to be moved from one area or country to another are not carrying infection by specific pathogens at subclinical levels, and is accomplished through screening of apparently healthy animals. The second equally important role of diagnostics is to determine the cause of unfavourable health or other abnormalities in order to recommend measures appropriate to a particular situation. The accurate and rapid diagnosis of an outbreak of disease in a cultured or wild population is essential to preventing further losses through correct treatment, and to disease containment and, where possible, eradication. Diagnostics is also a key supporting element of quarantine and health certification, surveillance and monitoring, zoning (including demonstration of national freedom from a disease), etc. Diagnostics includes both simple, pond-side methods and more advanced laboratory-based techniques requiring a high level of expertise and infrastructure.

6) Farm-level Biosecurity and Health Management

Farm-level biosecurity and health management includes such aspects as farm registration programmes, development of standard operating procedures (SOPs) and best management practices (BMPs), certification programmes for broodstock and postlarvae for fry, pond-side diagnostic techniques, disease reporting, farm-level-contingency planning for disease outbreaks, staff training, promotion of farmer associations, etc.

7) Use of Veterinary Drugs and Avoidance of Antimicrobial Resistance (AMR)

Access to safe and effective veterinary drugs is essential to the success of semi-intensive and intensive aquaculture, as in some instances entire stocks may be lost if such drugs are not available. However, veterinary drugs, if inappropriately used, may be ineffective or may lead to unacceptable residue levels in aquaculture products. The presence of residues in exported aquaculture products that are above the importing country's acceptable levels may lead to bans on importation, with severe impacts on a country's aquaculture industry. It is thus essential that countries establish mechanisms (e.g. laws, regulations, guidelines, standard operating procedures) to ensure the safe use of veterinary drugs, along with testing and monitoring programmes to ensure trading partners that national aquaculture products are safe and meet importing country standards. Antimicrobial resistance (AMR) is the development of bacterial strains that are resistant to antibiotics that have been inappropriately used in aquaculture and other farming systems. AMR is a growing problem, as the use (and misuse) of some antibiotics critical to human medicine by aquaculture and terrestrial farming systems has led to the development of "superbugs", reducing the effectiveness of some essential antibiotics in treating infections in humans.

8) Surveillance, Monitoring and Reporting

Disease surveillance is a fundamental component of any official aquatic animal health protection programme. Surveillance and monitoring programmes are essential for the detection and rapid emergency response to significant disease outbreaks and form the basis for early warning of exotic incursions or newly emerging diseases. They are also increasingly demanded by trading partners to support statements of national disease status and are the basis for disease zonation. Surveillance also provides the building blocks of information necessary to have an accurate picture of the distribution and occurrence of diseases relevant to disease control and international movement of aquatic animals and their products. Surveillance can be passive (reactive and general in nature) or active (proactive and targeted). In both cases, there must be adequate reporting mechanisms so that suspected cases of serious disease are quickly brought to the attention of the Competent Authority. Surveillance and monitoring efforts must be supported by adequate diagnostic capability (including appropriately trained expertise, suitably equipped laboratory and rapid-response field diagnostics, and standardized field and laboratory methods), information system management (i.e. a system to record, collate and analyze data and to report findings), legal support structures, transport and communication networks and linked to national and international (OIE) disease reporting systems (e.g. pathogen list or list of diseases of concern, disease notification and reporting procedures). Surveillance to demonstrate freedom from a specific disease requires a well-designed active surveillance programme that meets the standards outlined in the *OIE Aquatic Animal Health Code, 2016*.

9) Communication and Information Systems

Communication includes activities that increase the flow of information between and among national policy-makers, researchers, Competent Authorities, regional bodies and international agencies and experts. Communication activities assist with problem solving and keep national experts, who may be working in relative isolation, up to date with regard to the regional and global aquatic animal health situation. It is especially important to an effective national aquatic animal biosecurity programme to establish and promote good communication and linkages between national veterinary services and national fisheries authorities.

Communication may include development of national and regional aquatic animal health information systems and networks.

10) Zoning and Compartmentalization

Zoning and compartmentalization are mechanisms that allow a particular geographical unit (e.g. subregion, drainage basin, coastal area, cluster of aquaculture establishments or even a single establishment) to establish and maintain officially recognized freedom from a specified disease or diseases, even though surrounding units may be infected. A *zone* is a portion of one or more countries comprising an entire water catchment from the source of a waterway to the estuary or lake, or more than one water catchment, or part of a water catchment from the source of a waterway to a barrier that prevents the introduction of a specific disease or diseases, or part of a coastal area with a precise geographical delimitation, or an estuary with a precise geographical delimitation, that consists of a contiguous hydrological system with a distinct health status with respect to a specific disease or diseases. A *compartment* is one or more aquaculture establishments under a common biosecurity management system containing an aquatic animal population with a distinct health status with respect to a specific disease or diseases for which required surveillance and control measures are applied and basic biosecurity conditions are met for the purpose of international trade (see the OIE Aquatic Animal Health Code, 2016). In addition to contributing to the safety of international trade, zoning and compartmentalization may assist disease control or eradication.

11) Emergency Preparedness and Contingency Planning

Emergency preparedness is the ability to respond effectively and in a timely fashion to disease emergencies (e.g. disease outbreaks, mass mortalities). The capability to deal with emergency disease situations requires a great deal of planning and coordination (including establishing operational, financial and legislative mechanisms) and making available required resources (i.e. skilled personnel and essential equipment). As long as there is importation of live aquatic animals, the possibility of serious disease outbreaks due to exotic pathogens will exist. Even under the best of circumstances, pathogens will occasionally escape detection, breach national barriers, become established, spread and cause major losses. The extent to which losses occur often depends on the quickness of detection (which depends on the effectiveness of disease surveillance, diagnostics and reporting programmes) and the rapidity and effectiveness with which governments recognize and react to the first reports of serious disease. As quick and effective reaction (containment and/or eradication) is largely dependent upon contingency planning, all countries need to develop such plans for key cultured species and diseases.

12) Research and Development

Research capacity in aquatic animal health is necessary to the successful expansion of aquaculture development. Targeted and basic research can lead to better disease management, better understanding of national aquatic animal health status, support to risk analysis, improved diagnostic methods, etc. Where specific research capacity is lacking, countries must rely, to a large extent, on research conducted by scientists in other nations. Often, such “borrowed” research may not be directly applicable to local situations and experimental testing must be undertaken to adapt these findings. In other cases, little or no relevant information on the specific problem may be available. There are many mechanisms to improve access to research capacity. These include development of national aquatic animal health research laboratories, supporting linkages and research programmes within universities

and the private sector, contracting of targeted research with foreign institutions, and development of a regional aquatic animal health centre. Targetted national research needs to be supported to allow a better understanding of those aquatic diseases that have recently been introduced into national territory. The impact and spread of such diseases among indigenous species and the spread of such diseases among widely divergent catchments is often poorly studied. A better knowledge of such transboundary aquatic animal diseases (TAADs) under local conditions is vital for the sustainable development of national aquaculture production and the maintenance of aquatic biodiversity.

13) Institutional Structure (Including Infrastructure)

Infrastructure for aquatic animal health encompasses the essential facilities and systems serving a country and thus includes dedicated physical structures such as buildings for office space, diagnostic and other laboratories, quarantine facilities, tank rooms, experimental ponds, etc. Adequate and appropriate infrastructure is essential to the success of any national aquatic biosecurity programme. Institutional Structure includes the organizational hierarchy and inter- and intra-organizational relationships between the Competent Authority and other relevant governmental agencies. In some instances national organizational structures, hierarchies and lines of reporting and communication may need to be restructured in order to achieve efficient and effective national biosecurity.

14) Human Resources and Institutional Capacity

Human resources and institutional capacity development refers to having the correct number of staff with the appropriate expertise to accomplish the essential tasks that have been identified as part of a NAAHS. This requires the hiring and/or training of scientists, veterinarians and other staff possessing critical expertise and training in the key areas of aquatic animal health (often at the PhD, MSc and DVM (with specialized training in aquatic pathology) level, including, for example, disease diagnostics, aquatic biosecurity, aquatic veterinary medicine, risk analysis, aquatic epidemiology, emergency preparedness, extension services, enforcement, border control, information services, etc. In addition, a programme to maintain and upgrade expertise through short-term and other training, attendance at international conferences and meetings, international collaboration, etc. must be established.

15) Regional and International Cooperation

Cooperation refers to the sharing of effort and resources (e.g. staff, infrastructure, funding) between and/or among countries, government agencies, universities, the private sector and other stakeholders to achieve common objectives or goals. Cooperation in research and training is possible via international agencies such as the FAO and OIE and with foreign universities and experts. There is a great potential for regional cooperation and networking in almost all areas of aquatic animal health. Examples include the development of standardized procedures for import and export of live aquatic animals, harmonization of legislation, shared communication structures (websites, newsletters), development of a regional aquatic animal health information system (pathogen database, regional disease diagnostic and extension manuals), cooperative research programmes, development of regional strategy and policy, regional disease reporting, a regional emergency response system, regional reference laboratory, regional risk analysis case studies, coordinated training efforts, etc. At the national level, cooperation between agencies, particularly those agencies responsible for fisheries and

aquaculture, veterinary services, biosecurity and environmental/conservation issues, should be promoted.

6 Develop the contents of the NAAHS

In preparing the NAAHS, it should be kept in mind that this is a relatively short and concise policy document that should be written in a form that is easily understood by all stakeholders and the general public. (It is suggested that once approved as policy, the NAAHS should be published as a booklet with a length of 20-25 pp.) The NAAHS can consist of the following (brief) sections:

A. Introduction

- Background
- Scope
- General Information
- Aquatic Resources and Biodiversity
- Status of National Aquaculture Development
- Potential of Aquaculture
- International Trade in Live Aquatic Animals
- Status of Aquatic Animal Health in the Country
- Aquaculture Policy and Aquatic Animal Health
- The Way Forward

B. Statement of purpose - "the Why?"

A concise statement of what the NAAHS is intended to accomplish, for example:

“The purpose of the NAAHS is to reduce the risk of aquatic animal diseases impacting on the sustainable development of aquaculture, aquatic biodiversity, food safety and food security and the economy.”

C. The Vision - "the Where?"

A statement of where the NAAHS will lead your country, for example :

“To develop and maintain up-to-date an aquatic animal health management strategy in [country name] that will be able to support the sustainable development and management of the aquaculture sector, protect aquatic biodiversity, meet growing consumer demands for aquatic foods and products that are of high quality, safe, with maximum opportunity for profitability in all stages of the aquaculture product chain”.

D. The Guiding Principles - "Doing the right thing"

The Guiding Principles provide guidance in all circumstances, irrespective of changes in goals, strategies, work plan, structure or management of the NAAHS. They should accept and incorporate relevant international aquatic

animal health standards to ensure harmonization, transparency and equivalence and that the country be internationally recognized with respect to national aquatic animal health status.

The Guiding Principles may include principles based on, for example, the FAO *Technical Guidelines on Safe Transboundary Movement of Live Aquatic Animals*, as well as some general principles concerning economic, social and environmental conduct. An example of a Guiding Principle that might be included in a NAAHS is the statement that:

1. Aquatic animal health management should enable aquaculture to make a positive contribution to [country name] economy through being internationally competitive in the marketplace and economically viable at a national level.

The National Aquatic Animal Health Strategies of SADC Member Countries should include all of the Guiding Principles expressed in the SADC-AAHS 2015-2020, as well as any additional Guiding Principles relevant to the national situation.

E. The Programmes And Projects

There are many possible arrangements for programmes and projects (note that projects are often termed "activities"). However, within the NAAHS, all programmes are interconnected, and thus progress in one area is often linked with progress in others. It is important that all Programmes identified as important in the NAAHS framework are included.

When finalized each Programme should contain the following sections:

- Objectives – a brief statement of what the programme will achieve;
- Current Status – a short background summary of the current status of activities related to the programme;
- Projects – brief summaries of the projects to be implemented within the programme.
- Related activities – a summary listing of the other Programmes and Projects that may depend on or be linked to the current Programme.

For each Project, identified for the Programme under consideration, you will need to formulate:

- the Project title
- a brief description of the Project
- its time frame (short-, medium or long-term)⁸
- its priority (low, medium, high)⁹
- the responsible agency or sector (e.g. government, academe and/or private sector)

SADC Member Countries should take into consideration the 39 Projects outlined in the

⁸ Time frame can be further defined as Short-term: 1–2 years, Medium-term: 3–5 years or Long-term: 5–10 years.

⁹ Priority can be further defined as: Low: desirable but not essential, Medium: important and essential, but less urgent, or High: urgent, requires immediate action.

SADC-AAHS 2015-2020, 38 of which have an identified national responsibility. Examples of finalized Programmes and their associated Projects can be found in the SADC-AAHS 2015-2020.

F Implementation

A brief section on how the NAAS will be implemented should be included. This may include, for example, how proposals for the various projects will be developed such that they can be submitted to external donor agencies for possible funding. It should also be stated that once the NAAHS has been approved as policy, a separate Implementation Plan will be developed that will include detailed information on each Project, including staffing requirements, needed infrastructure and equipment, detailed time frame with measurable goals and an associated budget. It is useful to include a table at the end of the NAAHS summarizing all the Programmes and Projects, indicating the title, priority, time frame and responsibility for each Project. (an example of such an Implementation Table can be found in the SADC-AAHS 2015-2020.

7. Stakeholder consultation

The NWG will need to develop a plan for stakeholder consultation throughout the entire process of developing the NAAHS. This may include the holding of stakeholder meeting(s) at various points in the process (and particularly, once the draft NAAHS has been prepared) where the reason for developing the NAAHS is presented, along with the draft framework and contents. During these meetings, stakeholders are informed and comments and suggestions for changes to the NAAHS are discussed. During the final stakeholder meeting, the NWG should seek approval in principle of the NAAHS. This process ensures that all stakeholders are informed, consulted and will have a feeling of "ownership" or at least agreement on the contents of the NAAHS. Use of the Internet via a Website may also be a affective way to identify and inform stakeholders and seek their inputs to the NAAHS.

8. Final Revisions

Once the NWG has entered any final changes and satisfied with the NAAHS, and stakeholder approval has been achieved, the final version of the NAAHS must then be officially adopted as government policy. This will involve approval or signing by the Minister or head of the Competent Authority. It goes without saying that senior officials should be kept informed during the development of the NAAHS.

9. Detailed Implementation Plan

Once the NAAHS has been officially adopted by the government, the NWG (or an newly established group or committee) should be charged with developing a detailed plan for its implementation. Such a plan should include identification of key personnel for each Programme and Project, needed infrastructure, equipment, training, etc. and a detailed budget and time frame, including provisions for regular review and updating. The Implementation Plan should include the development of detailed proposals for each Project, so that these can be circulated to international and regional funding agencies for possible financial support. However, in the end, once the government has approved the NAAS and its Implementation Plan, it is the government's responsibility to allocate adequate funding and other support to accomplish the strategy.

**Example of the Terms of Reference and Composition of a Committee for the
Development of National Aquatic Animal Health Strategy**

**TERMS OF REFERENCE FOR THE
COMMITTEE ON THE NATIONAL STRATEGY FOR AQUATIC ANIMAL
HEALTH FOR MALAYSIA (NSAAHM)¹⁰**

DRAFT

1.0 PURPOSE

The **Committee** will provide strategic direction and leadership in the process of **revision, finalisation and approval** of the **National Strategy on Aquatic Animal Health for Malaysia (NSAAHM)** document to ensure Malaysia has a well-defined and guided policy on aquatic animal health management.

2.0 TERM

The Committee will come into effect / be operative from the 1st of August 2016 and will **terminate one (1) year after** the date of effect or if the process of NSAAHM requires less or more time; as determined with the consensus of the **Committee**.

3.0 MEMBERS

NO.	MEMBERS	POSITION	RESPONSIBILITY
1	SENIOR DIRECTOR of Fisheries Biosecurity Division	Chairperson	Take a lead role in implementing the tasks/ mandate of NSAAHM; direct reporting of the outcomes of NSAAHM meetings to the Director-General and of DOF.
2	HEAD OF SECTION of Fish & Public Health	Vice- Chairperson	Assist the Chairperson in implementing the tasks/mandate of NSAAHM and act as the Chairperson in the event of an absence of the Senior Director.
3	Fish & Public Health Section	Secretariats	Take notes and finalise minutes of meetings and important decisions reached and receive progress reports on every activity planned.
4	Aquaculture Development Division	Member	Contribute to agenda settings, discussions and decisions representing the interests of the aquaculture industry.
5	Planning & Development Division	Member	Contribute to agenda settings, discussions and decisions representing the interests of fisheries program planning and development.
6	National Fish Health Research Center	Member	Contribute to agenda settings, discussions and decisions representing the interests of fisheries

			research and expertise.
7	State Fisheries Biosecurity Sections / Centers	Member	Contribute to agenda settings, discussions and decisions representing the interests of fisheries in state-level.
8	Department of Fisheries Sabah	Member	Contribute to agenda settings, discussions and decisions representing the interests of fisheries in Sabah.
9	Department of Agriculture Sarawak	Member	Contribute to agenda settings, discussions and decisions representing the interests of inland fisheries in Sarawak.
10	Crops, Livestock and Fisheries Industry Division	Member	Contribute to agenda settings, discussions and decisions representing the interests of the Ministry of Agriculture & Agro-based Industries.
11	Malaysian Quarantine & Inspection Services	Member	Contribute to agenda settings, discussions and decisions representing the interests of the Malaysian border control.

***Note:** Every membership will have a permanent and an alternate member that are name-appointed and only these appointed members are allowed to attend the NSAAHM meetings.

4.0 ROLES AND RESPONSIBILITIES

The committee as a whole will be entrusted to:

- i. Develop the agenda, responsibility and estimated time-frame for the preparation, revision, approval and endorsement of the NSAAHM.
- ii. Conduct scheduled meetings and / or other medium of communication deemed appropriate.
- iii. Ensure the progress and completion of activities / programs that are decided by the committee as integral parts of the NSAAHM.
- iv. Appoint new or exclude any appointed members based on logical and necessary reasons through a consensus.
- v. Appoint any sub-groups / working groups / advisory groups / technical groups regarding NSAAHM as a supporting entity to the committee.
- vi. Record and retain information regarding meetings, discussions, progress reports, drafts and any other information that are vital to the NSAAHM.
- vii. Report and submit documents regarding the details of planning, progress and completion of the draft NSAAHM to the Director-General of Fisheries Malaysia.
- viii. Ensure the completed NSAAHM receive endorsement from the Director-General of Fisheries Malaysia and approval from the Minister of Agriculture & Agro-based Industries by the first quarter of the year 2017.

The membership of this committee will commit to:

- i. Appoint by-name a permanent and an alternate member to this committee.
- ii. Attend all scheduled meetings regarding the NSAAHM.
- iii. Wholeheartedly commit to the success of the NSAAHM document within and outside work areas.
- iv. Share all communications and information regarding NSAAHM across all members of the committee.
- v. Make good decisions and take immediate action so as to not hold up the success of the NSAAHM.

- vi. Notify all members of the committee as soon as possible regarding any issues that arise that may affect the development of the NSAAHM.

The membership of this committee will expect:

- i. To be provided by accurate and complete information regarding NSAAHM in an acceptable time-frame.
- ii. To be provided an acceptable time-frame to make key decisions regarding NSAAHM.
- iii. To be alerted to any potential risks or issues that may impact the development of the NSAAHM.
- iv. Honest and open discussions without any misleading assertions from any members.

5.0 MEETINGS

- i. All meetings regarding NSSAHM will be chaired by the Senior Director of the Fisheries Biosecurity Division.
- ii. At the absence of the Senior Director, only the Head of Fish & Public Health Section may be appointed as chairperson.
- iii. The meeting quorum will be appointed by at least 11 members of the committee as appointed.
- iv. Only the named permanent and / or alternate member may attend the meetings.
- v. All decisions must be made by consensus (i.e. members are satisfied with the decision even though it may not be their first choice). If not possible, the chairperson may make the final decision.
- vi. Minutes and agendas will be recorded and distributed by the Fish & Public Health Section, appointed as secretariat to the committee.
- vii. Meetings will be held at least three (3) times as scheduled by the committee through consensus.
- viii. If required, sub-group meetings may be arranged outside the scheduled times convenient to the sub-group members.

6.0 AMMENDMENTS / MODIFICATIONS / VARIATIONS

This Terms of Reference may be amended, varied or modified in writing after consultation and agreement through consensus of the committee members.

Endorsed by,

Approved by,

(AHMAD HAZIZI BIN AZIZ)
Senior Director
 Of Fisheries Biosecurity Division

(DATUK HJ. ISMAIL BIN ABU HASSAN)
Director-General
 of Fisheries Malaysia

Date:

Date:

Annex II.b(B)

Strengths, weaknesses, opportunities

and threats (SWOT) analysis for the SADC Region¹¹

<p style="text-align: center;"><u>STRENGTHS</u></p> <ul style="list-style-type: none"> • A SADC regional aquaculture strategy is being finalized • 12 countries have aquaculture strategies • Management authorities are in place • Surveillance for shrimp diseases is taking place in some countries • Disease reporting mechanisms exist through OIE Aquatic Animal Focal Points and for disease notification in general • Shared rivers/waterbodies (Chobe/Zambezi, Mozambique, Limpopo, Orange River, Kunene) • Diagnostic services are available in Madagascar, South Africa, Zambia and Zimbabwe • Aquaculture associations are established in Madagascar, Mozambique, Namibia, South Africa, Zambia and Zimbabwe 	<p style="text-align: center;"><u>WEAKNESSES</u></p> <ul style="list-style-type: none"> • Pollution, environmental degradation • Only three countries have aquatic animal health strategies • Lack of competence and personnel for aquatic animal health • Lack of complete political will • Lack of legal support for aquatic animal health in some countries • Risk pathways factors are not well known • Insufficient communication results in slow response to emergencies
<p style="text-align: center;"><u>OPPORTUNITIES</u></p> <ul style="list-style-type: none"> • South Africa, Zambia and Zimbabwe can form a consortium of universities • Continuing refresher courses are possible • Funding is available from external donors • Regional networks exist and can be further developed • Aquatic animal health services are available and can be enhanced (Zambia (EUS), South Africa (molluscs), Zimbabwe and South Africa (tilapia), Madagascar (shrimp)) 	<p style="text-align: center;"><u>THREATS</u></p> <ul style="list-style-type: none"> • Serious transboundary aquatic animal diseases (TAADs) are now present in the region (KHV, EUS, WSSV) • Mechanisms for the control of importations of live aquatic animals and any diseases or pathogens they may carry are often weak • Ornamental fish imports represent an unknown risk of introducing diseases • Aquaculture poses the risk of spreading diseases to wild fish populations, introducing aquatic invasive species (AIS) and genetic harms • The spread of diseases from aquafarms to wild fish populations is possible

¹¹ Extracted from FAO. 2015. Report of FAO/DAFF/AU-IBAR/SADC Regional Workshop on Improving Aquatic Animal Health Management and Strengthening Biosecurity Governance in Africa. Durban, South Africa, 5–7 November 2014. FAO Fisheries and Aquaculture Report No. 1023. Rome. Xx pp.

ANNEX II.c**List of participants****ANGOLA**

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ANNEX II.d

Workshop group photograph



Improving Aquatic Animal Health Management and Strengthening
Biosecurity Governance in Africa
The THREE CITIES - The Square Boutique Hotel & Spa (Umhlanga)
Durban, South Africa, 5 – 7 November 2014



ANNEX II.e

Opening Statements

Regional workshop

Improving Aquatic Animal Health Management and Strengthening Biosecurity Governance in Africa

Durban, South Africa, 5 – 7 November 2014

**Opening Statement by:
Dr. Tobias Takavarasha
FAO Representative in South Africa**

- The Deputy Director General – Department of Agriculture Forestry and Fisheries (DAFF)
- Representatives from the Africa Union Inter-African Bureau for Animal Resources (AU-IBAR)
- Representatives from the SADC Secretariat
- Representatives from the World Organisation for Animal Health (OIE)
- Representatives from the Food and Agriculture Organisation of the United Nations (FAO)
- Distinguished guests
- Colleagues,
- Ladies and Gentlemen,

I sincerely appreciate this opportunity to be with you today at the official opening of the “**REGIONAL WORKSHOP: Improving Aquatic Animal Health Management and Strengthening Biosecurity Governance in Africa**”. On behalf of the FAO, I wish to welcome you all to this event. I wish to thank the organisers for hosting and conducting this Workshop, which is of great importance to the African fisheries and aquaculture sector actors.

Ladies and Gentlemen,

As you are aware, FAO’s mandate is to eradicate hunger and malnutrition, fight poverty and ensure the sustainable and economic use of natural resources.

Sustainable fisheries and aquaculture play a crucial role in food and nutrition security and in providing for the livelihoods of millions of people. Fish are an important source of food for many African people, providing around 18 percent of their animal protein. With a growing and rapidly urbanizing population and capture fisheries largely reaching their limit, many countries are now looking towards aquaculture to supply an increasing demand for fish.

According to the FAO State of World Fisheries and Aquaculture 2014¹², the overall growth in aquaculture production remains relatively strong owing to the increasing demand for food fish among most producing countries. World food fish¹³ aquaculture production continues to grow at an average annual rate of 6 percent, at 70.5 million tonnes in 2013 up from 66.6

¹² <http://www.fao.org/3/a-i3720e.pdf>

¹³ This excludes non-food aquaculture items such as algae, seaweeds, ornamental fish and other products

million tonnes valued at US\$137.7 billion in 2012, thus becoming the fastest food producing industry.

Although our capture fisheries seem to have reached their limit, or are stagnating, effective fisheries management regimes and governance can help alleviate the situation and ensure the sustainability of the resource for our future generations.

Like anywhere else in the world, ladies and gentlemen - the health of our aquatic organisms, including fish have been threatened by disease outbreaks. Most of you may recall the challenges faced by the region since 2008, of two very significant aquatic diseases - the Epizootic Ulcerative Syndrome (EUS) of cultured and wild finfish in the Chobe-Zambezi River ecosystem and the White Spot Disease (WSD) of cultured shrimp in Mozambique and Madagascar. This has served as a wake-up call to Africa.

With the increasing expansion and intensification of aquaculture, it is clearly evident that new diseases are emerging and many pathogens are moved through trans-boundary movement of fish, causing disease outbreaks in many parts of the world. Most disease outbreaks are linked to the movement of live aquatic animals. It is therefore important that aquatic biosecurity in the region be strengthened through appropriate policies strategies and regulatory frameworks.

Ladies and Gentlemen,

FAO in South Africa (FAOZA) has a co-operation agreement with the government of South Africa, through Department of Agriculture, Forestry and Fisheries (DAFF) to develop policies, programmes and projects to reduce hunger and malnutrition; to help develop the agricultural, fisheries and forestry sectors to use their environmental and natural resources in a sustainable way and to provide technical support to ensure food security and rural development.

Several sector specific capacity building initiatives are already in place, including a recently conducted training programme for Veterinarians on aquatic animal health, held in July 2014 at Rhodes University. This was again a product of good collaboration between FAO and DAFF, SADC, NEPAD OIE and Rhodes University.

Through this **REGIONAL WORKSHOP on Improving Aquatic Animal Health Management and Strengthening Biosecurity Governance in Africa**, FAO has once again demonstrated the effectiveness of working together with parties of the region that I mention above, to develop a SADC Subregional Framework for an Aquatic Biosecurity Strategy that will support the growth of its aquaculture industry through a long-term, enabling policy environment and a framework for a cooperative programme on aquatic animal health management and biosecurity governance at the subregional and national levels.

I also wish to acknowledge the collaboration FAO has fostered with the AU-IBAR to identify, discuss and build consensus on the elements and procedures to be followed for responding to the call from STDF for the proposed (Trade and improved livelihoods in aquatic production in Africa) TILAPIA Project. We are looking forward to working together in the implementation of this good project.

I hope this event will open the doors in expressing our ideas and in the planning of concrete steps to follow for developing effective biosecurity Programmes for the African Region.

At this juncture, I wish to thank DAFF, FAO, AU-IBAR, OIE, SADC, NEPAD and other parties for working in collaboration with FAO to organize and fund this **REGIONAL WORKSHOP on Improving Aquatic Animal Health Management and Strengthening Biosecurity Governance in Africa.**

It now gives me great pleasure to declare this regional Event officially open and to wish you a great and fruitful workshop experience over the coming days.

I thank you all.



**Improving Aquatic Animal Health Management and Strengthening Biosecurity
Governance in Africa
Durban, South Africa, 5 – 7 November 2014**

**STATEMENT
BY DR. MOHAMED SEISAY
ON BEHALF OF
DIRECTOR OF AU-IBAR**

- The Deputy Director General of the Department of fisheries and aquaculture in South Africa
- The FAO Representatives to South Africa
- Representatives of AU member states
- Representatives of SADC and other Regional Economic Communities
- Representatives of FAO and other Development partners
- Ladies and gentlemen

On behalf of the Director of AU-IBAR, Professor Ahmed El-Sawalhy, I wish to extend my gratitude to the Government and people of South Africa for accepting to host this continental event on ***‘Improving Aquatic Animal Health Management and Strengthening Biosecurity Governance in Africa’***. This is indeed a significant manifestation of the spirit of collaboration and cooperation by an African Union member state. Special acknowledgment goes to the Department of Agriculture, Forestry and Fisheries in South Africa for their lead role in the planning and organization of this unique workshop.

It is reassuring to observe the presence, in appreciable numbers, of the representatives of African Union member states and the Regional Economic Communities across the continent. Based on recent experience of AU-IBAR during the process of formulation of the policy framework and reform strategy for fisheries and aquaculture in Africa, the significance of this high level participation becomes crucial when it comes to the political issue of endearing ownership of the eventual outcome of such deliberations. Thus this realization largely informed the observed composition of AU-IBAR’s list of participants, a deliberate blend of technicians and decision-makers.

AU-IBAR remains fully supportive of any activity on the continent that is fully aligned with its vision of ensuring animal resources contribute significantly to the reduction of poverty and hunger. We therefore view this workshop, with the overarching focus on building ***capacity in aquatic animal health and biosecurity***, as a major strategic action towards progress in the implementation of key pillars of AU-IBAR strategic plan as well as the policy framework and reform strategy for fisheries and aquaculture in Africa. Indeed, the pan African policy framework identified ***‘jump-starting market aquaculture development’*** as key for harnessing the full potential, in terms of food security and economic growth, of aquaculture subsector in the various African Union member states. In order to achieve this policy objective, the pan African policy framework stressed, among others, the importance of applying standards and norms on aquatic animal health: fish disease, safety, quality assurance and traceability at both national and regional levels of the African continent, underpinned

by harmonized and coherent policies, institutional and legal frameworks, this aspect being captured as one of the three result areas in the TILAPIA project Concept note.

Distinguished delegates

The current status of exploited fish populations in inland water bodies and large marine ecosystems in Africa has become a tremendous cause for concern at the highest levels of the continent. Reviews by FAO Working Groups showed that a significant number of commercially exploited fish and shellfish species are either overexploited or fully exploited. Production statistics of capture fisheries on the continent also showed fish production has become stagnant or declining. Distinguished ladies and gentlemen, you would agree with me that if this situation continues unabated, it would have far reaching implications for food security and other social factors. In recognition of this situation, the African Heads of States and Governments in June 2014 endorsed a resolution charging African Union to increase agricultural productivity, including aquaculture, on the continent towards zero hunger.

The sustainable development of aquaculture is therefore regarded as an alternative fish production technology to augment fish supplies from dwindling capture fisheries. However, in recent years, environmental and fish health issues have been a major concern in Africa; the white spot diseases in Mozambique, for example. Admittedly capacity in fish diseases and biosecurity is a huge gap on the continent. The continent should therefore endeavour to avoid the Asian experience where aquaculture expansion preceded fish health capabilities resulting in huge economic cost to the industry. As a lesson thereof fish health services needs to be put in place in parallel with the development of the aquaculture industry to ensure that growth is sustainable and that the economic interests of the farmers are safeguarded. The proposal for the formulation of the TILAPIA project, with a goal of ***building capacity on fish health and aquatic biosecurity to sustain and develop aquaculture and fisheries in Africa***, is therefore built on this premise. Thus contribution of the outcome of this workshop towards this goal would be immeasurable.

Before concluding this statement, it is my honour, on behalf of the Director of AU-IBAR, to express my profound gratitude to the World Trade Organization and the European Union for their valuable support to the AU-IBAR's component of this workshop. With your permission Chair, I wish to inform distinguished delegates that the process of preparation for this workshop has taken a while now since end of last year, some of you may recall. The preparation of the Tilapia component of the workshop has been an excellent collaborative venture between AU-IBAR, NPCA, FAO and OIE. AU-IBAR deeply appreciates this collaboration and sincerely looks forward to this partnership towards the eventual realization of the objectives of the Tilapia project- ***Trade and improved livelihoods in aquatic production in Africa***.

I would also like to thank the local organizers from FAO and the South African DAFF for untiring effort in ensuring the successful convening of this workshop.

Thank you for your attention

**Improving Aquatic Animal Health Management and Strengthening Biosecurity
Governance in Africa
Durban, South Africa, 5 – 7 November 2014**

by

**Mr Mortimer Mannya
Deputy Director General: Fisheries Management
Department of Agriculture, Forestry and Fisheries (DAFF)**

*Compiled by Mr. Belemane Semoli, Acting Chief Director – Aquaculture and Economic
Development*

Aquaculture is the fastest growing agriculture sector globally, and it presents an enormous opportunity to supplement the shortage in fish supply due to declining wild stocks and increasing global population. According to different experts, the future of aquaculture growth is in Africa, which only contributes one percent of global aquaculture production. Africa has the natural resources conducive for aquaculture development and to make the continent the fastest-growing aquaculture region in the world. The government of South Africa has recognized the potential presented by aquaculture growth towards food security, contribution towards GDP, job creation and rural development. As such, our government recently embarked on an initiative that aims to unlock the potential of our ocean economy, including aquaculture. The methodology is based on the Malaysian methodology of the Big Fast Results implemented successfully in Malaysia, and we applied it on key ocean economy sectors. This was a six weeks Lap process between July and August 2014, the President launched the outcomes of the Lap process on 15th October in Durban. Our five year target is to increase the aquaculture production fivefold from the current 4000 tonnes to 20 000 tonnes, create 15 000 tonnes and increase the sector's contribution towards GDP by six-fold from R0.5billion to R3billion.

Having recognized the potential for aquaculture development and at the same time the need to proactively address the issue of aquatic animal health management and biosecurity which presents a great threat to the sustainable development of this aquatic food producing sector, the Department of Agriculture, Forestry and Fisheries of South Africa (DAFF) and the Food and Agriculture Organization of the United Nations (FAO), in cooperation with Africa Union Inter-African Bureau for Animal Resources (AU-IBAR), New Partnership for African Development (NEPAD), World Organisation for Animal Health (OIE) and Southern African Development Community (SADC) are co-organizing the *Regional Workshop to Improve Aquatic Animal Health Management and Strengthen Biosecurity Governance in Africa*, to be held from 05 to 07 November 2014 in Durban, South Africa.

The purpose of this workshop is to support sustainable aquatic food security for dietary animal protein and livelihoods in Africa through responsible aquaculture. The workshop aims to establish a comprehensive model for building fish health infrastructure in the African region that will sustain capture fisheries and support the growth of its aquaculture industry through a long-term enabling policy environment and a framework for a cooperative programme on aquatic animal health management and biosecurity governance at the regional, subregional, and national levels.

Participants. It is expected that the workshop will be attended by about 130 participants, including delegates representing all 15 of SADC Member States (3 participants/country comprising policy/decision maker, a technical officer responsible for aquaculture or fish health and a veterinarian, preferably with knowledge on AAH), SADC Secretariat, FAO, DAFF and international resource experts

Latest developments on aquatic animal health in South Africa.

- It is important to highlight the progress made from the development of the National Aquaculture Strategic Framework (NASF) to this point in time, where the Subcommittee on Aquatic Animal Health (SCAAH) was established and is requesting endorsement of the Draft Implementation Plan for an Aquatic Animal Health Programme in South Africa from MINTEC and MINMEC.
- Terms of Reference have also been presented to MINTEC for endorsement.
- There are a few more important objectives that DAFF is trying to accomplish through this programme and working group:
 1. Addressing the legislative challenges concerning the divided regulation of aquatic animal health in South Africa (i.e. vertebrates versus invertebrates and freshwater versus marine).
 2. Creating a more holistic regulation of aquatic animal health by integrating and harmonizing efforts/activities by provincial departments of agriculture and different directorates of DAFF.
 3. Addressing aquatic animal health issues not only for aquaculture, but for wild capture fisheries, the ornamental fish sector and recreational fisheries.
 4. Enabling safe and responsible international trade in aquaculture products, as well as preserving and expanding export markets while advancing the local economy.
 5. Enabling us to fulfill the objectives of international agreements and bodies to which South Africa is a signatory (OIE, FAO, WTO, etc).
- DAFF is aligning its aquatic animal health standards to that of the OIE (International Organisation for Animal Health).
- **Disease surveillance and monitoring:** DAFF is for the first time taking a lead in this area. The unit is in the process of developing a National Surveillance Programme (which is a component of the National Aquatic Animal Health Programme) for aquatic invertebrates, to facilitate export certification, monitor the health status of our national stock and fulfill our reporting requirements to the OIE.

ANNEX II.f

Members of the Working Groups

A: Members of the SADC Regional Biosecurity Working Group

	Country	Name
1	Angola	Ms Ilda Lucas
2	Botswana	Dr Bernard C Mbeha
3	Botswana	Mr Supi Khuting
4	DRC	Mr Daniel Manyale
5	Lesotho	Dr Mosa Motsoene
6	Lesotho	Dr Mpalileng Matlali
7	Lesotho	Dr Marosi Molomo
8	Madagascar	Mr Andree N. Rakotomamonjy
9	Malawi	Dr Gilson Njunga
10	Malawi	Mr Innocent Gumulira
11	Mauritius	Dr Vidya B. Grodoyal
12	Mauritius	Mr Mohamud F. Hotee
13	Mauritius	Mr Joseph M. Ramsamy
14	Mozambique	Mr Zacarias E. Massicame
15	Mozambique	Dr Ana Paula Baloi
16	Namibia	Mr Frikkie Botes
17	Namibia	Mrs Heidi Skrypzeck
18	Seychelles	Mr Antoine-Marie Moustache
19	Seychelles	Dr Jimmy Melanie
20	Swaziland	Mr Freddy Magagula
21	Swaziland	Dr Cecilia Zandile Mlangeni
22	Tanzania	Ms Meresia Sebastian
23	Zambia	Dr Arthur Mumbolomena
24	Zambia	Mr Venantious M. Musonda
25	Zimbabwe	Dr Maxwell Barson
26	Zimbabwe	Dr Sithokozile Sibanda
27	South Africa	Mr Stephen Goetze
28	South Africa	Ms Maria Raesetja Tloubatla
29	South Africa	Mr Mbongeni Khanyile
30	South Africa	Mr Phosa Moatladi Jacob
31	South Africa	Dr Gary Buhrmann
32	South Africa	Mr Nelson Matekwe
33	South Africa	Ms Primrose Bontle Lehubye
34	South Africa	Dr Sasha Saugh
35	South Africa	Dr Mpho Maja
36	South Africa	Dr Boitumelo Motsistsi-Mehlape
37	South Africa	Mr Keagan Halley
38	South Africa	Ms Zukiswa Nkhereanye
39	South Africa	Dr Misheck Mulumba
40	South Africa	Dr Kevin Christison
41	Worldfish	Ms Songe Mwanza

	Country	Name
42	FAOZA	Mr Victor Ngomane
43	FAOZA	Mr Blessing Mapfumo
44	FAO Rome	Dr Melba Reantaso
45	SADC	Dr Motseki Hlatswayo
46	SADC	Mr Nyambe N. Nyambe
47	Australia	Dr Mark Crane
48	Canada	Dr Richard Arthur
49	Madagascar	Dr Marc Le Groumellec
50	South Africa	Dr David Huchzermeyer
51	Zambia	Dr Hang`ombe Bernard Mudenda

B: Members of the TILAPIA Working Group

	Country/agency	Name
1	Madagascar	Mr Zoelys Raboanarijaona
2	Madagascar	Mr Ralaivoavy H. Andriamboavonjy
3	Malawi	Dr Steven Donda
4	Mozambique	Mr Jimis Deve
5	Namibia	Ms Victoria M. Mumba
6	Seychelles	Mr Aubrey Lesperance
7	Swaziland	Mr Boy Mavuso
8	Tanzania	Dr Hamisi L Nikuli
9	Zambia	Mr Matale G. Namafuka
10	Zimbabwe	Mr Bothwell Makodza
11	Fao Rome	Dr Rohana Subasinghe
12	FAOSFS	Mr Vasco Schimdt
13	Zimbabwe	Mr Paul Mwera
14	South Africa	Mr Graeme Miles Hatley
15	South Africa	Ms Zandile Claudia Moloi
16	South Africa	Ms Rirhandzu Mkhari
17	South Africa	Ms Yvonnne Matebo Manganeng
18	South Africa	Mr Lomas Octavius Mavulwana
19	South Africa	Ms Mammikele Josephine Tsatsimpe
20	South Africa	Ms Bettie Masetense Matebesi
21	South Africa	Mr Peter Phetole Ramollo
22	South Africa	Mr Vusi Gedla Mthombeni
23	South Africa	Dr Dietana Mpfariseni Nemudzivhadi
24	South Africa	Mr Roger Guy Krohn
25	South Africa	Mr Qurban Ali Rouhani
26	South Africa	Dr Darshana Reddy
27	South Africa	Dr Brett Macey
28	South Africa	Ms Khumo Morake
29	South Africa	Ms Pontsho Sibanda
30	South Africa	Mr Belemane Semoli
31	South Africa	Ms Lindsey Squires
32	Mozambique	Mrs Alda Silva
33	Mozambique	Mrs Laurentica Cossa
34	Egypt	Prof Ade Shaheen
35	Malawi	Prof Kamlipe Watson Kaunda
36	Worldfish Centre	Dr Sloans Chimatiro
37	AU-IBAR	Dr Simplicie Nouala
38	AU-IBAR	Dr Hiver Boussini
39	AU-IBAR	Dr Mohamed Seisay
40	AU-IBAR	Dr Nelly Isyagi

41	AU-IBAR	Ms Hellen Moepi
42	AU-IBAR	Mr Obinna Anozie
43	NIGERIA	Prof Augustine Eyiunmi Falaye
44	OIE	Dr Moetapele Letshwenyo
45	Cameroon	Dr Divine Ngala Tombuh
46	Gabon	Ms Flore Wora
47	Senegal	Dr Magatte Ba
48	Burkina Faso	Dr Desire N. Coulibaly
49	Ivory Coast	Dr Marcel Boka
50	Ghana	Dr Peter Ziddah
51	Ghana	Mr Jacob Ainoo Ansah
52	Cameroon	Ngongalah Ngwa Roger
53	Kenya	Mutua Christine Kalui
54	Ivory Coast	Dr Amadou Tall

ANNEX II.g

Regional Workshop on Improving Aquatic Animal Health Management and Strengthening Biosecurity Governance in Africa *Durban, South Africa, 5 – 7 November 2014*

WORKSHOP EVALUATION SUMMARY

	Total responses	1	2	3	4	5	Total
		Poor		Average		Excellent	%
TECHNICAL ASPECTS							
PRESENTATIONS	25	-	-	16%	44%	40%	100%
FACILITATION	25	-	8%	12%	40%	40%	100%
PLENARY DISCUSSIONS	25	-	-	20%	44%	36%	100%
WORKING GROUP DISCUSSIONS	25	-	-	20%	40%	40%	100%
KNOWLEDGE GAINED	25	-	-	16%	40%	44%	100%
OVER-ALL ACHIEVEMENT OF WORKSHOP OBJECTIVES	25	-	-	12%	36%	52%	100%
LOGISTICAL ASPECTS							
LENGTH OF WORKSHOP	25	-	-	44%	32%	24%	100%
TRAVEL ARRANGEMENTS	25	4%	8%	12%	24%	52%	100%
MEETING VENUE & FACILITIES	25	4%	-	20%	36%	40%	100%

Participant Evaluation Comments (Random)¹

- The workshop was very informative on issues of aquatic animal health management and biosecurity governance strategies. It is hoped that implementation of the various ideas can be done here in Zambia, especially with the EUS and of course, the growing aquaculture industry to achieve the fish difficit in the country
- The workshop was well organized
- The shuttle service was not to expectations
- SADC has three official language. For me, who comes from an French country, I had many difficulties to follow the workshop easily and could not participate in the discussions. It is always useful to provide an interpreter.
- The meeting venue wasn't excellen, as during the second day there was another event, which made the venue too noisy and very disturbing

¹ Comments have been edited by FAO for clarity and grammar, but not for content.

- The overall workshop was excellently planned. My personal concern was the length of the workshop, as delegates were not given an opportunity to visit any center of excellence or successful projects in Kwazulu-Natal. All countries represented should have been given an opportunity to present their state of aquaculture production. I hope participants will witness these minor adjustments in future meetings
- Generally workshop was good.
- Considering the importance of the meeting at the regional level, the time scheduled (three days) was too short for the participants to have an intense discussion, especially during development of the draft SADC Regional Strategy on Aquatic Biosecurity and Aquatic Animal Health Management and the TILAPIA Project.
- The stipend (daily subsistence allowance) offered by FAO is very small to cover the participants' basic requirements. The improvement of this item is requested if possible.
- If you are organizing a workshop for a big group like in Durban, kindly provide a number of additional screens so that even the participants sitting at the back can see and follow the presentations.
- As there were both English and French speaking participants, next time there should be translating facilities
- Communication from the organizers was excellent
- This workshop was an eye opener to all the participants who work on aquaculture development activities but lack an aquatic animal health background like myself. I therefore would like to recommend that a follow-up workshop take place not more than a year after the November one in Durban. It is necessary to arrange such workshops, not only on issues of health and diseases, also on legislative alignment.
- The duration of the workshop was a bit short, and we ended up having a packed programme that would enable presenters sufficient time. Five days would have been excellent. However, overall the organization was excellent.
- This was a very good gathering. Well done to the organizers from FAO and the hosting country (South Africa).
- I rate the logistical aspects of the meeting as poor because the itinerary provided for us was badly selected. We left Maputo on the very first flight in the afternoon to connect in JHB, while a direct fly was available from Maputo to Durban; and our return was similar, we left Durban in late afternoon and arrived in the late evening.

- The venue was not appropriate for the meeting, because the participants who were seated in the back were unable to see the information projected on the screen and the speakers were not clearly heard.
- There was no time for a field visit, which would have added value to the workshop.
- The tea and coffee breaks had few options (e.g. soft drinks, juice for people who did not like to drink coffee/tea). Try to have a wider selection next time
- The venue was ok, except for the management hosting activities that were not compatible to the workshop (an award ceremony), which caused some disturbance.
- There was a little bit of miscommunication with the company and hotels doing the airport transfers. It will be good to ensure that these partners are well informed about the movements of participants in order to prevent long waits after arriving at the airport.
- It would be helpful to think about check-out times from hotels for participants and flight times to avoid participants having to check-out at e.g. 11 am to catch a flight at 6 pm! Other than that, the organization went well and I enjoyed the workshop and stay in Durban.
- Excellent work done.

ANNEX III

Draft regional aquatic biosecurity strategy for the Southern African Development Community (SADC)¹

PREPARATION OF THIS DOCUMENT

This document is the product of a systematic process which was initiated by an initial brainstorming session held from 9–10 April 2014 at the FAO Office in Pretoria that was attended by representatives from the Department of Agriculture, Forestry and Fisheries of South Africa (DAFF) (Dr Motseki Hlatshwayo), the New Partnership for Africa's Development (NEPAD) (Dr Sloans Chimatiro), the World Organisation for Animal Health (OIE) (Dr Neo Joel Mapitse), Rhodes University (Mr Rouhani Qurban) and the Food and Agriculture Organization of the United Nations (FAO) (Dr Tobias Takavarasha, Mr Madima Tshifhiwa and Mr Lot Mlati from the Pretoria office and Dr Melba B. Reantaso from the Rome office) and concluded through a *Regional Workshop on Improving Aquatic Animal Health Management and Strengthening Biosecurity Governance in Africa* held in Durban, South Africa from 5–7 November 2014 (the Regional Workshop). The April 2013 brainstorming session recognized the need to develop a robust and long-term regional framework that will guide the Southern African Development Community (SADC) countries in strengthening biosecurity governance at the regional and national levels that will support the sustainable development of the growing aquaculture sector.

Prior to the Regional Workshop, an FAO Aquatic Animal Health Performance and Capacity Survey was carried out in October 2014, with 14 SADC Member Countries (Botswana, Democratic Republic of Congo (DRC), Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe) completing the survey. A summary and analysis of this self-assessment survey, which served as a gap analysis, was presented during the Regional Workshop and facilitated the development of the Regional Biosecurity Strategy.

The participants in the Regional Workshop agreed on a draft framework for a broad yet comprehensive strategy to build and enhance capacity for the management of regional aquatic biosecurity and aquatic animal health. The framework contains the regional action plans at the short, medium and long-term using phased implementation based on regional needs and priorities and also outlines the programmes and activities that will comprise a regional approach to overall management of aquatic animal health in SADC.

Based on the consensus reached during the Regional Workshop, an FAO team comprised of Dr J. Richard Arthur (International Consultant, Canada), Dr Melba B. Reantaso (FAO, Rome), Dr Rohana P. Subasinghe (FAO, Rome) and Mr Blessing Mapfumo (FAO, Pretoria) prepared a draft *Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC)*. This draft document was circulated, in March 2015, to Drs Mark Crane (Australia), Marc Le Groumellec (Madagascar), David Huchzermeyer (South Africa) and Hang`ombe Bernard Mudenda (Zambia) – key invited experts on aquatic animal health during the Regional Workshop, for comment, and to all participants of the Working Group Session

¹ This draft strategy was presented during the SADC Technical Committee Meeting held in Johannesburg, South Africa on 16–17 April 2015.

on Development of a SADC Regional Framework for an Aquatic Biosecurity Strategy for their comment and approval. Workshop participants who provided their comments and suggestions for its improvement include: Jacob Ainoo-Ansah, Vidya Bhushan, Harrison Charo, Kevin Christison, A.R. Herizo, Aubrey Lesperance, Moetapele Letshwenyo, Boy R. Mavuso, Zandile Mlangeni, Hamisi L. Nikuli, Sasha Saugh, Merisia Sebastian, Vasco Schmidt, Mohamed Seisay, Alda Silva, Lindsey Squires, Amadou Tall and Maria Tjale.

The finalized *Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC)* will be submitted to DAFF and presented during the SADC Fisheries Technical Committee meeting to be held on 16–17 April 2015 and then to the SADC Ministers Meeting for approval and action. Following adoption by the Ministers, SADC will submit the Regional Strategy to potential donor agencies for funding support.

ACKNOWLEDGEMENTS

The 117 participants in the Regional Workshop came from 27 countries, including all 15 SADC Member Countries and nine other African states under the AU-IBAR auspices. They included representatives of Regional Fisheries Bodies and officials from partner organizations (AU-IBAR, OIE, SADC, WFC), as well as the private sector. The participants contributed to the following activities: (i) initial brainstorming and planning sessions held in Pretoria in April 2013; (ii) completion of the FAO self-assessment survey in October 2014; (iii) participation and contribution to the plenary discussions and working group sessions that took place as part of the Regional Workshop held in Durban in November 2014; and (iv) the finalization process of the current version of the Regional Biosecurity Strategy which took place between February and March 2015. The 51 participants of the Regional Workshop's Working Group Session on Development of a SADC Regional Framework for an Aquatic Biosecurity Strategy are especially thanked as their hard work during the Workshop that established the foundation for the drafting of this document.² This document would not have been possible without the cooperation and support provided by these participants.

² Participants in the Working Group Session are listed in Annex III.a.

CONTENTS

1 BACKGROUND.....	296
1.1 The Regional Workshop.....	296
1.1.1 Purpose	296
1.1.2 Participants	296
1.1.3 Process.....	297
1.2 Development of the Regional Strategy	298
2. CURRENT STATUS OF AQUACULTURE DEVELOPMENT AND AQUATIC ANIMAL HEALTH MANAGEMENT IN SADC	299
2.1 Results of the SWOT Analysis.....	302
3 THE REGIONAL AQUATIC BIOSECURITY STRATEGY FOR SADC	303
3.1 Purpose	303
3.2 Vision	303
3.3 Guiding principles	303
3.4 Overview of the programme components	304
3.5 Overview of implementation mechanisms	305
4 PROGRAMME COMPONENTS	306
4.1 Programme1: Policy and legislation	306
4.2 Programme 2: Risk Analysis.....	308
4.3 Programme 3: Pathogen List	310
4.4 Programme 4: Disease Diagnostics.....	312
4.5 Programme 5: Border Inspection and Quarantine.....	314
4.6 Programme 6: Surveillance, Monitoring and Reporting	316
4.7 Programme 7: Emergency Preparedness and Contingency Planning	318
4.8 Programme 8: Research and Development	319
4.9 Programme 9: Communication	321
4.10 Programme 10: Human Resources and Institutional Capacity Development.....	323
4.11 Programme 11: Infrastructure	325
4.12 Programme 12: Regional and International Cooperation.....	326
5 REFERENCES.....	328

ANNEXES

ANNEX III.a Members of the SADC Regional Biosecurity Strategy Working Group

ANNEX III.b Implementation Table

ANNEX III.c Suggested Additions to the "Current Status" section of each Programme,
as Provided by Reviewers

ABBREVIATIONS AND ACRONYMS

AIS	Aquatic invasive species
ALOP	Appropriate level of protection
ANAF	Aquaculture Network for Africa
AU-IBAR	Africa Union Inter-African Bureau for Animal Resources
ASTF	Africa Solidarity Trust Fund
BMPs	Better management practices
CITES	Convention on International Trade in Endangered Species
COMESA	Common Market for Eastern and Southern Africa
DRC	Democratic Republic of Congo
DAFF	Department of Agriculture, Forestry and Fisheries of South Africa
EC	European Commission
EDRT	Emergency Disease Response Team
EU	European Union
EUS	Epizootic ulcerative syndrome
FAO	Food and Agriculture Organization of the United Nations
HH	High health
IAAS	Invasive alien aquatic species
ICES	International Council for the Exploration of the Sea
IRA	Import risk analysis
IUCN	International Union for the Conservation of Nature
JICA	Japanese International Cooperation Agency
KHV	Koi herpesvirus
LGW	Legal working group
MOUs	Memoranda of Understanding
NEPAD	New Partnership for Africa's Development
NORAD	Norwegian Agency for Development Cooperation
OIE	World Organisation for Animal Health
PART	Pathogen Risk Analysis Team
PRA	Pathogen risk analysis
RAWGs	Risk Analysis Working Groups
SADC	Southern African Development Community
SPF	Specific pathogen free
SARNISSA	Sustainable Aquaculture Research Networks for Sub-Saharan Africa
STDF	Standards and Trade Development Facility
TAADs	Transboundary aquatic animal diseases
TILAPIA	Trade and Improved Livelihoods in Aquatic Production in Africa Project
TORs	Terms of Reference
WSSV	White spot syndrome virus
WTO	World Trade Organization
WWF	Worldwide Fund for Nature

SUMMARY

This document presents a draft Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC). The "Strategy" is the output of the *Regional Workshop on Improving Aquatic Animal Health Management and Strengthening Biosecurity Governance in Africa*, which was organized by the Food and Agriculture Organization of the United Nations (FAO) in cooperation with the Department of Agriculture, Forestry and Fisheries of South Africa (DAFF) (under the auspices of the FAO/DAFF Capacity Building Programme) and the Africa Union Inter-African Bureau for Animal Resources (AU-IBAR), in partnership with the European Union (EU), the Southern African Development Community (SADC), the World Organisation for Animal Health (OIE) and the Standards and Trade Development Facility (STDF).

The Working Group Session on Development of a SADC Regional Framework for an Aquatic Biosecurity Strategy was informed by the results of an FAO Aquatic Animal Health Performance and Capacity Survey that was carried out in October 2014, prior to the Workshop. The 14 SADC countries that completed the survey included Botswana, Democratic Republic of Congo (DRC), Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. The results of this process served as a gap analysis, facilitating the development of the Strategy. The session was attended by at least two representatives from each of the 15 Member States of SADC and by regional and international technical experts on aquatic animal health and was facilitated by FAO. The participants agreed on a draft framework for a broad yet comprehensive strategy to build and enhance capacity for the management of regional aquatic biosecurity and aquatic animal health. The framework contains the regional action plans at the short, medium and long term using phased implementation based on regional needs and priorities and also outlines the programmes and activities/projects that will assist in developing a regional approach to overall management of aquatic animal health in SADC.

The purpose of the Strategy is to assist in improving national and regional aquatic biosecurity and aquatic animal health, facilitating regional aquaculture development for the well-being of the people of the SADC Region through increased employment, availability of inexpensive, protein-rich food, and increased foreign exchange earnings through regional and international trade in live aquatic animals and their products.

The framework for the Strategy as developed and agreed upon during the Workshop includes the following sections: Summary, Background, Current status of aquaculture development and aquatic animal health management in SADC, Purpose, Vision, Guiding Principles and Programme Components and Implementation. The Session participants developed and approved the Strategy's Purpose, Vision and Guiding Principles and identified 12 major Programme Components to be addressed by the Strategy, including (1) Policy and Legislation; (2) Risk Analysis; (3) Pathogen List; (4) Disease Diagnostics; (5) Border Inspection and Quarantine; (6) Surveillance, Monitoring and Reporting; (7) Emergency Preparedness and Contingency Planning; (8) Research and Development; (9) Communication; (10) Human Resources and Institutional Capacity Building; (11) Infrastructure; and (12) Regional and International Cooperation. Within these 12 Programme Components, the participants identified at total of 39 Activities (projects) to be accomplished. For each Activity they further identified its priority (high, medium or low), time frame (short, medium or long term) and responsibility for completion (regional (i.e. SADC), national or both). They further

agreed that FAO would lead in developing the framework for this *Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC)*, and that following review and comment by participants and regional and international experts, the Strategy would be submitted to the SADC Member Countries for approval and action, and also to potential donor agencies for funding support.

1 BACKGROUND

1.1 The Regional Workshop

A *Regional Workshop on Improving Aquatic Animal Health Management and Strengthening Biosecurity Governance in Africa* was organized by the Food and Agriculture Organization of the United Nations (FAO) in cooperation with the Department of Agriculture, Forestry and Fisheries of South Africa (DAFF) (under the auspices of the FAO/DAFF Capacity Building Programme) and Africa Union Inter-African Bureau for Animal Resources (AU-IBAR), in partnership with the European Union (EU), the Southern African Development Community (SADC), the World Organisation for Animal Health (OIE) and the Standards and Trade Development Facility (STDF).

The Workshop was held in Durban, South Africa, under the current scenario of recognizing the good potential for aquaculture development in Africa, while at the same time acknowledging the need to address aquatic animal health management and biosecurity¹ issues proactively following recent aquatic animal health problems experienced in the region.

The three-day Workshop was officially opened by Mr Mortimer Mannya, DAFF Deputy Director General responsible for Fisheries Management, Dr Tobias Takavarasha, FAO Country Representative for South Africa, and Dr Mohamed Seisay, Senior Fisheries Officer, AU-IBAR.

1.1.1 Purpose

The general objective of the regional Workshop was to support sustainable aquatic food security for dietary animal protein and livelihoods in SADC and the African continent in general, through responsible aquaculture that is supported by effective biosecurity governance and aquatic animal health management. The Workshop had two distinct but complementary objectives: (i) to develop the building blocks for the Trade and Improved Livelihoods in Aquatic Production in Africa (TILAPIA) Project (detailed elsewhere)² and (ii) to develop a SADC Regional Framework for an Aquatic Biosecurity Strategy (detailed herein).

1.1.2 Participants

Some 117 participants from 27 countries attended the Workshop. All the 15 SADC countries were represented (Figure 2), with the majority sending three delegates; a policy/decision-maker, a technical officer responsible for aquaculture or fish health, and a veterinarian (preferably having knowledge on aquatic animal health). Experts, representatives of Regional

¹ In general terms, "biosecurity" is "...a strategic and integrated approach to analyzing and managing relevant risks to human, animal (including aquatic), plant life and health and associated risks to the environment." (see Arthur, J.R., M.G. Bondad-Reantaso & R.P. Subasinghe. 2008. *Procedures for the quarantine of live aquatic animals: a manual*. FAO Fisheries Technical Paper No. 502. Rome, FAO. 74 pp.). More specifically, aquatic biosecurity is "The sum total of a country's activities and measures taken to protect its natural aquatic resources, capture fisheries, aquaculture and biodiversity and the people who depend on them from the possible negative impacts resulting from the introduction and spread of serious transboundary aquatic animal diseases (TAADs)." (see FAO. 2007. *Aquaculture development 2. Health management for responsible movement of live aquatic animals*. FAO Technical Guidelines for Responsible Fisheries 5, Suppl. 2. Rome, FAO. 31 pp.).

² Information on the STDF can be found at <http://www.standardsfacility.org/>, while information on the TILAPIA Project is given at <http://www.standardsfacility.org/PPG-428>.

Fisheries Bodies and delegates from nine other African states under the AU-IBAR auspice also attended. There was also strong representation from partner organizations (AU/IBAR, FAO, OIE, SADC, WorldFish Center), as well as the private sector.

Figure 2. The SADC Region



1.1.3 Process

During Day 1 of the three-day Workshop, participants were informed by a number of technical presentations, including reviews on the status of global and regional aquaculture; the status of global and regional aquatic animal health; recent aquatic animal health initiatives and activities in Africa; the status of finfish, crustacean and molluscan diseases of importance to Africa; and presentations on commodity-specific industry biosecurity practices, an example of a national aquatic animal health strategy (South African case), and the roles of regional and international organizations. The presentations were given by international experts from AU-IBAR, FAO and OIE, private-sector operators, and other regional and international resource persons, as well as local South African technical experts.

On Day 2 and the morning of Day 3, two parallel sessions (comprising 1.5 day each) followed, focusing on achieving the two main objectives of the Workshop, namely: (1) development of a SADC Regional Framework for an Aquatic Biosecurity Strategy; and (2) identification, discussion and building consensus on the elements to be included and procedures to be followed for responding to the call from the STDF for the proposed TILAPIA Project.

The afternoon of Day 3 was devoted to a general plenary session during which all the participants were informed (by presentations) of the outcomes of the two parallel sessions for consensus building and discussion of the way forward.

The Working Group Session on Development of a SADC Regional Framework for an Aquatic Biosecurity Strategy was informed by the results of an FAO Aquatic Animal Health Performance and Capacity Survey that was carried out in October 2014.³ The 14 SADC countries that completed the survey included Botswana, DRC, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. The results of this self-assessment survey served as a gap analysis, facilitating the development of the framework.⁴

The SADC Working Group Session was attended by 50 participants, including at least two representatives from each of the 15 SADC Member Countries and a number of technical experts on aquatic animal health, and was facilitated by FAO. The session participants unanimously agreed on a framework for a broad yet comprehensive strategy to build and enhance capacity for the management of regional aquatic biosecurity and aquatic animal health. The framework for the draft strategy as developed and agreed upon during the Workshop includes the following sections: Summary, Background, Current status of aquaculture development and aquatic animal health management in SADC, Purpose, Vision, Guiding Principles and Programme Components; and Implementation. The session participants developed and approved the Strategy's Purpose, Vision and Guiding Principles and identified 12 major Programme Components to be addressed by the Strategy, including (1) Policy and Legislation; (2) Risk Analysis; (3) Pathogen List; (4) Disease Diagnostics; (5) Border Inspection and Quarantine; (6) Surveillance, Monitoring and Reporting; (7) Emergency Preparedness and Contingency Planning; (8) Research and Development; (9) Communication; (10) Human Resources and Institutional Capacity Building; (11) Infrastructure; and (12) Regional and International Cooperation. Within these 12 Programme Components, the participants identified a total of 39 Activities (projects) to be accomplished. For each Activity they further assigned its priority (high, medium or low), time frame (short, medium or long term) and responsibility for completion (regional (i.e. SADC), national or both). They further agreed that FAO would lead in developing the framework into this *Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC)*, and that following review and comment by Working Group participants and regional experts, the Strategy would be submitted to the SADC Member Countries for approval and action, and also to potential donor agencies for funding support.

1.2 Development of the Regional Strategy

In the three-month period following the Regional Workshop, a draft *Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC)* was written by an FAO team comprised of Dr J. Richard Arthur (International Consultant, Canada), Dr Melba B. Reantaso (FAO, Rome), Dr Rohana P. Subasinghe (FAO, Rome) and Mr Blessing Mapfumo (FAO, Pretoria). Following its completion, the initial draft was circulated to Drs Marc Le Groumellec (Madagascar), Mark Crane (Australia), David Huchzermeyer (South Africa) and Hang`ombe Bernard Mudenda (Zambia) for expert comment. Following its revision, the draft Regional Strategy was then sent to all 50 participants of the SADC

³ Arthur, J.R., Mapfumo, B. & Bondad-Reantaso, M.. 2015. *Southern African Development Community (SADC) Regional Aquatic Animal Health Capacity and Performance Survey: Summary of Survey Results and Analysis*, 168 pp. (In preparations).

⁴ The approach used thus differs substantially from that of the OIE's Performance of Veterinary Services (PVS) Pathway, which is a global programme for the improvement of a country's compliance with OIE standards on the quality of veterinary services that is accomplished via independent external expert evaluation (see <http://www.oie.int/support-to-oie-members/pvs-pathway/>).

Working Group Session for their comment and approval. After a final revision to address comments by the Working Group participants, the Regional Strategy was formatted and printed by FAO Rome. The finalized *Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC)* will be submitted to the SADC Fisheries Technical Committee meeting in April 2015 and then to the SADC Ministers Meeting in June 2015 for approval and action. Following adoption by the Ministers, SADC will submit the Regional Strategy to potential donor agencies for funding support.

2. CURRENT STATUS OF AQUACULTURE DEVELOPMENT AND AQUATIC ANIMAL HEALTH MANAGEMENT IN SADC⁵

The combined population of the 15 SADC Member Countries is estimated at 285 million people (2013), while the regional average gross domestic product (GDP) stands at USD3 873 per capita (2013).

Although aquaculture in Sub-Saharan Africa is regarded as being at its infancy, it has recorded impressive growth in countries such as Nigeria, Uganda, Ghana, Kenya and Zambia. A recent questionnaire survey by the SADC Secretariat and FAO (October 2014) revealed that the subsector has continued to grow significantly, total production for the SADC Region increasing to 104 117 tonnes in 2013 see Tables 1 and 2). Growth in production has been especially strong in DRC, Madagascar and Zambia, with modest growth in Zimbabwe, South Africa and Mozambique. Table 1 shows the most recent data on aquaculture production by volume and value for the top five producing countries (Zambia, Madagascar, Tanzania, Zimbabwe and South Africa), as well as the main species cultured. Table 2 shows the aquaculture production by volume for the remaining ten SADC countries.

⁵ This section draws heavily on the presentation of N.H. Nyambe and M. Hlatshwayo, SADC Secretariat, entitled "Trends in SADC regional aquaculture" that was given at the Durban Workshop.

Table 1. Aquaculture production in the top five producing SADC countries.

Country	2012 Data		2013 Data	Main species cultured
	Value (USD million)	Volume (tonnes)	Volume (tonnes)	
South Africa	62	5 999	6 927	Abalone, oysters, mussels, crayfish, trout, tilapias, catfish, kob, ornamentals
Madagascar	47	9 988	33 500	Shrimp, seaweeds, sea cucumber, tilapias, carp, ornamentals
Zambia	42	12 988	25 000	Tilapias, catfish, carp
Zimbabwe	20	8 010	9 700	Tilapias
Tanzania	14	9 917	2 990	Seaweeds, shrimp, crabs, tilapias, catfish, milkfish

Table 2. Aquaculture production by volume in other SADC countries.

Country	2012 Data			2013 Data
	Aquatic animals ¹ (tonnes)	Aquatic plants (tonnes)	Total volume (tonnes)	Total volume (tonnes)
Malawi	3 232	—	3 232	3 159
DRC	2 869	—	2 869	20 000
Mozambique	604	0	604	921
Namibia	440	130	570	498
Mauritius	514	—	514	119
Angola	450	—	450	450
Lesotho	400	—	400	500
Swaziland	220	—	220	343
Seychelles	0.1	—	0.1	0.1
Botswana	0	—	0	0

¹Fish, crustaceans, molluscs, etc.

Due to high local demand, the vast majority of fish farmed in Africa are freshwater species, the most important being Nile tilapia (*Oreochromis niloticus*) and African sharptooth catfish (*Clarias gariepinus*). These species are relatively easy to raise, both in ponds and cages and in facilities using advanced technologies such as recirculation systems and aquaponics. Other freshwater species cultured in SADC countries include trout, common carp and ornamentals. There is also growth in the culture of marine molluscs in countries such as South Africa and Namibia, where high-value species (e.g. abalone, oysters and mussels) are produced for the export markets. Until recently, shrimp aquaculture has been developing modestly in Madagascar and Mozambique.

Aquaculture development has been identified as a high priority and included in the national development plans of several SADC countries; thus, a significant increase in aquaculture production is envisaged in the coming years.

Aquatic animal health and aquatic biosecurity has received significant attention only in those countries such as Namibia and South Africa (for marine molluscs) which must meet the aquatic animal health standards of international markets (e.g. the European Union). Recent disease outbreaks and major losses in shrimp culture facilities in Madagascar and Mozambique due to white spot syndrome virus (WSSV) (see FAO 2015, Van Wyk *et al.* 2014) and in wild freshwater fishes in the Chobe-Zambezi River system due to epizootic ulcerative syndrome (EUS) (see FAO 2009a) has caused national governments of several countries to recognize the vulnerability of their countries to transboundary aquatic animal diseases (TAADs) and spurred a strong interest in aquatic animal health and improved aquatic biosecurity at both the national and local levels. These disease outbreaks have led to a number of regional meetings recommending actions for improved aquatic biosecurity and aquatic animal health in the SADC Region (see Tarabusi 2009; FAO 2009a, b, 2014; OIE 2008; RAF 2013; Van Wyk *et al.* 2014). The status of aquatic animal health in 14 SADC Member Countries was recently surveyed by the FAO and is reviewed and analyzed in the *SADC Regional Aquatic Animal Health Capacity and Performance Survey: Results and Analysis*, which has been used to produce the "Current Status" section of each of the 12 Programme Components developed in this Strategy.⁶

It should be noted that the OIE has been at the forefront of advancing aquatic animal health and aquatic biosecurity in Africa. This is accomplished through such mechanisms as the appointment of OIE Aquatic Animal Focal Points, the evaluation of national veterinary services via the OIE Performance of Veterinary Services (PVS) Pathway (which has so far not been effectively utilized by SADC Member Countries), and the promotion of Twinning Agreements between Veterinary Education Establishments (see http://www.oie.int/Veterinary_Education_Twinning_Guide.pdf).

During the last ten years, a number of projects and capacity building activities were carried out in SADC under various mechanisms such as, e.g. FAO's Technical Cooperation Programme⁷ and other Regular Programme and donor-funded projects. Activities included evaluation and drafting of the Aquaculture (Import and Export) Regulations and associated annexes (related mainly to aquatic animal health certification, quarantine and inspection) for Namibia; emergency disease investigations; and introductory training courses on risk analysis for aquatic animal movements. More recently, as a cooperative activity between Rhodes University, FAO and OIE and with funding support from DAFF, introductory and intermediate training courses on aquatic animal health were provided to SADC state veterinarians and aquaculture managers.

In addition, Africa also has a long history of fish parasitology as manifested from the published works (e.g. Khalil, 1971; Paperna 1996; Khalil and Polling, 1999).

⁶ A number of useful corrections to the "Current Status" as summarized from the *SADC Regional Aquatic Animal Health Capacity and Performance Survey: Results and Analysis* were provided by the participants and experts who reviewed the draft version of the Strategy. These have been compiled as Annex III.c.

⁷ TCP/NAM/0168(A) "Assistance in Establishing a Legal Framework for Responsible Aquaculture Development"; TCP/RAP/3111 Emergency assistance to combat EUS in the Chobe-Zambesi River.

2.1 Results of the SWOT Analysis

During the Working Group Session on Development of a SADC Regional Framework for an Aquatic Biosecurity Strategy, a SWOT (strengths, weaknesses, opportunities, threats) analysis was conducted to assist in formulating the Regional Strategy. The results were as follows:

STRENGTHS

- A SADC regional aquaculture strategy is being finalized
- 12 countries have aquaculture strategies
- Management authorities are in place
- Surveillance for shrimp diseases is taking place in some countries
- Disease reporting mechanisms exist through OIE Aquatic Animal Focal Points and for disease notification in general
- Shared rivers/waterbodies (Chobe/Zambezi, Mozambique, Limpopo, Orange River, Kunene)
- Diagnostic services are available in Madagascar, South Africa, Zambia and Zimbabwe
- Aquaculture associations are established in Madagascar, Mozambique, Namibia, South Africa, Zambia and Zimbabwe

WEAKNESSES

- Pollution, environmental degradation
- Only three countries have aquatic animal health strategies
- Lack of competence and personnel for aquatic animal health
- Lack of complete political will
- Lack of legal support for aquatic animal health in some countries
- Risk pathways factors are not well known
- Insufficient communication results in slow response to emergencies

OPPORTUNITIES

- South Africa, Zambia and Zimbabwe can form a consortium of universities
- Continuing refresher courses are possible
- Funding is available from external donors
- Regional networks exist and can be further developed
- Aquatic animal health services are available and can be enhanced (Zambia (EUS), South Africa (molluscs), Zimbabwe and South Africa (tilapia), Madagascar (shrimp))

THREATS

- Serious transboundary aquatic animal diseases (TAADs) are now present in the region (KHV, EUS, WSSV)
- Mechanisms for the control of importations of live aquatic animals and any diseases or pathogens they may carry are often weak
- Ornamental fish imports represent an unknown risk of introducing diseases
- Aquaculture poses the risk of spreading diseases to wild fish populations, introducing aquatic invasive species (AIS) and genetic harms
- The spread of diseases from aquafarms to wild fish populations is possible

3 THE REGIONAL AQUATIC BIOSECURITY STRATEGY FOR SADC

3.1 Purpose

The purpose of the *Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC)* is:

“To support the improvement of aquatic biosecurity; the development of aquatic animal health management capacity; the preservation of aquatic biodiversity; the improvement of food security, nutrition and safety; and sustainable management of aquatic resources in the SADC Region, through such actions as improved awareness of and risk mitigation for OIE-listed and other serious diseases transmitted by live aquatic animals and their products and enhanced coordination between key role players involved in aquatic animal health”

More specifically, through the implementation of this Regional Strategy the following outcomes will be achieved:

- Improved regional management of aquatic animal health and welfare.
- Improved awareness among aquatic animal health experts, aquaculturists and other stakeholders of the responsible and scientifically justifiable practices necessary to optimize aquatic animal health management.
- Improved technical capacity at different levels of expertise among Competent Authorities and other agencies responsible for the management of aquatic animal health.
- Improved collaborative efforts among SADC Member Countries resulting in improved confidence of the aquaculture sector and other stakeholders in national Competent Authorities, state veterinary services and relevant extension services.

3.2 Vision

The Vision is a statement of where the strategy will lead the region. The long-term vision of the Strategy is:

“To develop and maintain aquatic animal health capacity in the SADC Region that will be able to support the sustainable development and management of the aquaculture sector while protecting regional biodiversity and aquatic ecosystems from the impacts of exotic pathogens and epizootic disease”.

3.3 Guiding principles

The following set of ten Guiding Principles provides guidance to the Strategy in all circumstances, irrespective of changes in goals, work plan, structure or management. They accept and incorporate relevant international aquatic animal health standards to ensure harmonization, transparency and equivalence and the region to be internationally recognized with respect to its aquatic animal health status.

1. Aquatic animal health management should enable aquaculture to make a positive contribution to the SADC economies through being internationally competitive in the marketplace and economically viable at a national level.
2. Aquatic animal health management measures should facilitate aquaculture to develop in harmony with nature, managing and minimizing transient environmental impacts

and avoiding significant, cumulative, long-term or irreversible changes to ecosystems, to cultural remains or to valued landscape and scenery.

3. Aquatic animal health measures should foster strong aquaculturists' links, recognizing and supporting the needs of private-sector aquaculturists and working with community initiatives to manage local environments for mutual benefit.
4. The national aquatic animal health programmes of SADC Member Countries should contribute to social, economic and environmental sustainability and embrace the precepts of transparency, integration, coordinated government and fit-for-purpose regulation, partnership and stakeholder participation, accountability, ethics and regard for animal welfare, and a culture of best practice and continuous improvement.
5. SADC Member Countries may introduce or maintain sanitary measures resulting in a higher level of protection than would be achieved by measures based on the relevant international standards, guidelines or recommendations (e.g. the OIE *Aquatic Animal Health Code* – OIE 2014a); however, such measures must be justifiable based on science (i.e. risk analysis) and be consistent with the country's appropriate level of protection (ALOP). Control measures applied to movements of aquatic animals within the country must also be consistent with this ALOP.
6. Aquatic animal health is important for economic, social, developmental and public resource purposes. Collaboration among all stakeholders including governments, public institutions, the private sector and existing aquaculture and fishing industries is important to achieve effective health management.
7. The aquatic animal health strategy of SADC Member Countries and related procedures will adhere to international and regional standards and be harmonized on as wide a basis as possible.
8. SADC Member Countries should encourage their aquaculture sectors to use preventative measures to limit their exposure to pathogens and disease. Such measures include but are not limited to the use of better management practices (BMPs), health certification, specific pathogen free (SPF) and high health (HH) stocks, biosecurity and vaccination protocols.
9. Health management measures should be effective, practical, cost-effective and utilize readily available resources. These resources will allow the development of appropriate national and regional policies and regulatory frameworks as required to reduce the aquatic animal health risks inherent in the culture, reproduction and movement of aquatic animals.
10. Access to relevant national aquatic animal health capacity (infrastructure and specialized expertise) is crucial for health management of aquatic animals. Collaboration with international organizations and with other regional organizations will be sought wherever possible to further increase regional and national capacities in aquatic animal health issues.

3.4 Overview of the programme components

The Regional Strategy is comprised of 12 major Programmes which contain a total of 39 Activities, each Programme being defined by the following sections:

- (i) Background – a brief overview of the Programme
- (ii) Current Status – a summary of the current status of activities related to the Programme, based on findings of the SADC Regional Aquatic Animal Health Capacity and Performance Survey that was conducted in October 2014
- (iii) Objectives – a brief statement of what the Programme will achieve

- (iv) Activities – brief summaries of the key activities (projects) that will be accomplished within each Programme. Each Activity is:
- (a) prioritized as low, medium or high:
 - Low (desirable but not essential)
 - Medium (important and essential, but less urgent)
 - High (urgent, requires immediate action)
 - (b) with an associated time frame for completion:
 - Short (1–2 yrs)
 - Medium (2–5 yrs)
 - Long (5–10 yrs)
- and with a designated responsibility for completion:
- National (the national governments alone are responsible)
 - Regional (the SADC lead agency alone is responsible)
 - Both (the SADC lead agency and the national governments will both participate in completion of the Activity)

The Programme Components consist of 12 broad thematic areas which are all interrelated:

1. Policy and Legislation
2. Risk Analysis
3. Pathogen List
4. Disease Diagnostics
5. Border Inspection and Quarantine
6. Surveillance, Monitoring and Reporting
7. Emergency Preparedness and Contingency Planning
8. Research and Development
9. Communication
10. Human Resources and Institutional Capacity Development
11. Infrastructure
12. Regional and International Cooperation

3.5 Overview of implementation mechanisms

The final draft Strategy will be considered by SADC for official approval, including agreement of Member States for its implementation. The Strategy will be implemented by SADC with the assistance of interested external donors.

DAFF will continue to provide support for aquatic animal health within SADC through a Unilateral Trust Fund (UTF) Agreement with FAO and will consider the final, approved Strategy to determine the role that it can play in supporting implementation.

FAO will continue to provide technical support to implementation of programme activities subject to funding availability. Currently, under the ongoing project GCP/SFS/001/MUL Strengthening controls of food safety, plant and animal pests and diseases for agricultural productivity and trade in Southern Africa funded by the Africa Solidarity Trust Fund (ASTF) and participated by Botswana, Madagascar, Mozambique, Namibia, South Africa, Zambia and Zimbabwe, a number of regional and national activities will be implemented. These activities pertain to active surveillance for EUS, and the development of a regional model on assessing the risks of regional and international movement (introductions and transfers) of

live aquatic animals for aquatic biosecurity development, including capacity development for its implementation.

Implementation of the Strategy's Activities will be based on the best international standards and technical guidance developed by key international and regional agencies (i.e. FAO, OIE, AU-IBAR, SADC, European Commission (EC), World Trade Organization (WTO), International Council for the Exploration of the Sea (ICES), International Union for the Conservation of Nature (IUCN), etc.) and on the relevant scientific literature.

The implementation of activities identified at the national level will be the responsibility of national governments. It is essential that such activities are further developed and implemented within the framework of a national strategy on aquatic animal health.

Implementation of activities identified at the regional level will be the joint responsibility of SADC and other interested regional and international organizations, subject to funding availability. A resource mobilization exercise will need to be made to ensure that funds are made available for continued implementation of the Strategy. There are funding opportunities from existing programmes which could be explored to support Activity implementation, e.g. TILAPIA Project, Fish Trade Project, Fisheries Governance Project, and other bilateral mechanisms at the national and regional levels. The knowledge, experience and lessons learned in the development of the SADC Strategy can be used for developing a similar framework for other Regional Economic Communities (RECs).

4 PROGRAMME COMPONENTS

4.1 Programme1: Policy and legislation

Background

Policy refers to a national long-term (typically >20 years) programme prepared by government and outlining **what** is to be achieved in broad terms. It includes the government's major goals and objectives for the sector and recommendations for its sustainable development. In contrast, a *strategy* is typically a mid-term (5–15 year) plan and outlines **how** the national policy is to be achieved. It contains specific objectives and outputs, a time frame, indicators of performance, and provision for monitoring and review. *Legislation* is, of course, the sum total of laws, regulations, and other legally binding documents issued by the government to enforce its policies.

The inclusion of a national aquatic biosecurity strategy as a component of national aquatic animal health policy may be new to some authorities, and policy-makers may not realize the urgency of formulating effective regional and national strategies and acting on the respective programme activities needed to implement them. Yet many countries have immediate needs pertaining to, for instance, certification of aquaculture products for export to the European Union (EU) and other markets and for the importation of live fish for aquaculture and ornamental purposes that should be addressed within the framework of national and regional aquatic biosecurity strategies. The problem of recent incursions of serious aquatic diseases needs to be confronted, and control strategies limiting the spread of such diseases need to be formulated. Many SADC Member Countries have a climate and other characteristics that are favourable for the culture of ornamental and farmed aquatic animals, and the problem of invasiveness of escapees together with the diseases they might harbour poses a significant threat to indigenous species and the sustainability of aquaculture and aquatic biodiversity.

Hazard identification and risk assessment thus form an important component of managing aquatic biosecurity.

To have an effective national policy for aquatic animal health and biosecurity, identification of the Competent Authority on aquaculture and aquatic animal health is essential. The advantages of harmonizing aquatic animal health policy across the SADC Region are many and include facilitated trade in live aquatic animals and their products and increased aquatic biosecurity for all countries. To address aquatic biosecurity adequately and to support improved national aquatic animal health policy, the national legislation of all countries should be reviewed and where necessary, updated and/or revised. In some cases, new legislation should be drafted to support aquatic animal health and aquatic biosecurity.

Current status

The SADC Regional Aquatic Animal Health and Capacity Survey revealed that all 15 SADC countries (the 14 countries that completed the survey and Angola) are members of the World Organisation for Animal Health (OIE), and that 13 of the 15 countries are members of the World Trade Organization (WTO) (exceptions: DRC and Seychelles⁸). Eleven of the 14 responding countries (exceptions: DRC, Mozambique, Swaziland) indicated the existence of some national legislation relevant to the regulation of exports and imports of live aquatic animals. National legislation includes various general fisheries and veterinary acts (eight countries), as well as specific recent legislation dealing with aquatic animals (three countries).

Eight of 14 countries have a specific agency(ies) or department(s) responsible for national aquatic animal health matters (Botswana, DRC, Lesotho, Mozambique, Namibia, Seychelles and Swaziland do not). Only one country (South Africa) indicated that aquatic animal health policy is expressed in the form of a national aquatic animal health plan, strategy, legislation or other document. Five countries (DRC, Lesotho, Madagascar, Mozambique, Zambia) indicated that aquatic animal health is considered in national fisheries and/or aquaculture strategies. Nine countries indicated that subnational entities are involved in setting national aquatic animal health policy, with four countries (Mauritius, Mozambique, Tanzania, Zimbabwe) reporting that this is accomplished via stakeholder consultation and one country (Zambia) indicating that this was accomplished via a multidisciplinary Aquaculture Advisory Group.

The SADC Regional Aquatic Animal Health Capacity and Performance Survey conducted by FAO revealed that respondents from only two of the 14 SADC countries surveyed (Madagascar, Tanzania) felt that current policy and planning was adequate in preventing the entry and spread of pathogens, adequate for the domestic control of serious diseases, and effectively implemented. All other countries except Malawi (for which the response was incomplete) felt that national policy and planning was inadequate in all three areas.

Objectives

The Objectives of Programme 1 are:

- i. to harmonize SADC legislation related to aquatic animal health with relevant international legislation and standards (e.g. EU Directive 2006/88/EC and the OIE standards);
- ii. to establish and legally define the responsibilities for aquatic animal health management among existing fisheries and veterinary service institutions; and

⁸ Seychelles became a member of WTO in December 2014, just after the Durban Workshop.

- iii. to adopt legally obliging and clearly defined national lists of aquatic animal diseases (including notifiable diseases) (also see Programme 3: Pathogen List).

Activities

Two activities are defined under Programme 1:

Activity 1: Harmonize SADC Member Country legislation related to aquatic animal health with international legislation (e.g. EU Directive 2006/88/EC) and the OIE standards

- *Priority:* high
- *Time frame:* medium term
- *Responsibility:* national and regional
- *Description:* A Legal Working Group (LWG) comprised of national and international experts will be formed by SADC. The LWG will review the status of aquatic animal health and biosecurity-related legislation in the 15 Member Countries and prepare a regional status report and associated recommendations. It will then examine the relevant legislation and requirements of major trading partners (e.g. European Union (EU) Directive 2006/88/EC and the OIE standards) and draft model legislation that fully conforms to these laws and requirements.

Activity 2: Conduct in-depth reviews of national legislation related to aquatic animal health, and where absent, promulgate new legislation

- *Priority:* high
- *Time frame:* short, medium and long term
- *Responsibility:* national
- *Description:* Under Activity 2, individual SADC Member Countries will draw upon the outputs of Activity 1. As they deem necessary, they will undertake more comprehensive assessments of their legislative and regulatory needs to implement sound aquatic animal health and biosecurity policy. They should review their existing national legislation, comparing it with the model legislation drafted by Activity 1, which can be modified or adapted to individual national situations. Under Activity 2, each country should formally adopt the National Pathogen List drafted under the activities to be accomplished under Programme 3: Pathogen Lists.

4.2 Programme 2: Risk Analysis

Background

Risk analysis is a structured process that provides a flexible framework within which the risks of adverse consequences resulting from a course of action can be evaluated in a systematic, science-based manner. Import risk analysis (IRA) is an internationally accepted method for deciding whether trade in a particular commodity (a live aquatic animal or its product) poses a significant risk to human, animal or plant health and, if so, what measures, if any, can be applied to reduce that risk to an acceptable level.

Current status

Only five of the 14 countries (Madagascar, South Africa, Swaziland, Zambia and Zimbabwe) indicated the existence of some risk analysis capacity for proposed movements of live aquatic animals, while only two countries indicated that actual risk analyses had been completed. Only one country (South Africa) clearly indicated linkage of IRA with evaluation of other risks associated with the movement of live aquatic animals. SADC Member Countries have

little experience with pathogen risk analysis. Regional and national training programmes, appropriate regional or national structures for conducting risk analysis for key aquatic species and appropriate capacity in other areas of aquatic animal health is needed to support risk analysis. IRA should be coordinated with ecological and genetic risk analyses where proposals to introduce new species for aquaculture development are received.

Objectives

The Objectives of Programme 2 are:

- i. to incorporate a science-based, consultative and transparent pathogen risk analysis process in the development and implementation of the national and regional policies, mechanisms and procedures for dealing with import and export of live aquatic animals and their products;
- ii. to review and improve policy, mechanisms and procedures with regard to domestic, regional and international movement of live aquatic animals and their products so as to prevent the spread of important aquatic animal pathogens;
- iii. to develop capacity on risk analysis at the national and regional levels; and
- iv. to develop a regional commodity-based risk assessment framework for SADC.

Activities

Four activities have been identified under Programme 2:

Activity 3: Establishment of a Pathogen Risk Analysis Team and Risk Analysis Working Groups

- *Priority:* high
- *Time frame:* short, medium and long term
- *Responsibility:* national and regional
- *Description:* A regional Pathogen Risk Analysis Team (PART) consisting of regional/international experts in pathogen risk analysis and aquatic animal biosecurity will be established within SADC. The PART will complete Activities 4 and 5 (below) and, through consultation with relevant national agencies, will be responsible for identifying current or future trade in live aquatic animals or their products likely to pose significant risks to aquaculture development and the natural biodiversity of the countries of the region. The team will then "scope" the proposed risk analyses (i.e. develop the parameters of the risk analyses) and, based on the nature of the individual commodities, will establish the individual Risk Analysis Working Groups (RAWGs), define their terms of reference (TORs), including budgets, and oversee their progress and outputs. National agencies are expected to participate in this project through allowing their expert staff to participate in the PART and RAWGs when asked to do so.

Activity 4: Development of a regional commodity-based risk assessment framework

- *Priority:* medium
- *Time frame:* short, medium and long term
- *Responsibility:* regional

Description: The relevant framework for import risk analysis (IRA) is that outlined by the World Organisation for Animal Health in its *Aquatic Animal Health Code* (the Code, OIE 2014a). As the Code provides only the basic framework for IRA, individual countries are allowed considerable flexibility in how they conduct risk analyses. Drawing from the wide array of guidance available on IRA, Activity 4 will develop and publish a recommended risk

analysis framework and associated guidance that will facilitate the conduct of IRAs by both individual SADC Member Countries and by the SADC Pathogen Risk Analysis Team (PART) to be established through Activity 3 (see above).

Activity 5: Development of SADC-harmonized standards and guidelines for risk management requirements for importing ornamental aquatic animals

- *Priority:* high
- *Time frame:* short term
- *Responsibility:* national and regional
- *Description:* An expert review of published risk analyses (IRA and ecological/pest risk analyses) and international and regional standards and guidelines related to importations of live ornamental aquatic animals will be conducted and a set of standards and guidelines will be developed to assist SADC Member Countries in regulating international trade (importations) of live aquatic animals destined for the aquarium trade within the SADC Region. This Activity will be coordinated with Programme 5: Border Inspection and Quarantine, Activities 15, 16 and 18. Following the approval of the standards and guidelines by SADC, individual Member Countries are expected to adopt them as minimum national standards and guidelines such that a uniform approach and minimum standards will be applied throughout the region.

Activity 6: Promote cooperation to prevent the entry of biosecurity hazards by integrating import risk analysis/pathogen risk analysis (PRA) with associated genetic and ecological risk analyses

- *Priority:* high
- *Time frame:* short term
- *Responsibility:* national and regional
- *Description:* Under this Activity, the various guidance and procedures for IRA/PRA, genetic risk analysis and pest/ecological risk analysis will be examined and an integrated approach and framework for evaluating the risks associated with a proposed importation of a commodity (a live aquatic animal or its product) will be developed for use by SADC Member Countries.

4.3 Programme 3: Pathogen List

Background

National pathogen lists are essential for health certification, disease surveillance and monitoring, emergency response planning, prevention and control of diseases in aquaculture facilities, etc. Clearly established criteria for listing/delisting of diseases (based on internationally accepted methods) should be established. OIE-listed diseases that are relevant to national conditions form a good starting point; however, the OIE-listed diseases are those of internationally traded commodities, while national pathogen lists must also consider other serious diseases of national concern. National pathogen lists need to be founded on a thorough knowledge of a country's disease status, which can only be obtained through passive and active disease surveillance programmes, generalized disease/pathogen surveys, adequate disease record keeping and reporting, and a national disease database.

Current Status

National pathogen lists exist or are in progress in six of the 14 countries surveyed (Lesotho, Madagascar, Namibia, Tanzania, and Zimbabwe). Madagascar and Namibia base their

pathogen lists on the OIE disease list, while other countries use criteria such as potential zoonotic, economic and/or ecological impact.

Objective

The Objective of Programme 3 is:

- i. to prepare harmonized national and regional pathogen lists based on uniform criteria for listing and delisting of diseases (international standards) and pathogens of importance at the national and regional levels

Activities

There are four activities planned under Programme 3:

Activity 7: Develop SADC criteria for listing and delisting pathogens and harmonizing national criteria

- *Priority:* high
- *Time frame:* short term
- *Responsibility:* national and regional

Description: An expert working group will develop SADC criteria for the listing and delisting of pathogens on a regional basis. The expert working group will draw upon the criteria outlined in the OIE Code and developed by other international agencies and will contact the relevant Competent Authorities of all SADC Member Countries to solicit their suggestions and other inputs. A revised list of criteria will then be sent to all Member Countries for their approval. Once approved, individual Member Countries should officially adopt these criteria for listing and delisting pathogens on their National Pathogen Lists. Countries wishing to submit requests to OIE for the listing of new diseases may request technical guidance from the expert working group.

Activity 8: Develop SADC criteria for emerging diseases and a mechanism for their listing

- *Priority:* high
- *Time frame:* short term
- *Responsibility:* national and regional
- *Description:* New and emerging diseases present special problems to national and regional aquatic biosecurity. Such diseases may arise quickly and then be spread rapidly through pathogen shedding into the water column, the movement of infected aquatic animals for aquaculture development and/or the ornamental fish trade. Because the cause of such diseases is initially unknown, there is at first, only (at best) a case description; identification of the responsible pathogen and a reliable and rapid diagnostic test may take months or even years for development, after which official listing by the OIE may occur. Activity 8 will be conducted by the expert working group to be established in Activity 7, who will, through examination of the relevant scientific literature and past experiences in other regions, establish a set of criteria for the rapid listing of emerging diseases of significant (or potentially significant) impact to regional aquaculture development and natural aquatic biodiversity.

Activity 9: Design a regional pathogen list and a system for updating pathogen lists

- *Priority:* high
- *Time frame:* short term
- *Responsibility:* national and regional

- *Description:* Once a set of regional criteria for the listing/delisting of diseases has been approved (Activity 7), the expert working group will draw up a draft regional pathogen list for consideration by the 15 Member Countries.

Activity 10: Individual SADC countries to establish national pathogen lists for diseases of aquatic animals, or to update their national lists to be harmonized with the regional criteria for disease listing and the regional pathogen list

- *Priority:* high
- *Time frame:* short to medium term
- *Responsibility:* national
- *Description:* National Competent Authorities should adopt the SADC criteria for pathogen listing and delisting developed through Activities 7 and 8, and then modify the SADC Regional Pathogen List (developed through Activity 9) to their national situations, adding or removing pathogens as appropriate. It is also a responsibility of each SADC Member Country to ensure that their national pathogen list is formally adopted (see Programme 1: Policy and Legislation, Objective 3) and to provide a mechanism for its regular review and updating.

4.4 Programme 4: Disease Diagnostics

Background

Adequate disease diagnostic capability is an essential component of any national or regional aquatic biosecurity programme. Disease diagnostics plays two significant roles in health management and disease control. The first role of diagnostics is to ensure that stocks of aquatic animals that are intended to be moved from one area or country to another are not carrying infection by specific pathogens at subclinical levels and is accomplished through screening of apparently healthy animals. The second equally important role of diagnostics is to determine the cause of unfavourable health or other abnormalities in order to recommend measures appropriate to a particular situation. The accurate and rapid diagnosis of an outbreak of disease in a cultured or wild population is essential to preventing further losses through correct treatment, and to disease containment and, where possible, eradication. Diagnostics is also a key supporting element of quarantine and health certification, surveillance and monitoring, zoning (including demonstration of national freedom from a disease), etc. Diagnostics includes both simple, pond-side methods and more advanced laboratory-based techniques requiring a high level of expertise and infrastructure.

Current Status

Only three countries (Madagascar, South Africa and Zimbabwe) currently have adequate capacity to diagnose OIE-listed diseases of national concern. No country has capacity to diagnose all OIE-listed diseases; Madagascar can diagnose all crustacean diseases and some finfish diseases, South Africa can diagnose all molluscan diseases, some crustacean diseases and some finfish diseases, while Zambia and Zimbabwe can both diagnose some finfish diseases. Two countries (Madagascar and Zimbabwe) have designated national aquatic animal disease laboratories. No country has an accredited laboratory, while seven countries have some private laboratory services available that can be accessed to assist with aquatic animal disease diagnostics (Malawi, Mauritius, Mozambique, Namibia, South Africa, Tanzania, Zambia and Zimbabwe). Of these, Mauritius and Mozambique allow the use of overseas laboratories, while other countries rely on laboratories in government, university and/or the private sector. There is a clear need to increase national disease diagnostics capability in most SADC countries.

Objectives

The Objectives of Programme 4 are:

- i. to improve the capacity of SADC Member Countries to diagnose important diseases of aquatic animals to international standards;
- ii. to develop harmonized regional standards for disease diagnostics;
- iii. to identify regional reference laboratories and expertise for high-level diagnostic activities; and
- iv. to establish a regional network of diagnostic laboratories

Activities

There are four activities to be accomplished under Programme 4:

Activity 11: Identify and develop basic minimum national capacity and harmonized regional standards for disease diagnostics

- *Priority:* high
- *Time frame:* short, medium and long term
- *Responsibility:* national and regional
- *Description:* Under this Activity, a SADC expert team will develop harmonized standards for diagnosing those diseases of regional importance. This effort will primarily target diagnostic methods for those diseases listed in the SADC Regional Pathogen List to be developed under Programme 3: Pathogen List and will draw upon the OIE *Aquatic Animal Health Code* (OIE, 2014a) and the *Aquatic Animal Disease Diagnostics Manual* (OIE, 2014b), as well as other regional and national diagnostic manuals (e.g. *Asia Diagnostic Guide to Aquatic Animal Diseases*; Bondad-Reantaso, *et al.*, 2001). Based on these regional standards, the minimum SADC regional capacity for diagnosis of aquatic animal diseases can be established. Member Countries can then apply these regional standards, as appropriate, to their national situations (see Activity 14).

Activity 12: Identify regional reference laboratories and expertise for high-level diagnostic activities

Priority: high

- *Time frame:* short, medium and long term
- *Responsibility:* national and regional
- *Description:* Under this Activity, the SADC expert team will conduct a survey of diagnostic expertise and dedicated infrastructure present in Member Countries with the goal of identifying laboratories having the capacity to diagnose those diseases of regional importance (see Programme 3: Pathogen List) to international standards (i.e. for OIE-listed diseases, the standards specified in the OIE Code and Manual). Identified laboratories can then be designated as SADC regional reference laboratories for the diagnosis of specific diseases and mechanisms established so that SADC Member Countries will have access to these specialized diagnostic services.

Activity 13: Develop a regional network of public and private diagnostic laboratories

- *Priority:* high
- *Time frame:* short, medium and long term
- *Responsibility:* national and regional

- *Description:* Activity 13 will draw upon the survey of diagnostic expertise and infrastructure to be conducted in Activity 12 and will seek mechanisms to link public and private diagnostic laboratories to improve their diagnostic capabilities and interlaboratory communication. This will include developing a database of laboratories linking those with basic diagnostic capabilities with higher-level laboratories so that diagnostic assistance is more easily obtained and information on disease occurrence is routed to the disease reporting systems of national Competent Authorities.

Activity 14: Develop national diagnostic laboratories

- *Priority:* high
- *Time frame:* medium and long term
- *Responsibility:* national
- *Description:* Based on national assessments of diagnostic needs and existing capacity, individual Member Countries will, as appropriate, designate a National Aquatic Animal Disease Diagnostic Laboratory and develop the required specialist expertise and infrastructure, including adequate annual operating budget.

4.5 Programme 5: Border Inspection and Quarantine

Background

Border inspection includes all those activities regulating the importation and exportation of live aquatic animals and their products that are conducted by the national Competent Authority and national customs officers at international airports, land border posts and sea ports of international entry. Quarantine is the holding of aquatic animals under conditions that prevent their escape, and the escape of any pathogens or "fellow travellers" they may be carrying, into the surrounding environment. Quarantine may be conducted preborder (in the exporting country), border (at the border post of the importing country) or postborder (at a quarantine facility operated directly by the Competent Authority or by the private sector, under the standards and supervision of the Competent Authority). Quarantine is one of a number risk mitigation measures that may be applied to shipments of live aquatic animals to reduce the risk of introducing serious pathogens and pests.

Current Status

Eleven of 14 SADC Member Countries import live aquatic animals (no imports were reported for DRC, Mozambique and Tanzania). Six countries import some live aquatic animals destined for aquaculture development. The species imported include echinoderms (sea cucumbers), molluscs (giant cupped oyster, mussels), marine finfish (red drum, European seabass, Atlantic salmon), freshwater finfish (rainbow trout, Mozambique tilapia) and wild penaeid shrimp broodstock. Most countries also import small quantities of freshwater ornamental finfish (e.g. mollies, tetras, guppies, and koi carp) that are obtained from international markets (i.e. Hong Kong SAR, Singapore, Thailand, etc.). Information on species composition, volumes and values are not readily available (and in some cases may not be required of importers).

Eight of 14 countries require that imported shipments of live aquatic animals be accompanied by some form of health certificate. Five countries require certification of freedom from relevant OIE-listed diseases (Madagascar, Mauritius, Namibia, Seychelles, South Africa), one country (Lesotho) indicated that "knowledge of disease status is required", one country requires a sanitary health certificate issued by the Competent Authority of the exporting

country, and one country (Zimbabwe) requires certification to a national pathogen list. Several countries require other official controls (risk management measures), which may include: issuance of import permits, traceability, presence of acceptable legislation and sanitary policy, knowledge of health status of the exporting country, analysis for some specified diseases by an OIE Reference Laboratory, visual inspection upon arrival and/or at importer's premises, quarantine, safe disposal of transport water and packing materials, and restrictions on release of imported aquatic animals.

Objectives

The Objectives of Programme 5 are:

- i. to assist SADC Member Countries in reducing the risk of spreading serious diseases of aquatic animals through improved importation and exportation procedures, including border inspection of live aquatic animals and their products and the use of other risk management measures such as health certificates and quarantine;
- ii. to harmonize standards for handling importations of live aquatic animals and their products at the regional level, including associated health certificates; and
- iii. to prevent the introduction into the region of harmful aquatic species (invasive alien aquatic species (IAAS), aquatic pest species) by establishing a regional list of those species whose importation should be prohibited by all SADC Member Countries.

Activities

There are four activities to be accomplished under Programme 5:

Activity 15: Harmonize standards for handling importations of live aquatic animals and their products at the regional level, including associated health certificates

- *Priority:* high
- *Time frame:* short term
- *Responsibility:* national and regional
- *Description:* Under this Activity, and in consultation with national Competent Authorities, expert(s) appointed by SADC will undertake a review of the standards and procedures applied by SADC Member Countries in handling the importation of live aquatic animals. Based on the results of this review and on best international practice, the expert(s) will develop a set of recommended regional guidelines for standardized procedures to be followed during the importation of live aquatic animals and their products (including standards for health certificates to accompany imported shipments and recommended standards for the construction and operation of quarantine facilities).

Activity 16: Evaluate current import practices and existing standards for quarantine facilities

- *Priority:* high
- *Time frame:* short term
- *Responsibility:* national
- *Description:* Based on the guidelines and recommended procedures developed by Activity 15, individual Member Countries will review and, where necessary, revise their current import practices and existing standards for the construction and operation of quarantine facilities.

Activity 17: Capacity building at the national and regional levels

- *Priority:* high
- *Time frame:* short, medium and long term
- *Responsibility:* national and regional
- *Description:* A regional programme for improving the capacity of Member Countries, in particular, the appropriate personnel from the Competent Authority, to implement the recommended standards and procedures for the safe importation of live aquatic animals will be developed by SADC based on the assessment of national and regional needs conducted under Activities 15 and 16.

Activity 18: Develop a list of aquatic species not wanted/prohibited in the region

- *Priority:* high
- *Time frame:* short term
- *Responsibility:* national and regional
- *Description:* SADC experts, in consultation with national Competent Authorities, will review regional and international experiences with exotic aquatic species to identify those species that, due to their invasiveness or other negative characteristics, have caused serious harmful economic, environmental and/or human health impacts to importing countries, both within the SADC Region and elsewhere in the world. Based on this review, SADC will draw up a list of aquatic animal species that, if absent, should not be imported into the region or, if already introduced, should be prevented from further spread and, if possible, eradicated. Following approval of the list by SADC Member Countries, it is expected that Member Countries will take the necessary regulatory actions to prohibit the importation of these listed species into their national territories. SADC will also establish the criteria for listing of an aquatic species as "prohibited" and a mechanism for regular review and updating of the species listing.

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4.6 Programme 6: Surveillance, Monitoring and Reporting**Background**

Disease surveillance is a fundamental component of any official aquatic animal health protection programme. Surveillance and monitoring programmes are essential for the detection and rapid emergency response to significant disease outbreaks and form the basis for early warning of exotic incursions or newly emerging diseases. They are also increasingly demanded by trading partners to support statements of national disease status and are the basis for disease zonation. Surveillance also provides the building blocks of information necessary to have an accurate picture of the distribution and occurrence of diseases relevant to disease control and international movement of aquatic animals and their products. Surveillance can be passive (reactive and general in nature) or active (proactive and targeted). In both cases, there must be adequate reporting mechanisms so that suspected cases of serious disease are quickly brought to the attention of the Competent Authority. Surveillance and monitoring efforts must be supported by adequate diagnostic capability (including appropriately trained expertise, suitably equipped laboratory and rapid-response field diagnostics, and standardized field and laboratory methods), information system management (i.e. a system to record, collate and analyze data and to report findings), legal support structures, transport and communication networks and linked to national and international (OIE) disease reporting systems (e.g. pathogen list or list of diseases of concern, disease notification and reporting procedures). Surveillance to demonstrate freedom from a specific

disease requires a well-designed active surveillance programme that meets the standards outlined in the *OIE Aquatic Animal Health Code* (OIE, 2014a).

Current Status

Official surveillance and monitoring programmes for aquatic animal diseases are reported to be present in nine countries: Botswana (disease(s) not indicated); Malawi (for epizootic ulcerative syndrome, EUS); Madagascar (disease(s) not indicated; surveillance in aquaculture and fishing areas); Mozambique (passive surveillance in the main fisheries centre and in aquaculture stations country wide); Namibia (for EUS and for OIE-listed shellfish diseases); Tanzania (active surveillance for OIE listed-diseases); Zambia (type of surveillance not described); and Zimbabwe (passive surveillance and specific surveys – types of pathogens not indicated). In addition, South Africa is planning to implement a surveillance programme for diseases of marine invertebrates.

Objectives

The Objectives of Programme 6 are:

- i. to establish national and regional surveillance programmes for three priority diseases (EUS, KHV, WSSV);
- ii. to establish a regional surveillance programme for other OIE-listed diseases to demonstrate their absence in SADC; and
- iii. to establish a regional surveillance programme for the SADC List of Pathogens

Activities

There are three activities to be accomplished under Programme 6:

Activity 19: Establish national and regional surveillance programmes for three priority diseases (EUS, KHV, WSSV)

- *Priority:* high
- *Time frame:* short term
- *Responsibility:* national and regional
- *Description:* Under this Activity, a regional surveillance/monitoring programme will be conducted for two important diseases of freshwater finfish (epizootic ulcerative syndrome, EUS and koi herpesvirus, KHV) and one important disease of marine penaeid shrimp (whitespot syndrome virus, WSSV). The regional programme will be designed by SADC in collaboration with the Competent Authorities of Member Countries and will be implemented by individual Member Countries, with the technical assistance of SADC, where necessary.

Activity 20: Establish a regional surveillance programme for other OIE-listed diseases to demonstrate their absence in the SADC Region

- *Priority:* medium
- *Time frame:* medium term
- *Responsibility:* national and regional
- *Description:* Under Activity 20, SADC will identify the most regionally important OIE-listed diseases that have not yet been reported from Member Countries, and with the participation of the Competent Authorities of Member Countries, will design a regional disease surveillance programme for these diseases that will meet OIE criteria for demonstrating the absence of disease in the territory of SADC Member Countries.

The surveillance programme will be implemented by individual Member Countries, with the technical assistance of SADC, where necessary.

Activity 21: Establish a regional surveillance/monitoring programme for the SADC List of Pathogens

- *Priority:* medium
- *Time frame:* medium term
- *Responsibility:* national and regional
- *Description:* This Activity will establish a regional surveillance/monitoring programme for any diseases that are included in the SADC List of Pathogens (see Activity 9) that are not covered by Activities 19 and 20.

4.7 Programme 7: Emergency Preparedness and Contingency Planning

Background

Emergency preparedness is the ability to respond effectively and in a timely fashion to disease emergencies (e.g. disease outbreaks, mass mortalities). The capability to deal with emergency disease situations requires a great deal of planning and coordination (including establishing operational, financial and legislative mechanisms) and making available required resources (i.e. skilled personnel and essential equipment). As long as there is importation of live aquatic animals, the possibility of serious disease outbreaks due to exotic pathogens will exist. Even under the best of circumstances, pathogens will occasionally escape detection, breach national barriers, become established, spread and cause major losses. The extent to which losses occur often depends on the quickness of detection (which depends on the effectiveness of disease surveillance, diagnostics and reporting programmes) and the rapidity and effectiveness with which governments recognize and react to the first reports of serious disease. As quick and effective reaction (containment and/or eradication) is largely dependent upon contingency planning, SADC Member Countries need to develop such plans for key cultured species and diseases.

Current Status

Contingency planning for outbreaks of aquatic animal disease exists in only one country (Madagascar), while several other countries (DRC, Lesotho, Zambia) have given some consideration to emergency response to outbreaks of aquatic animal disease.

Objectives

The Objectives of Programme 7 are:

- i. to develop regional and national emergency response plans for key diseases;
- ii. to establish regional and national emergency disease response teams; and
- iii. to establish a regional emergency response fund

Activities

There are three activities to be accomplished under Programme 7:

Activity 22: Develop a SADC "AQUAVETPLAN"

- *Priority:* high
- *Time frame:* short term
- *Responsibility:* national and regional

- *Description:* AQUAVETPLAN is the Australian Aquatic Veterinary Emergency Plan and is a series of manuals outlining Australia's approach to national disease preparedness and proposing technical response and control strategies to be activated in a national aquatic animal disease emergency. The manuals are authored by Australian aquatic animal health experts with extensive stakeholder consultation and each manual is formally endorsed by government and relevant industry sectors. AQUAVETPLAN (see <http://www.agriculture.gov.au/animal-plant-health/aquatic/aquavetplan>) currently consists of ten Disease Management Strategy Manuals (covering 6 finfish diseases, 2 crustacean diseases and 2 molluscan diseases), three Operational Procedures Manuals, and two Management Manuals. Under Activity 22, SADC will engage a team of regional experts to develop a similar series of manuals outlining an emergency disease response plan for the SADC Region. Member Countries will be asked to assist by allowing participation of national experts to draft and review the manuals and in rapidly implementing the emergency response plans in the case of emergency disease situations within their national territories.

Activity 23: Establish national-level and SADC Emergency Disease Response Teams

- *Priority:* high
- *Time frame:* short term
- *Responsibility:* national and regional
- *Description:* Under this Activity, SADC will establish a regional Emergency Disease Response Team (EDRT) comprised of regional aquatic animal health experts. In the case of an aquatic disease emergency, at the request of the affected Member Country(ies) the EDRT will assist in activating the relevant sections of the SADC AQUAVETPLAN. National governments will also be responsible for establishing their own national EDRTs, who will be the first responders in the case of emergency disease situations and who will handle local logistics should assistance by the SADC EDRT be required.

Activity 24: Establish an emergency response fund

- *Priority:* high
- *Time frame:* short term
- *Responsibility:* national and regional
- *Description:* Under Activity 24, a regional emergency response fund will be established to support emergency response interventions by the SADC EDRT to be established through Activity 23. Member Countries will be responsible to establishing their own emergency response funds to support emergency response activities by their national EDRTs.

4.8 Programme 8: Research and Development

Background

Research capacity in aquatic animal health is necessary to the successful expansion of aquaculture development. Targeted and basic research can lead to better disease management, better understanding of national aquatic animal health status, support to risk analysis, improved diagnostic methods, etc. Where specific research capacity is lacking, countries must rely, to a large extent, on research conducted by scientists in other nations. Often, such "borrowed" research may not be directly applicable to local situations and experimental testing must be undertaken to adapt these findings. In other cases, little or no relevant information on the specific problem may be available. There are many mechanisms to

improve access to research capacity. These include development of national aquatic animal health research laboratories, supporting linkages and research programmes within universities and the private sector, contracting of targeted research with foreign institutions, and development of a regional aquatic animal health centre.

Ongoing research needs to be supported to allow a better understanding of a number of aquatic diseases that have recently been introduced into the SADC Region. The impact and spread of such diseases among indigenous species and the spread of such diseases among widely divergent catchments is as yet poorly studied. A better knowledge of such transboundary aquatic animal diseases (TAADs) under local conditions is vital for the sustainable development of aquaculture production and the maintenance of aquatic biodiversity.

Current Status

The results of the Regional Aquatic Animal Health Capacity and Performance Survey indicate limited research capacity in aquatic animal health in the region. At least six countries (Madagascar, Mozambique, South Africa, Tanzania, Zambia, Zimbabwe) report the existence of related research. Five of 14 countries reported research capacity in aquatic animal health (Madagascar, Mozambique, South Africa, Tanzania, Zambia, Zimbabwe). Research related to aquatic animal health includes:

- development of specific pathogen resistant (SPR) *Penaeus monodon* in Madagascar
- research on the prevalence of white spot disease in Mozambique
- research on EUS in Zambia
- studies on diagnostic methods and the characterization of new and emerging pathogens in South Africa
- development of preventative and treatment strategies in South Africa
- generation of epidemiological data for important diseases in South Africa
- other unspecified research topics in South Africa and Tanzania

Objectives

The Objective of Programme 8 is:

- i. to increase research activity in those areas that have greatest potential to contribute to the improvement of regional aquatic animal health and biosecurity. (Also see Activity 39 under Programme 12: International and Regional Cooperation).

Activities

There are four Activities to be accomplished under Programme 8:

Activity 25: Identify research establishments within SADC that will contribute to research efforts

- *Priority:* high
- *Time frame:* short term
- *Responsibility:* national and regional
- *Description:* SADC will conduct a regional survey of government, university and private research facilities to identify the expertise and infrastructure available in the region and establish a regional database of facilities, scientists, expertise and mandates/interests. This database can then be used to identify potential participants in projects targetting specific research needs for the advancement of regional aquatic

biosecurity. National Competent Authorities will assist by identifying institutions with research capacity within their individual countries.

Activity 26: Identify and prioritize aquatic animal health research and development programmes for the region and nationally (including research on emerging pathogens)

- *Priority:* high
- *Time frame:* short, medium and long term
- *Responsibility:* national and regional
- *Description:* Under Activity 26, SADC will identify and prioritize current and potential aquatic animal health research and development programmes that can contribute to the advancement of aquatic animal health management and biosecurity in the region. National Competent Authorities will assist by identifying and prioritizing current and potential activities on both a national and regional basis.

Activity 27: Conduct targeted research on epizootic ulcerative syndrome (EUS)

- *Priority:* high
- *Time frame:* short term
- *Responsibility:* national and regional
- *Description:* Because of its high importance to several SADC Member Countries, research on EUS has been targetted as having high priority for funding. SADC will establish an EUS Task Force to coordinate the efforts of key Member Countries, identify research areas of highest priority, develop proposals and seek regional and international donor assistance.

Activity 28: Identify and mobilize funding sources for aquatic animal health research for the SADC Region

- *Priority:* high
- *Time frame:* short, medium and long term
- *Responsibility:* national and regional
- *Description:* Based on the findings of Activities 25 and 26, this Activity will develop preproposals for priority aquatic animal health research projects in the SADC Region and will identify potential international, regional and national funding sources for individual projects based on the interests of potential funding agencies and the priorities of national agencies. Once potential funding sources for an individual project have been identified, SADC will lead (or assist national agencies as required) in the preparation of a proposal to funding-agency requirements.

4.9 Programme 9: Communication

Background

Communication includes activities that increase the flow of information between and among national policy-makers, researchers, Competent Authorities, regional bodies and international agencies and experts. Communication activities assist with problem solving and keep national experts, who may be working in relative isolation, up to date with regard to the regional and global aquatic animal health situation. It is especially important to an effective national aquatic animal biosecurity programme to establish and promote good communication and linkages between national veterinary services and national fisheries authorities.

Current Status

At present there are no regional mechanisms dedicated to promoting communication on aquatic animal health and biosecurity matters between aquatic animal health experts, policy-makers, quarantine officers, diagnosticians, etc. There is thus a great potential for increased communication within the SADC Region. This could include shared communication structures (websites, newsletters), development of a regional aquatic animal health information system (pathogen database, regional disease diagnostic and extension manuals) and linkage of experts by regional conferences and meetings.

Objectives

The Objective of Programme 9 is:

- i. to increase communication among key individuals and agencies concerned with aquatic animal health and biosecurity issues, by such activities as integrating aquatic animal health and biosecurity information within existing aquaculture networks and establishing a SADC regional communication hub.

Activities

There are two Activities to be accomplished under Programme 9:

Activity 29: Integrate aquatic animal health information within existing aquaculture networks

- *Priority:* high
- *Time frame:* short term
- *Responsibility:* national and regional
- *Description:* There are a number of existing aquaculture and biosecurity-related networks in the SADC Region (e.g. Aquaculture Network for Africa (ANAF), Sustainable Aquaculture Research Networks for Sub-Saharan Africa (SARNISSA)). Activity 29 will seek mechanisms to incorporate and/or increase the dissemination of information relevant to regional aquatic animal health and biosecurity by seeking cooperation with these networks and providing them with a regular source of information concerning recent happenings and advances in aquatic animal health, both within the region and globally. Member Countries will be asked to contribute regular information on national aquatic animal health issues and events.

Activity 30: Establish a regional communication hub for the SADC Regional Programme on Aquatic Animal Health

- *Priority:* high
- *Time frame:* short term
- *Responsibility:* national and regional
- *Description:* Through this SADC Regional Strategy, a Regional Programme on Aquatic Animal Health will be established. Activity 30 will establish and maintain a regional communication hub (a dedicated Website) to provide a source of information and communication for regional aquatic animal health and biosecurity workers. The Website will disseminate information on advancement of the Regional Strategy (e.g. activities, proposals, projects), contain databases developed by the various Activities, and provide current information on aquatic animal health and biosecurity topics of interest, both nationally and regionally. It will also link agencies and individuals involved in implementation of the Strategy through, for example, a regional experts database and a regional discussion group.

4.10 Programme 10: Human Resources and Institutional Capacity Development

Background

Human resources and institutional capacity development refers to having the correct number of staff with the appropriate expertise to accomplish the essential tasks that have been identified as part of a national aquatic animal health strategy or aquatic biosecurity plan. This requires the hiring and/or training of scientists, veterinarians and other staff possessing critical expertise and training in the key areas of aquatic animal health (often at the PhD, MSc and DVM (with specialized training in aquatic pathology) level, including, for example, disease diagnostics, aquatic biosecurity, aquatic veterinary medicine, risk analysis, aquatic epidemiology, emergency preparedness, extension services, enforcement, border control, information services, etc. In addition, a programme to maintain and upgrade expertise through short-term and other training, attendance at international conferences and meetings, international collaboration, etc. must be established.

A sound knowledge of aquatic diseases is a prerequisite to making informed decisions about aquatic disease management and implementation of all levels of an aquatic biosecurity strategy. At the same time, there is need for veterinarians and fisheries officers to provide support to a growing high-value aquaculture industry. Ongoing training in aquatic animal health will assist many countries in finalizing their respective national aquatic animal health and biosecurity plans and to implement corresponding control measures. With the expected rapid growth in aquaculture in the SADC Region, it is important that sufficient training opportunities are made available. Training opportunities should provide the academic foundation for veterinary officials to make informed decisions when dealing with the trade in aquatic animals and to assist farmers in setting up individual health management plans for their animals. This will support international market acceptance of fish exports from SADC countries and protect indigenous stocks from disease threats associated with importation of live aquatic animals, thus maintaining aquatic biodiversity.

Current Status

In contrast to the study of terrestrial livestock and their diseases, the study of aquatic animals plays a relatively small role in many veterinary curricula, and the field of aquatic animal diseases remains a challenge to veterinarians and other officials dealing with aquatic animals in Southern Africa. Veterinarians and scientists employed in the relevant Competent Authorities dealing with aquatic animals need considerable up-to-date knowledge of the disease issues facing their respective countries and the region as a whole and need to be in a position to engage with aquaculture producers. As many aspects of aquatic animal disease differ substantially from those of terrestrial animals, the necessary competencies needed to manage the health of aquatic species need to be developed and strengthened. Essential expertise is lacking in the majority of SADC Member Countries. The region is particularly weak in the key area of aquatic animal disease diagnostics (both molecular and traditional histopathological methods) and in the supporting areas of expertise (parasitology, bacteriology, mycology, virology, water quality analysis). Expertise is also insufficient in other key areas such as aquatic epidemiology, risk analysis and fish medicine. The SADC Regional Aquatic Animal Health Performance and Capacity Survey noted that a detailed analysis of regional expertise is needed to determine the region's strengths and weaknesses. It noted that South Africa (which did not complete this section of the survey) has significant

expertise in aquatic animal health in government and university which might be utilized to assist the weaker countries in the region.

Objectives

The Objectives of Programme 10 are:

- i. to increase the knowledge and expertise of regional aquatic animal health workers and aquaculturists through targeted short-term training;
- ii. to identify universities and other institutions that can offer aquatic animal health training in the SADC Region;
- iii. to assist regional universities by developing appropriate guidelines for curricula addressing the aquatic animal health needs of the SADC Region and engaging them to accept the need for related degree programmes;
- iv. to mobilize funding to support the development of human resources and institutional capacity; and
- v. to investigate Memoranda of Understanding (MOUs) and other means to facilitate collaboration between universities in the SADC Region.

Activities

There are five activities to be accomplished under Programme 10:

Activity 31: Build and expand on existing training programmes on aquatic animal health from producer to service-provider levels

- *Priority:* high
- *Time frame:* short, medium and long term
- *Responsibility:* national and regional
- *Description:* Under Activity 31, SADC will conduct a review of short-term (non-degree) training opportunities related to aquatic animal health that are currently available in the region. It will then conduct a survey of relevant agencies, organizations and private-sector aquaculturists in Member Countries to identify and prioritize short-term training needs. Based on the results of these surveys, SADC will seek mechanisms and funding to meet the training needs identified.

Activity 32: Identify universities and institutions that can offer aquatic animal health training in the SADC Region

- *Priority:* high
- *Time frame:* short term
- *Responsibility:* national and regional
- *Description:* Similar to Activity 31, Activity 32 will conduct a survey of universities and other training facilities to determine the opportunities for degree-related (BSc, MSc, PhD, DVM) training in aquatic animal health-related subjects in the region.

Activity 33: Develop appropriate curriculum guidelines addressing the needs of the SADC Region and engaging regional universities to accept the need for aquatic animal health training (degree programmes)

- *Priority:* high
- *Time frame:* short, medium and long term
- *Responsibility:* national and regional
- *Description:* Under Activity 33, SADC will conduct a survey of aquatic animal health programmes offered by universities in other regions of the world and from this, will

develop model curriculum guidelines appropriate to the SADC Region that can be adopted by regional universities. SADC will also seek methods to engage regional universities to recognize the need for establishing advanced degree and non-degree training programmes in aquatic animal health.

Activity 34: Investigate Memoranda of Understanding (MOUs) and other means to facilitate collaboration (e.g. twinning options) between universities in the SADC Region

- *Priority:* high
- *Time frame:* short, medium and long term
- *Responsibility:* national and regional
- *Description:* Under this Activity, SADC, with the collaboration and guidance of regional universities, will seek to develop MOUs and other mechanisms (e.g. twinning options) for the sharing of specialized expertise and capacity and the promotion of collaborative research between universities.

Activity 35: Mobilize funding to support development of human resources and institutional capacity

- *Priority:* high
- *Time frame:* short, medium and long term
- *Responsibility:* national and regional
- *Description:* Based on the results of the various Activities defined in this Strategy, SADC will approach national governments, regional bodies and international donor agencies to solicit funding support to develop regional human resource and institutional capacity in aquatic animal health and biosecurity.

4.11 Programme 11: Infrastructure

Background

Infrastructure for aquatic animal health encompasses the essential facilities and systems serving a country, and in the case of the SADC Regional Aquatic Animal Health Capacity and Performance Survey, includes dedicated physical structures such as buildings for office space, diagnostic and other laboratories, quarantine facilities, tank rooms, experimental ponds, etc. Adequate and appropriate infrastructure is essential to the success of any national aquatic biosecurity programme.

Current Status

Only five countries (Madagascar, Mozambique, Namibia, South Africa, Tanzania) have dedicated infrastructure for aquatic animal health. Madagascar has offices and some laboratory space dedicated to disease diagnostics (both histopathology and molecular diagnostics), as well as aquaculture ponds and tank rooms for holding of aquatic animals. Mozambique has three mobile laboratories equipped for the diagnosis of white spot disease (WSD). Namibia has dedicated office space and infrastructure for histopathology and molecular diagnostics, although these require equipping. South Africa (perhaps the country best equipped with infrastructure for aquatic animal health) was unable to provide detailed information. Tanzania has dedicated research sites and fish ponds at Sokoine University of Agriculture. Several SADC countries report the availability of shared infrastructure, including such items as electron microscopes (Botswana), state or private laboratories (Madagascar, Malawi, Mozambique, Swaziland, Tanzania, Zambia, Zimbabwe), office space (DRC, Seychelles, Swaziland, Tanzania, Zambia, Zimbabwe), quarantine facilities (Mauritius) and ponds and/or commercial aquaculture farms (Tanzania, Zambia).

Objectives

The Objective of Programme 11 is:

- i. to ensure that SADC Member Countries have sufficient and appropriate infrastructure to meet their national aquatic animal health and biosecurity objectives and to accomplish the goals of the Regional Strategy.

Activities

There are two activities to be accomplished under Programme 11:

Activity 36: Identify gaps in infrastructure requirements to support the SADC regional aquatic animal health programme

- *Priority:* high
- *Time frame:* short term
- *Responsibility:* national and regional
- *Description:* Under Activity 36, SADC will undertake a regional review and analysis of infrastructure needed and currently dedicated or available to support the regional aquatic animal health programme. The review will identify gaps in essential infrastructure needed to implement this Regional Strategy.

Activity 37: Develop appropriate infrastructure to support the SADC regional aquatic animal health programme for diagnostics, research, surveillance, etc. including integration with existing facilities for terrestrial animal health

- *Priority:* high
- *Time frame:* long term
- *Responsibility:* national and regional
- *Description:* This Activity will follow up on Activity 38, and will make recommendations for the upgrading or establishment of essential aquatic animal health and biosecurity infrastructure and will seek funding sources to support its development.

4.12 Programme 12: Regional and International Cooperation

Background

Cooperation refers to the sharing of effort and resources (e.g. staff, infrastructure, funding) between and/or among countries, government agencies, universities, the private sector and other stakeholders to achieve common objectives or goals. Cooperation in research and training is possible via international agencies such as the FAO and OIE and with foreign universities and experts. There is a great potential for regional cooperation and networking in almost all areas of aquatic animal health. Examples include the development of standardized procedures for import and export of live aquatic animals, harmonization of legislation, shared communication structures (websites, newsletters), development of a regional aquatic animal health information system (pathogen database, regional disease diagnostic and extension manuals), cooperative research programmes, development of regional strategy and policy, regional disease reporting, a regional emergency response system, regional reference laboratory, regional risk analysis case studies, coordinated training efforts, etc. Domestically, cooperation between agencies, particularly those agencies responsible for fisheries and aquaculture, veterinary services, biosecurity and environmental/conservation issues, should be promoted.

Current Status

Regional cooperation in areas related to aquatic animal health is in its infancy, but is occurring via the Africa Union Inter-African Bureau for Animal Resources (AU-IBAR), SADC, and the Common Market for Eastern and Southern Africa (COMESA). International cooperation occurs via membership in FAO and the OIE. Several countries have cooperative activities with other international agencies, for example: Madagascar, with the Worldwide Fund for Nature (WWF) and the Japanese International Cooperation Agency (JICA); Mauritius, with the Norwegian Agency for Development Cooperation (NORAD) and with Rhodes University; and Zambia, through the Convention on International Trade in Endangered Species (CITES), the World Trade Organization (WTO) and COMESA. Six countries (Botswana, Lesotho, Mauritius, Seychelles, South Africa, Zambia, Zimbabwe) have some form of formal or informal domestic cooperation among government agencies or between government and university or private sector, although some of the linkages cited may not be directly related to improving aquatic animal health.

Objectives

The Objective of Programme 12 is:

- i. to improve regional aquatic animal health and biosecurity by identifying mechanisms for increasing appropriate regional and international cooperation among Competent Authorities and other relevant stakeholders.

Activities

There are two Activities to be accomplished under Programme 12:

Activity 38: Promote cooperation among SADC Member Countries in the control of serious aquatic animal diseases that are present in the region

- *Priority:* high
- *Time frame:* long term
- *Responsibility:* national and regional
- *Description:* Under Activity 37, SADC will identify and facilitate mechanisms to increase cooperation among Member Countries that will assist in controlling serious aquatic animal diseases that are present in the region.

Activity 39: Facilitate research collaboration between SADC aquatic animal health experts and their local, regional and international counterparts

- *Priority:* high
- *Time frame:* short, medium and long term
- *Responsibility:* national and regional
- *Description:* Under Activity 39, SADC will identify and facilitate mechanisms to increase cooperation between SADC aquatic animal health experts and their local, regional and international counterparts.

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ANNEX III.a**Members of the SADC regional biosecurity strategy working group**

	COUNTRY	NAME
1	Angola	Ms Ilda Lucas
2	Botswana	Dr Bernard C Mbeha
3	Botswana	Mr Supi Khuting
4	DRC	Mr Daniel Manyale
5	Lesotho	Dr Mosa Motsoene
6	Lesotho	Dr Mpalileng Matlali
7	Lesotho	Dr Marosi Molomo
8	Madagascar	Mr Andree N. Rakotomamonjy
9	Malawi	Dr Gilson Njunga
10	Malawi	Mr Innocent Gumulira
11	Mauritius	Dr Vidya B. Groodoyal
12	Mauritius	Mr Mohamud F. Hotee
13	Mauritius	Mr Joseph M. Ramsamy
14	Mozambique	Mr Zacarias E. Massicame
15	Mozambique	Dr Ana Paula Baloi
16	Namibia	Mr Frikkie Botes
17	Namibia	Mrs Heidi Skrypzeck
18	Seychelles	Mr Antoine-Marie Moustache
19	Seychelles	Dr Jimmy Melanie
20	Swaziland	Mr Freddy Magagula
21	Swaziland	Dr Cecilia Zandile Mlangeni
22	Tanzania	Ms Meresia Sebastian
23	Zambia	Dr Arthur Mumbolomena
24	Zambia	Mr Venantious M. Musonda
25	Zimbabwe	Dr Maxwell Barson
26	Zimbabwe	Dr Sithokozile Sibanda
27	South Africa	Mr Stephen Goetze
28	South Africa	Ms Maria Raesetja Tloubatla
29	South Africa	Mr Mbongeni Khanyile
30	South Africa	Mr Phosa Moatladi Jacob
31	South Africa	Dr Gary Buhrmann
32	South Africa	Mr Nelson Matekwe
33	South Africa	Ms Primrose Bontle Lehubye
34	South Africa	Dr Sasha Saugh
35	South Africa	Dr Mpho Maja
36	South Africa	Dr Boitumelo Motsitsi-Mehlape
37	South Africa	Mr Keagan Halley
38	South Africa	Ms Zukiswa Nkhereanye
39	South Africa	Dr Misheck Mulumba
40	South Africa	Dr Kevin Christison
41	Worldfish Centre	Ms Songe Mwanza
42	FAOZA	Mr Victor Ngomane
43	FAOZA	Mr Blessing Mapfumo
44	FAO Rome	Dr Melba Reantaso
45	Sadc Secretariat	Dr Motseki Hlatwayo

	COUNTRY	NAME
46	Sadc Secretariat	Mr Nyambe N. Nyambe
47	Australia	Dr Mark Crane
48	Canada	Dr Richard Arthur
49	Madagascar	Dr Marc Le Groumellec
50	South Africa	Dr David Huchzermeyer
51	Zambia	Dr Hang`ombe Bernard Mudenda

ANNEX III.b

Implementation table

Programme/Activity	Priority ¹			Time frame ²			Responsibility ³		
	Low	Medium	High	Short	Medium	Long	National	SADC	Both
Programme 1: Policy and Legislation									
<i>Activity 1: Harmonize SADC Member Country legislation related to aquatic animal health with international legislation (e.g. EU Directive 2006/88/EC) and the OIE standards</i>			X		X				X
<i>Activity 2: Conduct in-depth reviews of national legislation related to aquatic animal health, and where absent, promulgate new legislation</i>			X	X	X	X	X		
Programme 2: Risk Analysis									
<i>Activity 3: Establish a Pathogen Risk Analysis Team and Risk Analysis Working Groups</i>			X	X	X	X			X
<i>Activity 4: Develop a regional commodity-based risk assessment framework</i>		X		X	X	X		X	
<i>Activity 5: Develop SADC-harmonized standards and guidelines for risk management requirements for importing ornamental aquatic animals</i>			X	X					X
<i>Activity 6: Promote cooperation to prevent the entry of biosecurity hazards by integrating import risk analysis/pathogen risk analysis (PRA) with associated genetic and ecological risk analyses</i>			X	X					X
Programme 3: Pathogen List									
<i>Activity 7: Develop SADC criteria for listing and delisting</i>			X	X					X

¹ Low = desirable but not essential; Medium = important and essential, but less urgent; High = urgent, requires immediate action.

² Short = 1–2 years; Medium = 2–5 years, Long = 5–10 years.

³ National = national governments alone are responsible; SADC = SADC alone is responsible; Both = both national governments and SADC are responsible.

[illegible]

Activity 19: Establish national and regional surveillance programmes for three priority diseases (EUS, KHV, WSSV)			X	X					X
Activity 20: Establish a regional surveillance programme for other OIE-listed diseases to demonstrate their absence in the SADC Region		X			X				X
Activity 21: Establish a regional surveillance/monitoring programme for the SADC List of Pathogens		X			X				X
Programme 7: Emergency Preparedness and Contingency Planning									
Activity 22: Develop a SADC "AQUAVETPLAN"			X	X					X
Activity 23: Establish national-level and SADC Emergency Disease Response Teams			X	X					X
Activity 24: Establish an emergency response fund			X	X					X
Programme 8: Research and Development									
Activity 25: Identify research establishments within SADC that will contribute to research efforts			X	X					X
Activity 26: Identify and prioritize aquatic animal health research and development programmes for the region and nationally (including research on emerging pathogens)			X	X	X	X			X
Activity 27: Conduct targeted research on epizootic ulcerative syndrome (EUS)			X	X					X
Programme/Activity	Priority			Time frame			Responsibility		
	Low	Medium	High	Short	Medium	Long	National	SADC	Both
Activity 28: Identify and mobilize funding sources for aquatic animal health research for the SADC Region			X	X	X	X			X
Programme 9: Communication									
Activity 29: Integrate aquatic animal health information within existing aquaculture networks			X	X					X
Activity 30: Establish a regional communication hub for the SADC Regional Programme on Aquatic Animal Health			X	X					X
Programme 10: Human Resources and Institutional									

Capacity Development									
<i>Activity 31: Build and expand on existing training programmes on aquatic animal health from producer to service-provider levels</i>			X	X	X	X			X
<i>Activity 32: Identify universities and institutions that can offer aquatic animal health training in the SADC Region</i>			X	X					X
<i>Activity 33: Develop appropriate curriculum guidelines addressing the needs of the SADC Region and engaging regional universities to accept the need for aquatic animal health training (degree programmes)</i>			X	X	X	X			X
<i>Activity 34: Investigate Memoranda of Understanding (MOUs) and other means to facilitate collaboration (e.g. twinning options) between universities in the SADC Region</i>			X	X	X	X			X
<i>Activity 35: Mobilize funding to support development of human resources and institutional capacity</i>			X	X	X	X			X
Programme 11: Infrastructure									
<i>Activity 36: Identify gaps in infrastructure requirement to support the SADC regional aquatic animal health programme</i>			X	X					X
<i>Activity 37: Develop appropriate infrastructure to support the SADC regional aquatic animal health programme for diagnostics, research, surveillance, etc. including integration with existing facilities for terrestrial animal health</i>			X			X			X
Programme 12: Regional and International Cooperation									
<i>Activity 38: Promote cooperation among SADC Member Countries in the control of serious aquatic animal diseases that are present in the region</i>			X			X			X
<i>Activity 39: Facilitate research collaboration between SADC aquatic animal health experts and their local, regional and international counterparts</i>			X	X	X	X			X

ANNEX III.c

Suggested additions to the "Current status" section of each programme, as provided by reviewers

Reviewer	Strategy Section	Suggested Correction or Addition
Moetapele Letshwenyo	4.1	Only three countries in the region (Lesotho , Mozambique and Seychelles) have so far applied for an OIE-led evaluation of their <i>Aquatic Animal Health Services</i> (AAHS) under the OIE PVS pathway programme (<i>Performance of Veterinary Services</i>).
David Huchzermeyer	4.3 Current Status	South Africa needs to be included here. Perhaps Sasha can comment, but we have listed the salmonid virus diseases which is essential in order to be able to certify our salmonid ova exports.
David Huchzermeyer	4.4 Current Status 3 rd and 4 th sentences	Not sure whether this statement is correct. It could either be left out or perhaps rephrased using the words ..designated national aquatic animal disease laboratories..In South Africa the OVI is an accredited laboratory working mainly with terrestrial animal diseases but the results of fish virus isolation done by OVI are internationally accepted.
David Huchzermeyer	4.5 Current Status 3 rd sentence 4 th sentence	Notes that "Nile tilapia" should be added to the list of imported freshwater finfish Notes that with regard to imports of freshwater ornamentals, "...large quantities.. would be more appropriate to South Africa"
Sasha Saugh	4.6 Current Status	In South Africa disease surveillance for abalone diseases, is currently being undertaken and has been done by the private sector for more than a decade. Disease surveillance for oysters has also been undertaken by the private sector. The DAFF is now planning to implement a disease surveillance and monitoring programme for diseases of marine invertebrates that will be undertaken and co-ordinated by state veterinarians.

ISBN 978-92-5-131184-4 ISSN 2070-6065



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CA2764EN/1/12.18