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Republic of Suriname
National Aquatic Animal Health Capacity
and Performance Survey:
Summary of Survey Results and Analysis

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BACKGROUND

The recently funded Project TCP/SUR/3401 “Strengthening Aquatic Animal Health Protection Systems in Suriname” will strengthen the competencies of national authorities in Suriname to implement effective aquatic animal health protection systems. In the long term, this capability will minimize risks to the aquaculture industry from aquatic animal diseases. The technical assistance to be provided includes 1) updating of the aquaculture sector strategic action plan based on participatory processes, and 2) design of an effective biosecurity governance through a national aquatic animal health management strategy. The prerequisite actions include review/design of policy and legislation, national pathogen list, risk assessment, surveillance and reporting structure, and performance survey of quarantine and health certification, emergency preparedness and contingency planning and farm-level biosecurity. Completion of this National Aquatic Animal Health Capacity and Performance Survey will set the stage for accomplishing the above tasks by providing the necessary background information required to assess Suriname's current national status and future needs with regard to aquatic animal health management.

PURPOSE

The purpose of this survey is to obtain information on national capacity and the agencies mandated to implement aquatic animal health programmes for Suriname. 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 national aquatic animal health framework and strategy. The results of this survey will help guide national strategic planning for improving aquatic animal health and assuring adequate and rational support services to achieve sustainable aquaculture development. This analysis of survey results will form the basis for the development of a National Aquatic Animal Health Strategy as a key part of Project TCP/SUR/3401.

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 (FIRI) (M. Reantaso, R. Subasinghe and A. Lovatelli) and International Consultant J.R. Arthur and modified to Suriname's national situation.

This survey was completed by Dr Anand R.J. Chotkan, Ministry of Agriculture, Livestock and Fisheries (LVV) and FAO National Project Coordinator, with the assistance of Mr. Soekirman Moeljoredjo, Anton de Kom University of Suriname, Ms. G. Karg, Head, Veterinary Laboratory, and other Veterinary Officers working in the Livestock Department.

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) 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.

PREPARATION OF THE SURVEY SUMMARY AND ANALYSIS

The completed survey forms were returned to FAO by the NPC. This information was then analyzed by the International Consultant, who requested any needed clarifications from the NPC and ATF.

The results of the survey are presented in this document, the sequence of presentation of information following the sequence of Sections and Questions used in the National Aquatic Animal Health Capacity and Performance Survey form. All significant information provided in the original survey form 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 Suriname.

ABBREVIATIONS AND ACRONYMS

The following abbreviations and acronyms appear in this document:

AAHRI	Aquatic Animal Health Research Institute (Department of Fisheries, Thailand)
ATF	Aquaculture Task Force
BMPs	Better Management Practices
CARICOM	The Caribbean Community
CRFM	Caribbean Regional Fisheries Mechanism
FAO	Food and Agriculture Organization of the United Nations
FIRI	Inland Water Resources and Aquaculture Service (of FAO)
GATT	General Agreement on Tariffs and Trade
HACCP	Hazard analysis and critical control point
HH	High health
IRA	Import risk analysis
LVV	Ministerie van Landbouw, Veeteelt en Visserij (Ministry of Agriculture, Animal Husbandry and Fisheries)
NAAHMS	National Aquatic Animal Health Management Strategy
NPC	National Project Coordinator
OIE	World Organisation for Animal Health (formerly the Organisation International des Epizooties)
SEAFDEC	Southeast Asian Fisheries Development Center
SOP	Standard operating procedures
SPF	Specific pathogen free
SPS Agreement	The Agreement on The Application of Sanitary and Phytosanitary Measures (of the WTO)
TCP	Technical Cooperation Programme (of the FAO)
VCM	Verenigde Cultuur Maatschappijen
VKI	Viskeurings Instituut (Fish Inspection Institute)
WTO	World Trade Organization

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

A. *Relevant International Memberships*

Summary of Results

Suriname has the following relevant memberships (Survey Questions 1.1–1.2).

- World Organisation for Animal Health (OIE)

The Chief Veterinary Officer is:

Dr Edmund Rozenblad
Director of Animal Production and Health and Chief Veterinary Officer
Ministerie van Landbouw, Veeteelt en Visserij
Letitia Vriesdelaan 8-10 P.O. Box 1807
Paramaribo
Tel.: 402546; E-mail: edmund.rozenblad@lvv.gov.sr

- World Trade Organization (WTO)
- Caribbean Regional Fisheries Mechanism (CRFM)

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 August 2012, the OIE had a total of 178 Member Countries and Territories. The OIE maintains permanent relations with 35 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” (available at: <http://www.oie.int/en/international-standard-setting/overview/>)). The OIE Aquatic Animal Health Standards Commission prepares these standards with 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.

As an OIE member, Suriname is 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 (current membership is 157 countries). 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 Suriname in the OIE and the WTO provides the country with a common, agreed-upon formal methodology and structure (as outlined in the OIE Code and Manual and the SPS Agreement) for conducting trade in live aquatic animals and which can be used in developing national and regional aquatic animal health programmes.

The Caribbean Regional Fisheries Mechanism (CRFM) (<http://www.caricom-fisheries.com/Default.aspx>) was officially inaugurated on 27 March 2003, in Belize City, Belize, where it is headquartered, following the signing of the “Agreement Establishing the CRFM” on February 4, 2002. It is an intergovernmental organization whose mission is “To promote and facilitate the responsible utilization of the region's fisheries and other aquatic resources for the economic and social benefits of the current and future population of the region”. The CRFM consist of three bodies – the Ministerial Council; the Caribbean Fisheries Forum; and the CRFM Secretariat. Its members are Anguilla, Antigua and Barbuda, The Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, Montserrat, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago and the Turks and Caicos Islands. One of CRFM's programme areas is Development of Aquaculture, which includes the formulation of a master plan for fisheries and aquaculture

development in the Caribbean, within which Suriname is included. Inter alia, aquatic biosecurity should be expected to be encompassed within this programme.

B. Legislation Relevant to Aquatic Animal Health

Summary of Results

Currently Suriname has no existing legislation that applies specifically to aquatic animal health. When importing or exporting live fish, the “rules and regulations” in use are adapted from those applied to the import and export of terrestrial animals (e.g. Standard Operating Procedures, see Box 1 and 2). (Survey Question 1.3)

Analysis

An in-depth review of the relevant national legislation is being included as an activity of the current FAO Project TCP/SUR/3401. This review and revision of national legislation is being done in conjunction with development of the National Aquatic Animal Health Strategy, which should be harmonized as far as possible, with national biosecurity, veterinary, aquaculture, conservation and marine resource law, and support standardized aquatic animal health procedures. At the same time another FAO project (TCP/SUR/300302 "Strengthening the Sanitary Regulatory Framework of Suriname" is undertaking a review of legislation related to terrestrial animal production. This project is addressing some concerns that also relate to aquatic animal health (e.g legislation concerning feeds, farm registration, regulation of veterinary medicines, animal welfare, etc.). Thus coordination between projects is needed to avoid overlap and to promote harmonization of approaches.

C. Trade in Live Aquatic Animals and Use of Health Certification

C.1 Exportations

Summary of Results

Survey results relating to the export of live aquatic animals by Suriname are presented in Table 1 (below) (Survey Questions 1.4–1.6). In all cases, the volume and value of the fish that are exported are unknown.

Table 1. Summary of recent exportations of live aquatic animals by Suriname.

Species	Country of destination	Year
<i>Hoplosternum littorale</i>	Holland	2010
<i>Corydoras bicolor</i>	Japan	2011
<i>C. baderi</i>	Japan	2011
<i>C. surinamensis</i>	Japan	2011
<i>C. guianensis</i>	Japan	2011
<i>C. aenus</i>	Japan	2011
<i>C. punctatus</i>	Japan	2011
<i>C. boesemani</i>	Japan	2011
<i>Pseudancestris</i> spp.	Japan	2011
<i>Ancistrus</i> spp.	Japan	2011
<i>Loricalia</i> spp.	Japan	2011

<i>Hemidolus</i> spp.	Japan	2011
<i>Leporinus</i> spp.	Japan	2011
<i>Characidium</i> spp.	Japan	2011
<i>Metinis</i> spp.	Japan	2011
<i>Crenicichla</i> spp.	Japan	2011
<i>Heptaterus</i> spp.	Japan	2011
<i>Hyphessobrycon</i> spp.	Japan	2011
<i>Poecilia reticulata</i>	Japan	2011
<i>Copella</i> spp.	Japan	2011
<i>Nibeia</i> spp.	Japan	2011
<i>Pangasius</i> spp.	Japan	2011
<i>Hassar orestis</i>	Japan	2011
<i>Geophagus surinamensis</i>	Japan	2011
Cichlidae spp.	Holland	2011
<i>Hoplosternum littorale</i>	Holland	2011
<i>Crenicichla multispinosa</i>	USA	2012
<i>Cichla ocellaris</i>	USA	2012
<i>Centropomus ensiferus</i>	USA	2012
<i>Hoplias curupira</i>	USA	2012
<i>Geophagus brokopondo</i>	USA	2012
<i>Guinacara</i> spp.	USA	2012
<i>Crenicichla multispinosa</i>	Germany	2012
<i>Cichla ocellaris</i>	Germany	2012
<i>Lythodora dorsalis</i>	Germany	2012
<i>Cichlosoma bimaculatis</i>	Germany	2012
<i>Serrasalmus</i> spp.	Germany	2012

When exporting live aquatic animals, a health certificate valid for 10 days is issued by the Department of Fisheries. This certificate is written by the Junior Veterinary Officer at the Aquaculture Section:

Dr. A.Chotkan
Cornelis Jongbawstraat #50
Tel: +597 479112 ext. 3125

In some cases, the importing country will ask for a certificate to be issued in accordance with a template that they provide.

Health certification of aquatic animals is thus done based on general appearance of health (e.g. by visual inspection) (Survey Question 1.7).

The procedures followed for the exportation of live aquatic animals are outlined in the Standard Operating Procedures (SOP), given in Box 1.

Box 1. Standard Operating Procedures (SOP) for export of live fish and aquatic animals

- 1) The invoice and all other documents required for the planned exports are sent to the Directorate of Fisheries. On the invoice should be mentioned:
 - a. The number of fish (by species)
 - b. The name of the fish ("common name" and Latin name)
- 2) If the exported animals are protected (CITES Appendix II), a CITES certificate should be requested from the nature services.*
- 3) An inspection is carried out by the state veterinarian or authorized person.
- 4) If there are no irregularities a health certificate that is valid for 7 (seven) days is issued.**
 - a. For a health certificate, the following data are required:
 - i. Name of the exporter
 - ii. Address where the animals are
 - iii. Name of the importer/buyer
 - iv. Address of the importer/buyer
 - v. Country where the exports are going
 - vi. Transport company/airline
 - vii. Flight number
 - viii. Date of export
- 5) With the above documents, the "Enig Document" (the customs declaration form) is requested at the customs office.
- 6) All of the above documents must be brought to the Department of Fisheries.
- 7) These are forwarded to the Deputy Director Fisheries who then gives his approval/no objections for export.

* If the exported animals are listed in CITES Appendix I, exports of these animals are prohibited and permission will not be given to export.

** Please note that there are costs connected for the health certificate.

Analysis

All species listed in Table 1 are exported for the ornamental fish trade. At present, live aquatic animals are not exported for aquaculture development. Exportation of ornamentals by Suriname is presently done by a single company, and is entirely based on fish collected from the wild. Interviews with pet store owners in the Paramaribo area indicate that Suriname is not currently competitive in the global ornamental fish trade with the large producers and suppliers such as P.R. China, Singapore, the United States of America and Trinidad and Tobago. Global interest in Suriname as a source of ornamental fishes is currently centered on a limited trade in wild-collected endemic species whose culture has not yet been established by global producers.

Procedures for the collection of more accurate and complete data on exportations of aquarium species is needed to fully understand trading patterns and the demands placed on competent authorities for issuance of health certificates. This includes information on species identities (identification to species rather than to genus is needed), life history stages, numbers of animals being shipped by species, origins, health status, destinations, values, etc. Such information should be systematically collected and stored in a national database in a format that is easily retrievable for use by policy planners.

Collection of local endemic species from the wild could pose threats to biodiversity and thus needs to be closely monitored. At present there does not seem to be significant potential to

develop exports of cultured ornamentals, due to the high costs of production in Suriname and the highly competitive global market.

The issuance of health certificates for ornamental aquatic animals based on visual inspection is a common practice applied by many exporting countries. While such certificates may satisfy the competent authorities of trading partners by indicating the absence of clinical disease based on general appearance of health, they are of little value in preventing the international spread of aquatic animal pathogens. It is increasingly recognized that ornamental aquatic animals can act as carriers of serious diseases and thus pose significant risks to cultured and wild stocks in importing countries. The current global trend is thus towards requiring that ornamentals be certified as free from specific diseases using internationally recognized diagnostics methods. To fully access international markets (e.g. for exportation of koi carp), Suriname would need to be able to provide health certificates 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*. However, issuance of such international health certificates requires a high level of diagnostic capability.

C.2 Importations

Summary of Results

Small quantities of marine and freshwater ornamental fishes and marine corals are obtained from several countries and sold in Paramaribo by local pet dealers (see Table 2) (Survey Questions 1.8–1.9). Suriname's only operating shrimp farm (Comfish n.v.) also imports postlarvae of whiteleg shrimp for stocking into culture ponds near Paramaribo.

Table 2. Summary of aquatic animals imported into Suriname. (In all cases, volume and value estimates are not available).

Species	Country of origin	Year
Whiteleg shrimp postlarvae (<i>Litopenaeus vannamei</i>)	USA	Yearly
Assorted freshwater ornamentals	Trinidad & Tobago	Yearly
Assorted fresh & saltwater ornamentals & corals	Singapore	Yearly
Assorted freshwater ornamentals	China	Yearly
Assorted fresh & saltwater ornamentals & corals	Curacao	On demand

In the case of species imported for aquaculture purposes (e.g. *L. vannamei*), a health certificate and certificate of origin from a facility culturing specific pathogen free (SPF) shrimp is required. In the case of aquarium fish, a valid health certificate from the country of origin signed by the competent authority is needed. (Survey Question 1.10)

The Standard Operating Procedures to be followed during importation of live aquatic animals are given in Box 2.

Box 2. Standard Operating Procedures (SOP) for imports of live fish and aquatic animals

1. Application for a permit **before** the import takes place (Form for import of live animals)
2. If the shipment has arrived in Suriname the following documents should be handed in at the Fisheries Department:
 - a. The health certificate from the country of origin
 - b. The customs forms ("enig document" and H03)
 - c. The invoice
 - d. Bill of loading
3. An inspection is carried out by the state veterinarian or authorized person.
4. All findings of the veterinarian are passed to the Deputy Director of Fisheries
5. If there are no irregularities, the documents are forwarded to the Deputy Director of Fisheries who will sign the document stating the approval/no objection to import/sale

The actual importation procedure is as follows:

- The importer applies to LVV for permission to import a shipment of live aquatic animals by presenting a pro forma invoice and completed application form for import of live animals to the Aquaculture Section specifying the fish to be imported.
- The responsible officer then checks the species listed on the invoice to determine if are any invasive, protected or CITES-listed species.
- If there are no issues, a permit number is given which allows the importation to proceed. Usually the permit is valid for 3 months.
- The shipment is then imported. When it arrives, no inspection is made at port of entry; however, Customs requests the importer to submit all the forms/permits so that duties can be assessed.
- The shipment is then "quarantined" on premise by the importer.
- The importer notifies the Aquaculture Section that the imported animals are on premise and the responsible officer then visits the premises to conduct a visual inspection. If no problems are seen, the officer adds a notation on the invoice which accompanies the two documents, and this is forwarded to the Director who then signs. However, there may be a delay in receipt of the documents such that the fish have already been sold, the documents being submitted only so that the importer can pay the assessed duties.
- There are forms (HO3 form and the "enig document") that the Fisheries Director needs to sign which state that he has no objection to the importation; however, these documents usually arrive at the Aquaculture Section after the aquatic animals have already entered Suriname and are at the premises of the importer. (Survey Question 1.11)

Analysis

Interviews with owners of pet stores in the Paramaribo area indicates that ornamental fish are also imported from the United States of America and from Japan (koi carp).

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. A review of the information that the state requires from importers is needed so that procedures for more accurate and complete data on species compositions, life history stages, numbers of

animals by species, origins, health status, destinations, value 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.

The procedures for health certification and other risk mitigation measures that are currently applied by Suriname can be improved so as to be more effective in preventing the entry of serious diseases and pathogens. For example, the current procedure of allowing "quarantine" on premise would not prevent the entry and spread of serious aquatic animal pathogens. Given the low volume of current trade, quarantine on premises makes sense (as well, it is a prudent practice for aquaculture farms and aquarium fish dealers to follow). However, there is currently no mandatory set of procedures or guidelines that must be followed (for recommended procedures for both high security and on-farm quarantine, see *Procedures for the quarantine of live aquatic animals A manual*. <http://www.fao.org/docrep/010/i0095e/i0095e00.htm>).

Use of risk analysis can also 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.

D. Risk Analysis Capacity

Summary of Results

Suriname currently has no capacity to conduct risk analysis. (Survey Questions 1.12–1.15).

The following importations of exotic species are thought likely to occur within the next 5 years (Survey Question 1.16):

Species	Purpose	Probable Source
Whiteleg shrimp (<i>Litopenaeus vannamei</i>)	Aquaculture	USA
Cachama (<i>Colossoma macropomum</i>)	Aquaculture	Brazil
Grass carp (<i>Ctenopharangodon idella</i>)	Maintenance of canals on-farm (Verenigde Cultuur Maatschappijen, VCM)	To be determined
Assorted ornamental fish	Pet Shop	Singapore, Trinidad, USA

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.

As there is currently no risk analysis capacity in Suriname, there is thus a need to increase capacity through national training programmes, to develop appropriate national structures for conducting risk analyses for key aquatic species and, as part of the National Aquatic Animal Health Management Strategy, to develop capacity in other areas of aquatic animal health 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. A basic training course in aquaculture risks is proposed under the current FAO Project TCP/SUR/3401.

Commodities analysis

Importations of whiteleg shrimp postlarvae are an established practice by Comfish n.v., and have been handled in a responsible manner, which includes use of high health (HH) postlarvae originating from an SPF (specific pathogen free) facility in Florida, USA. The company also practices a system of "on-farm quarantine" which would help to reduce disease spread should a serious pathogen be introduced. If the shrimp culture industry is projected to expand, the LVV should proactively consider a list of approved suppliers of SPF postlarvae and a standardized protocol for on-farm biosecurity.

Introduction of triploid grass carp from the USA has also been previously done by Comfish n.v. (Mr. A. van Alen, pers. comm.) However, it is recommended that further consideration be given before approving future introductions. Grass carp is considered an invasive species; and induction of triploidy in grass carp may not be 100% effective (e.g. see http://www.cerc.usgs.gov/pubs/center/pdfDocs/black_carp.pdf). A risk analysis focusing on the likely invasiveness of this species to Suriname and on the effectiveness of treatment to achieve the triploid state would thus seem prudent.

Introduction of cachama from Brazil should not be undertaken without a full risk analysis considering ecological, genetic and pathogen risks. If analysis shows that risks are acceptable, introduction should follow the code of practices established by the International Council for the Exploration of the Sea (<http://www.ices.dk/reports/general/2004/icescop2004.pdf>).

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

Summary of Results

Suriname currently has no regulations governing the domestic movement of live aquatic animals. Similarly, there are no regulations pertaining waste disposal from seafood processing plants in relation to preventing the spread of aquatic animal pathogens (Survey Questions 2.1–2.4). The following species are thought likely to be moved domestically during the next five years: various ornamental fishes (moved by hobbyists), *giant river prawn* (*Macrobrachium rosenbergii*), atipa (*Hoplosternum littorale*) (moved from Nickerie to Paramaribo as live fish for human consumption), chacama (*Colossoma macropomum*) for aquaculture development, tilapia (*Oreochromis* spp.) and common or koi carp (*Cyprinus carpio*). (Survey Question 2.5).

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 is 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. Because Suriname has significant freshwater aquatic systems with distinct drainage basins and a long marine coastline, disease zoning and control may be possible and measures for domestic control of movements may be desirable.

The unsafe disposal of aquatic animal wastes (including processing water) from seafood processing plants represents a potential source for transmission of viruses and other aquatic animal pathogens. Current regulations and procedures (e.g. HACCP, 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.

SECTION 3. POLICY AND PLANNING

The Aquaculture Section, under the Fisheries Department is responsible for the control and monitoring of all activities relating to aquaculture in Suriname, as well as the control of imports and exports of live aquatic animals, in collaboration with the Veterinary Inspection. (Survey Questions 3.1–3.2).

Suriname has an official policy that is expressed in the aquaculture draft legislation: Chapter 4, Article 24–27, Chapters 5, 6 and 7. (Survey Questions 3.3–3.5). Since the legislation is in draft form there are several procedures that are being followed:

- Currently there is only visual inspection of live aquatic animals entering the country through legal channels.
- At present, only the commercial large-scale aquaculture establishment (Comfish n.v.) has a protocol to follow in case of disease outbreaks. The protocol is described in the Veterinary Health Plan for this establishment.¹

Subnational entities play a role in setting national aquatic animal health policy through stakeholder consultation. In writing the draft aquaculture legislation, consultation with all stakeholders (government and private sector) was held. Their recommendations and comments have been taken in consideration in the drafting of the version that is now awaiting approval. (Survey Questions 3.6–3.7).

Current policy of aquatic animal health is not considered adequate for preventing the entry and spread of exotic aquatic animal pathogens or for controlling serious diseases within the country. In general, policy is not considered to be effectively implemented (Survey Question 3.8).

At present, none of the key components required for national aquatic animal health management are addressed in national policy (these include: national diagnostics services, risk analysis, farm-level treatment and prevention, emergency preparedness and disease control, manpower requirements, training requirements, infrastructural requirements, financial requirements and planning, international treaties, memberships & linkages and communication (interagency, stakeholder). However all of these areas are included within the NAAHMS being developed under the current FAO TCP Project (Survey Questions 3.9).

The current priorities with regard to national aquatic animal health policy are:

Comment [O1]: Can we get some statement from the Deputy Director on this? Anand to follow up.

Analysis

In Suriname, as in many countries, the agency responsible for ensuring aquatic animal health (the Fisheries Department) is that responsible for the management of both fisheries resources and aquaculture development. However, administratively, Suriname is in a favorable position, with Agriculture, Animal Husbandry (with Veterinary Services) and Fisheries (with the Aquaculture Section) all falling within a single ministry, the LVV.

Although results indicate that current policy is inadequate and inadequately enforced, this issue is being addressed by the FAO Project TCP/SUR/3401.

Development of a national strategy on aquatic animal health 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 Suriname to protect aquatic animal health, ensure healthy aquatic production, comply with international obligations, etc. A national strategy contains many of the essential elements for a successful aquatic animal health 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,

¹ Comfish n.v. . 2012. *Veterinary health plan (VHP) for shrimp production*. Version 8, 26/05/2012 - 26/11/2012, 47 pp.

financial resources, surveillance and monitoring, and evaluation and regional and international cooperation.

SECTION 4. LEGISLATION

Summary of Results

Development of essential enabling legislation is a key component of a national aquatic animal health strategy. Suriname has draft legislation dealing with aquatic animal health issues that is both specific legislation and as part of broader legislation. Existing legislation/regulations are considered to be in need of major review and/or revision. (Survey Question 4.1–4.3).

Analysis

Once 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 aquatic animal health 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 aquatic animal health. Such a review for the livestock sector is currently being accomplished by FAO TCP project TCP/SUR/3302 “Strengthening the Sanitary Regulatory Framework of Suriname”, while the current FAO Project TCP/SUR/3401 includes a component that will review national legislation dealing with aquaculture and aquatic biosecurity to ensure that all legislation is covered and that the aquaculture legislation is harmonized with that for the livestock sector.

SECTION 5. DISEASE SURVEILLANCE/MONITORING

Summary of Results

Suriname has an official surveillance and monitoring programme for plant diseases only. A surveillance and monitoring programme for aquatic animal diseases is being established as a part of the current FAO TCP/SUR/3401. (Survey Questions 5.1–5.3).

Analysis

Disease surveillance is a fundamental component of any official aquatic animal health 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.

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 pathogens 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, access to a 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. national pathogen list, disease notification and reporting procedures).

SECTION 6. DISEASE DIAGNOSTICS

Summary of Results

Suriname currently has no capacity to diagnose any aquatic animal diseases. Similarly there is no officially designated national laboratory of aquatic animal health diagnostics. Diagnostics expertise for terrestrial animal diseases exists in the Veterinary Laboratory. There is capacity in parasitology within the Veterinary Laboratory; in histopathology and general bacteriology/mycology within the Academics ziekenhuis (the "teaching hospital"); and in water quality analysis within the Viskeurings Instituut (VKI, the Fish Inspection Institute). (Survey Questions 6.1–6.8).

Currently there is no national pathogen list for aquatic animals, however, such a list is being developed under FAO Project TCP/SUR/3401. (Survey Questions 6.9–6.10).

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 aquatic animal health plan. Issuance of international health certificates 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 is no aquatic animal disease diagnostic laboratory present in Suriname. There is no regional aquatic animal health laboratory within CARICOM, 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:

- (i) 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

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.

- 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.
- (ii) Pathogenicity – The disease or pathogen has a significant adverse affect on host health.
- (iii) 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).
- (iv) 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).

It should be noted that a National Aquatic Animal Disease List that meets these criteria is currently being developed under FAO Project TCP/SUR/3401.

A national disease list needs 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.

For the foreseeable future, it is likely that Suriname will need to send material to recognized international diagnostics laboratories for analysis. The amount of testing required to implement a national disease surveillance and monitoring programme for Suriname is insufficient to justify the development of national capacity in this area.

However, LLV should consider training of at least 1 staff in basic aquatic animal disease diagnostics (level 1). This person would then be able to make a preliminary assessment and properly collect and prepare samples for shipment to an international laboratory for analysis.

SECTION 7. EMERGENCY PREPAREDNESS/CONTINGENCY PLANNING

Summary of Results

Suriname currently does not have any contingency or emergency response plans for containment or eradication of serious aquatic animal diseases. (Survey Questions 7.1–7.2).

A generic Emergency Preparedness Plan for the prevention and eradication of avian influenza was developed (but is not yet adopted by the government) through the assistance of the Strengthening Agricultural Quarantine Project of CARICOM. The LVV is committed to the protection of agricultural health in Suriname.

Emergency disease preparedness planning is one of the tasks of the Veterinary Inspection, Department of Animal Husbandry. The relevant supportive legislation is the "Landsverordening van 3 april 1954" ; Paragraaf 1 Algemene bepalingen, artikel 7. (Survey Question 7.3).

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, as a long-term goal, Suriname will need to develop such plans for key cultured species and diseases.

SECTION 8. EXTENSION SERVICES

Summary of Results

Currently there are no government or university extension services that support the prevention of aquatic animal diseases in aquaculture facilities. The agency that is mandated to do this is the Fisheries Department (see below), but there is not really any activity taking place in this field. (Survey Questions 8.1–8.3).

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Analysis

The initial development of the aquaculture sector in any country typically requires some key government interventions. Extension services are a way to provide farmer training in aquaculture methods and disease prevention. These are often supported by demonstration centers that develop culture species and techniques suitable for a given country/locality, often serving as an initial supplier of subsidized fish seed. However, when the aquaculture sector becomes well established, it can often deliver its own extension services; while in a mature industry, supply of inputs such as fry are better left to the free market.

Government extension services, either by training of fisheries or veterinary extension officers in the basics of aquatic animal health, 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.

SECTION 9. COMPLIANCE/ENFORCEMENT

Summary of Results

Suriname does not have any compliance services that monitors and enforces international (imports and exports) or domestic trade in live aquatic animals), including aquatic animal health regulations. (Survey Questions 9.1–9.3). Similarly, there are no compliance services that monitor and enforce regulations related to disease prevention, management and control in aquaculture facilities. (Survey Questions 9.4–9.5).

At the port of entry, it is Veterinary Inspection that has responsibility for checking the health status of any animal being imported. However, due to lack of personnel, the CVO had a verbal agreement with Customs (at the airport) that they will check if the documents of all live animal imports are in order. Although this system initially worked well, the reassignment of Customs Officers to different points of entry has made it ineffective. However, the mandate for border inspection of live aquatic animals lies with the Fisheries Department.

Analysis

Capacity to enforce aquatic animal health regulations is an essential component of a national aquatic animal health 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, aquatic animal health or veterinary officers who may have special training and powers of enforcement.

The government should review the effectiveness of current compliance and enforcement capacity and as 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.

SECTION 10. RESEARCH

Summary of Results

Suriname currently does not have any research activity that includes aquatic animal health within its scope. (Survey Questions 10.1–10.2).

Analysis

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.

The lack of specific research capacity in Suriname means that the country must rely 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. As part of the NAAHM Strategy, Suriname will develop a programme for targeted research to support national priorities in aquatic animal health. The FAO Project TCP/SUR/3401 will be exploring ways to fund priority research needs.

SECTION 11. TRAINING

Summary of Results

Currently there are no formal or informal training programmes in aquatic animal health offered in Suriname, either by the Fishery Department or by the Anton de Kom University of Suriname (Survey Questions 11.1–11.4).

Analysis

Consideration of training needs is a key component of a national aquatic animal health strategy. Postgraduate training is probably best accomplished by programmes for national staff in universities having internationally recognized programmes and expertise in aquatic animal health (examples include University of Stirling in Scotland and the University of Arizona in the United States).

There is potential for targeted short-term training, either through recognized courses given outside the region (such as those given by the Southeast Asian Fisheries Development Center (SEAFDEC) in Iloilo, Philippines (on-line course) and the Aquatic Animal Health Research Institute (AAHRI) in Bangkok, Thailand (customized training course, research attachments). Short-term regional training exercises can be easily organized and held in the CARICOM or Latin America 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 or other regional or international bodies.

SECTION 12. EXPERTISE

Summary of Results

There are no experts in Suriname actively employed in any of the areas directly relevant to aquatic animal health.

Analysis

There is no expertise in aquatic animal health currently present in Suriname. A minimum amount a capability is clearly desirable, and as a start, the LVV should consider adding an aquatic animal health and biosecurity post to the Aquaculture Section. In the future, it may be

possible to develop some aquatic animal health expertise at the university through participation in the FAO TCP project.

SECTION 13. INFRASTRUCTURE

Summary of Results

Currently Suriname has the following laboratories that have infrastructure that is available for aquatic animal health activities by is shared with other groups. (Survey Questions 13.1–13.2):

- Veterinary Laboratory (Not operational, tests are forwarded to other labs)
- VKI Laboratory (water quality analysis)

Analysis

Suriname currently lacks infrastructure dedicated to aquatic animal health, and there is little infrastructure in other areas (e.g. fish inspection, veterinary inspection, university) that could be adapted for such use. The possibility of developing shared facilities with national veterinary services, the university or the private sector should be considered. A level 1 laboratory with basic equipment should be considered.

SECTION 14. LINKAGES

Summary of Results

The current FAO Project TCP/SUR/3401 is the only international, regional or bilateral linkage, cooperation or joint project related to aquatic animal health in Suriname. (Survey Question 14.1)

The Anton de Kom University of Suriname has linkages with the UNAMAZ (Association of Amazonian Universities) and with PROCITROPICOS (Programa Cooperativo de Investigacion, Desarrollo e Inovacion Agricola para los Tropicos Sudamericanos; The Cooperative Program on Research and Technology Transfer for the South American Tropics). UNAMAZ is a network of research and higher education institutions which promotes academic, scientific, technological and cultural cooperation between universities in eight countries of the Amazon (<http://www.unamaz.org/site/index.php?trocaIdioma=en>). PROCITROPICOS results from the joint efforts of the National Agricultural Technology Institutes (NARIs) of Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela and the InterAmerican Institute for Cooperation on Agriculture (IICA, <http://www.iica.int/Eng/Pages/default.aspx>). Its purpose is to institutionalize a permanent system of coordination, mutual support, exchange of knowledge and cooperative actions related to the generation and transfer of agricultural technology for the sustainable development of the South American tropical ecosystems (<http://www.procitropicos.org.br/>).

Analysis

Developing international regional and domestic linkages and cooperation is clearly an area that offers great potential to increase aquatic animal health capacity in Suriname. 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 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 (a goal of CARICOM), shared communication structures (websites, newsletters), development of a regional aquatic animal health 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. Although Suriname is a member of CARICOM and thus looks to the Caribbean region in fisheries matters (via CRFM), its location on the mainland of South America should also open possibilities for linkages with major regional aquaculture-producing countries such as Brazil, Ecuador and Chile.

Domestically, linkages between 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. In this regard, the Aquaculture Section already has good informal linkages with Anton de Kom University of Suriname and with Comfish n.v.

SECTION 15. FUNDING SUPPORT

Summary of Results

The only funding currently dedicated specifically to aquatic animal health is under the current FAO Project TCP/SUR/3401, to the amount of SRD 280,000.00 for 2012.

Current funding is not considered adequate to meet current and future needs in aquatic animal health. At minimum, an operational budget for continuing the work that is being started under the FAO TCP project is required. The amount required needs to be determined. (Survey Questions 15.1–15.3).

Analysis

Aquatic animal health is a new issue for Suriname and thus the current lack of funding is understandable. However, this is clearly an important issue, as without adequate budget, little improvement in capacity can be achieved. LVV will need to provide sufficient core funding to continue projects started under the National Aquatic Animal Health Management Strategy and the Aquaculture Development Strategy. Many of the projects that will be identified by these strategies will be highly attractive to international and bilateral funding agencies; however, accessing these funds will require the preparation of well thought-out and formulated project proposals, with convincing justification (high national priority) and indication of the importance placed on these projects by the government through in-kind contributions.

SECTION 16. CURRENT CHALLENGES

Summary of Results

The main aquatic animal health challenges that currently face Suriname were identified as follows (Survey Question 16.1):

- (a) preventing the entry and spread of exotic pathogens:

- Absence of legal requirement (law)
 - Absence of required facilities for disease diagnostics (quarantine/testing)
 - Limited availability of technical expertise
- (b) preventing the domestic spread of serious pathogens:
- Absence of legal requirement (law)
 - Limited availability of technical expertise
 - Limited availability of (trained) personnel
 - Limited research/know how available on what diseases are present in Suriname
 - Absence of plans/procedures in place to identify/prevent diseases
- (c) meeting international/trading partner standards with regard to health certification of live aquatic animals:
- Absence of legal requirement (law)
 - Limited availability of technical expertise
 - Data not available because no testing is done
- (d) controlling mortalities/losses due to pathogens in aquaculture establishments:
- Absence of legal requirement (law)
 - Limited availability of technical expertise
 - Absence of required facilities for disease diagnostics (quarantine/testing)
- (e) other serious challenges related to aquatic animal health that your country is facing or is likely to face in the next 5 years:
- One of the greatest current challenges is lack of staff/personnel. The Aquaculture Section, which is responsible for aquaculture-related issues as well as aquatic animal health, lacks both technical and support personnel.

Analysis

The current challenges to improving aquatic animal health capacity relate mainly to (i) lack of legal framework; (ii) lack of technical expertise and support staff; (iii) absence of essential infrastructure (i.e. disease diagnostics facilities); and absence of data (e.g. knowledge of current disease situation) on which to base decision-making. These are all areas that will be included in the NAAHMS and that should be given high priority in planning to improve aquatic animal health capacity.

SECTION 17. CONSTRAINTS

Summary of Results

Constraints to implementing an effective aquatic animal health programme were identified as follows (Survey Question 17.1):

- Policy (law/legal requirement)
- Funding
- Expertise (know how/training)
- Personnel

Analysis

The constraints generally mirror the “current challenges”, as summarized in Section 16. The following are the major constraints faced by Suriname:

- Lack of a national plan for aquatic animal health (including lack of awareness and initiatives)
- Lack of specialized expertise/qualified staff
- Lack of training opportunities
- Lack of infrastructure (dedicated laboratories, quarantine facilities)
- Lack of budget/funding
- Other constraints (security situation, lack of regulations, lack of extension planning)

These are all serious constraints that need to be addressed if aquatic animal health capacity is to develop to the level needed to support a dynamic aquaculture industry.

SECTION 18. ADDITIONAL INFORMATION

None