1. Introduction

1.1 Background

This draft National Aquatic Animal Health Strategy for Bosnia and Herzegovina (NAAHS) has been developed to assist the Government of Bosnia and Herzegovina (BIH) through the State Veterinary Office (SVO) as BIH's Central Competent Authority (CCA) and the veterinary services of the entities of the Federation of Bosnia and Herzegovina (FBIH) and the Republic of Srpska (RS) and the District of Brcko (DB) in developing and implementing effective long-term policy and planning for protecting and improving BIH's national aquatic animal health status. Implementation of the NAAHS is expected to help BIH meet international aquatic animal health standards and obligations for the prevention of serious aquatic animal diseases within its national territory. It will also assist in promoting the sustainable development of the national aquaculture sector; facilitate access to international markets for aquaculture products; and protect existing aquaculture, capture and sport fisheries and natural aquatic systems and those who rely upon them from the social, economic and ecological impacts that can result from aquatic animal disease outbreaks.

1.1.1 General Information

Bosnia and Herzegovina is a southern European country located on the Balkan Peninsula. It was established as an independent country in 1991 after the disintegration of the former Yugoslavia. It shares its north, west and southwestern borders with Croatia, its eastern border with Serbia and its southeastern border with Montenegro. BIH's maritime access is a 20 km coast line on the Adriatic Sea. The country has an area of 51 209 km^2 (ASBH, 2008).

A Mediterranean climate prevails in the south, while a modified continental climate dominates the northern inland territory of BIH. Bosnia and Herzegovina is a mountainous country. Extensions of the Dinaric Alps form its western border and traverse the western and southern parts of the country. Much of the country also lies within the Karst, a barren limestone plateau broken by depressions and ridges. The northern part of the country is heavily forested, while typical Mediterranean macchia prevails in the south except in areas along the river banks where the soil is very fertile. The principal rivers include the Sava, which flows along the northern frontier, and its tributaries, the Una, Vrbas, Bosna and Drina rivers. These rivers all flow northwards toward the Black Sea; only a few other rivers, notably the Neretva, flow toward the Adriatic Sea. BIH has very significant water resources that besides the principal rivers include a large number of mountain streams and springs, glaciers and artificial lakes. A map of the surface water of BIH is given as Figure 1.

According to the most current census data, the total population of the country in 1991 was approximately 4 322 000 (ASBH, 1991). In 2006, the population was estimated to be 3 843 000 (ASBH, 2008). Bosnia's population density was estimated in 2005 to be 79 per-

FIGURE 1. Surface water map of Bosnia and Herzegovina

sons per km^2, with 45 percent of the population living in cities and towns. The largest city is Sarajevo, the capital and an important cultural and commercial center. Other prominent cities include Banja Luka, Bihać, Bijeljina, Mostar, Tuzla and Zenica.

BIH consists of two administrative units that are called entities, the Republic of Srpska (RS) and the Federation of BIH (FBIH), and a separate administrative district, the District of Brcko (DB). FBIH is composed of ten cantons, while RS has seven regions with far less governing autonomy as compared to the cantons in FBIH. The smallest administrative units are the municipalities. A map of the administrative borders within BIH is given as Figure 2.

1.1.2 Aquaculture in Bosnia and Herzegovina

Based on the overview of its natural resources, BIH has significant potential for aquaculture, especially for production of freshwater fish species. The earliest records of organized fish production date back to 1892. After the Second World War, this livestock

FIGURE 2. Map of administrative borders within Bosnia and Herzegovina

production sector expanded rapidly in response to increasing demands by a steadily growing urban population. Before the 1992–1995 war, BIH had a well-developed aquaculture sector, especially production of salmonid fish (rainbow trout, brown trout and brook char), whereas cyprinids (common carp, grass carp and silver carp) were cultured to a lesser extent. Total fish production before the war was 3 000 tonnes. During the 1992–1995 war, most of the production facilities were destroyed. The process for renewal of the aquaculture sector started immediately after the war, and by the year 2000 the first modern fish processing companies were established. The most significant positive impact on aquaculture production was made through the sale of the state-owned capital in aquaculture establishments (Hamzić, 1993).

In the year 2005, the production of salmonids was 3 410 tonnes, while the yield from carp culture was 2 968 tonnes. Although mariculture does not make a significant contribution to the overall aquaculture production in BIH, between 1999 and 2005, production of marine species quadrupled. Today, there are 34 salmonid farms, five cyprinid farms and two marine fish farms. In FBIH, there are 19 companies involved in aquaculture with an overall annual income of approximately USD 7.5 million (11 million BAM), and over 400 employees (FMA, 2006). As these figures show, aquaculture production has already reached the pre-war level and is continuing to expand, the average annual growth in total aquaculture production in BIH from 2000 to 2006 being 13.1 percent.

The abundant water resources of BIH provide ideal conditions for further development of aquaculture and fisheries through the installation of hatcheries and grow-out facilities on suitable rivers and floating cages in lakes and in the Bosnian part of the Adriatic Sea. Furthermore, existing resources also provide excellent conditions for sport fishing and fishing-based tourism.

2. Statement of purpose

This NAAHS is being developed during a period of rapidly increasing aquaculture production in BIH. The prices of aquaculture commodities on the national market are currently relatively stable, which is a reflection of the relative balance between domestic demand by consumers and the market supply in aquaculture products. During recent years, the contribution of domestic aquaculture production to the overall market supply has constantly increased. Moreover, for some commodities like salmonids, national production capacities are able to respond to national market demand entirely. These aquaculture subsectors are also demonstrating export potential, so that salmonids raised in BIH are a well established commodity on the markets of neighbouring countries. The entrance of BIH aquaculture products onto the market of the European Union (EU) is expected in the near future. However, increased marketability of BIH's aquaculture commodities depends heavily on development of an aquatic animal health management strategy, the application of food safety principles, protection of animal and human health and domestic production, capacity building and education in these areas, and enhancing the quality of aquatic products.

This NAAHS is a broad, comprehensive strategy to build and enhance capacity for the management of aquatic animal health in Bosnia and Herzegovina. ***The purpose of the NAAHS is to reduce the risk of aquatic animal diseases impacting on the livelihoods of aquaculture farmers, the national economy, trade and human health.*** This strategy outlines the objectives and projects that will assist in developing a national approach to the overall management of national aquatic animal health. It consists of a Statement of purpose, Vision, Guiding principles and Implementation and outlines nine major programmes of activity: (1) Policy, legislation and institutional framework; (2) Risk analysis and quarantine; (3) Diagnostics and health certification; (4) Surveillance, monitoring and reporting; (5) Emergency preparedness; (6) Capacity building; (7) Research and development; (8) Communication and international collaboration; and (9) Resources and funding. Within each major programme are presented its objectives, current status, and a number of projects that are to be accomplished during the initial phase of implementation. The NAAHS will be further developed by the State Veterinary Organization (SVO) for funding and implementation.

3. Vision

Bosnia and Herzegovina's aquaculture production is one of the nation's most important agricultural sectors, having the highest annual growth rate during the period of agricultural reconstruction and the overall economy following the destruction caused during the 1992-1995 war. Also, BIH's aquaculture shows remarkable capabilities for self-sustainability, self-promoting growth and a positive responsiveness to free market **incentives**. This exemplary status is somewhat in contrast to the general destituteness of BIH's agricultural sector in the midst of the country's transition to a free market economy.

Given that aquaculture is recognized as important and is sustained by the BIH government and entrepreneurs, development of a national aquatic animal health plan is crucial to maintain the positive growth trend and to acquire a competitive advantage in order to continue to provide national and international consumers with premium quality, locally produced aquaculture products. This calls for the commitment and alertness of all involved, and therefore this document is compiled with due consideration of the views and needs of both private and public stakeholders, who are anticipated to work together in implementing integrated plans and improving aquatic animal health in BIH.

As framed by the participants in the Training Workshop on Policy and Strategy Development in Aquaculture organized under FAO Project TCP/BIH/3101, the vision for BIH's NAAHS is: "***To develop and maintain up-to-date an aquatic animal health management strategy in BIH that will be able to support the sustainable development and management of the aquaculture sector, meet growing consumer demands for aquatic foods and products that are of high quality, safe, competitively priced and are produced in an environmentally responsible manner with maximum opportunity for profitability in all stages of the aquaculture product chain***".

It is foreseen that implementation of the NAAHS will have the following results:

- an improved national aquatic animal health management extension service system;
- improved awareness of responsible health management practices and their communication to aquaculturists;
- increased training and extension capacity in aquatic animal health management practices;
- reduced use of harmful or banned chemicals in aquaculture;
- promoted development and application of aquatic animal health code practices;
- promoted collective approaches (via associations/groups) to disease management; and
- improved farmers' confidence in the government veterinary service and extension system.

4. Guiding principles

A guiding principle in the development of any national animal health strategy is the acceptance and incorporation of relevant international animal health standards and guidance in order to most efficiently ensure harmonization, transparency and equivalency of animal health standards among trading countries and to assist the nation to become internationally recognized with respect to its animal health status. Simultaneously, this approach ensures an up-to-date scientific basis for national animal heath standards and animal products safety and quality regulations. The main international documents addressing the issues of aquatic animal health are the World Organisation for Animal Health's *Aquatic Animal Health Code* (OIE, 2008) and *Manual of Diagnostic Tests for Aquatic Animals* (OIE, 2006). Implementation of these standards in national legislation is important. Other voluntary international instruments providing guidance in the development of national strategies on aquatic animal health are contained in the FAO Technical Guidelines for Responsible Fisheries No. 5, Supplement 2 –*Aquaculture development. Health management for responsible movement of live aquatic animals* (FAO, 2007). These technical guidelines were developed in support of the FAO Code of Conduct for Responsible Fisheries (CCRF) (FAO, 1995).

Besides the OIE standards and the FAO voluntary technical guidelines, representing the foundation for the creation of the NAAHS for BIH, the reports of the national and international consultants working for the FAO TCP Project TCP/BIH/3101 "Strengthening capacities on aquaculture health management" were also used. Integration of the outputs (conclusions and recommendations) from this FAO TCP project (active from July 2006 to February 2008) has ensured a tailored approach to the current and main issues of concern of BIH aquaculture and BIH's national aquatic animal health status and needs. These principles are also fully compatible with BIH's goal of meeting European Union (EU) requirements for the entrance of its aquaculture products on the EU market.

The NAAHS is comprised of nine strategic programmes containing 20 identified priority projects that are defined in order to increase BIH's ability to prevent and control aquatic animal disease outbreaks, maintain access to regional and international markets, support quality assurance and improve the productivity and sustainability of the nation's aquaculture production.

In planning development of the NAAHS, the participants in the Training Workshop on Policy and Strategy Development in Aquaculture organized under FAO Project TCP/BIH/3101 agreed upon the following guiding principles:

1) Aquatic animal health management should enable aquaculture to make a positive contribution to the economy 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 ecological systems, 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) National aquatic animal health programmes 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) Aquatic animal health is important for economic, social, development 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.
6) The role of aquatic animal health management is to reduce the risks arising from the culture, the reproduction, the potential entry, establishment or spread of pathogens and the diseases they cause. This is necessary to protect living aquatic resources, the natural aquatic environment and the aquatic biodiversity in BIH and neighbouring regions, countries or territories.
7) BIH 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, 2008); however, such measures must be justifiable based on science (i.e. risk analysis) and be consistent with the country's acceptable level of protection (ALOP). Control measures applied to movements of aquatic animals within the country must also be consistent with this ALOP.
8) The aquatic animal health strategy of BIH and related procedures will adhere to international and regional standards and be harmonized on as wide a basis as possible.
9) SVO encourages the BIH aquaculture sector 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.
10) Health management measures will 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 incorporated in the culture, reproduction and movement of aquatic animals.
11) 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 countries in the European region will be sought wherever possible to further increase BIH's capacity in aquatic animal health issues.

5. Implementation

Mechanisms for implementation of the NAAHS and associated responsibilities and funding for projects will be developed through consultation between SVO, the veterinary services of FBIH, RK and DB, the private sector and other stakeholders. It is expected that SVO, through the National Task Force on Aquatic Animal Health (NTFAAH), will be the lead agency in overseeing the implementation and monitoring. A detailed implementation plan, including a list of priority activities, identification of responsibilities and resources and a time frame required will be prepared. It is expected that progress will be reviewed annually and the NAAHS updated and revised after an initial period of three to five years. It is important to emphasize that the implementation of the NAAHS requires a strong driver of the process, full commitment of the government and the necessary appropriate institutional and legal framework adopted by the highest competent authority.

6. Program overview

6.1 Programme 1: Policy, legislation and institutional framework

6.1.1 Objectives

In accordance with international criteria, the objectives of Programme 1 are:

1) To adopt legally obliging and clearly defined national lists of (i) aquatic animal diseases (including mandatorily notifiable diseases) and (ii) regulated residuals and contaminants.
2) To harmonize BIH legislation related to aquatic animal health with relevant European Union (EU) legislation (particularly Directive 2006/88/EC) and the relevant OIE standards.
3) To establish and legally define the responsibilities for aquatic animal health management among existing veterinary service institutions and other relevant public and private stakeholders (partly in relation to Objective 1 of Programme 4: Surveillance, monitoring and reporting) as a matter of policy.
4) To establish a mandatory, fully operational and nationally uniform system for registration of aquaculture establishments.

6.1.2 Current Status

Improvement of the aquaculture sector in BIH is strongly supported by the state and regional (entity) level veterinary agencies due to its great potential for generating in-

come, providing employment and fostering rural development, as well as its potential as a source of high-quality animal protein for domestic consumption and export and its potential contribution to increased tourism (e.g. for sport fishing).

The SVO of BIH under the Ministry of Foreign Trade and Economic Relations is the Central Competent Authority (CCA) with respect to the veterinary services at the state (national) level. Competencies, responsibilities and empowerment of the SVO are provided by the national Veterinary Law. The SVO is in charge of the following tasks: (i) adoption of regulations implementing national legislation; (ii) issuance of veterinary health certificates and import licenses; (iii) border veterinary control, (iii) design of disease surveillance programmes; (iv) management of the national animal health laboratory network; and (v) all other issues related to international traffic of live animals and products of animal origin.

Entity Ministries of Agriculture (MoA) (regional level) are in charge of the implementation of legislation issued at the state and entity levels and managing animal health and production programmes and projects under their jurisdiction. Responsibility for veterinary inspection has recently been transferred from the jurisdiction of the entities' MoA to the Administrations for Inspection Affairs (AIA), which is comprised of entity-level independent agencies. Organization of the veterinary inspection in the District of Brcko (DB) is comparably equal. The veterinary inspectorates within the AIAs have close cooperation with the veterinary inspection bodies at the cantonal/regional level.

The Food Safety Agency (FSA) is an independent administrative organization whose duties and tasks are defined by the Law on Food. In addition to activities linked to food and animal feed risk analyses, the FSA is responsible for development of regulations in the area of food safety and represents a point of contact for the activities of BIH in the Codex Alimentarius Commission. The FSA performs these activities in cooperation with other competent authorities.

The organizational scheme of the veterinary service organization in BIH is given in Figure 3.

Current legislation relevant to aquaculture in BIH includes:

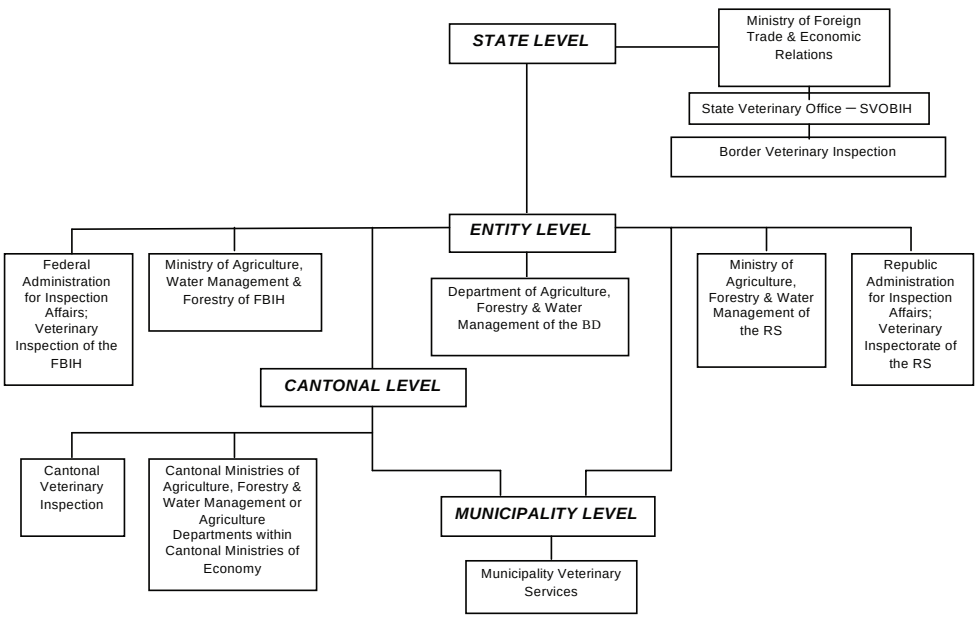
- State veterinary law (OJ BH, 34/02);
- decision on important animal infectious diseases (OJ BH, 44/03);
- annual decisions on control measures for animal infectious and parasitic diseases and their implementation and financing;
- decision on veterinary health conditions that must be fulfilled in trading with live fish, molluscs and crustaceans and product thereof (OJ BH, 62/05);

- decision on veterinary health conditions that must be fulfilled in premises for farming, production and trading of live fish, crustaceans and products thereof (OJ BH, 5/04);
- decision on the veterinary certificate on health conditions of animals and products of animal origin in domestic and international trade (OJ BH, 90/05); and
- decision on appointment of reference laboratories in BH (OJ BH, 68/05).

These legislative acts provide the legal basis and framework for:

- a national list of important and notifiable aquatic animal diseases;
- sampling and diagnostic protocols;
- disease reporting (both domestically and internationally); and
- general provisions on aquatic animal disease prevention, control and eradication, including movement control for animals and products, mandatory registration of animal and food-producing establishments and issuing of veterinary certificates.

FIGURE 3. Organizational scheme of the veterinary service in Bosnia and Herzegovina



6.1.3 Projects

Four projects have been identified under Programme 1:

Project 1: Establishment of the National Task Force on Aquatic Animal Health

Implementation of this project includes negotiation among all relevant public and private sector stakeholders on the establishment, terms of reference and financing of the

National Task Force on Aquatic Animal Health (NTFAAH). The general purpose of this group will be to ensure steady communication, information exchange and an increase of confidence among all stakeholders. This setting will provide the framework for effective coordination of disease prevention and control efforts, timely management of disease crises and transparency in adoption of any new aquatic animal health legislation. The project supports the National Strategy as the NTFAAH will provide advice and guidance to SVO on its implementation. Initially, the task force may be formed as a temporary body and following an initial trial period, the results of a review may indicate the need for its establishment as a permanent body.

Project 2: Revision of the National Aquatic Animal Disease List

As many analyses and reviews of the aquatic animal health management system in BIH have indicated that the current national aquatic animal disease list is in urgent need of review and revision based on agreed-upon, clearly defined and internationally-accepted criteria for the listing and delisting of diseases, this task may be the one of the first priorities for the NTFAAH. Completion of this project will be guided by the OIE's "Criteria for listing aquatic animal diseases" and "Diseases listed by the OIE" and the provisions of EU Directive 2006/88/EC, particularly the EU List of Diseases, which is harmonized with the OIE's Aquatic Animal Health Code and Manual of Diagnostic Tests for Aquatic Animals (OIE 2006, 2008). However, the National Aquatic Animal Disease List will be specifically tailored to address BIH's national situation, with strong consideration of the biological particularities (susceptible species inhabiting national waters and used for aquaculture production) and a clear export orientation for BIH aquaculture.

Project 3: Registration of aquaculture establishments

Current practices and the legal foundation for registration of aquaculture establishments stipulate that all food-producing enterprises must be registered by the entity MoA in accordance with the "Decision on conditions which have to be fulfilled by the establishments intended for slaughter of the animals, processing, refining and storing of the products of animal origin" (OJ BH No. 27/05). However, the registration process is not harmonized between the entities of FBIH and RS (and the DB), resulting in collection of heterogeneous and conflicting data on aquaculture establishments. Therefore a unique national system for registration of aquaculture establishments is required in order that BIH can fulfill all requirements in its pursuit towards recognition of disease-free status (whether for the entire county, for individual regions, or for industry compartments); validate its disease surveillance and monitoring system; ensure food safety, quality and consumer protection; and finally, establish the essential element of reliable data collection. In order to ensure that the new registration system is fully functional and regularly updated, there must be agreement among stakeholders (as overseen by a panel of the NTFAAH) as to its elements. In addition, an independent feasibility study is suggested to evaluate different approaches to the registration system and identify those that comply with all the necessary criteria.

Project 4: Workshops on the European Union System of Regulating Aquatic Animal Health and Trade in Aquatic Animal Commodities
This project involves the holding of a series of national workshops that will provide information to SVO, entity and district veterinary officers, university staff and the private sector on the EU system of regulating aquatic animal heath and trade in aquatic animal commodities. The workshops will be organized by SVO and will be conducted by national and international experts. The project goal is to familiarize and update participants on the actions that will be required so that aquaculture products from BIH will be granted and maintain access to EU markets. The workshops will also address issues on jurisdictions and responsibilities for aquatic animal health among existing veterinary service institutions and other public and private sector stakeholders.

6.2 Programme 2: Risk analysis and quarantine

6.2.1 Objectives

1) To incorporate a science-based, consultative and transparent pathogen risk analysis process in the development and implementation of the state and entity policies, mechanisms and procedures for dealing with import and export of live aquatic animals and their products
2) To review and improve state and entity policy, mechanisms and procedures with regard to domestic movement of live aquatic animals and their products so as to prevent the domestic spread of important aquatic animal pathogens
3) To review the need for the quarantine of live aquatic animals as a risk management measure within the pathogen risk analysis process and to establish standardized quarantine standards for specific commodities

6.2.2 Current status

As certain established trading practices related to aquaculture represent an unknown level of risk to BIH's national biosecurity, SVO recognizes the importance of the import risk analysis (IRA) process as an internationally-accepted method that can be used to determine the acceptability of the risks posed by the importation of a live aquatic animal or its product(s) (a "commodity"). Delegated SVO staff, entity veterinary inspectors, members of the Veterinary Faculty of the University of Sarajevo and some private-sector aquaculturists have been familiarized with the basic procedures of pathogen risk analysis via several international and national workshops and meetings sponsored by FAO and other international organizations. Although formal policy and mechanisms for the implementation of risk analysis have not yet been established, the legal authority to implement risk analysis is provided by the Veterinary Law in BIH (OJ BIH, 34/02, particularly Section IV – Minimum of Animal Health Protection/ Article 45) and associated decisions. It is thus urgent that these risks be assessed so that any unacceptable risks can be identified and appropriate actions (risk reduction measures) taken, where possible.

Quarantine is one of the risk management measures that is currently applied to imported consignments of live aquatic animals. However, the rationale and effectiveness of current quarantine policy need to be re-evaluated in order to establish adequate quarantine standards, so that quarantine is applied only in those cases where it is both necessary and likely to be effective in reducing risks. This will also place the policies and procedures of BIH in agreement with current international standards and agreements.

6.2.3 Projects

Four projects have been identified under Programme 2:

Project 5: Establishment of a Pathogen Risk Analysis Team and Risk Analysis Working Groups

Under this project, the representatives of various administrative agencies and expert groups will take part as members of a permanent Pathogen Risk Analysis Team (PRAT). Although funded by the government (state and/or entity level), the work of this team will be independent. The PRAT will work under the umbrella of the SVO of BIH, as this agency has jurisdiction over international veterinary affairs. It is anticipated that the PRAT will be charged with identifying, planning and monitoring pathogen risk analyses for terrestrial animals, aquatic animals and plants, and their products. Therefore, for each specific risk analysis project, the team would assemble a temporary Risk Analysis Working Group (RAWG) whose composition and expertise will be tailored to the nature (commodity, type of risk analysis, etc.) of the individual risk analysis being commissioned. A key initial activity of the PRAT will be to determine the acceptable level of protection (ALOP) for BIH. The PRAT will also be tasked with seeking mechanisms to link pathogen risk analysis with broader concerns related to the introduction and transfer of live aquatic species (ecological, environmental and genetic risks, including those due to pests and invasive alien aquatic species).

Project 6: Review and analysis of trade in aquatic animal commodities

Knowledge of historical and existing trading patterns in aquatic animal commodities is essential to conducting risk analyses. Therefore, through this project, key available data on aquatic species movements both internationally (imports and exports) and domestically will be consolidated in the form of a computerized database. Data on species, volume, origin, destination and use/purpose are examples of information that this database will contain. The database will contribute directly to the process of hazard identification for the purpose of IRA. Shortcomings in current practice in data keeping will be identified and if necessary, measures taken to improve data collection, management and storage. This activity will form the basis for an online database for use by risk analysts, state and entity veterinary officers, and border inspection personnel.

Project 7: Conducting risk analyses for key commodities

This project will be contingent upon successful completion of Projects 5 and 6, as these projects will establish a functional administrative and working structure for risk analysis

within the SVO and will identify and prioritize commodities of concern. Under this activity, risk analyses ("in house" and/or "external") will be conducted for one or more key commodities, identified by the PRAT to be established in Project 5. As an example, concern has been expressed that BIH may be at risk to koi herpes virus (KHV) due to its current practices of importing common carp and koi carp (*Cyprinus carpio*) for use in aquaculture, for the aquarium fish trade and for retail sale as a food commodity.

Project 8: Review of current quarantine practices
Quarantine is one of a number of measures that can be required to reduce the risk of introducing serious aquatic animal pathogens. However, as quarantine can impose financial burdens on both importers and state/entities agencies, it must be applied judiciously and effectively. The effectiveness of current quarantine policy will be reviewed as well as existing standards for quarantine facilities and the application of quarantine within the risk analysis process. Recommendations will be made for improvement and operating standards for approved quarantine facilities established.

6.3 Programme 3: Diagnostics and Health Certification

6.3.1 Objectives

1) To strengthen and expand existing diagnostic services to meet the expected growth in demand associated with increased aquaculture production, opening of new export markets, etc.
2) To complete the international standardization and certification process for the National Reference Laboratory (NRL) for aquatic animal diseases (at the Veterinary Faculty of the University of Sarajevo)
3) To establish a nationally uniform, domestically and internationally accepted system of health certification for aquatic animals guided by the OIE's *Aquatic Animal Health Code* and *Manual of Diagnostic Tests for Aquatic Animals* (OIE, 2006, 2008).

6.3.2 Current Status

Currently there are seven veterinary laboratories in BIH involved in the official system of animal disease surveillance and food safety monitoring. These laboratories are organized within the national animal health laboratory network and appointed as Authorized or Reference laboratories by the national CCA (SVO of BIH). Laboratory authorization and activities are regulated by Decision (OJ BH 25/04 and 16/05), while Reference Laboratories are appointed by separate Decision (OJ BH 68/05). The various laboratories have different appointments (as Reference Laboratory or Authorized Laboratory) with respect to individual diseases in accordance to their capacities, available equipment, human resources and expertise. In accordance with current legislation, laboratories are obliged to submit regular reports on implementation of diagnostic activities to the relevant competent authorities.

The laboratories show significant differences in efforts and capacities to fulfill basic Good Laboratory Practice (GLP) and accreditation/certification requirements, some being very far from meeting these thresholds while others have a real possibility of being acknowledged by an International Accreditation Body. Some laboratories seem to have major internal structural deficiencies, whereas others mainly have to cope with external deficiencies (e.g. waste disposal, availability of high quality materials, etc.). Although there has been some discussion in this direction, ring trials, proficiency tests, etc. have not been performed by any laboratory. Given the current availability of equipment and the structure of some laboratories, their capacities for reproducibility, comparability and correctness of laboratory testing results must seriously be questioned.

With respect to aquatic animal disease, the SVO has appointed the laboratory of the Center for Fishery of the Veterinary Faculty of the University of Sarajevo as the National Reference Laboratory (NRL) for the following viral diseases of fish: viral hemorrhagic septicemia (VHS), infectious haematopoietic necrosis (IHN), infectious pancreatic necrosis (IPN) and spring viraemia of carp (SVC). This laboratory also provides diagnostics services for parasitic and bacterial diseases of fish. Other authorized laboratories for fish diseases are the Veterinary Institute in Banja Luka and the Veterinary Institute in Mostar. However the diagnostic capability of all these laboratories is currently limited to screening methods using Enzyme Linked Immunosorbent Assay (ELISA), although some attempts have been made to introduce direct techniques for viral detection (cell culture) at the NRL in Sarajevo. At present, confirmatory diagnostic techniques are provided by contracting the Danish Veterinary Laboratory, Aarhus, Denmark. With respect to the diagnosis of aquatic animal diseases, laboratories in BIH are currently deficient due to compromised capacities for reliable and rapid detection of emerging and exotic infectious aquatic animal diseases associated with a lack of availability of reliable diagnostic tests necessary to detect and confirm disease occurrence. (Detection is also dependent upon legal enforcement of mandatory notification). Also none of the listed aquatic animal health laboratories currently has ISO 17025:2005 laboratory certification.

With respect to food safety, there is only one accredited laboratory (Veterinary Laboratory of Cantonal Veterinary Station Sarajevo), which is also one of the reference laboratories for food safety. However, the accreditation was performed by a national accreditation body that is not a part of an EU accreditation body.

6.3.3 Projects

Three projects have been identified under Programme 3:

Project 9: Improvement of diagnostic capabilities of the laboratories for aquatic animal diseases

Since lack of testing equipment, financial resources and adequate credentials were identified as major constraints to better diagnostics capability for aquatic animal diseases

in BIH, this project is of vital significance. Improvement of the aquatic animal health laboratories will also have a positive impact on many other programmes of the NAAHS, including risk analysis, surveillance and monitoring, emergency preparedness, capacity building and international collaboration. The aim of this project is to ensure adequate routine diagnostic capacity for nationally listed diseases and to enable early detection of emerging and exotic diseases of aquatic animals. Considering the specialized nature of laboratory operations and the need to achieve sustainability of introduced diagnostic procedures, a constant and steady delivery of samples for laboratory testing is necessary. This will be provided through an efficiently planned and well-established sampling scheme that will be an integral part of the surveillance programme (see Programme 4). Therefore, planning for disease surveillance and improvement of laboratory diagnostics capability go hand in hand, and neither should be considered without appreciation of the consequences for the other. Since laboratories, in this case, carry out testing for the official health programmes, a consistent level of financial support (including funds for improvement) needs to be provided from public funds. However, with respect to the general declining trend in public expenditures, some laboratory costs may have to be recovered from private sector producers. Improvement of laboratory capabilities, including expansion of laboratories, acquisition of new equipment and hiring of new staff, needs to be transparent, equally inclusive for all laboratories and economically sound. Introduction of new diagnostic techniques, in addition to being justifiable from a professional and technical stand point, has to have a strong economic justification. The details of this project will be agreed upon between laboratory representatives and the CCA, with the inputs of other stakeholders.

Project 10: Training plan for laboratory staff

This project involves the creation of a work plan for training (time period and topic) of laboratory staff of the NRL for aquatic animal diseases and other laboratories involved in the official system of diagnostics of aquatic animal diseases. The training plan will support specific improvements and the planned introduction of new diagnostics techniques and therefore is a concurrent activity with Project 12 (see Programme 4). The training plan will be developed by incorporating requests for training from all aquatic animal disease laboratories in BIH and will be reviewed by the CCA before its approval. The responsibility for organizing training delivery lies with the CCA (state and entity levels).

Project 11: Workshops on health certification of aquatic animals

With the assistance of international and national experts, the SVO will organize a series of workshops on current internationally accepted procedures for the health certification of live aquatic animals and their products. The purpose of the workshops is to ensure that health certification as practiced by BIH meets internationally recognized standards (i.e. those of the OIE) as well as current and potential trading partners. The format and content of health certificates as currently used by BIH will be reviewed and current requirements and format revised as necessary.

6.4 Programme 4: Surveillance, Monitoring and Reporting

6.4.1 Objectives

1) To establish nationally uniform and scientifically based active surveillance programmes for priority aquatic animal diseases (in relation to the objectives of Programme 1: Policy, legislation and institutional framework) that will include standardized laboratory procedures, defined rules for sample collection, geographical zoning of the country and all other components of a surveillance system as recommended/required by international authorities and required by trading partners
2) To further improve procedures, scope and effectiveness of the national monitoring system for aquatic animal health, including passive surveillance for aquatic animal diseases
3) To establish a system of information exchange on aquatic animal health status/events that will ensure timeliness, security of information and usefulness of data on aquatic animal health
4) To standardize procedures, forms and distribution lines of both emergency and regular reports on aquatic animal health and health management (prevention and control measures)
5) To establish a general framework, jurisdiction, competency and communication channels for disease surveillance, monitoring and reporting, together with a list of priority diseases (based on areas of the country) for the targeted or sentinel health surveillance of wild aquatic species

6.4.2 Current status

Mandatory notification to the national and international competent authorities of any unusual change in national aquatic animal health status and/or of any increased mortality, including the general procedure for disease notification, has a legal foundation, even though it is inconsistently applied. Additionally, the current national list of diseases requiring mandatory notification is both ineffective and inadequate. The diseases currently emphasized in BIH's aquatic animal diseases surveillance and reporting system are: VHS, SVC, epizootic haematopoietic necrosis (EHN), *Oncorhynchus masou* virus disease (OMVD), infectious salmonid anemia (ISA), IPN, bacterial kidney disease (BKD), enteric redmouth disease (ERD), furunculosis, gyrodactylosis, crayfish plague, bonamiosis, haplosporidiosis, perkinsiosis, marteiliosis, iridovirosis, microcystosis, Taura syndrome, white spot disease (WSD) and yellowhead disease (YHD).

The main source of information relevant to disease surveillance and monitoring is established through permanent official supervision of aquaculture establishments by individually appointed veterinary inspectors. These inspectors are in charge of sampling, sample submission and reporting of relevant information on the entity level. In the case of positive diagnostic test results, laboratories are obliged to report the results to the cor-

responding inspector, to the owner of the establishment, and to the entity and state-level competent authorities.

An aquatic animal health diagnostic laboratory system was established in BIH in 2005 (see Programme 3: Diagnostics and health certification). Authorized laboratories are required to submit regular monthly reports on sample submission and the results of diagnostic testing to entity and state-level veterinary agencies. The SVO also receives compiled monthly reports from the entity-level veterinary agencies. Additionally, the SVO is responsible for communicating changes in national disease status internationally.

Although guidelines for the mandatory epidemiological investigation of disease outbreaks are given in the Veterinary Law of BIH and Instructions issued by the SVO in 2004 (based on EU Regulation 2001/183/EC), no such investigation has been conducted.

6.4.3 Projects

There are five projects identified under this programme:

Project 12: Establishment of a national database on aquatic animal health
A national database will be established to contain the results of surveillance activities, laboratory testing, health management measures and other relevant information. The database will resolve the issues of inconsistently collected and unreliable data on aquatic animal health in BIH. Previous reviews have established that a centralized electronic database is the only way to appropriately manage information on disease outbreaks in this country. Information for entry into the database will be obtained from the regular reports of the veterinary inspectors, laboratories and other data sources. Along with development of an information technology (IT) platform for the database, uniform report sheets for collection and submission of information (weekly, monthly, quarterly, etc.) on all relevant aquaculture issues need to be established. These report sheets will formally correspond to the data entry elements of the electronic database. Transparency and accessibility of the data will be provided through supervised and multileveled Internet access. The main responsibility for creation and maintenance of the database lies with the SVO; however active and constant participation of the entity and lower-level veterinary services is anticipated. This database, which will be based on constant and complete data management, will improve rapid detection of new and exotic infectious diseases in aquatic animals (including disease information dissemination), facilitate assessment of progress in control or eradication of listed diseases and provide elements for reliable economic analysis (cost-benefit analysis) of planned control and eradication measures.

Project 13: Establishment of an aquatic animal internal movement control scheme
This project will examine ways to regulate and monitor domestic movements of live aquatic animals. Such data are essential for effective disease control programmes and

emergency response and this project will examine possible options for tracking movements and data storage and retrieval.

Project 14: Establishment of a categorization scheme for aquaculture establishments

A categorization scheme for aquaculture establishments based on their current health status, exposure to health risks and health status history represents a type of targeted surveillance and is aimed to further improve the overall quality of the aquatic animal health surveillance system in BIH. In addition to passive and active surveillance, targeted surveillance will be applied for high risk diseases, high risk practices and high risk regions. Historical records will be used to reinforce the hypothesis of freedom from disease based on targeted surveillance for possible environmental and/or pathogen changes. This system may form the basis for future disease-zoning activities.

Project 15: Training in outbreak investigation

The capability of competent authorities (CAs) to efficiently investigate outbreaks of any unusual health event is of essential importance for any consistent health surveillance system. An outbreak investigation should be carried out by performing systematic and logical steps toward identification of the cause(s) and source(s) of the disease in question to put the spread of the existing epidemic under appropriate control, and to prevent exposure to new infections in the future. Under this project appropriate short-term training in aquatic animal disease epidemiology and emergency response will be arranged for government officials, veterinary inspectors, NRL staff and other relevant parties.

Project 16: Pilot study on surveillance of wild aquatic species health

Information on the health status of wild aquatic species is essential to supporting claims of freedom from specific disease agents, in conducting risk analyses and in controlling disease spread. Under this project disease surveys of key wild species that are likely to be carriers of or susceptible to diseases of the main finfish species cultured in BIH will be undertaken. The study will investigate the diseases of a key species (salmonid or cyprinid) throughout its natural distribution in BIH, will document the presence of pathogens and parasites throughout the country's drainage systems and establish an electronic database for record keeping, disease mapping and data retrieval.

6.5 Programme 5: Emergency preparedness

6.5.1 Objectives

1) To elaborate a general contingency plan for controlling and/or eradicating outbreaks of exotic and emerging aquatic animal diseases
2) To create priority contingency plans for eradicated aquatic animal diseases and exotic animal diseases identified to be important to BIH via the risk analysis process

3) To introduce and promote contingency planning among involved parties, including the periodic updating of plans in order to ensure that the agencies and staff responsible for their implementation are familiar with their assigned tasks and responsibilities
4) To increase the reactivity level of the entire emergency preparedness system

6.5.2 Current status

BIH currently has in place the elements for an aquatic animal disease contingency plan (SVO BH Instruction from 2004), allowing the establishment of an emergency response unit, procedures for epidemiological investigation and the emergency restriction of movement of live aquatic animals. However, the mandates and responsibilities of the various concerned agencies need to be reviewed and existing contingency plans reviewed, updated and tested via simulation exercises.

6.5.3 Projects

Three projects have been identified under this programme:

Project 17: Review, revision and updating of emergency preparedness procedures for aquatic animal disease outbreaks

Under this project, the SVO will conduct a review of existing national legislation and operational documents and procedures related to emergency response to outbreaks of serious transboundary aquatic animal diseases (TAADs).

Project 18: Simulation exercises

Under this project, SVO will test the rapidity and effectiveness of contingency plans for aquatic animal disease outbreaks. Results will be used to improve the operational framework, refine responsibilities of the various agencies and individuals and revise protocols to achieve better response.

Project 19: Establishment of case definitions for nationally listed diseases

Case definitions are an integral part of contingency plans, representing sets of standardized criteria that are used to decide whether an individual unit of interest (an individual animal or a group of animals such as a fish cage, an aquaculture establishment or an aquaculture zone) has a particular disease. Unambiguous case definitions provide essential consistency in the detection and diagnosis of nationally listed diseases. Indicators of the defined case may be relevant to the clinical field diagnostics and/or laboratory diagnostics of the disease. This project will develop or revise case definitions for diseases for which contingency plans have been developed under projects 17 and 18. This project will be led by SVO with the participation of aquaculture and aquatic animal disease experts, including staff of the authorized diagnostic laboratories, along with government representatives and other stakeholders. Meeting the criteria listed in a specific disease case definition will trigger further diagnostic and epidemiological investigations and the initiation of an appropriate contingency plan.

6.6 Programme 6: Capacity building

6.6.1 Objectives

To increase the capacity of the state, entity and district veterinary services and other key partners to plan and implement the NAAHS for Bosnia and Herzegovina

6.6.2 Current status

Professional assistance and technical support related to food safety and food quality management are particularly needed by the aquaculture producers of BIH. Mainly this relates to the implementation of Hazard Analysis Critical Control Point (HACCP)-based systems, good management practices (GMP)/good animal husbandry practices (GAHP) and Quality Management Systems (QMS) in aquaculture establishments seeking to export to the European Union and other markets. Because of difficulties with transportation facilities and hygienic measures, fish originating from BIH are mainly exported live. Experiences from other countries indicate that these elements are most commonly addressed through the agricultural extension service.

Aquaculture businesses with a registration number and permission to export their produce must have implemented HACCP systems according to the decision on conditions which have to be fulfilled by the establishments intended for slaughter of the animals, processing, refining and storing of the products of animal origin (OJ BH 27/05); however, this isn't being verified or audited by international authorities.

During the process of negotiating the exportation of live aquatic animals and their products to EU Member States, the competent authorities of BIH, in particular the SVO, have recognized a certain lack of capacity related to aquatic animal health management and food safety. Specific capacities regarded as insufficient are outlined by several previous projects and official reports on aquaculture in BIH and include:

- lack of human resources;
- lack of technical knowledge and skills;
- lack of diagnostic capacities (both quantitative and qualitative) for aquatic animal disease; and
- lack of extension service to the aquaculture producers (lack of institutional framework, personnel and technical expertise).

6.6.3 Projects

This programme contains one project; additional capacity building activities are included under Programme 1, Project 4; Programme 3, Project 10; and Programme 4, Project 15. Capacity building is recognized as an important long-term and continuing activity. Additional projects will be formulated as specific needs are identified.

Project 20: Short courses on quality control in aquaculture
Under this project a series of short courses will be developed for aquaculturists and post-harvest processors on maintaining quality control in aquaculture. The course series will use both international and national expertise and will focus on the application of HACCP, BMPs, GMPs, etc., to aquaculture production in BIH.

6.7 Programme 7: Research and Development

6.7.1 Objective
To identify and undertake research and development activities in support of the NAAHS and sustainable aquaculture development in BIH

6.7.2 Current status
There is currently little basic or applied research conducted in BIH related to aquatic animal health and aquaculture development. The NAAHS recognizes the key importance of research and the transfer of research results and new technology to the private sector and has identified strengthening research and development in aquatic animal health as a key area supporting sound aquaculture development.

6.7.3 Projects
Strengthening capacity for research and development is a long-term goal and thus specific projects under this programme will be identified as the NAAHS is implemented. A research component is included in the NAAHS under Programme 4, Project 16.

6.8 Programme 8: Communication and international collaboration

6.8.1 Objectives:
1) To develop and improve communication linkages nationally between the veterinary services, the academic community and other stakeholders concerned with aquatic animal health within both government and private sectors
2) To disseminate the outcomes of the surveillance and monitoring programmes for aquatic animal diseases and the results of risk analyses to all interested parties
3) To improve international linkages and the exchange of information on aquatic animal health with concerned international agencies (e.g. OIE, FAO, EU), national competent authorities and other interested parties
4) In particular, to strengthen linkages and information exchange on the status of aquatic animal health, diseases affecting aquaculture and programmes for disease diagnosis and prevention via networking, information sharing, harmonized diagnostics standards, regional disease reporting, sharing of technical expertise, etc. with other Western Balkan Countries

6.8.2 Current status

The NAAHS recognizes the importance of communication and international collaboration in achieving a high standard of national aquatic animal health. At the national level, shortcomings in effective communication and coordination among responsible government agencies are reflected in untimely collection of disease and demographics data, lack of uniformity and transparency of relevant epidemiological data and inconsistent dissemination of feed-back information to stakeholders.

6.8.3 Projects

Specific projects under this programme will be developed as implementation of the NAAHS proceeds.

6.9 Programme 9: Resources and funding

6.9.1 Objective

To ensure allocation of resources and funding needed to implement the NAAHS.

6.9.2 Current Status

Additional resources and funding will need to be allocated to undertake the various programmes and projects outlined in this document.

6.9.3 Projects

No specific projects are outlined under this programme. However, to move the NAAHS forward, it is essential that a detailed implementation plan be prepared, including a time frame, list of required resources and identification of funding requirements and the preparation of a budget.

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