

Achievements and priorities in aquaculture and health management of aquatic organisms in Bosnia and Herzegovina

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conference report

Summary

The paper presents the current condition in aquaculture of Bosnia and Herzegovina, taking into account a long tradition in fishery and a global growth in aquaculture. Along with basic information on hydrography and ichthyofauna, the paper also presents information on the production of fish and shellfish intended for human consumption, total production per certain categories of fish and fish products, export capacities, organization of private sector and aquaculture analysis with an overview of future challenges.

Key words: aquaculture, fish for human consumption, legislation

Introduction

Aquaculture approximately ensures 20 million tons of the total world's needs for fish and shellfish, which are estimated to be 140 million tons. In the period to 2025, the total global production in aquaculture is expected to grow from 20 to 55 million tons, along with the simultaneous stagnation or a decrease in fish catch from natural habitats. These intensive conditions of production growth in aquaculture also have influenced the development of disciplines which follow, first of all, health and economic aspects of aquatic organism production (Anon., 2007).

Global trends which follow the production of the most important fish species in aquaculture (salmon, trout, carp, catfish) are vertical integration, an increase in production capacities and high population density with determined dietary regimen for optimization of growth (Anon., 2005).

Based on available data, Bosnia and Herzegovina is considered to have significant potential in aquaculture.

The history of aquaculture in Bosnia and Herzegovina

The period of Austro-Hungarian rule (1878-1918)

Fish breeding and fishermen's associations started in Bosnia and Herzegovina during the Austro-Hungarian rule.

The following information are significant (Anon., 2008):

- 1882- Income from fish farming 5,342 forints; income of 8,401 forints in 1900
- 1886- Regulation, which organized protection of waters
- 1892- The first fishermen's association was founded
- 1894- The first fish farm "Vrelo Bosne" Ilidža was opened (600,000 pieces of fry capacity)
- 1902- The development of carp

fishing started:

- Prijedor (300 acres, 300- 400 kg/ acre)
- Bosanska Gradiška (600 acres, 100- 150 kg/ acre)

The period of the Kingdom of Yugoslavia (1919-1941)

During the period of the Kingdom of Yugoslavia, the development of fishery in the country stagnates.

The period of The Socialist Federal Republic of Yugoslavia (1946- 1991)

During the period of former Yugoslavia, fishery in Bosnia and Herzegovina had some progress, especially in terms of monitoring the fish health protection and breeding control. It is significant that following institutions were founded:

- 1952- Institute of Fisheries
- 1957- Yugoslav business association for the improvement of freshwater fisheries
- 1959- Center for Fisheries, Faculty of Veterinary Medicine



Figure 1 Hydrological conditions of fish farming in Bosnia and Herzegovina (Hamzić, 1993)

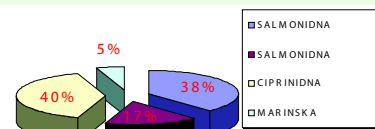


Figure 2 Percentage of fish farms in production of fish and shellfish for consumption in Bosnia and Herzegovina



Full-system trout farm, Konjic (photo A. Jažić)

The production of salmonid fish farms in 1982 was 1,086 tons. The production of fish for human consumption in 1990 was 3,000 tons per year.

The period since the Declaration of Independence of Bosnia and Herzegovina (since 1992)

During the war in Bosnia and Herze-

govina, fish ponds were destroyed and the production was neglected. Such situation lasted from 1992 to 1995. Then in 1996, reconstruction and development of fisheries in Bosnia and Herzegovina started. Since 1999 new technologies were introduced, capacities were expanded, fish food of better quality was introduced, and all that enabled the recovery of fisheries in Bosnia and Herzegovina and achievement of significant results in aquaculture.

Basic information on hydrography in Bosnia and Herzegovina

Bosnia and Herzegovina is characterized by favorable geographic, climatic, hydrological and ecological conditions, as well as physicochemical properties of watercourses for intensive farming of freshwater fish. Its hydro resources belong to the basins of the Adriatic and Black Sea. A potential for fish farming consists of a total of 20,000 km of rivers and streams (Sava - 355 km; Drina - 346 km; Bosna - 308 km; Vrbas - 240 km; Una - 207 km; ...), 400 ha of lakes (Buško, Višegradsko, Jablaničko, Modrač...) and 1,400 ha of seashore (Figure 1).

Ichthyofauna in Bosnia and Herzegovina

Rich ichthyofauna in Bosnia and Herzegovina consists of 27 fish-families, 69 genera and 119 species of fish. The following species are raised (Hamzić, 1993):

- salmonid (rainbow trout, brown-trout, brook trout, grayling,...)
- cyprinid (common carp, silver carp, catfish...)
- sea fish (sea bass, gilthead sea bream, common dentex, mussels, oysters, ...)

The situation in aquaculture

The production in aquaculture in 2002 reached the level from 1991. Along with a significant increase in the production of rainbow and brown trout and brook trout, new

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technologies of raising grayling, Adriatic trout and Arctic char were introduced.

The production of sea bass and gilthead sea bream in marine fisheries has also multiply increased (Figure 2.) and the production of common dentex, mussels and oysters was introduced.

So, an increase in the production of fish and shellfish occurred in the period from 1999 to 2008 (Tables 1. and 2.). That production has also influenced the growth of employment. At the same time, the growth of production of sea fish and shellfish is very distinct, even 400%. There was an increase during the above mentioned period:

- total production of fish and shellfish for consumption +55%
- production of salmonid eggs +98%
- production of salmonid fry +69%
- production of salmonid fish for consumption +82%
- production of cyprinid fry +19%
- production of cyprinid fish for consumption +11%
- production of sea fish and shellfish +400%
- production per employee +37%
- production capacities +12%
- employment +12%

Production of trout for consumption in Europe has reached over 40,000 tons of fish per year. With its production, Bosnia and Herzegovina takes a high ninth place (Table 3.).

Farmed fish is exported to neighboring countries (Croatia, Montenegro, Serbia and Macedonia) and it is important to emphasize export to the countries of the EU since January 2009.

The situation in aquaculture

There are several groups and associations in Bosnia and Herzegovina

Table 1. Total production of fish in Bosnia and Herzegovina 1999 – 2007 (tons)

Year	Salmonid	Cyprinid	Marine	TOTAL:
1999	1.389	1.807	40	3.236
2000	1.785	1.602	60	3.447
2001	2.241	1.818	70	4.129
2002	2.737	2.009	190	4.936
2003	2.794	2.422	172	5.388
2005	3.085	2.811	174	6.070
2007	3.410	2.968	163	6.541

Table 2. Production of salmonid fry (tons)

YEAR	1999	2000	2001	2002	2007
Salmonid fry	890	830	781	1.057	1.570

Table 3. Production of trout for consumption in Europe (Hamzić, 1993)

Country	t
1 Italy	41.900
2 Turkey	35.250
3 France	32.500
4 Denmark	31.000
5 Spain	29.500
6 Germany	23.000
7 England	16.200
8 Poland	11.000
9 Bosnia and Herzegovina	3.400
10 Austria	3.000
11 Greece	3.000
12 Portugal	1.500
13 Ireland	1.000
14 Czech Republic	656
15 Belgium	400
Overall:	233.306

which monitor activities related to the production of fish. In this way there were founded the Aquaculture Group of the Federation of Bosnia and Herzegovina, then the Aquaculture Group of the Republic of Srpska and the Aquaculture Association of Bosnia and Herzegovina. The HACCP system was introduced to most fish farms and rules of good manufacturing practice (GMP) are applied.

The growth of production in aquaculture has also been followed by an active participation of veterinary profession since 2003. So, at the level of Veterinary Office of Bosnia and Herzegovina with the cooperation

of the Department of Aquaculture of the Veterinary Faculty Sarajevo and representatives of veterinary inspections of the Federation of Bosnia and Herzegovina and the Republic of Srpska, a model was made and implemented which would enable control and monitoring of fish diseases in the aim of prevention, control and eradication of infectious and parasitic diseases of fish and shellfish according to the standards of OIE. At the same time, relevant legal acts are also adopted which monitor and regulate issues in aquaculture of Bosnia and Herzegovina, according to EU directives.



Cage half-system trout farm, Neretva (photo A. Jažić)



Hatchery of brown and rainbow trout Konjic (photo A. Jažić)



Carp farming, Saničani-Prijedor (photo A. Jažić)

Education of veterinary inspectors in the fields of control and fish disease monitoring is equally important. In order to establish self-control, a special attention is given to education of the owners of fish farms.

Monitoring of viral diseases of fish is established, and they are: infectious pancreatic necrosis (IPN), viral hemorrhagic septicemia (VHS), infectious haematopoietic necrosis (IHN), spring viraemia of carp (SVC) at the level of Bosnia and Herzegovina which includes almost all full-system and most half-system fish farms.

Veterinary office of Bosnia and Herzegovina appointed Department of Aquaculture of the Veterinary Faculty Sarajevo for NRL. Except for diagnosing viral diseases of freshwater fish, this department also diagnoses parasitic and bacterial diseases.

During its work in the post-war period, Department for Aquaculture has determined the following diseases in freshwater fish:

Viral: infectious pancreatic necrosis
Bacterial: redmouth disease, bacterial gill disease, bacterial nephritis, furunculosis of trout, *carp erythrodermatitis*

Fungal: *Saprolegnia*
Parasitic: hirling disease of trout, *Ichthyobdosis*, *Ichthyophthiriasis*, *Hexamitiasis*, *Chilodonellosis*, *Trichodinosis*, *Gyrodactylus*, *Dactylogirose*, *Diplostomosis*, *Botrioccephalosis*, *Ligulosis*, *Lernaeosis* and *Argulus*.

Analysis of aquaculture development in Bosnia and Herzegovina

Advantages of aquaculture development in our country are seen in the fact that Bosnia and Herzegovina has significant potentials in aquaculture. Primarily, it applies to:

- clean water of high quality
- uninfected fish species in open waters and controlled breeding
- quality breeding stock which is

- renewed from free watercourses
- hatcheries and other facilities for fish farming of good quality and
- available fish processing facilities

Weaknesses of aquaculture development primarily are:

- low consumption of fish
- lack of indigenous production of fish food
- limited consumer purchasing power
- poor road infrastructure
- lack of adequate subvention
- unsatisfying loans
- incoherence of the market

It should be added that imported fish food is very expensive and that financial problems that fish farmers meet primarily apply to taxes. Then, government incentives are very symbolic. The problem of protecting springs, water reservoirs and the sea should be especially emphasized. Modernization of production should be certainly approached by purchasing equipment which can be used to double the production per area unit in comparison to earlier capacities. Therefore, the following are necessary:

- modernization of water intake
- aerators
- fish egg sorters
- automatic "sorter" devices
- elevators
- cisterns

Aquaculture certainly guarantees export of fish to the EU through good manufacturing practice. Natural resources are a guarantee and a high potential for fish production. It should be insisted on the production of autochthonous fish species for stocking of open waters but also the production of autochthonous fish species for export. At the same time, it means that the number of employees will be increased.

There are many assignments waiting for producers and legislators, veterinary services and everyone includ-



Mariculture, Neum, (photo A. Jažić)

ed in aquaculture business. First of all, legislation should be completely coordinated with the legislation of the EU (88/R/2006/EC). Health safety of fish in terms of finding residues of veterinary drugs and other contaminants should continue to be systematically monitored. The accompanying laboratories must be accredited and equipped so that they can conduct official researches.

A legislator must ensure uniform registration of full-system farms.

In order to improve aquaculture, the following forms of incentives need to be established:

- privileges for the import of fish food
- stimulation for the production and export of fish
- stimulation for employment and expanding capacities
- stimulation for the production of autochthonous fish species and their production
- uniform registration of all fish farms
- applying prophylactic measures from spawn to fish for consumption
- protection of one's own actualizable potential from fish diseases
- disease control and monitoring at the national level in the aim of prevention, control and eradication of infectious and parasitic diseases of fish and shellfish according to OIE standards

- system control
- awareness (from farmers, over veterinary service to consumer)

Conclusion

Bosnia and Herzegovina has significant potentials in aquaculture. Current utilization of existing capacities is of about 60% and it is possible to produce 10,000 tons of fish and shellfish for consumption annually, intended for domestic and foreign market. Thereby, it is necessary to emphasize the role and active participation of veterinary profession in establishment of systems of control and monitoring of fish diseases at the national level in the aim of prevention, control and eradication of infectious and parasitic diseases of fish and shellfish according to the OIE standards (Anon, 2008).

Breeding autochthonous fish species for stocking and export should be encouraged.

July 26, 2011

Bosnia and Herzegovina State Veterinary Office receives prestigious FAO's 2010-2011 EdouardSaouma Award

Rome – Bosnia and Herzegovina's State Veterinary Office (SVO) is one of the winners of FAO's 2010-2011 EdouardSaouma Award for its outstanding contribution to the implementation of the Technical Cooperation Project for Strengthening

Leistungen und Prioritäten in Aquakultur und Gesundheitsverwaltung der aquatischen Organismen in Bosnien und Herzegovina

Zusammenfassung

In dieser Arbeit ist der aktuelle Zustand in der Aquakultur in Bosnien und Herzegovina dargestellt, wobei die lange Tradition im Fischerei und Globalwuchs in Aquakultur in Betracht gezogen wurde. Neben Grundinformationen über Hydrographie und Ichthyofauna sind in der Arbeit Angaben gegeben, u.zw. über die Herstellung von Konsumfisch und Muscheln, Gesamtherstellung nach einzelnen Fischkategorien und Fischerzeugnissen, Ausfuhrkapazitäten, Organisation des Privatsektors, Analyse der Aquakultur mit Bezug auf die Zukunft und deren Herausforderungen.

Schlüsselwörter: Aquakultur, Konsumfisch, Legislative

Risultati e priorità nell'acquacoltura e nella cura della salute degli organismi acquatici della Bosnia ed Erzegovina

Sommario

In questo lavoro l'autore presenta la situazione attuale nell'acquacoltura della Bosnia ed Erzegovina, prendendo in considerazione una lunga tradizione di pesca e l'aumento globale dell'acquacoltura. Oltre alle informazioni principali sull'idrografia e sull'itiofauna, il lavoro contiene anche i dati sulla produzione dei pesci e delle conchiglie da consumo, sulla produzione totale dei pesci e prodotti di pesce divisi in categorie, sulle capacità dell'esportazione, sull'organizzazione del settore privato, sull'analisi dell'acquacoltura tenendo conto delle sfide future.

Parole chiave: acquacoltura, pesce da consumo, apparato legislativo

Capacity on Aquaculture Health Management.

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