

THE ACTUAL FISH DISEASES IN LATVIA

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The most important fish diseases in Latvia fish hatcheries are myxobacteriosis of salmonids, furunculosis of salmonids and aeromonosis of carp. Both of them are caused by bacteria. Routine pathological examination of fish was performed around the year from 1997 till 2009, in 7 state fish hatcheries and individually from 3 private farms. In period of 1997 till 2000 bacteriological investigations were more performed to myxobacteriosis of salmonids and only last years the bacteriological examination was focused also to aeromonosis of salmonids and cyprinids. A total of 3334 fish salmon, trout, from larvae (0+) to smolt stage, 2 samples of carps, 4 samples of breeders of pike perch, 10 samples of trout (2+) were examined. Bacterial samples were taken from fish without any clinical signs of disease and with clinical signs, from surface and internal organs. Bacteriological material was inoculated on the plates with specific medium. All plates were cultivated at + 18 - +25 C for 24 – 72 h, and representative colonies were reisolated for characterization and identification according to standard bacteriological methods using API-20E. A total of 345 bacteriological tests were performed, hereof 15,3% tests were positive for aeromonosis, 16,5% tests were positive for myxobacteriosis and 68,2 % tests were negative. The majority of disease outbreaks were observed in spring – summer season, when water temperature raises above +20 °C.

Key words: Salmon, trout, rainbow trout, carp, pike perch, disease, aeromonosis.

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INTRODUCTION

In fish farming, mortality due to infectious diseases has been considered to be a significant factor contributing to reduced production and profits (Lillehaug et.al. 2003). The most important fish diseases in fish hatcheries in Latvia are initiated by bacteria. Bacteria are important pathogens for both cultured and wild fish, and are responsible for serious economic losses (Inglis et.al. 2001). Some bacteria cause only skin or gill infections, but some - systemic disease. In terms of pathological capability, there are two disease producing types of bacteria - obligate

pathogens, and nonobligate or facultative pathogens.

Many potentially pathogenic bacteria of fish normally exist in a commensal association with the host or free in the environment. Facultative pathogens can survive indefinitely in water and when environmental conditions are conducive, infectious fish diseases may spread out.

Some diseases are the result of obligate bacterial pathogens but some of facultative pathogenic bacteria. Bacteria become pathogenic when the fish is immuno - compromised by some form of stressor (Kirjusina et.al. 2007). Bacterial diseases

have a significant impact on salmonids and cyprinids and can equally affect both wild and cultured fish in situations where stress and crowding will favour transmission.

In fish farms, outbreaks are typically associated with stress, especially high temperatures. Predisposing risk factors include also overcrowding, organic pollution and hypoxia. Some cyprinid fish establish favourable transmission conditions for pathogens by forming into vast shoals, especially at spawning times.

The main fish bacterial diseases in Latvia are myxobacteriosis of salmonids, furunculosis of salmonids, and aeromonosis of carp.

Myxobacteriosis is a common bacterial disease that affects the skin or gills of freshwater fish. *Flexibacter columnaris* is the most prevalent member of this group, which has a worldwide distribution and can probably infect most freshwater fish. It is an important fish pathogen and can rapidly infect a population and cause large mortalities (Kirjusina, et. al. 2007).

Aeromonas spp. are universally distributed and widely isolated from environmental and water samples.

Aeromonas salmonicida is the aetiological agent of furunculosis, a disease that affects many species of fish and is a significant cause of economic losses in the aquaculture of trout and salmon (Balcázar et.al. 2007). The disease is characterized by the presence of general septicaemia, lack of appetite, lethargy and haemorrhagic and necrotic lesions in gills, gut and muscle (Kirjusina et.al. 2007). This bacterium has also been associated with ulcer disease in carp (Balcázar et.al. 2007).

A mainly isolated pathogenic bacterium from environment is *Aeromonas hydrophila* (Briede, Medne 2004). *Aeromonas hydrophila* is the causative agent of motile aeromonad septicaemia, registered for a wide variety of freshwater fish

species. Outbreaks of motile aeromonad septicemia usually occur when the fish are immunocompromised by stresses such as overcrowding or concurrent disease (Tan et.al. 1998).

That is why recently more attention is directed to aeromonosis, it has a significant impact on cultured and occasionally wild populations. Future investigations will expect wild fish population examination for aeromonosis and furunculosis.

The aim of this study was to investigate the bacteriological background of fish diseases in state and private farms.

MATERIALS AND METHODS

In state fish hatcheries Baltic salmon (*Salmo salar* L), trout (*Salmo trutta* L) and rainbow trout (*Oncorhynchus mykiss* W) from larvae (0+) to smolt (1) stage were bred in 800 litre tanks and supplied with aerated fresh water from river basin. The fish were fed daily on a pelleted diet of an appropriate size according to manufacturer's recommendation. Feed was dispensed from clockwork belt feeders in the circular tanks.

Routine pathological examination of fish was performed during the year from 1997 to 2009. The first four years bacteriological investigations were managed only to myxobacteriosis of salmonids but since 2001 the bacteriological investigations were focussed also to aeromonosis of salmonids and cyprinids. Sampling from 7 state fish hatcheries and 3 private fish farms was provided.

The fish samples were placed on the ice and immediately transported to the laboratory for further investigation. A total of 3334 fish Baltic salmon, trout, rainbow trout from larvae (0+) to smolt (1) stage, 2 carps (*Cyprinus carpio* L) (n/d), 4 breeders of pike perch (*Stizostedion lucioperca* L), 10 rainbow trout (2+) were investigated. Bacteriological material from ulcers

of the surface, gills and from internal organs – heart, liver, kidney, spleen and muscles were sampled from fish with clinical signs and clinically health fish. Bacteriological samples were inoculated on the plates with specific medium. All plates were cultivated for 4–5 d, at +18 - +25 °C. Typical colonies were reisolated for characterization and identification according to standard bacteriological methods using API-20E. In each fish hatchery water temperature and fish mortality were estimated daily during the year.

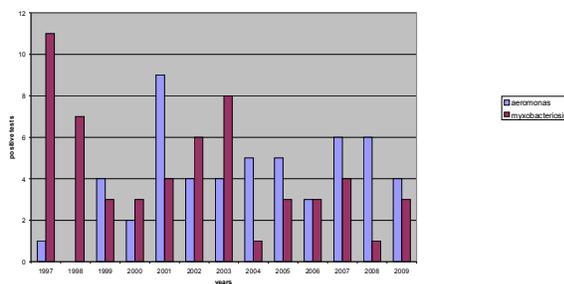


Fig. 1. Positive bacteriological results for aeromonosis and myxobacteriosis during 1997. – 2009.

RESULTS

Bacteriological investigations were performed in all 7 state hatcheries on main river basins – Daugava, Gauja, Venta, Salaca from which fish farms received its water supply. In summer season water temperature vary between + 18 °C - + 26 °C, with the highest peak in July, sometimes the high temperature lasts for a long time, but the lowest temperature was in January and February (approximately +0.3 °C). The majority of disease outbreaks occurred during spring – summer season. The most

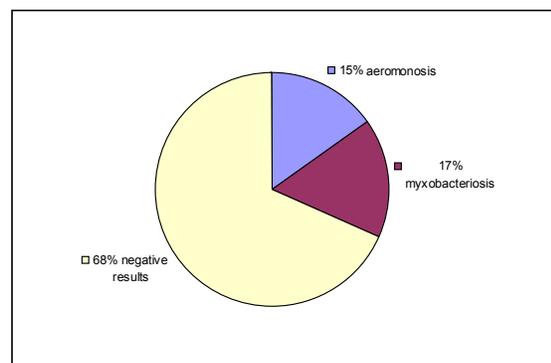


Fig. 2. Positive results for aeromonosis and myxobacteriosis.

Tab. 1. Positive results for myxobacteriosis from river basins

Years	River basins			
	Daugava	Gauja	Venta	Salaca
1997	9	1		1
1998	5			2
1999	1	1		1
2000	3			
2001	2	2		
2002	5		1	
2003	4	4		
2004	1			
2005		3		
2006	1	2		
2007	2	2		
2008			1	
2009	1	1	1	
Total	34	16	3	4

acute outbreaks were registered in years 1997, 2001, 2003 and 2004 when massive fish mortality was observed (fig.1).

In 1997 there was registered massive mortality caused by *Flexibacter* spp. but in 2001, 2003 and 2004 the positive results of aeromonosis was compatible with disease outbreaks. In other years there were registered individually cases of diseases with low mortality and bacteriological examination demonstrated that these bacteria could be isolated also from clinically health fish and water supply.

Bacteriological examinations demonstrated that 52 tests (15,3%) were positive for aeromonosis, 57 tests (16,5%)

- for myxobacteriosis and 236 (68,2%) tests presented negative results (fig. 2.).

The mainly isolated bacteria from fish was *Flexibacter* spp. and from year 2000 also *Aeromonas* spp. Other facultative pathogen bacteria such as *Pseudomonas aeruginosa* and *P. fluorescens* were detected in separate cases along with *Aeromonas* spp. Bacteriological findings demonstrated that from state hatcheries on Daugava and Gauja river basins from salmon and trout *Flexibacter* spp. were detected both from clinically health fish and fish with clinical signs of disease (tab. 1.).

Bacteriological investigations presented that from year 2000 besides *Flexibacter* spp. were identified bacteria *Aeromonas* spp. Only some individual cases -two cases - carps collected from lakes in Latgale district and one case – rainbow trout collected from Daugava river basin were related with disease outbreak (tab.2.).

To compare between rather fish species Baltic salmon was more contaminated with bacteria in comparison with trout because salmon and trout were investigated all around the year but other fish species - only individually (tab.3.).

DISCUSSION

Tab.2. Positive results for aeromonosis from river basins.

Years	River basin				Lake in Latgale
	Daugava	Gauja	Venta	Salaca	
1997				1	
1998					
1999	2	2			
2000	2				
2001	5	4			
2002	2	1	1		
2003	2	1			1
2004	4				
2005	2	2			1
2006	1	2			
2007	2	4			
2008	1	4	1		
2009		3	1		
Total	23	23	3	1	2

Bacterial infections that affect salmonids occur extensively and can have a significant impact on cultured and occasionally wild populations. Some fish bacterial infections are caused by obligate pathogens and produce clinical disease without adverse environmental influences, but many epizootics are related with stress. It is important to maintain a high standard of water quality, other associated environmental conditions, overall management in controlling, preventing and reducing effects of disease.

Tab. 3. Positive results of aeromonosis and myxobacteriosis from investigated fish species

Fish species	Aeromonosis					Myxobacteriosis			
	Lake in Latgale	River basin				River basin			
		Daugava	Gauja	Venta	Salaca	Daugava	Gauja	Venta	Salaca
Baltic salmon		17	18	3	1	32	12	2	4
Trout		4	5			2	4	1	
Rainbow trout		1							
Carp	2								
Pike-perch		1							
Total	2	23	23	3	1	34	16	3	4

Bacteriological examination demonstrated that most important fish bacterial diseases were myxobacteriosis of salmonids and furunculosis of salmonids and individual cases of aeromonosis of carps and pike perch. The disease outbreaks were established in spring - summer period when water temperature was above + 20 °C. During this period several outbreaks with massive fish mortality were registered. The mainly isolated bacteria were from fish with clinical signs of disease. They were pathogenic bacteria *Flexibacter* spp., *Aeromonas salmonicida*, *Aeromonas hydrophila* and three cases of other facultative pathogens – *Pseudomonas aeruginosa* and *Pseudomonas fluorescens*. *Pseudomonas* spp. were identified in the same samples along with *Aeromonas* spp., what allowed to conclude that these bacteria normally exist in a commensal association with the fish or sometimes free in the environment.

The bacteriological findings demonstrated that fish collected from the Daugava and Gauja river basins produced more positive results for both aeromonosis and myxobacteriosis than samples from other river basins. It may be occasionally that the Daugava and Gauja river basins were more contaminated with bacteria that could raise disease. On the Daugava river there were three salmonid fish hatcheries downstream one after another, what allowed supposing that it may transfer disease agent from one hatchery to another and it could be the reason of disease outbreaks in distal hatchery. On the Gauja river there are two hatcheries, on rather tributaries what allowed supposing that they could not transmit infection.

In comparison with all investigated fish species, salmon produced significant positive results than other fish species.

Since 2004 investigations were focused as well to aeromonosis because *Aeromonas* spp. could be isolated from clinically health fish and from water supply and the obtained results allowed supposing that these bacteria could be find in water supply and positive results were not

always related with disease outbreaks. In winter period it was acquired to isolate bacteria *Aeromonas* spp. or *Flexibacter* spp. only from sick fish and it was possible only in a few cases, but in summer period they were obtained even from clinically healthy

fish. The better growth for these bacteria was connected with water temperature, the optimal water temperature for their growth is + 20 - +24 °C and such temperature was observed. The greatest part of positive results of bacteriological tests for isolation of *Aeromonas* spp. was closely connected with disease outbreaks.

In the near future the greater attention will be directed to fish diseases, because it has a significant impact on cultured and occasionally wild populations. Future investigations will expect wild fish population examination for aeromonosis and myxobacteriosis.

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