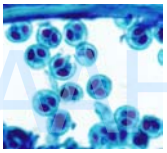
Myxobolus cerebralis in fishes at reservoirs of Kamchatka



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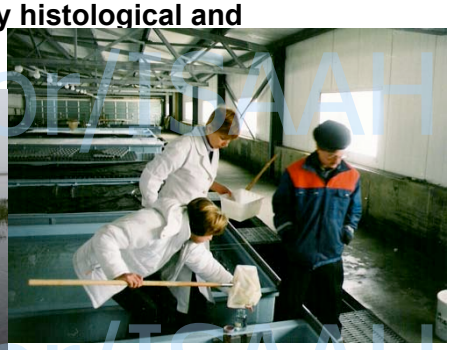
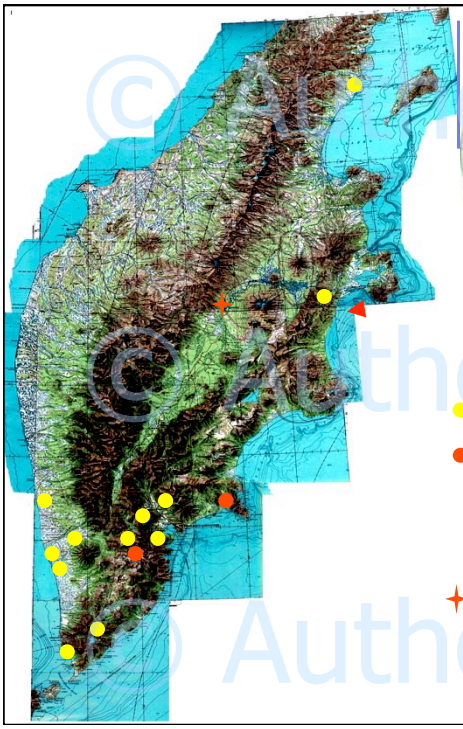
During 2000-2010 the 2750 wild and cultured young salmonids fish (*Oncorhynchus nerka, O. tschawytscha, O. keta, O. kisutch*) and trout (*Salvelinus malma)* from Kamchatka were examined by histological and histochemical methods



During the work we described external clinical signs, pathoanatomical changes and diagnostics of diseases, using standard histological and histochemical methods.



Map of Kamchatka

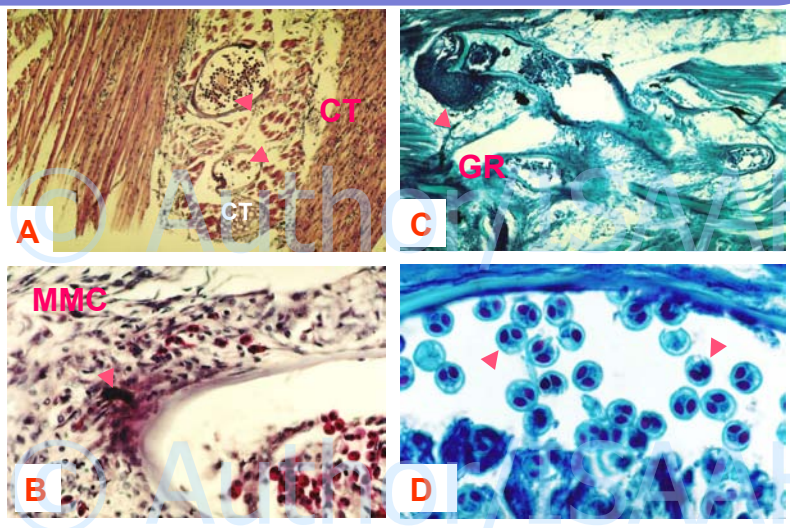
- Places of fishes sampling
- Places of detection *Myxobolus cerebralis*
- Previously detection *M. cerebralis* (Bogdanova, 1970)

Lake Nachikinskoe

Fingerlings of sockeye salmon *O. nerka*

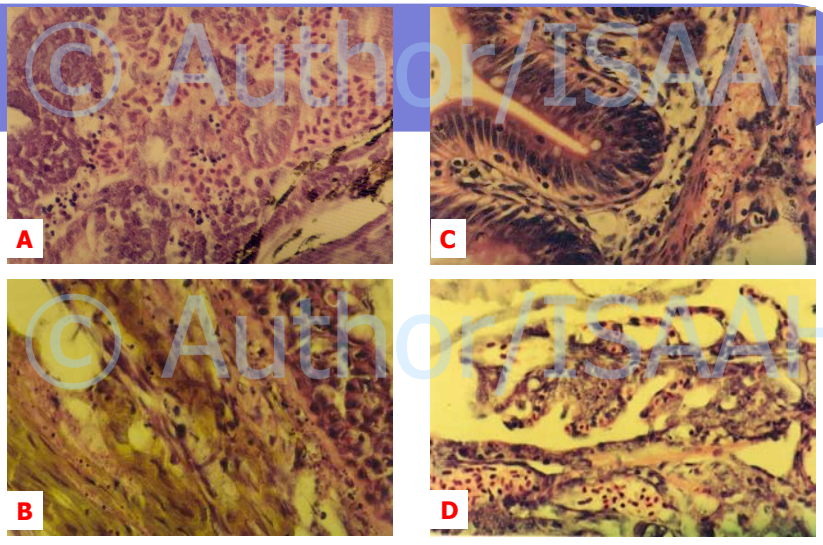
***M. cerebralis* was revealed only in wild fingerlings of sockeye salmon with pathological signs from Lake Nachikinskoe (western sea coast of Kamchatka) in August 2006**

The pathogenic influence of the *Myxobolus cerebralis* (↑), determined from cartilaginous tissue (CT) in the fingerlings sockeye salmon from Lake Nachikinskoe in 2006. A. Necrosis, lysis of the chondrocytes. B. Melanisation of the macrophages (MMC). C. Formation by epithelial granuloma (GR) around of the affected area of a necrotic tissue. D. Spores (↑) and developing stages of the parasite

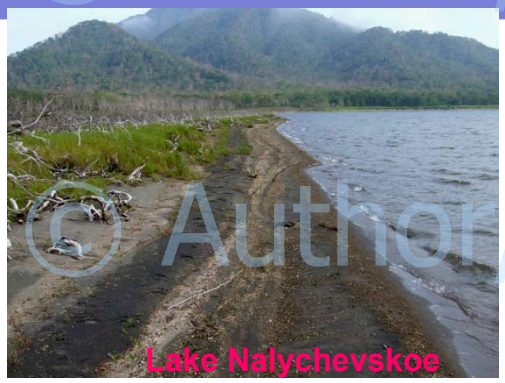


Spores of the *M. cerebralis*, determined from cartilaginous tissue of the fingerlings sockeye salmon from Lake Nachikinskoe in 2006

Spores fine, almost round, polar capsules of identical size, are separately placed among themselves, but converge to a forward pole, and during too time spores do not touch lateral walls. Sutural ridge is well advanced. Diameter of spores 7-9 µm, thickness 4-5 µm, length of polar capsules 3.0-3.5 µm their diameter 1.5-2.0 µm (by Aseeva N.L.)



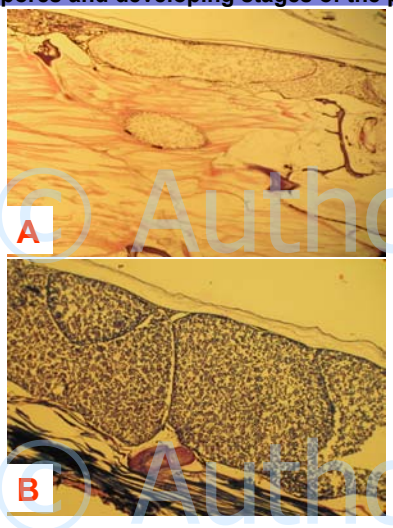
The histopathological changes in organs and tissues at separate (30%) underyearlings sockeye, characteristic for infectious necrosis hematopoietic tissue (IHN)

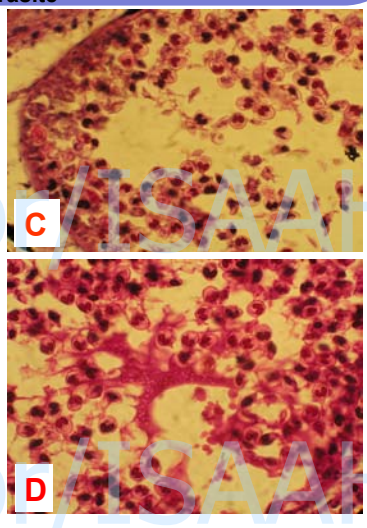


M. cerebralis was revealed in 60% of dead nine-spined stickleback from Lake Nalychevskoe (eastern coast of Kamchatka) in August 2009

Nine-spined stickleback *Pungitius pungitius* is typical hydrobiont of Kamchatka rivers and lakes

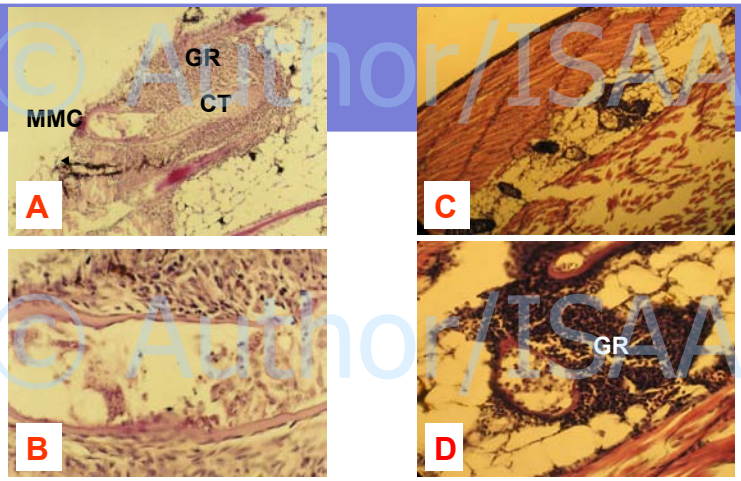
Histopathological lesions revealed in the dead nine-spined stickleback *P. pungitius* from Lake Nalychevskoe in 2009. A, B. The complete replacement of the cartilaginous tissue of spinal column of nine-spined stickleback with spores of the parasite without granuloma formation (↑). B, C. Spores and developing stages of the parasite





Summary behaviours of the Lakes Nachikinskoe and Nalychevskoe (Nikolaev, Nikolaeva, 1991; Kurenkov, 2005, 2007; Bugaev, Kirichenko, 2008)

Behaviours	Lake Nachikinskoe	Lake Nalychevskoe
Derivation (origin)	glacial	glacial-fiord
Height above sea level	346 m	1.3 m
Area	7.4 km²	13.2 km²
The maximal depth	36.5 m	4 m
Average temperature of the water in summer	16 ºC	18 ºC



Pathological lesions in the cartilaginous tissue (CT) of vertebrae ribs in the fingerlings of *S. malma* (A, B) from Lake Kurilskoe in 2008 and *O. nerka* in Lake Nachikinskoe in 2005 (C, D) as a result of the infestatiom by myxosporidia. A, C. Melanisation of the macrophages (MMC), formation by epithelial granuloma (GR) around of the affected area of a necrotic tissue (x100, H-E). B, D. Prespore myxosporidian aggregates in the cartilaginous tissue (x400, H-E)

Conclusion

M. cerebralis were determined from salmonid and nonsalmonid fishes. This pathogenic agent was revealed in fishes from basins of the rivers of western and eastern coast of Kamchatka.

The visual signs of a pathology in salmon were black discoloration of skin, lethargic swimming behavior, the delayed response on external stimulus. The following pathological lesions were determined in the surveyed fishes: in salmonids spores and developing stages of the parasite caused local necrosis of vertebrae ribs and lysis of the chondrocytes. The formation by epithelial granuloma around of the affected area of a tissue was marked.

In nine-spined stickleback the cartilaginous tissue of a spinal column has been completely replaced with mature spores of the parasite without granuloma formation and destroyed head cartilage.

May be nine-spined stickleback is natural carrier or source of *M. cerebralis* for salmonids fish in reservoir of Kamchatka.

It is necessary to make a point of detection of *M. cerebralis* in Lake Nachikinskoe as basin of the river Bolshaya where two fish-hatcheries are located that reared fingerlings of sockeye, chum and chinook salmons.