LEGISLATION AND HEALTH SITUATION IN CROATIAN AQUACULTURE

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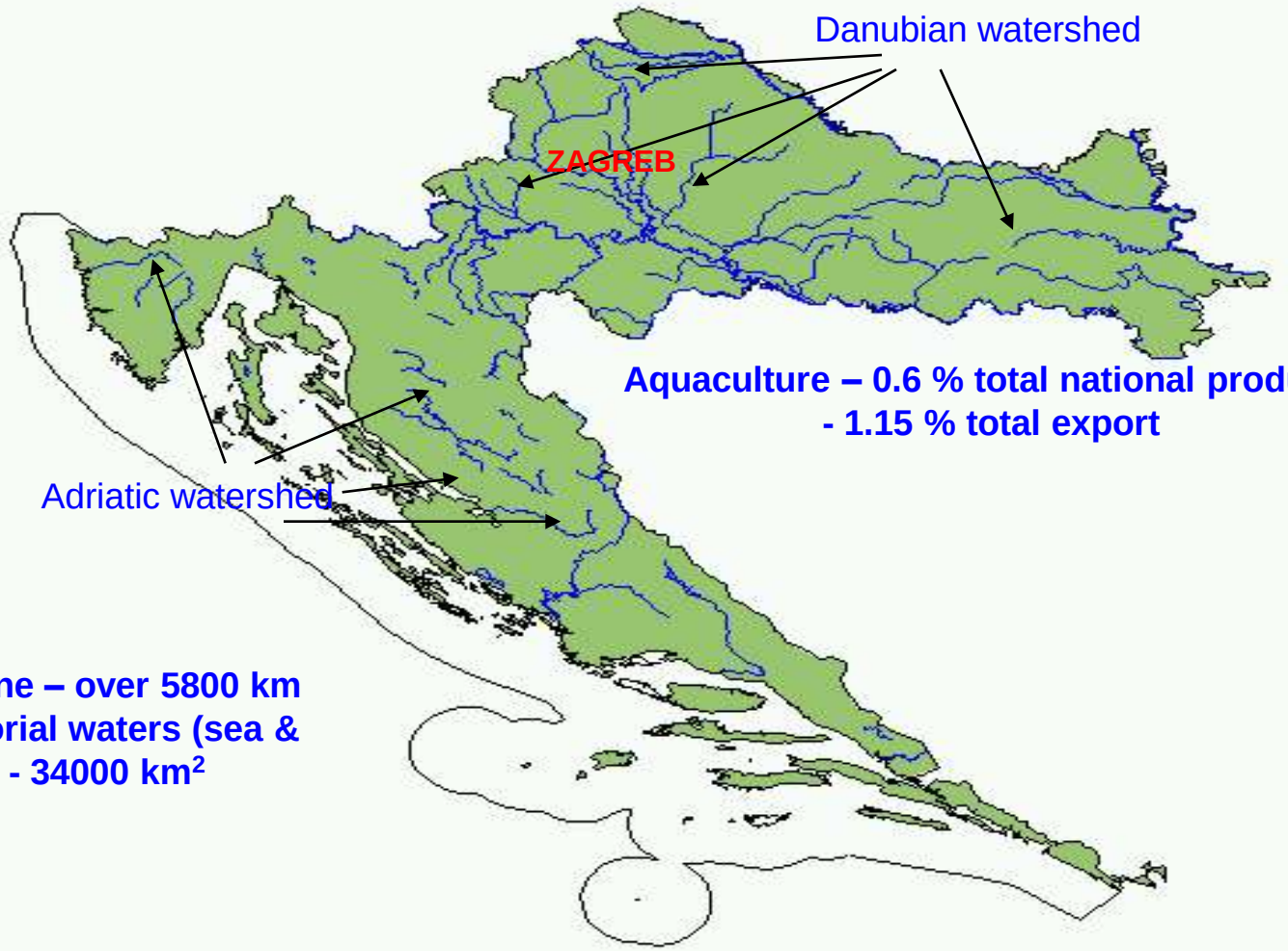
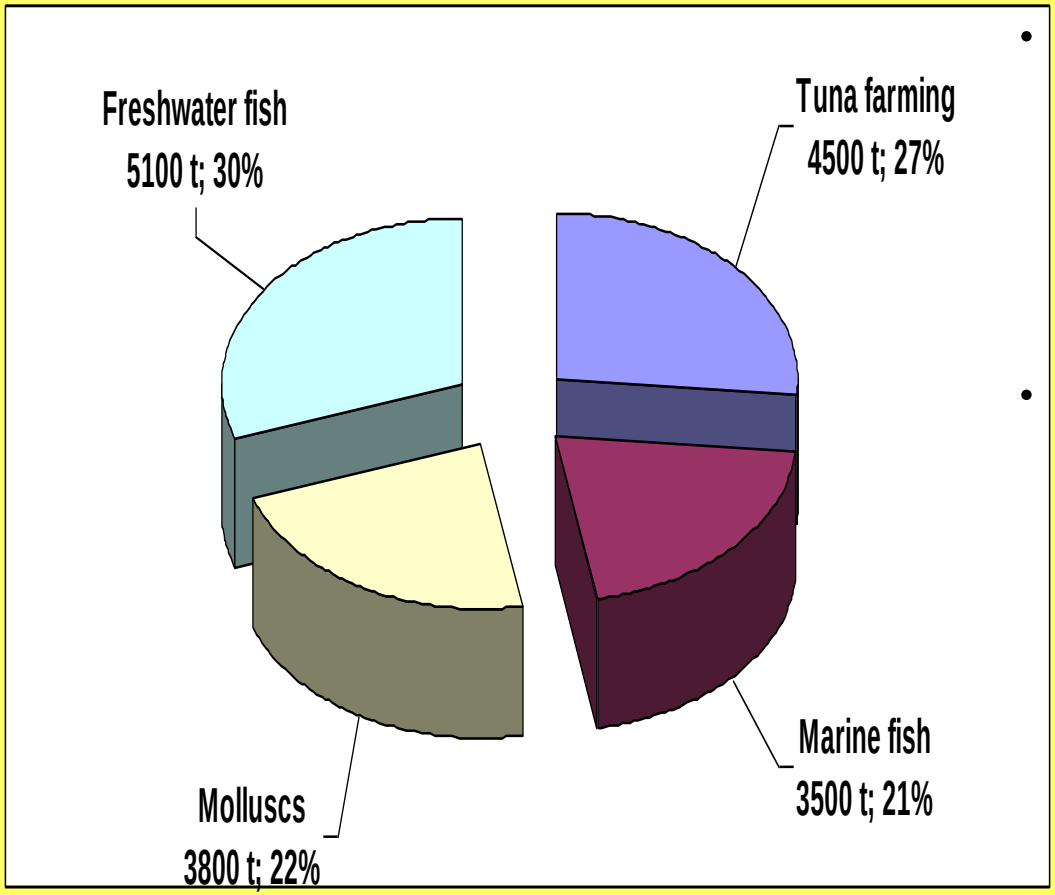
MAP OF CROATIA



Aquaculture – 0.6 % total national production
- 1.15 % total export

Costline – over 5800 km
Territorial waters (sea & inland - 34000 km^2

NATIONAL PRODUCTION DATA



- Total annual production of freshwater fish for 2006. was 5.100 tons (3.215 tons of cyprinids and 1.885 tons of salmonids)
- Total production in the Adriatic sea was close to 12.000 tons (2.400 tons of sea bass, 1.100 tons of sea bream, 4.500 tons of tuna and about 3.800 tons of mussels and flat oysters

CULTIVATION OF FRESHWATER SPECIES

SALMONICULTURE

- about 13 (mainly family owned & run) trout farms with total area of 5,8 ha
- production of rainbow trout (*Oncorhynchus mykiss*) and small quantites of brown trout (*Salmo trutta* m. *fario*), brook trout (*Salvelinus fontinalis*) - for stocking angling waters
- farms situated on the spring water comprising hatchery, cultivation of fry and market sized fish

CYPRINID AND OTHER SPECIES

- 20 farms occupying 10.000 ha; 6.600 ha utilized for production of warm water species: 86 % common carp (*Cyprinus carpio*), 14 % other species: grass carp (*Ctenopharyngodon idella),* bighead carp (*Aristichthys nobilis*), silver carp (*Hypophthaltmichthys molitrix*), pike (*Esox lucius*), pike-perch (*Sander lucioperca)* and European catfish (*Silurus glanis*)
- Earthern ponds (1-100 ha)
- Average production 650 kg/ha

CULTIVATION OF MARINE SPECIES

- Cultivation of sea bass (*Dicentrarchus labrax*) and gilthead sea bream (*Sparus aurata*) has 30 years old tradition
- 34 farms; 5 farms with production from 200 to 800t and about 30 "family farms" with production up to 100 t
- some quantities of fry from 4 Croatian hatcheries - rest imported from Mediterranean countries (Italy, France...)
- annual production is about 5000 t
- sharpsnout seabream (*Diplodus puntazzo*) and dentex (*Dentex dentex*)

BLUEFIN TUNA CULTIVATION

Foto: Sardina, Postira

- Tuna fattening – new branch of mariculture, started 1998.
- feeding captured wild fish of different size, age and origin caught in Mediterranean Sea according to ICCA's quotas in off-shore cages
- Fed fresh/frozen sardines, herrings or cephalopods during six months to two years
- At beginning there were 2 farms with small annual production and until 2007. it rose up to 4500 tons through 7 farms.

BIVALVE MOLLUSCS CULTIVATION

- first written documents - mollusc cultivation in Limski Bay Roman time
- in the Middle Age, Republic of Ragusa supported oyster cultivation in Malostonski Bay
- recorded cultivation of molluscs began in 1888 in Limski Bay
- cultivation sites are situated mainly in the bays with influence of rivers
- 124 family owned farmes & 1 experimental hatchery

- Annual production is about 3550 t of mussels + 65 t from natural beds and 81 t of oysters + 8.5 t from natural beds and it is sold on the local market and 78 t of other species like scallops – *Pecten jacobeus*, cockle – *Cardium edule*, clam – *Ruditapes decussatus*, Noah arch (*Navicula noae*)- hardly to estimate real quantities
- Starts with collection of natural spats and the cultivation facilities are hung on the ropes and the process lasts one and half to two years

LEGISLATION IN HEALTH MANAGEMENT OF AQUATIC ANIMALS

- "Veterinary Law" (Official Gazette 41/2007)
- "Ordinance on animal health requirements for aquatic animals and products thereof, and on the prevention and control of certain diseases in aquatic animals" (Official Gazette 42/2008)
- "Ordinance concerning the manner and procedure on the notification of suspicion and confirmation of animal infectious diseases and model and contents of prescribed forms" (OG 194/04)
- "Order on measures to protect animals from infectious and parasitic diseases" (OG 134/07)
- Compulsory notification of suspicion to exotic diseases and control of viral fish (IHN & VHS, SVC, KHV) and molluscs diseases (infection with *Bonamia ostreae* and infection with *Marteilia refringens*)

PARTICULARITY OF HEALTH MANAGEMENT ON THE NATIONAL LEVEL

AQUISITIONS

- Sampling plans and methods can be compared to 2006/88
- Laboratory for fish diseases, CVI is designated as NRL for aquatic animal diseases
- Diagnostic methods are harmonized to the methods recommended by OIE, EC
- Laboratory is participating in proficiency testing for fish and molluscs diseases organized by CRLs for fish and molluscs diseases

PITFALLS

- Implementation of the 2006/88/EC hasn't been fulfilled:
- Untio now there is no zoning and no programms for aquiring declared diseases free farm/zone
- There are no contingency plans
- Disease control is still performing according to yearly issued "Order on measures to protect animals from infectious and parasitic diseases"

COMPULSORY SURVEILLANCE & MONITORING OF FISH VIRAL DISEASE

- Although an "Ordinance on animal health requirements for aquatic animals and products thereof, and on the prevention and control of certain diseases in aquatic animals" based on 2006/88/EC is issued for the current year the surveillance is realized according the mentioned "Order "
- Veterinary inspection is obliged to collect samples of spawning products of fish species susceptible for particular viruses during the spawning season and fry twice a year for viral diseases control
- Samples are sent to the laboratory for diagnosis
- Diagnostic procedures are harmonized with recommendation of OIE Code and Manual for aquatic animal diseases and Decision 2001/183/EC

CONTROL OF OTHER VIRAL DISEASES

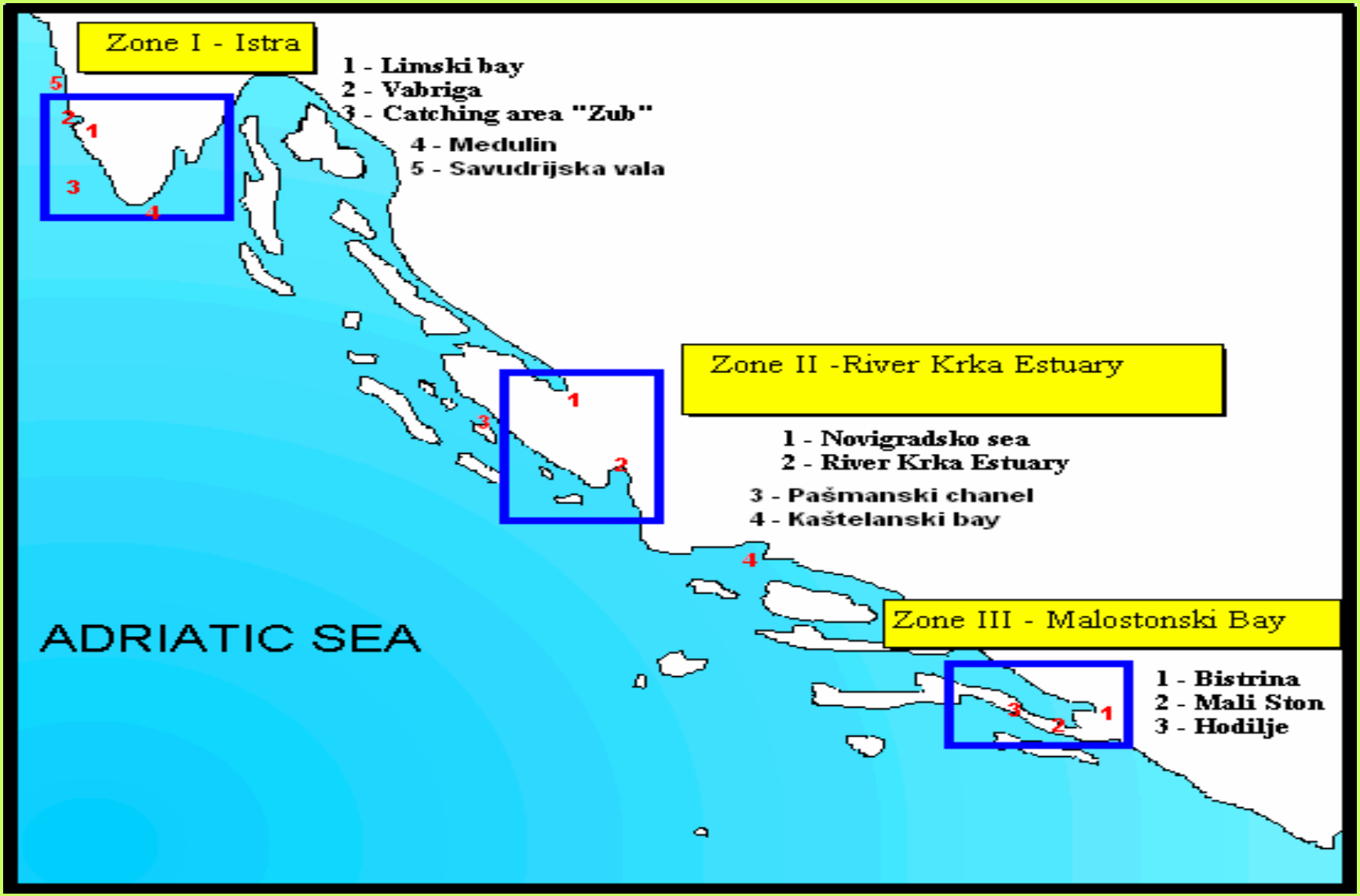
- Same "Order" is prescribing control of cyprinid fish on presence of SVCV and KHV
- Marine fish, sea bass on VER (Viral encephalopathy and retinopathy) in hatcheries and in imported fry situated in carantine cages at the farms
- Importers of fish from foreign countries need the import permission and are obliged to put imported fish to carantine until laboratory examination of samples that have been collected by vet. inspection is finished
- In the case of the viral disease outbreak the measures for avoidance of the disease spreading are determined by all included in the control (Vet.Direct., Inspection and Lab)

RESULTS OF THE FISH VIRAL DISEASE CONTROL IN 2007

FISH SPECIES	Origin of samples	No of samples[1]	RESULTS OF VIRAL DISEASES CONTROL				
			VHS	IHN	IPN	SVC	VER
RAINBOW TROUT	Broodstock (spawning products)	99	0/99	0/99	0/99	-	-
	Fry	79	0/79	0/79	15/79**	-	-
CARP	Broodstock (spawning products)	0	-	-	-	0	-
	Fry	60	-	-	-	0/60	-
SEA BASS	Fry	77	-	-	-	-	0/77

1 - Samples sent to the Lab according to Decree and samples from carantine
0/0 – number of positive samples/ nubmer of samples submitted to examination
** - Samples of spawning products at the same farm were negative while the fry was positive

SURVEILLANCE AND MONITORING OF BONAMIOSIS & MARTEILIOSIS



- Zoning was created in 2000. with help of CRL for molluscs diseases, IFREMER, La Tremblade

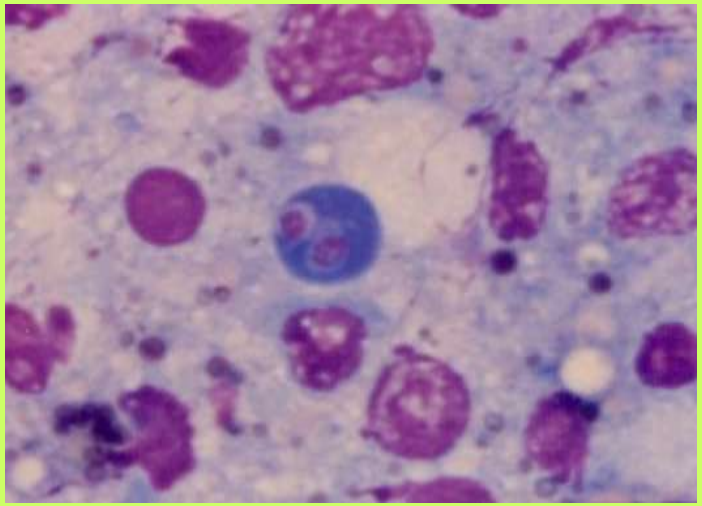
Diagnostic methods

- *Bonamia ostreae* - histology/smears –oysters
- *Marteilia refringens* -histology/smears – oysters, mussels

Sampling

- Geographical positions - Zone I, Zone II, Zone III, some points out of zones
- Sampling plan for oyster- 6 samples (300 individuals), 2 samples (60 individuals), 9 samples (450 individuals) in April/May and Sept/Oct
- Sampling plan for mussels – 3 samples (90 ind.), 2 samples (60) ind. and 3 samples (90 ind.) and 1 sample (30 ind.) per other points in Sept/Oct

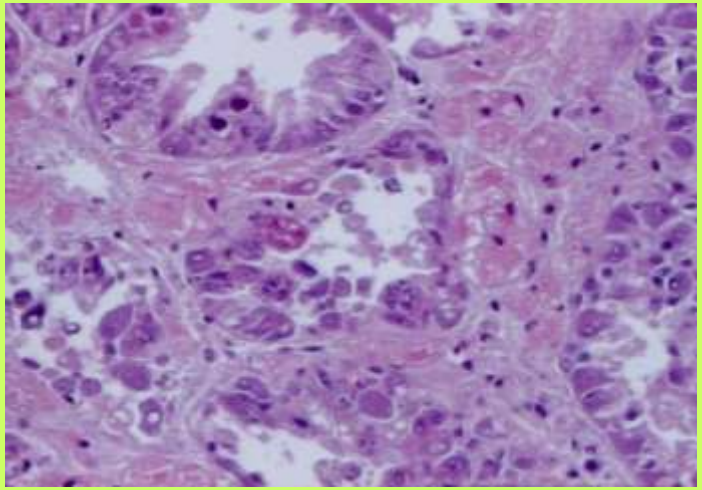
RESULTS OF MOLLUSCS DISEASES CONTROL IN 2007.



Oyster (*O.edulis*)

Bonamia ostrea – 0/100, 0/30, 0/250

Marteilia refringens – 0/50, 0/30, 0/250



Mussels (*M.galloprovincialis*)

Marteilia refringens – 12/90*, 2/30*, 5/90*, 7/90*

*positive/examined

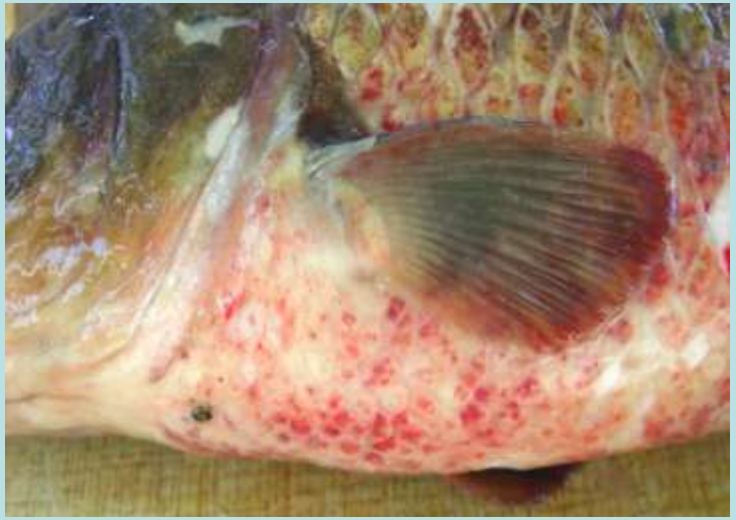
ECONOMICALLY MOST IMPORTANT DISEASES IN CROATIAN AQUACULTURE

- Parasitic diseases
- Bacterial infections

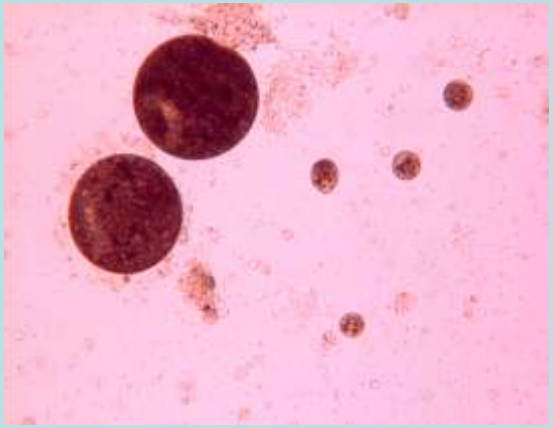
Photo: I. Mladineo

MOST OFTEN BACTERIAL AND PARASITIC DISEASES IN CARP CULTIVATION

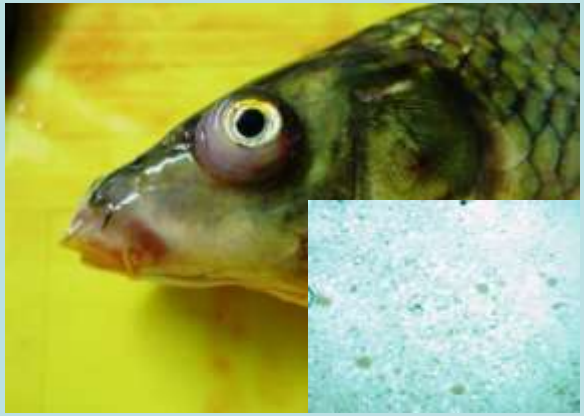
Carp erythrodermatits (acute form) caused by *Aeromonas salmonicida* subsp. *nova*



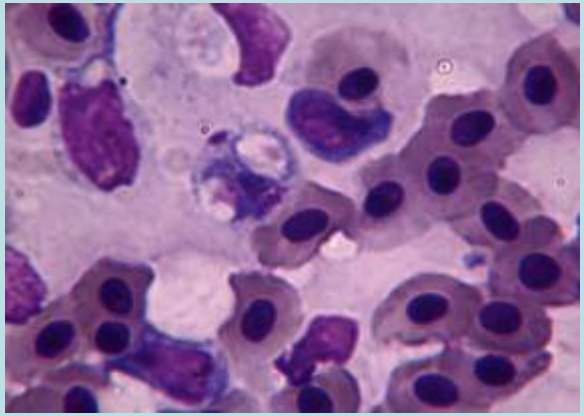
Pseudomonas fluorescens septicaemia



Ichthyophthyorius multifiliis



Diplostomum spathaceum



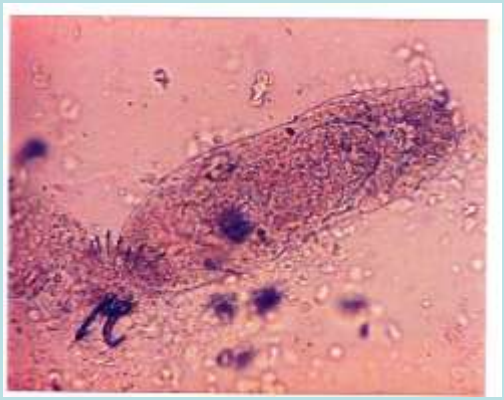
Spaherospora renicola, cause of URM

MOST OFTEN BACTERIAL AND PARASITIC DISEASES IN SALMONICULTURE

BKD caused by
Renibacterium salmoninarum

Furunculosis caused by *Aeromonas salmonicida* subsp. *salmonicida*

RTFS caused by
Flavobacterium psychrophila



Gyrodactylus salmonis

Heavy infestation by *Echynorhynchus truttae* and *Cythocephalus truncatus*

MAIN DISEASE PROBLEMS IN MARICULTURE SPECIES

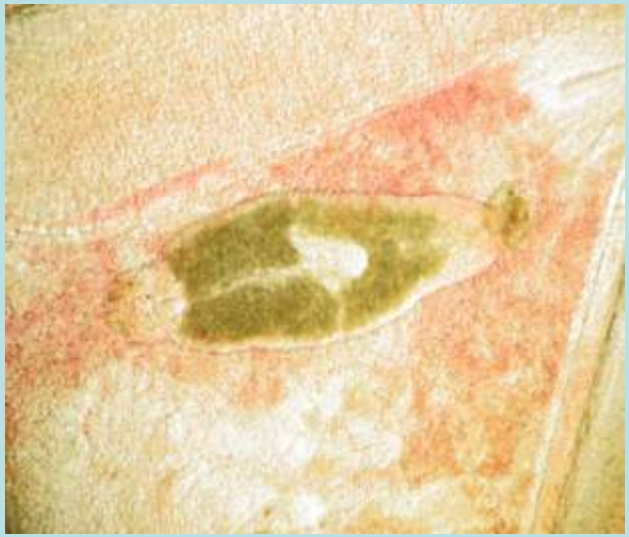
Lymphocystis (Iridovirus)

Winter diseases (WD) syndrom of sea bream

Subacute course of vibriosis in sea bass

Myxobacteriosis caused by *Tenacibaculum maritimum*

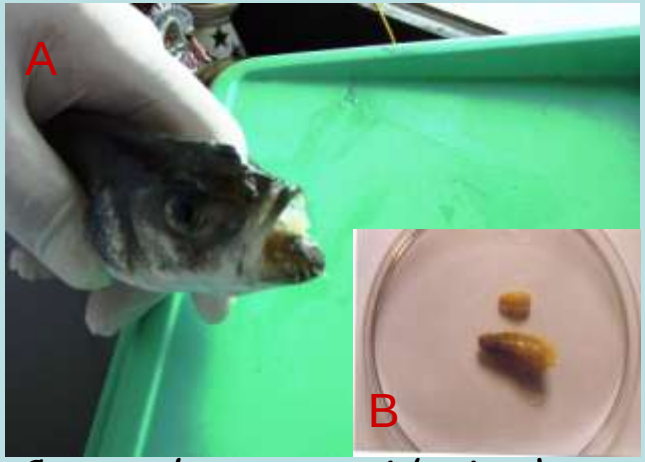
Pasteurelosis of seabass caused by *Photobacterium damselae* subsp. *piscicida*



Diplectanum aequans

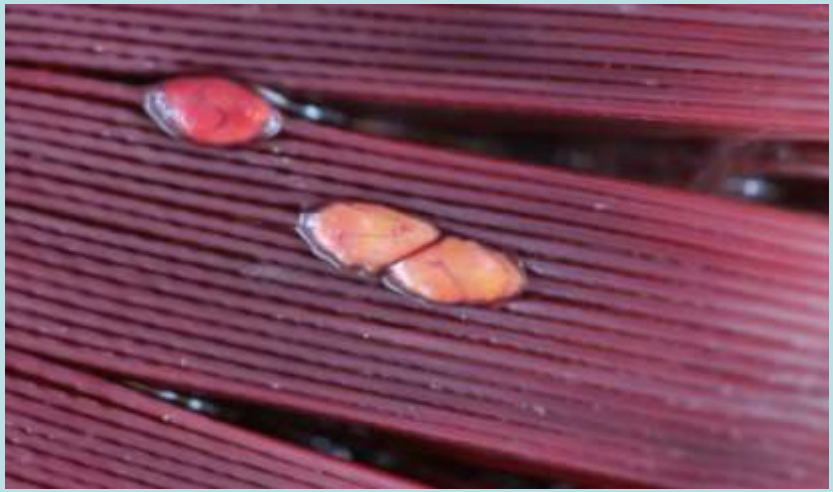
A-Enteromyxosis in *Diplodus puntazzo*
B-spores C-intestinal wall

Caligus minimus

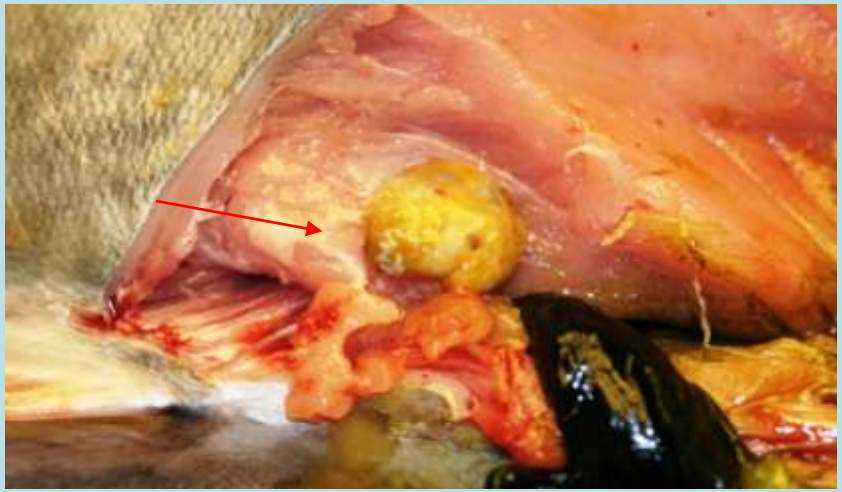


A - *Ceratothoa oestroides* in the mouth cavity of sea bass B – male and female

PARASITOLOGICAL FINDINGS IN BLUEFIN TUNA

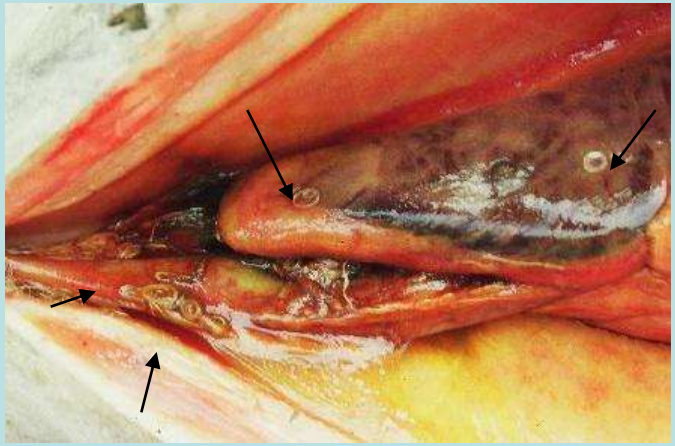


Koellikerioides apicalis

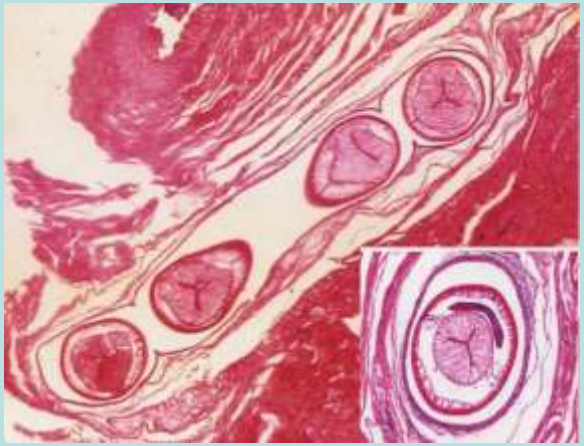


Coelididymocystis abdominalis

Koellikerioides intestinalis



Anisakis spp.



Hysterothylacelum sp.

ISOLATION OF BACTERIA (*Photobacterium, Vibrio, Aeromonas)*?

MEDICATION IN CROATIAN AQUACULTURE

Several drugs registered for use in aquaculture:

Antimicrobials (potentiated sulphonamide, OTC, quinolons, florphenicol, erythromycin)

Antiectoparasitics are not registered for use in aquaculture

Problems with treatment of some ectoparasitosis (Ceratothoe, Caligus) in marine fish; endoparasitosis (cestode invasion in carp)

Medication by drug registered for other animals like Neguvon, Mebendazol, Praziquantel, etc.)

IMMUNOPROPHYLAXIS

- experimental vaccination against vibriosis in small private hatchery
- vaccine prepared from *Listonella anguillarum* isolated from sea bass cultivated along the Adriatric coast
- Vaccination by commercial vaccine started few years ago in hatchery as well as oral booster

GRAZIE PER LA VOSTRA ATTENZIONE