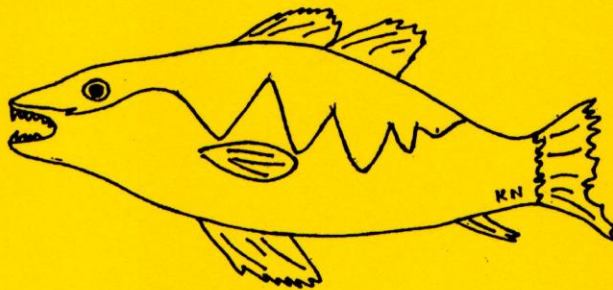


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6th INTERNATIONAL SYMPOSIUM ON FISH PHYSIOLOGY
22nd LINDERSTRØM-LANG SYMPOSIUM

BIOCHEMISTRY AND PHYSIOLOGY OF ENVIRONMENTAL ADAPTATIONS IN FISHES



KIRKKONUMMI, FINLAND

1. - 5.9.1993

FISH ULTRASONOGRAPHY CHARACTERIZATION OF CARDIAC MORPHOLOGY AND BLOOD FLOW

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Non invasive identification and characterization of cardiac morphology and flow of *Lophius s.p.* and *Halobatrachius s.p.* was performed using color echo doppler. We used an ALOKA echo camera SSD 830 with a 5 MHz transducer. Fishes were kept alive with water circulation device.

The transducer was applied in the ventral middle line over heart chambers. Bidimensional images were obtained from long and short axis incidences at various levels of cardiac chambers. During each cardiac cycle and for every specimen it was possible to identify the relationship between each structure, measure longitudinal and transversal diameters, identify blood fluxes and quantify their velocities.

Conclusion: In live specimens it is possible, applying non invasive techniques, to observe the cardiac structures and to study the kinetic of the ventricle and bulbus, to identify blood flow and to measure his velocity. This can be used as an experimental model for cardiac function.

A POLLUTANT INDUCED HAEMOLYTIC ANAEMIA IN SALMON

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Between 1976-1988 a pollutant-induced haemolytic anaemia was prevalent in adult Atlantic salmon (*Salmo salar*) returning to the river Don, Aberdeen, Scotland. Experimental work had concluded that the disease was caused by exposure to a combination of effluents from paper mills and an industrial area discharging to the river (Everall *et al.*, 1992). The present work attempts to determine the chemicals involved in the cause of this disease and their biochemical effects on the fish. S1 salmon parr were exposed (by intraperitoneal injection) to a mixture of the diterpenoid (resin) acids dehydroabietic acid, abietic acid and isopimaric acid at a range of concentrations (0.12, 1.2 and 12 mg/100 g of fish weight, with respect to total resin acid). Other groups of fish received a model inducer of the cytochrome P450 1A enzyme subfamily - β -naphthoflavone (BNF) - at 20 mg/100 g of fish weight, in addition to the resin acid mixture. At all of the concentrations tested, the resin acid mixture alone did not induce the cytochrome P450 1A enzymes, as measured by the liver microsomal 7-ethoxyresorufin O-deethylase (EROD) activity. However, in combination with BNF, EROD activity increased by 200 % (* p= 0.004, n= 10) in fish receiving 0.12 mg/100g of resin acid and decreased by 50 % (* p= 0.013, n= 9) in fish receiving 1.2 mg/100g of resin acids compared to controls receiving BNF alone (Mann-Whitney U-test, * indicates significance p < 0.05). Fish given a resin acid dose of 12 mg/100 g were moribund after 20 d of exposure. The data suggest that resin acids do not induce the salmon cytochrome P450 1A activities when administered alone but may interact with them when they are induced by other chemicals.

References:

N. C. Everall, C. G. Mitchell, and J. N. Robson (1992). Diseases of Aquatic Organisms 12, 199-205.

PHYSIOLOGICAL RESPONSES OF THE COMMON CARP (*Cyprinus carpio*) TO SUBLETHAL LEVELS OF COPPER.

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To evaluate the use of physiological energetics as clinical indicators of environmental stress, we have monitored several aspects of the energy status of the common carp (*Cyprinus carpio*). One of the aspects measured is the oxygen consumption/nitrogen excretion ratio (O/N ratio in atomic equivalents). During the experiment, the O/N ratio of carp (15-25 g) was determined after three and four weeks of acclimation to chemically defined freshwater at 20 °C. At the beginning of the fifth week, the fish were exposed to sublethal levels of copper (250, 125 and 62.5 μ g/l) and the O/N ratio was measured for one hour immediately after exposure. Measurements were repeated starting 3, 6 and 9 hours after exposure. Subsequently the carps were kept under these conditions for two weeks and the O/N ratio determined after the first and second week of exposure to copper.

At a concentration of 250 μ g/l an immediate significant drop of 60% in the O/N ratio is observed. This is followed by a transient, partial, but significant recovery. Finally, the O/N ratio stabilises at the level reached

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