PHYSIOLOGICAL CONSEQUENCES OF LOW DOSE ANAESTHESIA IN RESTED AND EXERCISED CHINOOK SALMON (*ONCORHYNCHUS TSHAWYTSCHA*: SALMONIDAE) AND SNAPPER (*PAGRUS AURATUS*: SPARIDAE).

Suzy E. Black
[1]New Zealand Institute for Crop and Food Research Ltd.
Seafood Research Unit
Port Nelson
New Zealand
phone: +64 3 5390757 / fax: +64 3 5467049 / e-mail: blacks@crop.cri.nz

Alistair R. Jerrett[1], A. Jan Holland[1] and Sharon C. Ford[1].

EXTENDED ABSTRACT ONLY – DO NOT CITE

This study examined the physiological consequences of anaesthesia for chinook salmon (*Oncorhynchus tshawytscha*) and snapper (*Pagrus auratus*) during simulated rested and exercised harvesting. Tank-rested fish were anaesthetised in their home tank, were not handled prior to anaesthesia and were exposed to low (non-irritant) concentrations of the anaesthetic agent (AQUI-S™; 20 mg/L for salmon; 17 mg/L for snapper). For exercised harvesting fish were forced to exercise prior to anaesthesia. Mixed venous blood samples were taken by ventricular stab during exposure to the anaesthetic. Sampling was initiated from when the first fish was insensitive to the stab. Plasma adrenaline (ADR) and nor-adrenaline (NOR) were measured to indicate primary responses to any acute stress during exposure to the anaesthetic. Plasma glucose was monitored as a secondary, indirect indicator of stress. Blood pH, and lactate levels were monitored as secondary indicators of oxygen debt caused by ventilatory arrest or by swimming activity. Antero-dorsal "white" muscle (WM) samples were taken for each treatment. Cut-surface pH and [lactate] measurements were made to assess the extent of WM fatigue during anaesthesia. WM pH and WM lactate content confirmed the rested state of the fish in that both rested salmon and snapper had high WM pHs and low WM lactate. The exercised treatment produced fish with low and variable WM pHs and high WM lactates.

In rested salmon, blood pH was high (~7.6), and blood glucose, lactate, plasma adrenaline (ADR) and noradrenaline (NOR) levels were low until

~150 min exposure to the anaesthetic. After ~150 min mixed venous blood pH dropped rapidly with concomitant rises in plasma NOR, ADR, blood glucose and lactate. In rested snapper, plasma NOR and ADR increased after ~70 min exposure but did not coincide with decreased blood pH or sharp increases in blood lactate and glucose. Blood glucose levels in rested snapper were still high after 120 min even when catecholamine levels were consistently low, possibly indicating a post-ADR release state. In contrast to rested salmon, rested snapper showed a progressive respiratory acidosis of the blood shown by the steady rise in [lactate] and drop in blood pH, rather than a sudden change that coincided with catecholamine release.

In salmon, pre-anaesthesia exercise reduced the time fish became insensitive to ventricular stab by ~60%. Blood pHs of exercised salmon were lower than rested salmon. After ~30-40 min exposure there were concomitant rises in plasma NOR, ADR, blood glucose and lactate. Release of ADR and NOR did not appear to occur during the exercise protocol. Blood pH of exercised snapper was not different to rested snapper, even though blood lactate and blood glucose levels were high. High blood glucose levels suggested that catecholamines had been released during pre-anaesthesia exercise. In both rested and exercised salmon release of catecholamines only occurred when ventilation was depressed by anaesthesia, producing mixed venous blood pH values below ~7.4 (a common blood pH reported for exhaustively exercised salmonids). In rested snapper catecholamine release occurred prior to any decline in blood pH or sharp increase in blood lactate and glucose.

It is suggested that the mechanisms triggering catecholamine release in salmon (e.g. blood pH, hypoxia) may be less sensitive than in snapper due to the differences in activity of the two species. Because salmon burst exercise frequently they may only release catecholamines in extreme cases. Snapper burst exercise less frequently than salmon, but the severity of each burst may be greater, requiring catecholamine release for recovery purposes. These results highlight significant species differences in physiological response to a stressor. It is an excellent reminder that we should not assume that all species react in a similar way to the same treatment.