

# Health Status and Biomarker Responses in Fish from the Athabasca and Slave Rivers in Relation to Potential Exposure to Contaminants from Oilsands operations

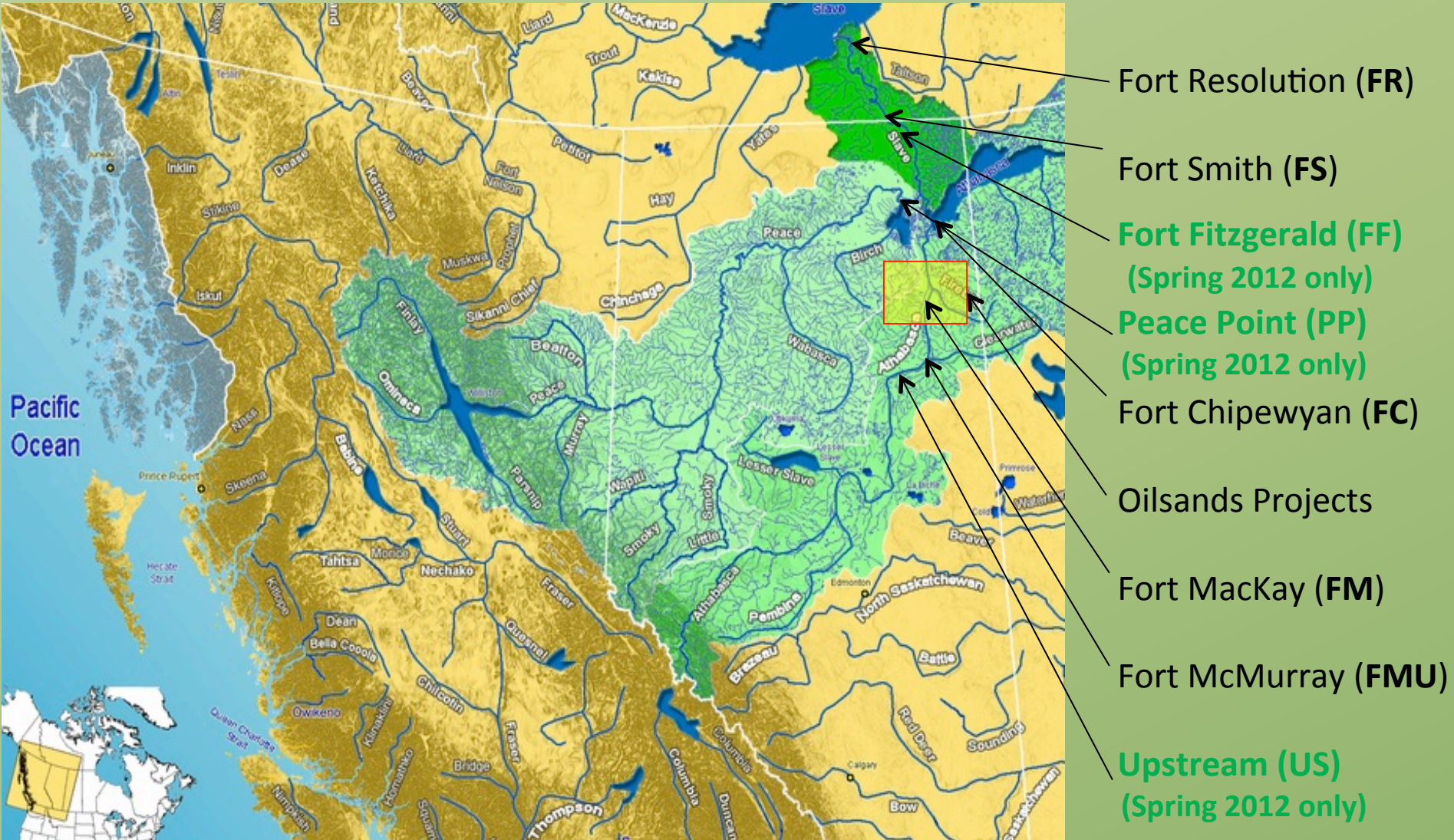
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## AIM

The aim of the study was to investigate the health status of fish populations in the Athabasca and Slave Rivers as related to environmental contaminants potentially originating from oil sands development. In addition to investigating the general health condition of the collected fish we considered contaminant concentrations in their tissues from both the fish and human health perspectives.

## INTRODUCTION

Potential environmental impacts of oil extraction activities in the northeastern region of Alberta Canada have recently received attention in both the scientific and general media. Chief among the global concerns are the fact that the open pit mining and oil extraction and conversion processes release a variety of environmental contaminants to the local and regional environments. Among the contaminants of concern in these aerial emissions are PAHs and a variety of metals and releases of water-soluble organic acids to the aquatic environment. Potential for these contaminants to accumulate in fish and wildlife are of particular concern to aboriginal consumers of wild foods. Consumption of fish and wildlife from the region are of cultural as well as nutritional and economic significance to aboriginal communities. An apparent increase in the occurrence of fishes with deformities and lesions has been reported by local communities as remote from the oilsands operations as the lower Slave River.

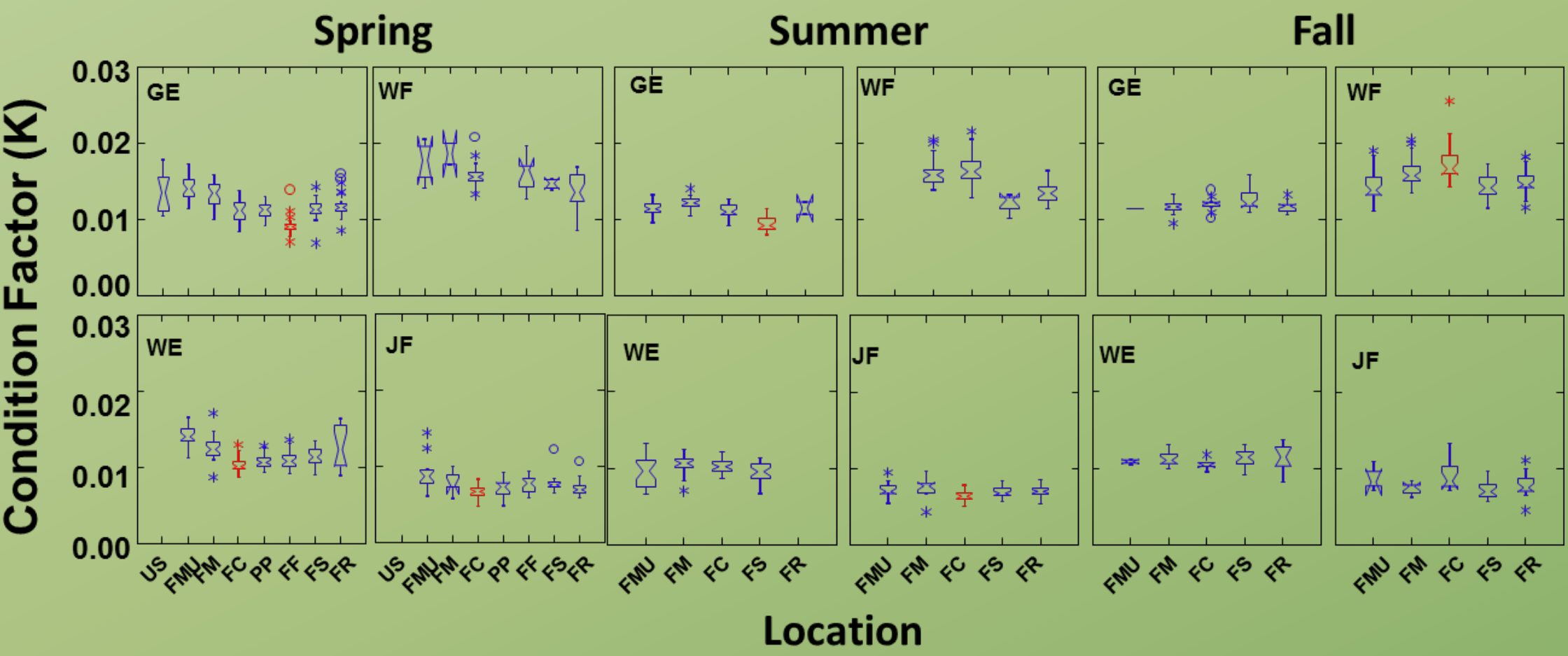


## METHODS

1,498 fish were collected over the summer, fall, winter and spring of 2011-2012, from 8 locations on the Athabasca and Slave rivers. Each fish was given a detailed external and internal health examination and tissues were collected for biochemical and contaminant measurements. Target sample size for the project was 30 individuals of 5 species (Goldeye - *Hiodon alosoides*, Whitefish - *Coregonus clupeaformis*, Northern Pike - *Esox lucius*, Walleye - *Sander vitreus*, Burbot - *Lota lota*).

	Goldeye	Whitefish	Burbot	Walleye	JackFish
Trophic Level (Fishbase)	3.0 ± 0.4	3.1 ± 0.4	4.0 ± 0.7	4.5 ± 0.5	4.4 ± 0.7
Migratory	Yes	Yes	Yes	Yes	No
Spawns	Spring	Fall	Fall	Fall	Spring
Consumed	Yes	Yes	Yes	Yes	Yes
Basin wide	Yes	Yes	Med	Yes	Yes

## RESULTS – Condition Factor



**Figure 1** Condition Factor for all Species by Season.

Few significant seasonal or location specific differences in condition factor were observed. Changes that were observed were not consistent among species.



Pike or Jackfish (*Esox lucius*) **JF**



Whitefish (*Coregonus clupeaformis*) **WF**



Loche Mariah, Burbot (*Lota lota*) **BB**

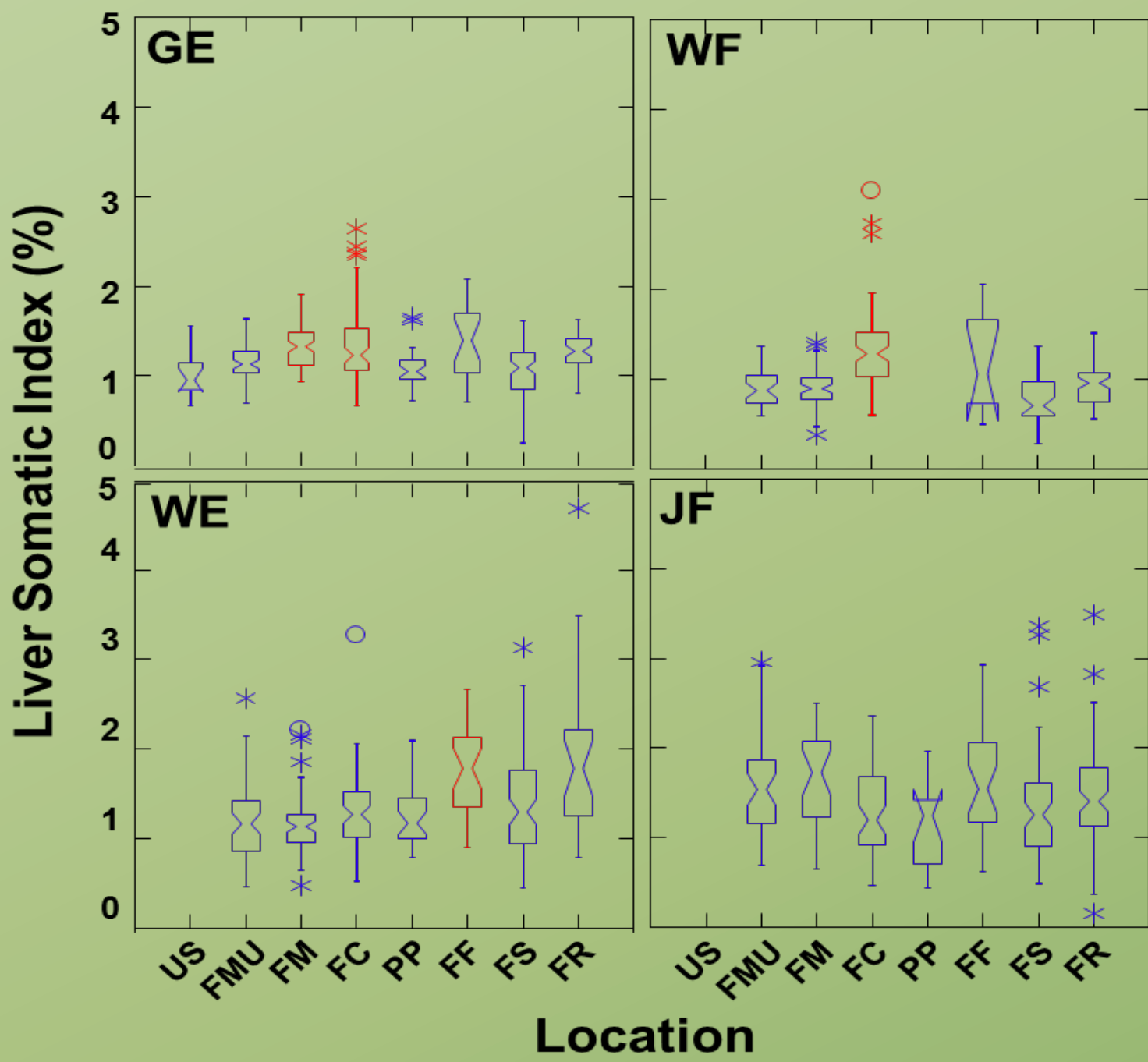


Walleye or Pickerel (*Sander vitreus*) **WE**



Goldeye (*Hiodon alosoides*) **GE**

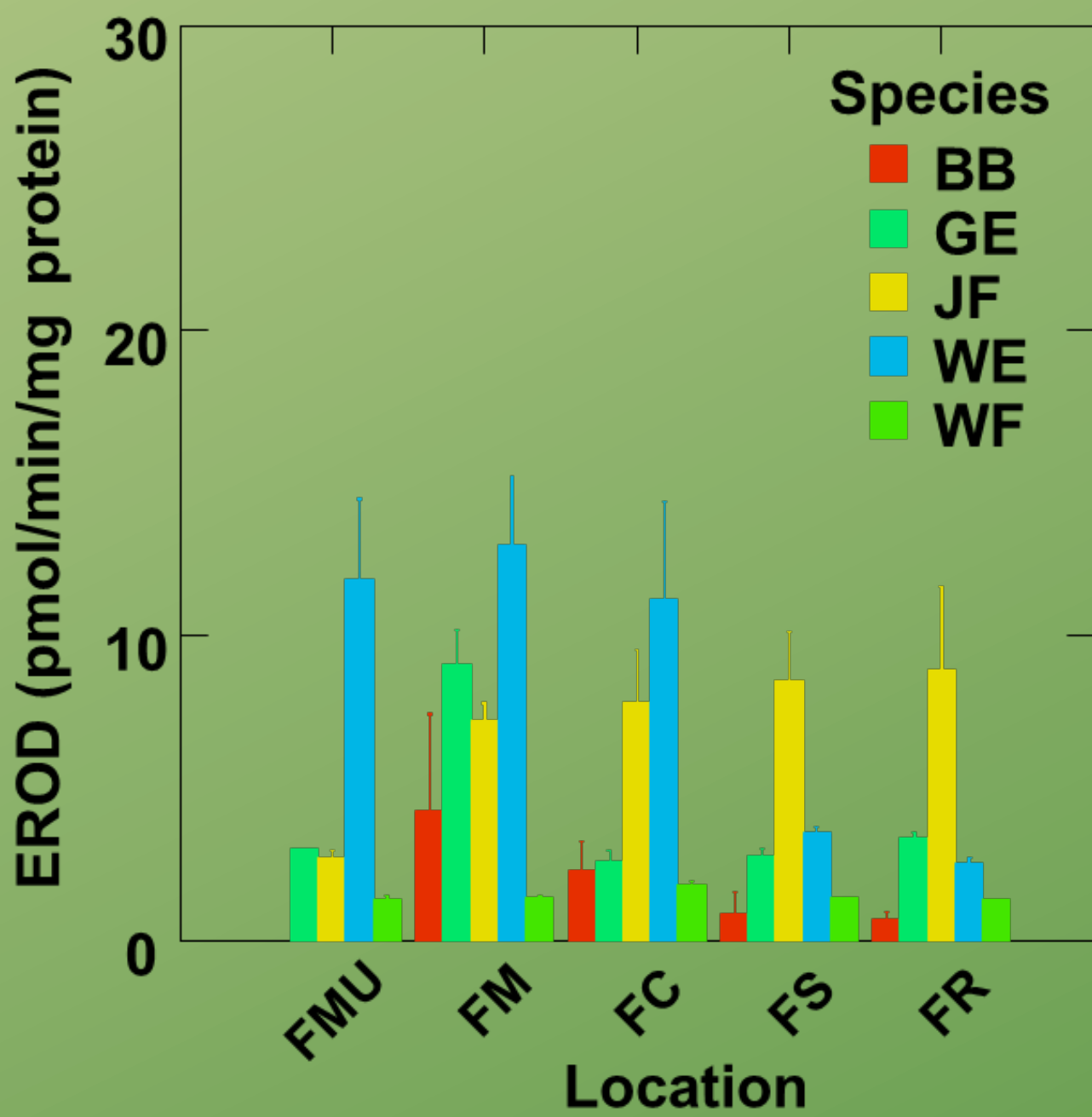
## RESULTS – Liver Somatic Index



**Figure 2** LSI values for all seasons by species.

Few differences in relation to Liver Somatic Index. However, some increases were noted in lower trophic level fish and is coincident with increased bile PAH concentrations (see **WP103**).

## RESULTS – EROD Activity



**Figure 3** EROD activity for Fall collection.

EROD (ethoxyresorufin-o-deethylase) activity was greater in walleye from the Athabasca river. EROD was greatest in higher trophic level fish despite their apparently lower exposure to PAHs (see Poster **WP103**).

## CONCLUSIONS

- Please visit the accompanying posters for information on metals (**WP239**) and PAHs (**WP103**) concentrations.
- Assessment of condition and health during 4 seasons suggests that currently, conditions of fishes are relatively stable over the length of the river system.
- While some statistically significant differences in morphometrics were observed these tended to be relatively small in magnitude and were not consistent for all species from the same location.
- Morphometric measures as indicators of health of fish do not indicate major effects on fish based on current contaminant loadings to the river system.
- Analysis of a suite of sensitive biochemical indicators of fish health and stress is currently underway.
- Chemical exposure data (**WP239**, **WP103**) demonstrate increased exposure to PAHs in the vicinity of oilsands operations while the concentrations of some metals (i.e. Tl, Se) are greater in the Slave river than in the Athabasca.
- Proposed increases oil sands development could potentially increase releases of contaminants to the aquatic ecosystem.

## ACKNOWLEDGEMENTS

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