Health Status of Fish Populations in the Slave and Athabasca Rivers Systems, Northern Canada

Paul D Jones, Hill, A.C., Tendler, B., Ohiozebau, E., Kelly, E., Fresque-Baxter, J., Giesy, J.P.

University of Saskatchewan and Government of the Northwest Territories
David Schindler with deformed fish (2010).
Slave River Inconnu ...

... 1 out of 1700 caught (Eric Beck, Ft Resolution, NWT)
Aims

- Fish Health Investigation
  a) Systematic investigation of occurrence of ‘lesions’
  b) Collection of fish morphometric health measures
  c) Collection of samples for assessment of health
  d) Fortuitous collection of ‘deformed fish’
Sampling Strategy

- Most commonly caught/consumed by First Nations fishers
- Areas most frequently used to harvest
- Fish present throughout the Slave and Athabasca rivers
- Limited to some extent by total numbers of fish required from both permitting and logistics angles
- Species: Pike (Jackfish), Walleye (Pickerel), Whitefish, Goldeye, Burbot (Loche Mariah, Loche, Mariah)
- Multiple years of data (2011-2015) and seasons
- Funding allowed only Slave sampling 2013 and 2014
Examination

Fish received and kept on ice until examination
All information recorded on data sheets
All ‘anomalies’ preserved in formalin for possible histopathology

**External**
Length and mass recorded
Photographs of whole fish and any external anomalies
Fins, skin, eyes and scales examined carefully and systematically

**Internal**
Body cavity opened and internal organs examined for anomalies
Internal organs and any anomalies photographed
Heart, liver, stomach, intestine, kidney and spleen examined
Masses of liver, spleen and gonads determined
Internal tissues preserved for analysis (biochemical and chemical)
Fish Health Assessment
August 2013

• Empowering local communities
• Record Keeping
• What is normal?
• Look at lots of fish
Jackfish – all seasons (2011-2012), both sexes

Upstream (Athabasca R.)  Location  Downstream (Slave R.)

Length (cm)
Condition Factor (CF) = Weight/Length$^3$

US, PP, FF only sampled in Spring 2012
- CF can vary as a natural part of the life cycle of fish
- Looking for consistent changes across species and seasons
Bile Screening Analysis Method

- 1000 fold dilution with 50% methanol - Diluted bile sample was analyzed a synchronous fluorescence spectrometer
- Quick and Cheap
- Measure of recent exposure of the fish to PAHs
- Not necessarily related to what is in the portions of the fish that are eaten by people – separate analysis
Bile PAHs in Whitefish 2011-2012
Bile PAHs in Pike 2011-2012

ΣPAH in bile ng/ml

0 2000 4000 6000 8000

F. McMurray Summer
F. McMurray Fall
F. McMurray Spring
F. McKay Summer
F. McKay Fall
F. McKay Spring
F. Chipewyan Summer
F. Chipewyan Fall
F. Chipewyan Spring
F. Smith Summer
F. Smith Fall
F. Smith Spring
F. Resolution Summer
F. Resolution Fall
F. Resolution Spring
CF for walleye

- Fort McMurray
- Fort McKay
- Fort Chipewyan
- Fort Smith
- Fort Resolution
CF for jackfish

Fort McMurray

Fort McKay

Fort Chipewyan

Fort Smith

Fort Resolution

YEAR

YEAR

YEAR

YEAR

YEAR

YEAR

YEAR

YEAR

YEAR

YEAR

YEAR

YEAR

YEAR

YEAR

YEAR
External ‘Lesions’

- Based on Best Professional Judgement
- Excluded minor external asymmetries
- Excluded healed wounds
- Excluded haemorrhages of fins and eyes
- Included lymphocystis like cysts
- Other things that make the fish look ‘unhealthy’
- 59 in 1768 fish examined
## External ‘Lesions’

<table>
<thead>
<tr>
<th>Year</th>
<th>Count/Total</th>
<th>Incidence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>36/875</td>
<td>4.1%</td>
</tr>
<tr>
<td>2012</td>
<td>19/646</td>
<td>2.9%</td>
</tr>
<tr>
<td>2013</td>
<td>2/110</td>
<td>1.8%</td>
</tr>
<tr>
<td>2014</td>
<td>1/137</td>
<td>0.7%</td>
</tr>
<tr>
<td>2015</td>
<td>4/144</td>
<td>2.8%</td>
</tr>
</tbody>
</table>

- **Athabasca + Slave**
- **Slave only**
Conclusions

- Evidence of exposure to oil derived contaminants
- Exposures vary between AB and NWT sites
- Resurgence of CF after a low in 2011
- Significant annual variation in incidence of anomalies
- Species differences in incidence of anomalies
- Even 2000 fish is a relatively low sample size when stratified by spp, location and year
Acknowledgements

- Ehimai Ohiozebau, Brett Tendler, Allison Hill, Tim Tse, Jon Doering, Eric Higley, Garry Codling,
- John Giesy
- Erin Kelly, Jen Fresque-Baxter (ENR GNWT)
- ENR Ft. Smith
- Slave River and Delta Partnership
- Boreal Songbird Initiative, AANDC, GNWT – Funding
- CWN for funding – 2013-2014 sampling
Questions

Exposure of Fish in the Athabasca and Slave Rivers to PAHs Potentially Derived from Petrogenic Activities

Ehimai Ohiozebau Tue, 10:50-11:10

Chemodynamic behavior of Thallium in the Slave River, Northwest Territories, Canada

Brett Tendler Mon, Poster #2

A Community Based Cumulative Effects Monitoring Program for the Slave River, Northwest Territories, Canada

Paul Jones Wed, 9:30-9:50