

**Alberta Conservation Association  
2008/09 Project Summary Report**

**Project name:** *Abundance and Distribution of Arctic Grayling in the Upper Little Smoky River*

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**Primary ACA staff on this project:** Kevin Fitzsimmons, Mike Rodtka, Mike Blackburn

**Partnerships:**

Forest Resource Improvement Association of Alberta  
Devon Energy Canada

**Key findings**

In the Little Smoky River study area:

- Arctic grayling catch rates ranged from 0.0 to 7.09 fish per hour with a mean catch rate of 3.41 fish per hour.
- Size distribution of Arctic grayling captured in the Little Smoky ranged from 106 to 375 mm FL with no evidence of missing size classes.
- Estimated total abundance of Arctic grayling (> 150 mm FL) was 27,250.
- Small fish were more abundant than large fish, while legal-sized fish comprised less than less than 3 % of the estimated total abundance.
- Abundance of Arctic grayling (both large and small) peaked 135 km upstream of the bottom limit of the study area. Upstream of this point, small fish abundance dropped, while large fish abundance remained constant.

**Abstract**

Arctic grayling (*Thymallus arcticus*) in Alberta are listed as "Sensitive" and populations near their southern extent, like the Little Smoky River, have experienced declines in abundance and distribution. In the summer of 2007 we used sample angling to assess the abundance of Arctic grayling in the upper 235 km of the Little Smoky River. We angled 27 stream reaches and captured a total of 1714 individual Arctic grayling. Less than 5% of the total catch were fish of legal-size (350 mm total length (TL). Fish 150-249 mm fork length (FL) were twice as abundant as fish  $\geq$  250 mm FL (estimates of 17, 294 and 9,326 small and large fish, respectively). Estimated abundance of legal-sized fish was only 3 % of the total estimated abundance. Spatially, abundance of Arctic grayling (both large and small) peaked around 135 km upstream of the bottom limit of the study area; upstream of this point, small fish abundance dropped, while

large fish abundance remained constant. Our findings will aid resource managers by providing current abundance and distribution estimates of Arctic grayling the Little Smoky River.

## **Introduction**

The Little Smoky River contains one of Alberta's southernmost Arctic grayling (*Thymallus arcticus*) populations and provides angling opportunities for trophy Arctic grayling. Currently, Arctic grayling in Alberta are listed as "Sensitive" and populations near the southern extent of their range have experienced the greatest population decline. Habitat fragmentation, increased water temperature, and angling pressure may be hastening declines (Alberta Sustainable Resource Development 2005). To date, however, no comprehensive studies on the status of Arctic grayling in the Little Smoky River have been conducted. To aid in the development of management plans, the Alberta Conservation Association began a study in the summer of 2007 to document the distribution, abundance and size structure of the ARGR population in the upper Little Smoky River.

## **Methods**

We collected Arctic grayling abundance data by sample angling (fly fishing and spin casting) at 27 systematic sampling sites in the upper 235 km of the Little Smoky River. At each site we collected biological (i.e. size, sex, age) and abundance data on fish, as well as quantitative habitat data (stream width, water temperature). We used mark-recapture surveys at a subset of seven sites to estimate angling capture efficiency using the program MARK (Cooch and White 2008). Results from this survey indicated capture efficiency varied by fish size with efficiency of large fish (fish  $\geq 250$  mm fork length (FL)) being 2.4 times greater than that for small fish for small fish (150 – 249 mm). We used this size structured capture efficiencies and a non-parametric spatial model to estimate the distribution and abundance of Arctic grayling over the study area.

## **Results**

We captured 1714 individual Arctic grayling in 378.25 angling hours (mean = 14 h/site). Of this catch, 89 fish (5.2 %) were of legal size ( $>350$  mm total length). Overall, catch rates ranged from 0.0 to 7.09 fish/h (mean= 3.41 fish/h). Size distribution of Arctic grayling captured ranged from 106 to 375 mm FL with no evidence of missing size classes (Figure 1).

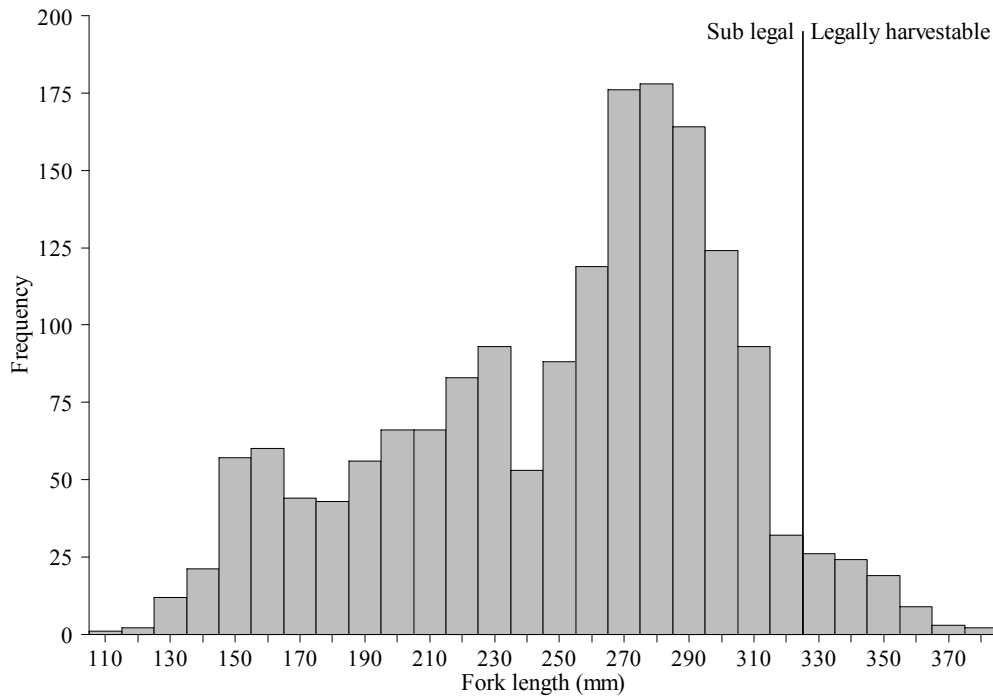


Figure 1. Length frequency distribution of Arctic grayling captured in the Little Smoky River during the summer of 2007 using angling (n = 1,854 includes fish captured during the mark-recapture survey). Distribution of legal-sized fish (i.e.  $\geq 323$  mm FL) is indicated.

Estimated total abundance of Arctic grayling ( $>150$  mm) was 27,250 (90% CI = 14545-51209), consisting of 17,924 (90% CI = 6698-40965) small fish ( ) and 9,326 (90% CI = 5713-15307) large fish; thus, small fish were 1.9 times more abundant than large fish. Abundance of both small and large fish increased from the downstream limit of the study area (km 0) until approximately 135 km upstream (Figure 2). Upstream of this point, small fish abundance dropped, while large fish abundance remained constant (Figure 1). Estimated abundance of legally harvestable ( $> 350$  mm TL) was 812 (90% CI = 481-1366), representing 3.0 % of the estimated total population abundance.

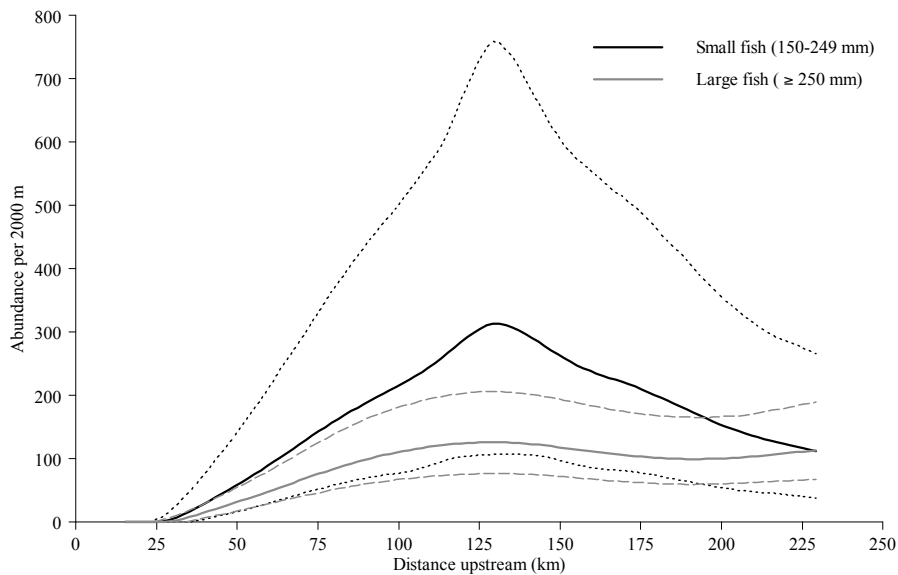


Figure 2. Estimated spatial distribution of small and large Arctic grayling in the 235 km Little Smoky River study area (2007). Shown is the mean of all estimates (solid line) and the 90% confidence intervals (dotted lines).

## Conclusion

Size distribution of Arctic grayling captured in the Little Smoky ranged from 106 to 375 mm FL with no evidence of missing size classes. Small fish were more abundant than large fish, while legal-sized fish comprised less than 3 % of the estimated total abundance. Abundance of both small and large fish increased from the downstream limit of the study area until approximately 135 km upstream. Upstream of this point, small fish abundance dropped, while large fish abundance remained constant.

## Communications

- Project summary information was distributed to partners.
- Draft ACA data report produced.

## Literature cited

Alberta Sustainable Resource Development. 2005. Status of the Arctic grayling (*Thymallus arcticus*) in Alberta. Alberta Sustainable Resource Development, Fish and Wildlife Division, and Alberta Conservation Association, Wildlife Status Report No. 57, Edmonton, AB. 41 pp.

Cooch, E., and G. White. 2008. Program MARK: a gentle introduction. Available in .pdf format for free download at: <http://www.phidot.org/software/mark/docs/book> 797 pp.

Figure 1.

