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An Evaluation of Population Monitoring Methods for Arctic grayling in Alberta

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Introduction

- Arctic grayling (ARGR) abundance has **decreased by 70% in Alberta¹**, resulting in their provincial listing as **Species of Special Concern**
- ARGR are a high-priority candidate for examination by the Committee on the Status of Endangered Wildlife in Canada
- Catchability (q)** is the **probability of capturing a species using a set gear type per unit of effort** and has been shown to vary by gear type, species, and habitat
- Capture efficiency (p) measures the percent of target organisms captured, and is closely related to q
- Angling and electrofishing are the primary gear types for monitoring ARGR
- Understanding how sampling methods affect q and p is critical to species management**

Table 1: Examples of capture efficiency for gear types used to monitor salmonids. n = number of sites q calculated from.

Gear Type	Study Area	Species	Catchability (q)	Capture Efficiency (p)
Angling	Little Smoky River, AB	Arctic grayling ²	0.143 ARGR/hour (n=7)	
			0.341 ARGR/hour (n=7)	
Backpack Electrofishing	Waiparous Creek Drainage, AB	Bull trout ³		35%
		Cutthroat trout ³		48%
		Brook trout ³		40%
Raft and Barge Electrofishing	Perkins Creek Drainage, MT	Rainbow trout ⁴		17-20%
		Brown trout ⁴		17-28%
		Cutthroat trout ⁴		14%

Objectives

- Compare q between backpack electrofishing and angling
- Utilize outputs from these data to inform future monitoring approaches for ARGR

Methods

Pilot Study

- Isolate two adjacent 500-meter sites
 - Site 1: Electrofish
 - Site 2: Angle
- Perform independent single pass marking events per site
- Wait 24 hours
- Perform independent recapture event per site using same gear type
- Backpack electrofishing and angling performed by teams of 2



Figure 1: ARGR captured via angling. Photo Credit: K. Marouelli

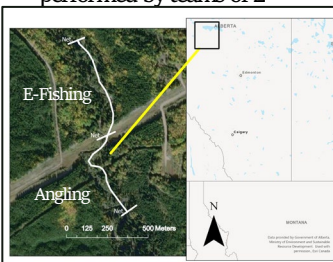


Figure 2: Map of study site



Figure 3: Setting block net to create closed population. Photo Credit: K. Marouelli

Analysis

- Calculate population estimate for each site
- Estimate catchability q for each gear type

Lincoln-Peterson Population Estimate

$$N = \frac{MC}{R}$$

N = population size estimate

M = # marked during first sampling

C = # captured during second sampling event

R = # recaptured

Catchability Coefficient (q)

$$q = \frac{C}{EN}$$

Capture Efficiency (p)

$$p = \frac{C}{N}$$

q = catchability
 p = capture efficiency
 C = catch
 E = effort
 N = population size



Figure 4: FRI staff with ARGR angled during pilot study. Photo Credit: K. Marouelli

Results

- Backpack Electrofishing Effort: 1,306 seconds, 500 meters
- Angling Effort: 8 angler hours, 500 meters

Table 2: Results from mark-recapture pilot study.

	Angling	Electrofishing
ARGR Marked	19	0
ARGR Captured	10	-
ARGR Recaptured	3	-
CPUE	2.4 ARGR/hr	0 ARGR/second
PE	63	0
q	0.026/angler hr	0/second
p	41%	0%
# Non-ARGR Fish	0	17

Table 3: Backpack electrofisher settings and water chemistry of site.

Backpack Electrofisher Settings	
Frequency (Hz)	30
Volts (v)	275
Water Temp (°C)	14.96
Conductivity (µS/cm)	97

- Returned to electrofishing site and angled
 - ARGR detected at similar rates as angling site

Discussion

- Electrofishing unsuccessful at detecting ARGR
- Angling successfully detected ARGR
- Suggests differences in q and p between gear types

Future Actions:

- Replication across additional watersheds needed to determine whether findings are consistent across systems
- Quantify differences in q and p to aid in ARGR management approaches

References

- Cahill, C.L. 2015. Status of the Arctic Grayling (*Thymallus arcticus*) in Alberta: Update 2015. Alberta Wildlife Status Report No. 57 (Update 2015). Alberta Environment and Parks, Edmonton, Alberta.
- Fitzsimmons, K., and M. Blackburn. 2009. Abundance and distribution of Arctic Grayling (*Thymallus arcticus*) in the Upper Little Smoky River, Alberta, 2007. Data Report D-2009-004. Alberta Conservation Association, Cochrane, Alberta.
- Fitzsimmons, K. 2008. Assessment of trout abundance and distribution in the Waiparous Creek drainage, Alberta, 2006. Data Report D-2008-011. Alberta Conservation Association, Cochrane, Alberta.
- Montana Fish, Wildlife & Parks. 2003. Bitterroot drainage fisheries management: Perkins Creek drainage. Federal Aid Job Report, Montana Statewide Fisheries Management, Federal Aid Project. Montana Fish, Wildlife & Parks, Helena, Montana.

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