

# **Enumeration of Overwintering Dolly Varden in the Wulik River**

by

**James W. Saveriede**

and

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March 2015

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries





***REGIONAL OPERATIONAL PLAN SF.3X.2014.08***

**ENUMERATION OF OVERWINTERING DOLLY VARDEN IN THE  
WULIK RIVER**

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March 2015

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Project Title: Enumeration of Overwintering Dolly Varden on the Wulik River

Project leader(s): James W. Saveriede Fishery Biologist III

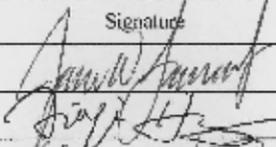
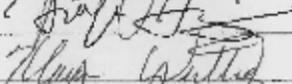
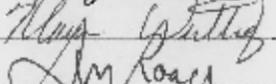
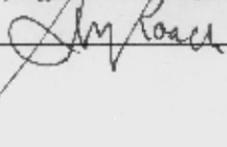
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**Approval**

Title	Name	Signature	Date
Project leader	James Saveriede		
Biometrician	Jiaqi Huang		
Research Coordinator	Matt Evenson		
Regional Supervisor	Don Roach		3/5/15

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## ABSTRACT

The primary goal of this project is to enumerate the outmigration of overwintering Dolly Varden *Salvelinus malma* to obtain an estimate of the abundance. A large overwintering population is assessed every fall (August/September) on the Wulik River using aerial counting techniques that are subject to weather conditions and migration timing. In recent years the aerial index has decreased and Region III Sport Fish along with the Habitat Division would like to establish an assessment technique that is subject to less error than an aerial index to determine if this decrease is due to an actual reduction in the population. This project will provide an annual estimate of the overwintering abundance, which will provide managers with a reliable index of the Dolly Varden population. Sonar techniques will be used to record images of Dolly Varden during their outmigration to the sea. The estimate will be a census of the overwintering population because images will be recorded 24 hours a day, 7 days a week throughout the run.

Key words: Dolly Varden, *Salvelinus malma*, sonar, Wulik River, overwintering abundance, subsistence.

## PURPOSE

In northwest Alaska, Dolly Varden *Salvelinus malma* are highly valued as a subsistence fish and local residents harvest thousands of these fish each year. Because there is a large zinc mining operation at the headwaters of the Wulik River and the fact these fish are a critical subsistence resource, it is imperative to understand their current spatial and temporal use patterns. A large overwintering population is assessed every fall (August/September) on the Wulik River using aerial counting techniques that are subject to weather conditions and migration timing. In recent years the aerial index has decreased and Region III Sport Fish along with the Habitat Division would like to establish an assessment technique that is subject to less error than an aerial index to determine if this decrease is due to an actual reduction in population. To enumerate the overwintering Dolly Varden population a DIDSON (Dual Frequency Identification Sonar) sonar will be deployed immediately after ice-out in the Lower Wulik River. Recorded sonar images will be used to enumerate the total number of Dolly Varden as they outmigrate to sea after overwintering in the Wulik River.

## BACKGROUND

In northwest Alaska, Dolly Varden are highly valued as a subsistence fish and local residents harvest thousands of these fish each year. For example, in Kivalina and Noatak (Figure 1), Dolly Varden landings in 2007 (30,761 fish) exceeded those of all species of salmon combined (5,241 fish; Magdanz et. al *In prep*). Dolly Varden are captured in rivers with gill nets or beach seines during open water periods, and with gill nets or hook and line during winter ice fishing.

Dolly Varden in northwestern Alaska are classified as anadromous fishes, meaning they spawn and rear as juveniles in freshwater and feed in saltwater later in life. Young Dolly Varden rear in freshwater for 2–5 years and after this freshwater residence period, they undertake annual migrations in the spring into marine waters to feed during the summer. Dolly Varden usually undertake three to five ocean migrations before reaching maturity, and once becoming sexually mature, they generally only spawn every 2 years. While it was originally believed that anadromous Dolly Varden did not travel very far offshore while in saltwater, DeCicco (1997) reported records of Dolly Varden tagged in northwestern Alaska that were recovered as far as 1,690 km away from their tagging site 14 months after being released. Using 35 years of by-catch data from offshore salmon fisheries south of the Bering Strait, Morita et al. (2009) found that Dolly Varden were distributed throughout a wide range in the Pacific Ocean, including

nearshore and offshore waters of the Japan Sea, Bering Sea, Okhotsk Sea, and the Gulf of Alaska.

In the fall, these fish return to rivers to overwinter. Immature and mature-nonspawning Dolly Varden do not demonstrate site fidelity to overwintering areas, therefore during this phase in their life these fish may become distributed over a wide geographic area (DeCicco 1997) resulting in mixed populations in overwintering areas. However, evidence suggests that Dolly Varden home to natal streams for spawning (DeCicco 1997).

In northwest Alaska, important overwintering rivers include the lower Wulik, Kivalina, and Noatak rivers, where sufficient groundwater provides suitable habitat throughout the winter, and all of which drain into the Chukchi Sea (Figure 1; DeCicco 1997). The largest congregation of Dolly Varden is believed to be the overwintering population that occurs in the Wulik River

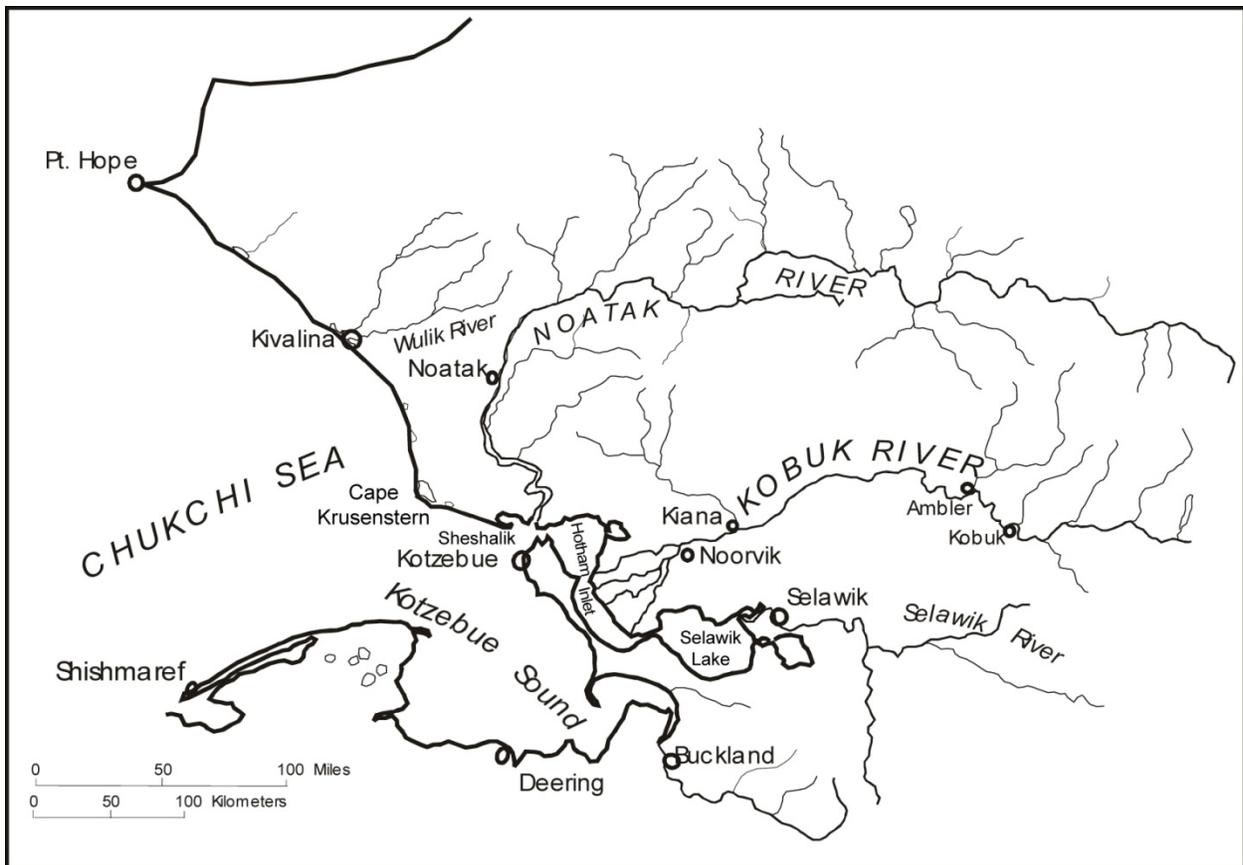


Figure 1.–Northwest Alaska drainages with local villages and rivers denoted.

drainage, where over 100,000 fish have been counted via aerial surveys in some years (Scanlon 2009).

Of these Dolly Varden that overwinter in the Wulik River, there are several intermingling groups (DeCicco 1996). The fish in the first group, which comprises the vast majority of the Dolly Varden in the Wulik River, are small, have never spawned and will not spawn during the

upcoming year. These fish range in size up to about 540 mm fork length (FL), but overlap to some degree in size with first time spawners, beginning around 500 mm FL. The second group contains fish that will be spawning during the upcoming year in the Wulik River and will forego migration to sea prior to spawning in late August. These fish have the highest condition factor (weight/length) of any fish in the population and generally will stay in the upper reaches of the overwintering area in spring as other fish begin to move downstream toward the sea. The third group is prespawning fish that will be moving to the sea with the nonspawners. These fish also will be in very good condition, but likely will not undertake long migrations while at sea. Rather, most will swim directly down to the Noatak drainage and migrate upstream while a few will go to the Kivalina River, some to the Kobuk River, and some to other drainages in northwestern Alaska. The fourth group is “spent” fish, which are individuals that spawned the previous year. Spent fish, whose abundance averages approximately 3,000–5,000 individuals, are typically found in the lower 30 km of the Wulik River as the ice melts in spring on their way to oceanic feeding grounds. These fish are readily identifiable by their darker color and relatively low condition factor when compared to the entire overwintering population. Of the four groups of Dolly Varden, the spent fish are the most likely to occupy productive offshore feeding grounds for the entire summer, as it is necessary for them to replenish energy stores that are depleted during egg production, maturation, and spawning processes.

## **OBJECTIVES**

The objectives for 2014 are to:

1. enumerate the entire outmigration of prespawning and nonspawning Dolly Varden from the Wulik River using a DIDSON sonar; and,
2. describe the outmigration timing of Dolly Varden from the Wulik River.

## **METHODS**

### **Study Area and Sampling Design**

A DIDSON sonar used to enumerate migrating fish will be deployed on the Lower Wulik River to obtain daily counts of outmigrating Dolly Varden (Figure 2). It is believed the overwintering population outmigrates right after ice-out and in a relatively fast time span around a couple of weeks. Recorded DIDSON sonar images of migrating Dolly Varden will be enumerated every day. The objective is to position the sonar so it can record images from the entire river, 24 hours a day, 7 days a week. The Wulik River is approximately 30 m wide where we would like to set-up the sonar station. On low frequency the sonar can ensonify up to 40 m. If whitefish are present in significant proportions then 2 sonars will be used to ensonify the river on high frequency, which allows for more precise length measurements from the fish images. The DIDSON will be mounted to a portable aluminum stand that is moved manually to adjust for water depth. Small weir structures will be deployed at each site to ensure migrating Dolly Varden pass through the sonar beam. The DIDSON will be deployed as soon as conditions allow; immediately after ice-out, which will be around the end of May. Sonar images will be recorded for 2 weeks and all fish over that time will be counted to derive a total count of outmigrating Dolly Varden.

It is possible that we may encounter a number of whitefish during the sampling period. To ensure all fish recorded are actually Dolly Varden, daily beach seine hauls throughout the outmigration

will be conducted near the study area. A count and length of all species will be recorded. If a large proportion of fish in the beach seine are whitefish, which are smaller in size, then length compositions will be used to cull out images of fish smaller than a certain length.

Two technicians will be assigned to enumerate the Dolly Varden outmigration in the Wulik River. Two additional biologists will assist with the beach seine hauls and initial DIDSON deployment and training.

### **Data Collection**

Daily images of outmigrating Dolly Varden will be recorded by the sonar. The technicians will ensure the sonar is running continually and that the proper sonar angle has been maintained with multiple checks during the day (0900 to 2200) and checks every 2 hours during the evening (2400 to 0800). They will be responsible for any adjustments necessary due to water level and/or debris.

### **Data Reduction**

All recorded images from the DIDSON will be stored on an external hard drive capable of holding large data files. All data collected, other than the DIDSON images, will be recorded in all-weather notebooks. Following the fieldwork, data will be transcribed into an Excel workbook spreadsheet from which all data analysis will be referenced and performed. The electronic files will be submitted upon completion of the final report and placed into the Division's Intranet DocuShare website – the file name and directory location will be presented in the final report. The spreadsheet will also be archived with the ADF&G Research and Technical Service (333 Raspberry Road, Anchorage, AK 99518) when completed.

### **Data Analysis**

Recorded DIDSON images from the previous day will be processed by both technicians. A total count of all Dolly Varden migrating downstream will be completed for each day during the 2 week sampling period.

## **SCHEDULE AND DELIVERABLES**

Results from this project will be summarized in a memorandum for which a draft will be submitted to the Research Supervisor by 31 July. The memorandum will satisfy the requirements from the funding source (Habitat Division). Probable dates for sampling activities are summarized below.

Sampling = (S), Mobilization = (M), Demobilization = (D), Analysis = (A), Memo = (R)

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Date	Chena Juvenile
May 26–29	M/S
May 30–June 10	S/D
July 2014	R

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## RESPONSIBILITIES

### Project Staff and Primary Assignments

James Savereide, *Fisheries Biologist III*. Co-Project Leader. Responsible for supervision of all aspects of the Wulik River Dolly Varden project, managing the project budget, and writing the final report.

Brendan Scanlon, *Fisheries Biologist III*. Co-Project Leader. Responsible for supervision of all aspects of the Wulik River Dolly Varden project, managing the project budget, and writing the final report.

Vacant, *Fish & Wildlife Technician II*. Crew leader. Mobilization, day-to-day project tasks, all aspects of field work, demobilization.

Samantha Taube, *College Intern II*– Mobilization, day-to-day project tasks, all aspects of field work, demobilization.

Jiaqi Huang, *Biometrician III*. Assist with project design and data analysis.

Matt Evenson, *Fishery Biologist IV*. Final report editing and project support.

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