

# Arctic grayling (*Thymallus arcticus*)

**Data: Alaska Department of Fish & Game**

**Partners: AK**

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## Species Status Review:

The Arctic grayling is listed as a species of least concern by the International Union for Conservation of Nature and not vulnerable in most of its range. In Alaska, populations in the Nome and Solomon rivers near Nome are considered vulnerable.

## Sportfishing Status of Arctic grayling:

Arctic grayling are primarily a sportfish, but they are also used as a subsistence resource. The Arctic graylings' insatiable appetite and wide distribution makes them a popular sport fish in Alaska; especially in the Interior. Because Arctic grayling have a tendency to eat almost anything, any fishing technique, including bait, lures, and flies, will work at one time or another. The largest grayling fisheries occur along the road system in Interior Alaska.

The Alaska Department of Fish and Game manages Arctic grayling to maintain healthy populations at numbers that meet the harvest needs of subsistence users and sport anglers. Sportfishing regulations are used to control sport harvest, while subsistence permits and regulations control subsistence harvest. Emergency orders can be issued under short notice to reduce or close harvest for protection of populations when information indicates a threat is imminent. For long term solutions, regulations for sport and subsistence harvest are changed during a deliberative regulatory process held by the Board of Fish.

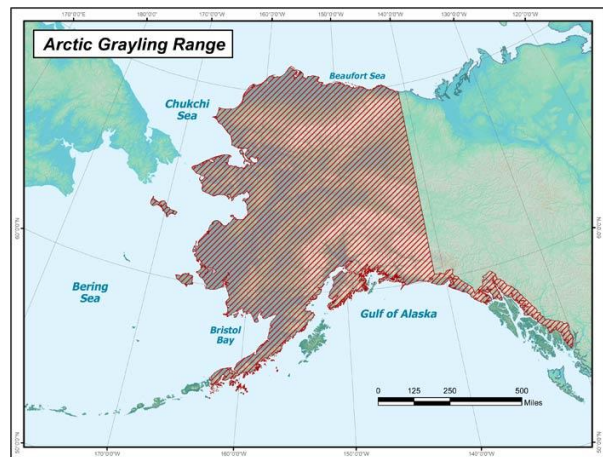
## Distribution of Arctic grayling:

Arctic grayling distributions vary by area and time throughout their range. High densities of adults have been recorded in the upper Delta River and the Delta Clearwater River, whereas low densities have been observed in the Nome

River. Radio telemetry data have indicated that distributions of adult Arctic grayling change seasonally.

## Range of Arctic grayling:

Arctic grayling are found throughout mainland Alaska and some islands such as St. Lawrence and Nunivak. The full extent of their native range through the Alaska and Kenai Peninsulas, western Alaska, and coastal areas of South Central and Southeast Alaska is not well documented.



## Arctic grayling Habitat Requirements:

Among salmonids, the Arctic grayling is regarded as requiring colder water than most others. Thermal maximum temperatures for adults are around 20°-25°C (dependent upon several factors). Temperatures above 15°C are stressful and avoided, and temperatures greater than 20°C cannot be tolerated for long without mortality. Although adult Arctic grayling can persist between 15 and 20°C for short periods, temperatures between 4° and 15°C are conducive to growth. For young-of-year and juveniles, slightly warmer temperatures (10° - 20°C) are preferable for growth. Thus the water temperature of summer habitats, often in conjunction with a competitor species such as rainbow trout, is an important determinant of the

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summer distribution of Arctic grayling. Within the acceptable range of water temperatures, summer habitat can be quite variable, ranging from lakes, glacial rivers, small bog water streams, spring streams, and clear mountain streams. When in streams, young-of-year tend to be found near shorelines, juveniles are found away from shore in slower currents or behind current breaks, and adults occupy swifter waters. Arctic grayling are also distributed by size in streams, such that larger grayling tend to be found in the cooler upper reaches of rivers, whereas smaller grayling tend to be located in warmer downstream reaches.

During autumn, Arctic grayling vacate many tributaries and upper portions of the drainage because of the impending loss of habitat during winter, when river discharge reaches annual lows and some streambeds go dry while others freeze to the bottom. For winter, Arctic grayling seek out habitat that minimizes energy expenditure (e.g. low velocity water), has physiochemically suitable water (e.g. adequate depth, oxygen, and no frazzle ice), and provides cover from predators (e.g. overhead ice). These habitat requirements may be found in a limited number of areas, and, in conjunction with reduced metabolism (i.e. less feeding and competition for food and space), large congregations of fish can occur among normally competitive fish.

As winter ends, Arctic grayling migrate to spawning habitat, usually located nearby, just before and after breakup. For both lake and stream dwelling Arctic grayling, spawning usually occurs over shallow riffles having small pea-sized gravel. However, spawning in grasses and lakes has also been observed occasionally. After spawning, Arctic grayling redistribute to summer feeding areas to complete an annual cycle between seasonal habitats that may have required well over one hundred miles in migration.

### **Concerns, Issues, or Obstacles relative to the Conservation and Improvement of the status of Arctic grayling:**

#### **Population Viability Concerns**

There is little concern for population viability for Arctic grayling. Biologists have noted however that the life history of grayling on the Seward Peninsula is such that high adult survival and low annual recruitment generally results in small populations that turn over very slowly.

#### **Genetic Concerns**

The genetic studies that have been done on Arctic grayling in Alaska are dated and use older genetic techniques such as starch gel electrophoresis. Otherwise, little is known other than Arctic grayling across its range from northern Siberia, Alaska, Canada, and Montana constitute a single species. Across and within river basin differences have not been investigated, yet determining if differences exist and to what extent is one of the most valuable information components needed for management.

#### **Disease Concerns**

None.

#### **Habitat Concerns**

Mineral resource extraction exists in a number of locations across its range as well as other developments, such as roads and bridges, which could impact populations. The potential increase in mineral resource extraction in Alaska is substantial if some of the large-scaled mining operations, such as Donlin Creek, Pebble, and Ambler Mines are developed. Even excluding the mining footprints, the associated development, such as 300-mile long roads or gas pipelines, have the potential to adversely affect Arctic grayling. Major habitat concerns include restricted access to critical overwintering and spawning habitats, dewatering of overwintering habitats, sedimentation, changes to water quality, and bioaccumulation of toxic elements such as mercury and arsenic.

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### **Introduced Species Concerns**

None.

### **Overutilization Concerns**

There are current mechanisms of regulation that are sufficient as well as mechanisms to adapt regulations as needed to prevent overutilization.

### **Oil and Gas Development Concerns**

There are some existing oil and gas developments on the North Slope and Cook Inlet, as well as new explorations on the North Slope, Cook Inlet, and Nenana-Minto Flats basin. The threats currently remain limited and mechanisms are in place to protect fish and their habitats.

### **Opportunities and Strategies for Improving Arctic grayling Status:**

Arctic grayling in Alaska remain abundant, widespread, and common in nearly all waters. Although Arctic grayling currently hold the status of 'least concern,' important baseline data are needed so that inevitable future developments do not adversely affect that status. To that end, the range of this species needs to be better delineated across Alaska especially in southern and western Alaska, local stocks and their seasonal distributions need to be better understood especially near proposed resource extraction, and genetic relationships across Alaska as well as within large drainage systems such as the Yukon and Kuskokwim rivers need to be determined. Maintaining the status of Arctic grayling requires four general activities:

- fish population surveys and analysis
- radiotelemetry studies
- genetic analysis
- regulatory actions

### **Population surveys and analysis:**

Arctic grayling are found throughout most of the state of Alaska, but because of Alaska's extent and remoteness, its range is not definitively known. While in larger drainage basins, such as the Tanana River, Arctic grayling are found throughout the basin, little is known about their distribution in small basin coastal rivers. For example, it is known that some systems do not have Arctic grayling, such as the Penny and Tisuk rivers on the Seward Peninsula.

#### *Key Actions:*

Continue assessing stock status of exploited stocks.
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Conduct standardized surveys to more accurately characterize the range and habitat requirements of Arctic grayling in Alaska.
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Develop and implement consistent methods for fish population status and trend analyses.
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### **Radiotelemetry studies:**

Arctic grayling usually migrate seasonally to habitats important for overwintering, spawning and summer feeding. Identification of these areas and the migration corridors is critical to managing impacts of development on an Arctic grayling population. Data provided by radiotelemetry studies provide strong evidence for protection of habitat and for development and enforcement of protective regulations.

#### *Key Actions:*

Identify populations at most risk due to development and for which the information on seasonal habitats and migration pathways are unknown.
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Conduct radiotelemetry studies of populations most at risk.
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## **Arctic grayling genetic analysis:**

Differences across and within river basin populations of Arctic grayling have not been investigated. Determining levels and extent of genetic differentiation among Arctic grayling aggregations across Alaska is valuable information needed for management.

### *Key Actions:*

Collecting tissue samples and two voucher specimens from multiple river drainages around the state.
Collecting tissue samples and two voucher specimens from multiple locations in a river drainage (e.g. Tanana River basin).
Perform initial assessment on examination of variability in mitochondrial DNA sequences and several nuclear genes.
Develop a large set of variable nuclear genome markers for high-resolution assessment of population genetic variability.

## **Regulatory and Administrative Actions:**

Maintaining the sportfish status of Arctic grayling and utilizing regulations to control over-utilization will be an important component of maintaining the health of Arctic grayling populations. In addition, the maintenance, development, and enforcement of appropriate regulations for prevention of disease, water quality impairment, and habitat disturbance are important considerations.

### *Key Actions:*

Provide technical information, administrative assistance, and financial resources to assure compliance with the listed objectives.
Maintain and protect Arctic grayling habitat from degradation by achieving compliance with existing habitat protection laws, policies and guidelines.

Enforce regulatory mechanisms that prevent impacts associated with recreational angling.
Enhance and maintain regulatory mechanisms that prevent diseases or illegal introduction of nuisance species.

## **Recommended Actions to improve the status of the Arctic grayling:**

1. Fish population surveys to determine extent of range
2. Radiotelemetry studies to determine important habitats and migration pathways
3. Genetic analysis to determine if differences in populations exist
4. Regulatory actions ( fishing regulations, water use, land management, etc.) to protect habitat and fish stocks



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