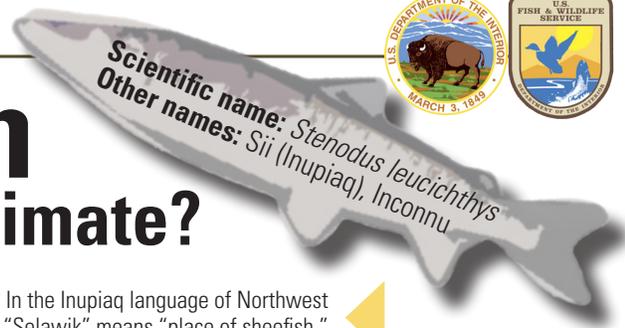




Selawik Sheefish

Murky Future in a Changing Climate?



Did you know? In the Inupiaq language of Northwest Alaska, "Selawik" means "place of sheefish."

Why Sheefish?

Sheefish are one of the most important food fishes in Northwest Alaska's Kotzebue region: they are caught and used year-round for subsistence in Kotzebue, Noorvik, Kiana, Ambler, Kobuk, Shungnak, Selawik, and other regional villages. Snapshot estimates of regional subsistence harvests are 10,000–20,000 fish annually.

Sometimes referred to as the *Tarpon of the North*, sheefish are also a much sought-after trophy sportfish due to their large size and fighting spirit. Sport harvest in Northwest Alaska averaged 1,000 sheefish annually from 2001–2010. Between 1967–2004, commercial harvests in the Kotzebue region winter fishery have varied widely from 19 to 4,000 fish annually.

Sheefish from the Selawik and Kobuk Rivers make up these mixed stock subsistence, commercial, and sport fisheries.

Range

Sheefish are found in many of the Arctic and sub-Arctic waters of Asia and North America. Selawik River-origin sheefish spend their entire life within the Selawik River and the Selawik Lake/Hotham Inlet estuary system. Selawik sheefish have been captured as far west as the nearshore waters of Kotzebue Sound. They overwinter in Selawik Lake and the brackish waters of Hotham Inlet and spawn in the upper reaches of the Selawik River.

Spawning

Only two sheefish spawning grounds are known to exist in Northwest Alaska: in the upper Selawik and upper Kobuk Rivers. The Selawik River spawning grounds are located entirely within the Selawik National Wildlife Refuge. Adult sheefish may spawn every year or skip years to rebuild sufficient energy reserves to spawn again.

In spring, mature sheefish begin a prolonged migration up the Selawik River. Nonspawning adults and immature sheefish remain in the lower river system and estuary. By late September/early October, would-be spawners have congregated. They broadcast their eggs and milt over gravelly areas before ice-up and immediately migrate downstream to their overwintering grounds. Meanwhile, fertilized eggs settle into the spaces between gravels to mature. Hatching is believed to occur in late winter or spring and larvae are carried downstream with spring floods.

Murky Waters?

In the spring of 2004, a large area of thawed permafrost slid and carried tundra and sediment into the normally clear Selawik River approximately 30 river miles upstream of the sheefish spawning grounds.

Did you know? Sheefish were identified by Congress as a species of interest in the Selawik National Wildlife Refuge (encompasses over 2 million acres).

Below: A mature Selawik River female is released by Service crew member Bill Carter. USFWS



Adult males caught in the Selawik River typically range from 2-3 feet in length and weigh 6-17 pounds. Females are larger, reaching lengths of nearly 4 feet and weighing 11-22 pounds.

Fairbanks Fish & Wildlife Field Office

Did you know? During the last 50 years, Alaska has seen some of the most rapid warming on earth. Impacts already being documented include thawing permafrost, eroding shorelines, and loss of sea ice.

The size of this “thaw slump” has continued to grow each year, resulting in large quantities of silt eroding into the river and creating highly turbid water in the summer months. At times, turbidity from the slump has extended over 100 miles downstream. When freezing temperatures resume in fall, the slump emits less sediment and water clarity improves.

The impact to the Selawik River aquatic community is unknown. Research in other areas has shown negative impacts from the silting of spawning habitat, especially for fish species that require gravel substrates. One concern for Selawik sheefish is that silt entering the river from the slump may fill in the spaces between streambed gravels that developing eggs need to overwinter successfully.

The Question: *Is the silt input from the slump impacting the Selawik River sheefish population?*

Methods

Given logistical challenges of sampling juvenile sheefish, the best way to begin answering this question was to assess the age structure of adult male spawners at the Selawik spawning grounds and estimate total spawner abundance.

Collecting age samples

After arriving at the Selawik population’s spawning grounds (an adventure in itself, see back page), a crew consisting of Selawik residents and Service technicians/biologists catch adult sheefish with rod and reel. The fish are reeled in quickly and sex is determined by external characteristics. Female sheefish are

Long-lived!

Sheefish, the largest member of the whitefish sub-family, don’t typically mature until 8-12 years old. Capable of living for 30+ years, the oldest Selawik River sheefish aged to date was 41!



At times, the Selawik River is very turbid from increased slump thawing. Steve Hildebrand/USFWS

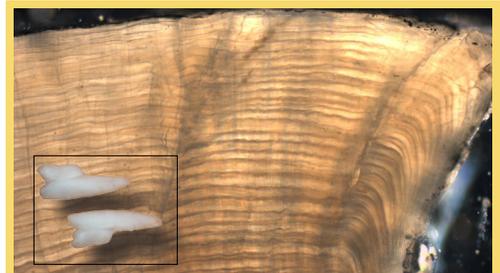
Since 2004, thawing permafrost has resulted in more than 760,000 cubic yards of sediment/tundra entering the Selawik River. That’s enough dirt to fill the Rose Bowl stadium almost two times. Or, roughly the same volume of dirt contained in 38,000 loads from a 20 cubic yard dumptruck!

immediately released unless mortally hooked. Males are weighed, measured, then dispatched prior to otolith (inner ear bone) extraction for ageing. Their fillets are hung to dry (protected from predators by an electric fence) and transported to the Selawik community for subsistence purposes.

For statistical purposes it is critical to obtain otoliths from 200 male sheefish per year, for three years, to help document the slump’s impact on future spawners whose age coincided with its inception and silt deposition over time.

Counting Sheefish

After age sampling, the crew moves their camp just below the spawning area, deploys an imaging sonar unit (much like a doctor’s ultrasound) in the river, and waits for the sheefish that have spawned to head back downstream to the wintering grounds. Fish are digitally recorded as they pass the sonar unit 24 hours/day for about two weeks and then counted back at the Fairbanks Office.



Magnified cross section of a sheefish otolith (inner ear bone). Ageing fish using otoliths is similar to ageing a tree by counting its rings. **Inset:** Two otoliths from a male sheefish (actual size).

Fairbanks Fish & Wildlife Field Office

Community Involvement and Benefits

During development of the Selawik Sheefish study plan, Fisheries staff consulted directly with the Native Village of Selawik. They attended council meetings and presented how the project sought to address changes in the Selawik River that were of concern to Selawik residents, the Fairbanks Field Office, and the Selawik National Wildlife Refuge.

Staff explained to community members that obtaining otoliths from male sheefish had the major disadvantage of being lethal to the fish (due to their long lifespan, non-lethal methods like scale analysis cannot be used to accurately age sheefish). But advantages of the method included accurate ageing and that meat from these fish would in fact be saved and given to Selawik residents. The Selawik Village council considered the study's implications for this important subsistence resource and approved the project.

Preliminary Results & Next Steps

In 2011, otoliths from 193 males and seven females were collected. These fish ranged in age from 9-30 years with an average was 19.6 years. Spawner abundance was estimated at approximately 21,000 fish with the sonar. In 2012, otoliths were collected from 196 males and four females. Analysis of data from the 2012 field season is underway. The next two years of data collection for this study, and a complimentary set of age data being collected in cooperation with the Alaska Department of Fish and Game on the Kobuk River, will help bring clarity to this issue. Stay tuned!

This project is funded through the Federal Subsistence Management Program, Fisheries Resource Monitoring Program.

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Bottom Left: Selawik resident and crew member Patrick Foster reels in a sheefish. Dan Prince/USFWS



Crew member Dan Prince weighs a male sheefish. K.Mueller/USFWS



Project lead Ray Hander takes a length measurement. K.Mueller/USFWS



Sheefish fillets that have been drying on fish racks are boated downriver to the Native Village of Selawik for subsistence purposes. K.Mueller/USFWS



Uniquely Alaska LOGISTICS



The Selawik River. K.Mueller/USFWS



Transferring gear at the Selawik airport. K.Mueller/USFWS



Almost to upper campsite. K.Mueller/USFWS

Like most of Alaska's river systems, the Selawik is not accessible by road. It meanders from its origins in the Purcell Mountains through the heart of Selawik National Wildlife Refuge in an extremely remote area of Northwestern Alaska. Snowmachine, airplane, and boat are the only viable transportation options.

Getting There: Advanced planning, meticulous organization, and partnerships are the key to all remote field projects. With the arrival of our fisheries crew in Kotzebue, it takes well over a week to organize and move fuel and gear to our upper campsite (~150 river miles upriver from the Native Village of Selawik). It takes roughly seven hours to reach the uppermost campsite by boat and then roughly a day to set up camp. Refuge staff provide critical support including boats, aircraft, daily safety contacts, and lodging. We contract with the Native Village of Selawik for sampling assistance, transportation of supplies upriver, and transportation of sheefish meat back to the community.

Self-Sufficiency: In September and October, temperatures can range from 5 to 50°F with any combination of rain or snow so we must always be ready to take on the elements. We must also be prepared for wildlife encounters (e.g., grizzly bears and moose), flooding, and boat/equipment repair.

Food and Field Gear: We air freight over a ton of field gear and groceries from the Refuge headquarters in Kotzebue to Selawik. Gear is moved by ATV from the airport to Refuge and Selawik contract boats. We need enough food and cooking fuel to feed 3-8 people for 4-6 weeks.

Water: We draw water from the river via a solar powered pump. We then filtered it and store it in containers at camp.

Shelter: Includes the Selawik National Wildlife Refuge bunkhouse in Kotzebue, a Refuge cabin 60 miles upriver from Selawik, and tents beyond that.

Fuel: Approximately 850 gallons are required to safely and efficiently transport our crew and gear between the Village of Selawik and several sheefish sampling sites (fuel in Selawik is \$7/gal).

Waste Management: All non-burnable waste is back-hauled to Selawik for proper disposal.

Essential camping items include zero degree sleeping bags, sleeping pads, and breathable/fire-resistant wall tents for cooking and drying our clothes. D. Prince/USFWS

