Forest Sciences

Prince Rupert Forest Region

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Eulachon: A Significant Fish for First Nations Communities

Research Issue Groups:

- **Fish Habitat**
- **Forest Biology**
- **Forest Growth**
- **Soils**
- **Wildlife Habitat**
- **Silviculture**
- **Timber Harvesting**
- **Ecosystem Inventory and Classification**
- **Biodiversity**
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- **Hydrology**
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PHOTO 1. Adult Eulachons: male above, female below.

Introduction

Eulachon are small fish that spend a short, but critical period of their life cycle in a limited number of streams and rivers of the coastal temperate rain forest of western North America. In the early 1990's very little was known about Eulachon biology.

In 1994, representatives from coastal First Nations, Department of Fisheries and Oceans and the Ministry of Forests agreed that the lack of Eulachon research was a significant concern for fisheries and forest management. As a result, the Eulachon Research Council was established to facilitate coast-wide communication and cooperative research among fisheries researchers and First Nations people. This extension note provides background on Eulachon biology, discusses recent population declines, and provides information for forestry people planning or undertaking work in Eulachon watersheds.

Forest Sciences, Prince Rupert Forest Region
Bag 5000, Smithers, BC V0J 2N0 847-7500 (FAX 847-7217)

Eulachon Biology

Eulachons (also known as Juk'wun, oolichans, ooligan, candle fish) are members of the smelt family. They are small, pelagic, anadromous, schooling fish. That is, they live at sea and return to spawn in or near the rivers in which they were hatched. Adult eulachons are 15 to 20 cm long and weigh 40 to 60 grams, with the males being slightly longer and heavier than the females. Eulachons are confined to the eastern side of the Pacific where they spawn in a few dozen rivers. Formerly they were found from the Bering Sea coast of Alaska, south to the Sacramento River in California. Presently their numbers are greatly reduced from historic levels, especially in the southern part of their range. Some people think that overall Eulachon populations may have already declined by up to 90%. There are various suspected causes of this recently recognized decline, but whatever the cause, Eulachons now require conservation of remaining stocks.

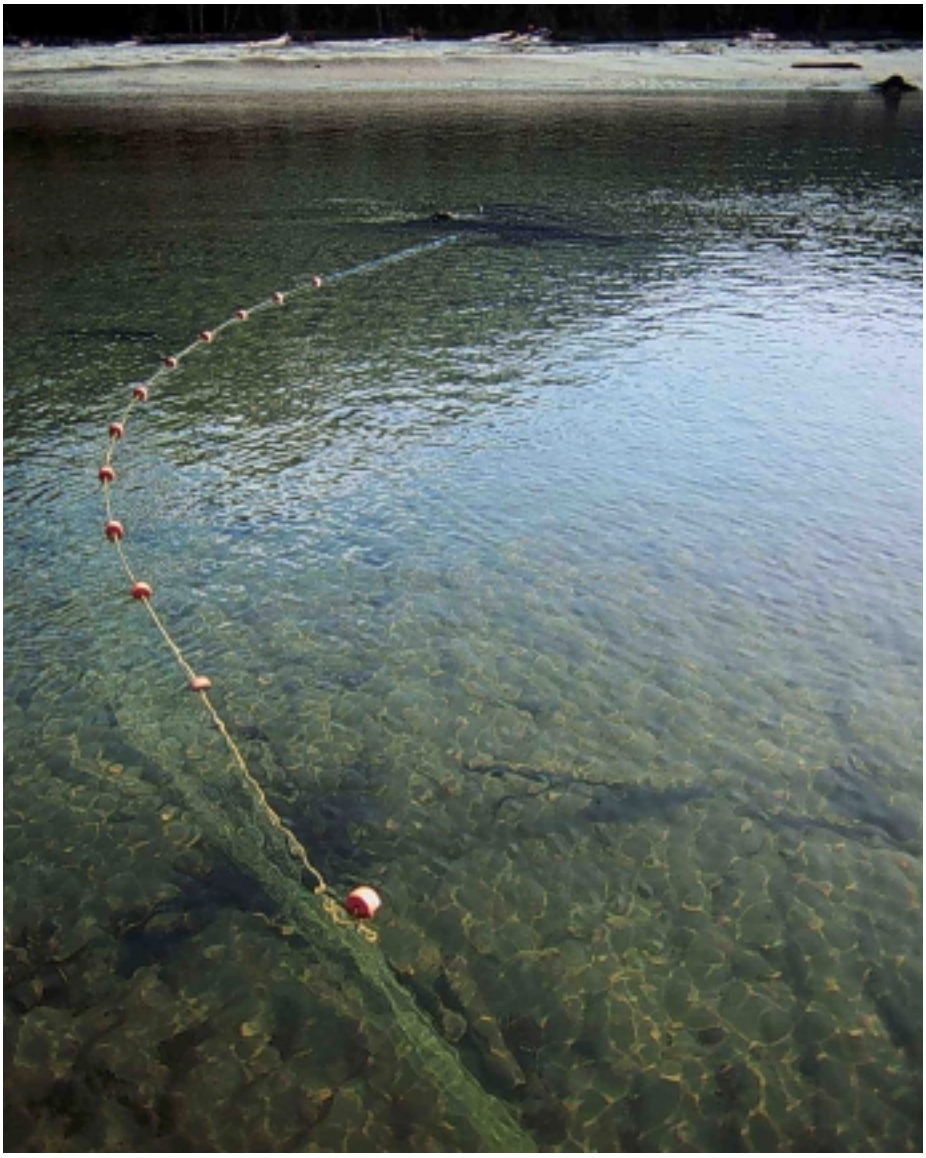

PHOTO 2. An Eulachon research gillnet set in a characteristic sandy spawning reach.

Typically, Eulachons spawn before the spring freshet at night on a large tide. In this region, spawning occurs from early to late March. Tide is very important to the timing of a run although river temperature and flow are also important. During spawning, most adult fish are found in the lower river, above the saltwater wedge (which travels upstream with the tide) up to the upstream extent of tidal influence. Some spawners may be found a little farther if the river gradient allows these relatively weak swimmers upstream. Eulachons broadcast spawn similar to herring except they do so in fast flowing water. This may explain the unusually high ratio of males to females present in the population. Females lay about 25,000 eggs. Eggs become adhesive once fertilized and adhere to whatever substrate they settle on, or to each other. Incubation lasts approximately three to four weeks depending on water temperature. Immediately upon hatching, larvae are carried downstream where they live in the estuarine water near their natal river, probably within a narrow layer where the fresh and salt water meet.

Once they are of sufficient size, the larvae gradually move out to sea. Throughout their life cycle,

PHOTO 3. A Native fisheries technician involved in an Eulachon spawning study.

Eulachons function as an important element of the coastal ecosystem, moving energy between trophic levels. For example, Eulachons transfer energy from zooplankton they eat to the predators that eat Eulachon, such as sealions, Pigeon guillemots and Harlequin ducks, and other aquatic life such as sturgeon and trout. Eulachons remain in coastal regions, probably travelling less than 100 km offshore, where they mature in 2 to 3 years and can live until the age of 6 or 7 years. Although large numbers die after spawning, some researchers believe they can spawn more than once.

Within the Prince Rupert Forest Region, the majority of Eulachon spawning occurs in the Nass, Skeena, Kitimat, Kildala, Dala, Kemano, Kowesas and Kitlope rivers. Occasionally some spawning will occur in small rivers such as Bish Creek in Kitimat Arm and the tributaries of the Skeena such as the Exstew. Eulachons from this region probably spend their at-sea life in and around Hecate Strait and Queen Charlotte Sound, and in the inlets near their natal rivers.

Cultural Significance

Eulachons are highly valued among coastal aboriginal people, both as healthy traditional food and as a valuable trade item. Within this region, Eulachons are harvested by the Haisla, Nisga'a, and Tsimshian. Spawning Eulachons are fished with dip nets and beach seines. Eulachons contain important "good" fats such as linoleic and omega 3 fatty acids. They also contain protein, calcium and vitamins. Eulachons are eaten fresh (fried or in soup), half-smoked (steamed or boiled) and smoked (steamed, boiled or roasted in a fire like a marshmallow).

PHOTO 4. Eulachons curing in a smokehouse.

Coastal Native food without Eulachon grease is like fries without ketchup or gravy. Most of Eulachon harvest is rendered down into Eulachon grease, a nutritious dietary fat. The grease is an essential ingredient in traditional food. In the past, grease was traded up and down the coast and to the interior as far as Prince George. Today, grease remains very valuable and is traded for other essential traditional food such as herring roe and seaweed.

The Eulachon fishery is one of the best remaining examples of traditional culture. Except for a commercial harvest on the Fraser River, Eulachons are unregulated by the Department of Fisheries and Oceans. However, each Native nation regulates their own fishery. Generally, Elders organize and run the camps. A significant amount of work is required to harvest and process Eulachons, and those not able to participate are provided for by those who do. The fishery itself is important as an exercise in traditional culture, much like Christmas or Thanksgiving is to European Canadian culture.

PHOTO 5. A Haisla fisherman boiling Eulachons for grease.

Threats - The Big Picture

The exact causes of the decline in Eulachon stocks are unknown, however, Eulachon abundance could be affected by a variety of factors. Once the larvae move to the ocean their survival is related to marine productivity and predation. These factors are dependent on ocean climate, which could be affected by global warming or periodic natural perturbations such as *el Nino*. By-catch in fisheries, mainly from shrimp trawling, is known to kill a large number of Eulachons. In 1997 this amount was estimated to be 140 tonnes B.C. coastwide. Pollution may damage the immune system of the fish, and lower their reproductive ability through hormone mimicry. Natural variations in streamflow volumes and water quality affect spawning ability as well as egg survival. Forest practices can also alter habitat suitability through sediment production, changes to peak streamflows, and physical impacts to spawning reaches.

In consideration of present abundance and the threats they face, Eulachons appear to be a species at risk, possibly deserving of threatened or endangered status. While ocean climate may be the primary cause of decline, other factors within human control could impede recovery. In terms of forestry, the onus is on foresters to do whatever possible to minimize disturbance of fish and habitat, especially during spawning and incubation.

Issues surrounding forestry activities in Eulachon watersheds

Key freshwater issues for Eulachon:

- they spawn in the very lower ends of stream systems, within or slightly above tidal influence, characteristically in clean sandy textured reaches;
- if fertilized eggs come into contact with silt, the eggs become coated, lose their adhesiveness and are swept to the ocean. A layer of silt also reduces the transfer of oxygen to the eggs, reducing their viability or causing mortality;
- spawning occurs in early spring, just prior to spring snowmelt peakflows. This is a very narrow window between increase of stream temperatures above winter lows and the occurrence of peak streamflows;
- temperatures are very important - cool but not cold.

For forestry to be feasible in an Eulachon watershed, the freshwater issues must be addressed, primarily through: no net increase in surface erosion, mass wasting, water temperatures and peakflows. Channel stability is a key issue, and since channels are linked throughout a watershed, any activity that destabilizes even a class 6 stream could have consequences for Eulachon spawning.

Forestry activities are undertaken against a natural background of mass wasting, surface erosion and

wildly fluctuating peakflows. Significant natural events also occur, such as the glacial outburst lake events in the Kitimat River. It is therefore necessary to have good baseline information regarding the naturally functioning watershed, particularly any factors that can impact Eulachon spawning success.

Some Eulachon watersheds, such as the Skeena, also have considerable human activities that can affect the key freshwater habitat requirements. In these watersheds, it is necessary to evaluate the degree to which these activities have impacted Eulachon production and ensure that the biological/physical limits have not be exceeded.

Watershed size is also a consideration. The smaller a watershed, the more direct the linkages between forestry practices and Eulachon habitat.

One additional element of human interaction with Eulachon is rooted in traditional knowledge. Given the cultural significance of Eulachon, a great amount of respect is given the fish. Legends illustrate how ungrateful attitudes, disrespect and unnatural noise can lead to a failure of Eulachon to return for spawning. It is possible that foreign substances in the water such as traces of blasting powder, petroleum products, food waste and garbage can also discourage spawning.

Addressing Eulachon habitat issues in forestry planning and operations

A key step early in the forestry planning process is to identify fish habitat. While the Forest Practices Code does not specifically require identification of fish species, doing so is appropriate in potential Eulachon watersheds to focus attention on their very limited habitat. While the habitat is limited, it is connected through the stream system to the whole watershed.

The Forest Practices Code provides guidance and tools to address most of the issues outlined above. In particular:

- **sedimentation**–background sources plus forestry hazards are identified through mapping of sediment sources, and potential slope stability and surface erosion hazards. In addition, the Gully Assessment Procedure is undertaken in the field to identify specific debris flow hazards. Sediment transfer capability mapping is a key factor to link unstable sites to the Eulachon spawning habitat.
- **changes to peakflows**–the Coastal Watershed Assessment Procedure (CWAP) is used to identify potential impacts to peakflows (as well as surface erosion, mass wasting and riparian impacts). CWAP is required for watersheds with significant fisheries values (including Eulachons) that are jointly requested by Ministry of Environment, Lands and Parks and the Ministry of Forests.
- **temperatures**–riparian reserves are designed to limit temperature increases. Riparian reserves may have to be specifically prescribed for some S4, S5 and S6 streams, which normally require only management zones.

In addition to the Forest Practices Code, the regional Erosion Control Procedures are designed to focus attention on avoiding and dealing with sedimentation issues. Scheduling of operations to avoid road construction and harvesting during wet periods is a standard forestry practice. Precipitation shutdown guidelines are designed to limit forestry activities during periods of high hazard for mass wasting.

Since many potential impacts to fish habitat are related to roads, harvesting systems that limit the amount of roads should reduce risks in Eulachon watersheds. Examples include skyline and helicopter harvesting.

Direct work in Eulachon spawning reaches should be avoided, but where absolutely necessary, approvals are required from the Ministry of Environment and the Department of Fisheries. Time windows will need to be placed on activities to avoid conflict with spawning.

Given the importance of clean water for Eulachon, attention should be paid to practices near streams during

and preceding spawning. This includes blasting in locations where powder (or sound) could be transported to spawning reaches.

Field staff should be aware of the traditional knowledge regarding respect for the Eulachon. While forestry workers may not be recipients of the harvest, they should be mindful that their thoughts and actions could have an adverse effect on the Eulachon harvest.

Conclusion

Eulachon are a culturally significant fish in decline on the BC coast. Forestry practices have the potential to impact both spawning habitat and the behaviour of Eulachon. However, the Forest Practices Code and other procedures provide the tools to design appropriate forestry in Eulachon watersheds. For forestry to be feasible in these watersheds it is critical for all forestry people, from planners to loggers, appreciate the biology and cultural significance of this fish.

Contacts:
David Wilford, Research Forest Hydrologist, 847-7428
David Maloney, Research/ Extension Hydrologist, 847-7429
Steve Osborn, Tenures Forester, 847-7504

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