Eulachon
(Thaleichthys pacificus)

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Eulachon, sometimes called "hooligan," are small slender fishes up to 10 in. (25 cm) long that belong to the smelt family (Osmeridae) (Fig. 1). These anadromous fishes spend most of their lives in the ocean. At maturity, eulachon migrate into certain mainland rivers of Southeastern Alaska (Southeast) for spawning, usually during April and May. Features distinguishing eulachon from other smelt in Alaska are obvious circular grooves on their gill covers and dorsal fins that begin well behind the pelvic fins (Mecklenburg et al. 2002).

FIG 1. Eulachon in a Yakutat river ready to spawn. (Richard Carstensen)

The eulachon has been of relatively little commercial importance; therefore, less is known about this species than commercially important fishes, such as salmon. The role of eulachon in Native culture has been studied more than has its basic biology and ecology. But increasing attention to the role of eulachon as important food for many animals, including some of conservation significance such as Steller sea lions *(Eumetopias jubatus)*, is prompting greater interest in understanding the biology and ecology of this small fish (Willson et al. 2004).

In Southeast, the eulachon is a key food for bald eagles (*Haliaeetus leucocephalus*), harbor seals (*Phoca vitulina*), Steller sea lions, gulls, and other animals (Drew and Lepp 1996, Marston et al. 2002, Womble 2003). Partly because of abundance and ease of capture when on their spawning runs, eulachon serve as forage fish. They are most important, however, because they provide a higher amount of energy than other forage fish, including Pacific herring (*Clupea barengus*), Pacific sand lance (*Ammodytes hexapterus*), capelin (*Mallotus villosus*), and walleye pollock (*Theragra chalcogramma*) (Kuhnlein et al. 1982, Perez 1994, Payne et al. 1999, Kuhnlein 2000). In addition, they are available to animals that feed on them during a season when energy costs for animals are high and when food sources, such as spawning salmon, are not available.

Eulachon are notable for their high concentration of oils (mostly mono-unsaturated fatty acids and particularly oleic acid). For example, samples of eulachon obtained from February to June in the Gulf of Alaska contained 18-20% oil (wet mass), a value higher than that for other common forage fishes, such as sand lance (3-6%) or capelin (2-10%), during the same time frame (Payne et al. 1999). Eulachon also contain high levels of vitamins A and E (Crissey et al. 1998, Kuhnlein 2000) and are good sources of calcium, iron, and zinc (Kuhnlein et al. 1996).

STATUS IN SOUTHEASTERN ALASKA

Distribution

Eulachon occur only on the northwest coast of North America, from northern California to southwestern Alaska. They reportedly spawn in 34 mainland rivers in Southeast (Willson et al. 2004, Fig. 2). Although they probably spawn in other rivers, at least occasionally, these occurrences have not yet been documented. No eulachon runs in island rivers have been reported in Southeast.

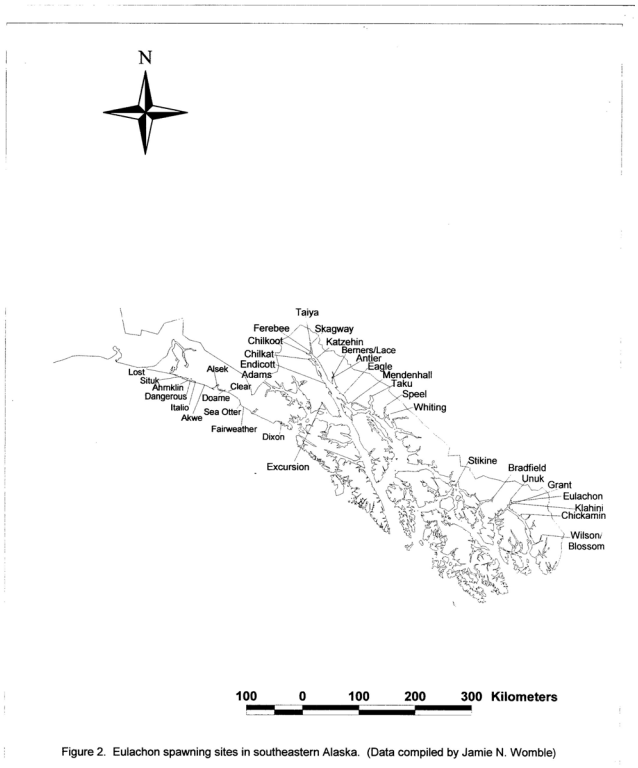

FIG 2. Map of Eulachon spawning distribution in Southeastern Alaska (Jamie Womble).

Throughout their range, eulachon runs tend to be erratic, appearing in some years but not others, and appearing only rarely in some river systems (Willson et al. 2004).

In the ocean, eulachon appear to live near the bottom, on the shelf, usually at moderate depths of about 60-650 ft (20-500 m), but they may occur at depths greater than 2,000 ft (~610 m) (Allen and Smith 1988, Eulachon Research Council 2000, Hay and McCarter 2000). In the Gulf of Alaska, eulachon have been captured in trawl samples as deep as 1,640 ft (500 m), with considerable variation among portions of the gulf (Mueter and Norcross 2002). In northern Southeast, they have often been captured in trawl samples in the coastal fiords (Carlson et al. no date).

Abundance

The populations of eulachon in Southeast rivers are not known, but the species is often observed in tremendous numbers in certain rivers, where large congregations of birds and mammals feed on them (for example, in the Alsek, Stikine, and Chilkat rivers and in Berners Bay).

Eulachon have been abundant enough in Southeast to support small commercial harvests. Commercial harvests have occurred in the Stikine, Unuk and Chickamin, and Bradfield river systems, at least in some years (Alaska Department of Fish and Game 2000). The little fish also support subsistence and personal use fisheries in the Chilkat and Chilkoot rivers near Haines (Mills 1982, Magdanz 1988, Betts 1994, Reeves 2001) and the Berners Bay system near Juneau (M. Willson, ecologist, Juneau, AK, personal communication 2004).

Taxonomic Considerations

The genetics of eulachon has received little study, and no studies are known to have been done in Southeast. Genetic evidence indicates that eulachon in general constitute a single evolutionarily significant unit throughout their entire range (McLean et al. 1999); however, other biological data indicate that stocks in individual rivers may differ in characteristics such as size and spawning times (Hay and McCarter 2000).

Significance to the Region and Tongass National Forest

In Southeast, the eulachon is of special importance because of its traditional use by Native groups and its value as a forage fish. The species also occasionally supports small commercial fisheries.

Traditional Use by Native Groups

The name “eulachon” comes from the Chinook Indian word *ulakan*, which means “candlefish” and refers to the unusually large amount of oil in the fish. Alaska Natives traditionally harvested eulachon to be eaten fresh, smoked or dried, or rendered into oil as a dietary supplement or condiment.

According to Betts (1994), the contemporary eulachon subsistence fishery in Southeast is conducted primarily by the Chilkat (*Jilka'at*) and Chilkoot (*Lkoot*) Tlingits of Klukwan and Haines. The fishery is grounded in Tlingit culture and mythology. Locations of fishing and processing are organized by clan affiliation.

In modern times, people have adopted new tools of production and organized labor to fit contemporary family and household structures. Some fishing sites

have changed, and participants have had to shift processing to fewer locations as development and privatization of land have increased.

Commercial Fisheries

In Southeast, small commercial harvests of eulachon have taken place in the Stikine, Unuk and Chickamin, and Bradfield river systems, at least in some years (Alaska Department of Fish and Game 2000). On the Stikine River, in 1975 and 1976, 23,000-29,000 lb (10,455-13,182 kg) of eulachon were harvested, but in many other years no fish were harvested (Walker 2001). From the Unuk and Chickamin rivers in 1984, almost 35,000 lb (15,000 kg) were harvested; however, in some years, no fish have been harvested, and sometimes, the runs appear to have failed completely (Miller and Moffitt 1999, Walker 2001).

Value as a Forage Fish

Eulachon may be especially important to Steller sea lions in Southeast. Energy demands are high for sea lions during spring when females are pregnant and lactating and males are preparing for extended fasting prior to the breeding season. Seasonal pulses of high-energy food resources may be critical to the reproductive success of individual Steller sea lions (Womble 2003). Many sea lions concentrate during the eulachon runs in Berners Bay (Womble 2003) and in Dry Bay near Yakutat (Catterson and Lucey 2002). The importance of eulachon to sea lions could be quite significant because Steller sea lions are listed as a threatened species in Southeast under the U.S. Endangered Species Act.

In some instances, eulachon appear to be extremely important in the diet of bald eagles (Drew and Lepp 1996). Almost 2,000 eagles are attracted to the Stikine Delta spring run of eulachon. The second largest springtime concentration of bald eagles in North America has been noted (anonymous no date). In addition, an estimated 1,000 bald eagles concentrate in Berners Bay in the spring to feed on eulachon (M. Wilson, personal communication 2005).

Research shows that many animals feed on eulachon, including fish (spiny dogfish (*Squalus acanthias*), sablefish (*Anoplopoma fimbria*), arrowtooth flounder (*Atheresthes stomias*), salmon (*Oncorhynchus spp.*), Dolly Varden char (*Salvelinus malma*), Pacific halibut (*Hippoglossus stenolepis*), and Pacific cod (*Gadus macrocephalus*)), sea birds (harlequin ducks (*Histrionicus histrionicus*), pigeon guillemots (*Cepphus columba*), common murres (*Uria aalge*) [Scott 1973], mergansers (*Mergus spp.*), cormorants (*Phalacrocorax spp.*), gulls (*Larus spp.*), and bald eagles (*Haliaeetus leucocephalus*), marine mammals (baleen whales, orcas (*Orcinus Orca*), dolphins, pinnipeds [Kajimura et al. 1980, Huntington 2000, Speckman and Piatt 2000]), and terrestrial mammals (brown bears (*Ursus actos*), wolves (*Canis lupus*).

Considering their oil content and food value, their appearance in rivers before salmon begin spawning, and the number and variety of animals that feed on them, eulachon could be considered one of the most important forage fish in Southeast.

Special Management or Conservation Designations

There are no special designations for eulachon in Southeast. In the last 20 years, however, especially since the mid-1990s, nearly all eulachon spawning runs—from California to Southeastern—have declined (Hay and McCarter 2000). This decreased abundance has caused some scientists to recommend a classification of "threatened" in Canadian waters (Hay and McCarter 2000). For at least one river in Canada, the Bella Coola, scientists recommended a Code 2 status, meaning "intense protective action of uncertain duration" (Lewis and O'Connor 2002).

The eulachon has been recommended by some scientists as an indicator species in the North Pacific (Hay et al. 1997).

HABITAT RELATIONSHIPS

Eulachon spawn only in certain mainland rivers in Southeast. Spawning rivers may be turbid or clear, but all are thought to have spring high water periods caused by heavy rains, characteristic of rivers draining large snowpacks or glaciers (Hay and McCarter 2000). Most of the reported spawning rivers in Alaska are glacial in origin.

In many rivers, spawning is more or less limited to the part of the river influenced by tides (Lewis et al. 2002). In the Berners Bay system, the greatest abundance of eulachon was observed in tidally influenced areas, but some fish ascended well beyond the tidal influence. Eulachon are reported to go as much as 50 mi (80 km) up the Susitna River in Southcentral Alaska (Barrett et al. 1984, Vincent-Lang and Queral 1984), possibly because of a low gradient (Lewis et al. 2002). Eulachon once ascended more than 100 mi (160 km) in the Columbia River system in the Pacific Northwest. Some evidence indicates that water

velocity can limit upstream movements (Lewis et al. 2002). Recent studies by Splangler et al. (2003) in the Twentymile River of Turnagain Arm in Southcentral Alaska should expand knowledge of eulachon ecology and subsistence use in Alaska.

Egg survival of eulachon is greatly influenced by salinity. Exposure to salt water, especially of salinity greater than 16 ppt, can be lethal (Farara 1996). Major temperature changes can also affect survival (Lewis et al. 2002).

Spawning substrates can range from silt, sand, or gravel to cobble and detritus (Smith and Saalfeld 1955, Barrett et al. 1984, Vincent-Lang and Queral 1984,), but sand appears to be most common (Langer et al. 1977, Lewis et al. 2002).

IMPLICATIONS FOR CONSERVATION

Nearly all eulachon spawning runs have declined from California to Southeast in the last 20 years, especially since the mid-1990s. The causes of the declines have not been determined. One factor may be climate change; others may include commercial fisheries for eulachon, forest industry interactions, dredging and habitat alteration in spawning areas, pollution of spawning rivers, and by-catch in offshore trawl fisheries (Hay and McCarter 2000).

Eulachon seem to easily pick up and store pollutants from their spawning rivers. This assimilation of pollutants occurs even though the fish do not feed in fresh water and remain there only a few weeks (Rogers et al. 1990, Washington Department of Fish and Wildlife and Oregon Department of Fish and Wildlife 2001). This sensitivity to pollutants has been a significant problem in British Columbia in areas of industrial development and where mining occurs. For example, eulachon returning to the lower Fraser River contained contaminants from wood-treatment processes (Rogers et al. 1990), and apparently acquired them after river entry (Birtwell et al. 1988, Rogers et al. 1990). Industrial effluent into the Kitimat River after 1972 has tainted eulachon flesh and made it unpalatable (Mikkelson et al. 1996, Pedersen et al. 1995). Nass River eulachon acquired detectable levels of metals derived from mine tailings (Futer and Nassichuk 1983).

Two major eulachon spawning areas in Southeast could be affected by proposed mining activities. In the Taku River, proposed reopening of the Tulsequah Mine could affect water quality. As noted by the Environmental Mining Council of British Columbia, "Re-opening this old acid and heavy metal polluting mine will also involve setting a new tailings pond in the flood plain of the Tulsequah River. While the new mine plan calls for clean-up of the old mine waste, it will introduce new toxic waste problems to the watershed" (Environmental Mining Council of British Columbia 2004).

Berners Bay eulachon could be affected by proposed developments at the Kensington Gold Mine. Current concerns center around a proposed tailings facility in Lower Slate Lake or pollution from increased barge and ferry traffic. The *Alaska Journal of Commerce* reported that Andrew Eller, a university graduate student who had studied the eulachon runs in Berners Bay, said he worried about the effect of the proposed marine terminals associated with the mine on the eulachon and other highly valued marine life (Bluemink 2004)

The eulachon characteristic of picking up pollutants could have far-reaching implications for Native people who harvest them and the many creatures in Southeast that depend on them for food. Pollutants could be passed along to people and up the food chain to bald eagles, Steller sea lions, bears, and perhaps even humpback whales.

The importance of habitat and access to harvesting locations also are concerns of many Native communities.

Three considerations seem to be most important for conserving healthy populations of eulachon in Southeast:

- Because the number of systems supporting eulachon are relatively few and these fish are an important forage resource, provide special attention and protection for all systems supporting eulachon;
- Because eulachon appear to pick up and store pollutants, passing them up the food chain, recognize the potential of activities such as mining, other industrial development, and urban development to pollute the waters that eulachon use; and
- Recognize the traditional value of eulachon to the Native people of Southeast and that maintaining populations involves attention to both habitat and access.

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