Chum Salmon
(Oncorhynchus keta)

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Chum salmon have the widest geographical distribution of all Pacific salmon (Fig 1). They are found from Korea to the Siberian Arctic and from California to the Alaskan and Canadian Arctic. Biologists estimate that chum salmon have a greater biomass than any other Pacific salmon species—upwards of 50% of the annual biomass of all salmon and well more than 1 million tons in some years (Salo 1991).

FIG 1. Adult chum salmon in spawning coloration. (John Schoen)

Chum salmon (also called dog salmon) are of special interest in Southeastern Alaska (Southeast) because they provide the commercial fishery with the second highest catch in numbers and value of all salmon harvested. Because of their abundance and large size, chum salmon are also important for subsistence and provide valuable food for a variety of other animals.

Chum salmon may be sensitive to changes in streams that result from timber harvest, especially any changes in water flow, temperature, or sedimentation (Murphy 1985, Holtby et al. 1989, Scrivener and Brownlee 1989). Because of large-scale hatchery releases of chums, detection of declines in the wild stocks may be difficult or obscured (Halupka et al. 2000).

Chum salmon young go to sea soon after emerging from the gravel. After spending several months close to shore, they disperse to the open ocean, where they are found in water as deep as 200 ft (61 m). After 3 to 5 years at sea, chum salmon return to spawn in their natal streams.

Chum salmon adults have no distinct black spots. Their gill rakers are smooth, fairly short, stout, widely spaced, and fewer than 30 (Mecklenberg et al. 2002). At sea, chums are metallic greenish blue on top and silver below. At spawning, they have vertical bars of green and purple on their sides and white-tipped anal and pelvic fins. Females have single dark horizontal bands along the sides. Juvenile chum salmon have 6 to 14 narrow, short parr marks above the lateral line.

The state angling record for chum salmon is 32 lb (14.5 kg), but most chums weigh between 7 and 18 lb (3 and 8 kg).

STATUS IN SOUTHEASTERN ALASKA

Distribution

In Alaska, chum salmon can be found in all coastal and offshore waters, but their numbers are limited along the Arctic coast (Armstrong 1996). They spawn in coastal streams from intertidal areas to 2,000 mi (3,200 km) upstream in the Yukon River drainage.

In Southeast, chum salmon are abundant and widespread (Fig 2). They inhabit more than 3,000 streams in the region and have 2 population types: summer chum populations that spawn primarily in mainland or northern-island drainages, and fall populations that spawn in ground-water fed streams primarily in southern-island drainages (Halupka et al. 2000).

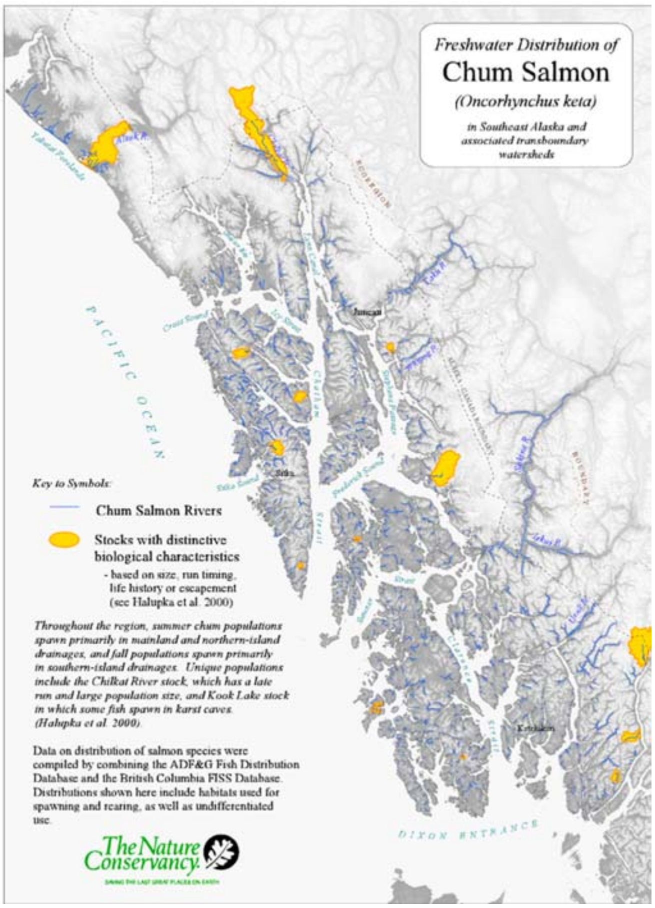

FIG 2. Distribution map of known chum salmon spawning streams in southeastern Alaska.

Chum salmon stocks are distributed more densely and evenly in southern Southeast than in northern Southeast (Halupka et al. 2000). In the Yakutat region, only the East Alsek and Italio rivers support significant numbers of chum salmon. In the rest of Southeast, only the Stikine and Taku rivers support transboundary populations of chum salmon (Halupka et al. 2000).

Abundance

In a few rivers in Southeast, escapements of chum salmon have been quite large through the years. The Chilkat River run of chum salmon is the largest in the region and usually averages more than 54,000 fish a year (Halupka et al. 2000). Escapements of chum salmon into Fish Creek near Hyder have numbered more than 60,000 in some years (Armstrong and Hermans 2004). Disappearance Creek on southern Prince of Wales Island has had a mean escapement count of 26,336 fish, and a mean escapement of nearly 16,000 chum salmon was counted at Harding River near Bradfield Canal (Halupka et al. 2000).

Some stocks appear to be declining, however. When Baker et al. (1996) evaluated escapement trends beginning in 1960, they found that 8 stocks (18% of those studied) were increasing, 27 (60%) were stable, 9 (20%) were declining, and 1 (2%) was in precipitous decline.

In a later study, Halupka et al. (2000) evaluated escapement trends for 433 chum salmon stocks in Southeast for the years 1960 through 1993. They found that, though escapement trends for 12 of these stocks had increased significantly, trends for 41 stocks were significantly declining. Although 41 is a relatively small proportion (9.5%) of the stocks evaluated, the figure represents the highest percentage of decline among all salmon species in the region.

In the study by Halupka et al. (2000), clusters of declining stocks were located on Prince of Wales Island, in Petrof Bay on Kuiu Island, and in Seymour Canal on Admiralty Island. Seven of the declining stocks were from streams on Chichagof Island. Five of the stocks that were increasing were in Cholmondeley Sound. The remainder were scattered throughout Southeast.

Taxonomic Considerations

Halupka et al. (2000) analyzed the biological characteristics of chum salmon stocks in Southeast and concluded that the following stocks had distinctive characteristics:

- The **Chilkat River** stock has late run timing, a large population size, and is an important resource for wildlife.
- The **Herman Creek** stock has a genetic affinity to populations in central British Columbia and may exhibit subpopulation genetic structure. Significant declines in size and age were detected in this stock.
- The **Port Real Marina** stock has a genetic affinity to Queen Charlotte Island stocks, as well as other Prince of Wales Island stocks.
- The **Lover's Cove Creek** stock has unusual allele frequencies, but no other stocks in its geographic area were sampled. Further genetic sampling of northern Southeast stocks is required.

Of special interest are the chum salmon from **Fish Creek** near Hyder, which are thought to be the largest chum salmon in North America. Biologists have found several chums weighing more than 38 lb (17 kg) there. The average weight of chums from the creek is about 20 lb (9 kg), twice the average weight of chums elsewhere (Armstrong and Hermans 2004).

Significance to the Region and Tongass National Forest

One exceptionally late run of chum salmon has become world famous. In the Chilkat River near Haines, upwellings of warm water keep portions of the river ice-free throughout the winter. Large numbers of chum salmon spawn here in October and November and provide food for a phenomenal gathering of bald eagles (*Haliaeetus leucocephalus*) that numbers up to 3,500 at a time (Armstrong 1996). According to Hansen (1987), the strength of the late chum run in the Chilkat Valley may influence the reproductive success of bald eagles over a wide geographic area. In 1982, the State of Alaska recognized the importance of the eagles, the salmon, and their surrounding habitat by establishing the 48,000-acre Alaska Chilkat Bald Eagle Preserve to protect them (Fig 3).

FIG 3. Chilkat River draining into upper Lynn Canal near Haines has warm upwellings and a later run of chum salmon that attracts thousands of bald eagles. In recognition of this unique salmon-eagle system, the State of Alaska established the Chilkat River Bald Eagle Preserve in 1982. (John Schoen)

Throughout Southeast, chum salmon is a major food for bears because of the abundance and large size of the species. In addition, spent chums provide a valuable food source for bald eagles. Chum salmon fry in fresh water are important food for young coho salmon (*Oncorhynchus kisutch*), Dolly Varden (*Salvelinus malma*), cutthroat trout (*O. clarki*), rainbow trout (*O. mykiss*), sculpins, mergansers (*Mergus merganser*), and belted kingfishers (*Ceryle alcyon*) (Armstrong 1996).

Gende et al. (2004) quantified the energy and mineral composition (nitrogen and phosphorous) of live chums, their eggs, and their carcasses and determined where those nutrients went in the watershed. They found that bears removed nearly 50% of the salmon-derived nutrients and energy from the stream by capturing salmon and dragging the carcasses from the water. Much of the salmon biomass was made available to riparian scavengers because bears only partially consumed the fish.

In 2004, commercial fisheries in Southeast harvested 11.2 million chum salmon. The ex-vessel value of the chum harvest at 16 cents a pound was $14.6 million. That value is 25% of the value of all salmon harvested in Southeast, and second only to the value of the commercial coho catch for that year (Alaska Department of Fish and Game [ADF&G] 2004a).

In 2003, sportfishers harvested an estimated 21,000 chum salmon (ADF&G 2004b). In 2002, more than 1,800 chum salmon were reported taken for subsistence or personal use (K. Monagle, ADF&G, personal communication 2004).

Since the early 1970s, hatchery production has doubled the biomass of salmon in the North Pacific Ocean. Chum salmon harvests in Southeast are near historical levels largely because of hatchery production (EVOS Trustee Council 2002).

Special Management or Conservation Designations

The chum salmon from Fish Creek near Hyder have been designated as a Sensitive Species by the U.S. Forest Service because of their large size (Armstrong and Hermans 2004).

Chum salmon stocks of southern Southeast and northern British Columbia, particularly those in Portland Canal, have been designated as Stocks of Special Concern by the U.S./Canada Pacific Salmon Treaty (Halupka et al. 2000).

HABITAT RELATIONSHIPS

In general, early-run chum salmon spawn in the main stems of streams and late-run spawners seek out spring water that has more favorable temperatures through the winter (Salo 1991). The importance of these spring areas extends to the wildlife that use chum salmon at a critical time when other salmon species are not available. The late fall run of salmon in the Chilkat River is a prime example of this relationship.

In Southeast, chum salmon typically spawn in the lower 125 mi (200 km) of rivers, sometimes using the intertidal zone (Halupka et al. 2000). The chums seem to be unable or reluctant to surmount barriers, and this limits the stream habitat they use (Hale et al. 1985). Chums also seem to prefer spawning where upwelling occurs or just above areas of turbulent flow (Salo 1991).

River and stream estuaries are very important for young chum salmon. The timing of entry of juvenile chum salmon into sea water is commonly correlated with the warming of nearshore waters and the accompanying plankton blooms (Salo 1991). Chum salmon smolts typically remain in estuaries for one to several months, feeding extensively and growing rapidly (Mason 1974, Healey 1980).

IMPLICATIONS FOR CONSERVATION

According to Halupka et al. (2000), two factors that could contribute to declining abundance in chum salmon in Southeast are logging practices that result in increased sediment loads in spawning streams and large-scale enhancement activities that may contribute to overexploitation of wild stocks. Several of the declining populations they reported were in areas of intensive timber harvest. In a study on the effects of logging at Carnation Creek in British Columbia, Scrivener and Brownlee (1989) found that after logging, survival of chum salmon up to the time of emergence from the gravel declined from 22.2% to 11.5%.

On the other hand, several other chum salmon stocks in Southeast have declined for no apparent reason. In the analysis by Halupka et al. (2000), 14 declining chum salmon stocks spawned in drainages with minimal human disturbance to their habitat (wilderness areas, roadless areas, and national parks and preserves).

Halupka et al. (2000) also suggest that large-scale enhancement activities can contribute to overexploitation of wild stocks. They wrote:

> A few hatcheries in the region can produce enormous numbers of chum salmon fry and correspondingly large returns of mostly unmarked adults, which cannot be identified as hatchery fish in mixed stock fisheries. For those relying on harvest statistics to assess the health of a fish resource, the success of enhancement efforts has the potential to obscure widespread declines in wild stocks.

Hatcheries in Southeast now mark the majority of chum salmon fry that are released by using the thermal otolith (inner ear bone) mark. Therefore, the contribution of hatchery fish to the chum salmon fisheries is now being assessed. The problem of wild stocks being intercepted during the harvest of hatchery returns still exists, however.

One alarming trend was the decrease in size and age at maturity for some chum salmon stocks from 1980 to mid-1990s, as reported by Helle and Hoffman (1998). This trend appeared to be associated with a major ocean climate regime shift in the North Pacific Ocean that occurred in 1976-77. Two populations of chum salmon studied declined significantly in size at maturity starting in about 1980 (Helle and Hoffman 1998). Four-year-old males declined in weight by about 46% between the early 1970s and the early 1990s. As growth decreased during these years, mean age at maturity increased; therefore, salmon were older before they spawned. The authors and others hypothesize that decreased size could be caused by changes in oceanographic conditions, increased population density, or other factors. Because reproductive success is positively related to body size, smaller size could result in lower survival of chum salmon stocks (Helle and Hoffman 1998). Since the mid-1990s, however, size at maturity and population abundance have increased, possibly indicating another change in the North Pacific Ocean (Helle and Hoffman 1998).

Several considerations seem most important for conserving healthy populations of chum salmon in Southeast:

- Develop research to establish baseline data on habitat condition and spawner abundance to determine status of populations and changes in size of fish at maturity;
- Employ conservative management practices for known threats such as logging and large-scale enhancement activities; and
- Explore the potential importance of streams associated with karst (i.e., limestone substrate) for certain populations of chum salmon (for example, Disappearance Creek and Kook Lake Creek, mentioned in Halupka et al. 2000).

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