

Update on the Status of Pink Salmon in the Pacific Northwest

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The National Marine Fisheries Service (NMFS) received a petition in March 1994 from Professional Resources Organization–Salmon (PRO-Salmon 1994) seeking protection under the U.S. Endangered Species Act of 1973, as amended (ESA, 16 U.S.C. §§ 1531-1543, ESA) for two populations of pink salmon (*Oncorhynchus gorbuscha*) in the state of Washington. In response to the petition, NMFS established a Biological Review Team (BRT) of federal scientists with expertise in salmon biology and ecology, population biology, and genetics to review the status of pink salmon throughout its range in Washington, Oregon, California, and southern British Columbia. The review (Hard et al. 1996) incorporated biological and management information from a variety of sources developed during a public process to identify “distinct population segments” under the ESA and evaluate the risk of extinction of each of these.

The ESA permits listing of distinct population segments of vertebrates as well as named species and subspecies. NMFS policy on this issue for anadromous Pacific salmonids considers a population to be “distinct” for purposes of the ESA if it represents an evolutionarily significant unit (ESU) of the species as a whole (Federal Register 56 [20 November 1991]:58612). To be considered an ESU, a population or group of populations must 1) be substantially reproductively isolated from other populations, and 2) contribute substantially to ecological/genetic diversity of the biological species (Waples 1991, 1995).

Once an ESU is identified, a variety of factors related to population abundance is considered in determining whether a listing is warranted. The pink salmon status review (Hard et al. 1996) addressed two key questions: (1) is the entity in question a distinct population segment (or “species”) as defined by the ESA?, and (2) if so, is the “species” threatened or endangered? The BRT considered several factors in evaluating the first question, including natural rates of straying and recolonization, natural barriers to migration, and measurements of genetic differences among populations. Factors considered by the BRT in evaluating the second question included absolute abundance

and distribution, trends in abundance, natural and human-influenced factors that cause variability in survival and abundance, and possible threats to genetic integrity.

Pink Salmon ESUs

Pink salmon spawn around the Pacific Rim from 44°N to 65°N in Asia and from 48°N to 64°N in North America (Heard 1991). Washington appears to be the southern limit of the spawning distribution of pink salmon in North America; no persistent populations have been documented in Oregon or California, and pink salmon are absent from Idaho. The BRT used genetic, life-history, biogeographic, physiographic, and environmental information to delineate the ESU boundaries for pink salmon in this region. The BRT found that genetic population structure and life history variation (primarily adult run timing and body-size variation) were most informative in identifying pink salmon ESUs (Hard et al. 1996). Even-year pink salmon are genetically distinct from odd-year pink salmon in Washington and southern British Columbia; available data indicate that adult even-year pink salmon from the Snohomish River, Washington also tend to be smaller and spawn earlier than most odd-year pink salmon in northwestern Washington. Based largely on these differences, the BRT identified two pink salmon ESUs in Washington and southern British Columbia (Hard et al. 1996, 2000). These ESUs are based on the marked distinction between even- and odd-year broodlines that are characteristic of pink salmon throughout this species' natural range (Heard 1991).

In the Pacific Northwest south of British Columbia, spawning even-year pink salmon are restricted to the Snohomish River. Genetic and life history data indicate that this population is quite distinctive compared to all other pink salmon in the region. However, available data cannot confirm whether these fish are endemic to this drainage. Several attempts in the early 1900s to establish even-year pink salmon in Puget Sound by transplants of fish from Alaska and British Columbia raise the possibility that Snohomish River even-year pink salmon are not native to the drainage (Hard et al. 1996). However, the BRT concluded that, absent more conclusive evidence to the contrary, these fish should be considered native to the Snohomish River. The BRT could not resolve the extent of the ESU that contains the Snohomish River even-year pink salmon population due to uncertainty about the origin of the Snohomish River population and its relationship to even-year populations in British Columbia. After considering all available information, about half of the BRT members concluded that the Snohomish River even-year population is in an ESU by itself, whereas half judged that the ESU also included populations from British Columbia. In any case, the BRT agreed unanimously that any conclusion about the extent of the even-year pink salmon ESU should be regarded as provisional and subject to revision should substantial new information become available.

The BRT evaluated several possible ESU scenarios for odd-year pink salmon. The majority of BRT members concluded that all odd-year pink salmon populations in

Washington are part of a single ESU. This ESU includes populations in Washington as far west as the Dungeness River (the Elwha River population is considered to be functionally extinct, and the few fish that spawn in that system are considered by the Washington Department of Fish and Wildlife to be strays), and in southern British Columbia (including the Fraser River and eastern Vancouver Island) as far north as Johnstone Strait. A minority of BRT members concluded that populations from Washington rivers draining into the Strait of Juan de Fuca are members of a separate ESU. Collectively, however, BRT members agreed that odd-year pink salmon in Washington contain a considerable amount of genetic and life-history diversity, with populations from the Dungeness, Nooksack, and Nisqually rivers being the most distinctive (Hard et al. 1996). Although several small odd-year populations occur on southwestern Vancouver Island, insufficient information was available for the BRT to determine the relationship of these populations to the proposed odd-year ESU.

Assessment of Extinction Risk

The ESA (Section 3) defines the term “endangered species” as “any species which is in danger of extinction throughout all or a significant portion of its range.” The term “threatened species” is defined in the ESA as “any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.” According to the ESA, the determination whether a species is threatened or endangered should be made on the basis of the best scientific information available regarding its current status, after taking into consideration conservation measures that are proposed or are in place. Because the BRT did not evaluate likely or possible effects of conservation measures, it limited its determinations to scientific conclusions about the risk of extinction faced by identified ESUs under the assumption that present conditions will continue (see Hard et al. 1996). The BRT did not make recommendations as to whether identified ESUs should be listed as threatened or endangered species; these conclusions are made by NMFS after considering conservation measures and other factors that may affect future viability.

The BRT concluded that the even-year pink salmon ESU is not presently at risk of extinction. The BRT based its conclusion on escapement estimates from populations in Washington and southern British Columbia (Hard et al. 1996). Nevertheless, most BRT members were concerned about the status of the sole U.S. population in this ESU (Snohomish River pink salmon). Escapement data indicate that the even-year pink salmon population in the Snohomish River has been increasing steadily since 1980, and this trend has continued since the listing determination was made by NMFS in 1995 (Hard et al. 2000). Nevertheless, this population remains small and isolated. These characteristics and the lack of variable age structure in pink salmon indicate that the population is at some risk due to demographic or environmental fluctuations. All BRT members agreed that this population should be closely monitored, even if it is

determined to be part of a larger ESU. Similarly, many even-year pink salmon populations in British Columbia have very small spawning populations (Hard et al. 1996). Nevertheless, based on this information, NMFS concluded that this ESU does not currently warrant a listing as a threatened or endangered species under the ESA.

The BRT concluded that the odd-year ESU as a whole is not presently at risk of extinction. Most populations in Washington and southern British Columbia have relatively large escapements (Hard et al. 1996). In general, the abundances of most populations are similar to historical levels. Of the two most distinctive Puget Sound populations (from the Nooksack and Nisqually rivers), that from the Nooksack River shows a nonsignificant trend in recent abundance, and that from the Nisqually River shows a significant declining trend. No other factors were found that would suggest that either of these populations is at immediate risk. However, all BRT members expressed concerns about the status of populations in Hood Canal and those along the Strait of Juan de Fuca. Pink salmon in the Dungeness River are declining steeply in abundance, and the Elwha River population is thought to be functionally extinct. Two of the three populations nearest to these have also shown recent declines. However, the remaining odd-year populations in Washington, as well as most of those in southern British Columbia, show no evidence of sustained declines, and some are increasing in abundance (Hard et al. 1996). The BRT members therefore concluded that the odd-year pink salmon ESU is not presently at risk of extinction or endangerment. Based on this conclusion, NMFS determined that this ESU does not currently warrant a listing as a threatened or endangered species under the ESA. However, the BRT members emphasized their concern that further erosion of the marginal populations along the Strait of Juan de Fuca might eventually pose risk to a significant portion of the ESU as a whole. Prominent risk factors for these populations include the quality of freshwater habitat and water withdrawal. In addition, evidence exists for a recent decline in body length of odd-year Washington pink salmon, which increases risk to these populations by limiting their reproductive potential (Hard et al. 1996).

Status Update

Since the review was completed in 1996, many of the same population trends have continued for Washington pink salmon (Hard et al. 2000). Even-year Snohomish River fish are continuing to grow in abundance (see Hendrick, this volume), and there are unpublished reports of even-year pink salmon now in the Stillaguamish River, in low numbers. It remains to be determined whether these are Snohomish River strays.

Odd-year populations in Puget Sound show only moderate departures in abundance from those in the early and mid-1990s. Unpublished WDFW data indicate that abundances of pink salmon in Hood Canal have been variable, and there is some

evidence for further declines in some of these populations. Dungeness River pink salmon continue to occur at very low abundance.

Available data do not provide a serious challenge to the BRT's determinations of ESU boundaries or of its assessment of extinction risk, but these populations should be closely monitored for evidence of declines.

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