APPENDIX D.

HISTORICAL OCCURRENCE OF COHO SALMON IN THE UPPER KLAMATH, SHASTA, AND SCOTT RIVERS.

California Department of Fish and Game
Northern California and North Coast Region
February 2002

There has been recent public controversy regarding the historical distribution of coho (or silver) salmon (*Oncorhynchus kisutch*) in California. Some believe that coho salmon are not native to the upper Klamath River and tributaries (Siskiyou County Farm Bureau 2001a, 2001b; Interactive Citizens United 2001; California Farm Bureau Federation 2001). Others contend that coho salmon are not native to California (Greenhorn Action Grange 2001). Reasons cited are that existing natural coho salmon populations in the upper Klamath River and tributaries (primarily the Scott and Shasta rivers) are derived from hatchery stocking of non-indigenous stocks in the late nineteenth century (Siskiyou County Farm Bureau 2001a, 2001b; Interactive Citizens United 2001; California Farm Bureau Federation 2001) and natural historical habitat conditions did not provide suitable habitat conditions to support self-sustaining coho salmon populations (Siskiyou County Farm Bureau 2001a; Greenhorn Action Grange 2001). The purpose of this report is to review the available information and to provide some insight on whether coho salmon are native to the upper Klamath River and tributaries.

Written documentation regarding coho salmon in the Klamath Basin, especially in the upper Klamath River, is scarce prior to the early 1900's. Contributing to the lack of information was the apparent difficulty in recognizing that there were different species of salmon inhabiting the rivers of the state. Fortune et al. (1966), reviewed Klamath Falls newspaper accounts of salmon and possibly steelhead in the upper Klamath Basin and found that many people had difficulty properly identifying the different species of salmonids in the river. The term "salmon-trout" was a popular name used by many local inhabitants to describe any large, silvery-looking fish that appeared periodically in the river. Fortune et al. (1966) suggests that Klamath River fishermen apparently supported the use of the term salmon-trout *"in order to fish when trout season was closed, as there was no closed season on salmon-trout*". On April 9, 1912, The Evening Herald published an article that classified all trout on the Pacific Coast as "salmon-trout".

Snyder (1931) stated that *"(s)ilver salmon are said to migrate to the headwaters of the Klamath to spawn. Nothing definite was learned about them from inquiry because most people are unable to distinguish them*". It was his opinion that there was little interest in coho salmon in general because chinook salmon were so much larger and more abundant. The lack of ability to differentiate between various salmonid species was not only a problem in the Klamath Basin, but apparently occurred throughout the State. In the Twenty-Second Biennial Report to the State of California Fish and Game Commission (CFGC 1913) , W. H. Shebley, Superintendent of Hatcheries, writes *"Strange as it may appear, the presence of the silver [coho] salmon in the waters of this State remained unnoticed until Dr. Gilbert, Professor of Zoology at Stanford University, a few seasons ago called attention to them. Heretofore, all the salmon taken in our rivers have been commercially classed as Quinnat [chinook]*".

Early Stocking History

The earliest record of coho salmon being stocked in the Klamath Basin was of a plant made in 1895. Fortune et al. (1966) reports that 460,000 coho salmon were stocked in the Klamath River (300,000 fry and 160,000 yearlings). Further examination of the original records from the U.S. Commission on Fish and Fisheries (1895) revealed those fish were raised in the Ft. Gaston facility in Hoopa and were stocked in the Trinity River and in Supply Creek, a tributary to the Trinity River. Those fish were reared from eggs taken at a facility in Redwood Creek (a substation of the Ft. Gaston facility) and also from eggs shipped from another facility not identified in the report (but were likely from out of the basin). Insight as to the purpose of this 1895 coho salmon plant may be found in the U.S. Commission on Fish and Fisheries (1895) report that states; "*Most of the salmon and steelhead eggs were taken at the* [Redwood Creek] *substation, as there was no run of either kind in the Trinity, all the fish having been taken at the cannery at the mouth of Klamath River*". Although the Ft. Gaston facility operated until 1898, 1895 was the only year coho salmon were stocked into the Klamath Basin prior to 1911 (Cobb 1931).

In anticipation of the construction of Copco Dam, the "Klamathon Racks", a fish egg taking station located near the old town of Klamathon, was built in 1910 and began operating that same year (Leitritz 1970). These racks extended across the Klamath River, effectively blocking the salmon runs. The Klamathon Racks were, "*necessary that the supply of salmon may be maintained in the Klamath River...*" (CFGC 1918). Fish trapping records beginning in the 1910-1911 season indicate that coho salmon were migrating upriver through that area, making it clear that their upstream migration encompassed areas upriver from where the Iron Gate and Copco dams now reside (Cobb 1931).

Although the construction of the Klamathon Racks began in 1910, the racks were not completed on time. The Fiscal Year 1911 report (July 1, 1910 to June 30, 1911) of the U.S. Fish Commissioner states that: *"....the racks were not completed in time to intercept the run of chinook salmon. Later in the season, before the completion of the silver salmon work, they were carried away, but not before satisfactory collections of eggs had been made"*. The actual number of coho salmon eggs taken during the 1910-1911 season at the Klamathon Racks was not given in the records, however, 2,109,000 coho salmon eggs collected there were transferred to the California Fish Commission's Sisson (Mt. Shasta) Hatchery (CFGC 1913). The resultant fry were subsequently stocked back into the Klamath and Sacramento rivers (CFGC 1913). This was the first effort made by the State of California to increase the runs of coho salmon (CFGC 1913). Beginning with the 1912-1913 season, coho salmon eggs taken at the Klamathon Racks were mostly reared and released from the US Bureau of Fisheries' Hornbrook Hatchery on the Klamath River.

Apparently, no coho salmon eggs were collected at the Klamathon Racks during the 1911-1912 and 1917-1918 seasons as coho salmon are not mentioned in the available federal and state records. However, coho salmon eggs were taken during the five consecutive seasons beginning with the 1912-1913 season (Cobb 1931). With two exceptions (1913-1914 and 1915-1916), the numbers of coho salmon eggs collected each season at the Klamathon Racks are not available, however, the number of fry reared at the Hornbrook Hatchery from coho salmon eggs taken at the Klamathon Racks are provided (Cobb 1931, Fortune et al. 1966). Number of eggs collected and number of coho salmon produced from 1910 through 1917 are summarized in Appendix Table D-1.

Appendix Table D-1. Coho salmon eggs collected at the Klamathon Racks and coho salmon hatchery production in the upper Klamath River, 1910 through 1917 (source: CFGC 1913; Cobb 1931; Fortune 1966).

Season	Eggs taken	Number of coho produced	Est. # of females[2/]	Number released to Klamath River[1/]		
				Fry	Yearling	Total
1910-1911	2,109,000 (minimum)	unknown	881	700,000	0	700,000 [3/]
1911-1912	0	0	0	0	0	0
1912-1913	unknown	117,320	49	17,320	0	17,320[4/]
1913-1914	3,129,000	2,632,300	1,307	2,548,960	0	2,548,960
1914-1915	unknown	2,375,770	992	1,098,000	0	1,098,000[5/]
1915-1916	2,823,000	2,169,050	1,179	2,169,050	0	2,169,050
1916-1917	unknown	61,000	25	50,000	11,000	61,000

1/ Released in Siskiyou County.
2/ Number of coho produced, or eggs taken if available, divided by 2,394 (average # of eggs per female coho).
3/ 719,000 were also stocked in the Sacramento River.
4/ Disposition of 100,000 remaining eggs collected is not specified in the available records.
5/ Disposition of remaining coho production is not given in the available records.

To estimate the number of females needed to obtain the number of eggs collected at the Klamathon Racks, we used the average number of eggs per female coho salmon (2,394 - see Coho Salmon Status Review, *Chapter III, Biology - Life History and Unique Characteristics*). Based on this, an estimated 881 females would have been required to obtain the number of eggs collected at the Klamathon Racks that were transferred to Sisson Hatchery during the 1910-1911 season. Greater numbers of females were required in subsequent seasons (1913-1914 through 1915-1916) (Appendix Table D-1). The 1912 -1913 and 1916-1917 seasons were drought years in which the take of salmon eggs, both chinook and coho salmon, was greatly reduced (Fiscal Year 1913 report of the U.S. Fish Commissioner, CFGC 1918). The relatively large numbers of coho salmon females required to yield the reported egg take and hatchery production indicates that significant numbers of coho salmon were in the Klamath River in the vicinity of the Klamathon Racks during those years.

The Klamathon Racks were rebuilt during the fall of 1918 and ownership of the facility was granted to the State of California by the U.S. Bureau of Fisheries. It began supplying most of the eggs utilized by the State because production from other stations, such as the Baird Station on the McCloud River, was seriously curtailed due to impacts from ocean harvest, irrigation diversions and dam building (CFGC 1921). At this time, fish culture emphasis for the State focused on the production of chinook salmon and trout, and although many coho salmon were caught at the Klamathon Racks, it was the larger chinook salmon that were selected (Bryant 1923). Since the Hornbrook Hatchery was considered by the State to be ill-equipped to rear fry and because it had an unreliable water supply, the facility was abandoned in 1919 in favor of the new Fall Creek Hatchery (CFGC 1921).

Fortune et al. (1966) indicates that hatchery coho salmon were stocked in the Klamath River on only four occasions between 1919 and 1959. Totals of 178,000, 73,380, 20,000 and 20,000 fry and fingerlings were planted in 1919, 1934, 1940 and 1941, respectively. A review of California Fish and Game Commission Biennial Reports for the years 1930 through 1950 reveals that additional plants totaling 476,000 coho salmon were made to the Klamath River (Siskiyou County) between 1930 and 1932 (CFGC 1932). These fish were reared at the Fall Creek Hatchery (CFGC 1932) and presumably originated from the Klamathon Racks, as was the practice of the day.

Hatchery Stocks

Historically, the practice of importing non-native fish was common, especially in systems where native fish had been extirpated or were in low abundance (also see Status Review, *Chapter VII, Influence of Existing Management Efforts*). Following completion of Iron Gate Hatchery in 1966, adult coho salmon returns were less than 500 fish. After the completion of Trinity River Hatchery in 1963, adult coho salmon returns at this facility rarely exceeded 1,000 fish prior to 1971. In an effort to increase returns to Iron Gate Hatchery, coho salmon from the Cascade River in Oregon were stocked in 1966, 1967 and 1969 (CDFG 1994). The first significant transfer of coho salmon to Trinity River Hatchery occurred in 1964 when Eel River coho salmon stock were brought in. This was followed by plantings of coho salmon originating from the Cascade River, Oregon in 1966, 1967 and 1969. Noyo River stock was also planted in 1969 and Alsea River stock was planted in the Trinity in 1970 (CDFG 1994). It appears the intent of these out-of-basin transfers was to augment already existing, albeit dwindling, natural coho salmon populations. Current California Fish and Game Commission policy now essentially prohibits all out-of-basin fish transfers.

Coho Salmon in the Shasta and Scott Rivers

In 1930, the California Department of Fish and Game (Department) installed and began operating a fish counting station in the Shasta River near its confluence with the Klamath River. This counting station has been operated annually since then to enumerate the return of fall-run chinook salmon. In a few years however, the counting station has been operated later into the season to count coho salmon and steelhead. Coho salmon returns to the Shasta River have been documented in almost every year since 1934. More than 291 coho salmon were counted in 2001 (Mark Hampton, pers. comm.). Similar information is lacking for the Scott River as few attempts were made to document coho salmon returns in the past. However, the Department estimated historical coho salmon escapement in the Scott River to be 2,000 fish (CDWR 1965). The basis for this estimate is not provided in the report and thus the accuracy of the estimate cannot be determined. Brownell et. al. (1999) reviewed Department warden diaries from the 1950s that showed "*coho salmon in virtually every upper Klamath and Scott stream with a ditch and hayfield*". Prior to a federally-funded channel improvement project through the Scott River Valley, the Scott River was a low velocity, meandering stream, which is ideal for coho salmon (Brownell et. al. 1999)**.**

In the Scott River basin, adults are known to spawn in the East Fork of the Scott River upstream to Meadow Creek and in the South Fork as far as Jackson Creek. Coho salmon spawning was recently confirmed (Dec. 14, 2001) in the East Fork of the Scott River to approximately 200 yards upstream of the mouth of Kangaroo Creek, beneath the Highway 3 bridge crossings on Sugar and French creeks, and in Miners Creek immediately downstream of

the lower Miners Creek Road bridge crossing. Coho salmon also utilize many other tributaries to the Scott River such as Kelsey, Tompkins, Shackelford, Mill, Kidder, Patterson, and Etna creeks (Hassler et al. 1991). Juvenile coho salmon have been recently captured in Scott River mainstem outmigrant trapping efforts (Chesney 2002).

The distribution of rearing coho salmon within the streams listed above appear to be largely confined to the relatively deeper pool (>1.5') habitat where small and large woody debris (e.g. tree branches, tree trunks, root wads or overhanging live woody-stemmed vegetation) exist. These tributary streams also have a relatively dense riparian canopy which shades the stream for much of the day, keeping stream temperatures generally below 68ºF throughout the summer months, thus providing marginally suitable rearing habitat conditions for juvenile coho salmon.

Juvenile coho salmon are generally found where stream gradients are less than 3 to 4 percent. A good woody debris complex within deeper pool habitats appears to override bottom substrate deficiencies. A good example of this is Miners Creek where juvenile coho salmon have been seen in three different years residing in pools whose substrate is comprised entirely of pure decomposed granitic sand overlain with fine silt.

In the Shasta River, spawning coho salmon utilize gravel areas similar to those used by steelhead (Skinner 1959). These areas include the lower seven miles of the mainstem Shasta, Big Springs Creek, mainstem Shasta above Big Springs, Parks Creek (when flows are adequate), and the lower three miles of Yreka Creek (CDFG 1997). Juvenile coho salmon habitat is restricted in the Shasta River by high summer water temperature to approximately ten miles of the upper river, roughly delineated by the Siskiyou County Road A-12 crossing at river-mile 22 to one mile upstream of the confluence of Parks Creek at river-mile 32. Suitable water temperature is maintained in this reach by spring accretions that account for the majority of the flow in this system during the summer months. No water is released from Dwinnell Dam except for deliveries of irrigation water immediately downstream of the impoundment (CDFG 1997). This reach of the river is characterized by a meandering stream course, abundant aquatic vegetation, and intermittently dense riparian vegetation that provides the requisite cover elements for coho salmon and other juvenile salmonids. Summer water temperature limits salmonid rearing in the remainder of the river when Shasta Valley air temperature exceeds 100 ^{0} F and riparian vegetation is sparse or absent. Outmigrating juvenile coho salmon have recently been captured in downstream trapping efforts in the Shasta River (Chesney 2002).

Discussion and Conclusions

Information on the historical occurrence of coho salmon in the upper Klamath River is sparse. However, lack of information is not evidence that coho salmon were historically absent because this could be due to insufficient efforts to observe or document them, or to misidentification. Lack of historical information on coho salmon in the Klamath River can be attributed, in part, to the lack of proper species identification (Snyder 1931).

Credible scientific information sources describe the native North American range of coho salmon as extending from Alaskan coastal waters to the central California coast (Evermann and Clark 1931; Shapovalov and Taft 1954; Fry 1973; Moyle 1976; Sandercock 1991), and this description is widely accepted by fishery biologists and ichthyologists. Snyder (1931) states that coho salmon in the Klamath River “occur in large numbers”. Although these sources do not specifically state that coho salmon are native to the upper Klamath River and tributaries, it is

important to note that none of these references specifically exclude these streams from the described range of coho salmon.

The fact that the upper Klamath River and tributaries are: 1) contiguous with documented historical coho salmon distribution in the lower reaches of the Klamath River system and historical coho salmon streams both north and south of the Klamath River; 2) contain no natural barriers that would prevent their migration into the upper reaches and tributaries such as the Scott and Shasta rivers; 3) have physical attributes that would have produced suitable coho salmon habitat in the past (e.g. gradient, morphology, and, in some cases like the Shasta River, spring sources that provide perennial flow); and 4) still contain suitable coho salmon habitat, provides substantial evidence that coho salmon likely inhabited the upper Klamath River and tributaries prior to hatchery stocking. It is evident from the coho salmon's persistent presence, and field observations made by the Department and other biologists, that sufficient habitat still exists in the Shasta and Scott rivers to support sustainable populations of coho salmon.

Although it cannot be determined with absolute certainty that the 1895 stocking did not result in a portion of the runs observed 15 years later in the Klamath River, this initial stocking was likely too small and in the wrong area to have had much chance of establishing a new, self-reproducing population in the upper Klamath River and tributaries. At least some portion of the eggs reared and released in the Trinity system in 1895 originated from Redwood Creek; a much smaller system. Redwood Creek coho salmon are specifically adapted to swimming relatively short distances (<60 miles) to reach their customary spawning areas. It seems unlikely these fish could have strayed the additional 150 river-miles necessary to reach the upper Klamath River to successfully establish a new run. Further, the eggs hatched and reared at Fort Gaston had opportunity to imprint to the Trinity River, and this also would have reduced the chances of straying to the upper portions of the Klamath. Finally, as reported by the Klamath River Basin Fishery Task Force (1991), Withler (1982) found that no introduction of Pacific anadromous salmonids using non-native broodstock has been successful in producing new, self-reproducing populations anywhere on the West Coast.

The great majority of coho salmon returning to spawn are three-year-old fish (although a small portion of each brood year returns as two-year-old fish, these primarily consist of precocious males). Therefore, run size in any given year is strongly influenced by the number of fish produced three years prior. Hatchery records indicate both coho salmon fry and yearlings were planted in 1895. It is not clear from the records if the fry and yearlings originated from the same brood year or were from two separate brood years. Regardless, because of their three-year life cycle, coho salmon returns from the 1895 plant would have appeared at the Klamathon Racks in only one or two of every three consecutive years. Egg take records from the Klamathon Racks show that this is not the case: coho salmon eggs were taken in substantial numbers in consecutive years beginning with the 1912-1913 season (Appendix Table D-1). This would not have been possible if all the adult fish had been descendants of fry and yearling plants made in 1895.

Substantial coho salmon populations appear to have been present in the upper Klamath River in 1910 as evidenced by the egg collections made at the Klamathon racks during the initial year of operation. The relatively large number of females required to produce the number of eggs collected that year and in subsequent years suggests that native coho salmon were well established in the Klamath River upstream of Iron Gate Dam's location. For the reasons described above, it is unlikely that these runs could have originated from the plants made in the

Trinity River in 1895. Coho salmon were well documented in the Shasta and Scott rivers long before the construction of Iron Gate and Trinity River hatcheries and the subsequent introductions of large numbers of non-native coho salmon at the hatcheries. Based on the above discussions, the Department believes that coho salmon are native to the upper Klamath River system, including the Scott and Shasta Rivers, and historically occurred in these streams prior to any hatchery stocking.

LITERATURE CITED

Brownell, N. F., W. M. Kier, and M. L. Reber. 1999. Historical and current presence and absence of coho salmon, *Oncorhynchus kisutch*, in the northern California portion of the Southern Oregon-Northern California evolutionary significant unit. Prepared for the U.S. Department of Commerce, NOAA National Marine Fisheries Service, Southwest Fisheries Science Center, Service Order 40-ABNF-7-01479.

Bryant, H. C. 1923. Salmon fishcultural operations on the Klamath River. California Fish and Game. Sacramento, California. Volume 9, Number 1.

California Department of Fish and Game (CDFG). 1994. Petition to the Board of Forestry to list coho salmon (*Oncorhynchus kisutch*) as a sensitive species. Redding, Ca. 109p.

California Department of Fish and Game (CDFG). 1997. A Biological Needs Assessment for Anadromous Fish in the Shasta River Siskiyou County, California. Northern California-North Coast Region. Redding, CA. 29p.

California Department of Water Resources (CDWR). 1965. Bulletin No.136, North Coastal Area Investigation, Appendix C Fish and Wildlife. Prepared by California Department of Fish and Game Water Projects Branch, Sacramento CA.

California Farm Bureau Federation 2001. Letter from J. Hewitt to J. Pisciotto, plus supporting documentation, regarding submission of information for the CDFG coho status review, dated 8/31/2001.

California Fish and Game Commission (CFGC). 1913. Twenty-second Biennial Report for the years 1910-1912. Sacramento CA.

California Fish and Game Commission (CFGC). 1918. Twenty-fifth Biennial Report for the years 1912-1914. Sacramento CA.

California Fish and Game Commission (CFGC). 1921. Twenty-sixth Biennial for the years 1914-1916. Sacramento CA.

California Fish and Game Commission (CFGC). 1932. Thirty-second Biennial Report for the years 1930-1932. Sacramento CA.

Chesney, B. 2002. Shasta and Scott River Juvenile Salmonid Outmigrant Study. California Department of Fish and Game Steelhead Research and Monitoring Program, Annual Report 2001, Study 2a1. Draft-unpublished. Yreka, CA.

Cobb, J. N. 1931. Pacific Salmon Fisheries. Appendix XIII. Report of the United States Commissioner of Fisheries for the Fiscal Year 1930. U.S. Department of Commerce, Bureau of Fisheries. U.S. Government Printing Office, Washington.

Evermann, A.M. and Clark, H. W. 1931. A distributional list of the species of freshwater fishes known to occur in California. Calif. Div. of Fish and Game. Fish Bull. No. 35. 67 pp.

Fortune, J. D., A. R. Gerlach and C. J. Hanel. 1966. A study to determine the feasibility of establishing salmon and steelhead in the upper Klamath Basin. Oregon State Game Commission and Pacific Power and Light. 129 p.

Fry, D.H. 1973. Anadromous fishes of California. Calif. Dept. of Fish and Game. 112 pp.

Greenhorn Action Grange. 2001. Letter from R. Butler to M. Chrisman, plus supporting documentation, regarding submission of information for the CDFG coho status review. no date.

Hassler, T.J., C.M. Sullivan, and G.R. Stern. 1991. Distribution of coho salmon in California. Annual Report to California Department of Fish and Game, Contract No. FG7292.

Interactive Citizens United 2001. Letter from R. Gierak to R. Hight, plus supporting documentation regarding submission of information for the CDFG coho status review, no date.

Klamath River Basin Fisheries Task Force. 1991. Long Range Plan for the Klamath Basin Conservation Area Fishery Restoration Program. U.S. Fish and Wildlife Service (Yreka, CA) and William M. Kier Associates.

Leitritz, E. 1970. A history of California fish hatcheries 1870-1960. California Department of Fish and Game. Fish Bulletin 150. Inland Fisheries Branch, Sacramento, California.

Moyle, P.B. 1976. Inland fishes of California. Univ. of Calif. Press. Berkeley. 415 pp.

Sandercock, F.K. 1991. Life history of coho salmon. *In*: Pacific salmon life histories, C. Croot and L. Margolis, (eds). UBC Press, Vancouver. 564 pp.

Shapovalov, L. and A. C. Taft. 1954. The life histories of the steelhead rainbow trout (*Salmo gairdneri*) and silver salmon *(Oncorhynchus kisutch*) with special reference to Waddell Creek, California, and recommendations regarding their management. Calif. Dept. Fish and Game, Fish Bull. No. 98. 373 pp.

Siskiyou County Farm Bureau 2001a. Letter from M. Armstrong to J. Pisciotto plus supporting documentation regarding submission of information for the CDFG coho status review, dated 9/19/2001.

Siskiyou County Farm Bureau 2001b. Letter from M. Armstrong to the CDFG, plus supporting documentation, regarding submission of information for the CDFG coho status review, dated 11/26/2001.

Skinner, J.E. 1959. Preliminary report of the fish and wildlife in relation to plans for water development in Shasta Valley. California Department of Water Resources; Shasta Valley Investigations, Bulletin No. 87.

Snyder, J.O. 1931. Salmon of the Klamath River, California. Division of Fish and Game, Bulletin No. 34.

U.S. Commission on Fish and Fisheries. 1895. Report of the Commissioner of Fisheries, 1895.

U.S. Fish Commission. 1911. Report of the Commission of Fisheries for Fiscal Year 1911.

U.S. Fish Commission. 1913. Report of the Commission of Fisheries for Fiscal Year 1913.

Withler, F. C. 1982. Transplanting Pacific salmon. Canadian Tech Report of Fisheries and Aquatic Sciences 1079. 27p.

Notes

Mark Hampton, Associate Fishery Biologist, California Department of Fish and Game, personal conversation, February 2002.