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HISTORICAL AND CURRENT PRESENCE-ABSENCE DATA OF COHO SALMON *(Oncorhynchus kisutch)* IN THE CENTRAL CALIFORNIA EVOLUTIONARY SIGNIFICANT UNIT

By

Peter B. Adams, Thomas E. Laidig, Kelly R. Silberberg,
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ADMINISTRATIVE REPORT T-96-01

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Historical and Current Presence-Absence Data of Coho Salmon (*Oncorhynchus kisutch*) in the Central California Evolutionary Significant Unit

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ABSTRACT

A summary of the presence and absence of coho salmon, *Oncorhynchus kisutch*, in streams in the Central California Evolutionary Significant Unit (ESU) with historical records of this species has been prepared to assist in the Endangered Species Act listing process. Presence-absence data were used because of: 1) the short time frame dictated by the listing process, and 2) the use of presence-absence data in pre-listing documents. Presence-absence data used here come from surveys conducted for this study and from data collected by other researchers.

Coho salmon were absent from 50% of the historical record streams. This figure is similar to reports by earlier researchers. The percent of historical record streams with coho salmon absent is highest in the highly urbanized San Francisco Bay and the lowest in coastal Marin County. Percent of absence was also high in Sonoma County, with other areas being roughly equal.

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INTRODUCTION

This report summarizes data collected by personnel of the Tiburon Laboratory and from a variety of other sources on coho salmon, *Oncorhynchus kisutch*, in the Central California Evolutionary Significant Unit (ESU). These data have been gathered and organized quickly with the intention of aiding the threatened species listing process. The Central California ESU is the only ESU where coho salmon are presently considered to be in danger of extinction (Weitkamp et al. 1995). Originally, this report was to cover only surveys conducted by the Tiburon Laboratory personnel, but as additional data from other sources became available, these data were incorporated into this report to increase its usefulness.

Coho salmon presence-absence data were used primarily because of the short time frame available to collect and analyze data. Abundance estimates would require much more time and effort, and therefore could have been accomplished only over a very restrictive geographical scope. Presence-absence data also figured prominently in the reports used in supporting the proposed endangered species status for the Central California ESU (Brown and Moyle 1991, Brown et al. 1994). The same presence-absence data were also used in the listing announcement (NMFS 1995) and the coastwide Status Review of coho salmon (Weitkamp et al. 1995). The Brown and Moyle (1991) report recommends the use of presence-absence surveys as a tool to assess coho salmon status. The limitations of presence-absence data are acknowledged by the authors, but their use is justified as "the best available data." The use of presence-absence data has the shortcoming of the difficultly of defining absence. While a single occurrence of a fish defines presence, absence can only be an estimate unless the entire stream is sampled. A sampling effort this extensive would defeat the purpose of a quick, exploratory study for which presence-absence data are used. Absence can only be defined as a coho salmon not occurring within a set sampling protocol. The uses and limitations of presence-absence data are examined more closely in the proceedings of a workshop on sampling coho salmon (Adams, In Prep.).

This report is a preliminary draft of the analysis of historical and current coho salmon presence-absence data from the Central California ESU that has been prepared to meet the listing deadline. We fully expect to obtain more presence-absence data from the next sampling season and other sources, and will incorporate that data into a final version of this report.

METHODS

Study Area

The Central California ESU ranges from Punta Gorda in northern California to the San Lorenzo River in Santa Cruz, California, and includes tributaries to San Francisco Bay, but excludes the Sacramento-San Joaquin River system (Weitkamp et al. 1995). The northern limit, Punta Gorda, was selected primarily because of the clear shift in terrestrial and marine environment that occurs there. Coho salmon populations in the Mattole River, just north of Punta Gorda, were more similar to populations in the north than to populations in south. The

San Lorenzo River is thought to mark the current southern boundary of coho salmon on the Pacific coast.

Historical Presence-Absence

Historical presence-absence data were drawn from a large number of literature sources (Appendix). The four principal sources were Brown and Moyle (1991), Hassler et al. (1991), Wahle and Pearson (1987), and Atkinson et al. (1967). Various other literature sources cited in the reference section of the Appendix were also used. Streams are listed in geographical order from north to south by county, and within a drainage from closest to the ocean to the headwaters.

Current Presence-Absence

Current presence-absence data were gathered using a variety of methods and from an even larger variety of sources (Appendix). Most streams included had a historical record of the presence of coho salmon, but a few were found with coho salmon that had no historical reference. Sampling methodology for snorkel surveys of juvenile numbers conducted by the Tiburon Laboratory personnel is described below. The methods used to collect other current presence-absence data include electrofishing, spawner surveys, snorkel surveys, and hatchery planting records. In a few instances, there are numbers from different methods for estimating current abundance in the same year. The actual sampling protocols that produced these data were usually not available, beyond the general sampling method. It was also intended to conduct adult spawner surveys for this study, but this was precluded by Federal budget issues.

Year of current abundance is the most recent year for which there are data. Since coho salmon have a three-year life cycle, data from the last three years are used (1993 through 1995), but in some streams, there are older sampling data. Ideally, there should be data for all three life cycle years, but this is rare. In some instances when data from the last three years were available, coho salmon were both present and absent in the three-year cycle. In those instances, data from years with coho salmon presence were included.

Snorkel surveys were conducted on central and northern California streams between August 1 and October 31, 1995. For practicality, a maximum of ten sampling units was chosen. An ideal sampling unit was a shaded low velocity pool with large woody debris. The actual sampling units matched the ideal as well as possible. The ten units were divided among lower, middle, and upper reaches of the stream. At each unit, one of the divers monitored the pool by entering on the downstream side to avoid disturbance, and recorded the species, numbers, and size of the fish, along with any comments, particularly in relation to visibility. The alternate diver estimated pool size and recorded habitat characteristics. If presence was determined, sampling was terminated at the end of the individual sampling unit. Otherwise, sampling continued until ten sampling units were completed.

RESULTS

Coho salmon were absent from exactly one-half of the streams in the Central California ESU for which we have current data (Table 1). There were 203 streams in the Central California ESU with historical records of coho salmon and there were current data for 74 streams or 36%. Of the 74 streams, coho were absent in 37 of them and present in the other 37 streams. However, there were also nine streams in which coho salmon were found for which there were no historical records.

Coho salmon were absent in 38% (14 of 37) of the Mendocino County streams for which there were both historical and current data. Coho salmon were found in four Mendocino County streams with no historical records. Mendocino County had the largest number of streams with historical records of coho salmon (115).

In Sonoma County, which is largely the Gualala River and Russian River Drainages, both of which extend into Mendocino County, coho salmon were absent in 73% (11 of 15) of the streams with both historical and current data. Dry Creek was not included because of the location of Warm Springs Hatchery there. Coho salmon were found in five streams with no historical data records. This area had the second highest number of streams with historical records of coho salmon.

In coastal Marin County, only 17% (one of six) of the streams with both historical and current data had coho salmon absent. There were no streams that were found with coho salmon that did not have historical records, and there were only 11 streams with historical records.

In San Mateo County, only four streams with historical records had both historical and current data and coho salmon were absent in two of them (50%). There were no streams that were found with coho salmon that did not have historical records.

In Santa Cruz County, coho salmon were absent in 40% (two of five) of the streams with both historical and current data. Coho salmon were not found in any streams that did not have historical records, and there were only seven streams with historical records.

In Monterey County, only one of the two streams with historical data had current data and coho salmon were absent there (100%). Coho salmon were not found in any streams in Monterey County.

Coho salmon were absent from all streams in San Francisco Bay (100%, six of six). No other streams were found where coho salmon were present.

Table 1. Summary statistics of historical and current presence-absence data for coho salmon, *Oncorhynchus kisutch*, from the Central California Evolutionary Unit (Appendix). Historical data were determined from literature and current data determined from surveys conducted from 1993 to 1995. Absence data from Brown et al. (1994) are also included.

Area	Historical Record	Streams With Data	Number Absent	Percent Absent	Brown et al. Percent Absent
Mendocino County	115	37	14	38	41
Sonoma County	57	15	11	73	85
Coastal Marin County	11	6	1	17	0
San Mateo County	5	4	2	50	
Santa Cruz County	7	5	2	40	61
Monterey Count	2	1	1	100	
San Francisco Bay	6	6	6	100	100
Total	203	74	37	50	53

While numbers found by different sampling methodologies are not directly comparable, they do provide some rough measure as to how large populations are in the different areas. This is only intended to give some measure of scale beyond what simple presence can provide. Numbers of coho salmon were highest in coastal Marin County due to large numbers found in the Lagunitas Creek Drainage and Olema Creek. No coho salmon were found in San Francisco Bay where they were absent from all creeks with historical records. Coho salmon were also absent from Monterey County, but only a single creek was surveyed. Numbers of coho salmon were also low for Mendocino County, partly due to extremely low numbers from the Ten Mile River Drainage.

DISCUSSION

The percentages of historically occupied streams where coho salmon are absent is remarkably similar to earlier published numbers by Brown et al. (1994) for streams in the Central California ESU. Their percent of absence of 53% is very close to the percent of 50% found here. It should also be noted that there were nine streams where coho salmon were found that had no historical records. Actually, one would expect the percent of absence to be slightly higher in this study than in Brown et al. (1994), since this study used much stricter rules for establishing presence and absence (actual numbers vs. classification) and a much more restrictive time span (1993 to 1995 vs. 1980s up to 1991).

The percent of streams with historical records where coho salmon are absent is the highest in San Francisco Bay, the most urbanized area, and the lowest in coastal Marin County. This is paradoxical because for some streams in Marin County, the headwaters of these two groups are on adjacent east and west facing watersheds of the same mountains. The next highest percent of streams where coho salmon are absent is in Sonoma County, with the other areas having similar percentages of absence in streams with historical record. An area-by-area comparison of this study and Brown et al. (1994) show that percents of absence are very similar. While again cautioning that the numbers from different methods are not directly comparable, the numbers of coho salmon taken in the sampling have generally the same pattern as the presence-absence data. The numbers are highest in coastal Marin streams and zero in the San Francisco Bay area. The exception to the presence-absence pattern data is that the numbers are lower in Mendocino County than in the presence-absence data pattern.

The percentages of absence are probably slightly high due to a sampling artifact that the San Francisco Bay area, where all streams did not have coho salmon were completely surveyed, while other areas further north, where there are more coho, still remain to be surveyed. This should be remedied by completion of the sampling in the upcoming season after which a more extensive analysis will be made of all of the data from the Central California ESU.

Weitkamp et al. (1995) in the coastwide coho salmon Status Review found the presence-absence data from Brown et al. (1994) compelling enough to declare that coho

salmon in the Central California ESU are presently in danger of extinction, the most ominous assessment of any of the ESUs. This study finds similar numbers to those reported by Brown et al. (1994) further supporting the assessment in the coastwide Status Review.

ACKNOWLEDGEMENTS

People from many organizations contributed data on coho salmon presence-absence in streams in the Central California ESU. We would particularly like to thank Weldon Jones and Scott Harris of California Department of Fish and Game, Ukiah; David Hines and Jon Ambrose of Georgia-Pacific Corporation; and Robert Coey of California Department Fish and Game, Healdsburg.

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Appendix. List of streams with historical records of coho salmon for the Central California ESU with current records of presence-absence where available. Data included are stream name, historical reference, current abundance, year of current abundance, method for estimating current abundance, and current reference. Current abundance is either the absolute number found during sampling, P for presence, A for absence, R for restocked, or U for unavailable to sampling. Method is either E for electrofishing, A for adult spawner survey, S for snorkel survey, or H for hatchery planting. When there is no current reference, data are collected by this study.

Stream	Historical Reference	Current Abundance	Year	Method	Current Reference
		Mendocino County			
Whale Gulch	10	A	1984	E	24
Indian Creek	38				
Jackass Creek	31	A	1987	E	24
Usal Creek	10,20	6	1993	E	24
Cottoneva Creek	8,41	A	1983	E	24
South Fork	10,23				
Slaughterhouse Gulch	37				
North Fork	23				
Hardy Creek	10				
Juan Creek	10				
Little Juan Creek	10				

Appendix (continued). List of streams with historical records of coho salmon for the Central California ESU with current records of presence-absence where available.

Stream	Historical Reference	Current Abundance	Year	Method	Current Reference
Howard Creek	38	R,A	95,95	H,E	21,24
DeHaven Creek	9,10,23	A	1995	E	24
Wages Creek	23	R,A,6	95,95,93	H,E	21,24
Abalobadiah Creek		2	1988	E	24
Seaside Creek	10				
Frazer Creek	10				
Ten Mile River	10				
South Fork	3,10	6	1995/6	A	2
Smith Creek	10	P,4	95,95/6	E,A	2,28
Campbell Creek	10	P,7	95,95/6	E,A	2,28
Churchman Creek	10	2	1995/6	A	28
Redwood Creek	32	A	1995	E	2
Mill Creek	10				
North Fork	3,10	A	1995	E	2
Little North Fork	10,23	P,10	94,95/6	E,A	2,28
Bald Hill Creek		1	1991	E	24
Middle Fork	10	10	1995/6	A	28
Bear Haven Creek		P,2	94,95/6	E,A	2,28
Little Bear Haven Creek	10	A	1995	E	2

Appendix (continued). List of streams with historical records of coho salmon for the Central California ESU with current records of presence-absence where available.

Stream	Historical Reference	Current Abundance	Year	Method	Current Reference
Pudding Creek	3,10,23	10	1995	E	24
Little Valley Creek	10				
Noyo River	3,8,23				
South Fork	10,23	220	1991/2	A	29
Kass Creek	10,23	31	1991/2	A	29
North Fork	10,23	1	1995	E	24
Parlin Creek	10	A	1991/2	A	29
Bear Gulch	10				
Duffy Gulch	10	A	1986	E	24
North Fork	10				
Marble Gulch Creek	10				
Hayworth Creek	10				
Little North Fork	10,23,37	3	1992	E	24
Middle Fork	10				
Olds Creek	10				
Hayshed Gulch	10				
Redwood Creek	10,37	6	1989	E	24
Hare Creek	23	15	1989	E	24
South Fork	10				
Bunker Gulch Creek	10,23				
Covington Gulch Creek	23				
Jug Handle Creek	10	A	1995	E	24

Appendix (continued). List of streams with historical records of coho salmon for the Central California ESU with current records of presence-absence where available.

Stream	Historical Reference	Current Abundance	Year	Method	Current Reference
Caspar Creek	6,10,23	25,75	95,95/6	E,A	21,28
North Fork	41	36	1995/6	A	28
South Fork	41	10	1995/6	A	28
Doyle Creek	10,23	1	1986	E	24
Russian Gulch	7	75	1988	E	24
Big River	3,8,10,23				
Railroad Gulch		5	1995	E	24
Little North Fork	10				
East Branch	10,23,37	2	1986	E	24
Berry Gulch Creek	23	14	1995	E	24
North Fork	37				
Two Log Creek	23,37	12	1983	E	24
North Fork	10	1	1995	E	24
Chamberlain Creek	10,23	1	1983	E	24
Arvola Gulch	10	A	1983	E	24
James Creek	10,37	A	1995	E	24
North Fork	10				
South Fork	10	A	1983	E	24
Ramon Creek	32				
Daugherty Creek	10				
Gates Creek		9	1988	E	24
Johnson Creek	37				

Appendix (continued). List of streams with historical records of coho salmon for the Central California ESU with current records of presence-absence where available.

Stream	Historical Reference	Current Abundance	Year	Method	Current Reference
Little River	10,23	9	1995	E	24
Buckhorn Creek	10				
Albion River	10,23	2	1983	E	24
Railroad Gulch	10				
South Fork	10				
North Fork	10				
Marsh Creek	10				
Big Salmon Creek	10,23	6	1995	E	19
Little Salmon Creek	10				
Donnelly Creek		20	1995	E	19
Hazel Gulch Creek	10	28	1995	E	19
West Branch	10	A	1995	E	19
Navarro River	3,8,23				
North Fork	10	4	1994	E	24
Tramway Gulch	37				
Flynn Creek	23	13	1983	E	24
South Branch	10	A	1991	E	24
Bridge Creek	10				
North Branch	10	4	1994	E	24
Little North Fork	10	A	1994	E	21
John Smith	10,23	8	1994	E	24

Appendix (continued). List of streams with historical records of coho salmon for the Central California ESU with current records of presence-absence where available.

Stream	Historical Reference	Current Abundance	Year	Method	Current Reference
Navarro River (continued)					
Mill Creek	10				
Indian Creek	10				
North Fork	10				
Gut Creek	10				
Ham Canyon (Big Canyon)	10				
Rancheria Creek (Big Canyon)	10	A	1994	E	21
Horse Creek	10				
Minnie Creek	10				
Camp Creek	10				
German Creek	10				
Robinson Creek (Anderson-Mills)	10				
Greenwood Creek	10	A	1986	E	24
Elk Creek	10				
Three Springs Creek	10				
Soda Fork	10				
Sulphur Fork	10				
Mallo Pass Creek	10	A	1988	E	24
Brush Creek	10	A	1986	E	24

Appendix (continued). List of streams with historical records of coho salmon for the Central California ESU with current records of presence-absence where available.

Stream	Historical Reference	Current Abundance	Year	Method	Current Reference
Garcia River	3,8,10,23	A	1987	E	24
South Fork	23	R,A	95,92	H,E	21,24
Fleming Creek	23	A	1991	E	24
Schooner Gulch	10	A	1986	E	24
North Fork	10				
Fish Rock Gulch	10				
Sonoma County					
Gualala River	3,10,11,16,23				
Little North Fork	23	R,A	95,95	H,E	21,24
Doty Creek	10	A	1986	E	24
South Fork	11,16,23				
Buckeye Creek	11	A	1995	E	24
Franchini Creek	11	A	1995	E	24
Marshall (Sproule) Creek	11				
Wheatfield Fork	11,16				
Fuller Creek	11,16				
North Fork	11,16				
South Fork	11,16				
Haupt Creek	11				
House Creek	11,16				

Appendix (continued). List of streams with historical records of coho salmon for the Central California ESU with current records of presence-absence where available.

Stream	Historical Reference	Current Abundance	Year	Method	Current Reference
Fort Ross Creek	11,16				
Russian Gulch	9,10,16,23				
Middle Branch	10				
East Branch	10				
Russian River	3,8,10,11,16				
Willow Creek	11,16	P	1995	E	15
Sheephouse Creek	11,16				
Freezeout Creek	11,16	A	1995	E	15
Austin Creek	11,16				
Kohute Gulch	11				
Kidd Creek	11,16				
East Austin Creek	11,16				
Gilliam Creek	11				
Gray Creek	4				
Ward Creek	4				
Red Slide Creek	11				
Dutch Bill Creek	11,16,25				
Hulbert Creek	25				
Mission Creek	11				
Green Valley Creek	16	P	1995	E	15
Purrington Creek		P	1995	E	15
Mark West Creek	16	A	1995	S	
Maacama Creek		P	1995	E	15

Appendix (continued). List of streams with historical records of coho salmon for the Central California ESU with current records of presence-absence where available.

Stream	Historical Reference	Current Abundance	Year	Method	Current Reference
Russian River (continued)					
Franz Creek		P	1995	E	15
Redwood Creek		P	1995	E	15
Dry Creek	10.11	P	1995	E,H	15
Mill Creek	25	P	1995	E	15
Felta Creek		P	1995	E	15
Wallace Creek	25	A	1995	E	15
Pena Creek	25				
Warm Springs Creek	16				
East Fork	10				
West Fork	10	A	1995	S	
York Creek	10				
Forsythe Creek	23				
Seward Creek	23	A	1995	S	
Eldridge Creek	23				
Jack Smith Creek	23				
Salt Hollow Creek	10				
Rocky Creek	10				
Mariposa Creek	10	A	1995	S	
Fisher Creek	10				
Corral Creek	10				
Scotty Creek	11,16				

Appendix (continued). List of streams with historical records of coho salmon for the Central California ESU with current records of presence-absence where available.

Stream	Historical Reference	Current Abundance	Year	Method	Current Reference
Salmon Creek	3,11,16	A	1995	S	
Finley Creek	11,16	U			
Coleman Valley Creek	11,16				
Fay Creek	11,16	A	1995	S	
Tannery Creek	16	U			
Coastal Marin County					
Walker Creek	12,16	U			
Salmon Creek	12	U			
Arroyo Sausal Creek	12				
Lagunitas Creek	3,8,12,16,18	62	1995	E	39
Haggerty Gulch Creek	12	U			
Olema Creek	16	47	1995	S	
Nicasio Creek	12				
Devil Gulch Creek	12,16	64	1995	E	39
San Geronimo Creek	12,16	87	1995	E	39
Bolinas Lagoon					
Pine Gulch Creek	16	A	1995	E,S	
Redwood Creek	12,16	13	1994	E	35

Appendix (continued). List of streams with historical records of coho salmon for the Central California ESU with current records of presence-absence where available.

Stream	Historical Reference	Current Abundance	Year	Method	Current Reference
		San Mateo County			
San Gregorio Creek	40	A	1995	S	
Pescadero Creek	13,14,34,40	18	1995	S	
Butano Creek	40	A	1995	S	
Gazos Creek	13	1	1995	S	
		Santa Cruz County			
Waddell Creek	33				
East Branch	3,14,34,40	24	1995	E	36
Scott Creek	3,14,40	222	1995	E,H	36
San Vicente Creek	14	U			
San Lorenzo River	22	P	1994	H	30
Hare Creek	3,14,34,40				
Soquel Creek	5,40	A	1995	S	
Aptos Creek	5	A	1995	S	

Appendix (continued). List of streams with historical records of coho salmon for the Central California ESU with current records of presence-absence where available.

Stream	Historical Reference	Current Abundance	Year	Method	Current Reference
		Monterey County			
Carmel River	5				
Big Sur River	5	A	1995	S	
		San Francisco Bay			
Alameda Creek	27	A	1995	E	1
San Pablo Creek	27	A	1995	S	
Walnut Creek	26	A	1995	S	
Corte Madera Creek	27	A	1995	S	
San Anselmo Creek	17	A	1995	S	
Mill Creek	27	A	1995	S	

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