Fish Population Information in KRIS Gualala

KRIS Web Background Pages: Fish Populations

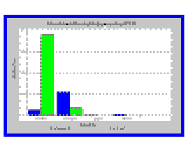
Fisheries data in KRIS Gualala come mostly from California Department of Fish and Game (CDFG). Numerous electrofishing samples were collected in 2001 as part of the North Coast Watershed Assessment Program (NCWAP), although not all was available for use in KRIS Gualala. Older data include an adult steelhead and coho creel census, mark-recapture adult steelhead population estimates, downstream migrant trapping, direct observation and electrofishing samples dating back to 1952 (Kimsey, 1953). A private firm, EIP Associates, combined direct dive observation with electrofishing in an extensive survey of the lower South Fork Gualala River in July 1991, October 1991 and October 1993 (EIP, 1995) as part of studies funded by Gualala Aggregate, Inc. Although data are not sufficiently complete to estimate fish populations of the Gualala River, recent and historic samples in combination with habitat information allows discussion of status and trends of various species.

CDFG surveys from the 1960's and early 1970's (Klamt and Edwards, 1970) included visual estimates of juvenile steelhead, coho and other fishes present. The abundance of fish was estimated as the number of fish by species per hundred feet of stream. Although considerable effort was expended in formulating these estimates (Bob Klamt, personal communication), they are not useful for quantitatively estimating fish populations. They can, however, be used as a relative indicator of abundance, and an indicator of fish community structure during the period of the survey. Fish communities and relative abundance can then be compared with fish community structure as indicated by electrofishing in more recent periods (Higgins, 1997). NCWAP CDFG staff object to the use of recently collected electrofishing data in assessment of community structure (see note).

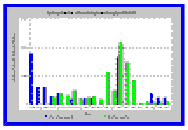
Coho Salmon: Taylor estimated that the Gualala River coho salmon population in the 1960's, prior to 1964 flood damage, was 4,000 adults annually (table). No self sustaining, viable adult coho salmon population has been evident in the Gualala River since the drought of 1976-77. All recent sightings of coho have been immediately following planting of hatchery fish. Recovery through re-introduction of coho in the Gualala River has failed several times. The response to habitat collapse after Post WW II floods was to try to restore fisheries through artificial culture and planting was heavy from 1969 through 1973 (see table). Re-introduction was attempted again in 1983-84, 1988 and from 1995-1997. Recently CDFG (2002) published the *Status Review of California Coho Salmon North of San Francisco,* which specifically mentions the Gualala River and Russian River as basins where coho recovery will be problematic.

Although the actual historic distribution of coho salmon in the Gualala River basin is unknown, the mild gradient, the cooling influence of the marine climate and tributaries from old growth forests, and the abundant large wood would have made the lower reaches of the North Fork, Buckeye Creek, Rockpile Creek, Wheatfield Fork, and the South Fork ideal for coho spawning and rearing (Groot and Margolis, 1991; Welsh et al., 2000).

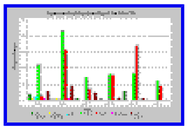
This image from the KRIS Gualala Map project shows stream gradient. The large extent of stream reaches with gradient less than two percent (light and dark blue) explains why the Gualala was once a producer of coho salmon. Mild gradients such as these were optimal for this species for both spawning and rearing and they overlap in the west with what was mature redwood forest. The latter would have produced both cool water and complex streams with numerous pools formed by large wood. Coho were also known to extend to interior basin streams such as House Creek (Cox, 1994).



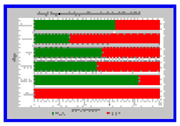
This chart shows the number of adult steelhead and coho salmon captured in the Gualala River in the 1972-73 fishing season (November-February). The catch of over 800 coho is the last indication of a substantial coho population in the Gualala. CDFG was planting coho juveniles in the Gualala in years prior to this survey (Boydstun, 1975) so some fish may have been of hatchery origin. High flows most likely hampered catch in January and February. Data provided by California Department of Fish and Game (Boydstun, 1975).



The number of juvenile coho salmon and steelhead trout planted in the Gualala River between 1969 and 1997 is shown at left. The California Department of Fish and Game is responsible for all coho plants but many of the steelhead plants in recent years were by the Gualala River Steelhead Project. Coho were planted in the Little North Fork Gualala River in 1988 and 1995-1997.



Results from a downstream migrant trap on Pepperwood Creek in 1974 are shown at left. This is the only California Department of Fish and Game effort using a downstream migrant trap in the Gualala Basin. Although coho salmon juveniles were still present in Pepperwood Creek, they were at extremely low levels relative to other species. Steelhead juveniles sampled included both wild and hatchery fish that had been planted in Pepperwood Creek. The high number of sculpin and Gualala roach relative to coho and steelhead are likely linked to habitat simplification in response to post WW II logging and the 1964 flood.

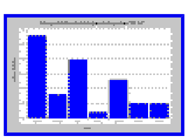


This chart shows the findings of field surveys (Adams et al., 1999) to determine the presence or absence of juvenile coho salmon within the Central California ESU in streams that were known to harbor coho historically. The ESU extends south of the Mattole River to Santa Cruz, including some San Francisco Bay tributaries. Thirty-six percent of Mendocino streams surveyed lacked coho and they were missing in 72% of Sonoma streams where they were formerly known to occur. The loss of coho salmon from tributary basins and portions of large rivers shows fragmentation of coho populations and a warning sign for declines toward extinction according to the authors. Absence data is provisional pending more extensive study, because coho may exist but occur only in some years.

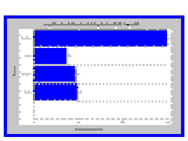
Governor Earl Warren. 1952.

Steelhead: Kimsey (1953) sampled the lower mainstem Gualala River using electrofishing in 1952 and found the reach dominated by steelhead juveniles, with some roach, stickleback and sculpin present. The adult steelhead population was estimated by the California Department of Fish and Game in 1974-75 at 7608, with a 95% confidence interval of 6126-10379, and in 1975-76 the population was estimated at 6300 (Boydstun, 1976a, 1976b). The author noted that catch per unit effort had declined from 1950 to 1970's (see below) and took that as evidence that the adult steelhead population was declining. Boydstun (1977) found that Gualala River steelhead spent two years in freshwater and two years in the ocean before returning as adults. IFR interprets the current lack of older age juvenile salmonids, low density of juvenile steelhead overall, predominance of Gualala roach in many stream reaches and the extensive reaches of dry habitat as indications that steelhead have declined still further (see Hypothesis #1). Samples where steelhead yearlings and two year olds are a significant component of the community may represent reaches in a state of recovery.

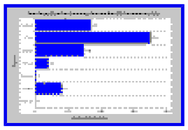
Gualala River steelhead in the estuary (Brown, 1986) show a much smaller size relative to the nearby Garcia River estuary (Higgins, 1995). This could be as a result of lack of carrying capacity of reaches upstream and would be consistent with the fisheries data collected in 2001 by CDFG, which showed few old age steelhead and many streams dominated by roach, stickleback and sculpin. This is also consistent with habitat conditions showing few deep pools, extensive dry reaches and high water temperatures (see Hypotheses #2 and #4).



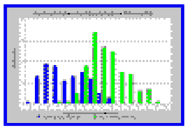
Catch rates of adult steelhead for sport anglers were much higher in 1953-54 than in subsequent years. In contrast to the four hours it took an angler to catch a steelhead in 953-54, it took about twenty angler hours to catch a steelhead in 1972-73. Boydstun (1974a) noted that while angler effort in 1972-73 was 60% greater than in 1953-55, the catch in the 1970s was just 25% of the 1950's catch. He attributed the decreased catch rate to decreased adult steelhead abundance. Angler effort and success may be impaired by high flow conditions and associated turbidity. Data from CDFG (Boydstun, 1976a, 1976b).



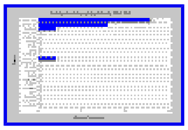
This chart summarizes an electrofishing sample taken on the lower main Gualala River just below the North Fork in August 1952 by the California Department of Fish and Game (Kimsey, 1953). It shows that steelhead juveniles were more abundant than roach and other species present. Because this sample was taken below the North Fork, where waters are cooler, it cannot be directly compared with more recent samples that were taken further upstream.



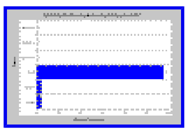
This chart summarizes results of electrofishing surveys of the Lower South Fork Gualala River below the Wheatfield Fork in July 1991 by EIP Associates (1995). The chart shows a community dominated by Gualala roach and stickleback with steelhead present but sub-dominant.



This chart compares the length of the juvenile steelhead in seining samples by Brown (1986) in the Gualala River estuary to those caught by Higgins (1995) in the Garcia River estuary. Fish from the Gualala estuary were smaller than those captured in the Garcia estuary. Yearling steelhead are those between 100 mm-150 mm (4-6 inches) and fish over 150 mm are two years old or older. Data are derived from a California Department of Fish and Game memo (Brown, 1986) and Higgins (1996).



California Department of Fish and Game electrofishing in November 1995 showed that Flatridge Creek had a fish community dominated by young-of-the-year steelhead with yearling and older steelhead also represented in the sample. Presence of older age steelhead suggests some modest pool habitat in this reach of Flat Ridge Creek, but no habitat typing data were collected in this tributary of Buckeye Creek in 2001.



California Department of Fish and Game electrofishing in September 2001 showed that the middle mainstem Wheatfield Fork Gualala River had no steelhead, but that the fish community was dominated by roach. The endemic Gualala roach is well adapted to warm water and thrives in reaches with elevated temperatures. The mainstem Wheatfield attains lethal temperatures for salmonids.

Gualala roach are endemic and, according to Moyle (1976), capable of withstanding water temperatures of 95^{o} F. The Gualala roach experiences a competitive advantage over salmonids in warm water, similar to the findings of Reeves (1985) regarding competition of red-side shiners and steelhead in the Umpqua River. The roach has always been present in the Gualala River basin but was formerly present only at low levels (Bruer, 1953). It has only risen to dominance with ecological change but it too faces a threat to survival, the loss of surface flows (Higgins, 1997).

Sacramento suckers were also native to the Gualala basin. Spacek (1997) noted that suckers were the most abundant species immediately after the 1964 flood and that they were extremely common in the Wheatfield Fork near Boy Scout Camp. Klamt and Edwards (1970) also noted the presence of suckers in a survey of Buckeye Creek. The absence of suckers in the Gualala River in all recent surveys is likely indicative of a major decline in their population, if not their wholesale disappearance. This fish is somewhat tolerant of sediment and very tolerant of warm water.

Pacific lamprey: This species needs clean gravel for spawning, similar to salmonids. Juveniles remain in freshwater for up to four years. Known as ammocetes, they are blind and live burrowed into stable pockets of fine sediment. The downstream migrant trapping records for Big Pepperwood Creek in 1974 showed that almost 100 spawned out adults were captured. Ammocetes are readily captured, if they are in the vicinity during electrofishing yet few recent samples include them. It is possible that high bedload mobility is also limiting the success of Pacific lamprey spawning and rearing in the Gualala and its tributaries, similar to problems affecting salmonids (see Hypothesis #2).

Stickleback: The stickleback is a hardy species with a high tolerance for warm water. They inhabit the margins of streams and areas with little current and often thrive in aggraded streams with shallow edges and elevated temperatures. The stickleback can exhibit either a resident or an anadromous life history. Profound habitat change in the Gualala has favored this species over salmonids, but continuing aggradation can also eclipse habitat even for the ubiquitous stickleback..

Candlefish (Eulachon): The candlefish or eulachon was found in the Gualala prior to 1970 but not in samples since (Brown, 1986). This member of the smelt family is anadromous, with adults running upstream in March and spawning in mainstems of large rivers. Their adhesive eggs stick to the surface of stream gravels and juveniles immediately leave freshwater after hatching within 60 days. This species was an important food fish for the Yurok Indians of the Klamath River, where the candlefish declined, probably as a result of shifting bedload (Kier Associates, 1991). It is likely that changes in mainstem stream bed conditions also brought about the demise of this species in the Gualala.

Sculpin: Both prickly sculpin and the coast range sculpin are found in the Gualala and they comprise a large proportion of the fish community in some samples. Maahs (1997) found abundant sculpin of various age classes in downstream migrant traps in Ten Mile River tributaries that were recently disturbed by logging. He also found that their predation on juvenile salmonids was significant. In the lower Klamath basin, downstream migrant trap results for logging damaged tributaries also show high proportions of sculpin (USFWS, 1990). Sculpin were the most prevalent species captured in Pepperwood Creek in 1974 after logging damage (see chart above). Sculpin may find easier foraging in simplified streams after logging. Prickly sculpin and other sculpin species may also go back and forth between fresh and salt water, which allows them to leave the river during adverse conditions and return when flows and turbidity drop.

See Higgins (1997) and the section "Fish Population Status and Trends" for scientific names of all species found in the Gualala River and its estuary and further discussions as well as more extensive references.

References

Boydstun, L. B. 1973. Progress Report for Coastal Steelhead Study. California Department of Fish and Game. 22 p.

Boydstun, L. B. 1974a. Project Progress Report Coastal Steelhead Study. June 1, 1972 to June 30, 1973. California Department of Fish and Game Project No. AFS-16-2.32 p.

Boydstun, L. B. 1974b. Coastal Steelhead Study. June 1, 1973 to June 30, 1974. California Department of Fish and Game Project No. AFS-16-1.32 p.

Boydstun, L. B. 1976a. Coastal Steelhead Study. July 1,1974 to June 30,1975. California Department of Fish and Game Project No. AFS-16-3. 8 p.

Boydstun, L. B. 1976b. Coastal Steelhead Study. July 1, 1975 to June 30, 1976. California Department of Fish and Game Project No. AFS-164. 12 p.

Boydstun, L.B. 1977. California's steelhead program. in T. Hassler and R. Van Kirk, eds. Proceedings of the genetic implications of steelhead management symposium, 1977. Calif. Coop. Fish. Res. Unit special report 77-1. pp. 26-30.

Brown, L.R., P.B. Moyle, and R.M. Yoshiyama. 1994. Historical Decline and Current Status of Coho Salmon in California. North American Journal of Fisheries Management. 14(2):237-261.

Bruer, RR 1953. Field correspondence to Inland Fisheries Branch, Region III recommending Gualala River be opened to sport fishing after closure for five years. California Dept. of Fish and Game, Yountville, CA.

CA Department of Fish and Game. 2002. Status Review of California Coho Salmon North of San Francisco . Report to the California Fish and Game Commission. California Department of Fish and Game, Sacramento , CA. 336pp. http://www.dfg.ca.gov/nafwb/pubs/2002/2002_04_coho_status.pdf. *Caution large file!*

California Resources Agency. In Review. Gualala River Watershed Synthesis. CA Dept. of Fish and Game, State Water Res. Control Bd., CA Dept. of Water Resources, CA Div. on Mines and Geology and CA Dept. of Forestry. Sacramento, CA. Draft released January 16, 2001.

Cox, W 1994. Letter to Jim Berry regarding distribution and habitat conditions of coho salmon with table showing current and historical distribution of coho within Gualala River and other streams in Sonoma and Mendocino County, California Department of Fish and Game, Region 3, Yountville, CA. 2 p.

DeHaven, R.W. 2001. Reconnaissance-level spawning and habitat surveys of steelhead trout, Gualala River, California, 2001. Prepared by the author (Richard_DeHaven@fws.gov Or drdehave@hotmail.com), April 2001, for use by agencies, groups and individuals involved in steelhead recovery efforts. 23pp.

EIP Associates. 1995. Gualala Aggregates, Inc. Addendum To Final Environmental Impact Report. State Clearinghouse No. 92 123014. April, 1995. Prepared for Permit and Resource Management Department Sonoma County, CA.

Gallagher, S.P. 2001. Results of the winter steelhead (*Oncorhynchus mykiss*) spawning survey on the Noyo River, California with comparison to some historic habitat information. California Department of Fish and Game. Steelhead Research and Monitoring Program. Fort Bragg, CA. 29 pp.

Groot, C. and L. Margolis (eds.). 1991. Pacific Salmon Life Histories. Department of Fisheries and Oceans, Canada. Printed by University of British Columbia Press, Vancouver, B.C. 564 p.

Higgins, P.T. 1997. Gualala River Watershed Literature Search and Assimilation. Funded by the Coastal Conservancy under contract to Redwood Coast Land Conservancy. Gualala, CA. 59 pp.

Jones, Wendell. Personal Communication. California Department of Fish and Game Fisheries Biologists, retired. Ukiah, CA.

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

Kimsey, J. B. 1953. Population Sampling of Three North Coastal Streams Closed To Summer Trout Fishing-1952 Season. First Progress Report. California Department of Fish and Game. 15 p.

Klamt, Robert. Personal communication. Fisheries biologist for the North Coast Regional Water Quality Control Board, Santa Rosa, CA.

Klamt, R.R. and R. Edwards. 1970. Buckeye Creek Stream Survey, personal observations. Buckeye Creek surveyed from headwaters to upper fish limit on foot and by vehicle, total distance 18.4 miles (3 hand drawn maps, description and dimensions of log jams). August 19, 1970. California Department of Fish and Game, Region 3, Yountville, CA. 2 p.

Maahs, M. 1997. 1997 Outmigrant trapping, coho relocation and sculpin predation survey of the South Fork Ten Mile River. Prepared for Humboldt County Resource Conservation District. Salmon Trollers Marketing Association, Inc. Fort Bragg, CA. 37 pp. without appendices.

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

Reeves, G.H. 1985. Competition between redside shiners and steelhead trout in the Umpqua River, Oregon. Doctoral thesis, Oregon State University, Corvalis, Ore.

Shapavalov, L. and A.C. Taft. 1954. The history of steelhead trout and silver salmon with special reference to Waddell Creek, California, with special recommendations regarding their management. CA Dept. of Fish and Game Bull. 98:375 p.

U.S. Fish and Wildlife Service. 1990. Klamath Fisheries Assessment Program: Investigations on lower tributaries Klamath River. Fisheries Assistance Office, Arcata, CA.

Welsh, H. H., Roelofs, T. D., Frissel, C. A., 2000. Aquatic Ecosystems of the Redwood Region. in The Redwood Forest. Eds. R. Noss. Island Press. Chapter 6.

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