Endangered Species Act - Section 7 Consultation

SUPPLEMENTAL BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The Pacific Coast Salmon Plan
and
Amendment 13 to the Plan

Agency: National Marine Fisheries Service,
Northwest and Southwest Regional
Sustainable Fisheries Divisions

Consultation Conducted by
National Marine Fisheries Service
Protected Resources Division

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INTRODUCTION

The National Marine Fisheries Service (NMFS) is required under section 7 of the Endangered Species Act (ESA) to conduct consultations which consider the impacts of ocean salmon fisheries to salmon species listed under the ESA. This supplemental biological opinion considers the effects of west coast ocean salmon fisheries on listed populations of coho salmon. NMFS has listed three distinct population segments, or evolutionarily significant units (ESU), of coho: the central California coastal (CCC) ESU, the southern Oregon northern California coastal (SONCC) ESU, and the Oregon coastal (OC) ESU (61 FR 56138, October 31, 1996; 62 FR 43937 August 18, 1997; 63 FR 42587, August 10, 1998).

The ocean salmon fisheries in the exclusive economic zone (EEZ) off Washington, Oregon, and California are managed under authority of the Magnuson-Stevens Act. Annual management recommendations are developed according the "Pacific Coast Salmon Plan" of the Pacific Fishery Management Council (PFMC). The PFMC provides its management recommendations to the Secretary of Commerce, who implements the measures in the EEZ if they are found to be consistent with the Magnuson-Stevens Act and other applicable law. Because the Secretary, acting through NMFS, has the ultimate authority for the Pacific Coast Salmon Plan and its implementation, NMFS is both the action agency and the consulting agency in this consultation.

CONSULTATION HISTORY

NMFS has considered the impacts to salmon species listed under the ESA resulting from PFMC fisheries in several biological opinions (Table 1). In a biological opinion dated March 8, 1996, NMFS considered the impacts to salmon species listed under the ESA resulting from PFMC fisheries. Provisions of the March 8, 1996, opinion regarding Sacramento River winter chinook were revised in a reinitiated section 7 consultation dated February 18, 1997. A supplemental biological opinion and conference report dated April 30, 1997, considered the effects from the 1997 PFMC fisheries on newly listed southern SONCC coho, CCC coho, and Umpqua River cutthroat trout as well as on ten ESUs of steelhead proposed for listing. A supplemental biological opinion dated April 29, 1998, was issued for seven new steelhead listings: two endangered steelhead ESUs located in California (Southern California) and Washington (Upper Columbia River), and five threatened steelhead ESUs located in California (Central Valley, Central California Coast and South-Central California Coast) and Idaho, Washington, and Oregon (Lower Columbia River and Snake River Basin). All provisions and conclusions in the March 8, 1996, opinion remain in effect unless specifically revised by either the February 18, 1997, consultation, the April 30, 1997 consultation, the April 29, 1998 consultation, or this supplemental opinion. The April 29, 1998, supplemental biological opinion was limited to consideration of the 1998 ocean salmon fishery annual regulation promulgated pursuant to the PFMC salmon FMP. Since the issuance of that opinion, NMFS has listed the OC coho ESU as threatened.

Table 1. NMFS biological opinions on ocean fisheries implemented under the FMP.

Date	ESU covered and effective period
March 1, 1991	Sacramento River winter chinook
March 8, 1996	Snake River chinook and sockeye, Sacramento River winter chinook (5 years)
February 18, 1997	Sacramento River winter chinook (4 years)
April 30, 1997	SONCC coho (1 year), CCC coho (1 year), Umpqua River cutthroat trout, all listed ESUs of steelhead
April 29, 1998	SONCC coho (1 year), CCC coho (1 year), Umpqua River cutthroat trout, all listed ESUs of steelhead

BIOLOGICAL OPINION

I. Description of the Proposed Action

A. Proposed Action

Pursuant to the Magnuson-Stevens Fishery Conservation and Management Act, the National Marine Fisheries Service proposes to promulgate ocean salmon fishing regulations developed in accordance with the Pacific Coast Salmon Plan (FMP). Specifically, NMFS proposes to implement a salmon fishery consistent with Amendment 13 to the FMP (PFMC 1997a), which was intended to (a) set management targets for the total harvest exploitation rate for Oregon Coast Natural (OCN) coho that significantly reduce the impact of fisheries on the recovery of depressed OCN stock components (see Attachment 2 for the exploitation rates associated with the proposed action) and (b) promote stock rebuilding on a more consistent basis while still allowing very limited access to harvest abundance salmon stock during critical rebuilding periods. Under Amendment 13, any increase in fishery impacts from the lowest allowable levels (not more than 15%) is contingent upon demonstrated progress in achieving spawner rebuilding criteria by parent broods and improvements in ocean survival conditions for returning adults. Amendment 13 would disaggregate management of Oregon Coast Natural coho (OCN) by establishing separate exploitation rate targets for four OCN sub-stocks: a northern component that includes coho subpopulations between Necanicum River and Neskowin Creek, a north-central component that includes the area from Salmon River to Siuslaw River, a south-central component that includes the area from Siltcoos River to Sixes River, and a souther component that includes the area from Elk River to Winchuck River.

As part of proposed Amendment 13 to the FMP, the PFMC plans to conduct a comprehensive review of all measures associated with the 1999 fishery in the year 2000.

B. Conservation Measures Included in the Proposed Action

The FMP defines the management unit for PFMC fisheries as the stocks of salmon that are harvested off the coasts of Washington, Oregon, and California. The management unit is comprised of several specific stocks or stock groupings and includes those stocks listed under the ESA (Table 2). The FMP specifies that stocks listed under the ESA will be managed consistent with NMFS jeopardy standards or the objectives of NMFS recovery plans. NMFS jeopardy standards and management recommendations for listed species are summarized and provided annually to the PFMC prior to its salmon season setting process.

C. Action Area

In developing the management recommendations, the PFMC analyzes several management options for ocean fisheries occurring in the EEZ. The analysis includes assumptions regarding the levels of harvest in state marine, estuarine, and freshwater areas, which are regulated under authority of the states. The States of Washington, Oregon and California generally manage their marine waters consistent with the management scheme approved by the Secretary of Commerce.

Table 2. Summary of salmon species listed and proposed for listing under the Endangered Species Act.

Species	Evolutionarily Significant Unit	Present Status	Federal Register Notice
Chinook Salmon (*O. tshawytscha*)	Sacramento River Winter	Endangered	54 FR 32085 8/1/89
	Snake River Fall	Threatened	57 FR 14653 4/22/92
	Snake River Spring/Summer	Threatened	57 FR 14653 4/22/92
	Central Valley Spring	Proposed Endangered	63 FR 11481 3/9/98
	Central Valley Fall	Proposed Threatened	63 FR 11481 3/9/98
	S. Oregon and California Coastal	Proposed Threatened	63 FR 11481 3/9/98
	Puget Sound	Threatened	64 FR 14308 3/24/99
	Lower Columbia River	Threatened	64 FR 14308 3/24/99
	Upper Willamette River	Threatened	64 FR 14308 3/24/99
	Upper Columbia River Spring	Endangered	64 FR 14308 3/24/99
Chum Salmon (*O. keta*)	Hood Canal Summer-Run	Threatened	64 FR 14508 3/25/99
	Columbia River	Threatened	64 FR 14508 3/25/99
Coho Salmon (*O. kisutch*)	Central California Coastal	Threatened	61 FR 56138 10/31/96
	S. Oregon/ N. California Coastal	Threatened	62 FR 24588 5/6/97
	Oregon Coastal	Threatened	63 FR 42587 8/10/98
Sockeye Salmon (*O. nerka*)	Snake River	Endangered	56 FR 58619 11/20/91
	Ozette Lake	Threatened	64 FR 14528 3/25/98
Steelhead (*O. mykiss*)	Southern California	Endangered	62 FR 43937 8/18/97
	South-Central California	Threatened	62 FR 43937 8/18/97
	Central California Coast	Threatened	62 FR 43937 8/18/97
	Upper Columbia River	Endangered	62 FR 43937 8/18/97
	Snake River Basin	Threatened	62 FR 43937 8/18/97
	Lower Columbia River	Threatened	63 FR 13347 3/19/98
	California Central Valley	Threatened	63 FR 13347 3/19/98
	Upper Willamette River	Threatened	64 FR 14517 3/25/99
	Middle Columbia River	Threatened	64 FR 14517 3/25/99

Species	Evolutionarily Significant Unit	Present Status	Federal Register Notice
Cutthroat Trout Sea-Run (*O. clarki clarki*)	Umpqua River Southwestern Washington/ Columbia River	Endangered Proposed Threatened	61 FR 41514 8/9/96 64 FR 16397 4/5/99

NMFS establishes fishery management measures for ocean salmon fisheries occurring in the EEZ (3-200 nautical miles off shore). In the case where a state's actions substantially and adversely affect the carrying out of the FMP, the Secretary may, under the Magnuson-Stevens Act, assume responsibility for the regulation of ocean fishing in state marine waters; however that authority does not extend to a state's internal waters. For the purposes of this opinion, the action area is the EEZ, which is directly affected by the federal action, as well as the marine waters (other than internal) of the States of Washington, Oregon and California, which may be indirectly affected by the federal action.

II. Status of the Species and Critical Habitat

A. Species and Critical Habitat Description

The OC ESU includes naturally spawning populations of coho salmon inhabiting coastal streams between Cape Blanco and the Columbia River. After reviewing biological data on the species' status and an assessment of protective efforts, NMFS concluded in August 1997 that this ESU did not warrant listing. However, the Oregon District Court overturned the decision, and NMFS listed the ESU as threatened on August 10, 1998. Critical habitat has not yet been designated.

The SONCC ESU was listed as threatened on August 18, 1997. The SONCC ESU consists of all naturally spawning populations of coho salmon that reside below long-term, naturally impassible barriers in streams between Punta Gorda, California and Cape Blanco, Oregon. Five of the seven hatchery stocks reared and released within the range of the ESU are included in the definition of the ESU; however, none of the hatchery populations are listed. Proposed critical habitat for the ESU encompasses accessible reaches of all rivers (including estuarine areas and tributaries) between the Mattole River in California and the Elk River in Oregon, inclusive (62 FR 62741, November 25, 1997).

The CCC ESU consists of all coho reproducing in streams between Punta Gorda and the San Lorenzo River, including hatchery stocks, with the exception of Warm Springs Hatchery on the Russian River. As in the case with OC and SONCC coho, CCC ESU hatchery stocks are not listed. Proposed critical habitat for CCC ESU encompasses accessible reaches of all rivers (including estuarine areas and tributaries) between Punta Gorda and the San Lorenzo River, and Mill Valley and Corte Madera Creeks, which enter the San Francisco Bay (62 FR 62741, November 25, 1997).

B. Life History

Coho salmon are short-lived species (generally two to three years) that reproduce only once shortly before dying. Spawning escapements of coho salmon are dominated by a single year class. The abundance of year classes can fluctuate dramatically with combinations of natural and human-caused environmental variation. General life history information for coho salmon (Oncorhynchus kisutch) is summarized below, followed by information on population trends for each coho salmon ESU. Further detailed information on these coho salmon ESUs are available in the NMFS Status Review of coho salmon from Washington, Oregon, and California (Weitkamp et al. 1995) and the NMFS proposed rule for listing coho (60 FR 38011, July 25, 1995).

Adult Freshwater Migration and Spawning Most coho salmon adults are 3 years old, having spent approximately 18 months in freshwater and 18 months in salt water. Wild female coho return to spawn almost exclusively at age 3, and in the absence of overlapping maternal generations, the separate maternal brood lineages are at high risk from the effects of catastrophic events such as floods or dewaterings due to drought or water diversions. An exception to this pattern are jacks, which are sexually mature males that return to freshwater to spawn after only 5-7 months in the ocean. Most west coast coho salmon enter rivers in October and spawn from November to December and occasionally into January. However, both run and spawn-timing of Central California coho salmon are very late (peaking in January), with little time spent in freshwater between river entry and spawning. This compressed adult freshwater residency appears to coincide with the single, brief peak of river flow characteristic of this area. Many small California systems have sandbars which block their mouths for most of the year except during winter. In these systems, coho salmon and other salmon species are unable to enter the rivers until sufficiently strong freshets break the sandbars (Gilbert 1912; Pritchard 1940; Marr 1943; Briggs 1953; Shapovalov and Taft 1954; Foerster 1955; Milne 1957; Salo and Bayliff 1958; Loeffel and Wendler 1968; Wright 1970; Sandercock 1991).

While central California coho spend little time between river entry and spawning, northern stocks may spend 1 or 2 months in fresh water before spawning (Flint and Zillges 1980, Fraser et al. 1983). In larger river systems like the Klamath River, coho salmon have a broad period of freshwater entry spanning from August until December (Leidy and Leidy 1984). In general, earlier migrating fish spawn farther upstream within a basin than later migrating fish, which enter rivers in a more advanced state of sexual maturity (Sandercock 1991).

Juvenile Rearing and Outmigration Coho salmon fry usually emerge from the gravel at night from March to May. Coho salmon fry begin feeding as soon as they emerge from the gravel, and grow rapidly. In California, fry move into deep pools in July and August, where feeding is reduced and growth rate decreased (Shapovalov and Taft 1954). Between December and February, winter rains result in increased stream flows, and by March, following peak flows, fish feed heavily again on insects and crustaceans and grow rapidly.

Peak outmigration timing generally occurs in May, about a year after emergence from the gravel. In California, smolts migrate to the ocean somewhat earlier, from mid-April to mid-May. Most smolts measure 90-115 mm, although Klamath River Basin tend to be larger, but this is possibly due to influences of off-station hatchery plants.

C. Population Dynamics and Distribution

Coho salmon occur naturally in most major river basins around the North Pacific Ocean from central California to northern Japan (Laufle et al. 1986). After entering the ocean, immature coho salmon initially remain in near-shore waters close to the parent stream. Details regarding marine recoveries of coded-wired tagged (CWT) coho are discussed by Weitkamp et al. (1995). In general, coho salmon remain closer to their river of origin than do chinook salmon, but coho may nevertheless travel several hundred miles (Hassler 1987). As a result, the ocean distributions of the three listed ESUs, while not identical, are substantially overlapping. During the 1980s and early 1990s, when coho were harvested in commercial and recreational fisheries, the majority of the coho caught off California originated from the Columbia River or from coastal Oregon streams. The prohibition of coho retention off California provides protection for the OC ESU as well as the SONCC and CCC ESUs. As with most species, coho are less abundant at the fringes of their range. Populations in California represent the southernmost extent of the species' North America range, which currently ends with the small populations found in Waddell and Scott creeks just north of Monterey Bay.

1. Oregon Coastal Coho

Based on historic commercial landing statistics and estimated exploitation rates, coho salmon escapement to coastal Oregon rivers has been estimated at between 1 and 1.4 million fish in the early 1900s, with harvest of nearly 400,000 fish (Mullen 1981; Lichatowich 1989). Recent spawning escapement from 1991-1993 has been estimated at an annual average of about 39,000 adults using stratified random surveys (SRS, Jacobs and Cooney 1991, 1992, 1993). This decline has been associated with a reduction in habitat capacity of nearly 50% (Lichatowich 1989). Current production potential for coho salmon in coastal Oregon rivers has been estimated at about 800,000 fish using stock-recruit models (Lichatowich 1989).

While the methods of estimating total escapement are not comparable between the historical and recent periods, these numbers suggest that current abundance of coho salmon on the Oregon coast may be less than 5% of that in the early part of this century. The Oregon Department of Fish and Wildlife (ODFW 1995) presented estimates of coho salmon abundance decline at several points of time from 1900 to the present. These data show a decline of about 75% from 1900 to the 1950s and further decline of about 90% since the 1950s.

Hatchery composition of naturally spawning coho salmon ranges from 18 to 62% in several Oregon coastal rivers. These estimates are for rivers known to have a high hatchery influence, but they also represent a substantial portion of natural coho salmon production in Oregon. Thus, hatchery fish have an extensive presence within the Oregon Coastal ESU. In recent years, the number of coho salmon smolts released from Oregon Coast hatcheries has been substantially reduced in response to ESA listings of coho stocks. In 1990 over 5.3 million smolts were released in Oregon Coast streams. However, in 1998 only 1.4 million smolts were released and the 1999 release is expected to be less than 1 million smolts (Stratton 1998).

Average spawner abundance has been relatively constant since the late 1970s. However, preharvest ocean abundance has declined. Spawner-to-spawner return ratios (based on peak counts) have been below replacement in 5 of the past 6 years, in spite of very substantial reductions in harvest. Average recruits-per-spawner may also be declining.

2. Southern Oregon/Northern California Coastal Coho

The three major river systems supporting coho in the SONCC ESU are the Rogue, Klamath (including the Trinity), and Eel rivers.

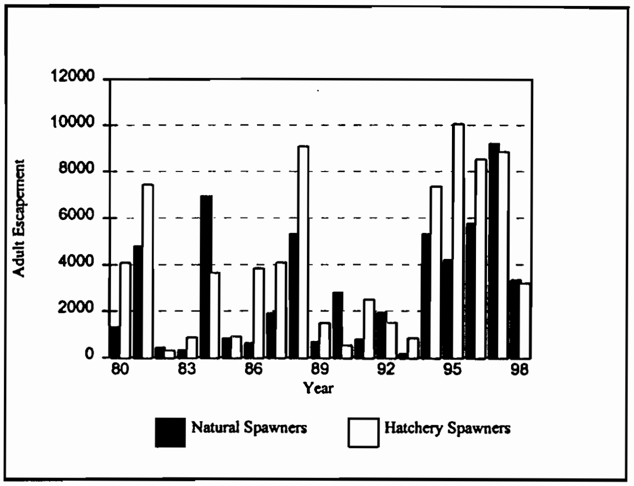


Figure 1 Rogue River natural and hatchery coho spawner abundance

The Rogue River accounts for the majority of coho salmon production in the Oregon portion of the SONCC ESU. Recent estimates of naturally produced adults returning to the Rogue River have ranged from less than 200 to 9,000 (Figure 1) and have shown an increase in the past four years. Average annual river run sizes during the past 10 years were 3,600 natural and 5,000 hatchery fish, respectively, with the total run averaging 58 percent hatchery fish (ODFW 1998).

Brown et al. (1994) reviewed the historic abundance, decline and present status of coho salmon in California. In estimating current abundance, the authors relied on a "20-fish rule": if a stream with historic accounts of coho salmon lacked recent data, it was assumed to still support a run of 20 adults; if coho salmon were present in recent stream surveys, they used 20 adults or the most recent run estimate, whichever was larger. While the resulting estimates are rough approximations, they are generally comparable with other estimates (Bryant 1994; CDFG 1994; Maahs and Gilleard 1994).

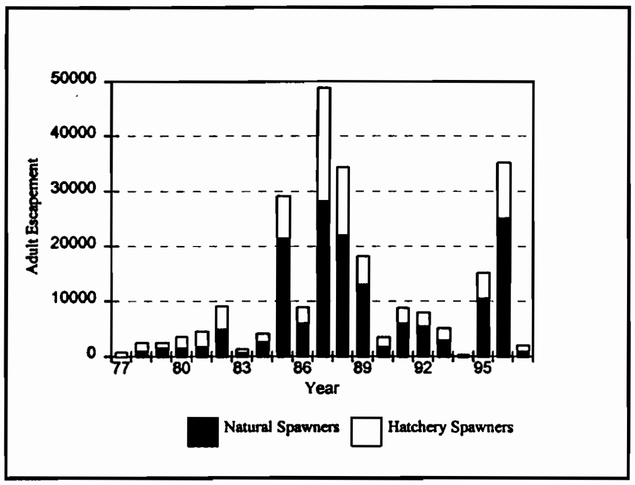


Figure 2 Spawner abundance to the Trinity River upstream of the Willow Creek weir.

Of the 396 streams within the range of the California portion of the SONCC ESU that were identified as once having coho salmon runs, recent survey information is available for 115 streams (29 percent). Of these 115 streams, 73 (64 percent) still support coho salmon runs, while 42 (36 percent) have lost their coho salmon runs. The rivers and tributaries in the California portion of the SONCC ESU were estimated to have average recent run sizes of 7,080 natural spawners and 17,156 hatchery returns, with 4,480 identified as native fish occurring in tributaries having little history of supplementation with non-native fish (Brown et al. 1994).

The Klamath Basin (including the Trinity River) historically supported abundant populations of coho salmon. Spawning runs have greatly diminished, however, and are now composed largely of hatchery fish, although small wild runs may remain in some tributaries (CDFG 1994). Figure 2 shows 20 years of adult coho escapements above the Willow Creek weir. Recent escapement estimates of coho salmon to the Klamath Basin are displayed in Table 3. These escapement estimates include: Yurok, Hoopa, and Karuk Tribal harvests, Trinity River adult escapement above the Willow Creek Weir, Iron Gate Hatchery adult returns, and recreational fishery harvest on the lower Klamath River and the Trinity River above Willow Creek.

Table 3. Known portions of adult in-river coho escapement to the Klamath Basin 1992-1997 (Hillemeier 1998; Karuk Tribe 1998; Sinnen, 1998, CDFG, personal communication).

Year	Yurok Harvest	Hoopa Harvest	Karuk Harvest	Sport Harvest	Trinity River Escapement	Iron Gate Hatchery Returns	Total In-river run
1992	122	52	34	30	7,961	1,697	9,896
1993	1,168	111	0	2	5,048	675	7,004
1994	27	25	162	2	239	172	627
1995	830	38	24	339	15,477	1,501	18,209
1996	953	208	115	401	35,047	3,546	38,270
1997	78	58	10	0	1,984	1,872	4,002
Total	3,178	492	345	774	63,756	9,463	78,008
Avg	530	82	58	129	10,626	1,577	13,001

It is difficult to estimate natural escapement for the Klamath Basin because spawning escapement and angler harvest information are lacking for the entire mainstem Klamath River, its tributaries and the lower Trinity River. Estimates of spawning escapement to the Klamath River consists entirely of returns to the Iron Gate Hatchery. Of the coho salmon passing the Willow Creek weir on the Trinity River, 97.9% were estimated to be hatchery origin for the years 1991-1995 (Polos 1996, USFWS, pers. comm.). Assuming only 2.1% of escapement in the Trinity River is natural production, the number of natural spawners in the Trinity River averaged 220 adults for the years 1992-1997 (2.1% of 10,626).

There is likely additional, unaccounted natural spawning in tributaries to the Klamath River and a small number in the South Fork Trinity River (CDFG 1994). Coho salmon in the mainstem Klamath River are considered to be primarily of hatchery origin, and natural production is a minor component (Klamath Fishery Management Council 1991).

Counts at Benbow Dam on the South Fork of the Eel River represent the best assessment and documentation of coho abundance and decline in California. Annual adult coho counts at Benbow averaged 15,000 during the 1940s and declined to an average of 1,800 between 1966 and 1970 (CDFG 1994). Brown et al. (1994) estimated the native population of coho in the Eel River at 2,000 adults, which is probably the largest remaining native coho population in

California. The CDFG conducts annual surveys on Sprowl and Tomki Creeks, tributaries to the Eel. The estimated total run size to Tomki Creek has declined from an average of 1800 fish during the 1980s to less than 100 fish in recent years (PFMC 1999a).

3. Central California Coho

Estimated average coho salmon spawning escapement in the central California ESU for the period from the early 1980s through 1991 was 6,160 naturally spawning coho salmon and 332 hatchery spawned coho salmon (Brown et al. 1994). Of the naturally-spawning coho salmon, 3,880 were from the tributaries in which supplementation occurs (the Noyo River and coastal streams south of San Francisco). Only 160 fish in the range of this ESU (all in the Ten Mile River) were identified as "native" fish, lacking a history of supplementation with the non-native hatchery stocks. Based on redd counts, the estimated run of coho salmon in the Ten Mile River was 14 to 42 fish during the 1991-1992 spawning season (Maahs and Gilleard 1994).

Of 186 streams in the range of the central California ESU identified as having historic accounts of adult coho salmon, recent data exist for 133 (72 %). Of these 133 streams, 62 (47 %) have recent records of occurrence of adult coho salmon, and 71 (53 %) no longer maintain coho salmon spawning runs (Brown et al. 1994).

The present abundance of coho populations south of the Golden Gate is not well documented. In this area, which represents the margin of the species' range, remnant populations of naturally spawning coho persist in Gazos, Waddell and Scott Creeks. In all three creeks, a measurable spawning run occurs only every third year (the 1993-1996 lineage), with the other two brood year lineages at high risk of extinction (Anderson 1995). Between 1934 and 1942, the annual numbers of spawners averaged 310 adults on Waddell Creek and 350 adults on Scott Creek. Beginning in 1913, both Scott and Waddell Creeks were heavily stocked with coho from various origins.

D. Status

The factors threatening naturally reproducing coho salmon throughout its range are numerous and varied. For coho salmon populations in California and Oregon, the present depressed condition is the result of several longstanding, human-induced factors (e.g. habitat degradation, water diversions, harvest, and artificial propagation) that serve to exacerbate the adverse effects of natural environmental variability from such factors as drought, floods, and poor ocean conditions. The major activities responsible for the decline of coho salmon in Oregon and California are logging, road building, grazing, mining activities, urbanization, stream channelization, dams, wetland loss, water withdrawals and unscreened diversions for irrigation. Detailed descriptions of coho population status are found in Weitkamp et al. (1995) and the NMFS proposed and final rules for listing coho (61 FR 56138, October 31, 1996; 62 FR 24588 May 6, 1997; 60 FR 38011, July 25, 1995).

Statewide coho salmon spawning escapement in California may have ranged between 200,000 to 500,000 adults per year in the 1940s (Brown et al. 1994). By the mid-1960s, statewide spawning escapement was estimated to have fallen to about 100,000 fish per year (CDFG 1965, California Advisory Committee on Salmon and Steelhead Trout 1988), followed by a further decline to about 30,000 fish in the mid-1980s (Wahle and Pearson 1987; Brown et al. 1994). From 1987 to 1991, spawning escapement averaged about 31,000, with hatchery populations composing 57% of this total (Brown et al., 1994). Brown et al. (1994) speculate that since 1987 approximately 5,000 or fewer naturally-spawning coho salmon spawn in California each year, and that many of these fish are in populations that contain less than 100 individuals.

The California Department of Fish and Game (CDFG 1994) concluded that "coho salmon in California, including hatchery stocks, could be less than 6 percent of their abundance during the 1940s and have experienced at least a 70 percent decline in numbers since the 1960s."

III. Environmental Baseline

Environmental baselines for biological opinions include the past and present impacts of all state, federal or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR §402.02).

A. Status of the Species included in this Biological Opinion

Three distinct vertebrate population segments of coho salmon (Oncorhynchus kisutch), each of which is listed as a threatened species pursuant to section 4 of the Endangered Species Act, are likely to be adversely affected by the proposed action and are included in this Biological Opinion: Oregon Coastal coho salmon, Southern Oregon/Northern California Coastal coho salmon, and Central California Coastal coho salmon. None of the inland critical habitat proposed for CCC or SONCC coho lies within the action area. Marine habitats (i.e., oceanic or near shore areas seaward of the mouth of coastal rivers) are vital to the species, and ocean conditions are believed to have a major influence on coho salmon survival (see review in Pearcy, 1992). However, there does not appear to be need for special management consideration or protection of this habitat. Therefore, NMFS has not proposed critical habitat in marine areas at this time for CCC or SONCC coho. Critical habitat for OC coho has yet to be proposed.

B. Factors Affecting Species Environment Within the Action Area

Salmon are taken incidentally in the groundfish fisheries off Washington, Oregon, and California. NMFS has conducted several section 7 consultations on the impacts of fishing conducted under the Pacific Coast Groundfish Fishery Management Plan (PCGFMP) on species listed under the ESA and concluded that impacts on listed species are negligible (NMFS, 1996c). NMFS has reinitiated consultation on the PCGFMP regarding impacts to recently listed species including coho. That consultation is not yet complete. However, the incidental catch of coho in the groundfish fisheries is quite low. The estimated total catch of coho (including both listed and unlisted fish) in the whiting fishery for example has averaged only 315 in the years 1991 to 1997. There are no other tribal, local, private, or federal actions unrelated to the salmon FMP or activities under the ESA that substantially affect the environment of listed coho in the action area. State fishing regulations in the action area nearly always conform to the federal regulations developed under the FMP and are therefore not considered separately.

C. Activities Affecting Coho Outside the Action Area

Tribal Harvest in the Klamath-Trinity Basin

Members of the Hoopa Valley and Yurok Indian Tribes of the Klamath River Basin enjoy a federally protected right to fishery resources of the Klamath River Basin sufficient to support a moderate standard of living or 50 percent of the total available harvest of Klamath-Trinity basin salmon, whichever is less (U.S. Department of the Interior 1993). The Karuk Tribe conducts a dip net fishery at Ishi-Pishi Falls on the Klamath River under California State regulations (California Code of Regulations Title 14). The tribal fisheries target fall-run chinook salmon. However, depending on the fall chinook run timing and the time at which the Hoopa Valley and Yurok Indian Tribe's chinook quota is reached, the fishery may extend into the coho run and incidentally take coho salmon. Beginning in 1998, the Karuk Tribe adopted a policy of non-retention for coho (Karuk Tribe 1998).

NMFS formally consulted with the Bureau of Indian Affairs for the Hoopa Valley Tribes 1997 fall chinook fishery in the Klamath Basin and the 1997 and 1998 Yurok fall chinook fisheries (NMFS 1997a, 1997b, 1998a). NMFS is considering the Yurok, Hoopa Valley, and Karuk Tribes' harvest impacts on SONCC coho in the present consultation on the FMP.

Brown et al. (1994) estimated that approximately 90% of the Klamath-Trinity basin coho are of hatchery origin. The average annual tribal harvest of coho over the past 5 years has been 670 fish (Table 3; NMFS 1997a), of which 70 may have been naturally spawning. If the minimum population of naturally spawning SONCC coho is about 10,000 fish (Weitkamp et al. 1995), the Tribal impact on listed SONCC coho has been relatively small, on average less than 100 fish per year during the past 5 years and less than 1% of the SONCC ESU. Estimated tribal harvest rates on Klamath Basin coho averaged 5% from 1992 - 1997. There are no tribal fisheries on coho populations in the Rogue, Smith, Eel or Mattole rivers.

Inland Sport Harvest

The in-river harvest of coho in Oregon waters is currently directed at hatchery origin fish through various selective fisheries. The other impact from sport fisheries result from hooking mortality in both chinook and coho selective fisheries, both of which are included in the overall impacts considered in this opinion.

California State fishing regulations prohibit retention of coho in all marine and fresh water fisheries. Some incidental coho mortality likely occurs in association with the release of coho in chinook directed fresh water fisheries but that level of take is believed to be low.

Combined Effects Across the Range of the Species

The conclusions of this biological opinion are made with consideration of the incidental take occurring in Tribal and recreational fisheries. Regulation of the incidental take associated with those activities occurs under separate section 7, 10(a), or 4(d) processes. Although past harvest activities have contributed to the decline of coho salmon in Oregon and California, other activities affecting coho include logging, road building, grazing, mining activities, urbanization, stream channelization, dams, wetland loss, water withdrawals and unscreened diversions for irrigation. However, the determination of whether a given activity that incidentally takes listed coho does or does not jeopardize the continued existence of the species ideally requires analysis of the activity within the context of the full range of human and environmentally induced mortality during all life history stages of the listed species. These considerations should include the increased risk of extinction to listed coho resulting from all in-river and ocean fisheries, various land use activities (operation of dams, logging, road building, grazing, mining activities, water withdrawals and unscreened diversions for irrigation), artificial propagation, as well as changes in ocean and freshwater productivity. Determining the risk to the ESU would also require an assessment of the relative importance of the hatchery and naturally spawning populations to the continued existence of an ESU as a whole.

Such an analysis requires a life cycle model capable of evaluating many complexities, including separation of natural and hatchery production, juvenile migration, the fate of adults surviving natural mortality, and the relationship between habitat and egg production, instream mortality rates, and smolt production. Life-cycle models require extraordinary levels of detailed information on survival between key life-history stages. The approach requires knowledge of streambed morphology, its relation to potential fish density, and data on survival and fecundity rates. There is currently strong interest in developing such models, particularly as applied to Oregon coastal coho. Detailed measures of habitat quality have the potential to allow modeling of individual stream reaches. However, such an approach is unlikely to become available for any coho populations within the SONCC or CCC ESUs in the near future.

Natural Factors Causing Variability in Population Abundance

Changes in the abundance of coho populations are a result of variations in freshwater and marine environments. For example, large scale changes in climatic regimes, such as El Niño, likely affect changes in ocean productivity; much of the Pacific coast has experienced drought conditions in recent years, which may depress freshwater salmon production.

Coho salmon are exposed to high rates of natural predation, particularly during freshwater rearing and migration stages. Ocean predation likely also contributes to significant natural mortality; however, the levels of predation are largely unknown. In general, coho are prey for pelagic fishes, birds, and marine mammals, including harbor seals, sea lions, and killer whales. There have been recent concerns that the rebounding of seal and sea lion populations, following their protection under the Marine Mammal Protection Act of 1972, has resulted in substantial mortality for salmonids.

The natural factors affecting coho abundance are extremely variable, specific to different life stages, and have different magnitudes. Where possible, variations in productivity and natural mortality are incorporated in management models.

IV. Effects of the Action

The standards for determining jeopardy are set forth in Section 7(a)(2) of the ESA as defined at 50 CFR §402.02. The jeopardy determinations in this opinion are based on the consideration of the proposed management actions taken to reduce the catch of listed fish, the magnitude of the remaining harvest, particularly as it relates to the period of decline, and available risk assessment analyses.

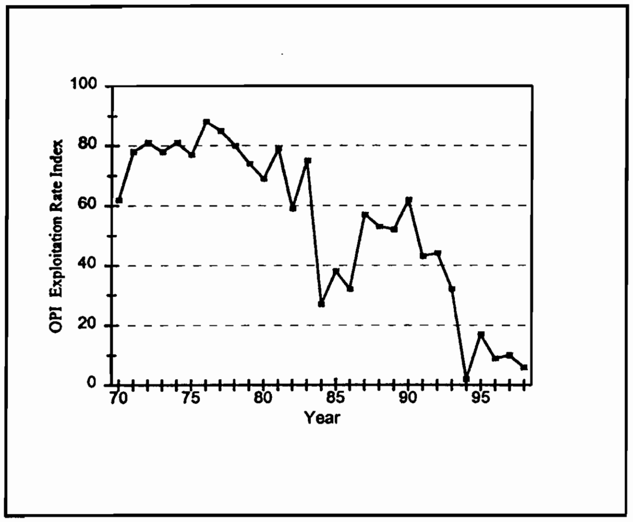


Figure 3 OPI exploitation rate index (From Table 1-11 PFMC 1999a)

Since 1994, the retention of coho has been prohibited in PFMC fisheries south of Cape Falcon, Oregon.[1] Coho are still impacted, however, as a result of hook-and-release mortality in chinook-directed fisheries. Figure 3 shows the reduction in the ocean exploitation rate index on Oregon Production Index (OPI) coho stocks (which includes the three listed ESUs) that has occurred as a result of implementing non-retention fisheries off Oregon and California. Harvest impacts on coho stocks can be assessed through the use of models based on recoveries of CWTs from ocean fisheries and hatchery returns. The Fishery Regulation Assessment Model (FRAM) estimates stock specific exploitation rates and is used by the PFMC's Salmon Technical Team (STT) to evaluate proposed fishing plans relative to the PFMC's management objectives. The FRAM uses the magnitude of the chinook catch during the recent years of non-retention to provide an estimate of the exploitation rate on coho resulting from hooking mortality. The FRAM currently includes stocks that represent OC and SONCC coho but not CCC coho. Impacts to CCC coho must therefore be assessed more qualitatively.

A. Oregon Coastal Coho

Oregon coastal natural coho stocks are currently managed as one stock aggregate that includes coho produced from Oregon river and lake systems south of the Columbia River. The OCN stock aggregate contributes primarily to ocean fisheries off Oregon and California, and to a lessor extent, to ocean fisheries off Washington and British Columbia. The ocean fisheries within the OPI area (Leadbetter Point, Washington to the U.S.-Mexico border) are managed to achieve OCN coho spawner escapement goals. The goal, found in Section 6.1.1 of the Pacific Coast

[1] In 1994 and 1995, coho retention was permitted in the California recreational fisheries south of Horse Mountain from mid February through April 30. Monthly catches in those fisheries were negligible (less than 50 fish).

Salmon Plan (PFMC 1997b), is to meet an aggregate density of 42 naturally spawning adults per mile in standard index survey areas (considered equal to 200,000 index spawners). At OCN stock sizes that are less than 125% of the annual numerical escapement goal (less than 250,000 coho), an exploitation rate of up to 20% will be allowed for incidental impacts of the combined troll, sport, and freshwater fisheries. At projected OCN spawner escapements of 28 or fewer adults per mile, an exploitation rate of up to 20% may be allowed to provide only minimum incidental harvest to prosecute other fisheries, provided the rate will cause no irreparable harm to the OCN stock. This management structure has been in place since 1994. However, because of the depressed status of the stock, the Council and NMFS have managed fisheries conservatively with an average OPI exploitation rate of 9.5% since 1994.

Available CWT recovery patterns for the three northern subaggregates of OCN coho indicate distribution patterns which are similar, and the three northern subaggregates are therefore managed as a single unit in ocean fisheries. However, the maximum exploitation rate allowed will be determined by the population status of the weakest of the four subaggregate stock components. This approach addresses unique conservation concerns of distinct OCN coho populations and ties harvest management to observed parent spawner abundance and juvenile survival as opposed to projected spawner abundance (PFMC 1997a, ODFW/NMFS 1998). The objectives of the amendment are to 1) set management targets for the total harvest exploitation rate for OCN coho that significantly reduce the impact of fisheries on the recovery of depressed OCN stock components and 2) promote stock rebuilding on a more consistent basis while still allowing very limited access to harvest abundant salmon stocks during critical rebuilding periods. Any increase in fishery impacts from the lowest allowable levels under this amendment (15% or less) are contingent upon demonstrated progress in achieving spawner rebuilding criteria by parent broods and improvements in ocean survival conditions for the returning adults (PFMC 1997a).

The amendment makes several significant changes from the current management regime for OCN coho. To better address identified disparities among various components of the overall OCN coho aggregate stock, Amendment 13 subdivides the current OCN aggregate into four separate geographically defined components. For the first time, the amendment would directly consider variations in habitat production potential in setting the annual spawner objective. This will be accomplished through the incorporation of 1) the estimated production potential parameters for the freshwater habitat derived from a Habitat-Based Life Cycle Model developed by Nickelson and Lawson (1996) and 2) an estimate of potential marine survival conditions for the returning adults. In addition, a brood's parent and, at higher allowable harvest levels, grandparent spawner abundance would have to be considered in arriving at the final allowable exploitation rate. Allowable total harvest impacts on OCN coho under this amendment would be limited to a range that includes the recent historic low levels of 1994-1996 (11 to 13%) to a ceiling which, in the most abundant years, allows a 35% exploitation rate. Intensive monitoring will also be included in the implementation that will include tracking of juveniles and adults in freshwater as well as determining ocean fishery impacts.

The ODFW conducted a risk assessment at the request of the PFMC of Amendment 13 (ODFW/NMFS 1998) which was presented at the November 1998 Council meeting in Portland, Oregon. There were four main aspects that the analysis focused on: 1) a projection of spawner abundance under low, medium, and high marine survival conditions over four generation (12 years); 2) an estimate of the probability of achieving the projected spawner abundance which includes statistical variability of key parameters, i.e. marine survival, spawner abundance, fishery impacts, and habitat capacity; 3) a direct comparison of the Amendment 13 fishery regime to the status quo Amendment 11 fishery regime, and in addition, a no fishing option; and 4) an analysis of long term (100 years) spawning escapement and local extinction probabilities for OCN coho salmon.

The ODFW/NMFS risk assessment used a modified version of the Nickelson and Lawson (1996) habitat-based life cycle model to address the comparison of the three management regimes. Stream-reach-specific spawner escapements for 1995-97 and habitat quality data for each stream reach within each sub-aggregate were compiled and used as input to the model. The model included 3,500 individual stream reaches encompassing all four OCN sub-aggregates of Amendment 13. The model did not include Oregon coastal lake systems which represent some of the most stable OCN production (ODFW/NMFS 1998).

The results of the of the risk assessment (ODFW/NMFS 1998) are summarized as follows:

Projection of Spawner Abundance at Low, Medium, and High Marine Survival over Four Generations The projected median population sizes for OCN sub-aggregates show that rebuilding is most likely to occur under medium and high marine survival conditions. During prolonged low marine survival, the OCN sub-aggregates tend to remain stable at current levels of abundance, with little or no rebuilding. The four sub-aggregates show trends in population size within each marine survival category (Figure 4).

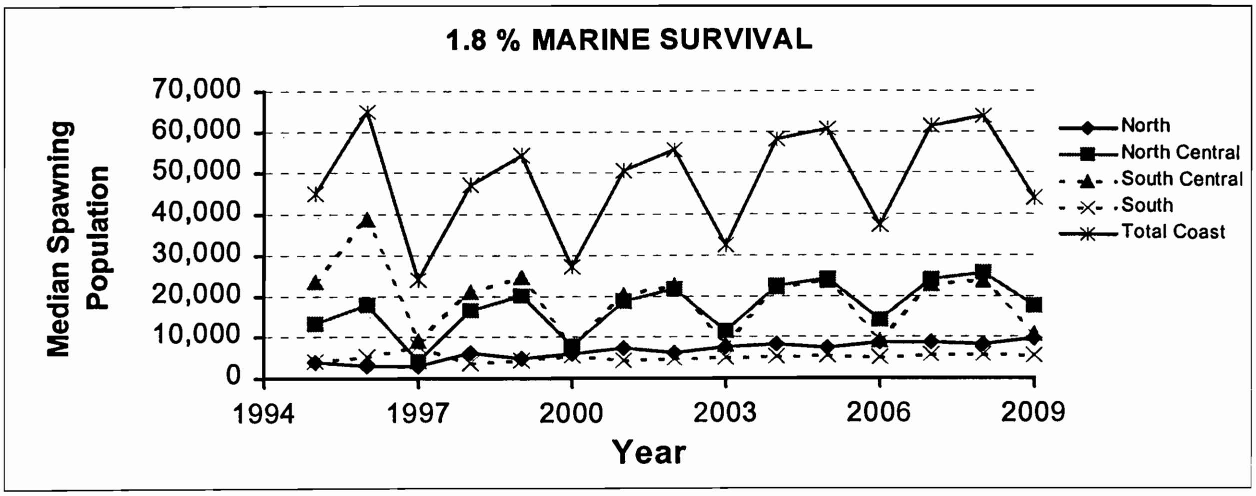
Probability of Achieving Projected Spawner Abundance Probabilities of achieving escapement benchmarks are higher under the Amendment 13 management regime than the Amendment 11 regime, particularly at medium and high marine survival (Figure 5 and 6). Model runs at low marine survival indicate the probability of rebuilding in four generations is small and very similar between management regimes.

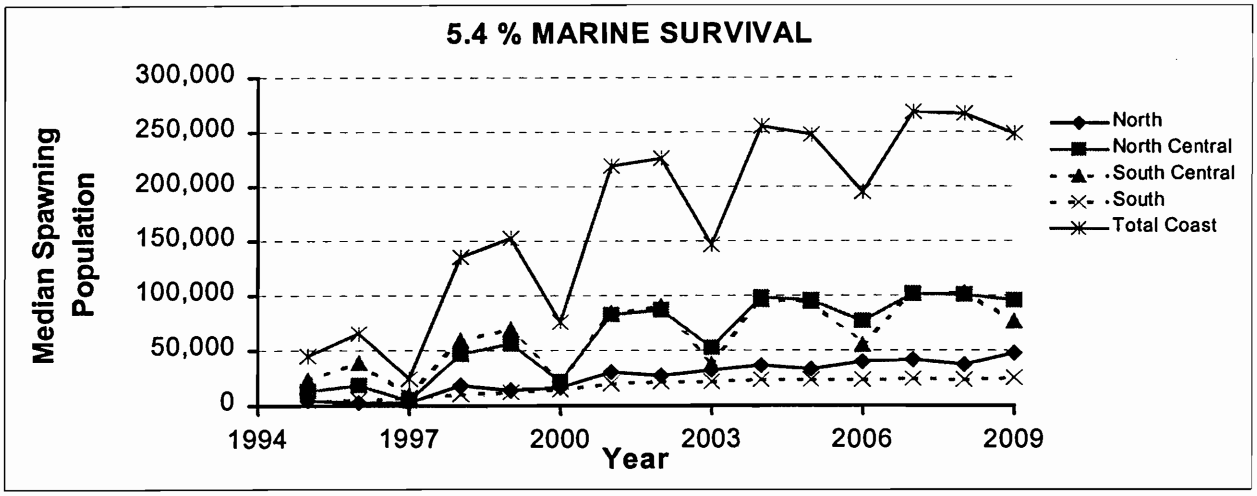
However, four generations is a relatively short time period to rebuild, especially for the very small brood 1997 year. It can be expected that rebuilding of a small brood (1997) would take longer and have lower probabilities over the short term of achieving rebuilding targets compared to a brood that was twice as large (Figure 6).

Probabilities associated with achieving full seeding of high quality habitat are higher under the Amendment 13 management regime than under Amendment 11 regime at the medium and high marine survivals. Probabilities of achieving full seeding of the 1996 brood in four generations with 5.4% marine survival are 84% under Amendment 13 and 64% under Amendment 11 (Figure 5).

Figure 7 displays the cumulative probability of attaining median OCN population sizes for three brood cycles modeled at low, medium, and high marine survival for Amendment 11 and

Amendment 13 management regimes.





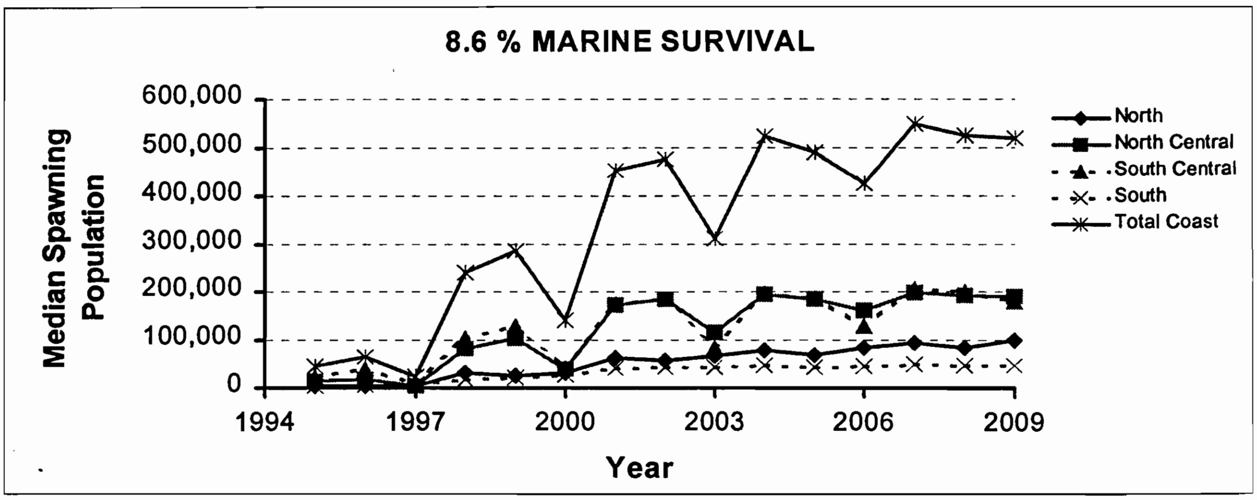


Figure 4. Projected median spawning populations over four generations under A-13 management and low, medium and high marine survivals.

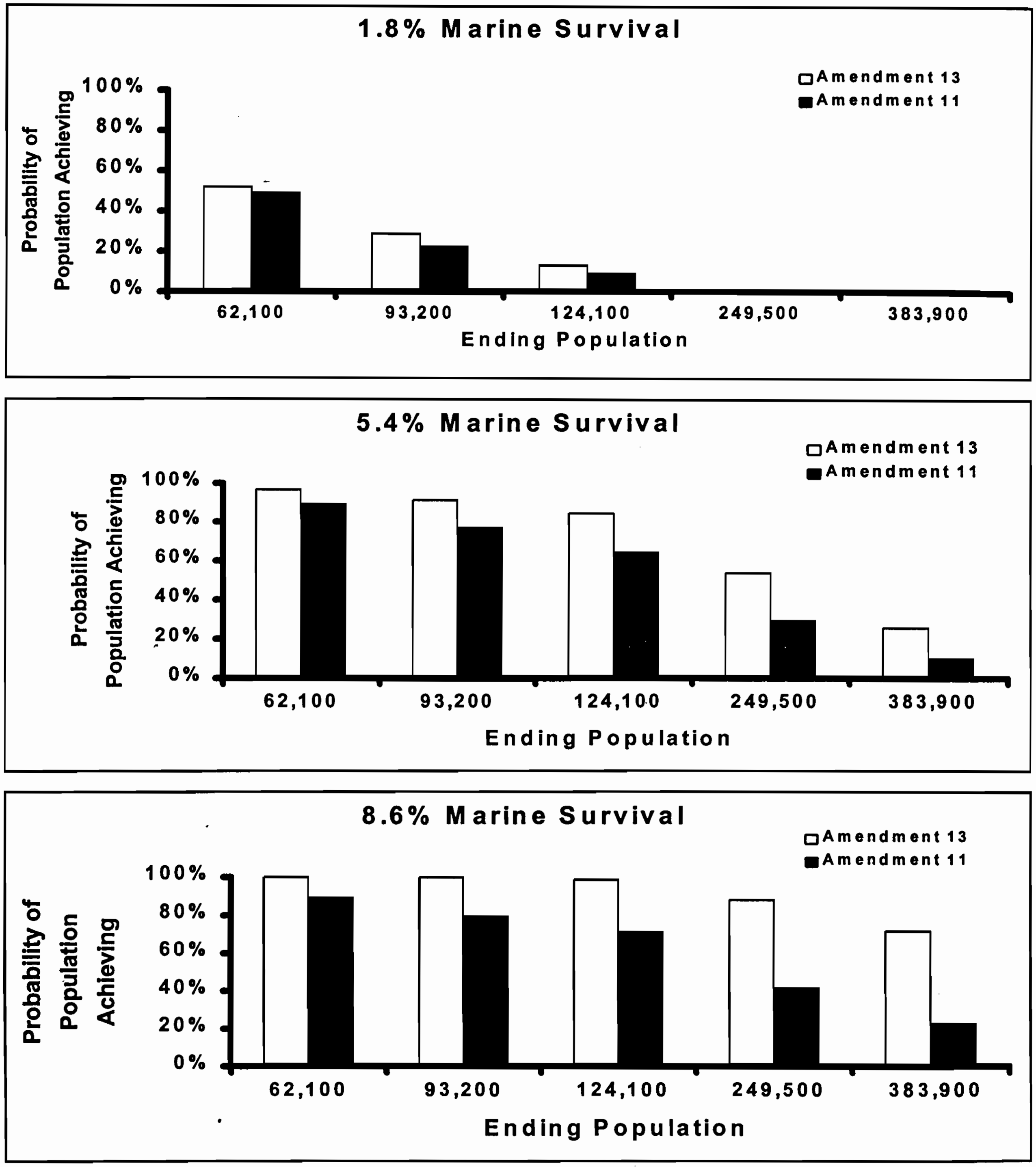


Figure 5. Probabilities of 1996 brood OCN coho achieving specific spawning populations after four generations under conditions of low, medium, and high marine survivals. The two smallest spawning populations (62,100, and 93,200 fish) represent 50% and 75% of full seeding at low marine survivals. The next three highest spawning populations (124,100; 249,500; and 383,900 fish respectively) represent full seeding at low, medium, and high marine survivals.

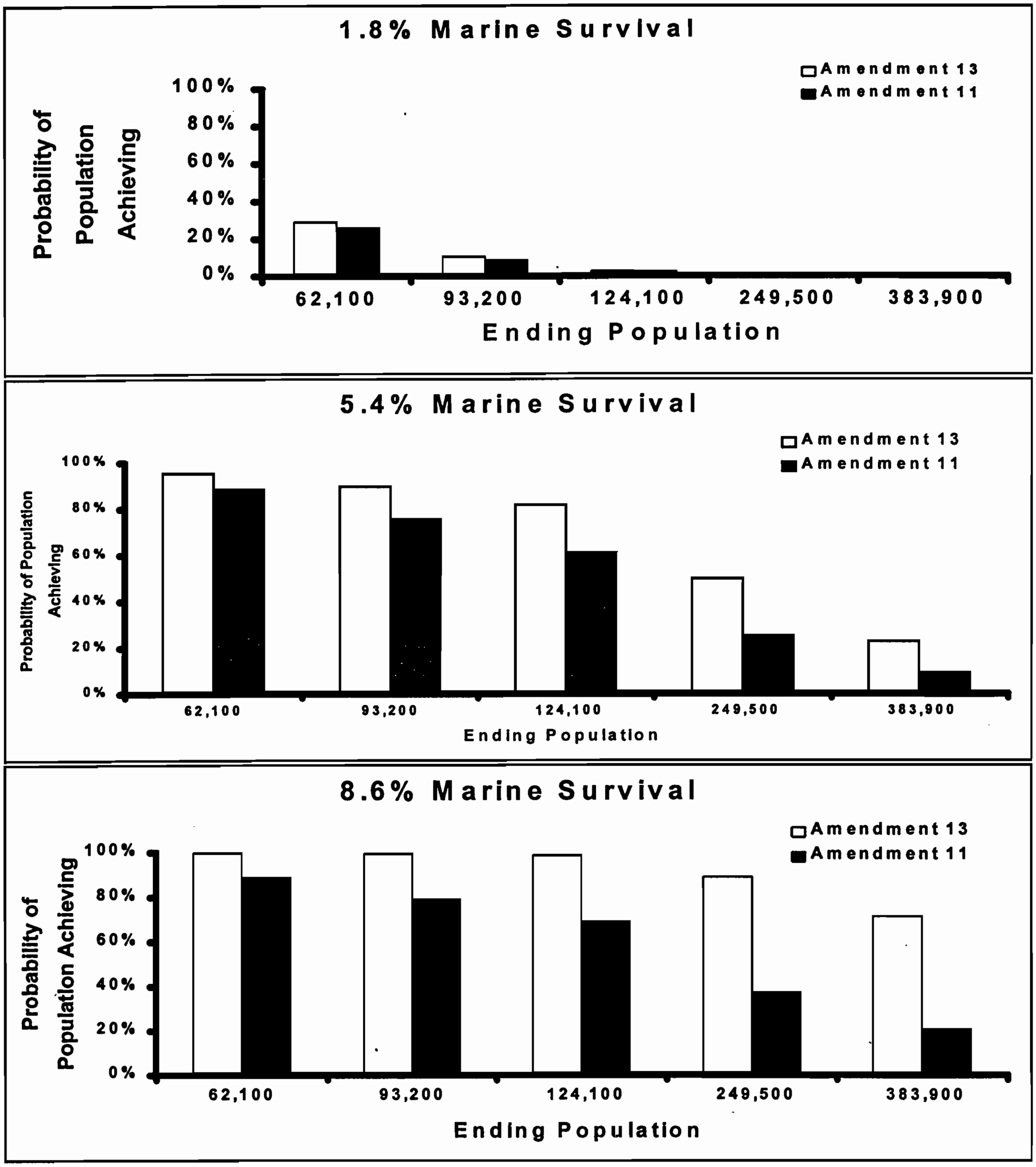


Figure 6. Probabilities of 1997 brood OCN coho achieving specific spawning populations after four generations under conditions of low, medium, and high marine survivals. The two smallest spawning populations (62,100, and 93,200 fish) represent 50% and 75% of full seeding at low marine survivals. The next three highest spawning populations (124,100; 249,500; and 383,900 fish respectively) represent full seeding at low, medium, and high marine survivals.

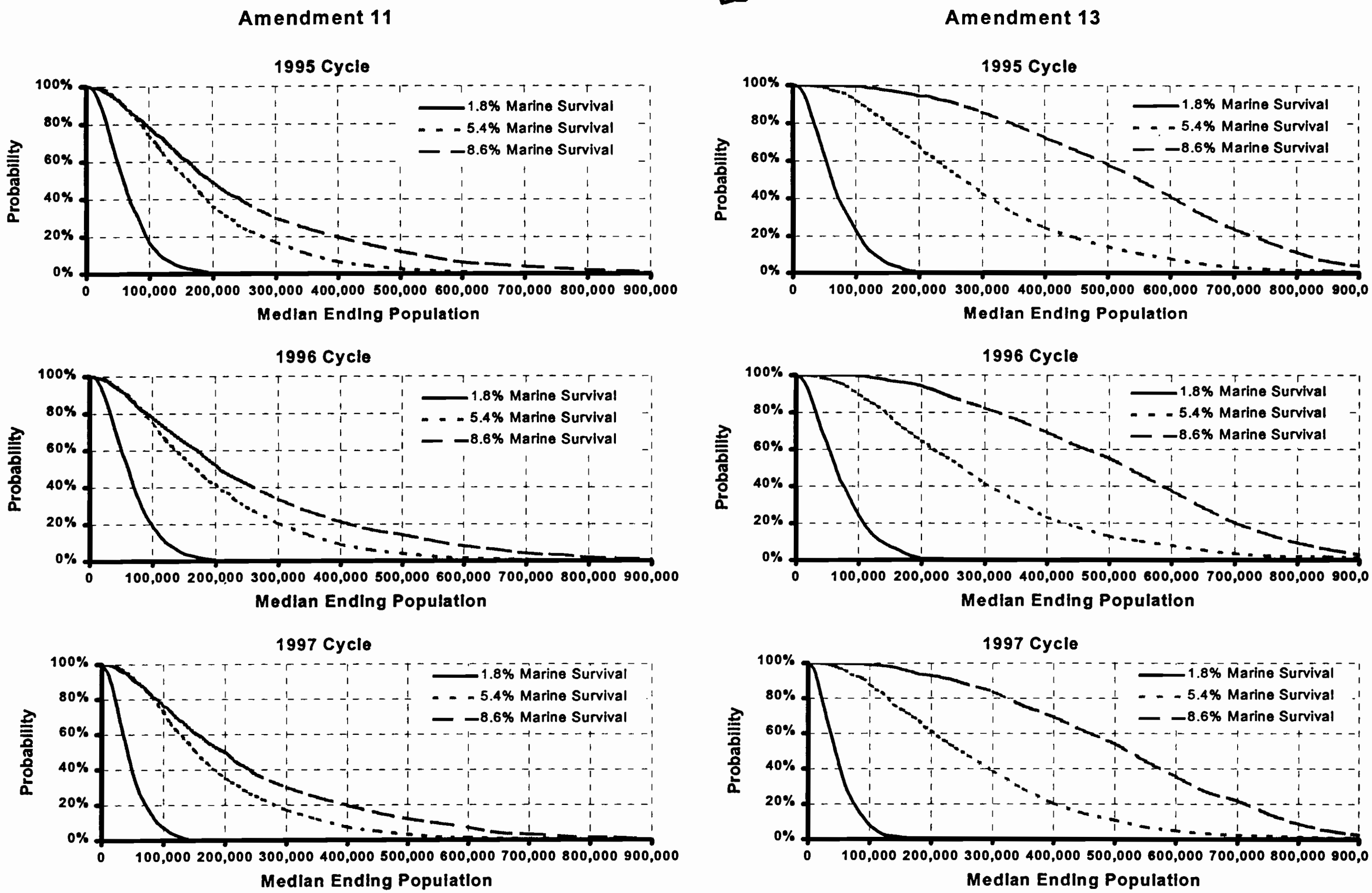


Figure 7. Probabilities of attaining median ending OCN populations for three brood cycles modeled at low, medium, and high marine survival for Amendment 11 and Amendment 13 management.

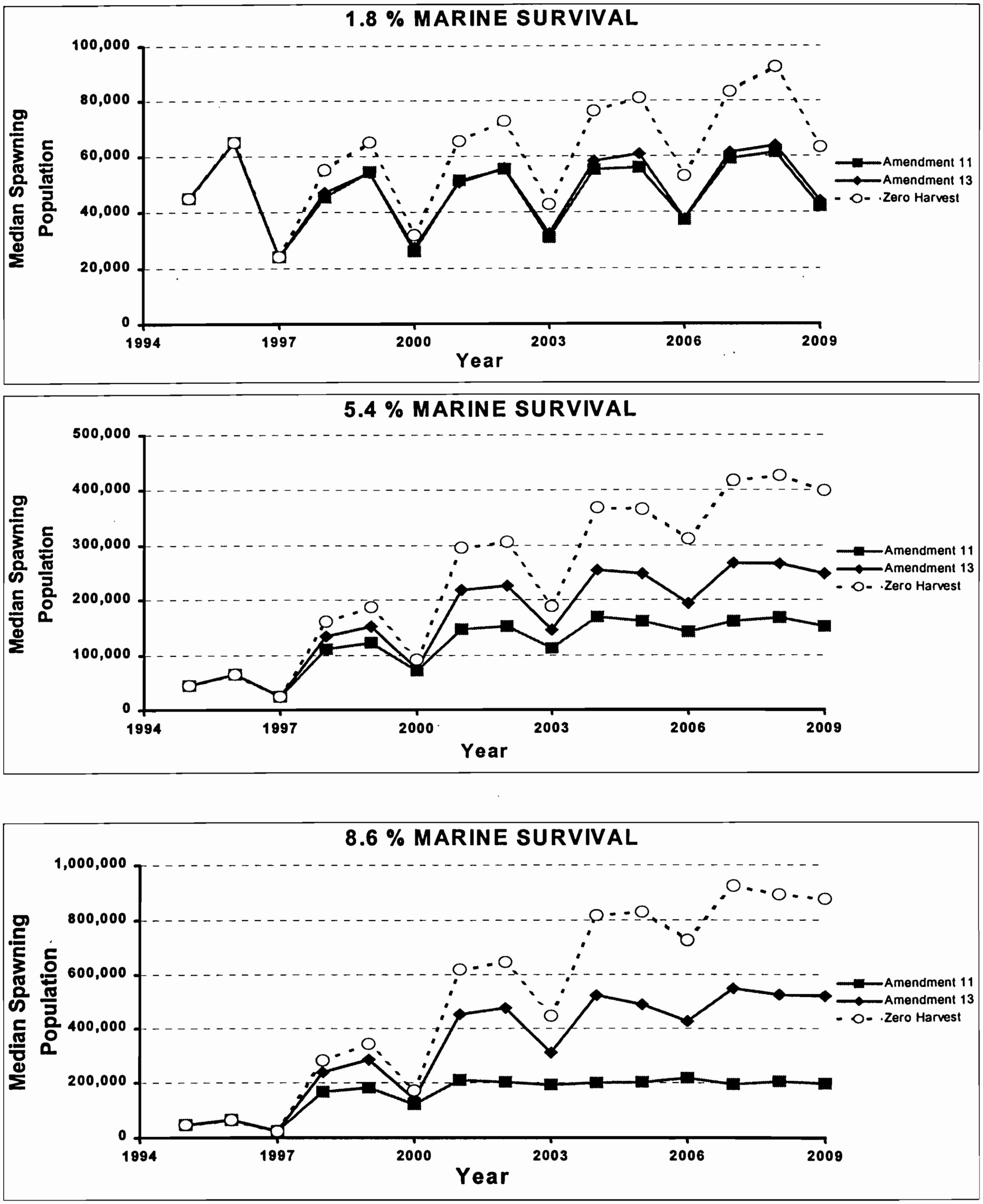


Figure 8. Comparison of projected aggregate OCN spawning populations when modeled for A-11 and A13 management regimes and for no harvest at low, medium, and high marine survivals.

Direct Comparison of the Amendment 13 Management Regime to the Amendment 11 Management Regime Both harvest management regimes, when modeled at low marine survival, result in population sizes in the range of recent observations (1990-97). Model runs at low population sizes indicate that projected escapements are very similar under both management regimes (Figure 8); however, Amendment 11 at low marine survival was modeled using 13% or 15% exploitation rates rather than the full 20% as allowed. The Amendment 11 model runs under low escapements represent historical Council practices under this management regime and could have actual impacts up to 20%; higher than those that were modeled. Projected spawner escapements at low marine survival would be somewhat lower under Amendment 11 if the fishery exploitation rate was allowed to approach the maximum allowable level. For comparative purposes, projected median population size for the OCN aggregate was also modeled with zero harvest and is included in Figure 9.

Projected median population size for the OCN aggregate under Amendment 13 and Amendment 11 indicates that at medium and high marine survival, Amendment 13 has the capability of allowing higher escapements (Figure 8). Additionally, management under Amendment 13 provides for higher probabilities of achieving escapement thresholds (Figures 5-7).
4) Long-term Simulation Modeling

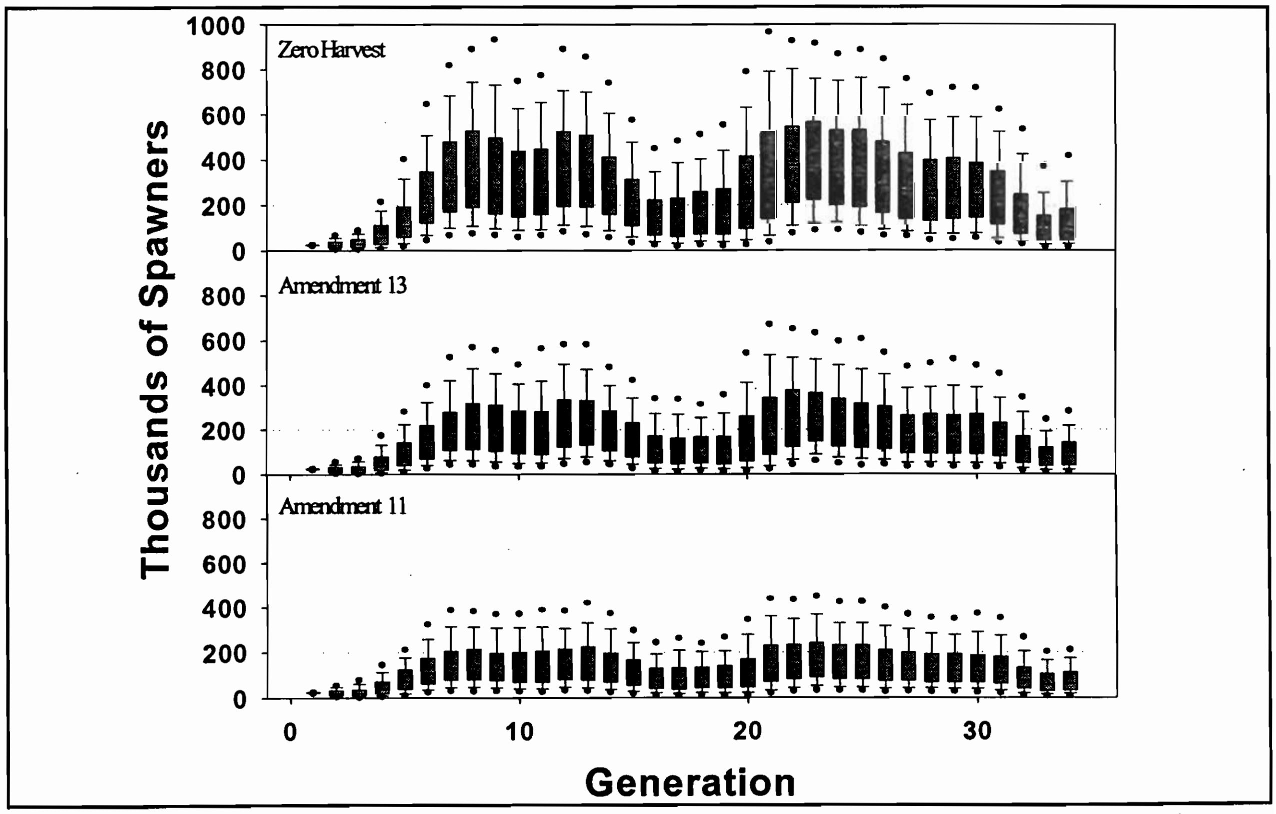


Figure 9. A time series of 33 generations of spawning escapements with zero harvest, and A-11 and A-13 harvest strategies. Marine survival ranged from 1.5% to 6% on a template of the Aleutian Low Pressure Index with a periodicity of approximately 50 years. The boxes depict the median and upper/lower quartiles, whiskers are 10/90 percentiles, and dots are 5/95 percentiles.

Thirty-three generation model runs were completed for the 1997 brood year under zero, Amendment 11, and Amendment 13 harvest levels. The 1997 year was selected from the available data sets from 1994-97, which were complete enough to run the model, because it had the lowest brood size. The use of the weakest available brood enabled the analysis to use the most conservative model run. Assumed marine survival for the long-term modeling varies between 1.5% and 6%, on a template of the Aleutian Low Pressure Index (ALPI). The ALPI has long-term periodicity of about 50 years. Figure 9 displays a 33 generation time series of spawning escapements with zero harvest, Amendment 11, and Amendment 13 harvest strategies. Under Amendment 13 median escapements of 200,000 or greater occur approximately 20% of the time and the upper quartiles of the median exceed 200,000 fish approximately 70% of the time. Escapements under Amendment 11 are lower than Amendment 13, and the median escapement is never greater than 175,000 fish. While escapements under a zero harvest scenario always exceed those under Amendment 13 and Amendment 11 management, escapements with no harvest still failed to exceed 200,000 fish in more than 30% of the 33 generations.

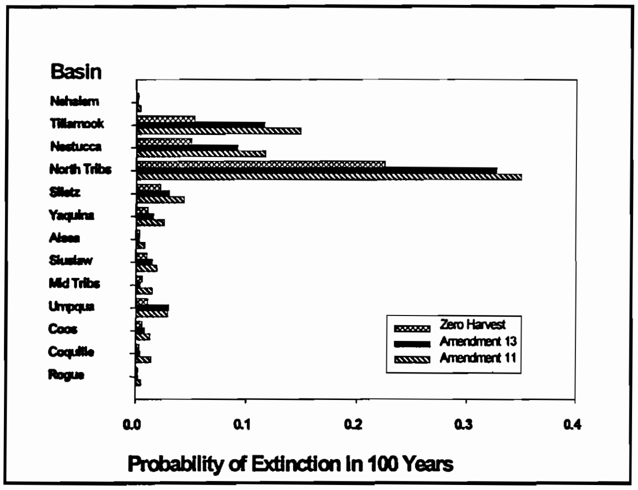


Figure 10. Local extinction probabilities with zero harvest, Amendment 11 and Amendment 13 harvest strategies.

Figure 10 displays local extinction probabilities (probability of going extinct in 100 years) under zero harvest, Amendment 11, and Amendment 13 harvest strategies for each of the major basins for OCN. Extinction probabilities are lowest with zero harvest, and lower under Amendment 13 than under Amendment 11. Extinction probabilities for 10 of the 13 basins is less than 0.05. Three of the northern river systems, the Tillamook, Nestucca and North Tribs have the greatest risk.

The North Tribs group, which consists of small systems widely dispersed along the coast among the larger systems, had the highest extinction probabilities: approximately 0.22 under zero harvest, 0.32 under Amendment 13, and 0.35 under Amendment 11. These relatively high extinction probabilities may be attributed to the limited habitat area and small population size of each of the small coastal streams comprising this grouping. The North Tribs group had only 97 combined miles of available habitat with individual streams widely distributed over approximately 100 miles of coast compared to the Tillamook basin, with 249 miles of habitat, and Nestucca basin, with 168 miles of habitat. The model treated these small coastal tributaries as a single population with the standard influence of intra-basin straying. In reality, these smaller systems appear to be strongly influenced by larger, nearby systems. The coho habitat in many of these northern tributaries is at best marginal, due to the volcanic geology and steep stream gradient. Further analysis of these small northern tributaries was conducted by ODFW (Tom Nickelson 1998, ODFW, personal communication). An example of a small stream, approximately 9 km in length, was modeled with the habitat variable artificially set for the best coho habitat under a harvest strategy that was a close approximation of the Amendment 13 proposal. The model run concluded that the probability of extinction in the next 100 years was 0.16. The modeling of these smaller systems appears to be more problematic because they are affected by the various impacts differently than larger systems. The extinction probabilities on these small systems may be biased high because the various modeled impacts will have a greater effect on the smaller populations over 100 years. The model runs should have incorporated these smaller basins with those larger systems, with which they typically interact as a population.

Based on the results of these simulations, the 100-year extinction probabilities under zero harvest, Amendment 13, and Amendment 11 strategies are 0.05, 0.09, and 0.12, respectively, for the Nestucca basin, and 0.06, 0.12, and 0.15 for the Tillamook basin. While these probabilities may be of concern, it should be kept in mind that the conservative approach used in the modeling may over-estimate the contribution of the proposed action to the existing extinction probabilities of Oregon coastal coho salmon. The model excluded available Oregon coastal lake systems, which represent some of the most stable and highest OCN production, and used the weakest brood year from the available data sets. Under Amendment 13, Tillamook and Nestucca basins are estimated to have probabilities of extinction of approximately 0.1.

B. Southern Oregon/Northern California Coastal Coho

Coho salmon from this region are contacted by ocean fisheries primarily off California. Coded-wire tagged coho released from hatcheries south of Cape Blanco have a southerly recovery pattern: primarily in California (65-92%), with some recoveries in Oregon (7-34%) and almost none (<1%) in Washington or British Columbia (percent data represent range of recoveries for 5 hatcheries by state or province) (Weitkamp et al. 1995).

Ocean exploitation rates for SONCC coho are based on the exploitation rate on Rogue/Klamath hatchery stocks and have only recently become available. The estimated ocean exploitation rates were 5% in 1996 and 1997, 12% in 1998, and are projected to be 5% in 1999 (PFMC 1997c, PFMC 1998c, PFMC 1999). In an interim rule (62 FR 38479, July 18, 1997) promulgated under section 4(d) of the ESA, NMFS determined that it is unnecessary to prohibit the take of SONCC coho (including the California component) in Oregon state waters if the harvest is carried out in accordance with the Oregon Coastal Salmon Restoration Initiative[2] OCSRI. The PFMC has recommended for approval to NMFS FMP Amendment 13 (PFMC 1997a), which would implement the harvest component of the OCSRI.

Amendment 13 disaggregates management of OCN coho by establishing exploitation rate targets based on marine survival and the parent spawner status for four OCN sub-stocks, the most southern of which is the Oregon component of the SONCC ESU. The Amendment 13 harvest objectives permit exploitation rates on the Oregon component of the SONCC ESU of up to 35%

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[2] This biological opinion will refer to the OCSRI, which has become part of the expanded Oregon Plan for Salmon and Watersheds (Oregon Governor's Executive Order No. EO 99-01). Amendment 13 was proposed and developed on the basis of the OCSRI.

(Table 4). Four tiers of harvest rates would be allowed, depending on parent spawner escapement relative to so-called Level 1 and Level 2 rebuilding criteria. The harvest rates within each tier vary depending on smolt to adult survival, as estimated by an ocean productivity index. Rogue River coho, the indicator stock for the Oregon component of the SONCC ESU, currently meets the Level 1 parent spawner status, and may be exploited at rates in the next to the highest tier: up to 15%, 20% and 25%. If escapement of Rogue River coho remained unchanged for three additional years, exploitation rates up to 15%, 30% or 35% could be permitted, depending on ocean survival conditions.

Table 4. Management for Oregon coho under Amendment 13 to the FMP.

	Low Marine Survival	Medium Marine Survival	High Marine Survival
High Parent Spawning Escapement	≤15%	≤30%	≤35%
Medium Parent Spawning Escapement	≤15%	≤20%	≤25%
Low Parent Spawning Escapement	≤15%	≤15%	≤15%
38% Below Low Parent Spawning Escapement	≤13%	≤13%	≤13%

C. Central California Coastal Coho

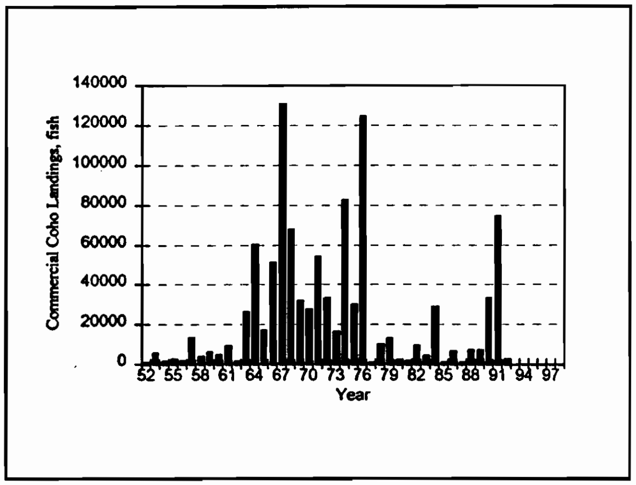

Figure 11. Commercial deliveries in number of coho to the ports of San Francisco and Monterey, 1952-present (PFMC 1993, PFMC 1999a)

Very little information on spawning escapement, historical harvest rates, or hooking mortality incidental to chinook fisheries exists for CCC coho. Commercial deliveries of coho to the ports of San Francisco and Monterey are displayed in Figure 11. Between 1963 and 1975, commercial catches of coho in California ranged from 100,000 to 650,000. These harvests were likely the result of the large increases in hatchery production in Oregon that occurred during the same time period. PFMC recommendations for OCN coho harvest rates have resulted in little or no coho harvest off California since 1992, and coho retention has been prohibited off California since 1994. Although the prohibition of coho retention was a consequence of meeting exploitation rate goals for OCN coho, the prohibition has also benefitted California coho populations as well. While a specific incidental exploitation rate on CCC coho can not presently be estimated for no-coho-retention chinook fisheries, NMFS believes the exploitation rate on CCC coho since 1992 has been greatly reduced compared to historical levels and considers the continued prohibition of coho retention critical to protection of the CCC ESU. Incidental exploitation rates on CCC coho would be expected to be similar to the exploitation rates

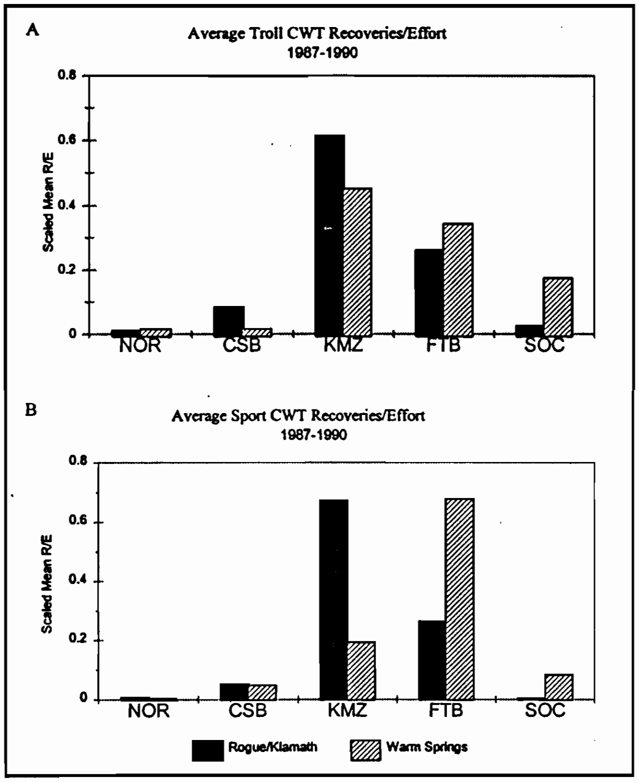

Figure 12 Average troll (A) and sport (B) recoveries/effort from 1987-1990 for five catch areas; the recoveries/effort have been scaled so the sum of recoveries/effort for each ESU in each panel sums to one.

estimated by the PFMC for Klamath/Rogue coho to the extent that ocean distributions of CCC coho and SONCC coho are similar. The Warm Springs Hatchery on the Russian River is the only hatchery in the CCC range releasing CWT marked coho in sufficient numbers to be considered for distribution comparison between other stocks. Although the information provided by Warm Springs Hatchery coho on the ocean distribution of CCC coho is the best available, it is far from ideal.

Weitkamp et al. (1995) reported that the recovery pattern of Warm Springs coho exhibited a higher proportion of California recoveries than other California or Oregon hatcheries. Tweit (1997) compared the ocean distributions of CWT recoveries of hatchery-produced coho from the Warm Springs Hatchery and coho from Klamath basin hatcheries. He concluded that, while their distributions show "reasonably strong correlations" and a comparable range, a more southerly concentration is indicated by the Warm Springs hatchery stock.

Spencer (1997, Attachment 1) compared the relative frequency of CWT recoveries per unit effort of Rogue/Klamath hatchery stocks to the Warm Springs stock for the commercial and sport sectors (Figure 12)[3]. The relative frequencies of sport and troll recoveries suggest that Warm Springs coho distribute in a slightly more southerly pattern than do Klamath/Rogue coho. In the troll data, the highest recoveries/effort for both ESUs is seen in the Klamath Management Zone (KMZ) area, although the recoveries/effort for the Warm Springs coho in the KMZ is relatively smaller. In contrast, the sport recoveries/effort of the Warm Springs coho are highest in the Fort Bragg area, whereas the sport recoveries/effort for the Rogue/Klamath coho are highest in the KMZ. Contact rates of Warm Springs coho in the area south of Point Arena (SOC) would be expected to be greater than for Rogue/Klamath coho. Assuming that hatchery stocks are representative of wild stocks[4], the SONCC coho and the CCC coho appear to have similar, but

[3] Catch areas referred to in Figure 2 are as follows: NOR - Cape Falcon to Heceta Head, OR; CSB - Heceta Head to Humbug Mtn. OR; KMZ - Humbug Mtn. OR to Horse Mtn. CA; FTB - Horse Mtn. to Pt. Arena CA; SOC - Pt. Arena to Pt. Sur CA.

[4]The extent to which CWT recovery patterns of the Warm Springs and Klamath basin hatcheries may coincide with the distribution patterns of wild coho from the respective ESUs is not known; no tagging studies of wild

not identical distributions, with the CCC coho exhibiting a more southerly distribution.

A more southerly distribution of CCC coho relative to SONCC coho, in combination with the relatively large amount of sport and commercial fish effort south of Point Arena, would likely result in incidental ocean exploitation rates on CCC coho that are higher than the recent rates of 5-12% estimated for the SONCC ESU. The actual CCC coho exploitation rate would depend on the magnitude of the difference between the ocean distributions of the two ESUs.

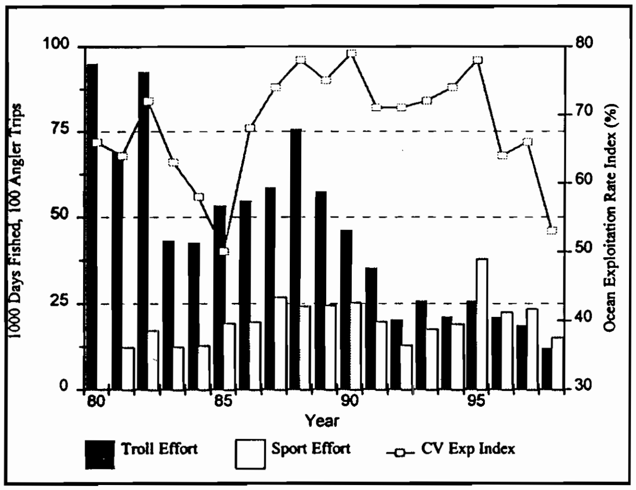

Figure 13 California troll and sport effort and Central Valley Exploitation Index.

The magnitude of the hook-and-release mortality in non-retention fisheries will be proportional to the amount of fishing effort allowed in chinook-directed fishing seasons. Ocean salmon fisheries off California, which target Central Valley fall chinook, are limited by the abundance of Klamath River fall chinook and ESA jeopardy standards for listed salmon species. In 1993, the Department of the Interior quantified the federally reserved fishing rights of the Yurok and Hoopa Valley Indian tribes of the Klamath Basin. Application of those rights has required significant reductions in the ocean harvest rate on Klamath River fall chinook, and will permanently constrain California and Oregon troll seasons relative to seasons prior to 1993. In 1996 and 1997, NMFS issued biological opinions requiring reductions in fishing effort off California in order to protect Sacramento River winter chinook. These restrictions have been applied primarily to the recreational fishery. Figure 13 shows annual California troll and recreational effort since 1980 (PFMC 1999a). In the past three years there has been a substantial reduction in the Central Valley ocean harvest index, which is an indicator of the harvest rate on Central Valley chinook stocks. If this trend continues, additional reduction in coho mortality associated with chinook directed fisheries in California would be expected to occur relative to the rates that existed prior to 1993.

Although no data exist that permit direct estimation of exploitation rates on CCC coho, the

California coho exist that would permit a comparison. The Warm Springs Hatchery population was initiated through stock transfers from outside the ESU and has incorporated at least 3 additional stocks that are not native to the Russian River basin (NMFS 1996). Accordingly, the NMFS Biological Review Team concluded that the Warm Springs Hatchery population should not be considered part of the CCC ESU. Within the SONCC ESU, the Klamath hatchery contains source stock from the Cascade River, and the Trinity hatchery has received source stock from the Eel, Cascade, Noyo, and Alsea Rivers (Weitkamp et al. 1995). Weitkamp et al. (1995) reported that the transfer of non-ESU coho into northern California hatcheries has been "fairly large", and Brown et al. (1994) concluded that Klamath and Trinity hatchery coho stocks are primarily of non-native origin. NMFS determined that several hatchery populations in the SONCC range were part of the ESU, including the Trinity River Hatchery, but that they were not essential for recovery, and therefore should not be listed (62 FR 24588, May 6, 1997).

similarity in ocean distribution of hatchery stocks from the CCC and SONCC ESUs suggests that incidental exploitation rates on CCC coho do not greatly exceed those observed for SONCC coho. Reduced fishing effort off California and a continued prohibition in California of coho fisheries and coho retention in chinook fisheries should insure that incidental mortality of CCC coho remains low.

V. Cumulative Effects

Cumulative effects are defined as the "effects of future state or private activities, not involving federal activities, which are reasonably certain to occur within the action area of the federal action subject to consultation" (50 CFR 402.02). For the purposes of this analysis, the action area includes ocean fishing areas off the coast of Washington, Oregon, and California. As with winter chinook (noted in the March 8, 1996 biological opinion) the production of coho salmon, steelhead and cutthroat trout by state hatchery programs will likely continue and has the potential to add cumulative impacts to listed and proposed populations in the ocean, through competition and predation. State hatchery salmon production may also influence exploitation rates on coho in the ocean through increasing chinook salmon abundance above natural salmon abundance. At this time, the extent of cumulative impacts from State hatcheries' salmon production is not known. Further evaluation is warranted, but this can best be done as part of an overall assessment of species specific hatchery programs.

VI. Integration and Synthesis of Effects

As a result of conservative management recommendations by the PFMC, which have included the prohibition of coho fisheries south of Cape Falcon since 1994, the magnitude of fishery impacts to coho salmon in PFMC fisheries has been reduced substantially compared to any period in recent history. The ocean exploitation rate index on OPI coho has fallen from an average of 63% (1970-1993) to an average of 10.5% from 1995 to 1998 (PFMC 1999a). Ocean impact rates on OCN coho averaged 80% from 1970 to 1983, 55% from 1987 to 1992, and 7 to 12% from 1994 to 1996 (PFMC 1997a). Although historical exploitation rates are not available for the SONCC and CCC ESUs stocks, similar declines in exploitation rates have likely also occurred and the expected rates under Amendment 13 are substantially less than those prevailing over the past three decades. The proposed action will not result in the destruction or adverse modification of critical habitat for any of the coho salmon ESUs (see section III A).

The FMP specifies that stocks listed under the ESA will be managed consistent with NMFS jeopardy standards. Those jeopardy standards are reviewed and communicated annually to the PFMC. The expected impacts to listed coho ESUs from NMFS' proposal to continue implementation of the FMP as amended by Amendment 13 are listed below.

A. Oregon Coast Coho

The management regime under Amendment 13 overall is more conservative than the current regime under Amendment 11. The results from the risk assessment (ODFW/NMFS 1998) indicated that OCN stocks will have an increased probability under Amendment 13 of attaining recovery and achieving full seeding of high quality habitat, especially if marine survival improves. The greater resolution resulting from the stratification of the OCN stock aggregate into four regional management units will give managers the ability to adjust harvest and other aspects of the management regime to manage conservatively for the weakest of the stocks in the overall OCN stock aggregate. Amendment 13 is based on the harvest management proposals developed in the OCSRI. The OCSRI incorporates the new Habitat-Based Life Cycle Model (Nickelson and Lawson 1996), which has both freshwater habitat and marine variables, thus giving a more accurate estimate of spawner abundance. The plan also will require an intensive monitoring program that will integrate surveys of summer and winter juvenile abundance to evaluate seeding of habitat, surveys of adult abundance using SRS protocols to obtain confidence estimates around spawner estimates in the four regional stock components, fishery impacts monitoring using CWT groups from each regional stock component, a more comprehensive system of stream monitoring sites for both juvenile and adult life stages, and physical surveys of spawning and rearing habitat to gain better assessment of full seeding of habitat (PFMC 1997a). The increased resolution and accuracy of information needed to manage OCN coho salmon will give managers the flexibility to manage the entire OCN stock aggregate while accounting for the weakest stocks that need more conservative harvest constraints.

As discussed previously, the risk analysis NMFS used to assess the probable effects of Amendment 13 incorporated the marine mortalities, ocean harvest, demographic phenomena, and the effects of habitat-related changes that occurred between 1990 and 1999 on Oregon Coastal coho; the model did not incorporate the effects of habitat-related changes in the future on coho salmon. For comparison, the risk analysis evaluated the effects of not having a harvest, the status quo (Amendment 11), and the proposed action (Amendment 13). These simulations suggest the proposed action did not appreciably increase the likelihood of extinction when compared with the zero harvest regime or the status quo. With the proposed action, most of the 13 core populations of Oregon Coastal coho had probabilities of extinction well below 0.01.

There were three notable exceptions. Two exceptions were the Tillamook and Nestucca basins. From the zero harvest to Amendment 13 harvest regimes, respectively, the extinction probability of Tillamook basin coho salmon increased from 0.06 to 0.12 percent while the Nestucca basin coho salmon increased from 0.05 to 0.09 percent. Differences between these two basins and the other basins included in the analysis can also be explained by their location: they are located in the northern management unit where the quality of habitat for coho salmon was moderate at best even in pristine conditions. The size of coho salmon populations in the northern section has always been lower than populations in other management units along the coast. When modeled, these small populations in the northern systems will appear to have a greater response to harvests over 100 years than the higher populations in the southern management units.

The third exception, the Northern Trib group, had the highest extinction probabilities of the thirteen core populations (approximately 0.22 percent under zero harvest and 0.32 under Amendment 13). Although these extinction probabilities caused great concern for the coho salmon in this group, a closer examination of the model suggested that these estimates may be an artifact of the analysis itself. That examination suggests that the relatively high extinction probability for this Northern Trib group may be an artifact of the limited habitat area and small population size of each of the small coastal streams comprising this grouping, which are dispersed widely along the coast among the larger systems. The examination suggests that the model may magnify the effects of small population size of survival probability over 100 years because those populations (either through metapopulation dynamics or other extinction - colonization processes) have a high, background risk of extinction.

As discussed previously, the extinction probabilities for these three groups should not translate into a significant, additional risk of extinction for the entire Oregon Coastal coho salmon population because the subpopulations in the Tillamook, Nestucca, and Northern Trib basins represent a small percentage of the entire stock, which has a very low additional risk of extinction associated with the proposed action. In addition, the PFMC in recent years has recommended exploitation rates on OCN coho substantially lower than permitted under the FMP. These rates represent a dramatic decrease from historic harvest levels (Figure 3). Amendment 13 provides for continued reduction in ocean exploitation rates on OCN and a more accurate monitoring program for attaining recovery of the OCN stock aggregate, which includes the OC ESU and Oregon components of the SONCC ESU. Based on this information, NMFS believes the proposed action is not likely to appreciably reduce the likelihood of both the survival and recovery of Oregon Coastal coho salmon.

B. Southern Oregon/Northern California Coastal Coho

Ocean exploitation rates on Rogue/Klamath hatchery stocks are estimated to have been 5% in 1996 and 1997, and 12% in 1998. Amendment 13 permits ocean exploitation rates on the Oregon component of SONCC coho to increase to 35%, depending on spawner rebuilding criteria and ocean survival conditions. In the past six years the PFMC has recommended exploitation rates on OCN coho substantially lower than permitted under the FMP. These recommendations have resulted in a prohibition of coho retention south of Cape Falcon since 1994. The PFMC's proposed Amendment 14 to the FMP includes central California and northern California coho in the list of stocks managed under the FMP, and NMFS encourages development by the PFMC of a rebuilding plan for those stocks. However, neither the FMP nor Amendment 13 currently provide specific protection for California populations of coho apart from the limitation on harvest rates determined by the status of the Oregon coho stocks and the acknowledgment that the PFMC will manage all stocks listed under the ESA consistent with NMFS' ESA consultation standards. NMFS considers this absence of conservation goals for California coho a deficiency in the FMP which could result in inadequate consideration of protecting listed coho populations in California.

Based on an assessment of the effects of the proposed action, NMFS finds that the FMP and Amendment 13 do not provide protections that are specific to the California portion of the SONCC ESU. As a result, despite appropriate and conservative actions taken in recent years, NMFS believes the proposed action is likely to appreciably reduce the likelihood of both the survival and recovery of SONCC coho.

C. Central California Coastal Coho

Based on the analysis of distribution of Warm Springs Hatchery and Rogue/Klamath hatchery stocks, the total exploitation rate on CCC coho, while not quantifiable, is unlikely to have greatly exceeded the ocean harvest rate of 5% to 12% estimated for Rogue/Klamath stocks since 1996. Information on spawning escapement of CCC coho stocks is scant, in many cases limited to presence-absence data. The PFMC in recent years has recommended exploitation rates on OCN coho substantially lower than permitted under the FMP, and retention of coho has been prohibited in California commercial fisheries and in recreational fisheries after May 1 since 1993. However, as is the case with northern California coho, neither the FMP nor Amendment 13 currently provide specific protection for CCC coho populations, apart from the limitation on harvest rates determined by the status of the Oregon coho stocks and the acknowledgment that the PFMC will manage all stocks listed under the ESA consistent with NMFS' ESA consultation standards. NMFS considers this absence of conservation goals for California coho a deficiency in the FMP which could result in inadequate consideration of protecting listed coho populations in California.

Based on an assessment of the effects of the proposed action, NMFS finds that the FMP and Amendment 13 do not provide protections that are specific to the CCC ESU. As a result, despite appropriate and conservative actions taken in recent years by the PFMC, NMFS believes the proposed action is likely to appreciably reduce the likelihood of both the survival and recovery of central California coastal coho.

VII. Conclusion

After reviewing the current status of Oregon Coastal coho salmon, Southern Oregon - Northern California Coastal coho salmon, and Central California coastal coho salmon, the environmental baseline for the action area, the effects of the proposed fishery and the cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of Oregon Coastal coho salmon, but is likely to jeopardize the continued existence of Southern Oregon/Northern California coastal coho salmon and Central California coastal coho salmon. No critical habitat has been designated for these species; therefore, none will be affected.

VIII. Reasonable and Prudent Alternative

The regulations implementing section 7 of the ESA (50 CFR 402.02) define reasonable and prudent alternatives as alternative actions, identified during formal consultation, that (1) can be implemented in a manner consistent with the intended purpose of the action, (2) can be implemented consistent with the scope of the action agency's legal authority and jurisdiction, (3) are economically and technologically feasible, and (4) would, NMFS believes, avoid the likelihood of jeopardizing the continued existence of listed species and avert the destruction or adverse modification of critical habitat.

NMFS has developed a three part alternative to the proposed action. When taken together as an integrated action, the following Reasonable and Prudent Alternative (RPA) is not likely to jeopardize listed species. Part 1 of the RPA requires that PFMC fisheries be crafted to achieve an ocean exploitation rate on SONCC coho of no greater than 13%, which includes all harvest related mortality. Part 2 of the RPA requires the prohibition of both coho-directed fisheries and coho retention in chinook-directed fisheries off California. Part 3 of the RPA requires monitoring of harvest and stock composition. Taken as a whole, NMFS believes the RPA is not likely to jeopardize the continued existence of SONCC and CCC coho.

1. **Little information is available on natural coho spawning escapement levels in rivers of the California component of the SONCC ESU, and the status of parent spawner recruitment is therefore difficult to assess. Management measures developed under the FMP must be designed to achieve an ocean exploitation rate on Rogue/Klamath hatchery stocks of no greater than 13%, the lowest exploitation rate specified under Amendment 13 for OCN subaggregates. This should ensure that mortality rates on California coho stocks associated with the fishery do not increase until an adequate assessment of parent spawner recruitment rates is possible.**

NMFS previously established under section 4(d) of the ESA that the take of SONCC coho (including the California component) in Oregon state waters is exempted from Section 9 prohibitions if harvest is carried out in accordance with the Oregon Coastal Salmon Restoration Initiative. The harvest provisions of the Oregon Coastal Salmon Restoration Initiative are being implemented through Amendment 13 to the FMP. Under this determination the take of the SONCC coho can be quantified in terms of total harvest related exploitation rate, which may increase up to 35%, depending on ocean survival conditions and the parent spawner status of Rogue River coho and other OCN component stocks, as specified in Amendment 13. Because no regular escapement estimates exist for most naturally spawning coho in California streams, NMFS has determined that the incidental take of the California component of the SONCC ESU in ocean fisheries, as indicated by the Rogue/Klamath hatchery stocks, may not exceed a 13% exploitation rate. NMFS will reinitiate consultation on the SONCC ESU at such time that monitoring programs can be developed that permit a better assessment of population trends, and an improvement in the status of SONCC populations is documented.

2. **Little information is available on natural coho spawning escapement levels in rivers of the CCC ESU, and the status of parent spawner recruitment is therefore difficult to assess. Coho-directed fisheries and coho retention in chinook-directed fisheries are prohibited off California.**

NMFS is concerned that the amount of incidental take of CCC coho associated with ocean salmon fisheries authorized under the FMP cannot be directly assessed at this time. Until a more reliable index of harvest impacts on CCC coho is available, it is prudent to continue the prohibition of coho retention in salmon fisheries off California.

Commercial salmon fishermen can, to a certain extent, target coho based on the area of fishing and the depth at which gear is deployed. When coho retention is not permitted, it is in the self-interest of commercial fishermen to avoid strategies that increase the likelihood of coho encounters. In modeling coastwide coho exploitation rates, the PFMC's Salmon Technical Team reduces estimated coho encounters by a factor of 25% for fisheries in which coho retention is prohibited. The absence off California of fisheries directed at coho and the continued prohibition of coho retention in chinook-directed fisheries is expected to provide a substantial reduction in incidental coho mortality relative to years when coho retention was permitted.

The restrictions on the incidental exploitation rate on SONCC coho required under RPA part 1 are intended to ensure that the protection for SONCC coho is consistent with the highest level of protection afforded under Amendment 13: an exploitation rate of 13% or less. Because CCC coho may distribute in a more southerly pattern than SONCC coho, the incidental harvest rate (including hook and release mortality) will likely be higher for CCC coho than for SONCC coho. However, the exploitation rates estimated for SONCC, as indicated by Rogue/Klamath hatchery stocks, have on average been well below 13% (5% in 1996 and 1997, and 12% in 1998).

Since 1994, there has been little or no retention of coho permitted off California; the magnitude of the hook-and-release mortality incurred by CCC coho has been proportional to the amount of fishing effort permitted in chinook-directed fishing seasons. Since 1995, both commercial fishing effort and the harvest rate index on Central Valley fall chinook have fallen sharply. The reduction in commercial fishing effort off northern and central California is in part a result of the increase in Klamath River fall chinook harvest allocation to in-river Tribal fisheries. Additional constraints on ocean harvest necessary to protect Sacramento River winter chinook have primarily affected ocean recreational seasons.

NMFS will reinitiate consultation on the CCC ESU at such time that monitoring programs can be developed that permit a better assessment of population trends, and an improvement in the status of CCC populations is documented.

When applied together, RPA parts 1 and 2 will reduce landed mortality of coho to near zero off California and ensure that non-landed mortality will be constrained to the levels associated with a marine exploitation rate of 13% or less on Rogue/Klamath hatchery stocks.

3. **NMFS shall cooperate with the affected states and the PFMC to ensure that ocean salmon fisheries are monitored and sampled for stock composition including the collection of CWTs in all fisheries and other biological information to allow for a thorough post-season analysis of fishery impacts on listed species.**

Pacific coast salmon management is based on recoveries of CWTs embedded in hatchery produced salmon. The states of Washington, Oregon, and California conduct extensive monitoring programs to ensure ocean fisheries are properly sampled for the detection of CWT marked fish. The analysis of CWT recoveries provides estimates of harvest rates for various stocks, including hatchery stocks representative of Snake River fall chinook, Oregon coastal coho, and Rogue/Klamath hatchery coho. The monitoring of incidental harvest of Sacramento River winter chinook through CWT recoveries will again be possible for the 2000 ocean salmon fishery. Alternative methods of monitoring harvest on winter chinook are available through genetic stock identification, which can distinguish among various Central Valley chinook salmon stocks. This technique may present a more accurate method of assessing harvest impacts and shall be utilized where appropriate. NMFS shall ensure that the PFMC continues to report post-season analyses of the effects of ocean fisheries on listed species in the PFMC's annual Review of Ocean Salmon Fisheries, published prior to the pre-season planning process in March and April.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA, provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be undertaken by NMFS. NMFS has a continuing duty to regulate the activity covered by this incidental take statement. If NMFS fails to assume and implement the terms and.conditions, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, NMFS must document the progress of the action and its impact on the species as specified in the incidental take statement. [50CFR §402.14(i)(3)]

I. Amount or Extent of Incidental Take

A. Oregon Coastal Coho

All harvest that may occur will be limited specifically by the measures proposed by the PFMC in Amendment 13 to control the total catch of OCN coho salmon in ocean fisheries, including quotas and other time, area, gear and catch limitations measures that are implemented as part of the package of annual regulations. NMFS anticipates a level of take consistent with management measures developed under the FMP and Amendment 13 and the terms specified in the Reasonable and Prudent Alternative.

B. Southern Oregon Northern California Coastal Coho

NMFS projects a level of take consistent with the terms specified in the RPA. NMFS anticipates that most incidental take of SONCC coho will be difficult to detect because the incidental take results from the mortality associated with hook and release in chinook-directed fisheries, and the finding of a dead specimen is unlikely. Incidental take is estimated by applying hooking mortality rates to projected encounter rates based on historical catch effort data. Projected ocean exploitation rates on SONCC coho as indicated by Rogue/Klamath hatchery stocks will not exceed 13%. Additional harvest on of the southern Oregon component of the SONCC coho may occur in terminal or freshwater areas consistent with Amendment 13.

C. Central California Coastal Coho

NMFS projects a level of take consistent with the terms specified in the RPA. NMFS anticipates incidental take of CCC coho will be difficult to detect because the incidental take results from the mortality associated with hook and release in chinook directed fisheries and the finding of a dead specimen is unlikely. The amount of incidental take of CCC coho cannot be directly assessed at this time; however, the best available information indicates that the level will not greatly exceed the 12% ocean exploitation rate recently estimated for SONCC coho.

II. Effect of the Take

In the accompanying biological opinion, NMFS determined that the level of anticipated take of OC, SONCC, and CCC coho is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat when the reasonable and prudent alternative is implemented.

III. Reasonable and Prudent Measures

NMFS included two reasonable and prudent measures in the incidental take statement of the March 8, 1996, biological opinion, which remain in effect: 1) in-season management actions taken during the course of the fisheries shall be consistent with the harvest objectives established preseason that were subject to review for consistency with this biological opinion, and 2) incidental harvest impacts of listed salmon stocks shall be monitored using best available measures.

IV. Terms and Conditions

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action or RPA. In order to be exempt from the prohibitions of sections 9 and 4(d) of the ESA, NMFS must continue to comply with all of the terms and conditions listed in the March 8, 1996, biological opinion, as amended by the February 18, 1997, opinion concerning Sacramento River winter chinook. In addition, NMFS must comply with the following terms and conditions to implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. NMFS shall confer with the affected states and PFMC chair to ensure that in-season management actions taken during the course of the fisheries are consistent with the harvest objectives established preseason.

2. NMFS, in cooperation with the affected states and PFMC chair, shall monitor the catch and implementation of other management measures at levels that are comparable to those used in recent years. The monitoring is to ensure full implementation of, and compliance with, management actions specified to control the various ocean fisheries.

3. NMFS, in cooperation with the affected states and PFMC chair, shall sample the fisheries for

stock composition, including the collection of CWTs in all fisheries and other biological information to allow for a thorough post-season analysis of fishery impacts on listed species.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of threatened and endangered species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. NMFS believes the following conservation recommendations, in addition to those included in the March 8, 1996, biological opinion, are consistent with these obligations, and therefore should be implemented by NMFS.

1. NMFS should make efforts to ensure that within three years monitoring programs will be initiated by NMFS, the state of California, or other entity, that are capable of gathering information on coho spawning abundance and/or out-migrant abundance for no less than two populations within the CCC ESU and two populations within the California portion of the SONCC ESU. NMFS should coordinate with State, Tribal, and other agencies as appropriate to ensure that the appropriate monitoring of listed coho populations in California is instituted.

2. NMFS should evaluate the ability of each listed ESU to survive and recover, given the totality of impacts affecting each ESU during all phases of the salmonid's life cycle, including freshwater, estuarine and ocean life stages. For this effort, NMFS should evaluate available life cycle models or initiate the development of life cycle models where needed.

REINITIATION OF CONSULTATION

This concludes formal consultation on the Pacific Coast Salmon Plan and Amendment 13 to the Plan. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take specified in the Incidental Take Statement is exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the biological opinion; (4) a new species is listed or critical habitat designated that may be affected by the identified action. In instances where the specified amount or extent of incidental take is exceeded, section 7 consultation must be reinitiated immediately

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Attachment 1

MEMORANDUM TO: Peter Dygert
National Marine Fisheries Service
Northwest Region
Seattle, Washington

Dan Viele
National Marine Fisheries Service
Southwest Region
Long Beach, California

FROM: Paul Spencer
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Southwest Fisheries Science Center
Tiburon, California

SUBJECT: Analysis of distributions of coded wire tagged coho salmon from the central California and southern Oregon/northern California Evolutionarily Significant Units (ESUs).

INTRODUCTION

Ocean harvest models for salmonid fisheries, such as the Fisheries Regulation Assessment Model (FRAM), commonly use recoveries and hatchery returns of coded wire tagged (CWT) fish to estimate exploitation rates upon specific stocks. Of particular interest is the exploitation rate upon the central California coast (CCC) coho salmon, which comprise an Evolutionarily Significant Unit (ESU) listed under the Endangered Species Act (ESA), resulting from chinook salmon fisheries. Direct estimation of this exploitation rate is not available because the CCC coho are not included in the FRAM, but the hatchery stocks from the southern Oregon/northern California coast (SONCC) ESU may be used as a surrogate if their distribution is similar to the CCC ESU.

The extent to which hatchery fish are representative of natural fish in this ESU is of some concern. Analysis of CWT recoveries of coho originating from the CCC area are limited to releases from the Warm Springs hatchery on the Russian River system, the only hatchery in the CCC area to release CWT coho. However, this hatchery population was established from coho stocks outside the ESU, and has incorporated at least three additional stocks from outside the ESU; the NMFS Biological Review Team concluded that the Warm Springs hatchery coho are not part of the CCC ESU. Similar concerns exist regarding hatchery populations in the Klamath River system, which are used to represent northern California coho in the SONCC ESU. Although the NMFS Biological Review Team concluded that several hatchery populations in the

SONCC area were within the ESU, Weitkamp et al. (1995) reported that the transfer of non-ESU fish into northern California has been "fairly large", and Brown et al. (1994) concluded that the Klamath and Trinity River coho stocks are primarily of non-native origin. The analysis of CWT recoveries is presented here because information on coho ocean distributions is minimal, although questions regarding representativeness of hatchery stocks remains a concern.

Bill Tweit (Washington Department of Fish and Game), in a memo dated 1-31-97, analyzed the distribution of CWT recoveries and concluded that although significant differences exist, the more southerly distribution of the CCC coho salmon reflects "a difference of tendency rather than extent" which could not be described with precision; thus, Tweit did not recommend inclusion of CCC coho to models of ocean distribution. However, Tweit's analysis did not include the salmon from southern Oregon, which would be expected to increase the differences in the distributions. Also, the distribution of recoveries may reflect fishing effort more than species abundance. The purpose of this analysis is to: 1) reexamine the distributions of CWT recoveries from the two ESUs with the inclusion of the Rogue River fish, a major component of the southern Oregon hatchery fish; and 2) present the distribution of recoveries per unit effort (R/E) for the troll and sport fisheries for each ESU.

METHODS

Information on CWT releases and recoveries were obtained from the Regional Mark Information System (RMIS), a computerized database that synthesizes CWT data on the west coast of North America. To facilitate consistency with Tweit's original analysis, the marine capture locations of CWT coho salmon originating from the CCC and SONCC areas in return years 1987-1990 were used to compare distributions; CWT recoveries of fish reared at the Warm Springs Fish Hatchery were essentially nonexistent in 1986 and from 1991-1996. CWT coho from the SONCC area were reared at the Mad River, Trinity River, Iron Gate, Sawmill Ponds, and Rogue River hatcheries. Recaptured coho from the Warm Springs hatchery consisted of 18 tag codes spanning brood years 1984-1987, whereas fish recaptured from the SONCC area consisted of 21 tag codes spanning brood years 1983-1987, with brood year 1983 represented by a single recovery in 1987 (Table 1).

Raw recoveries were expanded for sampling and assigned to location categories developed from the ocean salmon catch areas for California and Oregon (Table 2, Table 3). For each recovery year, Chi-square tests of independence were applied to the expanded recoveries categorized by recovery location and ESU of origin to evaluate the null hypothesis that recovery location is independent of ESU of origin. Note that the expanded recoveries were treated as direct observations in the Chi-square test, which tends to artificially increase the Chi-square test statistic and lower the resultant p-value. The expanded recoveries remains the best information available on CWT recoveries and are thus used, but interpretation of the Chi-square results is complicated by this procedure.

Recoveries per unit effort were computed for five areas (Table 2): northern Oregon (NOR), Coos

Bay (CSB), Klamath Management Zone (KMZ), Fort Bragg (FTB), and southern California (SOC). These areas correspond to the degree of spatial aggregation of the effort data obtained from PFMC (1997). To facilitate ease in assigning CWT recoveries to catch areas, coho caught between Navarro Head and Pt. Sur were assigned to the SOC area. Recoveries per unit effort were calculated separately for the ocean troll (RMIS fishery code10) and ocean sport (RMIS fishery code 40) fisheries, with effort measured in kilodays and thousands of angler trips, respectively. The mean R/E in each catch area for each area across the four recovery years was calculated as $\sum_{i=1987}^{1990} R_i \; / \sum_{i=1987}^{1990} E_i$.

RESULTS AND DISCUSSION

The raw CWT recoveries of Warm Springs coho were very low, and were less than 40 for recovery years 1988 through 1990 (Table 3); the expanded recoveries were less than 300 for all four years. By comparison, the expanded recoveries of the SONCC coho were greater than 1400 for years 1987 through 1989.

The mode for the SONCC coho was the CA34 region in years 1987, 1989, and 1990, and the CA56 region in 1988. In contrast, the mode for the central California ESU fish was CA34-CA56 in 1987, CA56 in 1989, and CA710 in 1988 and 1990 (Figure 1). Based upon the expanded recoveries, Warm Springs coho had a significantly ($p < 0.05$) more southerly distribution in all four recovery years.

The recoveries in 1988 showed the greatest discrepancies between the ESUs, with the Warm Springs coho recovered primarily south of Navarro Head and the SONCC coho somewhat evenly distributed across catch areas (Figure 1). However, the R/E from the troll fishery indicates that relative abundance of the Warm Spring coho in the KMZ and Fort Bragg areas approach the high level seen in the SOC area; in contrast, a distinct peak in the 1988 R/Es for SONCC coho occurred in the KMZ (Figure 2). Thus, the troll R/E data indicate that the Warm Springs coho do appear to be distributed further south than the SONCC coho, but the pattern is not as anomalous as indicated by the expanded recoveries alone. It should be noted that partitioning the expanded recoveries by fishery and across catch areas for individual years further reduces the scant recovery data, particularly for the Warm Springs fish (Table 3).

Differences in the R/E across catch areas were more consistently observed in the sport than troll data. The peak troll R/E for both coho groups occurred in the KMZ in 1987 and the Fort Bragg area in 1989; the peak troll R/E for Warm Springs coho occurred further south (Fort Bragg) than the peak R/E of SONCC coho (KMZ) in 1990 (Figure 2). In contrast, the highest sport R/E of Warm Springs coho occurred in either the FTB (1987, 1988, and 1990) or SOC area (1988), whereas the highest sport R/E of the SONCC coho occurred in KMZ in all four recovery years (Figure 3).

Examination of the mean R/Es suggest that the Warm Springs coho distribute in a slightly more southern distribution than the SONCC coho. In the troll data, the highest R/E for both groups occurred in the KMZ area, although the R/E for the Warm Springs coho in the KMZ is relatively smaller (Figure 4a). In contrast, the sport R/E of the Warm Springs coho is highest in the Fort Bragg area, whereas the sport R/E for the SONCC coho are highest in the KMZ (Figure 4b).

In conclusion, this cursory analysis suggests that the distribution of Warm Springs coho has a slightly more southern distribution than the SONCC coho, although a valid statistical evaluation remains hindered by the expansion of the raw observations. In addition, some concern exists regarding the degree to which the hatchery stocks, particularily the Warm Springs coho, accurately represent natural coho.

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Table 1. Raw recoveries by tagcode and brood year for fish captured off Oregon and California.

Area of Origin	Recovery Year	Brood Year	Tag Codes	Raw Recoveries
Warm Springs	1987	1984	65103, 65104, 65105, 65106	78
		1985	65109, 65111	2
Warm Springs	1988	1985	65109, 65110, 65111, 65112	26
		1986	65114, 65116, 65117, B61304	9
Warm Springs	1989	1985	65109	1
		1986	65115, 65116, 65117	36
		1987	65118	1
Warm Springs	1990	1987	65121, 65122, 65123, 65124	26
SONCC	1987	1983	73011	1
		1984	62901, 62902, 62903, 65652, 65943, 65961, 73161	1238
		1985	62913, 65654	14
SONCC	1988	1985	62913, 65654, 74004, 74005	482
SONCC	1989	1985	74005	2
		1986	62916, 65656, 74058, 74059	397
		1987	74550	1
SONCC	1990	1987	65938, 74060, 74550	85

Table 2. Recovery locations for coded wire tagged coho salmon.

Code	Location
Recovery locations for analysis of expanded recoveries alone	
OR4N	North of Hecata Head
OR5	Hecata Head - Humbug Mountain
OR5N	North of Humbug Mountain
OR6	Humbug Mountain - CA/OR border
CA12	CA/OR border - Big Lagoon
CA34	Big Lagoon - Spanish Flat
CA56	Spanish Flat - Narvarro Head
CA710	Navarro Head - Pt. Conception
Recovery locations for analysis of expanded recoveries per unit effort	
NOR	Cape Falcon - Hecata Head
CSB	Hecata Head - Humbug Mountain
KMZ	Humbug Mountain - Horse Mountain/Spanish Flat
FTB	Horse Mountain/Spanish Flat - Point Arena
SOC	Point Arena - Big Sur

Table 3. Raw and expanded recoveries of coho salmon CWT recoveries; location codes are indicated in Table 2. Raw recoveries may differ slightly from those in Table 1 because some fish could not be assigned a recovery location.

Recovery Year: 1987

Release Area	OR4N	OR5	OR6	CA12	CA34	CA56	CA710	Totals
Warm Springs								
Raw	0	7	6	5	28	26	6	78
Exp	0	25	13	15	105	104	23	285
SONCC								
Raw	14	65	410	183	381	169	26	1248
Exp	28	132	864	504	1506	721	79	3834

Recovery Year : 1988

Release Area	OR4N	OR5	OR6	CA12	CA34	CA56	CA710	Totals
Warm Springs								
Raw	1	1	1	1	0	7	24	35
Exp	10	2	8	2	0	53	195	270
SONCC								
Raw	22	67	95	123	77	73	14	471
Exp	67	123	261	320	204	373	122	1470

Recovery Year: 1989

Release Area	OR5N	OR6	CA12	CA34	CA56	CA710	Totals
Warm Springs							
Raw	4	0	1	7	17	8	37
Exp	8	0	4	24	68	49	153
SONCC							
Raw	17	71	38	156	90	14	386
Exp	41	157	160	551	385	117	1411

Recovery Year : 1990

Release Area	OR5N	OR6	CA12	CA34	CA56	CA710	Totals
Warm Springs							
Raw	0	1	1	4	9	10	25
Exp	0	2	4	12	38	62	118
SONCC							
Raw	3	18	9	28	19	5	82
Exp	7	46	41	99	62	44	299

Table 4. Raw and expanded recoveries of Warm Springs and SONCC coho by fishery and catch area.

Area of Origin	Year	Rec. Type	Area					
			NOR	CSB	KMZ	FTB	SOC	Total
				Troll fishery				
Warm Springs	1987	Raw	0	2	13	20	6	41
		Exp	0	13.1	38.52	85	22.57	159.19
	1988	Raw	1	0	1	7	17	26
		Exp	9.67	0	8	52.98	180.47	251.12
	1989	Raw	0	0	2	15	5	22
		Exp	0	0	5.42	60.21	39.29	104.92
	1990	Raw	0	0	0	5	3	8
		Exp	0	0	0	16.49	22.23	38.72
SONCC	1987	Raw	11	114	122	153	27	427
		Exp	20.81	312.92	370.02	641.5	75.46	1420.71
	1988	Raw	9	75	62	67	12	225
		Exp	40.63	220.03	174.06	355.19	117.97	907.88
	1989	Raw	2	12	15	67	17	133
		Exp	3.81	41.2	57.49	390.59	132.74	625.83
	1990	Raw	1	3	3	15	4	26
		Exp	2.25	13.26	17.67	47.75	30.27	111.2
				Sport Fishery				
Warm Springs	1987	Raw	0	3	6	27	0	36
		Exp	0	7.94	96.05	18.84	0	122.83
	1988	Raw	0	1	1	0	7	9
		Exp	0	1.68	2.24	0	14.32	18.24
	1989	Raw	1	3	6	3	3	16
		Exp	2.19	6.26	22.39	11.4	9.9	49.95
	1990	Raw	0	0	6	5	7	18
		Exp	0	0	18.36	24.73	39.56	82.65
SONCC	1987	Raw	1	29	773	16	1	820
		Exp	1.54	60.65	2261.99	79.87	6	2410.05
	1988	Raw	13	19	209	8	2	251
		Exp	26.51	44.08	482.94	31.05	4.1	588.68
	1989	Raw	1	10	242	12	0	265
		Exp	2.44	19.86	783.86	36.58	0	842.74
	1990	Raw	0	3	48	4	1	56
		Exp	0	7.49	152.71	14.42	13.81	188.43

Figure Captions

Figure 1. Distribution of coded wire tagged coho salmon by location and area of origin for recovery years 1987-1990.

Figure 2. Recoveries per unit effort from the troll fishery by location and area of origin for recovery years 1987-1990.

Figure 3. Recoveries per unit effort from the sport fishery by location and area of origin for recovery years 1987-1990.

Figure 4. Relative average mean recoveries per unit effort from 1987-1990 for the troll (a) and sport (b) fisheries.

TABLE 6. Determination of the allowable total fishery exploitation rate under Alternative 1 for each OCN coho stock component.

	SMOLT TO ADULT MARINE SURVIVAL[1/]		
	Low	Medium	High
PARENT SPAWNER STATUS[2/]	ALLOWABLE TOTAL FISHERY IMPACT		
High Parent spawners achieved Level #2 rebuilding criteria; grandparent spawners achieved Level #1	≤15%	≤30%	≤35%
Medium Parent spawners achieved Level #1 or greater rebuilding criteria	≤15%	≤20%	≤25%
Low Parent spawners less than Level #1 rebuilding criteria [redacted]	≤15% [redacted]	≤15%	≤15%

Stock Component Rebuilding Criteria:	Level #1 (50%)	Level #2 (75%)
Northern	10,900	16,400
North-Central	27,500	41,300
South-Central	25,000	37,500
Southern	2,700	4,100
Total	66,100	99,300

1/ See the discussion of marine survival under Section 2.2.1.3.

2/ In the event that a spawner criteria is achieved, but a basin within the stock component is identified to have a severe conservation problem, the next tier of additional harvest would not be allowed in mixed-stock fisheries for that component, nor additional impacts within the basin (see Table A-3 in Appendix A for a list of stream basins within stock components).