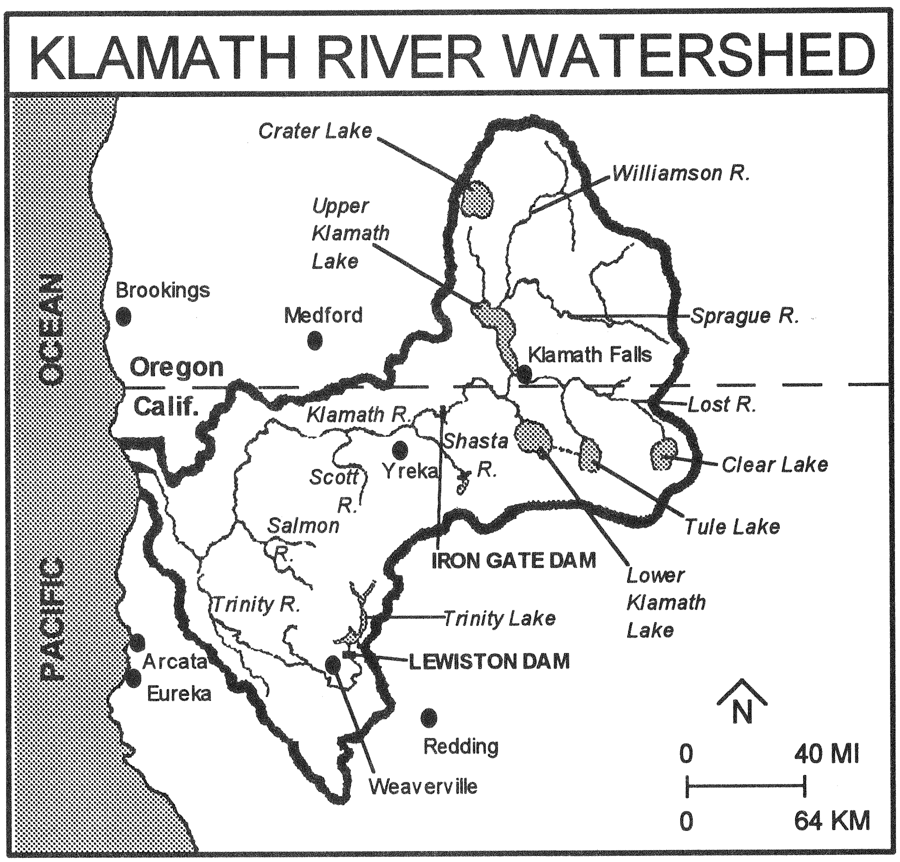
KLAMATH RIVER FALL CHINOOK REVIEW TEAM REPORT

AN ASSESSMENT OF THE STATUS OF THE KLAMATH RIVER FALL CHINOOK STOCK AS REQUIRED UNDER THE SALMON FISHERY MANAGEMENT PLAN



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This report was prepared at the request of the Pacific Fishery Management Council by a team of scientists and individuals with special knowledge and experience in salmon fishery and habitat management relationships as they relate to chinook salmon. The Council expresses its deep appreciation to members of the Klamath River Fall Chinook Review Team for providing this assessment of the status and management needs of the Klamath River fall chinook stock. In addition, the Council wishes to thank the team members' agencies and institutions for their willing support of this effort.

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ACRONYMS

Council	Pacific Fishery Management Council
CWT	coded–wire tag
FMP	fishery management plan
KFMC	Klamath Fishery Management Council
KRTAT	Klamath River Technical Advisory Team
PSC	Pacific Salmon Commission

CHARGE AND PURPOSE

The Magnuson Fishery Conservation and Management Act states, "Conservation and management measures shall prevent overfishing while achieving, on a continuous basis, the optimum yield from each fishery for the United States fishing industry." The implementation of Amendment 10 to the Pacific Fishery Management Council's salmon fishery management plan (FMP) in 1991 provided a definition of overfishing for each stock or stock complex covered in the FMP.

The Council's definition of overfishing states:

> Overfishing is an occurrence whereby all mortality, regardless of the source, results in a failure of a salmon stock to meet its annual spawning escapement goal or management objective, as specified in Section 3.5 of the salmon FMP, for three consecutive years, and for which changes in the fishery management regime offer the primary opportunity to improve stock status. While this condition is defined as overfishing in the broad sense, it is recognized that this situation may also be the result of nonfishing mortality, and fishery management actions may not adequately address the situation.

Under this definition, the determination of overfishing a stock is a two–step process. The first step occurs when a salmon stock fails to meet its annual spawning escapement objective for three consecutive years. The second step is a review by a Council–appointed work group to investigate the causes of the shortfall ("current status of stock productivity and all sources of mortality") and to report its conclusions and recommendations for assuring future productivity of the stock to the Council.

The Klamath River natural fall chinook stock, comprised of naturally spawning fall chinook in the Klamath–Trinity River Basin, failed to meet its FMP spawning escapement floor of 35,000 adults in 1990, 1991 and 1992. Therefore, at its April 1993 meeting, the Council directed the formation of a work group to review the status of this stock and report its conclusions and recommendations prior to the development of the 1994 ocean salmon fishery management options. This report, developed by the Klamath River Fall Chinook Review Team and presented in draft form at the March 1994 Council meeting, fulfills that Council directive.

The Klamath River Fall Chinook Review Team met on June 24–25, 1993, September 28–29, 1993, November 9–10, 1993 and February 3–4, 1994. Work subgroups met on several additional occasions to draft materials for review which are contained in a technical appendix to this report. A complete list of the members of the review team can be found in the acknowledgements on the inside cover of this report.

SPECIFIC BASIS FOR THE REVIEW

ASSESSMENT OF NUMERICAL SPAWNING ESCAPEMENTS AND SPAWNING ESCAPEMENT RATES

The Council's Salmon Framework Plan (Amendment 9) requires that Klamath fall chinook be managed to achieve an escapement rate for each brood of between 33 and 34 percent. At low stock sizes, the plan calls for escapement of 35,000 natural spawners, regardless of escapement rate. The escapement rate or minimum escapement is determined preseason based on the projected stock size.

Based on preseason projections, the escapement rate (with maximum allowable rates of fishing) was expected to be met in 1990 and the minimum escapement (with reduced rates of fishing) was expected to be met in 1991 (Table 1). In 1992, however, preseason stock size projections were not large enough to provide the minimum escapement, even in the absence of all fishing.

TABLE 1. Assessment of goal attainment for Klamath fall chinook, 1990–1992 escapements. (See Table 2 for brood escapement rates.)

Year	Goals	Were goals met?
1990	1) Exceed escapement floor of 35,000 natural adults.	1) No. Natural escapement was 15,600.
	2) Meet 0.33–0.34 escapement rate for the 1985–1988 broods.	2) Partially. The 1985–1986 brood escapement rates were not met; 1987 brood escapement rate was met; 1988 brood escapement rate was exceeded.
1991	1) Meet escapement floor of 35,000 natural adults.	1) No. Natural escapement was 11,600.
	2) Meet 0.33–0.34 escapement rate for the 1986–1989 broods.	2) Partially. The 1986 brood escapement rate was not met; 1987 brood rate was met; 1988 brood escapement rate was exceeded; too early for 1989 brood results.
1992	1) Meet escapement floor of 27,000 natural adults.[a/]	1) No. Natural escapement was 12,000.
	2) Meet 0.33–0.34 escapement rate for the 1987–1990 broods.	2) Yes. The 1987 brood escapement rate was met; 1988 brood rate was exceeded; too early to determine for 1989–1990 broods.

a/ Council proposed emergency plan amendment for the 1992 season. Final emergency rule regulations adopted by the departments of Commerce and Interior provided for about 25,800 adult natural spawners.

Based on postseason estimates of stock size, different target levels of harvest would have been appropriate in both 1990 and 1991. In 1990, full fishing rates should have been reduced, but in 1991, the minimum escapement would not have been met even if no fishing had been allowed.

The determination of escapement rate for a brood must rely on completion of that brood's life cycle. In the case of Klamath fall chinook, which live to be as old as five years of age, data exist to compute escapement rates for parent escapements as recent as 1987 (or 1988 if the small age–5 impacts and escapements are neglected).

The brood escapement rate for naturally produced Klamath fall chinook cannot be computed directly because no comprehensive program to collect the necessary catch and escapement data needed for such a computation exists. Rather, the natural escapement rate is best reflected in certain coded–wire tag releases from Iron Gate and Trinity River hatcheries (Table 2). The natural component on the Klamath River side of the basin (based on a similar maturity schedule) is best reflected in escapement rates of Iron Gate Hatchery fish tagged and released as fingerlings. Trinity River Hatchery fish tagged and released as fingerlings best reflect natural populations in the Trinity River sub–basin.

TABLE 2. Brood escapement rates (in percent) of Iron Gate and Trinity River hatchery fall chinook released as fingerlings, 1979–1988 broods.[a/]

Brood Year	Iron Gate Hatchery	Trinity Hatchery
1979	14	33
1980	23	69
1981	46	63
1982	33	41
1983	22	40
1984	16	31
1985	12	47
1986	18	46
1987	35	46
1988[b/]	65	64
1979–1988 Average	28	48

a/ Source: Klamath River Technical Advisory Team, 1990 (with updates).
b/ Does not include age–5 impacts or escapements.

The 1984, 1985 and 1986 broods (with the majority of harvest impacts occurring in 1987, 1988 and 1989) had particularly low escapement rates for fingerlings released from Iron Gate Hatchery. However, the 1987 and 1988 broods (with most harvest impacts occurring in 1990, 1991 and 1992) appear to have achieved or exceeded the escapement rate specified in Amendment 9. It is noteworthy that there is a differential harvest rate between the two hatchery stocks with a lower escapement rate occurring for the Iron Gate (Klamath River) stock.

CONCLUSION

The violation of the natural spawner escapement floor in the past three years, rather than failure to meet the specified escapement rate, has triggered the current overfishing review. The failure to meet the escapement rate in earlier broods (at least in the Klamath River sub–basin) is also of concern and deserves review.

FACTORS CONTRIBUTING TO THE VIOLATION OF THE SPAWNING ESCAPEMENT FLOOR

OVERVIEW

There are several reasons for the spawner escapement failures and low abundance of the Klamath River fall chinook since 1990. However, lack of any consistent or extensive data base for natural fish production and the multitude of factors acting simultaneously on fish survival make it impossible to definitively identify the primary cause in each case.

After an initial assessment of the existing data and probable primary causes of the stock failure, the team developed and reviewed additional data compilations and analyses which are contained in a separate document, Technical Appendix to the Klamath River Fall Chinook Review Team Report. A summary of the team's considerations and resulting conclusions follow.

Parent Stock Size and Distribution

Record high spawning escapements since 1978 were recorded in the Klamath River Basin during 1986–1988 (Figure 1). This resulted from high ocean survival of the 1983 and 1984 brood years of Klamath stock and restricted salmon fisheries in both the ocean and river. Subsequent recruitment from the 1986–1988 brood years was poor, resulting in this review for the 1990–1992 returns.

Most of the fish of the 1986–1988 returns spawned in the Trinity River, including the Trinity River Hatchery, Bogus Creek (located next to Iron Gate Hatchery) and Iron Gate Hatchery. Escapements to spawning areas which were not likely to be affected by hatchery production, such as the Salmon and Scott rivers, were about double the previous eight–year average, while the Shasta River return was about 60 percent of the previous eight–year average.

The high hatchery returns during 1986–1988 resulted in large egg takes at both Iron Gate and Trinity River hatcheries with resulting large numbers of fish released, many at a relatively small average size.

The spawning escapement into the Salmon, Scott and Shasta rivers complex is not likely to be a cause of poor natural production from the Klamath River during 1990–1992. However, the combined effect of high hatchery production and high natural escapement for the entire system could have affected the survival of natural production.

Analysis of available stock–recruitment data, adjusted for variations in survival rates of Klamath, Rogue and Sacramento hatchery stocks, produced the following conclusions:

1. Variation in recruitment of Klamath chinook, within the two relatively narrow ranges of parent–year escapements available, has been very large.

2. Poor ocean conditions affected progeny from the 1986 and 1989 broods.

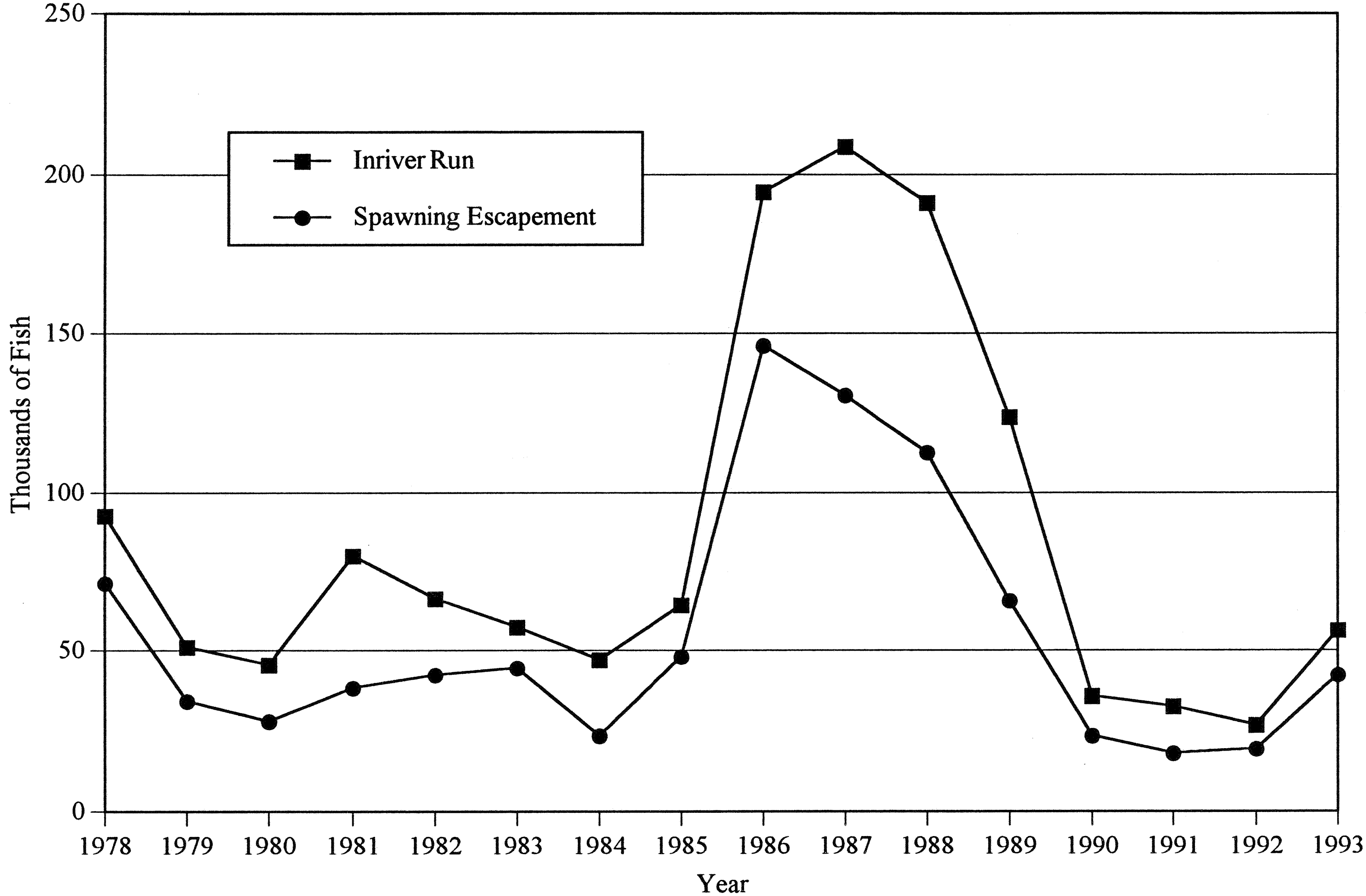

FIGURE 1. Klamath River fall chinook salmon inriver run and spawning escapements, 1978-1993.

3. The data do not conclusively demonstrate that overescapement is the primary cause of recent poor natural production.

Marine Habitat Conditions

Ocean conditions obviously play an important part in determining salmon stock size. The team analyzed two separate components of ocean survival: (1) overwinter adult survival and (2) survival of juveniles soon after ocean entry.

Overwinter ocean survival rates of adults (age–2 and older Klamath fall chinook) varied substantially, but in an apparently random manner, from 1982–1990. There was no evidence that these survival rates were markedly lower in the most recent years as compared to earlier years, although survival rates were lowest during the 1982–1983 El Niño–influenced period. The team concluded that recent poor productivity was probably not caused by extremely poor overwinter survival of age–2 and older fish.

Indices of juvenile survival rates to age 2 for subyearlings released in October from both Trinity River and Iron Gate hatcheries showed remarkably strong agreement across brood years (Figure 2). These indices also were positively correlated with survival indices of Rogue River spring chinook released in October. However, survival of Klamath and Rogue rivers hatchery releases were poorly correlated with releases from the Sacramento River Delta. All three stocks showed lower than average survival for the 1981 and 1988 broods and above average survival for the 1983 brood. For releases from Rogue River, Iron Gate and Trinity River hatcheries, juvenile survival for the 1987 and 1988 brood years was exceedingly low. These two brood years were the major component of the adult abundance during 1990–1992. The team, therefore, concluded that poor ocean survival conditions for juveniles probably have made a significant contribution to poor stock productivity in recent years, affecting the contribution to recruitment in 1990, 1991 and 1992.

Harvest Management

Allowable Harvest Rates

The Harvest Rate Model is used to determine allowable harvest rate combinations between ocean and river fisheries. It incorporates various parameter estimates describing the fish and the fisheries. The allowable harvest rate combinations that produce an escapement rate for each cohort of 33 to 34 percent is an assumed average for all natural stocks in the basin. Because of variable productivity, migration timing, ocean distribution, river run–timing and age composition, some sub–basin stocks will be subjected to higher or lower actual harvest rates than the 33 to 34 percent planned for all stocks.

The failure to meet target brood escapement rates at Iron Gate Hatchery may indicate that natural stocks from sub–basins, such as the Shasta, Salmon and Scott rivers, are being harvested at a higher rate than natural stocks in the Trinity sub–basin. Thus, the levels of escapement may be

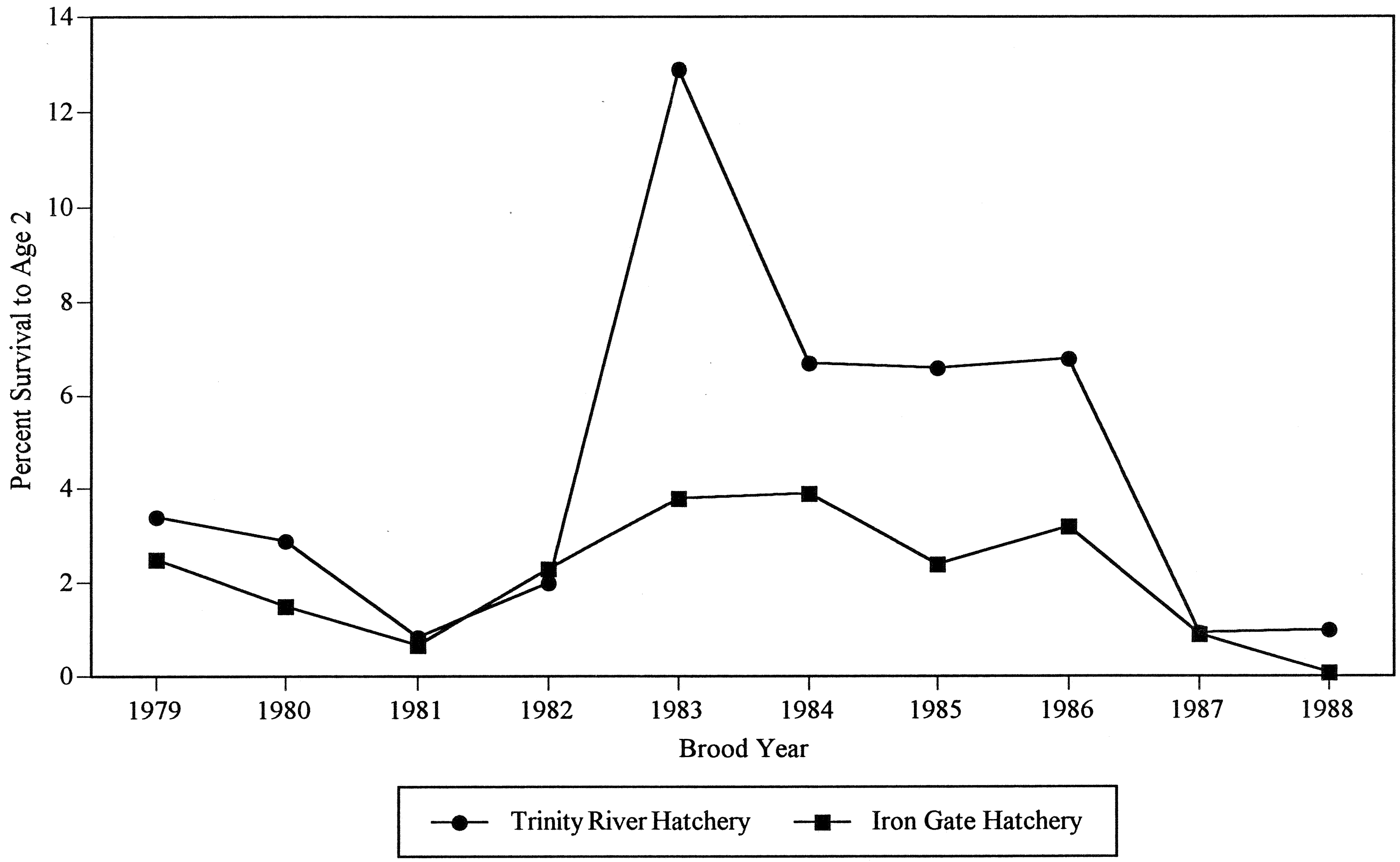

FIGURE 2. Survival rates from release to age 2 for yearling fall chinook salmon released from the Trinity River Hatchery and the Iron Gate Hatchery in the Klamath River system. Survival rates are equal to total estimated recoveries divided by release group size, but include no adjustment for ocean natural mortality.

insufficient to maintain optimal production of these populations. Differential productivity of naturally spawning populations, coupled with differential harvest rates, could lead to overall escapement goals for the Klamath fall chinook salmon stock being met while sub-basin stocks decline.

Methodologies

Three methodological tools are used in managing the harvest of Klamath fall chinook salmon to achieve spawning escapement targets: (1) ocean abundance prediction, (2) ocean-inriver fishery allocation modeling and (3) ocean fishery impact modeling. The team identified problems with each of the three methodologies that contributed to the subfloor spawning escapement of Klamath fall chinook in 1990-1992.

The team found that the ocean abundance predictor had a large standard error and a positive bias at low abundance levels. The model used to allocate ocean and river fisheries depends on assumptions about key life history parameters and fishery selectivities that are highly variable. This problem has led to underprojecting river fishery impact rates and overprojecting natural escapement levels for any given year. The team found the ocean fishery model to have low precision in projecting ocean fishery impact rates on Klamath fall chinook, especially in time/area managed fisheries in areas adjacent to the Klamath management zone.

Although some improvement in harvest management methodology may be realized in the future, the team believes that natural variability and measurement uncertainty will always hinder the performance of this process and that the present needs that harvest managers are asked to fulfill exceed the reliability of available methodology.

Social and Political Factors

The team does not believe that social and political factors and the allocation process were primary contributors to the spawner escapement shortfalls in 1990 and 1991. However, these factors did contribute to the size of the shortfall in 1992 when all management entities chose to purposely fish below the floor to allow for short-term economic relief.

Although the team concluded that allocation conflicts contributed to the escapement shortfalls only in 1992, it was noted that the problem with the disjointed management of the ocean and inriver fisheries by the secretaries of Commerce and Interior exacerbated independent decisions to fish below the floor for socioeconomic reasons. Although the Klamath Fishery Management Council (KFMC) is charged with the harvest allocation of the Klamath Basin fishery resources, it operates by consensus of its 11 members and has rarely made harvest allocation recommendations to the Pacific Fishery Management Council. This relinquishes the management of the ocean fisheries that impact Klamath fall chinook to the Pacific Fishery Management Council, the Department of Commerce and the states of California and Oregon. At the same time, the management of the inriver fisheries is decided by the State of California and the Department of Interior. This allows for the situation that occurred in 1992 (and almost in 1991) in which the different management agencies adopted uncoordinated management objectives without regard for the escapement goals and recommendations of their technical advisors. The disjointed management of the ocean and inriver fisheries that can be caused by different management jurisdictions may continue until KFMC is able to make harvest allocation recommendations to the Pacific Fishery Management Council or until some other federal–state–tribal control mechanism is instituted.

Freshwater Flows, Temperatures and Basic Habitat Condition

The relationship of freshwater flows and temperatures to salmon production is vital. These factors are basic requirements for survival. The linkage of a six–year drought with this recent period of depressed abundance seems intuitively sound. Inadequate and unsuitably warm migration and rearing flows are considered a major factor in the current depression of the stock. However, review of these factors in the Klamath–Trinity River Basin indicates there is insufficient data, time and resources for the team to clearly characterize the specific relationships or to separate the effects of these factors from varying ocean conditions. There is no readily available index of freshwater juvenile survival, particularly one that can be isolated to limnetic parameters. Nonetheless, the team examined annual discharge from the basin for the water years 1979–1990. The 1987–1989 brood years, which contributed to the 1990–1992 escapement years, coincided with the relatively low water years of 1988, 1989 and 1990 (Figure 3).

The habitat for chinook salmon in the Klamath River Basin has been seriously impacted beginning with gold dredging in the 1800s. Subsequent impacts from dam building, grazing, mining, wildfires, water diversion, timber harvest, floods and road construction have diminished the productive capacity of the stream and river habitat. The habitat is generally regarded as being on a slow recovery trend since the devastating 1964 flood.

It is not possible to segregate habitat causes from other environmental factors contributing to the recent decline of the natural population of Klamath River fall chinook. In consideration of the relatively sparse occupancy of spawning habitat and the lack of evidence of a decline in habitat quality affecting the subject brood years, it is probable that degraded non–flow habitat provides a chronic depression but has not caused the current drastic decline. The team's technical appendix provides specific information on habitat conditions in each of the major sub–basins of the Klamath watershed, downstream of Iron Gate Dam.

Hatchery Operations

The extremely high number of hatchery juveniles released and the small average size at release for the 1985–1989 brood fall chinook salmon probably had an impact on natural stocks (Figures 4 and 5). The combination of decreased river and estuary carrying capacity related to the drought conditions, extremely high numbers of hatchery released juveniles and the slow migration rate of the released fish (Figure 6) created conditions conducive to freshwater rearing competition between chinook salmon juveniles and likely contributed to the scarcity of fish available for harvest in the ocean.

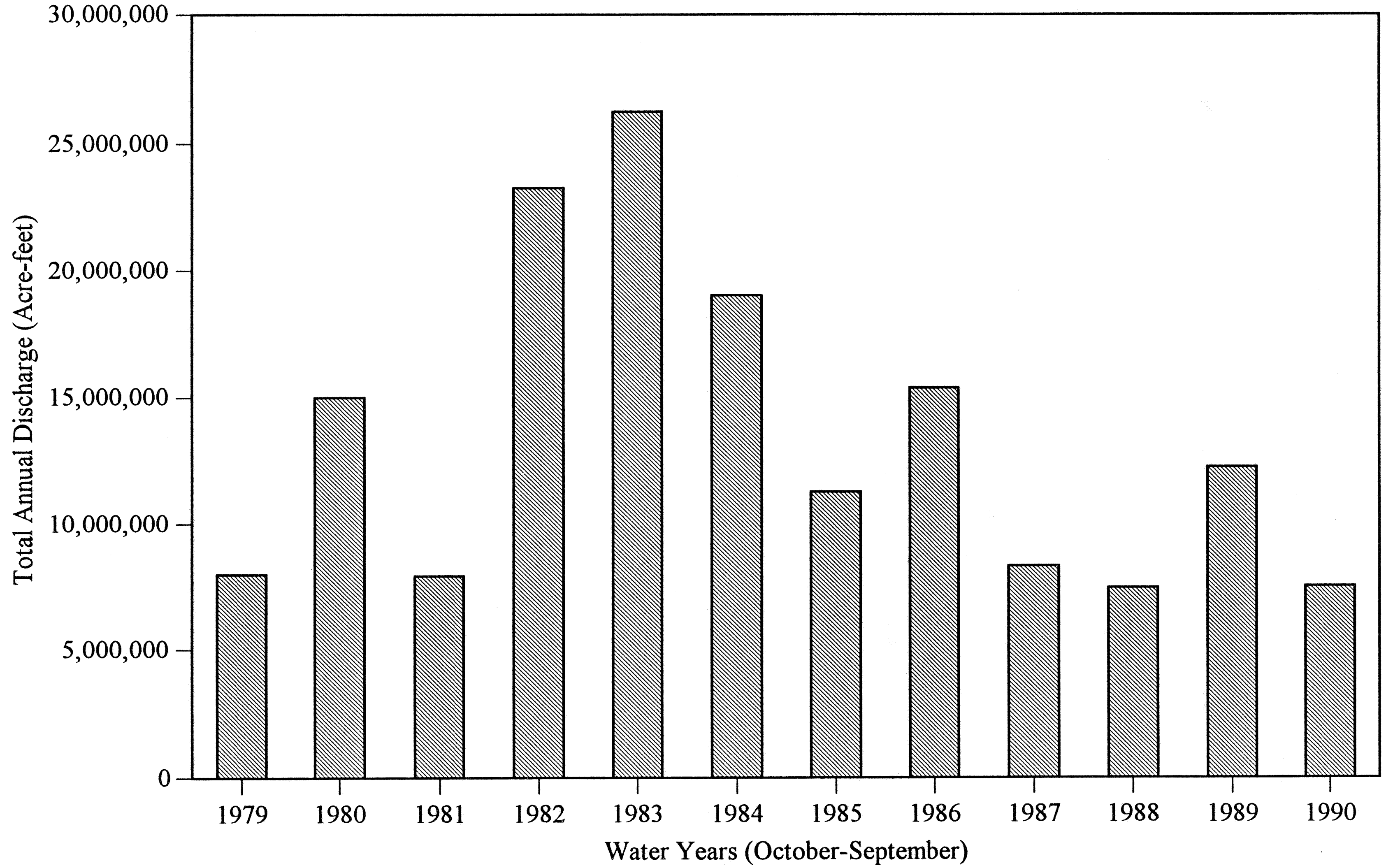

FIGURE 3. Total annual discharge at Klamath gauge for water years 1979-1990. Brood years of 1987, 1988 and 1989 coincided with water years 1988-1990.

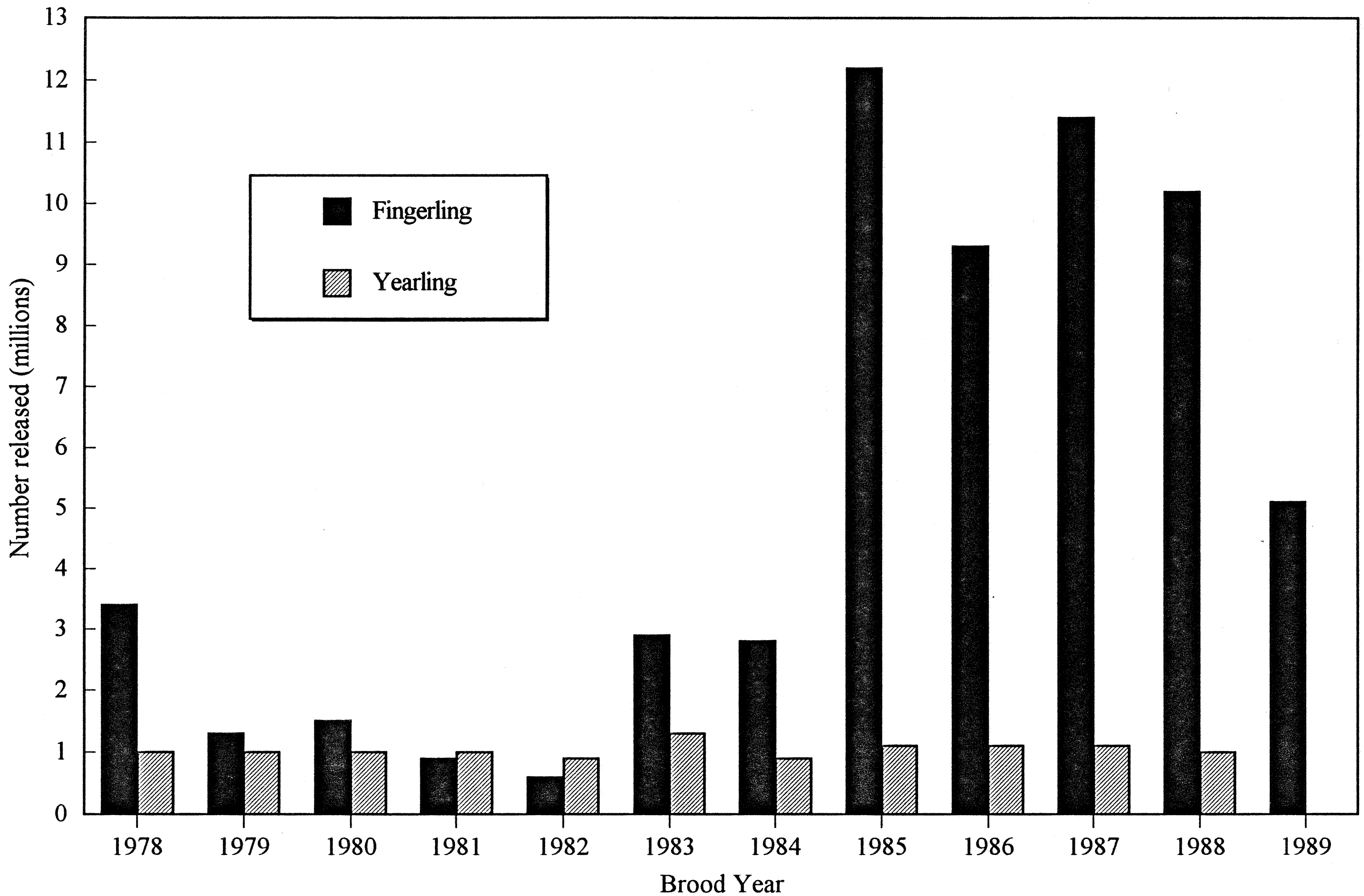

FIGURE 4. Fingerling and yearling releases of fall chinook from Iron Gate Hatchery, 1978-1989 broods.

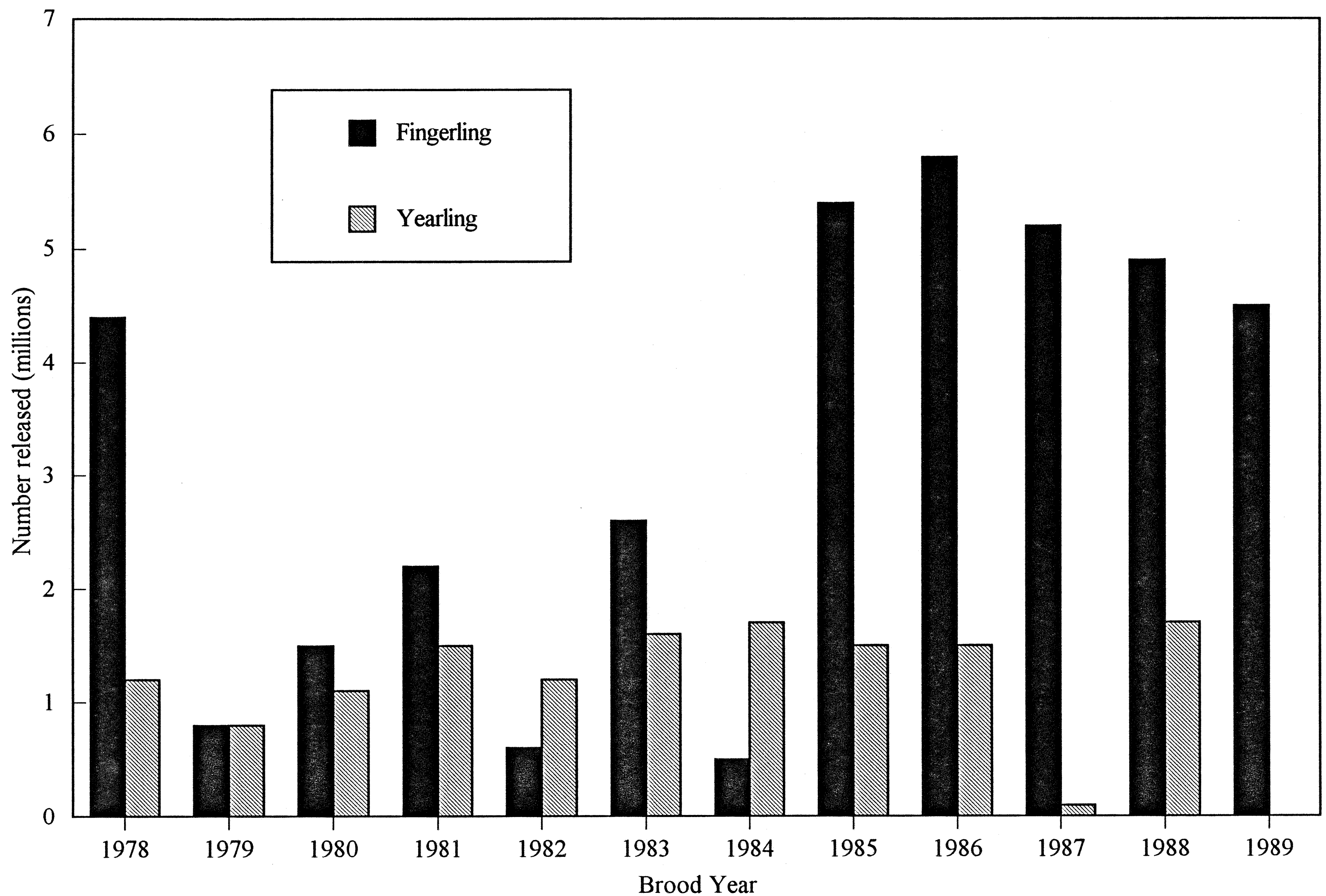

FIGURE 5. Fingerling and yearling releases of spring and fall chinook from Trinity River Hatchery, 1978-1989 broods.

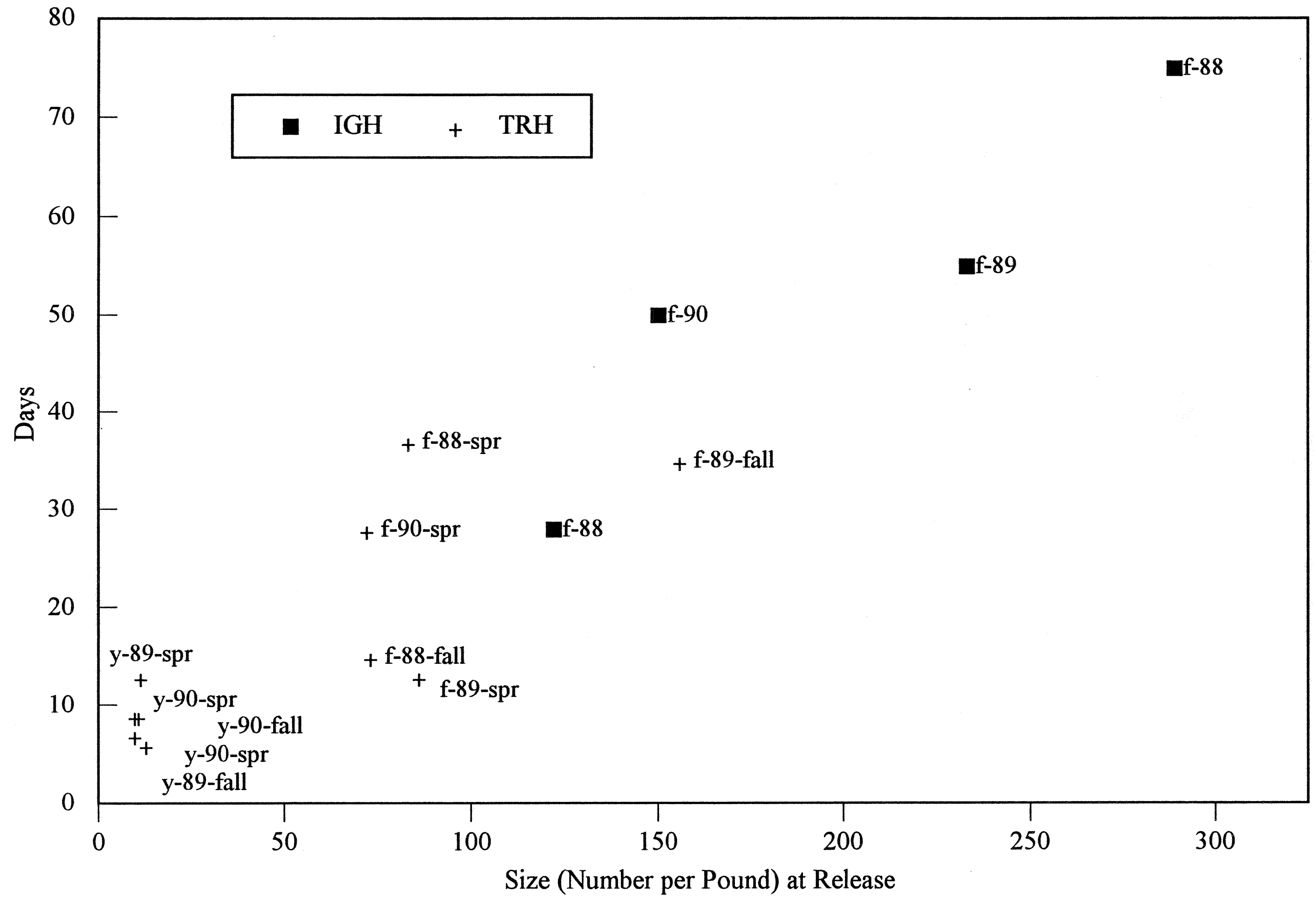

FIGURE 6. Size at release (number per pound) and estimated number of days required to reach the estuary for hatchery reared chinook (release type-brood year-race; y = yearling, f = fingerling).

Other Factors

Although marine mammals and sea birds have an observable impact on the Klamath River fall chinook resource, it does not seem reasonable that the recent sharp decline in abundance is caused by this factor. Marine mammal populations have increased in recent years, but not to an extent that would explain the major reductions seen in the salmon stock. The team's technical appendix contains an analysis of marine mammal depredation marks observed on Klamath River fall chinook.

A review of the bycatch of salmon in other marine fisheries does not indicate a trend toward increased catches in recent years that would explain the low abundance of Klamath River fall chinook.

CONCLUSIONS

Based on its review, the team arrived at five broad categories of causal factors that have led to the three–year failure to meet the spawner escapement floor for Klamath River fall chinook. These factors are listed below in the order of importance assigned to them by the team.

1. Poor survival conditions in the marine environment.

2. Harvest management methodologies.

3. Low mainstem and tributary flows, exacerbated by drought.

4. Hatchery operations with regard to the size of juveniles at release and the magnitude and timing of the releases.

5. Habitat conditions such as degradation of spawning and rearing areas by siltation, loss of riparian cover and woody debris removal.

The team concludes that the severely depressed status of Klamath River fall chinook since 1990 has been caused primarily by poor marine survival conditions which may have been further exacerbated by low freshwater flows and the potential of high intra–specific competition during the juvenile rearing phase. In this depressed situation, inaccuracies in the harvest management methodologies have become especially important, resulting in failure to meet the spawner escapement floor in both 1990 and 1991, and contributing to the degree of shortfall in 1992. The specific problems by year were as follows:

- In 1990, errors in accurately modeling the impacts of the ocean fisheries by time and area were the primary cause of the escapement shortfall. Errors in stock projections and river fishery management methodologies (assumed maturity rates and the ratio of natural to hatchery fish) also contributed to the escapement shortfall.

- In 1991, escapement shortfalls were exacerbated by overpredicting the ocean abundance of age–3 and age–4 Klamath River fall chinook. For both age classes combined, the preseason projection was 80 percent greater than the postseason abundance estimate. Underestimates of ocean impacts and overestimates of the proportion of natural spawners also contributed to the escapement shortfall.

- In 1992, the primary cause of the escapement shortfall was poor survival of progeny from the 1987–1989 brood years under the influence of inhospitable marine and freshwater conditions. Preseason projections clearly indicated the spawning escapement floor would not have been met even with no fisheries.

RECOMMENDATIONS

The Klamath River Fall Chinook Review Team recommends the actions listed below to address the failure of the natural Klamath River fall chinook stock to achieve its fishery management plan spawning escapement floor.

MARINE HABITAT

Recent poor marine survival conditions have adversely impacted several West Coast salmon stocks. At the present time, there is no way to predict the changes in the marine environment that affect salmon. History demonstrates that ocean survival of salmon has and will continue to show great variation. Long–term basic research may provide some answers to help us understand the mechanisms involved, but it is unlikely that any practical management scheme can be devised to avoid significant stock depression caused by adverse marine conditions.

HARVEST RATE POLICY

The current policy of managing the fisheries for an overall escapement rate of 33 to 34 percent of each cohort should be reviewed in light of differences in substock productivities. Continuation of the current policy will perpetuate high harvest rates for Klamath stocks and attendant low returns to most upper river natural spawning areas unless other compensatory management measures are taken.

The Harvest Rate Model is used to determine the appropriate escapement rate based on assumptions about fishery selectivities and biological parameters for the stock. Recalibration of the model should be undertaken with updated information, where available, to better reflect substock parameters and to determine the appropriate harvest rate combinations between the ocean and river fisheries.

STOCK PROJECTION METHODOLOGY

Action should be taken to eliminate bias in the models used to project ocean abundance of Klamath fall chinook. Alternative cohort regression relationships (e.g., zero intercept technique), with or without partitioning of hatchery and natural stock components, should be considered. Another approach would be to back–calculate cohort abundance for the individual stock units based on individual stock maturity rate data coupled with a projection of marine overwinter survival. This latter technique, referred to as the "Partitioned Cohort Method," is currently being evaluated by the Klamath River Technical Advisory Team (KRTAT) for presentation to the Salmon Technical Team and Scientific and Statistical Committee.

Accurately determining the proportion of natural and hatchery fish in the run is critical to meeting the Council's spawning escapement goal. Since the proportion of hatchery fish in the run has been increasing, an alternate methodology to the use of a long–term average proportion in every year may be more appropriate.

ALLOCATION

While harvest allocation was a minor issue affecting the returns that triggered this review, it did aggravate the 1992 shortfall. Allocation dispute was a major factor in the protracted process resulting in final 1993 regulations and may continue to be an issue in 1994 and beyond. The range of possible allocation options must be clarified early in the regulatory process to allow the Salmon Advisory Subpanel to develop an appropriate range of ocean harvest options.

The Klamath Fishery Management Council (KFMC) must be compelled to achieve more success in the development of harvest allocation recommendations. Disjointed management is a distinct possibility until KFMC is able to resolve its problems in achieving consensus.

OCEAN IMPACT CONTROL

The Klamath Ocean Harvest Model should be used to establish quotas in fisheries between Point Arena, California, and the Port of Florence, Oregon, rather than simple time/area fishery seasons. This is the area of highest abundance of Klamath chinook, accounting for over 90 percent of the potential impact of a fully open ocean fishery. The model should be updated and recalibrated as necessary with recent information to improve accuracy.

PROTECTING THE ESCAPEMENT FLOOR

Elimination of bias in the stock abundance projections by age and natural/hatchery components as well as increased accuracy in the assessment of ocean fishery impacts will not totally preclude subfloor escapements in all years. In response to new information and criticism of the existing floor definition, the KRTAT will review the significance of the floor level when the accounting of harvest impacts is complete for the 1991 brood.

Additional approaches to better assuring attainment of the floor could be considered, when warranted, including (1) a conservative approach for ocean fishery seasons, such as the use of quotas and other measures that have resulted in actual harvest rates less than the preseason expectations for 1992 and 1993, (2) establishment of a preseason target that is somewhat above the floor to provide an enhanced probability that the floor will be cleared and (3) evaluation of spawner deficit accounting, in which escapements below the floor are compensated in a future year. With regard to the latter concept, the team considers cohort accounting (following year) preferable to brood year accounting (three-year lag) and believes the concept of spawner deficit accounting should be comprehensively described to include features such as minimum fishery impacts and studies of the genetic relevance of the floor.

SELECTIVE HARVEST TECHNIQUES

Evaluation of selective harvest techniques is currently being undertaken by the Coho and Chinook Technical Committees of the Pacific Salmon Commission (PSC), with emphasis on the compatibility of fin marking with the coded-wire tag (CWT) data system and other protocols.

An interim report was due in April 1994 with preliminary results expected in July 1994. Plans call for a fall 1994 workshop to present final results. Action may be appropriate to implement selective fisheries depending on the results of the PSC analysis and cost.

Selective harvesting of stocks in river fisheries through time/area closures to protect earlier or later migrating natural stocks should be pursued by inriver management authorities.

INSEASON STOCK COMPOSITION ESTIMATES

No recommendation is forwarded with regard to development of inseason stock composition estimates. However, it should be recognized that the technology exists to make such estimates based on CWT or genetic stock identification procedures. Such estimates would better assure attainment of preseason allocation objectives but could lead to overharvest caused by an error in a critical stock projection. Implementing such a program could reduce effort in other critical sampling and management tasks.

HATCHERY MANAGEMENT

California Department of Fish and Game has recently implemented a new policy with regard to artificial propagation of salmonids at the two basin hatcheries. The policy includes a ceiling on fall chinook egg take at Iron Gate Hatchery of 10 million, rather than 18 million, eggs and a prohibition on the stocking of pre–smolts from either basin hatchery. Potential water supplies in the vicinity of Iron Gate Dam will be investigated to determine if suitable water is available to provide for an expanded yearling program at Iron Gate Hatchery; yearlings are released after naturally produced chinook juveniles have left the freshwater environment. The team supports this policy and believes adherence to this new direction should reduce negative interactions in the river between naturally produced and hatchery juveniles.

FRESHWATER HABITAT

The Klamath River Basin Task Force has developed a long–range plan for the restoration of anadromous fish stocks in the Klamath Basin, exclusive of the Trinity River. Problems of the upper Klamath Basin and proposed actions are addressed in an amendment to that plan. Problems for anadromous fish in the Trinity River are addressed in a plan developed in 1982 by the Trinity River Basin Fish and Wildlife Task Force. The Council's Habitat Committee is referred to these two groups for specific restoration proposals and ways in which the Council can contribute to their support and implementation.

The team encourages the development of a comprehensive data bank for habitat factors in the Klamath Basin based on available information.

ACTIONS TO IMPLEMENT IN 1994

1. Establish the range of options available for allocation of Klamath fall chinook early in the regulatory process.

2. Adopt an unbiased predictor of ocean abundance.

3. Restrict use of the ocean harvest model to setting quotas between Point Arena, California, and the Port of Florence, Oregon, and for evaluating time/area fisheries outside that area.

4. Decide on the appropriateness of conservative ocean management measures for use in 1994 and beyond.

5. Decide whether to forward a comprehensive concept of cohort spawner deficit accounting for socioeconomic analysis and public review as a potential plan amendment.

6. Direct the appropriate technical teams to undertake an analysis of allowable harvest rate combinations based on biological parameters for sub–basin stocks.