Escapement Goals for Yakutat Area Coho Salmon Stocks

By
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Alaska Department of Fish and Game
Division of Commercial Fisheries Management and Development
Juneau, Alaska

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ABSTRACT

Available harvest, escapement, and age composition data for coho salmon stocks returning to the East Alsek-Doame, Akwe, Italio, Situk, Lost, Kaliakh, and Tsiu-Tsivat rivers was analyzed to develop brood tables and to estimate spawner-recruit relationships. As part of this analysis, portions of the annual troll harvests in the northern outside waters of Southeast Alaska were annually allocated to each of these seven coho salmon stocks. Each spawner-recruit relationship was developed with a combination of data points based upon estimated total escapement of the specific coho salmon stock in a specific year as the independent variable and estimated total return resulting from that escapement as the dependent variable. Four models were developed for each of the seven stocks based upon alternate assumptions concerning the portion of total escapement counted in peak surveys of spawning populations. The four alternate assumptions were as follows: peak counts represent 25%, 50%, 75%, and 100% of the total escapement. Variability in each of the 28 spawner-recruit relationships was estimated with bootstrap procedures. Bootstrap runs were conducted for each spawner-recruit relationship and in each bootstrap run, residuals from fitted regressions were randomly added to observed values to develop a revised data set upon which regression analysis was conducted. Optimum escapements for the seven stocks were determined and the range of escapements estimated to provide 90% or more of the maximum sustained yield were calculated and used to define an escapement goal range. The following escapement ranges are recommended as goals for management of coho salmon fisheries in the Yakutat Area:

Coho Salmon Stock	Recommended Escapement Goal Range	Recommended Management Target
East Alsek/Doame River	2,500 to 8,500	Mid Range
Akwe	1,800 to 5,000	Mid Range
Italio	1,400 to 3,600	Upper Range
Situk	3,300 to 9,800	Mid Range
Lost	2,200 to 6,500	Mid Range
Kaliakh	4,000 to 14,000	Mid Range
Tsiu/Tsivat	10,000 to 29,000	Mid Range

Recommendations are provided concerning how the spawner-recruit relationships could be improved along with identifying some of the short-comings of the approach used in this study. Other recommendations concerning potential program improvements for the monitoring of Yakutat Area coho salmon stocks are made including: reinstituting age-sex-size sampling of coho salmon in Yakutat Area set gill net fisheries, monitoring of Yakutat Area coho salmon escapements, and future coded wire tag studies.

KEY WORDS: coho salmon, *Oncorhynchus kisutch*, Southeast Alaska, Yakutat, brood tables, spawner-recruit, escapement goal, East Alsek River, Akwe River, Italio River, Situk River, Lost River, Kaliakh River, Tsiu River.

INTRODUCTION

Coho salmon *Oncorhynchus kisutch* represent an important component of the salmon harvest in Southeast Alaska. Harvests of coho salmon from waters of Southeast Alaska averaged about 1.1 million fish annually during the 1970's, almost 2.0 million fish annually during the 1980's, and about 3.4 million fish annually so far during the first four years of the 1990's. Annual ex-vessel value of the commercial harvest of coho salmon from Southeastern waters during the 1990's has averaged more than $24 million.

More than 2,000 streams in Southeast Alaska provide spawning and rearing habitat for coho salmon. Coho salmon are harvested by an array of mixed-stock fisheries primarily prosecuted in marine waters. Less than a hundred of the more than 2,000 coho salmon spawning streams in Southeast Alaska are consistently monitored on an annual basis to determine strength of the spawning escapements. Some streams in Southeast Alaska support major spawning populations of coho salmon (such as the Taku River), however most streams support only a couple hundred spawners.

In the Yakutat area of Southeast Alaska (Figure 1), the situation is different. Although troll fishing in open marine waters occurs, much of the annual coho salmon harvest takes place in the lower rivers or estuaries with set gill net gear. Thus the harvests are much more stock specific. Unlike most of the rest of Southeast Alaska, a relatively small number of streams provide spawning and rearing habitat for coho salmon. Approximately 90 streams in the Yakutat area are included in the Anadromous Stream Catalogue. About 10 of these streams support major coho salmon runs and likely account for more than 80% of the production of coho salmon in the Yakutat Area (Leon Shaul, personal communication). As a consequence, there is an opportunity to optimize harvests of coho salmon in the Yakutat Area by managing the fisheries to achieve set escapement goals for these large coho salmon producing systems.

Spawning escapements of coho salmon into most of the major Yakutat streams have been annually monitored with aerial survey techniques by the Alaska Department of Fish and Game (ADF&G) during most years since the early 1970's. ADF&G initiated a sampling program to monitor age, sex, and size composition of coho salmon harvested in Yakutat set gill net fisheries in 1982 and continued the program into the 1990's. ADF&G has conducted coded wire tag studies of Yakutat coho salmon stocks intermittently during 1980's and 1990's to determine migratory patterns and harvest rates in various fisheries. These data provide the basis for initial development of spawner-recruit relationships and estimation of optimum escapement goals for major Yakutat coho salmon stocks. The potential for escapement goal management of Yakutat coho salmon generally exists because much of the harvest takes place in terminal areas on relatively discreet stocks. The development of biologically based escapement goals is intended to provide the basis for maximum sustained harvests of these valuable fishery resources.

The purpose of this report is: (1) to assemble available harvest, escapement, and age composition data for major Yakutat coho salmon stocks; (2) to develop estimates of total returns and construct brood tables for major Yakutat coho

salmon stocks; (3) to develop spawner-recruit relationships for these stocks; and, (4) to estimate optimum escapement goals for these coho salmon stocks.

DATA SOURCES AND ANALYSIS

Available escapement, harvest and age composition data for several coho salmon set gill net fisheries in the Yakutat Area were reviewed to determine if sufficient information was at hand to develop brood tables for stocks supporting these fisheries. Readily available escapement and age composition information for the period 1972-1993 was as follows:

Set Net Fisheries	Years of Escapement Data	Years of Age Composition Data
East Alsek-Doame	22	10
Alsek	[a]	8
Akwe	17	9
Italio	21	8
Situk	21	10
Lost	22	10
Yakutat Bay	[b]	8
Manby Shore	[c]	8
Yahtse	8	8
Kaliakh	16	11
Tsiu-Tvisat	21	11
Other	-	[d]

[a] Klukshu weir counts have been collected since 1976; however, the weir has been removed prior to the end of the coho salmon run. Counts of coho salmon in portions of the lower Alsek River have been collected sporadically.

[b] Yakutat Bay is an interception fishery.

[c] Data collected for Manby Shore fisheries prior to 1986 were combined (Keith Weiland, personal communication).

[d] No other set gill net fisheries in the Yakutat Area were sampled for age composition data.

Judgements were made concerning which stocks to evaluate, which time series of data to include in the analysis, how to deal with time-series data for which some values were missing, and how to model the spawner-recruit relationships. The following sections provide a description of the choices and judgements that were made.

Age Composition

Because of relatively large inter-stream variation in the age composition of coho salmon stocks returning to the Yakutat Area, it was decided to limit analysis to those stocks for which a reasonably long string of annual age composition estimates were available. Rowse (1990) provided estimates of the age composition of the annual harvests of coho salmon with set gill net gear for the East Alsek-Doame River, Alsek River, Akwe River, Italio River, Situk River, Lost River, Yakutat Bay, Manby Shore, Yahtse River, Kaliakh River, and Tsiu-Tsivat River fisheries for the years 1982-1988. The Yakutat Bay fishery

is an interception fishery that occurs in marine waters (average annual coho salmon harvest is 4,000 fish). The Manby Shore fishery is a collection of small set gill net fisheries of which each targets an individual stock; however, the harvest data prior to 1986 were combined (average annual coho salmon harvest is 10,000 fish). Because the Yakutat Bay fishery is an interception fishery and because the Manby Shore fishery data was combined, spawner-recruit analysis was not pursued. The other nine set gill net fisheries predominantly target coho salmon returning to specific river systems. Fishing zones in these fisheries primarily occur in-river, in the estuaries, and/or in nearby marine waters. Because the Alsek River is relatively long and complex, because the escapement data base is relatively fragmented and incomplete, and because management of Alsek River salmon stocks is the subject of cooperative management and research under the U.S. Canada Pacific Salmon Treaty, it was decided to not pursue development of a spawner-recruit relationship for the Alsek River coho salmon stock at this time. Because the escapement data base for the Yahtse River coho salmon stock is so limited, it was decided to not pursue development of a spawner-recruit relationship for that system at this time. This review resulted in seven stocks being chosen for this study:

(1) East Alsek-Doame;
(2) Akwe;
(3) Italio;
(4) Situk;
(5) Lost;
(6) Kaliakh; and,
(7) Tsiu-Tsivat.

Unpublished estimates of the age composition of coho salmon harvested in the annual set gill net fisheries for these seven stocks for the years 1989-1992 were obtained from Benjamin Van Alen and Mark Olson (personal communication). Average annual age composition during the years 1982-1992 was used as an approximation of the age composition for each stock for years not sampled (years prior to 1982, for 1993, and for other occasional cases when the stock was not sampled during the 1982-1992 time-series). An estimate of age composition for each year was needed to develop brood tables and we judged the use of simple averages to be an acceptable procedure. A very small percentage of coho salmon returning to these seven river systems during 1982-1992 were aged as six year olds (usually less than 1%); these fish were added to the five year old column to simplify brood table construction.

Coho salmon escapements were not sampled to determine age composition of the annual spawning populations. However, because coho salmon age variability is almost entirely associated with freshwater residence and not with marine life where almost all somatic growth occurs, typical size selective sampling gear such as gill nets do not present the selective sampling problems that are typically associated with other species such as sockeye salmon *Oncorhynchus nerka* that exhibit extensive marine age variability. Annual age composition estimates of coho salmon harvested in set gill nets were assumed to be representative of the age composition of the total return. Once estimates of the total number of coho salmon returning to a given river system during a given year were calculated, the age composition estimate obtained from the sampled set gill net fishery for that river system and year were applied to

provide estimates of the numbers of age three, four, and five fish that had been recruited from escapements three, four and five years ago, respectively. Total returns from a specific spawning escapement were then calculated. These paired sets of data (estimated spawning escapement and estimated total return) were used to develop spawner-recruit relationships and ultimately estimate optimum escapement goals.

Spawning Escapements

Surveys of the spawning populations of coho salmon returning to the East Alsek-Doame, Akwe, Italio, Situk, and Lost rivers have been conducted during most years since 1972. Surveys of the spawning populations of coho salmon returning to the Kaliakh and Tsiu-Tsivat rivers have been conducted during most years since 1973. Most systems are surveyed from fixed-wing aircraft; although some river systems such as the Situk River are usually surveyed from watercraft. During some years and in some river systems, only a single survey is conducted; however in most cases, several surveys are conducted annually. Escapement survey results have been included in the Integrated Fisheries Data Base (IFDB) located on the VAX computer at the Southeast Regional office of the Commercial Fisheries Management and Development Division of the Alaska Department of Fish and Game, Douglas, Alaska. Peak annual survey counts of the spawning escapements for the seven coho salmon stocks were obtained from the IFDB computer system.

Peak survey counts for some systems are combinations of peak counts made at several locations. Combinations used are as follows:

Coho Salmon Stock	Escapements Included and ADF&G Stream Codes
East Alsek	East Alsek (182-20-010) & Doame (182-10-010)
Akwe	Akwe (182-40-10)
Italio	Old Italio (182-55-015) & New & Middle Italio (182-50-010)
Situk	Situk (182-70-010)
Lost	Lost (182-80-010); Tawah (182-80-030); Ophir (182-80-050); and Coast Guard Lake (182-80-070)
Kaliakh	Kaliakh (192-41-010)
Tsiu-Tsivat	Tsiu (192-42-020) & Tsivat (192-42-040)

The Doame River joins the East Alsek River just upstream of the East Alsek River estuary and escapement counts for this stock are the peak annual counts of spawners made in the East Alsek River added to the peak annual counts of spawners made in the Doame River. Geological actions have altered the Italio River system since the early 1970's. Escapement counts used for the Italio River stock of coho salmon are the combination of annual peak escapement counts made in the Old, Middle, and New Italio rivers. Escapement counts of spawning coho salmon used for the Lost River are the summation of annual peak counts made in the Lost River, Tawah Creek, Ophir Creek, and Coast Guard Lake, all spawning sites located above the Lost River set gill net fishery. The Tsivat River drains into the Tsiu River estuary and escapement counts used for the Tsiu River stock of coho salmon represent the combination of peak annual counts made in both the Tsiu and Tsivat rivers.

In a few cases, annual escapement surveys were not made during the time series of years used in this study. In most cases, the peak survey during the prior year and the following year was averaged to provide an approximate estimate of the escapement level (for example, Italio peak escapement for 1979 was approximated at 3,000 fish, the 1978 and 1980 peak escapement counts were both 3,000 fish). A peak escapement count for each year was needed to develop brood tables and we judged the use of simple averages to be an acceptable procedure. The method(s) used to make these escapement approximations for completion of brood tables are footnoted on tables provided later in this report. Escapement surveys for the Akwe River coho salmon stock have not been conducted since 1987. Average peak escapement counts from 1972-1986 were used as an approximation of the spawning abundance during the years 1987-1991 in order to complete brood tables and the time series used to estimate the spawner-recruit relationship was limited to the years 1972-1991.

No studies have been conducted in the Yakutat Area wherein peak escapement counts of coho salmon have been compared to estimates of total escapement. Total escapement of coho salmon has not been estimated in any Yakutat stream. Because it is not known what proportion of the total abundance of spawners is represented by peak survey counts, it was decided to develop four data sets for each of the seven stocks corresponding to the following four alternative assumptions concerning total escapement:

(1) peak counts represent 25% of the annual abundance of spawners;
(2) peak counts represent 50% of the annual abundance of spawners;
(3) peak counts represent 75% of the annual abundance of spawners; or,
(4) peak counts represent 100% of the annual abundance of spawners.

Commercial Set Gill Net Harvests

Commercial harvests of coho salmon are reported on fish tickets; sales receipts filled out when commercial fishermen sell harvested fishery resources to processors. Data obtained from fish tickets is entered into the IFDB computer base and commercial harvest information included in this report was obtained from the IFDB computer system. Set gill net harvests of coho salmon attributed to specific stocks for development of brood tables were as follows:

Coho Salmon Stock	Set Gill Net Harvests Included and Sub-District Codes
East Alsek-Doame	East Alsek River (182-20); East Alsek Surf (182-21); and East Alsek Ocean (182-22)
Akwe	Akwe River (182-40)
Italio	Italio River (182-50) & Old Italio River (182-55)
Situk	Situk River (182-70)
Lost	Lost River (182-80)
Kaliakh	Kaliakh River (192-41)
Tsiu-Tsivat	Tsiu River (192-42)

Commercial harvest estimates for 1993 are considered preliminary estimates subject to change; harvests made in other years are considered final estimates.

Sport Fishery Harvests

Sport harvests of coho salmon in Alaska have been monitored annually since 1977 through the use of a postal questionnaire sent to randomly selected licensed sport fishermen. Statewide sport harvest and effort statistics are estimated annually based upon returned questionnaires and these published reports (Mills 1979-1993) were used as a basis for sport harvest information presented in this report. Estimates of the sport harvest of coho salmon in the Situk River have been made each year from 1977-1992 through the statewide harvest report. The statewide sport fish harvest surveys also provide estimates of the sport harvest of coho salmon from the Lost River in 1984, 1991, and 1992 and from the Tsiu River in 1991 and 1992. No sport fish harvest estimates are available for the East Alsek-Doame, Akwe, Italio, and Kaliakh rivers; although it is likely that minor sport harvests occur at least in some years. Table 1 provides a summary of available sport harvest information for coho salmon from the Situk, Lost and Tsiu rivers.

Although we decided to use harvest statistics based upon the statewide survey, an alternative approach would have been to use on-site creel census information that was collected for the Lost and Situk rivers for the years 1985-1989. Mean harvest of coho salmon from the Situk River for the years 1985-1989 as estimated with on-site creel census methods was about 2,150 fish or about 50% higher than the mean estimate of about 1,400 fish estimated for those same years through the statewide survey. Both estimation procedures for the sport fishery provided reasonably similar estimates indicating that the sport harvests are relatively small (3-5%) in comparison to set gill net harvests (Situk set gill net harvest in 1985-1989 averaged 40,200 fish). We choose to use statewide survey harvest estimates because this data set covered a longer period (16 years as contrasted to 5 for the Situk sport fishery).

When sport fisheries occur with relatively small levels of participation, the statewide harvest survey does not provide harvest estimates because sampling is limited to a relatively small proportion of the anglers and because several responses from fishermen fishing at a particular locale are needed to provide sufficient information to develop estimates. As a result, very small fisheries (for example, East Alsek-Doame, Akwe, Italio, and Kaliakh river sport fisheries) never are included in the statewide survey reports and minor fisheries (for example, Lost and Tsiu-Tsivat river sport fisheries) only occur periodically. When not enough responses are received to develop a site specific estimate, all such responses are lumped under an other category and the data is used to develop a harvest estimate which is listed under "other fisheries" in the management area.

The Lost River supported 17%, 15%, and 27% of the reported sport coho salmon harvest in the Yakutat Area during the years 1984, 1991, and 1992; respectively; the average being 20%. Using this as a basis, 20% of the total sport harvest of coho salmon from the Yakutat Area was estimated to have come from the Lost River during years when the statewide harvest survey was unable to provide specific sport harvest estimates. Similarly, the Tsiu River supported 14% and 15% of the sport harvests of coho salmon during 1991 and 1992 and 15% was used as a basis to estimate sport harvests of coho salmon from the Tsiu River during those years when specific sport harvest estimates

were unavailable. Sport harvest estimates for 1993 through the statewide harvest survey approach will not be available until fall of 1994. Therefore, 1992 data was used as an approximation for 1993. Because no sport harvest information is available for 1972-1976, average harvest estimates for the years 1977-1992 were used as an approximation. Sport harvest estimates developed with this approach are listed in parenthesis in Table 1; whereas, harvest estimates taken directly from Mills (1979-1993) are listed without parenthesis.

Commercial Troll Fishery Harvests

Hand troll and power troll fishermen harvest the majority of coho salmon taken in waters of Southeastern Alaska and significant troll fishing effort occurs in marine waters of the Yakutat Area. Developing estimates of the annual troll harvests of coho salmon bound for the East Alsek-Doame, Akwe, Italio, Situk, Lost, Kaliakh, and Tsiu-Tsivat rivers for the years 1972-1993 is one of the most difficult aspects of this research effort. In order to develop such estimates several assumptions had to be made.

The first assumption made was that the rate of troll harvest of Yakutat coho salmon stocks (exploitation rate) is directly related to the amount of troll fishing effort. To develop a model relating troll fishing effort to exploitation rates, two data sets were needed: (1) estimates of the annual level of troll fishing effort; and, (2) estimated exploitation rate of Yakutat coho salmon stocks during at least some of these years. Although fish ticket information concerning the troll fishery is readily available through the IFDB computer system, fish tickets do not provide direct information concerning fishing effort. Each fish ticket represents a landing or sale of commercially harvested coho salmon with troll gear. However, the fishermen may have been fishing for one day or for two weeks or for some other amount of time which is not recorded. In 1981, a sampling program was initiated in Southeast Alaska to obtain fishery performance data. Through this program, troll fishermen making landings were asked, among other things, how long they had been fishing. This data has been routinely collected since 1981 and by combining the trip length sampling information with landing information available from fish tickets, estimates of the number of boat-days of fishing effort by week in various portions of Southeastern Alaska were obtained. This data set was reduced to the northern outside area of Southeast Alaska (fishing districts 116, 156, 157, 181, 183, 186, 189, and 191) during weeks 30-38 (Table 2) for reasons explained later.

Shaul, Gray, and Koerner (1991) conducted a coded wire tag study of Situk, Lost, and Tsiu river coho salmon stocks to determine harvest rates of these fish in various fisheries. These researchers determined that all of the micro-wire tagged fish from the Situk River caught by troll fishermen were taken during weeks 30-38. These researchers also determined that the majority were taken in the northern outside area of Southeastern Alaska (82% of all troll caught tagged fish were taken in the northern outside area and 18% were taken from central outside and central intermediate areas). For this reason, troll fishing effort in the northern outside area of Southeastern Alaska during weeks 30-38 was used as a measure of troll fishing effort.

Leon Shaul (personal communication) provided a revised analysis of the data presented by Shaul, Gray, and Koerner (1991) and analyzed micro-wire tagging results obtained in 1993 for Situk coho salmon. Results provided were as follows:

River	Year	Fishery Type	No. Tags Recovered	Expansion	Percent of Total
Situk	1985	Situk Set Gill Net	67	158.5	58.0%
		Troll-Central Outside	3	19.8	7.2%
		Troll-Central Inter.	1	3.6	1.3%
		Troll-Northern Outside	18	91.5	33.5%
		TOTAL	89	273.4	100.0%
Lost	1986	Italio Set Gill Net	1	8.4	3.0%
		Situk Set Gill Net	5	48.9	17.2%
		Lost Set Gill Net	40	73.1	25.7%
		Troll Central Outside	4	22.8	8.0%
		Troll Northern Outside	23	131.1	46.1%
		TOTAL	73	284.4	100.0%
Tsiu	1986	Tsiu Set Gill Net	31	76.1	70.7%
		Troll Central Outside	1	8.4	7.8%
		Troll Northern Outside	5	23.2	21.5%
		TOTAL	37	107.7	100.0%
Situk	1993	Yakutat Bay Set Gill Net	2	71.2	4.4%
		Akwe Set Gill Net	1	18.5	1.1%
		Lost Set Gill Net	10	132.2	8.1%
		Situk Set Gill Net	143	884.8	54.2%
		Troll-Central Outside	2	11.5	0.7%
		Troll-Central Inter.	1	9.8	0.6%
		Troll-Northern Outside	83	469.5	28.8%
		Copper River Gill Net	8	23.2	1.4%
		Bering River Gill Net	5	10.9	0.7%
		TOTAL	255	1,631.6	100.0%

Troll harvests of 1986 Lost, 1986 Tsiu, and 1985 and 1993 Situk coho salmon were estimated by dividing the proportion of coho salmon caught in the troll fishery by the proportion of coho salmon caught in the respective set gill net fishery and then multiplying this ratio by the respective set gill net harvest. Results were as follows:

Coho Stock	Year	Set Gill Net Harvest	Estimated Troll Harvest
Situk	1985	55,223	39,989
Situk	1993	136,910	76,033
Lost	1986	2,489	5,239
Tsiu	1986	19,593	8,120

Total harvests of Situk River coho salmon in 1985 and 1993 and total harvests of Lost River and Tsiu-Tsivat River coho salmon in 1986 were calculated by adding estimated harvests in the respective set gill net fisheries to estimated harvests in the troll fishery (by stock see paragraph above) and the estimated harvests in the sport fishery (by stock see Table 1). Total

harvests were then added to twice the peak aerial survey counts to estimate total returns. Although the proportion of spawning coho salmon observed during peak surveys is not known (as was discussed earlier), it is believed that 50% is a reasonable starting approximation. Estimates based upon the assumption that peak escapement counts represent 100%, 75%, and 25% of the total escapement were also calculated for comparison. Exploitation rates of Situk coho salmon in 1985 and 1993 and exploitation rates of Lost and Tsiu-Tsivat coho salmon in 1986 were then estimated by dividing the estimated troll harvest by the estimated total return. Results of this analysis follow:

Coho Stock	Year	Peak Escapement Expansion Assumption	Estimated Troll Exploitation Rate	Estimated Fishing Effort
Situk	1985	100%	0.386	
Situk	1985	75%	0.378	
Situk	1985	50%	0.363	10,328
Situk	1985	25%	0.325	
Situk	1993	100%	0.338	
Situk	1993	75%	0.333	
Situk	1993	50%	0.322	3,862
Situk	1993	25%	0.296	
Lost	1986	100%	0.415	
Lost	1986	75%	0.379	
Lost	1986	50%	0.323	5,820
Lost	1986	25%	0.223	
Tsiu	1986	100%	0.190	
Tsiu	1986	75%	0.171	
Tsiu	1986	50%	0.143	5,820
Tsiu	1986	25%	0.095	

Approximately 7% of the coded-wire tags were recovered in fisheries other than the troll fishery or respective terminal set gill net fishery. These tags were not used in the estimates of the troll catch and exploitation rate. Thus troll exploitation rates and total returns are relative only to the troll catch, respective set gill net catch, sport catch, and escapement counts. The net effect of coho salmon being intercepted in Yakutat Bay, other set gill net fisheries, etc has an unknown but likely negligible effect on the analysis.

We believe that troll fishery exploitation rate of coho salmon stocks spawning in streams north of Yakutat Bay is less than the exploitation rate exerted on stocks spawning to the south because the majority of the troll fishery effort occurs to the south of Yakutat Bay. This opinion is supported by the fact that the estimated exploitation rate by the troll fishery of Tsiu-Tsivat coho salmon in 1986 was 44% of the rate estimated for Lost coho salmon during the same year. For these reasons, the seven coho salmon stocks were separated into two categories: (1) southern stocks (East Alsek-Doame, Akwe, Italio, Situk, and Lost); and, (2) northern stocks (Kaliakh and Tsiu-Tsivat). The estimated troll exploitation rate for southern stocks (using the 50%

assumption) increased as a function of fishing effort expressed in boat days as follows:

Coho Stock & Year	Estimated Fishing Effort	Estimated Troll Exploitation Rate
Situk - 1993	3,862	0.322
Lost - 1986	5,820	0.323
Situk - 1985	10,328	0.363

We assumed a relationship between troll fishing effort and exploitation rate in the troll fishery which would have a zero exploitation rate when troll fishing effort was zero and which would approach 1.0 when troll fishing effort was very large. The estimated troll exploitation rates for southern stocks and troll fishing effort statistics for the northern outside area during weeks 30-38 were used with the following equation to provide predictions concerning troll exploitation rates for southern stocks during those years when micro-wire tag data were not available (see Figure 1):

$$E = 1-e^{QF} \qquad (1)$$

where: E = predicted exploitation rate;
e = natural logarithm;
Q = -0.000054202; and,
F = estimated fishing effort in boat days in the northern outside area during weeks 30-38.

Q was estimated by linear regression using the log-transformed equation:

$$Ln(1-E) = QF + error \qquad (2)$$

with: Ln(1-E) being the dependent variable; and,
F being the independent variable.

Because estimates of troll fishing effort during the years 1972-1981 are not available, average troll fishing effort during the period 1982-1993 was used as an approximation. Troll fishery exploitation rates for northern stocks were calculated by multiplying the southern rate by 0.44 (estimated exploitation rate of Tsiu-Tsivat coho salmon was 0.143 or 44% of the rate (0.323) estimated for Lost coho salmon). Figure 1 provides a graphical view of the modeled relationship between estimated troll exploitation rates and estimated troll fishing effort and Table 2 provides specific predicted values concerning exploitation rates. Estimated troll harvests of East Alsek-Doame, Akwe, Italio, Situk, Lost, Kaliakh, and Tsiu-Tsivat coho salmon stocks for the years 1972-1993 were calculated using these predicted exploitation rates (Tables 3-24). An exception to this methodology was made for 1975. Use of the methodology outlined above with data from 1975 resulted in an estimated number of troll caught coho salmon from these seven stocks that was approximately double the actual number of coho salmon caught in the 1975 northern outside area troll fishery. Consequently, the estimated exploitation rates for 1975 were reduced from 25.8% and 11.4% for southern and northern stocks to rates of 9.3% and 4.1%; respectively, which provided an estimated

contribution rate of Yakutat stocks to the northern outside troll fishery of about 60%, a contribution rate in the high range of other years. It was assumed that the troll fishery exploitation rate estimated for southern stocks in a given year was applicable to all southern stocks for that year and that the rates estimated for northern stocks in a given year were applicable to all northern stocks in that year. These predicted troll fishery exploitation rates were subsequently used in combination with estimates of the inshore returns to estimate number of coho salmon by stock and by year harvested in the troll fishery (Tables 3-24).

Estimates of Total Returns and Development of Brood Tables

Estimates of the total number of coho salmon that annually returned to the East Alsek-Doame, Akwe, Italio, Situk, Lost, Kaliakh, and Tsiu-Tsivat rivers were developed based upon each of four assumptions: peak annual escapement counts represented 25%, 50%, 75%, or 100% of the total escapement. Total harvests were estimated for each of the seven stocks by summing the annual estimated set gill net harvests with the respective estimates of sport fishery and troll fishery harvests (Tables 25-31). These annual estimates of the total harvests were then subsequently added to the respective annual estimates of total escapements based upon the four assumptions regarding the proportion of total escapement represented by peak escapement counts (Tables 32-38). These data (Tables 32-38) represented the basic statistics used in combination with estimates of the annual age compositions (Tables 39-45) to develop cohort abundance estimates (Tables 46-63). Cohort abundance estimates were subsequently used to develop spawner-recruit relationships.

Analysis of Spawner-Recruit Relationships

Paired data sets consisting of estimated escapements of coho salmon and total returns resulting from these escapements were used to develop spawner-recruit relationships by fitting these paired data sets with the following model:

$$R = Se^{a(1-(S/Pm))} \qquad (3)$$

where: R = predicted total return (recruitment);
S = spawning escapement level;
e = natural logarithm;
a = intercept of the regression (Ricker's alpha); and,
Pm = carrying capacity as calculated by the regression.

This model, commonly referred to as a Ricker recruitment curve (Ricker 1975), has two parameters to estimate, a and Pm. We assumed the errors were multiplicative (as is common when variables are counts), resulting in the log-transformed equation:

$$Ln(R/S) = a-(a/Pm)S + error. \qquad (4)$$

Linear regression procedures provided estimates of the intercept (a) and the slope (a/Pm) of the equation. The estimated number of spawners that produce the maximum number of recruits is:

$$S = Pm/a; \quad (5)$$

and, the estimated number of spawners that produce the maximum harvestable surplus is estimated by iteratively solving the equation:

$$S = (Pm/a)\ \{1-\exp[-a(1-S/Pm)]\}. \quad (6)$$

Three spawner-recruit relationships were developed for each of the four models for each of the seven stocks. The first of these spawner-recruit analysis, termed full, was developed by using all available years of data. For the East Alsek-Doame stock of coho salmon for instance, the full analysis consisted of brood year 1972 through brood year 1989, or 18 paired data points. In cases where escapements were not directly monitored (specific river system - year combinations), the paired data sets were not included for spawner-recruit analysis (brood year 1979 for Italio stock, for instance). The second spawner-recruit analysis, termed partial, was developed using a subset of the data included in the full analysis. Paired data points not included were those years when age composition of the annual run was not directly monitored but was assumed average (brood years 1972-1978, 1988, and 1989 for the East Alsek-Doame stock for instance). Also during the earlier years, troll fishing effort was assumed average because the troll fishery performance program which provided estimates of actual troll fishery effort was not conducted. Fewer assumptions were needed to develop the estimates of total returns for the paired data points included in the partial analysis; however the number of years of data used to develop the spawner-recruit relationships was also less (9 years of data versus 18 for the East Alsek-Doame stock, for instance).

It was presumed that the spawner and recruit estimates used in the partial analysis were preferable to those spawner and recruit estimates that were included in the full analysis but not in the partial analysis. However, the "other" estimates did contain some information and would contribute to improving the estimated spawner-recruit relationships, especially if the estimated numbers of spawners were outside of the range of those in the partial analysis. Therefore, a third type of spawner-recruit relationship was developed and termed the weighted analysis. Parameters for the weighted spawner-recruit equations were estimated using all spawner and recruit estimates, but always weighting the observations from the partial analysis more than the "other" observations. The weights for the observations in the partial analysis were defined as 1.00 and weights for the "other" observations were constrained to values between 0 and 1.00, depending on the relative magnitude of the mean square error (MSE) of the full analysis as compared to the MSE of the partial analysis. If the MSE of the partial analysis was less than that of the full analysis, it would indicate that the additional observations used in the full analysis contributed little to improving the estimated spawner-recruit relationship and the weight of these observations should be small. If the MSE of the partial analysis was greater than that of the full analysis, it would indicate that the additional observations tend to

agree with the estimated spawner-recruit relationship and should have a relatively higher weight. A weight of 0.70 was arbitrarily set for the case where the full analysis MSE was equal to the partial MSE, and an exponential function was used to constrain the weights of the "other" observations to values between 0 and 1.00. The weights were calculated as follows:

$$Weight_{(partial)} = 1.00 \quad (7)$$

$$Weight_{(other)} = \exp\{-0.35667 * (MSE_{full} / MSE_{partial})\} \quad (8)$$

where:

$Weight_{(partial)}$ = weighting factor for observations included in the partial analysis;
$Weight_{(other)}$ = weighting factor for "other" observations;
MSE_{full} = mean square error in full analysis; and,
$MSE_{partial}$ = mean square error in partial analysis.

The weighted analysis was considered better than either the full or the partial analysis because all years of data were used but data associated with fewer assumptions were given more weight in determining the spawner-recruit relationships.

ESTIMATED OPTIMUM ESCAPEMENTS

Once spawner-recruit relationships were calculated, a series of statistics were estimated including: (1) natural equilibrium or carrying capacity (the point on the modeled spawner-recruit line where it intersects the replacement line); (2) the estimated escapement that produces the maximum recruits (highest point on the curve); and, (3) the optimum escapement (the point on the modeled spawner-recruit line where harvestable surplus is at a maximum). These fishery statistics along with various other descriptive statistics are provided for the 84 regressions (7 stocks x 4 models x 3 analysis) in Table 64.

Variability and bias associated with the optimum escapement estimates were estimated using a bootstrap technique, similar to that used by McPherson (1990). The Ricker recruitment curve was fitted to the original data used in the weighted analysis and a set of predicted values was calculated for each spawning escapement in the data set. Residuals were calculated as the difference in the natural log of the observed recruits per spawner and the estimated recruits per spawner. The residuals were identified as belonging to either the number of spawners in the partial data set or to the "other" data set. The residuals of the partial data set were randomly selected with replacement and matched sequentially with the predicted returns and original escapements in the partial data set; and, the residuals of the "other" data set were randomly selected with replacement and matched sequentially with the predicted returns and original escapements in the "other" data set. Thus each bootstrap iteration contained the original escapements and corresponding weights, but different recruits associated with these escapements, depending on which error was randomly chosen for each paired observation. This computer generated spawner and recruit data set was then used to estimate new values

for the parameters a and Pm and the corresponding optimum escapement. This procedure was repeated 4,001 times and the resulting optimum escapements were ordered from smallest to largest. The 200th and 3,800th of these ordered estimates was chosen to provide a 90% confidence interval and the 2,001th was the median bootstrap estimate of optimum escapement. In general it is recommended that a minimum of 1,000 bootstraps be used; we choose to use 4,001 to provide a smoother distribution of parameter estimates.

This same procedure was applied to each of the 28 weighted analyses (7 stocks x 4 models). Optimum escapement estimates from weighted regressions, bootstrap medians, and bootstrap 90% confidence bounds for the 75%, 50%, and 25% models were reduced or "scaled back" to "index" levels by multiplying estimates by 0.75, 0.50, and 0.25; respectively. This was done because index values are the escapement measurements collected and used by fishery managers. Bootstrap medians and 90% confidence bounds are provided in Table 65 and "scaled back" estimates are provided in Table 66.

Weighted regressions were used to determine the lower and upper escapement bounds that are estimated to provide 90% or more of the maximum sustained harvest. This approach was used for weighted regressions for each of the four models for a specific stock of coho salmon using "scaled back" numbers and subsequently examined to determine an overall range of "index" escapements expected to provide 90% or more of the maximum yield for that coho salmon stock. This range of escapements is recommended as the escapement goal range for use in fishery management as it is thought to be the range of index escapements that will result in sustainable yields within 10% of the long-term maximum (Table 67). The escapements achieved for each of the seven coho salmon stocks since the early 1970's were compared to the recommended escapement goal ranges to determine the proportion of years when escapements fell within these ranges, fell below these ranges, or exceeded these ranges (Table 68).

Because escapements of these seven Yakutat Area coho salmon stocks are not measured without error, a modification of the preceding bootstrapping technique was used to investigate potential bias and variability in estimated optimum escapements resulting from this additional source of error. Measurement error in the number of spawners may lead to either over- or under-estimation of optimum escapements, depending on the strength of density dependence compared to the measurement error (Walters and Ludwig 1981; Ludwig and Walters 1981). This analysis was conducted solely to provide a general idea of the direction and magnitude of the bias.

Spawner abundance residuals were developed by subtracting the natural log of the observed escapement from the log of the corresponding model escapement for the observed number of recruits. Graphically, this corresponds to projecting each observed recruitment horizontally (parallel to the x axis) back to the spawner-recruit line and determining the corresponding level of escapement (directly below this point on the line). Recruitment points above the peak of the spawner-recruit curve had no corresponding estimate and no residuals were estimated for these observations. Because the spawner-recruit curve is dome-shaped, each recruitment point has two intercepts on this curve. The nearest intercept was used to calculate the residual. As with the residuals

associated with the recruits, spawner residuals were identified with either the partial data set or with the "other" data set in order to maintain the associated weighting factor. These residuals were randomly added to the observed number of spawners for each observation and residuals were also added to the recruitments. Thus each bootstrap iteration contained escapements with errors randomly added, recruits with errors randomly added, and the weights associated with each point. This spawner and recruit data was then used to estimate new values for the parameters a and Pm and the corresponding optimum escapement. This procedure was also repeated 4,001 times, the resulting optimum escapements were ordered from the smallest to the largest, and the 2,001th was the median bootstrap estimate of optimum escapement. Because recruitment points that were above the peak of the spawner-recruit curve had no corresponding estimate, no residuals were estimated for these observations; and, hence, the bootstrap estimates were not completely random. Because of this, results from this analysis need to be viewed with caution. None-theless, the analysis suggests that all optimum escapements may be biased low due to uncertainty of absolute spawner abundance (Table 69). This potential bias is a result of the analytical methods chosen and does not necessarily have a relationship to possible errors in the enumeration of coho salmon during escapement surveys.

Total potential harvest rates at estimated maximum sustainable yield for each of the seven stocks under each of the four weighted models were calculated by dividing the estimated optimal escapement goal by the estimated production achieved with escapement at maximum sustainable yield and then subtracting this ratio from 1.0 (Table 70).

East Alsek-Doame River Stock of Coho Salmon

Estimates of optimum escapement for the stock of coho salmon that spawns in the East Alsek-Doame River range from a low of 3,651 fish in index counts for the full analysis with the 25% model to a high of 6,111 fish in index counts for the partial analysis with the 100% model (Table 64). Plots of the spawner-recruit relationships with estimates of optimum escapement from the weighted regressions along with median bootstrap estimates of optimum escapement and 90% confidence bounds for the 25%, 50%, 75%, and 100% models are provided in Figures 2, 3, 4, and 5; respectively. Estimates of optimum index escapement for this stock of coho salmon using weighted regression analysis ranges from a low of 3,888 fish with the 25% model to a high of 5,899 fish with the 100% model (Table 64). Maximum difference between weighted regression estimates of optimum escapement in index counts and median bootstrap estimates of optimum escapement in index counts for the various models is only 58 fish (25% model) representing a maximum difference of only 1.5% (Table 66), indicating that weighted regression estimates are not significantly biased when only recruitment residuals are considered.

Overall range of East Alsek-Doame River system coho salmon escapements where yield is predicted to provide 90% or more of the maximum is estimated to vary between about 2,500 and 8,500 fish in index counts (Table 67). The 90% confidence bounds of optimum escapement in index terms obtained from bootstrapping range from about 3,100 to 8,900 fish (Table 67), a fairly

similar index escapement range to the range expected to provide 90% or more of maximum yield. When spawner abundance residuals were also bootstrapped (Table 69), estimated optimum index escapements increased by an average of about 18%. However, all such median bootstrap estimates of optimum escapement fell within the overall ranges identified above, indicating that although estimates of optimum escapement may be biased due to uncertainty concerning absolute abundance of coho salmon escapement into the East Alsek-Doame River system, it is likely that actual optimum escapement falls within the identified ranges. Our recommendation is to establish an escapement goal range of from 2,500 to 8,500 coho salmon observed during index counts of the East Alsek-Doame River system. Optimal harvest rate at maximum sustainable yield for East Alsek-Doame coho salmon ranged from 55.8% for the 25% model to 75.7% for the 100% model (Table 70).

Coho salmon escapement counts in the East Alsek-Doame River system since 1972 have tended to be less than the range recommended for use in future fishery management. Since 1972, 22 coho salmon escapements have been counted in the East Alsek-Doame River system; and, of these, 11 (50%) were less than the recommended range, 9 (41%) fell within the recommended range, and 2 (9%) exceeded the range (Table 68). During the last five years (since 1989), 2 escapements were less than the recommended range, 2 escapements were within the recommended range, and 1 escapement exceeded the range. Adoption of this recommended escapement goal range (2,500-8,500 fish counted) for East Alsek-Doame coho salmon will likely result in a fishery management regime over the next few years that is somewhat more conservative. According to Keith Weiland (personal communication) enumeration of coho salmon in the Doame River is problematic due to typically strong winds in the drainage. This has resulted in incomplete surveys which has likely resulted in the counting of only 25% to 50% of the escapement.

Akwe River Stock of Coho Salmon

Estimates of optimum escapement for the stock of coho salmon that spawns in the Akwe River range from a low of 2,435 fish in index counts for the partial analysis with the 25% model to a high of 4,229 fish in index counts for the full analysis with the 100% model (Table 64). Plots of the spawner-recruit relationships with estimates of optimum escapement from the weighted regressions along with median bootstrap estimates of optimum escapement and 90% confidence bounds for the 25%, 50%, 75%, and 100% models are provided in Figures 6, 7, 8, and 9; respectively. Estimates of optimum index escapement for this stock of coho salmon using weighted regression analysis ranges from a low of 2,841 fish with the 25% model to a high of 3,407 fish with the 100% model (Table 64). Maximum difference between weighted regression estimates of optimum escapement in index counts and median bootstrap estimates of optimum escapement in index counts for the various models is only 147 fish (100% model) representing a maximum difference of only 4.3% (Table 66), thus indicating that weighted regression estimates are not significantly biased when only recruitment residuals are considered.

Overall range of Akwe River coho salmon escapements where yield is predicted to provide 90% or more of the maximum is estimated to vary between about 1,800

and 5,000 fish in index counts (Table 67). The 90% confidence bounds of optimum escapement in index terms obtained from bootstrapping range from about 2,500 to 4,400 fish (Table 67), a somewhat similar index escapement range to the range expected to provide 90% or more of maximum yield. When spawner abundance residuals were also bootstrapped (Table 69), estimated optimum index escapements increased by an average of about 55%. Most median bootstrap estimates of optimum escapement when spawner residuals were included fell above the overall ranges identified above, indicating that estimates of optimum escapement are likely biased low due to uncertainty concerning absolute abundance of coho salmon escapement into the Akwe River. Although this is troubling, we are uncertain of the actual magnitude of the potential bias because spawner residuals were not necessarily randomly chosen. Our recommendation is to establish an escapement goal range of from 1,800 to 5,000 coho salmon observed during index counts of the Akwe River. Optimal harvest rate at maximum sustainable yield for Akwe coho salmon ranged from 67.2% for the 25% model to 84.2% for the 100% model (Table 70).

Coho salmon escapement counts in the Akwe River since 1972 have tended to be in the range recommended for use in future fishery management. Since 1972, 15 coho salmon escapements have been counted in the Akwe River; and, of these, 1 (7%) was less than the recommended range, 9 (60%) fell within the recommended range, and 5 (33%) exceeded the range (Table 68). Adoption of this recommended escapement goal range for Akwe coho salmon will likely result in a continuation of the past fishery management regime over the next few years.

It is recommended that the Akwe River be annually surveyed to document coho salmon escapements. According to Keith Weiland (personal communication), the river has changed since the 1972-1986 period when aerial surveys were used to successfully enumerate the coho salmon escapement. Since that time, visibility in the river has only rarely been conducive to aerial survey enumerations. The coho salmon escapement could likely be enumerated via ground surveys, mark-recapture experiments, or via a weir, however, significant funding would be needed.

Italio River Stock of Coho Salmon

Estimates of optimum escapement for the stock of coho salmon that spawns in the Italio River range from a low of 2,101 fish in index counts for the partial analysis with the 25% model to a high of 2,475 fish in index counts for the partial analysis with the 75% model (Table 64). Plots of the spawner-recruit relationships with estimates of optimum escapement from the weighted regressions along with median bootstrap estimates of optimum escapement and 90% confidence bounds for the 25%, 50%, 75%, and 100% models are provided in Figures 10, 11, 12, and 13; respectively. Estimates of optimum index escapement for this stock of coho salmon using weighted regression analysis ranges from a low of 2,148 fish with the 25% model to a high of 2,439 fish with the 75% model (Table 64). Maximum difference between weighted regression estimates of optimum escapement in index counts and median bootstrap estimates of optimum escapement in index counts for the various models is only 56 fish (100% model) representing a maximum difference of only 2.3% (Table 66), thus

indicating that weighted regression estimates are not significantly biased when only recruitment residuals are considered.

Overall range of Italio River coho salmon escapements where yield is predicted to provide 90% or more of the maximum is estimated to vary between about 1,400 and 3,600 fish in index counts (Table 67). The 90% confidence bounds of optimum escapement in index terms obtained from bootstrapping range from about 1,800 to 3,100 fish (Table 67), a somewhat similar index escapement range to the range expected to provide 90% or more of maximum yield. When spawner abundance residuals were also bootstrapped (Table 69), estimated optimum index escapements increased by an average of about 220%. All of the median bootstrap estimates of optimum escapement when spawner residuals were included fell above the overall ranges identified above, indicating that estimates of optimum escapement are likely biased low due to uncertainty concerning absolute abundance of coho salmon escapement into the Italio River. Although this is troubling, we are uncertain of the actual magnitude of the potential bias because spawner residuals were not necessarily randomly chosen. Our recommendation is to establish an escapement goal range of from 1,400 to 3,600 coho salmon observed during index counts of the Italio River and because of the above described potential for significant bias, we believe the upper portion of the range is preferable (2,500 or more). Optimal harvest rate at maximum sustainable yield for the Italio River stock of coho salmon ranged from 70.1% for the 25% model to 83.5% for the 100% model (Table 70).

Coho salmon escapement counts in the Italio River since 1972 have tended to exceed the range recommended for use in future fishery management. Since 1972, 21 coho salmon escapements have been counted in the Italio River; and, of these, 3 (14%) were less than the recommended range, 6 (29%) fell within the recommended range, and 12 (57%) exceeded the range (Table 68). During the last five years (since 1989), all escapements exceeded the range. Adoption of this recommended escapement goal range (1,400-3,600 fish counted with emphasis on the upper part of the range) for the Italio River stock of coho salmon will likely result in a fishery management regime over the next few years that is somewhat more liberal.

Situk River Stock of Coho Salmon

Estimates of optimum escapement for the stock of coho salmon that spawns in the Situk River range from a low of 5,321 fish in index counts for the partial analysis with the 25% model to a high of 7,420 fish in index counts for the full analysis with the 100% model (Table 64). Plots of the spawner-recruit relationships with estimates of optimum escapement from the weighted regressions along with median bootstrap estimates of optimum escapement and 90% confidence bounds for the 25%, 50%, 75%, and 100% models are provided in Figures 14, 15, 16, and 17; respectively. Estimates of optimum index escapement for this stock of coho salmon using weighted regression analysis ranges from a low of 5,627 fish with the 25% model to a high of 6,517 fish with the 100% model (Table 64). Maximum difference between weighted regression estimates of optimum escapement in index counts and median bootstrap estimates of optimum escapement in index counts for the various models is only 54 fish (100% model) representing a maximum difference of only

1.0% (Table 66), indicating that weighted regression estimates are not significantly biased when only recruitment residuals are considered.

Overall range of Situk River coho salmon escapements where yield is predicted to provide 90% or more of the maximum is estimated to vary between about 3,300 and 9,800 fish in index counts (Table 67). The 90% confidence bounds of optimum escapement in index terms obtained from bootstrapping range from about 4,500 to 10,200 fish (Table 67), a somewhat similar index escapement range to the range expected to provide 90% or more of maximum yield. When spawner abundance residuals were also bootstrapped (Table 69), estimated optimum index escapements increased by an average of about 53%. Half of the median bootstrap estimates of optimum escapement when spawner residuals were included fell above the overall ranges identified above (the 75% and 100% models), indicating that estimates of optimum escapement are likely biased low due to uncertainty concerning absolute abundance of coho salmon escapement into the Situk River. Although this is troubling, we are uncertain of the actual magnitude of the potential bias because spawner residuals were not necessarily randomly chosen. Our recommendation is to establish an escapement goal range of from 3,300 to 9,800 coho salmon observed during index counts of the Situk River. Optimal harvest rate at maximum sustainable yield for Situk coho salmon ranged from 76.3% for the 25% model to 91.3% for the 100% model (Table 70).

Coho salmon escapement counts in the Situk River since 1972 have tended to be in the range recommended for use in future fishery management. Since 1972, 21 coho salmon escapements have been counted in the Situk River; and, of these, 5 (24%) were less than the recommended range, 12 (57%) fell within the recommended range, and 4 (19%) exceeded the range (Table 68). During the last five years (since 1989), 1 escapement was less than the recommended range, 2 escapements were within the recommended range, and 2 escapements exceeded the range. Adoption of this recommended escapement goal range for Situk coho salmon will likely result in a continuation of the past fishery management regime over the next few years.

Although escapement statistics we used to develop spawner-recruit relationships for Situk coho salmon were based entirely on escapements counted in the Situk River, coho salmon also spawn in the Ahrnklin and Antlen (a tributary to the Ahrnklin) rivers. The Ahrnklin River drains into the Situk lagoon and the Situk set gill net fishery harvests these fish. Escapement counts of coho salmon in the Antlen River are limited to 1986, 1988, and 1989 with the highest count being 3,500 fish in 1989. Escapement counts of coho salmon in the Ahrnklin River are limited to 1982, 1986, 1987, 1988, and 1992 with the highest count being 2,200 fish in 1992. Visibility in these rivers limits effectiveness of aerial and boat surveys. Although data are limited, Keith Weiland (personal communication) believes that the Ahrnklin River system may produce up to 60% of the coho salmon harvested in the Situk set gill net fishery. If the coho salmon escapements into both the Situk and Ahrnklin rivers vary proportionally, the spawner-recruit relationships we developed can still be used and the Situk coho salmon escapement can be used as an index of escapement into the combined system. However, if escapements of the two stocks do not vary proportionally, separate spawner-recruit relationships should be developed for each system, requiring a catch allocation estimation

procedure for Situk set gill net harvests as well as independent escapement enumerations of coho salmon in both rivers. This difficulty cannot be resolved until such time as the escapement of coho salmon into the Ahrnklin River is better enumerated over a period of years and compared to monitored escapements of coho salmon in the Situk River. Because the Situk set gill net fishery is a major fishery with coho salmon harvests averaging over 100,000 fish per year during the 1990's, resolving this uncertainty should be considered a priority.

Lost River Stock of Coho Salmon

Estimates of optimum escapement for the stock of coho salmon that spawns in the Lost River range from a low of 3,151 fish in index counts for the full analysis with the 25% model to a high of 6,165 fish in index counts for the partial analysis with the 100% model (Table 64). Plots of the spawner-recruit relationships with estimates of optimum escapement from the weighted regressions along with median bootstrap estimates of optimum escapement and 90% confidence bounds for the 25%, 50%, 75%, and 100% models are provided in Figures 18, 19, 20, and 21; respectively. Estimates of optimum index escapement for this stock of coho salmon using weighted regression analysis ranges from a low of 3,412 fish with the 25% model to a high of 4,496 fish with the 100% model (Table 64). Maximum difference between weighted regression estimates of optimum escapement in index counts and median bootstrap estimates of optimum escapement in index counts for the various models is 404 fish (100% model) representing a maximum difference of 9.0% (Table 66), indicating that weighted regression estimates are not substantially biased when only recruitment residuals are considered.

Overall range of Lost River coho salmon escapements where yield is predicted to provide 90% or more of the maximum is estimated to vary between about 2,200 and 6,500 fish in index counts (Table 67). The 90% confidence bounds of optimum escapement in index terms obtained from bootstrapping range from about 2,800 to 5,600 fish (Table 67), a reasonably similar index escapement range to the range expected to provide 90% or more of maximum yield. When spawner abundance residuals were also bootstrapped (Table 69), estimated optimum index escapements increased by an average of about 60%. Three of the four median bootstrap estimates of optimum escapement when spawner residuals were included fell within the overall ranges identified above (the 25%, 50%, and 75% models), indicating that although estimates of optimum escapement are likely biased low due to uncertainty concerning absolute abundance of coho salmon escapement into the Lost River, the ranges may incorporate the real optimum escapement. We are uncertain of the actual magnitude of the potential bias because spawner residuals were not necessarily randomly chosen. Our recommendation is to establish an escapement goal range of from 2,200 to 6,500 coho salmon observed during index counts of the Lost River. Optimal harvest rate at maximum sustainable yield for Lost River coho salmon ranged from 58.4% for the 25% model to 77.4% for the 100% model (Table 70).

Coho salmon escapement counts in the Lost River since 1972 have tended to be in the range recommended for use in future fishery management. Since 1972, 22 coho salmon escapements have been counted in the Lost River; and, of these, 5

(23%) were less than the recommended range, 11 (50%) fell within the recommended range, and 6 (27%) exceeded the range (Table 68). During the last five years (since 1989), 2 escapements were less than the recommended range, 2 escapements were within the recommended range, and 1 escapement exceeded the range. Adoption of this recommended escapement goal range for Lost coho salmon will likely result in a continuation of the past fishery management regime over the next few years.

Kaliakh River Stock of Coho Salmon

Estimates of optimum escapement for the stock of coho salmon that spawns in the Kaliakh River range from a low of 6,119 fish in index counts for the partial analysis with the 25% model to a high of 10,365 fish in index counts for the partial analysis with the 100% model (Table 64). Plots of the spawner-recruit relationships with estimates of optimum escapement from the weighted regressions along with median bootstrap estimates of optimum escapement and 90% confidence bounds for the 25%, 50%, 75%, and 100% models are provided in Figures 22, 23, 24, and 25; respectively. Estimates of optimum index escapement for this stock of coho salmon using weighted regression analysis ranges from a low of 6,211 fish with the 25% model to a high of 9,697 fish with the 100% model (Table 64). Maximum difference between weighted regression estimates of optimum escapement in index counts and median bootstrap estimates of optimum escapement in index counts for the various models is only 234 fish (100% model) representing a maximum difference of 2.4% (Table 66), indicating that weighted regression estimates are not significantly biased when only recruitment residuals are considered.

Overall range of Kaliakh River coho salmon escapements where yield is predicted to provide 90% or more of the maximum is estimated to vary between about 4,000 and 14,000 fish in index counts (Table 67). The 90% confidence bounds of optimum escapement in index terms obtained from bootstrapping range from about 4,900 to 14,300 fish (Table 67), a similar index escapement range to the range expected to provide 90% or more of maximum yield. When spawner abundance residuals were also bootstrapped (Table 69), estimated optimum index escapements increased by an average of about 23%. All median bootstrap estimates of optimum escapement when spawner residuals were included fell within the overall ranges identified above, indicating that although estimates of optimum escapement are likely biased low due to uncertainty concerning absolute abundance of coho salmon escapement into the Kaliakh River, the ranges likely incorporate the real optimum escapement. We are uncertain of the actual magnitude of the potential bias because spawner residuals were not necessarily randomly chosen. Our recommendation is to establish an escapement goal range of from 4,000 to 14,000 coho salmon observed during index counts of the Kaliakh River. Optimal harvest rate at maximum sustainable yield for Kaliakh coho salmon ranged from 49.2% for the 25% model to 69.2% for the 100% model (Table 70).

Coho salmon escapement counts in the Kaliakh River since 1973 have tended to be below the range recommended for use in future fishery management. Since 1972, 16 coho salmon escapements have been counted in the Kaliakh River; and, of these, 8 (50%) were less than the recommended range, 6 (38%) fell within

the recommended range, and 2 (12%) exceeded the range (Table 68). During the last five years (since 1989), 4 escapements were counted and all were less than the recommended range. Adoption of this recommended escapement goal range for Kaliakh coho salmon will likely result in a more conservative fishery management regime over the next few years. Surveys of coho salmon in the Kaliakh River are typically only flown once per year (Keith Weiland, personal communication). Additional surveys to better ensure that the annual counts represent peak counts would improve the data base for this stock of coho salmon.

Tsiu-Tsivat River Stock of Coho Salmon

Estimates of optimum escapement for the stock of coho salmon that spawns in the Tsiu and Tsivat rivers range from a low of 15,110 fish in index counts for the full analysis with the 25% model to a high of 20,864 fish in index counts for the partial analysis with the 100% model (Table 64). Plots of the spawner-recruit relationships with estimates of optimum escapement from the weighted regressions along with median bootstrap estimates of optimum escapement and 90% confidence bounds for the 25%, 50%, 75%, and 100% models are provided in Figures 26, 27, 28, and 29; respectively. Estimates of optimum index escapement for this stock of coho salmon using weighted regression analysis ranges from a low of 15,418 fish with the 25% model to a high of 20,073 fish with the 100% model (Table 64). Maximum difference between weighted regression estimates of optimum escapement in index counts and median bootstrap estimates of optimum escapement in index counts for the various models is only 271 fish (100% model) representing a maximum difference of only 1.4% (Table 66), indicating that weighted regression estimates are not significantly biased when only recruitment residuals are considered.

Overall range of Tsiu-Tsivat coho salmon escapements where yield is predicted to provide 90% or more of the maximum is estimated to vary between about 10,000 and 29,000 fish in index counts (Table 67). The 90% confidence bounds of optimum escapement in index terms obtained from bootstrapping range from about 13,500 to 25,100 fish (Table 67), a fairly similar index escapement range to the range expected to provide 90% or more of maximum yield. When spawner abundance residuals were also bootstrapped (Table 69), estimated optimum index escapements increased by an average of about 50%. Half of the median bootstrap estimates of optimum escapement when spawner residuals were included fell above the overall ranges identified above (the 75% and 100% models), indicating that estimates of optimum escapement are likely biased low due to uncertainty concerning absolute abundance of coho salmon escapement into the Tsiu and Tsivat rivers. Although this is troubling, we are uncertain of the actual magnitude of the potential bias because spawner residuals were not necessarily randomly chosen. Our recommendation is to establish an escapement goal range of from 10,000 to 29,000 coho salmon observed during index counts of the Tsiu-Tsivat river system. Optimal harvest rate at maximum sustainable yield for Tsiu-Tsivat coho salmon ranged from 59.0% for the 25% model to 76.2% for the 100% model (Table 70).

Coho salmon escapement counts in the Tsiu and Tsivat rivers since 1973 have tended to be in the range recommended for use in future fishery management.

Since 1972, 21 coho salmon escapements have been counted in the Tsiu and Tsivat rivers; and, of these, 2 (10%) were less than the recommended range, 11 (52%) fell within the recommended range, and 8 (38%) exceeded the range (Table 68). During the last five years (since 1989), no escapements were less than the recommended range, 3 escapements were within the recommended range, and 2 escapements exceeded the range. Adoption of this recommended escapement goal range for the Tsiu-Tsivat stock of coho salmon will likely result in a continuation of the past fishery management regime over the next few years.

RECOMMENDATIONS AND DISCUSSION

It is recommended that the following escapement goal ranges be formally adopted by ADF&G and subsequently be used by ADF&G for management of Yakutat Area coho salmon fisheries:

Coho Salmon Stock	Recommended Escapement Goal Range	Recommended Management Target
East Alsek/Doame River	2,500 to 8,500	Mid Range
Akwe	1,800 to 5,000	Mid Range
Italio	1,400 to 3,600	Upper Range
Situk	3,300 to 9,800	Mid Range
Lost	2,200 to 6,500	Mid Range
Kaliakh	4,000 to 14,000	Mid Range
Tsiu/Tsivat	10,000 to 29,000	Mid Range

These recommended escapement goals for coho salmon are aggregate goals. No attempt was made to investigate timing or tributary sub-stock goals; however fishery managers should attempt to distribute these escapement goal ranges across all temporal and spatial segments of the runs.

Spawner-recruit relationships were estimated with little consideration of the imprecision and bias added to the analysis resulting from variability in the estimates of number of spawners. In addition, other sources of uncertainty were discussed earlier in this report but not explicitly included as sources of variability in the analysis. Estimates which model errors in both the independent and dependent variables can be obtained using measurement error models (Fuller 1987). However, the combination of this type of analysis with bootstrapping techniques is quite complex, and would require more time and discussion than was available for the present analysis. It is recommended that subsequent spawner-recruit research investigate this type of approach.

Troll exploitation rates were based on the logical assumption of a relationship between troll fishing effort and exploitation rate. This relationship was estimated using three observations. With the troll fishery exploitation rate estimates we developed under the 50% model ranging from 8% to 43%, the estimated total return could be greatly affected by this relationship, especially in years with large or small levels of troll fishing effort. It is recommended that a more robust and accurate relationship be obtained by reinstituting a coho salmon coded-wire tagging program, preferably on the Situk River. Such a study would also provide information on

interceptions in other fisheries and help improve estimates of total return to these systems.

Most of the uncertainty in the analysis is likely due to uncertainty in escapement surveys. Inclement weather, other priorities, funding limitations, changes in the biological or physical attributes of the system, and many other factors affect the magnitude and quality of escapement counts. In some years, these factors may restrict or even prevent surveys during the coho returns, while in other years, multiple surveys may be taken throughout the run, ensuring a survey near the peak of the return. It is recommended that existing escapement data be evaluated and an escapement survey plan be developed to obtain more consistent survey information.

One of the major limitations in this analysis is the lack of any total escapement estimates for coho salmon in the Yakutat Area. Because of high water conditions typically present during the fall coho salmon migration period, the likelihood of maintaining a weir in a fish tight manner is low. However, we believe that fairly good estimates of total escapement could be obtained through mark-recapture experiments at a relatively low cost. A series of such experiments could shed some light on what proportion of the total escapements of coho salmon in the Yakutat Area are counted during peak aerial surveys.

It is recommended that these escapement goal ranges be reexamined in approximately five years because five additional paired data points concerning spawner abundance - total returns may significantly affect the spawner-recruit relationships. These escapement goal ranges should be reevaluated sooner if significant new information is collected over the next few years.

Age-sex-size composition sampling of coho salmon harvested in Yakutat Area set gill net fisheries was not conducted in 1993. Further, this sampling was not conducted in 1992 for the East Alsek, Akwe, Italio, and Situk set gill net fisheries. It is recommended that annual sampling of Yakutat Area set gill net fisheries to document age-sex-size composition of coho salmon be reinstituted in 1994 and be maintained annually so that long term data bases concerning spawner-recruit relationships for these coho salmon stocks can be developed with fewer assumptions. This improved longer-term data base can be used to gain a better understanding of the production potential of these coho salmon producing systems. This improved understanding can lead to improved fishery management to better achieve maximum sustained harvests under an escapement goal based fishery management approach.

The escapement of coho salmon into the Akwe River has not been documented since 1987, whereas, it was annually documented each year between 1972 and 1986. It is recommended that the Akwe River be annually surveyed with ground surveys or with mark-recapture experiments to document coho salmon escapements.

The uncertainty regarding coho salmon escapements into the Ahrnklin River causes us concern with Situk coho spawner-recruit relationships. This difficulty cannot be resolved until such time as the escapement of coho salmon into the Ahrnklin River is better enumerated over a period of years. It is

recommended that the Ahrnklin coho escapement be annually surveyed with ground surveys or with mark-recapture experiments to document coho salmon escapements. Because the Situk set gill net fishery is a major fishery, resolving this uncertainty is important.

The Yahtse River supports a significant run of coho salmon with set gill net harvests as large as 20,000 fish per year (average about 8,000) and with documented escapements as large as 3,000 fish (average about 900). However, escapements have only been monitored since 1985. It is recommended that escapement of coho salmon into the Yahtse River continue to be monitored and that the spawner-recruit relationship be researched in about five years at which time about 15 annual escapements and about 10 total returns will be available for the analysis.

The Alsek River supports a significant run of coho salmon with U. S. set gill net harvests as large as 13,000 fish per year (average about 6,000). The U. S. established a border escapement goal of 5,400 coho salmon whereas, Canada established a border escapement goal of 25,000 coho salmon. The Alsek River is relatively long and complex, and, the escapement data base is relatively fragmented and incomplete. It is recommended that U. S. and Canadian scientists cooperatively strive to work with the fragmentary escapement data base and reconstruct runs as best as possible to establish a jointly agreed to biological escapement goal for the Alsek River stock of coho salmon.

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Table 1. Estimated sport fishery harvests of coho salmon from the Situk, Lost, and Tsiu Rivers, 1972-1992.[a]

Year	Yakutat Area Harvest of Coho Salmon	Estimated Coho Salmon Harvests (extrapolations): Situk River		Lost River		Tsiu River	
		Number	Percent	Number	Percent	Number	Percent
1972	(2,100)	(1,256)	(60%)	(400)	(20%)	(300)	(15%)
1973	(2,100)	(1,256)	(60%)	(400)	(20%)	(300)	(15%)
1974	(2,100)	(1,256)	(60%)	(400)	(20%)	(300)	(15%)
1975	(2,100)	(1,256)	(60%)	(400)	(20%)	(300)	(15%)
1976	(2,100)	(1,256)	(60%)	(400)	(20%)	(300)	(15%)
1977	1,406	853	61%	(280)	(20%)	(210)	(15%)
1978	3,181	1,848	58%	(640)	(20%)	(480)	(15%)
1979	2,963	1,800	61%	(590)	(20%)	(440)	(15%)
1980	2,316	973	42%	(460)	(20%)	(350)	(15%)
1981	2,484	594	24%	(500)	(20%)	(370)	(15%)
1982	2,809	964	34%	(560)	(20%)	(420)	(15%)
1983	2,328	545	23%	(470)	(20%)	(350)	(15%)
1984	6,675	2,195	33%	1,110	17%	(1,000)	(15%)
1985	6,571	1,956	29%	(1,310)	(20%)	(990)	(15%)
1986	6,430	1,982	31%	(1,290)	(20%)	(960)	(15%)
1987	2,987	471	16%	(600)	(20%)	(450)	(15%)
1988	3,603	655	18%	(720)	(20%)	(540)	(15%)
1989	7,983	1,920	24%	(1,600)	(20%)	(1,200)	(15%)
1990	2,566	478	18%	(510)	(20%)	(380)	(15%)
1991	5,952	1,431	24%	914	15%	835	14%
1992	5,626	1,433	25%	1,514	27%	866	15%
1993	(5,626)	(1,433)	(25%)	(1,514)	(27%)	(866)	(15%)

[a] Data Source: Mills (1979-1993). Harvest of Situk River coho salmon in 1972-1976 is assumed to equal the average harvest from 1977-1992 and is assumed to represent 60% of the total Yakutat Area harvest of coho salmon (1977-1979 average percent). The harvest of coho salmon from the Lost River is assumed to represent 20% of the total coho harvest for years when harvest estimates are not available (average harvest percent for the years 1984, 1991, and 1992 = 19.7%). The harvest of coho salmon from the Tsiu River is assumed to represent 15% of the total coho harvest for years when harvest estimates are not available (average harvest percent for the years 1991 and 1992 = 14.5%). Harvests in 1993 are assumed equal to the 1992 harvests.

Table 2. Estimated fishing effort in the northern outside area of Southeast Alaska, estimated exploitation rate of Situk River coho salmon in 1985 and 1993, estimated exploitation rate of Lost and Tsiu river coho salmon in 1986, and predicted exploitation rates for southern and northern stocks of Yakutat Area coho salmon stocks, 1972-1993.[a]

Year	Estimated Fishing Effort (Boat-Days)	Stock and Estimated Exploitation Rate	Predicted Exploitation Rates	
			Southern Stocks	Northern Stocks
1972	(5,500)		0.258	0.114
1973	(5,500)		0.258	0.114
1974	(5,500)		0.258	0.114
1975	(5,500)		0.093[b]	0.041
1976	(5,500)		0.258	0.114
1977	(5,500)		0.258	0.114
1978	(5,500)		0.258	0.114
1979	(5,500)		0.258	0.114
1980	(5,500)		0.258	0.114
1981	5,420		0.255	0.112
1982	10,233		0.426	0.187
1983	8,075		0.355	0.156
1984	6,603		0.301	0.132
1985	10,328	Situk River: 0.363	0.429	0.189
1986	5,820	Lost River: 0.322 Tsiu River: 0.143	0.271	0.119
1987	5,194		0.245	0.108
1988	4,715		0.226	0.099
1989	3,106		0.155	0.068
1990	4,201		0.204	0.090
1991	1,562		0.081	0.036
1992	2,828		0.142	0.062
1993	3,862	Situk River: 0.323	0.189	0.083

[a] The northern outside area includes fishing districts 116, 156, 157, 181, 183, 186, 189, and 191. Southern stocks include the East Alsek River, Akwe River, Italio River, Situk River, and Lost River stocks of coho salmon; northern stocks include Kaliakh River and Tsiu River stocks of coho salmon. Predicted exploitation rates for northern stocks is equal to 0.44 times the southern stock rate. Predicted exploitation rates for southern stocks is based upon the following equation:

$E = 1-e^{QF}$ where: E = predicted exploitation rate;
e = natural logarithm;
Q = -0.00005420;
F = estimated fishing effort in boat days in the northern outside area during weeks 30-38.

[b] The exploitation rates used for 1975 were reduced from predicted rates by a a factor of 0.36 (see text for explanation).

Table 3. Estimated harvests of five coho salmon stocks in the Yakutat Area in 1972 by the offshore troll fishery.[a]

River System	Peak Escapement Count in 1972: Count	Count x 2	Set Net Harvest	Sport Harvest	Total Estimated Inshore Return	Estimated Total Return	Estimated Troll Fishery: Troll Harvest	Expl. Rate
East	1,500	3,000	1,685	0	4,685	6,314	1,629	25.8%
Akwe	7,000	14,000	5,270	0	19,270	25,970	6,700	25.8%
Italio	4,000	8,000	940	0	8,940	12,049	3,109	25.8%
Situk	5,100	10,200	17,848	1,256	29,304	39,493	10,189	25.8%
Lost	3,800	7,600	3,627	400	11,627	15,670	4,043	25.8%

Total Estimated Set Net Harvest for these Five Stocks in 1972:	29,370
Estimated 1972 Set Net Harvests of Coho Salmon from Yakutat Area:	46,289
Estimated Proportion of Yakutat Set Net Harvest Composed of 5 Stocks:	63.4%
Total Estimated Troll Harvest for these Five Stocks in 1972:	25,670
Estimated 1972 Troll Harvests of Coho Salmon from Area 1[b]:	108,674
Estimated Proportion of Area 1 Troll Harvest Composed of 5 Stocks:	23.6%

[a] Data sources: escapement and set net harvests from IFDB computer files and sport harvests from Table 1 (based upon statewide sport harvest reports; Mills 1979-1993). Analysis assumes that peak escapement counts represented 50% of the total escapement and that exploitation rate exerted on these stocks by the troll fishery was 25.8% (see Table 2).

[b] Area 1 = Northern Outside Area = Fishing Districts 116, 156, 157, 181, 183, 186, 189, and 191.

Table 4. Estimated harvests of seven coho salmon stocks in the Yakutat Area in 1973 by the offshore troll fishery.[a]

River System	Peak Escapement Count in 1973: Count	Count x 2	Set Net Harvest	Sport Harvest	Total Estimated Inshore Return	Estimated Total Return	Estimated Troll Fishery: Troll Harvest	Expl. Rate
East	300	600	1,353	0	1,953	2,632	679	25.8%
Akwe	3,000	6,000	4,670	0	10,670	14,380	3,710	25.8%
Italio	800	1,600	1,785	0	3,385	4,562	1,177	25.8%
Situk	1,719	3,438	10,026	1,256	14,720	19,838	5,118	25.8%
Lost	1,978	3,956	2,385	400	6,741	9,085	2,344	25.8%
Kaliakh	8,000	16,000	601	0	16,601	18,737	2,136	11.4%
Tsiu	30,000	60,000	8,803	300	69,108	77,994	8,886	11.4%

Total Estimated Set Net Harvest for these Seven Stocks in 1973:	29,623
Estimated 1973 Set Net Harvests of Coho Salmon from Yakutat Area:	41,776
Estimated Proportion of Yakutat Set Net Harvest Composed of 7 Stocks:	70.9%
Total Estimated Troll Harvest for these Seven Stocks in 1973:	24,050
Estimated 1973 Troll Harvests of Coho Salmon from Area 1[b]:	97,695
Estimated Proportion of Area 1 Troll Harvest Composed of 7 Stocks:	24.6%

[a] Data sources: escapement and set net harvests from IFDB computer files and sport harvests from Table 1 (based upon statewide sport harvest reports; Mills 1979-1993). Analysis assumes that peak escapement counts represented 50% of the total escapement; that exploitation rate exerted on southern stocks by the troll fishery was 25.8%; and, that exploitation rate exerted on northern stocks was 11.4% (see Table 2).

[b] Area 1 = Northern Outside Area = Fishing Districts 116, 156, 157, 181, 183, 186, 189, and 191.

Table 5. Estimated harvests of seven coho salmon stocks in the Yakutat Area in 1974 by the offshore troll fishery.[a]

River System	Peak Escapement Count in 1974: Count	Count x 2	Set Net Harvest	Sport Harvest	Total Estimated Inshore Return	Estimated Total Return	Estimated Troll Fishery: Troll Harvest	Expl. Rate
East	3,000	6,000	3,231	0	9,231	12,441	3,210	25.8%
Akwe	5,000	10,000	4,988	0	14,988	20,199	5,211	25.8%
Italio	3,000	6,000	5,460	0	11,460	15,445	3,985	25.8%
Situk	4,260	8,520	32,968	1,256	42,744	57,606	14,862	25.8%
Lost	2,500	5,000	4,300	400	9,700	13,073	3,373	25.8%
Kaliakh	5,700[b]	11,400	1,101	0	12,501	14,109	1,608	11.4%
Tsiu	15,000	30,000	8,258	300	38,558	43,519	4,961	11.4%

Total Estimated Set Net Harvest for these Seven Stocks in 1974:	60,306
Estimated 1974 Set Net Harvests of Coho Salmon from Yakutat Area:	77,556
Estimated Proportion of Yakutat Set Net Harvest Composed of 7 Stocks:	77.8%
Total Estimated Troll Harvest for these Seven Stocks in 1974:	37,210
Estimated 1974 Troll Harvests of Coho Salmon from Area 1[c]:	136,462
Estimated Proportion of Area 1 Troll Harvest Composed of 7 Stocks:	27.3%

[a] Data sources: escapement and set net harvests from IFDB computer files and sport harvests from Table 1 (based upon statewide sport harvest reports; Mills 1979-1993). Analysis assumes that peak escapement counts represented 50% of the total escapement; that exploitation rate exerted on southern stocks by the troll fishery was 25.8%; and, that exploitation rate exerted on northern stocks was 11.4% (see Table 2).

[b] Kaliakh River coho salmon escapement was not monitored in 1974; the value listed is the average escapement observed in 1973 and 1975.

[c] Area 1 = Northern Outside Area = Fishing Districts 116, 156, 157, 181, 183, 186, 189, and 191.

Table 6. Estimated harvests of seven coho salmon stocks in the Yakutat Area in 1975 by the offshore troll fishery.[a]

River System	Peak Escapement Count in 1975: Count	Count x 2	Set Net Harvest	Sport Harvest	Total Estimated Inshore Return	Estimated Total Return	Estimated Troll Fishery: Troll Harvest	Expl. Rate
East	1,500	3,000	1,442	0	4,442	4,897	455	9.3%
Akwe	2,200	4,400	3,160	0	7,560	8,335	775	9.3%
Italio	1,450	2,900	3,064	0	5,964	6,576	612	9.3%
Situk	4,500	9,020	16,408	1,256	26,664	29,398	2,734	9.3%
Lost	1,300	2,600	3,486	400	6,486	7,151	665	9.3%
Kaliakh	3,500	7,000	0	0	7,000	7,299	299	4.1%
Tsiu	8,150	16,300	0	300	16,600	17,310	710	4.1%

Total Estimated Set Net Harvest for these Seven Stocks in 1975:	27,560
Estimated 1975 Set Net Harvests of Coho Salmon from Yakutat Area:	37,403
Estimated Proportion of Yakutat Set Net Harvest Composed of 7 Stocks:	73.7%
Total Estimated Troll Harvest for these Seven Stocks in 1975:	6,250
Estimated 1975 Troll Harvests of Coho Salmon from Area 1[b]:	10,496
Estimated Proportion of Area 1 Troll Harvest Composed of 7 Stocks:	59.0%

[a] Data sources: escapement and set net harvests from IFDB computer files and sport harvests from Table 1 (based upon statewide sport harvest reports; Mills 1979-1993). Analysis assumes that peak escapement counts represented 50% of the total escapement; that exploitation rate exerted on southern stocks by the troll fishery was 9.3%; and, that exploitation rate exerted on northern stocks was 4.1% (see Table 2 and text for explanation).

[b] Area 1 = Northern Outside Area = Fishing Districts 116, 156, 157, 181, 183, 186, 189, and 191.

Table 7. Estimated harvests of seven coho salmon stocks in the Yakutat Area in 1976 by the offshore troll fishery.[a]

River System	Peak Escapement Count in 1976: Count	Peak Escapement Count in 1976: Count x 2	Set Net Harvest	Sport Harvest	Total Estimated Inshore Return	Total Estimated Return	Estimated Troll Fishery: Troll Harvest	Estimated Troll Fishery: Expl. Rate
East	2,200	4,400	1,280	0	5,680	7,655	1,975	25.8%
Akwe	1,500	3,000	3,816	0	6,816	9,186	2,370	25.8%
Italio	1,000	2,000	4,553	0	6,553	8,832	2,279	25.8%
Situk	3,280	6,560	15,664	1,256	23,480	31,644	8,164	25.8%
Lost	1,200	2,400	3,787	400	6,587	8,872	2,290	25.8%
Kaliakh	8,000	16,000	1,221	0	17,221	19,437	2,216	11.4%
Tsiu	30,000	60,000	3,129	300	63,429	71,590	8,161	11.4%

Total Estimated Set Net Harvest for these Seven Stocks in 1976:	33,450
Estimated 1976 Set Net Harvests of Coho Salmon from Yakutat Area:	51,743
Estimated Proportion of Yakutat Set Net Harvest Composed of 7 Stocks:	64.6%
Total Estimated Troll Harvest for these Seven Stocks in 1976:	27,455
Estimated 1976 Troll Harvests of Coho Salmon from Area 1[b]:	100,256
Estimated Proportion of Area 1 Troll Harvest Composed of 7 Stocks:	27.4%

[a] Data sources: escapement and set net harvests from IFDB computer files and sport harvests from Table 1 (based upon statewide sport harvest reports; Mills 1979-1993). Analysis assumes that peak escapement counts represented 50% of the total escapement; that exploitation rate exerted on southern stocks by the troll fishery was 25.8%; and, that exploitation rate exerted on northern stocks was 11.4% (see Table 2).

[b] Area 1 = Northern Outside Area = Fishing Districts 116, 156, 157, 181, 183, 186, 189, and 191.

Table 8. Estimated harvests of seven coho salmon stocks in the Yakutat Area in 1977 by the offshore troll fishery.[a]

River System	Peak Escapement Count in 1977: Count	Peak Escapement Count in 1977: Count x 2	Set Net Harvest	Sport Harvest	Total Estimated Inshore Return	Estimated Total Return	Estimated Troll Fishery: Troll Harvest	Estimated Troll Fishery: Expl. Rate
East	2,000	4,000	4,140	0	8,140	10,970	2,830	25.8%
Akwe	15,000	30,000	10,299	0	40,299	54,311	14,012	25.8%
Italio	8,000	16,000	4,912	0	20,912	28,183	7,271	25.8%
Situk	3,750	7,500	32,020	853	40,473	54,546	14,073	25.8%
Lost	4,050	8,100	6,052	280	14,432	19,450	5,018	25.8%
Kaliakh	16,500[b]	33,000	1,778	0	34,778	39,253	4,475	11.4%
Tsiu	25,000	50,000	5,691	210	55,901	63,094	7,193	11.4%

Total Estimated Set Net Harvest for these Seven Stocks in 1977:	64,892
Estimated 1977 Set Net Harvests of Coho Salmon from Yakutat Area:	92,214
Estimated Proportion of Yakutat Set Net Harvest Composed of 7 Stocks:	70.4%
Total Estimated Troll Harvest for these Seven Stocks in 1977:	54,872
Estimated 1977 Troll Harvests of Coho Salmon from Area 1[c]:	89,762
Estimated Proportion of Area 1 Troll Harvest Composed of 7 Stocks:	61.1%

[a] Data sources: escapement and set net harvests from IFDB computer files and sport harvests from Table 1 (based upon statewide sport harvest reports; Mills 1979-1993). Analysis assumes that peak escapement counts represented 50% of the total escapement; that exploitation rate exerted on southern stocks by the troll fishery was 25.8%; and, that exploitation rate exerted on northern stocks was 11.4% (see Table 2).

[b] Kaliakh River coho salmon escapement was not monitored in 1977; the value listed is the average escapement observed in 1976 and 1978.

[c] Area 1 = Northern Outside Area = Fishing Districts 116, 156, 157, 181, 183, 186, 189, and 191.

Table 9. Estimated harvests of seven coho salmon stocks in the Yakutat Area in 1978 by the offshore troll fishery.[a]

River System	Peak Escapement Count in 1978: Count	Peak Escapement Count in 1978: Count x 2	Set Net Harvest	Sport Harvest	Total Estimated Inshore Return	Total Estimated Return	Estimated Troll Fishery: Troll Harvest	Estimated Troll Fishery: Expl. Rate
East	4,500	9,000	7,635	0	16,635	22,419	5,784	25.8%
Akwe	7,000	14,000	14,903	0	18,903	25,476	6,573	25.8%
Italio	3,000	6,000	8,130	0	14,130	19,043	4,913	25.8%
Situk	3,850	7,700	32,057	1,848	41,605	56,071	14,466	25.8%
Lost	3,450	6,900	6,360	640	13,900	18,733	4,833	25.8%
Kaliakh	25,000	50,000	5,507	0	55,507	62,649	7,142	11.4%
Tsiu	40,000	80,000	34,392	480	114,872	129,652	14,780	11.4%

Total Estimated Set Net Harvest for these Seven Stocks in 1978:	108,984
Estimated 1978 Set Net Harvests of Coho Salmon from Yakutat Area:	139,500
Estimated Proportion of Yakutat Set Net Harvest Composed of 7 Stocks:	78.1%
Total Estimated Troll Harvest for these Seven Stocks in 1978:	58,491
Estimated 1978 Troll Harvests of Coho Salmon from Area 1[b]:	137,176
Estimated Proportion of Area 1 Troll Harvest Composed of 7 Stocks:	42.6%

[a] Data sources: escapement and set net harvests from IFDB computer files and sport harvests from Table 1 (based upon statewide sport harvest reports; Mills 1979-1993). Analysis assumes that peak escapement counts represented 50% of the total escapement; that exploitation rate exerted on southern stocks by the troll fishery was 25.8%; and, that exploitation rate exerted on northern stocks was 11.4% (see Table 2).

[b] Area 1 = Northern Outside Area = Fishing Districts 116, 156, 157, 181, 183, 186, 189, and 191.

Table 10. Estimated harvests of seven coho salmon stocks in the Yakutat Area in 1979 by the offshore troll fishery.[a]

River System	Peak Escapement Count in 1979: Count	Peak Escapement Count in 1979: Count x 2	Set Net Harvest	Sport Harvest	Total Estimated Inshore Return	Estimated Total Return	Estimated Troll Fishery: Troll Harvest	Estimated Troll Fishery: Expl. Rate
East	1,500	3,000	4,124	0	7,124	9,601	2,477	25.8%
Akwe	3,000	6,000	10,223	0	16,223	21,864	5,641	25.8%
Italio	3,000[b]	6,000	6,110	0	12,110	16,321	4,211	25.8%
Situk	7,000	14,000	17,624	1,800	33,424	45,046	11,622	25.8%
Lost	8,450	16,900	4,265	590	21,755	29,319	7,564	25.8%
Kaliakh	14,000[c]	28,000	5,266	0	33,266	37,546	4,280	11.4%
Tsiu	25,000	50,000	32,621	440	83,061	93,748	10,687	11.4%

Total Estimated Set Net Harvest for these Seven Stocks in 1979:	80,233
Estimated 1979 Set Net Harvests of Coho Salmon from Yakutat Area:	95,873
Estimated Proportion of Yakutat Set Net Harvest Composed of 7 Stocks:	83.7%
Total Estimated Troll Harvest for these Seven Stocks in 1979:	46,482
Estimated 1979 Troll Harvests of Coho Salmon from Area 1[d]:	118,217
Estimated Proportion of Area 1 Troll Harvest Composed of 7 Stocks:	39.3%

[a] Data sources: escapement and set net harvests from IFDB computer files and sport harvests from Table 1 (based upon statewide sport harvest reports; Mills 1979-1993). Analysis assumes that peak escapement counts represented 50% of the total escapement; that exploitation rate exerted on southern stocks by the troll fishery was 25.8%; and, that exploitation rate exerted on northern stocks was 11.4% (see Table 2).

[b] Italio River coho salmon escapement was not monitored in 1979; the value listed is the average escapement observed in 1978 and 1980.

[c] Kaliakh River coho salmon escapement was not monitored in 1979; the value listed is the average escapement observed in 1978 and 1980.

[d] Area 1 = Northern Outside Area = Fishing Districts 116, 156, 157, 181, 183, 186, 189, and 191.

Table 11. Estimated harvests of seven coho salmon stocks in the Yakutat Area in 1980 by the offshore troll fishery.[a]

River System	Peak Escapement Count in 1980: Count	Count x 2	Set Net Harvest	Sport Harvest	Total Estimated Inshore Return	Estimated Total Return	Estimated Troll Fishery: Troll Harvest	Expl. Rate
East	2,000	4,000	2,456	0	6,456	8,701	2,245	25.8%
Akwe	5,000	10,000	8,624	0	18,624	25,100	6,476	25.8%
Italio	3,000	6,000	6,927	0	12,927	17,422	4,495	25.8%
Situk	8,150	16,200	21,947	973	39,120	52,722	13,602	25.8%
Lost	5,700	11,400	6,813	460	18,673	25,166	6,493	25.8%
Kaliakh	3,000	6,000	8,725	0	14,725	16,620	1,895	11.4%
Tsiu	18,000	36,000	28,711	350	65,061	73,432	8,371	11.4%

Total Estimated Set Net Harvest for these Seven Stocks in 1980:	84,202
Estimated 1980 Set Net Harvests of Coho Salmon from Yakutat Area:	119,684
Estimated Proportion of Yakutat Set Net Harvest Composed of 7 Stocks:	70.4%
Total Estimated Troll Harvest for these Seven Stocks in 1980:	43,577
Estimated 1980 Troll Harvests of Coho Salmon from Area 1[b]:	61,112
Estimated Proportion of Area 1 Troll Harvest Composed of 7 Stocks:	71.3%

[a] Data sources: escapement and set net harvests from IFDB computer files and sport harvests from Table 1 (based upon statewide sport harvest reports; Mills 1979-1993). Analysis assumes that peak escapement counts represented 50% of the total escapement; that exploitation rate exerted on southern stocks by the troll fishery was 25.8%; and, that exploitation rate exerted on northern stocks was 11.4% (see Table 2).

[b] Area 1 = Northern Outside Area = Fishing Districts 116, 156, 157, 181, 183, 186, 189, and 191.

Table 12. Estimated harvests of seven coho salmon stocks in the Yakutat Area in 1981 by the offshore troll fishery.[a]

River System	Peak Escapement Count in 1981: Count	Count x 2	Set Net Harvest	Sport Harvest	Total Estimated Inshore Return	Estimated Total Return	Estimated Troll Fishery: Troll Harvest	Expl. Rate
East	7,200	14,400	6,938	0	21,338	28,642	7,304	25.5%
Akwe	5,000	10,000	6,691	0	16,691	22,404	5,713	25.5%
Italio	5,500	11,000	6,138	0	17,138	23,004	5,866	25.5%
Situk	8,430	16,860	37,871	594	55,325	74,262	18,937	25.5%
Lost	7,363	14,726	7,541	500	22,767	30,560	7,793	25.5%
Kaliakh	5,000	10,000	3,093	0	13,093	14,744	1,651	11.2%
Tsiu	20,000	40,000	30,109	370	70,479	79,368	8,889	11.2%

Total Estimated Set Net Harvest for these Seven Stocks in 1981:	98,381
Estimated 1981 Set Net Harvests of Coho Salmon from Yakutat Area:	132,579
Estimated Proportion of Yakutat Set Net Harvest Composed of 7 Stocks:	74.2%
Total Estimated Troll Harvest for these Seven Stocks in 1981:	56,153
Estimated 1981 Troll Harvests of Coho Salmon from Area 1[b]:	96,838
Estimated Proportion of Area 1 Troll Harvest Composed of 7 Stocks:	58.0%

[a] Data sources: escapement and set net harvests from IFDB computer files and sport harvests from Table 1 (based upon statewide sport harvest reports; Mills 1979-1993). Analysis assumes that peak escapement counts represented 50% of the total escapement; that exploitation rate exerted on southern stocks by the troll fishery was 25.5%; and, that exploitation rate exerted on northern stocks was 11.2% (see Table 2).

[b] Area 1 = Northern Outside Area = Fishing Districts 116, 156, 157, 181, 183, 186, 189, and 191.

Table 13. Estimated harvests of seven coho salmon stocks in the Yakutat Area in 1982 by the offshore troll fishery.[a]

River System	Peak Escapement Count in 1982: Count	Count x 2	Set Net Harvest	Sport Harvest	Total Estimated Inshore Return	Estimated Total Return	Estimated Troll Fishery: Troll Harvest	Expl. Rate
East	3,200	6,400	2,580	0	8,980	15,645	6,665	42.6%
Akwe	3,000	6,000	11,008	0	17,008	29,631	12,623	42.6%
Italio	5,000	10,000	6,940	0	16,940	29,512	12,572	42.6%
Situk	9,180	18,360	27,549	964	46,873	81,660	34,787	42.6%
Lost	10,400	20,800	9,366	560	30,726	53,530	22,804	42.6%
Kaliakh	8,000	16,000	16,489	0	32,489	39,962	7,473	18.7%
Tsiu	40,000	80,000	46,436	420	126,856	156,034	29,178	18.7%

Total Estimated Set Net Harvest for these Seven Stocks in 1982:	120,368
Estimated 1982 Set Net Harvests of Coho Salmon from Yakutat Area:	148,854
Estimated Proportion of Yakutat Set Net Harvest Composed of 7 Stocks:	80.9%
Total Estimated Troll Harvest for these Seven Stocks in 1982:	126,102
Estimated 1982 Troll Harvests of Coho Salmon from Area 1[b]:	198,077
Estimated Proportion of Area 1 Troll Harvest Composed of 7 Stocks:	63.7%

[a] Data sources: escapement and set net harvests from IFDB computer files and sport harvests from Table 1 (based upon statewide sport harvest reports; Mills 1979-1993). Analysis assumes that peak escapement counts represented 50% of the total escapement; that exploitation rate exerted on southern stocks by the troll fishery was 42.6%; and, that exploitation rate exerted on northern stocks was 18.7% (see Table 2).

[b] Area 1 = Northern Outside Area = Fishing Districts 116, 156, 157, 181, 183, 186, 189, and 191.

Table 14. Estimated harvests of seven coho salmon stocks in the Yakutat Area in 1983 by the offshore troll fishery.[a]

River System	Peak Escapement Count in 1983: Count	Peak Escapement Count in 1983: Count x 2	Set Net Harvest	Sport Harvest	Total Estimated Inshore Return	Estimated Total Return	Estimated Troll Fishery: Troll Harvest	Estimated Troll Fishery: Expl. Rate
East	3,000	6,000	4,991	0	10,991	17,040	6,049	35.5%
Akwe	6,000	12,000	5,290	0	17,290	26,806	9,516	35.5%
Italio	500	1,000	4,804	0	5,804	8,998	3,194	35.5%
Situk	5,300	10,600	15,207	545	26,352	40,856	14,504	35.5%
Lost	8,110	16,220	5,223	470	21,913	33,974	12,061	35.5%
Kaliakh	6,000	12,000	4,598	0	16,598	19,666	3,068	15.6%
Tsiu	16,500	33,000	20,119	350	53,469	63,352	9,883	15.6%

Total Estimated Set Net Harvest for these Seven Stocks in 1983:	60,332
Estimated 1983 Set Net Harvests of Coho Salmon from Yakutat Area:	81,541
Estimated Proportion of Yakutat Set Net Harvest Composed of 7 Stocks:	73.9%
Total Estimated Troll Harvest for these Seven Stocks in 1983:	58,275
Estimated 1983 Troll Harvests of Coho Salmon from Area 1[b]:	189,786
Estimated Proportion of Area 1 Troll Harvest Composed of 7 Stocks:	30.7%

[a] Data sources: escapement and set net harvests from IFDB computer files and sport harvests from Table 1 (based upon statewide sport harvest reports; Mills 1979-1993). Analysis assumes that peak escapement counts represented 50% of the total escapement; that exploitation rate exerted on southern stocks by the troll fishery was 35.5%; and, that exploitation rate exerted on northern stocks was 15.6% (see Table 2).

[b] Area 1 = Northern Outside Area = Fishing Districts 116, 156, 157, 181, 183, 186, 189, and 191.

Table 15. Estimated harvests of seven coho salmon stocks in the Yakutat Area in 1984 by the offshore troll fishery.[a]

River System	Peak Escapement Count in 1984: Count	Peak Escapement Count in 1984: Count x 2	Set Net Harvest	Sport Harvest	Total Estimated Inshore Return	Estimated Total Return	Estimated Troll Fishery: Troll Harvest	Estimated Troll Fishery: Expl. Rate
East	8,000	16,000	10,924	0	26,924	38,518	11,594	30.1%
Akwe	2,800	5,600	8,714	0	14,314	20,478	6,164	30.1%
Italio	4,450	8,900	9,213	0	18,113	25,913	7,800	30.1%
Situk	14,000	28,000	47,511	2,195	77,706	111,167	33,461	30.1%
Lost	6,780	13,560	10,717	1,110	25,387	36,319	10,932	30.1%
Kaliakh	3,500	7,000	13,081	0	20,081	23,135	3,054	13.2%
Tsiu	30,000	60,000	51,322	1,000	112,322	129,403	17,081	13.2%

Total Estimated Set Net Harvest for these Seven Stocks in 1984:	151,482
Estimated 1984 Set Net Harvests of Coho Salmon from Yakutat Area:	182,256
Estimated Proportion of Yakutat Set Net Harvest Composed of 7 Stocks:	83.1%
Total Estimated Troll Harvest for these Seven Stocks in 1984:	90,086
Estimated 1984 Troll Harvests of Coho Salmon from Area 1[b]:	180,895
Estimated Proportion of Area 1 Troll Harvest Composed of 7 Stocks:	49.8%

[a] Data sources: escapement and set net harvests from IFDB computer files and sport harvests from Table 1 (based upon statewide sport harvest reports; Mills 1979-1993). Analysis assumes that peak escapement counts represented 50% of the total escapement; that exploitation rate exerted on southern stocks by the troll fishery was 30.1%; and, that exploitation rate exerted on northern stocks was 13.2% (see Table 2).

[b] Area 1 = Northern Outside Area = Fishing Districts 116, 156, 157, 181, 183, 186, 189, and 191.

Table 16. Estimated harvests of seven coho salmon stocks in the Yakutat Area in 1985 by the offshore troll fishery.[a]

River System	Peak Escapement Count in 1985: Count	Peak Escapement Count in 1985: Count x 2	Set Net Harvest	Sport Harvest	Total Estimated Inshore Return	Estimated Total Return	Estimated Troll Fishery: Troll Harvest	Estimated Troll Fishery: Expl. Rate
East	13,000	26,000	8,932	0	34,932	54,843	19,911	36.3%
Akwe	2,400	4,800	4,429	0	9,229	14,490	5,261	36.3%
Italio	5,500	11,000	9,491	0	20,491	32,171	11,680	36.3%
Situk	6,490	12,980	55,223	1,956	70,159	110,148	39,989[b]	36.3%
Lost	3,300	6,600	9,119	1,310	17,029	26,736	9,707	36.3%
Kaliakh	37,500	75,000	22,809	0	97,809	116,442	18,633	16.0%
Tsiu	52,350	104,700	63,922	990	169,612	201,919	32,307	16.0%

Total Estimated Set Net Harvest for these Seven Stocks in 1985:	173,925
Estimated 1985 Set Net Harvests of Coho Salmon from Yakutat Area:	202,835
Estimated Proportion of Yakutat Set Net Harvest Composed of 7 Stocks:	85.7%
Total Estimated Troll Harvest for these Seven Stocks in 1985:	137,488
Estimated 1985 Troll Harvests of Coho Salmon from Area 1[c]:	332,153
Estimated Proportion of Area 1 Troll Harvest Composed of 7 Stocks:	41.4%

[a] Data sources: escapement and set net harvests from IFDB computer files and sport harvests from Table xx (based upon statewide sport harvest reports; Mills 1979-1993). Analysis assumes that peak escapement counts represented 50% of the total escapement and that exploitation of the Situk River coho salmon stock by the troll fishery was representative of the troll harvests for the East, Akwe, Italio, and Lost river coho salmon stocks in 1985 and that the exploitation rate for the Kaliakh and Tsiu river coho stocks was 44% of this rate (.363) or 16.0%.

[b] Shaul, Gray, and Koerner (1991) conducted a coded wire tag study of Situk River coho salmon to determine harvest rates of these fish in various fisheries. A revised analysis of their data (Leon Shaul, personal communication) indicated that set net gear was responsible for 58% of the harvest of Situk River coho salmon in 1985 with troll gear being responsible for the remaining 42% of the harvest in 1985. The set net harvest of coho salmon in the Situk River in 1985 was 55,223; thus the troll harvest of Situk River coho salmon is estimated to have been 39,989 fish.

[c] Area 1 = Northern Outside Area = Fishing Districts 116, 156, 157, 181, 183, 186, 189, and 191.

Table 17. Estimated harvests of seven coho salmon stocks in the Yakutat Area in 1986 by the offshore troll fishery.[a]

River System	Peak Escapement Count in 1986: Count	Peak Escapement Count in 1986: Count x 2	Set Net Harvest	Sport Harvest	Total Estimated Inshore Return	Estimated Total Return	Estimated Troll Fishery: Troll Harvest	Estimated Troll Fishery: Expl. Rate
East	2,200	4,400	2,825	0	7,225	10,666	3,441	32.3%
Akwe	5,900	11,800	8,629	0	20,429	30,159	9,730	32.3%
Italio	2,700	5,400	1,856	0	7,256	10,712	3,476	32.3%
Situk	3,162	6,324	14,760	1,982	23,066	34,052	10,986	32.3%
Lost	3,610	7,220	2,489	1,290	10,999	16,238	5,239[b]	32.3%
Kaliakh	5,200	10,400	10,770	0	21,170	24,702	3,532	14.3%
Tsiu	14,100	28,200	19,593	960	48,753	56,873	8,120[b]	14.3%

Total Estimated Set Net Harvest for these Seven Stocks in 1986:	60,922
Estimated 1986 Set Net Harvests of Coho Salmon from Yakutat Area:	92,097
Estimated Proportion of Yakutat Set Net Harvest Composed of 7 Stocks:	66.1%
Total Estimated Troll Harvest for these Seven Stocks in 1986:	44,504
Estimated 1986 Troll Harvests of Coho Salmon from Area 1[c]:	244,797
Estimated Proportion of Area 1 Troll Harvest Composed of 7 Stocks:	18.2%

[a] Data sources: escapement and set net harvests from IFDB computer files and sport harvests from Table xx (based upon statewide sport harvest reports; Mills 1979-1993). Analysis assumes that peak escapement counts represented 50% of the total escapement and that exploitation of the Lost River coho salmon stock by the troll fishery was representative of the troll harvests for the East, Akwe, Italio, and Situk river coho salmon stocks in 1986 and that the troll exploitation rate for the Tsiu River coho stock was representative of the rate for the Kaliakh River coho stock.

[b] A coded wire tag study of Lost and Tsiu river coho salmon stocks was conducted in 1986 to determine harvest rates of these fish in various fisheries. According to Leon Shaul (personal communication), set net gear (District 182-80; Lost River set net fishery) was responsible for 25.7% of the harvest of Lost River coho in 1986 with troll gear being responsible for 54.1% of the harvest; and, set net gear (District 192-42; Tsiu River set net fishery) was responsible for 70.7% of the harvest of Tsiu River coho in 1986 with troll gear being responsible for 29.3% of the harvest; thus, the troll harvest of Lost River coho is estimated to have been 5,239 fish and the troll harvest of Tsiu River coho is estimated to have been 8,120 fish.

[c] Area 1 = Northern Outside Area = Fishing Districts 116, 156, 157, 181, 183, 186, 189, and 191.

Table 18. Estimated harvests of seven coho salmon stocks in the Yakutat Area in 1987 by the offshore troll fishery.[a]

River System	Peak Escapement Count in 1987: Count	Peak Escapement Count in 1987: Count x 2	Set Net Harvest	Sport Harvest	Total Estimated Inshore Return	Estimated Total Return	Estimated Troll Fishery: Troll Harvest	Estimated Troll Fishery: Expl. Rate
East	1,300	2,600	4,890	0	7,490	9,921	2,431	24.5%
Akwe	4,900[b]	9,800	7,119	0	16,919	22,409	5,490	24.5%
Italio	3,500	7,000	1,399	0	8,399	11,125	2,726	24.5%
Situk	2,000	4,000	29,898	471	34,369	45,522	11,153	24.5%
Lost	5,482	10,964	3,750	600	15,314	20,283	4,969	24.5%
Kaliakh	3,800[c]	7,600	15,923	0	23,523	26,371	2,848	10.8%
Tsiu	52,350	104,700	35,297	450	140,447	157,452	17,005	10.8%

Total Estimated Set Net Harvest for these Seven Stocks in 1987:	98,276
Estimated 1987 Set Net Harvests of Coho Salmon from Yakutat Area:	124,406
Estimated Proportion of Yakutat Set Net Harvest Composed of 7 Stocks:	79.0%
Total Estimated Troll Harvest for these Seven Stocks in 1987:	46,622
Estimated 1987 Troll Harvests of Coho Salmon from Area 1[d]:	163,109
Estimated Proportion of Area 1 Troll Harvest Composed of 7 Stocks:	28.6%

[a] Data sources: escapement and set net harvests from IFDB computer files and sport harvests from Table 1 (based upon statewide sport harvest reports; Mills 1979-1993). Analysis assumes that peak escapement counts represented 50% of the total escapement; that exploitation rate exerted on southern stocks by the troll fishery was 24.5%; and, that exploitation rate exerted on northern stocks was 10.8% (see Table 2).

[b] Akwe River coho salmon escapement was not monitored in 1987; the value listed is the average escapement observed in 1972 through 1986.

[c] Kaliakh River coho salmon escapement was not monitored in 1987; the value listed is the average escapement observed in 1986 and 1988.

[d] Area 1 = Northern Outside Area = Fishing Districts 116, 156, 157, 181, 183, 186, 189, and 191.

Table 19. Estimated harvests of seven coho salmon stocks in the Yakutat Area in 1988 by the offshore troll fishery.[a]

River System	Peak Escapement Count in 1988: Count	Count x 2	Set Net Harvest	Sport Harvest	Total Estimated Inshore Return	Estimated Total Return	Estimated Troll Fishery: Troll Harvest	Expl. Rate
East	5,500	11,000	20,148	0	31,148	40,243	9,095	22.6%
Akwe	4,900[b]	9,800	13,705	0	23,505	30,368	6,863	22.6%
Italio	4,000	8,000	1,920	0	9,920	12,817	2,897	22.6%
Situk	11,000	22,000	61,689	655	84,344	108,972	24,628	22.6%
Lost	2,600	5,200	5,905	720	11,825	15,278	3,453	22.6%
Kaliakh	2,500	5,000	8,867	0	13,867	15,391	1,524	9.9%
Tsiu	14,100	28,200	56,116	540	84,856	94,180	9,324	9.9%

Total Estimated Set Net Harvest for these Seven Stocks in 1988:	168,350
Estimated 1988 Set Net Harvests of Coho Salmon from Yakutat Area:	205,866
Estimated Proportion of Yakutat Set Net Harvest Composed of 7 Stocks:	81.8%
Total Estimated Troll Harvest for these Seven Stocks in 1988:	57,784
Estimated 1988 Troll Harvests of Coho Salmon from Area 1[c]:	116,528
Estimated Proportion of Area 1 Troll Harvest Composed of 7 Stocks:	49.6%

[a] Data sources: escapement and set net harvests from IFDB computer files and sport harvests from Table 1 (based upon statewide sport harvest reports; Mills 1979-1993). Analysis assumes that peak escapement counts represented 50% of the total escapement; that exploitation rate exerted on southern stocks by the troll fishery was 22.6%; and, that exploitation rate exerted on northern stocks was 9.9% (see Table 2).

[b] Akwe River coho salmon escapement was not monitored in 1988; the value listed is the average escapement observed in 1972 through 1986.

[c] Area 1 = Northern Outside Area = Fishing Districts 116, 156, 157, 181, 183, 186, 189, and 191.

Table 20. Estimated harvests of seven coho salmon stocks in the Yakutat Area in 1989 by the offshore troll fishery.[a]

River System	Peak Escapement Count in 1989: Count	Count x 2	Set Net Harvest	Sport Harvest	Total Estimated Inshore Return	Estimated Total Return	Estimated Troll Fishery: Troll Harvest	Expl. Rate
East	2,000	4,000	7,287	0	11,287	13,357	2,070	15.5%
Akwe	4,900[b]	9,800	10,096	0	19,896	23,546	3,650	15.5%
Italio	4,200	8,400	0	0	8,400	9,941	1,541	15.5%
Situk	3,900	7,800	39,318	1,920	49,038	58,033	8,995	15.5%
Lost	2,190	4,380	5,737	1,600	11,717	13,866	2,149	15.5%
Kaliakh	1,000	2,000	16,858	0	18,858	20,234	1,376	6.8%
Tsiu	38,000	76,000	62,939	1,200	140,139	150,364	10,225	6.8%

Total Estimated Set Net Harvest for these Seven Stocks in 1989:	142,235
Estimated 1989 Set Net Harvests of Coho Salmon from Yakutat Area:	176,847
Estimated Proportion of Yakutat Set Net Harvest Composed of 7 Stocks:	80.4%
Total Estimated Troll Harvest for these Seven Stocks in 1989:	30,006
Estimated 1989 Troll Harvests of Coho Salmon from Area 1[c]:	243,824
Estimated Proportion of Area 1 Troll Harvest Composed of 7 Stocks:	12.3%

[a] Data sources: escapement and set net harvests from IFDB computer files and sport harvests from Table 1 (based upon statewide sport harvest reports; Mills 1979-1993). Analysis assumes that peak escapement counts represented 50% of the total escapement; that exploitation rate exerted on southern stocks by the troll fishery was 15.5%; and, that exploitation rate exerted on northern stocks was 6.8% (see Table 2).

[b] Akwe River coho salmon escapement was not monitored in 1989; the value listed is the average escapement observed in 1972 through 1986.

[c] Area 1 = Northern Outside Area = Fishing Districts 116, 156, 157, 181, 183, 186, 189, and 191.

Table 21. Estimated harvests of seven coho salmon stocks in the Yakutat Area in 1990 by the offshore troll fishery.[a]

River System	Peak Escapement Count in 1990: Count	Count x 2	Set Net Harvest	Sport Harvest	Total Estimated Inshore Return	Estimated Total Return	Estimated Troll Fishery: Troll Harvest	Expl. Rate
East	2,800	5,600	7,482	0	13,082	16,435	3,353	20.4%
Akwe	4,900[b]	9,800	6,718	0	16,518	20,751	4,233	20.4%
Italio	5,700	11,400	3,031	0	14,431	18,129	3,698	20.4%
Situk	1,630	3,260	45,075	478	48,813	61,323	12,510	20.4%
Lost	9,460	18,920	4,922	510	24,352	30,593	6,241	20.4%
Kaliakh	3,450	6,900	13,731	0	20,631	22,671	2,040	9.0%
Tsiu	16,800	33,600	33,757	380	67,737	74,436	6,699	9.0%

Total Estimated Set Net Harvest for these Seven Stocks in 1990:	114,716
Estimated 1990 Set Net Harvests of Coho Salmon from Yakutat Area:	148,890
Estimated Proportion of Yakutat Set Net Harvest Composed of 7 Stocks:	77.0%
Total Estimated Troll Harvest for these Seven Stocks in 1990:	38,774
Estimated 1990 Troll Harvests of Coho Salmon from Area 1[c]:	311,386
Estimated Proportion of Area 1 Troll Harvest Composed of 7 Stocks:	12.4%

[a] Data sources: escapement and set net harvests from IFDB computer files and sport harvests from Table 1 (based upon statewide sport harvest reports; Mills 1979-1993). Analysis assumes that peak escapement counts represented 50% of the total escapement; that exploitation rate exerted on southern stocks by the troll fishery was 20.4%; and, that exploitation rate exerted on northern stocks was 9.0% (see Table 2).

[b] Akwe River coho salmon escapement was not monitored in 1990; the value listed is the average escapement observed in 1972 through 1986.

[c] Area 1 = Northern Outside Area = Fishing Districts 116, 156, 157, 181, 183, 186, 189, and 191.

Table 22. Estimated harvests of seven coho salmon stocks in the Yakutat Area in 1991 by the offshore troll fishery.[a]

River System	Peak Escapement Count in 1991: Count	Peak Escapement Count in 1991: Count x 2	Set Net Harvest	Sport Harvest	Total Estimated Inshore Return	Total Estimated Total Return	Estimated Troll Fishery: Troll Harvest	Estimated Troll Fishery: Expl. Rate
East	1,900	3,800	3,857	0	7,657	8,332	675	8.1%
Akwe	4,900[b]	9,800	5,697	0	15,497	16,863	1,366	8.1%
Italio	5,000	10,000	1,877	0	11,877	12,924	1,047	8.1%
Situk	7,300[c]	14,600	89,410	1,431	105,441	114,734	9,293	8.1%
Lost	1,175	2,350	3,621	914	6,885	7,492	607	8.1%
Kaliakh	600	1,200	4,379	0	5,579	5,787	208	3.6%
Tsiu	16,600	33,200	38,195	835	72,230	74,927	2,697	3.6%

Total Estimated Set Net Harvest for these Seven Stocks in 1991:	147,036
Estimated 1991 Set Net Harvests of Coho Salmon from Yakutat Area:	166,356
Estimated Proportion of Yakutat Set Net Harvest Composed of 7 Stocks:	88.4%
Total Estimated Troll Harvest for these Seven Stocks in 1991:	15,893
Estimated 1991 Troll Harvests of Coho Salmon from Area 1[d]:	126,513
Estimated Proportion of Area 1 Troll Harvest Composed of 7 Stocks:	12.6%

[a] Data sources: escapement and set net harvests from IFDB computer files and sport harvests from Table 1 (based upon statewide sport harvest reports; Mills 1979-1993). Analysis assumes that peak escapement counts represented 50% of the total escapement; that exploitation rate exerted on southern stocks by the troll fishery was 8.1%; and, that exploitation rate exerted on northern stocks was 3.6% (see Table 2).

[b] Akwe River coho salmon escapement was not monitored in 1991; the value listed is the average escapement observed in 1972 through 1986.

[c] Situk River coho salmon escapement was not monitored in 1991; although a count was not made, the escapement was deemed average (Keith Weiland, personal communication).

[d] Area 1 = Northern Outside Area = Fishing Districts 116, 156, 157, 181, 183, 186, 189, and 191.

Table 23. Estimated harvests of six coho salmon stocks in the Yakutat Area in 1992 by the offshore troll fishery.[a]

River System	Peak Escapement Count in 1992: Count	Count x 2	Set Net Harvest	Sport Harvest	Total Estimated Inshore Return	Estimated Total Return	Estimated Troll Fishery: Troll Harvest	Expl. Rate
East	3,700	7,400	21,550	0	28,950	33,741	4,791	14.2%
Italio	5,550	11,100	1,482	0	12,582	14,664	2,082	14.2%
Situk	13,820	27,640	133,956	1,433	163,029	190,010	26,981	14.2%
Lost	4,235	8,470	10,244	1,514	20,228	23,576	3,348	14.2%
Kaliakh	1,500	3,000	4,138	0	7,138	7,610	472	6.2%
Tsiu	32,700	65,400	92,290	866	158,556	169,036	10,480	6.2%

Total Estimated Set Net Harvest for these Six Stocks in 1992:	263,660
Estimated 1992 Set Net Harvests of Coho Salmon from Yakutat Area:	290,342
Estimated Proportion of Yakutat Set Net Harvest Composed of 6 Stocks:	90.8%
Total Estimated Troll Harvest for these Six Stocks in 1992:	48,154
Estimated 1992 Troll Harvests of Coho Salmon from Area 1[b]:	300,932
Estimated Proportion of Area 1 Troll Harvest Composed of 6 Stocks:	16.0%

[a] Data sources: escapement and set net harvests from IFDB computer files and sport harvests from Table 1 (based upon statewide sport harvest reports; Mills 1979-1993). Analysis assumes that peak escapement counts represented 50% of the total escapement; that exploitation rate exerted on southern stocks by the troll fishery was 14.2%; and, that exploitation rate exerted on northern stocks was 6.2% (see Table 2).

[b] Area 1 = Northern Outside Area = Fishing Districts 116, 156, 157, 181, 183, 186, 189, and 191.

Table 24. Estimated harvests of six coho salmon stocks in the Yakutat Area in 1993 by the offshore troll fishery.[a]

River System	Peak Escapement Count in 1993: Count	Count x 2	Set Net Harvest	Sport Harvest	Total Estimated Inshore Return	Estimated Total Return	Estimated Troll Fishery: Troll Harvest	Expl. Rate
East	9,500	19,000	4,529	0	23,529	34,705	11,176	32.2%
Italio	8,050	16,100	2,898	0	18,998	28,022	9,024	32.2%
Situk	10,700	21,400	136,910	1,433	159,743	235,776	76,033[b]	32.2%
Lost	5,436	10,872	9,310	1,514	21,696	32,002	10,306	32.2%
Kaliakh	1,500	3,000	7,980	0	10,980	12,797	1,817	14.2%
Tsiu	17,500	35,000	56,736	866	92,602	107,928	15,326	14.2%

Total Estimated Set Net Harvest for these Six Stocks in 1993:	218,363
Estimated 1993 Set Net Harvests of Coho Salmon from Yakutat Area:	237,390
Estimated Proportion of Yakutat Set Net Harvest Composed of 6 Stocks:	92.0%
Total Estimated Troll Harvest for these Six Stocks in 1993:	123,682
Estimated 1993 Troll Harvests of Coho Salmon from Area 1[c]:	452,527
Estimated Proportion of Area 1 Troll Harvest Composed of 6 Stocks:	27.3%

[a] Data sources: escapement and set net harvests from IFDB computer files and sport harvests from Table xx (based upon statewide sport harvest reports; Mills 1979-1993). Analysis assumes that peak escapement counts represented 50% of the total escapement and that exploitation of the Situk River coho salmon stock by the troll fishery was representative of the troll harvests for the East, Italio, and Lost river coho salmon stocks in 1993 and that the exploitation rate for the Kaliakh and Tsiu river coho stocks was 44% of this rate (.322) or 14.2%.

[b] A coded wire tag study of the Situk River coho salmon stock was conducted in 1993 to determine harvest rate of these fish in various fisheries. Leon Shaul (personal communication) determined that set net gear (District 182-70; Situk set net fishery) was responsible for 54.2% of the harvest of Situk River coho salmon in 1993 with troll gear being responsible for 30.1% of the harvest; thus the troll harvest of Situk River coho salmon is estimated to have been 76,033 fish in 1993.

[c] Area 1 = Northern Outside Area = Fishing Districts 116, 156, 157, 181, 183, 186, 189, and 191.

Table 25. Peak escapement counts and estimated harvests of coho salmon returning to the East Alsek-Doame River System, 1972-1993.[a]

Year	Peak Aerial Escapement Count	Estimated Harvests (Number of Coho Salmon): District 182-20, 21, & 22 Commercial Set Nets	Offshore Commercial Trolling	Total Estimated Harvests
1972	1,500	1,685	1,629	3,314
1973	300	1,353	2,632	3,985
1974	3,000	3,231	3,210	6,441
1975	1,500	1,442	455	1,897
1976	2,200	1,280	1,975	3,255
1977	2,000	4,140	2,830	6,970
1978	4,500	7,635	5,784	13,419
1979	1,500	4,124	2,477	6,601
1980	2,000	2,456	2,245	4,701
1981	7,200	6,938	7,304	14,242
1982	3,200	2,580	6,665	9,245
1983	3,000	4,991	6,049	11,040
1984	8,000	10,924	11,594	22,518
1985	13,000	8,932	19,911	28,843
1986	2,200	2,825	3,441	6,266
1987	1,300	4,890	2,431	7,321
1988	5,500	20,148	9,095	29,243
1989	2,000	7,287	2,070	9,357
1990	2,800	7,482	3,353	10,835
1991	1,900	3,857	675	4,532
1992	3,700	21,550	4,791	26,341
1993	9,500	4,529	11,176	15,705

[a] Data sources: escapement and set net harvests from IFDB computer files; troll harvests based upon analysis provided in Table 2; sport harvests from Table 1 and based upon statewide sport harvest reports (Mills 1979-1993).

Table 26. Peak escapement counts and estimated harvests of coho salmon returning to the Akwe River, 1972-1991.[a]

Year	Peak Aerial Escapement Count	Estimated Harvests (Number of Coho Salmon): District 182-40 Commercial Set Nets	Offshore Commercial Trolling	Total Estimated Harvests
1972	7,000	5,270	6,700	11,970
1973	3,000	4,670	3,710	8,380
1974	5,000	4,988	5,211	10,199
1975	2,200	3,160	775	3,935
1976	1,500	3,816	2,370	6,186
1977	15,000	10,299	14,012	24,311
1978	7,000	14,903	6,573	21,476
1979	3,000	10,223	5,641	15,864
1980	5,000	8,624	6,476	15,100
1981	5,000	6,691	5,713	12,404
1982	3,000	11,008	12,623	23,631
1983	6,000	5,290	9,516	14,806
1984	2,800	8,714	6,164	14,878
1985	2,400	4,429	5,261	9,690
1986	5,900	8,629	9,730	18,359
1987	4,900[b]	7,119	5,490	12,609
1988	4,900[b]	13,705	6,863	20,568
1989	4,900[b]	10,096	3,650	13,746
1990	4,900[b]	6,718	4,233	10,951
1991	4,900[b]	5,697	1,366	7,063

[a] Data sources: escapement and set net harvests from IFDB computer files; troll harvests based upon analysis provided in Table 2; sport harvests from Table 1 and based upon statewide sport harvest reports (Mills 1979-1993).

[b] Escapements for the years 1987-1991 were not monitored; average escapement level for the years 1972-1986 were used as an estimate.

Table 27. Peak escapement counts and estimated harvests of coho salmon returning to the Italio River, 1972-1993.[a]

Year	Peak Aerial Escapement Count	Estimated Harvests (Number of Coho Salmon): District 182-50 & 55 Commercial Set Nets	Offshore Commercial Trolling	Total Estimated Harvests
1972	4,000	940	3,109	4,049
1973	800	1,785	1,177	2,962
1974	3,000	5,460	3,985	9,445
1975	1,450	3,064	612	3,676
1976	1,000	4,553	2,279	6,832
1977	8,000	4,912	7,271	12,183
1978	3,000	8,130	4,913	13,043
1979	3,000[b]	6,110	4,211	10,321
1980	3,000	6,927	4,495	11,422
1981	5,500	6,138	5,866	12,004
1982	5,000	6,940	12,572	19,512
1983	500	4,804	3,194	7,998
1984	4,450	9,213	7,800	17,013
1985	5,500	9,491	11,680	21,171
1986	2,700	1,856	3,456	5,312
1987	3,500	1,399	2,726	4,125
1988	4,000	1,920	2,987	4,907
1989	4,200	0	1,541	1,541
1990	5,700	3,031	3,698	6,729
1991	5,000	1,877	1,047	2,924
1992	5,550	1,482	2,082	3,564
1993	8,050	2,898	9,024	11,922

[a] Data sources: escapement and set net harvests from IFDB computer files; troll harvests based upon analysis provided in Table 2; sport harvests from Table 1 and based upon statewide sport harvest reports (Mills 1979-1993).

[b] The escapement was not monitored in 1979; the average level of escapement during 1978 and 1980 was used.

Table 28. Peak escapement counts and estimated harvests of coho salmon returning to the Situk River, 1972-1993.[a]

Year	Peak Escapement Count by Boat	Estimated Harvests (Number of Coho Salmon): District 182-70 Commercial Set Nets	Offshore Commercial Trolling	Sport Fishery	Total Estimated Harvests
1972	5,100	17,848	10,189	1,256	29,293
1973	1,719	10,026	5,118	1,256	16,400
1974	4,260	32,968	14,862	1,256	49,086
1975	4,500[b]	16,408	2,734	1,256	20,398
1976	3,280	15,664	8,164	1,256	25,084
1977	3,750	32,020	14,073	853	46,946
1978	3,850	32,057	14,466	1,848	48,371
1979	7,000	17,624	11,622	1,800	31,046
1980	8,100	21,947	13,602	973	36,522
1981	8,430	37,871	18,937	594	57,402
1982	9,180	27,549	34,787	964	63,300
1983	5,300	15,207	14,504	545	30,256
1984	14,000	47,511	33,461	2,195	83,167
1985	6,490	55,223	39,989[c]	1,956	97,168
1986	3,162	14,760	10,986	1,982	27,728
1987	2,000	29,898	11,153	471	41,522
1988	11,000	61,689	24,628	655	86,972
1989	3,900	39,318	8,995	1,920	50,233
1990	1,630	45,075	12,510	478	58,063
1991	7,300[d]	89,410	9,293	1,431	100,134
1992	13,820	133,956	26,981	1,433	162,370
1993	10,700	136,910	76,033[e]	1,433	214,376

[a] Data sources: escapement and set net harvests from IFDB computer files; troll harvests based upon analysis provided in Table 2; sport harvests from Table 1 and based upon statewide sport harvest reports (Mills 1979-1993).

[b] Aerial count.

[c] Based on 1985 coded wire tag recovery estimate that 0.58 of harvest was from set nets and 0.42 was from the troll fishery (Shaul, personal communication).

[d] Although a count was not made, the escapement was deemed average (Keith Weiland, personal communication).

[e] Based on 1993 coded wire tag recovery estimate that 0.542 of harvest was from District 182-70 set nets (Situk set net fishery) and 0.301 of harvest was from the troll fishery (Shaul, personal communication).

Table 29. Peak escapement counts and estimated harvests of coho salmon returning to the Lost River, 1972-1993.[a]

Year	Peak[b] Escapement Counts	Estimated Harvests (Number of Coho Salmon): District 182-80 Commercial Set Nets	Offshore Commercial Trolling	Sport Fishery	Total Estimated Harvests
1972	3,800	3,627	4,043	400	8,070
1973	1,978	2,385	2,344	400	5,129
1974	2,500	4,300	3,373	400	8,073
1975	1,300	3,486	665	400	4,551
1976	1,200	3,787	2,290	400	6,477
1977	4,050	6,052	5,018	280	11,350
1978	3,450	6,360	4,833	640	11,833
1979	8,450	4,265	7,564	590	12,419
1980	5,700	6,813	6,493	460	13,766
1981	7,363	7,541	7,793	500	15,834
1982	10,400	9,366	22,804	560	32,730
1983	8,110	5,223	12,061	470	17,754
1984	6,780	10,717	10,932	1,110	22,759
1985	3,300	9,119	9,707	1,310	20,136
1986	3,610	2,489	5,239[c]	1,290	9,018
1987	5,482	3,750	4,969	600	9,319
1988	2,600	5,905	3,453	720	10,078
1989	2,190	5,737	2,149	1,600	9,486
1990	9,460	4,922	6,241	510	11,673
1991	1,175	3,621	607	914	5,142
1992	4,235	10,244	3,348	1,514	15,106
1993	5,436	9,310	10,306	1,514	21,130

[a] Data sources: escapement and set net harvests from IFDB computer files; troll harvests based upon analysis provided in Table 2; sport harvests from Table 1 and based upon statewide sport harvest reports (Mills 1979-1993).

[b] Listed data represent the combination of peak counts of coho salmon in the Lost River, in Ophir Creek, in Tawah Creek, and in Coast Guard Lake.

[c] Based on 1986 coded wire tag recovery estimate that 0.257 of harvest was from District 182-80 set nets (Lost River set net fishery) and 0.541 of harvest was from the troll fishery (Shaul, personal communication).

Table 30. Peak escapement counts and estimated harvests of coho salmon returning to the Kaliakh River, 1973-1993.[a]

Year	Peak Aerial Escapement Count	Estimated Harvests (Number of Coho Salmon): District 192-41 Commercial Set Nets	Offshore Commercial Trolling	Total Estimated Harvests
1973	8,000	601	2,136	2,737
1974	5,700[b]	1,101	1,608	2,709
1975	3,500	0	299	299
1976	8,000	1,221	2,216	3,437
1977	16,500[b]	1,778	4,475	6,253
1978	25,000	5,507	7,142	12,649
1979	14,000[b]	5,266	4,280	9,546
1980	3,000	8,725	1,895	10,620
1981	5,000	3,093	1,651	4,744
1982	8,000	16,489	7,473	23,962
1983	6,000	4,598	3,068	7,666
1984	3,500	13,081	3,054	16,135
1985	37,500	22,809	18,633	41,442
1986	5,200	10,770	3,532	14,302
1987	3,800[b]	15,923	2,848	18,771
1988	2,500	8,867	1,524	10,391
1989	1,000	16,858	1,376	18,234
1990	3,450	13,731	2,040	15,771
1991	600	4,379	208	4,587
1992	1,500	4,138	472	4,610
1993	1,500[c]	7,980	1,817	9,797

[a] Data sources: escapement and set net harvests from IFDB computer files; troll harvests based upon analysis provided in Table 2; sport harvests from Table 1 and based upon statewide sport harvest reports (Mills 1979-1993).

[b] No survey was conducted; escapement level assumed to be equal to the average level of escapement during the year before and the year after.

[c] No survey was conducted; escapement level assumed equal to 1992 level.

Table 31. Peak escapement counts and estimated harvests of coho salmon returning to the Tsiu-Tsivat River, 1973-1993.[a]

Year	Peak Aerial Escapement[b] Count	Estimated Harvests (Number of Coho Salmon): District 192-42 Commercial Set Nets	Offshore Commercial Trolling	Sport Fishery	Total Estimated Harvests
1973	30,000	8,803	8,886	300	17,989
1974	15,000	8,258	4,961	300	13,519
1975	8,150	0	710	300	1,010
1976	30,000	3,129	8,161	300	11,590
1977	25,000	5,691	7,193	210	13,094
1978	40,000	34,392	14,780	480	49,652
1979	25,000	32,621	10,687	440	43,748
1980	18,000	28,711	8,371	350	37,432
1981	20,000	30,109	8,889	370	39,368
1982	40,000	46,436	29,178	420	76,034
1983	16,500	20,119	9,883	350	30,352
1984	30,000	51,322	17,081	1,000	69,403
1985	52,350	63,922	32,307	990	97,219
1986	14,100	19,593	8,120[c]	960	28,673
1987	8,500	35,297	17,005	450	52,752
1988	16,000	56,116	9,324	540	65,980
1989	38,000	62,939	10,225	1,200	74,394
1990	16,800	33,757	6,699	380	40,836
1991	16,600	38,195	2,697	835	41,727
1992	32,700	92,290	10,480	866	103,636
1993	17,500	56,736	15,326	866	72,928

[a] Data sources: escapement and set net harvests from IFDB computer files; troll harvests based upon analysis provided in Table 2; sport harvests from Table 1 and based upon statewide sport harvest reports (Mills 1979-1993).

[b] Aerial counts of spawning coho salmon in the Tsiu and Tsivat Rivers.

[c] Based on 1986 coded wire tag recovery estimate that 0.707 of harvest was from District 192-42 set nets (Tsiu River set net fishery) and 0.293 of harvest was from the troll fishery (Shaul, personal communication).

Table 32. Estimated total abundance of coho salmon returning to the East Alsek-Doame River System based upon four assumptions concerning the proportion of fish observed during peak escapement surveys, 1972-1993.[a]

Year	Total Estimated Harvests	Total Escapement with Assumption that Peak Count Represented (X) % of Total				Estimated Total Abundance of Coho Salmon if Peak Survey Represented (X) %			
		25%	50%	75%	100%	25%	50%	75%	100%
1972	3,314	6,000	3,000	2,000	1,500	9,314	6,314	5,314	4,814
1973	3,985	1,200	600	400	300	5,185	4,585	4,385	4,285
1974	6,441	12,000	6,000	4,000	3,000	18,441	12,441	10,441	9,441
1975	1,897	6,000	3,000	2,000	1,500	7,897	4,897	3,897	3,397
1976	3,255	8,800	4,400	2,933	2,200	12,055	7,655	6,188	5,455
1977	6,970	8,000	4,000	2,667	2,000	14,970	10,970	9,637	8,970
1978	13,419	18,000	9,000	6,000	4,500	31,419	22,419	19,419	17,919
1979	6,601	6,000	3,000	2,000	1,500	12,601	9,601	8,601	8,101
1980	4,701	8,000	4,000	2,667	2,000	12,701	8,701	7,368	6,701
1981	14,242	28,800	14,400	9,600	7,200	43,042	28,642	23,842	21,442
1982	9,245	12,800	6,400	4,267	3,200	22,045	15,645	13,512	12,445
1983	11,040	12,000	6,000	4,000	3,000	23,040	17,040	15,040	14,040
1984	22,518	32,000	16,000	10,667	8,000	54,518	38,518	33,185	30,518
1985	28,843	52,000	26,000	17,333	13,000	80,843	54,843	46,176	41,843
1986	6,266	8,800	4,400	2,933	2,200	15,066	10,666	9,199	8,466
1987	7,321	5,200	2,600	1,733	1,300	12,521	9,921	9,054	8,621
1988	29,243	22,000	11,000	7,333	5,500	51,243	40,243	36,576	34,743
1989	9,357	8,000	4,000	2,667	2,000	17,357	13,357	12,024	11,357
1990	10,835	11,200	5,600	3,733	2,800	22,035	16,435	14,568	13,635
1991	4,532	7,600	3,800	2,533	1,900	12,132	8,332	7,065	6,432
1992	26,341	14,800	7,400	4,933	3,700	41,141	33,741	31,274	30,041
1993	15,705	38,000	19,000	12,667	9,500	53,705	34,705	28,372	25,205

[a] Data sources: see Table 25.

Table 33. Estimated total abundance of coho salmon returning to the Akwe River based upon four assumptions concerning the proportion of fish observed during peak escapement surveys, 1972-1991.[a]

Year	Total Estimated Harvests	Total Escapement with Assumption that Peak Count Represented (X) % of Total				Estimated Total Abundance of Akwe River Coho Salmon if Peak Survey Represented (X) %			
		25%	50%	75%	100%	25%	50%	75%	100%
1972	11,970	28,000	14,000	9,333	7,000	39,970	25,970	21,303	18,970
1973	8,380	12,000	6,000	4,000	3,000	20,380	14,380	12,380	11,380
1974	10,199	20,000	10,000	6,667	5,000	30,199	20,199	16,866	15,199
1975	3,935	8,800	4,400	2,933	2,200	12,735	8,335	6,868	6,135
1976	6,186	6,000	3,000	2,000	1,500	12,186	9,186	8,186	7,686
1977	24,311	60,000	30,000	20,000	15,000	84,311	54,311	44,311	39,311
1978	21,476	28,000	14,000	9,333	7,000	49,476	35,476	30,809	28,476
1979	15,864	12,000	6,000	4,000	3,000	27,864	21,864	19,864	18,864
1980	15,100	20,000	10,000	6,667	5,000	35,100	25,100	21,767	20,100
1981	12,404	20,000	10,000	6,667	5,000	32,404	22,404	19,071	17,404
1982	23,631	12,000	6,000	4,000	3,000	35,631	29,631	27,631	26,631
1983	14,806	24,000	12,000	8,000	6,000	38,806	26,806	22,806	20,806
1984	14,878	11,200	5,600	3,733	2,800	26,078	20,478	18,611	17,678
1985	9,690	9,600	4,800	3,200	2,400	19,290	14,490	12,890	12,090
1986	18,359	23,600	11,800	7,867	5,900	41,949	30,159	26,226	24,259
1987	12,609	19,600	9,800	6,533	4,900	32,209	22,409	19,142	17,509
1988	20,568	19,600	9,800	6,533	4,900	40,168	30,368	27,101	25,468
1989	13,746	19,600	9,800	6,533	4,900	33,346	23,546	20,279	18,646
1990	10,951	19,600	9,800	6,533	4,900	30,551	20,751	17,484	15,851
1991	7,063	19,600	9,800	6,533	4,900	26,663	16,863	13,596	11,963

[a] Data sources: see Table 26.

Table 34. Estimated total abundance of coho salmon returning to the Italio River based upon four assumptions concerning the proportion of fish observed during peak escapement surveys, 1972-1993.[a]

Year	Total Estimated Harvests	Total Escapement with Assumption that Peak Count Represented (X) % of Total				Estimated Total Abundance of Italio River Coho Salmon if Peak Survey Represented (X) %			
		25%	50%	75%	100%	25%	50%	75%	100%
1972	4,049	16,000	8,000	5,333	4,000	20,049	12,049	9,382	8,049
1973	2,962	3,200	1,600	1,067	800	6,162	4,562	4,029	3,762
1974	9,445	12,000	6,000	4,000	3,000	21,445	15,445	13,455	12,455
1975	3,676	5,800	2,900	1,933	1,450	9,476	6,576	5,609	5,126
1976	6,832	4,000	2,000	1,333	1,000	10,832	8,832	8,165	7,832
1977	12,183	32,000	16,000	10,667	8,000	44,183	28,183	22,850	20,183
1978	13,043	12,000	6,000	4,000	3,000	25,043	19,043	17,043	16,043
1979	10,321	12,000	6,000	4,000	3,000	22,321	16,321	14,321	13,321
1980	11,422	12,000	6,000	4,000	3,000	23,422	17,422	15,422	14,422
1981	12,004	22,000	11,000	7,333	5,500	34,004	23,004	19,337	17,504
1982	19,512	20,000	10,000	6,667	5,000	39,512	29,512	26,179	24,512
1983	7,998	2,000	1,000	667	500	9,998	8,998	8,665	8,489
1984	17,013	17,800	8,900	5,933	4,450	34,813	25,913	22,946	21,463
1985	21,171	22,000	11,000	7,333	5,500	43,171	32,171	28,504	16,671
1986	5,312	10,800	5,400	3,600	2,700	16,112	10,712	8,912	8,012
1987	4,125	14,000	7,000	4,667	3,500	18,125	11,125	8,792	7,625
1988	4,907	16,000	8,000	5,333	4,000	20,907	12,907	10,240	8,907
1989	1,541	16,800	8,400	5,600	4,200	18,341	9,941	7,141	5,741
1990	6,729	22,800	11,400	7,600	5,700	29,529	18,129	14,329	12,429
1991	2,924	20,000	10,000	6,667	5,000	22,924	12,924	9,591	7,924
1992	3,564	22,200	11,100	7,400	5,550	25,764	14,664	10,964	9,114
1993	11,922	32,200	16,100	10,733	8,050	44,122	28,022	22,655	19,972

[a] Data sources: see Table 27.

Table 35. Estimated total abundance of coho salmon returning to the Situk River based upon four assumptions concerning the proportion of fish observed during peak escapement surveys, 1972-1993.[a]

Year	Total Estimated Harvests	Total Escapement with Assumption that Peak Count Represented (X) % of Total				Estimated Total Abundance of Situk River Coho Salmon if Peak Survey Represented (X) %			
		25%	50%	75%	100%	25%	50%	75%	100%
1972	29,293	20,400	10,200	6,800	5,100	49,693	39,493	36,093	34,393
1973	16,400	6,876	3,438	2,292	1,719	23,276	19,838	18,692	18,119
1974	49,086	17,040	8,520	5,680	4,260	66,126	57,606	54,766	53,346
1975	20,398	18,000	9,000	6,000	4,500	38,398	29,398	26,398	24,898
1976	25,084	13,120	6,560	4,373	3,280	38,204	31,644	29,457	28,364
1977	46,946	15,000	7,500	5,000	3,750	61,946	54,446	51,946	50,696
1978	48,371	15,400	7,700	5,133	3,850	63,771	56,071	53,504	52,221
1979	31,046	28,000	14,000	9,333	7,000	59,046	45,046	40,379	38,046
1980	36,522	32,400	16,200	10,800	8,100	68,922	52,722	47,322	44,622
1981	57,402	33,720	16,860	11,240	8,430	91,122	74,262	68,642	65,832
1982	63,300	36,720	18,360	12,240	9,180	100,020	81,660	75,540	72,480
1983	30,256	21,200	10,600	7,067	5,300	51,456	40,856	37,323	35,556
1984	83,167	56,000	28,000	18,667	14,000	139,167	111,167	101,834	97,167
1985	97,168	25,960	12,980	8,653	6,490	123,128	110,148	105,821	103,658
1986	27,728	12,648	6,324	4,216	3,162	40,376	34,052	31,944	30,890
1987	41,522	8,000	4,000	2,667	2,000	49,522	45,522	44,189	43,522
1988	86,972	44,000	22,000	14,667	11,000	130,972	108,972	101,639	97,972
1989	50,233	15,600	7,800	5,200	3,900	65,823	58,023	55,433	54,123
1990	58,063	6,520	3,260	2,173	1,630	64,583	61,323	60,236	59,693
1991	100,134	29,200	14,600	9,733	7,300	129,334	114,734	109,867	107,434
1992	162,370	55,280	27,640	18,427	13,820	217,650	190,010	180,797	176,190
1993	214,376	42,800	21,400	14,267	10,700	257,176	235,776	228,643	225,076

[a] Data sources: see Table 28.

Table 36. Estimated total abundance of coho salmon returning to the Lost River based upon four assumptions concerning the proportion of fish observed during peak escapement surveys, 1973-1993.[a]

Year	Total Estimated Harvests	Total Escapement with Assumption that Peak Count Represented (X) % of Total				Estimated Total Abundance of Lost River Coho Salmon if Peak Survey Represented (X) %			
		25%	50%	75%	100%	25%	50%	75%	100%
1972	8,070	15,200	7,600	5,066	3,800	23,270	15,670	13,136	11,870
1973	5,129	7,912	3,956	2,637	1,978	13,041	9,085	7,766	7,107
1974	8,073	10,000	5,000	3,333	2,500	18,073	13,073	11,406	10,573
1975	4,551	5,200	2,600	1,733	1,300	9,751	7,151	6,284	5,851
1976	6,477	4,800	2,400	1,600	1,200	11,277	8,877	8,077	7,677
1977	11,350	16,200	8,100	5,400	4,050	27,550	19,450	16,750	15,400
1978	11,833	13,800	6,900	4,600	3,450	25,633	18,733	16,433	15,283
1979	12,419	33,800	16,900	11,267	8,450	46,219	29,319	23,686	20,869
1980	13,766	22,800	11,400	7,600	5,700	36,566	25,166	21,366	19,466
1981	15,834	29,452	14,726	9,817	7,363	45,286	30,560	25,651	23,197
1982	32,730	41,600	20,800	13,867	10,400	74,330	53,530	46,597	43,130
1983	17,754	32,440	16,220	10,813	8,110	50,194	33,974	28,567	25,864
1984	22,759	27,120	13,560	9,040	6,780	49,879	36,319	31,799	29,539
1985	20,136	13,200	6,600	4,400	3,300	33,336	26,736	24,536	23,436
1986	9,018	14,440	7,220	4,813	3,610	23,458	16,238	13,831	12,628
1987	9,319	21,928	10,964	7,309	5,482	31,247	20,283	16,628	14,801
1988	10,078	10,400	5,200	3,467	2,600	20,478	15,278	13,545	12,678
1989	9,486	8,760	4,380	2,920	2,190	18,246	13,866	12,406	11,676
1990	11,673	37,840	18,920	12,613	9,460	49,513	30,593	24,286	21,133
1991	5,142	4,700	2,350	1,567	1,175	9,842	7,492	6,709	6,317
1992	15,106	16,940	8,470	5,647	4,235	32,046	23,576	20,753	19,341
1993	21,130	21,744	10,872	7,248	5,436	42,874	32,002	28,378	26,566

[a] Data sources: see Table 29.

Table 37. Estimated total abundance of coho salmon returning to the Kaliakh River based upon four assumptions concerning the proportion of fish observed during peak escapement surveys, 1973-1993.[a]

Year	Total Estimated Harvests	Total Escapement with Assumption that Peak Count Represented (X) % of Total				Estimated Total Abundance of Kaliakh River Coho Salmon if Peak Survey Represented (X) %			
		25%	50%	75%	100%	25%	50%	75%	100%
1973	2,737	32,000	16,000	10,667	8,000	34,737	18,737	13,404	10,737
1974	2,709	22,800	11,400	7,600	5,700	25,509	14,109	10,309	8,409
1975	299	14,000	7,000	4,667	3,500	14,299	7,299	4,966	3,799
1976	3,437	32,000	16,000	10,667	8,000	35,437	19,437	14,104	11,437
1977	6,253	66,000	33,000	22,000	16,500	72,253	39,253	28,253	22,753
1978	12,649	100,000	50,000	33,333	25,000	112,649	62,649	45,982	37,649
1979	9,546	56,000	28,000	18,667	14,000	65,546	37,546	28,213	23,546
1980	10,620	12,000	6,000	4,000	3,000	22,620	16,620	14,620	13,620
1981	4,744	20,000	10,000	6,667	5,000	24,744	14,744	11,411	9,744
1982	23,962	32,000	16,000	10,667	8,000	55,962	39,962	34,629	31,962
1983	7,666	24,000	12,000	8,000	6,000	31,666	19,666	15,666	13,666
1984	16,135	14,000	7,000	4,667	3,500	30,135	23,135	20,802	19,635
1985	41,442	150,000	75,000	50,000	37,500	191,442	116,442	91,442	78,942
1986	14,302	20,800	10,400	6,933	5,200	35,102	24,702	21,235	19,502
1987	18,771	15,200	7,600	5,067	3,800	33,971	26,371	23,838	22,571
1988	10,391	10,000	5,000	3,333	2,500	20,391	15,391	13,724	12,891
1989	18,234	4,000	2,000	1,333	1,000	22,234	20,234	19,567	19,234
1990	15,771	13,800	6,900	4,600	3,450	29,571	22,671	20,371	19,221
1991	4,587	2,400	1,200	800	600	6,987	5,787	5,387	5,187
1992	4,610	6,000	3,000	2,000	1,500	10,610	7,610	6,610	6,110
1993	9,797	6,000	3,000	2,000	1,500	15,797	12,797	11,797	11,297

[a] Data sources: see Table 30.

Table 38. Estimated total abundance of coho salmon returning to the Tsiu-Tsivat River based upon four assumptions concerning the proportion of fish observed during peak escapement surveys, 1973-1993.[a]

Year	Total Estimated Harvests	Total Escapement with Assumption that Peak Count Represented (X) % of Total				Estimated Total Abundance of Coho Salmon if Peak Survey Represented (X) %			
		25%	50%	75%	100%	25%	50%	75%	100%
1973	17,989	120,000	60,000	40,000	30,000	137,989	77,989	57,989	47,989
1974	13,519	60,000	30,000	20,000	15,000	73,519	43,519	33,519	28,519
1975	1,010	32,600	16,300	10,867	8,150	33,610	17,310	11,877	9,160
1976	11,590	120,000	60,000	40,000	30,000	131,590	71,590	51,590	41,590
1977	13,094	100,000	50,000	33,333	25,000	113,094	63,094	46,427	38,094
1978	49,652	160,000	80,000	53,333	40,000	209,652	129,652	102,985	89,652
1979	43,748	100,000	50,000	33,333	25,000	143,748	93,748	77,081	68,748
1980	37,432	72,000	36,000	24,000	18,000	109,432	73,432	61,432	55,432
1981	39,368	80,000	40,000	26,667	20,000	119,368	79,368	66,035	59,368
1982	76,034	160,000	80,000	53,333	40,000	236,034	156,034	129,367	116,034
1983	30,352	66,000	33,000	22,000	16,500	96,352	63,352	52,352	46,852
1984	69,403	120,000	60,000	40,000	30,000	189,403	129,403	109,403	99,403
1985	97,219	209,400	104,700	69,800	52,350	306,619	201,919	167,019	149,569
1986	28,673	56,400	28,200	18,800	14,100	85,073	56,873	47,473	42,773
1987	52,752	34,000	17,000	11,333	8,500	86,752	69,752	64,085	61,252
1988	65,980	64,000	32,000	21,333	16,000	129,980	97,980	87,313	81,980
1989	74,394	152,000	76,000	50,667	38,000	226,394	150,394	125,061	112,394
1990	40,836	67,200	33,600	22,400	16,800	108,036	74,436	63,236	57,636
1991	41,727	66,400	33,200	22,133	16,600	108,127	74,927	63,860	58,327
1992	103,636	130,800	65,400	43,600	32,700	234,436	169,036	147,236	136,336
1993	72,928	70,000	35,000	23,333	17,500	142,928	107,928	96,261	90,428

[a] Data sources: see Table 31.

Table 39. Estimated age composition of coho salmon returning to the East Alsek-Doame River System, 1972-1993.[a]

	Estimated Percent of Total Return by Age:		
Year	Age Three	Age Four	Age Five
1972	56%	40%	4%
1973	56%	40%	4%
1974	56%	40%	4%
1975	56%	40%	4%
1976	56%	40%	4%
1977	56%	40%	4%
1978	56%	40%	4%
1979	56%	40%	4%
1980	56%	40%	4%
1981	56%	40%	4%
1982	45%	52%	3%
1983	56%	44%	0%
1984	90%	10%	0%
1985	58%	39%	3%
1986	50%	43%	7%
1987	27%	59%	14%
1988	50%	43%	7%
1989	57%	39%	4%
1990	59%	39%	2%
1991	67%	31%	2%
1992	56%	40%	4%
1993	56%	40%	4%

[a] Data Source: Rowse (1990) for 1982-1988; Van Alen (personal communication) for 1989-1991; and, average age composition for 1982-1991 was used as an estimate for 1972-1981 and for 1992-1993. A very small percentage of coho salmon returning during 1982-1991 were aged as six year olds; these fish were added to the five year old column.

Table 40. Estimated age composition of coho salmon returning to the Akwe River, 1972-1991.[a]

	Estimated Percent of Total Return by Age:		
Year	Age Three	Age Four	Age Five
1972	33%	59%	8%
1973	33%	59%	8%
1974	33%	59%	8%
1975	33%	59%	8%
1976	33%	59%	8%
1977	33%	59%	8%
1978	33%	59%	8%
1979	33%	59%	8%
1980	33%	59%	8%
1981	33%	59%	8%
1982	47%	50%	3%
1983	46%	53%	1%
1984	35%	65%	0%
1985	31%	57%	12%
1986	33%	59%	8%
1987	16%	62%	22%
1988	28%	58%	14%
1989	24%	68%	8%
1990	41%	54%	5%
1991	33%	64%	3%

[a] Data Source: Rowse (1990) for 1982-1985 and for 1987-1988; Van Alen (personal communication) for 1989-1991; and, average age composition for 1982-1985 and 1987-1991 was used as an estimate for 1972-1981 and for 1986. A very small percentage of coho salmon returning during 1982-1991 were aged as six year olds; these fish were added to the five year old column.

Table 41. Estimated age composition of coho salmon returning to the Italio River, 1972-1993.[a]

Year	Estimated Percent of Total Return by Age:		
	Age Three	Age Four	Age Five
1972	52%	44%	4%
1973	52%	44%	4%
1974	52%	44%	4%
1975	52%	44%	4%
1976	52%	44%	4%
1977	52%	44%	4%
1978	52%	44%	4%
1979	52%	44%	4%
1980	52%	44%	4%
1981	52%	44%	4%
1982	50%	48%	2%
1983	69%	31%	0%
1984	55%	45%	0%
1985	37%	52%	11%
1986	38%	56%	6%
1987	67%	32%	1%
1988	34%	55%	11%
1989	52%	44%	4%
1990	67%	29%	4%
1991	52%	44%	4%
1992	52%	44%	4%
1993	52%	44%	4%

[a] Data Source: Rowse (1990) for 1982-1988; Van Alen (personal communication) for 1990; and, average age composition for 1982-1991 was used as an estimate for 1972-1981, for 1989, and for 1991-1993. A very small percentage of coho salmon returning during 1982-1991 were aged as six year olds; these fish were added to the five year old column.

Table 42. Estimated age composition of coho salmon returning to the Situk River, 1972-1993.[a]

Year	Estimated Percent of Total Return by Age: Age Three	Age Four	Age Five
1972	48%	47%	6%
1973	48%	47%	6%
1974	48%	47%	6%
1975	48%	47%	6%
1976	48%	47%	6%
1977	48%	47%	6%
1978	48%	47%	6%
1979	48%	47%	6%
1980	48%	47%	6%
1981	48%	47%	6%
1982	51%	46%	3%
1983	62%	37%	1%
1984	69%	31%	0%
1985	52%	43%	5%
1986	41%	56%	3%
1987	32%	59%	9%
1988	35%	53%	12%
1989	37%	51%	12%
1990	63%	34%	3%
1991	37%	56%	7%
1992	48%	47%	6%
1993	48%	47%	6%

[a] Data Source: Rowse (1990) for 1982-1988; Van Alen (personal communication) for 1989-1991; and, average age composition for 1982-1991 was used as an estimate for 1972-1981 and for 1992-1993. A very small percentage of coho salmon returning during 1982-1991 were aged as six year olds; these fish were added to the five year old column.

Table 43. Estimated age composition of coho salmon returning to the Lost River, 1972-1993.[a]

Year	Estimated Percent of Total Return by Age:		
	Age Three	Age Four	Age Five
1972	47%	47%	6%
1973	47%	47%	6%
1974	47%	47%	6%
1975	47%	47%	6%
1976	47%	47%	6%
1977	47%	47%	6%
1978	47%	47%	6%
1979	47%	47%	6%
1980	47%	47%	6%
1981	47%	47%	6%
1982	64%	36%	0%
1983	55%	45%	0%
1984	73%	27%	0%
1985	48%	50%	2%
1986	31%	55%	14%
1987	34%	53%	13%
1988	39%	50%	11%
1989	42%	48%	10%
1990	46%	51%	3%
1991	42%	53%	5%
1992	47%	47%	6%
1993	47%	47%	6%

[a] Data Source: Rowse (1990) for 1982-1988; Van Alen (personal communication) for 1989-1990; Mark Olson for 1991; and, average age composition for 1982-1991 was used as an estimate for 1972-1981 and for 1992-1993. A very small percentage of coho salmon returning during 1982-1992 were aged as six year olds; these fish were added to the five year old column.

Table 44. Estimated age composition of coho salmon returning to the Kaliakh River, 1973-1993.[a]

	Estimated Percent of Total Return by Age:		
Year	Age Three	Age Four	Age Five
1973	38%	55%	7%
1974	38%	55%	7%
1975	38%	55%	7%
1976	38%	55%	7%
1977	38%	55%	7%
1978	38%	55%	7%
1979	38%	55%	7%
1980	38%	55%	7%
1981	38%	55%	7%
1982	44%	55%	1%
1983	42%	57%	1%
1984	66%	33%	1%
1985	31%	60%	9%
1986	22%	66%	12%
1987	27%	57%	16%
1988	34%	47%	19%
1989	21%	68%	11%
1990	33%	60%	7%
1991	64%	36%	0%
1992	34%	65%	1%
1993	38%	55%	7%

[a] Data Source: Rowse (1990) for 1982-1988; Van Alen (personal communication) for 1989-1990; Mark Olson for 1991-1992; and, average age composition for 1982-1992 was used as an estimate for 1973-1981 and for 1993. A very small percentage of coho salmon returning during 1982-1992 were aged as six year olds; these fish were added to the five year old column.

Table 45. Estimated age composition of coho salmon returning to the Tsiu-Tsivat River, 1973-1993.[a]

Year	Estimated Percent of Total Return by Age: Age Three	Age Four	Age Five
1973	42%	52%	6%
1974	42%	52%	6%
1975	42%	52%	6%
1976	42%	52%	6%
1977	42%	52%	6%
1978	42%	52%	6%
1979	42%	52%	6%
1980	42%	52%	6%
1981	42%	52%	6%
1982	43%	53%	4%
1983	51%	47%	2%
1984	73%	27%	0%
1985	40%	55%	5%
1986	43%	48%	9%
1987	26%	59%	15%
1988	21%	66%	13%
1989	45%	48%	7%
1990	33%	62%	5%
1991	40%	58%	2%
1992	47%	49%	4%
1993	42%	52%	6%

[a] Data Source: Rowse (1990) for 1982-1988; Van Alen (personal communication) for 1989-1990; Mark Olson for 1991-1992; and, average age composition for 1982-1992 was used as an estimate for 1973-1981 and for 1993. A very small percentage of coho salmon returning during 1982-1992 were aged as six year olds; these fish were added to the five year old column.

Table 46. Brood year abundance estimates for East Alsek River coho salmon based upon the 25% and 50% escapement models.[a]

	Estimates Based on 25% Model:					Estimates Based on 50% Model:				
	Estimated	Estimated Total Return:				Estimated	Estimated Total Return:			
Year	Escapement	Age 3	Age 4	Age 5	Total	Escapement	Age 3	Age 4	Age 5	Total
1967				391					265	
1968			3,716	218				2,519	193	
1969		5,207	2,069	775	8,050		3,530	1,829	523	5,881
1970		2,898	7,358	332	10,588		2,563	4,964	206	7,733
1971		10,309	3,151	506	13,966		6,955	1,954	322	9,230
1972	6,000	4,414	4,810	629	9,853	3,000	2,737	3,054	461	6,253
1973	1,200	6,739	5,973	1,320	14,031	600	4,279	4,377	942	9,598
1974	12,000	8,368	12,536	529	21,434	6,000	6,132	8,945	403	15,481
1975	6,000	17,563	5,028	533	23,124	3,000	12,532	3,831	365	16,728
1976	8,800	7,044	5,068	1,808	13,919	4,400	5,367	3,472	1,203	10,042
1977	8,000	7,100	17,174	661	24,935	4,000	4,864	11,428	469	16,761
1978	18,000	24,060	11,463	0	35,524	9,000	16,011	8,135	0	24,146
1979	6,000	9,920	10,138	0	20,058	3,000	7,040	7,498	0	14,538
1980	8,000	12,902	5,452	2,425	20,779	4,000	9,542	3,852	1,645	15,039
1981	28,800	49,066	31,529	1,055	81,650	14,400	34,666	21,389	747	56,802
1982	12,800	46,889	6,478	1,753	55,120	6,400	31,809	4,586	1,389	37,784
1983	12,000	7,533	7,387	3,587	18,507	6,000	5,333	5,853	2,817	14,003
1984	32,000	3,381	22,034	694	26,109	16,000	2,679	17,304	534	20,517
1985	52,000	25,622	6,769	441	32,831	26,000	20,122	5,209	329	25,659
1986	8,800	9,893	8,594	243	18,730	4,400	7,613	6,410	167	14,190
1987	5,200	13,001	3,761	1,728	18,489	2,600	9,697	2,583	1,417	13,697
1988	22,000	8,128	16,415	2,256	26,799	11,000	5,582	13,463	1,458	20,503
1989	8,000	22,998	21,428		44,426	4,000	18,861	13,847		32,709
1990	11,200	30,021				5,600	19,400			
1991	7,600					3,800				
1992	14,800					7,400				
1993	38,000					19,000				

[a] Data Source: Table 32 for escapements; total returns on Table 32 are multiplied by the age composition estimates given on Table 39 to provide the estimates of recruits by age.

Table 47. Brood year abundance estimates for East Alsek River coho salmon based upon the 75% and 100% escapement models.[a]

	Estimates Based on 75% Model:					Estimates Based on 100% Model:				
	Estimated	Estimated Total Return:				Estimated	Estimated Total Return:			
Year	Escapement	Age 3	Age 4	Age 5	Total	Escapement	Age 3	Age 4	Age 5	Total
1967				223					202	
1968			2,120	184				1,921	180	
1969		2,971	1,750	439	5,159		2,691	1,710	397	4,797
1970		2,451	4,166	164	6,781		2,395	3,767	143	6,305
1971		5,837	1,555	260	7,651		5,278	1,355	229	6,862
1972	2,000	2,178	2,469	405	5,052	1,500	1,899	2,177	377	4,452
1973	400	3,459	3,845	816	8,120	300	3,049	3,579	753	7,381
1974	4,000	5,387	7,748	361	13,497	3,000	5,014	7,150	340	12,504
1975	2,000	10,855	3,432	309	14,596	1,500	10,017	3,232	281	13,530
1976	2,933	4,808	2,940	1,001	8,749	2,200	4,528	2,674	901	8,103
1977	2,667	4,119	9,513	405	14,037	2,000	3,746	8,555	373	12,675
1978	6,000	13,328	7,026	0	20,354	4,500	11,986	6,471	0	18,457
1979	2,000	6,080	6,618	0	12,698	1,500	5,600	6,178	0	11,778
1980	2,667	8,422	3,319	1,385	13,126	2,000	7,862	3,052	1,255	12,169
1981	9,600	29,867	18,009	644	48,519	7,200	27,466	16,319	593	44,378
1982	4,267	26,782	3,956	1,268	32,005	3,200	24,269	3,640	1,207	29,116
1983	4,000	4,600	5,342	2,560	12,502	3,000	4,233	5,086	2,432	11,751
1984	10,667	2,445	15,728	481	18,653	8,000	2,328	14,939	454	17,721
1985	17,333	18,288	4,689	291	23,269	13,000	17,372	4,429	273	22,073
1986	2,933	6,854	5,682	141	12,677	2,200	6,473	5,318	129	11,920
1987	1,733	8,595	2,190	1,314	12,099	1,300	8,045	1,994	1,262	11,300
1988	7,333	4,734	12,478	1,192	18,404	5,500	4,309	11,986	1,059	17,354
1989	2,667	17,482	11,320		28,803	2,000	16,793	10,057		26,850
1990	3,733	15,860				2,800	14,090			
1991	2,533					1,900				
1992	4,933					3,700				
1993	12,667					9,500				

[a] Data Source: Table 32 for escapements; total returns on Table 32 are multiplied by the age composition estimates given on Table 39 to provide the estimates of recruits by age.

Table 48. Brood year abundance estimates for Akwe River coho salmon based upon the 25% and 50% escapement models.[a]

	Estimates Based on 25% Model:					Estimates Based on 50% Model:				
	Estimated	Estimated Total Return:				Estimated	Estimated Total Return:			
Year	Escapement	Age 3	Age 4	Age 5	Total	Escapement	Age 3	Age 4	Age 5	Total
1967				3,198					2,078	
1968			23,582	1,630				15,322	1,150	
1969		13,190	12,024	2,416	27,630		8,570	8,484	1,616	18,670
1970		6,725	17,817	1,019	25,562		4,745	11,917	667	17,330
1971		9,966	7,514	975	18,454		6,666	4,918	735	12,318
1972	28,000	4,203	7,190	6,745	18,137	14,000	2,751	5,420	4,345	12,515
1973	12,000	4,021	49,743	3,958	57,723	6,000	3,031	32,043	2,838	37,913
1974	20,000	27,823	29,191	2,229	59,243	10,000	17,923	20,931	1,749	40,603
1975	8,800	16,327	16,440	2,808	35,575	4,400	11,707	12,900	2,008	26,615
1976	6,000	9,195	20,709	2,592	32,496	3,000	7,215	14,809	1,792	23,816
1977	60,000	11,583	19,118	1,069	31,770	30,000	8,283	13,218	889	22,390
1978	28,000	10,693	17,816	388	28,897	14,000	7,393	14,816	268	22,477
1979	12,000	16,747	20,567	0	37,314	6,000	13,927	14,207	0	28,134
1980	20,000	17,851	16,951	2,315	37,116	10,000	12,331	13,311	1,739	27,380
1981	20,000	9,127	10,995	3,356	23,479	10,000	7,167	8,259	2,413	17,839
1982	12,000	5,980	24,750	7,086	37,816	6,000	4,492	17,794	4,930	27,216
1983	24,000	13,843	19,970	5,624	39,436	12,000	9,952	13,894	4,252	28,098
1984	11,200	5,153	23,297	2,668	31,119	5,600	3,585	17,613	1,884	23,083
1985	9,600	11,247	22,675	1,528	35,450	4,800	8,503	16,011	1,038	25,552
1986	23,600	8,003	16,498	800	25,300	11,800	5,651	11,206	506	17,362

[a] Data Source: Table 33 for escapements; total returns on Table 33 are multiplied by the age composition estimates given on Table 40 to provide the estimates of recruits by age. Because 1986 was the last year that escapements of coho salmon into the Akwe River were monitored, the escapements for 1987-1991 were estimated as the average of the escapements during 1972-1986. Only escapements and estimated total returns through 1986 were included when developing the spawner-recruit relationship.

Table 49. Brood year abundance estimates for Akwe River coho salmon based upon the 75% and 100% escapement models.[a]

	Estimates Based on 75% Model:					Estimates Based on 100% Model:				
	Estimated	Estimated Total Return:				Estimated	Estimated Total Return:			
Year	Escapement	Age 3	Age 4	Age 5	Total	Escapement	Age 3	Age 4	Age 5	Total
1967				1,704					1,518	
1968			12,569	990				11,192	910	
1969		7,030	7,304	1,349	15,683		6,260	6,714	1,216	14,190
1970		4,085	9,951	549	14,586		3,755	8,967	491	13,214
1971		5,566	4,052	655	10,273		5,016	3,620	615	9,250
1972	9,333	2,266	4,830	3,545	10,641	7,000	2,025	4,535	3,145	9,704
1973	4,000	2,701	26,143	2,465	31,310	3,000	2,536	23,193	2,278	28,008
1974	6,667	14,623	18,177	1,589	34,389	5,000	12,973	16,801	1,509	31,283
1975	2,933	10,167	11,720	1,741	23,628	2,200	9,397	11,130	1,608	22,135
1976	2,000	6,555	12,843	1,526	20,923	1,500	6,225	11,859	1,392	19,476
1977	20,000	7,183	11,252	829	19,264	15,000	6,633	10,268	799	17,700
1978	9,333	6,293	13,816	228	20,337	7,000	5,743	13,316	208	19,267
1979	4,000	12,987	12,087	0	25,074	3,000	12,517	11,027	0	23,544
1980	6,667	10,491	12,097	1,547	24,135	5,000	9,571	11,491	1,451	22,512
1981	6,667	6,514	7,347	2,098	15,959	5,000	6,187	6,891	1,941	15,019
1982	4,000	3,996	15,473	4,211	23,680	3,000	3,748	14,313	3,852	21,913
1983	8,000	8,655	11,868	3,794	24,317	6,000	8,005	10,856	3,566	22,427
1984	3,733	3,063	15,719	1,622	20,404	2,800	2,801	14,771	1,492	19,065
1985	3,200	7,588	13,790	874	22,252	2,400	7,131	12,679	793	20,603
1986	7,867	4,867	9,441	408	14,716	5,900	4,475	8,560	359	13,393

[a] Data Source: Table 33 for escapements; total returns on Table 33 are multiplied by the age composition estimates given on Table 40 to provide the estimates of recruits by age. Because 1986 was the last year that escapements of coho salmon into the Akwe River were monitored, the escapements for 1987-1991 were estimated as the average of the escapements during 1972-1986. Only escapements and estimated total returns through 1986 were included when developing the spawner-recruit relationship.

Table 50. Brood year abundance estimates for Italio River coho salmon based upon the 25% and 50% escapement models.[a]

	Estimates Based on 25% Model:					Estimates Based on 50% Model:				
	Estimated	Estimated Total Return:				Estimated	Estimated Total Return:			
Year	Escapement	Age 3	Age 4	Age 5	Total	Escapement	Age 3	Age 4	Age 5	Total
1967				802					482	
1968			8,822	246				5,302	182	
1969		10,425	2,711	858	13,995		6,265	2,007	618	8,891
1970		3,204	9,436	379	13,019		2,372	6,796	263	9,431
1971		11,151	4,169	433	15,754		8,031	2,893	353	11,278
1972	16,000	4,928	4,766	1,767	11,461	8,000	3,420	3,886	1,127	8,433
1973	3,200	5,633	19,441	1,002	26,075	1,600	4,593	12,401	762	17,755
1974	12,000	22,975	11,019	893	34,887	6,000	14,655	8,379	653	23,687
1975	5,800	13,022	9,821	937	23,780	2,900	9,902	7,181	697	17,780
1976	4,000	11,607	10,306	1,360	23,273	2,000	8,487	7,666	920	17,073
1977	32,000	12,179	14,962	790	27,931	16,000	9,059	10,122	590	19,771
1978	12,000	17,682	18,966	0	36,648	6,000	11,962	14,166	0	26,128
1979[b]	12,000	19,756	3,099	0	22,855	6,000	14,756	2,789	0	17,545
1980	12,000	6,899	15,666	4,749	27,313	6,000	6,209	11,661	3,539	21,408
1981	22,000	19,147	22,449	967	42,563	11,000	14,252	16,729	643	31,624
1982	20,000	15,973	9,023	181	25,177	10,000	11,903	5,999	111	18,013
1983	2,000	6,123	5,800	2,300	14,222	1,000	4,071	3,560	1,420	9,050
1984	17,800	12,144	11,499	734	24,376	8,900	7,454	7,099	398	14,950
1985	22,000	7,108	8,070	1,181	16,360	11,000	4,388	4,374	725	9,488
1986	10,800	9,537	8,563	917	19,018	5,400	5,169	5,257	517	10,944
1987	14,000	19,784	10,087	1,031	30,902	7,000	12,146	5,687	587	18,420
1988	16,000	11,920	11,336	1,765	25,022	8,000	6,720	6,452	1,121	14,294
1989	16,800	13,397	19,414		32,811	8,400	7,625	12,330		19,955
1990	22,800	22,943				11,400	14,571			
1991	20,000					10,000				
1992	22,200					11,100				
1993	32,200					16,100				

[a] Data Source: Table 34 for escapements; total returns on Table 34 are multiplied by the age composition estimates given on Table 41 to provide the estimates of recruits by age.

[b] Because the 1979 Italio River coho salmon escapement was not monitored, the abundance of spawners was estimated as the average escapement monitored during 1978 and 1980. Because the 1979 escapement was not monitored, the 1979 escapement and estimated total return resulting from that escapement were not included when developing the spawner-recruit relationship.

Table 51. Brood year abundance estimates for Italio River coho salmon based upon the 75% and 100% escapement models.[a]

	Estimates Based on 75% Model:					Estimates Based on 100% Model:				
	Estimated	Estimated Total Return:				Estimated	Estimated Total Return:			
Year	Escapement	Age 3	Age 4	Age 5	Total	Escapement	Age 3	Age 4	Age 5	Total
1967				375					322	
1968			4,128	161				3,542	150	
1969		4,879	1,773	538	7,190		4,185	1,655	498	6,339
1970		2,095	5,920	224	8,240		1,956	5,480	205	7,641
1971		6,997	2,468	327	9,791		6,477	2,255	313	9,045
1972	5,333	2,917	3,593	914	7,423	4,000	2,666	3,446	807	6,919
1973	1,067	4,246	10,054	682	14,982	800	4,073	8,881	642	13,595
1974	4,000	11,882	7,499	573	19,954	3,000	10,495	7,059	533	18,087
1975	1,933	8,862	6,301	617	15,780	1,450	8,342	5,861	577	14,780
1976	1,333	7,447	6,786	773	15,006	1,000	6,927	6,346	700	13,973
1977	10,667	8,019	8,508	524	17,051	8,000	7,499	7,702	490	15,691
1978	4,000	10,055	12,566	0	22,621	3,000	9,102	11,766	0	20,868
1979[b]	4,000	13,090	2,686	0	15,776	3,000	12,256	2,632	0	14,888
1980	4,000	5,979	10,326	3,135	19,440	3,000	5,857	9,658	1,834	17,350
1981	7,333	12,620	14,822	535	27,977	5,500	11,805	8,669	481	20,954
1982	6,667	10,546	4,991	88	15,625	5,000	6,168	4,487	76	10,731
1983	667	3,387	2,813	1,126	7,326	500	3,045	2,440	980	6,464
1984	5,933	5,891	5,632	286	11,808	4,450	5,109	4,899	230	10,237
1985	7,333	3,482	3,142	573	7,197	5,500	3,028	2,526	497	6,052
1986	3,600	3,713	4,155	384	8,252	2,700	2,985	3,604	317	6,907
1987	4,667	9,600	4,220	439	14,259	3,500	8,327	3,487	365	12,179
1988	5,333	4,987	4,824	906	10,718	4,000	4,120	4,010	799	8,930
1989	5,600	5,701	9,968		15,669	4,200	4,739	8,788		13,527
1990	7,600	11,781				5,700	10,385			
1991	6,667					5,000				
1992	7,400					5,550				
1993	10,733					8,050				

[a] Data Source: Table 34 for escapements; total returns on Table 34 are multiplied by the age composition estimates given on Table 41 to provide the estimates of recruits by age.

[b] Because the 1979 Italio River coho salmon escapement was not monitored, the abundance of spawners was estimated as the average escapement monitored during 1978 and 1980. Because the 1979 escapement was not monitored, the 1979 escapement and estimated total return resulting from that escapement were not included when developing the spawner-recruit relationship.

Table 52. Brood year abundance estimates for Situk River coho salmon based upon the 25% escapement model.[a]

Year	Estimated Escapement	Estimated Total Return: Age 3	Age 4	Age 5	Total
1967				2,485	
1968			23,356	1,164	
1969		23,853	10,940	3,306	38,099
1970		11,172	31,079	1,920	44,172
1971		31,740	18,047	1,910	51,698
1972	20,400	18,431	17,956	3,097	39,484
1973	6,876	18,338	29,115	3,189	50,641
1974	17,040	29,734	29,972	2,952	62,659
1975	18,000	30,610	27,752	3,446	61,808
1976	13,120	28,342	32,393	4,556	65,292
1977	15,000	33,083	42,827	3,001	78,911
1978	15,400	43,739	46,009	515	90,262
1979	28,000	62,012	19,039	0	81,051
1980	32,400	35,505	43,142	6,156	84,803
1981	33,720	72,367	52,945	1,211	126,523
1982	36,720	50,482	22,611	4,457	77,550
1983	21,200	12,920	29,218	15,717	57,855
1984	56,000	17,333	69,415	7,899	94,647
1985	25,960	48,460	33,570	1,937	83,967
1986	12,648	41,468	21,958	9,053	72,480
1987	8,000	23,896	72,427	10,883	107,205
1988	44,000	62,080	102,296	12,859	177,235
1989	15,600	104,472	120,873		225,345
1990	6,520	123,444			
1991[b]	29,200				
1992	55,280				
1993	42,800				

[a] Data Source: Table 35 for escapements; total returns on Table 35 are multiplied by the age composition estimates given on Table 42 to provide the estimates of recruits by age.

[b] Although a count was not made of the 1991 escapement of coho salmon into the Situk River, the escapement was deemed average (Keith Weiland, personal communication).

Table 53. Brood year abundance estimates for Situk River coho salmon based upon the 50% escapement model.[a]

Year	Estimated Escapement	Estimated Total Return: Age 3	Age 4	Age 5	Total
1967				1,975	
1968			18,562	992	
1969		18,957	9,324	2,880	31,161
1970		9,522	27,075	1,470	38,067
1971		27,651	13,817	1,582	43,050
1972	10,200	14,111	14,873	2,722	31,706
1973	3,438	15,189	25,590	2,804	43,582
1974	8,520	26,134	26,353	2,252	54,740
1975	9,000	26,914	21,172	2,636	50,722
1976	6,560	21,622	24,779	3,713	50,115
1977	7,500	25,307	34,903	2,450	62,660
1978	7,700	35,646	37,564	409	73,618
1979	14,000	50,629	15,117	0	65,746
1980	16,200	28,191	34,462	5,507	68,160
1981	16,860	57,807	47,364	1,022	106,192
1982	18,360	45,161	19,069	4,097	68,327
1983	10,600	10,897	26,858	13,077	50,831
1984	28,000	15,933	57,755	6,963	80,651
1985	12,980	40,320	29,592	1,840	71,751
1986	6,324	36,554	20,850	8,031	65,436
1987	4,000	22,690	64,251	9,501	96,441
1988	22,000	55,072	89,305	11,789	156,166
1989	7,800	91,205	110,815		202,020
1990	3,260	113,172			
1991[b]	14,600				
1992	27,640				
1993	21,400				

[a] Data Source: Table 35 for escapements; total returns on Table 35 are multiplied by the age composition estimates given on Table 42 to provide the estimates of recruits by age.

[b] Although a count was not made of the 1991 escapement of coho salmon into the Situk River, the escapement was deemed average (Keith Weiland, personal communication).

Table 54. Brood year abundance estimates for Situk River coho salmon based upon the 75% escapement model.[a]

Year	Estimated Escapement	Estimated Total Return: Age 3	Age 4	Age 5	Total
1967				1,805	
1968			16,964	935	
1969		17,325	8,785	2,738	28,848
1970		8,972	25,740	1,320	36,032
1971		26,288	12,407	1,473	40,168
1972	6,800	12,671	13,845	2,597	29,113
1973	2,292	14,139	24,415	2,675	41,229
1974	5,680	24,934	25,147	2,019	52,100
1975	6,000	25,682	18,978	2,366	47,026
1976	4,373	19,382	22,241	3,432	45,055
1977	5,000	22,715	32,262	2,266	57,243
1978	5,133	32,948	34,748	373	68,070
1979	9,333	46,835	13,810	0	60,644
1980	10,800	25,753	31,569	5,291	62,612
1981	11,240	52,954	45,503	958	99,415
1982	12,240	43,387	17,889	3,977	65,252
1983	7,067	10,222	26,072	12,197	48,490
1984	18,667	15,466	53,869	6,652	75,987
1985	8,653	37,606	28,271	1,807	67,684
1986	4,216	34,923	20,480	7,691	63,094
1987	2,667	22,287	61,526	9,040	92,853
1988	14,667	52,736	84,975	11,432	149,143
1989	5,200	86,783	107,462		194,245
1990	2,173	109,749			
1991[b]	9,733				
1992	18,427				
1993	14,267				

[a] Data Source: Table 35 for escapements; total returns on Table 35 are multiplied by the age composition estimates given on Table 42 to provide the estimates of recruits by age.

[b] Although a count was not made of the 1991 escapement of coho salmon into the Situk River, the escapement was deemed average (Keith Weiland, personal communication).

Table 55. Brood year abundance estimates for Situk River coho salmon based upon the 100% escapement model.[a]

Year	Estimated Escapement	Estimated Total Return: Age 3	Age 4	Age 5	Total
1967				1,720	
1968			16,165	906	
1969		16,509	8,516	2,667	27,692
1970		8,697	25,073	1,245	35,015
1971		25,606	11,702	1,418	38,726
1972	5,100	11,951	13,331	2,535	27,817
1973	1,719	13,615	23,827	2,611	40,053
1974	4,260	24,334	24,544	1,902	50,780
1975	4,500	25,066	17,882	2,231	45,179
1976	3,280	18,262	20,972	3,292	42,526
1977	3,750	21,419	30,941	2,174	54,534
1978	3,850	31,599	33,341	356	65,296
1979	7,000	44,938	13,156	0	58,093
1980	8,100	24,534	30,122	5,183	59,838
1981	8,430	50,527	44,573	927	96,026
1982	9,180	42,500	17,298	3,917	63,715
1983	5,300	9,885	25,678	11,757	47,319
1984	14,000	15,233	51,925	6,495	73,653
1985	6,490	36,250	27,603	1,791	65,643
1986	3,162	34,097	20,296	7,520	61,913
1987	2,000	22,086	60,163	8,810	91,059
1988	11,000	51,568	82,809	11,254	145,631
1989	3,900	84,571	105,786		190,357
1990	1,630	108,036			
1991[b]	7,300				
1992	13,820				
1993	10,700				

[a] Data Source: Table 35 for escapements; total returns on Table 35 are multiplied by the age composition estimates given on Table 42 to provide the estimates of recruits by age.

[b] Although a count was not made of the 1991 escapement of coho salmon into the Situk River, the escapement was deemed average (Keith Weiland, personal communication).

Table 56. Brood year abundance estimates for Lost River coho salmon based upon the 25% and 50% escapement models.[a]

	Estimates Based on 25% Model:					Estimates Based on 50% Model:				
	Estimated	Estimated Total Return:				Estimated	Estimated Total Return:			
Year	Escapement	Age 3	Age 4	Age 5	Total	Escapement	Age 3	Age 4	Age 5	Total
1967				1,396					940	
1968			10,937	782				7,365	545	
1969		10,937	6,129	1,084	18,151		7,365	4,270	784	12,419
1970		6,129	8,494	585	15,209		4,270	6,144	429	10,843
1971		8,494	4,583	677	13,754		6,144	3,361	533	10,038
1972	15,200	4,583	5,300	1,653	11,536	7,600	3,361	4,172	1,167	8,700
1973	7,912	5,300	12,949	1,538	19,787	3,956	4,172	9,142	1,124	14,438
1974	10,000	12,949	12,048	2,773	27,769	5,000	9,142	8,805	1,759	19,705
1975	5,200	12,048	21,723	2,194	35,964	2,600	8,805	13,780	1,510	24,094
1976	4,800	21,723	17,186	2,717	41,626	2,400	13,780	11,828	1,830	27,442
1977	16,200	17,186	21,284	0	38,470	8,100	11,828	14,363	0	26,191
1978	13,800	21,284	26,759	0	48,043	6,900	14,363	19,271	0	33,634
1979	33,800	40,882	22,587	0	63,469	16,900	29,442	15,288	0	44,730
1980	22,800	36,642	13,467	667	50,776	11,400	24,801	9,806	535	35,142
1981	29,452	23,942	16,668	3,284	43,894	14,726	17,433	13,368	2,273	33,074
1982	41,600	10,334	12,902	4,062	27,298	20,800	8,288	8,931	2,637	19,856
1983	32,440	7,976	16,561	2,253	26,789	16,220	5,521	10,750	1,681	17,951
1984	27,120	12,186	10,239	1,825	24,250	13,560	7,910	7,639	1,387	16,936
1985	13,200	8,601	8,758	1,485	18,844	6,600	6,417	6,656	918	13,990
1986	14,440	8,393	25,252	492	34,137	7,220	6,378	15,602	375	22,355
1987	21,928	20,795	5,216	1,923	27,934	10,964	12,849	3,971	1,415	18,234
1988	10,400	4,626	15,062	2,572	22,260	5,200	3,521	11,081	1,920	16,522
1989	8,760	15,062	20,151		35,212	4,380	11,081	15,041		26,122
1990	37,840	20,151				18,920	15,041			
1991	4,700					2,350				
1992	16,940					8,470				
1993	21,744					10,872				

[a] Data Source: Table 36 for escapements; total returns on Table 36 are multiplied by the age composition estimates given on Table 43 to provide the estimates of recruits by age.

Table 57. Brood year abundance estimates for Lost River coho salmon based upon the 75% and 100% escapement models.[a]

	Estimates Based on 75% Model:					Estimates Based on 100% Model:				
	Estimated	Estimated Total Return:				Estimated	Estimated Total Return:			
Year	Escapement	Age 3	Age 4	Age 5	Total	Escapement	Age 3	Age 4	Age 5	Total
1967				788					712	
1968			6,174	466				5,579	426	
1969		6,174	3,650	684	10,508		5,579	3,340	634	9,554
1970		3,650	5,361	377	9,388		3,340	4,969	351	8,661
1971		5,361	2,953	485	8,799		4,969	2,750	461	8,180
1972	5,066	2,953	3,796	1,005	7,755	3,800	2,750	3,608	924	7,282
1973	2,673	3,796	7,873	986	12,655	1,978	3,608	7,238	917	11,763
1974	3,333	7,873	7,724	1,421	17,017	2,500	7,238	7,183	1,252	15,673
1975	1,733	7,724	11,132	1,282	20,138	1,300	7,183	9,808	1,168	18,159
1976	1,600	11,132	10,042	1,539	22,714	1,200	9,808	9,149	1,392	20,349
1977	5,400	10,042	12,056	0	22,098	4,050	9,149	10,903	0	20,052
1978	4,600	12,056	16,775	0	28,831	3,450	10,903	15,527	0	26,429
1979	11,267	25,628	12,855	0	38,484	8,450	23,722	11,639	0	35,360
1980	7,600	20,854	8,586	491	29,930	5,700	18,881	7,976	469	27,325
1981	9,817	15,264	12,268	1,936	29,468	7,363	14,179	11,718	1,768	27,665
1982	13,867	7,606	7,607	2,162	17,375	10,400	7,265	6,945	1,924	16,135
1983	10,813	4,703	8,813	1,490	15,005	8,110	4,294	7,845	1,395	13,533
1984	9,040	6,485	6,773	1,241	14,498	6,780	5,772	6,339	1,168	13,279
1985	4,400	5,689	5,955	729	12,372	3,300	5,325	5,604	634	11,563
1986	4,813	5,707	12,386	335	18,428	3,610	5,371	10,778	316	16,465
1987	7,309	10,200	3,556	1,245	15,001	5,482	8,876	3,348	1,160	13,384
1988	3,467	3,153	9,754	1,703	14,610	2,600	2,969	9,090	1,594	13,653
1989	2,920	9,754	13,338		23,092	2,190	9,090	12,486		21,576
1990	12,613	13,338				9,460	12,486			
1991	1,567					1,175				
1992	5,647					4,235				
1993	7,248					5,436				

[a] Data Source: Table 36 for escapements; total returns on Table 36 are multiplied by the age composition estimates given on Table 43 to provide the estimates of recruits by age.

Table 58. Brood year abundance estimates for Kaliakh River coho salmon based upon the 25% and 50% escapement models.[a]

	Estimates Based on 25% Model:					Estimates Based on 50% Model:				
	Estimated	Estimated Total Return:				Estimated	Estimated Total Return:			
Year	Escapement	Age 3	Age 4	Age 5	Total	Escapement	Age 3	Age 4	Age 5	Total
1968				2,432					1,312	
1969			19,105	1,786				10,305	988	
1970		13,200	14,030	1,001	28,231		7,120	7,760	511	15,391
1971		9,693	7,864	2,481	20,038		5,361	4,014	1,361	10,736
1972		5,434	19,490	5,058	29,982		2,774	10,690	2,748	16,212
1973	32,000	13,466	39,739	7,885	61,091	16,000	7,386	21,589	4,385	33,361
1974[b]	22,800	27,456	61,957	4,588	94,001	11,400	14,916	34,457	2,628	52,001
1975	14,000	42,807	36,050	1,583	80,440	7,000	23,807	20,650	1,163	45,620
1976	32,000	24,907	12,441	1,732	39,081	16,000	14,267	9,141	1,032	24,441
1977[b]	66,000	8,596	13,609	560	22,764	33,000	6,316	8,109	400	14,824
1978	100,000	9,403	30,779	317	40,498	50,000	5,603	21,979	197	27,778
1979[b]	56,000	24,623	18,050	301	42,974	28,000	17,583	11,210	231	29,024
1980	12,000	13,300	9,945	17,230	40,474	6,000	8,260	7,635	10,480	26,374
1981	20,000	19,889	114,865	4,212	138,967	10,000	15,269	69,865	2,964	88,099
1982	32,000	59,347	23,167	5,435	87,950	16,000	36,097	16,303	4,219	56,620
1983	24,000	7,722	19,363	3,874	30,960	12,000	5,434	15,031	2,924	23,390
1984	14,000	9,172	9,584	2,446	21,202	7,000	7,120	7,234	2,226	16,580
1985	150,000	6,933	15,119	2,070	24,122	75,000	5,233	13,759	1,587	20,579
1986	20,800	4,669	17,743	0	22,412	10,400	4,249	13,603	0	17,852
1987[b]	15,200	9,758	2,515	106	12,380	7,600	7,481	2,083	76	9,641
1988	10,000	4,472	6,897	1,106	12,474	5,000	3,704	4,947	896	9,546
1989	4,000	3,607	8,688		12,296	2,000	2,587	7,038		9,626
1990	13,800	6,003				6,900	4,863			
1991	2,400					1,200				
1992	6,000					3,000				
1993[b]	6,000					3,000				

[a] Data Source: Table 37 for escapements; total returns on Table 37 are multiplied by the age composition estimates given on Table 44 to provide the estimates of recruits by age.

[b] The escapement of coho salmon into the Kaliakh River was not monitored in 1974, 1977, 1979, 1987, and 1993; see Table 30 for the methods used to approximate the escapements in these years.

Table 59. Brood year abundance estimates for Kaliakh River coho salmon based upon the 75% and 100% escapement models.[a]

	Estimates Based on 75% Model:					Estimates Based on 100% Model:				
	Estimated	Estimated Total Return:				Estimated	Estimated Total Return:			
Year	Escapement	Age 3	Age 4	Age 5	Total	Escapement	Age 3	Age 4	Age 5	Total
1968				938					752	
1969			7,372	722				5,905	589	
1970		5,094	5,670	348	11,111		4,080	4,625	266	8,971
1971		3,917	2,731	987	7,636		3,195	2,089	801	6,085
1972		1,887	7,757	1,978	11,622		1,444	6,290	1,593	9,327
1973	10,667	5,360	15,539	3,219	24,117	8,000	4,346	12,514	2,635	19,496
1974[b]	7,600	10,736	25,290	1,975	38,001	5,700	8,646	20,707	1,648	31,001
1975	4,667	17,473	15,517	1,023	34,014	3,500	14,307	12,950	953	28,210
1976	10,667	10,721	8,041	799	19,561	8,000	8,947	7,491	682	17,121
1977[b]	22,000	5,556	6,276	346	12,178	16,500	5,176	5,359	320	10,854
1978	33,333	4,336	19,046	157	23,539	25,000	3,703	17,579	137	21,418
1979[b]	18,667	15,237	8,930	208	24,374	14,000	14,063	7,790	196	22,049
1980	4,000	6,580	6,865	8,230	21,674	3,000	5,740	6,480	7,105	19,324
1981	6,667	13,729	54,865	2,548	71,143	5,000	12,959	47,365	2,340	62,665
1982	10,667	28,347	14,015	3,814	46,176	8,000	24,472	12,871	3,611	40,955
1983	8,000	4,672	13,588	2,608	20,867	6,000	4,290	12,865	2,449	19,605
1984	4,667	6,436	6,450	2,152	15,039	3,500	6,094	6,059	2,116	14,269
1985	50,000	4,666	13,306	1,426	19,398	37,500	4,383	13,079	1,345	18,808
1986	6,933	4,109	12,223	0	16,332	5,200	4,039	11,533	0	15,572
1987[b]	5,067	6,722	1,939	66	8,728	3,800	6,343	1,867	61	8,271
1988	3,333	3,448	4,297	826	8,570	2,500	3,320	3,972	791	8,082
1989	1,333	2,247	6,488		8,736	1,000	2,077	6,213		8,291
1990	4,600	4,483				3,450	4,293			
1991	800					600				
1992	2,000					1,500				
1993[b]	2,000					1,500				

[a] Data Source: Table 37 for escapements; total returns on Table 37 are multiplied by the age composition estimates given on Table 44 to provide the estimates of recruits by age.

[b] The escapement of coho salmon into the Kaliakh River was not monitored in 1974, 1977, 1979, 1987, and 1993; see Table 30 for the methods used to approximate the escapements in these years.

Table 60. Brood year abundance estimates for Tsiu River coho salmon based upon the 25% escapement model.[a]

Year	Estimated Escapement	Estimated Total Return: Age 3	Age 4	Age 5	Total
1968				8,279	
1969			71,754	4,491	
1970		57,955	38,230	2,017	98,202
1971		30,878	17,477	7,895	56,251
1972		14,116	68,427	6,786	89,329
1973	120,000	55,268	58,809	12,579	126,656
1974	60,000	47,499	109,019	8,625	165,143
1975	32,600	88,054	74,749	6,526	169,369
1976	120,000	60,374	56,905	7,162	124,441
1977	100,000	45,961	62,071	9,441	117,474
1978	160,000	50,135	125,098	1,927	177,160
1979	100,000	101,495	45,285	0	146,780
1980	72,000	49,140	51,139	15,331	115,609
1981	80,000	138,264	168,640	7,657	314,561
1982	160,000	122,648	40,835	13,013	176,495
1983	66,000	36,581	51,184	16,897	104,662
1984	120,000	22,556	85,787	15,848	124,190
1985	209,400	27,296	108,669	5,402	141,367
1986	56,400	101,877	66,982	2,163	171,022
1987	34,000	35,652	62,714	9,377	107,743
1988	64,000	43,251	114,874	8,576	166,700
1989	152,000	110,185	74,323		184,507
1990	67,200	60,030			
1991	66,400				
1992	130,800				
1993	70,000				

[a] Data Source: Table 38 for escapements; total returns on Table 38 are multiplied by the age composition estimates given on Table 45 to provide the estimates of recruits by age.

Table 61. Brood year abundance estimates for Tsiu River coho salmon based upon the 50% escapement model.[a]

Year	Estimated Escapement	Estimated Total Return: Age 3	Age 4	Age 5	Total
1968				4,679	
1969			40,554	2,611	
1970		32,755	22,630	1,039	56,424
1971		18,278	9,001	4,295	31,575
1972		7,270	37,227	3,786	48,283
1973	60,000	30,068	32,809	7,779	70,656
1974	30,000	26,499	67,419	5,625	99,543
1975	16,300	54,454	48,749	4,406	107,609
1976	60,000	39,374	38,185	4,762	82,321
1977	50,000	30,841	41,271	6,241	78,354
1978	80,000	33,335	82,698	1,267	117,300
1979	50,000	67,095	29,775	0	96,870
1980	36,000	32,310	34,939	10,096	77,344
1981	40,000	94,464	111,055	5,119	210,638
1982	80,000	80,768	27,299	10,463	118,529
1983	33,000	24,455	41,154	12,737	78,346
1984	60,000	18,136	64,667	10,528	93,330
1985	104,700	20,576	72,189	3,722	96,487
1986	28,200	67,677	46,150	1,499	115,326
1987	17,000	24,564	43,458	6,761	74,783
1988	32,000	29,971	82,828	6,476	119,274
1989	76,000	79,447	56,123		135,569
1990	33,600	45,330			
1991	33,200				
1992	65,400				
1993	35,000				

[a] Data Source: Table 38 for escapements; total returns on Table 38 are multiplied by the age composition estimates given on Table 45 to provide the estimates of recruits by age.

Table 62. Brood year abundance estimates for Tsiu River coho salmon based upon the 75% escapement model.[a]

Year	Estimated Escapement	Estimated Total Return: Age 3	Age 4	Age 5	Total
1968				3,479	
1969			30,154	2,011	
1970		24,355	17,430	713	42,498
1971		14,078	6,176	3,095	23,349
1972		4,988	26,827	2,786	34,601
1973	40,000	21,668	24,142	6,179	51,989
1974	20,000	19,499	53,552	4,625	77,676
1975	10,867	43,254	40,082	3,686	87,022
1976	40,000	32,374	31,945	3,962	68,281
1977	33,333	25,801	34,338	5,175	65,314
1978	53,333	27,735	68,565	1,047	97,346
1979	33,333	55,628	24,605	0	80,233
1980	24,000	26,700	29,539	8,351	64,589
1981	26,667	79,864	91,860	4,273	175,997
1982	53,333	66,808	22,787	9,613	99,207
1983	22,000	20,413	37,810	11,351	69,574
1984	40,000	16,662	57,627	8,754	83,043
1985	69,800	18,336	60,029	3,162	81,527
1986	18,800	56,277	39,206	1,277	96,761
1987	11,333	20,868	37,039	5,889	63,796
1988	21,333	25,544	72,146	5,776	103,465
1989	50,667	69,201	50,056		119,257
1990	22,400	40,430			
1991	22,133				
1992	43,600				
1993	23,333				

[a] Data Source: Table 38 for escapements; total returns on Table 38 are multiplied by the age composition estimates given on Table 45 to provide the estimates of recruits by age.

Table 63. Brood year abundance estimates for Tsiu River coho salmon based upon the 100% escapement model.[a]

Year	Estimated Escapement	Estimated Total Return: Age 3	Age 4	Age 5	Total
1968				2,879	
1969			24,954	1,711	
1970		20,155	14,830	550	35,535
1971		11,978	4,763	2,495	19,237
1972		3,847	21,627	2,286	27,760
1973	30,000	17,468	19,809	5,379	42,656
1974	15,000	15,999	46,619	4,125	66,743
1975	8,150	37,654	35,749	3,326	76,729
1976	30,000	28,874	28,825	3,562	61,261
1977	25,000	23,281	30,871	4,641	58,794
1978	40,000	24,935	61,498	937	87,370
1979	25,000	49,895	22,020	0	71,915
1980	18,000	23,895	26,839	7,478	58,212
1981	20,000	72,564	82,263	3,850	158,677
1982	40,000	59,828	20,531	9,188	89,546
1983	16,500	18,392	36,139	10,657	65,188
1984	30,000	15,926	54,107	7,868	77,900
1985	52,350	17,216	53,949	2,882	74,047
1986	14,100	50,577	35,734	1,167	87,478
1987	8,500	19,020	33,830	5,453	58,303
1988	16,000	23,331	66,805	5,426	95,561
1989	38,000	64,078	47,023		111,100
1990	16,800	37,980			
1991	16,600				
1992	32,700				
1993	17,500				

[a] Data Source: Table 38 for escapements; total returns on Table 38 are multiplied by the age composition estimates given on Table 45 to provide the estimates of recruits by age.

Table 64. Estimated spawner-recruit parameters for seven Yakutat Area coho salmon stocks using full, partial, and weighted data sets.[a]

Coho Salmon Stock	Sample Size Model	n	Analysis Type	Ricker Alpha	Carrying Capacity	R^2 (adj)	MSE	Escapement @ Prod. Maximum	Optimum Escapement: Estimate	Index
East	100%	18	Full	2.20339	15,644	0.442	0.2465	7,100	5,418	5,418
East	100%	9	Part	2.17417	17,539	0.637	0.1290	8,067	6,111	6,111
East	100%	18	Weight	2.17035	16,919	0.551	0.1686	7,795	5,899	5,899
East	75%	18	Full	2.00369	18,610	0.433	0.2464	9,288	6,709	5,032
East	75%	9	Part	1.96333	20,870	0.625	0.1387	10,630	7,584	5,688
East	75%	18	Weight	1.96750	20,005	0.544	0.1777	10,193	7,282	5,462
East	50%	18	Full	1.75355	23,700	0.447	0.2482	13,515	8,971	4,486
East	50%	9	Part	1.69565	26,516	0.606	0.1556	15,638	10,148	5,074
East	50%	18	Weight	1.71337	25,377	0.536	0.1920	14,811	9,679	4,840
East	25%	18	Full	1.41823	36,251	0.467	0.2571	25,561	14,602	3,651
East	25%	9	Part	1.32894	39,990	0.572	0.1913	30,092	16,367	4,092
East	25%	18	Weight	1.37304	38,298	0.526	0.2189	27,893	15,552	3,888
Akwe	100%	15	Full	2.50163	12,983	0.731	0.1460	5,190	4,229	4,229
Akwe	100%	8	Part	2.88138	9,358	0.831	0.0413	3,248	2,815	2,815
Akwe	100%	15	Weight	2.69005	10,879	0.753	0.0678	4,044	3,407	3,407
Akwe	75%	15	Full	2.28805	15,892	0.728	0.1466	6,946	5,410	4,057
Akwe	75%	8	Part	2.65558	11,609	0.829	0.0411	4,372	3,662	2,746
Akwe	75%	15	Weight	2.47147	13,397	0.751	0.0670	5,421	4,391	3,294
Akwe	50%	15	Full	2.01562	21,129	0.723	0.1488	10,483	7,599	3,800
Akwe	50%	8	Part	2.36406	15,739	0.824	0.0414	6,657	5,275	2,638
Akwe	50%	15	Weight	2.18904	17,994	0.747	0.0667	8,220	6,250	3,125
Akwe	25%	15	Full	1.63839	34,755	0.708	0.1562	21,213	13,445	3,361
Akwe	25%	8	Part	1.95246	26,749	0.805	0.0439	13,700	9,741	2,435
Akwe	25%	15	Weight	1.78763	30,217	0.730	0.0694	16,903	11,363	2,841
Italio	100%	17	Full	2.64247	7,620	0.661	0.2260	2,884	2,410	2,410
Italio	100%	7	Part	2.49986	7,229	0.573	0.2697	2,892	2,356	2,356
Italio	100%	17	Weight	2.63316	7,543	0.652	0.2285	2,865	2,390	2,390
Italio	75%	17	Full	2.44243	9,848	0.647	0.2182	4,032	3,248	2,436
Italio	75%	7	Part	2.29573	9,708	0.490	0.2998	4,229	3,300	2,475
Italio	75%	17	Weight	2.42776	9,832	0.629	0.2253	4,050	3,252	2,439
Italio	50%	17	Full	2.21338	13,499	0.681	0.1851	6,099	4,666	2,333
Italio	50%	7	Part	2.10322	13,148	0.574	0.2300	6,251	4,647	2,324
Italio	50%	17	Weight	2.20288	13,446	0.670	0.1868	6,104	4,657	2,329
Italio	25%	17	Full	1.90845	23,582	0.717	0.1525	12,357	8,662	2,166
Italio	25%	7	Part	1.85706	22,647	0.698	0.1473	12,195	8,403	2,101
Italio	25%	17	Weight	1.90710	23,379	0.722	0.1434	12,259	8,590	2,148

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Table 64. Continued (page 2 of 3).[a]

Coho Salmon Stock	Model	Sample Size n	Analysis Type	Ricker Alpha	Carrying Capacity	R^2 (adj)	MSE	Escapement @ Prod. Maximum	Optimum Escapement: Estimate	Optimum Escapement: Index
Situk	100%	18	Full	3.24468	26,641	0.364	0.2500	8,211	7,420	7,420
Situk	100%	9	Part	3.47802	22,457	0.664	0.1427	6,457	5,955	5,955
Situk	100%	18	Weight	3.35846	23,963	0.545	0.1840	7,135	6,517	6,517
Situk	75%	18	Full	2.99163	32,701	0.371	0.2433	10,931	9,609	7,207
Situk	75%	9	Part	3.21175	27,873	0.664	0.1403	8,678	7,818	5,864
Situk	75%	18	Weight	3.09940	29,617	0.548	0.1800	9,556	8,507	6,380
Situk	50%	18	Full	2.65151	43,363	0.385	0.2319	16,354	13,690	6,845
Situk	50%	9	Part	2.84768	37,626	0.664	0.1363	13,213	11,398	5,699
Situk	50%	18	Weight	2.74852	39,721	0.553	0.1734	14,452	12,287	6,144
Situk	25%	18	Full	2.12930	69,346	0.416	0.2082	32,568	24,380	6,095
Situk	25%	9	Part	2.26842	62,266	0.659	0.1288	27,449	21,282	5,321
Situk	25%	18	Weight	2.20162	64,965	0.562	0.1601	29,508	22,508	5,627
Lost	100%	15	Full	2.39314	12,191	0.556	0.2133	5,094	4,061	4,061
Lost	100%	8	Part	1.78401	16,382	0.224	0.1528	9,183	6,165	6,165
Lost	100%	15	Weight	2.26305	13,139	0.525	0.1912	5,806	4,496	4,496
Lost	75%	15	Full	2.19347	14,867	0.553	0.2171	6,778	5,160	3,870
Lost	75%	8	Part	1.59944	19,197	0.240	0.1494	12,003	7,481	5,611
Lost	75%	15	Weight	2.06010	15,971	0.525	0.1901	7,752	5,693	4,270
Lost	50%	15	Full	1.94286	19,692	0.546	0.2244	10,136	7,185	3,593
Lost	50%	8	Part	1.37202	23,984	0.261	0.1456	17,481	9,741	4,871
Lost	50%	15	Weight	1.80439	21,036	0.523	0.1892	11,658	7,885	3,943
Lost	25%	15	Full	1.60541	32,383	0.529	0.2420	20,171	12,605	3,151
Lost	25%	8	Part	1.07457	35,799	0.291	0.1435	33,314	15,306	3,827
Lost	25%	15	Weight	1.46051	34,139	0.517	0.1912	23,375	13,647	3,412
Kaliakh	100%	17	Full	1.88411	25,455	0.713	0.2330	13,510	9,395	9,395
Kaliakh	100%	7	Part	1.86285	27,967	0.666	0.2849	15,013	10,365	10,365
Kaliakh	100%	17	Weight	1.86758	26,190	0.703	0.2416	14,024	9,697	9,697
Kaliakh	75%	17	Full	1.70736	30,234	0.710	0.2453	17,708	11,545	8,659
Kaliakh	75%	7	Part	1.66453	32,619	0.647	0.3210	19,597	12,557	9,418
Kaliakh	75%	17	Weight	1.68838	30,931	0.696	0.2591	18,320	11,853	8,890
Kaliakh	50%	17	Full	1.48781	38,498	0.695	0.2764	25,876	15,313	7,657
Kaliakh	50%	7	Part	1.51536	40,194	0.620	0.3831	28,398	16,199	8,100
Kaliakh	50%	17	Weight	1.46576	39,075	0.679	0.2962	26,659	15,605	7,803
Kaliakh	25%	17	Full	1.19497	58,978	0.656	0.3615	49,355	24,708	6,177
Kaliakh	25%	7	Part	1.07847	57,280	0.579	0.5125	53,112	24,474	6,119
Kaliakh	25%	17	Weight	1.16849	59,030	0.639	0.3902	50,518	24,842	6,211

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Table 64. Continued (page 3 of 3).[a]

Coho Salmon Stock	Model	Sample Size n	Analysis Type	Ricker Alpha	Carrying Capacity	R^2 (adj)	MSE	Escapement @ Prod. Maximum	Optimum Escapement: Estimate	Optimum Escapement: Index
Tsiu	100%	18	Full	2.20413	56,508	0.662	0.1150	25,637	19,568	19,568
Tsiu	100%	9	Part	2.21377	60,369	0.731	0.0851	27,270	20,864	20,864
Tsiu	100%	18	Weight	2.19523	57,861	0.700	0.0983	26,358	20,073	20,073
Tsiu	75%	18	Full	2.02485	68,968	0.681	0.1062	34,061	24,759	18,569
Tsiu	75%	9	Part	2.01367	73,544	0.723	0.0876	36,522	26,460	19,845
Tsiu	75%	18	Weight	2.00902	70,491	0.704	0.0955	35,087	25,385	19,039
Tsiu	50%	18	Full	1.80477	91,694	0.701	0.0982	50,806	34,367	17,184
Tsiu	50%	9	Part	1.76273	97,251	0.707	0.0929	55,171	36,745	18,373
Tsiu	50%	18	Weight	1.78043	93,445	0.708	0.0934	52,485	35,188	17,594
Tsiu	25%	18	Full	1.51824	152,794	0.709	0.0964	100,639	60,439	15,110
Tsiu	25%	9	Part	1.42536	159,288	0.670	0.1066	111,753	64,081	16,020
Tsiu	25%	18	Weight	1.48201	154,879	0.701	0.0972	104,506	61,671	15,418

[a] Model refers to the proportion of total escapement assumed to be indexed by peak escapement counts. Sample size (n) is the number of paired escapement-total return data points included in the analysis. Analysis type refers to use of the full or partial data set or a data set that was weighted. Carrying capacity is the modeled escapement level that is equal to the replacement line. The R^2 listed is adjusted for sample size (n). MSE is the mean square error of the regression. Escapement at production maximum is the escapement level that produces the maximum modeled total return. The modeled optimum escapement estimate is scaled to provide an estimate of optimum escapement as an index value. Scaled optimum escapements for weighted models are underlined.

Table 65. Estimated spawner-recruit parameters based on weighted regressions and bootstrap statistics for seven Yakutat Area coho salmon stocks.[a]

Coho Salmon Stock	Model	Sample Size	R^2 (adj)	Weighted Regression Estimate of Optimum Escapement	Bootstrap Statistics: Median Optimum Escapement	Bootstrap Statistics: Lower 90% Bound	Bootstrap Statistics: Upper 90% Bound
East	100%	18	0.551	5,899	5,936	4,673	8,906
East	75%	18	0.544	7,282	7,301	5,785	10,926
East	50%	18	0.536	9,679	9,600	7,717	14,425
East	25%	18	0.526	15,552	15,319	12,521	22,984
Akwe	100%	15	0.753	3,407	3,554	2,977	4,394
Akwe	75%	15	0.751	4,391	4,573	3,854	5,650
Akwe	50%	15	0.747	6,250	6,508	5,554	7,893
Akwe	25%	15	0.730	11,363	11,777	10,196	14,030
Italio	100%	17	0.652	2,390	2,334	1,936	3,026
Italio	75%	17	0.629	3,252	3,207	2,628	4,120
Italio	50%	17	0.670	4,657	4,604	3,864	5,662
Italio	25%	17	0.722	8,590	8,554	7,412	10,085
Situk	100%	18	0.545	6,517	6,545	5,048	10,206
Situk	75%	18	0.548	8,507	8,478	6,625	12,954
Situk	50%	18	0.553	12,287	12,254	9,778	18,378
Situk	25%	18	0.562	22,508	22,293	18,092	31,816
Lost	100%	18	0.525	4,496	4,092	3,344	5,629
Lost	75%	18	0.525	5,693	5,201	4,281	7,201
Lost	50%	18	0.523	7,885	7,329	6,095	9,740
Lost	25%	18	0.517	13,647	12,860	11,022	16,789
Kaliakh	100%	13	0.703	9,697	9,463	8,116	14,347
Kaliakh	75%	13	0.696	11,853	11,568	9,615	21,104
Kaliakh	50%	13	0.679	15,605	15,249	12,993	22,571
Kaliakh	25%	13	0.639	24,842	24,089	19,961	35,373
Tsiu	100%	17	0.698	20,073	19,802	16,756	25,070
Tsiu	75%	17	0.704	25,385	25,132	21,531	31,970
Tsiu	50%	17	0.708	35,188	34,697	30,259	42,937
Tsiu	25%	17	0.701	61,671	61,201	53,992	74,567

[a] Model refers to the proportion of total escapement assumed to be indexed by peak escapement counts. Sample size is the number of paired escapement-total return data points. The R^2 listed is adjusted for sample size. Optimum escapement estimates were calculated from the spawner-recruit regressions. The bootstrap median and 90% confidence bounds for each model were taken from the set of optimum escapements calculated from a set of 4,000 bootstrap runs conducted for each of the models.

Table 66. Estimated spawner-recruit parameters based on weighted regressions and bootstrap statistics for seven Yakutat Area coho salmon stocks wherein the estimates have been scaled to account for modeled escapement expansions.[a]

Coho Salmon Stock	Model	Sample Size	R^2 (adj)	Weighted Regression Estimate of Optimum Escapement	Bootstrap Statistics: Median Optimum Escapement	Bootstrap Statistics: Lower 90% Bound	Bootstrap Statistics: Upper 90% Bound
East	100%	18	0.551	5,899	5,936	4,673	8,906
East	75%	18	0.544	5,462	5,476	4,339	8,195
East	50%	18	0.536	4,840	4,800	3,859	7,213
East	25%	18	0.526	3,888	3,830	3,130	5,746
Akwe	100%	15	0.753	3,407	3,554	2,977	4,394
Akwe	75%	15	0.751	3,294	3,430	2,891	4,238
Akwe	50%	15	0.747	3,125	3,254	2,777	3,947
Akwe	25%	15	0.730	2,841	2,944	2,549	3,508
Italio	100%	17	0.652	2,390	2,334	1,936	3,026
Italio	75%	17	0.629	2,439	2,405	1,971	3,090
Italio	50%	17	0.670	2,329	2,302	1,932	2,831
Italio	25%	17	0.722	2,148	2,139	1,853	2,521
Situk	100%	18	0.545	6,517	6,545	5,048	10,206
Situk	75%	18	0.548	6,380	6,359	4,969	9,716
Situk	50%	18	0.553	6,144	6,127	4,889	9,189
Situk	25%	18	0.562	5,627	5,573	4,523	7,954
Lost	100%	18	0.525	4,496	4,092	3,344	5,629
Lost	75%	18	0.525	4,270	3,901	3,211	5,401
Lost	50%	18	0.523	3,943	3,665	3,048	4,870
Lost	25%	18	0.517	3,412	3,215	2,756	4,197
Kaliakh	100%	13	0.703	9,697	9,463	8,116	14,347
Kaliakh	75%	13	0.696	8,890	8,676	7,447	12,993
Kaliakh	50%	13	0.679	7,803	7,625	6,496	11,286
Kaliakh	25%	13	0.639	6,211	6,022	4,990	8,843
Tsiu	100%	17	0.698	20,073	19,802	16,756	25,070
Tsiu	75%	17	0.704	19,039	18,849	16,148	23,978
Tsiu	50%	17	0.708	17,594	17,349	15,130	21,469
Tsiu	25%	17	0.701	15,418	15,300	13,498	18,642

[a] Model refers to the proportion of total escapement assumed to be indexed by peak escapement counts. Sample size is the number of paired escapement-total return data points The R^2 listed is adjusted for sample size. Optimum escapement estimates were calculated from the spawner-recruit regressions. The bootstrap median and 90% confidence bounds for each model were taken from the set of optimum escapements calculated from a set of 4,000 bootstrap runs conducted for each of the models.

Table 67. Optimum escapement estimates and lower and upper escapements that are estimated to produce 90% of the maximum yield based on weighted regressions of the spawner-recruit relationships along with estimates of median optimum escapements with 90% confidence bounds when recruitment errors were bootstrapped for seven Yakutat coho salmon stocks. All estimates have been scaled to account for modeled escapement expansions.[a]

		Weighted Regression:			Bootstrap Statistics When Recruitment Errors Are Included:		
			Escapements Where Yield is 90% of Maximum:				
Coho Salmon Stock	Model	Estimate of Optimum Escapement	Lower Bound	Upper Bound	Median Optimum Escapement	Lower 90% Bound	Upper 90% Bound
East	100%	5,899	3,800	8,500	5,936	4,673	8,906
East	75%	5,462	3,500	7,900	5,476	4,339	8,195
East	50%	4,840	3,100	6,800	4,800	3,859	7,213
East	25%	3,888	2,500	4,300	3,830	3,130	5,746
Range for East:			2,500 to 8,500			3,130 to 8,906	
Akwe	100%	3,407	2,100	5,000	3,554	2,977	4,394
Akwe	75%	3,294	2,000	4,900	3,430	2,891	4,238
Akwe	50%	3,125	2,000	4,500	3,254	2,777	3,947
Akwe	25%	2,841	1,800	4,100	2,944	2,549	3,508
Range for Akwe:			1,800 to 5,000			2,549 to 4,394	
Italio	100%	2,390	1,500	3,500	2,334	1,936	3,026
Italio	75%	2,439	1,500	3,600	2,405	1,971	3,090
Italio	50%	2,329	1,500	3,400	2,302	1,932	2,831
Italio	25%	2,148	1,400	3,100	2,139	1,853	2,521
Range for Italio:			1,400 to 3,600			1,853 to 3,090	
Situk	100%	6,517	4,000	9,800	6,545	5,048	10,206
Situk	75%	6,380	3,900	9,500	6,359	4,969	9,716
Situk	50%	6,144	3,800	9,000	6,127	4,889	9,189
Situk	25%	5,627	3,300	8,600	5,573	4,523	7,954
Range for Situk:			3,300 to 9,800			4,523 to 10,206	
Lost	100%	4,496	2,800	6,500	4,092	3,344	5,629
Lost	75%	4,270	2,600	6,200	3,901	3,211	5,401
Lost	50%	3,943	2,500	5,700	3,665	3,048	4,870
Lost	25%	3,412	2,200	4,800	3,215	2,756	4,197
Range for Lost:			2,200 to 6,500			2,756 to 5,629	

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Table 67. Continued (page 2 of 2).[a]

Coho Salmon Stock	Model	Weighted Regression: Escapements Where Yield is 90% of Maximum: Estimate of Optimum Escapement	Lower Bound	Upper Bound	Bootstrap Statistics When Recruitment Errors Are Included: Median Optimum Escapement	Lower 90% Bound	Upper 90% Bound
Kaliakh	100%	9,697	6,000	14,000	9,463	8,116	14,347
Kaliakh	75%	8,890	5,800	12,600	8,676	7,447	12,993
Kaliakh	50%	7,803	5,000	11,000	7,625	6,496	11,286
Kaliakh	25%	6,211	4,000	8,600	6,022	4,900	8,843
Range for Kaliakh:			4,000 to 14,000			4,900 to 14,347	
Tsiu	100%	20,073	13,000	29,000	19,802	16,756	25,070
Tsiu	75%	19,039	12,000	28,000	18,849	16,148	23,978
Tsiu	50%	17,594	11,000	25,000	17,349	15,130	21,469
Tsiu	25%	15,418	10,000	22,000	15,300	13,498	18,642
Range for Tsiu:			10,000 to 29,000			13,498 to 25,070	

[a] Model refers to the proportion of total escapement assumed to be indexed by peak escapement counts. Optimum escapement estimates were calculated from the spawner-recruit regressions. The range of escapements expected to produce 90% or more of the maximum yield were calculated from the spawner-recruit regressions. The bootstrap medians and 90% confidence bounds for each model were taken from the set of optimum escapements calculated from a set of 4,000 bootstrap runs conducted for each of the models. Recruitment residuals from the spawner-recruitment relationship were used to generate errors for column 6, 7, and 8 for each model. Escapement bounds estimated to produce 90% of maximum yield were rounded to the nearest 100.

Table 68. Recommended escapement goal ranges for fishery management of seven Yakutat area coho salmon stocks with the number and percentage of times that monitored escapement was within the range since the early 1970's.

Coho Salmon Stock	Recommended Escapement Range	Number of Years Escapement Monitored	No. of Years Escapement Was: Below: Range: No.	%	Within: Range: No.	%	Above: Range: No.	%	No. of Years Since 1989 That Escapement Was Within Range: No.	%
East	2,500-8,500	22	11	50	9	41	2	9	2	40
Akwe	1,800-5,000	15	1	7	9	60	5	33	NA	NA
Italio	1,400-3,600	21	3	14	6	29	12	57	0	0
Situk	3,300-9,800	21	5	24	12	57	4	19	1	20
Lost	2,200-6,500	22	5	23	11	50	6	27	2	40
Kaliakh	4,000-14,000	16	8	50	6	38	2	12	0	0
Tsiu	10,000-29,000	21	2	10	11	52	8	38	3	60

Table 69. Estimates of median optimum escapements when only recruitment errors were bootstrapped versus when recruitment and spawner abundance errors were bootstrapped for seven Yakutat coho salmon stocks.[a]

Coho Salmon Stock	Model	Bootstrap Errors Included: Recruitment Only: Median Optimum Escapement	Recruitment & Spawners Median Optimum Escapement	Percent Change
East	100%	5,936	6,977	+17.5%
East	75%	5,476	6,404	+16.9%
East	50%	4,800	5,679	+18.3%
East	25%	3,830	4,514	+17.9%
Akwe	100%	3,554	5,564	+56.6%
Akwe	75%	3,430	5,502	+60.4%
Akwe	50%	3,254	5,096	+56.6%
Akwe	25%	2,944	4,257	+44.6%
Italio	100%	2,334	5,740	+244.9%
Italio	75%	2,405	5,342	+222.1%
Italio	50%	2,302	4,695	+204.0%
Italio	25%	2,139	4,348	+203.3%
Situk	100%	6,545	10,712	+63.7%
Situk	75%	6,359	10,242	+61.1%
Situk	50%	6,127	9,441	+54.1%
Situk	25%	5,573	7,493	+34.5%
Lost	100%	4,092	6,823	+66.7%
Lost	75%	3,901	6,476	+66.0%
Lost	50%	3,665	5,795	+58.1%
Lost	25%	3,215	4,779	+48.6%
Kaliakh	100%	9,463	11,987	+26.7%
Kaliakh	75%	8,676	10,989	+26.7%
Kaliakh	50%	7,625	9,388	+23.1%
Kaliakh	25%	6,022	6,887	+14.4%
Tsiu	100%	19,802	32,387	+63.6%
Tsiu	75%	18,849	29,091	+54.3%
Tsiu	50%	17,349	25,194	+45.2%
Tsiu	25%	15,300	20,369	+33.1%

[a] Model refers to the proportion of total escapement assumed to be indexed by peak escapement counts. The bootstrap medians for each model were taken from the set of optimum escapements calculated from a set of 4,000 bootstrap runs conducted for each of the models. Recruitment residuals from the spawner-recruitment relationship were used to generate errors for column 3 for each model. Spawner abundance residuals and recruitment residuals from the spawner-recruitment relationship were used to generate errors for column 4 for each model. All estimates for the 25%, 50%, and 75% models have been scaled to account for modeled escapement expansions.

Table 70. Estimates of the harvest rates for seven Yakutat coho salmon stocks at maximum sustainable yield.[a]

Coho Salmon Stock	Weighted Model	Estimated Optimum Escapement	Estimated Production at Optimum Escapement	Harvest Rate at Optimum Production and Escapement
East	100	5,899	24,250	75.7%
East	75	7282	25,450	71.4%
East	50	9679	27,934	65.4%
East	25	15552	35,151	55.8%
Akwe	100	3407	21,616	84.2%
Akwe	75	4391	23,126	81.0%
Akwe	50	6250	26,083	76.0%
Akwe	25	11363	34,666	67.2%
Italio	100	2390	14,442	83.5%
Italio	75	3252	16,511	80.3%
Italio	50	4657	19,654	76.3%
Italio	25	8590	28,703	70.1%
Situk	100	6517	75,151	91.3%
Situk	75	8507	77,481	89.0%
Situk	50	12287	82,011	85.0%
Situk	25	22508	94,889	76.3%
Lost	100	4496	19,923	77.4%
Lost	75	5693	21,434	73.4%
Lost	50	7885	24,362	67.6%
Lost	25	13647	32,792	58.4%
Kaliak	100	9697	31,435	69.2%
Kaliak	75	11853	33,581	64.7%
Kaliak	50	15605	37,637	58.5%
Kaliak	25	24842	48,876	49.2%
Tsiu	100	20073	84,187	76.2%
Tsiu	75	25385	91,808	72.3%
Tsiu	50	35188	106,771	67.0%
Tsiu	25	61671	150,461	59.0%

[a] Model refers to the proportion of total escapement assumed to be indexed by peak escapement counts.

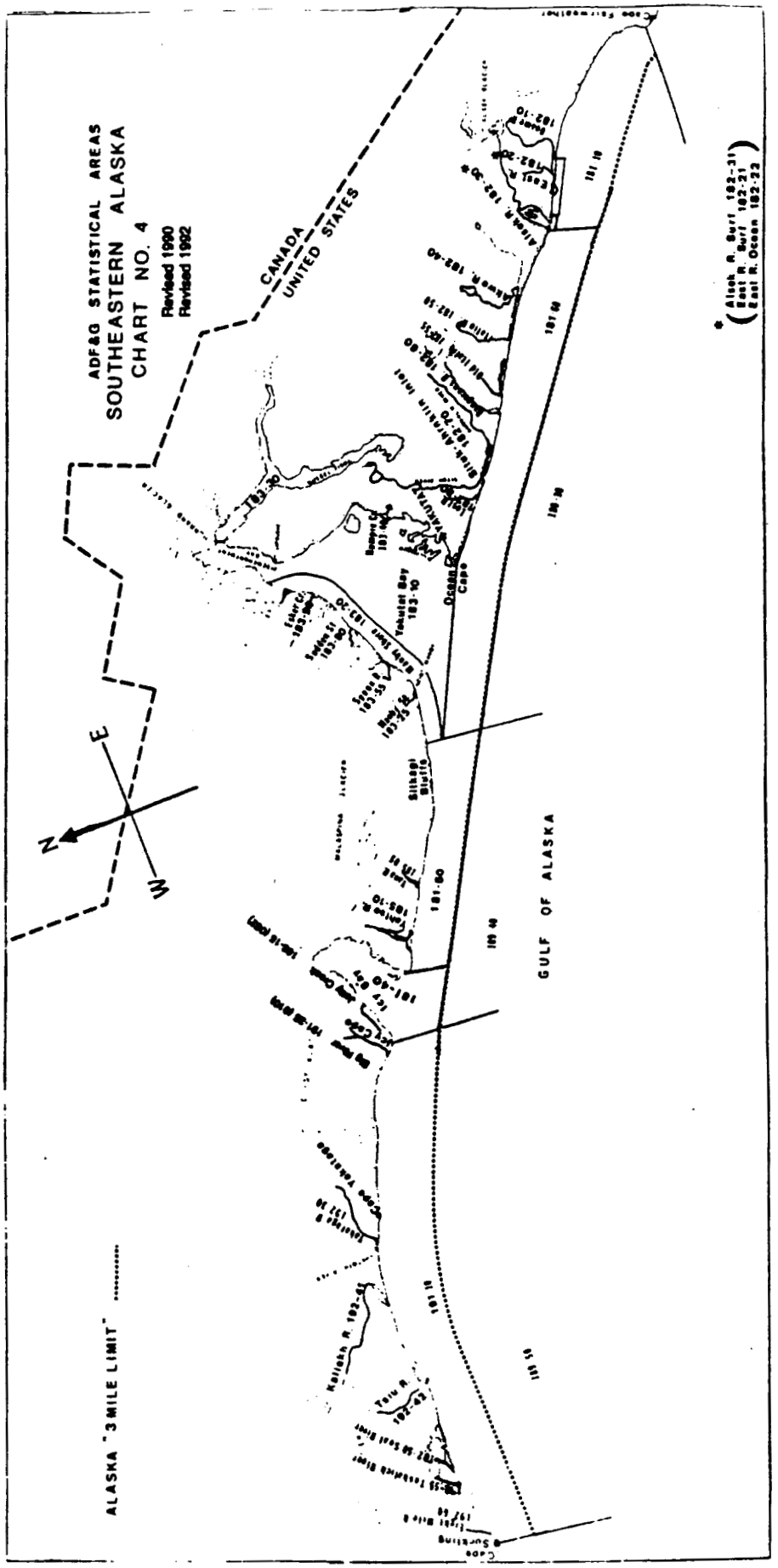

Figure 1. Map of Yakutat Area.

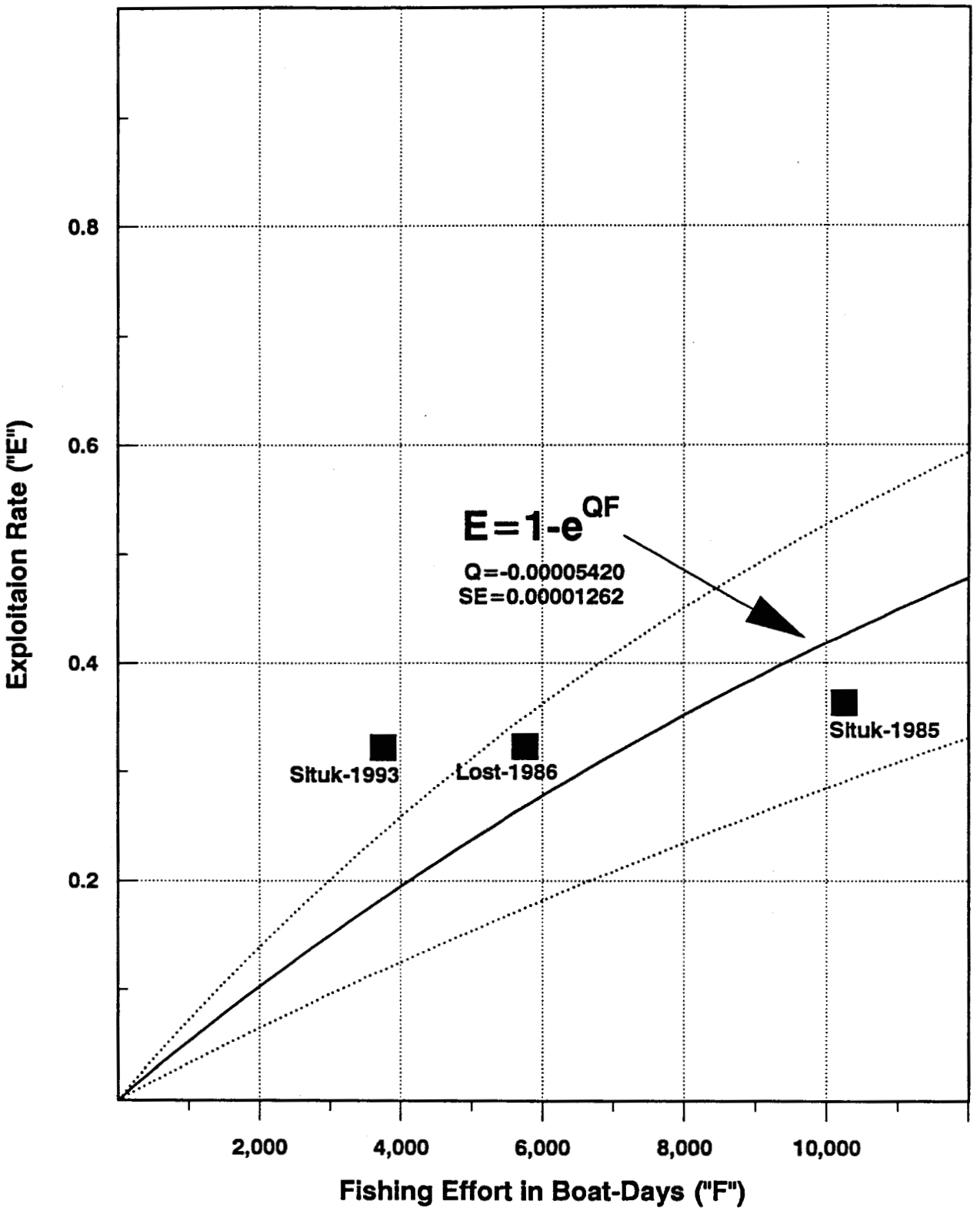

Figure 2. Relationship between fishing effort in boat-days and estimated exploitation rate (solid line = estimate; dotted lines = 90% C.I.).

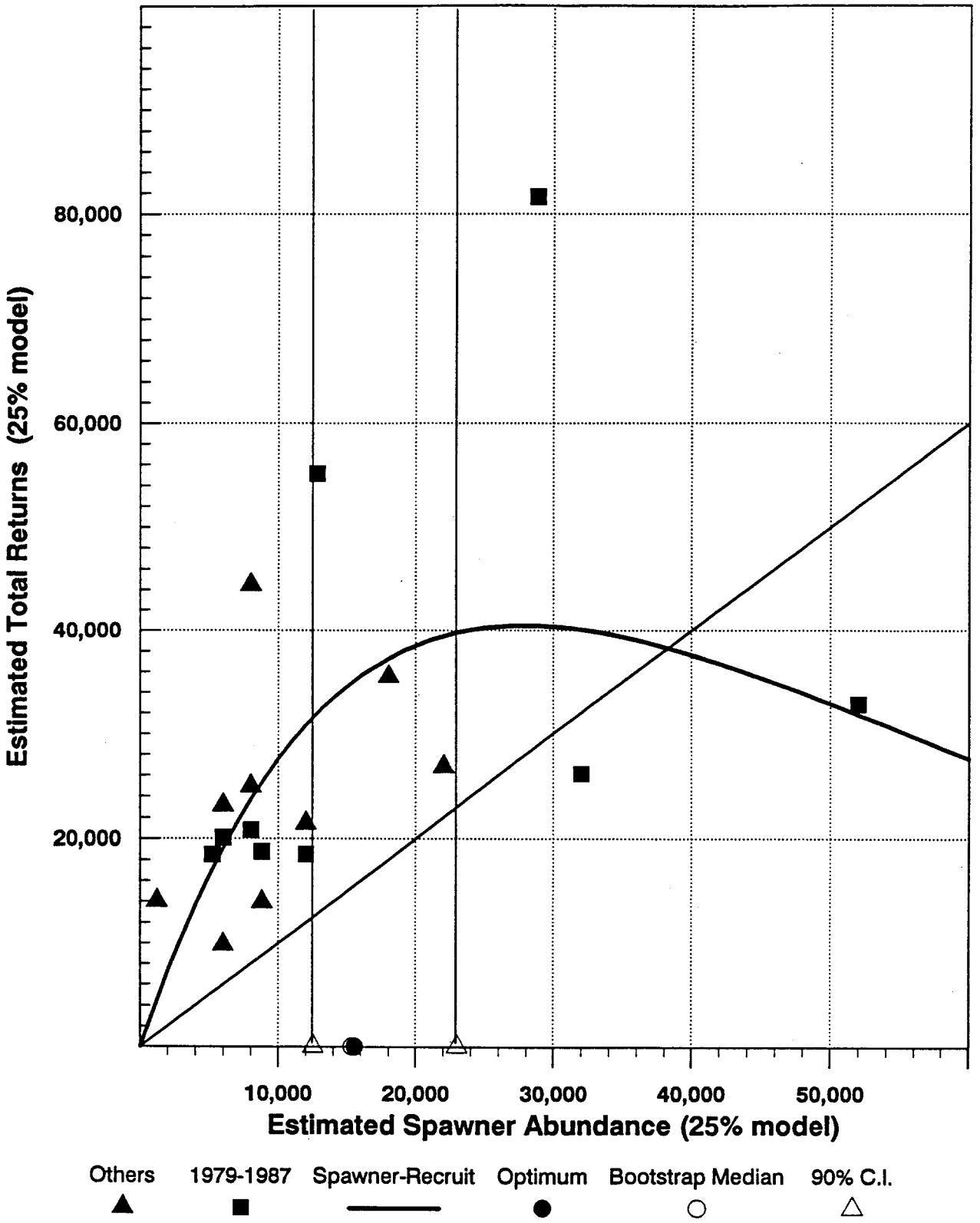

Figure 3. Spawner-recruit relationship for East Alsek River stock of coho salmon, 25% model.

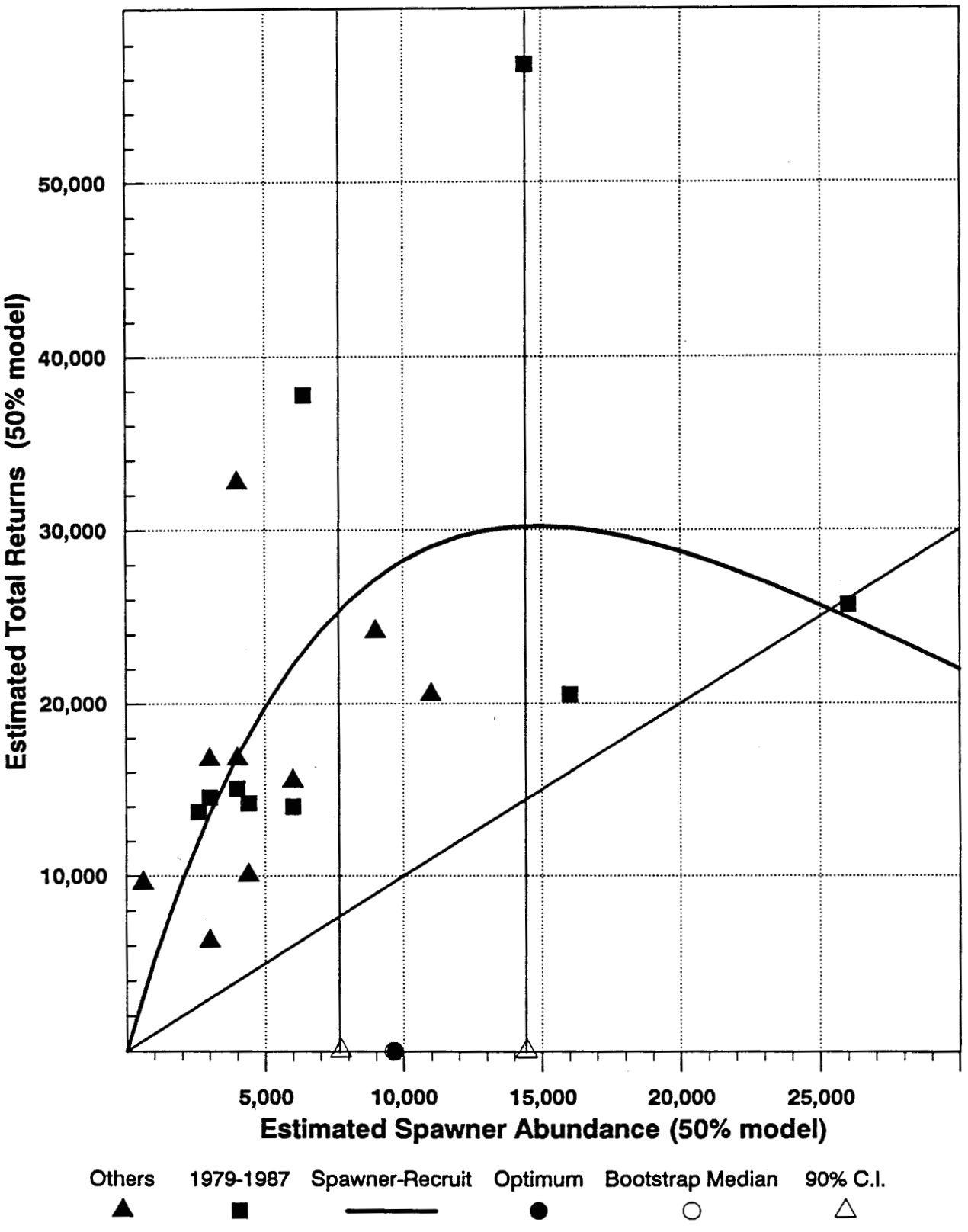

Figure 4. Spawner-recruit relationship for East Alsek River stock of coho salmon, 50% model.

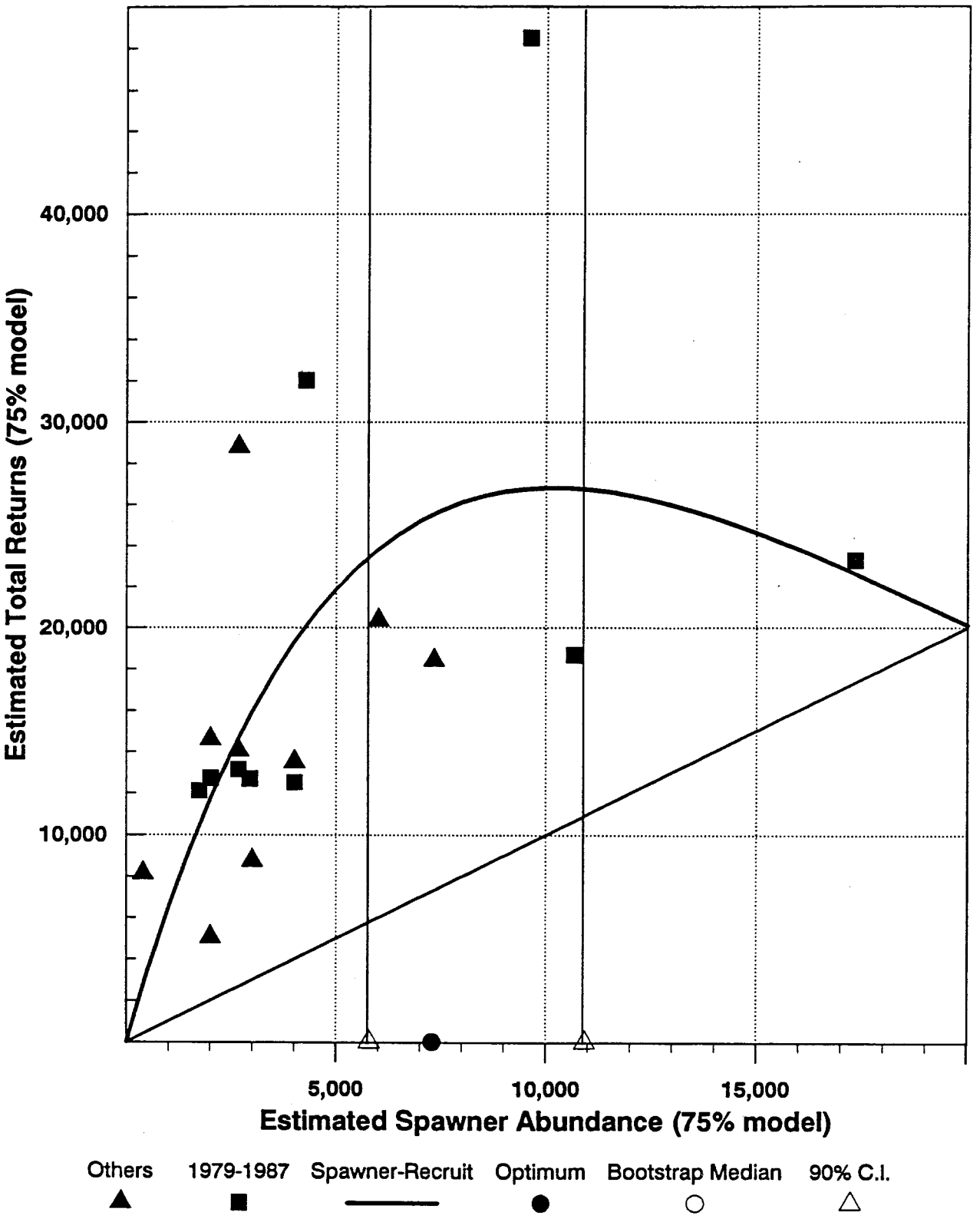

Figure 5. Spawner-recruit relationship for East Alsek River stock of coho salmon, 75% model.

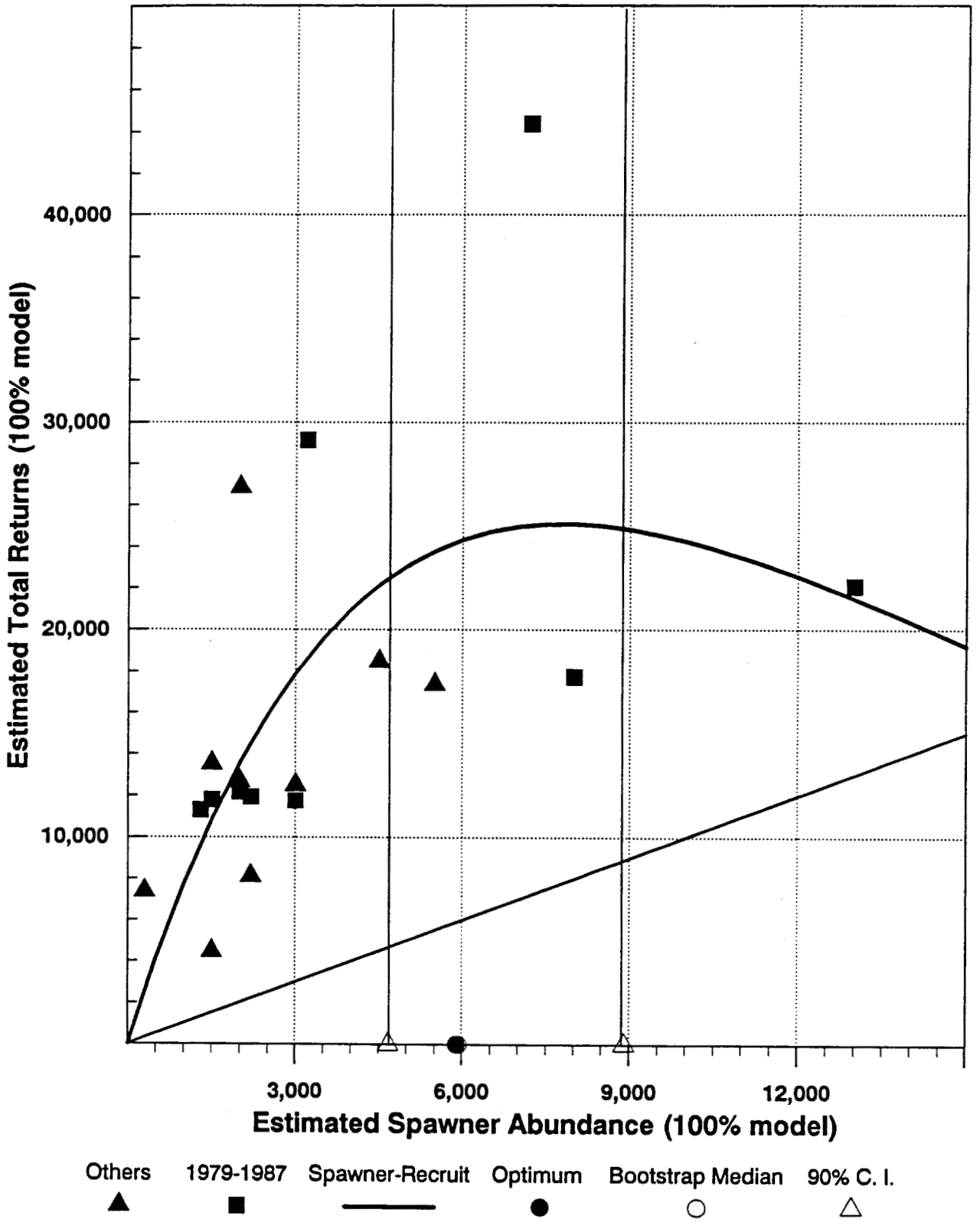

Figure 6. Spawner-recruit relationship for East Alsek River stock of coho salmon, 100% model.

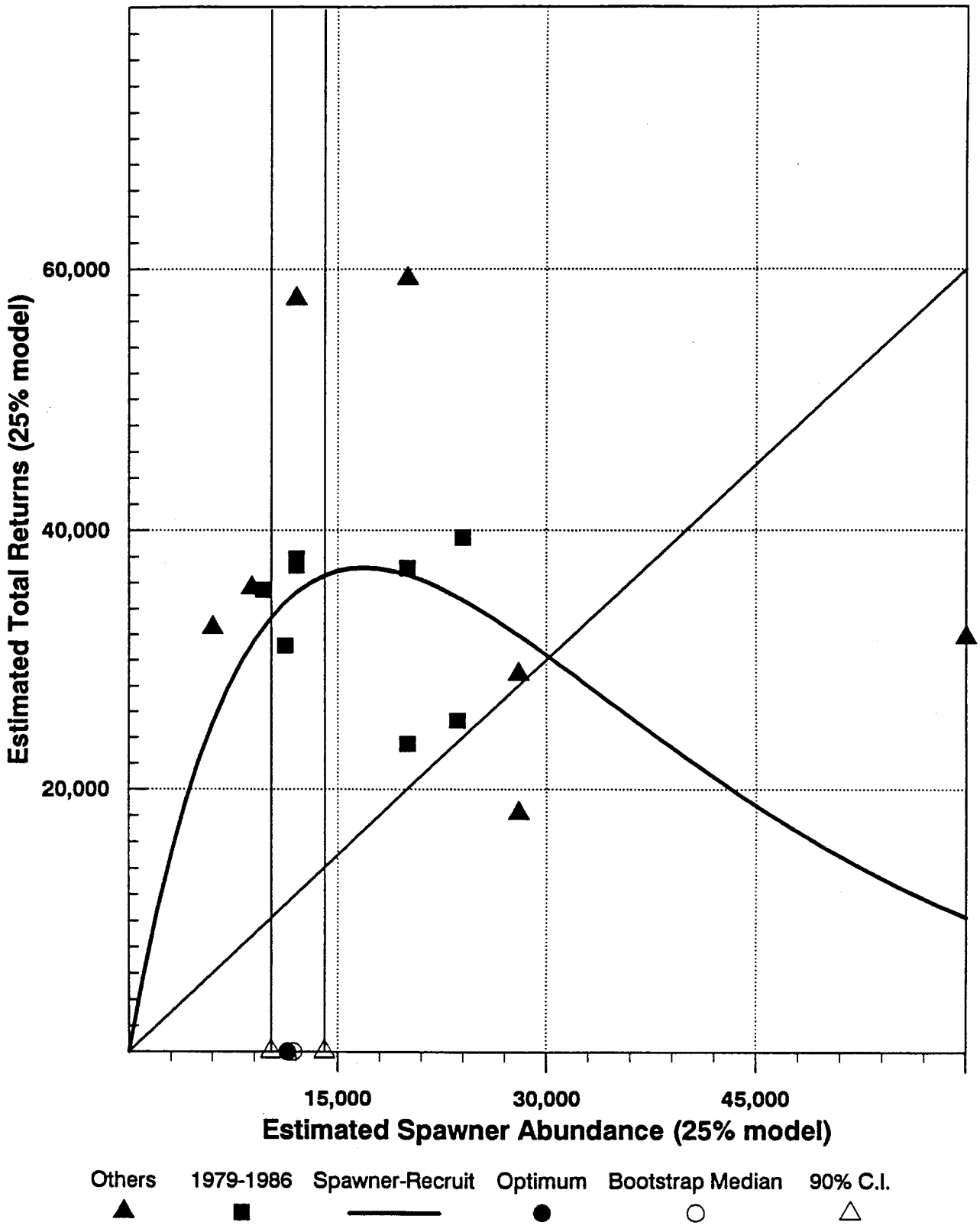

Figure 7. Spawner-recruit relationship for Akwe River stock of coho salmon, 25% model.

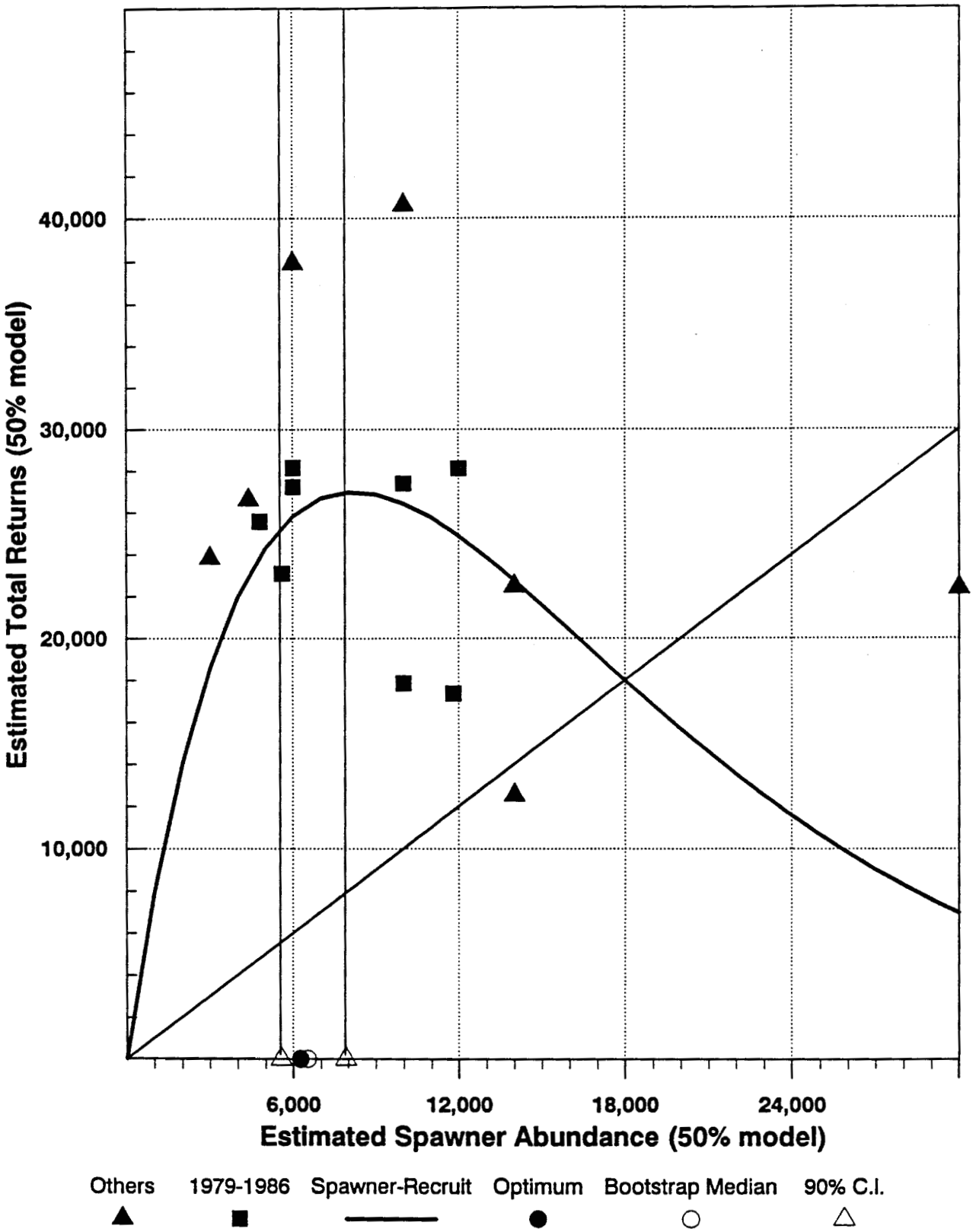

Figure 8. Spawner-recruit relationship for Akwe River stock of coho salmon, 50% model.

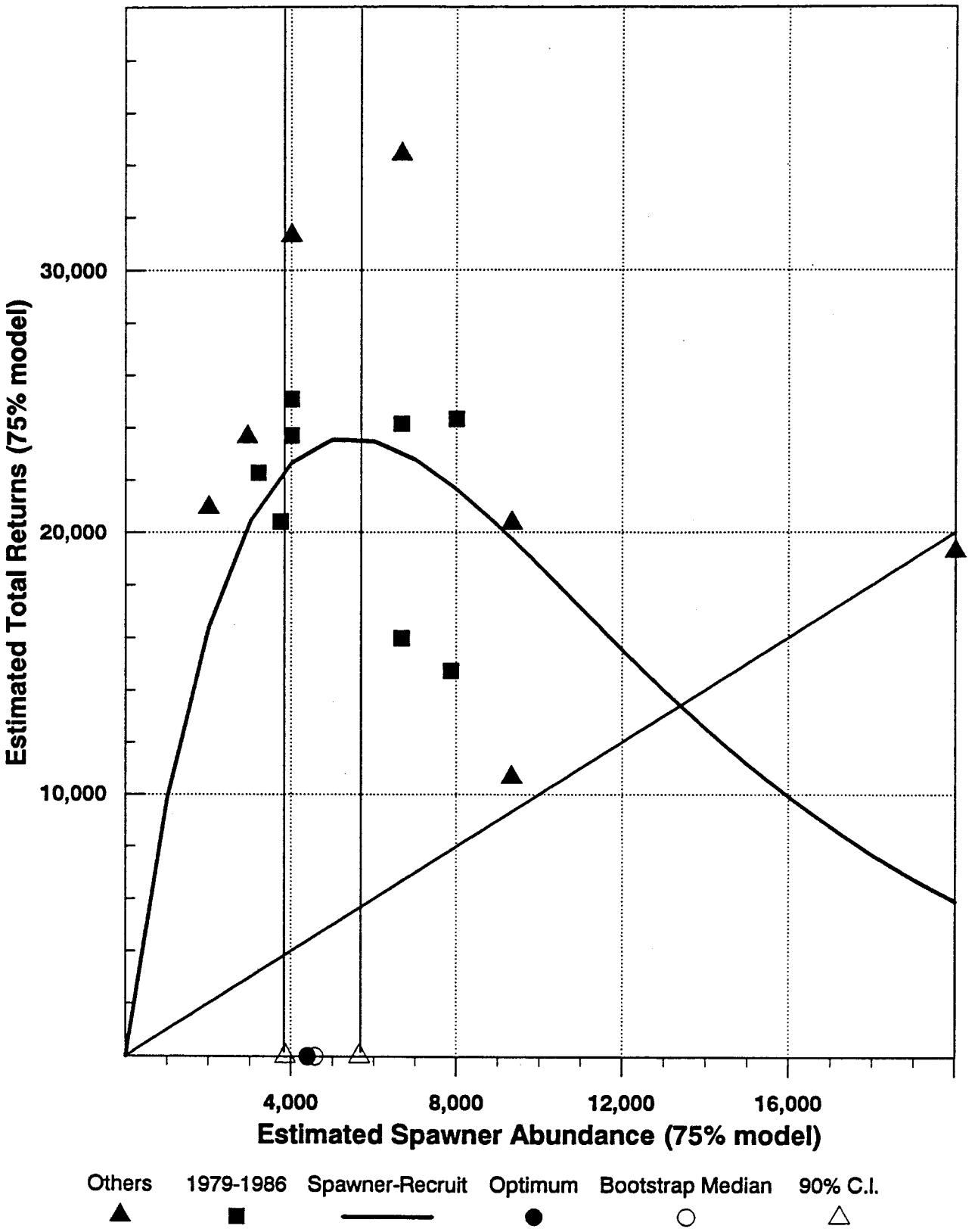

Figure 9. Spawner-recruit relationship for Akwe River stock of coho salmon, 75% model.

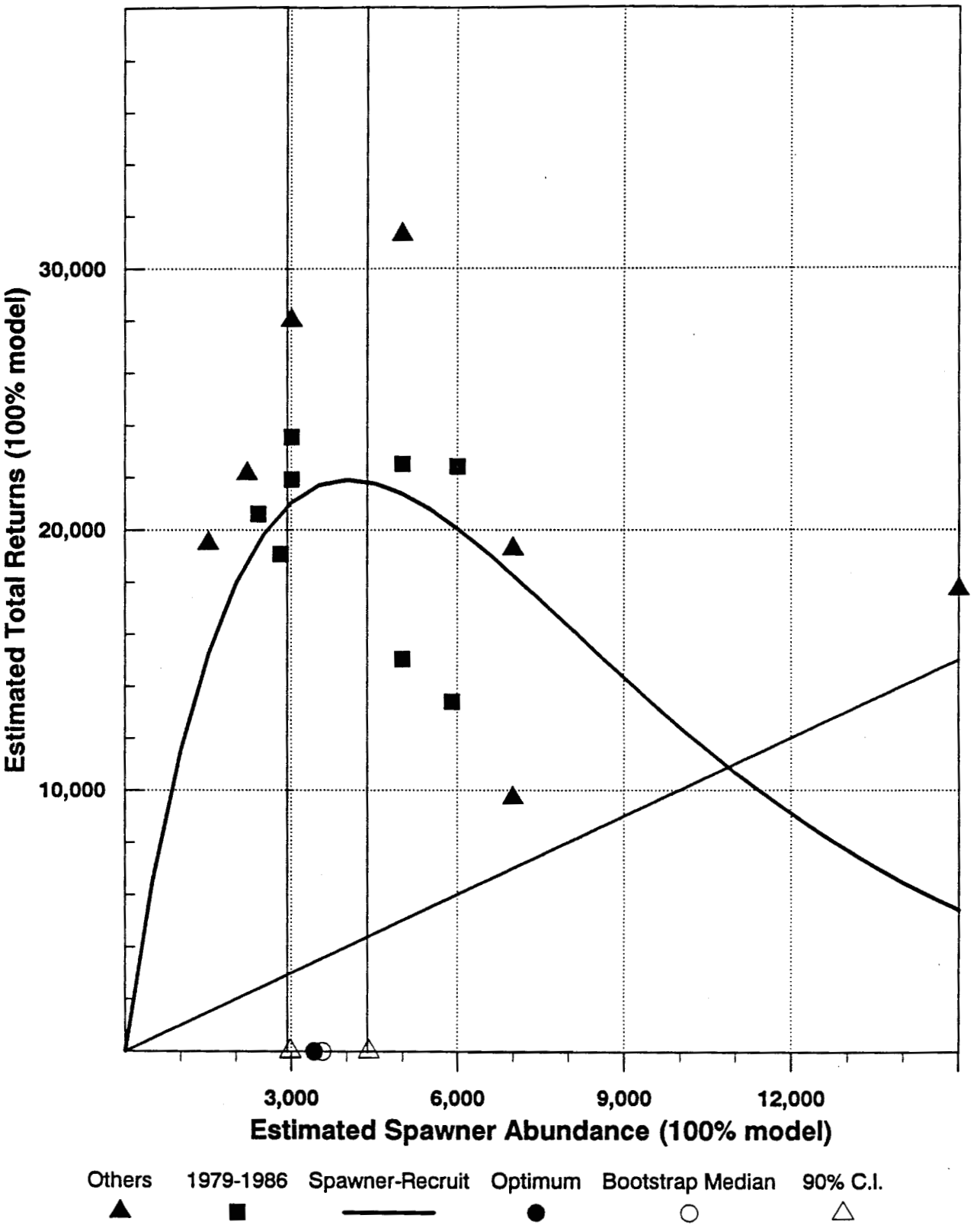

Figure 10. Spawner-recruit relationship for Akwe River stock of coho salmon, 100% model.

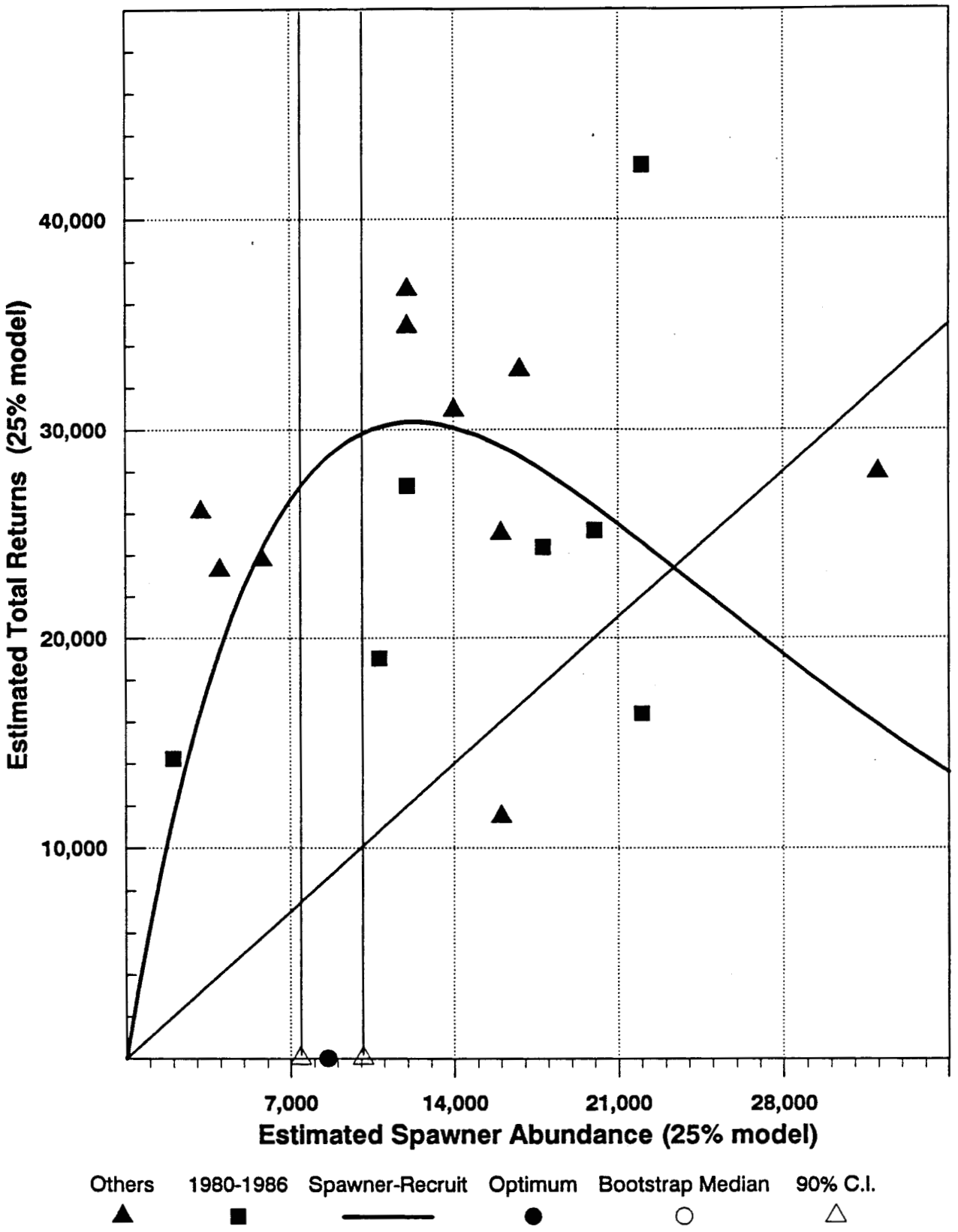

Figure 11. Spawner-recruit relationship for Italio River stock of coho salmon, 25% model.

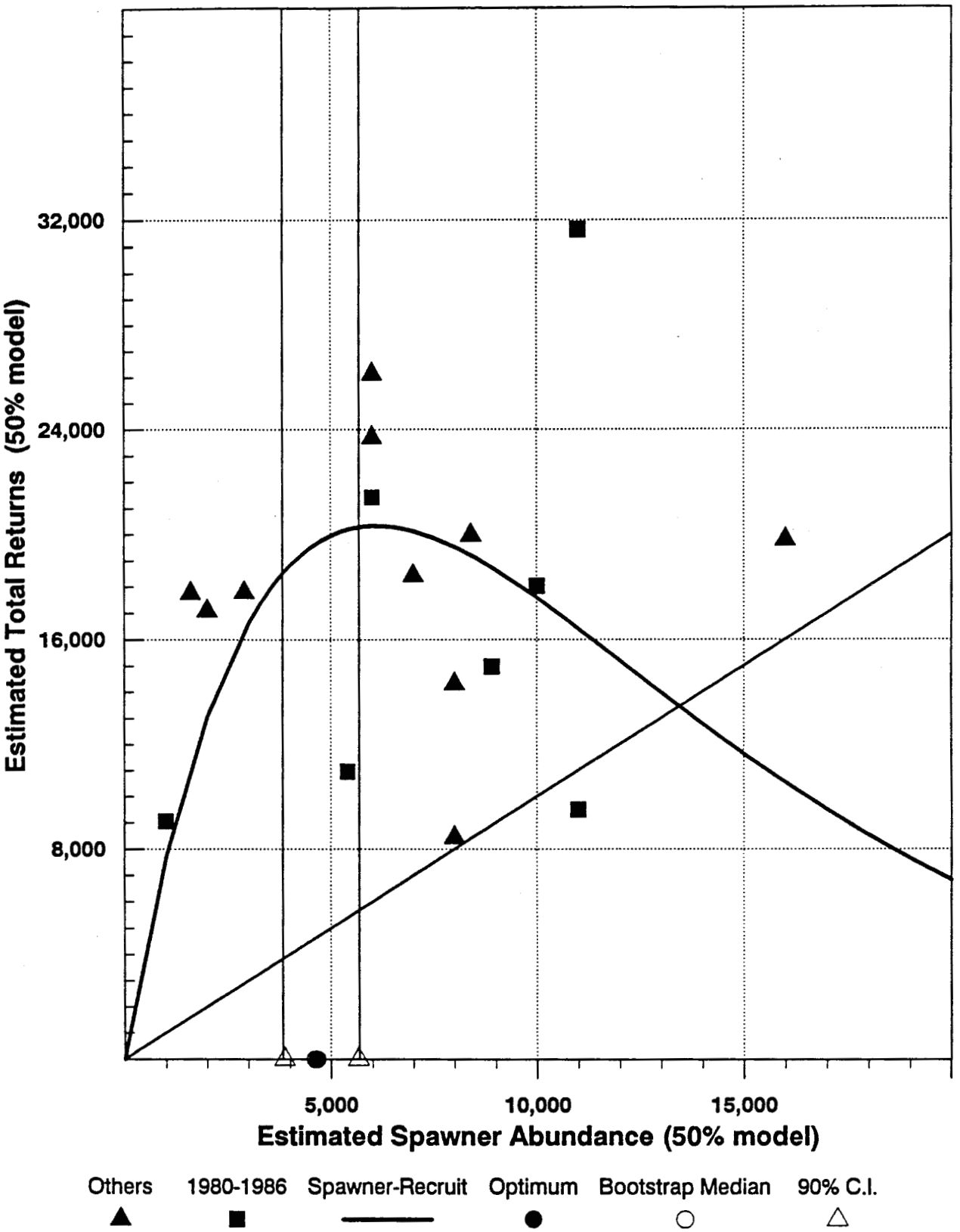

Figure 12. Spawner-recruit relationship for Italio River stock of coho salmon, 50% model.

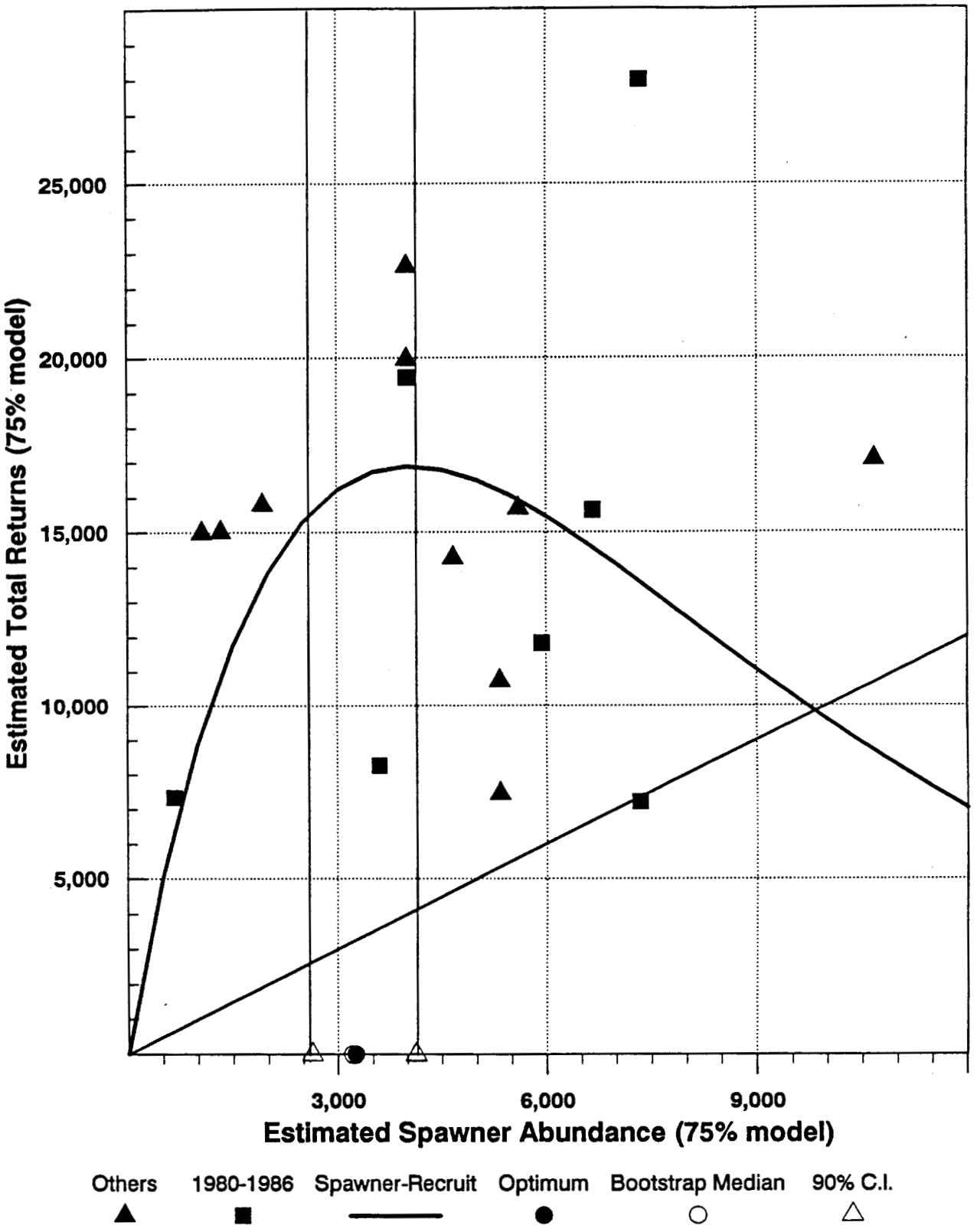

Figure 13. Spawner-recruit relationship for Italio River stock of coho salmon, 75% model.

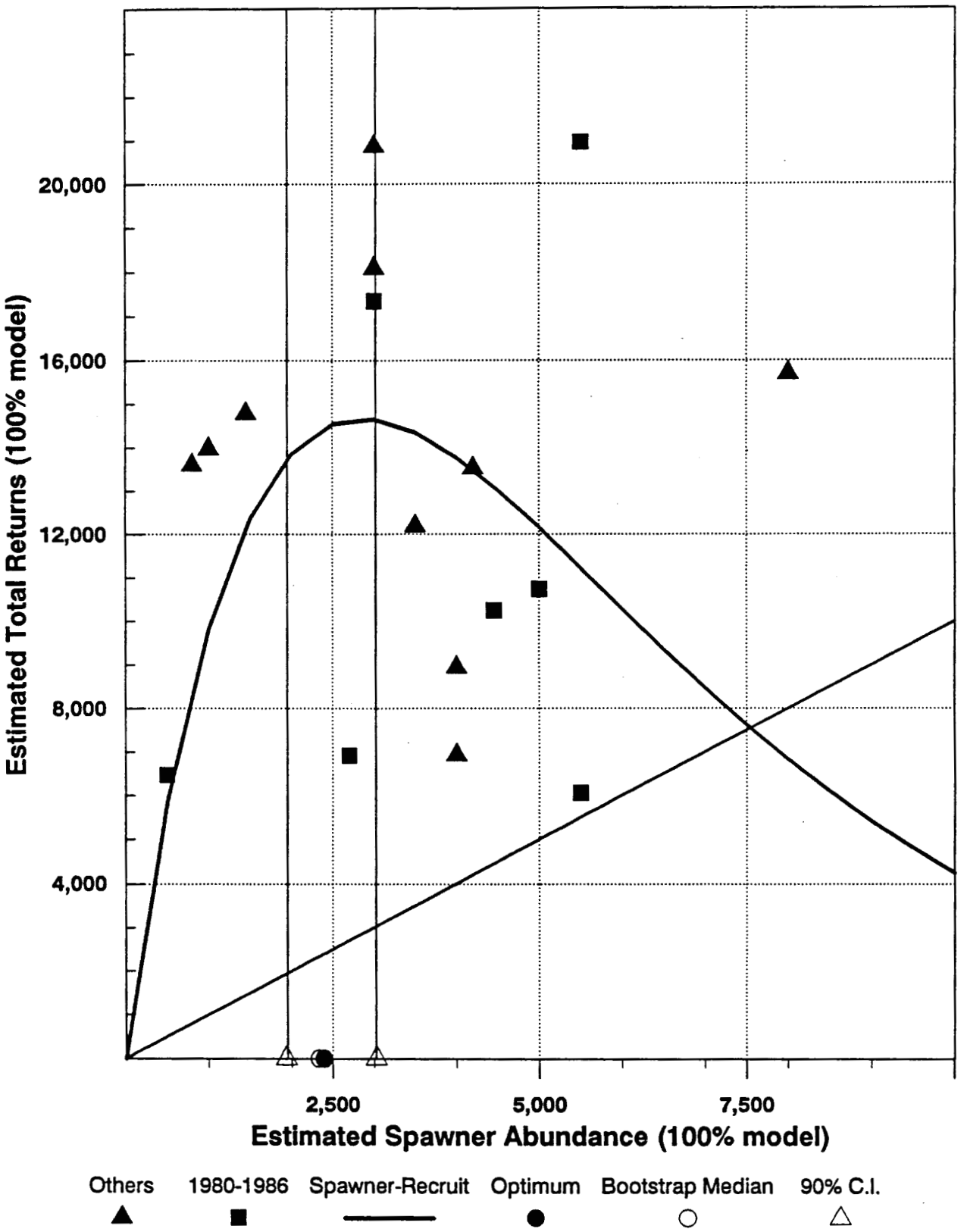

Figure 14. Spawner-recruit relationship for Italio River stock of coho salmon, 100% model.

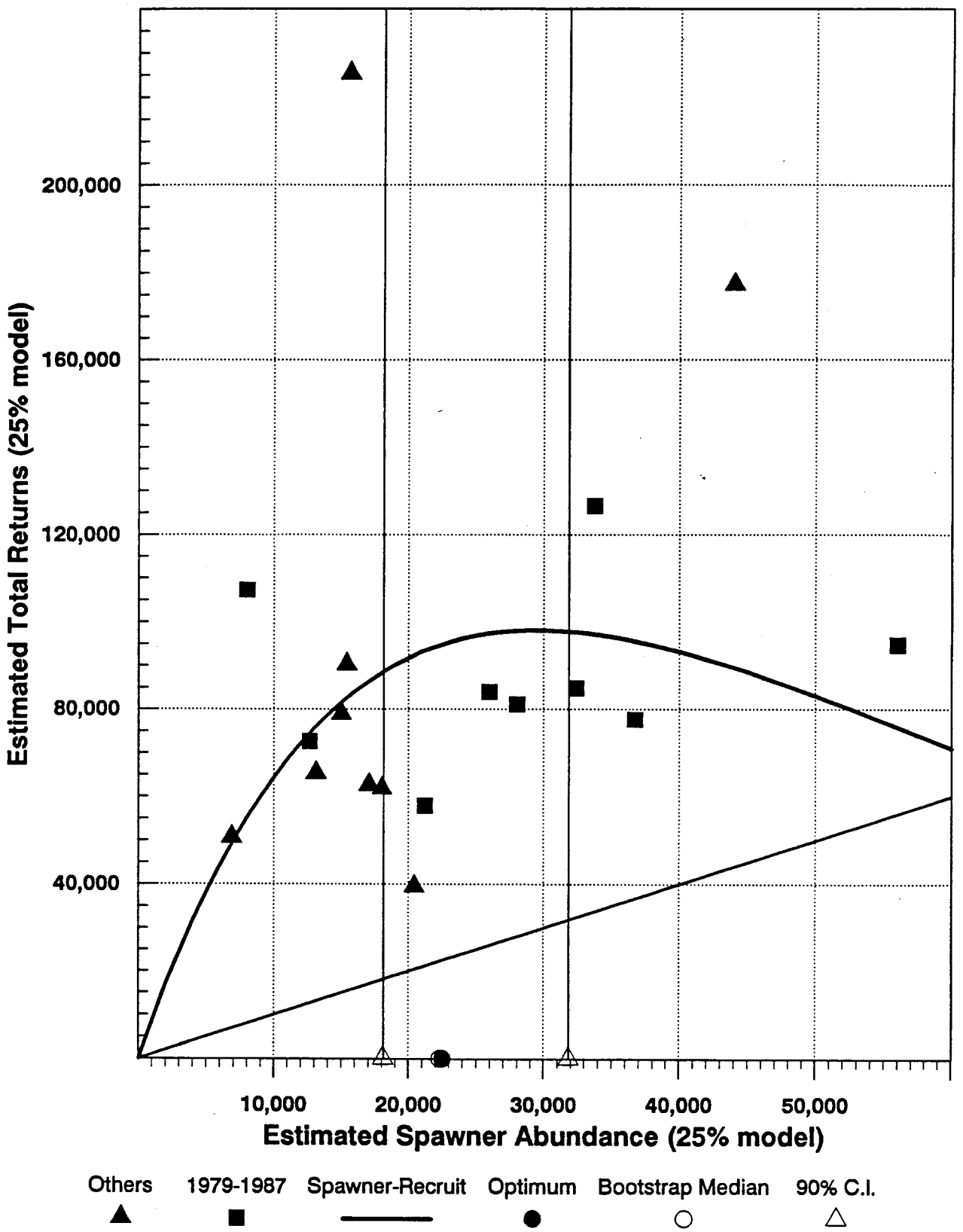

Figure 15. Spawner-recruit relationship for Situk River stock of coho salmon, 25% model.

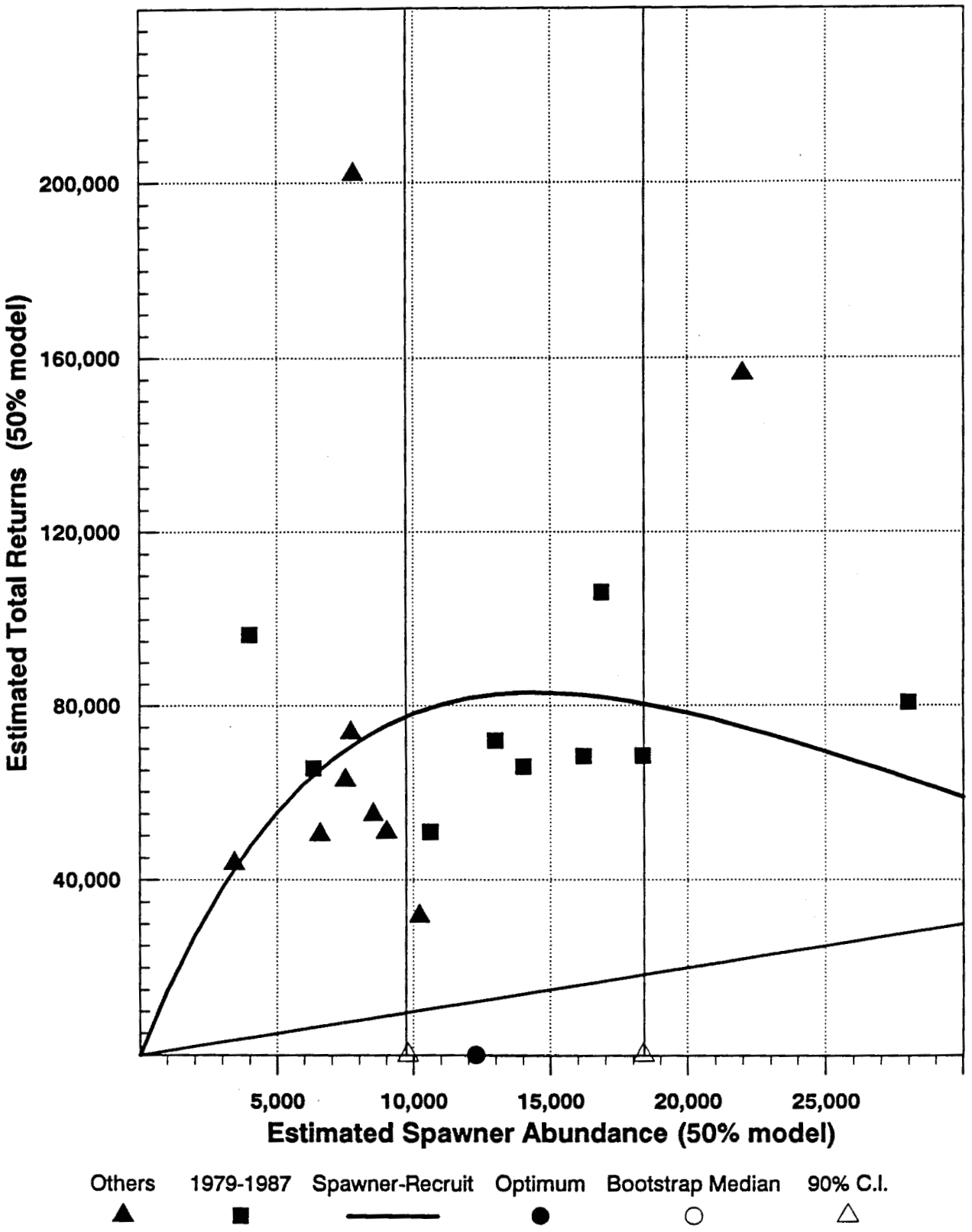

Figure 16. Spawner-recruit relationship for Situk River stock of coho salmon, 50% model.

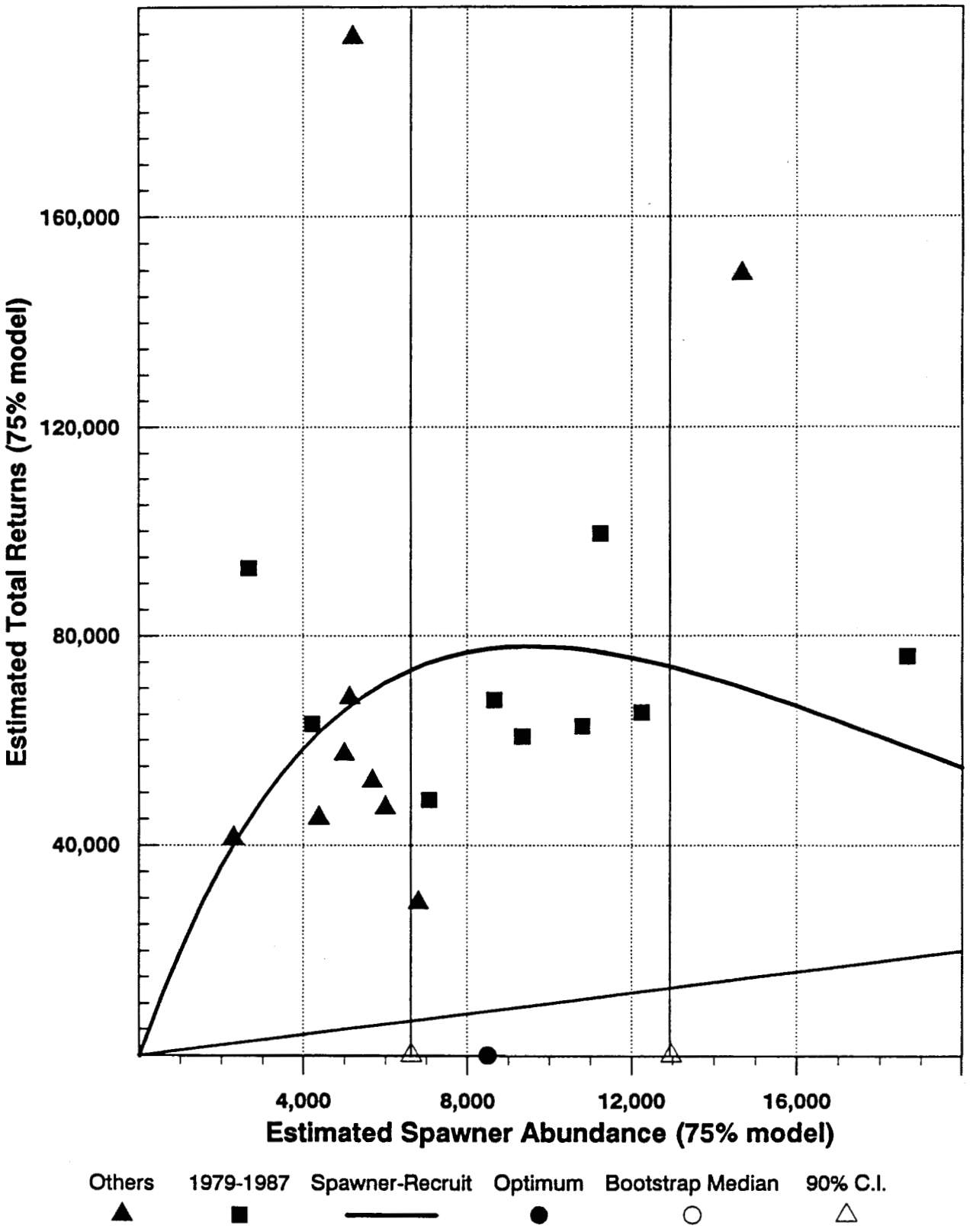

Figure 17. Spawner-recruit relationship for Situk River stock of coho salmon, 75% model.

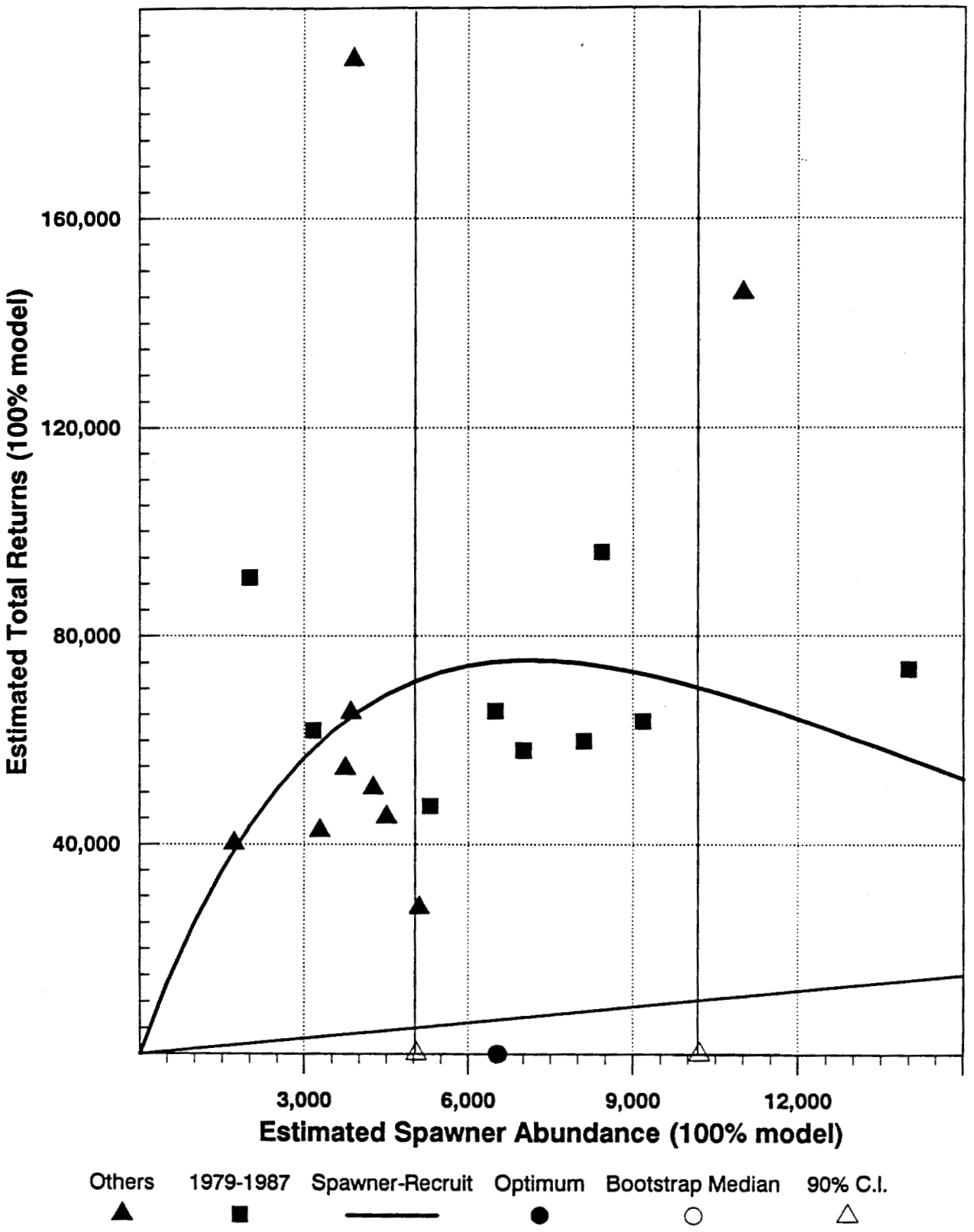

Figure 18. Spawner-recruit relationship for Situk River stock of coho salmon, 100% model.

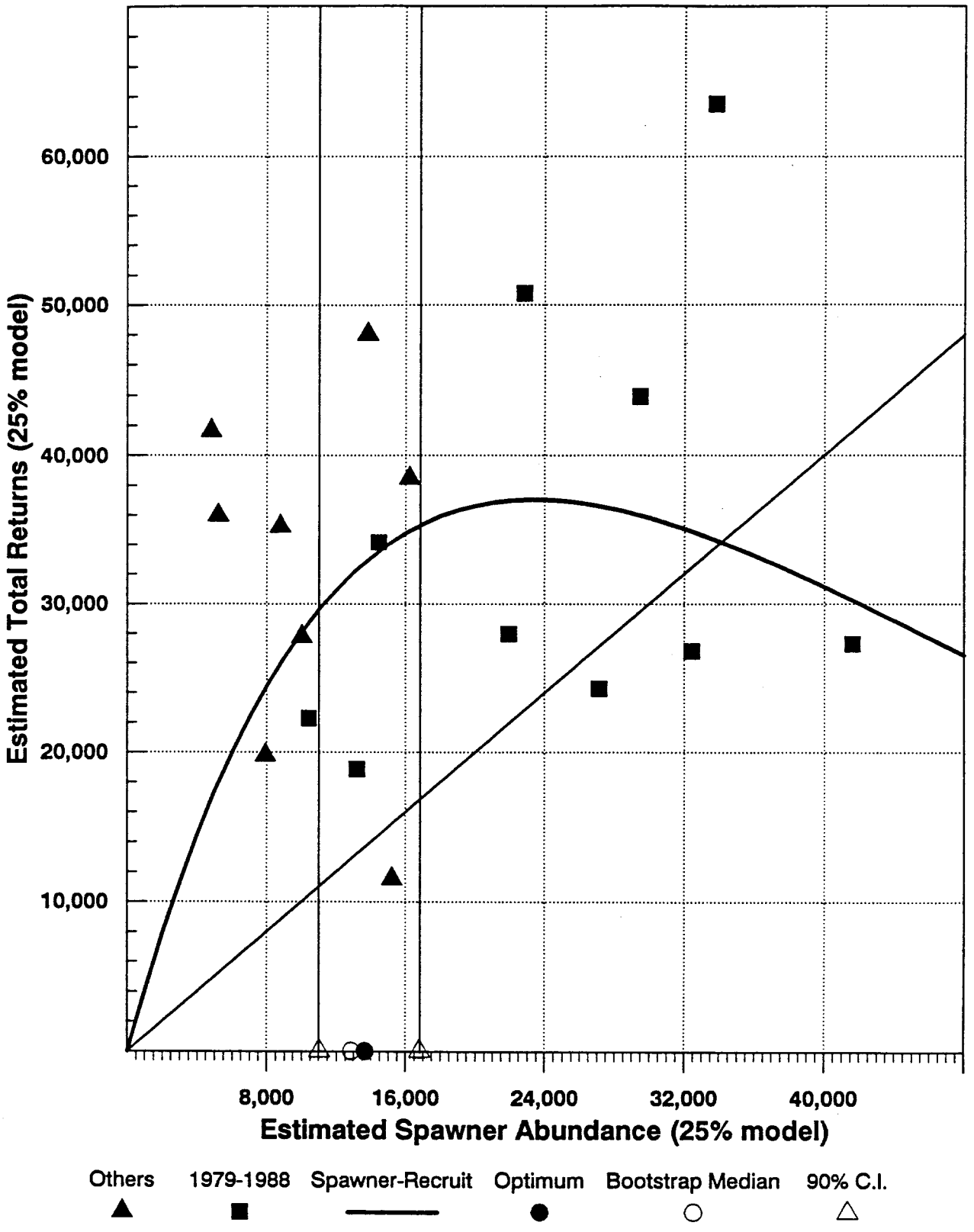

Figure 19. Spawner-recruit relationship for Lost River stock of coho salmon, 25% model.

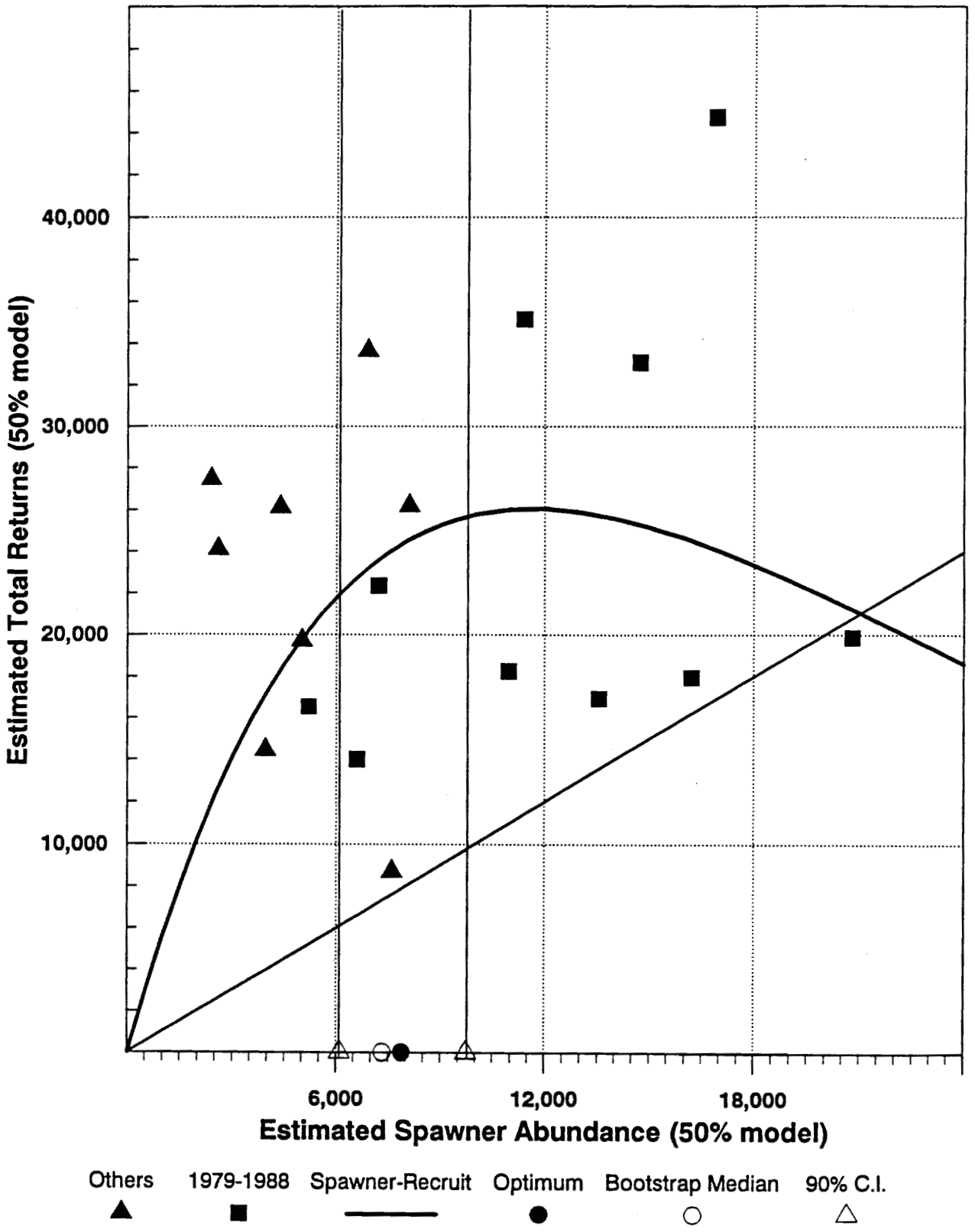

Figure 20. Spawner-recruit relationship for Lost River stock of coho salmon, 50% model.

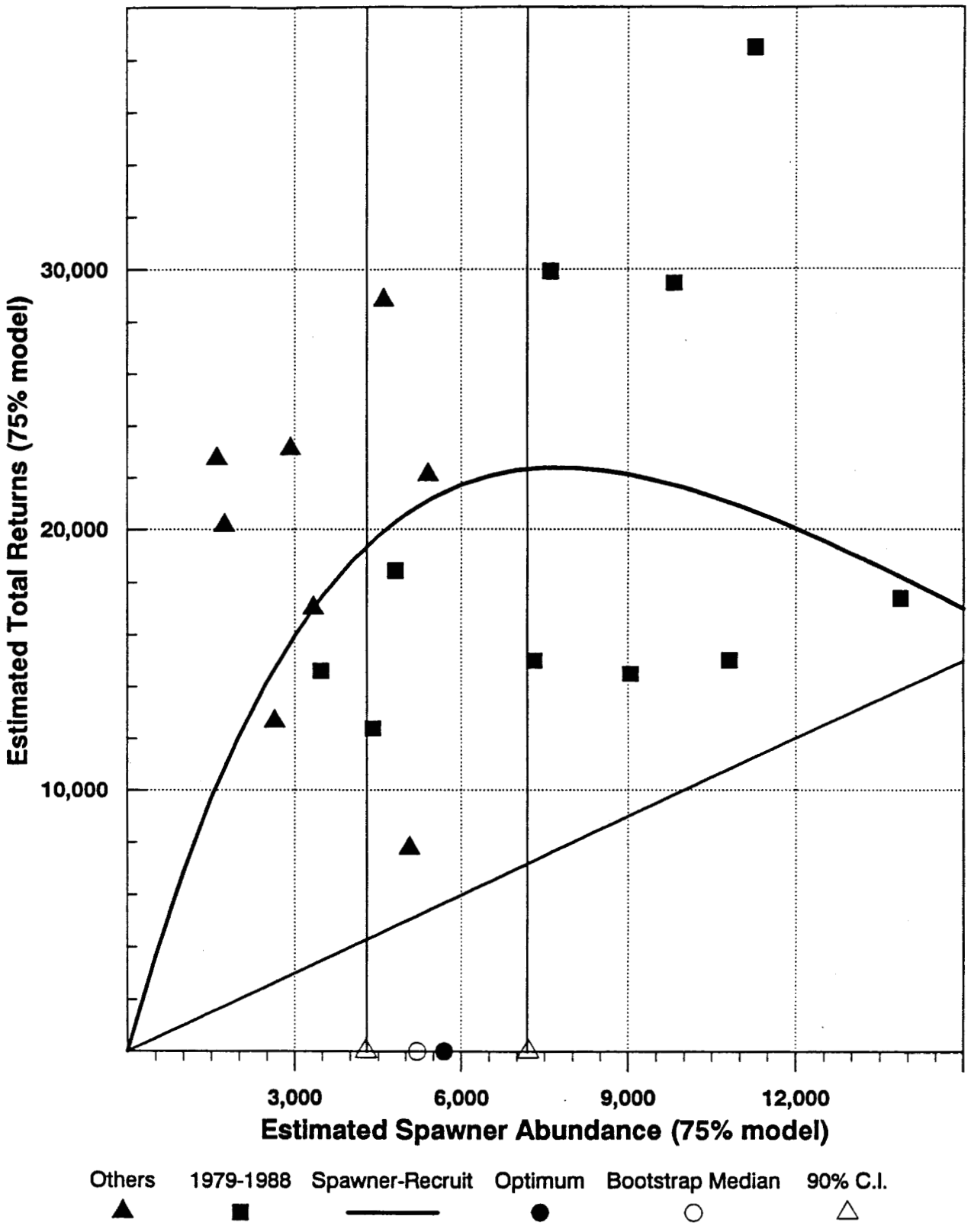

Figure 21. Spawner-recruit relationship for Lost River stock of coho salmon, 75% model.

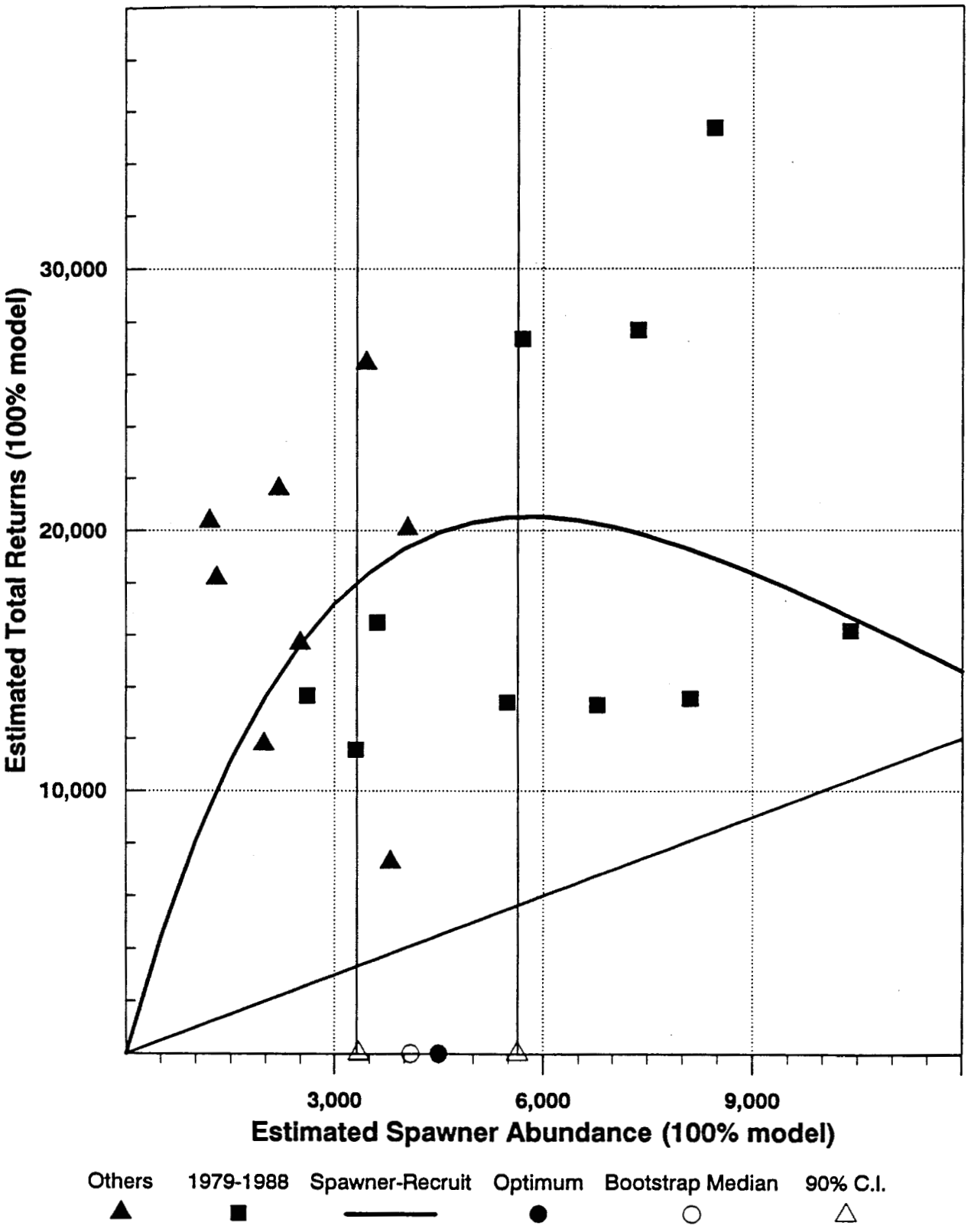

Figure 22. Spawner-recruit relationship for Lost River stock of coho salmon, 100% model.

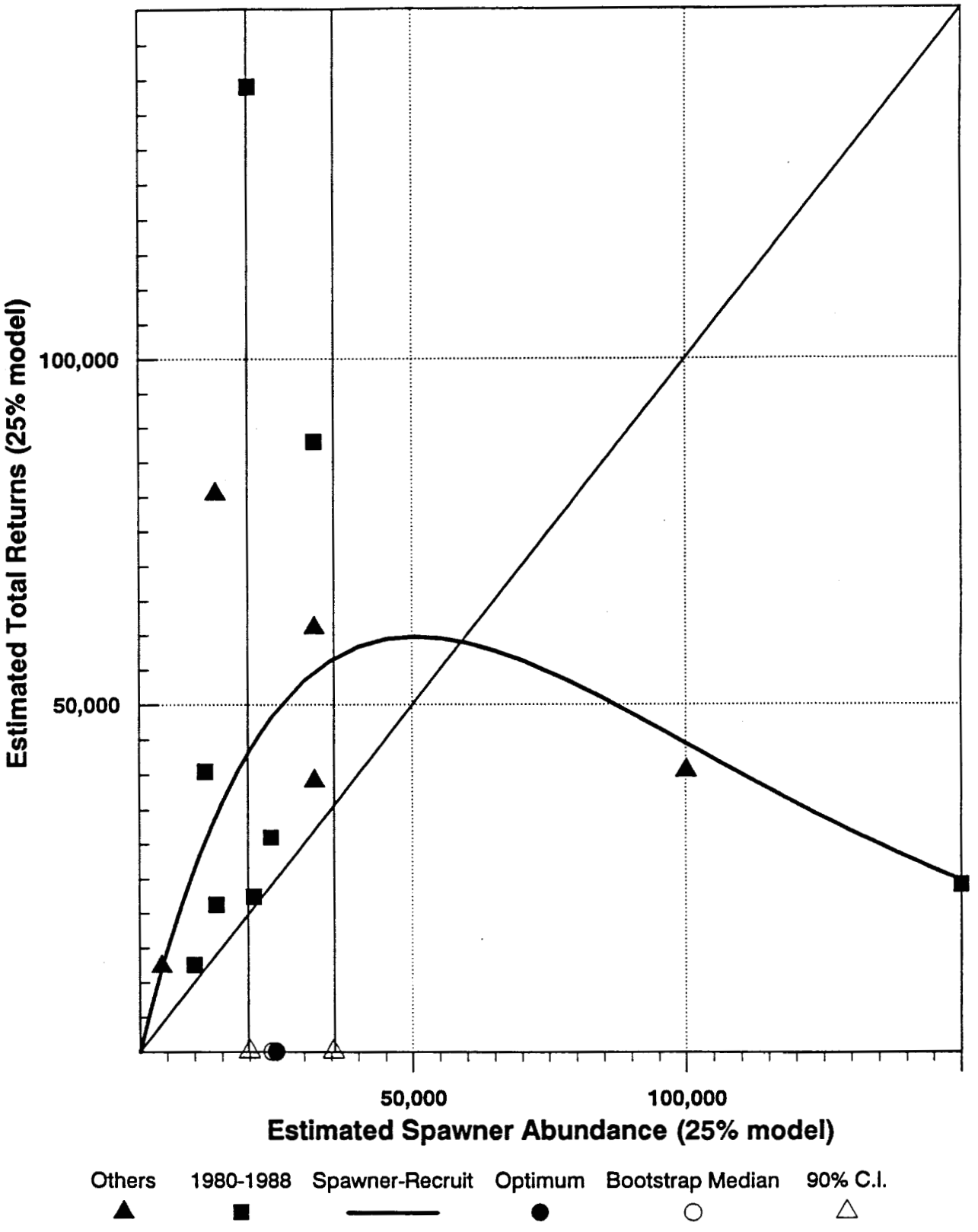

Figure 23. Spawner-recruit relationship for Kaliakh River stock of coho salmon, 25% model.

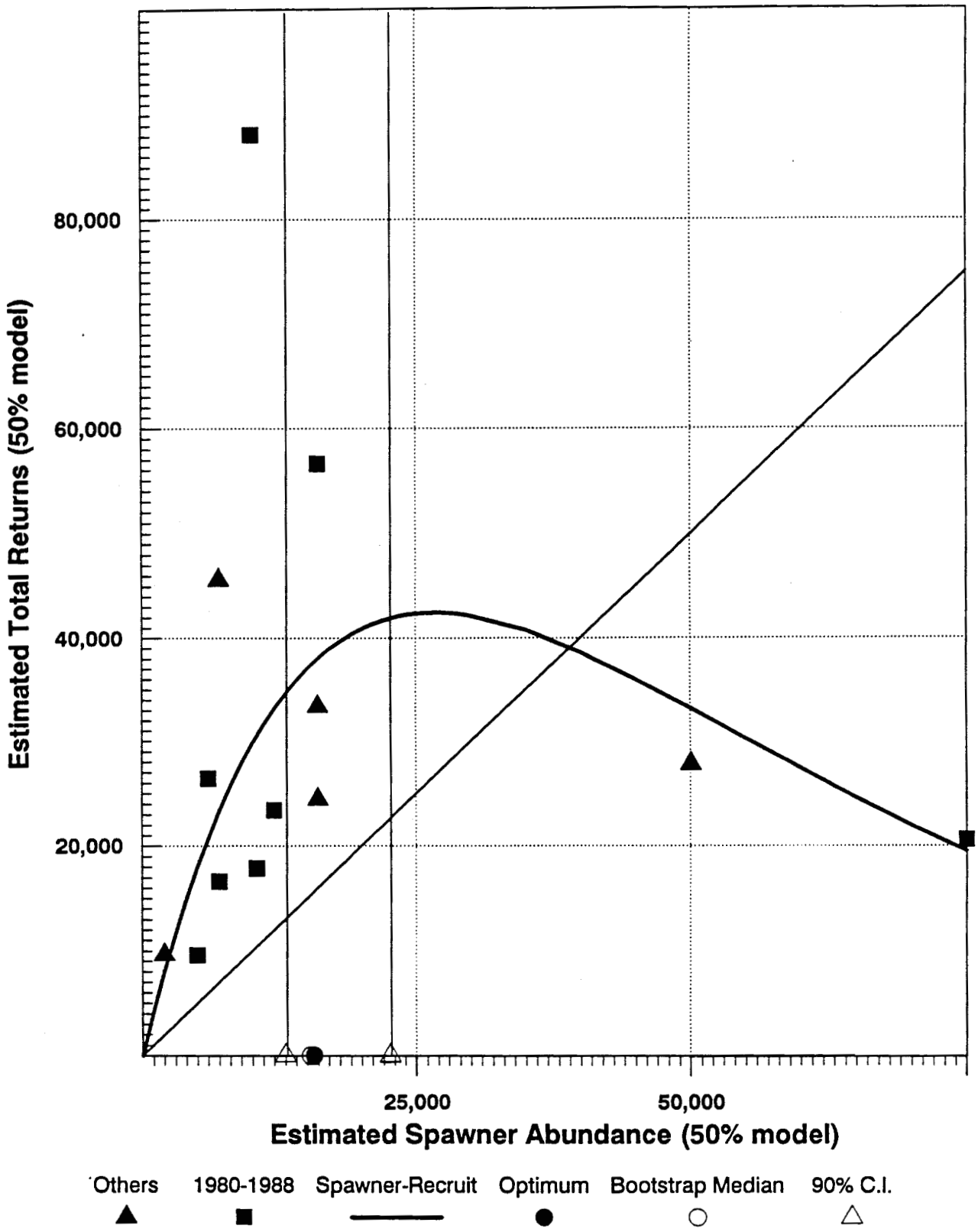

Figure 24. Spawner-recruit relationship for Kaliakh River stock of coho salmon, 50% model.

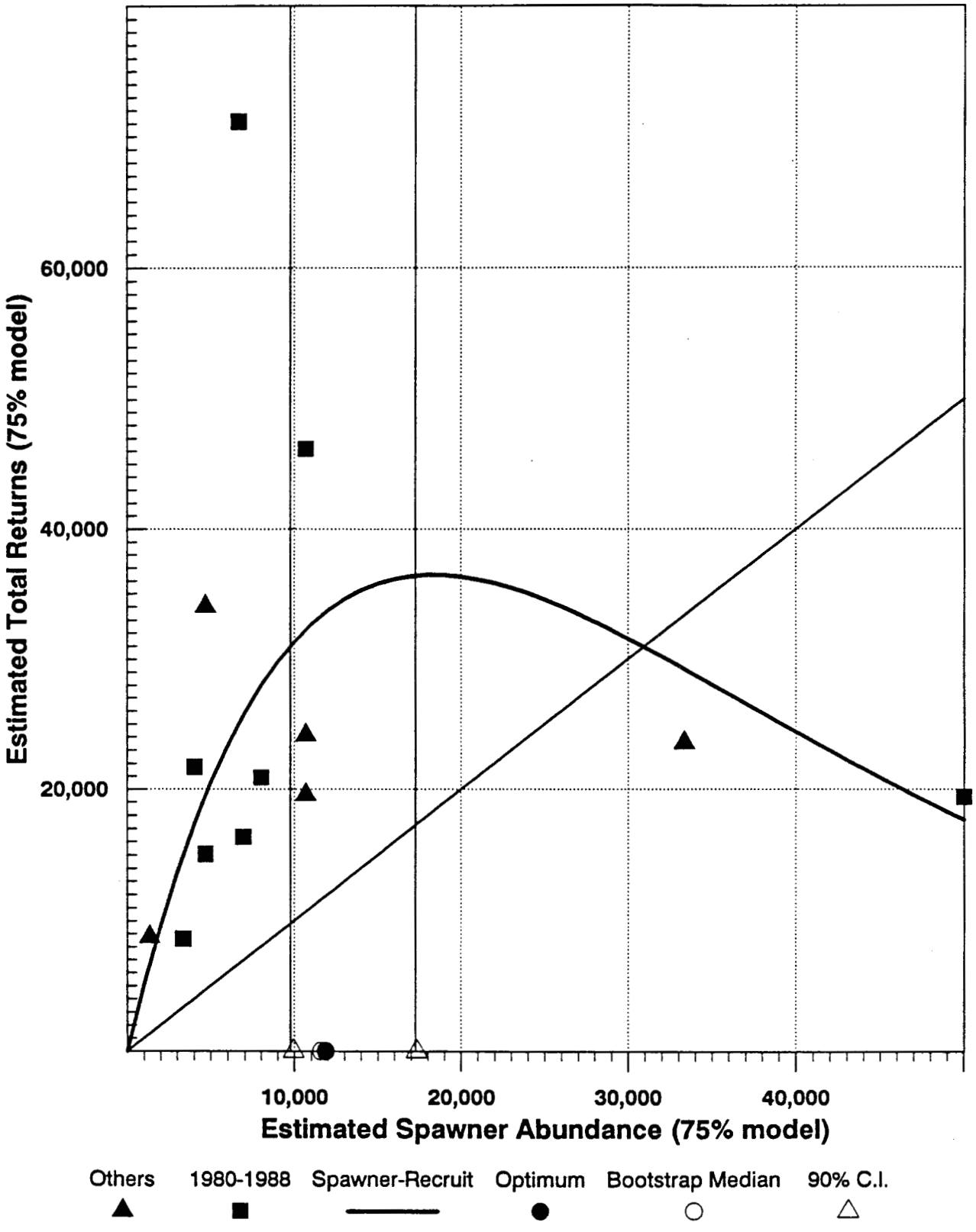

Figure 25. Spawner-recruit relationship for Kaliakh River stock of coho salmon, 75% model.

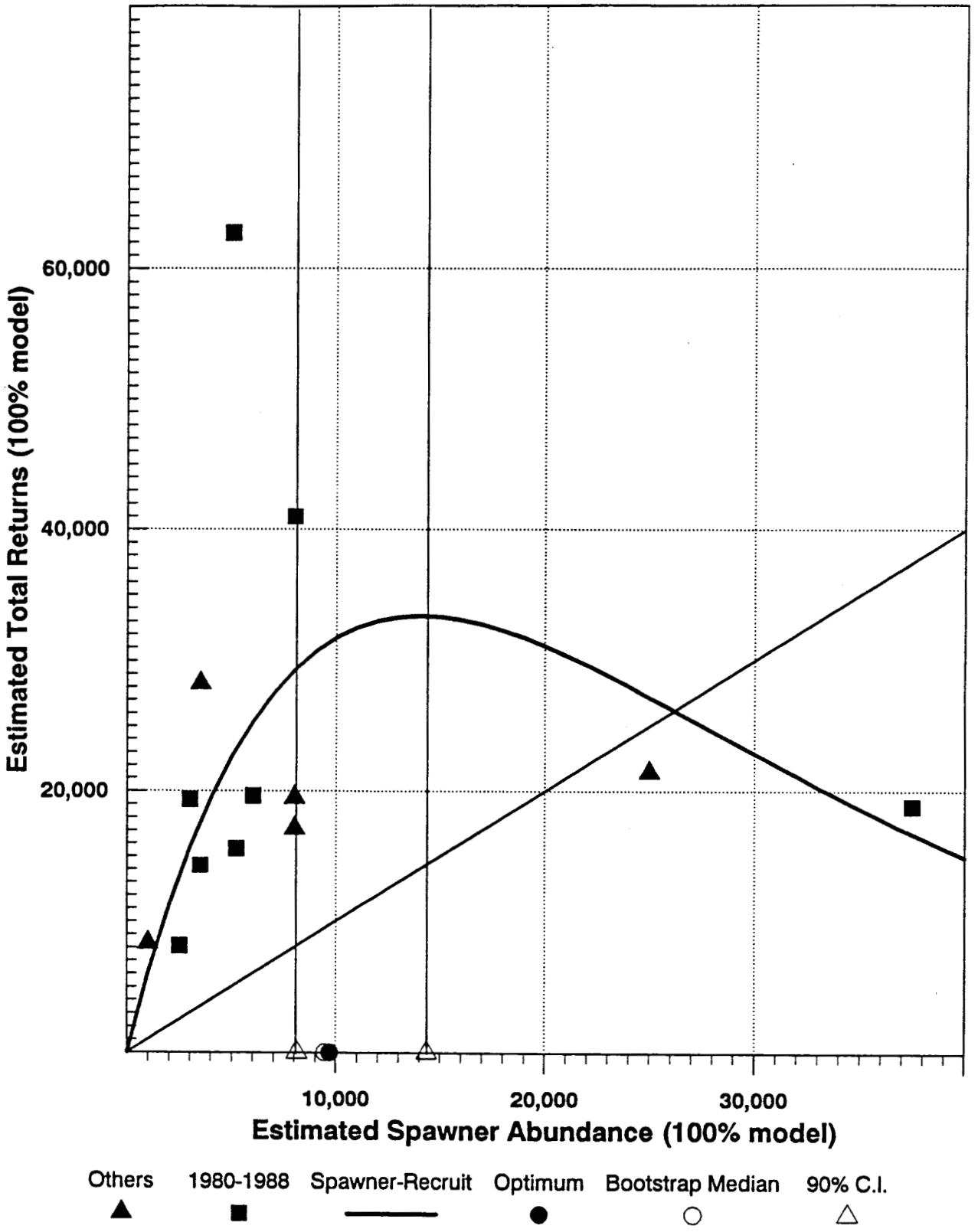

Figure 26. Spawner-recruit relationship for Kaliakh River stock of coho salmon, 100% model.

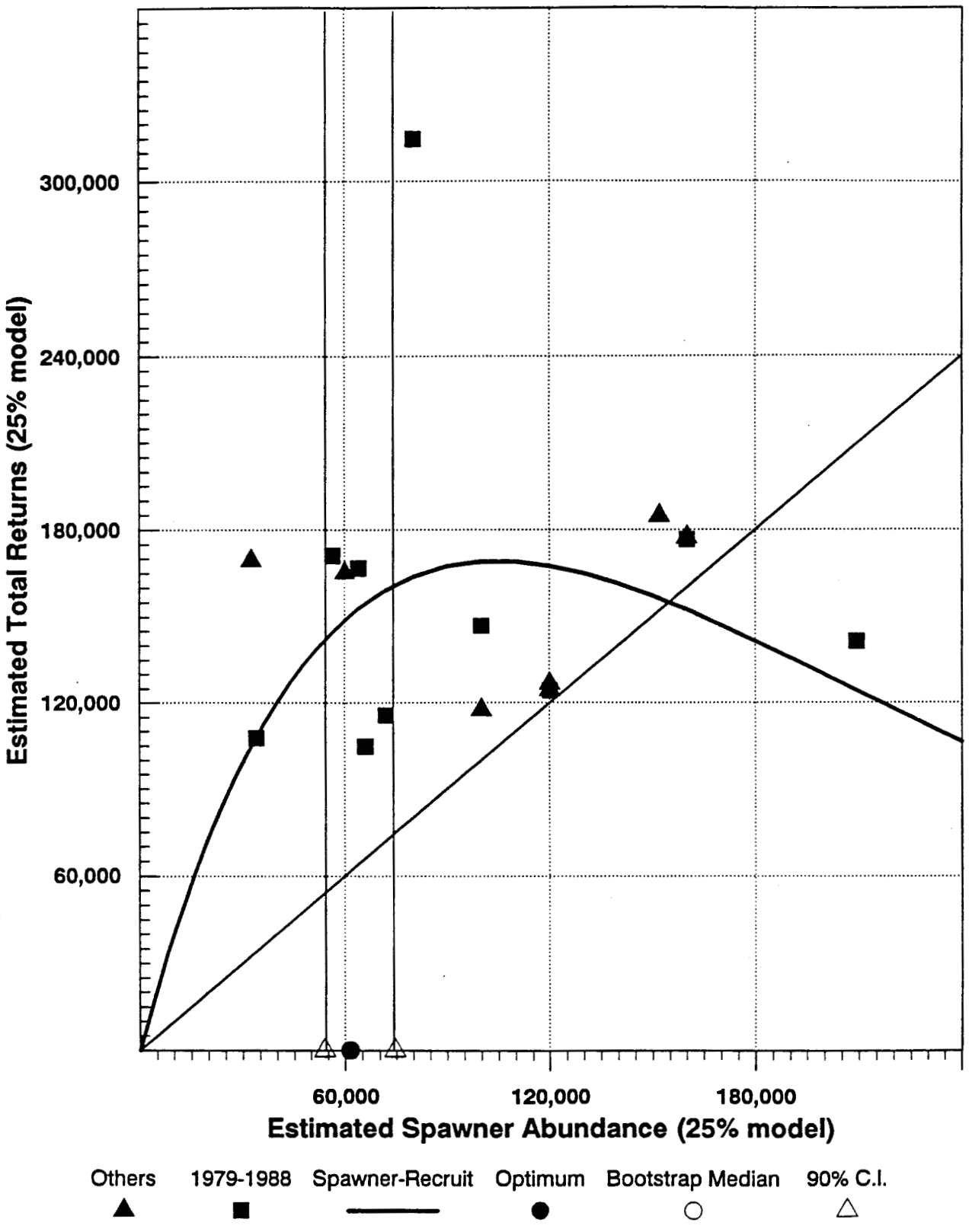

Figure 27. Spawner-recruit relationship for Tsiu River stock of coho salmon, 25% model.

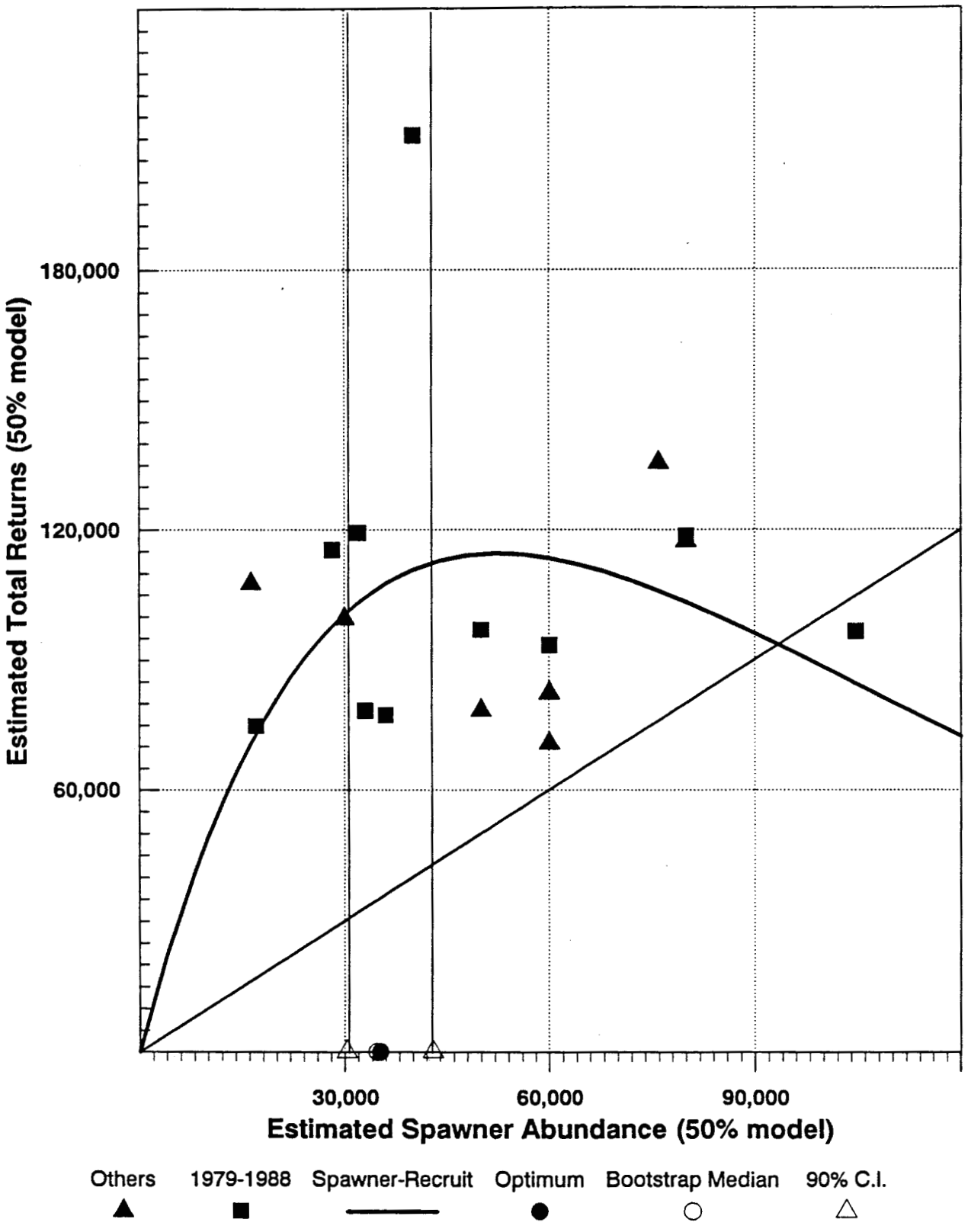

Figure 28. Spawner-recruit relationship for Tsiu River stock of coho salmon, 50% model.

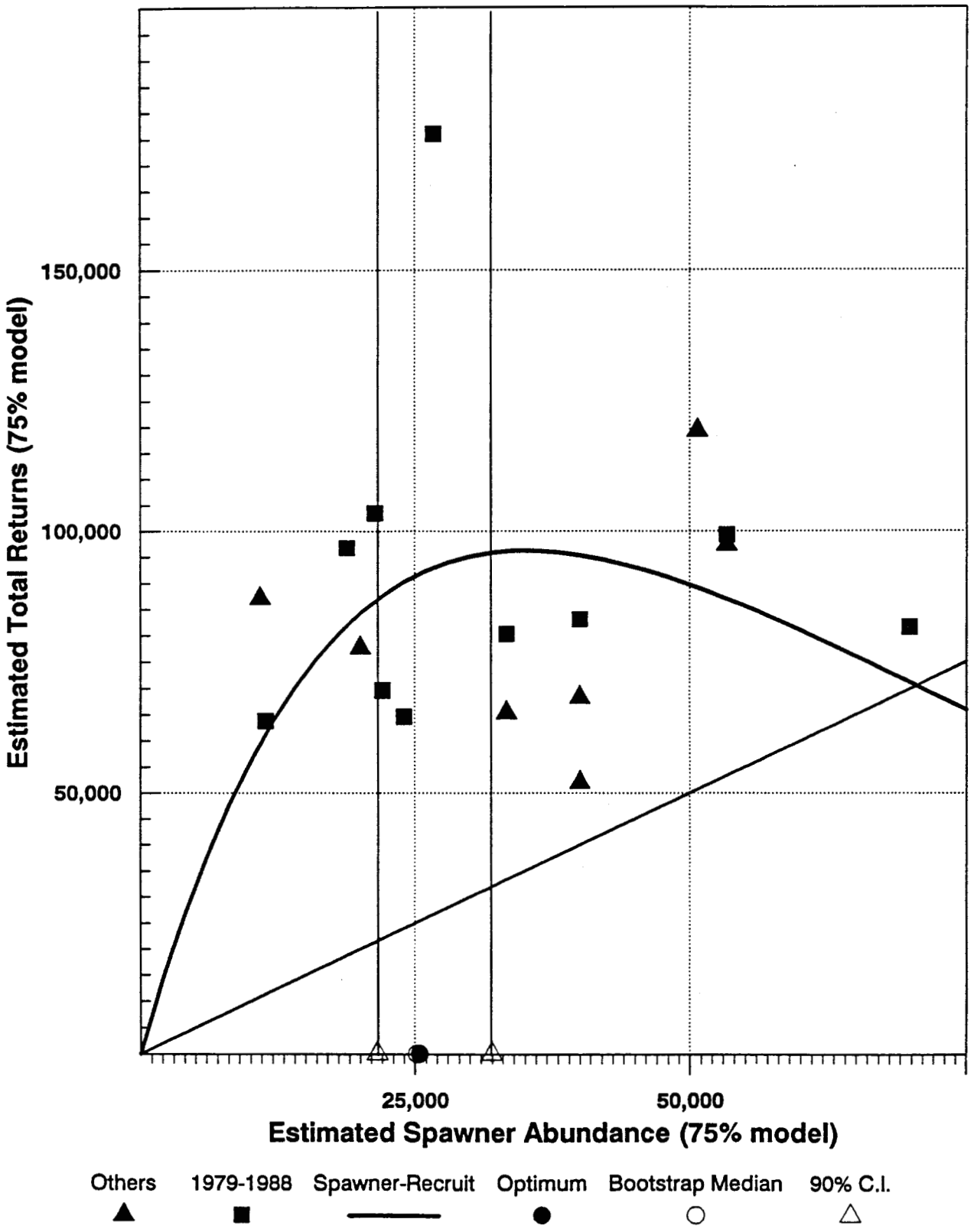

Figure 29. Spawner-recruit relationship for Tsiu River stock of coho salmon, 75% model.

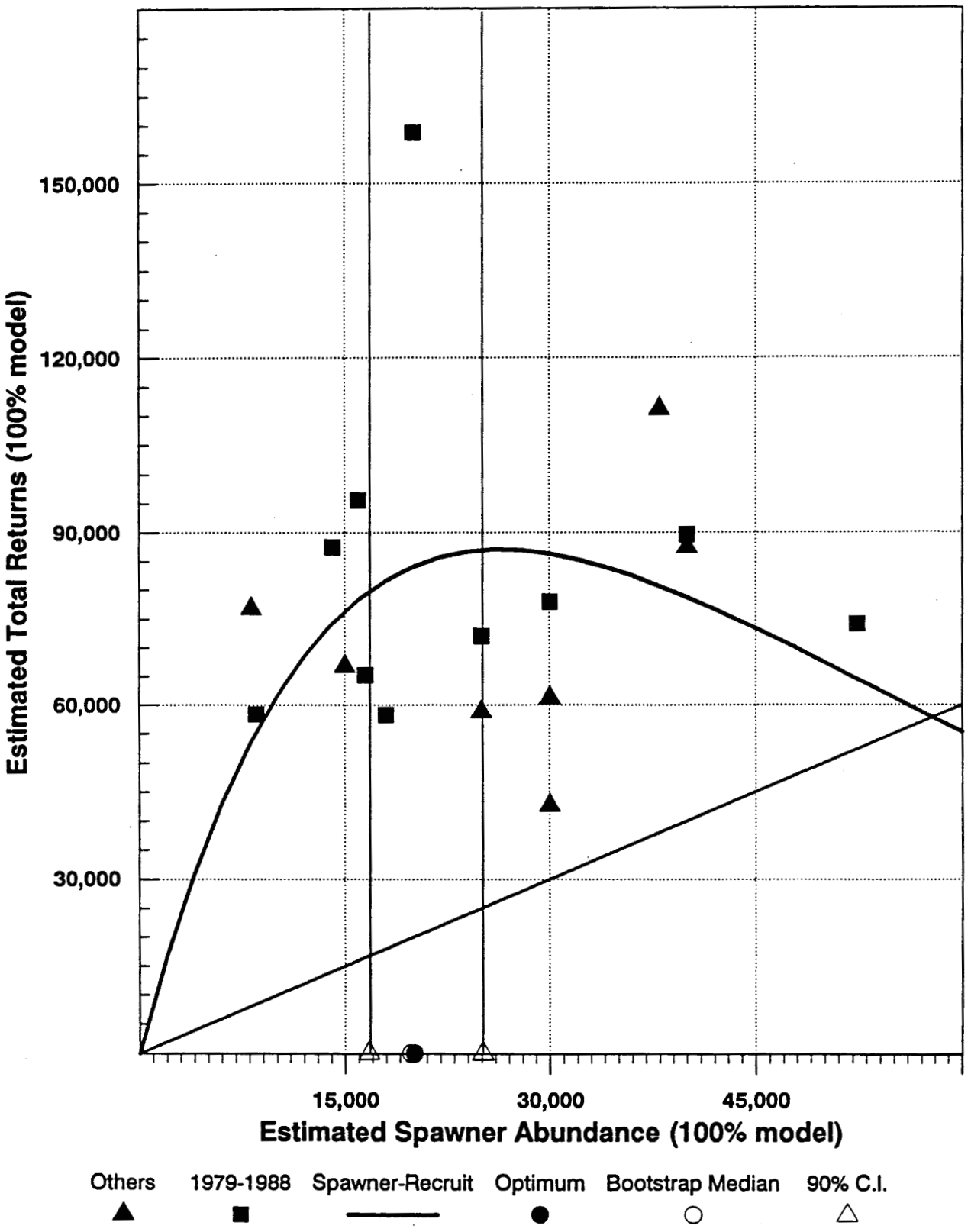

Figure 30. Spawner-recruit relationship for Tsiu River stock of coho salmon, 100% model.