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THE PACIFIC SALMON COMMISSION
JOINT CHUM TECHNICAL COMMITTEE REPORT

REPORT TCCHUM (88)-1

HISTORICAL CANADIAN AND UNITED STATES CHUM SALMON DATA REPORT FOR THE YEARS PRIOR TO 1985

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PREFACE

The following summary and the two agency reports are intended to provide the majority of the historical information required by paragraph 1 of Chapter 6, Annex IV of the Pacific Salmon Treaty (PST). The report includes descriptions of the fishery areas and chum stocks of concern under the PST, the management policies on, and processes involved in, managing the fisheries on those stocks, and the stock assessment procedures used by the two countries. Also included are the terms of reference for the joint chum salmon committee and a list of the participants who contributed to the report.

TERMS OF REFERENCE

SOUTHERN BRITISH COLUMBIA -
WASHINGTON CHUM FISHERIES

Chapter 6, Annex IV of the Pacific Salmon Treaty (PST) calls for the formation of a Joint Chum Technical Committee and charges that committee with responsibilities as follows:

Considering that anticipated returns of some natural salmon stocks originating in Johnstone Strait, the Strait of Gerogia, the Fraser River, Puget Sound, Juan de Fuca Strait and Nitinat Lake are expected to be weak and therefore not likely to provide a harvestable surplus in 1985, although some enhanced stocks originating in these areas may provide harvestable surpluses and anticipating locally directed fisheries on such enhanced stocks, the Parties shall

1. no later than March 31, 1985, establish a Joint Chum Technical Committee (Committee) reporting, unless otherwise agreed, to the Southern Panel and the Commission, to, inter alia,

(a) identify and review the status of stocks of primary concern;
(b) present the most current information on harvest rates and patterns on these stocks, and develop a joint data base for assessments;
(c) collate available information on the productivity of Chum stocks in order to identify escapements which produce maximum sustainable harvests and allowable harvest rates;
(d) present historical catch data, associated fishing regimes, and information on stock composition in fisheries harvesting those stocks;
(e) develop analytical methods to permit the exploration of alternative regulatory and production strategies;
(f) identify information and research needs, to include future monitoring programs for stock assessments;
(g) develop fishery regimes for the 1985 season and thereafter.

2. no later than August 15, 1985, instruct the Committee to present a report to the Parties on the activities set out in paragraph 1 herein.

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II. SUMMARY OF AGENCY HISTORICAL REPORTS

CANADA

Southern British Columbia chum salmon stocks and fishing areas are divided into two major components; the stocks of Johnstone and Georgia straits, herein termed inside chum, and those off the west coast of Vancouver Island including Juan de Fuca Strait, termed west coast chum. The primary fisheries of concern are net and troll fisheries off the west coast of Vancouver Island and net fisheries in Johnstone, Georgia, and Juan de Fuca straits and in the Fraser River.

INSIDE CHUM

Stock Description

Inside chum include stocks spawning along the east and west coasts of Johnstone and Georgia straits from the north end of Vancouver Island to Boundary Bay and Saanich Inlet to the south. The Fraser River is the most productive unit while other major production originates from mid Vancouver Island, Howe Sound, South and Lower Vancouver Island, Jervis Inlet and Lougborough/Bute inlets.

Most inside stocks are fall chum that spawn from October through December although there are a few runs of summer chum which spawn prior to October in some mainland inlets. Fall chum migration through Johnstone Strait generally extends from early September through November, with major abundance occurring during October.

Most chum migrate through Johnstone Strait on their approach to the spawning grounds although there is growing evidence that in some years a significant proportion of Fraser River and some southern Strait of Georgia stocks migrate through Juan de Fuca Strait. While each stock has a characteristic migration timing, there is substantial overlap so that many stocks may be present along the migratory pathways at any given time. Chum salmon overlap with other species including late Fraser River sockeye and pink salmon in September, and chinook, coho and steelhead in September and October. These species are taken into account in designing fishing plans.

Between 1960 and 1984, the estimated total run size of

inside chum averaged 1,743,000 with a range from 445,000 (1965) to 4,507,000 (1973). The 1980-84 average was 1,958,000. The Fraser River component averaged 631,000 since 1964 with a range from 208,000 (1965) to 1,334,000 (1968). The size of the runs and productivity are generally greater in even numbered years. Average even year run size since 1960 was 2,043,000, about 44% greater than the odd year average of 1,418,000. Returns per spawner average 2.0 in the even years compared to 1.6 in odd years.

Since 1960, wild spawning escapements, including spawning channel areas, have averaged 1,093,000 with a range from 404,000 (1965) to 1,829,000 (1972). The 1980-84 average was 1,355,000 indicating a general increase in recent years, but still well below the interim goal of 2,500,000. Fraser River escapements averaged 341,000 since 1960 (range of 173,000 to 822,000). The status of chum throughout Johnstone and Georgia straits varies considerably in different areas. Escapements of some stocks such as those in Loughborough, Bute and Jervis inlets, Howe Sound, and the Fraser River are improving (1980-84 average is 60% of goal). Others, such as Upper Vancouver Island and several of the mainland inlets off Johnstone Strait are well below their escapement goal (1980 to 84 average is 12% of goal).

Canadian commercial inside catches of chum averaged 619,000 since 1960 with a range from 26,000 (1965) to 2,897,000 (1973). The 1980-84 average was 558,000.

Enhancement of inside chum began in 1963 at the Qualicum River with flow control and spawning channel construction. There was little additional enhancement effort until the Salmonid Enhancement Program initiated a number of new projects starting in the late 1970's. Existing facilities throughout the inside waters have the capacity to produce about 1,500,000 chum with full production expected to return in 1989. The major facilities are located in mid Vancouver Island, with a production potential average of 900,000 adults and in the Fraser River with a potential average return of 500,000 adults. An additional 100,000 average production is anticipated various minor facilities. Returns to these facilities were taken into account in the design and implementation of the wild stock rebuilding program.

Management Regime and Fishery Description

The major Canadian commercial fishing areas for inside chum are Johnstone Strait (Areas 12 and 13), mid Vancouver Island (Area 14) and the Fraser River (Area 29). Minor fisheries occasionally occur in Bute Inlet and off the Nanaimo and Cowichan rivers. In the past, chum were taken in the Juan de Fuca Strait (Area 20) fishery directed mainly at coho. Inside chum are also taken in the west coast troll fishery.

The Johnstone Strait mixed stock fishing area is about 200 km in length and harvests the largest catches. Chum caught in

this area are of high quality and fetch a relatively high price compared to those caught in more terminal areas. The fleet size often exceeds 400 purse seines and 500 gill nets with seines harvesting an average of 75% of the catch during the period 1960-1984. Chum catches in Johnstone Strait averaged 458,000 from 1960-84 with a range from 14,000 (1965) to 2,296,000 (1973). The 1980-84 average was 390,000.

The Fraser River commercial fishing area (Area 29) includes the Fraser River up to Mission and may include a portion of the Strait of Georgia adjacent to the river mouth. Chum caught in the Fraser area are generally dark in colour. Fishing is restricted to gill nets with in excess of 500 vessels participating on some openings. The number of chum fishing days permitted has been sharply reduced in recent years, and, in 1984, openings were linked to fisheries in Johnstone Strait. The 1960-84 average catch was 78,000 with a range from 8,000 (1979) to 256,000 (1972). The 1980-84 average was 35,000; however, directed chum fisheries occurred only in 1980 and 1982 with catches of 75,500 and 63,300, respectively.

The mid Vancouver Island fishery (Area 14) is a terminal fishery directed on enhanced chum returning to the area. As the enhanced returns increased and fishing in Johnstone Strait was reduced, catches in this fishery have grown. Average catches for Area 14 during the period 1960-84 were 49,000 with a range from zero (1963-69,1971 and 1977) to 197,400 (1982). The 1980-84 average was 123,700. In 1984, an attempt was made to limit the harvest to those areas where Fraser chum comprise less than 10% of the anticipated catch.

The catch of chum salmon elsewhere in the Strait of Georgia is minor in most years. The 1960-84 average catch for areas 15-19 was 33,600 with a range from zero (1983,1984) to 225,100 (1973). The 1980-84 average was 9,000. Since 1980 fisheries directed at chum salmon harvest occurred only in 1982 with a catch of 41,000.

Indian food fisheries in the Fraser River and Johnstone and Georgia straits take a small catch of chum salmon. No sales of Indian food fish are permitted. The catch for all areas combined averaged 31,000 from 1960-84 with a range from 15,000 (1965) to 58,000 (1984). The 1980-84 average was 46,000. The Fraser River catch averaged 15,000 from 1980-84.

Canadian inside and Puget Sound chum are also caught in Canadian west coast troll and net fisheries and in the Juan de Fuca Strait fishery. United States fisheries, mainly in the San Juan Islands, Point Roberts and Juan de Fuca Strait areas also harvest Canadian inside chum.

The strategy for managing inside chum has been modified substantially in recent years. Until 1983, the stated management approach involved harvesting all chum in excess of an escapement goal for all stocks combined. In practice, this approach was

difficult to implement because of the differences in run timing and productivity with the result that some stocks were overharvested while others could potentially be underharvested. A new approach, with the objective of achieving the escapement goal of 2,500,000 within three cycles, was implemented in 1984. The approach involved managing the total run by variable harvest rate in the Johnstone Strait and Fraser River areas. At the lowest run sizes (under 2,600,000), a harvest rate of 10% in Johnstone and Georgia straits and the Fraser River is permitted. At the highest run sizes (over 4,900,000) a 40% harvest rate applies. Harvest rates above 10% are adjusted in a stepwise manner in relation to the estimated increased run size in Johnstone Strait. Escapements above the stated objective were permitted as they provide information about stock productivity.

Management Process

The management process for inside chum had been relatively unstructured but it has recently evolved into a more formalized approach. The first step is the development of preseason quantitative forecasts which are distributed to industry during spring. Until recently, the first meetings with industry advisors were held in late September, after the Johnstone Strait evaluation fishery. Since the management objectives were often unclear and the decision criteria not well defined, the meetings were often unproductive. Dissatisfaction with the advisory process led to the development of the "clockwork" approach which laid out a framework for managing the fisheries. This framework included a definition of objectives, criteria for making management decisions and run size evaluation techniques.

Stock Assessment Techniques

Preseason forecasts of inside chum have been made using various methods since the early 1960's. In general, predictions were made for each age class which were then added to provide the total run size forecast. Age 4 returns were forecast from a relationship with age 3 returns the previous year while age 3's were predicted using brood year escapements, average returns per spawner and average age composition. Starting in 1974, a correlation between rates of return for pink and chum salmon was used to improve the accuracy. The average annual error in the prediction was 33% from 1970-84 and 18% from 1980-84. In most years, Fraser River predictions were made by applying the ratio of Fraser to non-Fraser brood year escapements to the projected total returns for all inside chum. More recently, the Fraser River forecast has been developed independently by applying even and odd year average returns per spawner to the appropriate brood years and then using average age compositions.

Forecasts for returns to enhancement facilities were made by applying expected survival rates to the fry output for each

brood year.

The abundance of chum salmon is estimated inseason by means of test fisheries and through comparative catch data from commercial fisheries. The first indication of run strength is from an evaluation commercial fishery in Johnstone Strait during the third week in September. For the remainder of the season, purse seine test fishing is the primary evaluation tool. Two test fisheries operate in Johnstone Strait; one in Area 12, with a relatively long history, is the main indicator of abundance while a second in Area 13, is comparatively new and is less useful at present. There are also two test fisheries in the Fraser River which are used to provide inseason estimates of run strength in the river. In terminal areas, such as Area 14, and occasionally off other river systems, estimates of abundance are based on a combination of comparative catch data, visual surveys and sporadic test fishing.

Electrophoresis has proven useful in estimating the proportional contribution of major chum stocks in areas where they intermingle. It has been used inseason to determine the proportion of Fraser chum in the outer portions of Area 14 to assist in setting fishing boundaries. In addition, chum have been sampled since 1981 to provide estimates of the proportion of Fraser, Canadian non-Fraser and Puget Sound chum entering Johnstone Strait.

The majority of spawning populations of chum salmon are enumerated visually, either by foot or by air. The methods for deriving escapement estimates are not standardized but usually involve counting live and dead fish then relating these counts to estimates of spawning turnover rate, timing of observations, and possibly other factors, to get a total population estimate. Within the Fraser River tag and recapture programs were used to estimate major populations from 1960-1969 and for several years in the 1970's.

The total run size of inside chum returns is estimated by summing the spawning escapements with the catches in all inside areas, including estimates of Canadian chum in US areas 7 and 7A. At present, the Fraser and Big Qualicum rivers are the only individual stocks for which total return estimates are made. As information from electrophoresis becomes available, more reliable estimates of major stock contribution to fishing areas will be possible with consequent improvements in the accuracy of run reconstructions.

The first reported spawning goal for inside wild chum, developed in 1962, was derived by adding together the highest recorded escapements during the period 1949 to 1961 to provide a target of 2,375,000. Subsequently, the targets for individual sub areas have been modified but the total of 2,500,000 is similar to the original target. The present spawning targets are primarily based on professional judgement. The present goal for the Fraser River wild spawning areas is 700,000 although stock

recruitment analysis suggests that this may be a minimum requirement.

WEST COAST CHUM

Stock Description

Chum salmon returning to Area 22 originate mainly from the Nitinat River with smaller contributions from four other streams. A major hatchery (capacity of 28,000,000 eggs; first egg releases from 1980 brood) is now returning adults to the area with hatchery production expected to dominate the returns from now on. Hatchery returns of up to 400,000 adults are anticipated.

Little information is available on migration routes of Nitinat chum. It is assumed that they make landfall on the north end of Vancouver Island and migrate southeast arriving off Nitinat in early to mid October. This is a fall stock with peak abundance occurring within the lake during mid October to mid November.

The total stock of Nitinat chum has fluctuated wildly over the years ranging from 4,500 (1979) to 1,555,000 (1972) with an average of 134,000 from 1960-84. The 1980-84 average was 147,000. Since 1960, spawning escapements averaged 55,000 with a range from 4,500 (1979) to 265,000 (1972). The 1980-84 average was 55,000. The escapement target of 125,000 was achieved only three times during this period. Rates of return per spawner averaged 3.78:1, with a range from 0.09:1 to 13.99:1, indicating little relationship between escapements and subsequent returns.

Chum salmon production from the Canadian portion of the Juan de Fuca Strait originates from eight streams with the Sooke River being the most important producer. Spawning escapements averaged 30,000 from 1960-84 with a range from 5,000 (1979) to 111,000 (1973). The 1980-84 average was 21,000, indicating a downward trend from earlier years. Fisheries in Juan de Fuca Strait are thought to harvest mainly passing stocks. There is no information on total run sizes or productivity.

Management Regime and Fisheries Description

Fisheries occurred in Nitinat Lake on a more or less regular basis until the late 1950's with substantial catches in some years (217,000 in 1954, for example). However, the stock declined to the extent that the fishery was closed in 1961 and did not reopen until 1972 when there was a huge return and 1,290,000 chum were caught. Fisheries were conducted in 1973 with a catch of 175,000 chum and in 1980 with a catch of 274,000. The next fishery occurred in 1984 when the first hatchery returns were expected and 187,000 chum were caught. To improve fleet safety and fish quality, the fishery took place outside of the

lake in 1984. Future fisheries will be designed to harvest surplus hatchery chum. Nitinat fisheries, like those elsewhere in southern B.C., are discussed with industry advisors to determine timing of fisheries, area to be opened and other relevant matters.

Until the late 1970's, Juan de Fuca Strait (Area 20) was opened for fishing after the International Pacific Salmon Fisheries Commission (IPSFC) relinquished control near the beginning of September until effort dropped off to nothing. The September openings were generally directed at coho while those in October and later were directed at chum. Due to the limited production from streams in this area, the majority of chum caught in this fishery likely were destined for Strait of Georgia, Fraser River or Puget Sound. By agreement with the United States, the area did not open after the IPSFC relinquished control in 1983 and 1984. The catch from 1960-84 averaged 42,000 with a range from 100 (1983) to 202,000 (1972). The catch for 1980-84 averaged 17,000. The catch in the 1980-82 chum fishing years averaged 28,000.

Until the 1970's, troll catches of chum salmon by the west coast Vancouver Island troll fleet were minor with a maximum catch of 2,300 and an average of 1,000. Increased effort directed at chum increased the average catch to 9,000 in the 1970's and to 21,000 from 1980-84. The largest catch up to 1984 occurred in 1982 when 63,000 were taken. The majority of the catch is taken off northwestern Vancouver Island. Peak catch generally occurs during the last or second to last week in July. Stock identification analyses are underway in an attempt to determine the composition of the catch.

Stock Assessment Techniques

Attempts to predict wild chum returns from brood year escapements have been unsuccessful for the Nitinat area, probably because of the marked influence of environmental factors, especially flooding, on survival. Hatchery returns were forecast using average survivals from egg to adult although there are insufficient data to assess the accuracy of the method.

To assess abundance inseason, a test fishery using a chartered purse seine vessel makes sets just off shore from the entrance to the lake. This is considered to provide a qualitative estimate of abundance only. In addition, starting in 1985, a commercial gill net fishery will be permitted to take a previously determined number of chum early in the season to evaluate stock abundance. Further fishing will be contingent on the performance of this fishery.

Electrophoretic stock identification was first applied to chum caught at Nitinat in 1984 in order to acquire information on the proportion of United States and inside Canadian chum.

UNITED STATES

United States chum stocks of interest are grouped into three geographical units: Puget Sound, Washington Coast and Oregon and are discussed in that order.

PUGET SOUND

Stock Description

Chum salmon spawn in a number of rivers throughout Puget Sound as well as in rivers along Juan de Fuca Strait. Some of the major wild chum producers are the Nooksack, Skagit, Stillaguamish and Snohomish rivers as well as the South Sound area. The stocks are grouped into three timing periods based on average peak spawning: early - prior to November, normal - November to early January and late - after early January. The majority of Puget Sound chum are of normal timing.

Most Puget Sound chum are currently believed to migrate through Juan de Fuca Strait where they are present in significant numbers from late Spetember through early November. Recent information from electrophoretic analysis indicates that a portion of the run approaches Puget Sound through Johnstone and Georgia straits.

The estimated total run of chum returning to Puget Sound averaged 734,000 from 1968 to 1984 with a range from 207,000 (1975) to 1,474,000 (1978). The 1980-84 average was 950,000. As is the case with British Columbia's inside chum, in most areas, even year runs tend to be larger than odd year runs. The average even year run size is 975,000 compared to 474,000 for odd years.

Early chum have decreased since 1968 with the recent (1980-84) average at 28,000 for even years and 18,000 for odd years. Previously, runs of up to 190,000 were observed. Returns from enhancement started in 1976 and have averaged 7,000 through 1984 (range 800 to 20,000).

Wild and enhanced normal chum combined have increased in abundance since 1968. The 1968-84 run size averaged 647,000 chum (837,000 even year and 392,000 odd year). The 1980-84 averages for even and odd years are 1,063,000 and 599,000, respectively. The largest run since 1968 was 1,366,000 (1978). Although most regions of Puget Sound are managed on a wild basis, hatchery production contributes substantially to normal runs particularly in Hood Canal where more than half the Puget Sound hatchery production originates. Major hatchery production in regions managed on a wild basis is confined to areas and for time periods

where the stocks can be differentially harvested.

Wild runs of late chum have, on average, changed little since 1968. Even and odd year averages for the 1980-84 period are 57,000 and 35,000, respectively. The maximum run recorded since 1968 was 73,000 (1980).

Wild late chum escapements averaged 26,500 from 1968-84 with a range from 9,900 (1971, 1975) to 41,000 (1980). In general, wild stocks have achieved desired escapement levels in most recent years.

Management Regime and Fishery Description

The long term intent for Puget Sound chum is to return the maximum sustained harvest to Washington fisheries. For Puget Sound regions where the maximum sustained harvest level is undetermined, the management intent is to achieve fixed spawner escapement goals. Most stocks are managed for wild production; the only major stock group and area managed for hatchery production is normal chum in Hood Canal. Fisheries other than the main mixed stock fishing areas (4B, 5, 6, 6C, 7, and 7A) are generally managed to achieve fixed spawning escapement goals. Time periods, reflecting the central 80% of the run timing, have been identified for each species and catch area to establish periods when management actions are to be directed at the needs of each species or stock.

Washington fisheries which harvest a mixture of Puget Sound and Canadian stocks are located in Juan de Fuca Strait (areas 4B, 5, 6, 6C) and the San Juan Islands (Area 7) and Point Roberts (Area 7A) areas. Other fisheries in more terminal areas are considered to harvest only Puget Sound origin chum.

The Juan de Fuca Strait fishery historically took relatively few chum salmon with a maximum of 40,500 (1978) up to 1979. Fisheries prior to 1980 were restricted in duration after IPSFC control. The 1980 catch increased to 17,000 and 15,000 were taken in 1983 and 1984. The 1980-84 average is 9,900. In the 1980's, this area has been managed on a fixed fishing schedule of five days per week for the Treaty tribes gill net fishermen. The number of boats operating currently averages about 25.

Area 7 has historically been managed on the basis of both Canadian and Puget Sound chum while Area 7A is considered to be a harvest area for Fraser River chum. Since 1977, both areas have been managed on the basis of Canadian stock status and associated fisheries in Canadian waters. There have been significant chum fisheries in only two of the last seven years (1978, 1980), and a limited fishery in 1982.

Until the mid 1970's, when court decisions established allocation sharing between Indians and non-Indians, only

Washington Department of Fisheries (WDF) licensed fishermen fished these areas. Three types of gear are currently allowed under the WDF and Tribal regulations: purse seines, gill nets and reef nets. Reef nets have operated intermittently, even when other gear types have been closed. The gear count averages about 245 gill nets (200 non-Indian, 45 Indian), 85 purse seines (70 non-Indian, 15 Indian) and 20 reef nets. Catches in areas 6, 7 and 7A combined fluctuated between 8,100 (1965) and 427,000 (1978) from 1960-84 and averaged 116,800. The 1980-84 average catch was 88,100 with a range from 1600 (1984) to 350,000 (1980); however, at Canada's request fisheries directed at chum salmon during the 1980-84 period occured only in 1980 and 1982 with catches of 350,000 and 76,000, respectively.

Management Process

The management process for Puget Sound salmon fisheries is embodied in the Puget Sound Salmon Management Plan (PSSMP), a negotiated set of rules for preseason planning and inseason management between the treaty tribes and WDF. A major objective of the PSSMP is to obtain preseason agreement on detailed management strategies to minimize inseason disputes. It lays out procedures for establishing and modifying escapement goals, management periods, harvest rates and test and evaluation fisheries. In addition, there are procedures for regulation notification, schedules for preseason planning and report preparation, and mechanisms for dispute resolution.

Preseason planning is conducted in accordance with a fixed schedule, beginning with preliminary forecast development in April, followed by a technical review of the forecasts and resolution of any disagreements at that level. Proposals on escapement goals, management recommendations and enhancement plans are exchanged between WDF and tribal technical staff in May. A draft management report is then submitted to the administrative/policy level for resolution of any differences of opinion. The final preseason reports are prepared in July. The preseason agreements are binding unless the parties agree to modifications. Disputes generally arise when inseason conditions deviate significantly from preseason expectations. If disputes can not be resolved through the mechanisms within the PSSMP, the Federal Court is the final arbiter.

Stock Assessment Techniques

Preseason forecasts of the magnitude of the chum runs expected to return to Puget Sound have been made since 1974. The forecasting methods for wild chum have varied over the years. From 1974-79, the number of age 4 and 5 fish were predicted from a relationship with previous returns of age 3 fish while the age 3's prediction was based on mean recruits per spawner. The total forecast was then apportioned to individual stocks or management units. Since 1980, environmental variables correlated with the

total return have been employed in the forecast development. The total forecast for Puget Sound is apportioned to regions using parent year escapements. In 1983 and 1984, indices of juvenile abundance were also used for some areas. Forecasts of hatchery chum are based on fry to adult return data for specific facilities. From 1980 to 1984, the average deviation of actual returns from forecast levels was 18%.

Models for inseason updating of run sizes are developed where possible. Run size updates are generally provided after the first week or two of the fishery with successive updates available through the peak of the run. The total run entering U.S. waters is estimated using run reconstruction starting from terminal areas and working through mixed stock fishing areas. Inseason estimates in terminal areas are based on the relationship between catch/effort and run size. If the inseason data base is inadequate, the preseason forecast directs inseason management.

For run reconstruction, modifications (to take into account changes in U.S. and Canadian chum production) of the 1971 U.S./Canada agreed upon stock composition estimates have been used since 1979. Electrophoretic genetic stock identification techniques are just starting to be used for differentiating stocks by country of origin in mixed stock areas and are expected to enhance the accuracy of run reconstruction estimates in the future.

Enumeration of spawning chum salmon is done visually from boats or on foot. For small rivers, escapement curves are constructed using peak live and dead counts and the area under the curve is converted into an estimate of total escapement. Estimates for large rivers are derived by relating index area counts to base year estimates of total escapements developed from tagging studies where available.

Spawning goals have been developed for all management units within Puget Sound using either the average of observed escapements for selected years or spawner/recruit relationships. Where there are differences in odd and even years production, odd year escapement goals have been adjusted by an odd/even year production ratio.

WASHINGTON COAST

Stock Description

There are three chum stocks of interest along the west coast of Washington: Grays Harbor, Willapa Bay and Quinault River.

Grays Harbor chum salmon declined in abundance in the

1960's but have improved slightly in more recent years with escapements now generally at or above the goal of 21,000. The 1980-84 average spawning escapement was 25,000 (while the average run size for this period was 55,000). The timing is one to two weeks earlier than that of normal Puget Sound chum with peak abundance in the terminal area in mid to late October. Age 4 fish predominate in most years although age 3's occasionally are the dominant age class. The average return rate is 4.55 per spawner. There is a poor relationship between spawners and returns. Hatchery production of Grays Harbor chums was low until 1979 when 7,000,000 fry and fingerlings were released. Recent production has been lower.

Willapa Bay chum also declined in the 1960's; although there has been some recovery since 1980. Wild spawning escapements since 1980 have ranged from 21,000 to 66,000 averaging 37,500, slightly above the goal of 35,400. The 1980-84 average run size was 84,000. The migratory timing of Willapa Bay chum tends to be slightly earlier than that of Grays Harbor chum. On average 3.44 fish return from each spawner. Hatchery production began to increase in 1976 and peaked in 1982 with the release of 7,100,000 fingerlings.

Quinault River wild chum salmon suffered a severe decline in abundance during the period from 1935 to 1970 and have failed to recover. The terminal area fishery is supported mainly by hatchery production although survival of hatchery fish has been poor. Release of juveniles at more optimum size for survival is expected to improve production in the future. The goal is to release 3 million fry each year. Additional enhancement is on line at the Makah National Fish Hatchery and returns are anticipated in the near future.

Management Regime and Fishery Description

The Grays Harbor chum gill net fishery takes place within the harbor and the lower portions of the Chehalis and Humptulips rivers. The chum management period is from October 21 to November 10. There is a catch sharing arrangement between the Indian and non-Indian fishermen. In addition, a sport fishery for chum occurs in some freshwater tributaries. Grays Harbor chum are managed to achieve wild escapement goals. Catches since 1960 have averaged 19,400 with a range of 450 (1979) to 61,600 (1982). The 1980-84 average was 29,000 fish. The sport catch is 150-400 most years, but reached 2,300 in 1982, a year of high returns.

The Willapa Bay commercial gill net fishery is conducted in the harbor while sport fisheries occur in the tributaries. The chum management period is from October 15 to November 1. Effort is directed on the early portion of the run to improve fish quality. During the period 1960 to 1984, catches have averaged 27,200, ranging from 1,200 (1979) to 76,000 (1982). The 1980-84 average catch was 42,000.

A treaty Indian fishery for hatchery chum occurs in the lower Quinault River. The historical catch pattern is similar to that of Grays Harbor and Willapa Bay except that the wild chum abundance remains low.

Management Process

Preseason forecasts of returns to Grays Harbor and Willapa Bay are published annually by WDF. Negotiations take place between WDF and the tribes to develop fishing schedules designed to achieve allocation quotas. WDF holds public hearings with non-treaty fishermen to receive their input into the management process. Disputes arising during the season are usually mediated by the Court's Fisheries Advisory Board.

Stock Assessment Techniques

Forecasts of chum returns to Grays Harbor and Willapa Bay have been made for only the last four years. They are based on average returns per spawner, by age group, adjusted by return rates observed for prior ages of the same brood. Separate average return rates are used for odd and even year returns. Expected returns to the Quinault River are based on average survival rates at Quinault National Fish Hatchery.

Inseason adjustment of run sizes in both Grays Harbor and Willapa Bay is based on a one week full fleet test fishery in Willapa Bay. This adjustment is derived from historical relationships between the two stocks.

Escapement estimates are made for Grays Harbor stocks by comparing annual index counts with a base year in which there was a total escapement estimate. For Willapa Bay stocks, the area under the curve for index areas is expanded to take into account uncounted areas.

OREGON

Stock Description

Chum salmon spawn in the lower Columbia River and rivers entering some coastal bays of Oregon, particularly Tillamook and Netarts bays. Both Columbia River and coastal Oregon chum have normal timing with peak spawning occurring from the last week in November to the first week in December. Numerical spawning escapement estimates are not made although trends from index areas indicate that Columbia River and Tillamook Bay chum declined during the period 1950-80. Unlike some other areas, there is no apparent odd/even year pattern.

The first hatchery releases of Oregon chum occurred in Netarts Bay in 1969. Since 1971, 11 private hatcheries have been

issued permits to produce chum. Currently, most hatchery production from Oregon coastal rivers is from private sea ranching operations. There have been some chum fry releases into the lower Columbia River by Oregon Department of Fish and Wildlife and WDF.

Management Regime and Fishery Description

Chum gill net fisheries operated in the lower Columbia River, Tillamook Bay and Nestucca Bay before the stocks declined. Chum catches in the Columbia were as high as 425,000 in 1942 but declined sharply afterwards. Chum salmon are now taken only as an incidental catch in the Columbia River commercial fishery. The 1960-84 average was 1,100 (range from 100 to 3,900) while the 1980-84 average was 500. The Nestucca Bay net fishery was terminated in 1927 while the Tillamook Bay fishery ended in 1961. The Tillamook Bay fishery took an estimated average of 91,000 chum from 1927-36 but the catches declined thereafter with an average of 6,000 taken for the five year period from 1957-61.

Coastal chum are now taken by sport fisheries and at hatchery racks by private operators. The sport catch has increased recently and takes place mainly in the Miami and Kilchis rivers which flow into Tillamook Bay.

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3.0 Stock Description

The primary Canadian stocks of concern are those of Johnstone and Georgia straits (herein referred to as "Inside" chum) and those of Juan de Fuca Strait and the southwest coast of Vancouver Island (referred to collectively as "West Coast" chum). The West Coast Troll Fishery is also included under "West Coast Chum" where applicable. West coast of Vancouver Island chum originating from streams north of Nitinat River are not included in this report as they are unlikely to influence fisheries that intercept U.S. chum nor be subject to interception by U.S. fisheries to a significant extent.

3.1 Inside Chum

Inside chum include stocks spawning in more than 150 streams along the east and west coasts of Johnstone and Georgia straits from the north end of Vancouver Island to Boundary Bay and Saanich Inlet to the south. For descriptive and, to some extent, management purposes the stocks are grouped into 14 geographic units as indicated in Figure 1. Statistical areas of catch for southern British Columbia waters are given in Figure 2. The Fraser River is the most productive unit while major production also originates from mid-Vancouver Island (primarily hatchery output from Big Qualicum, Little Qualicum and Puntledge rivers), Howe Sound (mainly Squamish River), South and Lower Vancouver Island, Jervis Inlet and Loughborough/Bute inlets. In most of these geographic units there are many streams contributing to the total production but usually only one or, at most, a few that predominate. Within the Fraser River, for example, chum spawn in excess of 40 streams but about 80% of the wild production in recent years has originated from only three major tributaries: Harrison, Chilliwack and Stave rivers.

Most Inside chum migrate through Johnstone Strait on their approach to their spawning streams. There is a possibility that, in some years, a proportion of southern Georgia Strait stocks migrate through Juan de Fuca Strait. Major chum fisheries occur along the migration routes, primarily in Johnstone Strait, mid-Vancouver Island, in and adjacent to the Fraser River, as well as off Point Roberts and the San Juan Islands in the United States.

The majority of Inside chum are fall chum which enter their natal streams from September through December. There are a few earlier migrating summer chum runs (prior to September) to some mainland inlets including those spawning in the Ahnuhati River in Knight Inlet and in Orford River in Bute Inlet.

The migration timing and rate of travel through Johnstone and Georgia straits and in the Fraser River were defined by tagging studies conducted during the 1960s and 1970s (Palmer, 1972; Anderson and Beacham, 1983). Migration of fall chum through Johnstone Strait generally begins in September and continues to late November. Timing of major chum stocks in upper Johnstone Strait and in the Fraser River is depicted in Figures 3 and 4, respectively. Tagging over several years indicated that each stock had a characteristic timing period and that there was substantial overlap among stocks so that many stocks may be present along the migratory pathways at any given time. Among the earliest stocks are those spawning in the Loughborough/Bute and Lower Vancouver Island areas as well as some Fraser River tributaries. Late stocks include those from the Johnstone Strait, mid-Vancouver Island and Southern Vancouver Island areas plus some Fraser tributaries such as Harrison River (certain populations), Chilliwack River and

Inch Creek. The migration period of all Fraser River chum combined encompasses the entire migration period for Inside chum.

Tagging also indicated the presence of a small proportion of Puget Sound chum in Johnstone Strait (Anderson and Beacham, 1983).

Inside chum coincide in timing with other species including late Fraser River sockeye and pink salmon in September and chinook, coho and steelhead in September and October. These species, particularly the latter three, are taken into account in designing fishing plans for chum salmon as they may be adversely affected.

The travel time from Upper to Lower Johnstone Strait is about seven days and about twenty days from Upper Johnstone Strait to the Fraser River with early stocks migrating slightly faster than late stocks. Some stocks delay off their respective river mouths before entering freshwater. Chum were estimated to delay for at least one week off the Fraser River before entering the river (Palmer, 1972).

Spawning escapements of Inside chum averaged 1,057,000 from 1960-84 with a range from 404,000 (1965) to 1,898,000 (1968) (Table 1; Fig. 5). There has been an upward trend in recorded escapement over this time period with the 1980-84 average of 1,355,000 being 54% higher than the 1960-69 average of 882,000. Stocks in the 1960s were recovering from the effects of excessive harvest rates of earlier years. In spite of an improving trend, recent escapements through 1984 were still well below the interim goal of 2,500,000.

The status of chum escapements relative to the interim goals differs markedly among stocks from different geographical areas (Fig. 6). In general, stocks in the Strait of Georgia south of Campbell River have recently been closer to their escapement goals than stocks further north. Some of the latter (upper Vancouver Island, Toba, Kingcome, Bond, and Knight inlets) stocks have been in a very depressed state for many years. An exception is Loughborough/Bute chum which have exceeded the 150,000 goal in some years. Spawning escapement of Fraser River chum averaged 343,000 from 1960-84 with a range from 173,000 (1961) to 822,000 (1968). The 1980-84 average was 393,000.

The total run size of Inside chum (exclusive of the catch in U.S. waters) averaged 1,743,000 from 1960-84 with a range from 446,000 (1965) to 4,509,000 (1973). The stocks were relatively depressed in most years in the 1960s with an average return of 1,245,000. Conservation measures applied during this period resulted in improved escapements, which, coupled with several years of high productivity, led to larger average run sizes in the 1970s with 1972 and 1973 having record high returns. From 1980-84 the total stock averaged 1,958,000 with a range from 1,460,000 to 2,882,000.

The Fraser River component is estimated separately by making certain assumptions about the contribution to catches in the interception areas based on historical tagging data and adding the estimated catch in these areas to the catch and spawning escapement in the Fraser River. The method details are described in Section 5.4.1 and the results listed in Table 2. Between 1974-84 the Fraser run size averaged 699,000 with a range from 296,000 (1979) to 1,265,000 (1978). In the 1970s runs exceeding 1,000,000 were recorded in four years. The Fraser run averaged 634,000 from 1980-84 indicating a decline from the 1970s average.

The size of the runs and productivity of Inside chum are generally greater in the even numbered years (Table 3). Average run size for even years between 1960 and 1984 was 2,043,000, about 44% greater than the odd year average of 1,418,000. Returns per spawner averaged 2.0 on even years compared to 1.6 on odd years. The average age composition on a brood year return for Inside chum have been 26% age 3, 69% age 4, and 5% age 5. Returns from even year spawners typically have a lower proportion of age 3 and a higher proportion of age 4 fish than do returns from odd year spawners.

Enhancement of Inside chum salmon began in 1963 at Qualicum River with flow control and side channel construction. Only minor efforts for producing additional chum salmon were attempted until the advent of the Salmonid Enhancement Program in the late 1970s when a major expansion was undertaken. Existing facilities now have the capacity to produce about 1,500,000 adults.

The majority of the enhanced chum is produced by major facilities in the mid-Vancouver Island area and in the Fraser River. Smaller facilities scattered throughout the area also collectively contribute significant numbers. The three large facilities on the eastern shore of Vancouver Island: Puntledge, Big Qualicum and Little Qualicum have a combined escapement capacity of 150,000. The Puntledge facility is a hatchery while Big Qualicum and Little Qualicum are spawning channel operations. Other smaller facilities are located near Powell River, on the Nanaimo, Chemainus, and Cowichan rivers, along the Sunshine Coast, in Howe Sound and upper Johnstone Strait. Production from each of these facilities is expected to range from a few hundred adults to 40,000 when operating at capacity. In the Fraser River a number of facilities have a combined production capacity of approximately

500,000 adults. Again, the majority of the production is from three major facilities: Chehalis, Chilliwack and Inch hatcheries. Smaller facilities include hatcheries, incubation boxes and spawning channels.

The program for Fraser River chum involves enhancing all major stocks and many of the smaller ones and allowing some of the returning hatchery fish to augment wild spawning. Returns of hatchery fish (some of which are marked with coded wire tags and/or fin clips) will be monitored in selected tributaries to determine if they are mixing and spawning with and among wild fish. If this approach is judged to be successful, harvest rates in the terminal area could be increased to take advantage of surplus hatchery fish while still achieving escapement targets for most stocks. The hatchery program is flexible enough to allow stocks not currently enhanced to be assisted if they show a declining trend.

In all cases, enhancement of chum salmon is confined to increasing the freshwater survival rates. Chum eggs or fry are not transferred to provide brood for another major area; however, restocking of natural spawning areas within a river by enhanced surpluses does take place.

3.2 West Coast Chum

The West Coast production areas included in this report are Juan de Fuca Strait and Nitinat River and adjacent streams. These two areas will be discussed separately.

Wild chum produced in Statistical Areas 21 and 22 (Nitinat) originate mainly from the Nitinat River with small contributions from Hobiton and Doobah creeks and the Cheewhat and Caycuse rivers. A major hatchery recently started production with the first egg take in 1980. The capacity is about 28,000,000 eggs which is expected to return up to 500,000 adults. Production from this facility is expected to dominate chum returns to Nitinat in most years in the future.

There is little available information on the timing or migration route of Nitinat chum as they approach the coast in preparation for spawning. It is generally assumed that they make landfall on the north end of Vancouver Island then migrate southward, arriving in the Nitinat area in late September. Peak abundance within Nitinat Lake is from mid-October to mid-November.

Marked annual variations in run size and spawning escapements are characteristic of this and other west coast of Vancouver Island chum stocks. From 1960-84 the total run averaged 133,800 with a range from 4,500 (1979) to 1,555,000 (1972). The 1980-84 average was 147,300 (Table 4). Because there have been few fishing years since 1960 the spawning escapement of Nitinat chum is usually the same as the terminal run size. The 1960-84 average was 54,800 with a range from 4,500 (1979) to 264,600 (1972) during this period. The 1980-84 average was 55,200. The escapement target of 125,000 was achieved only three times since 1960.

Rates of return for Nitinat chum averaged 2.32:1 with a range from 0.09:1 to 14:1 indicating little relationship between spawning escapements and

subsequent returns (Fig. 7). The age composition on a brood year return for Nitinat chum varies markedly from one year to another. Age 3 fish may be dominant in some years while age 4 fish may be more abundant in other years (Table 4).

Chum salmon production from the Canadian portion of the Strait of Juan de Fuca originates from eight streams with the Sooke River and one of its tributaries, Demamiel Creek, being the most important. The other contributors are Gordon, Jordan and San Juan rivers, and Kirby, Muir and Tugwell creeks. During the 1960s escapements averaged 29,900 and 35,000 during the 1970s (Table 5). The 1980-84 average was 20,700 indicating a downward trend from earlier years. There is no available information on total run sizes or productivity. These fish are havested incidental to the harvesting of passing stocks in Area 20.

4.0 Fishery Description and Management Regime

Southern British Columbia chum salmon fisheries can, by virtue of their geographical location, be conveniently divided into two major components: those operating between Vancouver Island and the mainland and those situated off the west coast of Vancouver Island. Within each major area several individual fisheries occur. They are described separately, starting with the inside fisheries.

4.1 Inside Chum

4.1.1 Fishing Description

4.1.1.1 General Overview

Chum entering the inside waters of Johnstone and Georgia straits are subjected to commercial net fisheries and limited Indian food fisheries. The commercial fisheries developed during the 1930s, reaching a peak in the 1940s and early 1950s. In the late 1950s and early 1960s catches declined sharply due largely to overfishing. Subsequently, restrictive management measures allowed spawning escapements to increase with resultant rebuilding of some stocks. In recent years, overharvesting has again raised concerns over the long term viability of the stocks, resulting in renewed efforts to manage stocks to achieve their full potential. The program recently implemented is described in more detail in a later section.

The main Canadian commercial fishing areas for Inside chum salmon are Johnstone Strait, Area 14 (Qualicum), and the Fraser River (Table 6). Johnstone Strait is a mixed-stock area where all stocks are harvested to some extent. Chum caught in this area are high quality "silver bright" fish that fetch a relatively high price. The largest proportion of the total catch is usually taken in Johnstone Strait. Area 14 is a terminal area for chum destined mainly to the Big Qualicum, Little Qualicum and Puntledge rivers. The majority of these stocks are enhanced. Fish caught in this area early in the season are of relatively high quality; later in the season, the quality deteriorates, resulting in a corresponding decrease in the price paid to fishermen. The Fraser River could also be considered to be a terminal fishing area, although it is still a mixed-stock fishery in that there are numerous individual Fraser stocks present at any given time. Chum caught in the Fraser area are generally dark and of lower value than those caught in Johnstone Strait.

In addition to these major fisheries, minor net fisheries are occasionally permitted in the terminal areas of Jervis Inlet and the Nanaimo and Cowichan rivers, to take local surpluses.

The total catch of fall chum throughout the area by both commercial and Indian food fisheries averaged 650,000 from 1960-84 with a range of 41,000 (1965) to 2,929,000 (1973). Of this, commercial fisheries took by far the largest proportion (Table 6), averaging 619,000 (95%), while the food fishery (Table 7) averaged 32,000 (5%). Since 1960, purse seiners have taken about 61% of the total and gill netters 39%. A minor amount is also taken by the inside troll fishery. Over time the seiners have increased their share while

the gill net catch has declined correspondingly. The majority of the catch is taken by seine in Johnstone Strait (Table 8).

In addition to fall chum there is a relatively small catch of summer chum (averaging 48,000 from 1960-84) taken in Johnstone Strait and Bute Inlet. The catch of summer chum has increased since the 1960s (Table 9).

The harvest rate of Canadian fisheries on inside chum averaged 31% from 1960-84 with a range on individual years from 6% to 65% (Table 10). The highest average harvest rates were experienced in the 1970s (37%) although in 1982 it was 51%. In most years since the mid 1970s harvest rates on even years have exceeded those on odd years (1984 is an exception due to implementation of a new management approach).

4.1.1.2 Commercial Fishery Catch

4.1.1.2.1 Johnstone Strait

The **Johnstone Strait** fishing area (Statistical Areas 12 and 13) a narrow 200 km (120 miles) body of water extending approximately from Port Hardy in the north to Campbell River at its southern limit. The chum fishery in this area is very intense as it is here where fish are most abundant and at their best quality and, consequently, where potential profits for fishermen are greatest. Both purse seine and gill net vessels participate in the Johnstone Strait fishery with purse seines being the dominant gear type. The fleet size has grown and now often exceeds 400 purse seines and 500 gill nets during chum fisheries.

Commercial fisheries in Johnstone Strait catch significant numbers of fall chum salmon from early September through October. Until mid September the fisheries are managed for sockeye and pink salmon with chum taken incidentally. From mid September onward, management is directed toward chum salmon. Regardless of abundance there is always a fishery in the third week of September with the catch serving as the first in-season indicator of run strength for the entire season. Thereafter, fisheries are related to chum abundance.

Fall chum catches in Johnstone Strait have fluctuated markedly over time ranging from 14,000 in 1965 to 2,296,000 in 1973 with average of 458,000 taken from 1960-84 (Table 11). Average catches (705,000) were higher in the 1970s than in the 1960s (246,000) and the 1980s (390,000) but this was due largely to the big return years of 1972 and 1973.

4.1.1.2.2. Fraser River

The **Fraser River** commercial fishing area (Statistical Area 29) includes the Fraser River up to the town of Mission, approximately 80 km upstream from the mouth of the river, and, during some fishing periods, also includes a portion of the Strait of Georgia adjacent to the river mouth.

Fishing is restricted to drifted gill nets with more than 500 vessels participating in some openings. Chum caught in the Fraser area are generally dark in colour so fishermen receive a lower price per pound than in Johnstone Strait.

The Fraser was once a major chum fishing area with fishing permitted four or five days per week with catches up to several hundred thousand. Closures for conservation and a trend toward increased harvesting in Johnstone Strait have all but eliminated the Fraser chum fishery. In recent years openings have been linked to those in Johnstone Strait.

The catch from 1960-84 averaged 78,000 with a range from 7,800 (1979) to 256,400 (1972). The 1980-84 average was 35,000 with directed fisheries occurring only in 1980 and 1982 resulting in catches of 75,500 and 63,300, respectively (Table 11). Although there have been few Fraser River chum openings for many years, fishing opportunities are expected to increase as the runs rebuild and the number of enhanced fish increases.

4.1.1.2.3 Mid-Vancouver Island

The **mid-Vancouver Island** fishery (Statistical Area 14) extends from just off Campbell River to about Parksville. Both gill nets and purse seines are permitted in this area.

Mid-Vancouver Island stocks are dominated by enhanced returns to the Big Qualicum, Little Qualicum and Puntledge rivers. These stocks have generally remained productive, even in years of low overall abundance of Inside chum. Because of conservation requirements for wild stocks these enhanced fish are not fully harvested in Johnstone Strait. Consequently, the surpluses to these facilities are fished terminally in the mid-Vancouver Island area. Although this is the terminal area for these stocks a small proportion of other passing stocks, notably Fraser River, may be present, particularly in the outer portion of the area.

The mid-Vancouver Island terminal fishery is managed on the basis of a combination of a fixed escapement and quota management. Since 1981, the objective has been to achieve maximum quality while minimizing the risk of not achieving the spawning escapement. In years when fishing occurs in Johnstone Strait, the catch of mid-Vancouver Island chum is determined in-season through analysis of coded wire tag data. The difference between the pre-season forecast and the catch of mid-Vancouver Island chum in Johnstone Strait is used to approximate the number of chum expected in the terminal area. In years of no fishing in Johnstone Strait it is assumed that the total run predicted pre-season would be available in the terminal area. The general approach taken in recent years is to harvest 60-65% of the expected total catch early in the season (during October) prior to the spawning escapement being achieved. This enables quality of the catch to be maximized. After this initial catch is taken further fishing is delayed until the spawning goals are met, after which time, a "cleanup" fishery occurs to take any remaining surplus. Chum taken in this later fishery are in dark condition. In 1984, an attempt was made to limit the fishery to those areas where Fraser chum comprise less than 10% of the anticipated catch.

The mid-Vancouver Island fishery took relatively few chum until 1972 when enhanced fish from the Big Qualicum River facility provided a catch of 134,000. Since then the catch has ranged from zero (1977) to 197,000 (1982). The average catch in Area 14 during the period 1960-84 was 49,000 while from 1980-84 an average of 124,000 were taken (Table 11).

4.1.1.2.4 Strait of Georgia

In the **Strait of Georgia** (excluding Statistical Area 14) there have been sizeable fisheries in some years with catches in the 1950s of up to 200-300,000. Restrictive management measures, including closures, reduced the catches in later years. With the return of enhanced chum, terminal fisheries have been permitted in selected areas recently when stock size warrants them.

From 1960-84 the catch in areas 15-19 combined averaged 34,000 with a range from zero (1983, 1984) to 225,000 (1973). The 1980-84 average was 8,700. Since 1980, chum fisheries in these areas occurred only in 1982, resulting in a catch of 41,000 (Table 11).

4.1.1.3 Indian Food Fishery

Native Indians are issued permits to catch sufficient salmon to meet their "reasonable food fish needs". Fish caught under the food fish permits are not allowed to be sold. The largest catch is usually taken in the Fraser River with smaller numbers caught in several locations throughout the Strait of Georgia and in some rivers.

Overall the Indian food fish catch in the inside area averaged 32,000 from 1960-85 with a range from 15,000 (1965) to 58,000 (1984) (Table 7).

In the Johnstone Strait area, permits are issued authorizing natives to take a specified catch of salmon for food fish requirements. The catch of chum in this area averaged 9,700 from 1960-85 and 15,000 from 1980-85.

Elsewhere in the Strait of Georgia and associated streams chum are taken in a variety of small fisheries, mainly by set gill nets. The average catch in areas 14-19 was 12,000 from 1960-85 and 21,000 from 1980-85. A peak catch of 27,000 was taken in 1974.

Within the lower Fraser River, where chum are available to the Indian Food Fishery, the majority are taken with set gill nets except in the Steveston area at the river mouth where drifted gill nets are used. Chum comprise a relatively small proportion of the total salmon catch in the Indian food fishery. From 1960-85 the catch averaged 10,000 with a range from 4,000 (1971) to 19,000 (1984). The 1980-85 average was 13,000.

4.1.2 Management Regime

The stated objective has been, for many years, to manage salmon stocks to achieve optimum escapement. During the 1960s a number of programs were initiated to collect the information which would form the biological basis for management of Inside chum. These programs included tagging to determine migration patterns and rates as well as stock composition and test fisheries to assess stock abundance. At the same time a rebuilding strategy was adopted which involved curtailment of most fisheries. The general approach was to harvest only when surpluses above the overall escapement goal for Inside chum could be identified. While the intention was sound, before many years had passed, it became evident that management of Inside chum suffered from lack of a real commitment to ensure that the stocks were managed to achieve their full potential. Fisheries were frequently opened without regard to their effects on spawning escapement. As a consequence, the stocks were overfished in many years.

Repeated failure to achieve management objectives and dissatisfaction with the communicative process between industry representatives and DFO precipitated a number of joint workshops and meetings between 1982 and 1984 which led to development of a new approach for managing Inside chum. The so-called "Clockwork Approach", which was first implemented in 1984, is a system whereby specific management objectives and criteria on which management decisions are based are agreed to in advance of the fishing season by both Department of Fisheries and Oceans (DFO) and the industry advisors. As the season unfolds all management decisions should be made in accordance with the pre-arranged plan with catches and escapements predicted with reasonable accuracy.

During development of the Clockwork Approach management objectives were clarified and a strategy for achieving them developed. The most important objective was to achieve a wild spawning escapement of 2.5 million chum to all areas combined including 700,000 to the Fraser River. It was recognized that attempting to achieve this escapement target quickly would result in considerable financial hardship to fishermen. Consequently, a three cycle (or 12-15 year) rebuilding program, which would allow some commercial fishing in years when it was known that escapement would be less than optimum, was agreed upon. The management strategy involved a stepwise increase in harvest rates to a maximum of 40% as the run size estimated in Johnstone Strait increased. For the years 1984 through 1986 a total escapement goal of 1.8 million wild chum was established with a minimum escapement of 500,000 wild chum in the Fraser River. Allowable harvest rates related to specific run size ranges were established with no directed commercial chum fishing (other than during the third week in September in Johnstone Strait) permitted for runs less than

2.6 million. The specific run sizes and associated harvest rates are as follows:

Total Run	Allowable Harvest Rate
0 - 2,500,000	10% *
2.6 - 3,200,000	20%
3.3 - 4,800,000	30%
4.9 and higher	40%

* At the lowest run sizes Indian food and test fishing continues and an evaluation fishery in Johnstone Strait in the third week in September takes place. Total harvest rate is roughly estimated at 10% on average.

The first in-season estimate run size is based on the third week of September evaluation fishery. Subsequent run size estimates are derived from test fishing and on commercial catch data in Johnstone Strait.

Catches taken into account in determining the harvest rate include these from commercial fisheries in Johnstone Strait, Fraser River and U.S. Areas 7 and 7A, incidental commercial catches of passing stocks in Area 14 and catches of chum in all inside Indian food and test fisheries.

The agreed upon rules state that Johnstone Strait chum fisheries will be a minimum of 24 hours duration and that they will include both Areas 12 and 13 without ribbon boundaries. Directed chum fisheries in the Fraser River are contingent on fisheries also being held in Johnstone Strait. If one opening

is allowed in Johnstone Strait then one will be allowed in the Fraser River. In seasons where more than one opening is allowed in Johnstone Strait only one opening will take place in the Fraser for every two in Johnstone Strait. Fraser River chum openings are permitted only after October 15 to protect wild coho, chinook and steelhead and are a minimum of 12 hours duration in subareas 29-11 to 29-17 (within the river) only, to minimize the capture of non-Fraser chum.

Samples are taken weekly from the Johnstone Strait test fishery for electrophoretic analysis but the analyses are not completed until after the fishing season. The results assist in run reconstruction. Samples taken from specific locations in Area 14 prior to the commercial openings in that area are analyzed within two days to determine the Fraser River proportion. Subareas are opened to fishing only if Fraser River chum comprise less than 10% of the total.

4.2 West Coast Chum

4.2.1 Fishery Description

4.2.1.1 Nitinat Lake

Chum fisheries at **Nitinat** (Statistical Areas 21 and 22) prior to 1984 were conducted within Nitinat Lake where the fish congregated primarily at the Nitinat River prior to spawning in tributary streams. Fisheries took place on a more or less regular basis until the late 1950s, with substantial catches in some years (217,000 in 1954, for example). Both gill net and purse seine

vessels participated. The fishery was closed in 1959 and from 1961 through 1971 due to apparently poor returns (Table 12). It was reopened in 1972 when exceptionally large numbers of chum returned to this area, resulting in a catch of 1,290,500. Fisheries were conducted in 1973 with a catch of 175,000 and in 1980 when 274,000 chum were caught. The next fishery occurred in 1984 when the first returns to the Nitinat hatchery were anticipated and 187,000 chum were taken. To improve fleet safety and fish quality, the 1984 fishery was conducted at the entrance to the lake while the chum were still in the ocean.

In the future it is likely that fisheries will continue to be conducted outside of the lake to increase product quality and improve safety to fishermen. Recent silting of the bar at the entrance to the lake, has made entry, in all except flat calm weather and high tides, a dangerous undertaking. It is particularly hazardous when boats heavily laden with fish try to leave the lake during rough weather. Lack of unloading facilities within the lake necessitates transport of fish to processing plants by sea.

4.2.1.2 Strait of Juan de Fuca

The fishery in the **Strait of Juan de Fuca** (Statistical Area 20) encompasses the area between Sooke and Port San Juan. The major fisheries in the area are directed towards sockeye and pink salmon which were managed by the International Pacific Salmon Fisheries Commission (IPSFC). Until the late 1970s, the Strait of Juan de Fuca was opened by DFO after IPSFC relinquished control in early September until fishing effort dropped off to nothing due to poor catches and deteriorating weather. Fisheries in September were directed

primarily at coho while those in October targetted on chum. As there are few chum spawning in local streams, the majority of those caught were probably destined to the Strait of Georgia, Fraser River or Puget Sound. By agreement with the United States, the area did not open after IPSFC control in 1983 and 1984.

The catch was relatively small compared to most other areas although there were occasional years when substantial numbers were taken. From 1960-84 the catch ranged from 83 (1983) to 202,000 (1972). However, the average total catches were 22,000 for 1960-69, 74,000 for 1970-79, and 17,000 for 1980-84 (Table 13).

4.2.1.3 West Coast Troll

Until the 1969s, troll catches of chum of the **West Coast** of British Columbia were minor with a maximum of 2,300 taken in 1969 and on a yearly average of 1,000 or less (Table 14). Greater effort directed at chum resulted in higher catches with the average increasing to 9,000 in the 1970s and to 21,000 for 1980-84. The largest annual catch occurred in 1982 when 63,000 were taken. The majority of the catch is taken off northwestern Vancouver Island, particularly off Area 27 (Quatsino). The peak catch usually occurs during the latter half of July (Table 15). Chum caught in the troll fishery are a mixture of stocks originating throughout the coast. Stock identification analyses are underway in an attempt to more carefully define the composition of the catches.

4.2.2 Management Regime

The management regime for **Nitinat** (Statistical Areas 21 and 22) is one of harvesting returns surplus to a fixed escapement requirement for all stocks in aggregate. For years prior to 1985, "surpluses" were identified in only four years since 1960. During these infrequent years fishing was permitted on a "clean-up" basis. In two of the four years escapement targets were not obtained.

Catches in **Juan de Fuca Strait** (Statistical Area 20) are of a mixed stock origin. Catch levels and levels of escapement to the area, although important, are minor in comparison to other fishery and stock areas. As such this area and its stocks have not been actively managed for chum salmon. Starting in 1981, excepting 1982 during which an early September fishery occurred for coho, this area has not been fished following IPSFC de-control.

Catches in the **West Coast** Troll Fishery (Statistical Area 121-127) have occurred at incidental levels to the other troll caught species. Catches of chum are considered to be of mixed stock origin. As such, this fishery has not been actively managed for chum salmon.

5.0 STOCK ASSESSMENT TECHNIQUES

5.1 Pre-season Forecasts

5.1.1 Inside Chum

Preseason forecasts of chum salmon returns to the inside waters of southern British Columbia have been developed annually since the early 1960s. Annual forecasts are comprised of predictions for each age class which are added to provide a total return forecast. In past years, the magnitude of the age 4 return, the dominant age class, was forecasted on the basis of a correlation between the returns of age 3 chum in one year and the return of age 4 chum the following year (Anon., 1963). Age 3 returns were forecast using brood year escapements, assumed returns per spawner rates and average age composition. Age 5 returns averaged 5 percent of the production from a brood year so knowing the number of age 3 and age 4 chum that have returned from a given brood year the forecasted age 5 component was computed.

Commencing with the 1974 forecast, a correlation between rates of return for pink and chum salmon of the same brood year was taken into account to improve the accuracy of forecasts (Anderson and Bailey, 1973). The rates of return for pink and chum salmon tend to fluctuate in unison thereby enabling the return rate for chum to be estimated from the return rate for pinks which mature at age 2.

A comparison of predicted and actual returns from 1969 to 1984 is shown in Table 16. The average annual error (regardless of direction) over the

period of record was 569,000 or 29 percent on an average return of 2,052,000. The forecasts were low in eight years and high in seven. While there are marked fluctuations in forecast accuracy there has been a tendency to improved accuracy in recent years with a 16.2 percent average annual error from 1980 to 1984.

Forecasts of **Fraser River** chum returns have been made in the past by applying the ratio of Fraser to non-Fraser brood year escapements to the projected total returns for each age class as described above. From 1974 to 1984 the average annual error (regardless of direction) using this method was 151,000 or 22 percent on an average run size of 699,000 (Table 2).

Separate forecasts for returns to the major enhancement facilities are made by applying expected survival rates to the fry output for each brood year. Until recently, the only facility where this was done was Big Qualicum which commenced operation in the 1960s. The past couple of years, with the first expected returns to a number of enhancement facilities, forecasts for enhanced returns of these stocks have been developed as well. These forecasts of enhanced chum are added to those for wild Fraser and non-Fraser chum to obtain the total forecast for "Inside" chum.

5.1.2 West Coast Chum

No particular stock identifications have been made for Areas 21 and 22. For the time period under consideration (1951-84) these fish were fished, when fished, in Nitinat Lake except in 1984. Such a terminal fishery did not require monitoring for passing stocks. In 1984, these stocks were fished in

Area 21, outside Nitinat Lake. To check on interceptions of passing stock, electrophoretic samples for stock identification were taken in 1984. The results of this sampling are to be reviewed as a separate report by the Chum Technical Committee.

Until recently, with the advent of hatchery stocks, Nitinat stock forecasts were done using brood year strength moderated by "environmental factors" such as flooding. A strong brood year was a predictor of strong returns. This technique requires that rates of return be constant (or at least known before the fishing occurs). Table 3 and Figure 7 show that this is not the case and that productivities have varied between 0.09:1 and 13.99:1. This wide range of productivity makes it impossible to predict return on the basis of brood year strength.

5.2 In-season Stock Assessment

5.2.1 Inside Chum

The abundance of chum salmon during the fishing season has been estimated primarily by means of test fisheries or through comparative catch per unit of effort data from commercial fisheries. As the majority of Inside chum are considered to migrate through Johnstone Strait it is here where the first estimates of the total run size are made. Test fisheries in the Fraser River are used to determine the strength of the chum run into that major system. Estimates of total abundance in the Qualicum area and occasionally off other river systems are usually based on a combination of comparative catch data, visual surveys and sporadic test fishing.

The fisheries during the first three weeks of September are traditionally directed at sockeye and pink salmon with chum taken incidentally. The first indication of total run strength through Johnstone Strait is derived from comparative commercial catch data during the first three weeks of September. Catches during the third week showing a strong correlation, (R square = 0.69), with the total chum run for the season (Table 17; Fig. 8). The chum stock size prediction has proved to be so useful that a commercial fishery for chum assessment purposes is now conducted annually during the third week in September. Based on this prediction the fishing pattern for the season is established in accordance with the management plan described elsewhere in this report.

In addition to this early September commercial catch, test fisheries operate in Johnstone Strait during September through to October to provide updates on run strength which in turn enable fishing patterns to be adjusted. A detailed description is given in Gould and Hop Wo (1986). There are two test fishery locations, both of which utilize commercial purse seine vessels under charter. The first test fishery, located in Area 12, has operated annually since 1965 and involves making approximately 6 sets per day, 3 to 5 days per week. A weekly index of abundance is derived by averaging the chum catch in all sets made during a given week (Table 18). This average catch can then be correlated with total run size. Figure 9 summarizes an example of the average catch cummulative for the fourth week of September and the first week of October (R square = 0.83).

The magnitude of the **Fraser River** run through Johnstone Strait has been estimated in-season by assuming Fraser to non-Fraser proportions remain the

same as in the pre-season forecast and that the Fraser run simply fluctuates in relation to the total run.

There are two test fisheries in the Fraser River involving commercial gill net boats under charter which operate from approximately October 1 until late December (Farwell, 1985). One test fishery, established in 1963, is located at Cottonwood Drift approximately 9 km from the mouth of the Fraser. The second test fishery, which first went into operation in 1979, is situated near the village of Albion, another 50 km upstream from Cottonwood Drift.

During the period of operation both vessels fish daily making two 30-minute sets per day. The number of chum caught is converted to an index of abundance (catch per thousand fathom minutes) which is related to total abundance escaping to the river (Fig. 10). These test fisheries are used to predict spawning escapement during the season. The test fishery has a predictive value (Fig. 11).

The application of electrophoresis as a technique for determining the proportional contribution of major chum stocks in areas where they are intermingled has proved useful in-season in a couple of areas. The principal use as an in-season management tool has been in determining the proportion of Fraser-bound chum in the outer portions of Area 14 to assist in establishing the placement of fishing boundaries. Since 1982, chum have been sampled from Johnstone Strait and occasionally analysed in-season to provide estimates of the proportions of Fraser, Canadian non-Fraser and U.S. chum. The results of this sampling are to be reviewed and published as a separate report by the Chum Technical Committee.

5.2.2 West Coast Chum

Decisions on whether or not to open fisheries were based on results from visual observations, commercial catches, Indian Food Fisheries or test fisheries. The visual observations were made from the water or from aircraft. Their value depended on the experience of the observer and on the climatic conditions at the time of the observations. The Indian Food Fishery was not suitable for determining early estimates of stock strength because their fishery occurred at river mouths. The early test fisheries were limited and lack of background data, such as age composition, reduced their effectiveness.

When the chum fisheries resumed during the late 1960s, the catches during the first and second week of September were used sometimes as an indicator of stock strength. This method was useful when the fishing effort remained low, but lost its value in recent years due to increased fleet size, mobility, and efficiency.

During the 1970s, the fisheries occurred sporadically and extreme fluctuations in stock strength made management of the west coast chum fishery difficult. In 1977, a test fishery program was implemented to gather reliable age data from which estimates of returns from individual brood years would be made.

With the increase in chum releases from the Nitinat Hatchery in recent years, and a subsequent expected increase in numbers of returning adults, an improved in-season stock assessment was required. An expanded test fishery was initiated in 1984 in Area 21 just offshore from the entrance to the lake.

5.3 Escapement Assessment

5.3.1 Inside Chum

With few exceptions chum salmon are enumerated through visual estimates, either by foot or by air, by Fishery Officers assigned to specific geographical locations. An exception is the Big Qualicum River facility where chum salmon escapements are enumerated passing a weir. The number of times each stream is surveyed during a season varies, but usually larger systems are surveyed several times while some small streams may be observed only once.

Although there is no standard method for deriving escapement estimates the usual approach involves counting live fish and carcasses then relating these counts to estimates of spawning turnover rate, body condition, timing of observations and perhaps other factors to estimate the magnitude of the total spawning population. The counts are affected markedly by water clarity and weather conditions as well as the timing of the surveys. Lack of standardized approaches sometimes results in estimates being affected by staff changes, although officers who have remained in one area for a number of years generally maintain consistency within their own areas. The methods in use are not well documented and in recognition of this deficiency use of a new standardised form is being initiated to capture additional information from each survey. The information on these in-season forms will then be used to derive the final spawning population estimates as well as other information such as date of first arrival on the spawning grounds and the start, peak and end of spawning.

Within the **Fraser River** system there have been some significant exceptions to the visual approach for estimating spawning escapements. From 1960 to 1969 and during several years in the 1970s, spawning populations in the major tributaries of the Fraser River were estimated through tag and recapture programmes (Palmer, 1972). During the 1960s programme, tagging of chum in the mainstem of the Fraser River upstream of Mission with subsequent recapture in the tributaries provided an estimate of the total population of Fraser estimate indicated the presence of a substantial, previously undocumented, mainstem spawning population.

During the 1960s, the mainstem populations estimate was derived by subtracting the combined tributary estimate from the total Fraser River estimate. During the 1970s, an expansion factor was applied to the visual estimates for several major tributary populations based on a relationship between visual and tagging estimates determined previously. The mainstem population was derived by subtracting the tributary total from the Fraser total as estimated by test fishing. Since 1980, tributary escapements have been determined by visual estimates and the mainstem population has been assigned a fixed proportion (14%) of the total Fraser River escapement.

5.3.2 West Coast Chum

Escapement assessments for the west coast of Vancouver Island chum stocks are done using visual estimation techniques. The variations in the technique and other associated problems are similar to those discussed previously in Section 5.3.1.

5.4 Run Reconstruction

5.4.1 Inside Chum

The total run size of chum returning to the inside waters of southern British Columbia is determined by summing: the spawning escapements to all areas; all Canadian commercial, Indian food, and test fishery catches in the area from upper Johnstone Strait to the Fraser River and southern Vancouver Island. Catches in U.S. Areas 7 (San Juan Islands) and 7A (Point Roberts) are not included. Likewise, U.S. chum caught in Canadian fisheries have not been subtracted from the total. The run reconstruction methods are currently under review with the intention of implementing improvements to permit new information to be used in run reconstruction of each of the major stocks. Currently Fraser River and Big Qualicum are the only individual stocks for which total return estimates are made.

To determine the magnitude of the **Fraser River** chum run the spawning escapement estimates are added to total catches in the Fraser River and to the proportion of the catch in Johnstone Strait and in U.S. Areas 7 and 7A that is assumed to be of Fraser River origin. Palmer (1972) described a method for estimating the catch of Fraser River chum in Johnstone Strait. The method has been used with some modifications in recent years. For the purposes of run reconstruction the percentage of the catches in U.S. Areas 7 and 7A that are assumed to be of Fraser River origin are 56% and 95%, respectively. As information from electrophoresis becomes available more reliable estimates of major stock contribution to the major fisheries will be possible with consequent improvements in the accuracy of run reconstructions.

5.4.2 West Coast Chum

Prior to 1984, the majority of the fishing occurred within the lake so the run recontruction was simply a method of adding Area 22 escapement to Area 22 catch. In 1980 and 1984, fisheries also occurred in Area 21 and these catch statistics were then added to the Area 22 escapement.

5.5 Estimates of Production Capacity

5.5.1 Inside Chum

The first reported attempt to develop spawning goals for chum salmon in the inside area was in 1962 (Anon., 1962). As an interim measure the highest recorded escapements to individual streams during the period 1949 to 1961 were added together to provide a total escapement target of 2,375,000 for the entire area. Since that time there have been modifications to the targets for individual sub-areas although the current total of 2,500,000 for all Inside chum is not substantially different from the original 1962 target. The rationale for these modifications has generally not been well documented. Most estimates are based on the professional judgement of people familiar with the spawning areas.

For the **Fraser River,** Palmer (1972) reviewed the available spawning areas and suggested an escapement target of 510,000. This has subsequently been modified to 700,000. In the course of his review of Canada's Pacific fisheries, Pearse (1982), on the basis of stock recruitment analysis, concluded that greater chum escapements, particularly in the Fraser River,

would lead to larger catches. He suggested an escapement goal of 1,000,000 chum spawners for the Fraser but with a wide range of 600,000 to 3,000,000. The large uncertainty is a reflection of the relatively narrow range of observed spawners with only one year when escapements were in excess of 600,000. Returns from the record escapement of nearly 900,000 in 1985 should help to establish a realistic escapement goal for the Fraser River in the future.

5.5.2 West Coast Chum

Origin of the spawning goal for Nitinat has not been documented, but is considered to be an estimate based on the amount of habitat available in the system. This estimate, as in other areas, is likely based on the professional judgement of people familiar with this area.

6.0 MANAGEMENT PROCESS

6.1 Inside Chum

In general, the management of Inside chum stocks is done on an aggregate basis in the mixed-stock interception area of Johnstone Strait. Further management is done once the stocks have moved into the terminal areas. Inadequacies in separating individual chum stocks and defining their harvest requirements complicates this aggregated approach. The management approach, until 1983, was to harvest all chum salmon above a stipulated combined escapement target. This procedure did not recognize productivity differences between stocks and often resulted in over or under-harvesting certain stocks. In 1984, the Inside chum fishery has operated on a variable harvest rate schedule which is dependent on the returning stock size.

The rationale for the management change from harvesting above the escapement goal to the variable harvest rate strategy was proposed because the escapement goal approach was not rehabilitating wild chum. Theoretically, either strategy would permit rehabilitation; however, poorly enforced escapement goals, lobbying by various gear, and area sectors of the industry, and loosely defined management objectives, had combined to maintain low levels of chum production under the escapement goal approach.

The Department of Fisheries and Oceans working with the South Coast Advisory Committee (SCAC) spent two years developing several options for a rebuilding program for fall chum. During the discussions leading to the development of the current approach, several options were discussed and

evaluated using deterministic and stochastic model analyses. The variable harvest rate strategy was the endorsed option. A detailed description is given in Hop Wo, Gould, and Farwell (1987) and in Hilborn and Luedke (in press, 1987). Implementation of the present strategy is described below.

The chum run returning through **Johnstone Strait** is managed through a predetermined management plan known as the "clockwork". This clockwork began operation in 1984. The clockwork required fishermen, processors, and managers to carefully decide on a set of rules to manage the fishery by, before the season began. Then as the stocks arrive on the fishing grounds, the rules dictate how and when management decisions will be made. The clockwork is an agreement amongst all user groups that includes the following elements:

1. a clear set of objectives, most importantly the escapement goal;
2. a program of data collection that will provide information necessary for in-season measurement of stock abundance and composition;
3. an accurate, reliable set of methods to estimate stock size and stock composition; and
4. a set of rules stating how the objectives will be achieved and how estimates of run size will be used to determine openings.

The objectives of the clockwork included the following:

1. define the escapement goal as 2,500,000 wild chum;
2. reach the escapement goal within three cycles (12-15 years);
3. stabilize the catch;
4. learn as much as possible about stock productivity; and
5. allow limited fishing at low stock size.

The first and most important objective is the escapement goal. A minimum escapement of 1,800,000 wild chum was accepted. Additionally, to provide for

Canadian enhanced and U.S. origin chum migrating through Johnstone Strait, 700,000 and 100,000 chum, respectively, were accepted and included so that the total run entering Johnstone Strait must reach 2.6 million before fishing is allowed. Various stock size ranges and their associated harvest rates are described in Table 19.

The clockwork starts at the beginning of September with a pre-season forecast which gives a general idea of what may happen during the coming season. Pink or sockeye fisheries are usually held during the first three weeks of September. At the end of the third week of September, incidental chum catches during these fisheries are used to calculate the first in-season estimate of stock size. This estimate is applied to the rules outlining the harvest strategy to determine the allowable catch and the probable number of openings.

In addition to the commercial catches, a test fishing program operating during September and October provides information used to estimate stock size after the first week of October. A revised stock size estimate is determined each week from this information (see Section 5.2.1).

The clockwork was fixed for three years (1984 to 1986) after which time amendments and revisions, based on three years of experience, could be made. The review of the clockwork will take place in 1986 so that a revised management process can be in place for the 1987 season.

The **Fraser River** chum run has been heavily harvested in Johnstone Strait and in U.S. waters (Palmer, 1972; Anderson and Beecham, 1983). Commercial

chum harvesting in the Fraser River area has, in recent years, been dictated by the amount of fishing in other areas. Typically, if the Fraser River stocks were significantly harvested in Johnstone Strait and in U.S. waters, then the Fraser River area also partook in the harvest of the returning chum.

In 1984 to 1986, with the clockwork management process in place, the harvest of Fraser chum was tied to the overall harvest place, and sharing of the total allowable catch was accomplished under the auspices of the clockwork system and the associated Advisory Group. However, the clockwork did not fully address local management issues. Therefore, there exists a Fraser River Advisory Group which has been participating in the development of a Fraser River management process. This local process will determine the harvest strategy and rules for terminal Fraser harvests. Prior to 1985, this process was still under development.

Mid-Vancouver Island stocks are dominated by enhanced returns to the Big Qualicum, Little Qualicum and Puntledge Rivers. These enhanced stocks have, in years of low overall abundance, remained productive. Because of conservation requirements for other stocks these enhanced fish are not fully harvested in Johnstone Strait. As a consequence, the surpluses to these facilities are fished terminally off the mid-Vancouver Island area (Area 14). Although this is the terminal area for these stocks, it does contain other passing stocks, notably the Fraser River stocks.

The mid-Vancouver Island terminal fishery is managed on the basis of a fixed escapement. The expected total returning stock is determined from pre-season estimates and then reduced by the estimated magnitude of the

catches in Johnstone Strait. When fishing takes place in Johnstone Strait, the catch of mid-Vancouver Island enhanced chum is determined using coded wire tag data. The difference between the pre-season estimate of total stock and the catch in Johnstone Strait is expected to arrive off the mid-Vancouver Island terminal area. If there is no Johnstone Strait harvest than the full pre-season estimate of mid-Vancouver Island stocks is expected to arrive terminally.

In order to account for errors in stock size prediction only 60-65% of the expected total catch is harvested before the escapement requirement is met. This harvest takes place on bright chum whereas the remaining 35 - 40% are taken in dark condition just prior to spawning.

6.2 West Coast Chum

Of the three "Outside" fisheries and stocks of interest for the purpose of this report only the Nitinat stock and fishery is actively managed.

The management of the **Nitinat** (Statistical Areas 21 and 22) stocks have been done within the terminal area of Nitinat Lake. Given the variability in wild stock production and the infrequent fisheries, a specific management process had not been developed.

In 1984 a management process was initiated to account for newly enhanced production and to incorporate improved fleet safety, improved catch quality, and attainment of information for the development of an identifiable management process.

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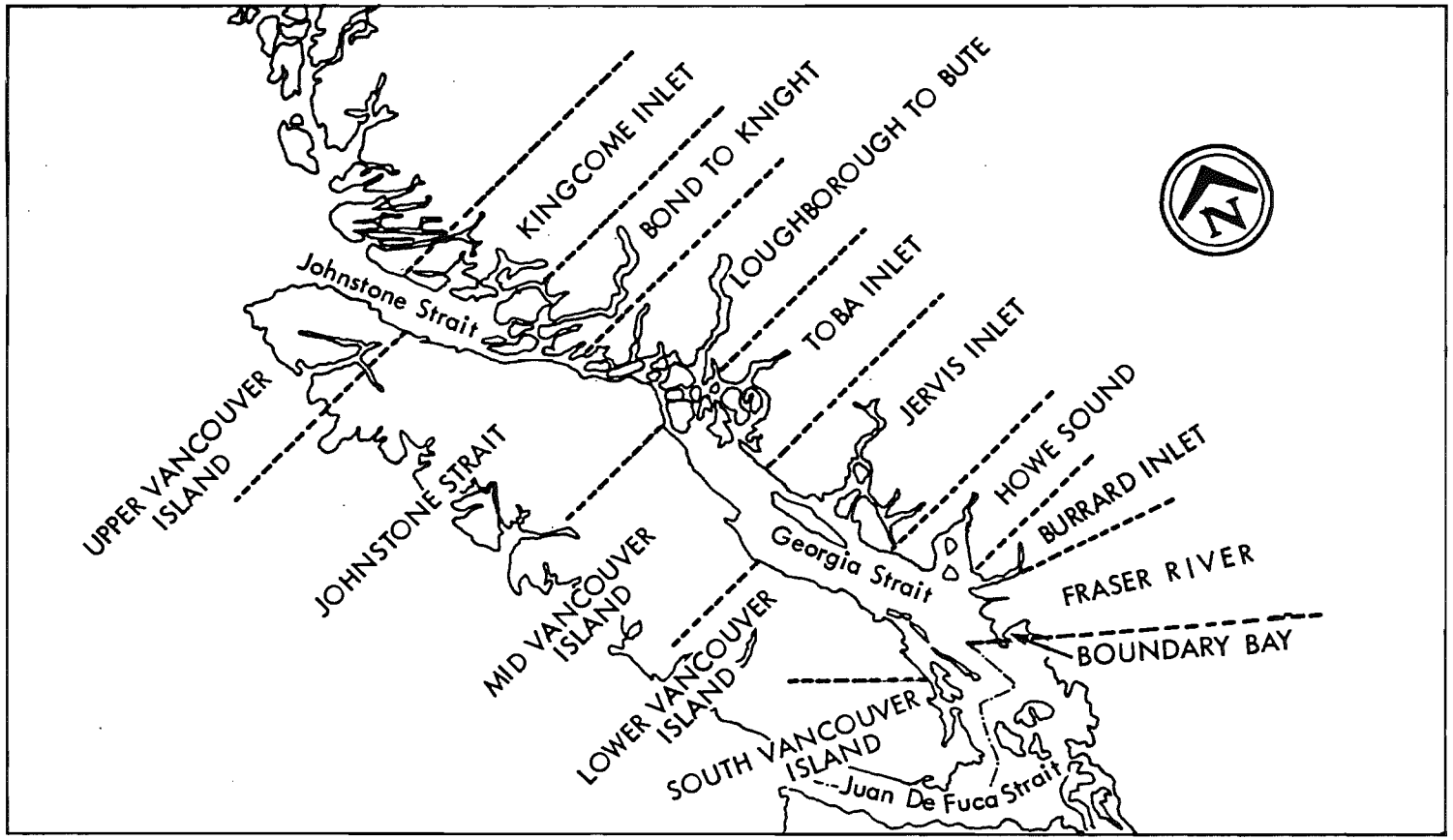


Figure 1. Location map of the Johnstone Strait - Fraser River Chum salmon study area.

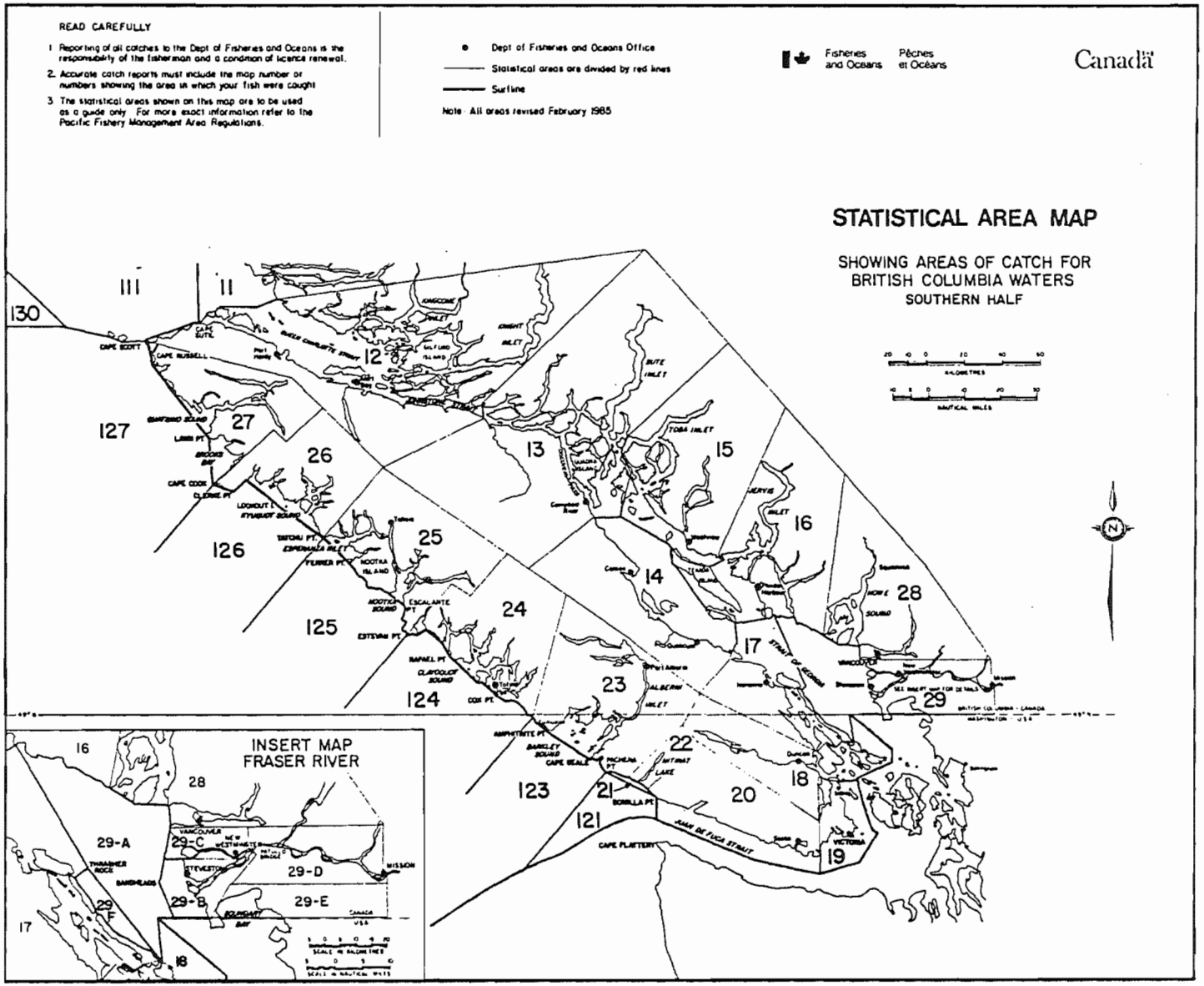


Figure 2. Statistical areas of catch for southern British Columbia waters.

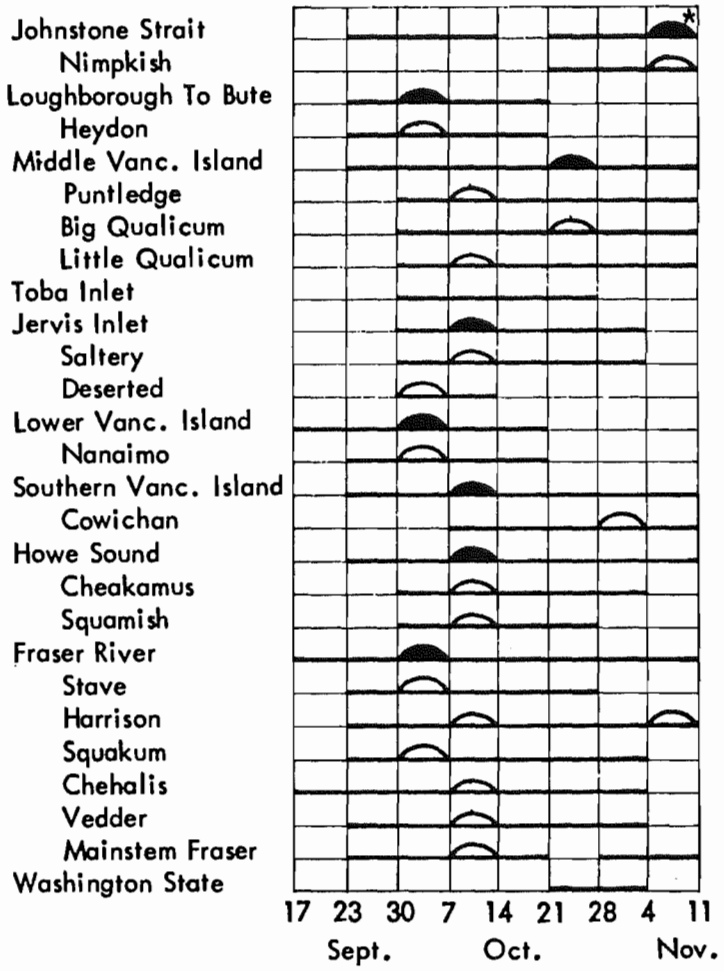


Figure 3. Timing of Chum salmon entering upper Johnstone Strait (* indicates week of peak entrance).

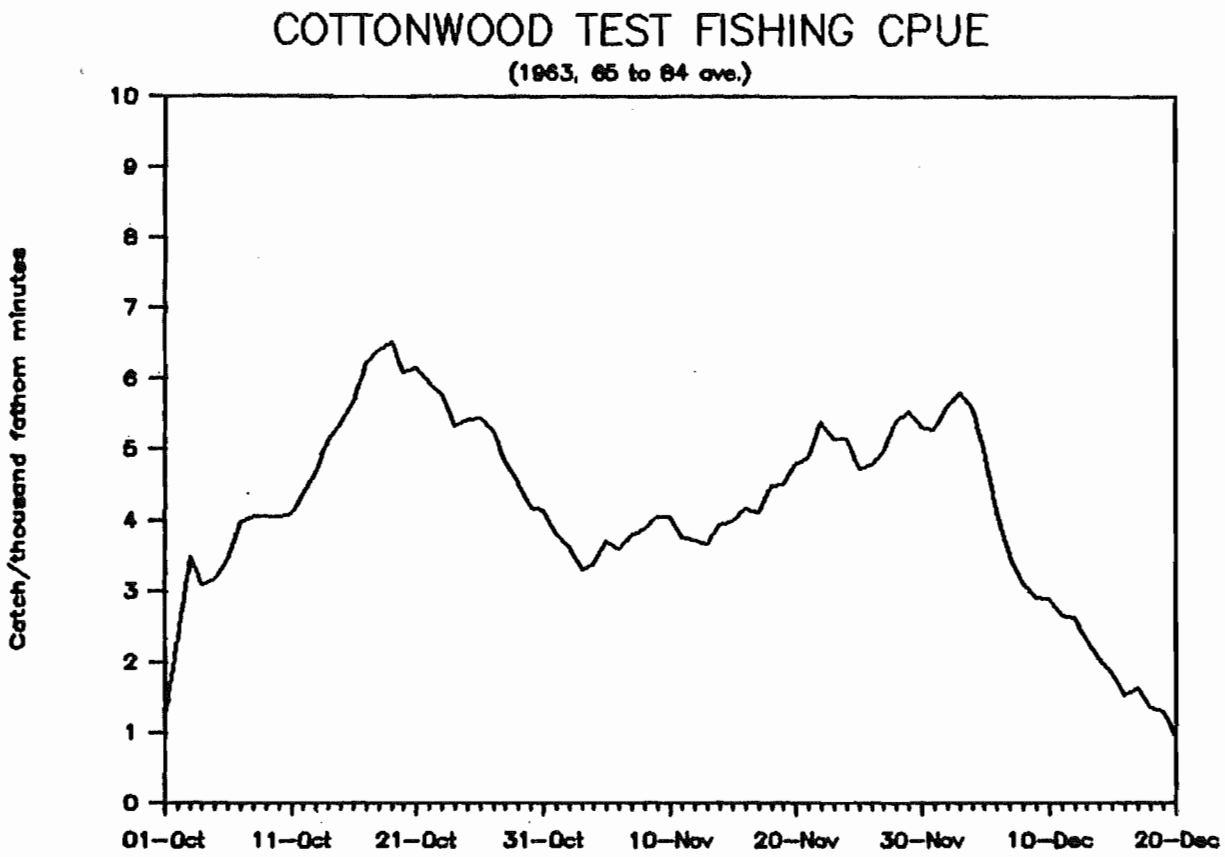


Figure 4. Timing of Chum salmon entering the Fraser River.

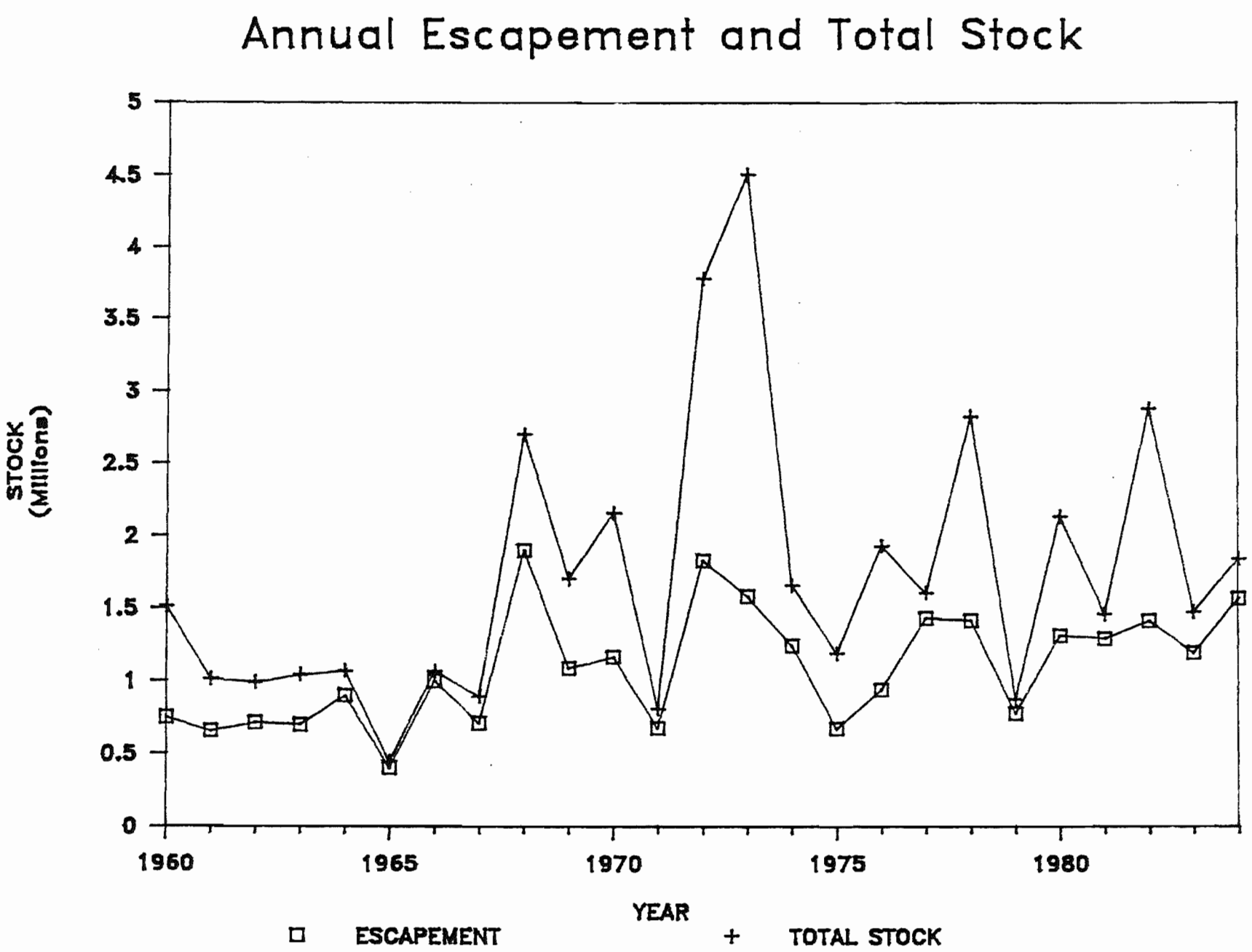


Figure 5. Spawning escapements of Inside Chum and total stock.

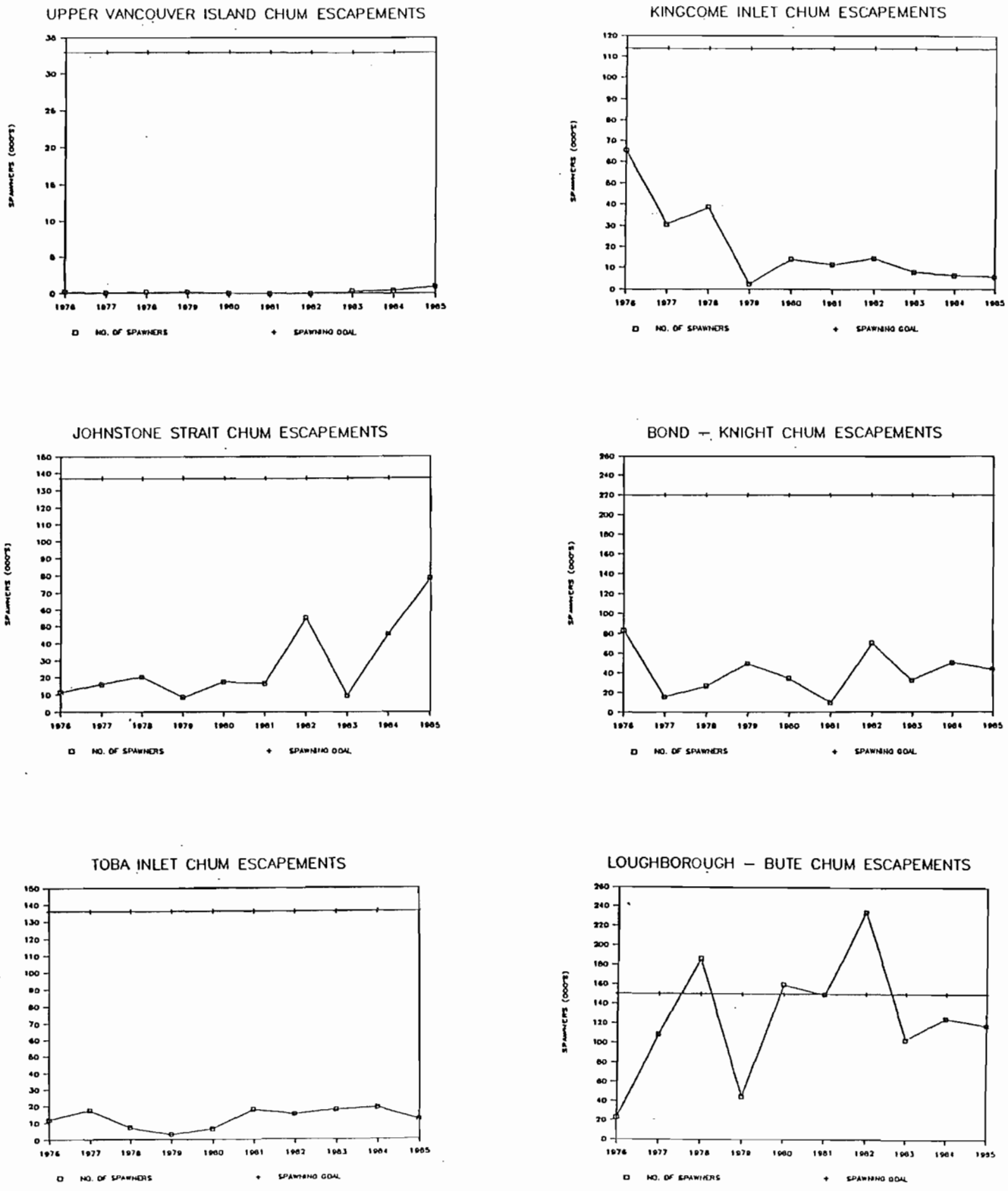
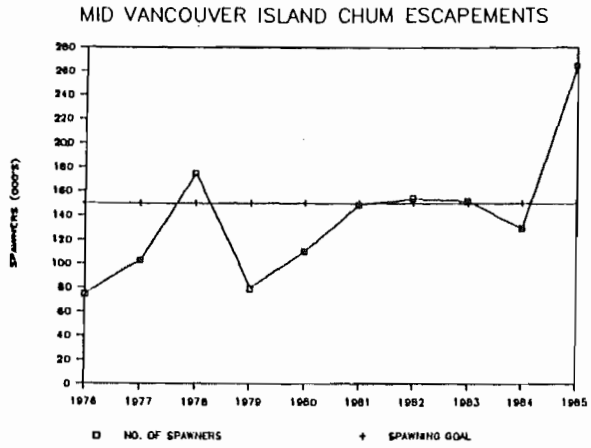
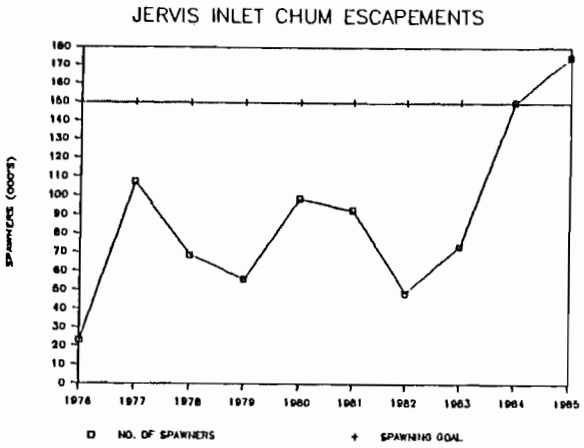
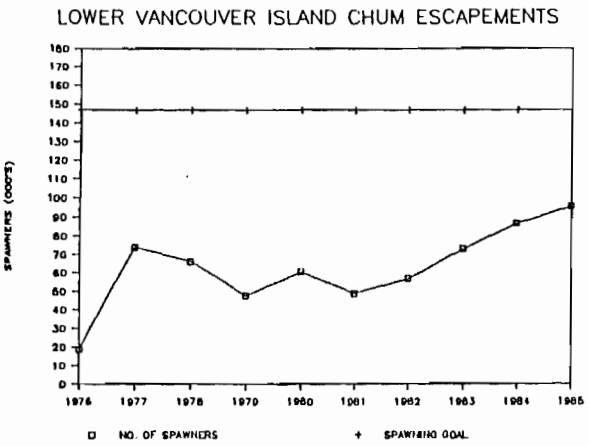
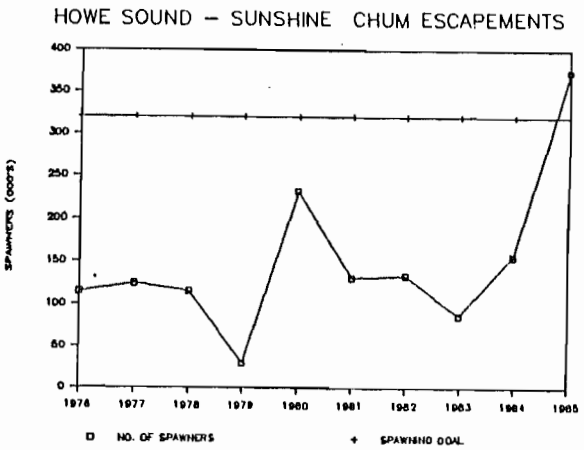


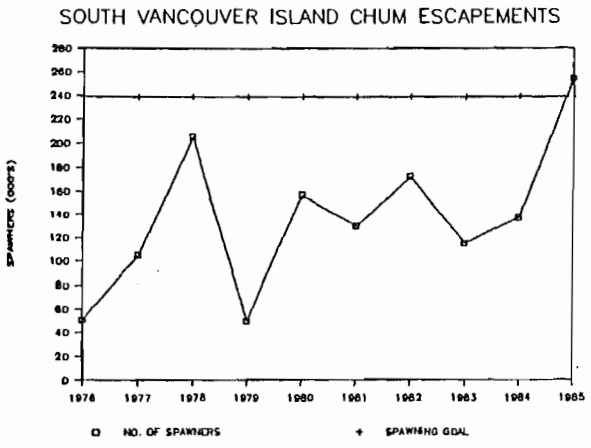
Figure 6. Annual Chum salmon escapements for each Johnstone Strait - Fraser River sub area.

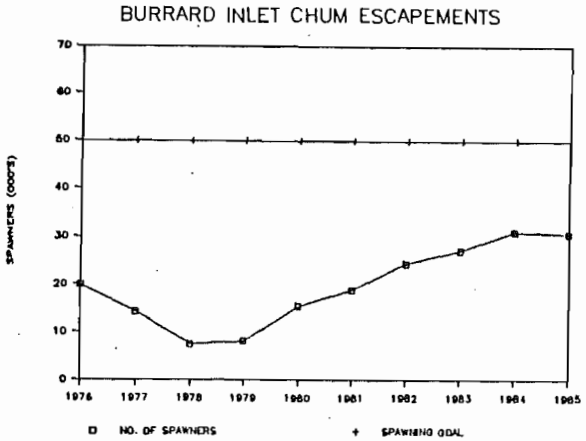












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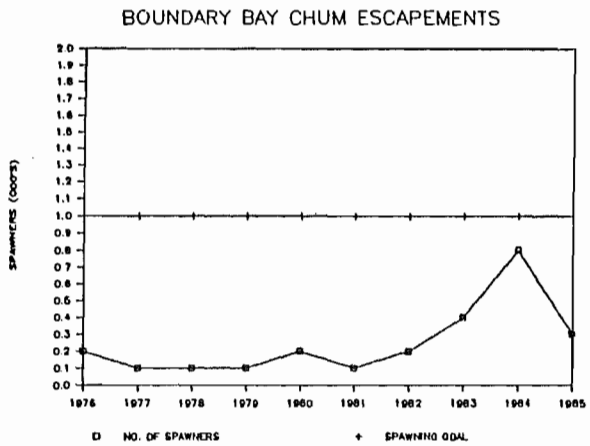

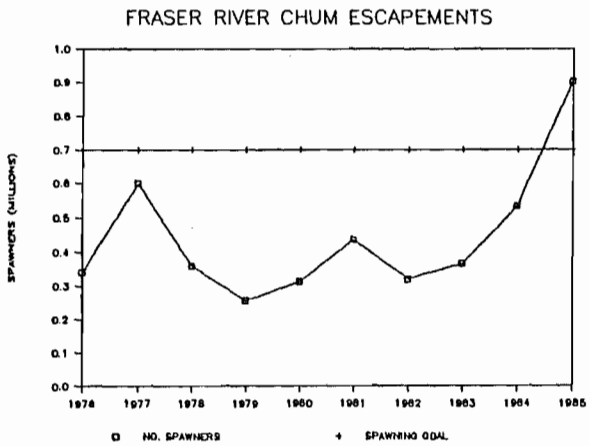

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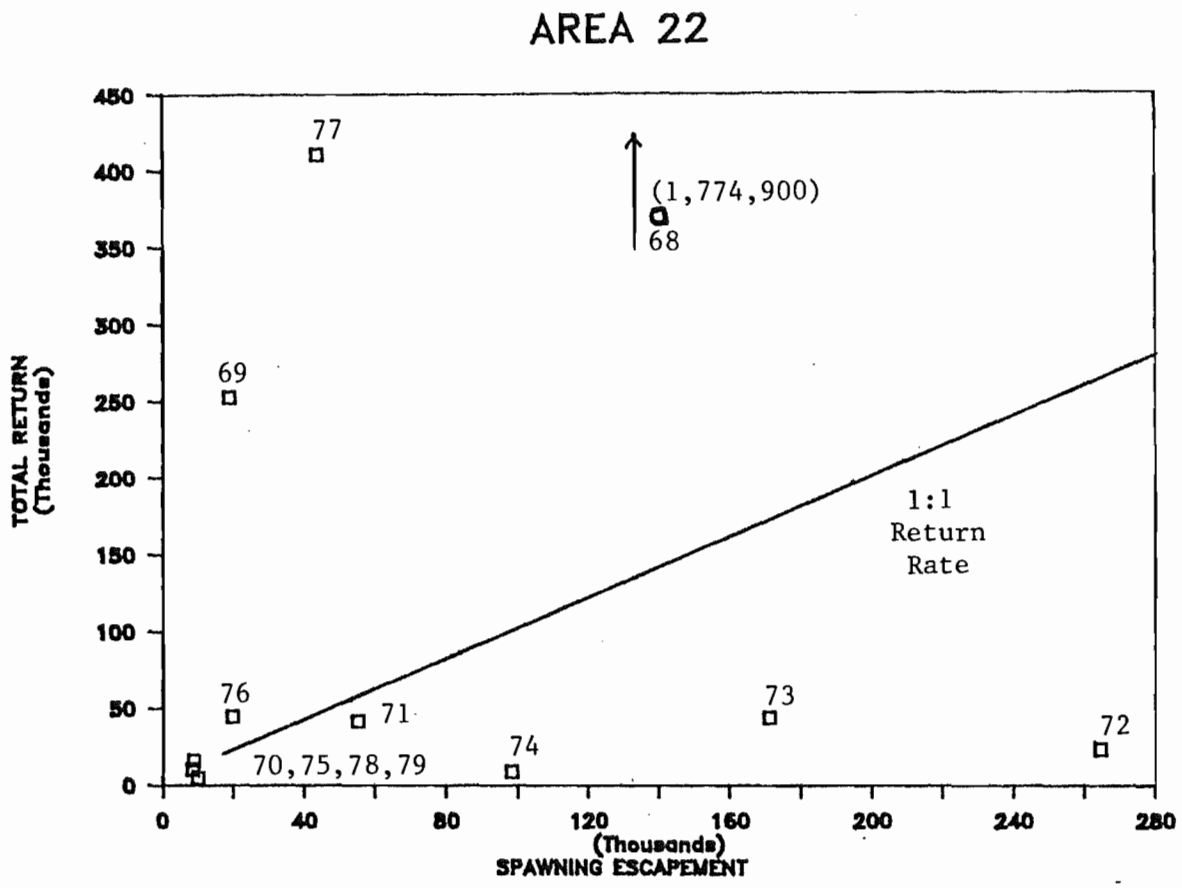

Figure 7. Escapements and subsequent returns of Chum salmon to Nitinat Lake, 1968 - 1978.

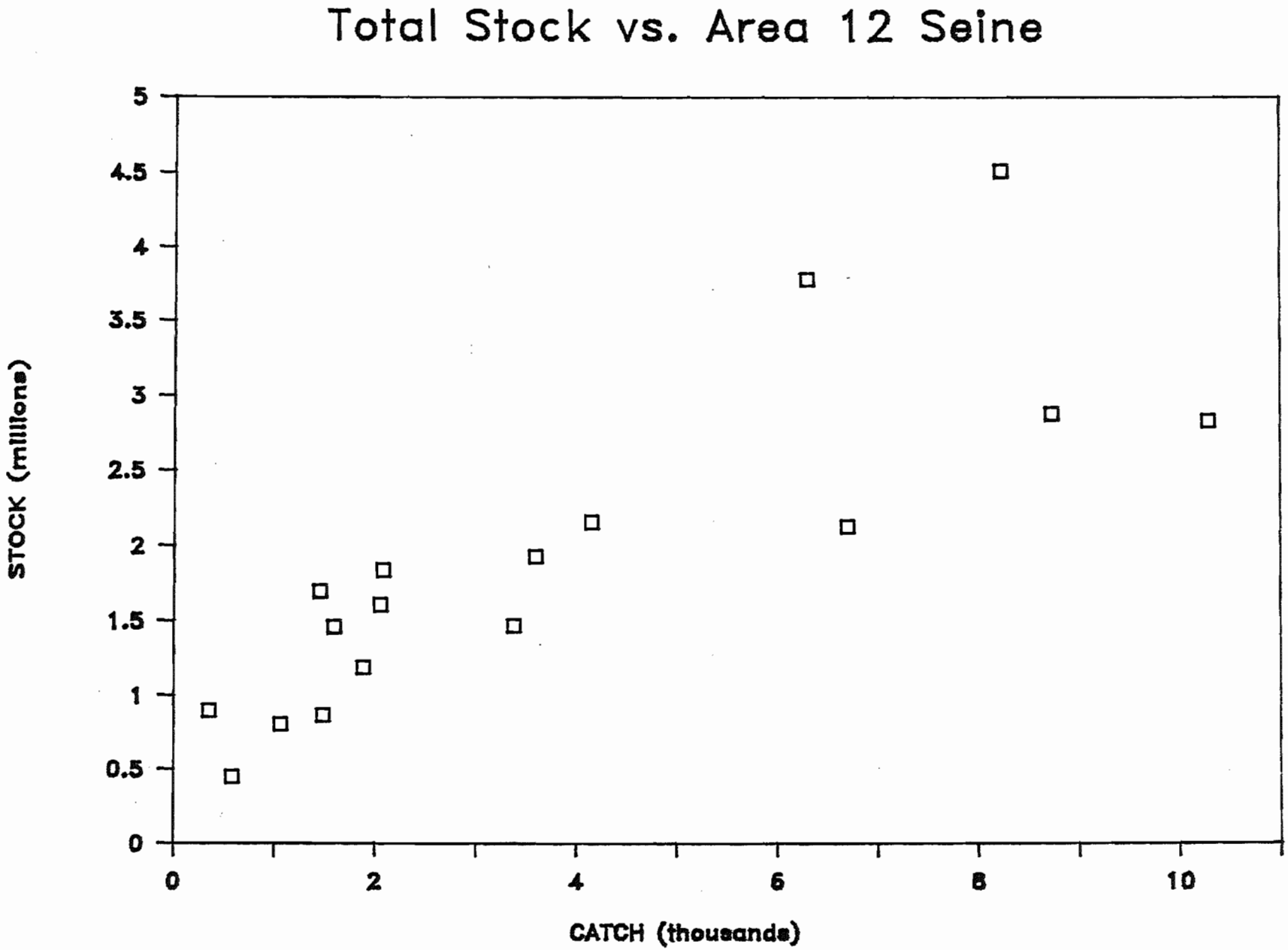

Figure 8. Correlation between Area 12 commercial seine catch for the third week of September and total stock size.

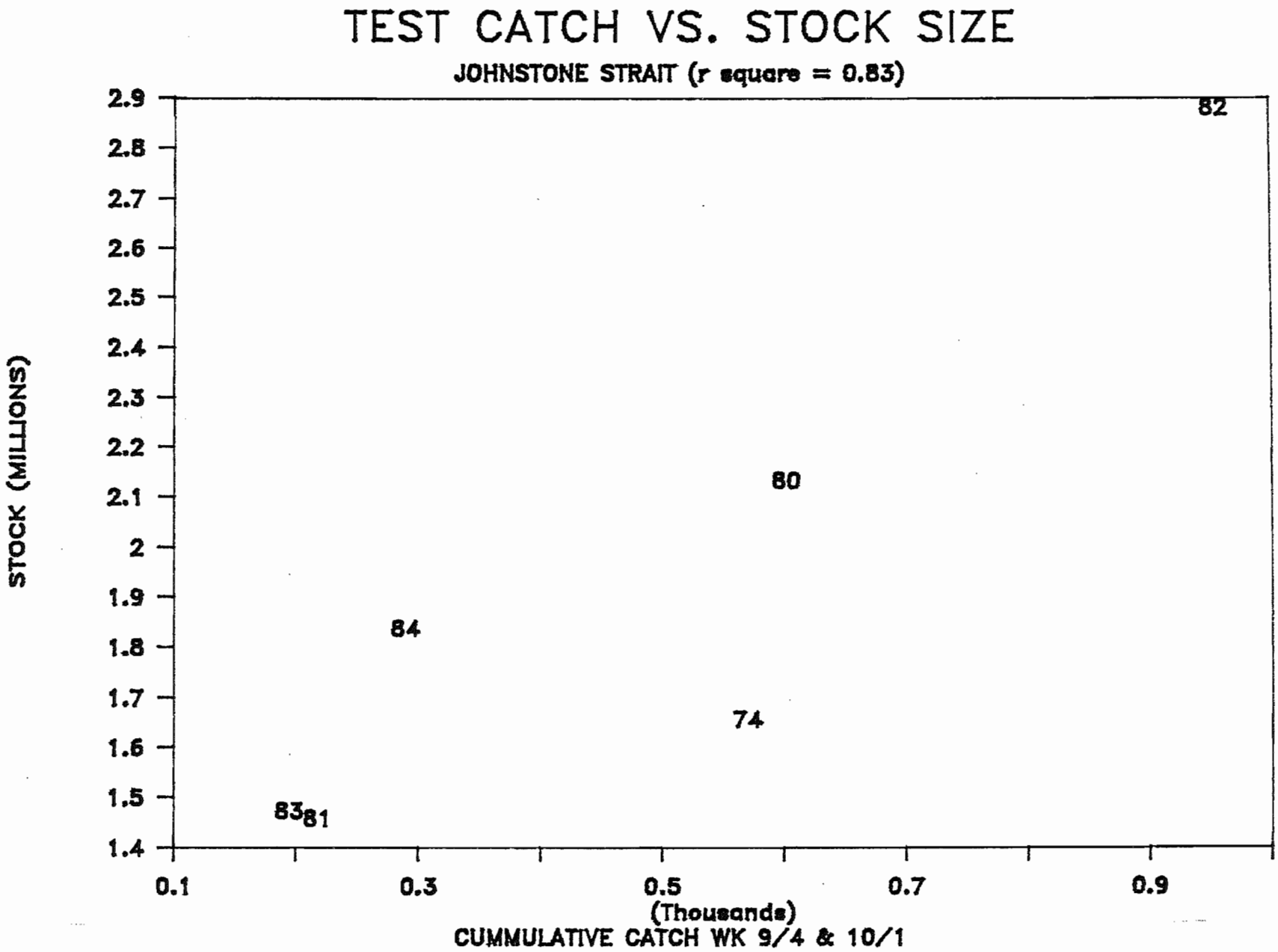

Figure 9. Correlation between Area 12 test fishing catches, cummulative for the fourth week of September and the first week of October, and total stock size.

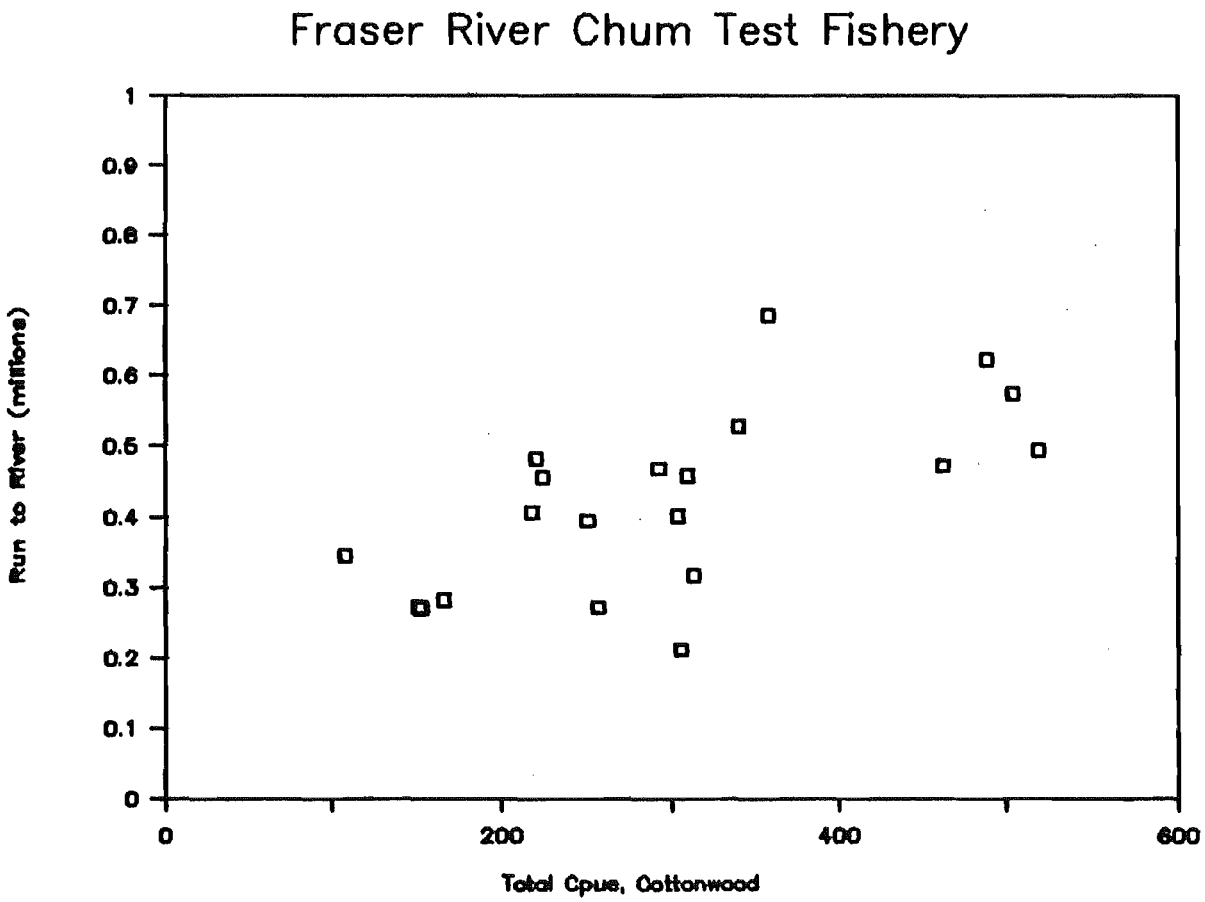

Figure 10. Correlation between test fishery CPUE for the season and Chum run to the Fraser River.

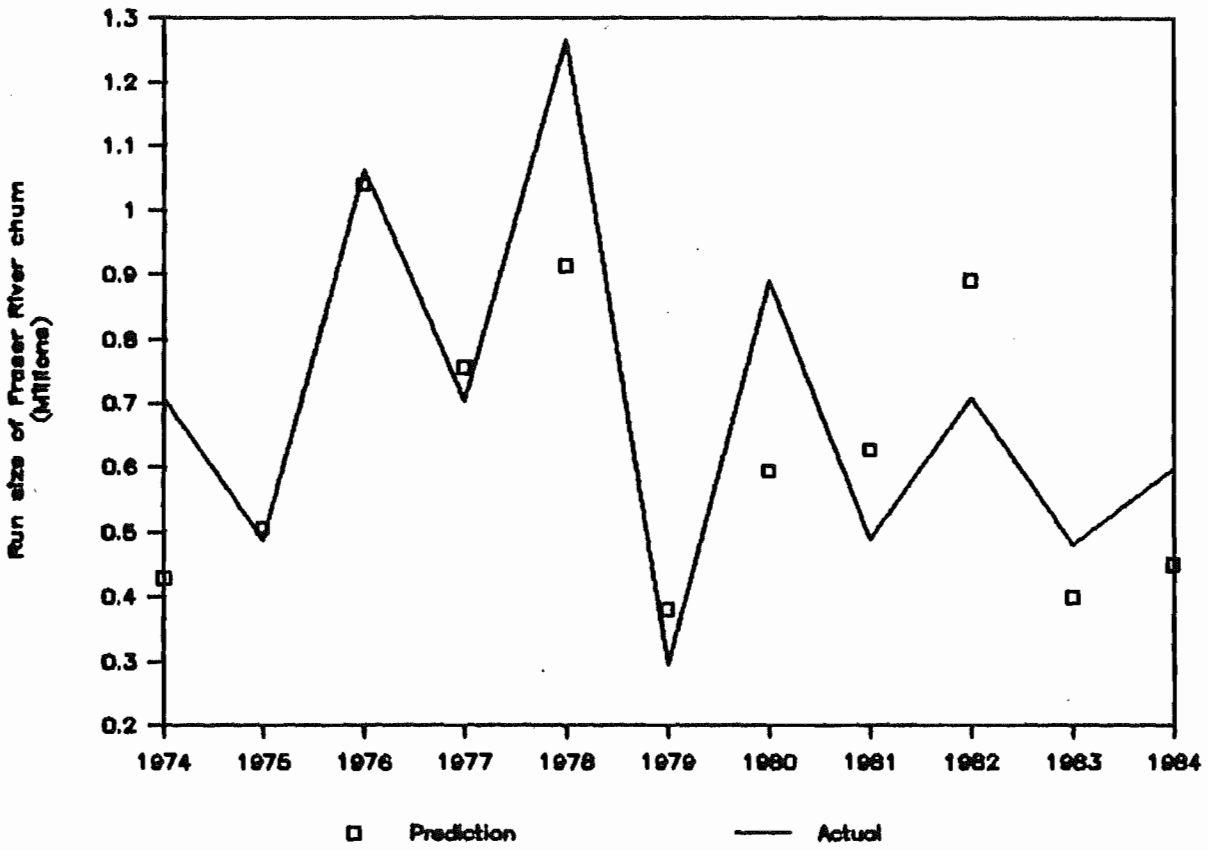

Figure 11. Predicted variance of the test fishery used to predict spawning escapement to the Fraser River during the season.

Table 1. Total study area fall Chum salmon escapements in thousands of fish by sub area, 1960 - 1984.

SUBAREA STOCK	CURRENT CAPACITY	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
UPPER VANCOUVER IS.	32.9	13.7	17.5	5.7	2.0	14.3	9.8	3.7	1.9	16.0	5.1	4.4	0.6	4.7	2.2
KINGCOME INLET	113.5	24.0	38.4	22.8	25.0	19.1	8.8	14.3	21.7	21.7	8.7	24.5	6.4	52.3	88.6
BOND TO KNIGHT INLET	220.0	43.0	107.8	108.9	94.0	150.9	5.0	28.1	86.3	70.7	70.8	89.6	10.2	115.7	178.3
JOHNSTONE STRAIT	137.0	40.4	42.4	22.7	19.9	20.2	17.2	45.5	21.8	60.2	11.2	24.1	9.4	32.9	35.9
LOUGHBOROUGH TO BUTE	150.0	11.2	22.9	23.3	30.6	56.4	7.8	26.7	36.4	91.3	30.6	118.4	24.6	210.0	122.0
MID VANCOUVER IS.	299.0	165.3	80.3	116.9	157.7	134.4	40.3	147.2	119.5	338.3	233.6	300.6	166.0	248.2	322.9
TOBA INLET	136.0	20.5	14.3	11.9	11.3	17.1	17.0	22.0	18.9	78.6	20.0	10.2	23.6	50.8	11.4
JERVIS INLET	149.8	103.8	68.8	46.3	41.2	47.5	18.3	36.0	17.3	101.4	104.8	67.2	42.2	95.7	93.3
LOWER VANCOUVER IS.	147.4	10.5	13.7	19.5	13.9	28.8	22.8	93.9	29.0	46.2	48.0	56.4	32.5	104.4	66.4
SOUTHERN VAN. IS.	238.5	22.3	53.6	102.0	45.6	47.7	58.8	127.3	98.3	126.2	95.5	51.3	26.5	125.6	115.0
HOWE SD. TO SUNSHINE	350.0	26.4	21.1	50.6	41.7	34.2	10.3	23.7	43.1	110.4	54.8	117.0	38.4	327.9	241.1
BURRARD INLET	50.0	4.1	2.6	3.6	3.2	5.1	3.6	3.6	3.6	15.3	15.2	15.1	7.6	36.9	36.2
FRASER RIVER	700.0	263.7	172.7	180.2	214.2	325.4	184.8	429.7	213.9	822.2	390.1	287.3	290.2	423.3	267.1
BOUNDARY BAY	5.0	0.1	0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.2	0.2	0.4	0.2
GRAND TOTAL	2729.1	748.8	656.1	714.2	700.3	901.0	404.4	1001.8	711.6	1898.4	1088.2	1166.1	678.2	1828.6	1580.4

SUBAREA STOCK	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	80-84	70-79	60-69	60-84
UPPER VANCOUVER IS.	1.7	0.2	0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.3	0.4	0.1	1.4	9.0	4.4
KINGCOME INLET	63.8	18.6	66.0	31.1	38.8	2.7	14.1	11.6	14.5	8.0	6.4	10.9	39.3	20.5	22.9
BOND TO KNIGHT INLET	63.3	19.1	87.6	15.8	26.5	50.3	34.6	9.7	69.9	32.4	50.3	39.4	65.6	76.5	59.7
JOHNSTONE STRAIT	9.5	11.6	11.4	16.1	20.7	8.5	17.5	16.6	55.1	9.5	45.8	28.9	18.0	30.1	24.9
LOUGHBOROUGH TO BUTE	68.5	26.2	24.4	113.9	187.7	47.3	159.8	149.3	234.3	103.1	125.1	154.3	94.3	33.7	77.0
MID VANCOUVER IS.	234.8	182.6	167.6	203.6	302.7	207.3	203.1	230.8	269.7	281.8	221.8	241.4	233.6	153.4	197.3
TOBA INLET	27.2	18.2	12.5	17.5	8.1	3.9	6.3	17.7	15.0	17.7	18.9	15.1	18.3	23.2	18.4
JERVIS INLET	108.5	51.9	25.3	114.5	77.3	61.5	98.5	92.3	48.6	73.2	150.1	92.5	73.7	58.5	70.6
LOWER VANCOUVER IS.	50.8	19.8	18.7	74.2	66.4	48.0	60.6	48.9	56.7	72.9	86.7	65.2	53.8	32.6	44.8
SOUTHERN VAN. IS.	109.5	61.4	50.9	108.5	204.5	51.3	157.0	130.7	172.6	115.5	138.0	142.8	90.5	77.7	96.7
HOWE SD. TO SUNSHINE	146.2	55.6	114.6	124.1	115.5	29.7	231.7	130.2	133.8	86.5	156.2	147.7	131.0	41.6	84.4
BURRARD INLET	9.0	15.4	20.0	14.3	7.5	8.1	15.5	18.9	24.4	27.1	31.0	23.4	17.0	6.0	12.1
FRASER RIVER	350.4	191.4	340.5	599.4	359.1	255.6	312.1	435.3	320.3	365.0	533.0	393.2	336.4	319.7	343.0
BOUNDARY BAY	0.3	0.4	0.2	0.1	0.1	0.1	0.2	0.1	0.2	0.4	0.8	0.3	0.2	0.0	0.2
GRAND TOTAL	1243.4	672.3	939.9	1433.1	1415.0	774.4	1311.0	1292.1	1415.0	1193.3	1564.4	1355.2	1173.1	882.5	1056.6

FILE : FALLSUM DISK : US TABLE
DATE NOV/19/86
ORGINALLY FROM DISK : STUDY AREA CHUM ESCAPEMENT
15-Dec-86

Table 2. Comparison of predicted and actual returns of Fraser River Chum salmon, 1974 - 1984.

Year	Published Prediction	Actual Return	Error	Percent Error
1974	430,000	707,000	(277,000)	-39%
1975	506,000	486,000	20,000	4%
1976	1,040,000	1,064,000	(24,000)	-2%
1977	756,000	704,000	52,000	7%
1978	914,000	1,265,000	(351,000)	-28%
1979	381,000	296,000	85,000	29%
1980	595,000	891,000	(296,000)	-33%
1981	628,000	489,000	139,000	28%
1982	890,000	708,000	182,000	26%
1983	400,000	482,000	(82,000)	-17%
1984	450,000	599,000	(149,000)	-25%
Average	635,000	699,000	(63,727)	-5%

Note: numbers in brackets represent negative values.

/data/chum/expect/history

Table 3. Production of Canadian caught study area Chum salmon, 1960 - 1984.

YEAR	ESCAPE-MENT	CATCH	TOTAL RETURN	RETURN AT AGE 3	RETURN AT AGE 4	RETURN AT AGE 5	BROOD RETURN	AGE 3	AGE 4	AGE 5	RATIO R/E
1960	748,800	766,000	1,514,800	363,520	817,770	10,068	1,191,358	30.5	68.6	0.8	1.59
1961	656,100	357,400	1,013,500	244,839	275,898	9,613	530,350	46.2	52.0	1.8	0.81
1962	714,200	273,700	987,900	159,534	867,297	11,657	1,038,488	15.4	83.5	1.1	1.45
1963	700,300	342,200	1,042,500	191,190	321,915	13,255	526,361	36.3	61.2	2.5	0.75
1964	901,000	169,100	1,070,100	562,231	2,237,200	62,471	2,861,902	19.6	78.2	2.2	3.18
1965	404,400	41,100	445,500	454,474	857,909	20,306	1,332,688	34.1	64.4	1.5	3.30
1966	1,001,800	66,300	1,068,100	781,310	1,955,845	87,642	2,824,797	27.7	69.2	3.1	2.82
1967	711,600	185,100	896,700	184,265	384,750	69,556	638,571	28.9	60.3	10.9	0.90
1968	1,898,400	806,800	2,705,200	337,770	3,440,738	747,592	4,526,100	7.5	76.0	16.5	2.38
1969	1,088,200	614,000	1,702,200	269,906	3,642,370	434,422	4,346,699	6.2	83.8	10.0	3.99
1970	1,166,100	994,100	2,160,200	119,038	880,451	40,219	1,039,707	11.4	84.7	3.9	0.89
1971	678,200	131,800	810,000	338,252	461,324	27,017	826,594	40.9	55.8	3.3	1.22
1972	1,828,600	1,951,600	3,780,200	687,762	1,617,172	35,317	2,340,251	29.4	69.1	1.5	1.28
1973	1,580,400	2,928,600	4,509,000	285,610	1,192,738	57,927	1,536,275	18.6	77.6	3.8	0.97
1974	1,243,400	414,700	1,658,100	375,640	2,365,111	146,546	2,887,298	13.0	81.9	5.1	2.32
1975	672,300	517,600	1,189,900	404,075	409,109	17,078	830,261	48.7	49.3	2.1	1.23
1976	939,900	989,900	1,929,800	317,517	1,515,637	97,382	1,930,536	16.4	78.5	5.0	2.05
1977	1,433,100	172,200	1,605,300	604,120	1,159,970	129,713	1,893,803	31.9	61.3	6.8	1.32
1978	1,415,000	1,410,700	2,825,700	201,480	2,156,110	390,822	2,748,412	7.3	78.4	14.2	1.94
1979	774,400	97,900	872,300	596,678	824,413	82,805	1,503,895	39.7	54.8	5.5	1.94
1980	1,311,000	823,700	2,134,700	258,090	846,446						
1981	1,292,100	167,900	1,460,000	905,329							
1982	1,415,000	1,467,500	2,882,500								
1983	1,193,300	281,500	1,474,800								
1984	1,564,400	275,700	1,840,100								
AVERAGE:	1,093,280	649,884	1,743,164	392,847	1,344,294	124,570	1,867,717	25.5	69.4	5.1	1.8
EVEN YRS:	1,242,123	800,754	2,042,877	378,536	1,699,980	162,972	2,338,885	17.8	76.8	5.3	2.0
ODD YRS:	932,033	486,442	1,418,475	407,158	866,400	86,169	1,396,550	33.1	62.0	4.8	1.6

NOTE : ESCAPEMENT INCL. MISCALLANEOUS AND ADDED NEW WEST STREAMS 1956-85
FILE..NEWPROD.WKS DISK..U.S. TABLES
ORIGINALLY FROM DISK..CHUM PRODUCTION (P)

16-Dec

Table 4. Production of Canadian caught Area 22 Chum salmon, 1960 - 1984.

YEAR	ESCAPEMENT	CATCH	TOTAL RETURN	RETURN AT AGE 3	4	5	BROOD RETURN	AGE 3	AGE 4	AGE 5	RATIO R/E
1960	44,100	48274	92,374	N/A	N/A	N/A	0	N/A	N/A	N/A	0.00
1961	44,200	0	44,200	N/A	N/A	N/A	0	N/A	N/A	N/A	0.00
1962	18,700	0	18,700	N/A	N/A	N/A	0	N/A	N/A	N/A	0.00
1963	6,700	0	6,700	N/A	N/A	N/A	0	N/A	N/A	N/A	0.00
1964	44,200	0	44,200	N/A	N/A	N/A	0	N/A	N/A	N/A	0.00
1965	80,300	0	80,300	N/A	N/A	N/A	0	N/A	N/A	N/A	0.00
1966	8,500	0	8,500	N/A	N/A	1601	1601	0.00	0.00	100.00	0.19
1967	21,200	0	21,200	N/A	773	0	773	0.00	100.00	0.00	0.04
1968	124,700	0	124,700	52826	1530218	161834	1744878	3.03	87.70	9.27	13.99
1969	18,800	0	18,800	24882	180853	46794	252529	9.85	71.62	18.53	13.43
1970	8,700	0	8,700	3112	12655	198	15965	19.49	79.27	1.24	1.84
1971	55,200	0	55,200	38651	2178	571	41400	93.36	5.26	1.38	0.75
1972	264,600	1290457	1,555,057	7524	15071	830	23425	32.12	64.34	3.54	0.09
1973	171,000	174834	345,834	4058	39199	899	44156	9.19	88.77	2.04	0.26
1974	98,100	0	98,100	3671	4847	194	8712	42.14	55.64	2.23	0.09
1975	9,900	0	9,900	2654	2246	0	4900	54.16	45.84	0.00	0.49
1976	19,700	0	19,700	2061	42364	460	44885	4.59	94.38	1.02	2.28
1977	43,700	0	43,700	286037	113390	11048	410475	69.68	27.62	2.69	9.39
1978	8,400	0	8,400	1150	8865	N/A	10015	11.48	88.52	0.00	1.19
1979	4,500	0	4,500	N/A	N/A	N/A	0	N/A	N/A	N/A	0.00
1980	54,500	273904	328,404	N/A	N/A	N/A	0	N/A	N/A	N/A	0.00
1981	115,000	0	115,000	N/A	N/A	N/A	0	N/A	N/A	N/A	0.00
1982	22,500	0	22,500	N/A	N/A	N/A	0	N/A	N/A	N/A	0.00
1983	8,000	0	8,000	N/A	N/A	N/A	0	N/A	N/A	N/A	0.00
1984	76,000	186663	262,663	N/A	N/A	N/A	0	N/A	N/A	N/A	0.00
AVERAGE	54848	78965	133813	17065	78106	8977	104149	13.96	32.36	5.68	2.32

CMRPROR/D26

Table 5. Annual escapements for chum salmon in Area 20, 1951-1984.

YEAR	Escapement
1951	57,675
1952	18,275
1953	60,075
1954	52,200
1955	51,675
1956	23,350
1957	23,850
1958	75,650
1959	29,400
1960	10,075
1961	9,200
1962	13,025
1963	12,400
1964	52,675
1965	19,100
1966	13,725
1967	41,975
1968	75,850
1969	51,200
1970	59,075
1971	22,625
1972	93,725
1973	111,054
1974	19,675
1975	7,650
1976	5,825
1977	11,525
1978	18,055
1979	5,465
1980	32,084
1981	17,825
1982	11,222
1983	17,371
1984	25,242
AVERAGES	
1951-59	43,572
1960-69	29,923
1970-79	35,467
1980-84	20,749

Data sources: Escapements from BC catalogue of salmon stream asd spawning escapements.

CMESC20/D26

Table 6. Fall commercial Chum catches by region and gear, 1960 - 1984.

YEAR	AREAS 11 TO 13 JOHNSTONE STRAIT			AREAS 14 TO 19 GULF			AREA 29 FRASER RIVER			TOTAL COMMERCIAL CATCH			TOTAL COMMERCIAL CATCH ALL GEAR
	GN	SN	TR	GN	SN	TR	GN	SN	TR	GN	SN	TR	
1960	170800	421500	100	68600	9300	0	67300	0	0	306700	430800	100	737600
1961	92300	127400	200	58900	8300	0	47900	0	0	199100	135700	200	335000
1962	31300	87800	100	67200	16000	0	47600	0	0	146100	103800	100	250000
1963	99700	151000	300	10800	3000	100	53800	0	0	164300	154000	400	318700
1964	25600	55000	100	2800	700	0	60800	0	0	89200	55700	100	145000
1965	2800	11300	100	300	0	0	11900	0	0	15000	11300	100	26400
1966	10200	19300	200	600	0	0	13900	0	0	24700	19300	200	44200
1967	44100	74300	200	0	100	0	46500	0	0	90600	74400	200	165200
1968	221500	344500	200	9000	2900	0	202400	0	0	432900	347400	200	780500
1969	182000	288700	600	24900	9800	0	88900	0	0	295800	298500	600	594900
1970	239000	457800	1000	81600	13400	300	178900	0	0	499500	471200	1300	972000
1971	39100	49100	800	900	300	0	21700	0	0	61700	49400	800	111900
1972	344700	1007000	100	200500	116800	100	256400	0	0	801600	1123800	200	1925600
1973	441700	1853200	900	272700	137500	200	190500	0	0	904900	1990700	1100	2896700
1974	64700	172600	200	22800	4200	2900	93100	0	0	180600	176800	3100	360500
1975	104200	240800	1000	37000	31000	200	73300	0	200	214500	271800	1400	487700
1976	143500	557800	900	30300	42800	100	174100	0	0	347900	600600	1000	949500
1977	24200	91100	2600	0	0	100	14400	0	0	38600	91100	2700	132400
1978	182600	968400	6000	32400	67800	300	124400	0	300	339400	1036200	6600	1382200
1979	7200	42600	1300	4200	2200	200	7700	0	100	19100	44800	1600	65500
1980	110700	528500	2000	29200	51500	100	75500	0	0	215400	580000	2100	797500
1981	11500	44400	1100	41000	14100	100	8700	0	100	61200	58500	1300	121000
1982	244400	865000	2600	117800	120600	100	63200	0	100	425400	985600	2800	1413800
1983	14400	83800	3700	81700	41800	200	12600	0	0	108700	125600	3900	238200
1984	2700	35300	200	63300	100900	0	15000	0	0	81000	136200	200	217400
AVERAGE:													
1960-1969	88030	158080	210	24310	5010	10	64100	0	0	176440	163090	220	339750
	25.9%	46.5%	0.1%	7.2%	1.5%	0.0%	18.9%	0.0%	0.0%	51.9%	48.0%	0.1%	
1970-1979	159090	544040	1480	68240	41600	440	113450	0	60	340780	585640	1980	928400
	17.1%	58.6%	0.2%	7.4%	4.5%	0.0%	12.2%	0.0%	0.0%	36.7%	63.1%	0.2%	
1980-1984	76740	311400	1920	66600	65780	100	35000	0	40	178340	377180	2060	557580
	13.8%	55.8%	0.3%	11.9%	11.8%	0.0%	6.3%	0.0%	0.0%	32.0%	67.6%	0.4%	
1960-1984	105737	317711	981	46611	29444	185	72241	0	30	242556	374928	1292	618776
	17.1%	51.3%	0.2%	7.5%	4.8%	0.0%	11.7%	0.0%	0.0%	39.2%	60.6%	0.2%	

NOTE : CATCH DATA FROM BRITISH COLUMBIA CATCH STATISTICS
AREA 29, 1983,1984 INCLUDE ADDITIONAL TEST CATCHES.
FILE..FAL6085.WK1 DISK..US TABLE
DATE NOV/19/86
ORGINALLY FROM BB COMMERCIAL CATCH (C)

FILE..DEC80 DISK..BB COMMERCIAL CHUM CATCH 2 (C)
15-Dec-86

Table 7. Indian food fishery catches of Chum salmon by statistical area, 1960 - 1985.

YEARS	STATISTICAL AREA									TOTAL	TOTAL	TOTAL	COMBINED
	12	13	14	15	16	17	18	19	29	12-13	14-19	29	TOTAL
1960	4600	2583	245	3500	4500	750	2231		9970	7183	11226	9970	28379
1961	4600	2431	150	2500	300	700	1978		9647	7031	5628	9647	22306
1962	4391	1412	45	2000	400	860	3197		11300	5803	6502	11300	23605
1963	5122	1359	506	1500	650	280	3317		10741	6481	6253	10741	23475
1964	6054	1756	21	1200	400	580	1773		12210	7810	3974	12210	23994
1965	3432	748	124	500	100	400	1960	0	7390	4180	3084	7390	14654
1966	4313		157	950	400	1480	2772	0	12181	4313	5759	12181	22253
1967	5201		215	200	600	850	4000	0	8800	5201	5865	8800	19866
1968	4046	1708	360	2356	349	905	5395	100	11102	5754	9465	11102	26321
1969	3367	3346	440	2162	300	1745	3400	50	4300	6713	8097	4300	19110
1970	3632	4725	972	1652	200	3000	2204	50	5603	8357	8078	5603	22038
1971	4406	3677	850	1952	1317	2275	1375	0	4022	8083	7769	4022	19874
1972	5487	4690	265	1320	243	4675	3000	100	6301	10177	9603	6301	26081
1973	2979	3543	5530	1400	637	4800	2200	0	10742	6522	14567	10742	31831
1974	4814	6940	14000	2000	300	6000	5000	20	15102	11754	27320	15102	54176
1975	6800	5656	2800	3000	400	1700	2400	0	7087	12456	10300	7087	29843
1976	3400	6679	9273	2200	55	1800	3500	0	13603	10079	16828	13603	40510
1977	8030	9419		5000	2036	2550	3350	22	9342	17449	12958	9342	39749
1978	3750	5572			1263	4805	3000	633	9509	9322	9701	9509	28532
1979	6900	7836	950		1639	4470	1500	950	8202	14736	9509	8202	32447
1980			4576	3000	1500	2750	1000	1055	12333		13881	12333	26214
1981	4700	6779	13044	5500	1500	2200	2000		11170	11479	24244	11170	46893
1982	8456	12733	1212	6000	664	3588	2000		19233	21189	13464	19233	53886
1983	7608	77	3154	4200	1180	9550	5000		12637	7685	23084	12637	43406
1984	11906	9000	2000	3000	1634	8000	4000		18637	20906	18634	18637	58177
1985	3692	9070	10920	5500	0	5800	9000		5859	12762	31220	5859	49841
AVERAGES:													
1960-1969:	4513	1918	226	1687	800	855	3002	30	9764	6047	6585	9764	22396
1970-1979:	5020	5874	4330	2316	809	3608	2753	178	8951	10894	12663	8951	32508
1980-1985:	7272	7532	5818	4533	1080	5315	3833	1055	13312	14804	20755	13312	46403
1960-1985:	5267	4858	2992	2608	868	2943	3098	186	10270	9737	12193	10270	31825

AREAS 12 TO 19 DATA FROM SUB DISTRICT OFFICES
AREA 29 DATA FROM N. SCHUBERT.
REVISED
FILE..CM_60_85 DISK..US TABLE
ORIGINALLY FROM DISK..IFF CATCHES (C)

15-Dec-86

Table 8. Fall Chum commercial catch by major gear type, 1960 - 1984.

YEAR	FALL COMMERCIAL CATCH GN	SN	TR	TOTAL FALL CATCH	PERCENT OF TOTAL CATCH GN %	SN %	TR %
1960	306,700	430,800	100	737,600	41.6%	58.4%	0.0%
1961	199,100	135,700	300	335,100	59.4%	40.5%	0.1%
1962	146,100	103,800	100	250,000	58.4%	41.5%	0.0%
1963	164,300	154,000	300	318,600	51.6%	48.3%	0.1%
1964	89,300	55,700	100	145,100	61.5%	38.4%	0.1%
1965	15,000	11,300	200	26,500	56.6%	42.6%	0.8%
1966	24,600	19,300	200	44,100	55.8%	43.8%	0.5%
1967	90,700	74,400	200	165,300	54.9%	45.0%	0.1%
1968	432,900	347,400	200	780,500	55.5%	44.5%	0.0%
1969	295,800	298,400	600	594,800	49.7%	50.2%	0.1%
1970	499,400	471,300	1,300	972,000	51.4%	48.5%	0.1%
1971	61,700	49,400	800	111,900	55.1%	44.1%	0.7%
1972	801,500	1,123,900	100	1,925,500	41.6%	58.4%	0.0%
1973	904,900	1,990,700	1,100	2,896,700	31.2%	68.7%	0.0%
1974	180,600	176,800	3,100	360,500	50.1%	49.0%	0.9%
1975	214,500	271,800	1,400	487,700	44.0%	55.7%	0.3%
1976	347,900	600,500	1,000	949,400	36.6%	63.3%	0.1%
1977	38,600	91,100	2,700	132,400	29.2%	68.8%	2.0%
1978	339,500	1,036,200	6,600	1,382,300	24.6%	75.0%	0.5%
1979	19,200	44,800	1,500	65,500	29.3%	68.4%	2.3%
1980	215,400	580,000	2,100	797,500	27.0%	72.7%	0.3%
1981	61,100	58,500	1,400	121,000	50.5%	48.3%	1.2%
1982	425,300	985,600	2,700	1,413,600	30.1%	69.7%	0.2%
1983	108,600	125,600	3,900	238,100	45.6%	52.8%	1.6%
1984	81,100	136,200	200	217,500	37.3%	62.6%	0.1%
AVERAGES							
60-69	176,450	163,080	230	339,760	51.9%	48.0%	0.1%
70-79	340,780	585,650	1,960	928,390	36.7%	63.1%	0.2%
80-84	178,300	377,180	2,060	557,540	32.0%	67.6%	0.4%
60-84	242,552	374,928	1,288	618,768	39.2%	60.6%	0.2%

NOTES: DATA FROM BRITISH COLUMBIA CATCH STATISTICS.
AREA 29 1983 & 1984 INCL. TEST FISHING DATA
CATCH DOES NOT INCL. IFF DATA
US ORIGIN FISH INCLUDED
DATE NOV/18/86
FILE..BBSUM.WK1 DISC..CHUM CATCH (C)
Dec-86

Table 9. Catch, escapement and total stock of summer and fall chum.

	CANADIAN CATCH		ESCAPEMENT		TOTAL STOCK	
YEAR	SUMMER	FALL	SUMMER	FALL	SUMMER	FALL
1960	51,900	766,000	9,000	748,800	60,900	1,514,800
1961	34,000	357,400	22,500	656,100	56,500	1,013,500
1962	16,700	273,700	15,000	714,200	31,700	987,900
1963	38,600	342,200	15,000	700,300	53,600	1,042,500
1964	46,200	169,100	22,500	901,000	68,700	1,070,100
1965	9,700	41,100	6,800	404,400	16,500	445,500
1966	17,100	66,300	2,300	1,001,800	19,400	1,068,100
1967	33,500	185,100	11,000	711,600	44,500	896,700
1968	92,500	806,800	21,500	1,898,400	114,000	2,705,200
1969	25,000	614,000	11,000	1,088,200	36,000	1,702,200
1970	60,500	994,100	7,000	1,166,100	67,500	2,160,200
1971	7,700	131,800	2,300	678,200	10,000	810,000
1972	15,600	1,951,600	38,500	1,828,600	54,100	3,780,200
1973	28,600	2,928,600	104,000	1,580,400	132,600	4,509,000
1974	19,900	414,700	16,000	1,243,400	35,900	1,658,100
1975	40,200	517,600	57,500	672,300	97,700	1,189,900
1976	91,500	989,900	140,000	939,900	231,500	1,929,800
1977	58,300	172,200	45,000	1,433,100	103,300	1,605,300
1978	128,700	1,410,700	90,500	1,415,000	219,200	2,825,700
1979	71,900	97,900	42,300	774,400	114,200	872,300
1980	95,700	823,700	62,000	1,311,000	157,700	2,134,700
1981	54,600	167,900	103,000	1,292,100	157,600	1,460,000
1982	78,500	1,467,500	84,000	1,415,000	162,500	2,882,500
1983	53,200	281,500	27,700	1,193,300	80,900	1,474,800
1984	32,900	275,700	15,500	1,564,400	48,400	1,840,100
AVG. 60-69	36,520	362,170	13,660	882,480	50,180	1,244,650
AVG. 70-79	52,290	960,910	54,310	1,173,140	106,600	2,134,050
AVG. 80-84	62,980	603,260	58,440	1,355,160	121,420	1,958,420
AVG. 60-84	48,120	649,884	38,876	1,093,280	86,996	1,743,164

FILE..ALLCATES.WK1 DISK..US TABLE
DATA INCLUDES AREA 11 TO 19, 29
FALL CATCH FROM 1ST WEEK IN SEPT ONWARD OF AREA 11 TO 19
SUMMER CATCH IS CATCH PRIOR TO 1ST WEEK IN SEPT OF AREA 11 TO 19
TOTAL AREA 29 INCLUDED IN FALL CATCH
ALL INDIAN FOOD FISH INCLUDED
15-Dec Dec-86

Table 10. Catch, escapement, total stock and harvest rate for Canadian caught Chum, 1960 - 1984.

YEAR	FALL ESCAPEMENT	CANADIAN COMMERCIAL CATCH	INDIAN FOOD CATCH	CANADIAN TOTAL STOCK	HARVEST RATE
1960	748,800	737,600	28,400	1,514,800	50.6%
1961	656,100	335,100	22,300	1,013,500	35.3%
1962	714,200	250,100	23,600	987,900	27.7%
1963	700,300	318,700	23,500	1,042,500	32.8%
1964	901,000	145,100	24,000	1,070,100	15.8%
1965	404,400	26,500	14,700	445,600	9.2%
1966	1,001,800	44,100	22,300	1,068,200	6.2%
1967	711,600	165,300	19,900	896,800	20.7%
1968	1,898,400	780,500	26,300	2,705,200	29.8%
1969	1,088,200	594,900	19,100	1,702,200	36.1%
1970	1,166,100	972,000	22,000	2,160,100	46.0%
1971	678,200	111,900	19,900	810,000	16.3%
1972	1,828,600	1,925,600	26,100	3,780,300	51.6%
1973	1,580,400	2,896,800	31,800	4,509,000	65.0%
1974	1,243,400	360,500	54,200	1,658,100	25.0%
1975	672,300	487,700	29,800	1,189,800	43.5%
1976	939,900	949,400	40,500	1,929,800	51.3%
1977	1,433,100	132,400	39,700	1,605,200	10.7%
1978	1,415,000	1,382,200	28,500	2,825,700	49.9%
1979	774,400	65,500	32,400	872,300	11.2%
1980	1,311,000	797,500	26,200	2,134,700	38.6%
1981	1,292,100	121,000	46,900	1,460,000	11.5%
1982	1,415,000	1,413,600	53,900	2,882,500	50.9%
1983	1,193,300	238,100	43,400	1,474,800	19.1%
1984	1,564,400	217,500	58,200	1,840,100	15.0%
AVERAGES					
1960-1969	882,480	339,790	22,410	1,244,680	26.4%
1970-1979	1,173,140	928,400	32,490	2,134,030	37.1%
1980-1984	1,355,160	557,540	45,720	1,958,420	27.0%
1960-1984	1,093,280	618,784	31,104	1,743,168	30.8%

(2) 1983-84 AREA 29 CATCHES FROM B.C. CATCH STATISTICS AN
(3) DATA SOURCES:
ESCAPEMENTS DATA FROM B.C. 16's - FISHERY OF
COMMERCIAL CATCH DATA FROM B.C. ANNUAL CATCH
IFF (INDIAN FOOD FISHERY) CATCHES FROM FISHER
(5) Escapements of Fall chum only (exclude Orford and Ann
FILE..HARVEST2 DISC..US TABLE
ORIGINALLY FROM CHUM PRODUCTION (P)

TABLE 11. FALL COMMERCIAL CHUM CATCH BY MAJOR AREA, 1960-1984

YEAR	FALL COMMERCIAL CATCH AREA 11-13	AREA 14	AREA 15-19	AREA 29	TOTAL FALL CATCH
1960	592,400	11,300	66,600	67,300	737,600
1961	219,900	11,600	55,700	47,900	335,100
1962	119,200	11,600	71,700	47,600	250,100
1963	251,000	0	13,900	53,800	318,700
1964	80,800	0	3,500	60,800	145,100
1965	14,200	0	300	11,900	26,400
1966	29,600	0	600	13,900	44,100
1967	118,600	0	100	46,500	165,200
1968	566,200	0	11,900	202,400	780,500
1969	471,300	0	34,600	88,900	594,800
1970	697,800	6,300	89,000	178,900	972,000
1971	88,900	0	1,300	21,700	111,900
1972	1,351,800	134,300	183,100	256,400	1,925,600
1973	2,295,800	185,300	225,100	190,500	2,896,700
1974	237,500	12,500	17,400	93,200	360,600
1975	346,000	52,500	15,900	73,500	487,900
1976	702,100	67,000	6,200	174,100	949,400
1977	117,900	0	100	14,400	132,400
1978	1,156,900	100,200	400	124,800	1,382,300
1979	51,100	6,500	100	7,800	65,500
1980	641,100	80,700	100	75,500	797,400
1981	57,000	52,800	2,400	8,800	121,000
1982	1,111,900	197,400	41,100	63,300	1,413,700
1983	101,800	123,600	0	12,600	238,000
1984	38,300	164,100	0	15,100	217,500
AVERAGES					
60-69	246,320	3,450	25,890	64,100	339,760
	72.5%	1.0%	7.6%	18.9%	
70-79	704,580	56,460	53,860	113,530	928,430
	75.9%	6.1%	5.8%	12.2%	
80-84	390,020	123,720	8,720	35,060	557,520
	70.0%	22.2%	1.6%	6.3%	
60-84	458,364	48,708	33,644	78,064	618,780
	74.1%	7.9%	5.4%	12.6%	

NOTES: DATA FROM BRITISH COLUMBIA CATCH STATISTICS.
AREA 29 1983 & 1984 INCL. TEST FISHING DATA
CATCH DOES NOT INCL. IFF DATA
DATE NOV/18/86
FILE..BBCAT.WK1 DISC..CHUM CATCH
Dec-86

Table 12. Annual catch, escapement and total stock estimates for Chum salmon in Area 22, 1951 - 1984.

YEAR	ESCAPEMENT	CATCH			TOTAL STOCK	HARVEST RATE
		GILLNET	SEINE	TOTAL		
1951	12,500	6,300	20,800	27,100	39,600	68.4
1952	46,000	0	0	0	46,000	0.0
1953	16,500	26,500	33,400	59,900	76,400	78.4
1954	86,000	39,000	178,200	217,200	303,200	71.6
1955	12,500	3,400	3,800	7,200	19,700	36.5
1956	46,100	23,500	94,800	118,300	164,400	72.0
1957	23,300	19,200	66,100	85,300	108,600	78.5
1958	19,000	37,000	168,800	205,800	224,800	91.5
1959	23,000	0	0	0	23,000	0.0
1960	44,100	6,500	41,700	48,200	92,300	52.2
1961	44,200	0	0	0	44,200	0.0
1962	18,700	0	0	0	18,700	0.0
1963	6,700	0	0	0	6,700	0.0
1964	44,200	0	0	0	44,200	0.0
1965	80,300	0	0	0	80,300	0.0
1966	8,500	0	0	0	8,500	0.0
1967	21,200	0	0	0	21,200	0.0
1968	124,700	0	0	0	124,700	0.0
1969	18,800	0	0	0	18,800	0.0
1970	8,700	0	0	0	8,700	0.0
1971	55,200	0	0	0	55,200	0.0
1972	264,600	246,400	1,044,100	1,290,500	1,555,100	83.0
1973	171,000	50,000	124,800	174,800	345,800	50.5
1974	98,100	0	0	0	98,100	0.0
1975	9,900	0	0	0	9,900	0.0
1976	19,700	0	0	0	19,700	0.0
1977	43,700	0	0	0	43,700	0.0
1978	8,400	0	0	0	8,400	0.0
1979	4,500	0	0	0	4,500	0.0
1980	54,500	37,500	236,400	273,900	328,400	83.4
1981	115,000	0	0	0	115,000	0.0
1982	22,500	0	0	0	22,500	0.0
1983	8,000	0	0	0	8,000	0.0
1984	76,000	10,753	175,910	186,663	262,663	71.1

Data sources: Catches from BC Cach Statistics; escapements from Fishery officers Stream Reports.
Catch and escapement numbers rounded to the nearest hundred.
Zero catch indicates closed fishery or negligible catch, (<50 pieces). Averages have not been included due to the large number of zero catch entries.
A22STOCK/D26

Table 13. Annual catch by gear type for chum salmon in Area 20, 1951-1984.

YEAR	Catch		
	Gillnet	Seine	Total
1951	406	7,125	7,531
1952	0	1,815	1,815
1953	539	8,303	8,842
1954	2,252	3,566	5,818
1955	7,726	10,302	18,028
1956	1,089	442	1,531
1957	1,922	938	2,860
1958	26,019	2,493	28,512
1959	27,335	8,589	35,924
1960	14,669	1,114	15,783
1961	10,985	2,212	13,197
1962	11,192	2,479	13,671
1963	14,635	4,799	19,434
1964	35,737	1,500	37,237
1965	20,111	3,463	23,574
1966	22,878	3,963	26,841
1967	13,725	6,850	20,575
1968	22,708	4,042	26,750
1969	16,778	1,580	18,358
1970	20,431	5,086	25,517
1971	18,752	5,684	24,436
1972	139,950	62,208	202,158
1973	62,881	111,183	174,064
1974	34,532	45,065	79,597
1975	16,235	24,354	40,589
1976	35,960	77,045	113,005
1977	9,225	12,716	21,941
1978	30,951	24,069	55,020
1979	631	3,268	3,899
1980	46,409	14,162	60,571
1981	2,077	6,190	8,267
1982	734	13,788	14,522
1983	19	64	83
1984	112	450	562
AVERAGES			
1951-59	7,476	4,841	12,318
1960-69	18,342	3,200	21,542
1970-79	36,955	37,068	74,023
1980-84	9,870	6,931	16,801

Data sources: catches from BC Catch Statistics.

CHUMRPT84/D26

Table 14. Chum Troll Catches (Pieces) for Areas 20-27, 1951-1984.

YEAR	Area 20	Area 21	Area 23	Area 24	Area 25	Area 26	Area 27	Total For Year
1951	11	4	55	22	145	89	111	437
1952	0	11	64	0	22	0	0	97
1953	3	5	44	0	100	22	11	185
1954	0	18	105	78	66	11	22	300
1955	2	3	75	22	77	11	22	212
1956	1	2	96	3	22	18	3	145
1957	18	2	117	14	114	110	39	414
1958	4	21	38	0	155	44	35	297
1959	246	9	173	11	46	207	31	723
1960	27	3	27	31	12	73	41	214
1961	75	12	127	49	96	192	201	752
1962	8	16	72	58	105	565	460	1,284
1963	204	23	206	50	111	228	444	1,266
1964	21	10	190	35	47	367	214	884
1965	10	14	128	82	36	118	516	904
1966	14	1	53	56	45	133	125	427
1967	43	20	180	91	57	41	181	613
1968	2	28	201	233	176	224	943	1,807
1969	30	27	860	82	111	98	1,104	2,312
1970	308	522	904	1,452	1,013	1,564	4,182	9,945
1971	33	84	700	409	807	354	3,300	5,687
1972	142	12	386	59	262	131	407	1,399
1973	69	624	2,723	759	1,163	908	1,121	7,367
1974	72	51	507	516	3,029	208	694	5,077
1975	230	68	1,394	429	1,073	1,520	3,164	7,878
1976	490	74	365	885	990	1,077	851	4,732
1977	131	196	2,400	1,354	424	610	3,571	8,686
1978	89	241	1,076	1,946	3,095	2,901	14,260	23,608
1979	16	118	2,687	3,392	2,403	887	6,349	15,852
1980	860	75	1,060	4,981	609	1,098	11,871	20,554
1981	162	103	1,047	1,160	507	212	3,866	7,057
1982	0	443	5,531	11,514	7,576	2,085	35,510	62,659
1983	0	140	525	951	669	281	3,078	5,644
1984	1	100	306	225	404	428	7,842	9,306
AVERAGES								
1951-59	32	8	85	17	83	57	30	312
1960-69	43	15	204	77	80	204	423	1,046
1970-79	158	199	1,314	1,120	1,426	1,016	3,790	9,023
1980-84	205	172	1,694	3,766	1,953	821	12,433	21,044

Source: Salmon Section Catch Database, P.B.S.
No troll catch of chums in area 22.

PN/D26:TRCA5184

Table 15. WEEKLY TROLL CATCH OF CHUM SALMON IN AREA 27, 1980-84.

Stat Week	1980	1981	1982	1983	1984	AVERAGE	TOTAL
4/1	0	0	4	0	0	1	4
4/2	0	0	0	0	0	0	0
4/3	0	0	0	0	0	0	0
4/4	4	0	0	0	2	1	6
4/5	3	0	0	0	8	2	11
5/1	3	1	10	0	5	4	19
5/2	5	0	16	0	10	6	31
5/3	16	0	5	0	6	5	27
5/4	54	0	17	7	21	20	99
6/1	10	0	104	6	76	39	196
6/2	18	1	365	13	618	203	1,015
6/3	579	2	327	24	0	186	932
6/4	209	4	118	72	0	81	403
7/1	114	14	107	134	351	144	720
7/2	1,317	136	243	737	4,679	1,422	7,112
7/3	2,004	84	1,107	147	259	720	3,601
7/4	1,385	370	13,376	131	268	3,106	15,530
7/5	3,111	222	11,394	279	538	3,109	15,544
8/1	2,464	1,563	606	641	522	1,159	5,796
8/2	305	767	951	224	187	487	2,434
8/3	106	399	683	161	91	288	1,440
8/4	23	182	68	77	117	93	467
9/1	17	51	94	169	31	72	362
9/2	6	35	53	150	13	51	257
9/3	38	15	150	12	13	46	228
9/4	14	9	2,822	72	27	589	2,944
10/1	62	10	2,890	22	0	597	2,984
10/2	3	0	0	0	0	1	3
10/3	1	0	0	4	0	1	5
10/4	0	0	0	247	0	49	247
10/5	0	0	0	596	0	119	596
11/1	0	0	0	0	0	0	0
11/2	0	0	0	0	0	0	0
11/3	0	0	0	0	0	0	0
11/4	0	0	0	0	0	0	0
TOTALS	11,786	3,864	35,458	3,918	7,790		62,816

Table 16. Comparison of predictions and actual returns for Inside Chum, 1969 - 1984.

YEAR	PREDICTED RETURN	ACTUAL RETURN	ERROR	DIFF COMPARED TO PREDICTED
1969	1,597,000	1,702,200	105,200	6.6%
1970	1,876,000	2,160,200	284,200	15.1%
1971	1,573,300	810,000	763,300	48.5%
1972	1,515,000	3,780,200	2,265,200	149.5%
1973	3,900,000	4,509,000	609,000	15.6%
1974	1,554,000	1,658,100	104,100	6.7%
1975	1,350,000	1,189,900	160,100	11.9%
1976	3,600,000	1,929,800	1,670,200	46.4%
1977	2,577,000	1,605,203	971,700	37.7%
1978	2,395,000	2,825,700	430,700	18.0%
1979	1,205,000	872,300	332,700	27.6%
1980	1,617,300	2,134,700	517,400	32.0%
1981	1,809,500	1,460,000	349,500	19.3%
1982	2,860,000	2,882,500	22,500	0.8%
1983	1,864,600	1,474,800	389,800	20.9%
1984	1,701,800	1,840,100	138,300	8.1%
TOTAL AVG	2,062,200	2,052,175	569,619	29.0%
1980-1984	1,970,600	1,958,400	283,500	16.2%

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ORIGINALLY FROM DISK..CHUM PRODUCTION (P)
15-Dec-86

Table 17. Area 12 commercial seine catch for the third week of September compared to total stock size.

Year	Area 12 Seine Catch	Adjusted Catch (thousand)	Total Stock (million)
1965	3,300	0.58	0.45
1967	2,800	0.34	0.90
1969	7,600	1.45	1.70
1970	21,400	4.15	2.16
1971	9,600	1.06	0.81
1972	51,000	6.29	3.78
1973	89,400	8.22	4.51
1975	13,900	1.88	1.19
1976	26,800	3.60	1.93
1977	16,800	2.05	1.61
1978	85,700	10.28	2.83
1979	8,100	1.48	0.87
1980	37,300	6.70	2.13
1981	7,600	1.59	1.46
1982	46,100	8.73	2.88
1983	19,400	3.38	1.47
1984	12,100	2.08	1.84

r square = 0.69

TABLE 18. UPPER JOHNSTONE STRAIT TEST FISHING AVERAGE CATCHES BY WEEK FOR 1965-1985.

WEEK ENDING	1984	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1972	1971	1969	1968	1967	1966	1965
9/1	18.8		27.0															
9/2	85.8	22.0	42.0								18.9							
9/3	84.0	33.7	282.4		63.7	14.5					79.9						16.7	
9/4	218.9	71.1	370.7	158.3	310.4	30.0				198.8	149.9	214.8		217.3	1087.5	11.4	28.5	21.0
10/1	71.0	123.6	583.9	59.7	292.0	120.9	237.1	103.2			420.1		41.0	145.7	1143.5	177.8	47.0	75.0
10/2	326.5	151.8	308.6	57.8	414.6	34.6	792.7	277.3	134.7	384.7	341.5		110.9	358.9	500.5	19.1	21.0	9.0
10/3	231.4	110.3	464.9	281.1	149.9	103.4	219.0	112.7	61.9	31.6	546.5		211.3	465.9	224.9	598.8	62.3	28.0
10/4	38.5	92.1	632.3	71.0	698.9	38.7	167.4	148.7	79.1				21.7	394.9	212.5	47.4	55.3	70.0
10/5		25.0	154.1		10.2	30.5	125.5	171.2	48.2	8.1	168.6		14.1	45.2	18.6	214.2	550.0	81.0
11/1										20.3			23.4	30.0	230.0	15.0	48.7	72.0
11/2																5.7	76.5	
11/3																	15.5	
STOCK (MILLIONS)	1.840	1.474	2.882	1.46	2.134	0.872	2.825	1.605	1.929	1.189	1.658	3.780	0.81	1.702	2.7052	0.896	1.068	0.445

NOTE : NO TEST FISHING RESULTS FOR 1970 AND 1973.
:TOTAL STOCK IS STUDY AREA FALL CHUMS
:FILE..TFSUMAVG.WK1 DISK..J.S. TEST FISHING DB (T)

Table 19. Clockwork Harvest Plan for Inside Chum Fishing Area For Years 1984 and 1985.

WILD RUN	ENHANCED ALLOTMENT	U.S. ALLOTMENT	TOTAL RETURN
20% Harvest Rate			
1,800,000	700,000	100,000	2,600,000
30% Harvest Rate			
2,500,000	700,000	100,000	3,300,000
40% Harvest Rate			
4,100,000	700,000	100,000	4,900,000

TOTAL RUNS	OVERALL HARVEST RATE
0 - 2.5 million	10% Harvest Rate
2.6 - 3.2 million	20% Harvest Rate
3.3 - 4.8 million	30% Harvest Rate
4.9 - Max.million	40% Harvest Rate

U.S. SECTION HISTORICAL CHUM REPORT

I. STOCK DESCRIPTIONS

A. Puget Sound

Puget Sound managers recognize early, normal, and late timed chum stocks on the basis of three temporally distinct peak-spawning periods. In general, the early, normal, and late timed stocks peak in October, November-December, and January, respectively. However, there are a wide variety of peak spawning dates for individual chum stocks within each of the three major run timed categories.

Puget Sound chum management and allocation are based on hatchery/wild production returning to each of six regions or allocation units (Figure 1). Within each region, management is directed to the spawner escapement needs of specific stocks, where practicable. Puget Sound chum run size and spawner escapement summaries are provided in Tables 1 through 6. Region-specific return rate, harvest rate, enhanced stock production, escapement, age composition, and return per spawner estimates appear in Appendices A through E. Data from the Strait of Juan de Fuca tributaries region have been omitted due to low chum abundance and inadequate data. Specific Puget Sound catch data for 1970 through 1984 (including catch of all chum salmon stocks by area) are presented in Appendix F.

DIRECTORY OF APPENDICES

Most Puget Sound chum stocks are managed to achieve maximum sustained harvest (MSH). Wild early timed chum destined for South Sound and Hood Canal are intercepted during coho fisheries with their harvests based on the allowable coho harvest rate. Spawner escapement goals were established in 1979 (based on 1968-1977 data) as interim estimates expected to yield MSH, and annual fisheries are managed to achieve these goals. Postseason escapement estimates are determined from actual hatchery escapements and from spawner count surveys in stream index areas expanded to develop total creek or river system estimates.

A differential even/odd year run strength pattern is evident in most Puget Sound chum stocks, with the even numbered years yielding the larger run sizes on average. Escapement goals and

resultant harvests take this pattern into account. The 1968 to 1979 and 1980 to 1984 average total run sizes and ranges of observed values, grouped by even and odd return years, appear below.

TOTAL PUGET SOUND CHUM RUN SIZE

		AVERAGE	RANGE
Even	1968-1978	873,800	547,600 - 1,474,000
	1980-1984	1,172,500	1,015,500 - 1,351,100
Odd	1969-1979	395,500	207,300 - 672,000
	1981-1983	668,600	604,500 - 732,700

Total chum run size in Puget Sound (all stocks combined) has been increasing since the mid-1960s (Figure 2), averaging 733,600, with most of the increase in the normal timed stocks. Likewise, Puget Sound total spawning escapements between 1968 and 1984 (Figure 3) have increased averaging 319,300. Wild chum run size and escapement (Tables 2 and 5) have shown moderate increases since 1968, averaging 588,600 and 279,700, respectively. Enhanced (hatchery and off-station) run size and escapement (Tables 3 and 6) have increased markedly since the mid-1970s, with much of the increase in total run size likely attributable to increased hatchery production after 1976 in Hood Canal. Puget Sound run sizes for each of the three major run timed categories are illustrated in Figure 4.

Early timed stocks

In South Puget Sound, Hood Canal, and the Strait of Juan de Fuca, early timed chum occur in low abundance. Early stocks destined for South Sound and Hood Canal are harvested incidentally in coho directed fisheries in terminal and preterminal areas. Consequently, early chum abundance is expected to remain low because of anticipated high harvest rates for coho in the terminal area. No terminal area fisheries have been scheduled for Strait of Juan de Fuca early chum, with the majority of interceptions occurring incidentally during fisheries directed at sockeye, pink and coho salmon in the Strait of Juan de Fuca mixed stock area.

The 1968-1979 and 1980-1984 average early run size and range of observed values grouped by even and odd return years appear below.

EARLY PUGET SOUND CHUM RUN SIZE

		AVERAGE	--------RANGE--------
Even	1968-1978	96,300	34,700 - 189,700
	1980-1984	36,200	27,700 - 44,500
Odd	1969-1979	37,300	10,900 - 68,200
	1981-1983	24,100	22,800 - 25,400

Early chum total run size declined between 1968 and 1984, however, enhanced stock production has helped to stabilize run size in recent years. Returns of the enhanced early stocks began in 1976 and have averaged about 6,900 annually.

Normal timed stocks

Normal timed stocks are the main component of Puget Sound chum production and are present in all six regions. These runs have increased since 1968, with major increases since the mid-1970s (Figure 4). However, considerable annual variation and differential enhanced stock production is evident among the regions of Puget Sound. The 1968-1979 and 1980-1984 average normal run size and range of observed values grouped by even and odd return years appear below.

NORMAL PUGET SOUND CHUM RUN SIZE

		AVERAGE	--------RANGE--------
Even	1968-1978	721,700	463,500 - 1,366,200
	1980-1984	1,062,700	891,900 - 1,268,500
Odd	1969-1979	322,600	154,800 - 578,100
	1981-1983	599,000	544,900 - 653,000

Normal wild run size has increased over 30 percent while the run size of enhanced stocks has almost tripled during the same time period (Figure 4). Enhancement of normal chum stocks in Puget Sound increased significantly during the mid-1970's. Hood Canal is the only region of Puget Sound which is managed primarily for hatchery production, and accounts for over 75 percent of total enhancement in Puget Sound. Wild chum returning to Hood Canal later than the hatchery run are offered additional protection to maximize spawner returns after incidental catches in fisheries directed at hatchery surpluses. The remaining regions are managed to achieve wild stock escapement, so major enhancement within these regions is confined to areas and stocks that can be discriminately harvested. Recent Puget Sound enhanced stock production levels are detailed in Table 7.

Late timed stocks

Late chum stocks originate primarily from the Nisqually River in South Puget Sound. The 1968-1979 and 1980-1984 average late run size and range of observed values grouped by even and odd return years appear below.

LATE PUGET SOUND CHUM RUN SIZE

		AVERAGE	--------RANGE--------
Even	1968-1978	55,800	48,200 - 61,600
	1980-1984	73,600	54,900 - 86,900
Odd	1969-1979	35,600	14,700 - 55,300
	1981-1983	45,500	36,700 - 54,400

The late wild run size has remained relatively stable with increases in enhanced stocks during the same time period (Figure 4).

B. Washington Coast

Grays Harbor and Willapa Bay chum stocks, as reflected by commercial catches, have declined during the 1960's with some recovery evident in recent years (Table 8). Several strong returns to Grays Harbor in 1941-42, 1946, 1954, and 1959 boosted catches in the 1940's and 1950's. These strong returns were not evident in the 1960's and only to a minor extent in the 1970's.

Returns to Grays Harbor have shown some increase since 1980 and more restrictive management has resulted in good escapements at or above the spawning escapement goal of 21,000 (Table 9). The Willapa Bay stock has shown a similar pattern with strong returns in 1941-43, 1950-51, and 1953-54. A rather dramatic decline in 1960's is evident for this stock also. Run size and escapement data since 1969 show some recovery since 1980 but not to the levels of the 1940's and 1950's. Spawning escapements have increased since 1980 approaching or exceeding the present goal of 35,400.

Hatchery production in Grays Harbor remained at low levels until 1979 when 7,214,000 chum fry and fingerlings were released (Table 10). Recent production has been lower and shifted entirely to fingerling releases. Hatchery production in Willapa Bay hatcheries began to build in 1976. The largest release was made in 1982 when 7,091,000 chum were liberated into the Willapa drainage (Table 11).

Grays Harbor and Willapa Bay chum are somewhat earlier than normal timed Puget Sound chum stocks. Figures 5 and 6 illustrate their return timing to the extreme terminal area and the fairly high degree of overlap with chinook and coho. While Willapa Bay chum tend to be earlier than the Grays Harbor fish, the general

pattern in both areas is for a build-up in early October with peak abundances in the terminal area occurring in mid to late October. Abundances decline after early November.

Migration routes for the coastal stocks are largely unknown. It has been assumed that there are no prior interceptions outside the terminal area, although in 1980 recoveries were made in both Willapa Bay and Grays Harbor from chum tagged in Canadian Area 20. While these recoveries may not point toward significant prior interceptions, they probably indicate that some harvest is occurring beyond the terminal area. Future chum production at Makah National Fish Hatchery (NFH) may also be subject to preterminal interceptions, particularly in Canadian Area 20, the Nitinat Lake fishing area and the west coast Vancouver Island troll fishery.

Some data regarding return rates and productivity for Grays Harbor wild chum are available since 1969. Four year old fish are normally the dominant age at return to Grays Harbor although three year olds have been more abundant in a few years (Table 12). Returns per spawner have averaged 4.55 and have ranged from 0.21 to 15.74. No obvious relationship between spawners and subsequent recruits has been identified to describe a spawner/recruit function and a maximum sustainable harvest level.

Return rates for Willapa Bay chum since 1968 show an age structure very similar to the Grays Harbor stock with four year olds normally dominating the return (Table 13). Strong returns of three year olds appear to occur in the same years for both stocks. Returns per spawner to Willapa Bay average 3.44 with a range of .40 to 8.29. Again a good relationship between spawning escapement levels and future recruits is lacking. Nevertheless, fluctuations in productivity for the two stocks appear to be related. Total survival rates for Willapa hatchery releases have averaged 0.71 ranging from .10 to 2.19.

The wild chum run in the Quinault River has shown a severe decline between 1935 and 1970. Tribal net catch during this period ranged from a high of 89,062 in 1936 to a low of 216 in 1969. The tribal fishery is now supported primarily by enhancement programs at Quinault NFH and the Quinault Tribal hatchery, using Walcott X Quinault stock. Coded-wire tagging conducted on Quinault NFH releases indicates survival was relatively low, ranging from .05 to 1.01 percent, over several brood years. However, returns from more recent releases are expected to be higher because the fish were released at a more optimum size for survival. Hatchery returns of this stock are intermediate in timing between the native Quinault and Walcott stocks, with peak abundances occurring in late October and early November. On-station releases at Quinault NFH have increased since 1969 (Table 14) while production from the Tribal program has fluctuated since 1973. The combined contribution from the two programs has achieved the production goal for the Quinault system of a 3,000,000 chum release in most years.

C. Oregon

The Columbia River and Oregon coastal chum stocks have a normal run timing with peak spawning occurring from the last week of November to the first week of December. Spawning escapement estimates are not available for these stocks although some fish per mile and peak counts in spawner index areas are available. These counts are presented in Tables 15 through 16. Escapement trends to Columbia River and Tillamook Bay tributaries exhibited declines at various times during the period 1950-80. The factors responsible for these fluctuations are not known. Chum escapements to the Nestucca River have not shown any real trends.

The odd/even year pattern of abundance characteristic of more northerly stocks is not readily apparent in the Columbia River or Oregon coastal returns. Detailed biological data are, however, lacking and it has not been possible to assess spawner/recruit relationships.

Chum releases into Oregon coastal rivers were first made in 1969 by Oregon State University at Whiskey Creek in Netarts Bay. In 1971, the Oregon Legislature authorized private rearing and release of salmon. Eleven private operators were issued permits for chum culture. Most hatchery production from Oregon coastal rivers is now from sea ranching operations by these private hatcheries. Private operators have released chum as far south as Coos Bay. In most cases, returns to these private hatcheries have not been large enough to maintain brood programs.

The Oregon Department of Fish and Wildlife has released some chum from lower Columbia River hatcheries and utilized egg boxes on the Necanicum River, a small stream south of the Columbia River. The Washington Department of Fisheries has also released chum into lower Columbia River tributaries (Table 17).

II. MANAGEMENT REGIME AND FISHERY DESCRIPTION

A. Puget Sound

The currently identified United States fisheries of concern which harvest a mix of Canadian and Washington origin chum stocks occur in the contiguous waters of areas 4B, 5, 6C (western Strait of Juan de Fuca) and 7 and 7A (San Juan Islands and Point Roberts) (Figure 7). Fisheries in areas 6 and 6A (eastern Strait of Juan de Fuca) could potentially intercept Canadian origin chum but little if any fishing occurs in these areas. Area 6A has been closed to chum fishing in recent years, with the last significant harvest in 1977. Currently, no significant harvests of chum occur in Washington ocean waters. Terminal fisheries in Washington occur throughout the bays, estuaries, and rivers of Puget Sound (Figure 8).

The western Strait of Juan de Fuca fishery has historically been relatively low level and in recent years has been composed of Indian gill net effort only (Table 18). The San Juan Islands and Point Roberts (areas 7 and 7A) chum salmon fisheries have experienced a decline in amount of fishing time during October and November over the last 35 years (Table 19), with substantial reductions in recent years. The fishery was conducted only by WDF licensed fishermen until the mid 1970's when various court decisions established allocation sharing between Indians and non-Indians and independent management. WDF licensed fisheries were conducted in the Strait of Juan de Fuca until 1973.

Table 20 describes effort levels observed in these fisheries since 1978. The current fishery is composed primarily of gill net, purse seine, and reef net gears. The number of fishing days scheduled in areas 7 and 7A in recent years has varied due to management action taken because of expressed Canadian concerns regarding the status of Fraser River chum. Daily effort has been variable due to such things as weather, alternative fishery openings elsewhere in Puget Sound, and days per week open.

Washington fisheries in areas other than areas 4B, 5, 6, 6A, 6C, 7, and 7A (Figures 7 and 8) generally have been managed to achieve fixed spawner escapement goals. All major management units within Puget Sound, except for Hood Canal normal timed chum, have been managed for wild stock production.

Hatchery production in a region managed on a wild stock basis will typically result in a surplus return to the facility unless the hatchery stock can be discretely harvested. Certain extreme terminal areas have been managed on this basis. In recent years, Hood Canal normal timed stocks have been managed primarily on a hatchery basis. Wild stocks in this region may not produce at the maximum level, but mitigative enhancement has often been applied to utilize available habitat.

The time periods during which directed management actions are taken for each species have been identified for each species and Puget Sound catch area (Table 21). These management periods typically reflect the central 80 percent of the run timing (estimated from catch statistics), and frequently overlap with management periods for other species (Figure 9). The Puget Sound Salmon Management Plan defines the rules for addressing overlaps in management periods. In areas where data were lacking, management periods were developed based on neighboring area management periods or escapement timing curves. Directed management actions have accounted for escapement requirements and anticipated and observed incidental catches outside management periods.

Recent chum management in the western Strait of Juan de Fuca (areas 4B, 5, 6C) has been based on a fixed weekly fishing schedule for the Treaty Indian Tribes in that area. A relatively low effort level (less than 30 gillnet landings/day) has been

observed (Table 20).

Area 7 has been managed on the basis of Canadian and Puget Sound stock requirements, while area 7A has been considered a terminal harvest area for Canadian origin (Fraser River) stocks; however, due to domestic policy constraints, these areas have been opened concurrently. A reef net fishery in areas 7 and 7A has been conducted intermittently, even when other gears are closed for stock concerns, because of its limited harvest impact and lack of alternative fishing areas (immobility). Since 1977, harvest by gears other than reef nets has been predominantly based on the conservation needs of Canadian origin stocks and the status of fisheries on these stocks in Canadian waters.

The fishery in areas 7 and 7A has varied in recent years with significant fisheries in only three of the last seven years (Table 19, Figure 10). For these three years fishing effort in these areas has averaged approximately 200 gill nets and 70 purse seines per day for the non-Indian fleet, and 20 gill nets and 4 purse seines for the Indian fleet (Table 20), and has been extremely weather dependent.

Historic chum catch data for the period from 1935 through 1984 are presented in Table 22 and Figures 10 through 13. The variability in total Puget Sound catch over this period is illustrated in Figure 13. Detailed chum catch for each Puget Sound commercial salmon catch area from 1970 to 1984 is available in Appendix F.

In 1979, when Puget Sound origin chum returned in low numbers, and Canada expressed concern for Fraser River origin chum, areas 7 and 7A remained closed. The 1980 Fraser River chum run was also predicted to return below average and, as a result, no area 7 and 7A chum fisheries were anticipated prior to the season. However, fisheries were scheduled 3 days/week inseason until agreement was reached closing both Canadian and U.S. fisheries on November 22. Fisheries were not allowed in 1981, 1983, and 1984 due to Canadian stock concerns, however, a limited fishery was scheduled in 1982 in response to Canadian chum fishing patterns.

B. Washington Coast

Chum stocks in Grays Harbor and Willapa Bay are managed for wild escapement needs while the fishery in the Quinault River is managed for hatchery escapement needs.

The Grays Harbor fishery occurs within the harbor and in the lower portions of the Chehalis and Humptulips rivers (Figure 14). The chum management period runs from October 21 to November 10. The Washington Department of Fisheries (WDF) and the Quinault Tribe manage the fishery to achieve allocation sharing as ordered by the Federal Court. An Indian gillnet fishery operates in the harbor and in the Chehalis and Humptulips rivers. The non-treaty gill net fishery occurs within the harbor, while

a sport fishery takes place in the freshwater tributaries.

Grays Harbor catches have ranged from a high of 145,000 in 1954 to a low of 450 in 1979 (Table 8). Beginning with 1980, the chum escapement goal of 21,000 has been met or exceeded every year, except 1981 when 18,050 fish escaped to spawn. Fishery management in Grays Harbor has been hampered by the high degree of overlap in timing between chinook, coho, and chum. Overlaps in run timing with normal and late timed coho stocks have been particularly difficult to manage. There has been little flexibility in gear, time or area closures which could provide protection of one species while the others were harvested.

The commercial gill net fishery in Willapa Bay has been conducted in the harbor with sport fisheries occurring in the tributaries (Figure 15). The chum management period extends from October 15 - November 1. Fishing effort has been directed upon the early portion of the management period to increase the quality of the catch. The commercial catch has ranged from a high of 203,000 in 1942 to a low of 1,200 in 1979 (Table 8). The Willapa Bay chum escapement goal of 35,400 has been met or exceeded three out of the five years between 1980-1984. Harvest rates during this period ranged from 34-70 percent (Table 23). Fishery management in Willapa Bay is also complicated by timing overlaps between chinook, coho, and chum.

A treaty Indian gillnet fishery for hatchery chum occurs in the lower Quinault River. Harvest rates are based upon hatchery escapement needs. Historical catches in the tribal fishery have followed a pattern somewhat similar to Grays Harbor and Willapa Bay fisheries although wild chum have not recovered to the same extent.

C. Oregon

Gill net fisheries for chum operated in Tillamook Bay and Nestucca Bay (Figure 16) before these stocks declined. The net fisheries in Tillamook (Table 24) and Nestucca bays were terminated in 1961 and 1927, respectively. Henry (1954) reported 62 - 113 gill net and 123 - 216 set net licenses operating in Tillamook Bay from 1933-49. During the years this fishery operated, there was a decline in both the catch and escapement to index streams. Since the closure, escapement has recovered in some spawning indexes.

The Columbia River net fishery has harvested chum in fairly large numbers of up to 425,000 in 1942 (Table 25). However, as this run declined directed net fisheries were terminated. Present net harvest of chum is taken incidental to coho fisheries in October.

Oregon coastal chum are now harvested by recreational hook and line fisheries and at hatchery racks by private operators (small incidental catches in the ocean fisheries occur in some years). The recreational catch has increased in recent years due to

greater angler interest and pressure. Most of the catch comes from the Miami and Kilchis rivers (Table 26) which flow into Tillamook Bay. Small numbers of chum are caught in other Tillamook Bay rivers incidental to chinook and steelhead fisheries.

III. STOCK ASSESSMENT TECHNIQUES

A. Puget Sound

Preseason Forecast Methodologies:

Since the early 1970's, preseason forecasts for Puget Sound chum have been made for the run size (net catch plus escapement) entering United States waters at the mouth of the Strait of Juan de Fuca (Area 4B). The methods used to forecast the runs have varied from year to year with no single best preseason forecast method for Puget Sound chum stocks identified at this time.

Hatchery run sizes have been forecast using observed returns for known releases by numbers, and/or pounds, of chum fry. These forecasts have been hatchery/facility specific in most cases. When information for a specific hatchery was not available information from the nearest facility with similar stocks was used until suitable information became available.

Prior to 1974 no wild stock run size forecasts were made and preseason planning was based on estimated relative changes in abundance. From 1974 through 1979 forecasts of wild run sizes were developed for major regions within Puget Sound based on the previous year's return of three year olds to predict four and five year old returns, and a mean recruit per spawner estimate to predict the three year old return. These forecasts were then further apportioned to individual stocks or management units based on the escapement goal proportions.

Beginning in 1980, total Puget Sound wild stock run size to United States waters was correlated with environmental variables (e.g. mean sea and air temperatures, stream flows, and salinities) to forecast total return. This forecast was then apportioned to regions using observed parent year escapements. In 1983 and 1984, indices of juvenile abundance were used in addition to environmental variables. Also in 1983 and 1984, the correlation method forecasts were averaged with forecasts made for individual regions, using observed returns by age class and brood escapements, to obtain the final preseason wild run size forecasts.

The performance of the preseason forecast methodologies on an annual basis shown in Table 27.

Inseason Run Size Estimation Methodologies:

Inseason estimates of Puget Sound chum run size have generally been made in each terminal region. These estimates have been derived using relationships between observed fishing statistics, e.g. catch per landing by purse seines or gillnets, and run sizes. For areas where no satisfactory methods had been identified the preseason run size forecast directed management actions. The total run entering area 4B was estimated by using inseason estimates of run strength entering the terminal areas and adding apportioned catches for mixed stock fisheries based on relative stock strength estimates for all contributing stocks in each catch area (Table 28).

The performance of the inseason run size estimation methodologies is also shown in Table 27.

Escapement Estimation:

Puget Sound escapement estimation methods were re-evaluated in 1983 on the basis of results from several major tagging studies. This re-evaluation resulted in a number of significant changes in the chum escapement data base, particularly for north Puget Sound rivers; and consequently in the Puget Sound run reconstruction data base and escapement goals.

Chum salmon escapement estimates for Puget Sound stocks are developed from visual spawning ground counts made primarily on foot or by boat. Approximately 1,000 miles of chum salmon surveys are conducted each spawning season. The basic methodology used to convert spawner counts to total escapement is through the construction of escapement curves. Live counts for each stream or index area are used to generate a curve representing total spawner abundance. For smaller streams where the majority of the spawners can be counted, an average survey - life value is used to convert the area under the curve into an estimate of total escapement. Escapement estimates for large rivers are derived by relating index area counts to base year estimates of total escapement developed from tagging studies.

Escapement Goals:

Escapement goals have been established for all management units within Puget Sound. For chum salmon, most management units correspond to stocks returning to each individual stream or river draining directly into salt water, and terminal area management is directed to achieving these goals.

Escapement goals for Puget Sound stocks are derived by a variety of methods. Generally, they are based on either an average of observed escapements for selected years (e.g. the average of the three highest escapements in the last 10 years), or through an examination of spawner/recruit relationships. Most Puget Sound

chum stocks exhibit an odd/even year difference in production, with even year returns the largest. For streams where this pattern can be demonstrated, the odd year escapement goals have been adjusted accordingly.

Run Reconstruction, Stock Composition and Travel Time:

Stock composition estimates in areas 4B, 5, 6, 6A, 6C, 7, and 7A were originally established as a result of U.S./Canada consultations in 1971. Subsequent increases in chum production in Puget Sound led to modification of most of these estimates by the United States in 1979 (Table 28), and those estimates have been used to date for both inseason management and postseason run reconstruction.

Run reconstruction for Puget Sound stocks has generally been accomplished using the assumed U.S./Canada stock composition estimates described above, and the fraction of the harvest in an area assigned to individual Puget Sound stocks on the basis of projected run strength for inseason analyses and spawning escapement and terminal area catch for postseason analyses.

Genetic stock identification (GSI) of chum stocks is in its infancy in Washington State. WDF is in the process of establishing a production lab, and baseline samples were collected from all Puget Sound stocks in 1985. It is anticipated that, for mixed stock chum fisheries, GSI methods may provide useful estimates of catch composition. Use of GSI stock composition data will be implemented on a situational basis.

A review of past Washington Department of Fisheries tagging studies on chum salmon migration, found three sources for information on mixed stock marine area fisheries containing both U.S. and Canadian origin chum:

> Barker (1979) assembled and summarized travel time information from a variety of WDF tagging studies conducted between 1950 and 1974. The intent of these studies was to investigate the contribution, migration, and origin of Washington chum stocks, however incidental recoveries in Canadian waters were also documented.
>
> Fiscus (1968) reported on the results of a major 1968 chum salmon tagging program at Discovery Bay (area 6B) and various locations on Admiralty Inlet, with subsequent recoveries in fisheries and freshwater areas of Puget Sound. Of 2,249 total recoveries, 6 (0.27%) were recovered in Canadian areas. This apparent contribution level by Canadian fish must be below the actual contribution since no directed recovery efforts were made in Canadian waters. No travel time information has been assembled from this study (not included in Barker's summary), however, the Squaxin Island Tribe is currently attempting to develop travel time information through a re-analysis of the raw data.

Fiscus, et al. (1975) conducted a tagging study on the 1974 return of chum to the West Beach - Rosario Bluff region (areas 6A and 7). A total of 30 chum (11.49%) of the 261 recoveries came from Canadian waters. Other areas of fishery recovery (e.g.- Salmon Banks) undoubtedly included fish of Canadian origin, and as with the 1968 study, estimates of Canadian contributions are probably conservative because recovery efforts were limited to Washington waters. Specific travel time information is not included in the report, however, each tag recovery is identified by tagging date, tagging location, recovery date, and recovery location. Individual travel times can be easily assembled.

Travel time data that are available are presented in Fiscus (1968), Fiscus, et al. (1975), and WDF Technical Report 48 (Barker, 1979). Tables 29 and 30 provide summaries of these results excerpted from these reports.

B. Washington Coast

Forecasted chum returns to Grays Harbor and Willapa Bay have been based upon average returns per spawner by age group adjusted by return rates observed for prior ages from the same brood. The averages are calculated separately for odd and even brood years which show different survival patterns. This methodology has been used for only the past four years and an evaluation of this technique is not completed.

Chum forecasts for the Quinault River are based upon average survival rates observed at Quinault NFH.

Inseason updates of run strength have been based upon a one week full fleet test fishery in Willapa Bay. This update is used to adjust run sizes in both Grays Harbor and Willapa Bay.

Escapement estimates in the Grays Harbor drainage are derived by comparing annual index area counts with a base year in which there was an estimate of the total escapement. In Willapa Bay, where no comprehensive escapement studies have been made, escapement estimates are based upon live count curves where the area under the curve represents the estimated escapement. These estimates are then expanded to uncounted areas.

C. Oregon

Escapement estimates for the lower Columbia River and Oregon's naturally spawning chum stocks are not available. Population trends are monitored using spawning index areas. Peak counts and average fish per mile in these indexes are used to monitor trends in escapement.

Henry (1964) conducted a tagging study in 1953 to estimate the run size and escapement of the Tillamook Bay chum run. He estimated a total run of approximately 54,000 from which a commercial catch of 20,878 was taken. However, this study was conducted at a time when the stock was declining and the relationship of this estimate to the present run is unknown.

IV. MANAGEMENT PROCESS

A. Puget Sound

The functional relationship between the treaty Tribes and the Washington Department of Fisheries (WDF), in regards to fisheries management, was originally established by the Federal Court in 1974 at the same time that specific treaty and non-treaty allocations were established. Subsequently, at the direction of the court, the Puget Sound Tribes and WDF negotiated a set of rules governing that relationship and establishing a procedure for annual management planning. This plan, called the Puget Sound Salmon Management Plan (PSSMP), was first negotiated between the parties and adopted by the court in 1977. After eight years of experience under the original PSSMP the parties had identified a number of shortcomings with the plan and a need to be more comprehensive. A revised PSSMP was negotiated between the parties and adopted by the court in 1985. This plan provides a detailed strategy and time schedule for preseason planning and inseason management.

A major objective of the PSSMP is to obtain preseason agreement on detailed management strategies and to document this agreement to minimize inseason disputes. Specifically, the PSSMP provides rules for establishing and modifying escapement goals, management periods, harvest rates and test and evaluation fisheries. It establishes a procedure for technical review and agreement on current and long term enhancement planning. The plan also provides a procedure for regulation notification, a schedule for the preparation of reports and a mechanism for dispute resolution.

Preseason planning under the PSSMP is conducted according to a fixed schedule (Table 31). In general, this schedule is based on the availability of spawning escapement data, hence total run size, from the immediately preceding return year. For runs to Puget Sound, preseason forecasts are first developed in April. Several weeks later the plan calls for a technical review and resolution of any forecasting disputes and final agreement on forecasts. Following the development and agreement on preseason forecasts, proposals are exchanged between the tribes and WDF on escapement goals, annual enhancement plans and management recommendations. This step occurs in the May-June time period. Differences in proposals are first reviewed at the technical level and as many as possible are resolved. A consolidated draft

management recommendation report is then prepared and submitted to the administrative/policy level for resolution of any remaining differences. Final preseason reports (status reports) are available in July. Separate reports are developed for inseason run size estimation methods. These reports are completed on a slightly later time schedule.

If preseason planning is thorough, and occurs as scheduled in the PSSMP, and if the salmon runs return as expected, inseason disputes are relatively rare. The preseason agreements of the parties are generally binding inseason unless both parties agree to a modification. Inseason disputes most often arise when actual inseason conditions deviate significantly from what was anticipated preseason and the parties agree that the preseason plan is no longer appropriate, but cannot agree on the necessary changes. If agreement cannot be reached, for whatever reason, the PSSMP establishes a dispute resolution mechanism to resolve any disputes, preseason or inseason. In addition, the Federal Court maintains continuing jurisdiction over management and allocation and is available as a last resort for dispute resolution.

Fisheries in Puget Sound other than those in the Strait of Juan de Fuca, San Juan Islands and Point Roberts areas, are generally managed to meet the needs of the weakest stock present. Most of these fisheries are terminal in nature and harvest only a few stocks or stock groupings. Specific harvest quotas are established for most stocks or stock groupings of concern (management units), based on the estimated run size entering Puget Sound minus the escapement goal. Fisheries in the inside areas of Puget Sound are initiated based on the preseason forecast of abundance. Models for inseason updating of the run size estimates are used wherever technically feasible. Generally, these update models provide inseason estimates of abundance after the first week or two of fishing, and provide successive updates, at weekly intervals, through the peak of the runs. Fisheries in any given area generally are closed once any management unit passing through that area no longer has harvestable numbers of fish remaining. Openings and closures of fisheries are also dictated by domestic allocation requirements.

B. Washington Coast

Preseason forecasts and harvestable numbers of Grays Harbor and Willapa Bay chum are published by WDF and distributed to treaty managers and non-treaty fishermen. WDF and the tribes negotiate fishing schedules designed to achieve allocation quotas. Disputes are normally mediated by the Court's Fisheries Advisory Board. WDF also holds public hearings with non-treaty fishermen to gather input on proposed fishing schedules.

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TABLE 1

TOTAL PUGET SOUND CHUM RUN SIZE BY RUN TIME AND STOCK, 1968-1984

	EARLY CHUM			NORMAL CHUM						LATE CHUM		
		SOUTH						SOUTH		SOUTH		
		PUGET	HOOD		NOOKS-		STILLY-	PUGET	HOOD	PUGET	ANNUAL	
YEAR	STRAIT	SOUND	CANAL	STRAIT	SAMISH	SKAGIT	SNOHOM	SOUND	CANAL	SOUND	TOTAL	YEAR
1968	1,639	42,239	49,835	2,407	24,342	87,101	91,087	195,569	122,724	48,181	665,124	1968
1969	1,694	8,310	16,063	3,022	33,826	23,695	37,401	78,303	52,718	35,125	290,157	1969
1970	1,658	11,244	21,800	3,081	39,043	134,653	102,892	98,819	84,988	49,444	547,622	1970
1971	1,562	14,363	26,384	3,936	13,068	51,451	22,713	111,359	74,790	22,299	341,925	1971
1972	1,917	135,422	52,358	4,303	32,101	168,169	70,966	281,242	118,673	59,919	925,070	1972
1973	1,477	41,245	25,525	2,999	44,028	91,964	31,020	190,962	92,379	54,869	576,468	1973
1974	1,570	22,589	13,991	2,037	21,401	180,956	78,634	173,003	136,639	61,142	691,962	1974
1975	1,873	8,493	27,327	1,074	14,222	19,676	12,427	60,128	47,317	14,724	207,261	1975
1976	2,470	96,062	76,773	4,883	24,636	133,734	89,608	267,814	188,478	54,687	939,145	1976
1977	1,611	11,175	25,837	2,096	54,267	52,104	37,020	220,011	212,623	55,266	672,010	1977
1978	2,354	17,290	26,552	2,194	36,105	231,708	122,126	372,711	601,376	61,591	1,474,007	1978
1979	785	2,371	7,742	520	32,529	39,034	11,103	34,442	125,436	31,221	285,183	1979
1980	5,450	23,001	16,058	14,084	35,207	112,587	87,053	399,329	243,620	79,073	1,015,462	1980
1981	1,060	16,882	7,440	9,029	85,035	78,126	70,229	216,884	193,696	54,352	732,733	1981
1982	2,047	13,539	12,132	4,791	112,733	275,761	251,510	339,041	284,681	54,872	1,351,107	1982
1983	1,607	13,681	7,561	5,916	74,602	31,204	29,912	196,989	206,353	36,684	604,509	1983
1984	1,559	28,980	5,736	11,018	128,107	51,592	123,219	289,395	424,468	86,937	1,151,011	1984
EVN MN	2,296	43,374	30,582	5,422	50,408	152,918	113,011	268,547	245,072	61,761	973,390	EVN MN
ODD MN	1,459	14,565	17,985	3,574	43,947	48,407	31,478	138,635	125,664	38,068	463,781	ODD MN
MEAN	1,902	29,817	24,654	4,552	47,368	103,736	74,642	207,412	188,880	50,611	733,574	MEAN

Source: WDF Stock Strength Calculation Summary, 18 April 86.

TABLE 2

WILD PUGET SOUND CHUM RUN SIZE BY RUN TIME AND STOCK, 1968-1984

	EARLY CHUM			NORMAL CHUM						LATE CHUM		
YEAR	STRAIT	SOUTH PUGET SOUND	HOOD CANAL	STRAIT	NOOKS-SAMISH	SKAGIT	STILLY-SNOHOM	SOUTH PUGET SOUND	HOOD CANAL	SOUTH PUGET SOUND	ANNUAL TOTAL	YEAR
1968	1,639	42,239	49,835	2,407	24,197	87,101	91,087	195,016	110,813	48,181	652,515	1968
1969	1,694	8,310	16,063	3,022	32,725	23,695	37,401	78,177	43,325	35,125	279,537	1969
1970	1,658	11,244	21,800	3,081	38,736	134,653	102,892	97,388	65,455	49,444	526,351	1970
1971	1,562	14,363	26,384	3,936	12,874	51,451	22,713	110,847	59,598	22,299	326,027	1971
1972	1,917	135,422	52,358	4,303	31,941	168,078	70,966	279,408	97,883	59,919	902,195	1972
1973	1,477	41,245	25,525	2,999	43,826	91,964	31,020	189,758	62,391	54,869	545,074	1973
1974	1,570	22,589	13,991	2,037	21,322	180,956	78,634	171,831	92,844	61,142	646,916	1974
1975	1,873	8,493	27,327	1,074	14,222	19,676	12,427	60,049	28,579	14,724	188,444	1975
1976	2,470	76,534	76,773	4,883	24,636	133,631	89,608	247,800	116,392	54,217	826,944	1976
1977	1,611	9,925	25,837	2,096	52,506	44,148	36,612	215,594	114,916	53,439	556,684	1977
1978	2,354	15,098	26,552	2,194	32,952	231,214	121,936	298,729	353,512	55,414	1,139,955	1978
1979	785	1,529	7,742	464	30,743	39,021	10,093	26,841	29,886	28,941	176,045	1979
1980	5,450	14,543	16,058	12,851	31,759	112,489	69,243	275,969	77,167	73,010	688,539	1980
1981	1,060	13,365	7,440	8,709	78,112	76,842	61,814	151,957	73,224	51,664	524,187	1981
1982	2,047	6,881	12,132	4,226	99,825	273,123	248,383	190,646	89,066	51,133	977,462	1982
1983	1,607	4,775	7,561	5,808	67,722	31,164	23,252	136,389	46,282	27,809	352,369	1983
1984	1,559	18,914	5,736	10,161	122,664	51,592	99,123	225,784	96,799	64,645	696,977	1984
EVN MN	2,296	38,163	30,582	5,127	47,559	152,537	107,986	220,286	122,215	57,456	784,206	EVN MN
ODD MN	1,459	12,751	17,985	3,514	41,591	47,245	29,417	121,202	57,275	36,109	368,546	ODD MN
MEAN	1,902	26,204	24,654	4,368	44,751	102,988	71,012	173,658	91,655	47,410	588,601	MEAN

Source: WDF Stock Strength Calculation Summary, 18 April 86.

TABLE 3

ENHANCED PUGET SOUND CHUM RUN SIZE BY RUN TIME AND STOCK, 1968-1984

	EARLY CHUM			NORMAL CHUM						LATE CHUM		
YEAR	STRAIT	SOUTH PUGET SOUND	HOOD CANAL	STRAIT	NOOKS-SAMISH	SKAGIT	STILLY-SNOHOM	SOUTH PUGET SOUND	HOOD CANAL	SOUTH PUGET SOUND	ANNUAL TOTAL	YEAR
1968	0	0	0	0	145	0	0	553	11,911	0	12,609	1968
1969	0	0	0	0	1,101	0	0	126	9,393	0	10,620	1969
1970	0	0	0	0	307	0	0	1,431	19,533	0	21,271	1970
1971	0	0	0	0	194	0	0	512	15,192	0	15,898	1971
1972	0	0	0	0	160	91	0	1,834	20,790	0	22,875	1972
1973	0	0	0	0	202	0	0	1,204	29,988	0	31,394	1973
1974	0	0	0	0	79	0	0	1,172	43,795	0	45,046	1974
1975	0	0	0	0	0	0	0	79	18,738	0	18,817	1975
1976	0	19,528	0	0	0	103	0	20,014	72,086	470	112,201	1976
1977	0	1,250	0	0	1,761	7,956	408	4,417	97,707	1,827	115,326	1977
1978	0	2,192	0	0	3,153	494	190	73,982	247,864	6,177	334,052	1978
1979	0	842	0	56	1,786	13	1,010	7,601	95,550	2,280	109,138	1979
1980	0	8,458	0	1,233	3,448	98	17,810	123,360	166,453	6,063	326,923	1980
1981	0	3,517	0	320	6,923	1,284	8,415	64,927	120,472	2,688	208,546	1981
1982	0	6,658	0	565	12,908	2,638	3,127	148,395	195,615	3,739	373,645	1982
1983	0	8,906	0	108	6,880	40	6,660	60,600	160,071	8,875	252,140	1983
1984	0	10,066	0	857	5,443	0	24,096	63,611	327,669	22,292	454,034	1984
EVN MN	0	5,211	0	295	2,849	380	5,025	48,261	122,857	4,305	189,184	EVN MN
ODD MN	0	1,814	0	61	2,356	1,162	2,062	17,433	68,389	1,959	95,235	ODD MN
MEAN	0	3,613	0	185	2,617	748	3,630	33,754	97,225	3,201	144,973	MEAN

Source: WDF Stock Strength Calculation Summary, 18 April 86.

TABLE 4

TOTAL PUGET SOUND CHUM ESCAPEMENT BY RUN TIME AND STOCK, 1968-1984

	EARLY CHUM			NORMAL CHUM						LATE CHUM		
		SOUTH PUGET	HOOD		NOOKS-		STILLY-	SOUTH PUGET	HOOD	SOUTH PUGET	ANNUAL	
YEAR	STRAIT	SOUND	CANAL	STRAIT	SAMISH	SKAGIT	SNOHOM	SOUND	CANAL	SOUND	TOTAL	YEAR
1968	1,605	22,008	43,620	2,292	10,899	44,049	39,260	47,075	54,119	27,553	292,480	1968
1969	1,605	3,440	13,709	2,955	27,863	22,393	27,500	37,336	37,578	20,292	194,671	1969
1970	1,605	5,411	18,228	3,023	33,905	127,588	75,223	42,180	57,256	34,068	398,487	1970
1971	1,548	4,808	22,516	3,893	9,530	48,827	17,790	43,870	53,419	9,937	216,138	1971
1972	1,890	33,523	39,452	3,975	26,932	144,811	32,751	65,548	54,387	34,388	437,657	1972
1973	1,446	9,643	20,859	2,650	26,164	83,497	16,200	55,601	48,296	29,825	294,181	1973
1974	1,543	19,730	10,519	1,492	9,653	160,248	56,110	105,261	88,602	34,676	487,834	1974
1975	1,739	5,804	16,122	580	6,011	15,762	9,774	31,109	31,831	9,936	128,668	1975
1976	2,319	40,914	28,268	2,236	4,854	93,072	43,325	56,525	96,521	23,728	391,762	1976
1977	1,540	4,284	12,910	1,886	21,717	42,486	28,897	54,677	61,141	24,528	254,066	1977
1978	2,244	6,706	16,987	1,537	16,207	133,179	98,504	109,899	132,443	31,057	548,763	1978
1979	743	1,490	5,504	422	28,983	23,161	7,877	23,628	67,644	24,577	184,029	1979
1980	4,886	11,723	5,345	12,297	27,703	19,442	44,561	104,836	64,373	46,300	341,466	1980
1981	952	7,899	2,881	8,259	64,924	17,222	23,118	49,941	35,916	33,863	244,975	1981
1982	2,003	8,222	3,317	2,869	49,092	153,918	108,907	43,185	43,514	32,698	447,725	1982
1983	1,581	4,895	1,300	5,499	21,044	3,197	11,611	44,763	31,128	15,516	140,534	1983
1984	1,554	12,163	2,039	10,412	51,086	46,817	96,952	85,056	84,165	34,913	425,157	1984
EVN MN	2,183	17,822	18,642	4,459	25,592	102,569	66,177	73,285	75,042	33,265	419,037	EVN MN
ODD MN	1,394	5,283	11,975	3,268	25,780	32,068	17,846	42,616	45,869	21,059	207,158	ODD MN
MEAN	1,812	11,921	15,504	3,899	25,680	69,392	43,433	58,852	61,314	27,521	319,329	MEAN

Source: WDF Puget Sound Escapement Estimates, 17 May 86.

TABLE 5

WILD PUGET SOUND CHUM ESCAPEMENT BY RUN TIME AND STOCK, 1968-1984

	EARLY CHUM			NORMAL CHUM						LATE CHUM		
YEAR	STRAIT	SOUTH PUGET SOUND	HOOD CANAL	STRAIT	NOOKS-SAMISH	SKAGIT	STILLY-SNOHOM	SOUTH PUGET SOUND	HOOD CANAL	SOUTH PUGET SOUND	ANNUAL TOTAL	YEAR
1968	1,605	22,008	43,620	2,292	10,779	44,049	39,260	46,964	47,468	27,553	285,598	1968
1969	1,605	3,440	13,709	2,955	26,785	22,393	27,500	37,275	30,070	20,292	186,024	1969
1970	1,605	5,411	18,228	3,023	33,603	127,588	75,223	41,630	41,699	34,068	382,078	1970
1971	1,548	4,808	22,516	3,893	9,340	48,827	17,790	43,689	41,141	9,937	203,489	1971
1972	1,890	33,523	39,452	3,975	26,784	144,732	32,751	65,163	41,601	34,388	424,259	1972
1973	1,446	9,643	20,859	2,650	26,006	83,497	16,200	55,282	27,869	29,825	273,277	1973
1974	1,543	19,730	10,519	1,492	9,592	160,248	56,110	99,539	52,223	34,676	445,672	1974
1975	1,739	5,804	16,122	580	6,011	15,762	9,774	31,100	16,265	9,936	113,093	1975
1976	2,319	32,743	28,268	2,236	4,854	93,000	43,325	53,304	48,079	23,311	331,439	1976
1977	1,540	3,836	12,910	1,886	21,263	36,000	28,730	54,080	26,075	23,590	209,910	1977
1978	2,244	5,873	16,987	1,537	14,677	132,895	98,504	105,451	79,153	29,608	486,929	1978
1979	743	1,004	5,504	382	27,388	23,153	7,877	18,816	14,221	22,613	121,701	1979
1980	4,886	7,553	5,345	11,289	25,445	19,425	42,710	84,261	21,154	41,015	263,083	1980
1981	952	6,292	2,881	7,950	62,359	16,939	21,325	42,110	14,255	31,326	206,389	1981
1982	2,003	4,088	3,317	2,650	42,965	152,541	108,074	30,378	13,577	30,573	390,166	1982
1983	1,581	1,769	1,300	5,406	18,074	3,193	9,014	36,360	7,145	14,013	97,855	1983
1984	1,554	8,033	2,039	9,702	48,601	46,817	87,341	72,318	22,970	33,726	333,101	1984
EVN MN	2,183	15,440	18,642	4,244	24,144	102,366	64,811	66,556	40,880	32,102	371,369	EVN MN
ODD MN	1,394	4,575	11,975	3,213	24,653	31,221	17,276	39,839	22,130	20,192	176,467	ODD MN
MEAN	1,812	10,327	15,504	3,759	24,384	68,886	42,442	53,984	32,057	26,497	279,651	MEAN

Source: WDF Puget Sound Escapement Estimates, 17 May 86.

TABLE 6

ENHANCED PUGET SOUND CHUM ESCAPEMENT BY RUN TIME AND STOCK, 1968-1984

	EARLY CHUM			NORMAL CHUM						LATE CHUM		
YEAR	STRAIT	SOUTH PUGET SOUND	HOOD CANAL	STRAIT	NOOKS-SAMISH	SKAGIT	STILLY-SNOHOM	SOUTH PUGET SOUND	HOOD CANAL	SOUTH PUGET SOUND	ANNUAL TOTAL	YEAR
1968	0	0	0	0	120	0	0	111	6,651	0	6,882	1968
1969	0	0	0	0	1,078	0	0	61	7,508	0	8,647	1969
1970	0	0	0	0	302	0	0	550	15,557	0	16,409	1970
1971	0	0	0	0	190	0	0	181	12,278	0	12,649	1971
1972	0	0	0	0	148	79	0	385	12,786	0	13,398	1972
1973	0	0	0	0	158	0	0	319	20,427	0	20,904	1973
1974	0	0	0	0	61	0	0	5,722	36,379	0	42,162	1974
1975	0	0	0	0	0	0	0	9	15,566	0	15,575	1975
1976	0	8,171	0	0	0	72	0	3,221	48,442	417	60,323	1976
1977	0	448	0	0	454	6,486	167	597	35,066	938	44,156	1977
1978	0	833	0	0	1,530	284	0	4,448	53,290	1,449	61,834	1978
1979	0	486	0	40	1,595	8	0	4,812	53,423	1,964	62,328	1979
1980	0	4,170	0	1,008	2,258	17	1,851	20,575	43,219	5,285	78,383	1980
1981	0	1,607	0	309	2,565	283	1,793	7,831	21,661	2,537	38,586	1981
1982	0	4,134	0	219	6,127	1,377	833	12,807	29,937	2,125	57,559	1982
1983	0	3,126	0	93	2,970	4	2,597	8,403	23,983	1,503	42,679	1983
1984	0	4,130	0	710	2,485	0	9,611	12,738	61,195	1,187	92,056	1984
EVN MN	0	2,382	0	215	1,448	203	1,366	6,729	34,162	1,163	47,667	EVN MN
ODD MN	0	708	0	55	1,126	848	570	2,777	23,739	868	30,691	ODD MN
MEAN	0	1,594	0	140	1,297	506	991	4,869	29,257	1,024	39,678	MEAN

Source: WDF Puget Sound Escapement Estimates, 17 May 86.

TABLE 7

WASHINGTON STATE

CHUM ENHANCEMENT BY REGION OF ORIGIN

(NUMBER RELEASED IN THOUSANDS)

REGION OF ORIGIN	BROOD YEAR 1976	1977	1978	1979	1980	1981	1982	1983	1984
NOOKSACK-SAMISH	1,729	2,076	3,262	4,646	4,755	2,748	2,341	3,565	407
SKAGIT	3,230	3,136	514	8	24	0	741	0	0
STILLAGUAMISH-SNOHOMISH	5,140	5,568	617	168	2,312	1,680	1,993	1,948	10,147
SOUTH SOUND	23,479	9,001	23,211	17,160	24,044	11,151	16,106	12,081	15,832
HOOD CANAL	23,676	14,833	39,548	47,109	43,313	25,743	44,510	31,974	64,189
STRAIT OF JUAN DE FUCA	2,206	2,859	3,532	640	1,242	885	233	99	622
NORTH COAST, WASHINGTON	5,888	4,994	8,083	4,566	2,056	1,434	5,574	3,399	5,463
GRAYS HARBOR	1,624	914	7,305	2,815	4,291	1,007	5,249	765	897

SOURCE: WDF PROGRESS REPORTS, "A DETAILED LISTING OF THE LIBERATIONS OF SALMON INTO OPEN WATERS OF THE STATE OF WASHINGTON."

TABLE 8

Number of chum salmon caught in Willapa Bay and Grays Harbor, 1940-1984.

Year	Willapa Bay	Grays Harbor
1940	50,900	23,900
1941	136,300	124,400
1942	203,000	85,600
1943	85,300	21,300
1944	44,300	15,400
1945	43,600	24,400
1946	98,600	71,400
1947	54,100	22,000
1948	78,400	26,900
1949	41,100	17,600
Mean 1940-49	83,560	43,290
1950	104,900	41,500
1951	106,900	60,200
1952	80,600	46,800
1953	105,800	35,800
1954	135,600	145,100
1955	83,200	60,400
1956	59,300	26,100
1957	61,800	37,200
1958	65,600	60,900
1959	67,100	73,500
Mean 1950-59	87,080	58,750
1960	43,900	19,700
1961	24,400	11,100
1962	35,900	21,100
1963	12,100	7,100
1964	21,900	13,600
1965	12,800	4,500
1966	7,500	11,400
1967	8,100	10,600
1968	11,600	5,800
1969	29,300	24,350
Mean 1960-69	20,750	12,925
1970	22,900	28,650
1971	17,100	12,900
1972	56,400	46,900
1973	35,400	35,000
1974	35,700	29,650
1975	23,600	13,200
1976	33,500	23,350
1977	8,500	2,550
1978	29,700	17,400
1979	1,200	450
Mean 1970-79	26,400	21,005
1980	30,500	25,800
1981	19,500	20,900
1982	76,000	61,600
1983	57,400	18,650
1984	25,600	17,850
Mean 1980-84	41,800	28,960

TABLE 9

Catch and escapement data for Grays Harbor chum runs, 1969-1984 (Washington Department of Fisheries).

Year	Catch		Escapement			Total Run	Harvest Rate
	Gill Net	River Sport 1/	Total	Hatchery	Wild		
1969	24,350		24,350	400	11,150	35,900	0.68
1970	28,650		28,650	450	15,700	44,800	0.64
1971	12,900		12,900	250	10,250	23,400	0.55
1972	46,900		46,900	350	8,000	55,250	0.85
1973	35,000		35,000	0	12,350	47,350	0.74
1974	29,350	300	29,650	0	8,300	37,950	0.78
1975	13,150	50	13,200	600	11,750	25,550	0.52
1976	23,000	350	23,350	1,200	11,650	36,200	0.65
1977	2,350	200	2,550	300	21,000	23,850	0.11
1978	17,050	350	17,400	1,400	11,000	29,800	0.58
1979	300	150	450	0	1,050	1,500	0.30
1980	25,650	150	25,800	2,550	24,700	53,050	0.49
1981	20,650	250	20,900	1,000	18,050	39,950	0.52
1982	59,300	2,300	61,600	2,900	35,100	99,600	0.62
1983	18,250	400	18,650	800	21,000	40,450	0.46
1984	16,450	1,400	17,850	1,050	23,700	42,600	0.42

1 / River sport catches by species are unavailable prior to 1974. Total run size and catch estimates from 1969-1973 will be biased low by the amount of the actual sport catch.

TABLE 10

Grays Harbor chum releases by brood year, 1965-1983 (releases X 1000, Washington Department of Fisheries).

	FRY						FINGERLING					
Brood Year	Simpson	Humptulips	Satsop Springs	Egg Boxes	Other Off	Total	Simpson	Humptulips	Satsop Springs	Egg Boxes	Other Off	Total
1965	0	0	0	0	-	0	0	0	0	0	-	0
1966	0	0	0	0	-	0	0	0	0	0	-	0
1967	80	0	189	0	-	269	0	0	0	0	-	0
1968	0	0	228	0	-	228	0	0	0	0	-	0
1969	0	0	422	0	-	422	0	0	0	0	-	0
1970	0	0	414	0	-	414	0	0	0	0	-	0
1971	0	0	612	0	-	612	0	0	0	0	-	0
1972	0	0	857	0	-	857	0	0	0	0	-	0
1973	0	0	932	0	-	932	0	0	0	0	-	0
1974	0	0	250	0	-	250	18	0	0	0	-	18
1975	0	0	0	0	-	0	250	0	0	0	-	250
1976	0	0	0	272	81	353	0	992	279	0	0	1,271
1977	0	0	0	0	0	0	0	586	139	189	0	914
1978	0	0	0	1,624	0	1,624	660	4,455	249	0	226	5,590
1979	0	0	0	0	90	90	0	24	0	0	0	24
1980 1	0	0	0	0	0	0	0	2,566	1,700	0	26	4,292
1981	0	0	0	0	0	0	0	154	854	0	0	1,008
1982	0	0	0	0	0	0	0	2,077	3,172	0	0	5,249
1983	0	0	0	0	0	0	0	440	325	0	0	765

1/ The Humptulips release includes large numbers of Hood Canal stock.

TABLE 11

Releases of chum salmon into the Willapa Bay system by brood year, 1966-1983 (releases X 1000, Washington Department of Fisheries).

Brood Year	Willapa		Nemah		Naselle		Egg Boxes	Co-op	
	On	Off	On	Off	On	Off	Off	Projects	Total
1966	0	0	749	0	0	0	0	0	749
1967	0	0	412	0	0	0	0	0	412
1968	25	0	660	0	0	0	0	0	685
1969	0	0	667	0	0	0	0	0	667
1970	0	0	536	0	0	0	0	0	536
1971	0	0	965	0	0	0	0	0	965
1972	0	0	622	31	0	0	0	110	763
1973	0	0	771	0	0	0	0	200	971
1974	0	0	840	0	0	0	0	0	840
1975	0	0	922	0	0	0	0	0	922
1976 1/	0	0	954	0	0	0	475	1,368	2,797
1977	0	0	1,134	0	0	0	1,400	735	3,269
1978 2/	0	0	1,540	0	0	0	960	218	2,718
1979	0	0	287	0	40	0	144	500	971
1980	0	0	2,000	0	1,858	0	0	476	4,334
1981	0	0	950	0	623	0	547	0	2,120
1982	0	0	2,159	0	4,127	0	805	0	7,091
1983	0	0	2,139	0	2,714	0	1,144	0	5,997

1/ Co-op projects include 1,055,000 Hood Canal stock in the Naselle River system.

2/ Egg boxes include 500,000 Hood Canal stock in the Naselle River system.

TABLE 12

Grays Harbor wild chum return rates by brood year. Age composition based upon scale samples collected from the commercial catch (Washington Department of Fisheries).

Brood Year	Wild Escapement	Contributions			Return/Spawner			Total Contribution
		3's	4's	5's	3's	4's	5's	
1969	11,150	14,151	30,526	1,516	1.27	2.74	0.14	4.14
1970	15,700	13,225	25,431	413	0.84	1.62	0.03	2.49
1971	10,250	10,953	5,783	0	1.07	0.56	0.00	1.63
1972	8,000	18,104	29,356	846	2.26	3.67	0.11	6.04
1973	12,350	3,444	3,784	238	0.28	0.31	0.02	0.60
1974	8,300	18,871	24,130	180	2.27	2.91	0.02	5.20
1975	11,750	2,033	240	144	0.17	0.02	0.01	0.21
1976	11,650	1,080	21,645	983	0.09	1.86	0.08	2.04
1977	21,000	26,311	26,536	4,508	1.25	1.26	0.21	2.73
1978	11,000	10,282	80,868	9,867	0.93	7.35	0.90	9.18
1979	1,050	6,440	9,633	455	6.13	9.17	0.43	15.74
1980	24,700	19,500	12,740		0.79	0.52		
1981	18,050	32,305			1.79			
1982	35,100							
1983	21,000							
1984	23,700							

TABLE 13

Willapa Bay wild chum return rates by brood year. Age composition based upon scale samples collected from the commercial catch (Washington Department of Fisheries).

Brood Year	Wild Escapement	Contributions			Return/Spawner			Total Contribution
		3's	4's	5's	3's	4's	5's	
1968	13200	37708	58064	6664	2.86	4.4	0.5	7.76
1969	33900	17836	30940	760	0.53	0.91	0.02	1.46
1970	23100	9996	22708	0	0.43	0.98	0	1.41
1971	37600	21232	6620	143	0.56	0.18	0	0.74
1972	22400	27680	42494	0	1.23	1.9	0	3.13
1973	14500	5162	5700	0	0.36	0.39	0	0.75
1974	12200	41800	38682	900	3.43	3.17	0.07	7.42
1975	12600	3318	1725	0	0.26	0.14	0	0.4
1976	16500	4875	29014	2309	0.3	1.76	0.14	2.2
1977	40200	32586	25312	536	0.81	0.63	0.01	1.45
1978	18900	12758	117605	26199	0.68	6.22	1.39	8.29
1979	6400	15957	22544	1879	2.49	3.52	0.29	6.3
1980	35700	18956	29808		0.53	0.83		
1981	22100	32854			1.49			
1982	66400							

TABLE 14

Releases of chum salmon into the Quinault river system by Quinault NFH and the Quinault Tribal hatchery, 1969-1984.

Release Year	Quinault NFH	Quinault Tribal
1970	38,600	
1971	619,700	
1972	1,139,200	
1973	79,600	250,000
1974	193,000	
1975	1,694,000	1,500,000
1976	3,121,900	
1977	2,225,000	669,000
1978	1,961,500	1,330,000
1979	2,918,600	3,021,000
1980	1,980,000	620,500
1981	1,641,000	150,000
1982	445,000	176,100
1983	3,391,000	1,099,900
1984	2,309,400	136,800

TABLE 15

Peak counts of chum salmon in Tillamook Bay and Nestucca River tributaries, 1950-83.

	TILLAMOOK BAY				
	MIAMA RIVER	KILCHIS RIVER	WILSON RIVER	TILLAMOOK RIVER	NESTUCCA RIVER
YEAR	MOSS CR	CLEAR CR	LITTLE NO FORK	MAINSTEMa/	CLEAR CREEK
1950	256	420	142	--	56
1951	193	699	712	--	73
1952	29	487	182	--	43
1953	330	780	104	--	5
1954	73	906	381	--	178
1955	14	201	97	--	35
1956	10	102	194	--	13
1957	54	351	172	--	88
1958	34	331	153	--	165
1959	7	87	152	--	36
1950-59 AVERAGE	100	436	229		69
1960	0	2	20	4	6
1961 b/	6	13	27	39	57
1962	86	6	25	61	156
1963	39	5	109	62	196
1964	18	18	13	16	40
1965	0	0	61	18	35
1966	50	12	87	74	89
1967	31	3	25	41	72
1968	9	0	107	11	80
1969	4	1	50	15	35
1960-69 AVERAGE	24	6	52	34	77
1970	183	23	64	27	53
1971	73	2	94	13	45
1972	13	0	127	83	49
1973	333	3	474	68	109
1974	111	85	373	63	214
1975	173	22	310	66	34
1976	19	2	214	45	72
1977	--	--	124	122	116
1978	--	--	326	182	295
1979	--	--	82	14	18
1970-79 AVERAGE	129	20	219	68	101
1980	4	75	724	43	87
1981	--	--	182	--	9
1982	191	532	825	--	45
1983	107	102	595	--	49
1980-83 AVERAGE	101	236	582	43	48

a/ Nonstandard survey unit.
b/ Commercial gill net fisheries for chum salmon closed after the season.

TABLE 16

Columbia River escapement of chum as measured by spawning ground counts from selected Washington tributaries, 1950-84.

YEAR	MILES SURVEYED	FISH OBSERVED	FISH/MILE
1950	0.5	475	950
1951	2.9	2,430	838
1952	2.9	2,087	720
1953	2.9	706	243
1954	0.9	650	722
1955	1.3	89	68
1956	1.2	242	202
1957	3.8	893	235
1958	2.5	412	165
1959	2.9	1,046	361
1950-59 AVERAGE			450
1960	4.3	693	161
1961	2.6	854	328
1962	2.3	822	357
1963	5.4	1,041	193
1964	3.7	642	174
1965	6.5	528	81
1966	6.5	1,303	200
1967	6.5	909	140
1968	4.3	276	64
1969	6.5	600	92
1960-69 AVERAGE			179
1970	4.0	414	104
1971	6.5	574	88
1972	6.5	1,086	167
1973	4.3	403	94
1974	6.5	277	43
1975	6.5	322	50
1976	6.5	271	42
1977	6.5	593	91
1978	6.5	426	66
1979	6.5	130	20
1970-79 AVERAGE			77
1980	6.7	276	41
1981	4.0	56	14
1982	6.1	1,127	185
1983	5.8	317	55
1984	7.1	499	70
1980-84 AVERAGE			73

TABLE 17

RELEASES OF CHUM SALMON INTO THE LOWER COLUMBIA AND OREGON COASTAL RIVERS, 1972-1984.

RELEASE YEAR	NUMBERS IN THOUSANDS		
	COLUMBIA RIVER	OREGON	TOTAL
1972	638	51	689
1973	564	277	841
1974	627	575	1,202
1975	0	2,793	2,793
1976	1,127	2	1,129
1977	0	121	121
1978	50	465	515
1979	376	10,940	11,316
1980	835	8	843
1981	0	5,529	5,529
1982	625	1,650	2,275
1983	125	5,592	5,717
1984	-	1,470	1,470

TABLE 18

AREA 4B,5,6C CHUM COMMERCIAL FISHERY OPENINGS (DAYS/WEEK)

WEEKS-BEGINNING THE FIRST WEEK OF OCTOBER

WEEK	1		2		3		4		5		6		7		8		9		TOTAL DAYS	
YEAR	TRIBAL	WDF	TRIBAL	WDF	TRIBAL	WDF	TRIBAL	WDF	TRIBAL	WDF	TRIBAL	WDF	TRIBAL	WDF	TRIBAL	WDF	TRIBAL	WDF	TRIBAL	WDF
1950		6		6		6		6		6		6		6		6		5		53
51		5		5		5		5		5		5		5		5		5		45
52		3		6		6		6		6		6		6		6		6		51
53		6		6		6		6		5		6		1		0		0		36
54		6		6		6		6		0		0		1		6		3		34
55		5		5		5		5		3		4		0		0		0		27
56		2		2		2		2		2		2		2		2		1		17
57		0		0		0		0		4		1		0		0		0		5
58		2		4		4		4		4		4		4		4		4		34
59		1		0		4		4		4		4		4		4		4		29
1960		0		4		4		4		3		4		4		0		0		23
61		4		4		4		4		4		0		2		2		2		26
62		4		3		3		3		3		0		3		3		3		25
63		2		2		0		0		4		3		3		3		3		20
64		1		4		3		2		2		2		2		2		2		20
65		4		4		2		2		2		2		2		2		2		22
66		5		5		4		4		4		5		5		5		3		40
67		2		4		4		0		0		0		0		0		0		10
68		4		4		0		0		0		0		0		0		0		8
69		3		4		3		3		3		4		4		3		0		27
1970		1		5		4		2		2		2		2		0		0		18
71		4		4		2		2		2		2		2		0		0		18
72		4		3		4		4		4		4		2		0		0		25
73		3		3		3		3		3		3		3		3		3		27
74		0		0		0		0		0		0		0		0		0		0
75	a/	0	a/	0	a/	0	a/	0	a/	0	a/	0	a/	0	a/	0	a/	0	a/	0
76	7	0	7	0	7	0	7	0	7	0	7	0	0	0	0	0	0	0	42	0
77	7	0	7	0	7	0	7	0	7	0	7	0	7	0	7	0	7	0	63	0
78	7	0	7	0	7	0	7	0	7	0	7	0	7	0	7	0	7	0	63	0
79	6	0	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0
1980	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	45	0
81	7	0	7	0	3	0	0	0	0	0	4	0	4	0	4	0	4	0	33	0
82	7	0	7	0	7	0	7	0	7	0	7	0	7	0	7	0	7	0	63	0
83	7	0	7	0	7	0	7	0	7	0	7	0	7	0	7	0	7	0	63	0
84	7	0	7	0	7	0	7	0	7	0	7	0	7	0	7	0	7	0	63	0

a/ Specific tribal regulations unavailable prior to 1976.

TABLE 19

AREA 7,7A CHUM COMMERCIAL FISHERY OPENINGS (DAYS/WEEK)

WEEKS-BEGINNING THE FIRST WEEK OF OCTOBER

WEEK	1		2		3		4		5		6		7		8		9		TOTAL DAYS	
YEAR	TRIBAL	WDF	TRIBAL	WDF	TRIBAL	WDF	TRIBAL	WDF	TRIBAL	WDF	TRIBAL	WDF	TRIBAL	WDF	TRIBAL	WDF	TRIBAL	WDF	TRIBAL	WDF
1950		6		6		6		6		6		6		6		6		5		53
51		6		6		6		6		6		6		6		6		6		54
52		6		6		6		6		6		6		6		6		1		49
53		6		6		6		6		5		6		1		0		0		36
54		6		6		6		6		0		0		5		6		3		38
55		5		4		4		4		5		4		0		0		0		26
56		5		5		5		5		5		0		0		0		0		25
57		0		0		0		0		5		0		0		0		0		5
58		4		4		4		4		4		4		4		4		4		36
59		0		4		4		4		4		4		4		4		0		28
1960		0		4		4		4		4		4		4		0		0		24
61		4		4		4		4		4		0		2		2		2		26
62		4		3		3		3		3		0		3		3		3		25
63		3		2		0		0		4		3		3		3		3		21
64		4		3		2		2		2		2		2		2		0		19
65		5		4		2		2		2		0		0		0		0		15
66		5		5		5		0		0		0		0		0		0		15
67		2		4		4		0		0		0		0		0		0		10
68		4		4		4		2		4		4		4		2		2		30
69		4		4		3 1/		5		4		4		3		0		0		27
1970		5		4		0		2		2		4		4		2		0		23
71		4		4		2		0		0		0		0		0		0		10
72		4		5		4		4		4		4		3		0		0		28
73		3		5		5		5		5		3		3		3		3		35
74		2		3		3		3		3		3		3		3		0		23
75		3		3		3		3		2		1		0		0		0		15
76	7	3	7	3	7	3	7	3	7	3	7	3	7	3	7	3	7	0	63	24
77	7	3	7	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	5
78	7	3	7	3	7	3	7	3	7	3	7	3	7	3	7	3	7	3	63	27
79	0	0 1/	3	0 1/	0	0 /1	0	0	0	0	0	0	0	0	0	0	0	0	3	0
1980	7	3	7	3	7	3	7	3	7	3	7	3	7	3	7	0	0	0	56	21
81	0	0 1/	0	0 1/	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
82	0	0 1/	3	0 1/	5	1 1/	7	2 1/	7	0 1/	4	0 1/	0	0 1/	0	0 1/	0	0 1/	26	3
83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

1/ 3 DAY/WEEK WDF LICENSED REEFNET FISHERY ONLY

Average and peak daily ( ) fishing effort directed at Canadian origin chum salmon. (Data shown for fishery dates October 01 - November 30 in years when there was a fishery). 1/

YEAR	AREA	GEAR TYPE: INDIAN GILL NET	INDIAN P. SEINE	NON-INDIAN GILL NET	NON-INDIAN P. SEINE	NON-INDIAN REEF NET
1978	4B,5,6C	0 (5)				
	7	8 (28)	1 (6)	130 (210)	52 (98)	6 (26)
	7A	5 (17)	1 (6)	100 (171)	33 (74)	0 (2)
1979	4B,5,6C					
	7	2/	2/	2/	2/	2/
	7A					
1980	4B,5,6C	4 (19)				
	7	18 (44)	3 (11)	141 (203)	47 (88)	4 (20)
	7A	14 (45)	1 (9)	110 (158)	26 (73)	0 (1)
1981	4B,5,6C					
	7	2/	2/	2/	2/	2/
	7A					
1982	4B,5,6C	2 (15)				
	7	6 (22)	3 (14)	82 (84)	38 (50)	11 (14)
	7A	13 (45)	2 (11)	68 (92)	23 (36)	1 (4)
1983	4B,5,6C	5 (24)				
	7		2/	2/	2/	2/
	7A					
1984	4B,5,6C	6 (29)				
	7		2/	2/	2/	2/
	7A					

1/ Effort in area 6 is included in area 7; area 6A was closed for all years reported.
2/ Directed chum fishing did not occur.

TABLE 20

TABLE 21

Puget Sound Commercial Management Periods for Adult Salmon (1)

AREA	SP CHIN	S/F CHIN	PINK	COHO	E CHUM	N CHUM	L CHUM	EARLY SOCK	MID-LATE SOCK
4B	4/15-6/15	7/5-9/6	6/20-10/7	8/17-9/29	-----	9/26-12/4	11/4-12/14	6/1-7/28	6/20-10/1
5	4/15-6/15	7/5-9/6	6/20-10/7	8/17-9/29	-----	9/26-12/4	11/4-12/14	6/1-7/28	6/20-10/1
6	4/15-6/15	6/9-9/6	6/23-9/8	8/24-10/21	-----	9/29-12/7	11/7-12/17	6/3-8/4	6/20-10/1
6A	4/15-6/15	6/9-9/6	6/23-9/8	8/24-10/21	-----	9/29-12/7	11/7-12/17	6/3-8/4	6/20-10/1
6B	4/15-6/15	7/1-9/2	7/9-9/11	8/31-10/14	8/9-10/4	10/5-11/23	11/14-12/24	6/3-8/2	
6C	4/15-6/15	7/5-9/6	6/20-10/7	8/17-9/29	-----	9/26-12/4	11/4-12/14	6/1-7/28	6/20-10/1
6D	4/15-6/29	7/21-9/21	6/30-9/21	9/20-10/28		10/27-12/7			
DUNGENESS R	4/15-7/20	7/21-9/21	7/7-9/21	9/24-11/13		11/14-12/18			
ELWHA R	4/15-7/20	7/21-9/21	7/7-9/21	9/24-11/13		11/26-12/18			
SEKIU R		8/18-9/28		9/22-11/2		11/3-11/30			
HOKO R		8/18-9/28		9/22-11/2		11/3-11/30			
DISC/SEQ BAY				10/2-11/30	9/15-11/2				
MISC STR TRIBS		8/18-9/28		9/24-11/2	-----	11/3-11/30			
7	4/15-6/15	6/9-9/6	6/23-9/8	8/24-10/21	-----	9/29-12/7	11/7-12/17	6/5-7/28	6/20-10/1
7A	4/15-6/15	7/30-9/13	7/9-9/11	8/4-10/13	-----	10/6-11/11	11/7-12/17	6/5-7/28	6/20-10/1
7B	4/15- (2)	-9/7 (2)	6/30-8/17	9/8-10/26		10/27-12/14		-----	
NOOKSACK R	4/15- (2)	-9/14 (2)	-9/14	9/15-11/2		11/3-1/15		-----	
7C	4/15-	-MID OCT		10/15-10/26		10/27-12/14			
SAMISH R		-MID OCT		10/15-11/2		11/3- (2)			
7D		-9/7		9/8-10/26		10/27-12/14			
8	4/15- (2)	-8/31	8/22-9/15	9/2-10/27		10/25-11/28		6/24-7/13	
SKAGIT R #1	4/15- (2)	-8/31	8/22-9/15	9/2-10/27		10/25-11/28		6/24-7/13	
#2	4/15- (2)	-9/7	8/22-9/22	9/9-11/3		11/1-12/5		7/1-7/22	
#3	4/15- (2)	(2)	8/22-	9/16-		11/8-		7/1-7/22	
#4	4/15- (2)	(2)	8/29-	9/23-		11/15-		7/1-7/22	
#5	4/15- (2)	(2)	8/29-	9/30-		11/22-		7/1-7/22	
8A	-----	7/21-9/9	8/9-9/9	9/10-10/21		10/22-11/30		-----	
STILLAGUAMISH	4/15-6/29	7/1-9/21	8/9-9/23	9/7-10/28		10/29-12/7		-----	
SNOHOMISH R		7/21-9/9	8/9-9/9	9/10-10/21		10/22-11/30		-----	
8D	-----	7/21-9/25		9/7-10/30		10/31-12/25			
9	4/15-6/15	7/1-9/2	7/9-9/11	8/31-10/14	8/9-10/4	10/5-11/23	11/14-12/24	6/3-8/4	
9A	-----	-----		9/18-11/11		11/12-12/21			
10	4/15-6/29	7/1-9/7	8/18-9/18	9/8-10/12	9/8-10/11	10/12-11/20	11/21-1/1	6/10-8/4	
10A		7/1-9/14		9/15-11/2		11/3-11/30		6/10-8/4	
DUWA/GREEN R		7/15-9/28		9/29-11/9		11/10-11/30			
10C		7/1-9/28		9/28-11/30				6/10-12/31	
10D		7/15-10/5		10/6-12/14				6/10-12/31	
10E		7/1-9/13		9/14-10/11	9/28-10/11	10/12-12/31			
10F		7/1-9/14		9/15-11/30				6/10-8/4	
10G		7/1-9/28		9/29-11/30				6/10-12/31	
11	4/15-6/29	7/1-9/10	8/18-9/10	9/11-10/21	9/10-10/11	10/12-11/20	11/21-1/8	-----	
11A	4/15-6/29	7/1-9/5	8/18-9/5	9/6-10/18		10/19-12/10			
PUYALLUP R	4/15-6/29	7/15-9/10	8/22-9/13	9/11-10/23		10/24-12/14			
WHITE R	4/15-9/28	8/1-9/13	-----	9/14-10/23		-----			
12	4/15-6/29	7/17-9/6	7/16-8/24	9/7-10/18	8/16-9/22	10/16-11/20	11/21-12/7	-----	
12A	4/15-6/29			9/1-10/13	8/26-9/26	10/14-11/27	11/28-12/21		
QUILCENE R	4/15-8/31			9/1-11/9	9/8-10/19	11/26-12/21			
12B	4/15-6/29	7/17-9/6	7/16-8/24	9/7-10/18	8/16-9/22	10/16-11/20	11/21-12/14	-----	
12C	4/15-6/29	7/24-9/6	7/23-8/31	9/11-10/25	8/26-9/26	10/24-11/27	11/28-12/21	-----	
SKOKOMISH R	4/15-7/26	8/6-9/20	-----	9/18-11/6	9/8-10/19	11/9-11/30	12/1-1/4	-----	
12D	4/15-6/29	7/24-9/6		9/11-10/25	8/26-9/26	10/24-11/27	11/28-12/21		
HOOD C TRIBS		8/6-9/20	9/1-10/19	9/18-11/6	9/8-10/19	-----	11/9-1/4		
13	4/15-6/29	7/1-9/24	8/10-9/25	9/25-11/6	9/17-10/11	10/12-11/30	12/1-1/15	-----	
NISQUALLY R		7/1-9/30	8/25-9/30	10/1-11/20		-----	12/1-2/3	-----	
MCALLISTER CR		7/1-9/30		10/1-11/30		-----	12/1-2/3	-----	
13A	4/15-8/10	8/8-9/16	8/16-9/17	9/17-11/9		10/23-11/28	11/20-12/31		
13C		7/15-10/13		10/14-11/30		10/13-11/30	12/1-1/16		
13D		7/1-9/21		9/22-10/12		10/13-12/31			
13E		7/1-9/21		9/22-10/12		10/13-12/31			
13F		7/1-9/21		9/22-11/6		11/7-12/12			
13G		7/1-9/21		9/22-11/6		11/7-12/12			
13H		7/1-9/21		9/22-10/12		10/13-12/31			
13I		7/1-9/21		9/22-10/12		10/13-12/31			
13J		7/1-9/21		9/22-10/12	9/22-10/26		11/7-12/31		
13K		7/1-9/21		9/22-11/6	9/22-10/26		11/7-12/31		

(1, MANAGEMENT PERIODS ADUSTED ANNUALLY FOR ADMINISTRATION OF FISHERIES.
(2) MANAGEMENT PERIOD CURRENTLY UNDER TECHNICAL DISPUTE.

(-----)STOCK PRESENT BUT NO MANAGEMENT PERIOD ESTABLISHED.
( )STOCK NOT PRESENT.

SOURCE : PUGET SOUND MANAGEMENT PERIODS AND THEIR DERIVATIONS - TRIBAL/WDF REPORT, MAY 1986.

TABLE 22

Commercial catch summary of chum salmon in Puget Sound by area(s)
for 1935 through 1984 (continued next page)

YEAR	6B-9 INDIAN	6B-9 NON-INDIAN	6-7 INDIAN	6-7 NON-INDIAN	7A INDIAN	7A NON-INDIAN	4B,5,6C INDIAN	4B,5,6C NON-INDIAN	6A INDIAN	6A NON-INDIAN	OTHER PUGET SOUND AREAS	TOTAL PUGET SOUND CATCH
1935	0	299,016	0	42,633	0	24,952	0	1,742	0	118,471	203,895	718,634 a
1936	0	182,230	0	44,972	0	27,429	0	0	0	138,699	390,031	783,361
1937	0	303,096	0	26,858	0	35,248	0	0	0	126,000	275,201	766,403
1938	0	360,968	0	12,918	0	13,992	0	0	0	94,061	325,234	807,173
1939	0	114,420	0	17,145	0	22,143	0	0	0	29,561	148,181	331,450
1935-1939 AVERAGE	0	251,946	0	28,905	0	24,753	0	348	0	101,358	268,508	675,819
1940	0	156,717	0	13,133	0	11,687	675	0	0	94,019	288,824	565,055
1941	0	231,085	0	24,475	0	11,843	434	0	0	99,130	304,224	671,191
1942	0	256,472	0	19,238	0	25,055	0	0	0	54,139	258,257	613,161
1943	0	115,464	0	0	0	9,939	0	0	0	25,693	245,045	396,141
1944	0	59,305	0	3,033	0	5,451	0	577	0	38,150	193,098	308,550 a
1945	0	155,147	0	9,821	0	7,716	0	2	0	17,136	230,635	420,457
1946	0	483,146	0	16,461	0	47,104	0	396	0	99,667	656,289	1,303,063
1947	0	232,891	0	12,354	0	7,846	0	0	0	44,639	279,630	577,360
1948	0	339,478	0	58,666	0	30,701	0	318	0	59,874	420,785	909,822
1949	0	102,490	0	29,922	0	6,335	0	0	0	35,725	263,353	437,825
1940-1941 AVERAGE	0	213,220	0	18,710	0	16,368	111	129	0	56,817	314,014	619,369
1950	0	224,972	0	113,694	0	71,058	0	2,491	0	107,358	366,918	886,491
1951	0	228,583	0	48,125	0	72,247	0	71	0	85,975	361,009	796,010
1952	0	241,760	0	60,941	0	78,763	0	0	0	112,169	279,249	772,882
1953	0	128,488	0	29,578	0	19,126	0	0	0	35,135	133,966	346,293
1954	0	96,865	0	24,711	0	37,070	0	0	0	30,361	233,773	422,780
1955	0	50,220	0	34,892	0	30,632	0	29	0	16,284	80,303	212,360
1956	0	25,694	0	15,797	0	11,040	0	0	0	4,700	48,115	105,346
1957	1	11,328	0	1,448	0	5,676	0	151	0	4,489	80,402	103,495
1958	0	103,194	0	26,838	0	22,847	0	2,157	0	43,934	221,933	420,903
1959	0	69,316	0	29,963	0	26,464	0	3,113	0	36,318	195,923	361,097
1950-1959 AVERAGE	0	118,042	0	38,599	0	37,492	0	801	0	47,672	200,159	442,766

a - Total includes some catch (i.e. 27925 fish in '35 and 8936 fish in '44) not discriminated by area.

TABLE 22 (continued)

YEAR	68-9 INDIAN	68-9 NON-INDIAN	6-7 INDIAN	6-7 NON-INDIAN	7A INDIAN	7A NON-INDIAN	4B,5,6C INDIAN	4B,5,6C NON-INDIAN	6A INDIAN	6A NON-INDIAN	OTHER PUGET SOUND AREAS	TOTAL PUGET SOUND CATCH
1960	0	37,324	0	6,712	0	19,683	0	578	0	8,482	62241	135,020
1961	0	26,779	0	10,164	0	11,203	0	63	0	5,172	79863	133,244
1962	0	40,463	0	6,695	0	5,531	0	102	0	4,740	116150	173,681
1963	0	82,717	0	5,798	0	7,269	0	1,126	0	10,854	187598	295,362
1964	0	119,617	0	6,304	0	8,665	0	1,366	0	6,680	104714	247,346
1965	0	101,087	0	4,897	0	3,161	0	634	0	1,427	80482	191,688
1966	90	185,878	0	3,484	0	9,010	0	676	0	2,158	203166	404,462
1967	0	122,175	0	2,868	0	8,421	0	2,150	0	790	135242	271,646
1968	0	184,418	0	21,980	0	72,197	0	2,698	0	30,256	150852	462,401
1969	0	32,809	0	16,769	0	32,837	0	2,297	0	581	60073	145,366
1960-1969 AVERAGE	9	93,327	0	8,567	0	17,798	0	1,169	0	7,114	118,038	246,022
1970	0	59,306	0	20,340	0	55,118	82	957	0	2,564	79284	217,651
1971	79	43,574	9	13,044	115	13,780	138	466	0	1,265	78916	151,386
1972	215	201,758	21	163,563	825	176,943	315	1,559	0	10,909	232053	788,161
1973	37	92,686	4	135,736	591	137,614	818	1,191	0	943	165412	535,032
1974	107	11,480	619	104,801	1,319	94,388	3,801	197	7	52	179341	396,112
1975	2,051	1,637	589	41,374	258	50,499	454	365	101	840	77382	175,550
1976	7,067	94,210	27,860	143,471	3,830	102,055	2,738	781	1,410	10	374467	757,899
1977	1,866	65,160	7,261	24,779	161	23,001	612	1,344	4	4,763	327105	456,056
1978	2,058	28,661	27,599	234,054	20,712	144,615	659	208	3	3	773219	1,231,791
1979	3,168	244	1,257	1,725	1,830	148	1,064	194	8	16	114883	124,537
1970-1979 AVERAGE	1,665	59,872	6,522	88,289	2,964	79,816	1,068	726	153	2,137	240,206	483,418
1980	24,295	792	43,355	163,421	37,020	106,165	11,288	167	147	1	561688	948,339
1981	5,769	41,413	1,949	6,105	290	1,707	2,240	169	5	114	437142	496,903
1982	40,018	135,151	14,926	26,459	24,215	10,571	5,090	64	2	3	720233	976,732
1983	17,303	55,131	1,984	377	298	88	15,217	91	0	0	389144	479,633
1984	669	42	842	4	756	40	15,138	6	0	0	707027	724,524
1980-1984 AVERAGE	17,611	46,506	12,611	39,273	12,516	23,714	9,795	99	31	24	563,047	725,226

Source: Commercial fish ticket data, WDF.

TABLE 22 (continued)

TABLE 23

Catch and run size data for Willapa Bay chum, 1968-1984 (Washington Department of Fisheries).

Year	Catch			Escapement			Harvest Rate
	Gill Net	River Sport 1/	Total	Hatchery	Wild	Total Run	
1968	11,700		11,700	1,000	13,200	25,900	0.45
1969	29,300		29,300	2,000	33,900	65,200	0.45
1970	22,900		22,900	800	23,100	46,800	0.49
1971	17,100		17,100	1,400	37,600	56,100	0.30
1972	56,400		56,400	1,200	22,400	80,000	0.71
1973	35,400		35,400	1,000	14,500	50,900	0.70
1974	35,500	200	35,700	1,100	12,200	49,000	0.73
1975	23,500	100	23,600	1,400	12,600	37,600	0.63
1976	33,100	400	33,500	900	16,500	50,900	0.66
1977	8,100	400	8,500	4,400	40,200	53,100	0.16
1978	28,400	1,300	29,700	4,300	18,900	52,900	0.56
1979	1,200	0	1,200	600	6,400	8,200	0.15
1980	30,300	200	30,500	4,000	35,700	70,200	0.43
1981	19,300	200	19,500	1,100	22,100	42,700	0.46
1982	74,800	1,200	76,000	8,100	66,400	150,500	0.50
1983	55,000	2,400	57,400	4,500	20,600	82,500	0.70
1984	25,600	600	26,200	6,200	42,500	74,900	0.35

1/ River sport catches by species are unavailable prior to 1974. Total run size and catch estimates from 1968-1973 will be biased low by the amount of the actual sport catch.

TABLE 24

Estimated landings of chum salmon by the Tillamook Bay commercial fishery, 1927-61 (from Oregon Research Briefs, Vol.12, No.1, 1966).

YEAR	POUNDS (ROUND)	ESTIMATED NUMBERS
1927-36 AVERAGE	965,795	91,110
1937-46 AVERAGE	843,495	79,570
1947	373,664	35,830
1948	895,009	89,320
1949	436,168	39,190
1950	191,677	18,200
1951	324,981	28,310
1952	167,546	14,390
1953	253,087	22,120
1954	296,593	26,990
1955	92,692	7,130
1956	102,322	9,330
1947-56 AVERAGAE	313,374	29,081
1957	137,074	12,670
1958	112,678	9,930
1959	68,768	6,180
1960	11,978	1,150
1961	16,435	1,530
1957-61 AVERAGE	69,387	6,292

TABLE 25

Columbia River chum landings (in thousands), 1938-84 (from Columbia River Fish Runs and Fisheries, 1938-70 and 1960-84).

	NUMBERS LANDED BY ZONE		
YEAR	1-5 a/	6	1-6
1938	156.5	0.5	157.0
1939	94.6	1.7	96.3
1940	102.7	0.1	102.8
1941	340.1	0.0	340.1
1942	425.4	0.1	425.5
1943	78.7	0.0	78.7
1944	22.6	0.0	22.6
1945	48.3	0.0	48.3
1946	72.7	0.0	72.7
1947	40.7	0.0	40.7
1948	85.6	0.0	85.6
1949	44.4	0.3	44.7
1940-49 AVERAGE	126.1	0.1	126.2
1950	57.4	0.1	57.5
1951	42.6	1.0	43.6
1952	25.3	0.0	25.3
1953	20.4	0.0	20.4
1954	26.2	0.0	26.2
1955	10.3	0.0	10.3
1956	3.7	0.0	3.7
1957	2.7	0.0	2.7
1958	7.4	0.0	7.4
1959	3.5	0.0	3.5
1950-59 AVERAGE	20.0	0.1	20.1
1960	1.3	0.0	1.3
1961	1.3	0.1	1.4
1962	3.9	0.0	3.9
1963	1.2	0.0	1.2
1964	1.9	0.0	1.9
1965	0.5	0.0	0.5
1966	0.9	0.0	0.9
1967	0.9	0.0	0.9
1968	0.3	0.0	0.3
1969	0.3	0.0	0.3
1960-69 AVERAGE	1.3	0.0	1.3
1970	0.6	0.0	0.6
1971	0.5	0.0	0.5
1972	1.3	0.0	1.3
1973	1.4	0.0	1.4
1974	0.9	0.0	0.9
1975	0.5	0.0	0.5
1976	1.2	0.0	1.2
1977	0.2	0.0	0.2
1978	1.5	0.0	1.5
1979	0.1	0.0	0.1
1970-79 AVERAGE	0.8	0.0	0.8
1980	0.2	0.0	0.2
1981	1.4	0.0	1.4
1982	1.8	0.0	1.8
1983	0.2	0.0	0.2
1984	1.8	0.0	1.8
1980-84 AVERAGE	0.5	0.0	0.5

a/ Includes 1963-84 Youngs Bay and 1980-82 Washington terminal fisheries.

TABLE 26

Chum salmon sport catch estimates (based on catch-card returns) for the Miami and Kilchis rivers, 1974-83 (from Oregon Department of Fish and Wildlife).

YEAR	MIAMI RIVER	KILCHIS RIVER
1974	190	210
1975	100	200
1976	860	260
1977	780	330
1978	2,990	1,320
1979	1,210	610
1980	2,840	1,050
1981	2,200	950
1982	5,950	2,760
1983	1,300	1,710

TABLE 27

Comparison between forecasted and final estimated run sizes for Puget Sound chum stocks.

YEAR	UNIT	TIMING	PRESEASON FORECAST	FINAL UPDATE	FINAL RUN SIZE	PRESEASON/ FINAL	UPDATE / FINAL
1978	STRAIT	NORMAL	2,300	2,300	1,400	-0.643	-0.643
	NOOKSACK/SAMISH		11,500	35,220	36,600	0.686	0.038
	SKAGIT		67,200	160,450	154,900	0.566	-0.036
	STILL/SNOHOMISH		29,900	51,512	58,800	0.491	0.124
	SOUTH SOUND	EARLY	14,600	14,600	15,900	0.082	0.082
		NORMAL	246,800	290,760	337,200	0.268	0.138
		LATE	41,400	52,640	56,400	0.266	0.067
	HOOD CANAL	EARLY	39,600	39,600	25,300	-0.565	-0.565
		NORMAL	369,300	521,486	600,300	0.385	0.131
	TOTAL		822,600	1,168,568	1,286,800	0.361	0.092
1979	STRAIT	NORMAL	3,600	3,600	500	-6.200	-6.200
	NOOKSACK/SAMISH		18,950	15,300	29,800	0.364	0.487
	SKAGIT		22,700	49,400	31,900	0.288	-0.549
	STILL/SNOHOMISH		8,900	7,500	6,600	-0.348	-0.136
	SOUTH SOUND	EARLY	5,100	5,100	1,900	-1.684	-1.684
		NORMAL	72,300	72,300	33,900	-1.133	-1.133
		LATE	18,000	18,000	27,500	0.345	0.345
	HOOD CANAL	EARLY	20,100	20,100	7,500	-1.680	-1.680
		NORMAL	116,800	150,000	123,300	0.053	-0.217
	TOTAL		286,450	341,300	262,900	-0.090	-0.298
1980	STRAIT	NORMAL	17,800	17,800	6,800	-1.618	-1.618
	NOOKSACK/SAMISH		23,000	25,300	31,500	0.270	0.197
	SKAGIT		97,900	180,400	113,900	0.140	-0.584
	STILL/SNOHOMISH		42,500	58,700	58,100	0.269	-0.010
	SOUTH SOUND	EARLY	147,000	44,700	23,199	-5.336	-0.927
		NORMAL	352,500	347,000	404,099	0.128	0.141
		LATE	48,400	55,000	65,293	0.259	0.158
	HOOD CANAL	EARLY	44,700	44,700	16,900	-1.645	-1.645
		NORMAL	417,900	313,200	246,798	-0.693	-0.269
	TOTAL		1,191,700	1,086,800	966,589	-0.233	-0.124
1981	STRAIT	NORMAL	26,000	24,800	8,734	-1.977	-1.839
	NOOKSACK/SAMISH		22,500	31,900	85,710	0.737	0.628
	SKAGIT		57,600	88,600	72,871	0.210	-0.216
	STILL/SNOHOMISH		33,100	56,700	56,618	0.415	-0.001
	SOUTH SOUND	EARLY	5,300	5,300	16,013	0.669	0.669
		NORMAL	103,300	238,000	218,909	0.528	-0.087
		LATE	33,700	58,500	48,943	0.311	-0.195
	HOOD CANAL	EARLY	18,300	18,300	7,521	-1.433	-1.433
		NORMAL	209,200	232,600	191,909	-0.090	-0.212
	TOTAL		509,000	754,700	707,228	0.280	-0.067

TABLE 27 (continued)

1982	STRAIT	NORMAL	30,800	29,800	6,553	-3.700	-3.548
	NOOKSACK/SAMISH		42,500	99,900	109,744	0.613	0.090
	SKAGIT		126,300	146,300	217,524	0.419	0.327
	STILL/SNOHOMISH		70,800	141,000	166,256	0.574	0.152
	SOUTH SOUND	EARLY	9,800	11,440	12,486	0.215	0.084
		NORMAL	279,100	392,100	343,086	0.187	-0.143
		LATE	78,400	62,300	55,352	-0.416	-0.126
	HOOD CANAL	EARLY	33,700	26,517	12,008	-1.806	-1.208
		NORMAL	427,400	409,500	291,622	-0.466	-0.404
	TOTAL		1,098,800	1,318,857	1,214,631	0.095	-0.086
1983	STRAIT	NORMAL	11,600	11,300	7,470	-0.553	-0.513
	NOOKSACK/SAMISH		78,600	75,200	74,964	-0.049	-0.003
	SKAGIT		53,600	49,300	31,421	-0.706	-0.569
	STILL/SNOHOMISH		22,700	36,100	27,464	0.173	-0.314
	SOUTH SOUND	EARLY	6,700	12,160	13,603	0.507	0.106
		NORMAL	202,200	248,800	202,621	0.002	-0.228
		LATE	56,200	40,690	36,454	-0.542	-0.116
	HOOD CANAL	EARLY	8,600	8,967	7,577	-0.135	-0.183
		NORMAL	318,900	251,300	206,797	-0.542	-0.215
	TOTAL		759,100	733,817	608,371	-0.248	-0.206
1984	STRAIT	NORMAL	6,200	6,100	12,751	0.514	0.522
	NOOKSACK/SAMISH		121,800	98,100	128,618	0.053	0.237
	SKAGIT		48,700	47,800	51,201	0.049	0.066
	STILL/SNOHOMISH		103,400	40,600	121,489	0.149	0.666
	SOUTH SOUND	EARLY	15,400	31,400	28,542	0.460	-0.100
		NORMAL	305,500	290,600	263,577	-0.159	-0.103
		LATE	113,800	113,800	87,028	-0.308	-0.308
	HOOD CANAL	EARLY	4,200	7,850	5,665	0.259	-0.386
		NORMAL	334,000	328,800	416,162	0.197	0.210
	TOTAL		1,053,000	965,050	1,115,033	0.056	0.135

TABLE 28

APPORTIONMENT OF PRETERMINAL CHUM SALMON COMMERCIAL NET CATCHES

FOR PUGET SOUND RUN RECONSTRUCTION

Area(s)	Years Applied	Percent Puget Sound	Apportionment for Puget Sound Stocks
4B, 5, 6C	1977-78	20 - Early	All Puget Sound units by
		20 - Normal	run strength.
		100 - Late	
	1979 on	30 - Early	
		60 - Normal	
		100 - Late	
6	1977-78	20 - Early	All Puget Sound units by
		20 - Normal	run strength.
		100 - Late	
	1979 on	30 - Early	
		60 - Normal	
		100 - Late	
6A	1977-78	70 - Early	All Puget Sound units by
		70 - Normal	run strength.
		100 - Late	
	1979 on	50 - Early	80% Skagit; 10% Nooksack/Samish;
		95 - Normal	10% all other Puget Sound units
		100 - Late	by run strength
7	1977-78	15 - Early	All Puget Sound units by
		15 - Normal	run strength.
		15 - Late	
	1979 on	25 - Early	
		30 - Normal	
		20 - Late	
7A	1977 on	5 - Early	All Puget Sound units by
		5 - Normal	run strength.
		5 - Late	

24-Jan-86

TABLE 29

Mean travel time in days between tagging area and area of recovery for chum for all years: 1950-1956, 1959, 1962, 1964 and 1971 (from WDF Technical Rpt 48).

Area Tagged	Area Recovered	Mean	Standard Deviation	Variance	n
West Beach (6A)	7B marine	6.5	0.71	0.50	2
Area Mean		6.5	0.71	0.50	2
Dungeness Bay (6D)	6B marine	12.0	19.76	390.50	5
	8B marine	11.0	-	-	1
	9 marine	3.5	2.37	5.61	10
	10 marine	6.1	2.52	6.36	9
	11 marine	5.8	1.64	2.70	5
	11 freshwater	58.0	-	-	1
	12C freshwater	58.0	12.12	147.00	5
	12C marine	4.0	-	-	1
	12D freshwater	46.0	1.41	2.00	5
	13B freshwater	33.0	-	-	1
Area Mean		18.7	22.11	488.97	43
San Juan Islands (7)	7 marine	2.6	2.07	4.30	5
	7A marine	8.3	9.05	81.87	
Area Mean		5.7	7.18	51.62	11
Bellingham Bay (7B)	7B marine	3.0	-	-	1
	7B freshwater	6.8	3.27	10.70	5
Area Mean		6.2	3.31	10.97	6
Admiralty Inlet (9)	6A marine	6.5	5.68	32.30	6
	7 marine	6.8	2.87	8.25	4
	7a marine	7.0	-	-	1
	8 marine	12.7	5.13	26.33	3
	8 freshwater	15.0	-	-	1
	8A marine	15.0	-	-	1
	8B marine	13.2	8.04	64.57	6
	8C marine	8.0	7.44	55.33	4
	9 marine	4.9	2.75	7.55	8
	10 marine	8.3	7.90	62.42	11
	10A freshwater	63.0	-	-	1
	11 marine	8.8	6.34	40.16	21
	12 marine	16.0	1.41	2.00	2
	12A marine	34.0	-	-	1
	12A freshwater	33.0	-	-	1
	12C freshwater	30.0	3.00	9.00	3
	12D freshwater	41.5	19.99	399.50	6
	12E freshwater	39.0	-	-	1
	13A freshwater	27.8	8.38	70.15	2
	13B marine	51.0	24.56	603.33	
	13B freshwater	45.0	-	-	1
Area Mean		18.8	15.89	252.35	115

TABLE 30

Mean travel time in days between area of tagging and area of recovery for chum salmon tagged in 1974 (from WDF Tech. Rpt 48).

	Tagging Location					
	West Beach (6A)			Rosario Bluff (7)		
Tag Recovery Area	n	Mean	Range	n	Mean	Range
Pt. Roberts (7A)	6	8	3-26	8	6	4-13
Bellingham Bay (7B) (including Nooksack)	14	8	1-43	5	17	12-28
Lummi Island (7A)	0	-	-	9	6	4-18
Skagit BAy (8)	59	7	1-21	5	9	3-15
Skagit River	52	28	1-43	8	28	25-32
Salmon Bank (7)	25	5	1-12	8	7	3-12
Puget Sound (10-13B)	7	21	5-32	1	33	-
Canada	3	15	5-34	5	16	11-32

TABLE 31

Puget Sound Management Planning Time Schedules (Source: Puget Sound Salmon Management Plan, 1985)

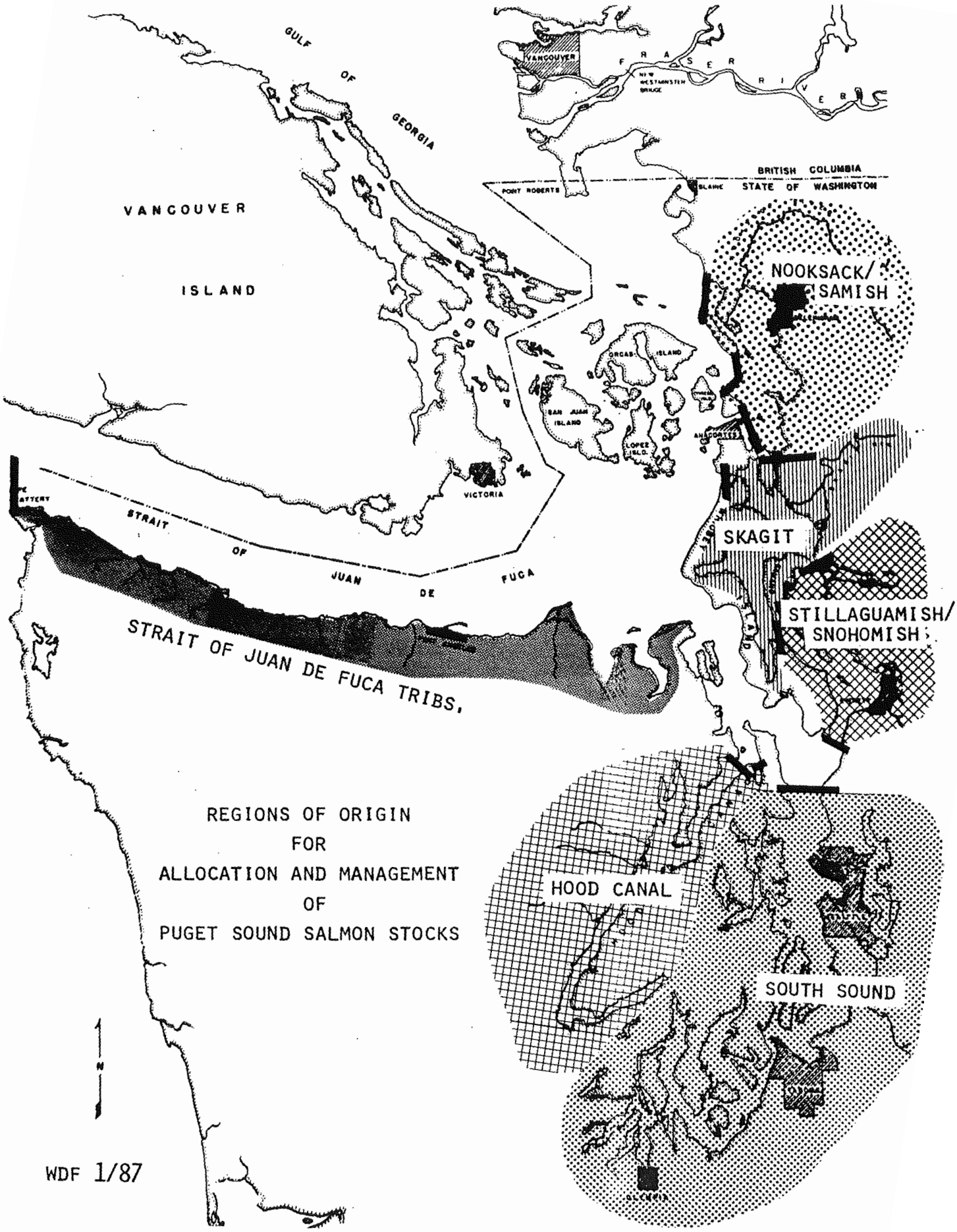
The various reporting and agreement requirements placed on the parties by this plan shall be fulfilled in accordance with the following scheduled deadlines for each species. Meeting these deadlines may necessitate omission of the most recent year of the data bases used to formulate run size forecasts.

	Spring chinook	Sockeye	Summer/fall chinook	Pink	Coho	Chum
Basic resource management documents finalized	----------	----------	----------	11/1	----------	----------
Co-op egg requests received	12/15	1/1	1/15	1/15	2/1	2/1
Escapement estimates compiled and available	12/15	1/15	2/15	2/15	3/1	3/15
Preliminary PSF established[1/]	-	12/1	1/8	12/1	1/8	1/8
Post-season audit report and soft catch available	1/1	1/23	3/1	3/1	3/15	3/15
Recreational management proposals available	----------	----------	----------	1/15	----------	----------
Pre-season forecasts completed/exchanged	1/8	2/1	3/8	3/8	3/23	4/23
Pre-season recreational management planning completed	----------	----------	----------	2/15	----------	----------
Scale data available	----------	----------	----------	3/1	----------	----------
CWT data available	3/1	3/1	3/1	3/1	3/15	3/15
Resolution of pre-season forecast conflicts completed	1/23	2/15	3/23	3/23	4/15	5/8
Future brood egg requests, commercial management recommendations, and proposed escapement goals exchanged	2/1	3/1	4/8	4/8	5/1	5/23
Draft status and future brood reports completed/ exchanged; including conflicting commercial management recommendations	2/15	3/15	4/23	4/23	5/15	6/8
Resolution of pre-season commercial management conflicts completed	3/1	4/1	5/23	5/23	6/15	7/8
Initial position statement on co-op egg requests sent out	2/15	3/15	4/23	4/23	5/15	6/8
In-season update methods exchanged/completed	2/15	4/1	5/1	5/1	5/15	6/15
Response from co-ops to initial position received	3/1	3/23	5/8	5/8	6/1	6/23
In-season update method conflicts resolved	3/1	4/15	5/23	5/23	6/8	7/8
Draft update method report released	3/15	4/23	6/1	6/1	6/15	7/15
Final position on co-op requests sent out	3/15	4/15	6/1	6/1	6/23	7/15
Final status and future brood reports released	3/15	4/15	6/1	6/1	6/23	7/15
Final update method report released[2/]	4/1	5/1	6/15	6/15	7/1	8/1
Commercial hard data available	----------	----------	----------	7/1	----------	----------
Sport hard data available	----------	----------	----------	8/1	----------	----------

1/ These estimates are subject to revision and are established by the parties to meet administrative procedures and the planning needs of other agencies such as PFMC.

2/ If hard catch data from the preceding year become available prior to use of agreed-to in-season update models, and these data would significantly alter the models, the parties should consider corrections to the models using hard data.

FIGURE 1



REGIONS OF ORIGIN
FOR
ALLOCATION AND MANAGEMENT
OF
PUGET SOUND SALMON STOCKS

WDF 1/87

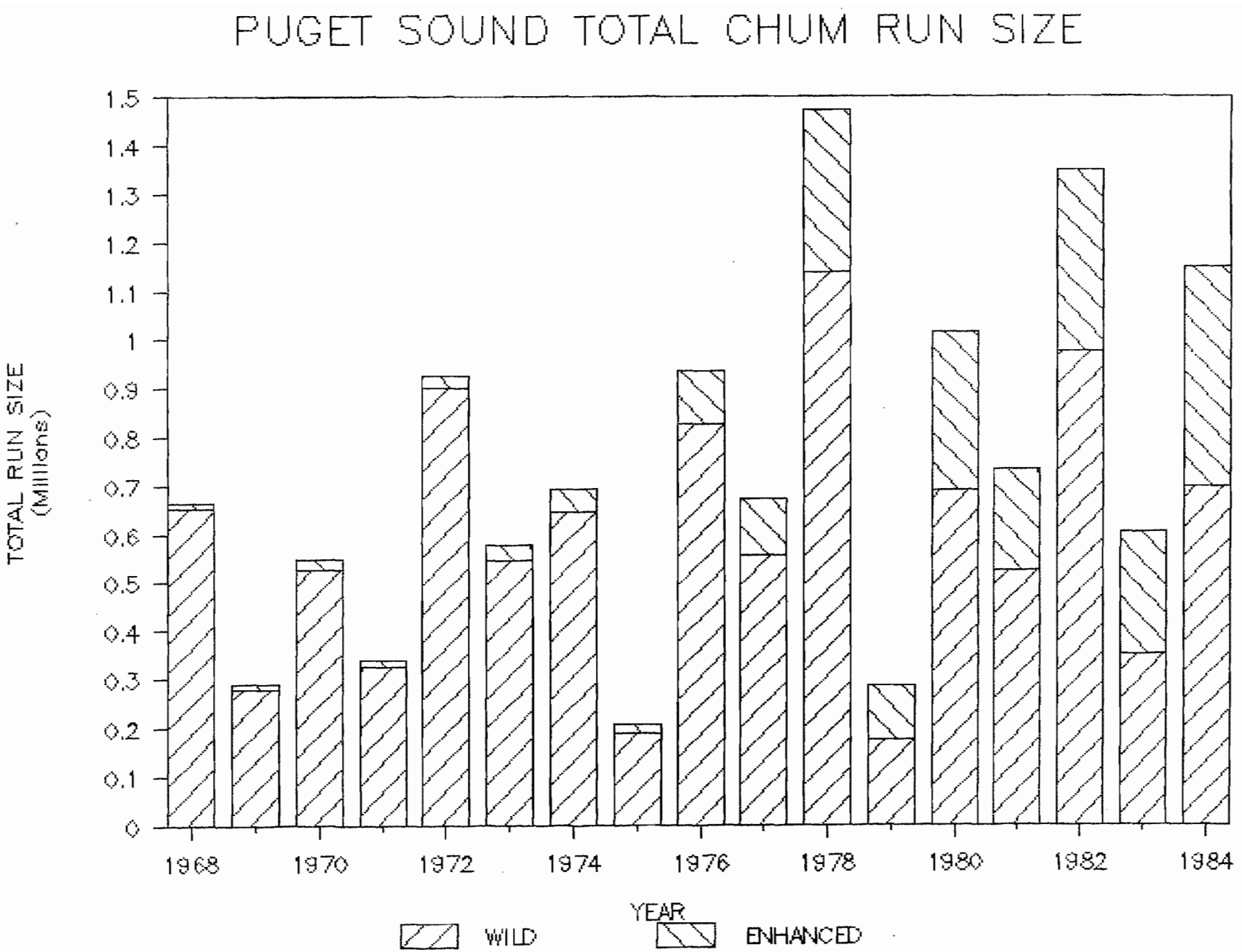

PUGET SOUND TOTAL CHUM RUN SIZE
TOTAL RUN SIZE
(Millions)
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1968
1970
1972
1974
1976
1978
1980
1982
1984
YEAR
WILD
ENHANCED

FIGURE 2

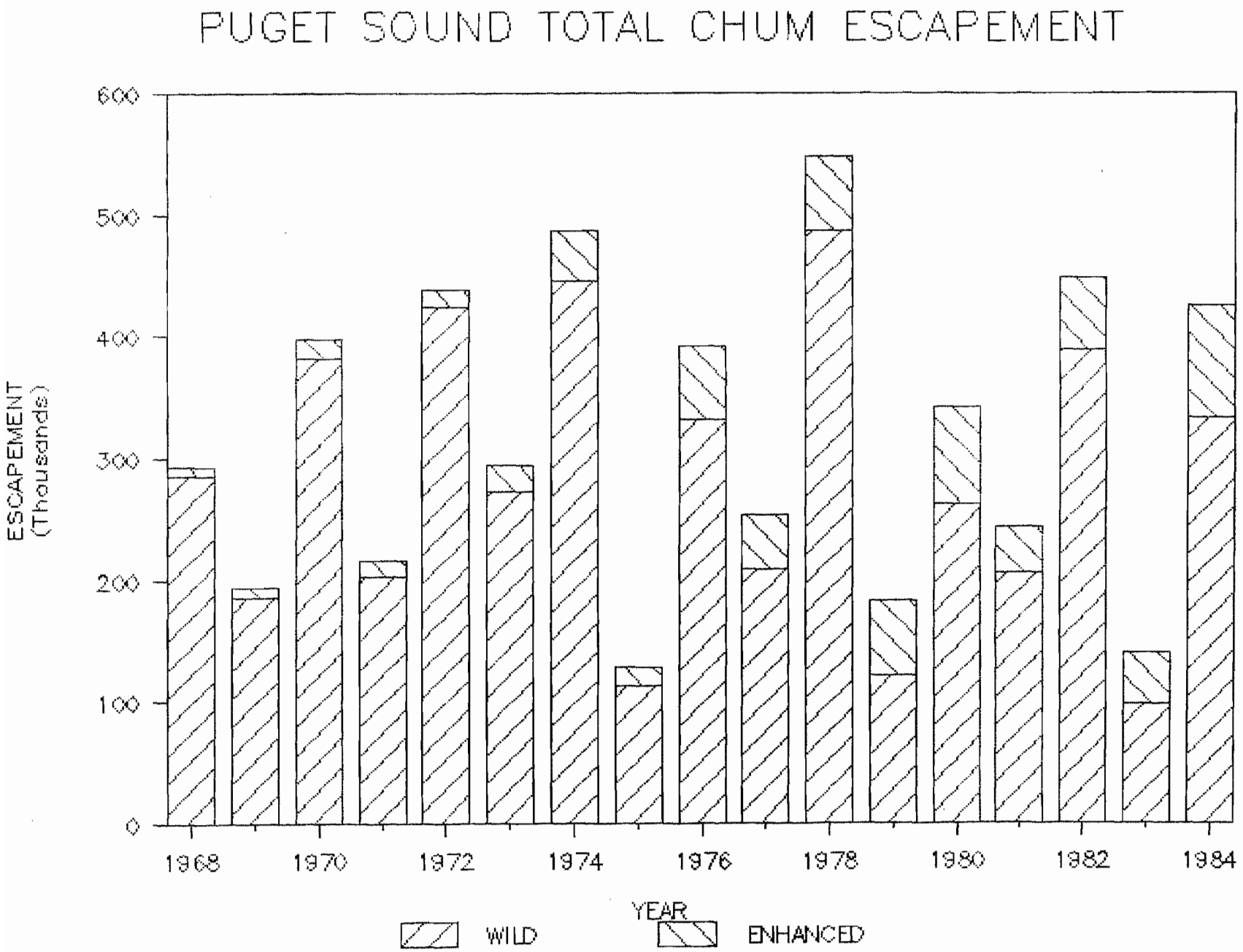
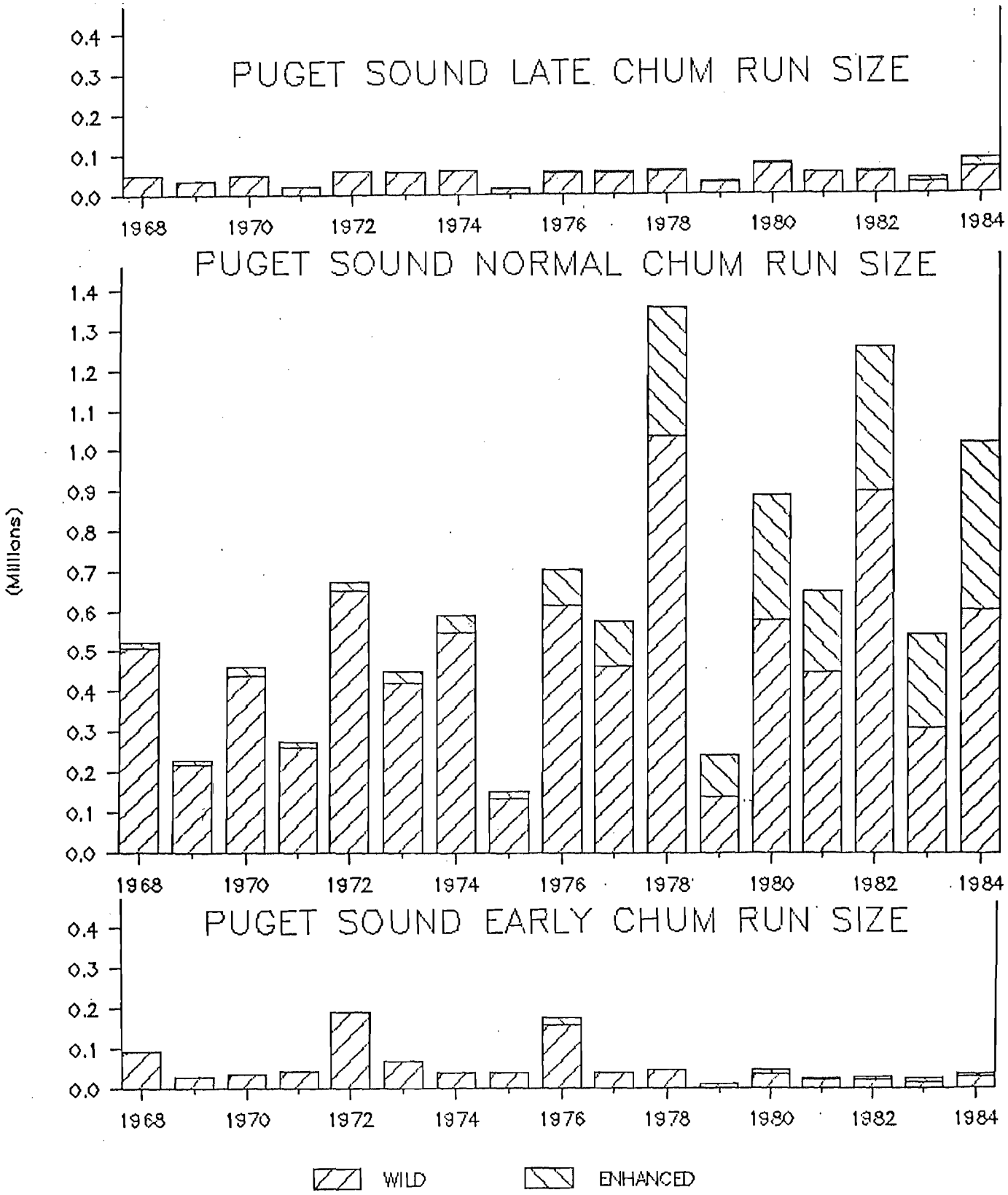
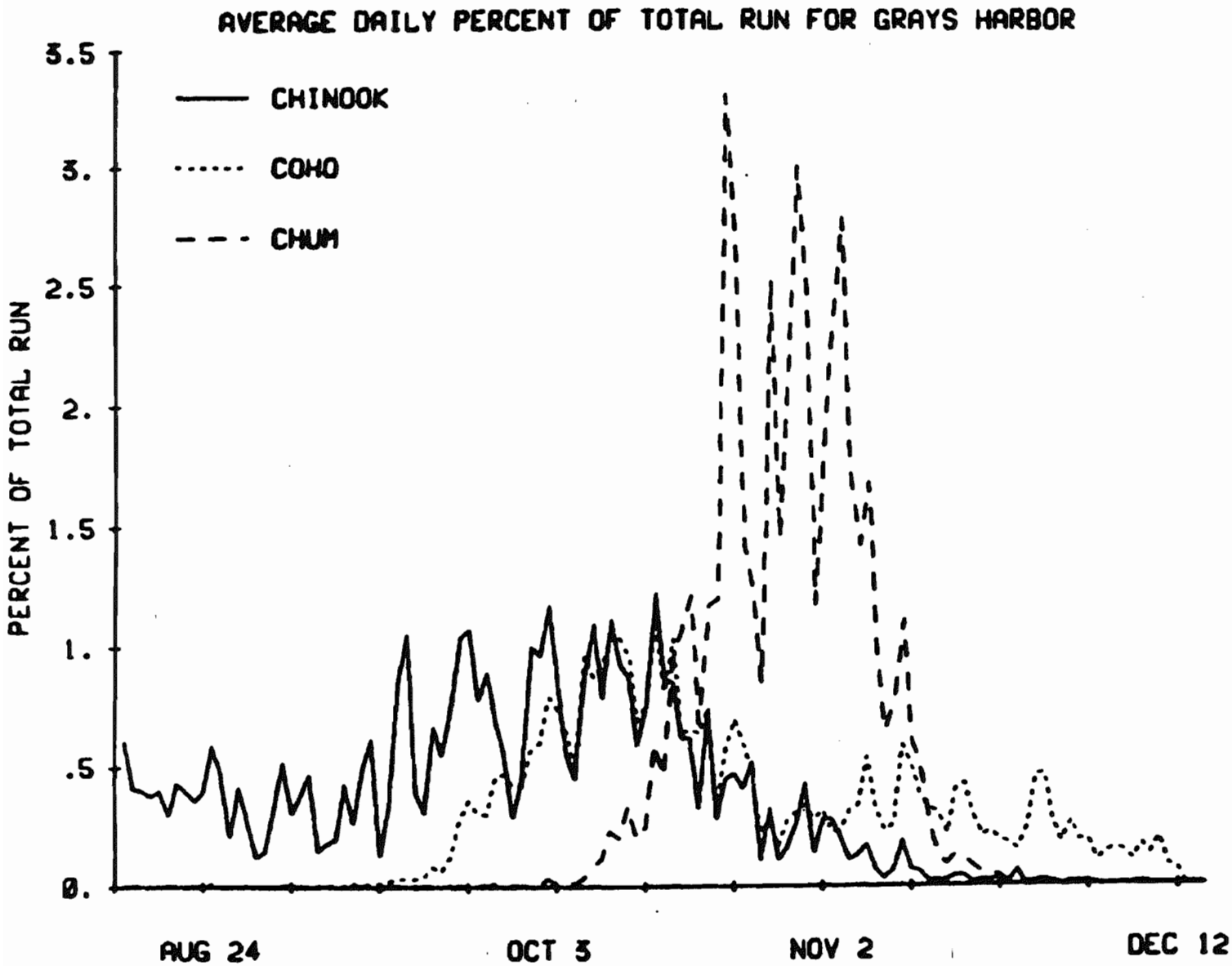

PUGET SOUND TOTAL CHUM ESCAPEMENT
ESCAPEMENT (Thousands)
600
500
400
300
200
100
0
1968
1970
1972
1974
1976
1978
1980
1982
1984
YEAR
WILD
ENHANCED

FIGURE 3

FIGURE 4

PUGET SOUND CHUM RUN SIZE BY RUN TIME





Timing of Grays Harbor salmon returns. (Washington Department of Fisheries)

FIGURE 5

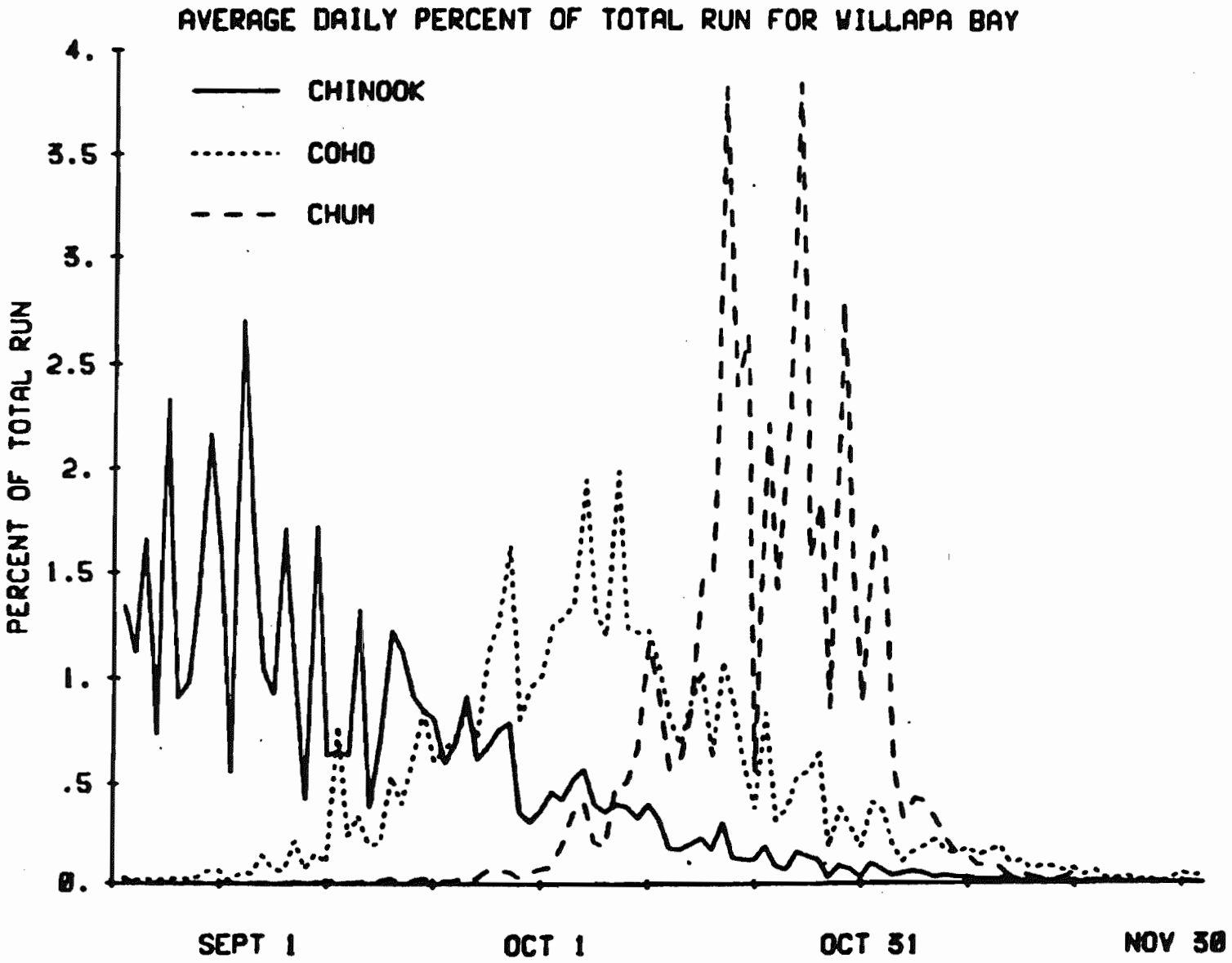


FIGURE 6

Timing of Willapa Bay salmon returns. (Washington Department of Fisheries)

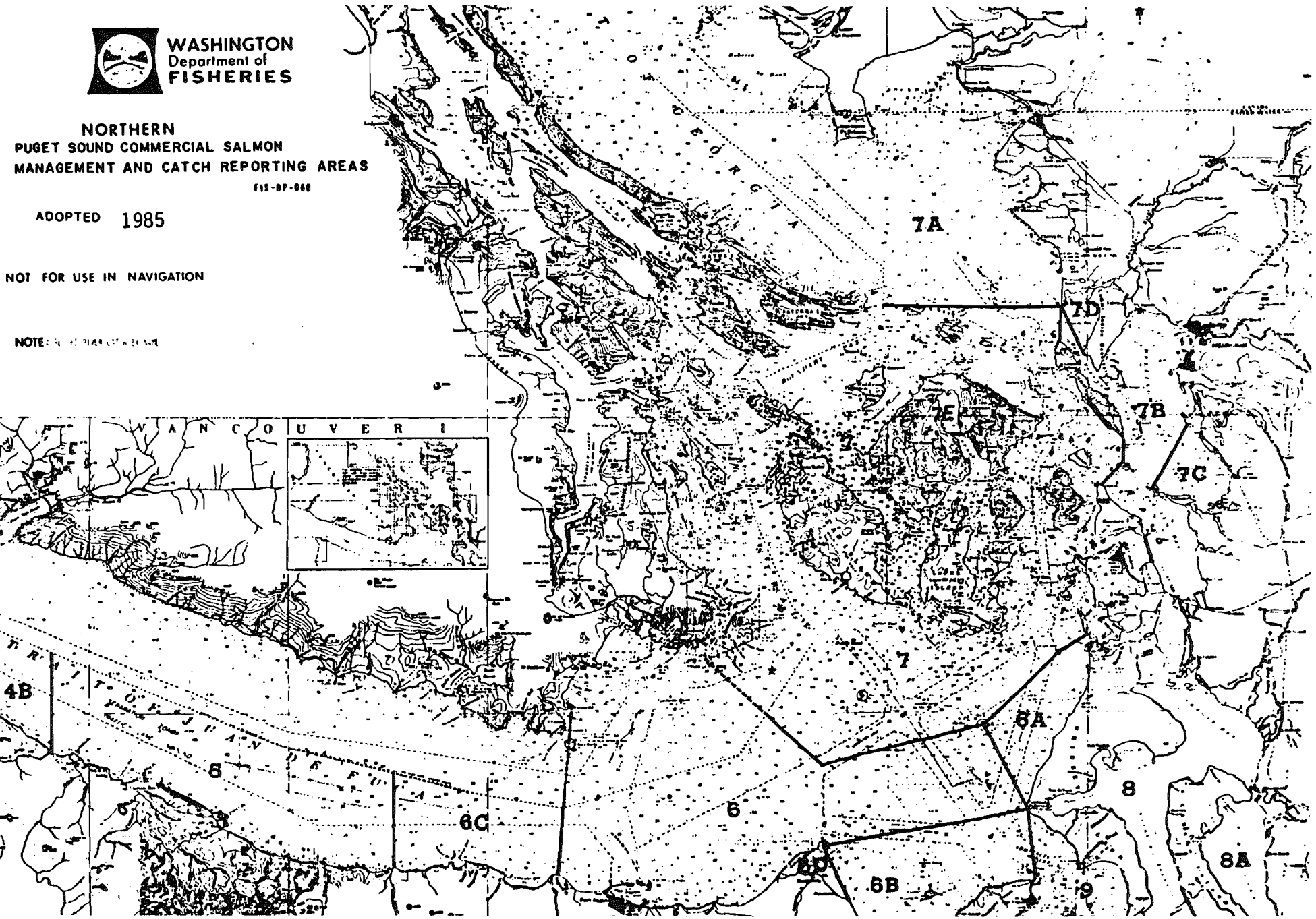
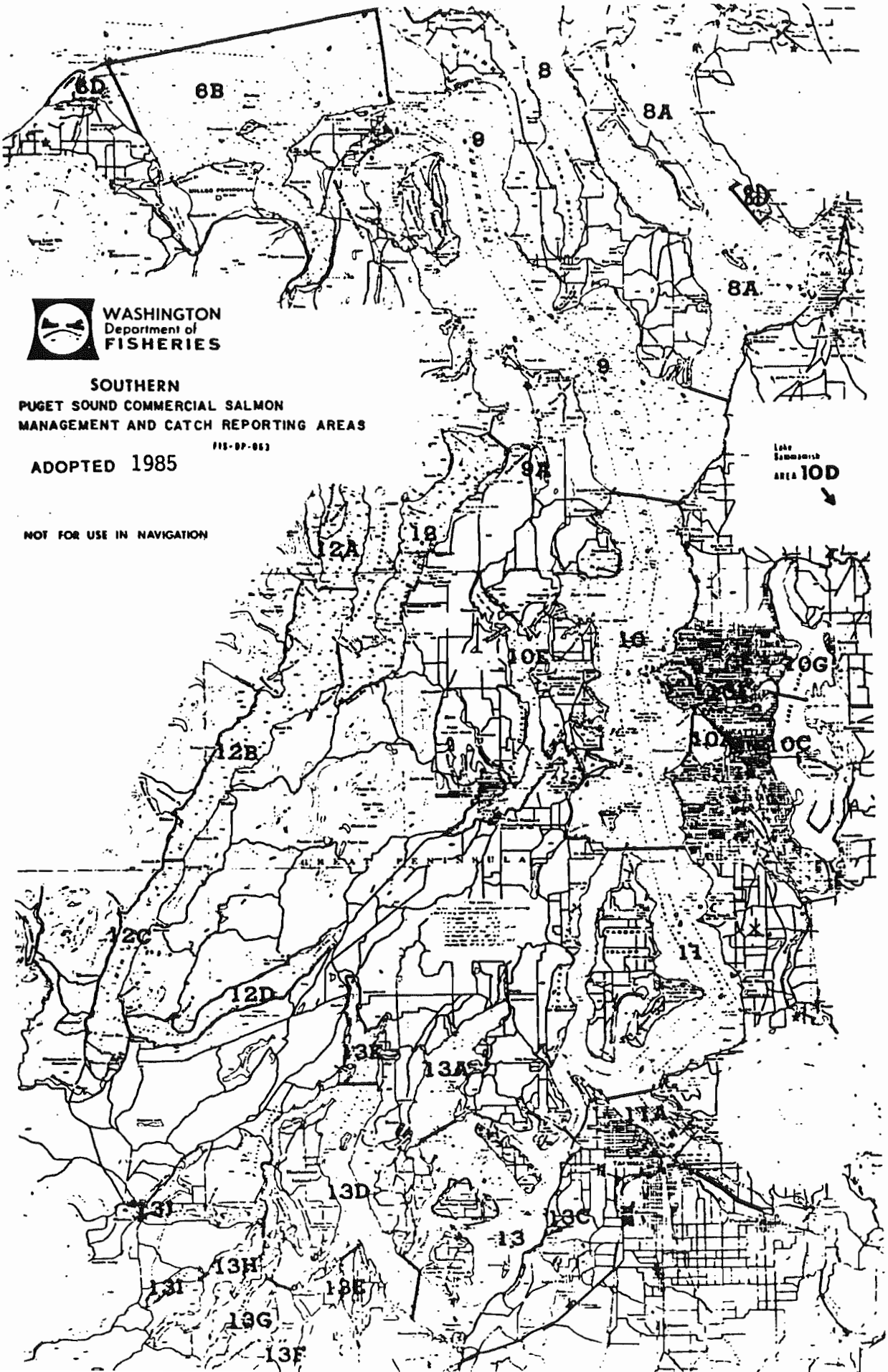

WASHINGTON
Department of
FISHERIES
NORTHERN
PUGET SOUND COMMERCIAL SALMON
MANAGEMENT AND CATCH REPORTING AREAS
FIS-8P-868
ADOPTED 1985
NOT FOR USE IN NAVIGATION
NOTE:
GEORGIA
STRAIT OF JUAN DE FUCA
VANCOUVER I
7A
7D
7B
7C
7E
7
4B
5
6C
6
6A
6D
6B
8
8A
9

FIGURE 7

FIGURE 8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Department of
FISHERIES
SOUTHERN
PUGET SOUND COMMERCIAL SALMON
MANAGEMENT AND CATCH REPORTING AREAS
FIS-DP-863
ADOPTED 1985
NOT FOR USE IN NAVIGATION
Lake Sammamish
AREA 10D
6D
6B
8
8A
9
9A
1B
2A
10E
10G
10A
10C
12B
12C
12D
11
13B
13A
11A
13D
13C
13
13I
13H
13E
13G
13F

FIGURE 9

Summary of management periods for northern Puget Sound areas.

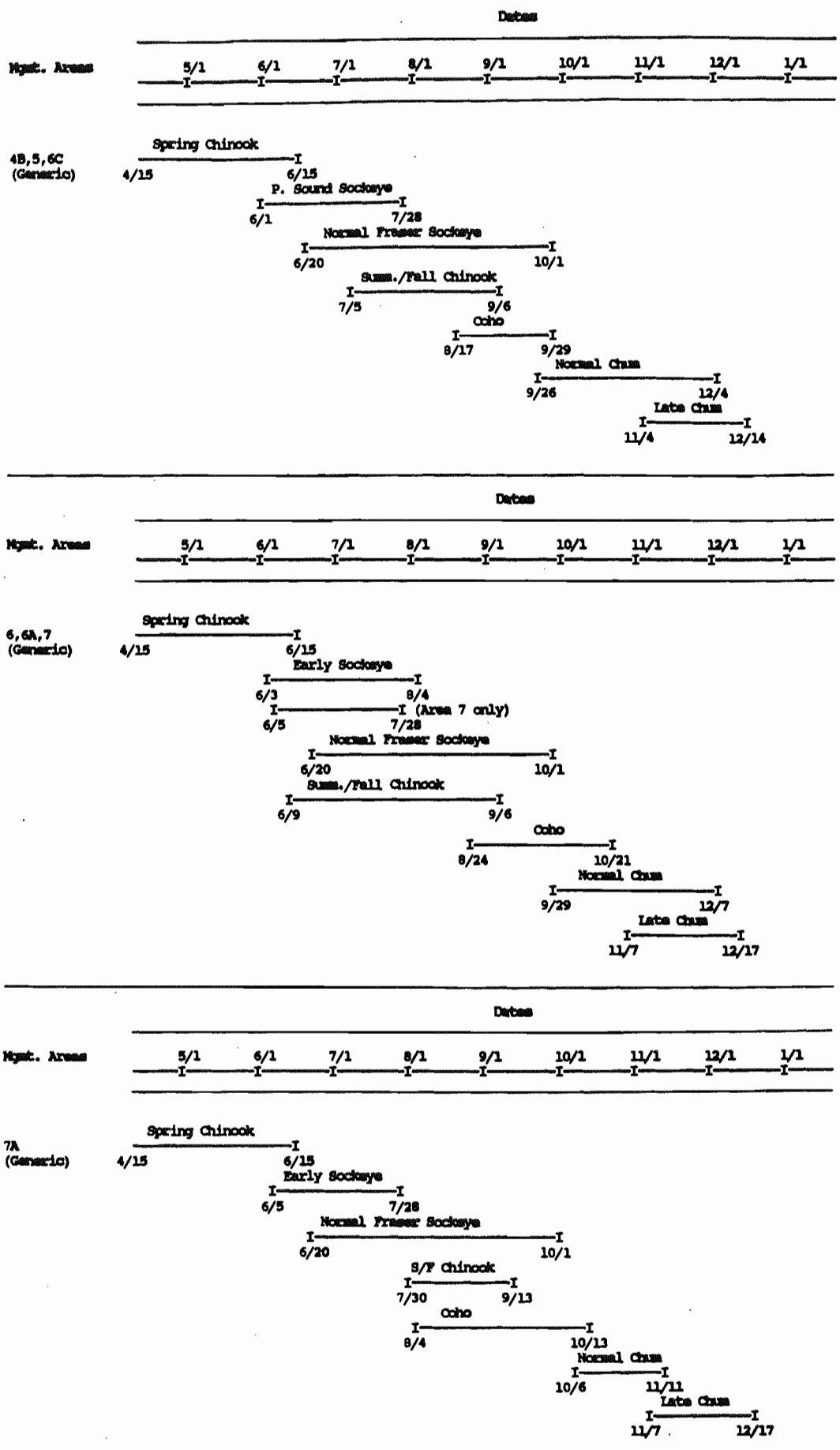


FIGURE 10

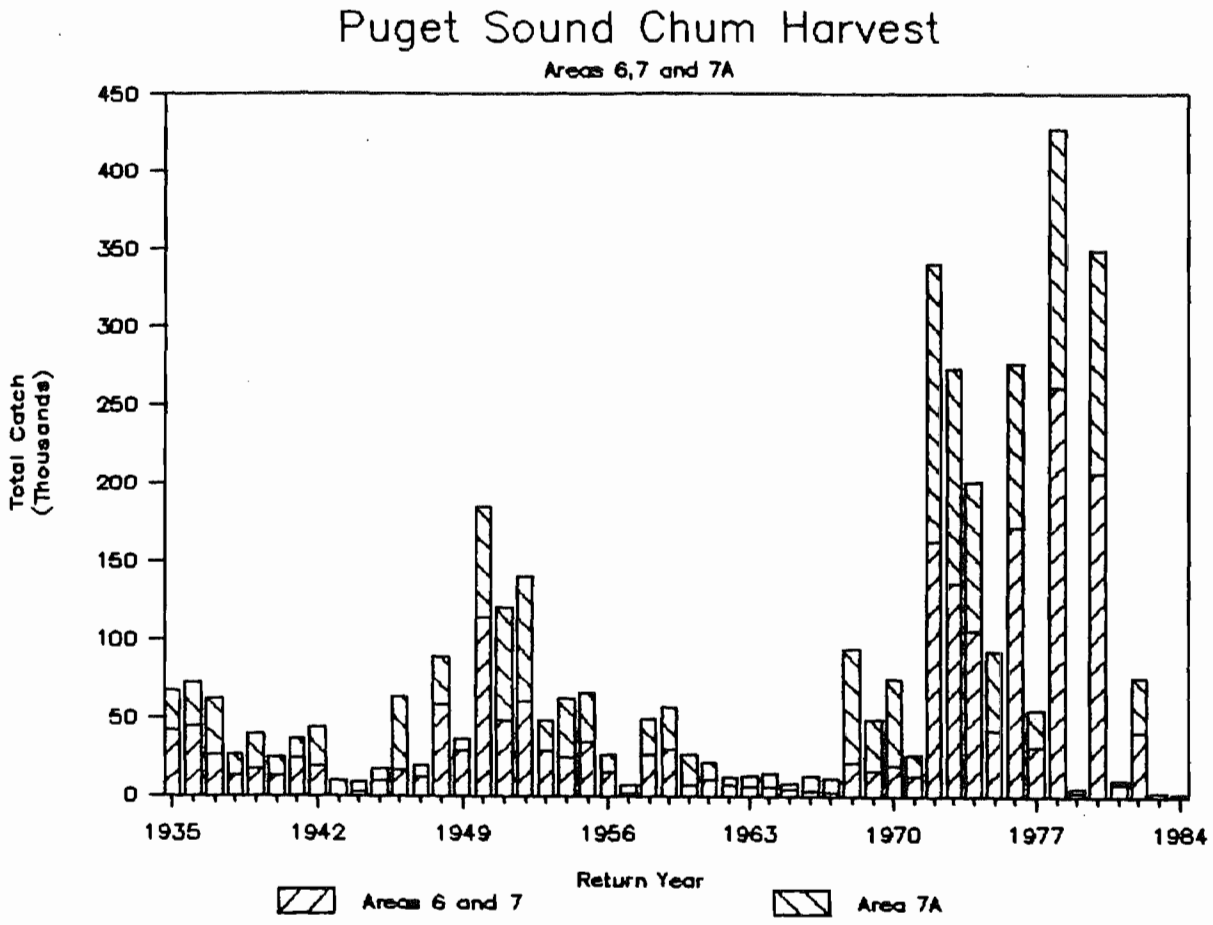

Puget Sound Chum Harvest
Areas 6,7 and 7A
Total Catch (Thousands)
450
400
350
300
250
200
150
100
50
0
1935
1942
1949
1956
1963
1970
1977
1984
Return Year
Areas 6 and 7
Area 7A

FIGURE 11

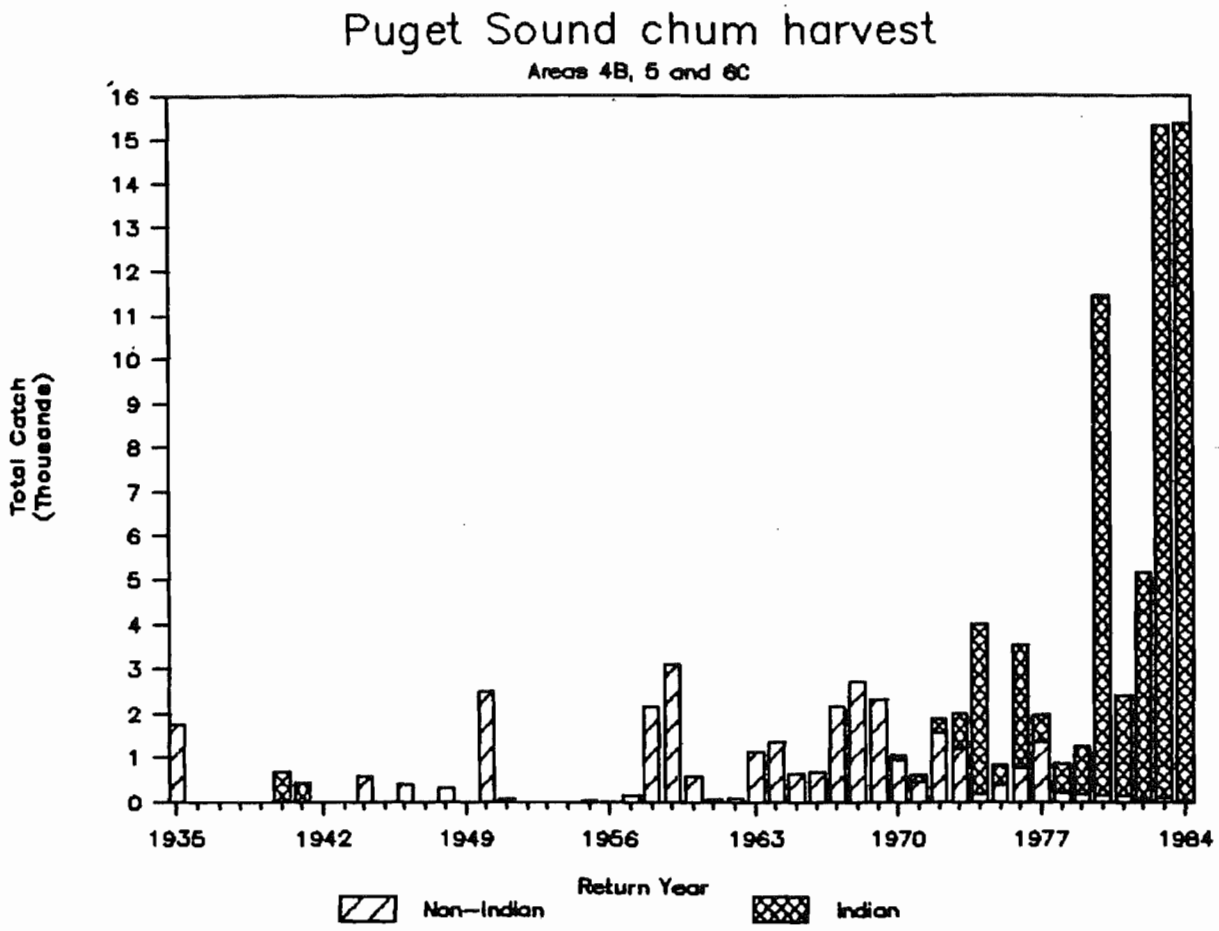

Puget Sound chum harvest
Areas 4B, 5 and 6C
Total Catch (Thousands)
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
1935
1942
1949
1956
1963
1970
1977
1984
Return Year
Non-Indian
Indian

FIGURE 12

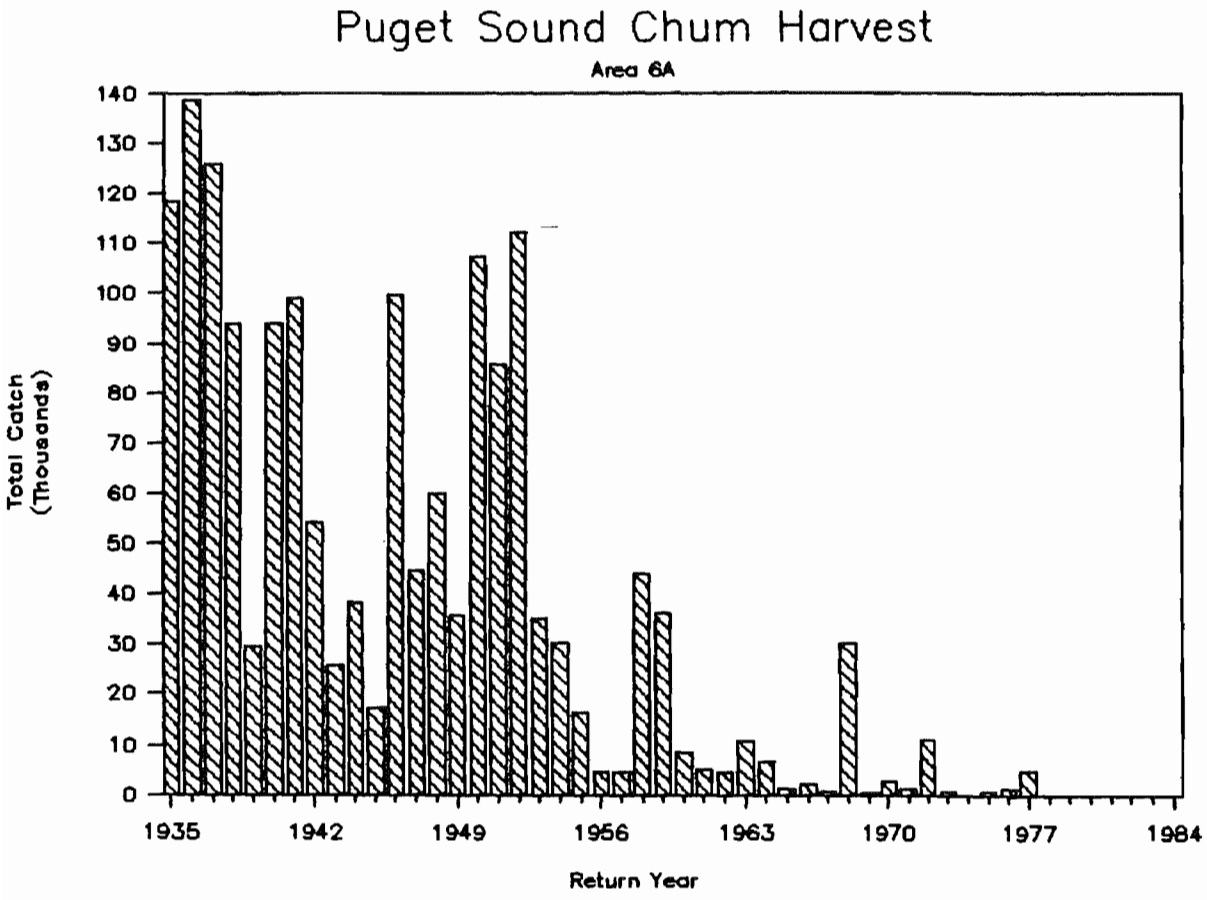
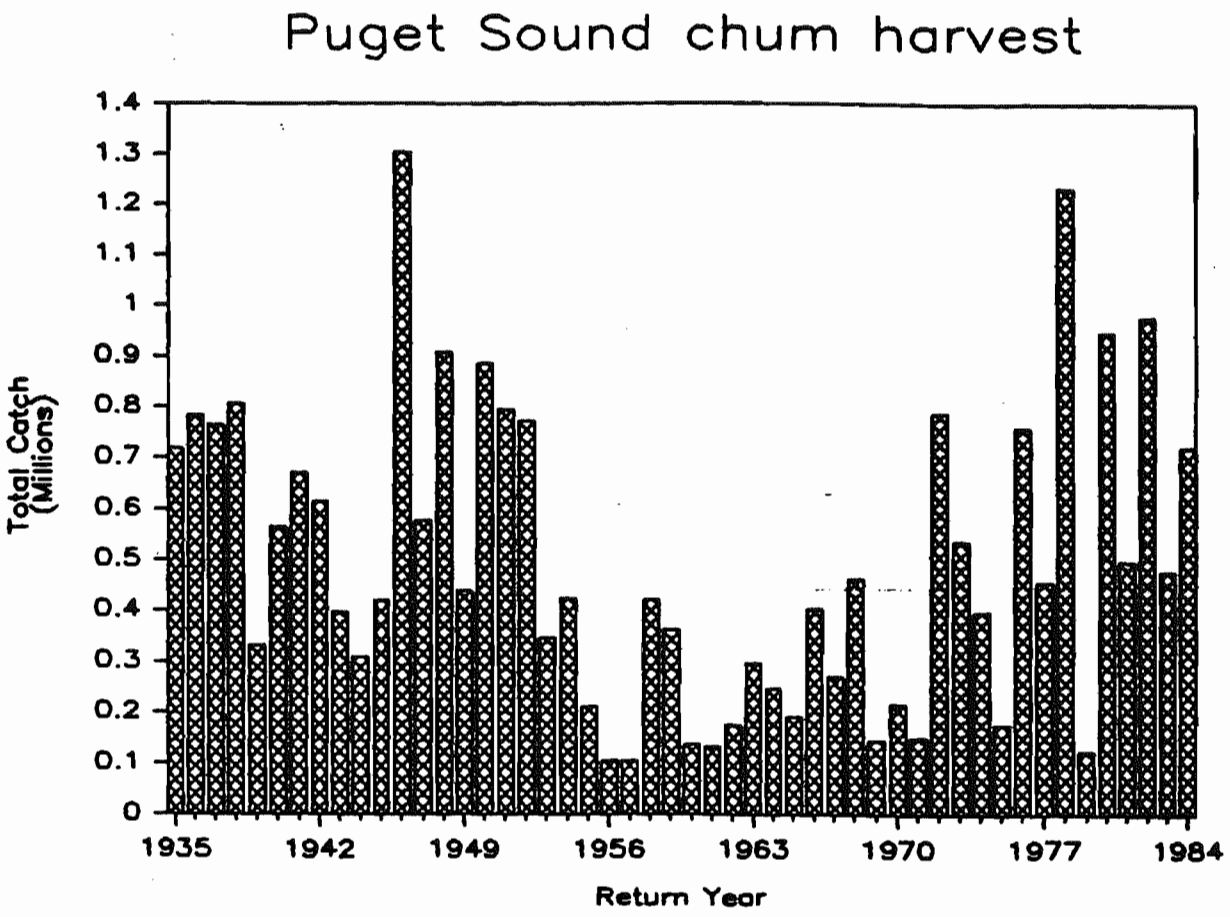
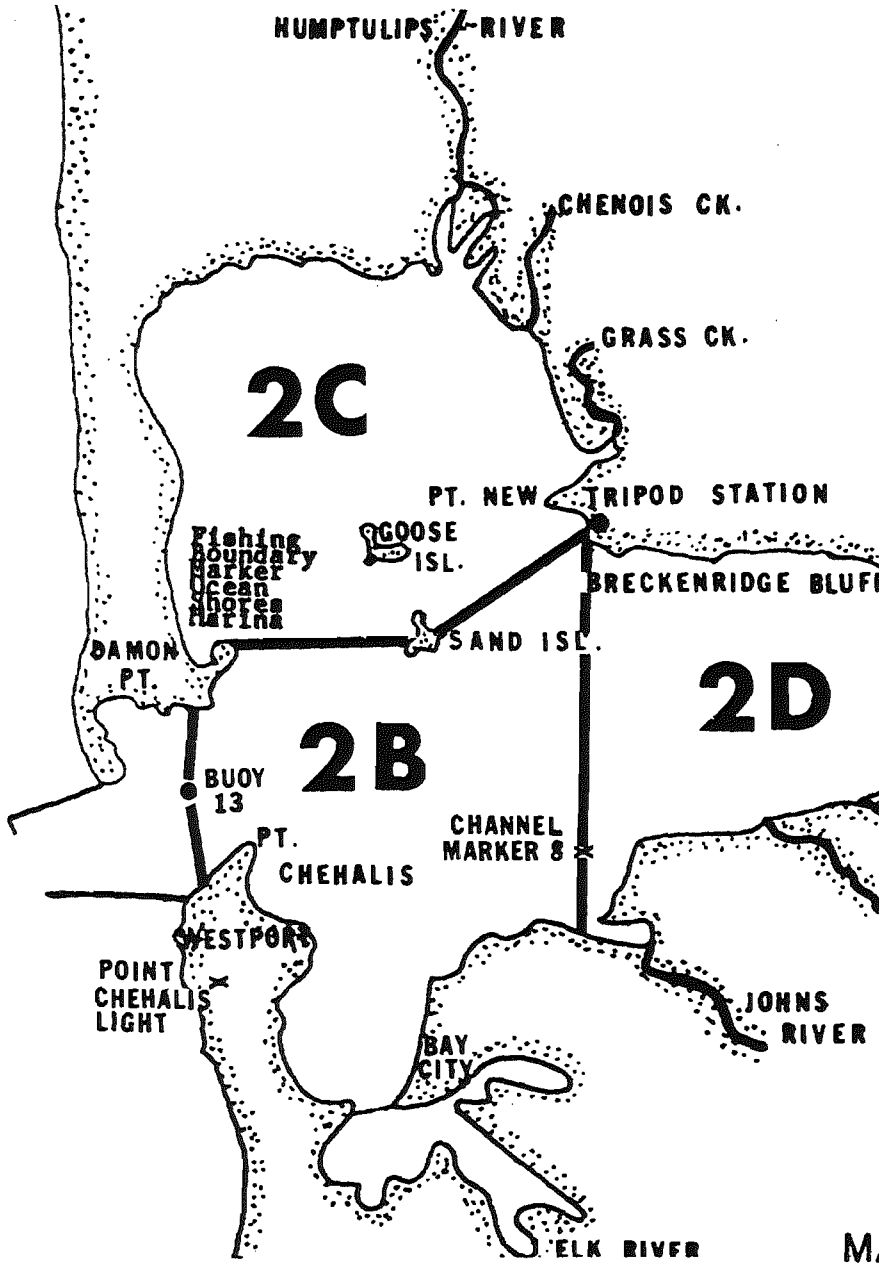

Puget Sound Chum Harvest
Area 6A
Total Catch (Thousands)
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
1935
1942
1949
1956
1963
1970
1977
1984
Return Year

FIGURE 13


Puget Sound chum harvest
Total Catch (Millions)
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1935
1942
1949
1956
1963
1970
1977
1984
Return Year



DEPARTMENT OF FISHERIES
ROOM 115, GENERAL ADMINISTRATION BLDG.
OLYMPIA, WASHINGTON 98504
Phone: 753-6600

Grays Harbor Salmon

MANAGEMENT AND CATCH REPORTING

AREAS

FIS-DP-068 Effective June 1979

FIGURE 14

FIGURE 15

Willapa Harbor salmon management and catch reporting areas. (Washington Department of Fisheries)

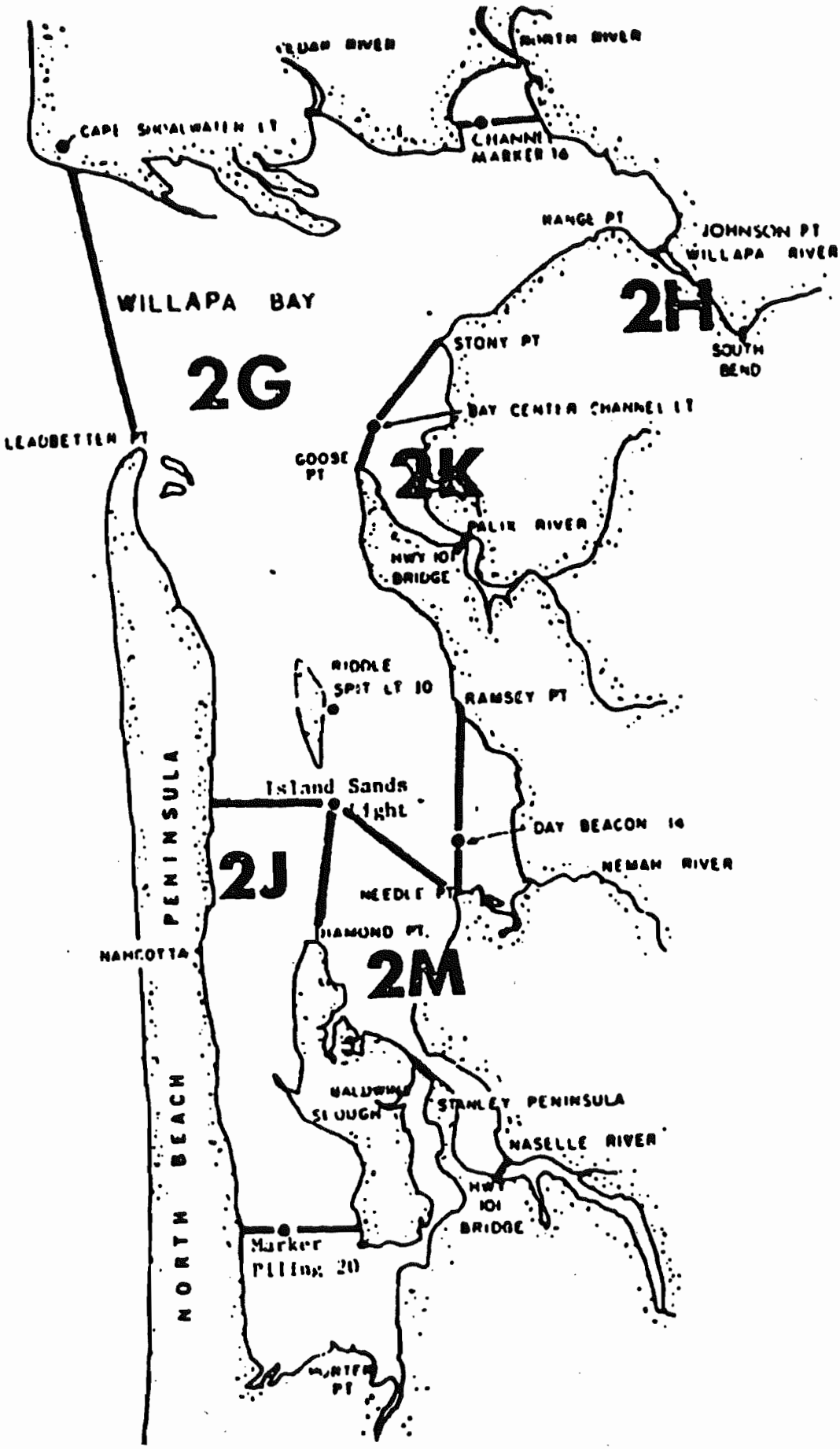
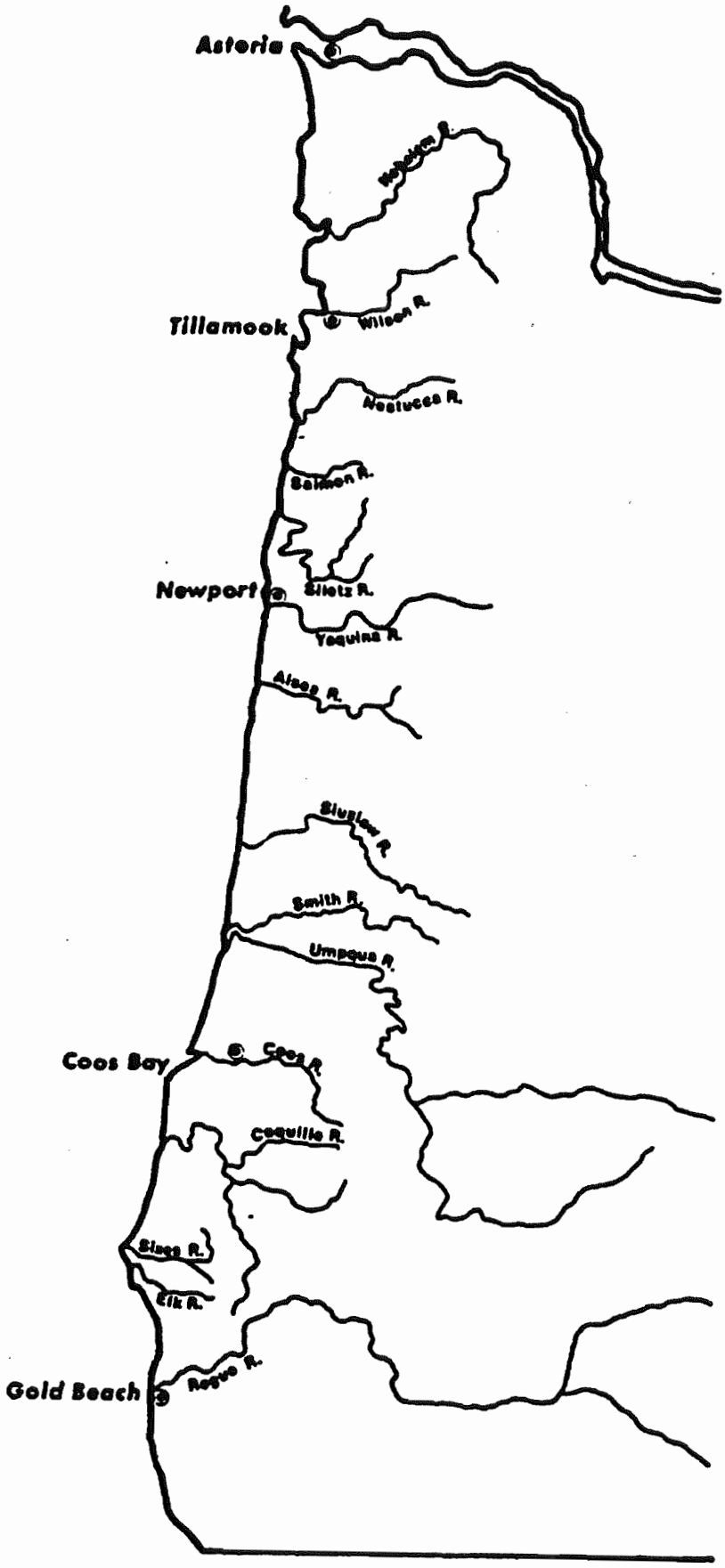


FIGURE 16



Principal Oregon coastal river systems supporting anadromous fish.

APPENDIX A

NOOKSACK-SAMISH REGION OF ORIGIN

Table A1. Nooksack-Samish normal chum return-year age composition (%) from scale analysis.

Return Year	Age		
	Three	Four	Five
1968	3.8	95.7	0.5
1969	25.8	68.3	5.9
1970	4.4	94.5	1.1
1971	27.6	69.6	2.8
1972	9.5	87.8	2.7
1973	11.2	69.8	19.0
1974	21.5	76.0	2.5
1975	50.6	45.8	3.6
1976	7.7	92.1	0.2
1977	11.4	84.7	3.9
1978	7.8	90.7	1.5
1979	9.2	86.0	4.8
1980	65.8	31.2	3.0
1981	16.2	82.7	1.1
1982	13.1	83.5	3.4
1983	37.4	50.0	12.6
1984	44.3	53.5	2.2

1/ Source: WDF, 3/87; excludes immature two-year-old chum in samples. Rounding error may be present.
2/ 1968-71 from Pink and Chum Prediction Studies (1973, Table 10 p36).
3/ 1971 from Skagit Bay samples.
4/ 1972 and 1974 from Admiralty Inlet samples.
5/ 1975-78 from 7A, 8, 8A, 8B and 8C samples.
6/ 1979-83 from river and carcass samples.
7/ 1984 from area 7B due to river and marine age sample differences.

Table A2. Nooksack-Samish normal wild chum return by age to United States waters.

Return Year	Age Three	Age Four	Age Five	Total
1968	919	23,157	121	24,197
1969	8,443	22,351	1,931	32,725
1970	1,704	36,606	426	38,736
1971	3,553	8,960	360	12,874
1972	3,034	28,044	862	31,941
1973	4,909	30,591	8,327	43,826
1974	4,589	16,200	534	21,322
1975	7,196	6,514	512	14,222
1976	1,897	22,690	49	24,636
1977	5,986	44,473	2,048	52,506
1978	2,586	29,887	497	32,952
1979	2,828	26,439	1,476	30,743
1980	20,897	9,909	953	31,759
1981	12,654	64,599	859	78,112
1982	13,103	83,324	3,401	99,825
1983	25,328	33,861	8,533	67,722
1984	54,291	65,625	2,696	122,664

Source: WDF Stock Strength Calculation Summary, 18 April 86; rounding error may be present.

Table A3. Nooksack-Samish normal wild chum brood-year return by age to U.S. waters.

Brood Year	Age			Brood Return
	Three	Four	Five	
1965	919	22,351	426	23,697
1966	8,443	36,606	360	45,409
1967	1,704	8,960	862	11,527
1968	3,553	28,044	8,327	39,924
1969	3,034	30,591	534	34,159
1970	4,909	16,200	512	21,621
1971	4,589	6,514	49	11,152
1972	7,196	22,690	2,048	31,934
1973	1,897	44,473	497	46,867
1974	5,986	29,887	1,476	37,349
1975	2,586	26,439	953	29,977
1976	2,828	9,909	859	13,596
1977	20,897	64,599	3,401	88,897
1978	12,654	83,324	8,533	104,511
1979	13,103	33,861	2,696	49,660

Source: WDF, 3/87; rounding error may be present.

Table A4. Nooksack-Samish normal wild chum spawners, brood return, and return-per-spawner.

Brood Year	Spawners	Brood Return	Return/ Spawner
1968	10,779	39,924	3.70
1969	26,785	34,159	1.28
1970	33,603	21,621	0.64
1971	9,340	11,152	1.19
1972	26,784	31,934	1.19
1973	26,006	46,867	1.80
1974	9,592	37,349	3.89
1975	6,011	29,977	4.99
1976	4,854	13,596	2.80
1977	21,263	88,897	4.18
1978	14,677	104,511	7.12
1979	27,388	49,660	1.81

Source: WDF Puget Sound Escapement Estimates, 17 June 86; rounding error may be present.

Table A5. Nooksack-Samish normal wild chum catch and harvest rates by area(s) based on run size entering United States waters.

Run Year	Areas of Catch (4B, 5, 6C) Catch	(4B, 5, 6C) Harv. Rate	(6, 7, 7A) Catch	(6, 7, 7A) Harv. Rate	(Other Puget Sound) Catch	(Other Puget Sound) Harv. Rate	Total Harvest Rate	Run Size
1968	7	0.00	264	0.01	13,084	0.54	0.55	24,197
1969	78	0.00	529	0.02	5,314	0.16	0.18	32,725
1970	0	0.00	428	0.01	6,499	0.17	0.18	38,736
1971	3	0.00	113	0.01	3,414	0.27	0.27	12,874
1972	4	0.00	1,476	0.05	3,651	0.11	0.16	31,941
1973	40	0.00	2,446	0.06	15,279	0.35	0.41	43,826
1974	48	0.00	705	0.03	10,969	0.51	0.55	21,322
1975	10	0.00	1,087	0.08	6,933	0.49	0.56	14,222
1976	36	0.00	1,455	0.06	17,706	0.72	0.78	24,636
1977	78	0.00	857	0.02	29,998	0.57	0.59	52,506
1978	3	0.00	2,228	0.07	15,844	0.48	0.55	32,952
1979	67	0.00	59	0.00	3,191	0.10	0.11	30,743
1980	206	0.01	2,232	0.07	3,597	0.11	0.19	31,759
1981	47	0.00	13	0.00	15,351	0.20	0.20	78,112
1982	195	0.00	1,025	0.01	53,590	0.54	0.55	99,825
1983	1,017	0.02	50	0.00	45,956	0.68	0.69	67,722
1984	981	0.01	33	0.00	68,899	0.56	0.57	122,664

Source: WDF Catch-Escapement Run Size Calculation Summary, 17 June 86; rounding error may be present.

APPENDIX B

SKAGIT REGION OF ORIGIN

Table B1. Skagit normal chum return-year age composition (%) from scale analysis.

Return Year	Age		
	Three	Four	Five
1968	2.7	97.3	0.0
1969	25.8	68.4	5.8
1970	3.6	96.1	0.3
1971	27.6	69.6	2.8
1972	9.5	87.8	2.7
1973	11.2	69.8	19.0
1974	21.5	76.0	2.5
1975	50.6	45.8	3.6
1976	7.8	91.9	0.3
1977	10.5	84.8	4.7
1978	12.0	86.9	0.1
1979	40.7	38.2	21.1
1980	14.7	84.9	0.4
1981	19.9	72.1	8.0
1982	4.1	93.9	2.0
1983	6.0	31.4	62.6
1984	38.0	60.5	1.5

1/ Source: WDF, 3/87; excludes immature two-year-old chum in samples. Rounding error may be present.
2/ 1968-70 and 1976-84 from river, carcass and area 8 samples.
3/ 1971 from Skagit Bay samples.
4/ 1972 and 1974 from Admiralty Inlet samples.
5/ 1975 from 7A, 8, 8A, 8B and 8C samples.

Table B2. Skagit normal wild chum return by age to United States waters.

Return Year	Age			
	Three	Four	Five	Total
1968	2,352	84,749	0	87,101
1969	6,113	16,207	1,374	23,695
1970	4,848	129,402	404	134,653
1971	14,200	35,810	1,441	51,451
1972	15,967	147,572	4,538	168,078
1973	10,300	64,191	17,473	91,964
1974	38,945	137,490	4,529	180,956
1975	9,956	9,012	708	19,676
1976	10,423	122,807	401	133,631
1977	4,636	37,446	2,075	44,148
1978	27,815	200,925	231	231,214
1979	15,882	14,890	8,226	39,021
1980	16,536	95,503	450	112,489
1981	15,292	55,403	6,147	76,842
1982	11,198	256,479	5,462	273,123
1983	1,870	9,785	19,509	31,164
1984	19,605	31,213	776	51,592

Source: WDF Stock Strength Calculation Summary, 18 April 87; rounding error may be present.

Table B3. Skagit normal wild chum brood-year return by age to United States waters.

Brood Year	Age			Brood Return
	Three	Four	Five	
1965	2,352	16,207	404	18,963
1966	6,113	129,402	1,441	136,955
1967	4,848	35,810	4,538	45,196
1968	14,200	147,572	17,473	179,246
1969	15,967	64,191	4,529	84,688
1970	10,300	137,490	708	148,499
1971	38,945	9,012	401	48,358
1972	9,956	122,807	2,075	134,838
1973	10,423	37,446	231	48,101
1974	4,636	200,925	8,226	213,786
1975	27,815	14,890	450	43,155
1976	15,882	95,503	6,147	117,532
1977	16,536	55,403	5,462	77,401
1978	15,292	256,479	19,509	291,279
1979	11,198	9,785	776	21,760

Source: WDF, 3/87; rounding error may be present.

Table B4. Skagit normal wild chum spawners, brood return, and return-per-spawner.

Brood Year	Spawners	Brood Returns	Return/ Spawner
1968	44,049	179,246	4.07
1969	22,393	84,688	3.78
1970	127,588	148,499	1.16
1971	48,827	48,358	0.99
1972	144,732	134,838	0.93
1973	83,497	48,101	0.58
1974	160,248	213,786	1.33
1975	15,762	43,155	2.74
1976	93,000	117,532	1.26
1977	36,000	77,401	2.15
1978	132,895	291,279	2.19
1979	23,153	21,760	0.94

Source: WDF Puget Sound Escapement Estimates, 17 June 86; rounding error may be present.

Table B5. Skagit normal wild chum catch and harvest rates by area(s) based on run size entering United States waters.

Run Year	Areas of Catch (4B, 5, 6C) Catch	Harv. Rate	(6, 7, 7A) Catch	Harv. Rate	(Other Puget Sound) Catch	Harv. Rate	Total Harvest Rate	Run Size
1968	27	0.00	968	0.01	42,057	0.48	0.49	87,101
1969	58	0.00	395	0.02	849	0.04	0.05	23,695
1970	1	0.00	1,502	0.01	5,562	0.04	0.05	134,653
1971	10	0.00	456	0.01	2,158	0.04	0.05	51,451
1972	22	0.00	7,837	0.05	15,487	0.09	0.14	168,078
1973	85	0.00	5,245	0.06	3,137	0.03	0.09	91,964
1974	409	0.00	6,024	0.03	14,275	0.08	0.11	180,956
1975	13	0.00	1,532	0.08	2,369	0.12	0.20	19,676
1976	208	0.00	8,150	0.06	32,273	0.24	0.30	133,631
1977	67	0.00	729	0.02	7,352	0.17	0.18	44,148
1978	23	0.00	15,837	0.07	82,459	0.36	0.43	231,214
1979	85	0.00	75	0.00	15,708	0.40	0.41	39,021
1980	764	0.01	8,291	0.07	84,009	0.75	0.83	112,489
1981	48	0.00	13	0.00	59,842	0.78	0.78	76,842
1982	562	0.00	2,950	0.01	127,070	0.47	0.48	273,123
1983	506	0.02	25	0.00	27,440	0.88	0.90	31,164
1984	443	0.01	14	0.00	4,318	0.08	0.09	51,592

Source: WDF Catch-Escapement Run Size Calculation Summary, 17 June 86; rounding error may be present.

APPENDIX C

STILLAGUAMISH-SNOHOMISH REGION OF ORIGIN

Table C1. Stillaguamish normal chum return-year age composition (%) from scale analysis.

Return Year	Age		
	Three	Four	Five
1968	3.8	95.7	0.5
1969	25.8	68.3	5.9
1970	4.4	94.5	1.1
1971	27.6	69.6	2.8
1972	9.5	87.8	2.7
1973	11.2	69.8	19.0
1974	21.5	76.0	2.5
1975	50.6	45.8	3.6
1976	7.7	92.1	0.2
1977	11.4	84.7	3.9
1978	7.8	90.7	1.5
1979	44.5	34.9	20.6
1980	27.5	71.6	0.9
1981	27.3	63.3	9.4
1982	2.7	94.4	2.9
1983	21.9	24.4	53.7
1984	37.8	61.4	0.8

1/ Source: WDF, 3/87; excludes immature two-year-old chum in samples. Rounding error may be present.
2/ 1968-71 from Pink and Chum Prediction Studies (1973, Table 10 p36).
3/ 1971 from Skagit Bay samples.
4/ 1972 and 1974 from Admiralty Inlet samples.
5/ 1975-79 and post 1981 from 7A, 8, 8A, 8B and 8C samples.
6/ 1980-81 from river and carcass samples.

Table C2. Stillaguamish normal wild chum return by age to United States waters.

Return Year	Age Three	Four	Five	Total
1968	1,596	40,199	210	42,005
1969	8,250	21,840	1,887	31,976
1970	2,786	59,828	696	63,310
1971	4,135	10,427	419	14,981
1972	4,469	41,298	1,270	47,037
1973	2,307	14,377	3,914	20,598
1974	10,622	37,498	1,235	49,353
1975	2,392	2,165	170	4,727
1976	4,505	53,879	117	58,500
1977	1,691	12,560	578	14,829
1978	7,049	81,474	1,356	89,828
1979	2,009	1,577	930	4,518
1980	6,599	17,182	216	23,997
1981	6,724	15,591	2,315	24,630
1982	2,263	79,137	2,431	83,832
1983	2,098	2,337	5,144	9,579
1984	20,795	33,777	440	55,012

Source: WDF Stock Strength Calculation Summary, 18 April 86; rounding error may be present.

Table C3. Stillaguamish normal wild chum brood-year return by age to United States waters.

Brood Year	Age			Brood Return
	Three	Four	Five	
1965	1,596	21,840	696	24,132
1966	6,066	43,739	329	50,133
1967	2,037	8,167	586	10,790
1968	3,239	19,060	2,044	24,342
1969	2,062	7,508	881	10,452
1970	1,205	26,757	134	28,096
1971	7,579	1,703	56	9,338
1972	1,881	25,995	454	28,330
1973	2,173	9,857	1,095	13,125
1974	1,327	65,817	724	67,868
1975	5,694	1,228	132	7,054
1976	1,565	10,466	731	12,762
1977	4,020	4,922	1,006	9,947
1978	2,123	32,743	1,763	36,628
1979	936	801	388	2,125

Source: WDF, 3/87; rounding error may be present.

Table C4. Stillaguamish normal wild chum spawners, brood return, and return-per-spawner.

Brood Year	Spawners	Returns	Return/ Spawner
1968	18,105	24,342	1.34
1969	23,510	10,452	0.44
1970	46,285	28,096	0.61
1971	11,734	9,338	0.80
1972	21,708	28,330	1.31
1973	10,757	13,125	1.22
1974	35,216	67,868	1.93
1975	3,718	7,054	1.90
1976	28,225	12,762	0.45
1977	11,637	9,947	0.85
1978	72,566	36,628	0.50
1979	3,520	2,125	0.60

Source: WDF Puget Sound Escapement Estimates, 17 June 86; rounding error may be present.

Table C5. Stillaguamish normal wild chum catch and harvest rates by area(s) based on run size entering United States waters.

Run Year	Areas of Catch: (4B, 5, 6C) Catch	(4B, 5, 6C) Rate	(6, 7, 7A) Catch	(6, 7, 7A) Rate	(6B, 9) Catch	(6B, 9) Rate	(Other Puget Sound) Catch	(Other Puget Sound) Rate	Total Harvest Rate	Run Size
1968	13	0.00	467	0.01	17,786	0.42	5,634	0.13	0.57	42,005
1969	79	0.00	533	0.02	5,793	0.18	2,061	0.06	0.26	31,976
1970	1	0.00	706	0.01	12,133	0.19	4,185	0.07	0.27	63,310
1971	3	0.00	133	0.01	2,729	0.18	382	0.03	0.22	14,981
1972	6	0.00	2,193	0.05	15,812	0.34	7,310	0.16	0.54	47,037
1973	19	0.00	1,175	0.06	5,368	0.26	3,279	0.16	0.48	20,598
1974	112	0.00	1,643	0.03	55	0.00	12,327	0.25	0.29	49,353
1975	3	0.00	368	0.08	129	0.03	509	0.11	0.21	4,727
1976	91	0.00	3,568	0.06	9,861	0.17	16,755	0.29	0.52	58,500
1977	22	0.00	245	0.02	1,967	0.13	958	0.06	0.22	14,829
1978	9	0.00	6,153	0.07	2,195	0.02	8,905	0.10	0.19	89,828
1979	10	0.00	8	0.00	34	0.01	946	0.21	0.22	4,518
1980	163	0.01	1,769	0.07	805	0.03	6,642	0.28	0.39	23,997
1981	15	0.00	4	0.00	2,397	0.10	14,439	0.59	0.68	24,630
1982	172	0.00	905	0.01	16,744	0.20	31,296	0.37	0.59	83,832
1983	156	0.02	8	0.00	1,584	0.17	4,548	0.47	0.66	9,579
1984	472	0.01	15	0.00	45	0.00	6,025	0.11	0.12	55,012

Source: WDF Catch-Escapement Run Size Calculation Summary, 17 June 86; rounding error may be present.

Table C6. Snohomish normal chum return-year age composition (%) from scale analysis.

Return Year	Age Three	Four	Five
1968	3.8	95.7	0.5
1969	25.8	68.3	5.9
1970	4.4	94.5	1.1
1971	27.6	69.6	2.8
1972	9.5	87.8	2.7
1973	11.2	69.8	19.0
1974	21.5	76.0	2.5
1975	50.6	45.8	3.6
1976	7.7	92.1	0.2
1977	11.4	84.7	3.9
1978	7.8	90.7	1.5
1979	44.5	34.9	20.6
1980	27.5	71.6	0.9
1981	27.3	63.3	9.4
1982	2.7	94.4	2.9
1983	21.9	24.4	53.7
1984	37.8	61.4	0.8

1/ Source: WDF, 3/87; excludes immature two-year-old chum in samples. Rounding error may be present.
2/ 1968-71 from Pink and Chum Prediction Studies (1973, Table 10 p36).
3/ 1971 from Skagit Bay samples.
4/ 1972 and 1974 from Admiralty Inlet samples.
5/ 1975-79 and post 1981 from 7A, 8, 8A, 8B and 8C samples.
6/ 1980-81 from river and carcass samples.

Table C7. Snohomish normal wild chum return by age to United States waters.

Return Year	Age			
	Three	Four	Five	Total
1968	1,865	46,971	245	49,082
1969	1,400	3,705	320	5,425
1970	1,742	37,405	435	39,582
1971	2,134	5,381	216	7,732
1972	2,273	21,010	646	23,929
1973	1,167	7,275	1,980	10,422
1974	6,302	22,248	733	29,281
1975	3,896	3,527	277	7,700
1976	2,395	28,650	62	31,108
1977	2,483	18,450	850	21,783
1978	2,520	29,122	485	32,108
1979	2,479	1,946	1,147	5,575
1980	12,443	32,396	407	45,246
1981	10,151	23,537	3,495	37,184
1982	4,443	155,336	4,772	164,551
1983	2,994	3,336	7,342	13,673
1984	16,674	27,084	353	44,111

Source: WDF Stock Strength Calculation Summary, 18 April 87; rounding error may be present.

Table C8. Snohomish normal wild chum brood-year return by age to United States waters.

Brood Year	Age			Brood Return
	Three	Four	Five	
1965	1,865	3,705	435	6,006
1966	1,400	37,405	216	39,021
1967	1,742	5,381	646	7,769
1968	2,134	21,010	1,980	25,124
1969	2,273	7,275	733	10,281
1970	1,167	22,248	277	23,692
1971	6,302	3,527	62	9,891
1972	3,896	28,650	850	33,396
1973	2,395	18,450	485	21,330
1974	2,483	29,122	1,147	32,753
1975	2,520	1,946	407	4,872
1976	2,479	32,396	3,495	38,370
1977	12,443	23,537	4,772	40,752
1978	10,151	155,336	7,342	172,830
1979	4,443	3,336	353	8,132

Source: WDF, 3/87; rounding error may be present.

Table C9. Snohomish normal wild chum spawners, brood return, and return-per-spawner.

Brood Year	Spawners	Returns	Return-Spawner
1968	21,155	25,124	1.19
1969	3,990	10,281	2.58
1970	28,938	23,692	0.82
1971	6,056	9,891	1.63
1972	11,043	33,396	3.02
1973	5,443	21,330	3.92
1974	20,894	32,753	1.57
1975	6,056	4,872	0.80
1976	15,100	38,370	2.54
1977	17,093	40,752	2.38
1978	25,938	172,830	6.66
1979	4,357	8,132	1.87

Source: WDF Puget Sound Escapement Estimates, 17 June 86; rounding error may be present.

Table C10. Snohomish normal wild chum catch and harvest rates by area(s) based on run size entering United States waters.

Run Year	Areas of Catch (4B, 5, 6C) Catch	Rate	(6, 7, 7A) Catch	Rate	(6B, 9) Catch	Rate	(Other Puget Sound) Catch	Rate	Total Harvest Rate	Run Size
1968	15	0.00	545	0.01	20,783	0.42	6,584	0.13	0.57	49,082
1969	13	0.00	90	0.02	983	0.18	349	0.06	0.26	5,425
1970	0	0.00	442	0.01	7,585	0.19	2,617	0.07	0.27	39,582
1971	2	0.00	68	0.01	1,409	0.18	197	0.03	0.22	7,732
1972	3	0.00	1,116	0.05	8,044	0.34	3,723	0.16	0.54	23,929
1973	10	0.00	594	0.06	2,716	0.26	1,659	0.16	0.48	10,422
1974	66	0.00	975	0.03	33	0.00	7,313	0.25	0.29	29,281
1975	5	0.00	600	0.08	211	0.03	828	0.11	0.21	7,700
1976	48	0.00	1,897	0.06	5,244	0.17	8,815	0.28	0.51	31,108
1977	33	0.00	360	0.02	2,890	0.13	1,407	0.06	0.22	21,783
1978	3	0.00	2,199	0.07	785	0.02	3,183	0.10	0.19	32,108
1979	12	0.00	11	0.00	42	0.01	1,153	0.21	0.22	5,575
1980	307	0.01	3,335	0.07	1,519	0.03	12,002	0.27	0.38	45,246
1981	23	0.00	6	0.00	3,618	0.10	19,987	0.54	0.64	37,184
1982	338	0.00	1,777	0.01	32,925	0.20	56,122	0.34	0.55	164,551
1983	222	0.02	11	0.00	2,262	0.17	5,447	0.40	0.58	13,673
1984	379	0.01	12	0.00	36	0.00	4,797	0.11	0.12	44,110

Source: WDF Catch-Escapement Run Size Calculation Summary, 18 April 86; rounding error may be present.

APPENDIX D

SOUTH SOUND REGION OF ORIGIN

Table D1. South Sound early chum return-year age composition (%) from scale analysis.

Return Year	Age Three	Four	Five
1968	26.7	72.4	0.9
1969	50.0	47.5	2.5
1970	30.3	69.7	0.0
1971	69.7	30.3	0.0
1972	12.7	85.8	1.5
1973	36.4	57.9	5.7
1974	34.3	62.4	3.3
1975	28.3	70.0	1.7
1976	5.6	94.3	0.1
1977	39.9	59.2	0.9
1978	34.1	64.7	1.2
1979	70.0	26.7	3.3
1980	64.7	35.1	0.2
1981	7.2	83.3	9.5
1982	39.5	47.4	11.8
1983	37.0	52.1	10.9
1984	30.6	68.5	0.9

1/ Source: WDF, 3/87; excludes immature two-year-old chum in samples. Rounding error may be present.
2/ 1968-75 from area 10(s), 11(s) and 13(s) samples.
3/ Post 1976 from area 10(s), 11(s) 13(s) samples prior to week 42.

Table D2. South Sound early wild chum return by age to United States waters.

Return Year	Age Three	Age Four	Age Five	Total
1968	11,278	30,581	380	42,239
1969	4,155	3,947	208	8,310
1970	3,407	7,837	0	11,244
1971	10,011	4,352	0	14,363
1972	17,199	116,192	2,031	135,422
1973	15,013	23,881	2,351	41,245
1974	7,748	14,098	745	22,589
1975	2,404	5,945	144	8,493
1976	4,278	72,179	77	76,534
1977	3,964	5,872	89	9,925
1978	5,148	9,768	181	15,098
1979	1,070	408	50	1,529
1980	9,404	5,110	29	14,543
1981	962	11,133	1,270	13,365
1982	2,718	3,262	812	6,881
1983	1,767	2,488	520	4,775
1984	5,788	12,956	170	18,914

Source: WDF Stock Strength Calculation Summary, 18 April 86; rounding error may be present.

Table D3. South Sound early wild chum brood-year return by age to United States waters.

Brood Year	Age			Brood Return
	Three	Four	Five	
1965	11,278	3,947	0	15,225
1966	4,155	7,837	0	11,992
1967	3,407	4,352	2,031	9,790
1968	10,011	116,192	2,351	128,554
1969	17,199	23,881	745	41,825
1970	15,013	14,098	144	29,255
1971	7,748	5,945	77	13,770
1972	2,404	72,179	89	74,672
1973	4,278	5,872	181	10,331
1974	3,964	9,768	50	13,783
1975	5,148	408	29	5,586
1976	1,070	5,110	1,270	7,450
1977	9,404	11,133	812	21,349
1978	962	3,262	520	4,744
1979	2,718	2,488	170	5,376

Source: WDF, 3/87; rounding error may be present.

Table D4. South Sound early, normal and late wild chum spawners, brood return, and return-per-spawner.

Brood Year	----Early Timed Stocks---- Spawners	Returns	R/S	----Normal Timed Stocks--- Spawners	Returns	R/S	-----Late Timed Stocks---- Spawners	Returns	R/S
1968	22,008	128,554	5.84	46,964	327,809	6.98	27,553	70,080	2.54
1969	3,440	41,825	12.16	37,275	151,025	4.05	20,292	41,947	2.07
1970	5,411	29,255	5.41	41,630	177,143	4.26	34,068	65,156	1.91
1971	4,808	13,770	2.86	43,689	101,640	2.33	9,937	18,352	1.85
1972	33,523	74,672	2.23	65,163	101,947	1.56	34,388	30,412	0.88
1973	9,643	10,331	1.07	55,282	292,137	5.28	29,825	66,771	2.24
1974	19,730	13,783	0.70	99,539	297,288	2.99	34,676	45,434	1.31
1975	5,804	5,586	0.96	31,100	101,217	3.25	9,936	47,754	4.81
1976	32,743	7,450	0.23	63,304	60,304	0.95	23,311	25,392	1.09
1977	3,836	21,349	5.57	54,282	366,762	6.76	23,590	102,537	4.35
1978	5,873	4,744	0.81	105,451	103,771	0.98	29,608	34,770	1.17
1979	1,004	5,376	5.35	18,816	228,449	12.14	22,613	41,423	1.83

Source: WDF Puget Sound Escapement Estimates, 17 June 86; rounding error may be present.

Table D5. South Puget Sound early wild chum catch and harvest rate by area(s) based on run size entering United States waters.

Run Year	Areas of Catch (4B, 5, 6C) Catch	Rate	(6, 7, 7A) Catch	Rate	(6B, 9) Catch	Rate	(Other Puget Sound) Catch	Rate	Total Harvest Rate	Run Size
1968	207	0.00	566	0.01	4,401	0.10	15,057	0.36	0.48	42,239
1969	57	0.01	368	0.04	782	0.09	3,663	0.44	0.59	8,310
1970	67	0.01	257	0.02	1,484	0.13	4,025	0.36	0.52	11,244
1971	39	0.00	67	0.00	1,974	0.14	7,475	0.52	0.67	14,363
1972	294	0.00	1,381	0.01	31,500	0.23	68,724	0.51	0.75	135,422
1973	145	0.00	664	0.02	6,669	0.16	24,124	0.58	0.77	41,245
1974	68	0.00	304	0.01	117	0.01	2,370	0.10	0.13	22,589
1975	40	0.00	562	0.07	188	0.02	1,899	0.22	0.32	8,493
1976	220	0.00	4,467	0.06	2,373	0.03	36,731	0.48	0.57	76,534
1977	33	0.00	408	0.04	1,224	0.12	4,424	0.45	0.61	9,925
1978	61	0.00	644	0.04	1,297	0.09	7,223	0.48	0.61	15,098
1979	16	0.01	67	0.04	4	0.00	438	0.29	0.34	1,529
1980	131	0.01	1,375	0.09	19	0.00	5,465	0.38	0.48	14,543
1981	273	0.02	1,088	0.08	215	0.02	5,497	0.41	0.53	13,365
1982	58	0.01	94	0.01	0	0.00	2,641	0.38	0.41	6,881
1983	32	0.01	44	0.01	141	0.03	2,789	0.58	0.63	4,775
1984	60	0.00	3	0.00	14	0.00	10,804	0.57	0.58	18,914

Source: WDF Catch-Escapement Run Size Calculation Summary, 17 June 86; rounding error may be present.

Table D6. South Sound normal chum return-year age composition (%) from scale analysis.

Return Year	Age		
	Three	Four	Five
1968	26.7	72.4	0.9
1969	50.0	47.5	2.5
1970	30.3	69.7	0.0
1971	69.7	30.3	0.0
1972	12.7	85.8	1.5
1973	36.4	57.9	5.7
1974	34.4	62.3	3.3
1975	28.3	70.0	1.7
1976	66.3	33.5	0.2
1977	39.9	59.2	0.9
1978	29.8	70.2	0.1
1979	51.1	42.9	6.0
1980	83.2	16.5	0.3
1981	12.2	87.1	0.7
1982	57.3	40.2	2.5
1983	10.4	83.1	6.3
1984	60.5	36.9	2.6

1/ Source: WDF, 3/87; excludes immature two-year-old chum in samples. Rounding error may be present.
2/ From marine areas 10(s), 11 and 13(s) after week 41.

Table D7. South Sound normal wild chum return by age to United States waters.

Return Year	Age			
	Three	Four	Five	Total
1968	52,069	141,192	1,755	195,016
1969	39,089	37,134	1,954	78,177
1970	29,509	67,879	0	97,388
1971	77,260	33,587	0	110,847
1972	35,485	239,732	4,191	279,408
1973	69,072	109,870	10,816	189,758
1974	59,110	107,051	5,670	171,831
1975	16,994	42,034	1,021	60,049
1976	164,291	83,013	496	247,800
1977	86,108	127,545	1,940	215,594
1978	88,872	209,561	300	298,729
1979	13,705	11,517	1,619	26,841
1980	229,661	45,535	828	275,969
1981	18,539	132,335	1,064	151,957
1982	109,240	76,640	4,766	190,646
1983	14,184	113,339	8,593	136,389
1984	136,587	83,307	5,870	225,764

Source: WDF Stock Strength Calculation Summary, 18 April 86; rounding error may be present.

Table D8. South Sound normal wild chum brood-year return by age to United States waters.

Brood Year	Age Three	Age Four	Age Five	Brood Return
1965	52,069	37,134	0	89,203
1966	39,089	67,879	0	106,968
1967	29,509	33,587	4,191	67,286
1968	77,260	239,732	10,816	327,809
1969	35,485	109,870	5,670	151,025
1970	69,072	107,051	1,021	177,143
1971	59,110	42,034	496	101,640
1972	16,994	83,013	1,940	101,947
1973	164,291	127,545	300	292,137
1974	86,108	209,561	1,619	297,288
1975	88,872	11,517	828	101,217
1976	13,705	45,535	1,064	60,304
1977	229,661	132,335	4,766	366,762
1978	18,539	76,640	8,593	103,771
1979	109,240	113,339	5,870	228,449

Source: WDF, 3/87; rounding error may be present.

Table D9. South Puget Sound normal wild chum catch and harvest rate by area(s) based on run size entering United States waters.

Run Year	(4B, 5, 6C) Catch	(4B, 5, 6C) Rate	(6, 7, 7A) Catch	(6, 7, 7A) Rate	(6B, 9) Catch	(6B, 9) Rate	(Other Puget Sound) Catch	(Other Puget Sound) Rate	Total Harvest Rate	Run Size
			---------- Areas of Catch ----------							
1968	59	0.00	2,168	0.01	82,576	0.42	63,249	0.32	0.76	195,016
1969	191	0.00	1,303	0.02	14,164	0.18	25,244	0.32	0.52	78,177
1970	1	0.00	1,101	0.01	18,664	0.19	35,986	0.37	0.57	97,388
1971	21	0.00	986	0.01	20,194	0.18	45,962	0.41	0.61	110,847
1972	36	0.00	13,112	0.05	93,928	0.34	107,255	0.38	0.77	279,408
1973	174	0.00	10,821	0.06	49,455	0.26	74,025	0.39	0.71	189,758
1974	388	0.00	5,720	0.03	196	0.00	65,991	0.38	0.42	171,831
1975	41	0.00	4,675	0.08	1,640	0.03	22,593	0.38	0.48	60,049
1976	385	0.00	15,113	0.06	41,771	0.17	137,227	0.55	0.78	247,800
1977	325	0.00	3,561	0.02	28,599	0.13	129,029	0.60	0.75	215,594
1978	31	0.00	21,006	0.07	7,299	0.02	165,489	0.55	0.65	298,729
1979	58	0.00	49	0.00	203	0.01	7,714	0.29	0.30	26,841
1980	1,875	0.01	20,339	0.07	9,268	0.03	160,230	0.58	0.69	275,969
1981	94	0.00	24	0.00	13,955	0.09	94,941	0.62	0.72	151,957
1982	394	0.00	2,058	0.01	38,146	0.20	119,670	0.63	0.84	190,646
1983	2,250	0.02	110	0.00	22,563	0.17	134,672	0.99	1.17	136,389
1984	2,221	0.01	62	0.00	186	0.00	151,276	0.67	0.68	225,784

Source: WDF Catch-Escapement Run Size Calculation Summary, 17 June 86; rounding error may be present.

Table D10. South Sound late chum return-year age composition (%) from scale analysis.

Return Year	Age		
	Three	Four	Five
1968	26.7	72.4	0.9
1969	50.0	47.5	2.5
1970	30.3	69.7	0.0
1971	69.7	30.3	0.0
1972	12.7	85.8	1.5
1973	36.4	57.9	5.7
1974	21.9	73.9	4.2
1975	66.3	33.7	0.0
1976	62.8	37.2	0.0
1977	39.9	59.2	0.9
1978	55.1	42.9	2.0
1979	39.9	59.0	1.1
1980	81.9	17.9	0.2
1981	20.4	78.1	1.5
1982	50.0	45.3	4.7
1983	42.9	53.3	3.8
1984	29.5	68.9	1.6

1/ Source: WDF, 3/87; excludes immature two-year-old chum in samples. Rounding error may be present.
2/ 1968-73, 1977 and 1982 from normal South Sound samples.
3/ 1974-76 and 1978-81 from river and specific late marine samples.

Table D11. South Sound late wild chum return by age to United States waters.

Return Year	Age Three	Four	Five	Total
1968	12,864	34,883	434	48,181
1969	17,563	16,684	878	35,125
1970	14,982	34,462	0	49,444
1971	15,542	6,757	0	22,299
1972	7,610	51,411	899	59,919
1973	19,972	31,769	3,128	54,869
1974	13,390	45,184	2,568	61,142
1975	9,762	4,962	0	14,724
1976	34,048	20,169	0	54,217
1977	21,344	31,615	481	53,439
1978	30,533	23,773	1,108	55,414
1979	11,547	17,075	318	28,941
1980	59,795	13,069	146	73,010
1981	10,550	40,338	776	51,664
1982	25,567	23,163	2,403	51,133
1983	11,930	14,822	1,057	27,809
1984	19,070	44,540	1,034	64,645

Source: WDF Stock Strength Calculation Summary, 18 April 86; rounding error may be present.

Table D12. South Sound late wild chum brood-year return by age to United States waters.

Brood Year	Age Three	Age Four	Age Five	Brood Return
1965	12,864	16,684	0	29,549
1966	17,563	34,462	0	52,025
1967	14,982	6,757	899	22,637
1968	15,542	51,411	3,128	70,080
1969	7,610	31,769	2,568	41,947
1970	19,972	45,184	0	65,156
1971	13,390	4,962	0	18,352
1972	9,762	20,169	481	30,412
1973	34,048	31,615	1,108	66,771
1974	21,344	23,773	318	45,434
1975	30,533	17,075	146	47,754
1976	11,547	13,069	776	25,392
1977	59,795	40,338	2,403	102,537
1978	10,550	23,163	1,057	34,770
1979	25,567	14,822	1,034	41,423

Source: WDF, 3/87; rounding error may be present.

Table D13. South Puget Sound late wild chum catch and harvest rate by area(s) based on run size entering United States waters.

Run Year	Areas of Catch (4B, 5, 6C) Catch	Rate	(6, 7, 7A) Catch	Rate	(6B, 9) Catch	Rate	(Other Puget Sound) Catch	Rate	Total Harvest Rate	Run Size
1968	0	0.00	0	0.00	1,481	0.03	19,147	0.40	0.43	48,181
1969	0	0.00	0	0.00	0	0.00	14,833	0.42	0.42	35,125
1970	0	0.00	0	0.00	0	0.00	15,376	0.31	0.31	49,444
1971	0	0.00	0	0.00	0	0.00	12,362	0.55	0.55	22,299
1972	0	0.00	0	0.00	0	0.00	25,531	0.43	0.43	59,919
1973	0	0.00	317	0.01	0	0.00	24,727	0.45	0.46	54,869
1974	22	0.00	0	0.00	0	0.00	26,337	0.43	0.43	61,142
1975	32	0.00	55	0.00	10	0.00	4,691	0.32	0.33	14,724
1976	1	0.00	852	0.02	3,830	0.07	26,223	0.48	0.57	54,217
1977	0	0.00	134	0.00	155	0.00	29,560	0.55	0.56	53,439
1978	0	0.00	1,679	0.03	141	0.00	23,986	0.43	0.47	55,414
1979	0	0.00	3	0.00	1,940	0.07	4,385	0.15	0.22	28,941
1980	12	0.00	19	0.00	477	0.01	31,487	0.43	0.44	73,010
1981	1	0.00	0	0.00	0	0.00	20,337	0.39	0.39	51,664
1982	21	0.00	0	0.00	1	0.00	20,534	0.40	0.40	51,133
1983	0	0.00	35	0.00	52	0.00	13,709	0.49	0.50	27,809
1984	20	0.00	0	0.00	0	0.00	30,899	0.48	0.48	64,645

Source: WDF Catch-Escapement Run Size Calculation Summary, 17 June 86; rounding error may be present.

APPENDIX E

HOOD CANAL REGION OF ORIGIN

Table E1. Hood Canal early chum return-year age composition (%) from scale analysis.

Return Year	Age		
	Three	Four	Five
1968	29.8	67.2	3.0
1969	69.2	27.7	3.1
1970	37.6	58.7	3.7
1971	56.8	43.3	0.0
1972	26.8	61.8	11.4
1973	39.6	60.4	0.0
1974	82.5	16.5	0.0
1975	96.4	2.6	0.1
1976	11.2	88.4	0.4
1977	41.3	52.0	6.7
1978	51.9	47.7	0.4
1979	34.7	61.6	1.8
1980	59.3	39.9	0.2
1981	39.4	55.1	3.9
1982	35.9	62.0	1.9
1983	65.5	31.0	3.5
1984	33.3	61.1	0.0

1/ Source: WDF, 3/87; excludes immature two-year-old chum in samples. Rounding error may be present.
2/ 1968-69 and 1971-75 from Big Beef Ck samples.
3/ 1970 average of even year samples 1968-76.
4/ Post 1975 from area(s) 12 prior to week 42.

Table E2. Hood Canal early wild chum return by age to United States waters.

Return Year	Age			
	Three	Four	Five	Total
1968	14,851	33,489	1,495	49,835
1969	11,111	4,454	496	16,063
1970	8,197	12,792	807	21,800
1971	14,973	11,411	0	26,384
1972	14,032	32,357	5,969	52,358
1973	10,108	15,417	0	25,525
1974	11,543	2,302	0	13,991
1975	26,343	717	27	27,327
1976	8,568	67,867	307	76,773
1977	10,671	13,435	1,731	25,837
1978	13,780	12,665	106	26,552
1979	2,686	4,769	142	7,742
1980	9,522	6,407	32	16,058
1981	2,931	4,099	290	7,440
1982	4,355	7,522	231	12,132
1983	4,952	2,344	265	7,561
1984	1,910	3,505	0	5,736

Source: WDF Stock Strength Calculation Summary, 18 April 86; rounding error may be present.

Table E3. Hood Canal early wild chum brood-year return by age to United States waters.

Brood Year	Age			Brood Return
	Three	Four	Five	
1965	14,851	4,454	807	20,112
1966	11,111	12,792	0	23,903
1967	8,197	11,411	5,969	25,577
1968	14,973	32,357	0	47,330
1969	14,032	15,417	0	29,449
1970	10,108	2,302	27	12,437
1971	11,543	717	307	12,567
1972	26,343	67,867	1,731	95,942
1973	8,568	13,435	106	22,109
1974	10,671	12,665	142	23,478
1975	13,780	4,769	32	18,582
1976	2,686	6,407	290	9,384
1977	9,522	4,099	231	13,853
1978	2,931	7,522	265	10,718
1979	4,355	2,344	0	6,699

Source: WDF, 3/87; rounding error may be present.

Table E4. Hood Canal early and normal wild chum spawners, brood return, and return-per-spawner.

Brood year	----Early Timed Stocks----- Spawners	Returns	R/S	----Normal Timed Stocks---- Spawners	Returns	R/S
1968	43,620	47,330	1.09	47,468	59,598	1.26
1969	13,709	29,449	2.15	30,070	97,883	3.26
1970	18,228	12,437	0.68	41,699	62,391	1.50
1971	22,516	12,567	0.56	41,141	92,844	2.26
1972	39,452	95,942	2.43	41,601	28,579	0.69
1973	20,859	22,109	1.06	27,869	116,508	4.18
1974	10,519	23,478	2.23	52,223	114,916	2.20
1975	16,122	18,582	1.15	16,265	353,512	21.73
1976	28,268	9,384	0.33	48,079	29,856	0.62
1977	12,910	13,853	1.07	26,075	77,167	2.96
1978	16,987	10,718	0.63	79,153	73,224	0.93
1979	5,504	6,699	1.22	14,221	89,066	6.26

Source: WDF Puget Sound Escapement Estimates, 17 June 86;
Rounding error may be present.

Table E5. Hood Canal early wild chum catch and harvest rates by area(s) based on run size entering United States waters.

Run Year	Areas of Catch (4B, 5, 6C) Catch	Rate	(6, 7, 7A) Catch	Rate	(6B, 9) Catch	Rate	(Other Puget Sound) Catch	Rate	Total Harvest Rate	Run Size
1968	244	0.00	667	0.01	5,191	0.10	113	0.00	0.12	49,835
1969	110	0.01	710	0.04	1,513	0.09	21	0.00	0.15	16,063
1970	129	0.01	498	0.02	2,878	0.13	67	0.00	0.16	21,800
1971	72	0.00	121	0.00	3,627	0.14	48	0.00	0.15	26,384
1972	113	0.00	534	0.01	12,179	0.23	80	0.00	0.25	52,358
1973	90	0.00	412	0.02	4,128	0.16	36	0.00	0.18	25,525
1974	42	0.00	188	0.01	71	0.01	3,171	0.23	0.25	13,991
1975	130	0.00	1,809	0.07	607	0.02	8,659	0.32	0.41	27,327
1976	221	0.00	4,482	0.06	2,381	0.03	41,421	0.54	0.63	76,773
1977	84	0.00	1,062	0.04	3,186	0.12	8,595	0.33	0.50	25,837
1978	108	0.00	1,131	0.04	2,281	0.09	6,045	0.23	0.36	26,552
1979	78	0.01	325	0.04	21	0.00	1,804	0.23	0.29	7,742
1980	145	0.01	1,517	0.09	22	0.00	9,028	0.56	0.67	16,058
1981	152	0.02	605	0.08	120	0.02	3,682	0.49	0.61	7,440
1982	102	0.01	165	0.01	1	0.00	8,547	0.70	0.73	12,132
1983	50	0.01	71	0.01	223	0.03	5,917	0.78	0.83	7,561
1984	18	0.00	0	0.00	4	0.00	3,675	0.64	0.64	5,736

Source: WDF Catch-Escapement Run Size Calculation Summary, 18 April 86; rounding error may be present.

Table E6. Hood Canal normal chum return-year age composition (%) from scale analysis.

Return Year	Age Three	Four	Five
1968	18.5	79.8	1.7
1969	43.2	55.5	1.3
1970	31.3	68.5	0.2
1971	47.2	52.0	0.8
1972	17.0	80.0	3.0
1973	37.4	55.3	7.3
1974	26.0	71.0	3.0
1975	38.7	59.4	1.9
1976	42.5	45.7	11.9
1977	37.4	62.6	0.0
1978	34.0	65.4	0.6
1979	84.9	2.4	12.6
1980	87.3	12.7	0.0
1981	0.0	97.9	2.1
1982	36.3	59.7	4.0
1983	24.5	65.9	9.6
1984	51.8	48.2	0.0

1/ Source: WDF, 3/87; excludes immature two-year-old chum in samples. Rounding error may be present.
2/ 1969 from Admiralty Inlet samples.
3/ All other years from area(s) 12 samples.
4/ Post 1982 by correction of area(s) 12 samples using hatchery samples.

Table E7. Hood Canal normal wild chum return by age to United States waters.

Return Year	Age Three	Age Four	Age Five	Total
1968	20,500	88,429	1,884	110,813
1969	18,716	24,045	563	43,325
1970	20,483	44,841	131	65,455
1971	28,130	30,991	477	59,598
1972	16,640	78,306	2,936	97,883
1973	23,334	34,502	4,555	62,391
1974	24,139	65,919	2,785	92,844
1975	11,060	16,976	543	28,579
1976	49,467	53,191	13,851	116,392
1977	42,979	71,937	0	114,916
1978	120,194	231,197	2,121	353,512
1979	25,373	717	3,766	29,886
1980	67,367	9,800	0	77,167
1981	0	71,686	1,538	73,224
1982	32,331	53,172	3,563	89,066
1983	11,339	30,500	4,443	46,282
1984	50,142	46,657	0	96,799

Source: WDF Stock Strength Calculation Summary, 18 April 86; rounding error may be present.

Table E8. Hood Canal normal wild chum brood-year return by age to United States waters.

Brood Year	Age			Brood Return
	Three	Four	Five	
1965	20,500	24,045	131	44,677
1966	18,716	24,045	563	43,325
1967	20,483	44,841	131	65,455
1968	28,130	30,991	477	59,598
1969	16,640	78,306	2,936	97,883
1970	23,334	34,502	4,555	62,391
1971	24,139	65,919	2,785	92,844
1972	11,060	16,976	543	28,579
1973	49,467	53,191	13,851	116,508
1974	42,979	71,937	0	114,916
1975	120,194	231,197	2,121	353,512
1976	25,373	717	3,766	29,856
1977	67,367	9,800	0	77,167
1978	0	71,686	1,538	73,224
1979	32,331	53,172	3,563	89,066

Source: WDF, 3/87; rounding error may be present.

Table E9. Hood Canal normal wild chum catch and harvest rates by area(s) based on run size entering United States waters.

Run Year	Areas of Catch (4B, 5, 6C) Catch	Rate	(6, 7, 7A) Catch	Rate	(6B, 9) Catch	Rate	(Other Puget Sound) Catch	Rate	Total Harvest Rate	Run Size
1968	33	0.00	1,231	0.01	46,923	0.42	15,158	0.14	0.57	110,813
1969	106	0.00	722	0.02	7,850	0.18	4,577	0.11	0.31	43,325
1970	0	0.00	730	0.01	12,545	0.19	10,481	0.16	0.36	65,455
1971	12	0.00	528	0.01	10,858	0.18	7,059	0.12	0.31	59,598
1972	14	0.00	4,565	0.05	32,904	0.34	18,799	0.19	0.57	97,883
1973	58	0.00	3,559	0.06	16,260	0.26	14,645	0.23	0.55	62,391
1974	210	0.00	3,091	0.03	105	0.00	37,215	0.40	0.44	92,844
1975	19	0.00	2,242	0.08	716	0.03	9,288	0.32	0.43	28,579
1976	183	0.00	7,147	0.06	19,806	0.17	41,414	0.36	0.59	116,392
1977	507	0.00	1,577	0.01	15,344	0.13	71,525	0.62	0.77	114,916
1978	6,290	0.02	18,484	0.05	8,870	0.03	241,472	0.68	0.78	353,512
1979	75	0.00	48	0.00	227	0.01	15,314	0.51	0.52	29,886
1980	791	0.01	5,462	0.07	2,608	0.03	47,212	0.61	0.73	77,167
1981	47	0.00	12	0.00	7,434	0.10	51,788	0.71	0.81	73,224
1982	189	0.00	980	0.01	17,930	0.20	56,521	0.63	0.85	89,066
1983	754	0.02	32	0.00	7,634	0.16	30,692	0.66	0.85	46,282
1984	823	0.01	23	0.00	100	0.00	72,893	0.75	0.76	96,799

Source: WDF Catch-Escapement Run Size Calculation Summary, 18 April 86; rounding error may be present.

Table E10. Hood Canal normal hatchery chum return-year age composition (%) from scale analysis.

Return Year	Age Three	Four	Five
1968	18.5	79.8	1.7
1969	43.2	55.5	1.3
1970	31.3	68.5	0.2
1971	47.2	52.0	0.8
1972	17.0	80.0	3.0
1973	37.4	55.3	7.3
1974	26.0	71.0	3.0
1975	29.0	71.0	0.0
1976	17.3	82.4	0.3
1977	40.1	54.3	5.6
1978	27.0	72.3	0.7
1979	22.6	76.3	1.1
1980	65.7	33.4	0.9
1981	42.4	56.3	1.3
1982	48.0	51.6	0.4
1983	21.5	70.0	8.1
1984	41.8	55.3	2.9

1/ Source: WDF, 3/87; excludes immature two-year-old chum in samples. Rounding error may be present.
2/ 1969 from Admiralty Inlet samples.
3/ 1968 and 1970-74 from area(s) 12 samples.
4/ Post 1974 from area 12D and/or hatchery samples.

Table E11. Hood Canal normal hatchery chum return by age to United States waters.

Return Year	Age			
	Three	Four	Five	Total
1968	2,204	9,505	202	11,911
1969	4,058	5,213	122	9,393
1970	6,113	13,381	39	19,533
1971	7,171	7,900	122	15,192
1972	3,534	16,632	624	20,790
1973	11,216	16,583	2,189	29,988
1974	11,387	31,094	1,314	43,795
1975	5,434	13,304	0	18,738
1976	12,471	59,399	216	72,086
1977	39,181	53,055	5,472	97,707
1978	66,849	179,280	1,733	247,864
1979	21,443	72,393	1,044	94,879
1980	94,109	47,842	1,289	143,240
1981	36,564	48,491	1,116	86,176
1982	87,656	94,328	730	182,807
1983	33,018	107,500	12,490	153,571
1984	121,601	160,582	8,437	290,619

Source: WDF Stock Strength Calculation Summary, 18 April 86; rounding error may be present.

Table E12. Hood Canal normal hatchery chum brood-year return by age to United States waters.

Brood Year	Age			Brood Return
	Three	Four	Five	
1965	2,204	5,213	39	7,456
1966	4,058	5,213	122	9,393
1967	6,113	13,381	39	19,533
1968	7,171	7,900	122	15,192
1969	3,534	16,632	624	20,790
1970	11,216	16,583	2,189	29,988
1971	11,387	31,094	1,314	43,795
1972	5,434	13,304	0	18,738
1973	12,471	59,399	216	72,086
1974	39,181	53,055	5,472	97,707
1975	66,849	179,280	1,733	247,862
1976	21,443	72,393	1,044	94,879
1977	94,109	47,842	1,289	143,240
1978	36,564	48,491	1,116	86,172
1979	87,656	94,328	730	182,715

Source: WDF, 3/87; rounding error may be present.

APPENDIX F

PUGET SOUND COMMERCIAL CHUM SALMON CATCHES

BY AREA AND GEAR

1970-1984

1970 PUGET SOUND COMMERCIAL CHUM SALMON CATCHES

AREA DESCRIPTION	NON-INDIAN				INDIAN					
	GILL NET	PURSE SEINE	OTHER	SUBTOTAL	GILL NET	PURSE SEINE	TROLL	OTHER	SUBTOTAL	TOTAL
PRE-TERMINAL										
4B (Tatoosh-Sail Rock)	719	2	2	723	82				82	805
5 (Clallam Bay)	213	16		229					0	229
6 (Partridge Bank)				0					0	0
6A (West Beach)	1061	1503		2564					0	2564
6C (Port Angeles)	5			5					0	5
SUBTOTAL	1998	1521	2	3521	82	0	0	0	82	3603
7 (San Juans)	8347	11154	839	20340					0	20340
7A (Point Roberts)	31984	23134		55118					0	55118
SUBTOTAL	40331	34288	839	75458	0	0	0	0	0	75458
6B (Discovery Bay)	6411	5586		11997					0	11997
9 (Admiralty Inlet)	15714	31595		47309					0	47309
SUBTOTAL	22125	37181	0	59306	0	0	0	0	0	59306
GRAND TOTAL: PRE-TERMINAL	64454	72990	841	138285	82	0	0	0	82	138367
TERMINAL										
Strait--										
6D (Dungeness Bay)				0					0	0
Strait Rivers				0	23				23	23
SUBTOTAL: Strait term.	0	0	0	0	23	0	0	0	23	23
7E (East Sound)				0					0	0
Nooksack/Samish--										
7B (Bellingham Bay)	5			5					0	5
7C (Samish Bay)	1			1					0	1
7D (Lummi Bay)				0					0	0
Nooksack River				0	4465				4465	4465
Samish River				0					0	0
SUBTOTAL: Nook./Sam. term.	6	0	0	6	4465	0	0	0	4465	4471
Skagit--										
8 (Skagit Bay)	2824	8		2832	503			439	942	3774
Skagit River				0					0	0
SUBTOTAL: Skagit term.	2824	8	0	2832	503	0	0	439	942	3774
Stillaguamish/Snohomish--										
8A (Port Susan/Port Gardner)	3007			3007	2016			1699	3715	6722
8D (Tulalip Bay)				0					0	0
Stillaguamish River				0					0	0
Snohomish River				0					0	0
SUBTOTAL: Stilly/Snoh. term.	3007	0	0	3007	2016	0	0	1699	3715	6722
South Sound--										
10 (Seattle)	17502	7734		25236					0	25236
11 (East-West Passage)	6137	7996		14133					0	14133
SUBTOTAL	23639	15730	0	39369	0	0	0	0	0	39369
10A (Elliott Bay)				0					0	0
10E (East Kitsap)				0					0	0
11A (Commencement Bay)				0					0	0
13 (Nisqually Reach)				0					0	0
13A (Carr Inlet)	2	4		6					0	6
13C-K (South Sound Inlets)				0	1077				1077	1077
SUBTOTAL S.S. marine ext. term.	2	4	0	6	1077	0	0	0	1077	1083
SUBTOTAL S.S. marine term.	23641	15734	0	39375	1077	0	0	0	1077	40452
10B&F=10B (N. Lk. Wash. & Canal)				0					0	0
10C (S. Lk. Washington)				0					0	0
10D (Lake Sammamish)				0					0	0
Green-Duwamish River				0					0	0
Puyallup River				0	22				22	22
White River				0					0	0
Nisqually River				0	13566				13566	13566
Misc. freshwater				0					0	0
SUBTOTAL: S.S. freshwater	0	0	0	0	13588	0	0	0	13588	13588
SUBTOTAL: S.S. terminal	23641	15734	0	39375	14665	0	0	0	14665	54040
Hood Canal--										
12 (Upper H.C.)				0					0	0
12B (Central H.C.)				0					0	0
SUBTOTAL:	0	0	0	0	0	0	0	0	0	0
12A (Quilcene-Dabob Bays)				0					0	0
12C (Lower Hood Canal)				0					0	0
12D (SE Hood Canal)				0					0	0
9A (Port Gamble)				0					0	0
SUBTOTAL: H.C. marine ext. term.	0	0	0	0	0	0	0	0	0	0
SUBTOTAL: marine terminal	0	0	0	0	0	0	0	0	0	0
Skokomish River				0	10254				10254	10254
Quilcene River				0					0	0
Misc. freshwater				0					0	0
SUBTOTAL: H.C. freshwater	0	0	0	0	10254	0	0	0	10254	10254
SUBTOTAL: H.C. terminal	0	0	0	0	10254	0	0	0	10254	10254
TOTAL: Terminal Marine	29478	15742	0	45220	3596	0	0	2138	5734	50954
TOTAL: Terminal Freshwater	0	0	0	0	28330	0	0	0	28330	28330
GRAND TOTAL TERMINAL	29478	15742	0	45220	31926	0	0	2138	34064	79284
GRAND TOTAL PRE-TERMINAL	64454	72990	841	138285	82	0	0	0	82	138367
GRAND TOTAL COMMERCIAL	93932	88732	841	183505	32008	0	0	2138	34146	217651

1971 PUGET SOUND COMMERCIAL CHUM SALMON CATCHES

AREA DESCRIPTION	NON-INDIAN				INDIAN					
	GILL NET	PURSE SEINE	OTHER	SUBTOTAL	GILL NET	PURSE SEINE	TROLL	OTHER	SUBTOTAL	TOTAL
PRE-TERMINAL										
4B (Tatoosh-Sail Rock)	406	1	4	411	138				138	549
5 (Clallam Bay)	54			54					0	54
6 (Partridge Bank)				0					0	0
6A (West Beach)	729	536		1265					0	1265
6C (Port Angeles)	1			1					0	1
SUBTOTAL	1190	537	4	1731	138	0	0	0	138	1869
7 (San Juans)	2446	9914	684	13044	9				9	13053
7A (Point Roberts)	8571	5209		13780	115				115	13895
SUBTOTAL	11017	15123	684	26824	124	0	0	0	124	26948
6B (Discovery Bay)	5833	4771		10604	6				6	10610
9 (Admiralty Inlet)	14786	18184		32970	73				73	33043
SUBTOTAL	20619	22955	0	43574	79	0	0	0	79	43653
GRAND TOTAL: PRE-TERMINAL	32826	38615	688	72129	341	0	0	0	341	72470
TERMINAL										
Strait--										
6D (Dungeness Bay)				0					0	0
Strait Rivers				0	5				5	5
SUBTOTAL: Strait term.	0	0	0	0	5	0	0	0	5	5
7E (East Sound)				0					0	0
Nooksack/Samish--										
7B (Bellingham Bay)				0					0	0
7C (Samish Bay)				0					0	0
7D (Lummi Bay)				0					0	0
Nooksack River				0	3310				3310	3310
Samish River				0					0	0
SUBTOTAL: Nook./Sam. term.	0	0	0	0	3310	0	0	0	3310	3310
Skagit--										
8 (Skagit Bay)	265			265	767			281	1048	1313
Skagit River				0					0	0
SUBTOTAL: Skagit term.	265	0	0	265	767	0	0	281	1048	1313
Stillaguamish/Snohomish--										
8A (Port Susan/Port Gardner)	202	2		204	246			118	364	568
8D (Tulalip Bay)				0					0	0
Stillaguamish River				0					0	0
Snohomish River				0					0	0
SUBTOTAL: Stilly/Snoh. term.	202	2	0	204	246	0	0	118	364	568
South Sound--										
10 (Seattle)	34745	12645		47390	33				33	47423
11 (East-West Passage)	3177	586		3763					0	3763
SUBTOTAL	37922	13231	0	51153	33	0	0	0	33	51186
10A (Elliott Bay)				0					0	0
10E (East Kitsap)				0					0	0
11A (Commencement Bay)				0					0	0
13 (Nisqually Reach)				0					0	0
13A (Carr Inlet)		100		100					0	100
13C-K (South Sound Inlets)				0	1986				1986	1986
SUBTOTAL S.S. marine ext. term.	0	100	0	100	1986	0	0	0	1986	2086
SUBTOTAL S.S. marine term.	37922	13331	0	51253	2019	0	0	0	2019	53272
10G&F=10B (N. Lk. Wash. & Canal)				0					0	0
10C (S. Lk. Washington)				0					0	0
10D (Lake Sammamish)				0					0	0
Green-Duwamish River				0					0	0
Puyallup River				0	92				92	92
White River				0					0	0
Nisqually River				0	13663				13663	13663
Misc. freshwater				0					0	0
SUBTOTAL: S.S. freshwater	0	0	0	0	13755	0	0	0	13755	13755
SUBTOTAL: S.S. terminal	37922	13331	0	51253	15774	0	0	0	15774	67027
Hood Canal--										
12 (Upper H.C.)				0					0	0
12B (Central H.C.)				0					0	0
SUBTOTAL:	0	0	0	0	0	0	0	0	0	0
12A (Quilcene-Dabob Bays)				0					0	0
12C (Lower Hood Canal)				0					0	0
12D (SE Hood Canal)				0					0	0
9A (Port Gamble)				0					0	0
SUBTOTAL: H.C. marine ext. term.	0	0	0	0	0	0	0	0	0	0
SUBTOTAL: marine terminal	0	0	0	0	0	0	0	0	0	0
Skokomish River				0	6693				6693	6693
Quilcene River				0					0	0
Misc. freshwater				0					0	0
SUBTOTAL: H.C. freshwater	0	0	0	0	6693	0	0	0	6693	6693
SUBTOTAL: H.C. terminal	0	0	0	0	6693	0	0	0	6693	6693
TOTAL: Terminal Marine	38389	13333	0	51722	3032	0	0	399	3431	55153
TOTAL: Terminal Freshwater	0	0	0	0	23763	0	0	0	23763	23763
GRAND TOTAL TERMINAL	38389	13333	0	51722	26795	0	0	399	27194	78916
GRAND TOTAL PRE-TERMINAL	32826	38615	688	72129	341	0	0	0	341	72470
GRAND TOTAL COMMERCIAL	71215	51948	688	123851	27136	0	0	399	27535	151386

1972 PUGET SOUND COMMERCIAL CHUM SALMON CATCHES

	NON-INDIAN				INDIAN					
AREA DESCRIPTION	GILL NET	PURSE SEINE	OTHER	SUBTOTAL	GILL NET	PURSE SEINE	TROLL	OTHER	SUBTOTAL	TOTAL
PRE-TERMINAL										
4B (Tatoosh-Sail Rock)	1178		2	1180	315				315	1495
5 (Clallam Bay)	369			369					0	369
6 (Partridge Bank)				0					0	0
6A (West Beach)	6655	4254		10909					0	10909
6C (Port Angeles)	10			10					0	10
SUBTOTAL	8212	4254	2	12468	315	0	0	0	315	12783
7 (San Juans)	29133	131544	2886	163563	21				21	163584
7A (Point Roberts)	79780	97042	121	176943	825				825	177768
SUBTOTAL	108913	228586	3007	340506	846	0	0	0	846	341352
6B (Discovery Bay)	27906	11288		39194					0	39194
9 (Admiralty Inlet)	89329	73235		162564	215				215	162779
SUBTOTAL	117235	84523	0	201758	215	0	0	0	215	201973
GRAND TOTAL: PRE-TERMINAL	234360	317363	3009	554732	1376	0	0	0	1376	556108
TERMINAL										
Strait--										
6D (Dungeness Bay)				0					0	0
Strait Rivers				0	116				116	116
SUBTOTAL: Strait term.	0	0	0	0	116	0	0	0	116	116
7E (East Sound)				0					0	0
Nooksack/Samish--										
7B (Bellingham Bay)		56		56					0	56
7C (Samish Bay)				0					0	0
7D (Lummi Bay)				0					0	0
Nooksack River	718			718	1921				1921	2639
Samish River				0					0	0
SUBTOTAL: Nook./Sam. term.	718	56	0	774	1921	0	0	0	1921	2695
Skagit--										
8 (Skagit Bay)	5545	381		5926	1462			253	1715	7641
Skagit River				0					0	0
SUBTOTAL: Skagit term.	5545	381	0	5926	1462	0	0	253	1715	7641
Stillaguamish/Snohomish--										
8A (Port Susan/Port Gardner)	3704	26		3730	6656			508	7164	10894
8D (Tulalip Bay)				0					0	0
Stillaguamish River				0					0	0
Snohomish River				0					0	0
SUBTOTAL: Stilly/Snoh. term.	3704	26	0	3730	6656	0	0	508	7164	10894
South Sound--										
10 (Seattle)	93833	16465		110298	681				681	110979
11 (East-West Passage)	39888	20861		60749					0	60749
SUBTOTAL	133721	37326	0	171047	681	0	0	0	681	171728
10A (Elliott Bay)				0					0	0
10E (East Kitsap)				0					0	0
11A (Commencement Bay)				0					0	0
13 (Nisqually Reach)				0					0	0
13A (Carr Inlet)		85		85					0	85
13C-K (South Sound Inlets)				0	3641				3641	3641
SUBTOTAL S.S. marine ext. term.	0	85	0	85	3641	0	0	0	3641	3726
SUBTOTAL S.S. marine term.	133721	37411	0	171132	4322	0	0	0	4322	175454
10G&F=10B (N. Lk. Wash. & Canal)				0					0	0
10C (S. Lk. Washington)				0					0	0
10D (Lake Sammamish)				0					0	0
Green-Duwamish River				0	20				20	20
Puyallup River				0	78				78	78
White River				0					0	0
Nisqually River				0	16213				16213	16213
Misc. freshwater				0					0	0
SUBTOTAL: S.S. freshwater	0	0	0	0	16311	0	0	0	16311	16311
SUBTOTAL: S.S. terminal	133721	37411	0	171132	20633	0	0	0	20633	191765
Hood Canal--										
12 (Upper H.C.)				0					0	0
12B (Central H.C.)				0					0	0
SUBTOTAL:	0	0	0	0	0	0	0	0	0	0
12A (Quilcene-Dabob Bays)				0					0	0
12C (Lower Hood Canal)				0					0	0
12D (SE Hood Canal)				0					0	0
9A (Port Gamble)				0					0	0
SUBTOTAL: H.C. marine ext. term.	0	0	0	0	0	0	0	0	0	0
SUBTOTAL: marine terminal	0	0	0	0	0	0	0	0	0	0
Skokomish River				0	18942				18942	18942
Quilcene River				0					0	0
Misc. freshwater				0					0	0
SUBTOTAL: H.C. freshwater	0	0	0	0	18942	0	0	0	18942	18942
SUBTOTAL: H.C. terminal	0	0	0	0	18942	0	0	0	18942	18942
TOTAL: Terminal Marine	142970	37874	0	180844	12440	0	0	761	13201	194045
TOTAL: Terminal Freshwater	718	0	0	718	37290	0	0	0	37290	38008
GRAND TOTAL TERMINAL	143688	37874	0	181562	49730	0	0	761	50491	232053
GRAND TOTAL PRE-TERMINAL	234360	317363	3009	554732	1376	0	0	0	1376	556108
GRAND TOTAL COMMERCIAL	378048	355237	3009	736294	51106	0	0	761	51867	788161

1973 PUGET SOUND COMMERCIAL CHUM SALMON CATCHES

AREA DESCRIPTION	NON-INDIAN				INDIAN					
	GILL NET	PURSE SEINE	OTHER	SUBTOTAL	GILL NET	PURSE SEINE	TROLL	OTHER	SUBTOTAL	TOTAL
PRE-TERMINAL										
4B (Tatoosh-Sail Rock)	736			736	813				813	1549
5 (Clallam Bay)	394	61		455	5				5	460
6 (Partridge Bank)				0					0	0
6A (West Beach)	709	234		943					0	943
6C (Port Angeles)				0					0	0
SUBTOTAL	1839	295	0	2134	818	0	0	0	818	2952
7 (San Juans)	55432	77140	3164	135736	4				4	135740
7A (Point Roberts)	77145	60469		137614	591				591	138205
SUBTOTAL	132577	137609	3164	273350	595	0	0	0	595	273945
6B (Discovery Bay)	11163	10540		21703					0	21703
9 (Admiralty Inlet)	25647	45336		70983	37				37	71020
SUBTOTAL	36810	55876	0	92686	37	0	0	0	37	92723
GRAND TOTAL: PRE-TERMINAL	171226	193780	3164	368170	1450	0	0	0	1450	369620
TERMINAL										
Strait--										
6D (Dungeness Bay)				0					0	0
Strait Rivers				0	173				173	173
SUBTOTAL: Strait term.	0	0	0	0	173	0	0	0	173	173
7E (East Sound)				0					0	0
Nooksack/Samish--										
7B (Bellingham Bay)		4		4					0	4
7C (Samish Bay)				0	178				178	178
7D (Lummi Bay)				0					0	0
Nooksack River	31			31	15029				15029	15060
Samish River				0					0	0
SUBTOTAL: Nook./Sam. term.	31	4	0	35	15207	0	0	0	15207	15242
Skagit--										
8 (Skagit Bay)	83	6		89	2398			79	2477	2566
Skagit River				0					0	0
SUBTOTAL: Skagit term.	83	6	0	89	2398	0	0	79	2477	2566
Stillaguamish/Snohomish--										
8A (Port Susan/Port Gardner)	720	40		760	4086			84	4170	4930
8D (Tulalip Bay)				0					0	0
Stillaguamish River				0					0	0
Snohomish River				0					0	0
SUBTOTAL: Stilly/Snoh. term.	720	40	0	760	4086	0	0	84	4170	4930
South Sound--										
10 (Seattle)	41696	12885		54581	307				307	54888
11 (East-West Passage)	18097	20586		38683	28				28	38711
SUBTOTAL	59793	33471	0	93264	335	0	0	0	335	93599
10A (Elliott Bay)				0					0	0
10E (East Kitsap)				0					0	0
11A (Commencement Bay)				0					0	0
13 (Nisqually Reach)				0					0	0
13A (Carr Inlet)		49		49					0	49
13C-K (South Sound Inlets)				0	3974				3974	3974
SUBTOTAL S.S. marine ext. term.	0	49	0	49	3974	0	0	0	3974	4023
SUBTOTAL S.S. marine term.	59793	33520	0	93313	4309	0	0	0	4309	97622
10G&F-10I (N. Lk. Wash. & Canal)				0					0	0
10C (S. Lk. Washington)				0					0	0
10D (Lake Sammamish)				0					0	0
Green-Duwamish River				0	227				227	227
Puyallup River				0	481				481	481
White River				0	5				5	5
Nisqually River				0	29528				29528	29528
Misc. freshwater				0					0	0
SUBTOTAL: S.S. freshwater	0	0	0	0	30241	0	0	0	30241	30241
SUBTOTAL: S.S. terminal	59793	33520	0	93313	34550	0	0	0	34550	127863
Hood Canal--										
12 (Upper H.C.)				0					0	0
12B (Central H.C.)				0					0	0
SUBTOTAL:	0	0	0	0	0	0	0	0	0	0
12A (Quilcene-Dabob Bays)				0					0	0
12C (Lower Hood Canal)				0					0	0
12D (SE Hood Canal)				0					0	0
9A (Port Gamble)				0					0	0
SUBTOTAL: H.C. marine ext. term.	0	0	0	0	0	0	0	0	0	0
SUBTOTAL: marine terminal	0	0	0	0	0	0	0	0	0	0
Skokomish River				0	14638				14638	14638
Quilcene River				0					0	0
Misc. freshwater				0					0	0
SUBTOTAL: H.C. freshwater	0	0	0	0	14638	0	0	0	14638	14638
SUBTOTAL: H.C. terminal	0	0	0	0	14638	0	0	0	14638	14638
TOTAL: Terminal Marine	60596	33570	0	94166	10971	0	0	163	11134	105300
TOTAL: Terminal Freshwater	31	0	0	31	60081	0	0	0	60081	60112
GRAND TOTAL TERMINAL	60627	33570	0	94197	71052	0	0	163	71215	165412
GRAND TOTAL PRE-TERMINAL	171226	193780	3164	368170	1450	0	0	0	1450	369620
GRAND TOTAL COMMERCIAL	231853	227350	3164	462367	72502	0	0	163	72665	535032

1974 PUGET SOUND COMMERCIAL CHUM SALMON CATCHES

AREA DESCRIPTION	NON-INDIAN				INDIAN					
	GILL NET	PURSE SEINE	OTHER	SUBTOTAL	GILL NET	PURSE SEINE	TROLL	OTHER	SUBTOTAL	TOTAL
PRE-TERMINAL										
4B (Tatoosh-Sail Rock)	69			69	3651				3651	3720
5 (Clallam Bay)	8			8	128				128	136
6 (Partridge Bank)				0					0	0
6A (West Beach)	17	35		52	7				7	59
6C (Port Angeles)	120			120	22				22	142
SUBTOTAL	214	35	0	249	3808	0	0	0	3808	4057
7 (San Juans)	58402	43464	2935	104801	619				619	105420
7A (Point Roberts)	70372	24007	9	94388	1319				1319	95707
SUBTOTAL	128774	67471	2944	199189	1938	0	0	0	1938	201127
6B (Discovery Bay)	474	55		529	107				107	636
9 (Admiralty Inlet)	3462	7489		10951					0	10951
SUBTOTAL	3936	7544	0	11480	107	0	0	0	107	11587
GRAND TOTAL: PRE-TERMINAL	132924	75050	2944	210918	5853	0	0	0	5853	216771
TERMINAL										
Strait--										
6D (Dungeness Bay)				0					0	0
Strait Rivers				0	470				470	470
SUBTOTAL: Strait term.	0	0	0	0	470	0	0	0	470	470
7E (East Sound)				0					0	0
Nooksack/Samish--										
7B (Bellingham Bay)		440		440					0	440
7C (Samish Bay)				0	84				84	84
7D (Lummi Bay)				0					0	0
Nooksack River	3			3	10419				10419	10422
Samish River				0					0	0
SUBTOTAL: Nook./Sam. term.	3	440	0	443	10503	0	0	0	10503	10946
Skagit--										
8 (Skagit Bay)	1362	48		1410	8169			96	8265	9675
Skagit River				0	4573				4573	4573
SUBTOTAL: Skagit term.	1362	48	0	1410	12742	0	0	96	12838	14248
Stillaguamish/Snohomish--										
8A (Port Susan/Port Gardner)	1427	4		1431	17773			437	18210	19641
8D (Tulalip Bay)				0					0	0
Stillaguamish River				0					0	0
Snohomish River				0					0	0
SUBTOTAL: Stilly/Snoh. term.	1427	4	0	1431	17773	0	0	437	18210	19641
South Sound--										
10 (Seattle)	1722	12617		14339	24519				24519	38858
11 (East-West Passage)	301	713		1014	3317				3317	4331
SUBTOTAL	2023	13330	0	15353	27836	0	0	0	27836	43189
10A (Elliott Bay)				0					0	0
10E (East Kitsap)				0					0	0
11A (Commencement Bay)				0					0	0
13 (Nisqually Reach)				0					0	0
13A (Carr Inlet)	239	15		254	4662				4662	4916
13C-K (South Sound Inlets)				0	24129				24129	24129
SUBTOTAL S.S. marine ext. term.	239	15	0	254	28791	0	0	0	28791	29045
SUBTOTAL S.S. marine term.	2262	13345	0	15607	56627	0	0	0	56627	72234
10G&F=10B (N. Lk. Wash. & Canal)				0	26				26	26
10C (S. Lk. Washington)				0					0	0
10D (Lake Sammamish)				0					0	0
Green-Duwamish River				0	609				609	609
Puyallup River				0	1495				1495	1495
White River				0					0	0
Nisqually River				0	24269				24269	24269
Misc. freshwater				0					0	0
SUBTOTAL: S.S. freshwater	0	0	0	0	26399	0	0	0	26399	26399
SUBTOTAL: S.S. terminal	2262	13345	0	15607	83026	0	0	0	83026	98633
Hood Canal--										
12 (Upper H.C.)				0					0	0
12B (Central H.C.)				0					0	0
SUBTOTAL:	0	0	0	0	0	0	0	0	0	0
12A (Quilcene-Dabob Bays)				0					0	0
12C (Lower Hood Canal)				0	14158				14158	14158
12D (SE Hood Canal)				0					0	0
9A (Port Gamble)				0					0	0
SUBTOTAL: H.C. marine ext. term.	0	0	0	0	14158	0	0	0	14158	14158
SUBTOTAL: marine terminal	0	0	0	0	14158	0	0	0	14158	14158
Skokomish River				0	21245				21245	21245
Quilcene River				0					0	0
Misc. freshwater				0					0	0
SUBTOTAL: H.C. freshwater	0	0	0	0	21245	0	0	0	21245	21245
SUBTOTAL: H.C. terminal	0	0	0	0	35403	0	0	0	35403	35403
TOTAL: Terminal Marine	5051	13837	0	18888	96811	0	0	533	97344	116232
TOTAL: Terminal Freshwater	3	0	0	3	63106	0	0	0	63106	63109
GRAND TOTAL TERMINAL	5054	13837	0	18891	159917	0	0	533	160450	179341
GRAND TOTAL PRE-TERMINAL	132924	75050	2944	210918	5853	0	0	0	5853	216771
GRAND TOTAL COMMERCIAL	137978	88887	2944	229809	165770	0	0	533	166303	396112

1975 PUGET SOUND COMMERCIAL CHUM SALMON CATCHES

AREA DESCRIPTION	NON-INDIAN				INDIAN					
	GILL NET	PURSE SEINE	OTHER	SUBTOTAL	GILL NET	PURSE SEINE	TROLL	OTHER	SUBTOTAL	TOTAL
PRE-TERMINAL										
4B (Tatoosh-Sail Rock)	353		3	356	407		9		416	772
5 (Clallam Bay)	9			9	38				38	47
6 (Partridge Bank)				0					0	0
6A (West Beach)	407	433		840	101				101	941
6C (Port Angeles)				0					0	0
SUBTOTAL	769	433	3	1205	546	0	9	0	555	1760
7 (San Juans)	20501	19934	939	41374	555	34			589	41963
7A (Point Roberts)	34709	15691	99	50499	179	79			258	50757
SUBTOTAL	55210	35625	1038	91873	734	113	0	0	847	92720
6B (Discovery Bay)	336			336					0	336
9 (Admiralty Inlet)	1069	232		1301	723	1328			2051	3352
SUBTOTAL	1405	232	0	1637	723	1328	0	0	2051	3688
GRAND TOTAL: PRE-TERMINAL	57384	36290	1041	94715	2003	1441	9	0	3453	98168
TERMINAL										
Strait--										
6D (Dungeness Bay)				0	397				397	397
Strait Rivers				0	380			29	409	409
SUBTOTAL: Strait term.	0	0	0	0	777	0	0	29	806	806
7E (East Sound)				0					0	0
Nooksack/Samish--										
7B (Bellingham Bay)	6	3		9	5651	104			5755	5764
7C (Samish Bay)	31	1		32	235				235	267
7D (Lummi Bay)				0	63	12			75	75
Nooksack River				0	1052				1052	1052
Samish River				0					0	0
SUBTOTAL: Nook./Sam. term.	37	4	0	41	7001	116	0	0	7117	7158
Skagit--										
8 (Skagit Bay)	197	5		202	1311			172	1483	1685
Skagit River				0	316				316	316
SUBTOTAL: Skagit term.	197	5	0	202	1627	0	0	172	1799	2001
Stillaguamish/Snohomish--										
8A (Port Susan/Port Gardner)	70	10		80	1242	1		2	1245	1325
8D (Tulalip Bay)				0					0	0
Stillaguamish River				0					0	0
Snohomish River				0					0	0
SUBTOTAL: Stilly/Snoh. term.	70	10	0	80	1242	1	0	2	1245	1325
South Sound--										
10 (Seattle)	972	224		1196	4156	975			5131	6327
11 (East-West Passage)	736	274		1010	5471	8			5479	6489
SUBTOTAL	1708	498	0	2206	9627	983	0	0	10610	12816
10A (Elliott Bay)	714	71		785	1567				1567	2352
10E (East Kitsap)	19			19	1891	32			1923	1942
11A (Commencement Bay)	16	27		43	162				162	205
13 (Nisqually Reach)				0					0	0
13A (Carr Inlet)	504	46		550	2718				2718	3268
13C-K (South Sound Inlets)	1			1	4830				4830	4831
SUBTOTAL S.S. marine ext. term.	1254	144	0	1398	11168	32	0	0	11200	12598
SUBTOTAL S.S. marine term.	2962	642	0	3604	20795	1015	0	0	21810	25414
10G&F=108 (N. Lk. Wash. & Canal)				0	44				44	44
10C (S. Lk. Washington)				0					0	0
10D (Lake Sammamish)				0	96				96	96
Green-Duwamish River				0	116				116	116
Puyallup River				0	375				375	375
White River				0	1				1	1
Nisqually River				0	20979			1	20980	20980
Misc. freshwater				0					0	0
SUBTOTAL: S.S. freshwater	0	0	0	0	21611	0	0	1	21612	21612
SUBTOTAL: S.S. terminal	2962	642	0	3604	42406	1015	0	1	43422	47026
Hood Canal--										
12 (Upper H.C.)				0					0	0
12B (Central H.C.)				0					0	0
SUBTOTAL:	0	0	0	0	0	0	0	0	0	0
12A (Quilcene-Dabob Bays)	43	1		44	379	268			647	691
12C (Lower Hood Canal)	1382	3019		4401	7030	371			7401	11802
12D (SE Hood Canal)				0	59	52			111	111
9A (Port Gamble)				0					0	0
SUBTOTAL: H.C. marine ext. term.	1425	3020	0	4445	7468	691	0	0	8159	12604
SUBTOTAL: marine terminal	1425	3020	0	4445	7468	691	0	0	8159	12604
Skokomish River				0	6462				6462	6462
Quilcene River				0					0	0
Misc. freshwater				0					0	0
SUBTOTAL: H.C. freshwater	0	0	0	0	6462	0	0	0	6462	6462
SUBTOTAL: H.C. terminal	1425	3020	0	4445	13930	691	0	0	14621	19066
TOTAL: Terminal Marine	4691	3681	0	8372	37162	1823	0	174	39159	47531
TOTAL: Terminal Freshwater	0	0	0	0	29821	0	0	30	29851	29851
GRAND TOTAL TERMINAL	4691	3681	0	8372	66983	1823	0	204	69010	77382
GRAND TOTAL PRE-TERMINAL	57384	36290	1041	94715	2003	1441	9	0	3453	98168
GRAND TOTAL COMMERCIAL	62075	39971	1041	103087	68986	3264	9	204	72463	175550

1976 PUGET SOUND COMMERCIAL CHUM SALMON CATCHES

	NON-INDIAN				INDIAN					
AREA DESCRIPTION	GILL NET	PURSE SEINE	OTHER	SUBTOTAL	GILL NET	PURSE SEINE	TROLL	OTHER	SUBTOTAL	TOTAL
PRE-TERMINAL										
4B (Tatoosh-Sail Rock)	134			134	1890				1890	2024
5 (Clallam Bay)	178			178	528				528	706
6 (Partridge Bank)				0					0	0
6A (West Beach)	10			10	643	767			1410	1420
6C (Port Angeles)	469			469	320				320	789
SUBTOTAL	791	0	0	791	3381	767	0	0	4148	4939
7 (San Juans)	68733	71735	3003	143471	16321	11539			27860	171331
7A (Point Roberts)	35724	66331		102055	1953	1877			3830	105885
SUBTOTAL	104457	138066	3003	245526	18274	13416	0	0	31690	277216
6B (Discovery Bay)	22094			22094	758	4			762	22856
9 (Admiralty Inlet)	72116			72116	5191	1114			6305	78421
SUBTOTAL	94210	0	0	94210	5949	1118	0	0	7067	101277
GRAND TOTAL: PRE-TERMINAL	199458	138066	3003	340527	27604	15301	0	0	42905	383432
TERMINAL										
Strait--										
6D (Dungeness Bay)	32			32	472				472	504
Strait Rivers				0	1779			56	1835	1835
SUBTOTAL: Strait term.	32	0	0	32	2251	0	0	56	2307	2339
7E (East Sound)				0					0	0
Nooksack/Samish--										
7B (Bellingham Bay)	2668	653		3321	13673	10			13683	17004
7C (Samish Bay)	55	156		211	560	42			602	813
7D (Lummi Bay)				0					0	0
Nooksack River				0	338				338	338
Samish River				0					0	0
SUBTOTAL: Nook./Sam. term.	2723	809	0	3532	14571	52	0	0	14623	18155
Skagit--										
8 (Skagit Bay)	6962	4315		11277	11552	1825		208	13585	24862
Skagit River				0	7019				7019	7019
SUBTOTAL: Skagit term.	6962	4315	0	11277	18571	1825	0	208	20604	31881
Stillaguamish/Snohomish--										
8A (Port Susan/Port Gardner)	638	1873		2511	20163	760		1344	22267	24778
8D (Tulalip Bay)				0					0	0
Stillaguamish River				0	171				171	171
Snohomish River				0					0	0
SUBTOTAL: Stilly/Snoh. term.	638	1873	0	2511	20334	760	0	1344	22438	24949
South Sound--										
10 (Seattle)	48478	18039		66517	16608	21081			37689	104206
11 (East-West Passage)	16907	18005		34912	1705				1705	36617
SUBTOTAL	65385	36044	0	101429	18313	21081	0	0	39394	140823
10A (Elliott Bay)	386	308		694	11742	49			11791	12485
10E (East Kitsap)				0	1244				1244	1244
11A (Commencement Bay)	10	12		22	1098				1098	1120
13 (Nisqually Reach)				0					0	0
13A (Carr Inlet)	24			24	11624	329		70	12023	12047
13C-K (South Sound Inlets)	246			246	26959			1147	28106	28352
SUBTOTAL S.S. marine ext. term.	666	320	0	986	52667	378	0	1217	54262	55248
SUBTOTAL S.S. marine term.	66051	36364	0	102415	70980	21459	0	1217	93656	196071
10G&F=10B (N. Lk. Wash. & Canal)				0	20				20	20
10C (S. Lk. Washington)				0					0	0
10D (Lake Sammamish)				0	1				1	1
Green-Duwamish River				0	639				639	639
Puyallup River				0	759				759	759
White River				0	20				20	20
Nisqually River				0	9938				9938	9938
Misc. freshwater				0					0	0
SUBTOTAL: S.S. freshwater	0	0	0	0	11377	0	0	0	11377	11377
SUBTOTAL: S.S. terminal	66051	36364	0	102415	82357	21459	0	1217	105033	207448
Hood Canal--										
12 (Upper H.C.)				0					0	0
12B (Central H.C.)		5247		5247	4030				4030	9277
SUBTOTAL:	0	5247	0	5247	4030	0	0	0	4030	9277
12A (Quilcene-Dabob Bays)				0	6944			529	7473	7473
12C (Lower Hood Canal)		13195		13195	33188			7	33195	46390
12D (SE Hood Canal)				0	1626				1626	1626
9A (Port Gamble)				0					0	0
SUBTOTAL: H.C. marine ext. term.	0	13195	0	13195	41758	0	0	536	42294	55489
SUBTOTAL: marine terminal	0	18442	0	18442	45788	0	0	536	46324	64766
Skokomish River				0	24929				24929	24929
Quilcene River				0					0	0
Misc. freshwater				0					0	0
SUBTOTAL: H.C. freshwater	0	0	0	0	24929	0	0	0	24929	24929
SUBTOTAL: H.C. terminal	0	18442	0	18442	70717	0	0	536	71253	89695
TOTAL: Terminal Marine	76406	61803	0	138209	163188	24096	0	3305	190589	328798
TOTAL: Terminal Freshwater	0	0	0	0	45613	0	0	56	45669	45669
GRAND TOTAL TERMINAL	76406	61803	0	138209	208801	24096	0	3361	236258	374467
GRAND TOTAL PRE-TERMINAL	199458	138066	3003	340527	27604	15301	0	0	42905	383432
GRAND TOTAL COMMERCIAL	275864	199869	3003	478736	236405	39397	0	3361	279163	757899

1977 PUGET SOUND COMMERCIAL CHUM SALMON CATCHES

	NON-INDIAN				INDIAN					
AREA DESCRIPTION	GILL NET	PURSE SEINE	OTHER	SUBTOTAL	GILL NET	PURSE SEINE	TROLL	OTHER	SUBTOTAL	TOTAL
PRE-TERMINAL										
4B (Tatoosh-Sail Rock)	127			127	382		4		386	513
5 (Clallam Bay)	1197		2	1199	216				216	1415
6 (Partridge Bank)	3903			3903	1				1	3904
6A (West Beach)	4715	48		4763	4				4	4767
6C (Port Angeles)	18			18	10				10	28
SUBTOTAL	9960	48	2	10010	613	0	4	0	617	10627
7 (San Juans)	4402	14089	2385	20876	4647	2543	70		7260	28136
7A (Point Roberts)	9350	13651		23001	161				161	23162
SUBTOTAL	13752	27740	2385	43877	4808	2543	70	0	7421	51298
6B (Discovery Bay)	8037	351		8388	124				124	8512
9 (Admiralty Inlet)	44226	12546		56772	1628	114			1742	58514
SUBTOTAL	52263	12897	0	65160	1752	114	0	0	1866	67026
GRAND TOTAL: PRE-TERMINAL	75975	40685	2387	119047	7173	2657	74	0	9904	128951
TERMINAL										
Strait--										
6D (Dungeness Bay)				0					0	0
Strait Rivers				0	149			19	168	168
SUBTOTAL: Strait term.	0	0	0	0	149	0	0	19	168	168
7E (East Sound)				0					0	0
Nooksack/Samish--										
7B (Bellingham Bay)	7352	1109		8461	17166	62			17228	25689
7C (Samish Bay)	523	91		614	1578				1578	2192
7D (Lummi Bay)				0					0	0
Nooksack River				0	3148				3148	3148
Samish River				0	1				1	1
SUBTOTAL: Nook./Sam. term.	7875	1200	0	9075	21893	62	0	0	21955	31030
Skagit--										
8 (Skagit Bay)	28			28	4360			89	4449	4477
Skagit River				0	587				587	587
SUBTOTAL: Skagit term.	28	0	0	28	4947	0	0	89	5036	5064
Stillaguamish/Snohomish--										
8A (Port Susan/Port Gardner)	43			43	2436			31	2467	2510
8D (Tulalip Bay)				0					0	0
Stillaguamish River				0					0	0
Snohomish River				0					0	0
SUBTOTAL: Stilly/Snoh. term.	43	0	0	43	2436	0	0	31	2467	2510
South Sound--										
10 (Seattle)	48302	18035		66337	20956	1759			22715	89052
11 (East-West Passage)	7050	4095		11145	921				921	12066
SUBTOTAL	55352	22130	0	77482	21877	1759	0	0	23636	101118
10A (Elliott Bay)	196	569		765	4092	332			4424	5189
10E (East Kitsap)	187			187	7239	450			7689	7876
11A (Commencement Bay)	909	32		941	1362				1362	2303
13 (Nisqually Reach)	2488	9		2497	770				770	3267
13A (Carr Inlet)	100	1		101	8004	3		2	8009	8110
13C-K (South Sound Inlets)	27			27	11163			133	11296	11323
SUBTOTAL S.S. marine ext. term.	3907	611	0	4518	32638	785	0	135	33558	38068
SUBTOTAL S.S. marine term.	59259	22741	0	82000	54507	2544	0	135	57186	139186
10G&F=10B (N. Lk. Wash. & Canal)				0	3				3	3
10C (S. Lk. Washington)				0					0	0
10D (Lake Sammamish)				0					0	0
Green-Duwamish River				0	215				215	215
Puyallup River				0	15				15	15
White River				0					0	0
Nisqually River				0	22667				22667	22667
Misc. freshwater				0	4				4	4
SUBTOTAL: S.S. freshwater	0	0	0	0	22904	0	0	0	22904	22904
SUBTOTAL: S.S. terminal	59259	22741	0	82000	77411	2544	0	135	80090	162090
Hood Canal--										
12 (Upper H.C.)	54703	9935		64638	10015				10015	74653
12B (Central H.C.)	449			449	2191	200			2391	2840
SUBTOTAL:	55152	9935	0	65087	12206	200	0	0	12406	77493
12A (Quilcene-Dabob Bays)	568			568	2457				2457	3025
12C (Lower Hood Canal)	3940			3940	34353				34353	38293
12D (SE Hood Canal)				0	7				7	7
9A (Port Gamble)				0					0	0
SUBTOTAL: H.C. marine ext. term.	4508	0	0	4508	36817	0	0	0	36817	41325
SUBTOTAL: marine terminal	59660	9935	0	69595	49023	200	0	0	49223	118818
Skokomish River				0	7406				7406	7406
Quilcene River				0					0	0
Misc. freshwater				0	19				19	19
SUBTOTAL: H.C. freshwater	0	0	0	0	7425	0	0	0	7425	7425
SUBTOTAL: H.C. terminal	59660	9935	0	69595	56448	200	0	0	56648	126243
TOTAL: Terminal Marine	126865	33876	0	160741	129070	2806	0	255	132131	292872
TOTAL: Terminal Freshwater	0	0	0	0	34214	0	0	19	34233	34233
GRAND TOTAL TERMINAL	126865	33876	0	160741	163284	2806	0	274	166364	327105
GRAND TOTAL PRE-TERMINAL	75975	40685	2387	119047	7173	2657	74	0	9904	128951
GRAND TOTAL COMMERCIAL	202840	74561	2387	279788	170457	5463	74	274	176268	456056

1978 PUGET SOUND COMMERCIAL CHUM SALMON CATCHES

AREA DESCRIPTION	NON-INDIAN				INDIAN					
	GILL NET	PURSE SEINE	OTHER	SUBTOTAL	GILL NET	PURSE SEINE	TROLL	OTHER	SUBTOTAL	TOTAL
PRE-TERMINAL										
4B (Tatoosh-Sail Rock)	133		2	135	473		6		479	614
5 (Clallam Bay)	65			65	180				180	245
6 (Partridge Bank)	39570	18		39588	85				85	39673
6A (West Beach)	3			3	3				3	6
6C (Port Angeles)	8			8					0	8
SUBTOTAL	39779	18	2	39799	741	0	6	0	747	40546
7 (San Juans)	97733	94331	2402	194466	23350	4164			27514	221980
7A (Point Roberts)	87594	56923	98	144615	10564	10148			20712	165327
SUBTOTAL	185327	151254	2500	339081	33914	14312	0	0	48226	387307
6B (Discovery Bay)	466	5		471	218			10	228	699
9 (Admiralty Inlet)	26986	1204		28190	1170	651		9	1830	30020
SUBTOTAL	27452	1209	0	28661	1388	651	0	19	2058	30719
GRAND TOTAL: PRE-TERMINAL	252558	152481	2502	407541	36043	14963	6	19	51031	458572
TERMINAL										
Strait--										
6D (Dungeness Bay)				0					0	0
Strait Rivers				0	505			5	510	510
SUBTOTAL: Strait term.	0	0	0	0	505	0	0	5	510	510
7E (East Sound)				0					0	0
Nooksack/Samish--										
7B (Bellingham Bay)	10514	333		10847	3835	18			3853	14700
7C (Samish Bay)	223			223	344				344	567
7D (Lummi Bay)				0					0	0
Nooksack River				0	2233				2233	2233
Samish River				0					0	0
SUBTOTAL: Nook./Sam. term.	10737	333	0	11070	6412	18	0	0	6430	17500
Skagit--										
8 (Skagit Bay)	26238	11011		37249	23604			5	23609	60858
Skagit River				0	21776				21776	21776
SUBTOTAL: Skagit term.	26238	11011	0	37249	45380	0	0	5	45385	82634
Stillaguamish/Snohomish--										
8A (Port Susan/Port Gardner)	183	29		212	11221	2		1027	12250	12462
8D (Tulalip Bay)				0					0	0
Stillaguamish River				0					0	0
Snohomish River				0					0	0
SUBTOTAL: Stilly/Snoh. term.	183	29	0	212	11221	2	0	1027	12250	12462
South Sound--										
10 (Seattle)	40904	20429		61333	26996	10595			37591	98924
11 (East-West Passage)	16169	7545		23714	4820				4820	28534
SUBTOTAL	57073	27974	0	85047	31816	10595	0	0	42411	127458
10A (Elliott Bay)	305			305	12009				12009	12314
10E (East Kitsap)				0	27840				27840	27840
11A (Commencement Bay)				0	345				345	345
13 (Nisqually Reach)	3430			3430	625			3	628	4058
13A (Carr Inlet)	25			25	30076	29		302	30407	30432
13C-K (South Sound Inlets)				0	16715			300	17015	17015
SUBTOTAL S.S. marine ext. term.	3760	0	0	3760	87610	29	0	605	88244	92004
SUBTOTAL S.S. marine term.	60833	27974	0	88807	119426	10624	0	605	130655	219462
10G&F=10B (N. Lk. Wash. & Canal)				0	121				121	121
10C (S. Lk. Washington)				0					0	0
10D (Lake Sammamish)				0					0	0
Green-Duwamish River				0	201				201	201
Puyallup River				0	136				136	136
White River				0					0	0
Nisqually River				0	20519				20519	20519
Misc. freshwater				0	85				85	85
SUBTOTAL: S.S. freshwater	0	0	0	0	21062	0	0	0	21062	21062
SUBTOTAL: S.S. terminal	60833	27974	0	88807	140488	10624	0	605	151717	240524
Hood Canal--										
12 (Upper H.C.)	91129	55701		146830	33200	6364			39564	186394
12B (Central H.C.)	1177			1177	34681				34681	35858
SUBTOTAL:	92306	55701	0	148007	67881	6364	0	0	74245	222252
12A (Quilcene-Dabob Bays)	76			76	677				677	753
12C (Lower Hood Canal)	17037	41664		58701	124849			122	124971	183672
12D (SE Hood Canal)				0					0	0
9A (Port Gamble)				0					0	0
SUBTOTAL: H.C. marine ext. term.	17113	41664	0	58777	125526	0	0	122	125648	184425
SUBTOTAL: marine terminal	109419	97365	0	206784	193407	6364	0	122	199893	406677
Skokomish River				0	12772				12772	12772
Quilcene River				0	40				40	40
Misc. freshwater				0	100				100	100
SUBTOTAL: H.C. freshwater	0	0	0	0	12912	0	0	0	12912	12912
SUBTOTAL: H.C. terminal	109419	97365	0	206784	206319	6364	0	122	212805	419589
TOTAL: Terminal Marine	207410	136712	0	344122	351837	17008	0	1759	370604	714726
TOTAL: Terminal Freshwater	0	0	0	0	58488	0	0	5	58493	58493
GRAND TOTAL TERMINAL	207410	136712	0	344122	410325	17008	0	1764	429097	773219
GRAND TOTAL PRE-TERMINAL	252558	152481	2502	407541	36043	14963	6	19	51031	458572
GRAND TOTAL COMMERCIAL	459968	289193	2502	751663	446368	31971	6	1783	480128	1231791

1979 PUGET SOUND COMMERCIAL CHUM SALMON CATCHES

AREA DESCRIPTION	NON-INDIAN				INDIAN					
	GILL NET	PURSE SEINE	OTHER	SUBTOTAL	GILL NET	PURSE SEINE	TROLL	OTHER	SUBTOTAL	TOTAL
PRE-TERMINAL										
4B (Tatoosh-Sail Rock)	108			108	429		3		432	540
5 (Clallam Bay)	85			85	632				632	717
6 (Partridge Bank)	221	1		222	17				17	239
6A (West Beach)	5	11		16	4	4			8	24
6C (Port Angeles)	1			1					0	1
SUBTOTAL	420	12	0	432	1082	4	3	0	1089	1521
7 (San Juans)	427	360	716	1503	786	454			1240	2743
7A (Point Roberts)	25	122	1	148	994	836			1830	1978
SUBTOTAL	452	482	717	1651	1780	1290	0	0	3070	4721
6B (Discovery Bay)				0					0	0
9 (Admiralty Inlet)	244			244	3168				3168	3412
SUBTOTAL	244	0	0	244	3168	0	0	0	3168	3412
GRAND TOTAL: PRE-TERMINAL	1116	494	717	2327	6030	1294	3	0	7327	9654
TERMINAL										
Strait--										
6D (Dungeness Bay)				0	33				33	33
Strait Rivers				0	56			9	65	65
SUBTOTAL: Strait term.	0	0	0	0	89	0	0	9	98	98
7E (East Sound)				0					0	0
Nooksack/Samish--										
7B (Bellingham Bay)	814	369		1183	2043	8			2051	3234
7C (Samish Bay)	6			6	3	9			12	18
7D (Lummi Bay)				0					0	0
Nooksack River				0	98				98	98
Samish River				0					0	0
SUBTOTAL: Nook./Sam. term.	820	369	0	1189	2144	17	0	0	2161	3350
Skagit--										
8 (Skagit Bay)	3623	750		4373	4048	188		2	4238	8611
Skagit River				0	7033				7033	7033
SUBTOTAL: Skagit term.	3623	750	0	4373	11081	188	0	2	11271	15644
Stillaguamish/Snohomish--										
8A (Port Susan/Port Gardner)	4			4	2974			106	3080	3084
8D (Tulalip Bay)				0					0	0
Stillaguamish River				0	11				11	11
Snohomish River				0					0	0
SUBTOTAL: Stilly/Snoh. term.	4	0	0	4	2985	0	0	106	3091	3095
South Sound--										
10 (Seattle)	554	119		673	515	1			516	1189
11 (East-West Passage)	8	34		42	1				1	43
SUBTOTAL	562	153	0	715	516	1	0	0	517	1232
10A (Elliott Bay)				0	671				671	671
10E (East Kitsap)				0	2244				2244	2244
11A (Commencement Bay)				0	70				70	70
13 (Nisqually Reach)				0	947			29	976	976
13A (Carr Inlet)				0	2435			4	2439	2439
13C-K (South Sound Inlets)				0	1695			57	1752	1752
SUBTOTAL S.S. marine ext. term.	0	0	0	0	8062	0	0	90	8152	8152
SUBTOTAL S.S. marine term.	562	153	0	715	8578	1	0	90	8669	9384
10G&F=10B (N. Lk. Wash. & Canal)				0					0	0
10C (S. Lk. Washington)				0					0	0
10D (Lake Sammamish)				0	17				17	17
Green-Duwamish River				0	151				151	151
Puyallup River				0	29				29	29
White River				0					0	0
Nisqually River				0	23693				23693	23693
Misc. freshwater				0	4				4	4
SUBTOTAL: S.S. freshwater	0	0	0	0	23894	0	0	0	23894	23894
SUBTOTAL: S.S. terminal	562	153	0	715	32472	1	0	90	32563	33278
Hood Canal--										
12 (Upper H.C.)	6979	5669		12648	23059	379			23438	36086
12B (Central H.C.)	262	340		602	11674				11674	12276
SUBTOTAL:	7241	6009	0	13250	34733	379	0	0	35112	48362
12A (Quilcene-Dabob Bays)	17			17	2120			2	2122	2139
12C (Lower Hood Canal)	1276			1276	4654				4654	5930
12D (SE Hood Canal)				0					0	0
9A (Port Gamble)				0					0	0
SUBTOTAL: H.C. marine ext. term.	1293	0	0	1293	6774	0	0	2	6776	8069
SUBTOTAL: marine terminal	8534	6009	0	14543	41507	379	0	2	41888	56431
Skokomish River				0	2806				2806	2806
Quilcene River				0	175			6	181	181
Misc. freshwater				0					0	0
SUBTOTAL: H.C. freshwater	0	0	0	0	2981	0	0	6	2987	2987
SUBTOTAL: H.C. terminal	8534	6009	0	14543	44488	379	0	8	44875	59418
TOTAL: Terminal Marine	13543	7281	0	20824	59186	585	0	200	59971	80795
TOTAL: Terminal Freshwater	0	0	0	0	34073	0	0	15	34088	34088
GRAND TOTAL TERMINAL	13543	7281	0	20824	93259	585	0	215	94059	114883
GRAND TOTAL PRE-TERMINAL	1116	494	717	2327	6030	1294	3	0	7327	9654
GRAND TOTAL COMMERCIAL	14659	7775	717	23151	99289	1879	3	215	101386	124537

1980 PUGET SOUND COMMERCIAL CHUM SALMON CATCHES

	NON-INDIAN				INDIAN					
AREA DESCRIPTION	GILL NET	PURSE SEINE	OTHER	SUBTOTAL	GILL NET	PURSE SEINE	TROLL	OTHER	SUBTOTAL	TOTAL
PRE-TERMINAL										
4B (Tatoosh-Sail Rock)	47			47	3923				3928	3975
5 (Clallam Bay)	106			106	7334				7334	7440
6 (Partridge Bank)	5070			5070	616				616	5686
6A (West Beach)	1			1	101	46			147	148
6C (Port Angeles)	14			14	31				31	45
SUBTOTAL	5238	0	0	5238	12085	46	0	0	12051	17289
7 (San Juans)	79585	77160	1606	158351	22585	20154			42739	201090
7A (Point Roberts)	70706	35435	24	106165	27157	9863			37020	143185
SUBTOTAL	150291	112595	1630	264516	49742	30017	0	0	79759	344275
6B (Discovery Bay)	66			66					0	66
9 (Admiralty Inlet)	30	696		726	9581	14714			24295	25021
SUBTOTAL	96	696	0	792	9581	14714	0	0	24295	25087
GRAND TOTAL: PRE-TERMINAL	155625	113291	1630	270546	71328	44777	0	0	116105	386651
TERMINAL										
Strait--										
6D (Dungeness Bay)				0	111				111	111
Strait Rivers				0	533			6	539	539
SUBTOTAL: Strait term.	0	0	0	0	644	8	0	6	650	650
7E (East Sound)				0					0	0
Nooksack/Samish--										
7B (Bellingham Bay)	668	1876		2544	1212	87			1299	3843
7C (Samish Bay)	1	1		2	1				1	3
7D (Lummi Bay)				0	539				539	539
Nooksack River				0	351				351	351
Samish River				0					0	0
SUBTOTAL: Nook./Sam. term.	669	1877	0	2546	2103	87	0	0	2190	4736
Skagit--										
8 (Skagit Bay)	22290	10721		33011	19497	265		1	19763	52774
Skagit River				0	31279				31279	31279
SUBTOTAL: Skagit term.	22290	10721	0	33011	50776	265	0	1	51042	84053
Stillaguamish/Snohomish--										
8A (Port Susan/Port Gardner)	6497	2217		8714	20657			2921	23578	32292
8D (Tulalip Bay)				0					0	0
Stillaguamish River				0	274				274	274
Snohomish River				0					0	0
SUBTOTAL: Stilly/Snoh. term.	6497	2217	0	8714	20931	0	0	2921	23852	32566
South Sound--										
10 (Seattle)	46610	34207		80817	15737	6028			21765	102582
11 (East-West Passage)	14753	21055		35808	444				444	36252
SUBTOTAL	61363	55262	0	116625	16181	6028	0	0	22209	138834
10A (Elliott Bay)				0	3820				3820	3820
10E (East Kitsap)				0	12884				12884	12884
11A (Commencement Bay)				0	4513				4513	4513
13 (Nisqually Reach)	39			39	28960			33	28993	29032
13A (Carr Inlet)	9			9	37589	19		8	37616	37625
13C-K (South Sound Inlets)				0	31441			129	31570	31570
SUBTOTAL S.S. marine ext. term.	48	0	0	48	119287	19	0	170	119396	119444
SUBTOTAL S.S. marine term.	61411	55262	0	116673	135388	6047	0	170	141605	258278
10G&F=10B (N. Lk. Wash. & Canal)				0	158				158	158
10C (S. Lk. Washington)				0					0	0
10D (Lake Sammamish)				0	2				2	2
Green-Duwamish River				0	2286			14	2300	2300
Puyallup River				0	1600				1600	1600
White River				0					0	0
Nisqually River				0	16739				16739	16739
Misc. freshwater				0					0	0
SUBTOTAL: S.S. freshwater	0	0	0	0	20785	0	0	14	20799	20799
SUBTOTAL: S.S. terminal	61411	55262	0	116673	156173	6047	0	184	162404	279077
Hood Canal--										
12 (Upper H.C.)	18400	58196		76596	41732	1545			43277	119873
12B (Central H.C.)				0	33445				33445	33445
SUBTOTAL:	18400	58196	0	76596	75177	1545	0	0	76722	153318
12A (Quilcene-Dabob Bays)				0	180				180	180
12C (Lower Hood Canal)				0	2349				2349	2349
12D (SE Hood Canal)				0					0	0
9A (Port Gamble)				0	4145				4145	4145
SUBTOTAL: H.C. marine ext. term.	0	0	0	0	6674	0	0	0	6674	6674
SUBTOTAL: marine terminal	18400	58196	0	76596	81851	1545	0	0	83396	159992
Skokomish River				0	305			42	347	347
Quilcene River				0	171			96	267	267
Misc. freshwater				0					0	0
SUBTOTAL: H.C. freshwater	0	0	0	0	476	0	0	138	614	614
SUBTOTAL: H.C. terminal	18400	58196	0	76596	82327	1545	0	138	84010	160606
TOTAL: Terminal Marine	109267	128273	0	237540	259256	7944	0	3092	270292	507832
TOTAL: Terminal Freshwater	0	0	0	0	53698	0	0	158	53856	53856
GRAND TOTAL TERMINAL	109267	128273	0	237540	312954	7944	0	3250	324148	561688
GRAND TOTAL PRE-TERMINAL	155625	113291	1630	270546	71328	44777	0	0	116105	386651
GRAND TOTAL COMMERCIAL	264892	241564	1630	508086	384282	52721	0	3250	440253	948339

1981 PUGET SOUND COMMERCIAL CHUM SALMON CATCHES

AREA DESCRIPTION	NON-INDIAN				INDIAN					
	GILL NET	PURSE SEINE	OTHER	SUBTOTAL	GILL NET	PURSE SEINE	TROLL	OTHER	SUBTOTAL	TOTAL
PRE-TERMINAL										
4B (Tatoosh-Sail Rock)	11			11	173				173	184
5 (Clallam Bay)	146			146	1998				1998	2144
6 (Partridge Bank)	847	12		859	32				32	891
6A (West Beach)	102	12		114	5				5	119
6C (Port Angeles)	12			12	69				69	81
SUBTOTAL	1118	24	0	1142	2277	0	0	0	2277	3419
7 (San Juans)	649	3377	1220	5246	394	1467		56	1917	7163
7A (Point Roberts)	319	1386	2	1707	144	142		4	290	1997
SUBTOTAL	968	4763	1222	6953	538	1609	0	60	2207	9160
6B (Discovery Bay)				0	9				9	9
9 (Admiralty Inlet)	18486	22927		41413	4158	1602			5760	47173
SUBTOTAL	18486	22927	0	41413	4167	1602	0	0	5769	47182
GRAND TOTAL: PRE-TERMINAL	20572	27714	1222	49508	6982	3211	0	60	10253	59761
TERMINAL										
Strait--										
6D (Dungeness Bay)				0	131			1	132	132
Strait Rivers				0	630			3	633	633
SUBTOTAL: Strait term.	0	0	0	0	761	0	0	4	765	765
7E (East Sound)				0					0	0
Nooksack/Samish--										
7B (Bellingham Bay)	3921	1109		5030	5926				5926	10956
7C (Samish Bay)	1			1	822				822	823
7D (Lummi Bay)				0	3395				3395	3395
Nooksack River				0	4816				4816	4816
Samish River				0	54				54	54
SUBTOTAL: Nook./Sam. term.	3922	1109	0	5031	15013	0	0	0	15013	20044
Skagit--										
8 (Skagit Bay)	16888	12599		29487	9685				9685	39172
Skagit River				0	21635				21635	21635
SUBTOTAL: Skagit term.	16888	12599	0	29487	31320	0	0	0	31320	60807
Stillaguamish/Snohomish--										
8A (Port Susan/Port Gardner)	10498	4493		14991	22077			1878	23955	38946
8D (Tulalip Bay)				0					0	0
Stillaguamish River				0	1241				1241	1241
Snohomish River				0					0	0
SUBTOTAL: Stilly/Snoh. term.	10498	4493	0	14991	23318	0	0	1878	25196	40187
South Sound--										
10 (Seattle)	28007	20769		48776	13061	5834			18895	67671
11 (East-West Passage)	7436	13218		20654	1330				1330	21984
SUBTOTAL	35443	33987	0	69430	14391	5834	0	0	20225	89655
10A (Elliott Bay)				0	4207				4207	4207
10E (East Kitsap)				0	3226				3226	3226
11A (Commencement Bay)				0	1905				1905	1905
13 (Nisqually Reach)				0	3827	627		23	4477	4477
13A (Carr Inlet)				0	11034			125	11159	11159
13C-K (South Sound Inlets)				0	25518			674	26192	26192
SUBTOTAL S.S. marine ext. term.	0	0	0	0	49717	627	0	822	51166	51166
SUBTOTAL S.S. marine term.	35443	33987	0	69430	64108	6461	0	822	71391	140821
10G&F=10B (N. Lk. Wash. & Canal)				0	34				34	34
10C (S. Lk. Washington)				0	14				14	14
10D (Lake Sammamish)				0					0	0
Green-Duwamish River				0	995				995	995
Puyallup River				0	66				66	66
White River				0	4				4	4
Nisqually River				0	19714				19714	19714
Misc. freshwater				0	11438			136	11574	11574
SUBTOTAL: S.S. freshwater	0	0	0	0	32265	0	0	136	32401	32401
SUBTOTAL: S.S. terminal	35443	33987	0	69430	96373	6461	0	958	103792	173222
Hood Canal--										
12 (Upper H.C.)	25608	24307		49915	53196	175		26	53397	103312
12B (Central H.C.)	2377	1966		4343	13565			38	13603	17946
SUBTOTAL:	27985	26273	0	54258	66761	175	0	64	67000	121258
12A (Quilcene-Dabob Bays)				0	94			102	196	196
12C (Lower Hood Canal)				0	16868				16868	16868
12D (SE Hood Canal)				0					0	0
9A (Port Gamble)				0	2160				2160	2160
SUBTOTAL: H.C. marine ext. term.	0	0	0	0	19122	0	0	102	19224	19224
SUBTOTAL: marine terminal	27985	26273	0	54258	85883	175	0	166	86224	140482
Skokomish River				0	1631				1631	1631
Quilcene River				0	3			1	4	4
Misc. freshwater				0					0	0
SUBTOTAL: H.C. freshwater	0	0	0	0	1634	0	0	1	1635	1635
SUBTOTAL: H.C. terminal	27985	26273	0	54258	87517	175	0	167	87859	142117
TOTAL: Terminal Marine	94736	78461	0	173197	192027	6636	0	2867	201530	374727
TOTAL: Terminal Freshwater	0	0	0	0	62275	0	0	140	62415	62415
GRAND TOTAL TERMINAL	94736	78461	0	173197	254302	6636	0	3007	263945	437142
GRAND TOTAL PRE-TERMINAL	20572	27714	1222	49508	6982	3211	0	60	10253	59761
GRAND TOTAL COMMERCIAL	115308	106175	1222	222705	261284	9847	0	3067	274198	496903

1982 PUGET SOUND COMMERCIAL CHUM SALMON CATCHES

AREA DESCRIPTION	NON-INDIAN				INDIAN					
	GILL NET	PURSE SEINE	OTHER	SUBTOTAL	GILL NET	PURSE SEINE	TROLL	OTHER	SUBTOTAL	TOTAL
PRE-TERMINAL										
4B (Tatoosh-Sail Rock)	40		3	43	658		5		663	706
5 (Clallam Bay)	17			17	4382				4382	4399
6 (Partridge Bank)	104			104	6				6	110
6A (West Beach)	1	2		3	2				2	5
6C (Port Angeles)	4			4	45				45	49
SUBTOTAL	166	2	3	171	5093	0	5	0	5098	5269
7 (San Juans)	9301	13085	3969	26355	5680	8931		309	14920	41275
7A (Point Roberts)	4350	6047	174	10571	16702	7513			24215	34786
SUBTOTAL	13651	19132	4143	36926	22382	16444	0	309	39135	76061
6B (Discovery Bay)				0					0	0
9 (Admiralty Inlet)	47558	87593		135151	23126	16892			40018	175169
SUBTOTAL	47558	87593	0	135151	23126	16892	0	0	40018	175169
GRAND TOTAL: PRE-TERMINAL	61375	106727	4146	172248	50601	33336	5	309	84251	256499
TERMINAL										
Strait--										
6D (Dungeness Bay)	307			307	53			2	55	362
Strait Rivers				0	1485			14	1499	1499
SUBTOTAL: Strait term.	307	0	0	307	1538	0	0	16	1554	1861
7E (East Sound)				0					0	0
Nooksack/Samish--										
7B (Bellingham Bay)	16125	5802		21927	22479	1463			23942	45869
7C (Samish Bay)	45			45					0	45
7D (Lummi Bay)				0	899				899	899
Nooksack River				0	15386				15386	15386
Samish River				0					0	0
SUBTOTAL: Nook./Sam. term.	16170	5802	0	21972	38764	1463	0	0	40227	62199
Skagit--										
8 (Skagit Bay)	34959	56630		91589	14356	252			14608	106197
Skagit River	10			10	21978				21978	21988
SUBTOTAL: Skagit term.	34969	56630	0	91599	36334	252	0	0	36586	128185
Stillaguamish/Snohomish--										
8A (Port Susan/Port Gardner)	17333	27702		45035	37015	435		3870	41320	86355
8D (Tulalip Bay)				0					0	0
Stillaguamish River				0	2701				2701	2701
Snohomish River				0					0	0
SUBTOTAL: Stilly/Snoh. term.	17333	27702	0	45035	39716	435	0	3870	44021	89056
South Sound--										
10 (Seattle)	40667	33105		73772	12815	11077			23892	97664
11 (East-West Passage)	13699	31196		44895	1484				1484	46379
SUBTOTAL	54366	64301	0	118667	14299	11077	0	0	25376	144043
10A (Elliott Bay)				0	883				883	883
10E (East Kitsap)				0	8105				8105	8105
11A (Commencement Bay)				0	329				329	329
13 (Nisqually Reach)				0	3906			822	4728	4728
13A (Carr Inlet)				0	31425			884	32309	32309
13C-K (South Sound Inlets)				0	33578			3695	37273	37273
SUBTOTAL S.S. marine ext. term.	0	0	0	0	78226	0	0	5401	83627	83627
SUBTOTAL S.S. marine term.	54366	64301	0	118667	92525	11077	0	5401	109003	227670
10G&F=10B (N. Lk. Wash. & Canal)				0	7				7	7
10C (S. Lk. Washington)				0					0	0
10D (Lake Sammamish)				0					0	0
Green-Duwamish River				0	210				210	210
Puyallup River				0	867				867	867
White River				0					0	0
Nisqually River				0	19011				19011	19011
Misc. freshwater	4			4	1725				1725	1729
SUBTOTAL: S.S. freshwater	4	0	0	4	21820	0	0	0	21820	21824
SUBTOTAL: S.S. terminal	54370	64301	0	118671	114345	11077	0	5401	130823	249494
Hood Canal--										
12 (Upper H.C.)	16423	65089		81512	57363	2679			60042	141554
12B (Central H.C.)	12			12	14756				14756	14768
SUBTOTAL:	16435	65089	0	81524	72119	2679	0	0	74798	156322
12A (Quilcene-Dabob Bays)				0	133	194			327	327
12C (Lower Hood Canal)				0	28157				28157	28157
12D (SE Hood Canal)				0					0	0
9A (Port Gamble)				0	338			2	340	340
SUBTOTAL: H.C. marine ext. term.	0	0	0	0	28628	194	0	2	28824	28824
SUBTOTAL: marine terminal	16435	65089	0	81524	100747	2873	0	2	103622	185146
Skokomish River				0	4233				4233	4233
Quilcene River				0	42			2	44	44
Misc. freshwater				0	15				15	15
SUBTOTAL: H.C. freshwater	0	0	0	0	4290	0	0	2	4292	4292
SUBTOTAL: H.C. terminal	16435	65089	0	81524	105037	2873	0	4	107914	189438
TOTAL: Terminal Marine	139570	219524	0	359094	268074	16100	0	9275	293449	652543
TOTAL: Terminal Freshwater	14	0	0	14	67660	0	0	16	67676	67690
GRAND TOTAL TERMINAL	139584	219524	0	359108	335734	16100	0	9291	361125	720233
GRAND TOTAL PRE-TERMINAL	61375	106727	4146	172248	50601	33336	5	309	84251	256499
GRAND TOTAL COMMERCIAL	200959	326251	4146	531356	386335	49436	5	9600	445376	976732

1983 PUGET SOUND COMMERCIAL CHUM SALMON CATCHES

	NON-INDIAN				INDIAN					
AREA DESCRIPTION	GILL NET	PURSE SEINE	OTHER	SUBTOTAL	GILL NET	PURSE SEINE	TROLL	OTHER	SUBTOTAL	TOTAL
PRE-TERMINAL										
4B (Tatoosh-Sail Rock)	16			16	1626		1		1627	1643
5 (Clallam Bay)	74			74	13585		3		13588	13662
6 (Partridge Bank)	33			33	90				90	123
6A (West Beach)				0					0	0
6C (Port Angeles)	1			1	2				2	3
SUBTOTAL	124	0	0	124	15303	0	4	0	15307	15431
7 (San Juans)	198	138	8	344	32	1861		1	1894	2238
7A (Point Roberts)	9	77	2	88	47	251			298	386
SUBTOTAL	207	215	10	432	79	2112	0	1	2192	2624
6B (Discovery Bay)				0					0	0
9 (Admiralty Inlet)	6497	48634		55131		9461			9461	64592
SUBTOTAL	6497	48634	0	55131	7842	9461	0	0	17303	72434
GRAND TOAL: PRE-TERMINAL	6828	48849	10	55687	23224	11573	4	1	34802	90489
TERMINAL										
Strait--										
6D (Dungeness Bay)	130	18		148	4				4	152
Strait Rivers				0	164				164	164
SUBTOTAL: Strait term.	130	18	0	148	168	0	0	0	168	316
Nooksack/Samish--										
7B (Bellingham Bay)	15217	4673		19890	16556	829			17385	37275
7C (Samish Bay)	198			198	1				1	199
7D (Lummi Bay)				0	506				506	506
Nooksack River				0	15028			16	15044	15044
Samish River				0					0	0
SUBTOTAL: Nook./Sam. term.	15415	4673	0	20088	32091	829	0	16	32936	53024
				0					0	0
Skagit--				0					0	0
8 (Skagit Bay)	973	449		1422	7943				7943	9365
Skagit River				0	18159			1	18160	18160
SUBTOTAL: Skagit term.	973	449	0	1422	26102	0	0	1	26103	27525
Stillaguamish/Snohomish--										
8A (Port Susan/Port Gardner)	2093	434		2527	9397			220	9617	12144
8D (Tulalip Bay)				0	735				735	735
Stillaguamish River				0					0	0
Snohomish River				0					0	0
SUBTOTAL: Stilly/Snoh. term.	2093	434	0	2527	10132	0	0	220	10352	12879
South Sound--										
10 (Seattle)	30130	15804		45934	4809	979			5788	51722
11 (East-West Passage)	6723	12346		19069	3580	12			3592	22661
SUBTOTAL	36853	28150	0	65003	8389	991	0	0	9380	74383
10A (Elliott Bay)				0	597				597	597
10E (East Kitsap)				0	1275				1275	1275
11A (Commencement Bay)				0	105				105	105
13 (Nisqually Reach)				0	2945			48	2993	2993
13A (Carr Inlet)				0	21311			545	21856	21856
13B (South Sound Inlets)				0	28414			1615	30029	30029
SUBTOTAL S.S. marine ext. term.	0	0	0	0	54647	0	0	2208	56855	56855
SUBTOTAL S.S. marine term.	36853	28150	0	65003	63036	991	0	2208	66235	131238
10G&F=10B (N. LK. Wash. & Canal)				0	10				10	10
10C (S. LK. Washington)				0					0	0
10D (Lake Sammamish)				0					0	0
Green-Duwamish River				0	80				80	80
Puyallup River				0	112				112	112
White River				0					0	0
Nisqually River				0	20218				20218	20218
Misc. freshwater				0	158				158	158
SUBTOTAL: S.S. freshwater	0	0	0	0	20578	0	0	0	20578	20578
SUBTOTAL: S.S. terminal	36853	28150	0	65003	83614	991	0	2208	86813	151816
Hood Canal--										
12 (Upper H.C.)	9216	54063		63279	37419	7384			44803	108082
12B (Central H.C.)	28	659		687	21538				21538	22225
SUBTOTAL:	9244	54722	0	63966	58957	7384	0	0	66341	130307
12A (Quilcene-Dabob Bays)				0	1089			67	1156	1156
12C (Lower Hood Canal)				0	6955				6955	6955
12D (SE Hood Canal)				0	30				30	30
9A (Port Gamble)				0	806				806	806
SUBTOTAL: H.C. marine ext. term.	1	0	0	0	8880	0	0	67	8947	8947
SUBTOTAL: marine terminal	9244	54722	0	63966	67837	7384	0	67	75288	139254
Skokomish River				0	4019				4019	4019
Quilcene River				0	254			22	276	276
Misc. freshwater				0	35				35	35
SUBTOTAL: H.C. freshwater	0	0	0	0	4308	0	0	22	4330	4330
SUBTOTAL: H.C. terminal	9244	54722	0	63966	72145	7384	0	89	79618	143584
TOTAL: Terminal Marine	64708	88446	0	153154	166015	9204	0	2495	177714	330868
TOTAL: Terminal Freshwater	0	0	0	0	58237	0	0	39	58276	58276
GRAND TOTAL TERMINAL	64708	88446	0	153154	224252	9204	0	2534	235990	389144
GRAND TOTAL PRE-TERMINAL	6828	48849	10	55687	23224	11573	4	1	34802	90489
GRAND TOTAL COMMERCIAL	71536	137295	10	208841	247476	20777	4	2535	270792	479633

1984 PUGET SOUND COMMERCIAL CHUM SALMON CATCHES

	NON-INDIAN				INDIAN					
AREA DESCRIPTION	GILL NET	PURSE SEINE	OTHER	SUBTOTAL	GILL NET	PURSE SEINE	TROLL	OTHER	SUBTOTAL	TOTAL
PRE-TERMINAL										
4B (Tatoosh-Sail Rock)	1			1	986		5		991	992
5 (Clallam Bay)	5			5	14136				14136	14141
6 (Partridge Bank)	1			1					0	1
6A (West Beach)				0					0	0
6C (Port Angeles)				0	11				11	11
SUBTOTAL	7	0	0	7	15133	0	5	0	15138	15145
7 (San Juans)	2	1		3	15	827			842	845
7A (Point Roberts)	3	37		40	2	754			756	796
SUBTOTAL	5	38	0	43	17	1581	0	0	1598	1641
6B (Discovery Bay)				0					0	0
9 (Admiralty Inlet)	42			42	669				669	711
SUBTOTAL	42	0	0	42	669	0	0	0	669	711
GRAND TOTAL: PRE-TERMINAL	54	38	0	92	15819	1581	5	0	17405	17497
TERMINAL										
Strait--										
6D (Dungeness Bay)				0					0	0
Strait Rivers				0	508			1	509	509
SUBTOTAL: Strait term.	0	0	0	0	508	0	0	1	509	509
7E (East Sound)										
Nooksack/Samish--										
7B (Bellingham Bay)	31935	3181		35116	26050	684			26734	61850
7C (Samish Bay)				0					0	0
7D (Lummi Bay)				0	18				18	18
Nooksack River				0	14350				14350	14350
Samish River				0					0	0
SUBTOTAL: Nook./Sam. term.	31935	3181	0	35116	40418	684	0	0	41102	76218
Skagit--										
8 (Skagit Bay)				0	1282				1282	1282
Skagit River				0	3079				3079	3079
SUBTOTAL: Skagit term.	0	0	0	0	4361	0	0	0	4361	4361
Stillaguamish/Snohomish--										
8A (Port Susan/Port Gardner)	58	71		129	22882			1994	24876	25005
8D (Tulalip Bay)				0					44	44
Stillaguamish River				0	44				45	45
Snohomish River				0	1				ERR	ERR
SUBTOTAL: Stilly/Snoh. term.	58	71	0	129	22927	0	0	1994	24921	25050
South Sound--										
10 (Seattle)	42286	35177		77463	16289	12159			28448	105911
11 (East-West Passage)	9272	19180		28452	7034				7034	35486
SUBTOTAL	51558	54357	0	105915	23323	12159	0	0	35482	141397
10A (Elliott Bay)				0	904				904	904
10E (East Kitsap)	5970	734		6704	6252	651			6903	13607
11A (Commencement Bay)				0	308				308	308
13 (Nisqually Reach)				0	278			85	363	363
13A (Carr Inlet)	13762	366		14128	18637			184	18821	32949
13C-K (South Sound Inlets)				0	45447			1052	46499	46499
SUBTOTAL S.S. marine ext. term.	19732	1100	0	20832	71826	651	0	1321	73798	94630
SUBTOTAL S.S. marine term.	71290	55457	0	126747	95149	12810	0	1321	109280	236027
10G&F-10B (N. LK. Wash. & Canal)				0	9				9	9
10C (S. LK. Washington)				0					0	0
10D (Lake Sammamish)				0	5				5	5
Green-Duwamish River				0	277				277	277
Puyallup River				0	243				243	243
White River				0					0	0
Nisqually River				0	23256				23256	23256
Misc. freshwater				0					0	0
SUBTOTAL: S.S. freshwater	0	0	0	0	23790	0	0	0	23790	23790
SUBTOTAL: S.S. terminal	71290	55457	0	126747	118939	12810	0	1321	133070	259817
Hood Canal--										
12 (Upper H.C.)	29826	98523		128349	62737				62737	191086
12B (Central H.C.)	10639	6950		17589	29438				29438	47027
SUBTOTAL:	40465	105473	0	145938	92175	0	0	0	92175	238113
12A (Quilcene-Dabob Bays)	369	44		413	1211				1211	1624
12C (Lower Hood Canal)	2018	12357		14375	67370				67370	81745
12D (SE Hood Canal)				0					0	0
9A (Port Gamble)				0	10665				10665	10665
SUBTOTAL: H.C. marine ext. term.	2387	12401	0	14788	79246	0	0	0	79246	94034
SUBTOTAL: marine terminal	42852	117874	0	160726	171421	0	0	0	171421	332147
Skokomish River				0	8126				8126	8126
Quilcene River				0	71			16	87	87
Misc. freshwater				0	712				712	712
SUBTOTAL: H.C. freshwater	0	0	0	0	8909	0	0	16	8925	8925
SUBTOTAL: H.C. terminal	42852	117874	0	160726	180330	0	0	16	180346	341072
TOTAL: Terminal Marine	146135	176583	0	322718	316846	13494	0	3315	333655	656373
TOTAL: Terminal Freshwater	0	0	0	0	50681	0	0	17	50698	50698
GRAND TOTAL TERMINAL	146135	176583	0	322718	367483	13494	0	3332	384309	707027
GRAND TOTAL PRE-TERMINAL	54	38	0	92	15819	1581	5	0	17405	17497
GRAND TOTAL COMMERCIAL	146189	176621	0	322810	383302	15075	5	3332	401714	724524