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## **NPAFC RESEARCH COORDINATION, 2002**

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## **NPAFC Research Coordination, 2001**

### **1. Executive Summary**

This report summarizes the results of research on high seas salmonids conducted in FY 2002 (1 October 2001-30 September 2002) by the High Seas Salmon Research Program, Fisheries Research Institute (FRI), School of Aquatic and Fishery Sciences (SAFS; formerly the School of Fisheries), University of Washington, under contract to the National Oceanic and Atmospheric Administration (NOAA Contract #50ABNF-1-00002, Title: NPAFC Research Coordination). This work is a continuation of research required to meet United States' commitments to the research program of the North Pacific Anadromous Fish Commission (NPAFC), and is authorized by the NOAA Authorization Act of 1992 (PL 102-567, Title VIII: North Pacific Anadromous Stocks Convention). The NOAA, National Marine Fisheries Service (NMFS), Auke Bay Laboratory (ABL) in Juneau, Alaska, is charged with the mission of stewardship for this program, and is its primary using office. The FY 2002 work was in two major areas: (1) international cooperative high seas salmon research, including maintenance of historical scale collections, high seas tagging, and salmon research vessel cruises; and (2) NPAFC participation.

High seas salmon tagging research, conducted by SAFS scientists since 1955, provides stock-specific information on ocean distribution and migration patterns of salmon. Our work in FY 2002 included international cooperative disk-tagging of salmon at sea, activities for recovery of high seas tagged salmon from inshore areas, recovery of coded-wire tags (CWTs) from fish caught during cooperative Japan-US research vessel operations, maintenance, updating, and analyses of high seas disk tag and CWT release and recovery databases, CWT database coordination activities with ABL, and reporting of data to NPAFC. In FY 2002, the most significant new information pertaining to ocean distribution and migration patterns of salmon was a western range extension for British Columbia chinook salmon. A slight range extension was also reported for Washington chinook salmon. Recovery of a lower Fraser River chum salmon in the Bering Sea was only the fourteenth reported recovery of a CWT chum salmon in the Bering Sea. Sockeye salmon recovered in the Ozernaya and Kamchatka rivers were at or near the western limits of the known ranges of those stocks when tagged with disks in the central North Pacific.

In 1998, we initiated cooperative programs with ABL and the Fisheries Agency of Japan (FAJ) to place data storage tags (DSTs), which measure water temperature and swimming depth, on salmonids at sea. Data from previous recoveries of DSTs have shown clear diel patterns of salmon remaining near the surface at night and making frequent dives and ascents during the day; salmon spent most of the time in the top 40 meters, with infrequent excursions to 60-100 m. One new recovery was reported from tagging in 2001: the previously mentioned sockeye salmon tagged in the central Bering Sea and caught in the Kamchatka River. One DST- tagged pink salmon (caught near

Kodiak, Alaska) has been returned from 58 offshore releases in 2002. Data from tags recovered in 2002 confirm diurnal patterns and depth ranges recorded on previous tags.

We continued to update and standardize documentation and archiving of all scale collections (1950s-present) and databases that have been developed for previous high seas analyses at SAFS (1978-present). Computerized documentation was written along with the data to compact disks. Newly acquired scale samples and acetate impressions were transferred to archive boxes. A comprehensive electronic database of all scale collections and scale measurement databases was updated and stored on compact disk. We also fulfilled or coordinated the fulfillment of requests for exchange of scale samples and associated biological data made to the United States by other governments through the NPAFC.

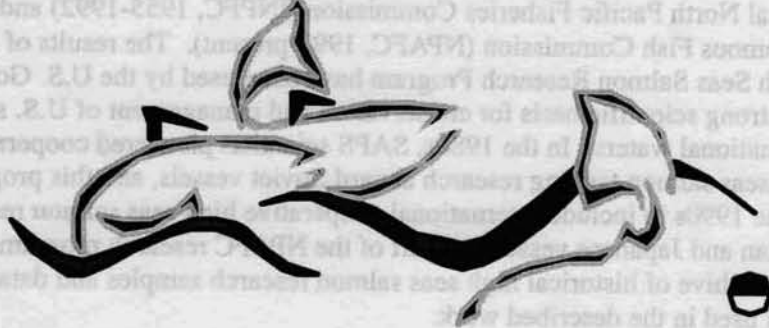
We participated in two Japanese research vessel cruises in the North Pacific Ocean and Bering Sea beyond the 200-mile limit, as part of the NPAFC program of cooperative international salmon research. Summaries are presented of salmon research cruise data and salmonid food habits. Sampling in the north central Gulf of Alaska was two weeks later than in previous years, so comparison between years may include some seasonal effects in addition to interannual variability. Sockeye relative abundance (mostly maturing ocean age -.2 fish) dropped to near average values in 2002, while chum salmon rose to their second highest level of abundance, second only to 1995. Chum salmon were approximately 90% immature, ocean age -.1 and -.2 in both areas. Body weights were the highest recorded for most species and age classes, and condition factors were also very high. This is probably due to sampling two weeks later than previously. In 1999 and 2000 the proportions of squid in the diets of sockeye and pink salmon in the Subarctic Current area of the Gulf of Alaska have been low, but in 2001 and 2002 proportions of squid in diets has returned to higher levels, and stomach content weights relative to body weight have increased. In the central North Pacific, the seasonal summer thermocline was at 25 to 30 m, 10-20 m deeper than in previous years. Warm water temperatures and large catches of salps in the ORI net characterized the Transition Domain (42°N-45°N), and salps were abundant in the contents of chum and coho salmon stomachs, the main species caught at this latitude. Chum salmon abundance in the central North Pacific remained at high levels.

In the Bering Sea in 2002, sockeye salmon abundance was half that of the high levels in 2001, and was about three-quarters of the 12-year average. Chum salmon abundance in the Bering Sea is inversely related to the odd-year cycle of pink salmon abundance, and in 2002 chum catches were higher than in the previous year, but lower than the even-numbered year average. Although pink salmon abundance in the Bering Sea is low in even-numbered years, it was lower than the even-year average, and about the same as in 2000. In two odd years, 1995 and 2001, pink salmon were particularly large, and the smallest pink salmon size was recorded in 1998, an even year. Pink salmon fork length, body weight, and condition factor were smaller in 2002 than in 2001. These observations do not support the assumption that pink salmon are smaller when they are abundant.

Catches of chinook rose from low levels in 2001 to close to the 12-year average, and the main age groups were older fish, more typical than the predominant age 1.1 fish in 2001.

2. Introduction

The work described herein is a continuation of North Pacific Anadromous Fish Commission (NPFC) research coordination efforts and international cooperative high seas salmon (*Oncorhynchus spp.*) research in support of U.S. commitments to the NPFC, which operates under the NOAA Authorization Act of 1992 (PL 102-567, Title VIII: North Pacific Anadromous Stocks Convention). The NOAA National Marine Fisheries Service (NMFS), Alaska Bay Laboratory (ABL) in Homer, Alaska, is charged with the mission of stewardship for this program. Since 1992, the U.S. Government has contracted the Fisheries Research Institute (FRI), School of Aquatic and Fishery Sciences (SAFS), formerly School of Fisheries, University of Washington (UW), to conduct research on issues related to Pacific salmon and stockfish trout in the North Pacific Ocean. This work has included participation of SAFS scientists in the deliberations of the International North Pacific Fisheries Commission (INPFC, 1952-1992) and the North Pacific Anadromous Fish Commission (NPFC, 1992-1997). The results of SAFS' long-term High Seas Salmon Research Program have been used by the U.S. Government to establish a strong scientific basis for the 1992 SAFS' and cooperative U.S.-U.S.S.R. high seas research program. This program was expanded in 1997 to include research on the Pacific salmon and trout stocks in the North Pacific Ocean and the U.S.S.R. The NPFC has also been instrumental in the development of a Pacific salmon and trout research program in the North Pacific Ocean (1994-present) that is described in the following text.



The NPFC Convention (Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean) entered into force on 16 February 1997. The Convention prohibits directed fishing for anadromous stocks in international waters of the North Pacific Ocean and its adjacent seas (north of 33°N latitude, beyond 200-mile zone), incidental taking of anadromous stocks in fisheries directed at other species is strictly limited, and retention of incidental take is prohibited. The NPFC member-nations (Canada, Japan, Russia, and the United States) can act individually or collectively to prevent unauthorized fishing activities and engaging in illegally harvested fish and they have the authority to board, inspect, and seize fishing vessels of other member-nations operating in violation of the Convention. The NPFC, established under the Convention, serves as a forum for international coordination of scientific research and enforcement activities and promotion of conservation of Pacific salmon and ecologically related species in the Convention area and adjacent waters.

Article VII of the NPFC Convention calls for extensive cooperation among member-nations in conducting scientific research for the purpose of conservation of anadromous stocks. With respect to the Convention area, cooperation includes

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Article VII of the NPAFC Convention calls for extensive cooperation among member-nations in conducting scientific research for the purpose of conservation of anadromous stocks. With respect to the Convention area, cooperation includes

"collecting, reporting and exchanging biostatistical information, fisheries data, including catch and fishing effort statistics, biological samples and other relevant data." Pertaining to areas adjacent to the Convention area, the member-nations can be requested by the NPAFC to provide "catch information, enhancement information, materials such as biological samples and other technical data or information related to anadromous stocks and ecologically related species." The Convention calls for the development of "appropriate cooperation programs, including scientific observer programs, to collect fishing information in the Convention Area for the purpose of scientific research on anadromous stocks." Member-nations are also to cooperate in scientific exchanges such as seminars, workshops, and exchanges of scientific personnel.

In 1995, ABL developed an Ocean Carrying Capacity (OCC) research plan to address research issues identified by NPAFC. SAFS's High Seas Salmon Research Program is closely coordinated with the research efforts and mission of ABL's OCC Program. Work under current and previous NOAA contracts has included provision of participants in OCC high seas salmon research cruises and extensive collaboration in the writing, review, and publication of research plans and results. In addition, SAFS and OCC scientists routinely exchange samples, databases, and other ocean salmon research information. We continue to work closely with scientists at ABL on all aspects of the design and implementation of international cooperative high seas salmon research and NPAFC participation to maximize its usefulness within the overall framework and design of the OCC research program. The work described herein contributes substantially to the U.S. commitment for high seas salmon research under the NPAFC Science Plan.

### **3. International Cooperative High Seas Salmon Research**

#### **3.1 Maintenance of historical scale collections**

One scientist, N. Davis, was designated to maintain the collection of scales, acetate impressions of scales, associated biological data, and scale measurement data used in previous contracted scale pattern analyses from 1956 through September 2000. Maintenance includes safe storage of scales and acetate impressions, maintenance of a scale inventory, and satisfying requests for scale exchange.

Historical collections of scales and acetate impressions of scales that are archived at SAFS, include samples from U.S., Canadian, and Japanese INPFC-related high seas research and observer programs (1955-1992), from cooperative U.S.-U.S.S.R. high seas salmon research (1983-1991), from recent cooperative NPAFC-related research (1992-present), and from various NMFS observer programs (1976-present). SAFS's high seas scale collections from historical tagging studies comprise over 240,000 scales from 1956 to 1991. SAFS is also the repository of scales collected during high seas salmon research by the former Bureau of Commercial Fisheries (BCF, now NMFS) from 1955 to 1973, and from various NMFS observer programs (Japanese mothership and squid driftnet

fisheries, and some salmon bycatch samples from Bering Sea and Gulf of Alaska groundfish fisheries). SAFS also has an extensive collection of acetate impressions of scales and biological data from Canadian high seas salmon research in the Gulf of Alaska (1962-1969), and from *Oshoro maru* (1980-2002) and *Wakatake maru* (1991-2002) cruises in the central North Pacific, Bering Sea, and Gulf of Alaska. SAFS currently has electronic archives of over 100,000 measurements of scale data from all six salmonid species, including data covering the major productive range of sockeye (*O. nerka*; five years), chinook (*O. tshawytscha*; seven years), coho (*O. kisutch*; six years), and chum (*O. keta*; one year) salmon. These historical collections and databases are useful for retrospective analyses of age, growth, and stock composition of salmon in the North Pacific Ocean and Bering Sea.

We continued to update and standardize documentation and archiving of all scale collections (1950s-present) and databases that have been developed for previous high seas analyses at SAFS (1978-present). Computerized documentation was written along with the data to compact disks. Newly acquired scale samples and acetate impressions were transferred to archive boxes. A comprehensive electronic database of all scale collections and scale measurement databases was updated and stored on compact disk. We also fulfilled or coordinated the fulfillment of requests for exchange of scale samples and associated biological data made to the United States by other governments through the NPAFC.

### 3.2 High seas tagging program

Since 1955, FRI has conducted a high seas tagging program consisting of release of disk-tagged salmon at sea and recovery activities for high seas tags from inshore areas. In the 1980s, we began a program of recovery of coded-wire tags from fish caught during high seas fishing operations. In 1998, SAFS added additional activities including cooperative programs with ABL and the Fisheries Agency of Japan (FAJ) for placing data storage tags (DSTs) on salmonids at sea.

Although no U.S. vessel has been dedicated to high seas salmon tagging since 1982, a pilot program of tagging trawl-caught fish was tested by SAFS and NMFS scientists during ABL cruises in 1998 and 1999. Since then, salmon have been tagged by NMFS scientists aboard ABL research cruises.

#### 3.2.1 Cooperative high seas tagging

In FY02, R. Walker served as the U.S. representative/co-operator with the NPAFC high seas salmonid tagging programs of Canada, Japan, and Russia. Japan is presently conducting high seas salmon tagging studies aboard two vessels, the *Wakatake maru* and the *Oshoro maru*, during summer research cruises in the central North Pacific, Bering

Sea, and Gulf of Alaska. Two numbered disk tags, one U.S. tag with addresses of FRI, the National Salmon Resources Center (NASREC) in Japan, and the Kamchatka Research Institute of Fisheries and Oceanography (KamchatNIRO) in Russia, and one Japanese tag (with the word "Japan" and no mailing address) are attached to the fish with a single plastic cinch strap.

### 3.2.1.1 Disk tag releases

Scientists aboard the *Wakatake maru* conducted tagging operations on viable salmonids caught by longline in the central North Pacific and Bering Sea in summer 2002 (Fig. 1; Fukuwaka et al. 2002, Tanaka et al. 2002). Thirty-nine disk-tagged salmonids were released in the central North Pacific, and 1,003 tagged salmon were released in the central Bering Sea. The total of 1,042 fish included release of 28 sockeye, 974 chum, 2 pink (*O. gorbuscha*), 15 coho, 21 chinook salmon, and 2 steelhead trout (*O. mykiss*). Among these releases, 86 fish were tagged with 92 DSTs, of which 60 were U.S. DSTs (Table 1).

In 2002 aboard the *Oshoro maru*, 2 salmon (60 salmonids in 2001) in the Gulf of Alaska (GOA) along the 145°W transect were double disk-tagged and released (Fig. 1; Table 1; Fukuwaka et al. 2002). Both salmon were also tagged with U.S. DSTs.

### 3.2.1.2 Disk tag recoveries

High seas tag recoveries totaled 35 Japan-U.S. tags in the period from 1 October 2001 through 30 September 2002, (31 chum, 2 sockeye, and 2 pink; Table 2; Walker et al. 2002, Fukuwaka et al. 2002). These tagged salmon were released from 2001 to 2002 during cooperative Japan-U.S. tagging operations aboard the *Wakatake maru* and *Oshoro maru* in the central Aleutian Islands, Bering Sea, and GOA in June and July. One sockeye was released south of the central Aleutian Islands in July 2001 and recovered in the Kamchatka River. This sockeye also carried a data storage tag and was the first Russian recovery of a salmon tagged with an archival tag. A disk-tagged sockeye tagged with disk tags only at 48°30'N, 180° was recovered in the Ozernaya River. The Ozernaya and Kamchatka River sockeye salmon were at or near the western limits of their known ranges when tagged in the central North Pacific. Thirty-one maturing chum salmon released in June and July of 2001 in the central North Pacific and Bering Sea were recovered in Hokkaido and Honshu, Japan, and Sakhalin and an unknown location, Russia, in September and October 2001. One maturing chum salmon recovered in Hokkaido carried a data storage tag attached by Japanese scientists. One pink salmon, tagged in the central Aleutian Islands, was recovered in the Karaginsky region of Russia. Another pink salmon, tagged in the GOA with both disk and data storage tags, was recovered off Afognak Island, central Alaska.

One tag from 1962 U.S. tagging operations was found in the Iliamna River of the Nushagak system, Bristol Bay, Alaska. It had been placed on a sockeye salmon in the central North Pacific.

### 3.2.1.3 Snout collection for potential recovery of coded-wire tags

During operations aboard foreign research vessels, participating SAFS scientists have always encouraged the examination of the catch for salmonids missing the adipose fin, which indicates that a coded-wire tag may be present. SAFS has also facilitated the transport and provision of recovery samples and data to ABL, which is responsible for processing high seas recoveries of coded-wire tagged fish.

Snouts were collected from fin-clipped salmonids because these fish may contain a coded-wire tag (CWT). During high seas salmon research operations in 2002 aboard the *Oshoro maru*, 23 snouts were collected from steelhead lacking the adipose fin (Table 3). Snouts were frozen and sent to ABL for recovery of coded-wire tags. Aboard the *Wakatake maru*, snouts were recovered from 12 steelhead lacking the adipose fin (Table 4). These snouts were also sent to ABL. Snouts from these cruises have not yet been examined to determine if they contain coded-wire tags.

In 2001, CWTs were found in one coho snout and three steelhead snout from 57 snouts collected on two vessels. Two steelhead CWTs were from snouts collected in the central North Pacific and the other two CWTs came from snouts collected in the central Gulf of Alaska. One wild coho had been tagged in south central Alaska, one hatchery steelhead had been tagged in the Quinault River, Washington, one hatchery steelhead had been tagged in a tributary of the Columbia River in Washington, and one hatchery steelhead had been tagged in a tributary of the Snake River in Oregon (Myers et al. 2001a). The coho and steelhead are discussed below in section 3.2.3.2.

### 3.2.2 New tagging technologies

New tagging technologies have enabled us to get precise detailed data from individual fish as they migrate, and data from a few recoveries have already yielded a wealth of information. We have worked with NPAFC scientists in the deployment of data storage tags (DSTs) for international cooperative high seas tagging programs since 1998. In 1998 and 1999 NMFS provided SAFS with archival DSTs that recorded temperature (1998) or temperature and depth (1999) during salmonid ocean migrations. These tags were applied to salmon captured during ABL and Japanese research cruises. The number of recoveries (for example, 6 of 24 sockeye salmon tagged in the GOA, 1 of 1 chinook salmon tagged in the GOA, 5 of 23 chum salmon in the Bering Sea) demonstrated that DST tagging programs were feasible and justified. These recoveries yielded the first records of the thermal environment of individual salmon migrating at sea, with new

information on diurnal behavior, length of recuperation from tagging procedures, and proportions of time spent at different temperatures. Data from the first recoveries of temperature-depth tags in 1999 show that salmon spent most of the time in the top 40 meters, with infrequent excursions to 60-100 m.

Japan has also initiated a program using DSTs. From 1998 to 2002, Japanese scientists surgically inserted or attached tags that recorded temperature, depth, light levels, and swimming (current meter) speeds in chum salmon in the Bering Sea. As recommended by the CSRS, research issues to be addressed with the data from DST tagging programs include concerns about conservation (stock-specific migration behavior), global warming (vertical and horizontal behavior and associated environmental factors), carrying capacity (swimming behavior and bioenergetics), salmon enhancement (migration mechanisms of Pacific salmon), and technical considerations (for example, geoposition algorithms and incorporation of new tag features).

### 3.2.2.1 2001 DST Tagging

The release of 88 DSTs and recovery of three DSTs in the GOA prior to 30 September 2001 were reported previously (Myers et al. 2001a, Walker et al. 2001b). Previously-reported 2001 recoveries were one coho salmon tagged in the GOA in July and recovered in southeast Alaska off Yakobi Island, Cross Sound, and two fish (one coho and one pink) tagged off Kodiak Island by ABL scientists and recovered in Chignik Lagoon and off Kodiak Island. Since our last annual report, one additional DST from 2001 tagging was returned (Table 2). A sockeye salmon carrying a temperature-depth DST was caught in 2001 in the Kamchatka River. This was the first recovery of a Russian salmon carrying a DST. The data from this tag indicate a diurnal pattern. Depths of dives were usually in the range of 10-30 m, with the deepest dive to 44 m. A graph of ambient temperature and pressure data from this tag is presented in Fig. 2.

### 3.2.2.2 2002 DST Tagging

Sixty-two DSTs, which record temperature and depth or temperature-only data, were placed on 56 Pacific salmonids in the North Pacific Ocean and Bering Sea during research cruises aboard two Japanese vessels in 2002 (Table 1; Walker et al. 2002). Six chum salmon in the Bering Sea carried both temperature-depth and temperature-only tags to cross check the data from the two types of tags. Seventeen sockeye, eighteen chum, and seventeen chinook salmon, and two steelhead trout were tagged with DSTs in June and July in the central North Pacific and Bering Sea aboard the R/V *Wakatake maru*. Two salmon (1 chum and 1 pink) were tagged aboard the T/S *Oshoro maru* along 145°W in the central GOA in July. As of September 30, 2002, a DST had been returned from a pink salmon tagged in July in the GOA and recovered off Afognak Island, central Alaska (Table 2). Data from this tag shows a diurnal pattern similar to that from previous pink

salmon recoveries, where the fish remains near the surface at night and makes frequent dives during the day, not always returning to the surface between dives. A graph of ambient temperature and pressure data from this tag is presented in Fig. 3.

### **3.2.3 Update and correct tag databases**

We continued SAFS's role under previous NOAA contracts in the updating and correction of the two parts of the high seas tagging database: (1) the NPAFC high seas tagging database and (2) the coded-wire tag database. The NPAFC tag release and recovery databases and the high seas CWT database are archived on CD ROM at the SAFS.

In 1998, SAFS added additional activities including the responsibility for managing the high seas salmonid coded-wire tag database (1981-present) and reporting CWT recoveries to NPAFC.

#### **3.2.3.1 NPAFC high seas tagging database**

The high seas salmon tag release and recovery databases were updated with data provided at the 2001 NPAFC annual meeting. Japan reported double-tagging operations conducted with the United States, and the United States reported U.S. tagging operations in the GOA. The release database was updated with 56 operations in which 772 fish were tagged and released. Nineteen fish were added to the tag recovery database (14 recoveries from Japan, 4 recoveries from Alaska, 1 recovery from Russia). The updated databases are available to all NPAFC Parties. Preliminary information from cruise data in 2002 indicates 1,044 fish were tagged during operations on two research cruises, and 36 recoveries were reported. New tag release and recovery information will be added to the databases.

#### **3.2.3.2 High seas coded-wire tag database**

Information on high seas recoveries of CWT salmonids has been reported annually to the INPFC (1981-1992) and to the NPAFC (1993-present). The Regional Mark Processing Center, Pacific States Marine Fisheries Commission (PSMFC), incorporates the high seas CWT recovery data into their coastwide, on-line CWT recovery data set (Regional Mark Information System (RMIS), [http://www.rmis.org/cwt/cwt\\_qbe.html](http://www.rmis.org/cwt/cwt_qbe.html)). SAFS maintains, updates, and corrects errors in the high seas CWT database, reports new CWT recovery data to NPAFC, and responds to all requests for high seas CWT recovery data. This work is fully coordinated with ABL, which receives and decodes CWTs from salmonids caught by high seas research vessels or in the U.S. groundfish fishery, codes the original recovery data, and reports CWT recovery data to PSMFC. High seas

recoveries of CWT salmon and steelhead in 2001 were reported to NPAFC at their 9th Annual Meeting (Myers et al. 2001b).

Release and recovery data for 185 CWT salmonids in 2002 were reported for the first time in a document submitted to the 10th Annual Meeting of the NPAFC (Myers et al. 2002a). Reported recoveries are from U.S. commercial groundfish (trawl) fishery operations (172 recoveries) in 1999-2002 and U.S. and Japanese high seas research vessel operations (13 recoveries) in 2001. The results were compared to previous CWT and high seas tag (HST) recoveries, and significant new information on ocean distribution of Pacific salmon and steelhead is discussed.

New and previously reported recoveries of CWT chinook salmon in commercial trawl fisheries in the Bering Sea/Aleutian Islands and Gulf of Alaska regions are shown by state or province in Figures 4-13. There were no new CWT recoveries from Idaho or California chinook salmon in these northern regions. One recovery in March 2001 at 177°48'W, 51°37'N in the central Aleutian Islands is a significant westward extension of the known ocean range of British Columbia chinook salmon (Fig. 7; previous western range limit from a CWT recovery at 169°40'W, 56°01'N in the eastern Bering Sea). Two new recoveries were slight northern and western extensions of the known ranges of Washington chinook salmon in the eastern Bering Sea (Fig. 8). None of the recoveries of immature and maturing CWT chinook salmon in the US West Coast region or in research vessel operations in 2001 were range extensions. Two U.S. research trawl recoveries in the Gulf of Alaska provide additional information on summer migrations of juvenile spring chinook salmon from the lower Columbia River (Oregon) (Fig. 10). One hatchery fall-run chum salmon, released in 1999 in the lower Fraser River Basin, British Columbia, was recovered in early October 2001 in the southeastern Bering Sea (Fig. 11). There have been only 13 other recoveries of CWT chum salmon by the U.S. Groundfish Observer Program since 1980, and all of these were Bering Sea recoveries of hatchery chum salmon released in British Columbia (9), southeast Alaska (3), and Washington (1). There were four recoveries of CWT coho salmon during U.S. and Japanese high seas research vessel operations in 2001. A wild CWT coho salmon released in Moose Creek (Cook Inlet), Alaska, and recovered in the central Gulf of Alaska at 56°N, 145°W was well within the known summer range of maturing central Alaska coho salmon. Three U.S. research trawl recoveries in the Gulf of Alaska provide additional information on summer migrations of juvenile coho salmon from southeastern Alaska (2) and Washington (1) (Figs. 12 and 13). Three Japanese research vessel recoveries of CWT steelhead were well within the known ocean ranges of these stocks.

#### **3.2.4 Processing center for high seas salmon tags**

Since 1956, FRI has served as the North American processing center for recovery of high seas salmonid tags. This activity requires advertising for tag returns, returning tags and recovery information to appropriate agencies, returning information on tag recoveries

and a reward to fishermen and processors who return high seas tags, and reporting new tag recoveries in documents for NPAFC (Walker et al. 2001, 2002).

Each year in the spring, we advertise for return of high seas salmon tags by mailing approximately 1400 informational packets to addresses in Alaska, British Columbia, Washington, Oregon, and California. These packets are sent to federal, state, and tribal fisheries research and management agencies, fishermen's organizations, salmon buyers and processors, and post offices. The informational packet includes a letter explaining the tagging program and the importance of returning tags, a poster advertising for tag returns (Fig. 14), and a business-reply envelope that includes a form for recording recovery information (tag number, date, location, fishing gear) and salmon biological data (species, sex, body weight, and how to collect scales).

Since 1991, we have offered a custom-embroidered cap as a reward for people who return high seas tags. The reward caps are embroidered with colorful, stylized salmon and lettering emphasizing the cooperative aspects of the high seas salmon tagging program.

### 3.3 Salmon research vessel cruises

Participation in cooperative cruises on foreign salmon research vessels has proven to be a cost-efficient and effective method for U.S. scientists to obtain up-to-date information on distribution, abundance, and origins of salmonids in offshore waters. SAFS has had a program for cooperative research on the high seas since 1983. In 2002, SAFS scientists participated in cooperative salmon research cruises with Hokkaido University (HU; *Oshoro maru*) and Hokkaido National Fisheries Research Institute (HNFRI; *Wakatake maru*). The *Oshoro maru* operated in the eastern North Pacific and GOA in July, continuing the transect at 145°W sampled since 1994 (Fig. 1). The *Wakatake maru* continued its sampling program, begun in 1991, along 180° in the central North Pacific in June and in the Bering Sea in July (Fig. 1; Tanaka et al. 2002).

#### 3.3.1 Data collection

The NPAFC provides a forum for international exchange of scientific data on salmon, and the CSRS is attempting to expand this role to include the standardization and compilation of comprehensive data sets that can be shared among scientists of the member nations. During the *Wakatake maru* and *Oshoro maru* cruises, N. Davis and R. Walker worked with Japanese scientists to collect biological samples and data pertinent to the continuation of existing data series that were initiated and developed under previous NOAA contracts.

### 3.3.1.1 Trends in salmonid abundance, maturity, age, and size - *Oshoro maru*

One SAFS scientist (R. Walker), in collaboration with an ADF&G scientist (J. Seeb), participated in the cooperative Japan-U.S. salmon research cruise on board the T/S *Oshoro maru* from 14 to 26 July 2002 (Fig. 1, Table 5). Salmon surveys conducted aboard the *Oshoro maru* in the central North Pacific Ocean and GOA have provided valuable time series of fisheries and oceanographic data. This was the ninth consecutive year of cooperative Japan-U.S. sampling for salmon along a 145°W-longitude transect in the central GOA in July. In 2002, no fishing was conducted on a transect along 165°W, which had been sampled 1998-2001. Due to changes in Hokkaido University vessel allocation, sampling along 145°W was approximately two weeks later than in previous years. The primary objective of the 2002 cooperative research was to continue the collection of oceanographic and biological data along the 145°W transect. Because of adverse weather conditions, no fishing was conducted at one southern (Subarctic Current) station on the 145°W transect. In 2002, late July mean SSTs (11.8°C) were 2.4°C warmer than early July SSTs in 2001 at gillnet stations along the 145°W transect and warmer than all but one previous year (1994-2001 average along 145°W: 10.4°C). The northern edge of the Subarctic Current (51°N) was near the average position, and the observed position of the minimum SST (52°N) was within the range of previous years (50°N-54°N). Although SSTs have fluctuated in the nine years the 145°W transect has been sampled, a declining trend is noticeable in the temperatures at 100 m in both the Ridge/Dilute Domain and the Subarctic Current (Table 5, Fig. 15). Temperatures in the Ridge/Dilute Domain steadily decreased from 5.6°C in 1994 to 4.1°C in 2002 ( $r^2=0.83$ ,  $p<0.0006$ ). In the Subarctic Current, temperatures at 100 m have fallen from 6.5°C in 1994 to 4.5°C in 2002 ( $r^2=0.68$ ,  $p<0.006$ ). Catches by gillnet totaled 1,042 salmonids along the 145°W transect in the GOA (1,737 in 2001).

On the *Oshoro maru* salmon research cruise along the 145°W transect in late July, salmonids were caught by research gillnet in the Subarctic Current (50°-51°N) and the Ridge/Dilute Domains (52°N-56°N). Because sampling was two weeks later than in previous years, differences between years may be due to a seasonal effect in addition to interannual variability. Sockeye relative abundance returned to near average values in 2002 (Table 6). Maturing ocean age -.2 fish composed over 90% of the catch and would be part of the large cohort of age -.1 fish caught in 2001 (Table 7, Fig. 16). The high return of sockeye to the Fraser River in 2002 suggests that the very high catches of age -.1 fish in 2001 were of Fraser origin. Chum salmon were at their second highest level of abundance in both oceanographic regions, second only to 1995. Chum salmon were predominantly (89% and 93%) immature, ocean age -.1 and -.2 in both areas (Table 8). The proportions by age in the Gulf of Alaska overall were similar to 1997-98, when these two age classes were also about equal, though abundances were higher in 2002 (Fig. 16). The abundances of pink and coho salmon in both areas in 2002 were at the lowest levels recorded during 1994-2002 sampling. This is possibly due to the later sampling period, after pink salmon in particular had moved to more coastal areas in their spawning migrations. Steelhead were roughly evenly divided between juvenile, ocean age-.0 fish

and maturing age-.1 or -.2, fish (Table 9). Fork lengths, body weights, and condition factors of salmonids in the 1994-2001 *Oshoro maru* research gillnet (C-gear) catches are summarized by species, age group and oceanic area (Tables 10-13). Preliminary statistical analyses of these biological data indicate that variation between stations within one year is as high as variation between years or between oceanic areas. Body weights were the highest recorded for most species and age classes, and condition factors were also very high. This is again due to sampling two weeks later than in previous years.

### 3.3.1.2 Trends in salmonid abundance, maturity, age, and size - *Wakatake maru*

One SAFS scientist (N. Davis) participated in an annual high-seas salmonid research cruise, which surveyed the central North Pacific and Bering Sea from June 6 to July 21, 2002 (Fig. 1; Tanaka et al. 2002). The objective of this cruise was to monitor salmon stock condition. Research cruise activities included collection of data on oceanography, primary production, zooplankton, salmonids, and other organisms. Average sea surface temperatures in the central North Pacific were 0.3°C warmer than in 2001, continuing a warming trend which began in 1999. In 2002, superficial warming of the sea surface during the summer produced a shallow seasonal thermocline at 25 to 30 m, which was 10-20 m deeper than in previous years. In the Bering Sea, sea surface temperatures in 2002 were 1.6°C warmer than in 2001, and were similar to water temperatures found in 2000. A total of 7,931 salmonids was caught by longline and gillnet, including 526 fish in the central North Pacific Ocean, and 7,405 salmon in the central Bering Sea. In the North Pacific, chum salmon was the most abundant species (58% of the salmonid catch) followed by coho (28%), sockeye (5.7%), steelhead trout (4.8%), pink (2.7%), and chinook salmon (0.6%). In the Bering Sea, chum salmon was the most abundant species (88% of the salmonid catch), followed by sockeye (9.3%), chinook (2.3%), and pink salmon (0.6%). The number of chum salmon caught by longline was three times higher than in the previous two years. A total of 1,042 salmonids (974 chum, 28 sockeye, 21 chinook, 15 coho, 2 pink salmon and 2 steelhead trout) was released with disk tags in the North Pacific Ocean and Bering Sea. These fish included a total of 48 chum, 18 chinook, and 16 sockeye salmon and 2 steelhead trout released with DSTs (30 Japanese and 60 US DSTs). Food habits data were obtained from examination of 718 stomach samples. Brain and pituitary samples were collected from 179 chum, and olfactory neuron and epithelium were collected from 46 chum salmon.

Abundance of salmonids caught by research gillnets fished by the *Wakatake maru* in 1991-2002 is summarized by oceanographic domain and year (Table 14). The abundance of sockeye in the Subarctic Current in 2002 was less than in 2001, and was less than the 12-year average (2002: 4.3; 12-year average: 5.1). In 2002, the size of ocean age -.1 and -.2 sockeye salmon was larger than in 2001 (Table 15). Most of the sockeye salmon were immature ages 2.1 (42%) and 1.2 (42%; Fig. 17, Table 16). In 2002 in the Bering Sea, sockeye salmon were approximately half as abundant as they were in 2001, and abundance was about three-quarters of the 12-year average (2002: 28.5; 12-year average: 41.1; Table 14). Mean sockeye salmon fork length and body weight of ocean age -.1 and

-.2 was larger in 2002 than in 2001 (Table 15). The most common sockeye salmon age-maturity groups in the Bering Sea were immature age 2.2 (27%), 1.2 (22%), 1.1 (18%), and 2.1 (14%; Fig. 18, Table 17). In 2002, abundance of ocean age -.1 sockeye salmon was at the lowest level since 1995.

In 2002, chum salmon abundance in the central North Pacific was slightly lower than it was in 2001, but it was higher than the 12-year average (2002: 24.8; 12-year average 16.9; Table 14). In 2002, mean fork length and body weight of ocean age -.1 and -.2 chum salmon were less than in 2001 (Table 18), and catch of ocean age -.1 chum salmon was higher than in any year since 1991 (Fig. 17). In even-numbered years, chum salmon were more abundant in the Bering Sea than in odd-numbered years, when pink salmon abundance was high (Table 14). As expected in 2002, the abundance of chum salmon was higher than in the previous year, however, the level of abundance was lower than the even-numbered year average (2001: 189.5; 6-year average for even-numbered years: 203.8). In 2002, mean fork length and body weight of ocean age -.2 and -.3 fish was less than in 2001 (Table 18), and abundance of ocean age -.1 chum salmon was lower in 2002 than in the previous year (Fig. 18, Table 19). Abundance of chum salmon in the Bering Sea was particularly low in 1991, 1995, and 1999. If this trend continues, there will be a small catch of chum salmon in the Bering Sea in 2003.

Pink salmon abundance in the central North Pacific in 2002 was lower than in 2000, and was lower than the even-numbered years average (2002: 0.6; even-year average 2.3; Table 14). All pink salmon were maturing ocean age -.1 (Table 20). In 2002, mean fork length was the same as in 2001, and mean body weight was smaller than in 2001 catches. In the Bering Sea, pink salmon continued a cycle of low abundance in even-numbered years (Table 14). In 2002, pink salmon abundance was the same as it was in 2000, however this level was lower than the even-year average (2001: 2.2; even-year average 6.2). Pink salmon fork length, body weight, and condition factor were smaller in 2002 than in 2001 (Table 20). The assumption that pink salmon have larger body size when their abundance is low does not fit these data.

In 2002, the abundance of coho salmon in the central North Pacific was lower than in 2001, and was approximately half of the 12-year average (2002: 6.0; 12-year average: 11.0; Table 14). All of the coho salmon caught by the Wakatake maru are maturing ocean age -.1 (Table 21). Mean fork length and body weight of coho salmon caught in the central North Pacific was smaller than that of fish caught in 2001.

Chinook salmon were not abundant in the central North Pacific Ocean (Table 14). In 2002, two chinook salmon were caught in the Subarctic Current. They were relatively small, immature, ocean age -.2 and -.3 fish (Tables 22 and 23). In the Bering Sea, chinook salmon were more abundant than in the central North Pacific (Table 14). The abundance of chinook salmon in 2002 was higher than in 2001 and close to the 12-year average (2002: 6.9; 12-year average: 7.1). Chinook salmon were mostly immature ages

1.2 (39%), 1.3 (21%), and 1.1 (19%), and the size at age of these fish was larger in 2002 than in 2001 (Tables 22 and 24).

In 2002, the abundance of steelhead trout was lower than in 2001 and somewhat lower than the 12-year average (2002: 1.1; 12-year average: 1.7; Table 14). Mean fork length and body weight of ocean age-.1 steelhead was smaller in 2002 than 2001, while the body size of ocean age-.2 steelhead was larger in 2002 than 2001 (Table 25). Generally, steelhead were age 1.1 (22% immature and 33% immature) fish, maturing age 2.2 (23%), and immature age 1.2 fish (22%; Table 26). Fifty-five percent of steelhead were freshwater age 1.-, indicating that most fish were of hatchery-origin because wild fish usually have an older freshwater age.

### 3.3.2 Process samples and update data series

SAFS scientists have been conducting cooperative shipboard research on offshore food habits of salmon with scientists at HNFRI since 1991, Hokkaido University since 1993, and Hokkaido Tokai University since 1997. We continued to process samples and update the recent Japan-U.S. cooperative high seas salmon data series for the central North Pacific and Bering Sea (1991-2002) and Gulf of Alaska (1993-2002).

#### 3.3.2.1 Summary of salmon food habits - *Oshoro maru*

Nine years of sampling along a 145°W transect by the *Oshoro maru* in the central GOA have generally shown some striking differences in the food habits of salmonids in Ridge/Dilute Domain versus Subarctic Current areas (Tables 27-28). In the Subarctic Current, squid, primarily *Berryteuthis anonychus*, usually has been the dominant prey of all species except chum salmon, which has had a much more diverse diet (primarily amphipods, euphausiids, copepods, pteropods, and gelatinous zooplankton; Table 27). In 1999 and 2000 the percentage of squid in the diets of sockeye and pink salmon in this area was low, and amphipods were abundant. In 2001 and 2002, salmon feeding seemed to have returned to conditions thought of as 'normal' in 1994-1998.

In the Ridge/Dilute Domain (Table 28), prey composition of stomach contents of sockeye, chum, and pink salmon is more diverse and the mean SCI is usually lower than in the Subarctic Current. Euphausiids and amphipods were important prey items for sockeye, chum, and pink salmon in the Ridge/Dilute Domain. Sockeye and pink also fed heavily on squid, while pteropods were a major component of chum diets. Coho, chinook, and steelhead tend to specialize in feeding on squid and fish, regardless of oceanic area, but in 2002 coho diets contained a high proportion of euphausiids as well as squid.

### 3.3.2.2 Summary of salmon food habits - *Wakatake maru*

In 2002, a total of 718 stomach samples was examined on board the *Wakatake maru*. This total includes samples collected from 162 sockeye, 338 chum, 52 pink, 51 coho, and 92 chinook salmon, and 23 steelhead trout. Results of *Wakatake maru* food habits investigations from 1991-2002 are summarized by salmon species, year and oceanographic areas (Tables 29-34).

Samples collected in 2002 from the Transition Domain showed an unusually high abundance of salps in the contents of chum and coho salmon stomachs (Table 30). Warm water temperatures and large catches of salps in the ORI net characterized this area. The stomach contents of chum and coho salmon also contained the hyperiid amphipod, *Phronima sedentaria*, which uses salps to create barrels in which to live and rear their young. Another hyperiid, *Themisto pacific*, was numerous in the stomach contents of chum salmon. Samples collected in 2002 north of 46°N and south of the Aleutian Islands showed chum contained more ctenophores, pteropods and copepods than further south. In this area squid, *Berryteuthis anonychus*, was present in the stomachs of coho, chinook, sockeye, and pink salmon, and steelhead trout (Tables 31-33). Chinook salmon and steelhead were also feeding on fish, including myctophids and Atka mackerel (*Pleurogrammus monopterygius*). Young sockeye (ocean age-.1) fed heavily on *Themisto*.

Salmon stomachs collected in 2002 from the Bering Sea showed a variety of post-larval and juvenile fish consumed by all salmon species, particularly chum, sockeye, and pink salmon (Table 34). These small fish included post-larval halibut, *Hippoglossus stenolepis*, *Atheresthes* sp., bathymasterids, juvenile Atka mackerel, and Irish lords (*Hemilepidotus*). The adult northern lampfish (*Stenobranchius leucopsarus*) was commonly found in the stomach contents of all salmon species, and may be a particularly important prey fish because it contains abundant lipid. In the Bering Sea, the euphausiid *Thysanoessa longipes* is a common prey item in the stomachs of chum, sockeye, pink, and chinook salmon. Chinook and sockeye salmon were found with large (>50 mm mantle length) *B. anonychus* squid in their stomachs, as well as small squid (<25 mm mantle length) that may be juvenile *B. anonychus*. Small squid are also consumed by chum and pink salmon. Other common prey organisms consumed by chum, pink, and sockeye salmon include *Themisto*, *Limacina* and *Clione* (both pteropods), and copepods (*Neocalanus cristatus*). Chum salmon had the most varied diet and were observed to feed on ctenophores (*Beroe* sp.), medusae (*Aglantha digitale*), and *Oikopleura* sp. The high abundance of euphausiids in the stomach contents of chum, sockeye, pink, and chinook salmon suggests a favorable feeding condition for salmon in the Bering Sea in 2002.

## **4. NPAFC Participation**

### **4.1 Participants for annual meetings, sub-committees, and working groups**

SAFS scientists have regularly participated as U.S. salmon experts at NPAFC meetings, 1993-present. Since her appointment in October 1997, K. Myers has served as the U.S. member of the Science Sub-Committee, which is charged with developing the Science Plan for the CSRS. K. Myers and R. Walker participated in the CSRS at the 9<sup>th</sup> Annual Meeting in Victoria, B.C., October 28-November 2, 2001. K. Myers served as Rapporteur, and R. Walker assisted with U.S. editorial duties, in preparing the annual CSRS report. K. Myers and R. Walker will participate in the CSRS at the 10<sup>th</sup> Annual Meeting in Vladivostok October 6-11, 2002.

### **4.2 Rapporteur's Report**

Duties of the Rapporteur include receiving, compiling, and editing material on field research plans, statistics, research results, and other routine information required for the annual report of the CSRS. A draft of the Rapporteur's report is sent by the NPAFC Secretariat to all CSRS participants prior to the start of the annual meeting. Since 1993, the appointment of the CSRS rapporteur has alternated between the United States and Canada, with the appointment of a Canadian rapporteur in odd years. K. Myers has been appointed as the CSRS Rapporteur in even years from 1994-present.

At the 9<sup>th</sup> Annual Meeting of NPAFC, the CSRS endorsed the rapporteur system for the 2002 CSRS Annual Meeting. K. Myers was appointed Rapporteur for the 10<sup>th</sup> Annual Meeting in Vladivostok October 6-11, 2002. The rapporteur's report serves as the basis for the Report of the CSRS, which will be incorporated in the NPAFC Records of the Tenth Annual Meeting and in the NPAFC Annual Report.

### **4.3 Participants for NPAFC-related salmonid workshops, symposiums, and meetings**

K. Myers is co-author with R. Brodeur and J. Helle of NMFS of the U.S. review of juvenile salmon research for NPAFC Bulletin 3. This review and publication is a product of the NPAFC workshop, "Factors Affecting Production of Juvenile Salmon," held together with PICES in October 2000 in Tokyo, Japan.

K. Myers was co-editor of NPAFC Technical Report 3, which contains extended abstracts from the NPAFC International Workshop on Salmonid Otolith Marking, held March 21, 2001 in Seattle.

An annual Research Planning and Coordinating Meeting (RPCM) of NPAFC scientists is usually held in March of each year. SAFS researchers (K. Myers, R. Walker, and N. Davis) participated in the NPAFC RPCM held March 12-13, 2002 in Vancouver, B.C. K. Myers served as rapporteur and R. Walker as a U.S. editor for a summary report of the RPCM.

The Joint Meeting on Causes of Marine Mortality of Salmon in the North Pacific and North Atlantic Oceans and in the Baltic Sea was held in Vancouver on Mar 14-15, 2002. SAFS scientists K. Myers, R. Walker, and N. Davis participated in the meeting, which was co-sponsored by the NPAFC, the International Baltic Sea Fishery Commission (IBSFC), the International Council for the Exploration of the Sea (ICES), the North Atlantic Salmon Conservation Organization (NASCO), and the North Pacific Marine Science Organization (PICES). K. Myers was co-editor of NPAFC Technical Report 4, which contains extended abstracts from the joint meeting.

As part of international cooperative tagging efforts, K. Myers, R. Walker, and other NPAFC scientists from Canada, Japan, and the U.S. attended the Pacific Ocean Salmon Tagging (POST) Project General Meeting on March 16, 2002 in Vancouver. POST is a pilot research project of the Census of Marine Life, an international research program to assess the diversity, distribution, and abundance of marine organisms. The workshop reviewed archival and acoustic tag research and future research plans in waters of the North Pacific Ocean and Bering Sea, and in Pacific Northwest freshwater and coastal areas. The workshop was sponsored and funded by the Sloan Foundation.

K. Myers attended the Bering Sea-Aleutian Salmon International Survey (BASIS) Working Group Meeting, on May 27-28, 2002 in Vladivostok. She served as co-rapporteur and helped prepare the report of the meeting for consideration by the CSRS (NPAFC 2002).

N. Davis participated in the PICES Symposium A Decade of Variability in the Physical and Biological Components of the Bering Sea Ecosystem, 1991-2001, held at PICES X on Oct. 9, 2001, in Victoria. She presented a poster "Food habits of sockeye, chum, and pink salmon from the central Bering Sea 1991-2000," and is co-author of a paper presented at the symposium and later published in a special volume of *Progress in Oceanography* (Ishida et al. 2002). R. Walker and K. Myers were co-authors of a paper presented at the meeting (Kaeriyama et al. 2001).

#### **4.4 Necessary documents for Annual Meetings**

In 2001, eight documents were submitted or co-authored by SAFS researchers for the CSRS at the NPAFC 9<sup>th</sup> Annual Meeting, including Abe et al. 2001; Fukuwaka et al. 2001a,b; Ishida et al. 2001; Myers et al. 2001a; Nomura et al. 2001; Walker et al. 2001;

and Yamaguchi et al. 2001. K. Myers helped prepare the draft plan for BASIS, in collaboration with J. Helle of ABL and R. Beamish of Canada, for consideration by the CSRS (NPAFC 2001). Five documents co-authored by SAFS researchers were submitted for the CSRS for the NPAFC 10<sup>th</sup> Annual Meeting, including Fukuwaka et al. 2002; Myers et al. 2002; Nomura et al. 2002; Tanaka et al. 2002; and Walker et al. 2002.

## 5. Acknowledgments

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## 6. 2000-2001 Reports, Documents, and Publications

The authors supported by NOAA Contract No. 50ABNF-1-00002 and previous contracts are indicated in bold characters.

Abe, S., H. Kojima, **N.D. Davis**, T. Nomura, S. Urawa. 2001. Molecular identification of parental species in a salmonid hybrid caught in the Bering Sea. NPAFC Doc. 539. Lab. of Animal Cytogenetics, Ctr. for Adv. Science and Technology, Hokkaido University, Sapporo. 11 p.

**Davis, N.D.**, Y. Ishida, M. Kaeriyama, K. Tadokoro, Y. Ueno, and M. Fukuwaka. 2001. Food habits of sockeye, pink, and chum salmon in the central Bering Sea, 1991-2000. Abstract presented at the Tenth Annual Meeting of the North Pacific Marine Science Organization (PICES), October 5-13, 2001, Victoria.

Friedland, K.D., **Walker, R.V.**, **N.D. Davis**, **K.W. Myers**, G. Boehlert, S. Urawa, and Y. Ueno. 2001. Open-ocean orientation and return migration routes of chum salmon based on temperature data from data storage tags. *Mar. Ecol. Prog. Ser.* 216: 235-252.

Fukuwaka, M., **N.D. Davis**, A. Urano, T. Onuma, and S. Tsuchiya. 2001a. International salmon research aboard the R/V *Wakatake maru* in the central North Pacific Ocean and Bering Sea during the summer of 2001. NPAFC Doc. 546. Hokkaido Nat. Fish. Res. Inst., Fisheries Research Agency, Kushiro. 18 p.

- Fukuwaka, M., S. Urawa, I. Ono, **N.D. Davis**, and **R.V. Walker**. 2001b. Recoveries of high-seas tags in Japan in 2000, and tag releases and recoveries of fin-clipped salmon from Japanese research vessel surveys in the North Pacific Ocean in 2001. NPAFC Doc. 545. Hokkaido Nat. Fish. Res. Inst., Fisheries Research Agency, Kushiro. 12 p.
- Ishida, Y., T. Azumaya, M. Fukuwaka, and **N. Davis**. 2001. Interannual variability in stock abundance and body size of Pacific salmon in the central Bering Sea. NPAFC doc. 549. Hokkaido National Fish. Res. Inst. Fisheries Research Agency, Kushiro. 12p.
- Ishida, Y., T. Azumaya, M. Fukuwaka, and **N. Davis**. 2002. Interannual variability in stock abundance and body size of Pacific salmon in the central Bering Sea. *Progress in Oceanography* 55:223-234.
- Kaeriyama, M., M. Nakamura, J.R. Bower, S. Yamaguchi, **R.V. Walker**, and **K.W. Myers**. 2001. Recent change in summer feeding ecology and trophic dynamics of Pacific salmon in the offshore waters of the Gulf of Alaska. Abstract presented at the Tenth Annual Meeting of the North Pacific Marine Science Organization (PICES), October 5-13, 2001, Victoria.
- Myers, K.W.**, A.G. Celewycz, and E.V. Farley, Jr. 2001a. High seas salmonid coded-wire tag recovery data, 2001. NPAFC Doc. 557. School of Aquatic and Fishery Sciences, University of Washington, Seattle (SAFS-UW-0111). 31 p.
- Myers, K.W.**, A. Celewycz and E.V. Farley, Jr. 2002. High seas salmonid coded-wire tag recovery data, 2002. NPAFC Doc. 610. SAFS-UW-0203. School of Aquatic and Fishery Sciences, University of Washington, Seattle, WA (SAFS-UW-0203). 42 p
- Myers, K.W.**, **R.V. Walker**, and **N.D. Davis**. 2001. NPAFC research coordination, 2001. Annual Report to Auke Bay Laboratory, NMFS, High Seas Salmon Research Program. School of Aquatic and Fishery Sciences, Seattle (SAFS-UW-0113). 82 p.
- Nomura, T., M. Fukuwaka, **N. Davis**, and M. Kawana. 2002. Total lipid contents in the white muscle, liver, and gonad of chum salmon caught in the Bering Sea and Gulf of Alaska in summer 2001. NPAFC Doc. 615. Nat. Salmon Res. Ctr., Sapporo. 12 p.
- Nomura, T., S. Urawa, M. Kawana, M. Fukuwaka, and **N.D. Davis**. 2001. Variation in lipid content in the muscle of chum salmon in the central North Pacific Ocean and Bering Sea. NPAFC Doc. 540. Nat. Salmon Res. Ctr., Sapporo. 10 p.
- North Pacific Anadromous Fish Commission (NPAFC). 2001. Draft plan for NPAFC Bering-Aleutian Salmon International Survey (BASIS) 2002-2006. NPAFC Doc. 579. 27 p.
- North Pacific Anadromous Fish Commission (NPAFC). 2002. Report of the Bering-Aleutian Salmon International Survey (BASIS) Working Group Meeting. NPAFC Doc. 599. 11 p.

- Pascual, M., P. Bentzen, C.R. Rossi, G. Mackey, M.T. Kinnison, and **R. Walker**. 2001. First documented case of anadromy in a population of introduced rainbow trout in Patagonia, Argentina. *Trans. Am. Fish. Soc.* 130: 53-67.
- Tanaka, H., **N. Davis**, T. Onuma, M. Yamada, Y. Yamamoto, and S. Tsuchiya. 2002. International salmon research aboard the R/V *Wakatake maru* in the central North Pacific Ocean and Bering Sea during the summer of 2002. NPAFC Doc. 622. Hokkaido Natl. Fish. Res. Inst., Fisheries Research Agency, Kushiro. 21 p.
- Walker, R.V., N.D. Davis, K.W. Myers**, M. Fukuwaka, and H. Tanaka. 2002. Releases and recoveries of U.S. salmonid data storage tags, and recoveries of high seas tags in North America, 2002. NPAFC Doc. 608. School of Aquatic and Fishery Sciences, Univ. Washington, Seattle (SAFS-UW-0204). 8 p.
- Walker, R.V., N.D. Davis, K.W. Myers, J.M. Murphy**, and M. Fukuwaka. 2001. Releases and recoveries of U.S. salmonid data storage tags, and recoveries of high seas tags in North America, 2001. NPAFC Doc. 556. Fish. Res. Inst., Univ. Washington, Seattle (SAFS-UW-0112). 11 p.
- Yamaguchi, H., Y. Kajiwara, S. Takagi, K. Sakaoka, J. Kimura, **R. Walker**, J. Murphy, and M. Kawana. 2001. The 2001 international cooperative salmon research cruise of the *Oshoro maru*. NPAFC Doc. 547. Faculty of Fisheries, Hokkaido Univ., Hakodate. 19 p.



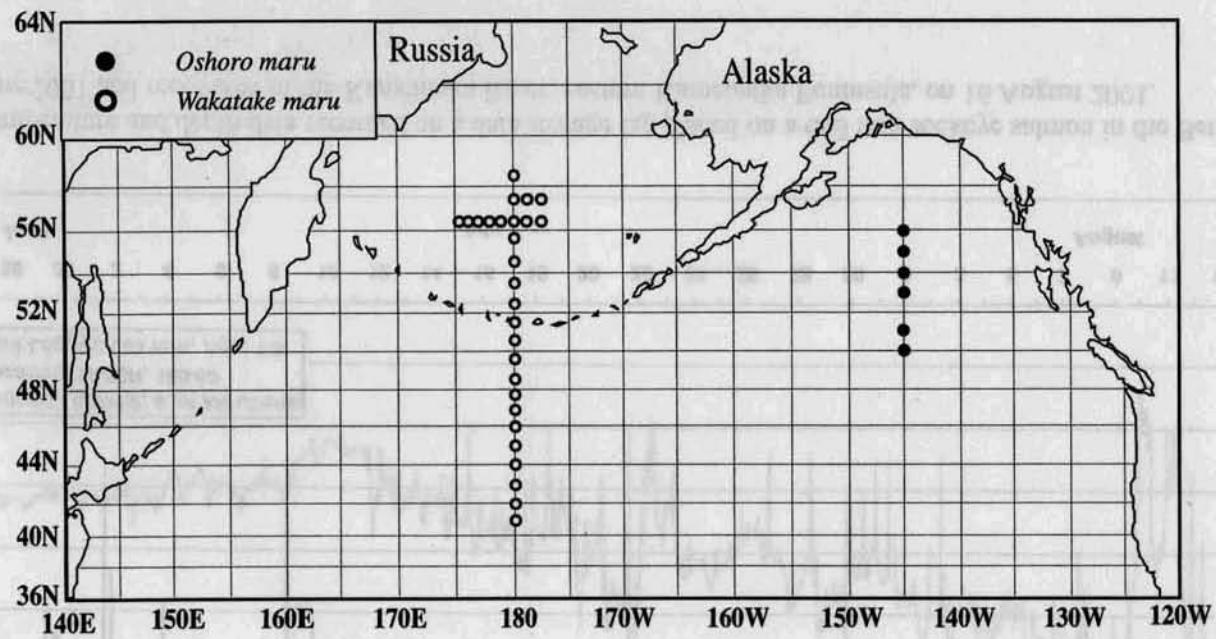


Figure 1. Sampling areas of international cooperative high seas salmon research cruises in FY 2002.

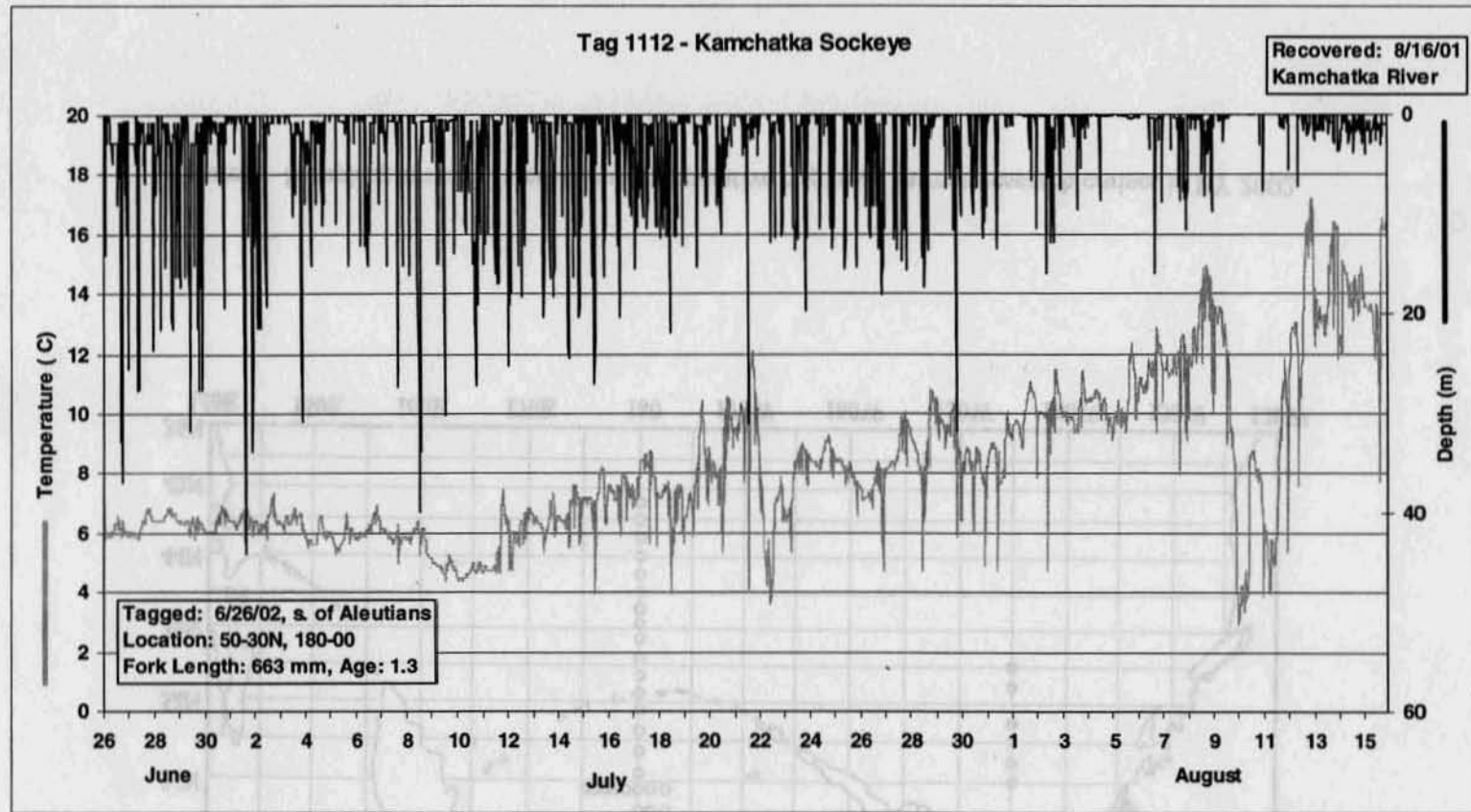


Figure 2. Temperature and depth data recorded on a data storage tag placed on a 663 mm sockeye salmon in the Bering Sea on 26 June 2001 and recovered in the Kamchatka River, eastern Kamchatka Peninsula, on 16 August 2001.

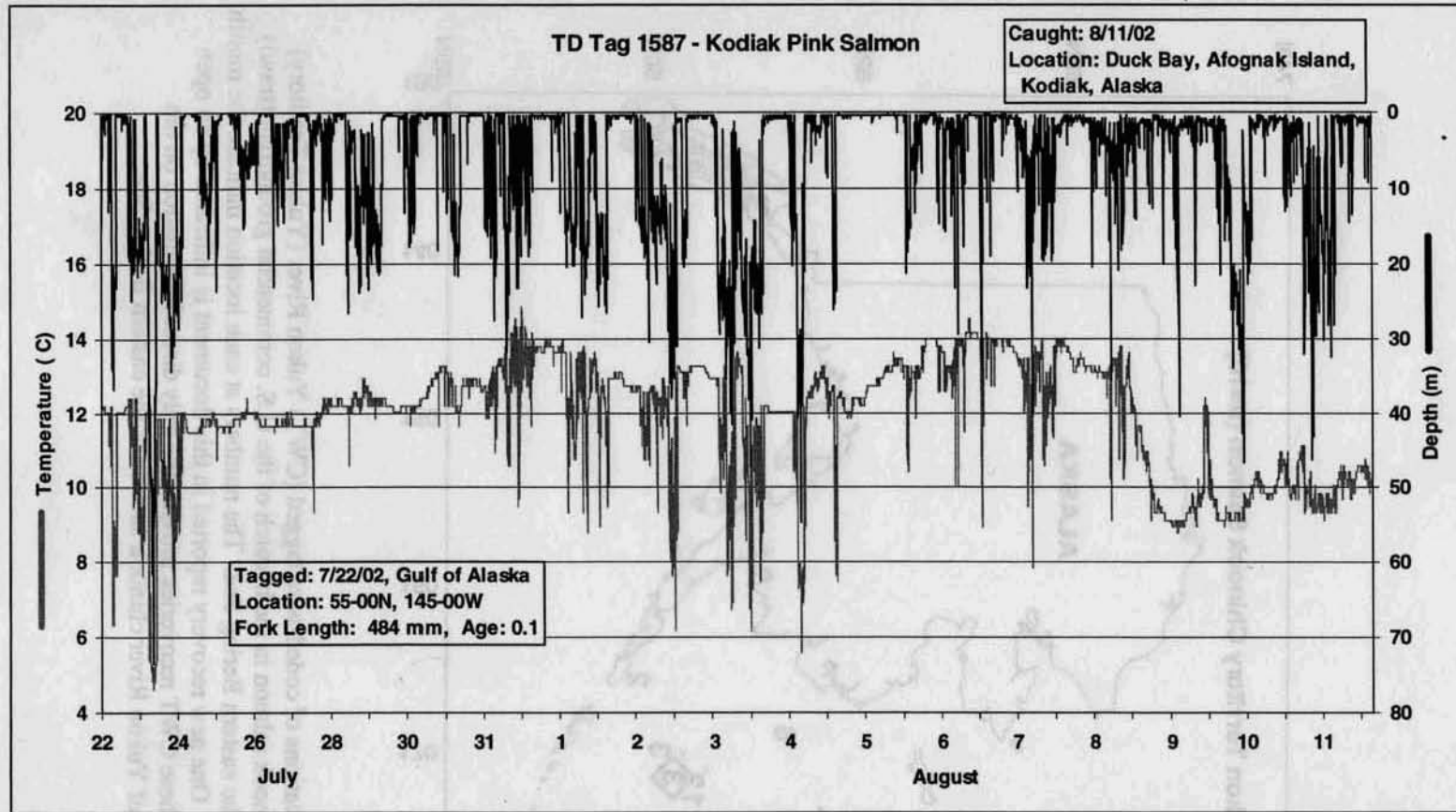


Figure 3. Temperature and depth data recorded on a data storage tag placed on a 484 mm pink salmon in the Gulf of Alaska on 22 July 2002 and recovered off Afognak Island, Kodiak, on 11 August 2002.

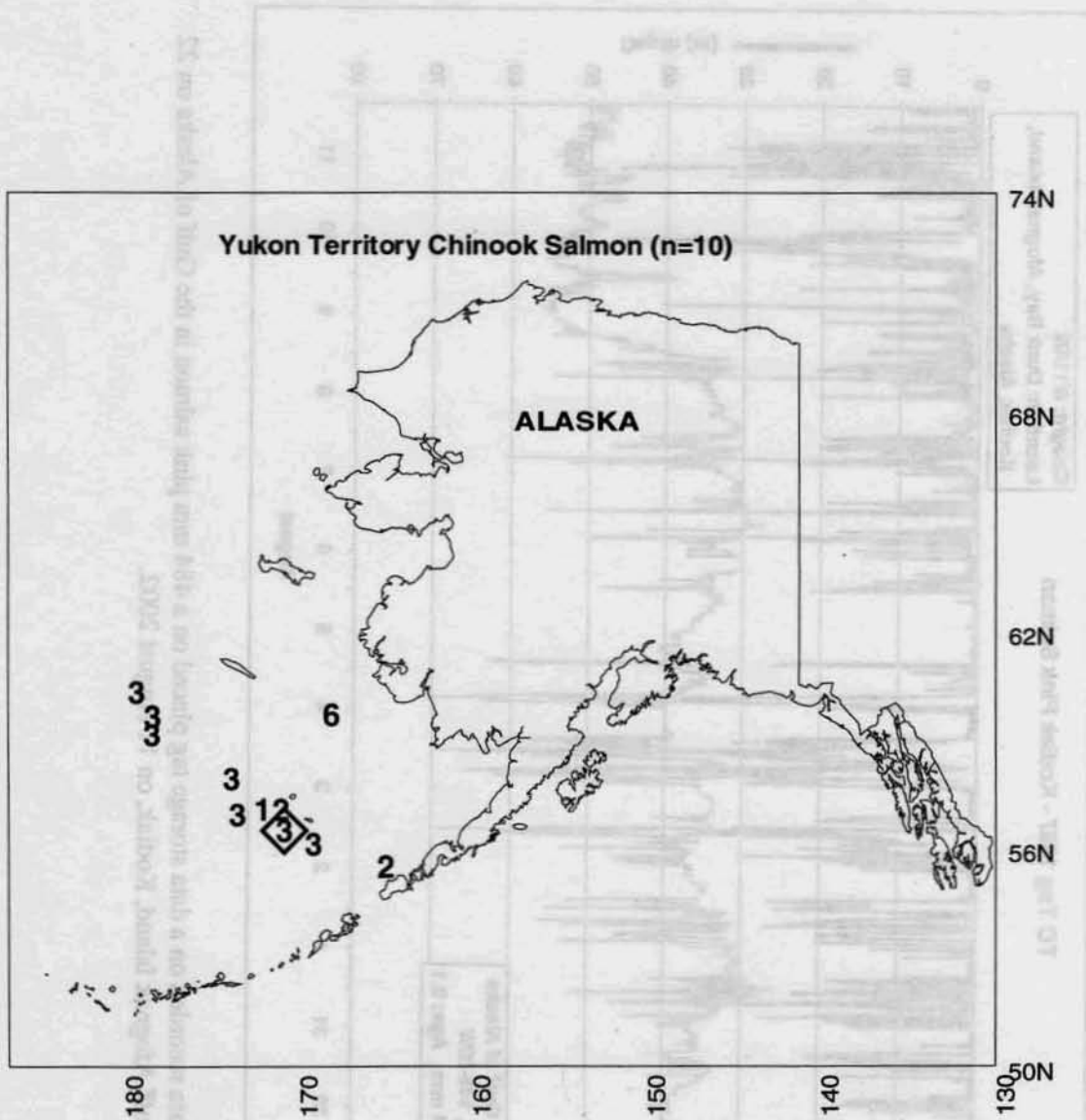


Fig. 4. Recovery locations of coded-wire tagged (CWT) Yukon River (Yukon Territory) hatchery chinook salmon in the bycatch of the U.S. commercial groundfish (trawl) fisheries in the eastern Bering Sea. The numbers at each location indicate the month of recovery. One new recovery reported in this document is indicated by an open diamond. These CWT recoveries provide the only direct information on the distribution of Yukon River chinook salmon in the eastern Bering Sea.

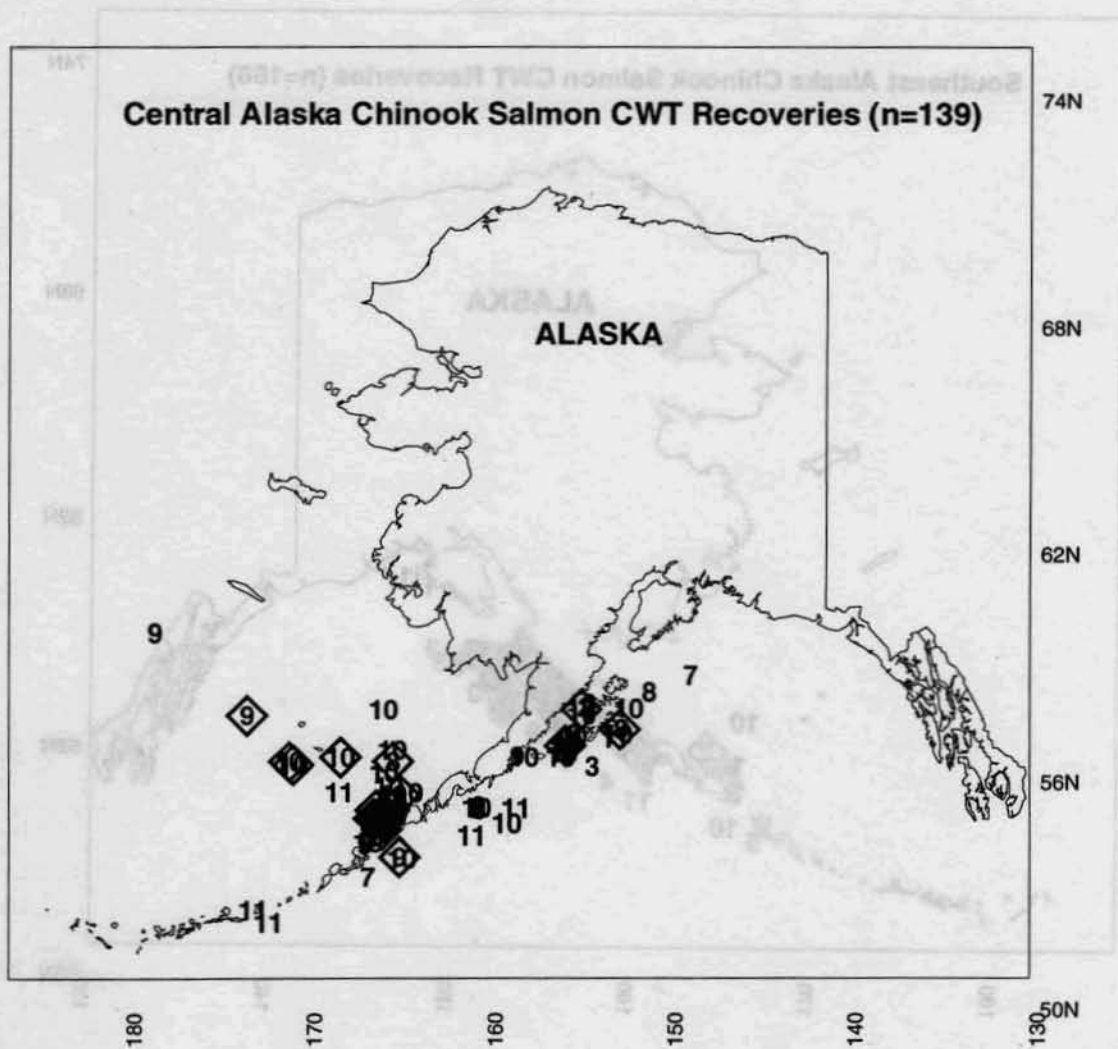


Fig. 5. Recovery locations of coded-wire tagged (CWT) central Alaska chinook salmon in the bycatch of the U.S. commercial groundfish (trawl) fisheries in the eastern Bering Sea, Aleutian Islands, and Gulf of Alaska. The numbers at each location indicate the month of recovery. New recoveries reported in this document are indicated by an open diamond.

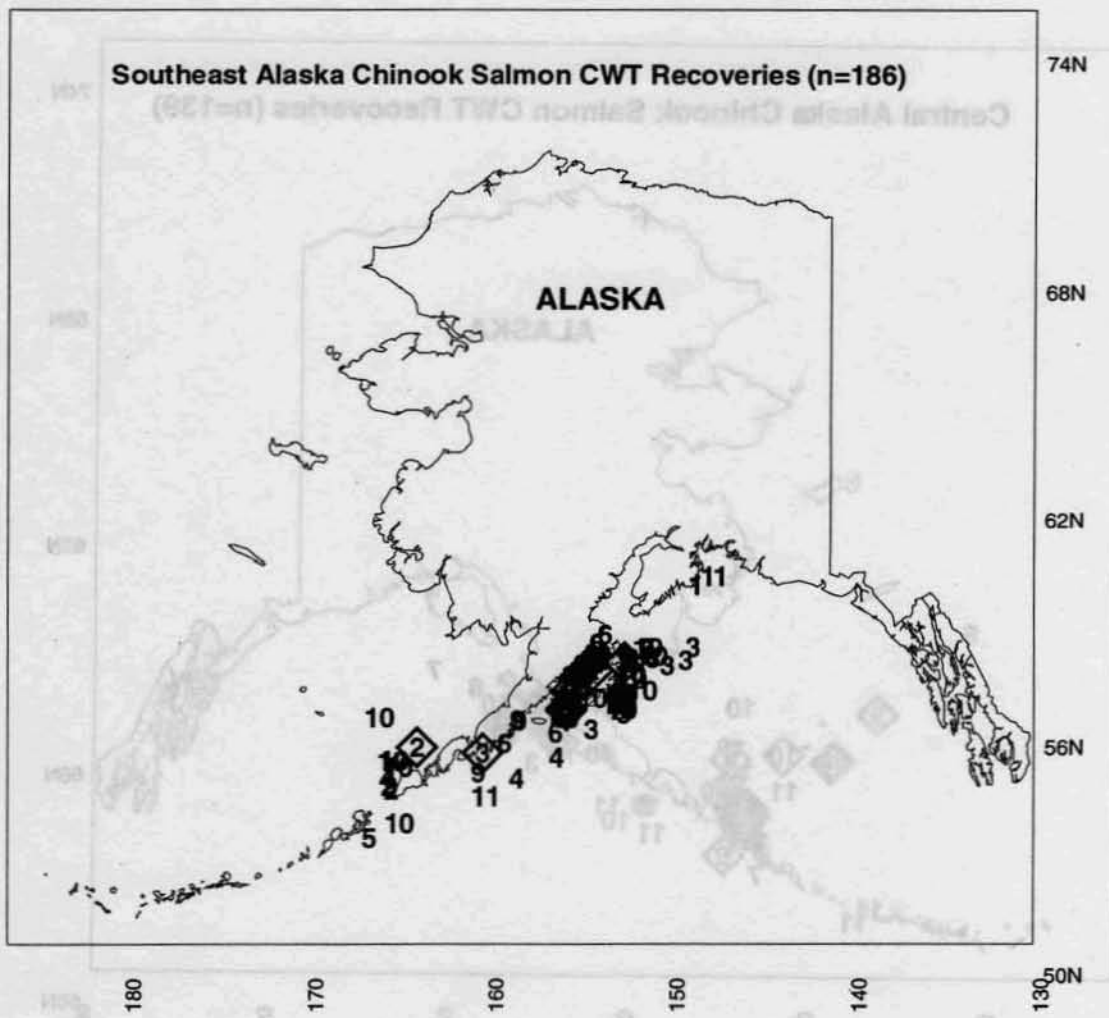


Fig. 6. Recovery locations of coded-wire tagged (CWT) southeastern Alaska chinook salmon in the bycatch of the U.S. commercial groundfish (trawl) fisheries in the eastern Bering Sea, Aleutian Islands, and Gulf of Alaska. The numbers at each location indicate the month of recovery. New recoveries reported in this document are indicated by an open diamond.

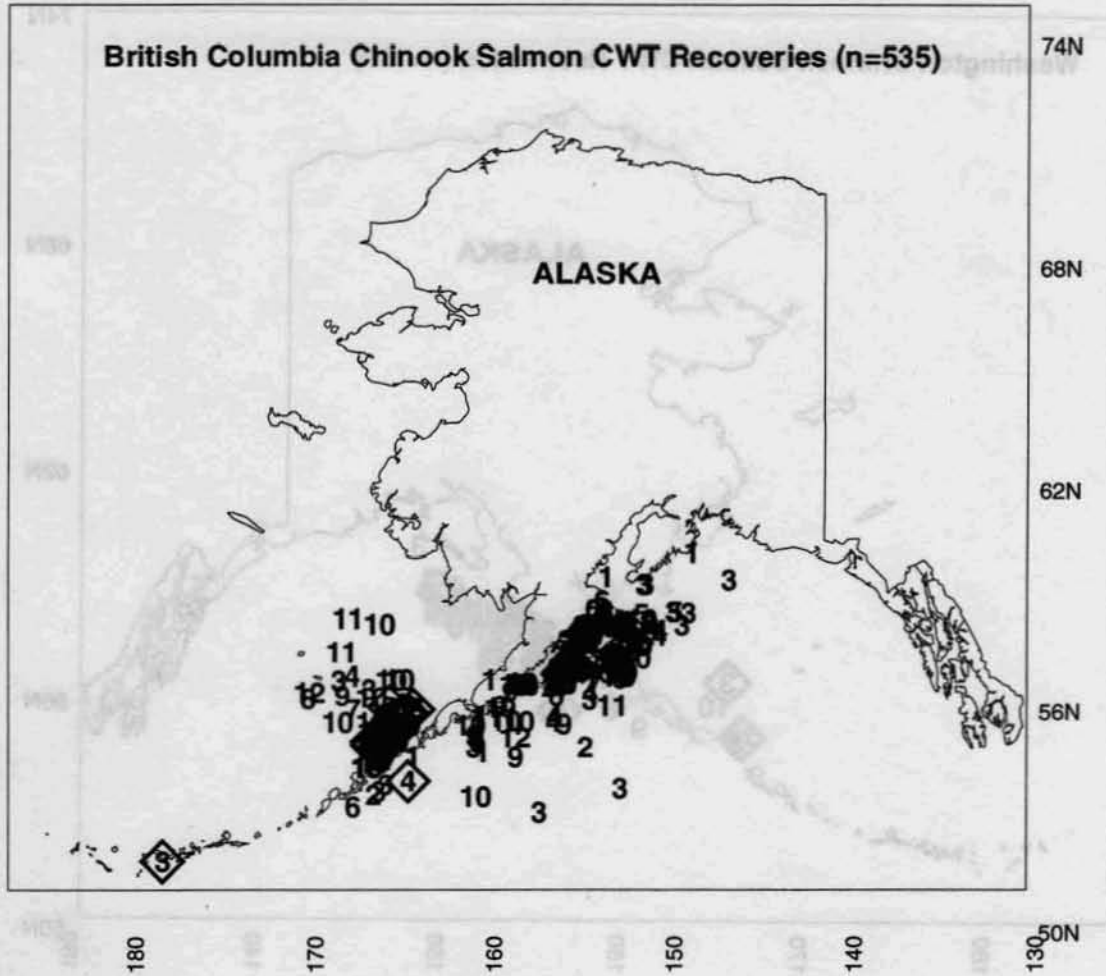


Fig. 7. Recovery locations of coded-wire tagged (CWT) British Columbia chinook salmon in the bycatch of U.S. commercial groundfish (trawl) fishery operations in the eastern Bering Sea, Aleutian Islands, and Gulf of Alaska. The numbers at each location indicate the month of recovery. New recoveries reported in this document are indicated by an open diamond. The recovery at  $177^{\circ}48'W$ ,  $51^{\circ}37'N$  in the central Aleutian Islands is a significant westward extension of the known ocean range of British Columbia chinook salmon.

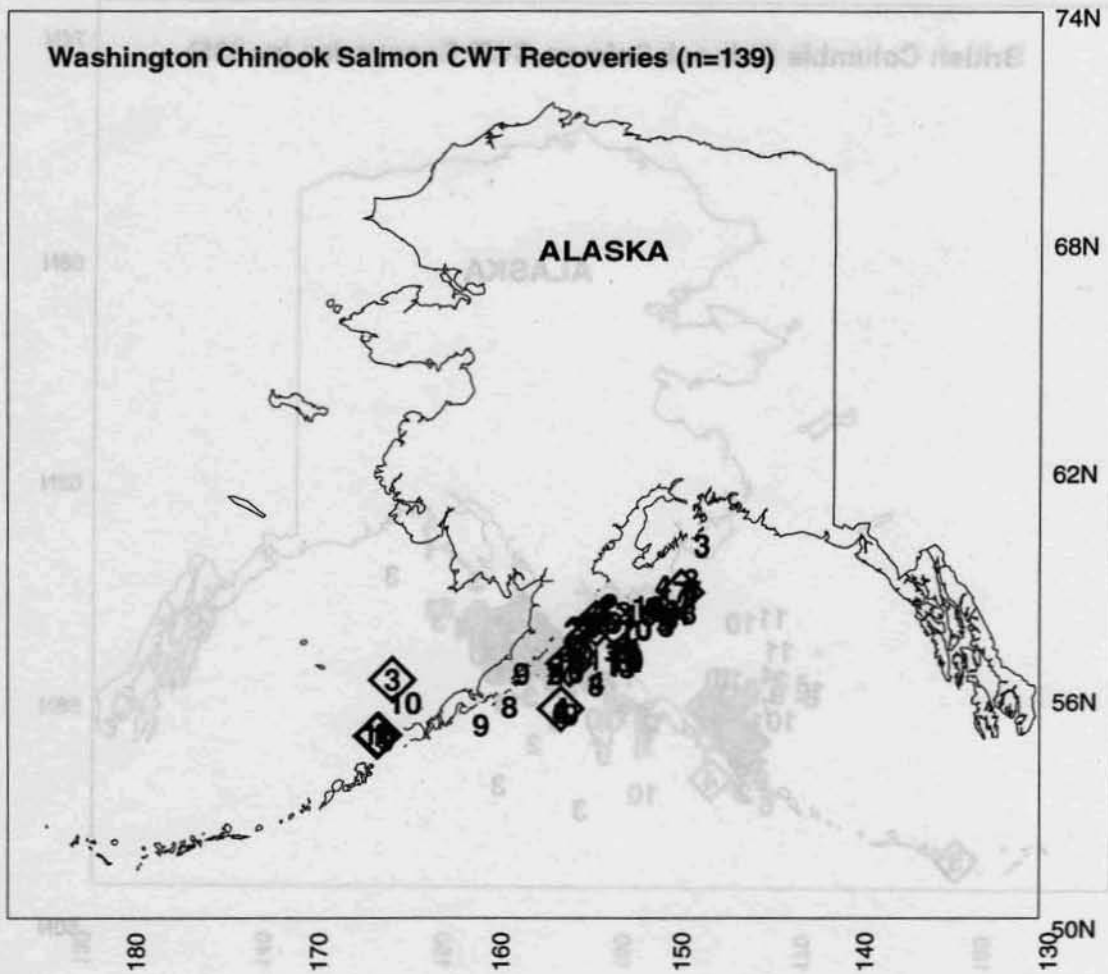


Fig. 8. Recovery locations of coded-wire tagged (CWT) Washington chinook salmon in the bycatch of U.S. commercial groundfish (trawl) fishery operations in the eastern Bering Sea, Aleutian Islands, and Gulf of Alaska. The numbers at each location indicate the month of recovery. New recoveries reported in this document are indicated by an open diamond. Two new recoveries are slight northern and western extensions of the known ranges of Washington chinook salmon in the eastern Bering Sea.

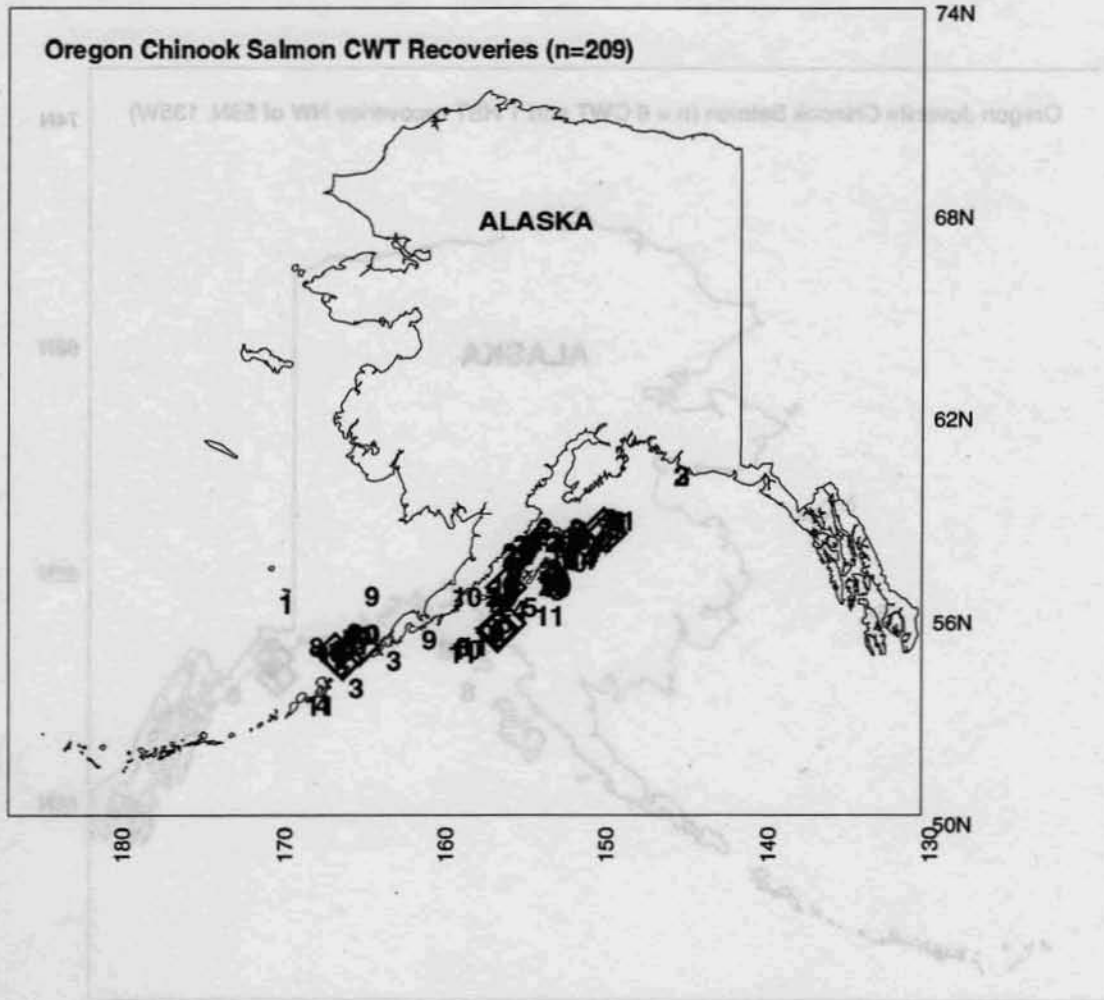


Fig. 9. Recovery locations of coded-wire tagged (CWT) Oregon chinook salmon in the bycatch of U.S. commercial groundfish (trawl) fishery operations in the eastern Bering Sea, Aleutian Islands, and Gulf of Alaska. The numbers at each location indicate the month of recovery. New recoveries reported in this document are indicated by an open diamond.

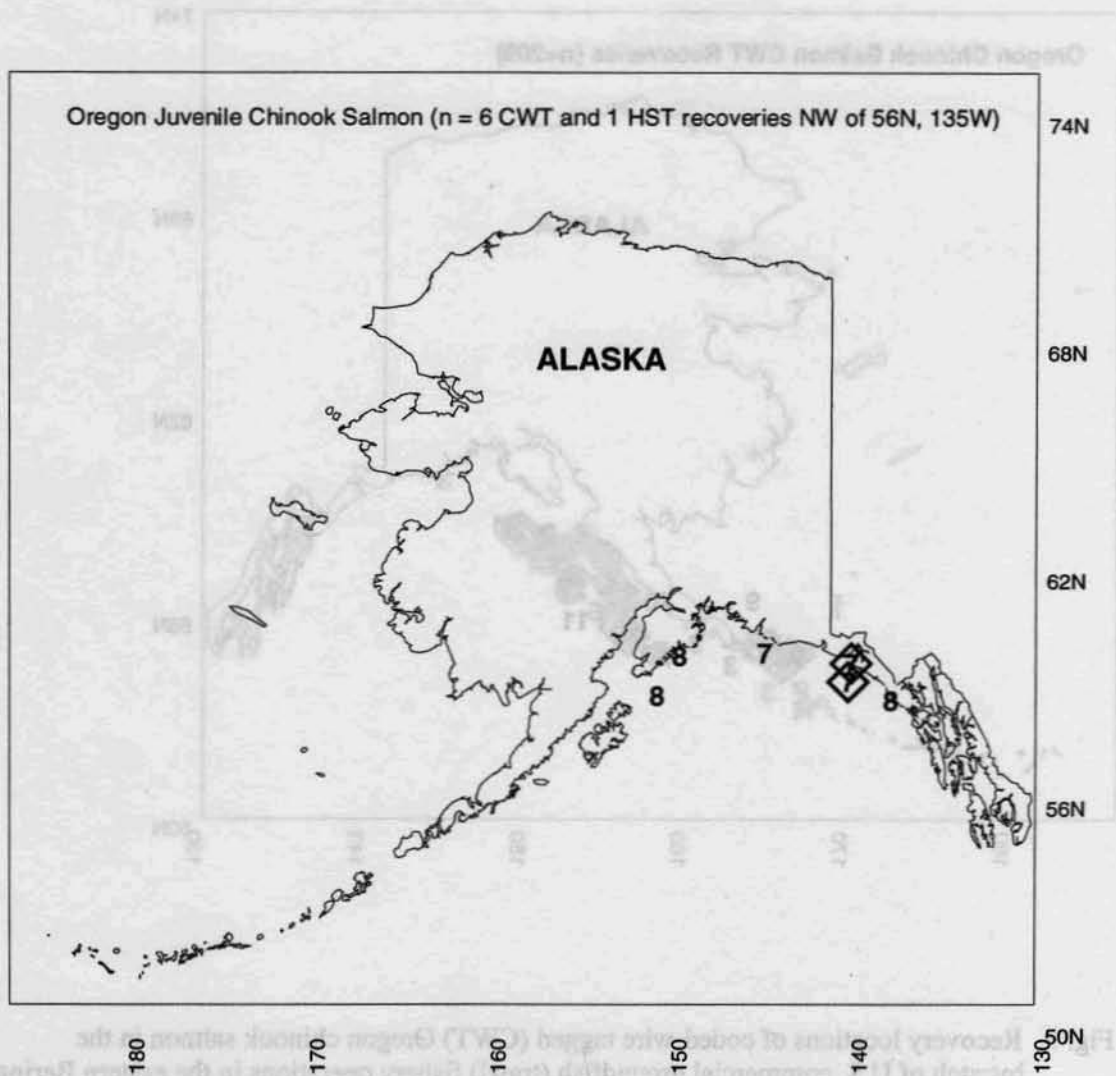


Fig. 10. Coded-wire tagged (CWT) recovery and high seas tag (HST) release locations of juvenile (ocean age-0) Oregon chinook salmon in U.S. research vessel operations in the Gulf of Alaska. The numbers at each location indicate the month of CWT recovery or HST release. New recoveries reported in this document are indicated by an open diamond.

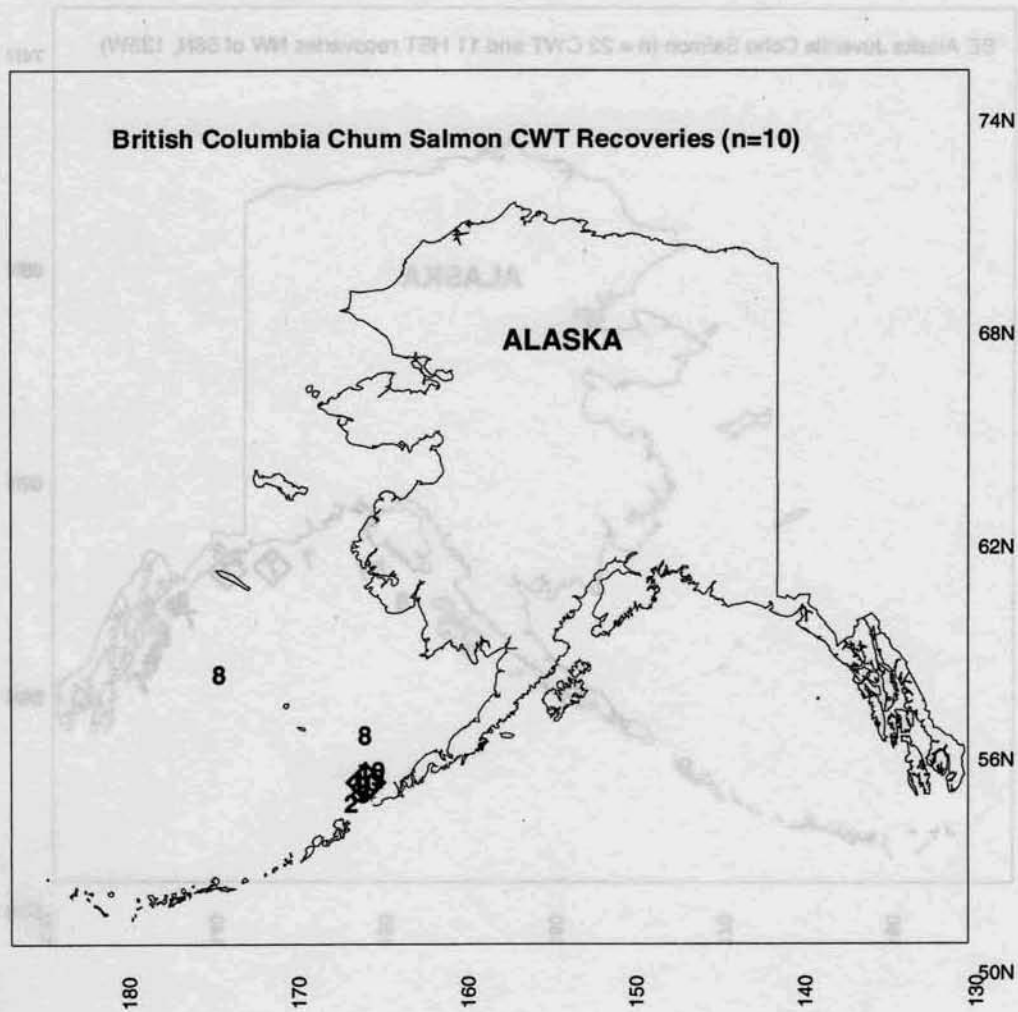


Fig. 11. Recovery locations of coded-wire tagged (CWT) British Columbia chum salmon in the bycatch of U.S. commercial groundfish (trawl) fishery operations in the eastern Bering Sea. The numbers at each location indicate the month of recovery. One new recovery reported in this document is indicated by an open diamond.

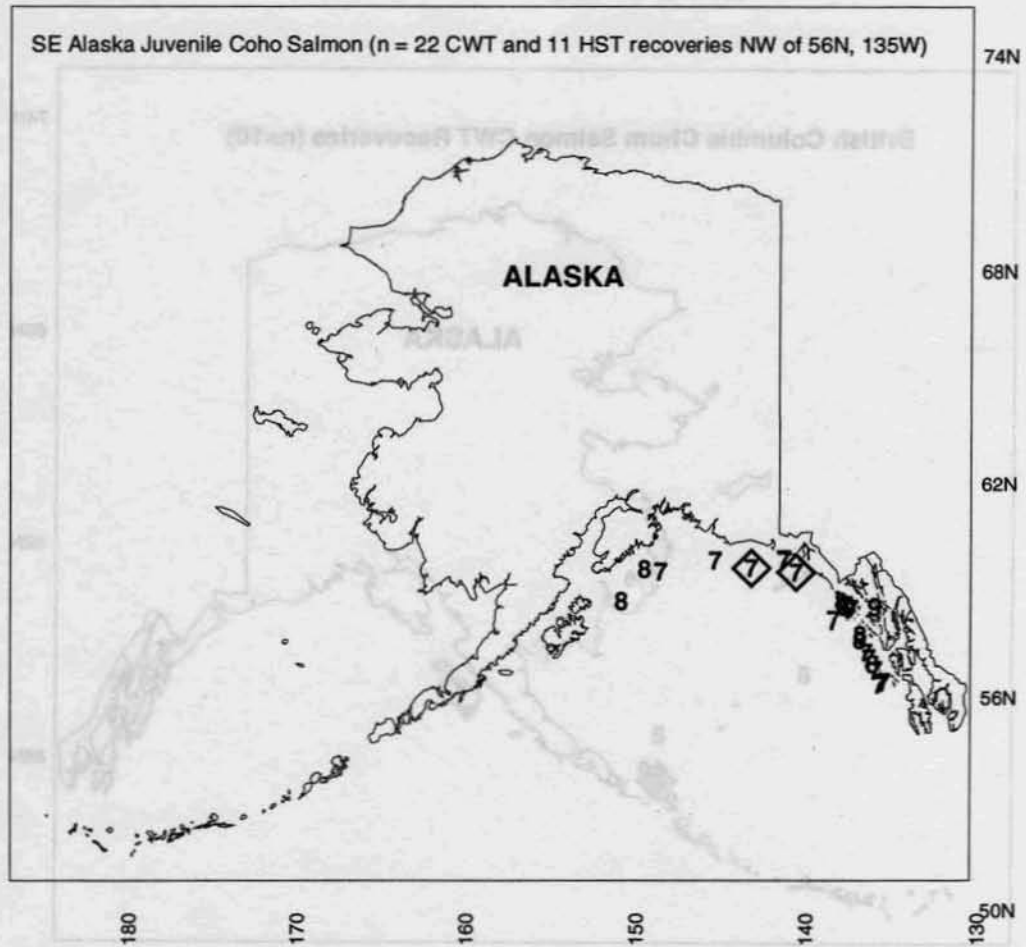


Fig. 12. Coded-wire tagged (CWT) recovery and high seas tag (HST) release locations of juvenile (ocean age-0) Southeast Alaska coho salmon in U.S. research vessel operations in the Gulf of Alaska. The numbers at each location indicate the month of CWT recovery or HST release. New recoveries reported in this document are indicated by an open diamond.

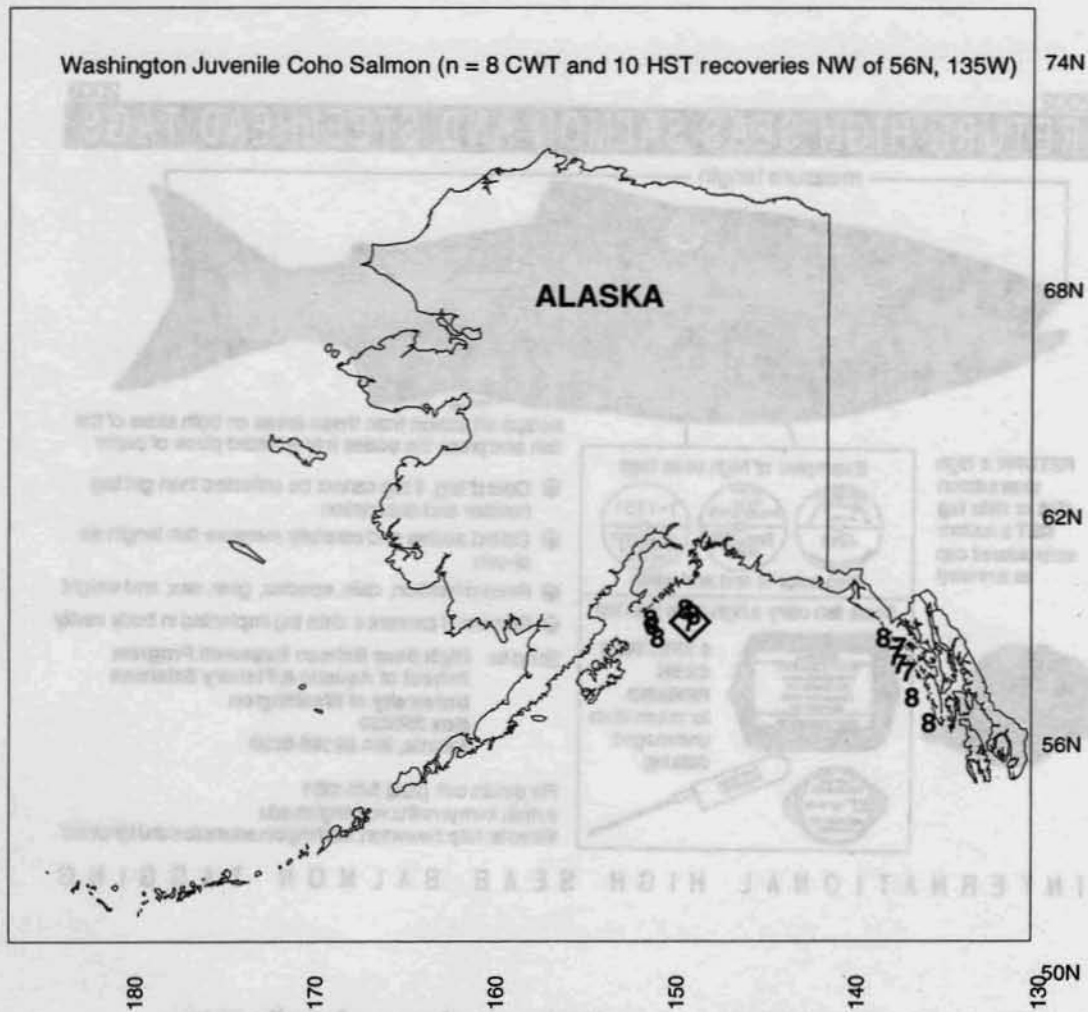


Fig. 13. Coded-wire tagged (CWT) recovery and high seas tag (HST) release locations of juvenile (ocean age-.0) Washington coho salmon in U.S. research vessel operations in the Gulf of Alaska. The numbers at each location indicate the month of CWT recovery or HST release. One new recovery reported in this document is indicated by an open diamond.

2002 2003

## RETURN HIGH SEAS SALMON AND STEELHEAD TAGS

measure length



**RETURN** a high seas salmon disk or data tag  
**GET** a custom embroidered cap as a reward

**Examples of high seas tags**



Tag color is red and white

Some fish carry a high-seas data tag

**\$ SPECIAL \$ CASH REWARD** for return of an undamaged data tag

scrape off scales from these areas on both sides of the fish and place the scales into a folded piece of paper

- Collect tag, if tag cannot be collected then get tag number and description
- Collect scales and carefully measure fish length as shown
- Record location, date, species, gear, sex, and weight
- Remove if present a data tag implanted in body cavity

Send to: **High Seas Salmon Research Program**  
School of Aquatic & Fishery Sciences  
University of Washington  
Box 355020  
Seattle, WA 98195-5020

For details call: (206) 543-1101  
e-mail: [kwmymers@u.washington.edu](mailto:kwmymers@u.washington.edu)  
Website: <http://www.fish.washington.edu/research/highseas/>

INTERNATIONAL HIGH SEAS SALMON TAGGING

Figure 14. Poster advertising for return of high seas salmon and steelhead tags.

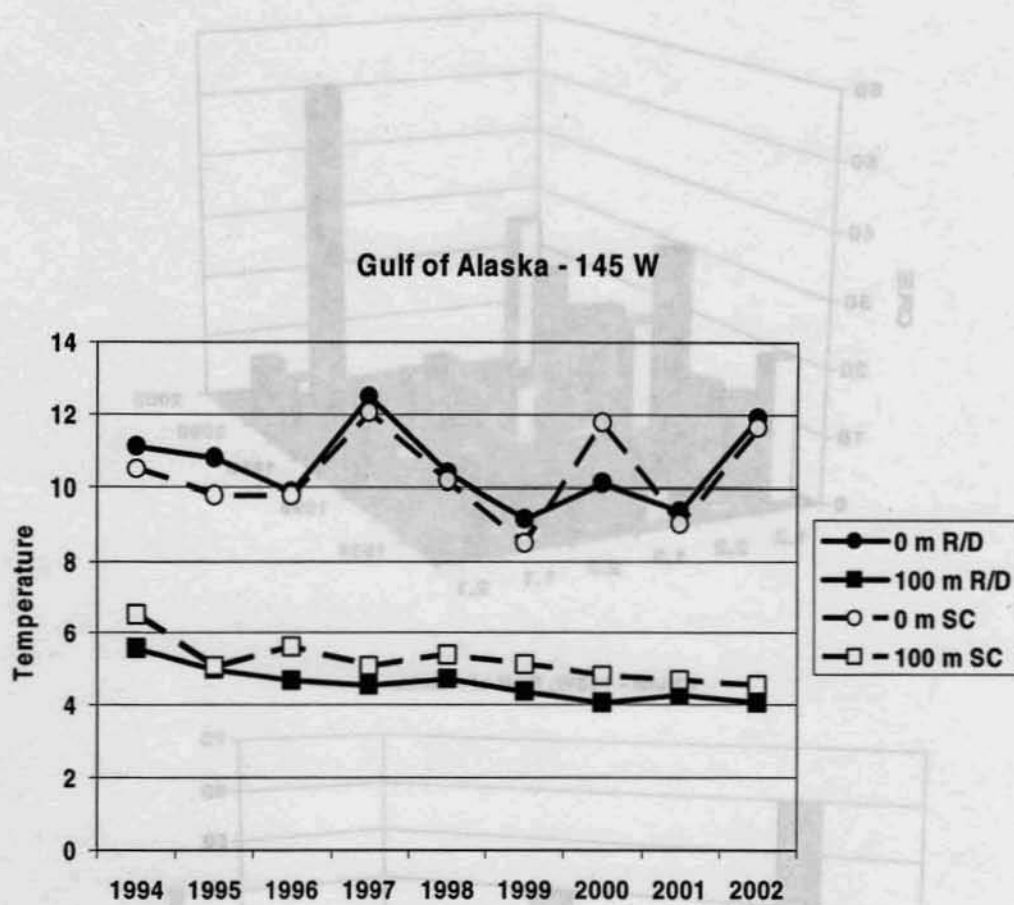
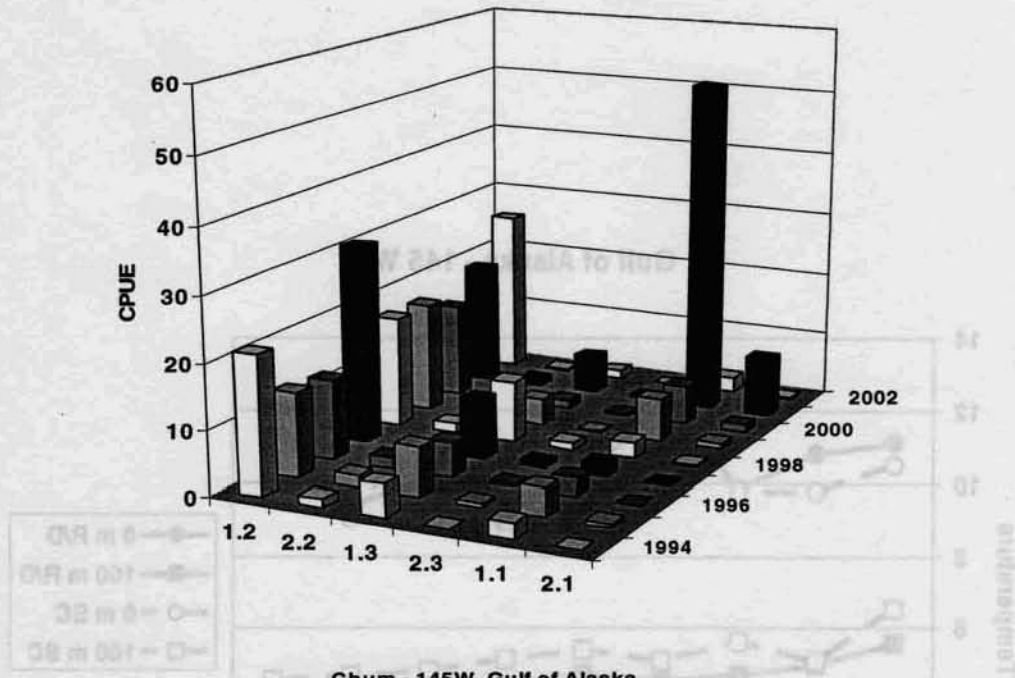


Figure 15. Sea temperatures recorded at 0 m and 100 m during T/S *Oshoro maru* cruises, 1994-2002, along 145°W longitude. R/D = Ridge/Dilute Domains, SC = Subarctic Current.

Sockeye - 145 W, Gulf of Alaska



Chum - 145W, Gulf of Alaska

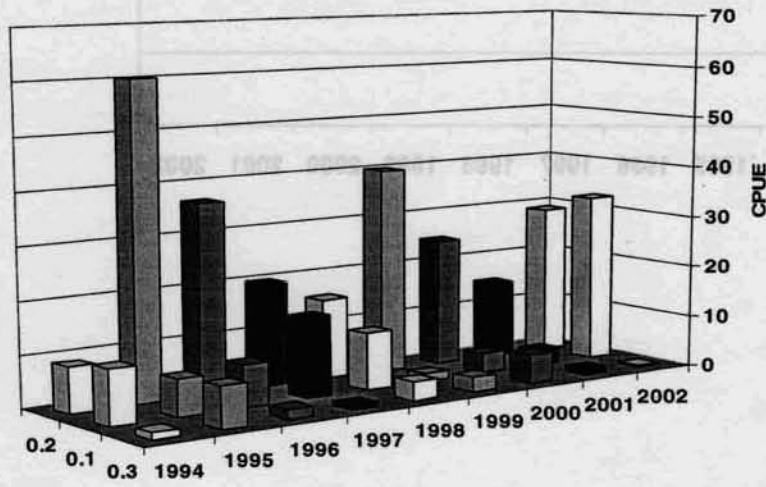


Figure 16. Estimates of CPUE represented by each age-class of sockeye and chum salmon in the central Gulf of Alaska, 1994-2002. CPUE = number of fish caught per 30 tans (1 tan = 50 m) of varied-mesh research gillnet (C-gear).

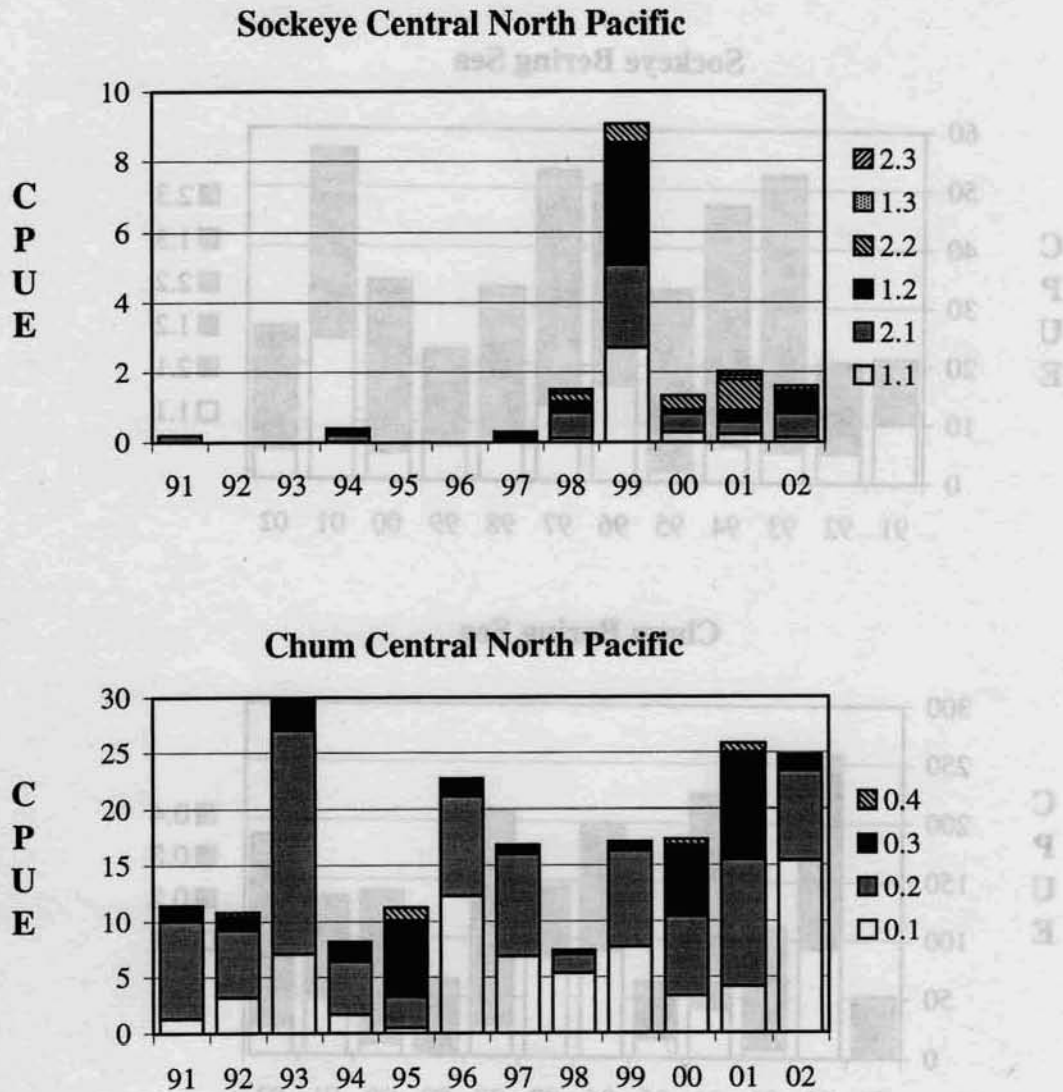
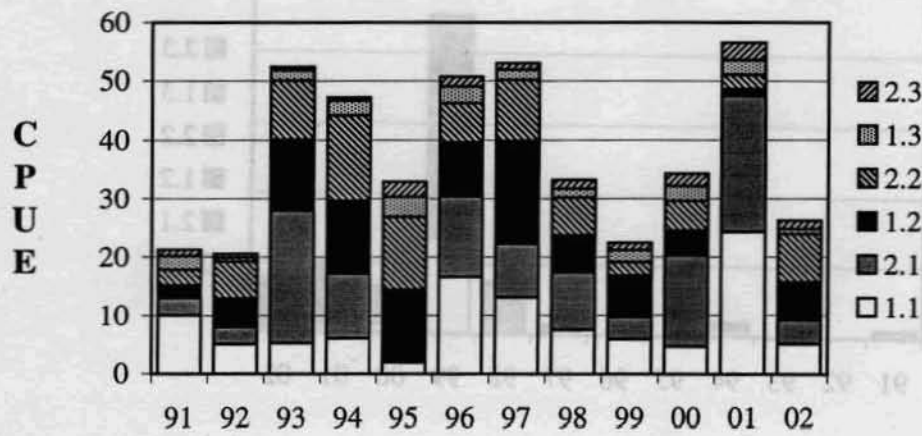


Figure 17. Estimates of CPUE represented by each age-class of sockeye and chum salmon in the central North Pacific Ocean, 1991-2002. CPUE=number of fish per unit (30-tans) of effort by C-gear (research-mesh gillnet). Values estimated by multiplying CPUE by % age composition and dividing by 100.

### Sockeye Bering Sea



### Chum Bering Sea

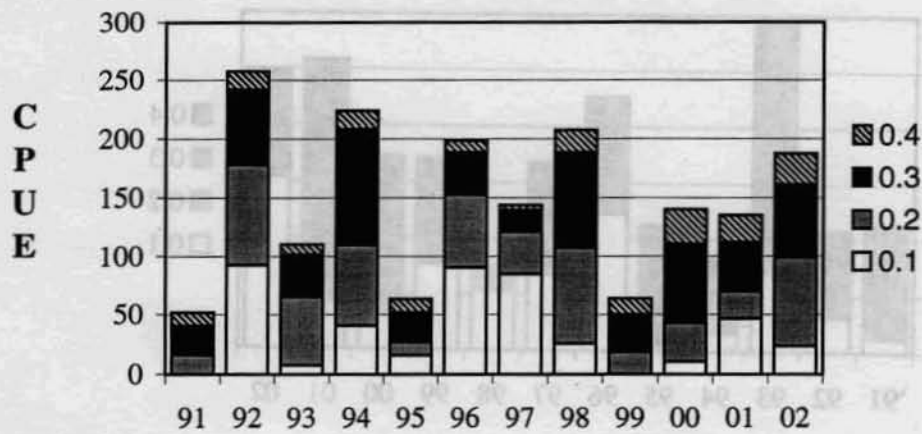


Figure 18. Estimates of CPUE represented by each age-class of sockeye and chum salmon in the central Bering Sea, 1991-2002. CPUE=number of fish per unit (30-tans) of effort by C-gear (research-mesh)gillnet. Values estimated by multiplying CPUE by % age composition and dividing by 100.

Table 1. U.S. archival data storage tags placed on salmonids in the North Pacific Ocean and Bering Sea in 2002. LTD tags record temperature and depth data; iButton tags record temperature only. LL = longline; HL = hook and line. FRI = Fisheries Research Institute; FRA = Fisheries Research Agency of Japan. LTD = Lotek LTD\_11100-300; IB = iButton.

Vessel and Data Tag #	Tag Model	Species	Release Date	Location		Gear	Fork Length	Age	Other tags	
				Latitude	Longitude				FRI	FRA
<b><i>R/V Wakatake maru</i></b>										
1	IB	Steelhead	06/19/02	45°00'N	180°00'	LL	568	X.1	LL5065	Y9065
2	IB	Steelhead	06/19/02	45°00'N	180°00'	LL	700	2.1	LL5064	Y9064
3	IB	Chum	06/24/02	48°30'N	180°00'	LL	469	0.3	LL5072	Y9072
4	IB	Chum	06/24/02	48°30'N	180°00'	LL	471	0.3	LL5073	Y9073
1318	LTD	Sockeye	06/25/02	49°30'N	180°00'	LL	565	1.3	LL5077	Y9077
1320	LTD	Sockeye	06/25/02	49°30'N	180°00'	LL	611	2.3	LL5078	Y9078
5	IB	Chum	06/26/02	50°30'N	180°00'	LL	545	0.3	LL5089	Y9089
1322	LTD	Sockeye	06/27/02	51°30'N	180°00'	LL	530	2.2	LL5090	Y9090
6	IB	Sockeye	06/27/02	51°30'N	180°00'	LL	440	1.2	LL5092	Y9092
16	IB	Chum	06/28/02	52°30'N	180°00'	LL	640	0.4	LL5093	Y9093
17	IB	Chum	06/28/02	52°30'N	180°00'	LL	666	0.4	LL5094	Y9094
18	IB	Chum	06/28/02	52°30'N	180°00'	LL	616	0.3	LL5095	Y9095
1327	LTD	Sockeye	06/28/02	52°30'N	180°00'	LL	548	1.2	LL5096	Y9096
1331	LTD	Sockeye	06/30/02	54°30'N	180°00'	LL	525	2.2	LL5239	Y9239
1332	LTD	Sockeye	06/30/02	54°30'N	180°00'	LL	615	2.3	LL5240	Y9240
19	IB	Chum	07/02/02	56°30'N	180°00'	LL	619	0.3	LL5423	Y9423
1334, 20	LTD, IB	Chum	07/03/02	57°30'N	180°00'	LL	691	0.4	LL5447	Y9447
7	IB	Sockeye	07/05/02	57°30'N	179°00'W	LL	482	2.2	LL5505	Y9505
8	IB	Chum	07/05/02	57°30'N	179°00'W	LL	526	0.2	LL5506	Y9506
9	IB	Chum	07/05/02	57°30'N	179°00'W	LL	484	0.2	LL5507	Y9507
10	IB	Chum	07/05/02	57°30'N	179°00'W	LL	594	0.3	LL5508	Y9508
11	IB	Sockeye	07/05/02	57°30'N	179°00'W	LL	478	2.2	LL5509	Y9509
1364	LTD	Chinook	07/05/02	57°30'N	179°00'W	LL	740	1.3	LL5510	Y9510
1365	LTD	Sockeye	07/05/02	57°30'N	179°00'W	LL	588	2.2	LL5559	Y9559
1373, 26	LTD, IB	Chum	07/05/02	57°30'N	179°00'W	LL	615	0.4	LL5562	Y9562
12	IB	Sockeye	07/06/02	57°30'N	178°00'W	LL	462	2.2	LL5592	Y9592
13	IB	Chum	07/06/02	57°30'N	178°00'W	LL	493	0.3	LL5593	Y9593
14	IB	Chum	07/06/02	57°30'N	178°00'W	LL	475	0.3	LL5594	Y9594
15	IB	Sockeye	07/06/02	57°30'N	178°00'W	LL	507	2.3	LL5595	Y9595
21	IB	Sockeye	07/06/02	57°30'N	178°00'W	LL	487	2.2	LL5596	Y9596
22	IB	Chinook	07/06/02	57°30'N	178°00'W	LL	547	X.2	LL5700	Y9700
23	IB	Chinook	07/06/02	57°30'N	178°00'W	LL	595	1.2	LL5701	Y9701
24	IB	Chinook	07/06/02	57°30'N	178°00'W	LL	575	1.2	LL5702	Y9702
25	IB	Chinook	07/06/02	57°30'N	178°00'W	LL	610	X.2	LL5703	Y9703
1392	LTD	Chinook	07/07/02	56°30'N	178°00'W	LL	570	1.2	LL5718	Y9718
1433	LTD	Chinook	07/07/02	56°30'N	178°00'W	LL	650	1.3	LL5729	Y9729
1434	LTD	Chinook	07/07/02	56°30'N	178°00'W	LL	622	1.2	LL5730	Y9730
1454	LTD	Chinook	07/07/02	56°30'N	178°00'W	LL	789	1.3	LL5731	Y9731
1432	LTD	Chinook	07/07/02	56°30'N	178°00'W	LL	600	1.2	LL5732	Y9732
1398	LTD	Chinook	07/08/02	56°30'N	179°00'W	LL	579	1.2	LL5783	Y9783
1401	LTD	Chinook	07/08/02	56°30'N	179°00'W	LL	562	1.2	LL5798	Y9798

continued

Table 1. continued.

Vessel and Data Tag #	Tag		Release Date	Location		Gear	Fork		Other tags	
	Model	Species		Latitude	Longitude		Length	Age	FRI	FAJ
<b><i>R/V Wakatake maru (continued)</i></b>										
1403	LTD	Chinook	07/08/02	56°30'N	179°00'W	LL	509	X.2	LL5799	Y9799
1417	LTD	Chinook	07/08/02	56°30'N	179°00'W	LL	546	1.2	LL5802	Y9802
1437	LTD	Chinook	07/08/02	56°30'N	179°00'W	LL	630	1.2	LL5803	Y9803
1444	LTD	Sockeye	07/08/02	56°30'N	179°00'W	LL	503	2.2	LL5814	Y9814
1465	LTD	Chinook	07/08/02	56°30'N	179°00'W	LL	527	1.2	LL5832	Y9832
1475	LTD	Chinook	07/08/02	56°30'N	179°00'W	LL	664	1.3	LL5835	Y9835
1477, 27	LTD, IB	Chum	07/08/02	56°30'N	179°00'W	LL	680	0.4	LL5876	Y9876
1478, 28	LTD, IB	Chum	07/08/02	56°30'N	179°00'W	LL	650	0.4	LL5877	Y9877
1583, 30	LTD, IB	Chum	07/09/02	56°30'N	179°00'E	LL	622	0.4	LL5001	Y1801
1562	LTD	Sockeye	07/09/02	56°30'N	179°00'E	LL	500	2.2	LL5998	Y9998
1565, 29	LTD, IB	Chum	07/09/02	56°30'N	179°00'E	LL	618	0.3	LL5999	Y9999
1585	LTD	Sockeye	07/10/02	56°30'N	178°00'E	LL	499	1.2	LL5023	Y1823
1586	LTD	Sockeye	07/10/02	56°30'N	178°00'E	LL	508	2.2	LL5024	Y1824
<b><i>R/V Oshoro maru</i></b>										
G13	IB	Chum	07/21/02	54°00'N	145° 00'W	HL	515	0.2	LL4871	AA1571
1587	LTD	Pink	07/22/02	55°00'N	145° 00'W	HL	484	0.1	LL4872	AA1572

Table 2. Preliminary release and recovery information for U.S. tags and cooperative Japan-U.S. tags reported from 1 October 2001 to 31 December 2002. A blank indicates the information is not available. LL=longline, PS=purse seine, HL=hook and line. Age designation is the European method, first number is the number of freshwater annuli, second number is the number of ocean annuli. FL=fork length and BW=body weight. Data storage tags: TD = temperature and depth, iButton = temperature only.

U.S. Tag Nos.	Japan Tag No.	Release							Recovery										
		Date	Lat. (°N)	Long.	2°X5° Area	FL (mm)	FL Age	Date	Lat. (°N)	Long.	Area Code	Gear	Sex	FL (mm)	BW (g)	Gonad (g)	Age	Location	
<b>A. Sockeye Salmon</b>																			
17353		13-Jun-02	53°09'	167°03'W	W7052	PS	535	-2	-	59°55'	153°29'W	47-1	-	-	-	-	-	-	Iliamna River, Kvichak system, Bristol Bay, Alaska, USA
LL4109	LL3109	24-Jun-01	48°30'	180°00'	W8048	LL	524	2.2	-	51°23'	156°30'E	09-3	River	-	-	-	-	-	Ozernaya River, W. Kamchatka, Russia
LL4140, TD tag no. 1112	LL3140	26-Jun-01	50°30'	180°00'	W8050	LL	663	1.3	16-Aug-01	56°10'	162°30'E	11-1	River	-	-	-	-	-	Kamchatka River, E. Kamchatka, Russia
<b>B. Chum Salmon</b>																			
LL4096	LL3096	23-Jun-01	47°30'	180°00'	W8046	LL	550	0.3	1-Oct-01	43°33'	145°21'E	02-0	Setnet	-	-	-	-	-	Nemuro Strait, Hokkaido, Japan
LL4135	LL3135	25-Jun-01	49°30'	180°00'	W8048	LL	643	0.2	14-Sep-01	43°42'	145°06'E	02-0	Setnet	M	605	2400	-	-	Nemuro Strait, Hokkaido, Japan
LL4177	LL3177	29-Jun-01	53°30'	180°00'	W8052	LL	505	0.3	late Sep-01	51°50'	143°10'E	06-0	River	M	650	3160	-	-	Tym River, Sakhalin, Russia
LL4191	LL3191	29-Jun-01	53°30'	180°00'	W8052	LL	556	0.3	5-Sep-01	42°12'	143°19'E	02-1	Setnet	M	500	3000	-	-	Pacific coast, Hokkaido, Japan
LL4225	LL3225, AT1601	30-Jun-01	54°30'	180°00'	W8054	LL	630	0.4	30-Sep-01	44°00'	144°55'E	02-2	Setnet	M	670	3500	-	-	Okhotsk Sea coast, Hokkaido, Japan
LL4252	LL3252	1-Jul-01	55°30'	180°00'	W8054	LL	567	0.3	5-Sep-01	44°04'	145°14'E	02-0	Setnet	M	605	2350	-	-	Nemuro Strait, Hokkaido, Japan
LL4276	LL3276	1-Jul-01	55°30'	180°00'	W8054	LL	572	0.3	22-Oct-01	40°31'	141°35'E	01-0	Setnet	F	-	-	-	-	Pacific coast, Aomori, Honshu, Japan
LL4291	LL3291	1-Jul-01	55°30'	180°00'	W8054	LL	601	0.4	28-Sep-01	44°57'	142°34'E	02-2	Setnet	M	-	-	-	-	Okhotsk Sea coast, Hokkaido, Japan
LL4294	LL3294	1-Jul-01	55°30'	180°00'	W8054	LL	606	0.3	19-Sep-01	44°23'	143°17'E	02-2	Setnet	-	656	3443	-	-	Okhotsk Sea coast, Hokkaido, Japan

Table 2. Continued

U.S.		Release							Recovery										
Tag.	Japan		Lat.		2°X5°	FL			Lat.	Area	FL	BW	Gonad						
Nos.	Tag	Date	(°N)	Long.	Area	Gear	(mm)	Age	Date	(°N)	Long.	Code	Gear	Sex	(mm)	(g)	(g)	Age	Location
<b>B. Chum Salmon (cont.)</b>																			
LL4303	LL3303	2-Jul-01	56°30	180°00	W8056	LL	676	0.4	8-Sep-01	42°24N	143°23E	02-1	Setnet	M	700	4000	-	-	Pacific coast, Hokkaido, Japan
LL4307	LL3307	2-Jul-01	56°30	180°00	W8056	LL	606	0.3	28-Sep-01	42°13	143°19E	02-1	Setnet	M	600	3400	-	-	Pacific coast, Hokkaido, Japan
LL4325	LL3325	3-Jul-01	57°30	180°00	W8056	LL	630	0.4	21-Sep-01	44°56	144°30E	02-2	Setnet	M	680	3500	-	-	Okhotsk Sea coast, Hokkaido, Japan
LL4329	LL3329	4-Jul-01	58°30	180°00	W8058	LL	636	0.4	1-Sep-01	42°12	143°19E	02-1	Setnet	M	600	4000	-	-	Pacific coast, Hokkaido, Japan
LL4379	LL3379	5-Jul-01	57°30	179°00W	W8056	LL	612	0.3	8-Oct-01	43°48	145°04E	02-0	Setnet	M	-	-	-	-	Nemuro Strait, Hokkaido, Japan
LL4380	LL3380	5-Jul-01	57°30	179°00W	W8056	LL	592	0.3	21-Sep-01	39°10	141°54E	01-0	Setnet	M	650	2600	-	-	Pacific coast, Iwate, Honshu, Japan
LL4391	LL3391	5-Jul-01	57°30	179°00W	W8056	LL	544	0.3	22-Sep-01	44°50	142°39E	02-2	Setnet	M	570	1700	-	-	Okhotsk Sea coast, Hokkaido, Japan
LL4393	LL3393	5-Jul-01	57°30	179°00W	W8056	LL	560	0.3	1-Oct-01	44°20	143°10E	02-2	Setnet	M	610	2600	-	-	Okhotsk Sea coast, Hokkaido, Japan
LL4400	LL3400	5-Jul-01	57°30	179°00W	W8056	LL	636	0.4	-	-	-	15-2	-	-	-	-	-	-	Russia
LL4405	LL3405	5-Jul-01	57°30	179°00W	W8056	LL	554	0.3	21-Sep-01	44°20	143°10E	02-2	Setnet	M	635	2600	-	-	Okhotsk Sea coast, Hokkaido, Japan
LL4489	LL3489	6-Jul-01	57°30	178°00W	W8056	LL	590	0.3	20-Sep-01	43°38	145°10E	02-0	Setnet	M	660	3000	-	-	Nemuro Strait, Hokkaido, Japan
LL4550	LL3550	7-Jul-01	56°30	178°00W	W8056	LL	567	0.3	25-Sep-01	43°37	145°11E	02-0	Setnet	-	-	-	-	-	Nemuro Strait, Hokkaido, Japan
LL4552	LL3552	7-Jul-01	56°30	178°00W	W8056	LL	545	0.2	4-Oct-01	44°08	145°05E	02-2	Setnet	-	-	-	-	-	Okhotsk Sea coast, Hokkaido, Japan
LL4587	LL3587	9-Jul-01	56°30	179°00E	E7556	LL	576	0.3	8-Oct-01	42°36	141°30E	02-1	Setnet	F	620	3000	-	-	Pacific coast, Hokkaido, Japan
LL4591	LL3591	9-Jul-01	56°30	179°00E	E7556	LL	584	0.4	24-Sep-01	44°12	143°41E	02-2	Setnet	-	550	2700	-	-	Okhotsk Sea coast, Hokkaido, Japan

Table 2. Continued

U.S. Tag Nos.	Japan Tag No.	Release							Recovery									
		Date	Lat. (°N)	Long.	2°X5° Area	FL (mm)	FL Age	Date	Lat. (°N)	Long.	Area Code	Gear	Sex	FL (mm)	BW (g)	Gonad (g)	Age	Location
<b>B. Chum Salmon (cont.)</b>																		
LL4596	LL3596	9-Jul-01	56°30'	179°00'E	E7556	LL	606	0.3	1-Oct-01	44°20'	145°19'E	02-2	Setnet	M	640	3200	-	Okhotsk Sea coast, Hokkaido, Japan
LL4603	LL3603	9-Jul-01	56°30'	179°00'E	E7556	LL	586	0.3	25-Sep-01	43°37'	145°11'E	02-0	Setnet	-	-	-	-	Nemuro Strait, Hokkaido, Japan
LL4607	LL3607	10-Jul-01	56°30'	178°00'E	E7556	LL	628	0.3	16-Oct-01	43°59'	144°18'E	02-2	Setnet	F	600	4000	-	Okhotsk Sea coast, Hokkaido, Japan
LL4609	LL3609	10-Jul-01	56°30'	178°00'E	E7556	LL	600	0.3	27-Oct-01	42°49'	141°39'E	02-2	River	F	650	2900	-	Chitose River, Hokkaido, Japan
LL4619	LL3619	11-Jul-01	56°30'	177°00'E	E7556	LL	650	0.4	1-Oct-01	42°11'	140°25'E	02-1	Setnet	M	670	3400	-	Pacific coast, Hokkaido, Japan
LL4651	LL3651	11-Jul-01	56°30'	177°00'E	E7556	LL	553	0.3	25-Sep-01	43°33'	145°21'E	02-0	Setnet	-	590	2100	-	Nemuro Strait, Hokkaido, Japan
LL4662	LL3662	12-Jul-01	57°30'	177°00'E	E7556	LL	550	0.3	27-Sep-01	43°37'	145°12'E	02-0	Setnet	F	595	2350	-	Nemuro Strait, Hokkaido, Japan
<b>B. Pink Salmon</b>																		
LL4117	LL3117	24-Jun-01	48°30'	180°00'	W8048	LL	445	0.1	-	58°42'	162°28'E	12-1	River	-	-	-	-	Dranka River, Karaginskiy, Russia
LL4872, TD tag no. 1587	AA1572	22-Jul-02	55°00'	145°00'W	W4554	HL	484	0.1	11-Aug-02	58°06'	152°28'W	56-3	PS	M	-	-	-	Duck Bay, Afognak Is., Kodiak, central Alaska, USA

Table 3. Snouts collected from salmonids without adipose fins caught by T/S *Oshoro maru*, 2002. Gear: A=commercial mesh gillnet; C=varied mesh gillnet; followed by mesh size (mm). N=23 steelhead

Species	Gillnet station	Date	Latitude	Longitude	Gear	Fork Length (mm)	Weight (g)	Sex	Gonad weight (g)	Age
Steelhead	OSG 0208	7/18/2002	50°00'N	144°59'W	A121	560	2400	F	9	1.1
Steelhead	OSG 0209	7/19/2002	51°00'N	145°00'W	C72	332	350	M	1	1.0
Steelhead	OSG 0210	7/21/2002	53°01'N	145°00'W	A115	710	3500	F	36	1.2
Steelhead	OSG 0210	7/21/2002	53°01'N	145°00'W	A115	322	370	M	2	1.0
Steelhead	OSG 0210	7/21/2002	53°01'N	145°00'W	A121	710	3050	M	12	1.2
Steelhead	OSG 0210	7/21/2002	53°01'N	145°00'W	C63	314	310	M	1	X.0
Steelhead	OSG 0211	7/22/2002	54°00'N	145°01'W	A121	584	2280	M	4	1.1
Steelhead	OSG 0211	7/22/2002	54°00'N	145°01'W	C55	324	355	F	3	1.0
Steelhead	OSG 0211	7/22/2002	54°00'N	145°01'W	C72	480	1120	F	8	X.0
Steelhead	OSG 0211	7/22/2002	54°00'N	145°01'W	C63	322	330	M	1	X.0
Steelhead	OSG 0211	7/22/2002	54°00'N	145°01'W	C63	332	375	F	2	1.0
Steelhead	OSG 0211	7/22/2002	54°00'N	145°01'W	C63	316	270	M	1	1.0
Steelhead	OSG 0211	7/22/2002	54°00'N	145°01'W	C63	312	290	M	1	1.0
Steelhead	OSG 0212	7/23/2002	55°00'N	144°59'W	C72	322	360	F	1	1.0
Steelhead	OSG 0212	7/23/2002	55°00'N	144°59'W	C72	353	435	M	1	1.0
Steelhead	OSG 0212	7/23/2002	55°00'N	144°59'W	C72	349	500	M	1	1.0
Steelhead	OSG 0212	7/23/2002	55°00'N	144°59'W	C72	372	520	M	2	1.0
Steelhead	OSG 0212	7/23/2002	55°00'N	144°59'W	C82	458	1880	F	130	X.1
Steelhead	OSG 0212	7/23/2002	55°00'N	144°59'W	C93	567	2240	M	61	1.1
Steelhead	OSG 0213	7/24/2002	56°00'N	144°59'W	C63	334	340	M	1	X.0
Steelhead	OSG 0213	7/24/2002	56°00'N	144°59'W	C72	330	440	F	4	X.0
Steelhead	OSG 0213	7/24/2002	56°00'N	144°59'W	C93	444	920	M	2	X.0
Steelhead	OSG 0213	7/24/2002	56°00'N	145°00'W	C121	362	440	M	5	1.0

Table 4. Steelhead snout samples collected for potential recovery of coded-wire tags from adipose fin-clipped fish from catches aboard the *Wakatake maru*, summer 2002. Gear: B=longline, A and C=research gillnet, number is mesh size (mm).

Date	Location		Fork Gear	Body Length (mm)	Sex	Gonad Weight (g)	Age	Sample Number	Clipped Fin
	Latitude	Longitude							
6/18/2002	43°00'N	180°00'	A115	576	M	1760	5 1.1	7-2	adipose
6/19/2002	44°00'N	180°00'	C106	540	F	1620	5 1.1	10-2	adipose, left ventral
6/19/2002	44°00'N	180°00'	A115	555	F	1630	4 1.1	15-6	adipose
6/19/2002	44°00'N	180°00'	A115	582	M	1840	2 1.1	15-7	adipose
6/19/2002	44°00'N	180°00'	A115	609	F	2050	4 1.1	15-8	adipose
6/23/2002	47°00'N	180°00'	A115	558	M	1780	5 1.1	39-7	adipose
6/23/2002	47°00'N	180°00'	A115	766	M	4800	25 1.2	39-14	adipose
6/23/2002	47°00'N	180°00'	A115	764	F	4600	50 1.2	39-15	adipose
6/23/2002	47°00'N	180°00'	C138	579	F	1920	8 1.1	42-3	adipose
6/23/2002	47°00'N	180°00'	C157	693	F	3650	43 1.2	45-1	adipose
6/23/2002	47°00'N	180°00'	C157	847	M	5950	6 1.2	45-2	adipose
6/23/2002	47°00'N	180°00'	C106	551	M	1800	13 1.1	48-4	adipose

Table 5. Gillnet stations, mean water temperature, and salinities by oceanic region along summer transect lines of the *Oshoro maru*, 1994-2002.

Transect line	Ocean domain	Year	Number of stations	Latitude, °N		Sampling Dates		Water temperature, °C				Water salinity, psu			
				start	end	start	end	at 0m		at 100m		at 0m		at 100m	
								mean	s.d.	mean	s.d.	mean	s.d.	mean	s.d.
145° W	R/D Domains	2002	5	52	56	July 10	July 23	11.9	0.6	4.1	0.3	32.54	0.04	33.05	0.10
		2001	4	53	56	June 30	July 3	9.4	0.2	4.3	0.1	32.69	0.10	33.06	0.06
		2000	5	52	56	July 5	July 9	10.1	0.7	4.1	0.6	33.00	0.51	33.22	0.25
		1999	5	52	56	July 10	July 14	9.2	0.7	4.4	1.1	32.76	0.09	33.46	0.35
		1998	3	54	56	July 3	July 5	10.4	0.5	4.7	0.5	32.36	0.21	33.29	0.10
		1997	5	52	56	July 8	July 12	12.5	0.2	4.6	0.6	32.58	0.04	33.20	0.30
		1996	5	52	56	July 3	July 7	9.8	0.5	4.7	0.3	32.58	0.03	32.92	0.13
		1995	4	53	56	July 7	July 10	10.8	0.5	5.0	0.5	31.24	1.79	32.94	0.31
		1994	6	51	56	July 3	July 8	11.1	0.5	5.6	0.5	32.37	0.14	32.95	0.22
	Subarctic Current	2002	2	50	51	July 17	July 18	11.7	0.4	4.5	0.1	32.60	0.03	32.86	0.00
		2001	2	50	52	July 4	July 7	9.0	0.4	4.7	0.2	32.57	0.02	32.86	0.06
		2000	5	47	51	July 10	July 14	11.8	0.8	4.8	0.3	32.52	0.13	32.75	0.10
		1999	2	50	51	July 8	July 9	8.5	0.2	5.1	0.2	32.71	0.00	32.87	0.01
		1998	5	49	53	July 6	July 10	10.2	0.4	5.4	0.3	32.45	0.12	33.16	0.22
		1997	2	50	51	July 6	July 7	12.0	0.3	5.1	0.2	32.54	0.03	33.13	0.13
		1996	2	50	51	July 8	July 9	9.8	0.1	5.6	0.1	32.61	0.04	32.93	0.02
		1995	1	51.5	51.5	July 6	July 6	9.8	-	5.1	-	28.70	-	33.02	-
		1994	1	50	50	July 2	July 2	10.5	-	6.5	-	32.60	-	33.30	-

Table 6. Catch (number of salmonids) per unit effort by C-gear summarized by oceanic region and transect line for the research vessel *Oshoro maru*, 1994-2002. One unit of effort is equal to one operation of the 30-tan (1500 m) non-selective research mesh gillnet, except as indicated below.

Transect line	Ocean domain	Year	Total sets	Tans per unit effort	C.P.U.E.											
					Sockeye		Chum		Pink		Coho		Chinook		Steelhead	
					mean	s.d.	mean	s.d.	mean	s.d.	mean	s.d.	mean	s.d.	mean	s.d.
145° W	R/D Domains	2002	4	30	36.3	23.5	75.5	20.1	7.3	7.1	1.8	0.5	0.0	0.0	7.3	4.6
		2001	4	30	133.8	92.3	16.3	15.0	35.5	23.9	17.5	6.5	0.8	1.0	5.8	3.0
		2000	5	27	39.0	15.2	60.4	21.8	52.2	42.2	21.2	14.5	0.2	0.4	9.8	2.5
		1999	5	30	34.2	11.4	54.6	30.3	95.0	84.4	29.0	7.9	1.0	1.7	7.4	3.0
		1998	3	30	41.0	24.9	34.3	10.6	57.3	12.3	18.3	10.1	1.7	2.9	4.3	2.1
		1997	5	30	59.6	22.9	48.0	39.5	21.0	15.4	10.2	5.7	0.0	0.0	3.4	2.5
		1996	5	27	33.8	16.6	65.2	40.1	15.4	14.8	20.4	10.6	0.4	0.9	6.2	6.6
		1995	4	30	36.3	13.0	88.8	4.2	42.5	5.4	13.5	4.7	0.5	0.6	4.0	2.9
		1994	6	30	42.5	32.6	26.2	24.7	30.8	14.7	14.0	6.8	0.2	0.4	2.3	2.7
	Subarctic Current	2002	2	30	19.0	8.5	37.5	14.8	1.5	0.7	0.5	0.7	0.0	0.0	0.5	0.7
		2001	2	30	33.5	7.8	30.5	34.6	24.5	17.7	10.5	3.5	2.0	0.0	10.0	2.8
		2000	5	27	14.4	14.1	10.0	7.5	11.0	13.3	0.8	0.8	0.0	0.0	2.0	2.5
		1999	2	28.5	24.5	17.7	20.5	6.4	58.0	7.1	21.5	9.2	0.0	0.0	3.5	4.9
		1998	5	30	32.0	22.8	31.4	19.0	21.0	14.5	5.6	6.5	0.4	0.9	7.4	3.4
		1997	2	30	14.5	6.4	14.5	0.7	0.0	0.0	2.0	1.4	0.0	0.0	0.0	0.0
		1996	2	26	7.5	6.4	10.5	3.5	16.0	1.4	6.0	7.1	0.0	0.0	2.0	0.0
		1995	1	30	29.0	-	68.0	-	18.0	-	15.0	-	1.0	-	8.0	-
		1994	1	30	9.0	-	10.0	-	27.0	-	0.0	-	0.0	-	2.0	-
	145° W - both areas combined	2002	6	30	30.5		62.8		5.3		1.3		0.0		5.0	
		2001	6	30	100.3		21.0		31.8		15.2		1.2		7.2	
		2000	10	27	26.7		35.2		31.6		11.0		0.1		5.9	
		1999	7	29.6	31.4		44.9		84.4		26.9		0.7		6.3	
		1998	8	30	35.4		32.5		34.6		10.4		0.9		6.3	
1997		7	30	46.7		38.4		15.0		7.9		0.0		2.4		
1996		7	26.7	26.3		49.6		15.6		16.3		0.3		5.0		
1995		5	30	34.8		84.6		37.6		13.8		0.6		4.8		
1994	7	30	37.7		23.9		30.3		12.0		0.1		2.3			

Table 7. Ocean age composition and maturity at age of sockeye salmon caught by the *Oshoro maru* research gillnet, 1994-2002. Percent values indicate average percentage of fish in specific age class and maturity in each catch, grouped by oceanic region and year.

Species		Sockeye		Percent of (year x domain) catch in each category													
Transect Line	Ocean Domain	Year	N	Ocean Age 1			Ocean Age 2			Ocean Age 3			Ocean Age 4			% Mature Overall	
				Immature	Mature	Total	Immature	Mature	Total	Immature	Mature	Total	Immature	Mature	Total		
145° W	R/D Domains	2002	280	5	0	5	2	90	92			3	3			95	
		2001	458	68	3	71	10	10	20			9	9			22	
		2000	195	35	1	36	31	24	55		1	7	8		1	1	33
		1999	167	31	1	32	28	29	57			11	11				41
		1998	119	14	3	17	3	34	37		2	42	44		3	3	82
		*1997	294	2	2	4	6	65	70	0.34		25	25				92
		1996	154	10	3	13	5	54	58			28	28		1	1	85
		1995	132	10	11	20	2	45	47			33	33				89
		1994	214	4	3	7	18	57	75			17	17		0.47	0.47	78
		Subarctic Current	2002	77	5		5	5	88	94			1	1			89
			2001	67	51	4	55	15	27	42			3	3			34
			2000	71	14		14	3	80	83			3	3			83
			1999	49	2	2	4	4	63	67			29	29			94
			1998	148	1		1	3	68	72			27	27			95
1997	28		7	7	14	18	61	79			7	7			75		
1996	13		15		15		77	77			8	8			85		
1995	22		5	9	14	9	59	68			14	14		5	5	86	
1994	9	11		11	33	56	89								56		

\*Catch included 1 immature ocean-age 5 fish.

Table 8. Ocean age composition and maturity at age of chum salmon caught by the *Oshoro maru* research gillnet, 1994-2002. Percent values indicate average percentage of fish in specific age class and maturity in each catch, grouped

Species		Chum														
Transect Line	Ocean Domain	Year	N	Percent of (year x domain) catch in each category												
				Ocean Age 1			Ocean Age 2			Ocean Age 3			Ocean Age 4			% Mature Overall
				Immature	Mature	Total	Immature	Mature	Total	Immature	Mature	Total	Immature	Mature	Total	
145° W	R/D Domains	2002	390	37	1	37	52	10	62	1	1	1				12
		2001	61	8	2	10	59	21	80	5	3	8	2	2		27
		2000	297	2		2	78	2	80	17	1	18				3
		1999	274	3		4	88	1	89	5	1	6	1	1		3
		1998	97	13		13	55	6	61	15	9	25	1	1		16
		*1997	232	39	3	43	53	2	54	2	0.43	3				6
		1996	276	17	1	18	74	3	77	1	3	4				7
		1995	315	8	3	11	59	19	77	6	5	11	0.32	0.32		27
		1994	133	47	7	53	31	10	41	2	4	6				20
		Subarctic Curren	2002	100	27		27	66	5	71	1		1	1	1	
	2001		56	25		25	62	9	71	4		4				9
	2000		46	72		72	26		26	2		2				0
	1999		41				90		90	10		10				0
	1998		153	51		51	45		45	3	1	4				1
	1997		29	41		41	59		59							0
	1996		18				100		100							0
	1995		62	2		2	81	11	92	5	2	6				13
	1994		8	13		13	50	25	75			13	13			38

\*Catch included 1 immature ocean-age 0 fish.

Table 9. Ocean age composition and maturity at age of chinook salmon and steelhead caught by the *Oshoro maru* research gillnet, 1994-2002. Percent values indicate average percentage of fish in specific age class and maturity in each catch, grouped by oceanic region and year.

Species		Chinook													
Transect Line	Ocean Domain	Year	N	Percent of (year x domain) catch in each category									% Mature Overall		
				Ocean Age 1			Ocean Age 2			Ocean Age 3					
				Immature	Mature	Total	Immature	Mature	Total	Immature	Mature	Total			
145° W	R/D Domains	2001	3					100		100					0
		2000	1					100		100					0
		1999	5					100		100					0
		1998	5	40		40		60		60					0
		1996	3	33		33		67		67					0
	Subarctic Current	2001	4					75		75	25		25		0
		1998	2					100		100					0

Species		Steelhead														
Transect Line	Ocean Domain	Year	N	Percent of (year x domain) catch in each category									% Mature Overall			
				Ocean Age 0			Ocean Age 1			Ocean Age 2				Ocean Age 3		
				Immature	Mature	Total	Immature	Mature	Total	Immature	Mature	Total		Immature	Mature	Total
145° W	R/D Domains	2002	41	44	12	56	2	22	24			20	20			54
		2001	23		4	4	13	57	70			9	9	17	17	87
		*2000	47	42		42	15	21	36	4		8	12	8	8	39
		*1999	37	22	3	24	35	22	57			11	11	5	5	43
		1998	13	54		54		15	15			8	8	23	23	46
		1997	16	44	31	75		13	13			13	13			56
		*1996	32	59		59	16	9	25			6	6	3	3	25
		1995	1											100	100	0
		1994	14	79	7	86								14	14	21
		Subarctic Current	2002	4	25		25	25	25	50			25	25		
	2001		20	5		5	25	65	90			5	5			70
	2000		10	90		90	10		10							0
	*1999		7				14	14	29			43	43	14	14	86
		1998	37	51	3	54	14	22	35			11	11			35
1996		4	50		50	25		25			25	25			25	
1994		2	50		50								50	50	50	

\*Catch included one mature ocean-age 4 fish

Table 10. Number sampled, mean and standard deviation of fork length (F.L., mm), body weight (B.W., g), and condition factor (C.F.= $10^6 \cdot B.W./F.L.^3$ ) of sockeye salmon caught by the *Oshoro maru* research gillnet, 1994-2002, grouped by ocean age.

Species		Sockeye																													
Transect Line	Ocean Domain	Year	Ocean Age 1						Ocean Age 2						Ocean Age 3						Ocean Age 4										
			N	F.L. mean	F.L. s.d.	B.W. mean	B.W. s.d.	C.F. mean	C.F. s.d.	N	F.L. mean	F.L. s.d.	B.W. mean	B.W. s.d.	C.F. mean	C.F. s.d.	N	F.L. mean	F.L. s.d.	B.W. mean	B.W. s.d.	C.F. mean	C.F. s.d.	N	F.L. mean	F.L. s.d.	B.W. mean	B.W. s.d.	C.F. mean	C.F. s.d.	
145°W	R/D Domains	2002	14	357	33	549	154	11.8	1.1	257	598	29	3001	479	13.9	1.0	9	633	35	3542	703	13.7	0.9								
		2001	326	318	32	376	114	11.5	1.6	92	515	63	1791	744	12.4	1.4	40	618	27	3180	436	13.4	0.9								
		2000	71	324	58	390	208	10.9	1.9	108	512	66	1820	836	12.7	1.9	15	611	38	3213	771	13.8	1.2								
		1999	53	342	33	452	156	10.9	0.9	98	519	61	1815	737	12.3	1.1	19	620	47	3059	727	12.6	1.0								
		1998	20	348	24	518	137	12.1	1.8	44	554	48	2260	619	12.9	1.0	52	610	31	2910	517	12.7	1.0	3	556	41	2287	658	13.0	1.5	
		*1997	12	413	80	1005	657	13.0	1.4	209	552	36	2225	471	12.9	2.3	74	610	39	2978	641	12.7	1.8								
		1996	20	359	52	589	458	11.6	1.2	90	563	46	2475	647	13.5	1.3	43	626	40	3360	669	13.5	1.3	1	610	-	3400	-	15.0	-	
		1995	27	349	23	527	133	12.2	1.6	62	546	47	2083	565	12.5	1.1	43	607	41	2878	561	12.9	2.0								
		1994	16	347	25	503	99	11.9	1.6	160	555	39	2255	463	13.1	1.7	37	603	35	2775	528	12.5	1.2	1	650	-	2750	-	10.0	-	
		Subarctic Current		2002	4	403	31	1060	463	16.8	9.5	72	593	33	3158	591	15.0	1.2	1	615	-	3300	-	14.2	-						
2001	37			348	39	485	160	11.3	1.4	28	535	66	2158	888	13.2	1.4	2	614	74	3210	1117	13.6	0.1								
2000	10			387	26	651	129	11.1	0.8	59	571	37	2621	489	13.8	1.0	2	612	25	3315	375	14.4	0.1								
1999	2			470	150	1570	1428	12.6	1.3	33	561	33	2299	480	12.8	1.0	14	613	34	3072	630	13.1	1.0								
1998	2			371	15	570	71	11.2	0.0	106	572	37	2641	584	13.9	1.1	40	613	31	3039	501	13.1	1.1								
1997	4			457	82	1295	714	12.4	1.7	22	539	27	2031	398	12.8	1.2	2	617	59	2970	891	12.4	0.2								
1996	2			369	4	550	14	11.0	0.7	10	578	29	2638	410	13.6	0.8	1	650	-	4050	-	14.7	-								
1995	3			386	48	680	314	11.3	1.2	15	537	50	2157	577	13.8	3.2	3	593	105	3167	679	16.2	6.2	1	640	-	3000	-	11.4	-	
1994	1			360	-	560	-	12.0	-	8	547	28	2341	292	14.3	1.0															

\*includes one ocean age 5 fish, FL 924, BW 7300, CF 9.25.

Table 11. Number sampled, mean and standard deviation of fork length (F.L., mm), body weight (B.W., g), and condition factor (C.F.= $10^6 \cdot B.W./F.L.^3$ ) of chum salmon caught by the *Oshoro maru* research gillnet, 1994-2002, grouped by ocean age.

Species Chum

Transect	Ocean Line Domain	Year	Ocean Age 1						Ocean Age 2						Ocean Age 3						Ocean Age 4									
			F.L.		B.W.		C.F.		F.L.		B.W.		C.F.		F.L.		B.W.		C.F.		F.L.		B.W.		C.F.					
			N	mean	s.d.	mean	s.d.	mean	s.d.	N	mean	s.d.	mean	s.d.	mean	s.d.	N	mean	s.d.	mean	s.d.	N	mean	s.d.	mean	s.d.				
145°W	R/D Domains	2002	146	408	26	774	167	11	1.2	241	507	52	1564	496	12.2	11	4	627	96	3190	1583	12	2							
		2001	6	387	85	687	617	10.3	2.0	49	504	32	1493	338	11.5	1.2	5	544	43	1860	336	11.5	1.2	1	575	-	2800	-	14.7	-
		2000	5	409	32	804	186	11.6	1.5	238	475	28	1233	229	11.4	0.9	54	524	37	1684	419	11.5	0.9							
		1999	10	394	44	695	258	10.9	1.1	242	470	34	1153	307	10.9	0.8	17	545	85	2058	1209	11.4	1.3	3	629	48	2883	1107	11.3	1.8
		1998	15	398	45	736	367	11.1	1.1	60	516	51	1631	561	11.6	1.3	24	579	72	2423	936	11.9	2.0	1	529	-	1820	-	12.3	-
		1997	99	390	29	742	189	12.3	1.4	126	459	29	1134	219	11.7	1.0	6	511	61	1583	531	11.6	1.9							
		1996	51	405	32	771	185	11.5	1.6	214	471	27	1216	209	11.5	0.9	12	586	97	2698	1428	12.3	1.2							
		1995	34	421	75	803	212	11.3	2.6	244	490	30	1387	245	11.8	1.7	36	527	28	1721	307	11.6	1.1	1	528	-	1540	-	10.5	-
1994	71	390	16	696	132	11.7	1.6	54	464	31	1205	313	11.9	1.5	8	492	37	1494	452	12.3	1.8									
Subarctic Current		2002	27	388	31	724	199	12	0.9	71	472	36	1367	307	12.9	1.8	1	560	-	2340	-	13	-	1	689	-	4500	-	13.8	-
		2001	14	405	29	767	198	11.3	0.9	40	482	24	1325	200	11.7	0.6	2	512	7	1700	0	12.7	0.5							
		2000	33	379	44	578	112	10.8	1.6	12	428	28	914	212	11.5	1.0	1	570	-	2350	-	12.7	-							
		1999								37	448	25	986	176	10.8	0.6	4	534	85	1865	1013	11.5	0.5							
		1998	78	387	24	656	138	11.2	0.7	69	471	45	1264	335	11.8	0.7	6	554	65	2162	957	12.0	1.5							
		1997	12	370	24	640	138	12.5	1.1	17	444	27	1145	190	13.0	0.9														
		1996								18	476	49	1237	268	11.6	2.0														
		1995	1	402	-	640	-	9.9	-	57	470	33	1219	271	11.5	0.7	4	510	23	1550	283	11.6	1.1							
1994	1	380	-	650	-	11.8	-	6	463	35	1213	263	12.1	0.6	1	460	-	1220	-	12.5	-									

\*includes 1 ocean age 0 fish: FL 402, BW 760, CF 11.7

Table 12. Number sampled, mean and standard deviation of fork length (F.L., mm), body weight (B.W., g), and condition factor (C.F.=  $10^6 \cdot \text{B.W.}/\text{F.L.}^3$ ) of pink and coho salmon caught by the *Oshoro maru* research gillnet, 1994-2002, grouped by ocean age.

Species		Pink								
Transect Line	Ocean Domain	Year	N	F.L.		B.W.		C.F.		
				mean	s.d.	mean	s.d.	mean	s.d.	
145°W	R/D Domains	2002	84	511	28	1737	317	12.6	2.2	
		2001	136	469	34	1259	409	11.9	1.7	
		2000	248	452	29	1055	232	11.3	1.1	
		1999	429	453	29	1098	254	11.6	0.9	
		1998	170	469	31	1228	325	11.7	1.2	
		1997	102	475	27	1300	217	11.7	2.2	
		1996	73	466	32	1217	339	11.5	2.9	
		1995	170	483	31	1337	370	11.7	1.6	
		1994	186	483	28	1472	424	12.8	2.3	
		2002	4	512	21	1838	281	13.6	1.2	
	2001	47	479	34	1441	487	12.6	1.8		
	2000	55	457	39	1141	299	12.0	2.4		
	1999	116	440	20	954	148	11.1	0.8		
	1998	104	480	30	1435	368	12.7	1.5		
	1996	30	493	32	1582	358	13.0	1.6		
	1995	18	475	25	1326	383	12.1	1.7		
	1994	28	491	22	1699	357	14.2	1.7		
	2002	2	634	37	3550	212	14.1	3.3		
	2001	21	606	41	3339	674	14.8	0.8		
	2000	4	590	63	2645	1273	12.1	2.1		
1999	42	570	44	2373	517	12.6	0.9			
1998	28	616	48	3239	1011	13.5	1.6			
1997	4	544	89	2390	1062	14.1	0.4			
1996	12	602	40	3237	468	14.8	1.8			
1995	15	566	57	2671	856	14.3	1.1			

Species		Coho								
Transect Line	Ocean Domain	Year	N	F.L.		B.W.		C.F.		
				mean	s.d.	mean	s.d.	mean	s.d.	
145°W	R/D Domains	2002	13	611	40	3096	667	13.4	1.0	
		2001	69	594	51	2896	771	13.6	1.9	
		2000	108	613	43	3050	657	13.1	1.8	
		1999	141	583	46	2423	553	12.0	0.9	
		1998	54	615	34	3102	612	13.2	1.4	
		1997	50	580	47	2670	711	13.3	1.4	
		1996	111	587	44	2817	659	13.8	1.7	
		1995	51	579	40	2607	565	13.3	1.7	
		1994	87	602	50	3021	815	13.6	1.9	
		2002	2	634	37	3550	212	14.1	3.3	
	2001	21	606	41	3339	674	14.8	0.8		
	2000	4	590	63	2645	1273	12.1	2.1		
	1999	42	570	44	2373	517	12.6	0.9		
	1998	28	616	48	3239	1011	13.5	1.6		
	1997	4	544	89	2390	1062	14.1	0.4		
	1996	12	602	40	3237	468	14.8	1.8		
	1995	15	566	57	2671	856	14.3	1.1		

Table 13. Number sampled, mean and standard deviation of fork length (F.L., mm), body weight (B.W., g), and condition factor (C.F.= $10^6 \cdot \text{B.W./F.L.}^3$ ) of chinook salmon and steelhead caught by the *Oshoro maru* research gillnet, 1994-2002, grouped by ocean

Species Chinook

Transect Line	Ocean Domain	Year	Ocean Age 1				Ocean Age 2				Ocean Age 3									
			F.L. N	F.L. mean	B.W. s.d.	C.F. mean	F.L. N	F.L. mean	B.W. s.d.	C.F. mean	F.L. N	F.L. mean	B.W. s.d.	C.F. mean						
145°W	R/D Domains	2001					3	618	50	3247	1052	13.4	1.2							
		2000					1	705	-	4610	-	13.2	-							
		1999					5	642	26	3512	435	13.2	0.5							
		1998					4	645	73	3880	1625	13.9	1.0							
		1996	1	374	-	550	-	2	563	10	2480	28	13.9	0.6						
	1995					1	652	-	4100	-	14.8	-								
	Subarctic Current	2001					3	627	28	3610	789	14.5	1.4	1	791	-	6800	-	13.7	-
		1998					2	656	84	4350	1697	15.0	0.2							
		1995					1	644	-	3800	-	14.2	-							

Species Steelhead

Transect Line	Ocean Domain	Year	Ocean Age 0				Ocean Age 1				Ocean Age 2				Ocean Age 3									
			F.L. N	F.L. mean	B.W. s.d.	C.F. mean	F.L. N	F.L. mean	B.W. s.d.	C.F. mean	F.L. N	F.L. mean	B.W. s.d.	C.F. mean	F.L. N	F.L. mean	B.W. s.d.	C.F. mean						
145°W	R/D Domains	2002	23	359	50	522	250	10.6	1.2	10	554	63	2006	520	11.9	2.8	8	692	40	3208	628	9.7	1.4	
		2001	1	330	-	310	-	8.6	-	16	537	35	1604	277	10.3	1.3	2	632	91	2500	849	9.8	0.8	
		****2000	20	322	22	306	89	8.9	1.7	17	570	40	1945	529	10.3	1.1	6	649	23	2476	405	9.0	1.3	
		**1999	9	329	39	369	142	10.0	1.1	21	567	28	1753	286	9.6	0.8	4	695	28	2820	381	8.4	1.1	
		1998	7	331	25	396	81	10.8	0.4	2	556	5	1800	226	10.5	1.6	1	581	-	2240	-	11.4	-	
		1997	12	314	36	345	149	10.6	1.6	2	587	11	2070	184	10.2	0.4	2	746	35	4000	707	9.8	3.1	
		*1996	19	323	22	342	88	10.0	1.3	8	525	45	1461	233	10.2	1.7	2	721	7	2910	14	7.8	0.3	
		1995	6	311	33	332	94	10.9	1.2	6	548	34	1897	546	11.5	3.3	1	609	-	3100	-	13.7	-	
		1994	12	327	28	372	80	10.6	1.2															
		Subarctic Current	2002	1	332	-	350	-	9.6	-	2	573	18	2620	311	13.9	0.3	1	630	-	2980	-	11.9	-
			2001	1	463	-	1020	-	10.3	-	18	588	34	2326	491	11.3	1.4	1	751	-	4300	-	10.2	-
			2000	9	362	37	456	183	9.4	1.8	1	488	-	1060	-	9.1	-							
		***1999	2	558	6	1695	92	9.8	0.2	3	727	38	3073	166	8.1	1.1	1	710	-	3050	-	8.5	-	
	1998	20	356	55	527	320	10.5	1.2	13	570	39	2145	492	11.4	1.3	4	695	72	4038	1006	11.9	0.9		
	1997	2	337	55	520	99	14.1	4.2	1	518	-	1580	-	11.4	-	1	732	-	4930	-	12.6	-		
	1996	7	557	56	1901	672	10.7	0.8																
1995	1	400	-	700	-	10.9	-																	

\*includes 1 ocean age 4 fish: FL 800, BW 3950, CF 7.7; \*\*includes 1 ocean age 4 fish: FL 830, BW 9720, CF 17.0; \*\*\*includes 1 ocean age 4 fish: FL 754, BW 4050, CF 9.4.

\*\*\*\*includes 1 ocean age 4 fish: FL 822, BW 4310, CF 7.8

Table 14. Mean catch (number of salmonids) per unit (30-tans, 1500 m) of effort by C-gear (research-mesh gillnet) calculated by oceanographic region for the Wakatake maru, 1991-2002. Research-mesh gillnet is composed of 3 tans each of the following mesh sizes: 48, 55, 63, 72, 82, 93, 106, 121, 138, and 157 mm.

Year	Sampling Dates	No. of Sta.	Locations	Mean Temperature		Mean Salinity		Mean Catch per 30 tans C-gear								Total	
				0 m	100 m	0 m	100 m	Sock-eye	Chum	Pink	Coho	Chi-nook	Steel-head	Dolly	Masu		
<b>Central North Pacific - Transition Zone</b>																	
2002	13-15 Jun	3	39°N-41°N, 180°	15.2	12.3	34.3	34.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	14-15 Jun	3	39°N-41°N, 180°	14.2	10.5	34.2	34.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	12-13 Jun	2	39°N-40°N, 180°	13.6	10.7	34.2	34.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	16-Jun	1	39°N, 180°	14.3	10.4	34.2	33.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	17-18 Jun	2	39°N-40°N, 180°	14.8	11.5	34.3	34.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	19-20 Jun	2	39°N-40°N, 180°	13.3	11.0	34.3	34.3	0.0	2.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	2.5
1996	15-17 Jun	3	38°N-40°N, 180°	14.3	11.2	34.2	34.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	18-21 Jun	4	38°N-41°N, 180°	13.0	10.8	34.1	34.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	18-20 Jun	3	38°N-40°N, 180°	14.2	11.6	34.3	34.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	17-22 Jun	5	38°N-42°N, 180°	12.9	10.6	34.2	34.2	0.0	13.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.4
1992	17-20 Jun	4	38°N-41°N, 180°	12.8	10.2	34.2	34.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	12-14 Jun	3	38°N-40°N, 180°	14.3	11.2	34.2	34.3	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.7
<b>Central North Pacific - Transition Domain</b>																	
2002	16-19 Jun	4	42°N-45°N, 180°	9.4	7.6	33.4	33.5	0.0	5.5	0.5	6.3	0.0	0.3	0.0	0.0	0.0	12.5
2001	16-18 Jun	4	42°N-45°N, 180°	8.9	6.0	33.4	33.5	0.0	14.5	1.3	32.0	0.5	2.3	0.0	0.0	0.0	50.5
2000	14-19 Jun	6	41°N-46°N, 180°	8.3	6.6	33.2	33.4	0.7	11.0	5.2	5.7	0.0	0.8	0.0	0.0	0.0	23.3
1999	16-22 Jun	6	40°N-45°N, 180°	9.1	7.4	33.3	33.4	0.0	2.5	1.0	9.0	0.0	1.0	0.0	0.0	0.0	13.5
1998	20-25 Jun	5	41°N-45°N, 180°	9.4	6.8	33.3	33.5	0.0	6.8	1.0	22.2	0.0	1.4	0.0	0.0	0.0	31.4
1997	21-25 Jun	5	41°N-45°N, 180°	10.0	7.7	33.5	33.6	0.2	11.6	1.4	21.0	0.2	2.4	0.0	0.0	0.0	36.8
1996	18-20 Jun	3	41°N-43°N, 180°	11.8	8.0	33.6	33.7	0.0	5.0	0.0	1.3	0.0	0.7	0.0	0.0	0.0	7.0
1995	22-24 Jun	3	42°N-44°N, 180°	10.6	8.4	33.7	33.9	0.0	3.7	2.0	9.0	0.0	0.3	0.0	0.0	0.0	15.0
1994	21-24 Jun	4	41°N-44°N, 180°	10.5	8.6	33.9	33.9	0.0	9.0	1.3	11.0	0.0	2.5	0.0	0.0	0.0	23.8
1993	23-25 Jun	2	43°N-44°N, 180°	9.2	7.7	33.7	33.9	0.0	27.5	0.0	8.5	0.0	1.0	0.0	0.0	0.0	37.0
1992	21-22 Jun	2	42°N-43°N, 180°	9.4	9.1	33.7	34.0	0.0	15.0	0.0	5.5	0.0	0.5	0.0	0.0	0.0	21.0
1991	15-19 Jun	5	41°N-45°N, 180°	10.4	8.3	33.5	33.8	0.0	10.6	0.4	29.2	0.0	3.2	0.0	0.0	0.0	43.4
<b>Central North Pacific - Subarctic Current</b>																	
2002	20-23 Jun	3	46°N-47°N, 180°	7.0	3.7	32.9	33.1	4.3	58.7	1.0	7.7	0.7	2.7	0.0	0.0	0.0	75.0
2001	20-23 Jun	3	46°N-47°N, 180°	6.6	3.2	33.0	33.2	5.3	49.3	42.0	1.3	0.0	0.3	0.0	0.0	0.0	98.3
2000	20-22 Jun	2	47°N, 180°	6.2	3.5	32.9	33.0	6.0	53.5	8.0	1.5	0.5	4.5	0.0	0.0	0.0	74.0
1999	24-26 Jun	3	46°N-47°N, 180°	5.8	3.7	32.7	33.0	36.0	52.0	51.0	2.3	2.0	4.0	0.0	0.0	0.0	147.3
1998	26-28 Jun	3	46°N-47°N, 180°	6.8	4.1	33.0	33.1	6.0	13.3	1.0	27.3	2.3	6.7	0.0	0.3	0.0	57.0
1997	26-28 Jun	3	46°N-47°N, 180°	8.8	4.8	32.8	33.0	0.7	35.3	24.7	8.3	2.0	1.7	0.0	0.0	0.0	72.7
1996	21-26 Jun	4	44°N-47°N, 180°	9.2	5.1	33.1	33.2	0.0	53.0	1.3	19.0	0.8	1.0	0.0	0.0	0.0	75.0
1995	25-27 Jun	3	45°N-47°N, 180°	7.8	4.7	33.0	33.2	0.7	33.0	6.7	25.7	0.7	7.7	0.0	0.0	0.0	74.3
1994	25-27 Jun	3	45°N-47°N, 180°	6.5	3.9	32.9	33.0	1.3	15.3	22.0	25.0	1.0	9.0	0.0	0.0	0.0	73.7
1993	26-28 Jun	3	45°N-47°N, 180°	7.3	3.6	33.0	33.2	0.0	58.3	2.7	16.3	0.3	5.0	0.0	0.0	0.0	82.7
1992	23-25 Jun	3	44°N-46°N, 180°	7.6	4.8	33.2	33.3	0.0	12.7	0.3	19.3	0.3	1.0	0.0	0.0	0.0	33.7
1991	20-21 Jun	3	46°N-47°N, 180°	7.4	4.5	33.0	33.1	1.0	30.5	10.5	24.0	1.0	1.5	0.0	0.0	0.0	68.5
<b>North Pacific Ridge Domain</b>																	
1992	26-Jun	1	47°N, 180°	6.7	3.1	33.0	33.1	0.0	40.0	1.0	34.0	0.0	2.0	0.0	0.0	0.0	77.0
<b>Central North Pacific All Areas Combined</b>																	
2002	13-23 Jun	10	39°N-47°N, 180°	10.4	7.8	33.5	33.6	1.6	24.8	0.6	6.0	0.3	1.1	0.0	0.0	0.0	34.4
2001	14-23 Jun	10	39°N-47°N, 180°	9.8	6.5	33.5	33.6	2.0	25.8	16.4	16.5	0.3	1.3	0.0	0.0	0.0	62.1
2000	12-22 Jun	10	39°N-47°N, 180°	9.0	6.8	33.3	33.5	1.6	17.3	4.7	3.7	0.1	1.4	0.0	0.0	0.0	28.8
1999	16-26 Jun	10	39°N-47°N, 180°	8.6	6.6	33.2	33.3	10.8	17.1	15.9	6.1	0.6	1.8	0.0	0.0	0.0	52.3
1998	17-28 Jun	10	39°N-47°N, 180°	9.7	6.9	33.4	33.5	1.8	7.4	0.8	19.3	0.7	2.7	0.0	0.1	0.0	32.8
1997	19-28 Jun	10	39°N-47°N, 180°	10.3	7.5	33.4	33.6	0.3	16.8	8.1	13.1	0.7	1.7	0.0	0.0	0.0	40.7
1996	15-27 Jun	10	38°N-47°N, 180°	11.5	7.8	33.6	33.7	0.0	22.7	0.5	8.0	0.3	0.6	0.0	0.0	0.0	32.1
1995	18-27 Jun	10	38°N-47°N, 180°	10.7	8.2	33.6	33.8	0.2	11.1	2.6	11.2	0.2	2.4	0.0	0.0	0.0	26.9
1994	18-27 Jun	10	38°N-47°N, 180°	10.4	8.1	33.7	33.7	0.4	8.2	7.1	11.9	0.3	3.7	0.0	0.0	0.0	31.6
1993	17-28 Jun	10	38°N-47°N, 180°	10.4	7.9	33.7	33.9	0.0	29.7	0.8	6.6	0.1	1.7	0.0	0.0	0.0	25.4
1992	17-25 Jun	10	38°N-47°N, 180°	9.9	7.7	33.7	33.8	0.0	10.8	0.2	10.3	0.1	0.6	0.0	0.0	0.0	22.0
1991	12-21 Jun	10	38°N-47°N, 180°	11.0	8.4	33.6	33.8	0.2	11.4	2.3	19.6	0.2	1.9	0.0	0.0	0.0	35.6
<b>Bering Sea</b>																	
2002	1-14 Jul	13	55°N-58°N, 178°W-176°E	7.0	2.2	33.1	33.2	28.5	189.5	2.2	0.2	6.9	0.0	0.0	0.0	0.0	227.2
2001	1-13 Jul	13	55°N-58°N, 178°W-176°E	5.4	1.7	33.1	33.2	60.8	136.5	164.9	0.1	2.5	0.0	0.0	0.0	0.0	364.8
2000	30 Jun-12 Jul	11	55°N-58°N, 178°W-178°E	7.9	1.8	33.0	33.2	36.1	141.5	2.2	0.0	10.2	0.0	0.0	0.0	0.0	189.9
1999	4-14 Jul	11	55°N-58°N, 178°W-178°E	6.5	1.9	32.9	33.0	25.5	64.1	357.3	0.0	4.1	0.0	0.0	0.0	0.0	450.9
1998	6-16 Jul	11	55°N-58°N, 177°W-177°E	7.0	2.5	32.3	33.0	37.7	209.6	5.6	0.4	22.7	0.0	5.0	0.0	0.0	281.1
1997	6-17 Jul	10	55°N-58°N, 177°W-177°E	8.4	3.0	32.8	32.9	57.0	143.9	379.7	0.3	3.5	0.0	0.1	0.0	0.0	584.5
1996	4-14 Jul	9	55°N-58°N, 177°W-179°E	7.5	2.9	32.8	33.0	55.1	200.7	4.8	0.1	6.8	0.0	0.2	0.0	0.0	267.7
1995	5-15 Jul	11	55°N-58°N, 177°W-177°E	7.5	2.0	32.9	33.1	37.8	63.8	174.5	0.5	6.5	0.0	0.2	0.0	0.0	283.3
1994	5-15 Jul	11	55°N-58°N, 177°W-177°E	6.7	1.8	32.9	33.2	50.3	224.0	13.1	0.0	5.2	0.0	0.2	0.0	0.0	292.7
1993	6-16 Jul	11	55°N-58°N, 177°W-177°E	7.2	2.1	33.1	33.2	58.2	111.6	141.2	0.8	1.4	0.0	0.0	0.0	0.0	313.2
1992	4-14 Jul	11	55°N-58°N, 177°W-177°E	6.4	2.5	33.0	33.3	22.8	257.5	9.0	0.3	5.4	0.0	0.5	0.0	0.0	295.5
1991	1-8 Jul	8	55°N-58°N, 180°W-177°W	7.6	2.2	33.0	33.2	22.9	53.9	365.5	0.0	9.9	0.0	0.0	0.0	0.0	452.1

Table 15. Number sampled, mean, and standard deviation of fork length (FL, mm), body weight (BW, g), and condition factor (CF= $10^6 \cdot BW/FL^3$ ) of sockeye salmon caught by the *Wakatake maru* research gillnet, 1991-2002, grouped by ocean age.

Sockeye																																
Year	Ocean Age .1							Ocean Age .2						Ocean Age .3						Ocean Age .4												
	% FL (mm)		B W (g)		CF		% FL (mm)		B W (g)		CF		% FL (mm)		B W (g)		CF		% FL (mm)		B W (g)		CF									
	N	Age	mean	sd	mean	sd	mean	sd	N	Age	mean	sd	mean	sd	mean	sd	N	Age	mean	sd	mean	sd	mean	sd								
<b>Central North Pacific - Subarctic Current (44°N-47°N, 180°)</b>																																
2002	6	50	364	32	493	83	10.3	1.4	6	50	469	22	1103	253	10.5	1.2	0								0							
2001	5	28	322	8	326	30	9.8	0.9	11	61	458	36	1097	482	11.0	1.2	2	11	544	14	1925	205	12	0	0							
2000	6	50	310	11	308	16	10.4	0.9	6	50	419	24	817	118	11.0	0.4	0								0							
1999	54	54	325	21	384	73	11.1	1.2	46	46	436	22	921	127	11.0	0.7	0								0							
1998	10	59	336	23	361	80	9.4	0.7	6	35	435	22	907	55	11.1	1.2	1	6	610		3000		13.2		0							
1997	0								5	100	461	41	1116	304	11.3	1.7	0								0							
1996	0								0								0								0							
1995	0								0								2	100	606	8	2950	354	13.2	1.0	0							
1994	2	50	365	49	464	91	9.7	2.0	1	25	452		980		10.6		1	25	615		3200		13.8		0							
1993	0								0								0								0							
1992	0								0								0								0							
1991	2	100	315	5	295	7	9.5	0.2	0							0									0							
<b>Bering Sea (55°N-58°N, 177°W-176°E)</b>																																
2002	125	34	324	26	366	87	10.7	1.3	200	55	476	31	1250	298	11.5	1.1	30	8	577	62	2584	1024	12.8	1.8	6	2	617	30	3258	663	13.7	1.1
2001	622	83	308	25	314	73	10.6	1.7	44	6	463	36	1066	262	10.6	1.0	70	10	576	46	2605	744	13	2	4	1	618	30	3335	675	14.0	1.0
2000	235	60	317	19	321	63	10.0	1.3	104	27	460	38	1099	311	11.0	1.1	53	13	603	42	3198	837	14	2	0							
1999	121	46	300	24	254	70	9.2	1.5	104	39	477	36	1290	355	11.6	1.5	40	15	583	41	2691	661	13.3	1.7	0							
1998	221	56	331	36	403	219	10.9	5.1	141	36	471	43	1275	471	11.8	1.8	33	8	574	44	2715	768	14.0	2.0	0							
1997	215	41	341	25	422	97	10.5	0.9	273	53	461	28	1112	217	11.2	1.1	30	6	574	58	2489	802	12.6	1.2	0							
1996	270	59	340	29	382	119	9.5	1.1	139	30	472	38	1250	355	11.6	1.4	48	11	585	54	2659	865	12.9	1.9	0							
1995	37	10	330	45	399	200	10.5	1.0	292	73	495	30	1447	354	11.8	1.0	70	17	586	58	2599	792	12.6	1.8	2	0	624	63	2925	601	12.1	1.2
1994	133	37	340	26	404	97	10.2	1.5	209	57	474	30	1189	255	11.1	1.1	23	6	583	38	2643	651	13.1	1.3	0							
1993	297	52	351	25	430	101	9.8	1.0	246	43	483	36	1301	329	11.3	1.1	31	5	571	44	2423	773	12.6	1.8	2	0	628	20	3275	601	13.1	1.2
1992	92	39	337	31	392	105	10.1	1.3	126	54	483	31	1364	324	12.0	1.5	16	7	584	46	2929	803	14.5	3.1	1	0	650		4500		16.4	
1991	101	59	313	21	332	70	10.7	1.1	38	22	480	39	1335	477	11.7	1.3	30	18	595	44	2851	781	13.2	1.7	2	1	653	33	4225	460	15.2	0.6





Table 18. Number sampled, mean, and standard deviation of fork length (FL, mm), body weight (BW, g), and condition factor (CF=10<sup>6</sup>\*BW/FL<sup>3</sup>) of chum salmon caught by the *Wakatake maru* research gillnet, 1991-2002, grouped by ocean age and oceanographic domain.

Year	Ocean Age 1			Ocean Age 2			Ocean Age 3			Ocean Age 4			Ocean Age 5			Ocean Age 6					
	% N	F.L.(mm) mean	B.W.(g) mean	% N	F.L.(mm) mean	B.W.(g) mean	% N	F.L.(mm) mean	B.W.(g) mean	% N	F.L.(mm) mean	B.W.(g) mean	% N	F.L.(mm) mean	B.W.(g) mean	% N	F.L.(mm) mean	B.W.(g) mean			
<b>Chum</b>																					
<b>Central North Pacific - Transition Domain (41°N-45°N, 180°)</b>																					
2002	3	278	26	22	13	10.7	2.3	13	69	423	45	818	272	10.7	1.9	0					
2001	3	314	9	370	98	11.8	2.1	36	67	435	30	939	182	11.4	1.2	0					
2000	11	315	15	331	59	10.5	0.9	22	39	436	21	956	158	11.5	0.8	0					
1999	4	44	329	14	322	55	6.8	4.6	4	44	379	55	688	133	13.5	5.3	0				
1998	25	89	318	16	306	56	9.4	0.8	3	11	394	9	633	21	10.4	8.1	0				
1997	7	13	337	40	381	127	9.8	0.8	42	79	423	23	862	240	11.2	2.4	0				
1996	1	8	328	380	10.8	10.77	434	15	1016	83	12.5	0.7	4	8	481	38	1330	358	11.8	1.3	
1995	0							7	58	480	46	1317	409	11.6	0.8	0					
1994	5	15	334	9	408	23	10.9	0.5	22	67	422	29	831	192	10.9	0.8	0				
1993	4	8	326	9	355	13	10.3	1.0	37	79	425	16	841	126	10.9	1.1	0				
1992	1	3	362	520	11.0	24	83	418	12	846	143	11.5	1.2	3	10	470	21	1207	172	11.3	0.9
1991	9	19	309	13	271	41	9.1	0.8	34	71	413	25	757	166	10.6	0.9	0				
<b>Central North Pacific - Subarctic Current (44°N-47°N, 180°)</b>																					
2002	112	68	294	16	256	39	10.1	1.4	43	26	421	18	808	123	10.7	0.6	0				
2001	29	19	307	13	273	51	9.4	1.2	60	38	458	35	1134	258	11.8	1.4	0				
2000	20	19	325	13	332	52	9.6	1.0	44	42	435	18	943	203	11.3	2.0	0				
1999	64	43	337	22	381	59	10.0	1.2	78	52	416	23	801	126	11.2	1.7	0				
1998	23	60	302	16	262	28	9.5	0.9	12	32	409	24	769	225	11.1	2.3	0				
1997	51	57	305	14	276	44	9.7	1.3	35	39	434	31	870	266	10.4	0.9	0				
1996	110	57	319	18	315	62	9.6	0.9	71	37	437	23	928	165	11.0	0.9	0				
1995	7	7	326	25	332	32	9.8	1.8	19	20	471	29	1236	255	11.7	0.8	0				
1994	10	23	341	21	419	72	10.5	1.1	22	51	414	27	780	209	10.8	1.3	0				
1993	56	37	338	19	385	98	10.0	2.1	83	55	419	24	784	140	10.6	1.3	0				
1992	1	3	309	6	291	30	9.9	0.8	21	60	422	21	797	163	10.5	0.8	0				
1991	2	3	344	25	430	85	10.5	0.2	47	83	421	25	804	164	10.6	1.1	0				
<b>Central North Pacific - Ridge Domain (47°N, 180°)</b>																					
1992	18	47	316	8	289	24	9.2	0.6	12	32	436	24	931	195	11.1	0.7	0				
<b>Central North Pacific - All Areas (41°N-47°N, 180°)</b>																					
2002	117	64	293	17	254	39	10.1	1.5	56	31	422	26	810	167	10.7	1.0	0				
2001	32	15	307	13	282	62	9.6	1.4	96	45	449	35	1064	251	11.6	1.4	0				
2000	31	19	322	14	331	53	9.9	1.0	66	41	456	19	947	188	11.4	1.7	0				
1999	68	43	336	22	379	59	9.8	1.7	82	52	414	26	795	128	11.3	2.0	0				
1998	48	73	310	18	285	50	9.5	0.9	15	23	406	22	742	207	10.9	2.0	0				
1997	58	41	309	21	289	68	9.7	1.2	77	54	428	27	865	250	10.9	1.9	0				
1996	111	54	319	18	316	62	9.7	0.9	81	39	457	22	939	159	11.2	1.0	0				
1995	7	7	326	25	332	32	9.8	1.8	26	24	473	33	1238	297	11.7	0.8	0				
1994	15	20	339	18	415	59	10.6	1.0	44	58	418	28	806	200	10.9	1.1	0				
1993	60	24	337	19	383	95	10.0	2.1	169	67	420	22	805	138	10.8	1.2	0				
1992	30	29	315	12	298	49	9.5	0.8	57	56	423	19	846	167	11.1	1.1	0				
1991	11	11	315	20	300	79	9.4	0.9	81	77	418	25	784	166	10.6	1.0	0				
<b>Bering Sea (55°N-58°N, 177°W-176°E)</b>																					
2002	266	12	352	28	421	102	9.6	1.3	900	40	451	34	1001	270	10.8	1.3	0				
2001	594	35	339	22	403	79	10.4	1.6	284	17	466	39	1163	329	11.2	1.0	0				
2000	106	7	350	25	439	113	10.1	1.5	354	23	466	32	1145	261	11.2	1.0	0				
1999	0								175	28	453	30	1091	263	11.6	1.4	0				
1998	281	14	341	21	396	159	9.8	1.3	786	39	425	37	837	266	10.6	1.3	0				
1997	749	59	340	17	407	76	10.3	0.9	324	25	442	35	955	297	10.8	1.9	0				
1996	732	45	342	21	375	95	9.2	1.0	903	31	440	32	921	231	10.7	1.0	0				
1995	155	24	364	44	515	224	10.4	1.7	480	33	482	33	1280	337	11.2	1.6	0				
1994	328	18	356	22	438	102	9.6	1.0	582	31	437	32	887	226	10.5	1.1	0				
1993	78	7	368	20	488	90	9.7	0.9	544	51	442	29	942	223	10.7	1.3	0				
1992	928	36	350	22	423	89	9.7	1.1	857	33	429	32	885	265	10.7	1.3	0				
1991	2	1	363	11	450	14	9.4	0.6	112	29	449	34	995	272	10.8	1.0	0				

\*chum salmon may be ocean age 7

Table 19. Percent ocean age composition and maturity at age of chum salmon caught by the *Wakatake maru* in research gillnets, 1991-2002. Percent values indicate the percentage of fish in each age and maturity class, grouped by year. Imm=immature, Mat=mature, Tot=Total.

Chum																					
Year	N	Ocean age .1			Ocean age .2			Ocean age .3			Ocean age .4			Ocean age .5			Ocean age .6			Total	
		Imm	Mat	Tot	Imm	Mat	Tot	Imm	Mat	Tot	Imm	Mat	Tot	Imm	Mat	Tot	Imm	Mat	Tot	Imm	Mat
<b>Central North Pacific - Transition Domain (41°N-45°N, 180°)</b>																					
2002	19	27	0	27	63	5	68	5	0	5	0	0	0	0	0	0	0	0	0	95	5
2001	52	6	0	6	65	0	65	21	6	27	2	0	2	0	0	0	0	0	0	94	6
2000	57	19	0	19	33	5	39	28	12	40	2	0	2	0	0	0	0	0	0	83	17
1999	8	38	0	38	50	0	50	12	0	12	0	0	0	0	0	0	0	0	0	100	0
1998	27	89	0	89	11	0	11	0	0	0	0	0	0	0	0	0	0	0	0	100	0
1997	53	13	0	13	62	17	79	6	2	8	0	0	0	0	0	0	0	0	0	81	19
1996	13	8	0	8	77	0	77	15	0	15	0	0	0	0	0	0	0	0	0	100	0
1995	12	0	0	0	33	25	58	25	17	42	0	0	0	0	0	0	0	0	0	58	42
1994	33	15	0	15	61	6	67	12	6	18	0	0	0	0	0	0	0	0	0	88	12
1993	47	9	0	9	79	0	79	8	4	12	0	0	0	0	0	0	0	0	0	96	4
1992	29	3	0	3	76	7	83	7	3	10	0	3	3	0	0	0	0	0	0	86	14
1991	48	19	0	19	65	6	71	2	8	10	0	0	0	0	0	0	0	0	0	85	15
<b>Central North Pacific - Subarctic Current (44°N-47°N, 180°)</b>																					
2002	161	67	1	68	24	2	26	2	3	5	0	1	1	0	0	0	0	0	0	93	7
2001	153	19	0	19	34	3	37	32	9	41	3	1	3	0	0	0	0	0	0	88	12
2000	105	19	0	19	40	2	42	32	3	35	3	1	4	0	0	0	0	0	0	94	6
1999	142	45	0	45	50	0	50	1	4	5	0	0	0	0	0	0	0	0	0	97	3
1998	38	61	0	61	24	8	32	5	0	5	0	3	3	0	0	0	0	0	0	90	10
1997	89	56	1	57	37	2	39	1	2	3	0	0	0	0	0	0	0	0	0	94	6
1996	192	56	1	57	35	2	37	5	1	6	0	1	1	0	0	0	0	0	0	96	4
1995	91	4	0	4	19	2	21	46	18	64	6	6	11	0	0	0	0	0	0	75	25
1994	43	23	0	23	49	2	51	14	9	23	2	0	2	0	0	0	0	0	0	88	12
1993	151	37	0	37	50	5	55	3	4	7	1	0	1	0	0	0	0	0	0	91	9
1992	35	31	0	31	54	6	60	3	6	9	0	0	0	0	0	0	0	0	0	89	11
1991	57	4	0	4	79	4	83	9	5	14	0	0	0	0	0	0	0	0	0	91	9
<b>Central North Pacific - Ridge Domain (47°N, 180°)</b>																					
1992	38	47	0	47	21	11	32	8	8	16	3	3	5	0	0	0	0	0	0	79	21
<b>Central North Pacific - All Areas (41°N-47°N, 180°)</b>																					
2002	180	62	0	62	28	4	32	2	3	5	0	1	1	0	0	0	0	0	0	92	8
2001	205	16	0	16	42	2	44	29	8	37	2	1	3	0	0	0	0	0	0	89	11
2000	162	19	0	19	38	3	41	31	6	37	3	1	3	0	0	0	0	0	0	90	10
1999	150	45	0	45	50	0	50	2	3	5	0	0	0	0	0	0	0	0	0	97	3
1998	65	72	0	72	19	5	23	3	0	3	0	2	2	0	0	0	0	0	0	94	6
1997	142	40	1	41	47	8	54	3	2	5	0	0	0	0	0	0	0	0	0	89	11
1996	205	53	1	54	38	2	39	5	1	6	0	1	1	0	0	0	0	0	0	96	4
1995	104	4	0	4	20	5	25	44	17	62	5	5	10	0	0	0	0	0	0	73	27
1994	76	20	0	20	54	4	58	13	8	21	1	0	1	0	0	0	0	0	0	88	12
1993	253	24	0	24	64	3	67	6	3	9	0	0	0	0	0	0	0	0	0	94	6
1992	102	29	0	29	48	8	56	6	6	12	1	2	3	0	0	0	0	0	0	84	16
1991	105	11	0	11	72	5	77	6	7	12	0	0	0	0	0	0	0	0	0	89	11
<b>Bering Sea (55°-58°N, 177°W-176°E)</b>																					
2002	2225	12	0	12	37	3	40	17	16	33	3	11	14	0	1	1	0	0	0	69	31
2001	1661	34	0	34	15	2	17	10	21	31	4	13	17	0	1	1	0	0	0	63	37
2000	1551	7	0	7	20	3	23	32	16	48	6	15	21	0	1	1	0	0	0	65	35
1999	624	0	0	0	26	2	28	29	22	50	2	19	21	0	1	1	0	0	0	56	44
1998	2004	12	0	12	37	3	39	18	21	39	2	7	9	0	0	1	0	0	0	69	31
1997	1281	58	0	59	23	3	25	4	9	13	1	2	3	0	0	0	0	0	0	85	15
1996	1606	45	0	45	30	1	31	11	7	18	2	3	5	0	1	1	0	0	0	89	11
1995	642	23	2	24	13	4	17	22	18	40	3	15	18	0	1	1	0	0	0	61	39
1994	1869	17	0	18	29	2	31	30	15	44	2	5	7	0	0	0	0	0	0	78	22
1993	1064	7	0	7	45	6	51	13	20	33	1	7	8	0	1	1	0	0	0	66	34
1992	2570	36	0	36	31	3	33	13	11	25	1	5	6	0	0	0	0	0	0	80	20
1991	370	0	0	0	23	6	29	10	36	46	1	20	21	0	5	5	0	0	0	34	66

Table 20. Number sampled, mean, and standard deviation of fork length (FL, mm), body weight (BW, g), and condition factor ( $CF=10^3 \cdot BW/FL^3$ ) of pink salmon caught by the Wakatake maru research gillnet, 1991-2002, grouped by ocean age and oceanographic domain.

Pink								
Year	Ocean Age .1							
	N	% Fork length (mm)		Body weight (g)		Condition Factor		
		Age	mean	sd	mean	sd	mean	sd
<b>Central North Pacific - Transition Domain (41°N-45°N, 180°)</b>								
2002	2	100	409	9	745	106	10.9	0.8
2001	4	100	452	37	1060	337	11.2	1.2
2000	26	100	461	31	1124	279	11.3	0.6
1999	4	100	434	29	940	104	11.5	1.0
1998	4	100	450	20	1055	168	11.5	1.1
1997	6	100	433	25	1045	279	12.9	3.9
1996	0							
1995	6	100	467	33	1186	328	11.4	1.2
1994	7	100	469	38	1063	265	10.1	0.3
1993	0							
1992	0							
1991	1	100	416		720		10.0	
<b>Central North Pacific - Subarctic Current (44°N-47°N, 180°)</b>								
2002	3	100	450	50	1103	474	11.6	1.6
2001	127	100	433	20	986	137	12.1	0.8
2000	17	100	444	36	1029	280	11.5	1.3
1999	148	100	410	23	776	131	11.2	1.7
1998	3	100	476	10	1193	83	11.1	0.6
1997	79	100	433	23	928	135	11.4	1.4
1996	5	100	436	45	844	349	9.6	1.4
1995	18	100	459	26	1070	360	10.8	1.7
1994	66	100	455	28	1023	210	10.8	1.0
1993	8	100	429	21	738	134	9.3	1.0
1992	2	100	458	0	920	57	9.6	0.6
1991	21	100	423	35	787	252	10.1	1.1
<b>Central North Pacific - Ridge Domain (47°N, 180°)</b>								
1992	1	100	450		910		10.0	
<b>Central North Pacific - All Areas Combined (41°N-47°N, 180°)</b>								
2002	5	100	434	42	960	392	11.3	1.2
2001	131	100	434	21	988	145	12.0	0.8
2000	43	100	454	34	1087	280	11.4	1.0
1999	152	100	411	23	780	132	11.2	1.6
1998	7	100	461	21	1114	148	11.3	0.9
1997	85	100	433	23	936	150	11.5	1.7
1996	5	100	436	45	844	349	9.6	1.4
1995	24	100	461	27	1099	349	11.0	1.6
1994	73	100	456	29	1027	214	10.7	1.0
1993	8	100	429	21	738	134	9.3	1.0
1992	3	100	455	5	917	40	9.7	0.5
1991	22	100	422	34	784	247	10.1	1.0
<b>Bering Sea (55°N-58°N, 177°W-176°E)</b>								
2002	26	100	450	37	1086	329	11.6	1.1
2001	1882	100	461	26	1220	247	12.3	1.1
2000	27	100	455	35	1165	290	12.1	0.7
1999	2485	100	441	31	1100	260	12.7	1.3
1998	60	100	414	40	859	342	11.7	2.1
1997	1537	100	446	27	1117	244	12.5	2.0
1996	43	100	455	35	1117	275	11.7	1.4
1995	1749	100	470	29	1298	266	12.4	1.2
1994	143	100	444	30	1055	262	11.9	1.1
1993	1434	100	449	27	1106	240	12.1	1.1
1992	100	100	451	27	1153	255	12.4	1.1
1991	2621	100	447	37	1108	362	12.0	1.2

Table 21. Number sampled, mean, and standard deviation of fork length (FL, mm), body weight (BW, g), and condition factor ( $10^6 \cdot BW/FL^3$ ) of coho salmon caught by the *Wakatake maru* research gillnet, 1991-2002, grouped by ocean age and oceanographic domain.

Coho Year	Ocean Age .1							
	N	Age	Fork length (mm)		Body Weight (g)		Condition Factor	
			mean	sd	mean	sd	mean	sd
<b>Central North Pacific - Transition Domain (41°N-45°N, 180°)</b>								
2002	24	100	537	39	2039	251	13.4	2.9
2001	125	100	556	34	2277	420	13.1	1.3
2000	33	100	540	58	1996	370	12.8	1.9
1999	53	100	515	32	1613	307	11.7	0.9
1998	110	100	519	34	1763	345	12.5	1.5
1997	99	100	510	37	1754	408	13.1	2.0
1996	4	100	542	20	1925	155	12.1	0.8
1995	26	100	525	40	1786	328	12.4	2.3
1994	43	100	516	39	1563	414	11.2	1.3
1993	18	100	506	58	1562	472	11.8	1.2
1992	11	100	512	55	1678	486	12.2	1.2
1991	148	100	520	40	1631	393	11.4	0.9
<b>Central North Pacific - Subarctic Current (44°N-47°N, 180°)</b>								
2002	22	100	560	30	2249	363	12.7	0.7
2001	4	100	553	65	2380	815	13.6	0.6
2000	3	100	507	43	1780	370	13.6	0.6
1999	7	100	505	57	2006	311	16.2	0.5
1998	80	100	543	43	2122	494	13.1	1.4
1997	32	100	498	49	1468	398	11.8	2.1
1996	75	100	516	39	1653	399	11.8	1.0
1995	73	100	532	46	1836	512	11.9	1.0
1994	78	100	527	39	1829	415	12.3	1.3
1993	49	100	521	48	1755	512	12.1	1.5
1992	58	100	503	31	1514	340	11.7	1.2
1991	49	100	526	39	1821	419	12.4	1.0
<b>Central North Pacific - Ridge Domain (47°N, 180°)</b>								
1992	34	100	507	39	1611	367	12.1	0.9
<b>Central North Pacific - All Areas Combined (41°N-47°N, 180°)</b>								
2002	46	100	548	36	2139	324	13.1	2.2
2001	129	100	556	35	2281	432	13.1	1.3
2000	36	100	537	57	1978	370	12.9	1.8
1999	60	100	514	36	1659	330	12.2	2.4
1998	190	100	529	40	1914	450	12.7	1.5
1997	132	100	508	41	1698	450	12.8	2.1
1996	79	100	517	38	1666	394	11.8	1.0
1995	99	100	530	45	1823	469	12.0	1.5
1994	121	100	523	39	1735	432	11.9	1.4
1993	67	100	517	51	1703	505	12.0	1.5
1992	103	100	505	37	1563	367	11.9	1.1
1991	197	100	521	40	1678	407	11.7	1.0
<b>Bering Sea (55°N-58°N, 177°W-176°E)</b>								
2002	1	100	599		2650		12.3	
2001	1	100	582		2150		10.9	
2000	0							
1999	0							
1998	3	100	556	62	2430	725	13.8	0.4
1997	3	100	518	72	1740	1095	11.4	2.3
1996	1	100	630		3800		15.2	
1995	5	100	605	35	2910	667	12.9	1.0
1994	0							
1993	9	100	556	33	2166	581	12.4	2.1
1992	3	100	568	37	2450	492	13.3	0.1
1991	0							

Table 22. Number sampled, mean, and standard deviation of fork length (FL, mm), body weight (BW, g), and condition factor ( $10^6 \cdot BW/FL^3$ ) of chinook salmon caught by the *Wakatake maru* research gillnet, 1991-2002, grouped by ocean age and oceanographic domain.

Chinook																													
Year	Ocean Age .1								Ocean Age .2				Ocean Age .3				Ocean Age .4												
	% FL (mm)		B W (g)		CF		N	Age	% FL (mm)		B W (g)		CF		N	Age	% FL (mm)		B W (g)		CF								
	mean	sd	mean	sd	mean	sd			mean	sd	mean	sd	mean	sd			mean	sd	mean	sd	mean	sd	mean	sd					
<b>Central North Pacific - Transition Domain (42°N-45°N, 180)</b>																													
2001	0								2 100 683 4 4650 212 14.6 0.9				0				0												
<b>Central North Pacific - Subarctic Current (44°N-47°N, 180)</b>																													
2002	0								1 50 602 2600 11.9				1 50 714 4400 12.1				0												
2001	0								0				0				0												
2000	0								1 100 600 3100 14.4				0				0												
1999	0								5 100 617 30 3220 448 13.6 0.6				0				0												
1998	0								6 86 582 39 2488 472 12.5 0.7				1 14 780 6850 14.4				0												
1997	0								6 86 641 47 3408 1026 12.6 2.2				1 14 700 4400 12.8				0												
1996	3 100 395 44 823 320 12.9 0.8								0				0				0												
1995	0								1 50 562 2200 12.4				1 50 832 7800 13.5				0												
1994	0								3 100 616 33 3150 477 13.4 0.3				0				0												
1993	0								1 100 624 3700 15.2				0				0												
1992	0								1 100 575 2300 12.1				0				0												
1991	0								2 100 572 82 2625 926 13.8 1.0				0				0												
<b>Central North Pacific - Ridge Domain (47°N, 180)</b>																													
1992	0								0				0				0												
<b>Bering Sea (55°-58°N, 177°W-176°E)</b>																													
2002	24	29	353	32	492	102	11.2	1.3	39	46	545	38	2026	427	12.4	1.1	21	25	695	65	4324	1136	12.5	0.9	0				
2001	24	73	345	28	476	136	11.4	1.3	5	15	492	99	1660	736	12.6	1.7	3	9	603	56	2260	754	10.1	1.7	1	3	780	6300	13.3
2000	36	33	326	49	421	329	11.0	1.6	50	46	520	51	1779	524	12.3	0.9	22	20	671	48	4030	1122	13.1	2.0	1	1	728	5300	13.7
1999	13	30	330	27	403	114	10.9	1.0	22	51	533	60	1936	694	12.5	2.2	8	19	658	64	3566	1236	12.1	0.8	0				
1998	140	60	348	41	528	311	11.7	1.2	62	27	545	57	2202	793	13.1	0.9	30	13	678	76	4346	1434	13.3	1.6	0				
1997	12	35	350	24	478	94	11.1	0.8	19	56	550	35	1954	390	11.6	0.8	3	9	714	100	4650	2079	12.2	0.9	0				
1996	24	43	407	31	826	221	12.0	1.0	25	45	567	46	2382	632	12.8	1.0	7	12	732	46	5121	1366	12.7	1.1	0				
1995	18	27	339	31	442	128	11.1	0.9	43	65	525	52	1813	522	12.3	1.7	4	6	726	61	4725	1300	12.2	0.8	1	2	812	6800	12.7
1994	25	47	374	31	620	173	11.3	1.0	11	21	543	57	2179	740	13.1	1.5	17	32	720	41	4855	1129	12.8	1.0	0				
1993	1	8	352		480		11.0		7	59	573	25	2340	314	12.4	0.6	3	25	716	95	4710	2175	12.3	1.1	1	8	862	8600	13.4
1992	17	36	356	27	525	116	11.4	0.9	23	49	567	47	2333	709	12.6	1.5	6	13	654	27	3822	648	13.6	0.8	1	2	850	7650	12.5
1991	45	66	345	26	497	120	11.9	1.3	21	31	530	57	1816	634	11.8	0.8	2	3	715	18	4050	71	11.1	1.0	0				

Table 23. Percent ocean and freshwater age composition and maturity at age of chinook salmon caught in the central North Pacific Ocean by the *Wakatake maru* in research gillnets, 1991-2002. Percent values indicate the percentage of fish in each age and maturity class, grouped by year. Imm=immature, Mat=Mature, Tot=Total.

Chinook, Central North Pacific- All Areas Combined																
Year	N	Ocean Age 1														
		FW Age 0		FW Age 1		FW Age 2		FW X		All FW Ages						
		Imm	Mat	Imm	Mat	Imm	Mat	Imm	Mat	Imm	Mat	Imm	Mat			
02	0															
01	0															
00	0															
99	0															
98	0															
97	0															
96	3	0	0	0	33	0	33	0	0	0	67	0	67	100	0	100
95	0															
94	0															
93	0															
92	0															
91	0															
Year	N	Ocean Age 2														
		FW Age 0		FW Age 1		FW Age 2		FW X		All FW Ages						
		Imm	Mat	Imm	Mat	Imm	Mat	Imm	Mat	Imm	Mat	Imm	Mat			
02	1	0	0	0	0	0	0	0	50	0	50	50	0	50		
01	2	0	0	0	50	0	50	0	0	0	50	0	50	100	0	100
00	1	0	0	0	100	0	100	0	0	0	0	0	0	100	0	100
99	5	0	0	0	80	0	80	0	0	0	20	0	20	100	0	100
98	6	0	0	0	57	0	57	0	0	0	29	0	29	86	0	86
97	6	0	0	0	71	0	71	0	0	0	14	0	14	86	0	86
96	0															
95	1	0	0	0	0	0	0	50	0	50	0	0	0	50	0	50
94	3	0	0	0	33	0	33	0	0	0	67	0	67	100	0	100
93	1	0	0	0	0	0	0	0	0	0	100	0	100	100	0	100
92	1	0	0	0	0	0	0	0	0	0	100	0	100	100	0	100
91	2	0	0	0	100	0	100	0	0	0	0	0	0	100	0	100
Year	N	Ocean Age 3														
		FW Age 0		FW Age 1		FW Age 2		FW X		All FW Ages						
		Imm	Mat	Imm	Mat	Imm	Mat	Imm	Mat	Imm	Mat	Imm	Mat			
02	1	0	0	0	50	0	50	0	0	0	0	0	0	50	0	50
01	0															
00	0															
99	0															
98	1	0	0	0	14	0	14	0	0	0	0	0	0	14	0	14
97	1	0	0	0	14	0	14	0	0	0	0	0	0	14	0	14
96	0															
95	1	0	0	0	0	0	0	0	0	0	50	0	50	50	0	50
94	0															
93	0															
92	0															
91	0															

Chinook salmon caught in the central North Pacific Ocean by the *Wakatake maru* in research gillnets, 1991-2002. Percent values indicate the percentage of fish in each age and maturity class, grouped by year. Imm=immature, Mat=Mature, Tot=Total.



Table 25. Number sampled, mean, and standard deviation of fork length (FL, mm), body weight (BW, g), and condition factor ( $10^6 \cdot BW/FL^3$ ) of steelhead trout caught by the *Wakatake maru* research gillnet, 1991-2002, grouped by ocean age and oceanographic domain.

Year	Ocean Age 1					Ocean Age 2					Ocean Age 3													
	% N	Age	FL (mm)	BW (g)	CF	% N	Age	FL (mm)	BW (g)	CF	% N	Age	FL (mm)	BW (g)	CF									
		mean	sd	mean	sd			mean	sd	mean	sd			mean	sd									
<b>Central North Pacific - Transition Domain (41°N-45°N, 180)</b>																								
2002	1	100	540	1620	10.3	0	0	698	44	3263	950	9.4	1.1	0	0									
2001	5	39	586	17	1928	101	9.6	0.8	2	40	694	117	3450	1909	9.7	0.8								
2000	2	40	557	1	1645	7	9.5	0.0	2	29	704	76	3275	1096	9.2	0.1								
1999	5	71	544	45	1492	375	9.2	0.8	2	29	708	76	3425	1167	9.5	0.2								
1998	5	71	539	52	1684	245	11.1	3.0	4	36	697	17	3323	349	9.8	0.6								
1997	7	64	549	63	1717	644	9.9	1.1	0	0	0	0	0	0	0	0								
1996	2	100	555	11	1770	212	10.4	0.6	0	0	0	0	0	0	0	0								
1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								
1994	9	100	564	16	1812	189	10.1	0.7	0	0	0	0	0	0	0	0								
1993	1	50	540	1520	9.7	1	50	656	2650	9.4	0	0	0	0	0	0								
1992	0	0	0	0	0	1	100	718	4000	10.8	0	0	0	0	0	0								
1991	8	73	542	49	1608	434	9.9	1.2	3	27	741	24	4533	797	11.1	1.4								
<b>Central North Pacific - Subarctic Current (44°N-47°N, 180)</b>																								
2002	3	37	554	23	1713	261	10.0	0.7	5	63	752	83	4530	1449	10.3	1.0								
2001	0	0	0	0	0	1	100	756	4250	9.8	0	0	0	0	0	0								
2000	0	0	0	0	0	7	78	670	18	3929	305	11.5	0.8	2	22	749	2	4425	672	10.5	1.5			
1999	3	25	615	108	2177	844	9.3	1.3	7	58	684	75	3124	992	9.5	0.6	2	17	747	57	4155	771	10.0	0.4
1998	10	50	556	52	1726	543	9.7	0.8	8	40	645	28	2488	330	9.3	1.0	2	10	692	28	3350	71	10.1	1.0
1997	1	16	536	1750	11.4	4	67	685	47	3005	308	9.4	1.1	1	17	800	4850	0	0	0	0	0		
1996	4	100	555	12	1608	116	9.4	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
1995	16	73	574	41	1791	317	9.4	0.6	5	23	672	51	3050	752	9.9	0.9	1	4	700	3000	8.7	0		
1994	21	84	551	44	1850	231	11.4	3.1	4	16	692	61	3538	1090	10.5	1.1	0	0	0	0	0	0		
1993	4	40	563	24	1695	93	9.6	1.2	6	60	688	70	2975	424	9.4	2.5	0	0	0	0	0	0		
1992	0	0	0	0	0	3	100	663	49	2867	569	9.8	0.5	0	0	0	0	0	0	0	0	0		
1991	2	75	522	60	1315	403	9.1	0.3	1	25	712	3800	10.5	0	0	0	0	0	0	0	0	0		
<b>Central North Pacific - Ridge Domain (47°N, 180)</b>																								
1992	1	50	548	1530	9.3	1	50	658	2350	8.2	0	0	0	0	0	0	0	0	0	0	0	0		
<b>Central North Pacific - All areas (41°N-47°N, 180)</b>																								
2002	4	44	551	20	1690	218	10.1	0.6	5	56	752	83	4530	1449	10.3	1.0	0	0	0	0	0	0		
2001	5	50	586	17	1928	101	9.6	0.8	5	50	709	46	3460	934	9.5	1.0	0	0	0	0	0	0		
2000	2	15	557	1	1645	7	9.5	0.0	9	64	698	44	3822	755	11.1	1.1	3	21	750	3	4300	522	10.2	1.2
1999	8	42	571	76	1749	640	9.2	0.9	9	47	689	71	3158	945	9.4	0.6	2	11	747	57	4155	771	10.0	0.4
1998	15	56	550	51	1712	455	10.2	1.8	10	37	657	44	2675	626	9.3	0.9	2	7	692	28	3350	71	10.1	1.0
1997	8	47	547	59	1721	597	10.1	1.1	8	47	691	33	3164	349	9.6	0.8	1	6	800	4850	9.5	0		
1996	6	100	555	11	1662	155	9.7	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
1995	16	70	574	41	1791	317	9.4	0.6	6	26	674	46	3042	673	9.8	0.9	1	4	700	3000	8.7	0		
1994	30	88	555	38	1839	216	11.0	2.7	4	12	692	61	3538	1090	10.5	1.1	0	0	0	0	0	0		
1993	5	42	558	23	1660	112	9.6	1.1	7	58	683	65	2929	406	9.4	2.3	0	0	0	0	0	0		
1992	1	17	548	1530	9.3	5	83	673	43	2990	728	9.7	1.0	0	0	0	0	0	0	0	0	0		
1991	10	71	538	49	1549	424	9.7	1.1	4	29	734	24	4350	747	10.9	1.1	0	0	0	0	0	0		



Table 27. Mean % composition of stomach contents of salmonids caught in the Subarctic Current along the 145° W transect line by the *Oshoro maru*, 1994-2002. PW=prey weight; % empty=percent of stomachs that did not contain stomach contents. Empty stomachs were not included in other table entries.  $SCI = PW * 100 / \text{body weight}$ . Prey composition is based on visual estimates.

Species	Year	% mean		mean SCI	Mean % composition by volume													
		N	empty		PW	EU	CO	AM	CR	SQ	PT	FI	PO	CH	GE	OTH	UNID	
Sockeye	2002	29	28	25	0.74	0	0	0	0	100	0	0	0	0	0	0	0	0
	2001	40	22	30	1.37	0	0	15	0	68	10	0	0	0	3	1	3	
	2000	57	23	11	0.50	3	4	38	0	50	2	3	0	0	0	0	0	
	1999	59	19	19	0.77	2	23	13	0	53	1	0	2	0	3	0	3	
	1998	127	13	37	1.45	1	0	0	0	92	5	0	0	0	0	1	0	
	1997	51	14	38	1.83	0	0	0	0	93	3	4	0	0	0	0	0	
	1996	39	18	30	1.20	0	0	0	0	100	0	0	0	0	0	0	0	
	1995	11	27	30	1.35	0	0	0	0	88	0	0	0	0	0	0	13	
	1994	12	25	20	1.19	0	0	0	0	100	0	0	0	0	0	0	0	
Chum	2002	24	17	4	0.41	0	0	3	0	0	0	9	0	0	0	0	88	
	2001	22	36	2	0.16	0	0	1	0	5	45	7	4	0	7	16	15	
	2000	42	12	7	0.79	2	9	38	0	6	0	31	0	0	10	0	4	
	1999	43	7	3	0.36	1	5	48	0	0	9	0	0	0	4	1	32	
	1998	105	31	4	0.30	2	1	11	0	1	27	1	4	0	6	0	47	
	1997	37	16	7	0.73	6	0	1	0	0	1	0	7	0	28	0	56	
	1996	25	44	6	0.43	2	0	2	0	7	2	0	0	0	37	1	49	
	1995	10	0	12	0.74	0	0	0	0	0	0	0	0	0	29	0	72	
	1994	16	50	2	0.17	0	0	0	0	0	13	0	1	0	1	0	84	
Pink	2002	4	0	25	1.34	0	0	0	0	75	0	25	0	0	0	0	0	
	2001	42	21	13	0.93	0	11	5	0	46	37	0	0	0	0	1	0	
	2000	43	14	13	1.03	1	12	54	0	8	3	22	0	0	0	0	0	
	1999	60	17	4	0.36	0	31	39	0	2	10	0	0	0	0	2	15	
	1998	116	16	23	1.52	0	0	1	0	80	16	2	0	0	0	0	0	
	1997	1	0	11	0.71	0	0	0	0	60	20	0	0	0	0	0	0	
	1996	51	6	18	1.09	0	0	0	0	71	23	6	0	0	0	0	0	
	1995	10	20	5	0.30	1	0	18	0	49	3	0	0	0	0	21	9	
	1994	14	21	8	0.45	0	0	0	0	66	25	0	0	0	0	0	9	
Coho	2002	0																
	2001	26	35	39	1.66	0	0	0	0	94	0	6	0	0	0	0	0	
	2000	14	57	30	0.91	17	15	18	0	50	0	0	0	0	0	0	0	
	1999	60	15	36	1.51	1	1	2	0	93	0	0	0	0	0	0	4	
	1998	57	12	41	1.28	0	0	0	0	93	2	3	0	0	0	2	0	
	1997	11	27	59	2.10	0	0	0	0	100	0	0	0	0	0	0	0	
	1996	22	45	36	1.18	0	0	0	0	100	0	0	0	0	0	0	0	
	1995	19	42	43	1.87	0	0	0	0	100	0	0	0	0	0	0	0	
	1994	1	100															
Chinook	2002	0																
	2001	8	0	72	1.86	0	0	0	0	100	0	0	0	0	0	0	0	
	2000	0																
	1999	0																
	1998	8	25	65	1.45	0	0	0	0	99	0	0	0	0	0	0	1	
	1997	0																
	1996	1	100															
	1995	2	100															
	1994	0																
Steelhead	2002	4	25	12	0.60	0	0	0	0	65	17	11	0	0	0	7	0	
	2001	32	28	23	1.09	0	0	0	0	78	9	13	0	0	0	0	0	
	2000	25	4	18	1.46	0	2	15	0	50	19	6	1	0	1	4	1	
	1999	21	24	7	0.31	0	0	13	0	24	0	32	6	0	0	25	0	
	1998	48	4	22	1.23	2	0	2	0	61	14	17	3	0	0	0	2	
	1997	8	25	24	0.92	0	0	0	0	83	0	0	17	0	0	0	0	
	1996	5	0	13	0.50	0	0	1	0	51	26	22	0	0	0	0	0	
	1995	19	11	15	1.02	0	0	18	0	61	0	9	9	0	0	3	0	
	1994	1	0	1	0.07	0	2	15	0	50	18	6	1	0	1	4	1	

Prey categories are: EU=euphausiids, AM=amphipods, CR=crab larvae, SQ=squids, PT=pteropods (shelled and naked), FI=fish, PO=polychaetes, CH=chaetognaths, GE=gelatinous zooplankton, including coelenterates, ctenophores, and salps. OTH=other groups, UNID=unidentified material.

Table 28. Mean % composition of stomach contents of salmonids caught in the Ridge/Dilute Domains along the 145° W transect line by the *Oshoro maru*, 1994-2002. PW=prey weight; % empty=percent of stomachs that did not contain stomach contents. Empty stomachs were not included in other table entries. SCI=PW\*100/body weight. Prey composition is based on visual estimates.

Species	Year	N	% empty	mean PW	mean SCI	Mean % composition by volume											GE	OTH	UNID
						EU	CO	AM	CR	SQ	PT	FI	PO	CH					
Sockeye	2002	61	21	11	0.43	36	4	15	2	24	12	2	1	0	0	1	3		
	2001	86	21	8	0.52	5	17	11	0	29	31	1	1	0	3	1	1		
	2000	86	14	13	0.91	15	7	33	0	34	6	5	0	0	0	0	0		
	1999	146	14	4	0.30	18	23	19	0	10	13	4	4	0	1	3	6		
	1998	64	25	20	0.74	7	6	11	0	32	27	3	2	0	2	5	5		
	1997	145	14	12	0.55	25	49	5	0	9	2	5	2	0	0	2	0		
	1996	96	25	26	0.96	6	14	9	0	62	2	5	0	0	0	0	2		
	1995	67	52	25	0.97	6	3	3	0	48	17	7	0	0	0	2	16		
	1994	90	18	21	0.97	9	5	21	0	49	6	4	2	0	0	0	5		
Chum	2002	68	31	3	0.26	19	1	23	0	0	35	0	0	0	0	0	22		
	2001	57	21	5	0.35	2	1	8	0	1	46	0	3	0	3	10	26		
	2000	66	2	5	0.35	8	7	38	1	2	0	8	3	0	9	1	23		
	1999	138	6	4	0.32	13	4	24	0	0	4	1	1	0	12	2	38		
	1998	60	38	6	0.36	4	4	18	1	0	33	0	0	0	10	0	29		
	1997	122	27	6	0.58	22	5	3	0	0	14	1	7	0	26	0	22		
	1996	105	42	5	0.30	25	3	9	0	1	4	2	2	0	27	0	27		
	1995	70	51	8	0.55	9	0	3	0	0	5	3	8	0	2	0	69		
	1994	97	19	4	0.35	3	0	32	0	1	21	0	1	0	3	0	39		
Pink	2002	40	15	10	0.59	26	6	29	8	23	2	5	0	0	1	0			
	2001	66	20	11	0.91	4	39	13	0	17	24	1	0	0	0	2	0		
	2000	73	15	6	0.52	2	7	57	1	25	3	5	0	0	0	0	0		
	1999	144	6	7	0.66	24	47	17	0	2	3	1	0	0	0	0	6		
	1998	61	13	10	0.71	1	15	17	0	22	38	2	0	0	0	0	3		
	1997	118	13	11	0.83	27	53	6	0	2	9	1	0	0	0	0	1		
	1996	76	29	14	1.04	7	13	13	2	45	5	4	0	0	0	11	1		
	1995	68	54	9	0.63	12	10	11	0	20	28	6	1	0	0	0	13		
	1994	94	27	11	0.69	1	10	18	2	36	20	3	0	0	0	0	10		
Coho	2002	12	58	18	0.71	38	0	0	0	62	0	0	0	0	0	0	0		
	2001	71	49	9	0.35	10	2	23	0	65	0	0	0	0	0	0	0		
	2000	65	31	76	2.50	14	0	6	0	79	1	0	0	0	0	0	0		
	1999	138	37	5	0.22	23	5	24	0	33	5	0	0	0	0	1	8		
	1998	70	37	37	1.16	8	0	7	0	77	8	0	0	0	0	0	0		
	1997	88	56	17	0.63	13	4	2	0	59	7	14	0	0	0	0	0		
	1996	92	27	43	1.50	0	0	0	0	99	0	1	0	0	0	0	0		
	1995	65	54	17	0.68	15	0	2	0	65	0	18	0	0	0	0	0		
	1994	89	34	41	1.47	3	0	7	0	73	9	7	0	0	0	0	1		
Chinook	2002	0																	
	2001	5	0	22	0.65	7	1	0	0	72	0	0	0	0	0	20	0		
	2000	3	67	2	0.06	0	0	0	0	100	0	0	0	0	0	0	0		
	1999	10	60	37	0.68	23	0	0	0	25	0	0	0	0	0	0	53		
	1998	17	47	15	0.47	0	0	6	0	94	0	0	0	0	0	0	0		
	1997	0																	
	1996	7	29	42	1.57	0	0	0	0	80	0	0	0	0	0	0	20		
	1995	5	40	32	0.76	0	0	0	0	100	0	0	0	0	0	0	0		
	1994	9	11	48	1.18	0	0	0	0	81	0	0	0	0	0	0	19		
Steelhead	2002	39	31	4	0.48	10	0	18	2	30	2	27	1	0	0	10	0		
	2001	36	39	8	0.51	0	5	15	0	7	7	40	6	0	0	19	1		
	2000	63	22	21	1.18	1	0	9	0	45	32	4	8	0	1	0	0		
	1999	57	14	8	0.73	3	2	2	0	31	3	34	6	0	1	11	6		
	1998	17	6	47	2.24	0	0	1	0	46	5	46	0	0	0	1	0		
	1997	26	8	29	1.60	0	0	3	0	10	8	58	0	0	0	21	0		
	1996	42	38	19	1.30	0	0	1	0	44	0	29	4	0	0	18	4		
	1995	40	35	13	0.68	0	0	0	0	47	8	32	12	0	0	0	0		
	1994	17	18	3	0.55	0	0	9	0	43	9	33	0	0	0	0	6		

Prey categories are: EU=euphausiids, AM=amphipods, CR=crab larvae, SQ=squids, PT=pteropods (shelled and naked), FI=fish, PO=polychaetes, CH=chaetognaths, GE=gelatinous zooplankton, including coelenterates, ctenophores, and salps. OTH=other groups, UNID=unidentified material.

Table 29. Mean percent composition of stomach contents of salmonids caught in the Transition Zone along the 180° longitude transect line by the *Wakatake maru*, 1991-2002. PW=prey weight, % empty=percent of stomachs that did not contain stomach contents. Empty stomachs were not included in other table entries. SCI=PW\*100/body weight. Prey composition is based on visual estimates.

Transition Zone					Mean % composition by volume													
Species	Year	N	% empty	Mean PW	Mean SCI	EU	CO	AM	CR	SQ	PT	FI	PO	CH	GE	OTH	UNID	
Sockeye	2002	0																
	2001	0																
	2000	0																
	1999	0																
	1998	0																
	1997	0																
	1996	0																
	1995	0																
	1994	0																
	1993	0																
1992	0																	
1991	0																	
Chum	2002	0																
	2001	0																
	2000	0																
	1999	0																
	1998	0																
	1997	3	0	4.3	0.37	0	0	0	0	0	0	20	0	0	2	78	0	
	1996	0																
	1995	1	0	8	0.45	0	5	0	0	0	0	0	0	0	95	0	0	
	1994	0																
	1993	14	14	5	0.62	0	4	0	0	1	0	11	0	2	65	0	17	
1992	0																	
1991	0																	
Pink	2002	0																
	2001	0																
	2000	0																
	1999	0																
	1998	0																
	1997	1	0	1	0.12	0	0	0	0	30	40	0	0	0	0	30	0	
	1996	0																
	1995	0																
	1994	0																
	1993	0																
1992	0																	
1991	0																	
Coho	2002	0																
	2001	0																
	2000	0																
	1999	0																
	1998	0																
	1997	4	25	71	2.03	0	0	0	0	0	0	100	0	0	0	0	0	
	1996	0																
	1995	0																
	1994	0																
	1993	1	100															
1992	0																	
1991	1	100																
Chinook	2002	0																
	2001	0																
	2000	0																
	1999	0																
	1998	0																
	1997	0																
	1996	0																
	1995	0																
	1994	0																
	1993	0																
1992	0																	
1991	0																	
Steelhead	2002	0																
	2001	0																
	2000	0																
	1999	0																
	1998	0																
	1997	0																
	1996	0																
	1995	0																
	1994	0																
	1993	0																
1992	0																	
1991	0																	

Prey categories are EU=euphausiids, CO=copepods, AM=amphipods, CR=crab larvae, SQ=squids, PT=pteropods, FI=fish, PO=polychaetes, CH=chaetognaths, GE=gelatinous zooplankton (coelenterates, ctenophores, and salps), OTH=other groups, and UNID=unidentified material.

Table 30. Mean percent composition of stomach contents of salmonids caught in the Transition Domain along the 180° longitude transect line by the *Wakatake maru*, 1991-2002. PW=prey weight, % empty=percent of stomachs that did not contain stomach contents. Empty stomachs were not included in other table entries. SCI= $PW \times 100/\text{body weight}$ . Prey composition is based on visual estimates.

Transition Domain				Mean % composition by volume															
Species	Year	N	% empty	Mean PW	Mean SCI	EU	CO	AM	CR	SQ	PT	FI	PO	CH	GE	OTH	UNID		
Sockeye	2002	0																	
	2001	0																	
	2000	5	40	33	1.73	0	0	0	0	100	0	0	0	0	0	0	0	0	
	1999	0																	
	1998	0																	
	1997	0																	
	1996	0																	
	1995	0																	
	1994	0																	
	1993	0																	
	1992	0																	
1991	0																		
Chum	2002	32	0	12	1.34	0	2	44	0	0	0	0	0	12	40	1	0	0	
	2001	30	3	8	0.71	3	1	6	0	1	9	0	12	0	62	6	0	0	
	2000	25	8	8	0.75	0	1	1	0	2	8	0	13	0	53	19	3	0	
	1999	7	14	3	0.47	0	7	26	0	0	8	2	0	29	22	0	6	0	
	1998	24	8	3	0.56	1	5	2	0	0	9	5	1	13	44	13	7	0	
	1997	32	6	5	0.56	10	8	5	0	1	1	5	2	35	25	7	1	0	
	1996	10	0	14	1.22	4	4	2	0	0	0	4	4	21	17	34	10	0	
	1995	7	0	9	0.85	0	3	1	0	0	0	32	0	9	51	4	0	0	
	1994	18	0	9	1.05	1	1	2	0	1	2	1	0	38	39	11	4	0	
	1993	23	4	10	1.13	0	5	6	0	0	8	7	1	30	25	11	7	0	
	1992	10	0	9	1.04	39	5	10	0	0	0	3	2	0	3	0	38	0	0
1991	14	0	16	1.92	5	0	18	0	0	0	0	0	0	2	0	75	0	0	
Pink	2002	3	0	4	0.49	0	0	70	0	0	0	0	0	0	13	17	0	0	
	2001	0																	
	2000	10	10	22	1.76	11	0	2	0	69	0	3	0	1	0	14	0	0	
	1999	0																	
	1998	4	0	8	0.87	0	1	25	0	14	2	11	0	0	0	47	0	0	
	1997	6	17	11	1.19	6	9	3	0	4	10	7	0	57	0	4	0	0	
	1996	0																	
	1995	3	0	17	1.83	0	3	6	0	2	0	17	0	43	0	29	0	0	
	1994	23	4	6	0.63	1	50	11	0	4	15	2	0	10	0	6	1	0	
	1993	0																	
	1992	0																	
1991	1	0	7	0.96	10	0	90	0	0	0	0	0	0	0	0	0	0	0	
Coho	2002	31	45	21	0.90	0	0	32	0	51	0	6	0	0	11	0	0	0	
	2001	38	16	45	1.91	0	0	5	0	90	0	5	0	0	0	0	0	0	
	2000	35	23	36	2.00	0	0	1	0	80	1	19	0	0	0	0	0	0	
	1999	14	86	<1	0.02	0	0	5	0	45	0	0	0	0	0	45	0	0	
	1998	39	41	21	1.17	0	0	3	0	91	5	1	0	0	0	0	0	0	
	1997	78	35	20	1.08	6	2	7	0	48	9	28	0	0	0	0	0	0	
	1996	13	15	41	2.04	18	0	1	0	74	3	4	0	0	0	0	0	0	
	1995	15	7	25	1.38	0	0	11	0	54	9	26	0	0	0	0	0	0	
	1994	16	19	13	0.84	0	0	17	0	34	27	22	0	0	0	0	0	0	
	1993	13	15	7	0.44	1	0	3	0	15	79	0	0	0	2	0	0	0	
	1992	8	0	25	1.44	12	1	4	0	76	1	1	0	0	5	0	0	0	
1991	57	9	26	1.37	4	0	23	0	59	11	2	0	0	1	0	0	0		
Chinook	2002	0																	
	2001	4	0	42	1.07	0	0	0	0	100	0	0	0	0	0	0	0	0	
	2000	2	0	76	2.07	0	0	0	0	100	0	0	0	0	0	0	0	0	
	1999	0																	
	1998	0																	
	1997	0																	
	1996	0																	
	1995	0																	
	1994	0																	
	1993	0																	
	1992	0																	
1991	0																		
Steelhead	2002	6	0	34	1.86	0	0	0	0	67	0	24	4	0	0	5	0	0	
	2001	23	17	18	0.81	0	0	2	0	26	0	51	17	0	0	1	3	0	
	2000	14	7	31	1.03	0	0	0	0	39	0	30	28	0	0	2	0	0	
	1999	1	0	5	0.26	0	0	0	0	0	0	95	0	0	0	5	0	0	
	1998	6	50	5	0.30	0	0	3	0	16	5	46	0	0	0	30	0	0	
	1997	26	27	7	0.35	3	1	16	0	9	3	9	31	0	0	28	0	0	
	1996	2	0	64	3.49	0	0	0	0	70	0	30	0	0	0	0	0	0	
	1995	1	0	5	0.27	0	0	0	0	0	5	95	0	0	0	0	0	0	
	1994	4	0	3	0.16	0	0	20	0	25	20	35	0	0	0	0	0	0	
	1993	1	0	16	0.88	5	0	5	0	85	5	0	0	0	0	0	0	0	
	1992	1	0	20	0.91	5	0	0	0	90	5	0	0	0	0	0	0	0	
1991	11	0	22	1.38	1	0	18	1	68	2	10	0	0	0	0	0	0		

Prey categories are EU=euphausiids, CO=copepods, AM=amphipods, CR=crab larvae, SQ=squids, PT=pteropods, FI=fish, PO=polychaetes, CH=chaetognaths, GE=gelatinous zooplankton (coelenterates, ctenophores, and salps), OTH=other groups, and UNID=unidentified material.

Table 31. Mean percent composition of stomach contents of salmonids caught in the Subarctic Current along the 180° longitude transect line by the *Wakatake maru*, 1991-2002. PW=prey weight, % empty=percent of stomachs that did not contain stomach contents. Empty stomachs were not included in other table entries. SCI=PW\*100/body weight. Prey composition is based on visual estimates.

Species	Year	N	% empty	Mean PW	Mean SCI	Mean % composition by volume											
						EU	CO	AM	CR	SQ	PT	FI	PO	CH	GE	OTHUNID	
Sockeye	2002	17	18	11	0.73	5	0	33	0	39	11	0	7	1	0	4	0
	2001	24	17	7	0.62	4	9	50	0	10	19	0	0	2	0	4	2
	2000	11	55	2	0.27	0	3	6	0	32	39	20	0	0	0	0	0
	1999	31	39	1	0.23	9	16	33	0	10	6	0	12	9	0	0	5
	1998	10	50	9	0.96	0	6	0	0	94	0	0	0	0	0	0	0
	1997	17	0	17	0.94	11	24	9	0	38	0	0	5	10	0	3	0
	1996	1	100														
	1995	0															
	1994	0															
	1993	0															
	1992	1	0	2	0.15	0	0	50	0	0	50	0	0	0	0	0	0
1991	0																
Chum	2002	42	5	12	1.33	0	2	5	0	2	32	0	0	16	33	10	0
	2001	43	7	14	0.89	3	1	1	0	3	27	0	0	0	65	0	0
	2000	19	0	8	0.85	0	3	2	0	12	9	0	5	0	66	0	3
	1999	35	17	4	0.46	5	5	11	0	0	17	0	0	13	29	0	20
	1998	44	27	4	0.60	0	4	4	0	1	25	1	2	6	11	1	45
	1997	32	3	8	0.75	6	5	10	0	0	2	1	3	45	24	0	4
	1996	67	0	8	0.72	1	1	5	0	6	8	1	5	10	43	8	12
	1995	41	0	8	0.70	28	3	5	0	3	6	0	1	1	50	0	3
	1994	27	1	11	1.16	0	0	0	0	0	3	0	0	17	32	0	48
	1993	39	0	12	1.61	0	3	5	0	1	17	0	7	4	2	45	16
	1992	18	11	5	0.62	6	1	26	0	8	9	0	2	12	11	0	25
1991	34	9	13	1.32	0	0	4	0	2	0	0	0	0	2	0	92	
Pink	2002	8	0	40	3.17	0	0	5	0	82	11	0	0	0	0	2	0
	2001	30	3	17	1.61	15	28	18	0	23	12	0	0	4	0	0	0
	2000	3	0	57	3.90	0	0	0	0	86	0	7	0	0	0	7	0
	1999	31	16	6	0.71	0	61	9	0	7	8	1	0	13	0	1	0
	1998	2	0	32	2.52	0	1	4	0	70	0	0	0	0	0	25	0
	1997	38	3	11	1.07	5	78	8	0	1	2	0	0	6	0	0	0
	1996	7	14	6	0.36	0	10	28	0	21	19	1	0	0	8	11	2
	1995	5	40	5	0.50	0	21	12	0	30	1	33	0	3	0	0	0
	1994	18	0	16	1.41	0	11	15	0	26	17	4	0	15	0	2	10
	1993	1	0	1	0.09	0	0	30	0	0	70	0	0	0	0	0	0
	1992	0															
1991	13	0	10	1.29	7	4	24	0	10	49	0	0	0	0	0	6	
Coho	2002	17	12	87	3.68	0	0	0	0	99	0	0	0	0	1	0	0
	2001	7	0	98	4.55	0	0	0	0	100	0	0	0	0	0	0	0
	2000	8	0	68	3.15	0	0	0	0	100	0	0	0	0	0	0	0
	1999	4	0	54	2.68	0	0	0	0	100	0	0	0	0	0	0	0
	1998	47	0	57	2.61	0	0	0	0	95	0	5	0	0	0	0	0
	1997	47	15	33	2.33	1	1	4	0	86	0	8	0	0	0	0	0
	1996	69	26	20	1.12	0	0	14	0	75	6	0	0	0	4	1	0
	1995	41	2	51	3.00	0	0	0	0	99	0	1	0	0	0	0	0
	1994	25	8	53	2.87	0	0	4	0	95	0	1	0	0	0	0	0
	1993	21	0	32	1.74	0	0	5	0	90	0	5	0	0	0	0	0
	1992	11	0	7	0.50	0	1	74	0	17	2	4	0	1	1	0	0
1991	25	0	53	2.69	0	0	0	0	100	0	0	0	0	0	0	0	
Chinook	2002	3	33	39	1.42	0	0	0	0	100	0	0	0	0	0	0	0
	2001	5	60	23	0.49	0	0	0	0	100	0	0	0	0	0	0	0
	2000	2	50	1	0.05	0	0	0	0	100	0	0	0	0	0	0	0
	1999	3	33	24	0.83	0	0	0	0	50	0	50	0	0	0	0	0
	1998	5	0	41	1.54	0	0	0	0	100	0	0	0	0	0	0	0
	1997	24	29	28	1.12	12	0	0	0	83	0	5	0	0	0	0	0
	1996	2	0	19	0.26	0	0	0	0	100	0	0	0	0	0	0	0
	1995	1	100														
	1994	3	0	13	0.28	0	0	0	0	100	0	0	0	0	0	0	0
	1993	3	33	74	1.94	0	0	0	0	100	0	0	0	0	0	0	0
	1992	0															
1991	2	0	23	0.49	0	0	2	0	63	0	0	0	0	0	0	35	
Steelhead	2002	17	6	103	2.88	0	0	0	0	92	0	8	0	0	0	0	0
	2001	2	0	5	0.11	0	0	10	0	40	0	50	0	0	0	0	0
	2000	14	0	68	1.70	0	0	0	0	69	0	31	0	0	0	0	0
	1999	8	13	16	0.45	0	1	4	0	14	1	79	0	0	0	0	0
	1998	15	0	37	1.72	0	0	0	0	79	0	15	0	0	0	6	0
	1997	26	12	13	0.67	1	1	3	0	22	0	41	9	0	0	23	0
	1996	13	15	5	0.34	0	0	8	0	36	0	39	1	0	0	16	0
	1995	8	38	10	0.49	0	0	11	10	28	0	51	0	0	0	0	0
	1994	9	0	33	1.39	0	0	0	0	74	0	26	0	0	0	0	0
	1993	1	0	2	0.06	0	0	100	0	0	0	0	0	0	0	0	0
	1992	4	0	7	0.37	26	0	26	0	23	0	25	0	0	0	0	0
1991	3	0	70	2.22	0	0	3	7	77	0	13	0	0	0	0	0	

Prey categories are EU=euphausiids, CO=copepods, AM=amphipods, CR=crab larvae, SQ=squids, PT=pteropods, FI=fish, PO=polychaetes, CH=chaetognaths, GE=gelatinous zooplankton (coelenterates, ctenophores, and salps), OTH=other groups, and UNID=unidentified material.

Table 32. Mean percent composition of stomach contents of salmonids caught in the Ridge Domain along the 180° longitude transect line by the *Wakatake maru*, 1991-2002. PW=prey weight, % empty=percent of stomachs that did not contain stomach contents. Empty stomachs were not included in other table entries. SCI=PW\*100/body weight. Prey composition is based on visual estimates.

Ridge Domain					Mean % composition by volume													
Species	Year	N	% empty	Mean PW	Mean SCI	EU	CO	AM	CR	SQ	PT	FI	PO	CH	GE	OTH	UNID	
Sockeye	2002	3	0	15	1.16	0	19	50	0	30	1	0	0	0	0	0	0	
	2001	24	17	7	0.62	4	9	50	0	10	19	0	0	2	0	4	2	
	2000	0																
	1999	1	0	5	0.16	5	5	5	0	0	85	0	0	0	0	0	0	
	1998	7	14	5	0.25	0	15	25	0	45	0	0	3	0	0	12	0	
	1997	10	0	20	1.04	47	29	10	0	10	3	0	0	1	0	0	0	
	1996	9	0	20	0.82	30	7	24	0	21	9	6	0	1	0	2	0	
	1995	8	0	25	1.09	0	22	20	0	51	2	1	0	4	0	0	0	
	1994	6	17	11	0.43	0	37	6	0	40	17	0	0	0	0	0	0	
	1993	0																
	1992	0																
	1991	4	25	17	0.96	27	18	7	0	0	8	0	0	3	0	0	37	
Chum	2002	14	0	33	1.73	2	2	4	0	2	72	1	0	1	16	0	0	
	2001	43	7	14	0.89	3	1	1	0	3	27	0	0	0	65	0	0	
	2000	4	0	14	1.17	1	3	2	0	0	18	1	1	0	72	0	2	
	1999	1	0	8	0.84	0	5	0	0	5	0	0	0	0	90	0	0	
	1998	13	15	2	0.42	1	3	35	0	1	21	0	0	26	8	2	3	
	1997	30	3	11	1.16	36	1	5	0	1	22	1	10	17	7	0	0	
	1996	27	15	13	1.01	15	7	23	0	4	41	0	0	5	5	0	0	
	1995	29	0	11	0.95	48	3	11	0	5	2	1	0	11	16	0	3	
	1994	41	0	7	0.78	7	2	4	0	2	20	1	0	3	28	0	33	
	1993	38	3	11	1.19	2	0	2	0	3	28	0	1	2	0	61	1	
	1992	9	11	5	0.66	0	4	47	0	0	5	0	5	0	23	0	21	
	1991	39	3	8	1.33	9	8	3	0	1	5	0	0	9	1	0	64	
Pink	2002	1	0	50	2.38	0	69	0	0	3	8	20	0	0	0	0	0	
	2001	30	3	17	1.61	15	28	18	0	23	12	0	0	4	0	0	0	
	2000	0																
	1999	4	0	13	1.46	5	61	1	0	1	4	20	0	3	0	5	0	
	1998	6	0	20	1.71	10	43	23	0	19	1	2	0	0	0	2	0	
	1997	16	0	27	2.68	37	34	5	0	6	10	8	0	0	0	0	0	
	1996	1	0	13	1.21	20	35	35	0	5	5	0	0	0	0	0	0	
	1995	22	5	17	1.71	1	32	19	0	27	8	8	0	5	0	0	0	
	1994	15	0	35	2.72	20	10	5	0	52	12	0	0	0	0	1	0	
	1993	3	0	17	1.92	22	2	13	0	21	40	0	0	0	0	2	0	
	1992	2	0	4	0.39	3	5	67	0	0	0	25	0	0	0	0	0	
	1991	40	0	17	2.19	43	30	2	0	8	14	1	0	2	0	0	0	
Coho	2002	0																
	2001	7	0	98	4.55	0	0	0	0	100	0	0	0	0	0	0	0	
	2000	0																
	1999	0																
	1998	2	100															
	1997	5	0	36	2.48	47	0	1	0	49	0	1	0	0	0	2	0	
	1996	0																
	1995	4	0	68	3.71	0	0	1	0	98	0	1	0	0	0	0	0	
	1994	4	0	97	3.75	25	0	0	0	75	0	0	0	0	0	0	0	
	1993	1	0	29	1.47	0	0	0	0	95	5	0	0	0	0	0	0	
	1992	1	0	83	4.15	0	0	0	0	100	0	0	0	0	0	0	0	
	1991	0																
Chinook	2002	0																
	2001	5	60	23	0.49	0	0	0	0	100	0	0	0	0	0	0	0	
	2000	0																
	1999	0																
	1998	3	67	29	0.85	0	0	0	0	100	0	0	0	0	0	0	0	
	1997	2	50	1	0.02	100	0	0	0	0	0	0	0	0	0	0	0	
	1996	0																
	1995	2	0	39	1.21	0	0	0	0	100	0	0	0	0	0	0	0	
	1994	0																
	1993	0																
	1992	0																
	1991	0																
Steelhead	2002	0																
	2001	2	0	5	0.11	0	0	10	0	40	0	50	0	0	0	0	0	
	2000	0																
	1999	0																
	1998	0																
	1997	3	0	7	0.24	12	0	0	0	12	0	55	0	0	0	21	0	
	1996	6	0	30	0.75	0	0	3	0	38	0	59	0	0	0	0	0	
	1995	1	0	194	3.88	0	0	0	0	90	0	10	0	0	0	0	0	
	1994	3	0	76	1.47	0	0	0	0	83	0	17	0	0	0	0	0	
	1993	1	0	41	1.78	0	0	0	0	95	5	0	0	0	0	0	0	
	1992	2	0	99	2.79	0	0	0	0	80	0	20	0	0	0	0	0	
	1991	0																

Prey categories are EU=euphausiids, CO=copepods, AM=amphipods, CR=crab larvae, SQ=squids, PT=pteropods, FI=fish, PO=polychaetes, CH=chaetognaths, GE=gelatinous zooplankton (coelenterates, ctenophores, and salps), OTH=other groups, and UNID=unidentified material.

Table 33. Mean percent composition of stomach contents of salmonids caught in the Alaska Stream along the 180° longitude transect line by the *Wakatake maru*, 1991-2002. PW=prey weight, % empty=percent of stomachs that did not contain stomach contents. Empty stomachs were not included in other table entries. SCI= $PW \times 100 / \text{body weight}$ . Prey composition is based on visual estimates.

Alaska Stream					Mean % composition by volume														
Species	Year	N	% empty	Mean PW	Mean SCI	EU	CO	AM	CR	SQ	PT	FI	PO	CH	GE	OTH	UNID		
Sockeye	2002	3	0	15	1.16	0	19	50	0	30	1	0	0	0	0	0	0	0	
	2001	8	0	25	0.93	1	0	33	0	19	14	11	0	0	0	0	22	0	
	2000	0																	
	1999	2	50	<1	<0.005	25	0	25	0	25	25	0	0	0	0	0	0	0	
	1998	1	0	64	3.05	0	0	2	0	0	1	95	2	0	0	0	0	0	
	1997	3	0	8	0.50	26	0	2	0	0	4	3	20	0	15	30	0	0	
	1996	4	25	14	0.56	12	0	35	0	40	12	1	0	0	0	0	0	0	
	1995	21	0	25	0.99	26	6	14	1	8	21	4	4	2	13	1	0	0	
	1994	27	4	25	1.01	14	2	26	0	45	7	1	0	0	1	4	0	0	
	1993	2	0	11	0.39	0	0	65	0	0	0	0	35	0	0	0	0	0	
	1992	2	0	13	0.90	10	0	25	0	65	0	0	0	0	0	0	0	0	
	1991	18	33	5	0.34	17	2	28	0	6	42	0	0	0	0	0	1	4	
Chum	2002	14	0	33	1.73	2	2	4	0	2	72	1	0	1	16	0	0		
	2001	11	0	29	1.60	0	0	3	0	1	15	9	0	0	72	0	0		
	2000	3	0	4	0.39	0	2	9	0	1	6	0	0	8	74	0	0		
	1999	4	0	32	0.99	0	0	2	0	1	6	0	0	0	91	0	0		
	1998	16	0	24	1.24	0	1	6	0	1	21	1	41	0	20	0	9		
	1997	2	0	16	2.29	0	0	1	0	0	3	0	0	48	0	48	0		
	1996	10	20	19	0.56	9	0	25	0	8	4	16	1	1	23	13	0		
	1995	28	4	12	0.91	34	0	1	0	10	19	0	10	1	25	0	0		
	1994	40	5	10	1.02	19	3	15	0	14	30	5	0	0	10	3	1		
	1993	6	17	14	1.22	0	0	4	6	0	1	2	82	1	4	0	0		
	1992	5	0	5	0.47	0	4	32	0	0	6	0	0	15	29	0	14		
	1991	47	4	10	1.27	2	1	5	0	2	17	3	0	1	0	0	69	0	
Pink	2002	1	0	50	2.38	0	69	0	0	3	8	20	0	0	0	0	0		
	2001	2	0	6	0.52	0	2	2	0	38	8	50	0	0	0	0	0		
	2000	0																	
	1999	5	0	17	1.54	33	0	1	0	45	20	0	0	0	0	1	0		
	1998	0																	
	1997	10	0	4	0.44	5	0	10	1	5	2	7	0	0	4	66	0		
	1996	0																	
	1995	14	0	17	1.44	27	1	14	1	10	20	24	3	0	0	0	0		
	1994	8	0	25	2.15	17	25	11	0	24	7	6	0	0	0	10	0		
	1993	2	0	10	0.95	0	3	15	0	0	15	60	2	0	5	0	0		
	1992	0																	
	1991	47	9	10	1.07	13	2	18	0	8	51	6	0	0	0	2	0	0	
Coho	2002	0																	
	2001	0																	
	2000	0																	
	1999	0																	
	1998	0																	
	1997	1	0	68	3.80	0	0	0	0	0	0	100	0	0	0	0	0	0	
	1996	0																	
	1995	1	0	47	2.47	85	0	0	0	10	0	5	0	0	0	0	0	0	
	1994	0																	
	1993	0																	
	1992	0																	
	1991	1	0	7	0.28	20	0	0	0	40	0	40	0	0	0	0	0	0	0
Chinook	2002	0																	
	2001	0																	
	2000	0																	
	1999	0																	
	1998	1	0	115	1.60	0	0	0	0	100	0	0	0	0	0	0	0	0	
	1997	0																	
	1996	0																	
	1995	1	0	43	0.95	0	0	0	0	100	0	0	0	0	0	0	0	0	
	1994	0																	
	1993	0																	
	1992	0																	
	1991	0																	
Steelhead	2002	0																	
	2001	0																	
	2000	0																	
	1999	0																	
	1998	0																	
	1997	0																	
	1996	0																	
	1995	0																	
	1994	2	0	28	0.72	0	0	0	0	50	0	50	0	0	0	0	0	0	
	1993	1	100																
	1992	1	0	40	0.85	0	0	0	0	60	0	40	0	0	0	0	0	0	0
	1991	0																	

Prey categories are EU=euphausiids, CO=copepods, AM=amphipods, CR=crab larvae, SQ=squids, PT=pteropods, FI=fish, PO=polychaetes, CH=chaetognaths, GE=gelatinous zooplankton (coelenterates, ctenophores, and salps), OTH=other groups, and UNID=unidentified material.

Table 34. Mean percent composition of stomach contents of salmonids caught in the central Bering Sea by the *Wakatake maru*, 1991-2002. PW=prey weight, % empty=percent of stomachs that did not contain stomach contents. Empty stomachs were not included in other table entries. SCI= $PW \times 100 / \text{body weight}$ . Prey composition is based on visual estimates.

Bering Sea						Mean % composition by volume												
Species	Year	N	% empty	Mean PW	Mean SCI	EU	CO	AM	CR	SQ	PT	FI	PO	CH	GE	OTH	UNID	
Sockeye	2002	141	12	11	0.86	18	9	35	0	19	4	14	0	0	1	0	0	
	2001	195	17	8	0.66	26	14	13	0	10	17	16	0	3	1	0	0	
	2000	133	8	15	0.78	12	11	28	1	17	4	25	0	1	0	1	0	
	1999	120	15	6	0.54	11	8	29	1	28	9	10	1	0	2	1	0	
	1998	113	19	12	1.21	28	18	18	2	14	8	10	0	0	1	1	0	
	1997	114	11	7	0.51	9	21	25	9	10	11	11	0	0	0	4	0	
	1996	134	16	12	0.70	24	13	16	1	15	11	19	0	0	1	0	0	
	1995	144	1	10	0.67	9	6	36	5	22	12	9	0	0	1	0	0	
	1994	115	10	11	0.90	15	20	30	0	22	5	7	0	0	0	1	0	
	1993	79	15	9	0.65	3	10	19	1	31	3	28	0	0	0	2	3	
	1992	36	14	13	0.68	11	30	22	0	18	0	14	0	2	3	0	0	
	1991	69	14	9	0.55	13	5	7	0	32	13	14	0	0	5	3	8	
Chum	2002	249	4	16	1.02	30	4	14	0	7	20	6	0	1	13	4	1	
	2001	199	3	35	1.51	18	1	1	0	2	46	2	0	0	29	1	0	
	2000	184	4	18	1.05	28	4	8	0	3	9	8	0	0	40	0	0	
	1999	228	4	14	0.68	11	2	2	0	3	20	3	1	0	54	1	3	
	1998	316	5	13	1.02	19	9	14	1	4	19	7	10	0	11	1	5	
	1997	174	3	14	1.05	20	2	6	1	5	28	5	5	2	8	16	2	
	1996	238	6	15	1.00	39	3	9	0	2	20	10	0	0	13	4	0	
	1995	216	2	14	1.01	23	1	12	1	7	9	22	0	0	23	0	2	
	1994	279	1	11	0.99	13	6	13	0	5	7	2	0	3	39	1	11	
	1993	291	4	16	1.42	6	2	4	0	10	5	14	1	0	27	29	2	
	1992	235	1	19	1.33	26	17	13	0	13	0	5	0	1	6	0	19	
	1991	311	1	23	1.53	8	2	4	0	3	4	1	0	0	11	22	45	
Pink	2002	40	10	14	1.23	34	8	10	0	10	2	36	0	0	0	0	0	
	2001	189	3	19	1.45	31	7	3	0	20	11	27	0	0	0	1	0	
	2000	5	0	24	2.22	0	0	0	0	19	0	81	0	0	0	0	0	
	1999	280	22	9	0.80	13	19	7	1	17	10	30	1	1	0	1	0	
	1998	31	13	12	1.46	12	16	11	4	15	6	36	0	0	0	0	0	
	1997	181	16	10	0.88	9	14	16	6	15	10	27	0	0	0	3	0	
	1996	52	8	19	1.43	21	5	5	3	14	2	50	0	0	0	0	0	
	1995	186	0	15	1.19	9	8	14	5	26	12	26	0	0	0	0	0	
	1994	28	0	17	1.37	23	12	8	4	28	2	23	0	0	0	0	0	
	1993	159	3	16	1.36	2	6	10	0	28	2	50	0	0	0	2	0	
	1992	14	0	27	1.95	14	12	6	0	40	0	21	0	0	0	4	3	
	1991	312	7	17	1.42	14	7	11	0	33	6	21	0	0	1	0	7	
Coho	2002	4	0	29	0.97	49	2	0	0	25	0	24	0	0	0	0	0	
	2001	1	100															
	2000	0																
	1999	0																
	1998	1	100															
	1997	8	50	16	0.94	15	0	0	0	36	0	49	0	0	0	0	0	
	1996	2	0	76	2.07	0	0	0	0	0	0	100	0	0	0	0	0	
	1995	0																
	1994	0																
	1993	0																
	1992	2	0	9	0.63	87	0	5	0	5	0	3	0	0	0	0	0	
	1991	2	0	11	0.30	50	0	0	0	50	0	0	0	0	0	0	0	
Chinook	2002	89	29	23	0.77	34	1	0	0	44	0	21	0	0	0	0	0	
	2001	40	35	4	0.50	6	0	0	0	34	2	58	0	0	0	0	0	
	2000	60	27	26	0.81	29	1	0	0	36	0	34	0	0	0	0	0	
	1999	22	32	3	0.26	9	0	6	0	36	4	45	0	0	0	0	0	
	1998	96	34	15	0.82	12	3	2	0	66	0	16	0	0	0	0	1	
	1997	54	35	13	0.54	29	0	0	0	52	0	19	0	0	0	0	0	
	1996	72	19	25	1.03	18	0	2	0	47	1	32	0	0	0	0	0	
	1995	44	16	10	0.63	16	0	0	0	52	0	29	0	0	0	0	3	
	1994	26	31	12	0.54	20	0	10	0	58	1	8	0	0	3	0	0	
	1993	12	17	12	0.54	27	0	0	0	39	0	34	0	0	0	0	0	
	1992	37	19	18	0.78	43	4	0	0	44	0	9	0	0	0	0	0	
	1991	30	17	19	0.86	33	1	0	0	43	0	23	0	0	0	0	0	
Steelhead	2002	0																
	2001	0																
	2000	0																
	1999	0																
	1998	0																
	1997	0																
	1996	0																
	1995	0																
	1994	0																

Prey categories are EU=euphausiids, CO=copepods, AM=amphipods, CR=crab larvae, SQ=squids, PT=pteropods, FI=fish, PO=polychaetes, CH=chaetognaths, GE=gelatinous zooplankton (coelenterates, ctenophores, and salps), OTH=other groups, and UNID=unidentified material.