# Age Composition of Chinook Salmon in the Commercial Gillnet, and Test *Fisheries of the Lower Fraser, 1958-1988*

S.J. Westrheim

Fisheries and Oceans Canada
Science Branch, Pacific Region
Pacific Biological Station
Nanaimo, British Columbia
V9R 5K6

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# AGE COMPOSITION OF CHINOOK SALMON IN THE COMMERCIAL GILLNET, AND TEST FISHERIES OF THE LOWER FRASER, 1958-88

by

S. J. Westrheim

Fisheries and Oceans Canada

Science Branch, Pacific Region

Pacific Biological Station

Nanaimo, British Columbia

V9R 5K6

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# ABSTRACT

Westrheim, S.J. 1998. Age composition of chinook salmon in the commercial gillnet, and test, fisheries of the lower Fraser River, 1958-88. Can. Manuscr. Rep. Fish. Aquat. Sci. 2435: 95 p.

With rare exceptions, past reports dealing with age composition of chinook salmon (Oncorhynchus tshawytscha), landed in British Columbia, consist of annual summaries, regardless of gear or location. These are of limited analytical value, particularly for gillnet-caught fish in river fisheries. For the Fraser River, an important source of chinook salmon in British Columbia, a search was undertaken for more detailed data. Weekly and/or monthly records (published and archival) were found of samples from the commercial and test fisheries in the lower Fraser River, during 1958-66, 1969, and 1981-88. All detailed records known to exist were not found. Since 1980, no directed commercial fishery has been permitted for chinook in the Fraser River, due to declining abundance.

During 1952-94, mean annual landing of gillnet-caught chinook in the lower Fraser River declined from 174,500 fish during 1952-54 to 13,100 fish during 1990-94. Principal time period was June-September (77-88%) through 1979, but July-September (85-89%) thereafter.

Age was determined from scales. Stream-type scales (one or more freshwater annuli) were more difficult to read than ocean-type scales (no freshwater annuli). Scale-type identification was complicated by inconsistent formation of freshwater annuli on scales of fish reared in the upper Fraser River.

Sampling the landings was complicated by an industry-imposed, variable, grading system (based on weight and/or length, and flesh color). Incidence of flesh color (red/white) and scale type (stream/ocean) exhibited seasonal trends. Incidence of red flesh, and stream-type scales, declined from spring to autumn, while incidence of white flesh and ocean-type scales increased during the same period. Flesh color and scale type appear to be genetically determined.

In the commercial catch, ocean-age-groups (OAGs) 2 ($3_1 + 4_2$) and 3 ($4_1 + 5_2$) generally predominated during May-September 1958-66 and 1969. OAG 1 was virtually absent in May and June, perhaps due to mesh selectivity. No reduction was apparent in the proportion of older chinook in the catch in any month, through 1969. Dominant age groups often differed by flesh color. Within age groups, white-flesh fish were generally larger than red-flesh fish, and within samples, sometimes older (higher proportion of OAG 3). Sex ratio (% females) generally exhibited a similar pattern among age groups, regardless of month or flesh color, during May-September 1964-66 and 1969. For red-flesh/white-flesh chinook, mean sex ratios for OAGs 1-4 were: 2%/1%, 35%/23%, 66%/66%, and 69%/76%, respectively,. Sex ratios declined from May to September for OAG-2 fish, regardless of flesh color. For the spring-run, red-flesh chinook in the Fraser and Columbia rivers, numbers of ova per fish (males + females), in age-group $5_2$ were

twice that for age-group $4_2$. This may be a factor to be considered when evaluating escapement requirements.

A modest 1983 mesh experiment indicated that mesh sizes as small as 5.5" (140 mm) were biased against OAG-1 fish

Test fisheries were conducted during 1964-66 and 1980-date, the former to monitor the escapement past the lower-river gillnet fishery, and the latter to assess inseason chinook abundance and run timing. The 1964-66 study used a gillnet with several mesh sizes (6.5-9.5"), but was biased against OAG-1 fish. No comparable data were found for the spawning grounds. The 1980-96 study used a gillnet with one mesh size (8"), which was biased against OAGs 1 and 2, and the larger members of OAG 3. A multiple-mesh-size net was added in 1997. Neither test fishery appeared to achieve its purpose, but both provided valuable insights into the complexities of chinook salmon entering the Fraser River. For white-flesh chinook, the 1984-88 test fishery provided fair predictions of the age composition of white-flesh chinook spawning in the Harrison River, based on test-fishery catches during September-October.

# RÉSUMÉ

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Sauf quelques rares exceptions, les rapports produits jusqu'ici sur la composition par âge des débarquements de saumon quinnat (*Oncorhynchus tshawytscha*) en Colombie-Britannique sont des sommaires annuels ne donnant aucune précision sur les engins utilisés ou sur les lieux de pêche. Ce genre de données ne permet guère d'analyse, surtout dans le cas des prises de la pêche au filet maillant en eau douce. Le fleuve Fraser étant une source importante de saumon quinnat en Colombie-Britannique, nous avons voulu rassembler des données plus détaillées sur cette pêche. Nous avons trouvé des données hebdomadaires et mensuelles (sources publiées ou archives) concernant des échantillons de poissons prélevés dans les débarquements de pêches commerciales et expérimentales effectuées dans le bas Fraser de 1958 à 1966, en 1969 et de 1981 à 1988. Nous n'avons pas retrouvé toutes les données détaillées dont l'existence était connue. Depuis 1980, en raison de la diminution de la ressource, aucune pêche commerciale directe du saumon quinnat n'a été autorisée dans le fleuve Fraser.

De 1952 à 1994, les débarquements annuels moyens de saumons quinnats capturés au filet maillant dans le bas Fraser ont baissé, passant de 174 500 poissons, pour la période de 1952 à 1954, à 13 100, pour la période 1990 à 1994. Jusqu'en 1979, la principale période de pêche s'étendait de juin à septembre (77 - 88 %), mais après 1979, elle n'allait que de juillet à septembre (85 - 89 %).

L'âge des spécimens était déterminé d'après leurs écailles. Les écailles caractéristiques des poissons de type dulcicole (présentant un ou plusieurs anneaux de croissance en eau douce) étaient plus difficiles à analyser que celles des poissons de type océanique (aucun anneau de croissance en eau douce). La détermination du type d'écailles était d'autant plus complexe que chez les saumons quinnats élevés dans le haut Fraser la formation des anneaux en eau douce n'est pas homogène.

L'échantillonnage des débarquements a été compliqué par un système de classement variable, imposé par l'industrie (basé sur le poids et/ou la longueur, et sur la couleur de la chair). L'incidence de la couleur de la chair (rouge/blanche) et du type d'écaillure (type dulcicole/type océanique) présentaient des tendances saisonnières. L'incidence de la chair rouge et de l'écaillure de type dulcicole baissaient du printemps à l'automne, tandis que l'incidence de la chair blanche et de l'écaillure de type océanique augmentaient pendant la même période. La couleur de la chair et le type d'écaillure semblent déterminés par des facteurs génétiques.

Dans les prises commerciales, les groupes 2 (2 ans en mer; $3_1 + 4_2$) et 3 (3 ans en mer; $4_1 + 5_2$) étaient généralement prédominants de mai à septembre, de 1958 à 1966, ainsi

qu'en 1969. Le groupe 1 n'était pratiquement pas représenté en mai et en juin, peut-être à cause de la sélectivité du maillage. Jusqu'en 1969, la proportion de spécimens plus âgés observée mensuellement dans les prises n'a jamais présenté de signe de baisse. Souvent, les groupes prédominants se distinguaient par la coloration de la chair. En général, dans un même groupe, les sujets à chair blanche étaient plus gros que les sujets à chair rouge et, dans un même échantillon, ils étaient parfois aussi plus âgés (proportion plus importante du groupe 3). De 1964 à 1966 et en 1969, pour la période allant de mai à septembre, la proportion des sexes (pourcentage de femelles) était généralement semblable d'un groupe à l'autre, quels que soient le mois considéré et la coloration de la chair. Pour le saumon quinnat à chair rouge ou à chair blanche, les valeurs moyennes de la proportion des sexes pour les groupes 1 à 4 étaient respectivement de 2 %/1 %, 35 %/23 %, 66 %/66 % et 69 %/76 %. Chez les sujets du groupe 2, le quotient diminuait de mai à septembre, quelle que soit la couleur de leur chair. Par ailleurs, on a déterminé, pour le saumon quinnat à chair rouge en montaison printanière dans le Fraser et le Columbia, que le nombres d'oeufs par poisson (mâles + femelles) dans le groupe $5_2$ était le double de celui mesuré dans le groupe $4_2$. Il y aurait peut-être lieu de prendre ce facteur en considération dans l'évaluation de l'échappée nécessaire.

En 1983, une pêche expérimentale d'échelle modeste a permis de constater que l'emploi d'un maillage de 5,5 pouces (140 mm) ou moins faisait apparaître un biais défavorisant les poissons du groupe 1.

De 1964 à 1966, on a fait des pêches expérimentales pour surveiller l'échappée en amont de la pêche au filet maillant du bas du fleuve; de 1980 jusqu'à aujourd'hui, les opérations expérimentales ont servi à évaluer l'abondance du saumon quinnat pendant la saison de pêche et la période de la montaison. Dans la première étude, on a utilisé des filets maillants de divers maillages (6,5 - 9,5 pouces), mais un biais défavorisait les poissons du groupe 1. Nous n'avons pas trouvé de données comparables sur les frayères. Pour la seconde étude, on a utilisé jusqu'en 1996 un filet à maillage unique (8 pouces), le biais défavorisant alors les poissons des groupes 1 et 2 et les gros spécimens du groupe 3. En 1997, on a ajouté un filet à mailles de grandeurs multiples. Ni l'une ni l'autre de ces pêches expérimentales n'a semblé donner les résultats escomptés, mais elles ont tout de même apporté des renseignements utiles sur la complexité des facteurs qui influent sur le saumon quinnat remontant le fleuve Fraser. Dans le cas du saumon à chair blanche, les pêches expérimentales effectuées de 1984 à 1988 ont permis de prévoir assez précisément la composition par âge de la population de saumon quinnat à chair blanche frayant dans la rivière Harrison, d'après les résultats des pêches expérimentales faites en septembre et octobre.

# INTRODUCTION

In 1995, the author undertook an investigation of Columbia River spring-run chinook salmon (Oncorhynchus tshawytscha), with respect to stock-recruitment and maternal influence on age at maturity. After information on age composition of catch and escapement was assembled, a search began for age composition data for spring-run chinook elsewhere. The Fraser River, entering the sea in southern British Columbia, was the nearest major source of this type of chinook salmon. In the lower Fraser River (Area 29; Fig. 1), during 1951-79, the gillnet fishery accounted for 97% of the chinook catch, and 42-64% of all gillnet-caught chinook landed in British Columbia (Healey 1982, Tables 4-6). For the same period, the second-ranking source of gillnet-caught chinook was Area 4 (essentially the Skeena River), 6-11%. The third-ranking source was Area 3 (essentially the Nass River), 4-9%. The latter two rivers enter the sea in northern British Columbia

Chinook salmon exhibit two basic life-history types (Healey 1991). Type-one juveniles spend at least one year in freshwater before migrating to the sea. Adults return to freshwater one or more years later, mostly in the spring or summer. The scales on type-one exhibit at least one freshwater annulus, and are labeled stream-type (Gilbert 1913). Type-two juveniles spend less than one year in freshwater, and adults return to freshwater one or more years later, mostly in summer or autumn. The scales on type-two adults exhibit no freshwater annulus, and are labeled ocean-type (sea-type in Gilbert 1913). In the Columbia and Fraser rivers, adult chinook with stream-type scales predominate during spring and early summer, while those with ocean-type scales predominate during late summer and autumn (Healey 1991).

In virtually all published reports, age compositions of chinook salmon landed in British Columbia, regardless of gear type, were arrayed by year, rather than by month, season, or stock. However, some reports contained appendices with more detailed data. Flesh color (red/white), also exhibiting seasonal variation, was commonly summarized on a monthly basis (e.g., Ball and Godfrey 1967, 1968a, 1968b, 1970; Godfrey 1975; Fraser et al. 1982). Incidence of white-flesh chinook is negligible south of British Columbia (Godfrey 1975).

The purpose of this report is to assemble the available age composition data for gillnet-caught chinook salmon from the lower Fraser River, by week and/or month, and to discuss the results. Available data consisted of samples from the commercial gillnet landings, two test fisheries, and a mesh experiment.

# MATERIALS AND METHODS

## COMMERCIAL FISHERY

### Regulations

A summary of pertinent regulations, during 1958-81, were extracted from Fraser et al. (1982), and included here in Table 1. Relevance of these will be discussed later.

### Landings

Salmonid records are stored in the mainframe computer (VAX) at the Pacific Biological Station (PBS) (Holmes and Whitfield 1991). For the gillnet fishery, species included are chinook, chum (O. keta), coho (O. kisutch), pink (O. gorbushca), sockeye (O. nerka), and steelhead (O. mykiss). For chinook only, flesh color (red/white) and grade (round weight/fork length) are included, based on fish-plant records. Ball and Godfrey (1967, 1968a,b, 1970) noted that size ranges of grades varied within the industry. During 1964-69, the grades were approximately: large (≥ 12 lb); medium (8-12 lb); small (26" FL to 8 lb); and tiny (<26" FL). A minimum size of 26" was imposed in 1966, but is now applicable only to the troll fishery. Godfrey (1975) reported that "in general", grades were: large reds (≥ 12.5 lb); medium reds (8-12.5 lb); small reds (5-8 lb); large whites (≥12 lb); medium whites (8-12 lb); small whites (<8 lb; jacks (3-5 lb); tiny (<3 lb); cannery (damaged fish used for canning); and No. 2 (damaged fish that provided chunks usable as a fresh product). Jacks, tiny, cannery, and No. 2, can be either flesh color. Holmes and Whitfield (1991) reported that grades in the present PBS database were: large red (>12 lb), medium red (8-12 lb); small red (1-7 lb); #2 red (<7 lb); whites (all weights); and jacks (<5 lb; all colors)

In the current database (Holmes and Whitfield 1991), chinook landings are available in numbers and weight by month for 1952-date; and by week for May-November 1963-68, and March-November 1969-date. These authors reported that sales-slips (filled out by the initial buyer at time of landing) provided weight and numbers (in most cases). Where numbers were missing from a sales slip, mean weights (for conversion of weight to numbers) were calculated from those sales slips containing both weight and numbers, for the same area-week-gear cell. Recently, it was found that this procedure did not begin until 1967. Prior to 1967, a common mean weight was applied to all landings, regardless of area, week, or gear (Susan Bates, PBS, pers. comm.). The pre-1967 data are being revised using preliminary weekly statistics, by area and gear (published monthly).

Weekly and/or monthly landings, in numbers, were extracted from the PBS database as per procedures in Holmes and Whitfield (1991).

Age Composition

Data consisted of samples collected from landings of the commercial gillnet fishery (Table 2). All sources including those for the test fisheries) reported ages by scale type (stream or ocean), in the nomenclature of Gilbert and Rich (1927b)[1]. Thus, stream-type ages were $X_2$ or $X_3$, and ocean-type ages were $X_1$.

Archival data were found on field sheets (1958-59; 1962-63) or in computer printouts (1960-61). Field sheets, with some exceptions, contained the following data for each fish sampled: sample date, length (fork, total, and/or orbit-hypural), weight (lb), flesh color, and age (if determined). The 1958 data produced this detail for samples during June 18-July 23, but only age-frequencies by scale type, for other periods of the year. The 1962-63 data reported an additional category, grade (1-5). The 1960-61 printout data, and the 1964-66 and 1969 data of Ball and Godfrey (1967, 1968a,b, 1970), consisted of length-frequencies by month, flesh color, sex, and age. Ball and Godfrey also provided mean lengths by month, week, flesh color, sex, and age.

Age was determined from scales for all data in this report. For the commercial fishery, data for 1958-61, 1964-66, and 1969, were simply compiled from available records. No weighting by grade was possible for 1958-61. For 1962-63, age-frequencies were weighted by grade where possible. All grades were not present in all landings sampled, nor were all grades sampled from each landing processed. For 1964-66 and 1969, sampling was reported to be roughly in proportion to the various grades in the landings (Ball and Godfrey 1967, 1968a,b, 1970). The authors' weighting procedure, tied to annual landing, was not used, due to computational difficulties.

Validation of age determinations was undertaken in the 1960s (Godfrey et al. 1968; specific time not reported). The Canada-U.S. coastwide test of scale readers was based on known-age scales from gillnet- and troll-caught chinook. The fish had been fin-marked before release from U.S. hatcheries. Overall (combined ages) accuracy was 75%. Overall consistency was 76% (disregarding accuracy), based on repeat readings of the same scales. Among age groups, both accuracy and consistency were higher for ocean-type scales than for stream-type scales, except for the accuracy values of age-group $5_2$ (Table 3).

An additional problem with chinook scales, is that of life-history interpretation. Tutty and Yole (1978) demonstrated that significant numbers of juvenile chinook overwintering in the McGregor River, and other upper Fraser River tributaries, failed to form a freshwater annulus, presumably due to the low water temperatures during winter. Thus, as adults, their scales would have been incorrectly interpreted as ocean-type. Timing of the McGregor River stock, and others in the upper Fraser River, through the lower Fraser River gillnet fishery is not known precisely, but Fraser et al. (1982) included them with the "early" run, whose general timing is March-July, principally June.

[1] Incorrectly attributed to Rich (1927a) by Koo (1962).

Ocean ages (numbers of ocean annuli) were used in the figures, to simplify the inter-month comparisons of age-frequencies. Ocean-age-frequencies were compiled by month for 1958-66, 1969, and 1981-88; by month and flesh color for 1964-66 and 1969; and by month, flesh color, and sex ratio (% females), for 1964-66 and 1969. Appendix tables contain the corresponding data by scale type.

## MESH EXPERIMENTS

A modest experiment was conducted in 1983, during August-October (Wilson and Pearce 1984). Primary purpose was to investigate the effectiveness of a 1981 mesh regulation intended to reduce the by-catch of "large" chinook during the sockeye and pink salmon fisheries. The regulation reduced the maximum mesh size from 14.9 cm (5.9") to 14.0 cm (5.5").

Fishing took place on the Graveyard Drift, near Albion (Fig. 2)(Wilson and Pearce 1984). The test gillnet was 120.7 m long, and consisted of three panels of equal length. Panel mesh sizes were 124 mm (4-7/8"), 149 mm (5-1/2"), and 149 mm (5-7/8"). The net was hung on a ratio of 3:1. Panels were interchangeable, and their order in each drift was determined by a randomized block design. The three-panel net was set twice a day on 12 days between August 16 and October 1.

Length-frequencies, but not age-frequencies, were reported by mesh size. Some of the results are included here, because they provided insight into the relative vulnerability of the smaller (jack) chinook to the mesh sizes used in the test fisheries.

## TEST FISHERIES

Two test fisheries were undertaken during the study period--1964-66 and 1980-date (Table 2; J.R. Irvine, PBS, pers. comm.). Records for 1964-66 consisted of field sheets found in the PBS Archives (Table 2). Time periods were July-September 1964, and April-September 1965 and 1966. The limited data for 1964 were not used in this analysis. Detailed records for 1981-87 were reported in Schubert et al. (1988). The authors reported that the 1980 records were lost. No records were found for subsequent years, except for white-flesh chinook during September-October 1988 (Starr and Schubert 1990).

### 1965-66

The program was conducted on the Fraser, Skeena, and Nass rivers "... to obtain information on the magnitude and composition of the salmon spawning escapements." (Godfrey 1968, p. 1). The Fraser River test fishing took place on the Silverdome Drift, near Mission, at approximately river-kilometer (rkm) 56 (A.R. Baker, pers. comm.)[2] (Fig. 2).

[2] A veteran gillnetter on the Fraser River.

Multi-panelled nets were used, with mesh sizes, in 1965, of 6.5" (165 mm), 7.0" (178 mm), 7.5" (191 mm), 8.5" (216 mm), and 9.5" (241 mm). The 7.0" mesh was eliminated in 1966. No description of fishing or sampling procedures was found. In 1965, the records indicated that the array of panels was altered periodically, with respect to the shore or vessel.

The archival data consisted of field sheets on which were recorded date and time (beginning and ending) of each set, and for each fish, sex (jack, female, male), round and/or dressed weight (lb), length (total, fork, and/or orbit-hypural; cm), flesh color, age (if determined), and mesh size. The 1965 data also recorded the mesh size nearest shore (or vessel) for each set, and river gauge reading. Age-frequencies were compiled by month, scale type, sex, and flesh color.

1981-87

The program was established on the Fraser River "... to assess inseason chinook abundance and run timing" (Schubert et al. 1988, p. 1). It was implemented in 1980 when the directed harvest of chinook salmon was eliminated in the Fraser River, for both commercial and recreational fisheries, due to declining returns to the river. Location of the test fishery was the Graveyard Drift, near Albion, at approximately rkm 50 (Fig. 2).

Schubert et al. (1988) described the test net, fishing procedures, and sampling procedures. The test gillnet was 274 m long, and was hung on a 3:1 ratio. Mesh size was 203 mm (8")[3] throughout. Standard depth of net was 50 meshes, but a net 60 meshes deep was used when river depth at Albion exceed 3.1 m. The 1981-86 test fisheries were conducted three days per week, but not during open periods for the commercial salmonid fishery. In 1987, test fishing occurred seven days per week, except during commercial fisheries. During 1981-86, up to 20 chinook per day were sampled, and in 1987, all chinook were processed. A minor change in the test gillnet was made in 1996, and a second net was added in 1997 which contained mesh sizes of 5" (127 mm), 6" (152 mm), 7" (178 mm), 8" (203 mm), and 9" (229 mm)(J.R. Irvine, PBS, pers. comm.).

The appendices of Schubert et al. (1988) listed, by sampling date: total numbers sampled; numbers by age, numbers not aged; sample mean length (cm); and sample mean weight (kg). For each year, five separate arrays of data were included: all chinook, males, females, red flesh (sexes combined), and white flesh (sexes combined)

For 1984-88, age composition data were found for white-flesh chinook caught the test fishery during September-October, and by seine in the Harrison River, near the spawning grounds (Starr and Schubert 1990). The seine fishery was part of a mark-recapture program to estimate the numbers of spawners (excluding jacks). Hereafter, the seine-caught fish will be referred to as the spawning-ground sample.

[3] A.R. Baker (pers. comm.), who is the only one to fish the test net to date. Schubert et al. (1988) reported "216 mm (8")".

## PROPORTION-DIFFERENCE TESTS

Differences in proportions of a selected age group in two categories were compared with a statistical test from Dixon and Massey (1969, p. 249), hereafter referred to as the Dixon-Massey test. The test produced 95% confidence intervals for the difference between the two proportions. If the confidence interval includes zero, then the difference between the two proportions is not significantly different from zero. One limitation is that the product of sample size and corresponding proportion (or its complement) must exceed five in each test.

The Dixon-Massey test was applied to three arrays of data: (1) red flesh vs white flesh, by month, principal ocean-age-group, and year, in samples from the commercial gillnet fishery, June-Seotember 1960-66 and 1969; (2) commercial fishery vs test fishery, by month and principal ocean-age-group, April-September 1965-66 ; and (3) September-October test fishery vs Harrison River spawning ground, by principal age-group (white-flesh only), 1984-88.

# RESULTS AND DISCUSSION

## COMMERCIAL FISHERY

### Landings

During 1952-54, mean annual landing of gillnet-caught chinook was 174,500 fish (Fig. 3). In subsequent five-year periods, mean annual landings declined from 147,700 during 1955-59 to 13,100 during 1990-94. Principal time period was June-September (77-88%) through 1979, but July-September (86-89%) thereafter. One reason for the decline, and shift of important time period, was the elimination of the directed fishery for chinook after 1979 (Fraser et al. 1982).

Numerically, chinook salmon are relatively unimportant in the Fraser River gillnet fishery for salmonids. For example, during May-September 1964-66 and 1969, total numbers of chinook landed annually ranged from 76,900 to 137,000, compared to 462,000-936,100 sockeye, 192-159,900 pink, and 11,300-85,700 coho (Fig. 4). Chum landings (not included in Fig. 4) never exceeded 5,500 fish during this period. Principal landing periods were July-August for sockeye, and September for pink and coho.

### Sampling

Table 4 summarizes the numbers of chinook salmon sampled and landed, by month, during 1958-66 and 1969. When sampling took place, proportions sampled ranged from 0.1% to 6.7%. The most consistent effort was expended during 1964-66 and 1969, particularly 1964.

Flesh Color

During 1959-66 and 1969, red-flesh chinook predominated during May-August, while white-flesh chinook predominated in September (Fig. 5). Monthly mean incidence of red flesh fish declined from 95.9% in May to 68.3% in August, then decreased sharply to 26.6% in September. During 1964-66 and 1969, when weekly data were plentiful, incidence values varied modestly among years, by week and month (Table 5). Estimated time of 50% incidence was late August in 1965, early September in 1964, 1966, and probably 1969. The 1964-73 mean was approximately mid-August (Godfrey 1975, Fig. 1), and for 1974-78, early September (Fraser et al. 1982, Fig. 18).

Sampling for flesh color, by month, appeared to be generally representative of the landings during 1964-66 and 1969 (Table 5). Chi-square tests of red-flesh incidence between biological samples and landing statistics yielded only two significant values in 19 tests--September 1964 and 1966.

Godfrey (1975) discussed the phenomenon of white-flesh chinook, and noted little evidence for occcurrence south of British Columbia. He also reported that white-flesh chinook were more prevalent in the Fraser River (36.4%) than in the Skeena (13.1%) or Nass (22.0%) rivers, based on fish caught in the 1964-66 test fisheries (Godfrey 1975, Table 3). He suspected genetic separation in the Fraser River, on the basis of: (1) spatial and temporal separation of some spawning stocks; (2) average size of adults (white-fleshed larger)[4]; (3) chronological regularity of appearance in the fishery; and (4) occurrence of fresh-caught individuals with both flesh colors in separate body parts. He concluded that "...it seems appropriate to accept that red- and white-fleshed chinook salmon do exist as separate races. However, it should be appreciated that the catch data on flesh color do not necessarily describe the true dimensions of the populations of each. As well as possible crosses and mutations, the effects of which would not be recognized in the catch statistics, the recording of chinook catches according to flesh-color categories is subject to appreciable error in a variety of ways..." (Godfrey 1975, p. 3). One example of reporting "error" concerned the higher price paid to the fisherman for red-flesh chinook. White-flesh chinook might be purchased as red-flesh to retain "good relations" with the fisherman, or when demand was especially strong.

Confirmation of Godfrey's (1975) observation of differential size, by flesh color, was found in samples collected from the commercial gillnet fishery during July and August-September, 1964-66 and 1969 (Ball and Godfrey 1967, 1968a,b, 1970). Mean lengths of white-flesh chinook, by month, sex, and ocean age were larger in 35 (79.5%), smaller in 7 (15.9%), and "tied" in 2 (4.5%), of 44 comparisons (Fig. 6). A simple Chi-square test (assuming expected values of 22 each for "larger" and "not larger" yielded a significant difference ($X^2 = 16.590$; $Df = 1$; $P < 0.01$). Actual differences in length were as much as 3 cm, where appreciable numbers were sampled (Appendix table 4).

Some confirmation of Godfrey's (1975) speculation on genetics was provided by Withler (1986). She conducted a study of the progeny of red- and white-flesh adult chinook, collected in

[4] He acknowledged that no comparisons were made with fish caught in the same month.

September 1982 from the Quesnel River (a Fraser River tributary), downstream from Quesnel Lake. All adults collected had stream-type scales (Withler, pers. comm.). Parents were taken to the Quesnel Hatchery to be classified by flesh color. Gametes were collected from each of four red-flesh females, white-flesh females, red-flesh males, and white-flesh males. Fertilization occurred 24 h later at the Rosewall Creek Hatchery, Vancouver Island. Four sets of 2 x 2 factorial crosses were made. The resulting 16 families were incubated separately. Subsequently 200 members of each family were cold-branded and placed in a single seapen at the Pacific Biological Station. Sampling of progeny for flesh color occurred in June-July and November 1983. Flesh color was determined qualitatively by eye, and quantitatively by carotenoid extraction (November sample). The author concluded "...that the production of red- and white-fleshed chinook salmon in the Quesnel River population is under genetic control. Flesh color type may be a threshold trait with very high heritability or a Mendelian trait under the control of at least two loci. There was no evidence of sex-linkage or sex-limitation in the control and expression of flesh color." (Withler 1986, p. 592)

Scale Type

Chinook with stream-type scales predominated during May-July 1958-66 and 1969, while those with ocean-type scales predominated in August and September (Fig. 7). The wide, among-year variation in incidence values during May-July may be due in part to the variable abundance of upriver fish which failed to develop a freshwater annulus. For combined years, monthly mean incidence of chinook with stream-type scales declined from 83.4% in May to 4.0% in September. During 1964-66 and 1969, when weekly data were plentiful, incidence values were similar for red-flesh and white-flesh chinook in the same weekly or monthly time cells (Table 5). However, estimated time of 50% incidence varied among years--early August in 1964; mid-August in 1965; mid-June in 1966; and early July in 1969.

The seasonal trend in scale-type dominance for chinook salmon was first reported for fish sampled in the Columbia River during 1919 (Rich 1926, Fig. 8 here). Subsequent reports for the Columbia River dealt with samples in 1960-69 (Young and Robinson 1974, Fig. 2), and 1992-94 (Fryer and Schwartzberg 1993, 1994, Fig. 3; Fryer et al. 1995, Fig. 3). The 1919 result was based on fish sampled from the commercial fishery, primarily in the lower river (Zone 1). The 1960-69 results were based on fish sampled from the commercial gillnet fishery in Zones 1-5 (mouth to below Bonneville Dam). The 1992-94 results were based on fish sampled from one of the four fish ladders at Bonneville Dam, located at river-mile 146 )(ODFW/WDFW 1995, Fig. 2). The respective estimated times at 50% incidence were: mid-June in 1919; early July in 1960-69; and mid-July in 1992-94.

Healey (1991) was the first to report this phenomenon for the Fraser River, and to compare it with that for the Columbia River, based on data from Ball and Godfrey (1968a,b, 1969 (sic), and 1970), and Rich (1942)[5]. In his Figure 6, 50% incidence occurred in early June on the Fraser River, and in mid-June on the Columbia River. He further noted that due to the differential timing of stream- and ocean-type adults and the "osmotically rigorous freshwater environment", that "...there must be more than casual genetic separation between stream- and ocean-type

[5] He meant Rich (1926). Rich (1942) contains no such data.

chinook" (Healey 1991, p. 320). No other report was found which dealt with this matter for Fraser River chinook. For the Columbia River, Kristiansson and McIntyre (1976) and Winans (1989) reported genetic differences. The former authors found significant differences between spring-run and fall-run chinook salmon in the lower- and middle-watershed, based on starch-gel electrophoresis analysis of samples collected from seven hatcheries. The latter author reported genetic differences among spring-run, summer-run, and fall-ruin chinook, based on electrophoretic analysis of 33 protein loci, for juveniles collected throughout the Columbia Basin.

Age Composition

By month. Ocean-age-groups (OAGs) 0-5 were present in commercial gillnet landings of chinook during May-September 1958-63 (Fig. 9), and 1964-66 and 1969 (Fig. 10). OAGs 2 and 3 predominated in most month-year cells. Alternation in their relative importance, in consecutive years, reflected the passage of strong year classes through the fishery. For example, the 1959 year-class (at ages $4_2$ and $5_2$) passed through during May-June 1963-64, and the 1955 year-class (at ages $3_1$ and $4_1$) passed through during August-September 1958-59. Interestingly, OAG 1 was virtually absent in May and June, but occasionally prominent in July, August, and September. Perhaps the smaller mesh sizes used for sockeye and pink salmon during July-September, caught more small chinook (see 1983 MESH EXPERIMENT). A second possibility is that there are few early-run chinook which mature at age $2_1$ or $3_2$. There was no apparent reduction in the proportion of older chinook in any month.

By month and flesh color. For 1959-63, comparisons were limited to 16 month-year cells--June-September 1960-63 (Fig. 11). White-flesh chinook were scarce in May, and sampling was weak in all months of 1959 (Table 4). The June-July pattern of ocean-age-frequencies differed from that of August-September. The June-July cells were dominated by OAG-2 chinook, regardless of flesh color (11 of 16 month-year-color cells)--6 of 8 for red flesh; 5 of 8 for white flesh. The August-September cells were dominated by OAG 3, regardless of color (12 of 16)--6 of 8 red flesh and white flesh.

For 1964-66 and 1969, comparisons were limited to 15 month-year cells (June-September 1964-66 and June-August 1969) (Fig. 12). White-flesh chinook were scarce in May, and no white-flesh fish were sampled in September 1969 (Appendix table 7). In contrast to 1960-63, OAG 2 was not dominant during June-July (8 of 16 cells). However, it was dominant among red-flesh fish--6 of 8 month-year cells. For white-flesh fish, OAG 3 was dominant in 7 of 8 cells. During August-September, OAG-3 domination was less than during 1960-63--9 of 15 month-year-color cells. For red-flesh fish, OAG 3 dominated in 4 of 7 cells. For white-flesh fish, OAG 3 dominated in 5 of the 7 cells.

Thus, for the 31 month-year cells compared (1960-66 and 1969), dominant age groups differed by flesh color in 17 cells. In 12 of these cells, white-flesh fish were older than red-flesh fish, and in 2, red-flesh were older.

Dixon-Massey tests of proportion differences between flesh color were completed for 62 month-year-age cells (Table 6). Of these, 35 (56.5%) produced significant differences--17 for

OAG 2, and 18 for OAG 3. However, during 1960-63, only 34.4% (11 of 32) of the cells produced significant differences, compared to 80.0% (24 of 30) for 1964-66 and 1969. No explanation was found for this phenomenon. Evidently, age compositions were more heterogeneous with respect to flesh color, during the period of "improved" sampling. A comparison of flesh color proportions between age groups, within year-month cells suggests that white-flesh chinook are generally older than red-flesh chinook in these cells. There were sixteen such comparisons, and proportion of red flesh was significantly greater at age-group 2 in 12 cells; at age-group 3 in 3 cells; and in both age groups in 1. White flesh was of course the near opposite--3 at age-group 2; 12 at age-group 3; and none at both age groups.

By month, flesh color, and sex ratio. For May-September 1964-66 and 1969, mean sex ratios (% females) generally exhibited a similar pattern among age groups, regardless of month or flesh color (Fig. 11). For red-flesh/white-flesh chinook, mean proportions of females for OAGs 1-4 were: 2%/1%; 35%/23%; 66%;66%; and 69%/76%, respectively.

Within age groups, little variation among months was evident, except for OAG 2 (both flesh colors)(Fig. 13). For red-flesh, OAG-2 chinook, proportion of females declined from 53% in May to 20% in September. Corresponding values for white-flesh, OAG-2 chinook were 25% in May, 36% in June, and 12% in September. No explanation is evident for this phenomenon. Age-group $3_1$ exhibited anomalous values among months, particularly for red-flesh fish during May-June (Appendix table 9). Perhaps some of these fish reared in the upper Fraser River, and did not form a freshwater annulus.

The differential sex ratio between age groups may be important when evaluating escapement requirements. That is, numbers of ova in the escapement may be important as well as the numbers of fish. An example is shown in Table 7, for chinook (red flesh; stream-type scales) sampled from the commercial gillnet fisheries in the Fraser (June 1964) and Columbia (May 1960-69) rivers. Proportions of females within age groups were virtually identical in the two fisheries--at age $4_2$, 44% in both fisheries; and at age $5_2$, 72% in the Fraser River, and 74% in the Columbia River. Likewise, for both rivers, fecundities were similar within age groups, but substantially different among age groups. For age-group $4_2$, estimated numbers of ova per fish (males + females) were 1996 in the Fraser River, and 3044 in the Columbia. For age-group $5_2$, comparable values were 4497 (Fraser) and 5923 (Columbia). The larger values per age group in the Columbia River were attributed to larger females. Mean lengths of age-$4_2$ females were 72 cm for Fraser River chinook, and 76 cm for Columbia River chinook. Comparable values for age-$5_2$ females were 86 and 88 cm, respectively.

Summary

Incidence of both flesh color and scale type exhibit consistent seasonal trends (with some variability in time of 50% incidence), and both may be genetically based. Monthly age compositions vary among years, and by flesh color. It seems likely that these reflect variations in year-class abundance among and within stocks. Sex ratios (% females) for red-flesh, spring-run chinook in both the Fraser and Columbia rivers were substantially larger for age-group $5_2$ than for age-group $4_2$. Since fecundity is an exponential relationship, the number of ova in the escapement

is a function of the age composition, and hence may well be factor in the effectiveness of the escapement.

The limited data examined clearly indicate that annual compilations of age compositions are inadequate for analytical purposes. Hopefully, the current results will encourage further effort to locate and compile the missing detailed records for the lower-river fisheries, and to search for other relevant data not yet reported. A second need is another age-validation study for comparison with that in the 1960s. As Beamish and McFarlane (1983) noted, too little effort is expended in this matter, in all fisheries investigations..

Fraser et al. (1982, Fig. 4) proposed three major groups of stocks (early, middle, and late), based on timing of the adult fish passing through the lower Fraser River. Time of passage was March-July (principally June) for the early group; mid-July to mid-September (principally mid-July through August) for the middle group; and September-October (principally mid-September to mid-October) for the late group. Distance to spawning grounds was generally longest for the early group, and shortest for the late group. However, only the Harrison River was listed for the late group, and other late stocks may spawn farther upriver, as in the Columbia River (ODFW/WDFW 1995). Since at least the early and late groups comprised numerous spawning stocks (see their Figure 5), age compositions, per se, in the commercial and test fisheries were unlikely to provide much insight into individual stocks.

## 1983 MESH EXPERIMENT

During the 12 days of fishing, 24 sets were completed (Wilson and Pearce 1984). Total catch, by species was 129 chinook, 72 chum, 107 coho, 1,834 pink, 966 sockeye, and 9 steelhead. The authors reported that "Significantly ($p \leq 0.05$) more large chinook (>2.3 kg) were captured in the 14.9 cm mesh than in either of the smaller meshes" (Wilson and Pearce 1984, p. viii). Extracted from their Table 1, and shown below, are the numbers of chinook salmon caught, by mesh size and category:

| Mesh size | | Large[a] | | Jack[b] | Total |
|---|---|---|---|---|---|
| (cm) | (in) | male | female | | |
| 12.4 | 4.9 | 16 | 10 | 19 | 45 |
| 14.0 | 5.5 | 21 | 9 | 3 | 33 |
| 14.9 | 5.9 | 26 | 20 | 5 | 51 |
| Total | | 63 | 39 | 27 | 129 |

a. Weight >2.3 kg. Excluding jacks.
b. Weight ≤2.3 kg. (mostly ages $2_1$ & $3_2$).

The data, albeit scanty, suggest that mesh sizes of 14.0 cm (5.5") and larger are not effective for catching jacks.

## TEST FISHERIES

### 1965-66

A total of 1287 chinook were sampled for length and scales, of which 891 (69.2%) yielded scale readings, i.e., were "successful" (Table 8). Success increased temporally, from 41.7% in April to 83.8% in September. Similar patterns were evident in both years--53.8% to 80.1% in 1965, and 38.3% to 86.8% in 1966. The temporal increase in successful scale readings was attributed in part to the difference in readability of stream-type and ocean-type scales, as reported by Godfrey et al (1968).

Age composition. The four mesh sizes, used in 1965 and 1966, produced substantially different ocean-age frequencies in both years (Fig. 14). Percentages of OAGs 1 and 2 varied inversely with mesh size, while those for OAGs 3 and 4 varied directly.. For 1965 (months combined), percentages of OAGs 1 and 2 declined from 9.2% and 59.6% at 6.5" to 1.2% and 11.8% at 9.5". comparable values for 1966 were 10.6% and 57.6% at 6.5", and 3.8% and 12.3% at 9.5".

Size composition. Not surprisingly, the four mesh sizes produced substantially different size compositions in both years (Fig. 15). For 1965, the principal modal frequencies at 6.5" (22.4%) occurred in the 55-59 cm interval, but at 9.5" (30.7%), in the 75-79 cm interval. Comparable values for 1966 were 27.3% at 50-54 cm for 6.5" mesh, and 39.7% at 70-74 cm for 9.5" mesh.

Test fishery vs commercial fishery. Ocean-age-frequencies in the test fishery catch (combined mesh sizes) were generally similar to those in the commercial fishery, in 1965 (Fig. 16) and 1966 (Fig. 17). For April-September 1965, age-group dominance, by month, was the same for both fisheries, except for July, where OAG 2 was dominant in the commercial fishery, and OAG 3 in the test fishery. For 1966, April and July produced anomalous relationships. In both cases, OAG-2 fish predominated in the commercial fishery, and OAG-3 fish in the test fishery. The April anomaly could be ascribed to small samples in the test fishery (39 and 18 fish). The coincidental anomalies in July, for both years, may be due to the commercial fishery's reaction to the arrival of the sockeye salmon (Appendix table 2). Since the sockeye are smaller than chinook, smaller-mesh nets are used, which would tend to catch smaller (younger) chinook. However, no anomaly appeared in August, also an important sockeye month.

Dixon-Massy tests of proportion differences, by ocean-age-group, between the two fisheries were completed for 22 month-year-age cells (Table 6). Significant differences were found in six cells--two for April (OAG 2 and 3 in 1966) and all four for July. The April 1965 data were not testable. Thus, for May, June, August, and September, the age composition in the test fishery accurately reflected that in the commercial fishery. Interestingly, in the comparisons of

age-group proportions within month-year cells, commercial fishery was significantly greater at age-group 2 in all three cases (April 1966; July 1965-66), while the test fishery predominated at age-group 3. Perhaps the test fishery catch was more representative of the fish moving upriver.

1981-87

A total of 7840 chinook salmon were sampled for length and scales, of which scale readings were reported for 7042 (89.8%) (Table 9). Scale reading success increased temporally, as with the 1965-66 test-fishery data. For the combined 1981-87 data, percentages rose from 83.4% in April to 95.9% in September (94.5% in October). No explanation was found for the increased success at reading scales over that in 1964-66 and 1969. Two plausible explanations are increased reading skills and the method of selecting scales from the fish. In the latter case, Schubert et al. (1988) reported that scales were collected from the "preferred" locations. Ball and Godfrey (1967, 1968a,b, 1970) did not report how scales were removed from the fish, nor did the archival records.

Age composition. The single mesh size (8") produced near-uniform ocean-age-frequencies among months and years (Fig. 18). OAG 3 accounted for 64.7-89.9% among months (years combined) during April-October 1981-87. These results compared favorably with those with the 8.5" mesh in 1965-66, where OAG-3 fish accounted for 66.7% in 1965, and 67.3% in 1966 (Appendix tables 10 and 11). Evidently, the 8" mesh does not catch a representative sample of chinook runs (or catches), nor does it necessarily catch a representative sample of OAG-3 fish, based on length-frequencies by mesh size, from the 1965-66 test fishery (Fig. 15). The 9.5" mesh caught larger fish than the 8.5" mesh. For OAG-3 fish, overall mean orbit-hypural length was 70.9 cm for fish caught in the 8.5" mesh, and 73.9 cm for those caught in the 9.5" mesh (Fig. 19A). Monthly records exhibited the same phenomenon, except for July (Fig. 19B). Differences among the other four months ranged from 2.1 cm to 7.0 cm.

Test fishery vs spawning ground, 1984-88. Principal age-groups of white-flesh chinook, in both locations, were $3_1$, $4_1$, and $5_1$ (Appendix table 17). Together, they comprised 90.4-98.3% in the test-fishery catch, and 98.8-99.6% on the spawning ground.

Test-fishery and spawning-ground age compositions were generally similar in each year (Fig. 20). However, percentages of age-group $3_1$ were consistently higher in the test fishery than on the spawning ground, and the reverse was the case for age-group $4_1$. For age-group $5_1$, percentages were higher in the test fishery during 1984 and 1986.

Dixon-Massey tests of proportion differences, by age group, between the test fishery and spawning ground were completed for 14 month-year-age cells (Table 6). Four cells yielded significant differences--two each for age-groups $3_1$ (1985, 1987) and $4_1$ (1986, 1988). None were found in the four tests of age-group $5_1$, but proportions were small (<0.10 in 8 of the 10 cells; Appendix table 18). Only in 1984 were there no significant differences for the principal age groups. The significant differences at age $3_1$ in 1985 and 1987 match up with the significant differences at age $4_1$ in 1986 and 1988, and reflect the above-average 1982 and 1984 year classes. Evidently, strong year classes disrupt the predictability of the test fishery for the Harrison River

chinook. The test fishery may be useful as a predictor of above-average year-classes when they return to spawn at age $4_1$. The test fishery yielded significantly greater proportions of age-group $3_1$ (1985, 1987), while the spawning ground sample yielded significantly greater proportions of age-group $4_1$ (1986 and 1988).

Summary

Apparently, neither test fishery achieved its purpose, but both yielded useful ancillary results. No report was found which dealt with the ability of the 1965-66 fishery to measure magnitude and composition of spawning escapements, nor were archival data found on age composition of spawning escapements. However, the test fishery data clearly demonstrated the difficulty in sampling the escapement past the lower-river fishery. Despite the multiple mesh sizes, the test net was biased against OAG-1 chinook. Ancillary biological data were published on fecundity, pyloric caeca counts, length-weight relationship, flesh-color ratios, and conversion formulae for dressed weight to round weight, and fork length to orbit-hypural length (Godfrey 1968).

The ability of the 1981-96 test fishery to assess inseason abundance and run timing seems unlikely with the single-mesh net, which was biased against OAG-1 and OAG-2 fish, as well as the larger members of OAG-3. However, fair results were obtained in reflecting the age composition of the white-flesh chinook (excluding jacks) destined for the Harrison River. The multi-mesh-size net introduced in 1997 offers hope for improvement, at least in assessing escapement past the lower-river fishery.

Probably neither the 1965-66 (minimum mesh size = 6.5") nor the 1981-87 (mesh size = 8") test fisheries adequately sampled jacks, when they were present in the river. An index of jack abundance might well be useful in predicting year-class abundance.

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Table 1. Open periods, and days open per week before, during, and after IPFSC control, by year, for the commercial gillnet fishery in the lower Fraser River 1958-81. (Source: Fraser et al. 1982, Appendix 3)

| Year | Open periods[a] | Days open: per week[c] before | during | after | Total | IPFSC control[b] |
|---|---|---|---|---|---|---|
| 1958 | Feb-Nov | 4 | 3 | 0-4 | 124 | Jun 23-Oct 7 |
| 1959 | Feb-Dec | 4 | 3 | 0-4 | 138 | Jun 21-Oct 11 |
| 1960 | Feb-Nov | 4 | 1-3 | 0-2 | 120 | Jun 27-Sep 26 |
| 1961 | Feb-Dec | 4 | 2 | 0-2 | 113 | Jun 25-Oct 8 |
| 1962 | Feb-Nov | 4 | 1-3 | 0-2 | 107 | Jun 24-Oct 8 |
| 1963 | Feb-Nov | 2-4 | 1-4 | 0-2 | 108 | Jun30-Oct12 |
| 1964 | Feb-Nov | 2 | 1-3 | 0-2 | 96 | Jun 28-Sep 26 |
| 1965 | Mar-Oct | 2 | 1-3 | 0-1 | 53 | Jun 27-Oct 4 |
| 1966 | Mar-Oct | 2 | 1-3 | 0-1 | 51 | Jun 26-Oct 2 |
| 1967 | Mar-Nov | 4 | 1-4 | 0-1 | 88 | Jun 25-Oct 14 |
| 1968 | Mar-Nov | 2 | 1-3 | 0-1 | 61 | Jun 30-Sep 21 |
| 1969 | Mar-Nov | 2 | 1-2 | 0-1 | 48 | Jun 26-Oct 11 |
| 1970 | Mar-Nov | 2 | 1-2 | 0-1 | 51 | Jun 28-Oct 11 |
| 1971 | Mar-Oct | 2 | 1-5 | 0-1 | 63 | Jun 27-Oct 13 |
| 1972 | Mar-Dec | 2 | 1-2 | 1 | 51 | Jun 25-Sep 24 |
| 1973 | Mar-Nov | 2 | 1-4 | 1-2 | 58 | Jun 24-Oct 14 |
| 1974 | Mar-Nov | 2 | 1-3 | 0-1 | 47 | Jun 23-Oct 6 |
| 1975 | Mar-Oct | 1 | 1-3 | 0-1 | 44 | Jun 26-Oct 9 |
| 1976 | Apr-Nov | 1 | 1-3 | 0-1 | 29 | Jun 27-Oct 7 |
| 1977 | Apr-Oct | 1 | 1-2 | 0-1 | 29 | Jun 27-Oct 9 |
| 1978 | Apr-Oct | 1 | 0-2 | 0-1 | 23 | Jun 25-Oct 12 |
| 1979 | Apr-Oct | 1 | 0-2 | 0-1 | 18 | Jun 24-Oct 6 |
| 1980 | Apr-Oct | 1 | 0-2 | 0-1 | 24 | Jun 22-Oct 11 |
| 1981[d] | Jul-Sep | 0 | 0-2 | 0 | 15 | Jun 21-Oct 11 |

a. Specific dates omitted here.
b. Internationald Pacific Salmon Commission: Areas 29B-D (See Fig. 1)
c. Rounded up to whole days per week.
d. Total closure, May 28-July 14.

Table 2. Inventory of age-composition data, by time, numbers sampled, type of fishery, and source, for chinook salmon in the lower Fraser River, 1952-87.

| Time | | N | Type[a] | Source[b] |
|---|---|---|---|---|
| 1952 | "May-Sep" | 35 | CF | Fraser et al. (1982)[c] |
| 1953 | "May-Sep" | 103 | CF | (from Milne 1964)[c] |
| 1954 | "May-Sep" | 40 | CF | |
| 1955 | "May-Sep" | 71 | CF | |
| 1956 | "May-Sep" | 372 | CF | |
| 1957 | "May-Sep" | 316 | CF | |
| 1952-56[d] | NR[e] | NR[e] | CF | Argue et al. (1983)[c] |
| 1957-59[d] | NR[e] | 326 | CF | |
| 1966-68[d] | NR[e] | 3818 | CF | |
| 1958 | "May-Sep" | 368 | CF | Fraser et al. (1982)[c] |
| | | | | (from Milne 1964)[c] |
| | Jun-Oct | 370 | CF | PBSA AC/39/19 |
| 1959 | "May-Sep" | 293 | CF | Fraser et al. (1982)[c] |
| | | | | (from Milne 1964)[c] |
| | May-Sep | 251 | CF | PBSA AC/38/58 |
| 1960 | May-Oct | 2221 | CF | PBSA BP/7/12 |
| 1961 | Jun-Oct | 2562 | CF | PBSA BP/7/15 |
| 1962 | May-Oct | 2341 | CF | PBSA AC/18/43 |
| 1963 | May-Oct | 1786 | CF | PBSA AC/23/36 |
| 1964 | "May-Sep" | 4676 | CF | Fraser et al. (1982)[c] |
| | (Mar-Oct) | (4726) | (CF) | (from Ball & Godfrey 1967) |
| | NR[e] | 198 | TF | Godfrey (1968)[c] |
| | Jul-Sep | <265 | TF | PBSA BP/3/25[f] |
| 1965 | "May-Sep" | 4099 | CF | Fraser et al. (1982)[c] |
| | (Apr-Sep) | (4102) | (CF) | (from Ball & Godfrey 1968a) |
| | NR[e] | 403 | TF | Godfrey (1968)[c] |
| | Apr-Sep | 402 | TF | PBSA BP/4/3,4 |

Table 2 (cont.)

| Time | | N | Type[a] | Source[b] |
|---|---|---|---|---|
| 1966 | "May-Sep" | 2675 | CF | Fraser et al. (1982)[c] |
| | (Apr-Sep) | (2692) | (CF) | (from Ball & Godfrey 1968b) |
| | NR[e] | 493 | TF | Godfrey (1968)[c] |
| | Apr-Sep | 378 | TF | PBSA BP/4/8 |
| 1969 | "May-Sep" | 2258 | CF | Fraser et al. (1982)[c] |
| | (Apr-Sep) | (2259 | (CF) | (from Ball & Godfrey 1970) |
| 1975 | NR[e] | 455 | CF | Fraser et al. (1982)[c] |
| 1976 | NR[e] | 429 | CF | |
| 1977 | NR[e] | 1451 | CF | |
| 1978 | NR[e] | 1068 | CF | |
| 1980-84[d] | "early"[g] | NR[e] | TF | Beamish et al. (1995) (from N.D. Schubert, pers. comm.) |
| 1981 | Mar-Oct | 803 | TF | Schubert et al. (1988)[h] |
| 1982 | Apr-Oct | 1047 | TF | |
| 1983 | Apr-Oct | 842 | TF | |
| 1984 | Apr-Oct | 1007 | TF | |
| 1985 | Apr-Oct | 1046 | TF | |
| 1986 | Apr-Oct | 917 | TF | |
| 1987 | Apr-Oct | 2271 | TF | |
| 1988 | Sep-Oct[i] | 242 | TF | Starr & Schubert (1990) (also Beamish et al. 1995) |

a. Type: CF = commercial gillnet fishery; TF = test fishery (gillnet).
b. Source: PBSA = Pacific Biological Station Archive.
c. Annual age-frequencies only. Time approximated, if reported.
d. Mean.
e. NR = not reported.
f. Age readings not located. L-F by sex & color.
g. "spring-summer".
h. Authors reported that the 1980 data were lost.
i. White flesh only.

Table 3. Percent accuracy (Acc) and consistency (Con), by age, of scale readings for known-age chinook salmon sampled from the gillnet and troll fisheries off Canada and the United States. (Source: Godfrey et al. 1968, text table, p. 1975)

| True age | N[a] | Acc | Con[b] | True age | N[a] | Acc | Con[b] |
|---|---|---|---|---|---|---|---|
| $3_2$ | 16 | 50.0 | 55.6 | $2_1$ | 248 | 62.2 | 72.8 |
| $4_2$ | 80 | 58.6 | 61.0 | $3_1$ | 920 | 81.1 | 87.1 |
| $5_2$ | 32 | 82.1 | 61.1 | $4_1$ | 304 | 69.2 | 63.8 |

a. N = numbers of scales read.
b. Disregarding accuracy.

Table 4. Numbers sampled (n) and landed (N), by year and month, of chinook salmon from the commercial gillnet fishery in the lower Fraser River, March-October 1958-66 and 1969.

| Year | Sample type | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct |
|---|---|---|---|---|---|---|---|---|---|
| 1958 | n | 0 | 0 | 0 | 79 | 74 | 116 | 65 | 36 |
| | N | 362 | 3951 | 9030 | 27516 | 40853 | 39768 | 33487 | 13099 |
| | %n | 0.0 | 0.0 | 0.0 | 0.3 | 0.2 | 0.3 | 0.2 | 0.3 |
| 1959 | n | 0 | 0 | 11 | 47 | 56 | 73 | 64 | 0 |
| | N | 1567 | 5269 | 11249 | 25678 | 27917 | 41796 | 63770 | 1211 |
| | %n | 0.0 | 0.0 | 0.1 | 0.2 | 0.2 | 0.2 | 0.1 | 0.0 |
| 1960 | n | 0 | 0 | 77 | 272 | 647 | 471 | 510 | 244 |
| | N | 222 | 1909 | 4092 | 12622 | 28745 | 30223 | 32863 | 9977 |
| | %n | 0.0 | 0.0 | 1.9 | 2.2 | 2.3 | 1.6 | 1.6 | 2.4 |
| 1961 | n | 0 | 0 | 0 | 577 | 734 | 489 | 685 | 77 |
| | N | 115 | 1894 | 5394 | 17944 | 22118 | 23636 | 19353 | 1492 |
| | %n | 0.0 | 0.0 | 0.0 | 3.2 | 3.3 | 2.1 | 3.5 | 5.2 |
| 1962 | n | 0 | 0 | 50 | 371 | 658 | 492 | 442 | 170 |
| | N | 200 | 3206 | 7807 | 20450 | 27901 | 14740 | 29503 | 2798 |
| | %n | 0.0 | 0.0 | 0.6 | 1.8 | 2.4 | 3.3 | 1.5 | 6.1 |
| 1963 | n | 0 | 0 | 135 | 410 | 169 | 450 | 386 | 85 |
| | N | 550 | 5581 | 13312 | 27607 | 8560 | 33416 | 16979 | 5964 |
| | %n | 0 | 0 | 1.0 | 1.5 | 2.0 | 1.3 | 2.3 | 1.4 |
| 1964 | n | 18 | 407 | 492 | 551 | 1053 | 1187 | 903 | 115 |
| | N | 2267 | 7191 | 7891 | 22402 | 41899 | 51036 | 23667 | 4524 |
| | %n | 0.8 | 5.7 | 6.2 | 2.5 | 2.5 | 2.3 | 3.8 | 2.5 |
| 1965 | n | 0 | 109 | 242 | 649 | 1142 | 1022 | 938 | 0 |
| | N | 304 | 1630 | 4793 | 15556 | 29587 | 21965 | 15082 | 1953 |
| | %n | 0 | 6.7 | 5.0 | 4.2 | 3.9 | 4.7 | 6.2 | 0 |
| 1966 | n | 12 | 39 | 95 | 419 | 870 | 696 | 561 | 0 |
| | N | 180 | 1258 | 3575 | 12493 | 32083 | 30236 | 13059 | 2862 |
| | %n | 6.7 | 3.1 | 2.7 | 3.4 | 2.7 | 2.3 | 4.3 | 0 |
| 1969 | n | 0 | 20 | 185 | 521 | 601 | 875 | 57 | 0 |
| | N | 207 | 3359 | 5952 | 19129 | 19704 | 23987 | 10210 | 3487 |
| | %n | 0 | 0.6 | 3.1 | 2.7 | 3.1 | 3.6 | 0.6 | 0 |

Table 5. Incidence (%), by month, week, and year, of red flesh, and stream-type scales by flesh color[a], among chinook salmon sampled from the commercial gillnet fishery in the lower Fraser River, and industry-reported incidence (%), by month, of red flesh in chinook landings, May-September 1964-66 and 1969.

| Week | Nos. sampled | | | | % red flesh | | | | % stream-type scales | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1964 | 1965 | 1966 | 1969 | 1964 | 1965 | 1966 | 1969 | 1964 | | 1965 | | 1966 | | 1969 | |
| | | | | | | | | | R | W | R | W | R | W | R | W |
| May | | | | | | | | | | | | | | | | |
| 1 | 180 | 18 | 35 | 0 | 97.2 | 100 | 94.3 | --- | 66.9 | 80.0 | 94.4 | 0 | 100 | 100 | --- | --- |
| 2 | 104 | 86 | 0 | 57 | 92.3 | 100 | --- | 100 | 82.3 | 100 | 97.7 | 0 | --- | --- | 45.6 | 0 |
| 3 | 106 | 63 | 17 | 53 | 98.1 | 100 | 100 | 100 | 65.4 | 50.0 | 95.2 | 0 | 94.1 | 0.0 | 67.9 | 0 |
| 4 | 107 | 75 | 43 | 75 | 80.4 | 81.3 | 100 | 100 | 70.7 | 65.0 | 93.4 | 92.9 | 97.7 | 0.0 | 61.3 | 0 |
| T | 497 | 242 | 95 | 185 | 93 | 94 | 98 | 100 | 71 | 74 | 96 | 93 | 98 | 100 | 58 | 0 |
| T[b] | | | | | 96 | 97 | 98 | 97 | | | | | | | | |
| June | | | | | | | | | | | | | | | | |
| 1 | 85 | 86 | 61 | 129 | 95.3 | 100 | 83.6 | 88.4 | 56.8 | 75.0 | 95.3 | 0.0 | 56.9 | 90.0 | 58.8 | 73.3 |
| 2 | 162 | 151 | 112 | 158 | 87.7 | 93.4 | 92.0 | 84.8 | 59.2 | 45.0 | 79.4 | 70.0 | 92.2 | 100 | 68.7 | 70.8 |
| 3 | 106 | 200 | 103 | 158 | 89.6 | 90.5 | 97.1 | 90.5 | 69.5 | 81.8 | 92.8 | 94.7 | 48.0 | 33.3 | 59.4 | 73.3 |
| 4 | 198 | 212 | 143 | 76 | 50.5 | 77.4 | 86.0 | 100 | 55.0 | 56.1 | 81.7 | 79.2 | 30.9 | 25.0 | 39.5 | 0 |
| T | 551 | 649 | 419 | 521 | 76 | 88 | 90 | 90 | 60 | 57 | 87 | 82 | 56 | 57 | 59 | 72 |
| T[b] | | | | | 91 | 91 | 94 | 94 | | | | | | | | |
| July | | | | | | | | | | | | | | | | |
| 1 | 177 | 323 | 180 | 52 | 74.6 | 84.5 | 84.4 | 94.2 | 86.4 | 77.8 | 86.1 | 82.0 | 15.1 | 10.7 | 57.1 | 66.7 |
| 2 | 150 | 275 | 133 | 116 | 56.0 | 82.9 | 83.5 | 63.8 | 78.6 | 80.3 | 86.4 | 89.4 | 43.2 | 36.4 | 39.2 | 69.0 |
| 3 | 174 | 120 | 195 | 135 | 51.1 | 68.3 | 89.7 | 88.1 | 85.4 | 81.2 | 93.9 | 100 | 33.7 | 30.0 | 36.1 | 37.5 |
| 4 | 274 | 341 | 97 | 225 | 66.4 | 77.1 | 94.8 | 64.0 | 90.1 | 82.6 | 90.1 | 98.7 | 39.1 | 80.0 | 41.0 | 53.1 |
| 5 | 278 | 83 | 265 | 73 | 64.7 | 79.5 | 70.9 | 68.5 | 71.7 | 78.6 | 83.3 | 94.1 | 34.6 | 40.3 | 32.0 | 34.8 |
| T | 1053 | 1142 | 870 | 601 | 63 | 80 | 83 | 73 | 82 | 80 | 88 | 93 | 32 | 34 | 40 | 53 |
| T[b] | | | | | 71 | 72 | 78 | 76 | | | | | | | | |

Table 5 (cont.)

| Week | Nos. sampled | | | | % red flesh | | | | % stream-type scales | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1964 | 1965 | 1966 | 1969 | 1964 | 1965 | 1966 | 1969 | 1964 | | 1965 | | 1966 | | 1969 | |
| | | | | | | | | | R | W | R | W | R | W | R | W |
| August | | | | | | | | | | | | | | | | |
| 1 | 263 | 138 | 189 | 153 | 64.6 | 63.0 | 67.2 | 74.5 | 64.7 | 75.3 | 50.6 | 66.7 | 37.0 | 50.0 | 20.2 | 35.9 |
| 2 | 271 | 370 | 245 | 71 | 62.0 | 74.6 | 75.9 | 90.1 | 22.0 | 26.2 | 35.9 | 64.9 | 18.8 | 44.1 | 3.1 | 0.0 |
| 3 | 337 | 393 | 0 | 250 | 68.8 | 81.9 | --- | 73.6 | 9.9 | 15.2 | 13.7 | 14.1 | --- | --- | 4.9 | 7.6 |
| 4 | 316 | 121 | 262 | 401 | 61.1 | 47.9 | 67.2 | 59.9 | 8.8 | 11.4 | 0.0 | 7.9 | 5.7 | 5.8 | 2.1 | 5.0 |
| T | 1187 | 1022 | 696 | 875 | 64 | 73 | 70 | 69 | 25 | 30 | 25 | 39 | 19 | 30 | 7 | 10 |
| T'[b] | | | | | 70 | 73 | 74 | 76 | | | | | | | | |
| September | | | | | | | | | | | | | | | | |
| 1 | 293 | 454 | 277 | 57 | 53.6 | 43.8 | 64.6 | 100[c] | 9.6 | 7.4 | 7.0 | 2.0 | 6.7 | 6.1 | 3.5 | --- |
| 2 | 309 | 484 | 284 | 0 | 39.5 | 12.6 | 34.2 | --- | 9.8 | 2.1 | 6.6 | 1.2 | 4.1 | 1.6 | --- | --- |
| 3 | 0 | 0 | 0 | 0 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 4 | 301 | 0 | 0 | 0 | 17.9 | --- | --- | --- | 7.4 | --- | --- | --- | --- | --- | --- | --- |
| T | 903 | 938 | 561 | 57 | 37[d] | 28 | 49[e] | --- | 9 | 3 | 7 | 2 | 6 | 3 | 4 | --- |
| T'[b] | | | | | 23 | 25 | 30 | 27 | | | | | | | | |

a. R = red flesh; W = white flesh.
b. T' = %red flesh reported in landings.
c. White-flesh fish probably not sampled.
d. Chi-square value significant: P >0.01<0.02.
e. Chi-square value significant: P <0.01.

Table 6. Results of three Dixon-Massey tests of differences in proportions, for selected age groups, between categories of chinook salmon sampled in the Harrison and/or Fraser rivers. (x = no significant difference)

Test 1: Red flesh vs white flesh, by ocean-age-group.[a]

| Year | Jun | | Jul | | Aug | | Sep | |
|---|---|---|---|---|---|---|---|---|
| Age-group: | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 |
| 1960 | x | x | x | x | x | x | x | x |
| 1961 | x | x | R | x | x | R | x | x |
| 1962 | W | R | x | R | R | R | R | W |
| 1963 | x | x | x | x | W | R | x | x |
| 1964 | R | W | R | W | R | W | W | R |
| 1965 | R | W | R | W | x | x | R | W |
| 1966 | R | W | R | W | x | x | R | W |
| 1969 | R | W | x | x | R | W | NS[b] | NS[b] |

Test 2: Commercial fishery vs test fishery, by ocean-age-group.[c]

| Month | 19 65 | | 19 66 | |
|---|---|---|---|---|
| Age-group: | 2 | 3 | 2 | 3 |
| April | NT[d] | NT[d] | C | T |
| May | x | x | x | x |
| June | x | x | x | x |
| July | C | T | C | T |
| August | x | x | x | x |
| September | x | x | x | x |

Test 3: Test fishery vs spawning ground, by age-group (white flesh only).[e]

| Age-group: | $3_1$ | $4_1$ | $5_1$ |
|---|---|---|---|
| 1984 | x | x | x |
| 1985 | T | x | NT[d] |
| 1986 | x | S | x |
| 1987 | T | x | x |
| 1988 | x | S | x |

Table 6 (cont.)

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a. Fraser River commercial gillnet fishery. Source: Appendix tables 8A and 8B. R = $P_R > P_W$ ; W = $P_W > P_R$; and P = proportion of category i.

b. NS = no sample.

c. Fraser River. Source: Appendix table 14. C = $P_C > P_T$; T = $P_T > P_C$; and P = proportion of category i.

d. NT = no test: $(P_i)(N_i) < 5$.

e. September-October test fishery (Fraser River) vs spawning ground (Harrison River). Source: Appendix table 18). S = $P_S > P_T$; T = $P_T > P_S$; and P = proportion of category i.

Table 7. Length-frequencies, by sex, and estimated fecundities, of age-$4_2$ and age-$5_2$, red-flesh chinook salmon sampled from the commercial gillnet fisheries in the Fraser (June 1964) and Columbia (May 1960-69) rivers. (Sources listed below.)

| OHL[a] | FL[b] | $4_2$ | | $5_2$ | | F L[c] | | $4_2$ | | $5_2$ | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | F | M | F | M | (in) | (cm) | F | M | F | M |
| --- | --- | | | | | 17 | 43 | --- | 1 | --- | --- |
| --- | --- | | | | | 19 | 48 | --- | 10 | --- | --- |
| --- | --- | | | | | 21 | 53 | 6 | 53 | 1 | 6 |
| 47 | 57 | --- | 6 | --- | --- | 23 | 58 | 21 | 279 | 3 | 19 |
| 52 | 63 | 3 | 17 | 1 | 2 | 25 | 64 | 143 | 1096 | 6 | 62 |
| 57 | 69 | 32 | 46 | 0 | 0 | 27 | 69 | 843 | 2470 | 38 | 103 |
| 62 | 75 | 30 | 16 | 1 | 0 | 29 | 74 | 2429 | 2596 | 152 | 196 |
| 67 | 81 | 3 | 1 | 17 | 3 | 31 | 79 | 2498 | 1306 | 466 | 325 |
| 72 | 87 | --- | 0 | 37 | 10 | 33 | 84 | 573 | 427 | 1191 | 366 |
| 77 | 93 | --- | 1 | 12 | 10 | 36 | 89 | 61 | 67 | 2204 | 474 |
| 82 | 99 | --- | --- | 1 | 2 | 37 | 94 | 16 | 8 | 1452 | 365 |
| --- | --- | | | | | 39 | 99 | 5 | 3 | 288 | 141 |
| --- | --- | | | | | 41 | 104 | 1 | --- | 16 | 19 |
| --- | --- | | | | | 43 | 109 | --- | --- | --- | 2 |
| Total | | 68 | 87 | 69 | 27 | | | 6596 | 8316 | 5817 | 2078 |
| Mean L | | 72 | 69 | 86 | 88 | | | 76 | 72 | 88 | 85 |
| %F | | 44 | | 72 | | | | 44 | | 74 | |
| Cum. Fec.[d] | | 309.4 | | 431.7 | | | | 45396 | | 46759 | |
| Fec/F | | 4550 | | 6257 | | | | 6882 | | 8038 | |
| Fec/F+M | | 1996 | | 4497 | | | | 3044 | | 5923 | |

a. Original measurement: OHL = orbit-hypural length (nearest cm). Frequencies grouped in 5-cm intervals (47 = 45-49, etc.). Source; Ball & Godfrey (1967).

b. FL = fork length. $FL_{mm} = 16.76 + (1.187)(OHL_{mm})$. Source: Ball & Godfrey (1967).

c. Original measurement: FL (nearest lower inch). Frequencies in 2-in intervals (21 = 20-21, etc.). Source: Young & Robinson (1964, Table 8).

d. Fec = fecundity in thousands of ova. Fraser River: log Fec = 1.7392(log $OHL_{mm}$) - 1.1673. (combined 1964-66 data, N = 202) Source; Godfrey (1968, Table XXVI). Columbia River: Fec = 235($FL_{in}$) - 2733. (stratified sample, May-August 1959, N = 62). Source: Galbreath & Ridenhour 1964).

Table 8. Numbers of chinook salmon, by year, month, and mesh size, caught in the Fraser River test fishery, for which fork lengths (L) and scale readings (S) were collected, April-September 1965-66.

| Month | Mesh Size (in) | | | | | | | | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 6.5 | | 7.0 | | 7.5 | | 8.5 | | 9.5 | | | | |
| | L | S | L | S | L | S | L | S | L | S | L | S | %S |
| 1965 | | | | | | | | | | | | | |
| Apr | 4 | 3 | 5 | 3 | 0 | --- | 2 | 0 | 2 | 1 | 13 | 7 | 53.8 |
| May | 36 | 25 | 11 | 8 | 20 | 10 | 16 | 12 | 9 | 6 | 92 | 61 | 66.3 |
| Jun | 40 | 28 | 0 | --- | 35 | 24 | 29 | 18 | 20 | 12 | 124 | 82 | 66.1 |
| Jul | 20 | 10 | 0 | --- | 32 | 17 | 14 | 7 | 20 | 15 | 86 | 49 | 57.0 |
| Aug | 26 | 18 | 3 | 3 | 28 | 25 | 31 | 22 | 12 | 10 | 100 | 78 | 78.0 |
| Sep | 30 | 25 | 0 | --- | 32 | 22 | 43 | 37 | 51 | 41 | 156 | 125 | 80.1 |
| Total | 156 | 109 | 19 | 14 | 147 | 98 | 135 | 96 | 114 | 85 | 571 | 402 | 70.4 |
| 1966 | | | | | | | | | | | | | |
| Apr | 12 | 2 | --- | --- | 13 | 9 | 16 | 4 | 6 | 3 | 47 | 18 | 38.3 |
| May | 15 | 8 | --- | --- | 30 | 20 | 24 | 15 | 10 | 6 | 79 | 49 | 62.0 |
| Jun | 24 | 15 | --- | --- | 45 | 25 | 24 | 15 | 16 | 7 | 109 | 62 | 56.9 |
| Jul | 25 | 15 | --- | --- | 42 | 27 | 47 | 30 | 42 | 26 | 156 | 98 | 62.8 |
| Aug | 26 | 20 | --- | --- | 40 | 29 | 46 | 32 | 24 | 17 | 136 | 98 | 72.1 |
| Sep | 30 | 25 | --- | --- | 33 | 29 | 73 | 63 | 53 | 47 | 189 | 164 | 86.8 |
| Total | 132 | 85 | 0 | --- | 203 | 139 | 230 | 159 | 151 | 106 | 716 | 489 | 68.3 |
| 1965-66 | | | | | | | | | | | | | |
| Apr | 16 | 5 | 5 | 3 | 13 | 9 | 18 | 4 | 8 | 4 | 60 | 25 | 41.7 |
| May | 51 | 33 | 11 | 8 | 50 | 30 | 40 | 27 | 19 | 12 | 171 | 110 | 64.3 |
| Jun | 64 | 43 | 0 | --- | 80 | 49 | 53 | 33 | 36 | 19 | 233 | 144 | 61.8 |
| Jul | 45 | 25 | 0 | --- | 74 | 44 | 61 | 37 | 62 | 41 | 242 | 147 | 60.7 |
| Aug | 52 | 38 | 3 | 3 | 68 | 54 | 77 | 54 | 36 | 27 | 236 | 176 | 74.6 |
| Sep | 60 | 50 | 0 | --- | 65 | 51 | 116 | 100 | 104 | 88 | 345 | 289 | 83.8 |
| Total | 288 | 194 | 19 | 14 | 350 | 237 | 365 | 255 | 265 | 191 | 1287 | 891 | 69.2 |

Table 9. Numbers, by month and year, of chinook salmon collected (T), and numbers for which scales were read (S), in the 1981-87 Fraser River test fishery. (Source: Schubert et al. 1988)

| Month | 1981 | | 1982 | | 1983 | | 1984 | |
|---|---|---|---|---|---|---|---|---|
| | T | S | T | S | T | S | T | S |
| Apr | 31 | 24 | 26 | 17 | 53 | 38 | 32 | 31 |
| May | 98 | 83 | 150 | 108 | 95 | 80 | 87 | 76 |
| Jun | 204 | 181 | 201 | 161 | 227 | 213 | 230 | 220 |
| Jul | 142 | 121 | 268 | 239 | 162 | 154 | 239 | 228 |
| Aug | 159 | 138 | 128 | 110 | 100 | 95 | 136 | 121 |
| Sep | 131 | 122 | 257 | 235 | 187 | 185 | 191 | 188 |
| Oct | 36 | 27 | 17 | 16 | 28 | 27 | 92 | 90 |
| Total | 801 | 696 | 1047 | 886 | 852 | 792 | 1007 | 954 |

| | 1985 | | 1986 | | 1987 | | 1981-87 | | |
|---|---|---|---|---|---|---|---|---|---|
| | T | S | T | S | T | S | T | S | %S |
| Apr | 28 | 24 | 47 | 42 | 114 | 100 | 331 | 276 | 83.4 |
| May | 73 | 59 | 105 | 95 | 367 | 317 | 975 | 818 | 83.9 |
| Jun | 229 | 198 | 189 | 174 | 870 | 769 | 2150 | 1916 | 89.1 |
| Jul | 197 | 179 | 241 | 210 | 581 | 520 | 1830 | 1651 | 90.2 |
| Aug | 144 | 132 | 151 | 134 | 171 | 155 | 989 | 885 | 89.5 |
| Sep | 215 | 213 | 89 | 84 | 113 | 108 | 1183 | 1135 | 95.9 |
| Oct | 59 | 55 | 95 | 92 | 55 | 54 | 382 | 361 | 94.5 |
| Total | 945 | 860 | 917 | 831 | 2271 | 2023 | 7840 | 7042 | 89.8 |

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Figure 1. Statistical areas for salmon catches along the coast of British Columbia.
(Figure 9 in Fraser et al. 1982)

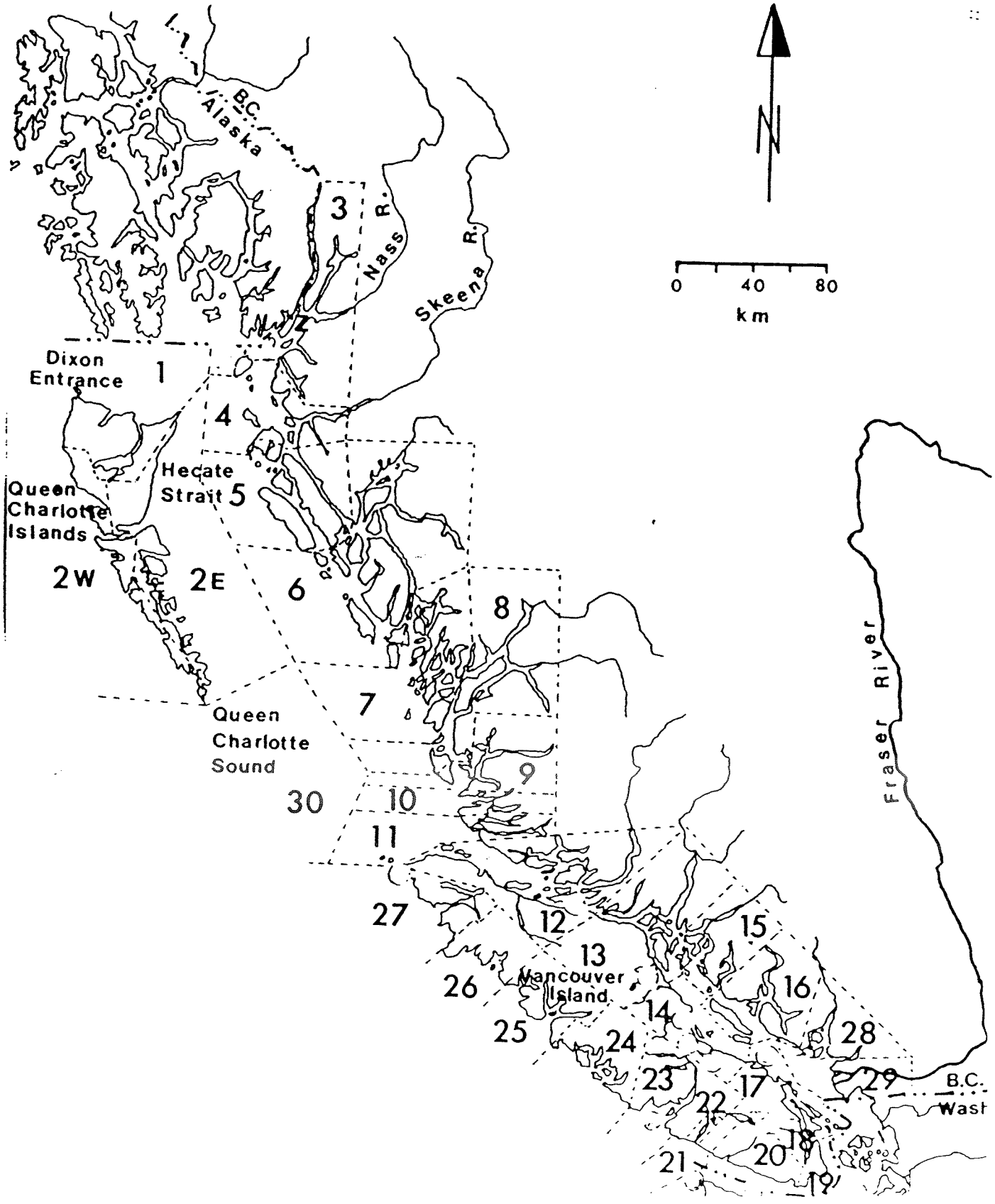


Figure. 2. Test-fishing sites on the lower Fraser River. (From Figure 10 in Fraser et al. 1982)

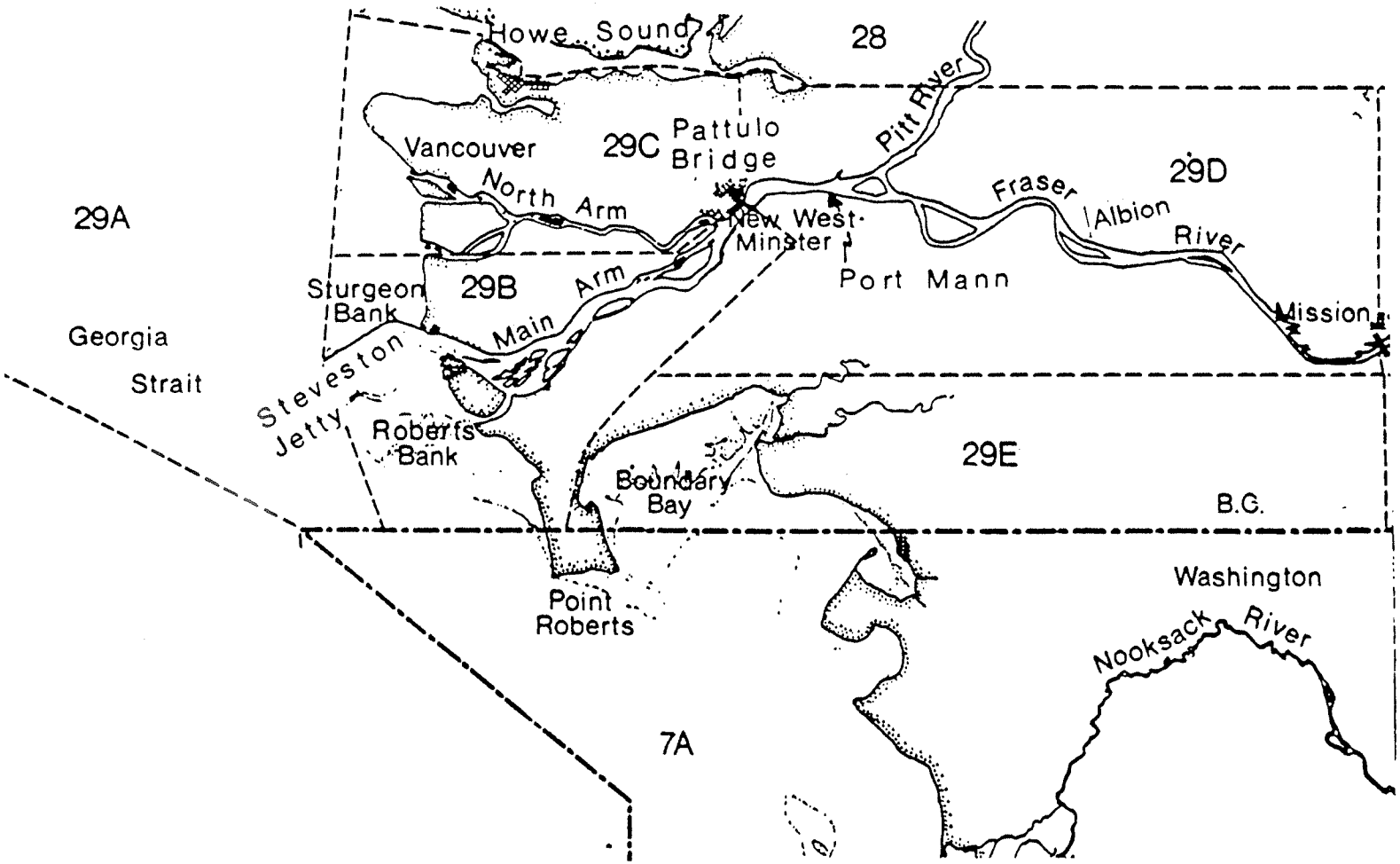


Figure 3. Percent, by month and five-year period, of mean annual numbers of chinook salmon landed by the commercial gillnet fishery in the lower Fraser River, March-December 1952-94. (Source: Appendix table 1)

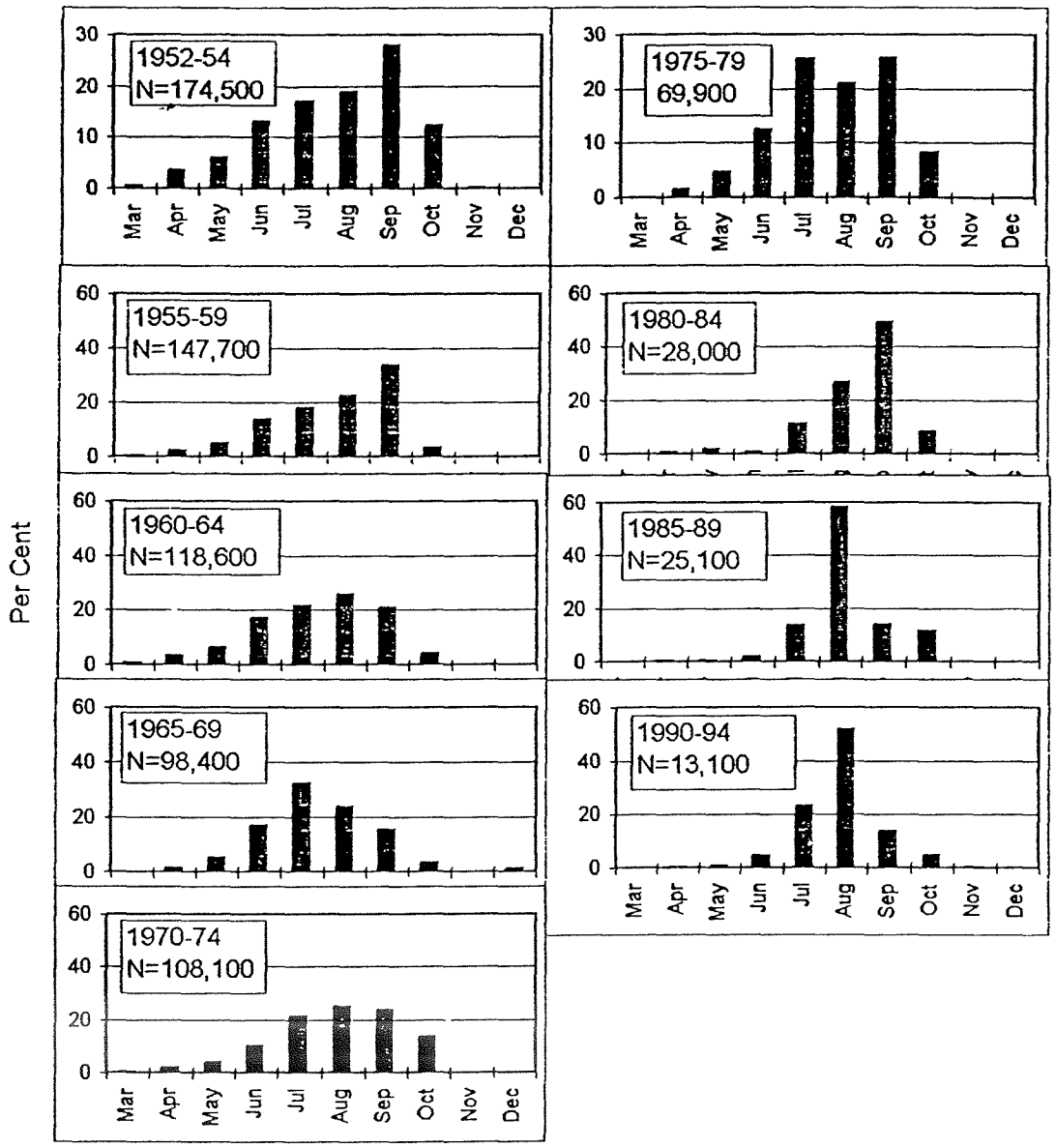


Figure 4. Landings (nos.), by month, of chinook, sockeye, pink, and coho salmon from the commercial gillnet fishery in the lower Fraser River, May-September 1964-66 and 1969. (Source: Appendix table 2)

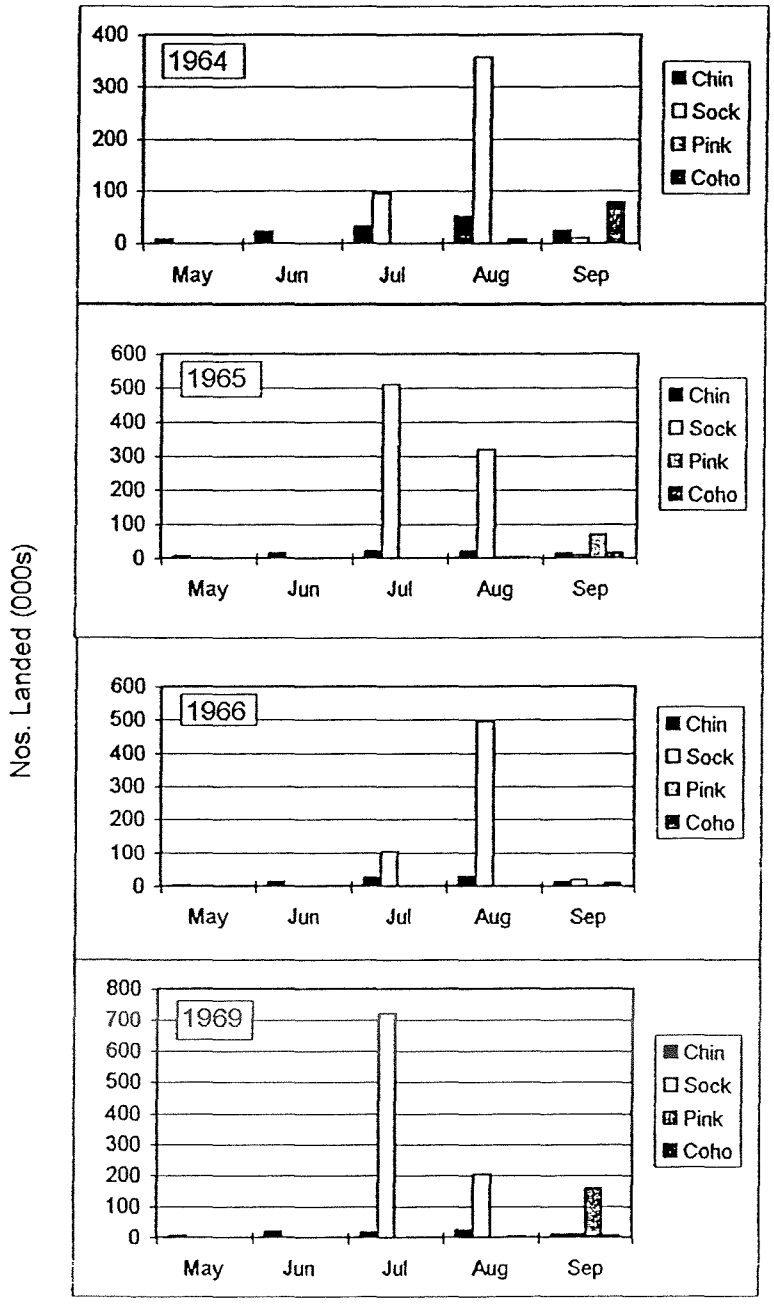


Figure 5. Mean incidence (%) of red-flesh chinook salmon in the landings from the commercial gillnet fishery in the lower Fraser River, May-September 1959-66 and 1969: A. by month and year; B. by month (years combined). (Source: Appendix table 3.

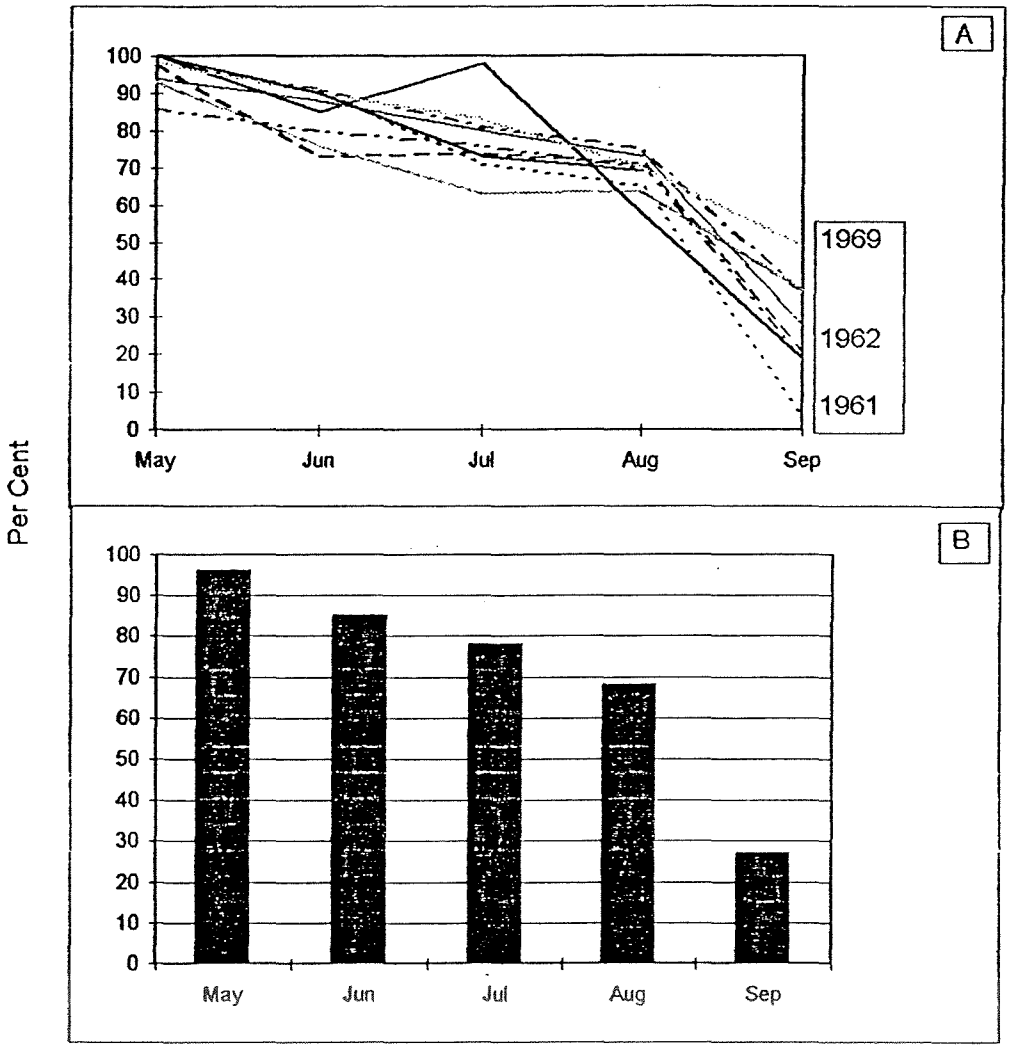


Figure 6. Mean orbit-hypural length (cm), by flesh color, sex, year, and ocean age, of chinook salmon in the landings from the commercial gillnet fishery in the lower Fraser River, July and August-September 1964-66 and 1969. (Source: Appendix table 4)

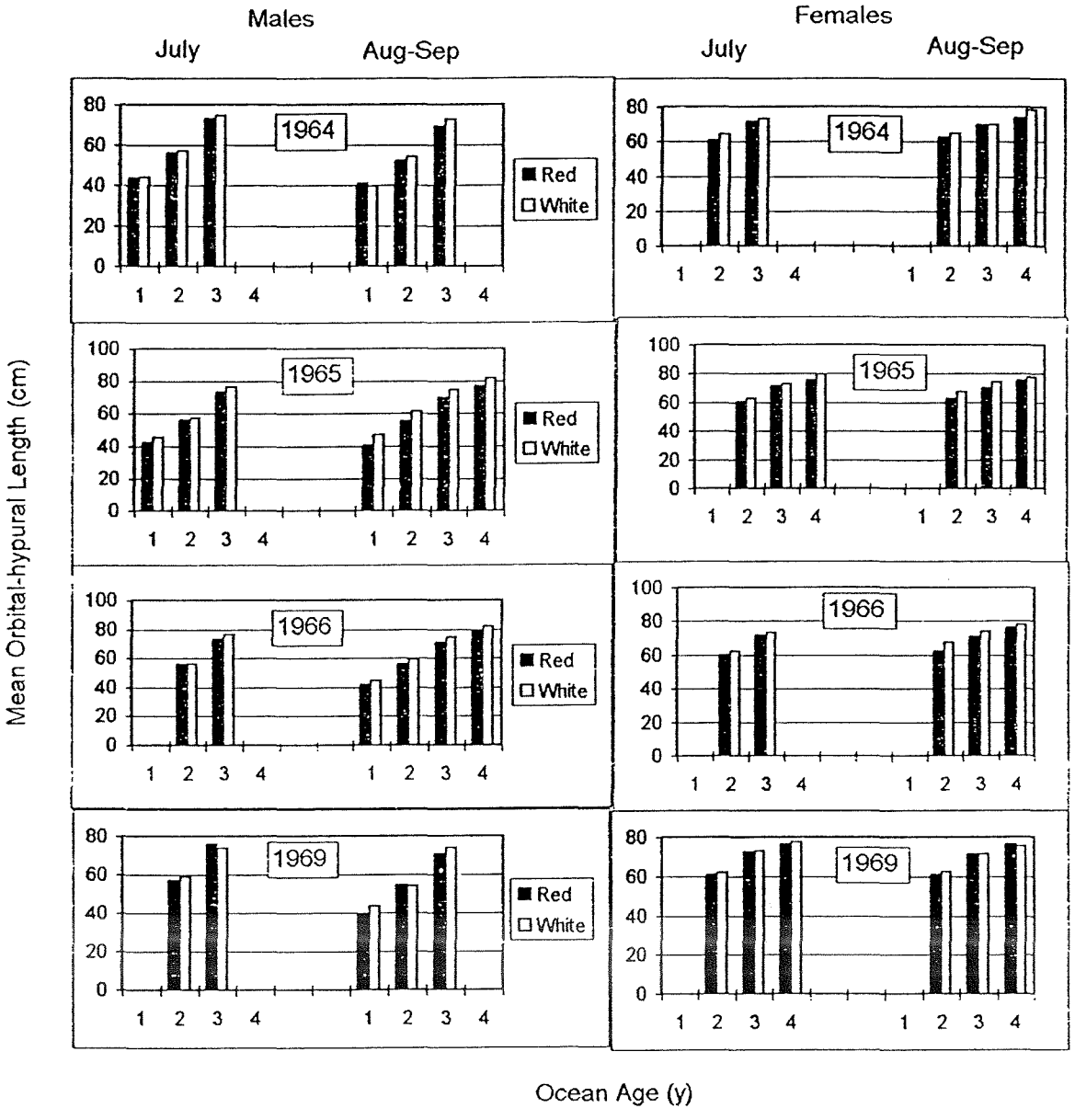


Figure 7. Mean incidence (%) of chinook salmon with stream-type scales in the landings from the commercial gillnet fishery in the lower Fraser River, May-September 1959-66 and 1969: A. by month and year; B. by month (years combined). (Source: Appendix table 4)

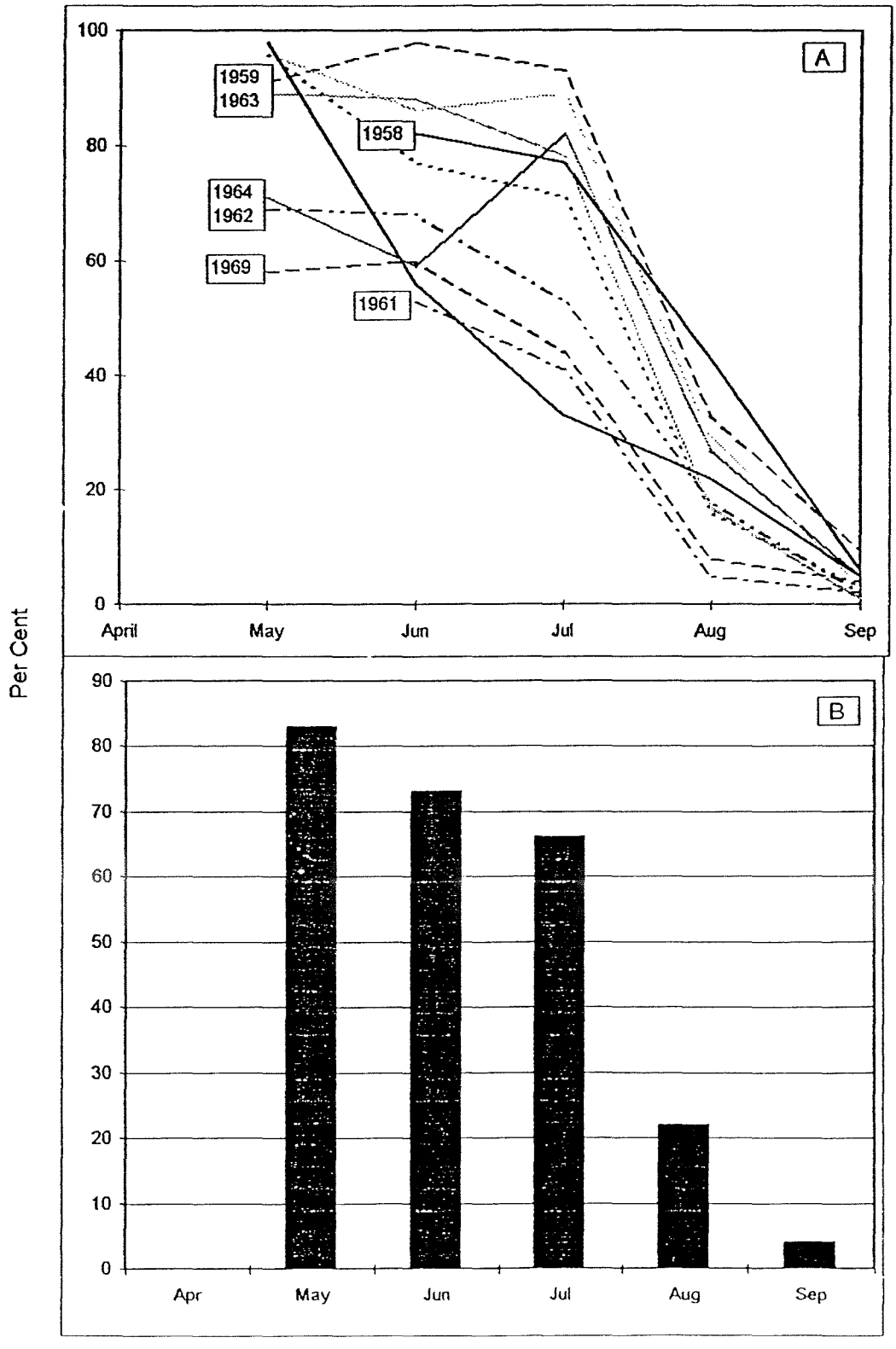


Figure 8. Incidence (%), by month, of chinook salmon with stream-type scales in the landings from the commercial fishery in the Columbia River (primarily the lower portion), May-September 1919. (Figure 12 in Rich 1926)

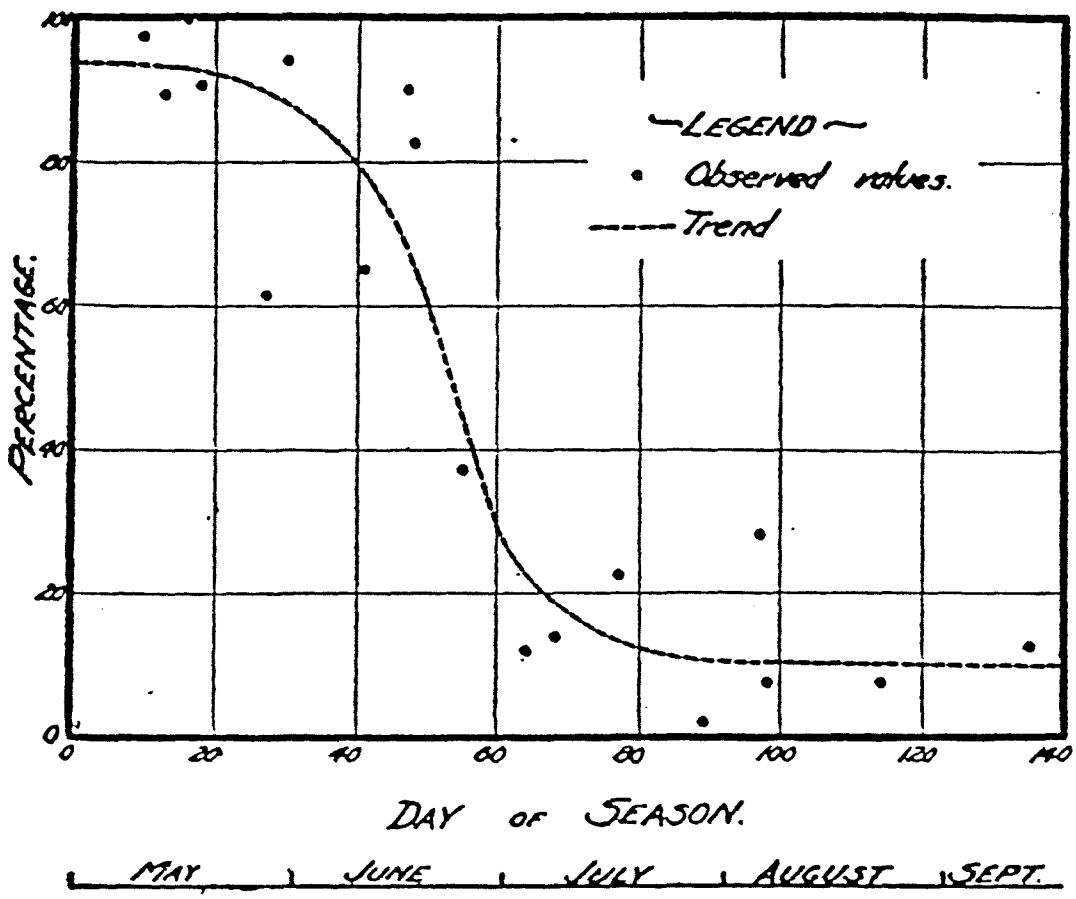


Figure 9. Ocean-age-frequencies (%), by month and year, of chinook salmon in the landings from the commercial gillnet fishery of the lower Fraser River, May-September 1958-63. (Source: Appendix table 5)

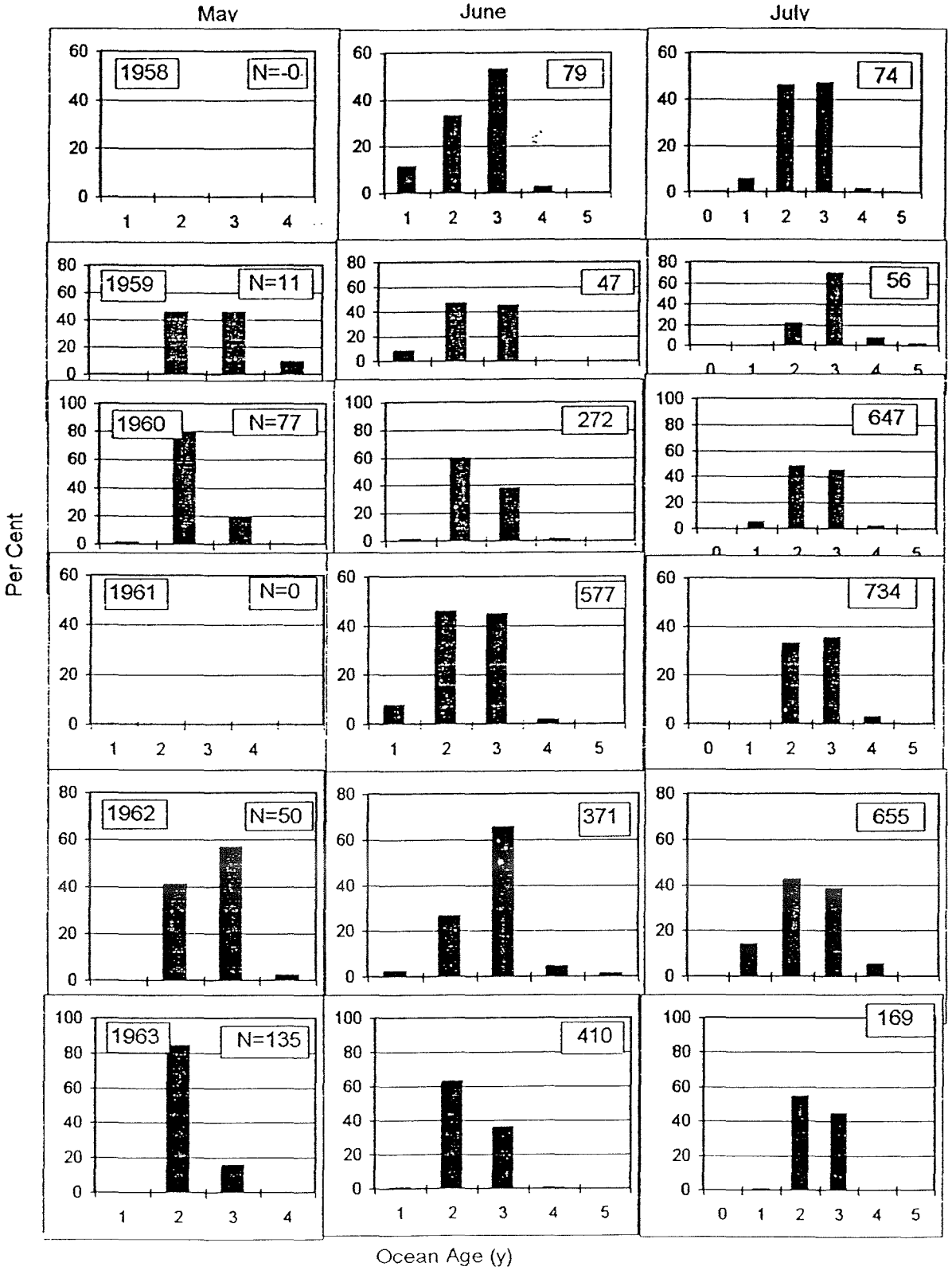


Fig. 9 (cont.)

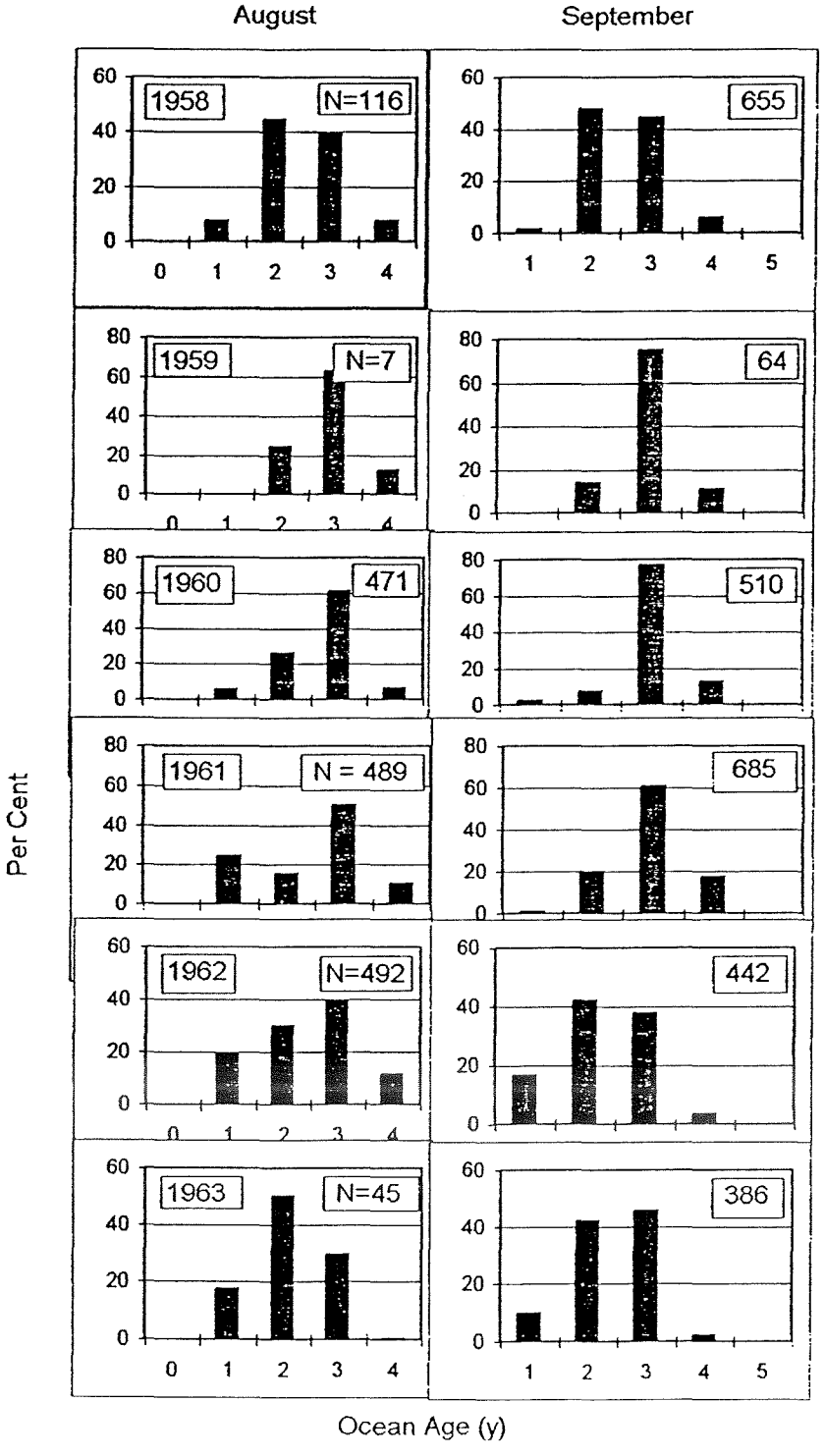

August
September
1958
N=116
655
1959
N=7
64
1960
471
510
1961
N = 489
685
1962
N=492
442
1963
N=45
386
Per Cent
Ocean Age (y)

Figure 10. Ocean-age-frequencies (%), by month and year, of chinook salmon in the landings from the commercial gillnet fishery of the lower Fraser River, May-September 1964-66 and 1969. (Source: Appendix table 5)

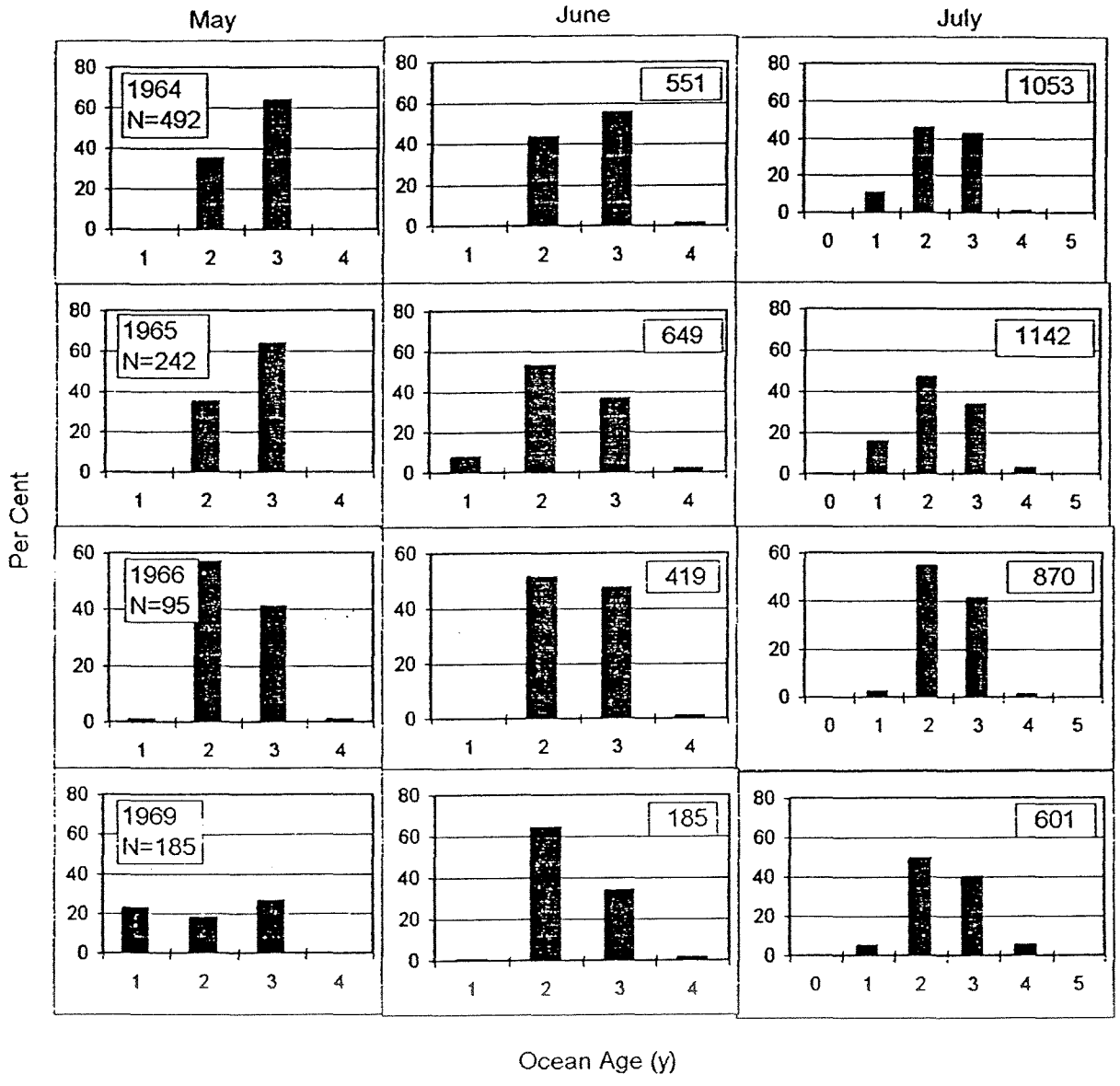


Fig. 10 (cont.)

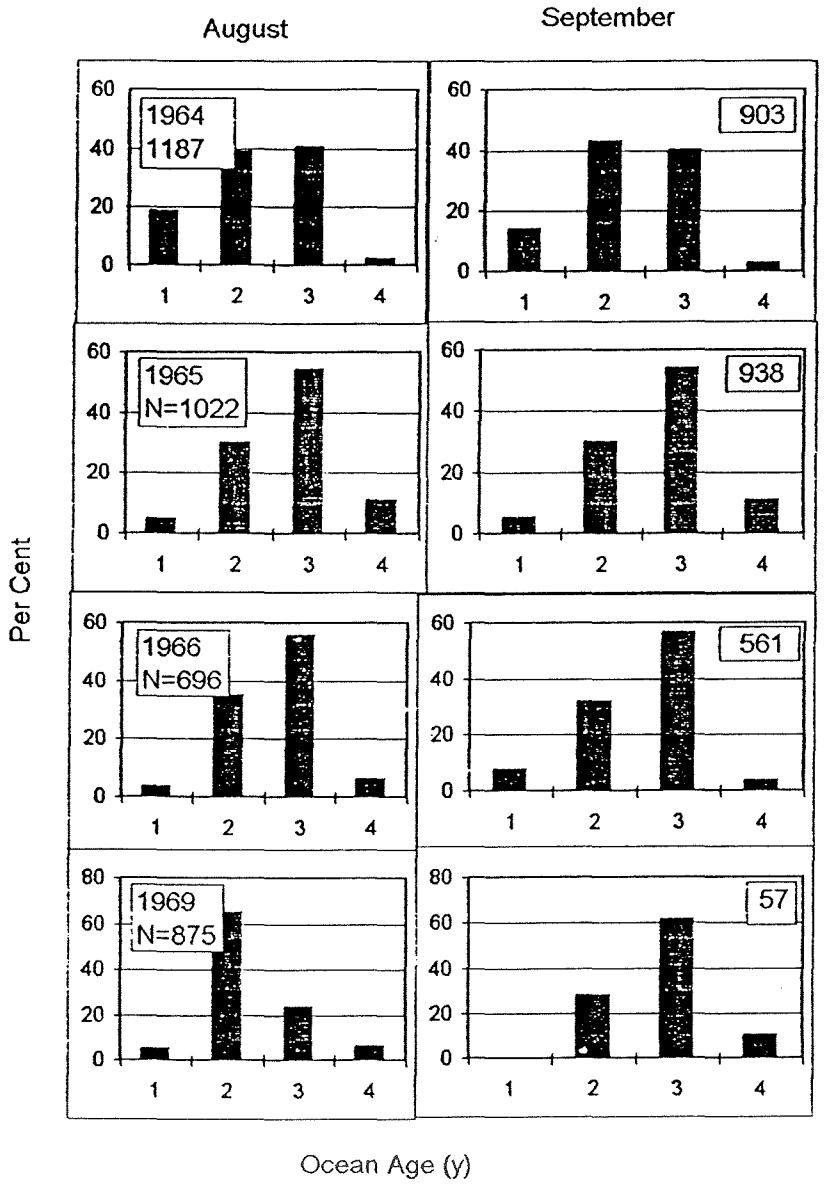

August
September
1964
1187
903
1965
N=1022
938
1966
N=696
561
1969
N=875
57
Per Cent
Ocean Age (y)

Figure 11. Ocean-age-frequencies (%), by month, year, and flesh color, of chinook salmon in the landngs from the commercial gillnet fishery of the lower Fraser River, June-September 1960-63. (Source: Appendix table 6)

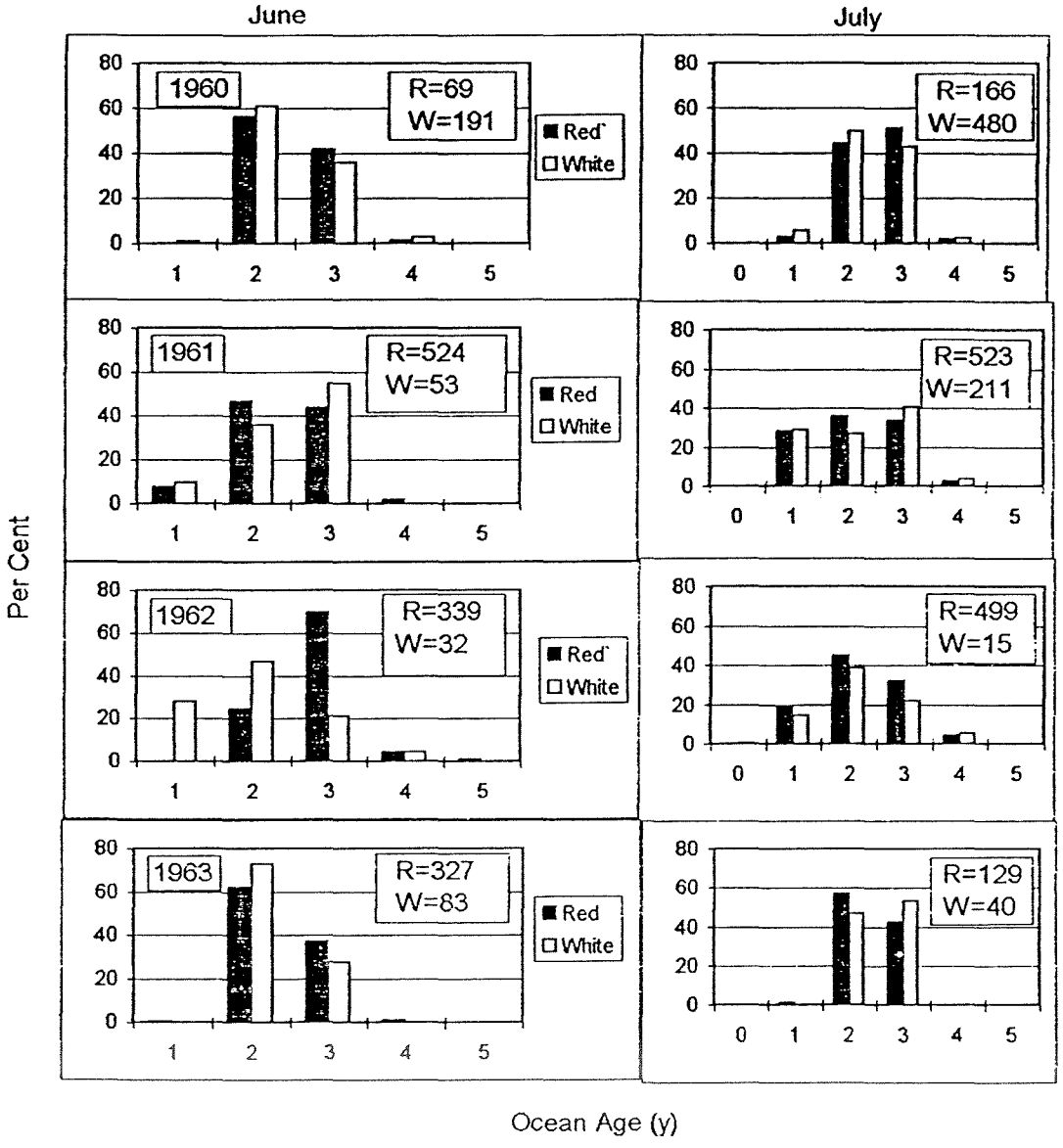


Fig. 11 (cont.)

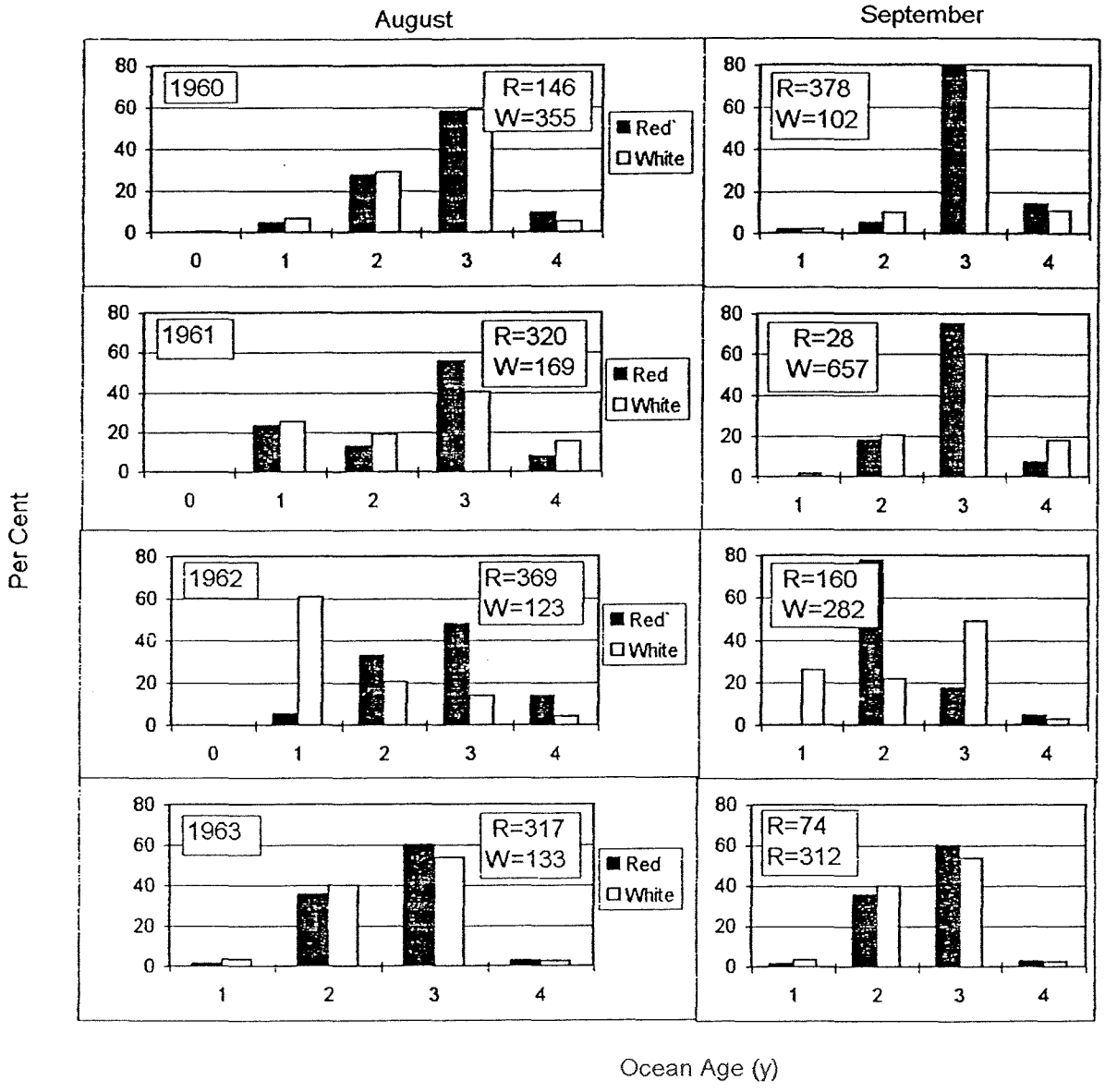

August
September
1960
R=146
W=355
R=378
W=102
1961
R=320
W=169
R=28
W=657
1962
R=369
W=123
R=160
W=282
1963
R=317
W=133
R=74
R=312
Red
White
Per Cent
Ocean Age (y)

Figure 12. Ocean-age-frequencies (%), by month, year, and flesh color, of chinook salmon in the landings from the commercial gillnet fishery in the lower Fraser River, June-September 1964-66 and 1969. (Source Appendix table 7)

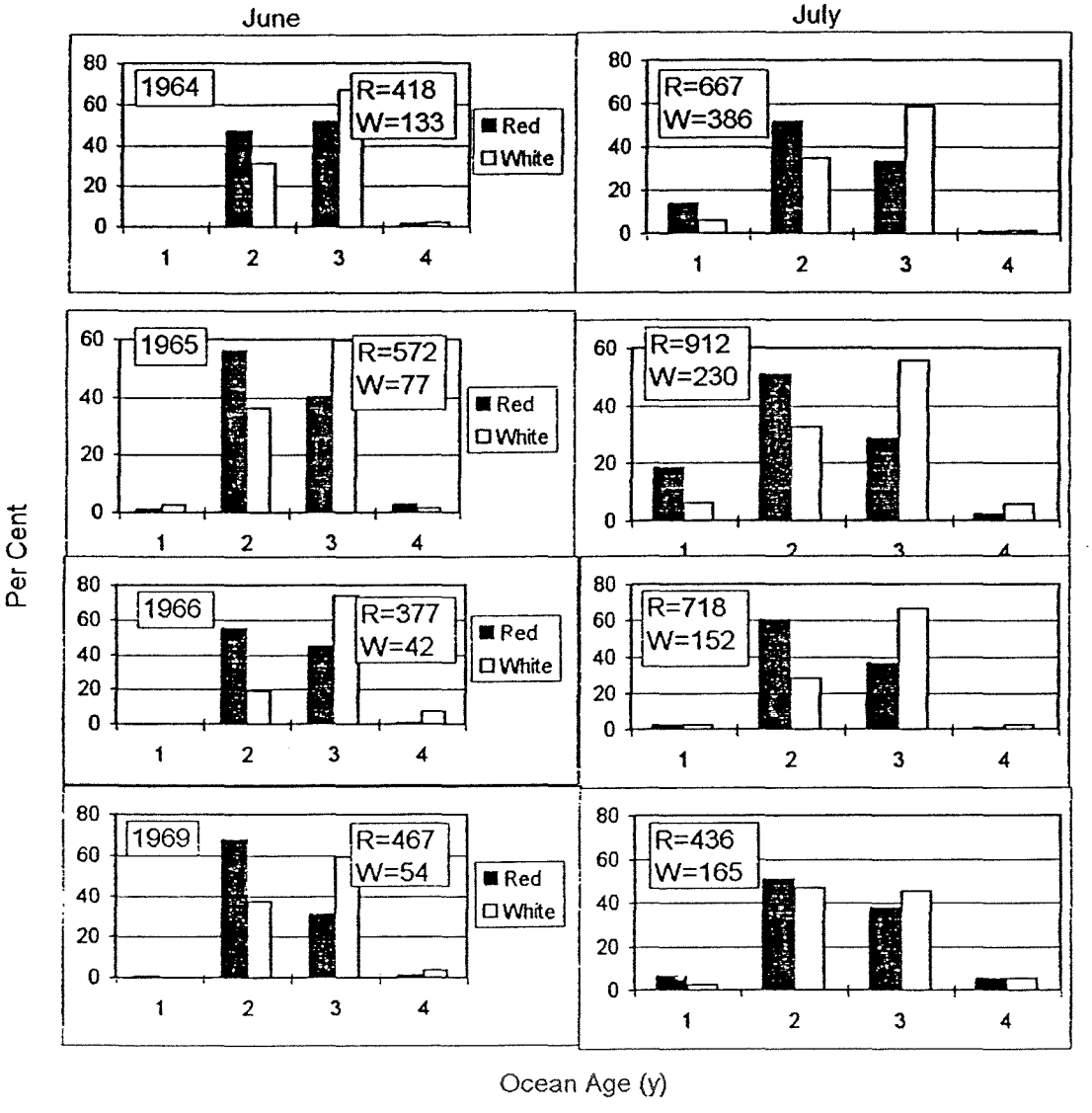


Fig. 12 (cont.)

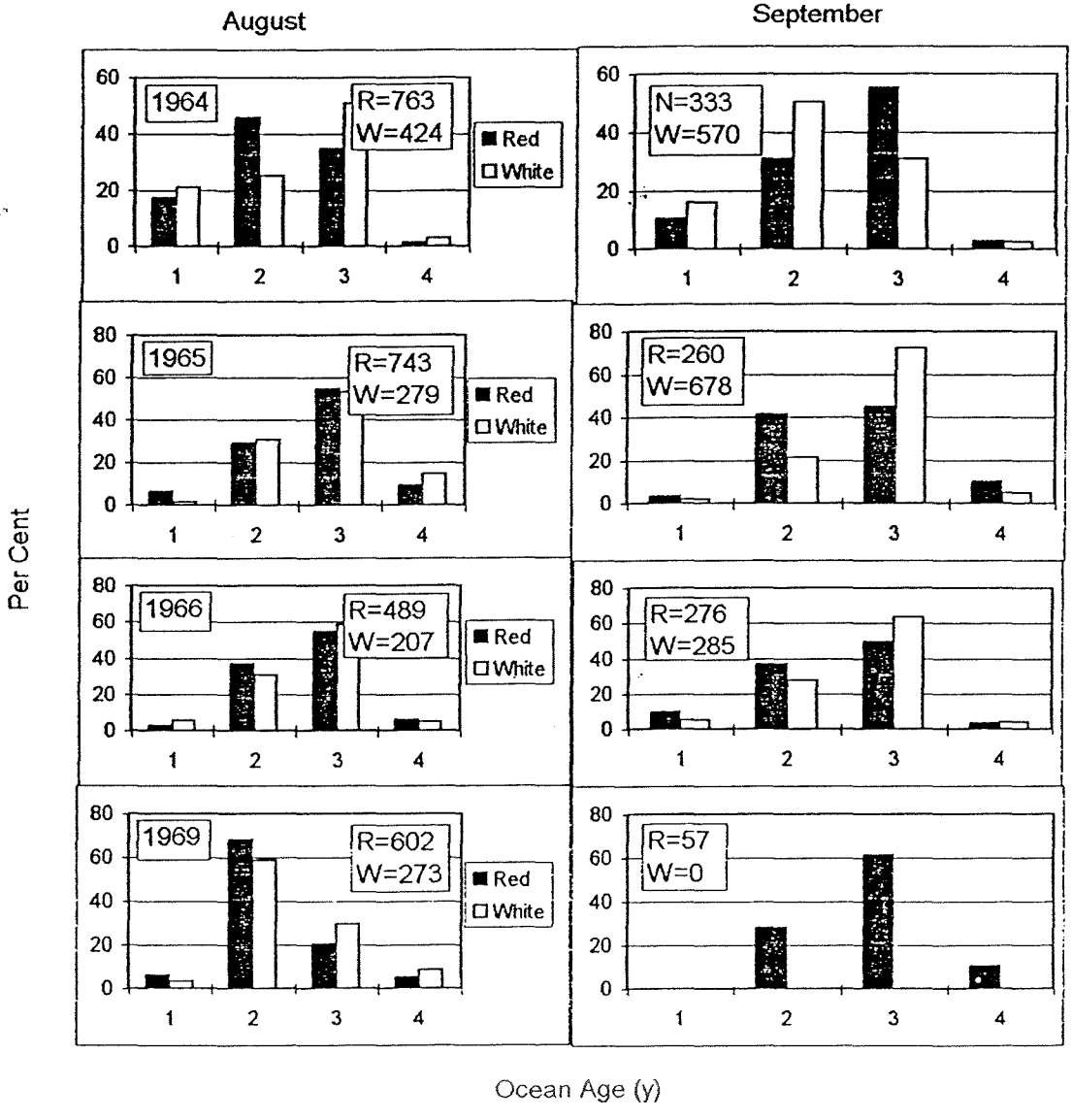

August
September
1964
R=763
W=424
Red
White
N=333
W=570
1965
R=743
W=279
R=260
W=678
1966
R=489
W=207
R=276
W=285
1969
R=602
W=273
R=57
W=0
Per Cent
Ocean Age (y)

Figure 13. Sex ratio (% females), by month, flesh color, and ocean age, of chinook salmon in the landings from the commercial gillnet fishery in the lower Fraser River, May-September 1964-66 and 1969. (Source; Appendix table 9)

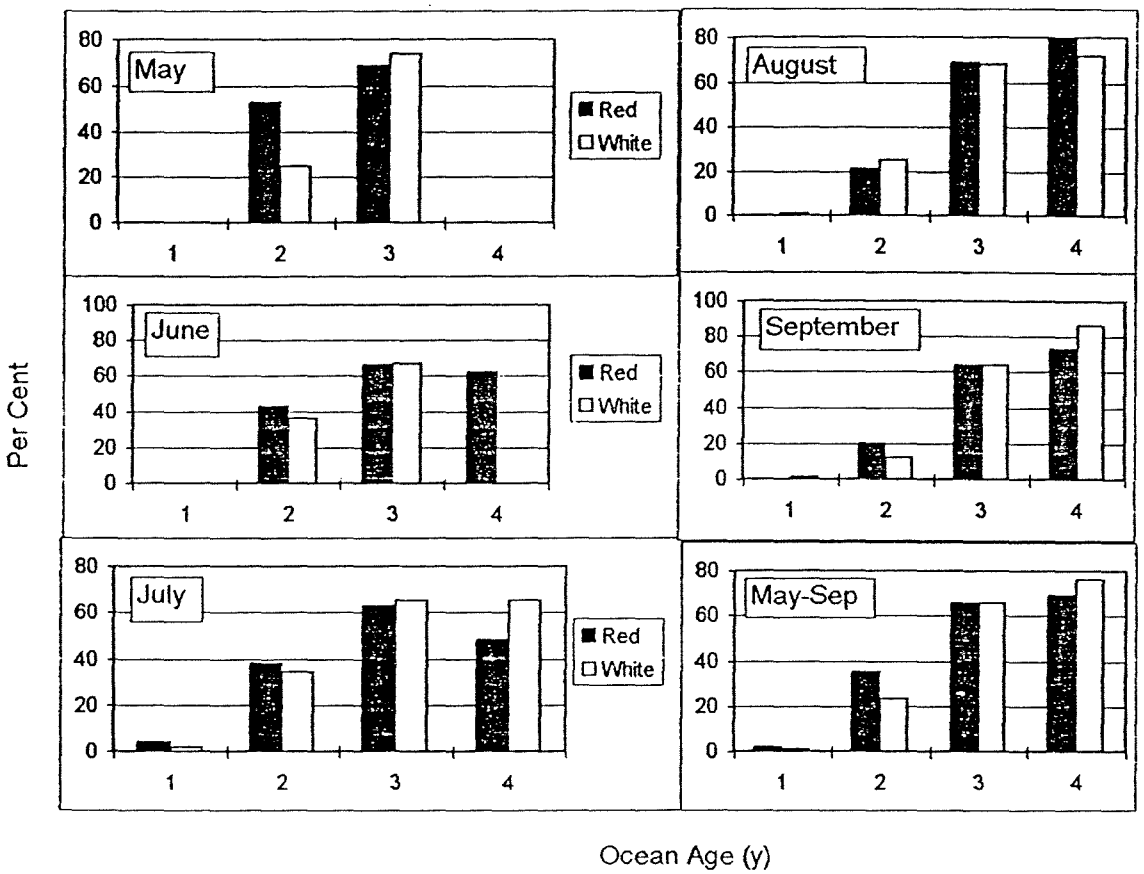


Figure 14. Ocean-age-frequencies (%), by mesh size and year (months combined) of chinook salmon in the catch of the test fishery in the lower Fraser River, April-September 1965-66. (Sources: Appendix tables 10 and 11)

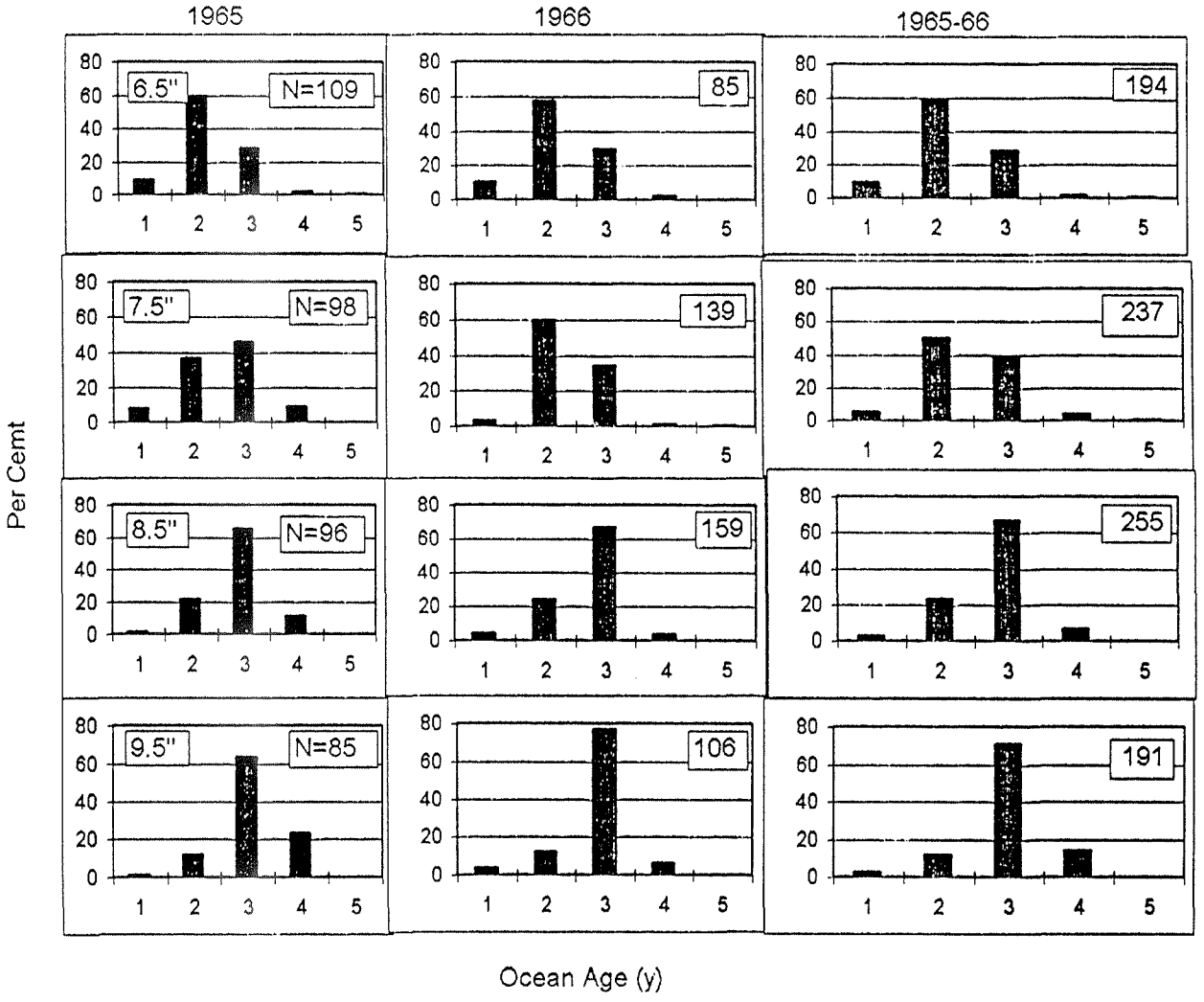


Figure 15. Length-frequencies (%), by mesh size and year (months combined), of chinook salmon in the catch of the test fishery on the lower Fraser River, April-September 1965-66. (Sources: Appendix tables 12 and 13)

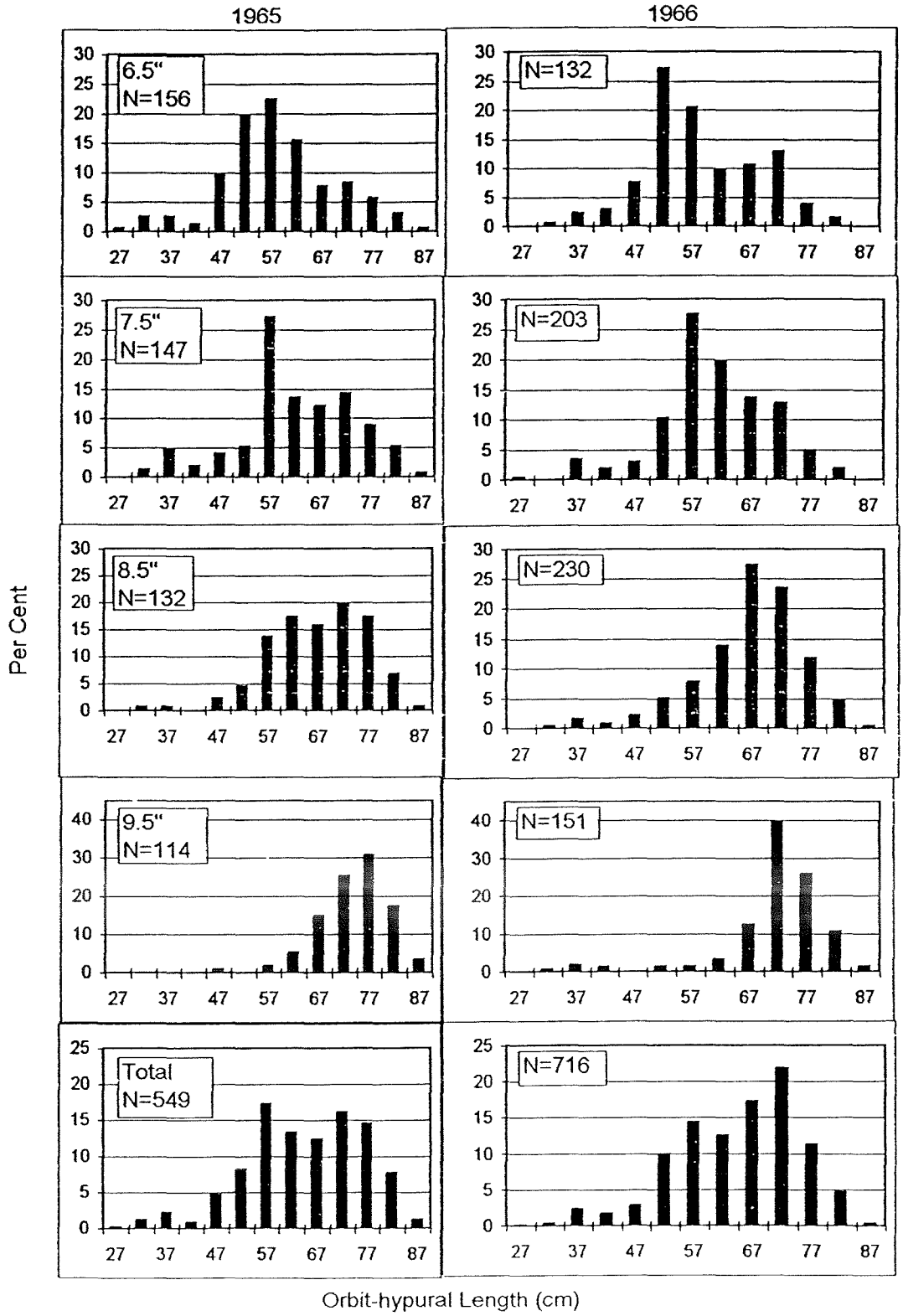


Figure 16. Ocean-age-frequencies (%), by month, of chinook salmon in the landings from the commercial gillnet fishery (C), and in the catch of the test fishery (T), in the lower Fraser River, April-September 1965. (Sources: Appendix tables 5 and 10)

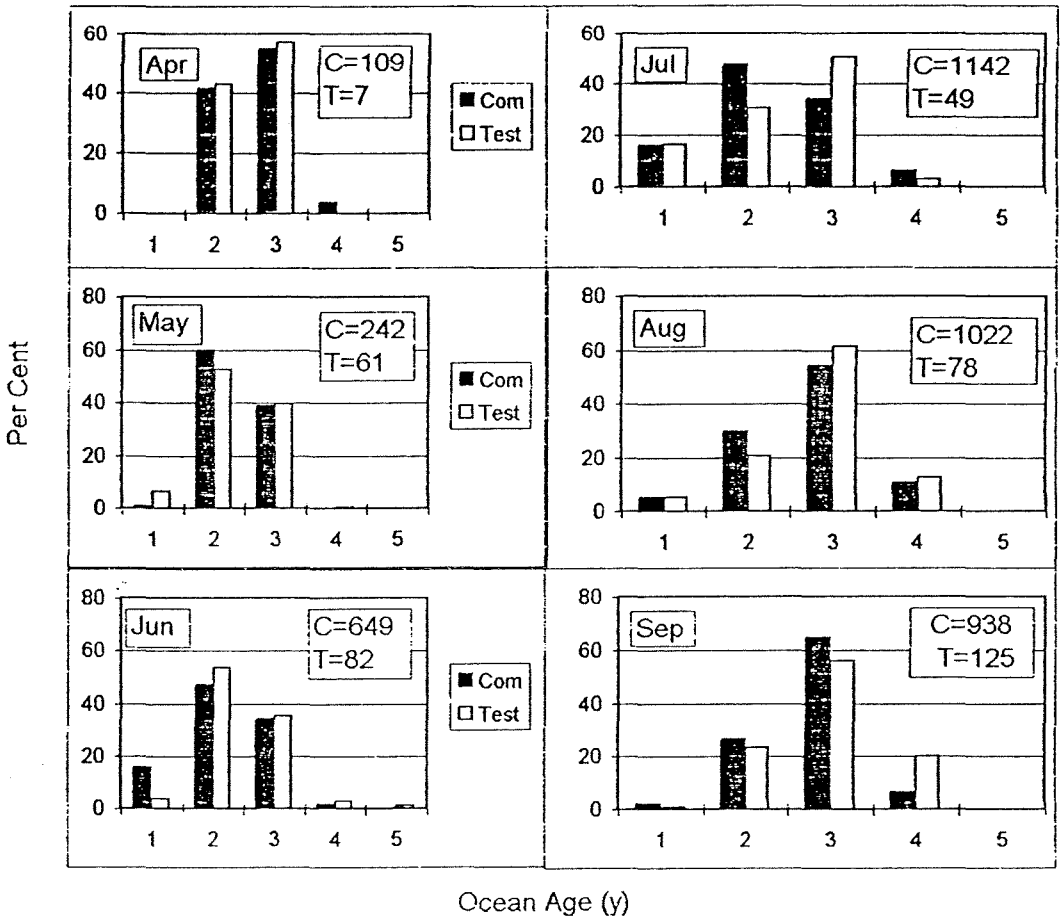


Figure 17. Ocean-age-frequencies (%), by month, of chinook salmon in the landings from the commercial gillnet fishery (C), and in the catch of the test fishery (T), in the lower Fraser River, April-September 1966. (Sources: Appendix tables 5 and 11)

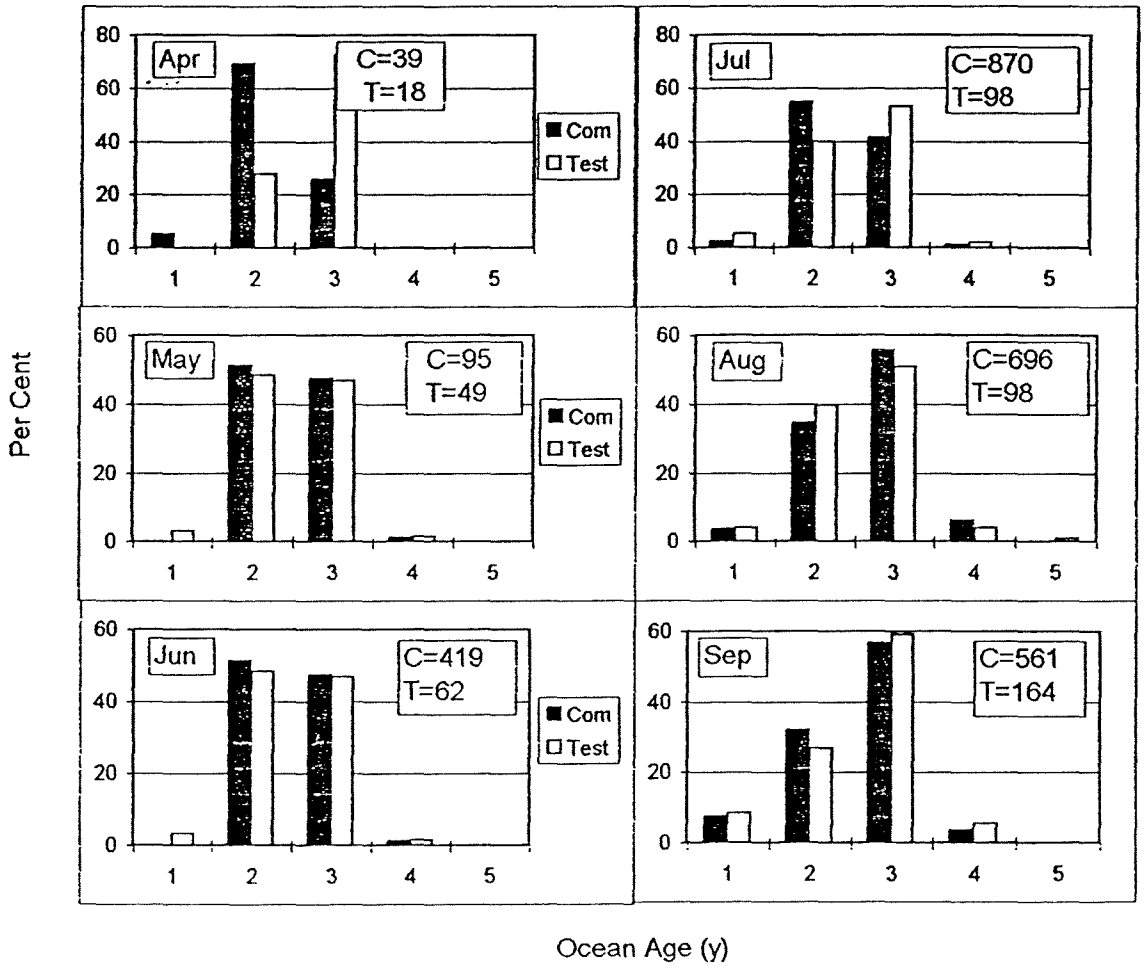


Figure 18. Mean ocean-age-frequencies (%), by month (years combined), of chinook salmon in the catch of the test fishery on the lower Fraser River, April-October 1981-87. (Source: Appendix table 15)

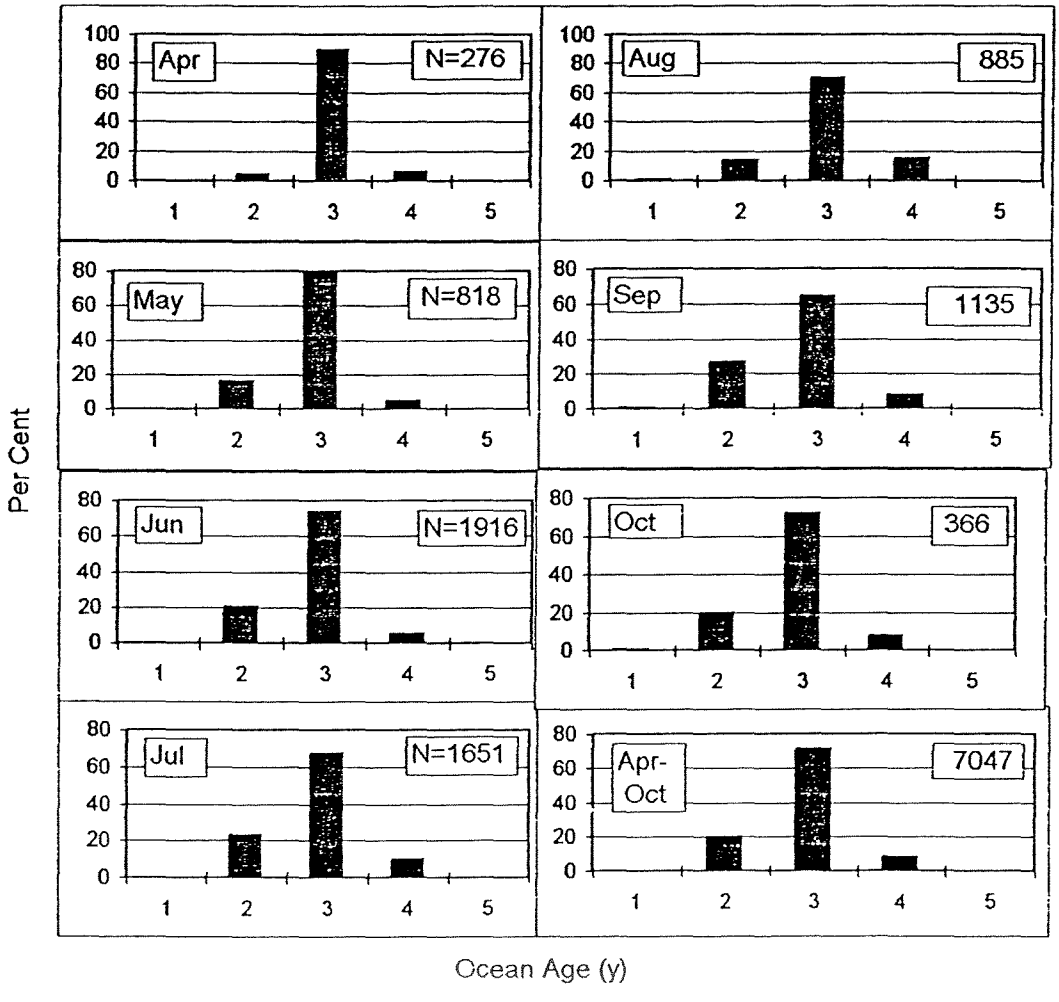


Figure 19. Ocean-age-3 chinook salmon caught in the 8.5" and 9.5" meshes of the test-fishery net in the lower Fraser River, 1965-66: A. length-frequencies (%), by mesh size, May-September; B. mean orbit-hypural lengths (cm), by month and mesh size (boxes contain numbers sampled: 8.5"/9.5"). (Source: Appendix table 16)

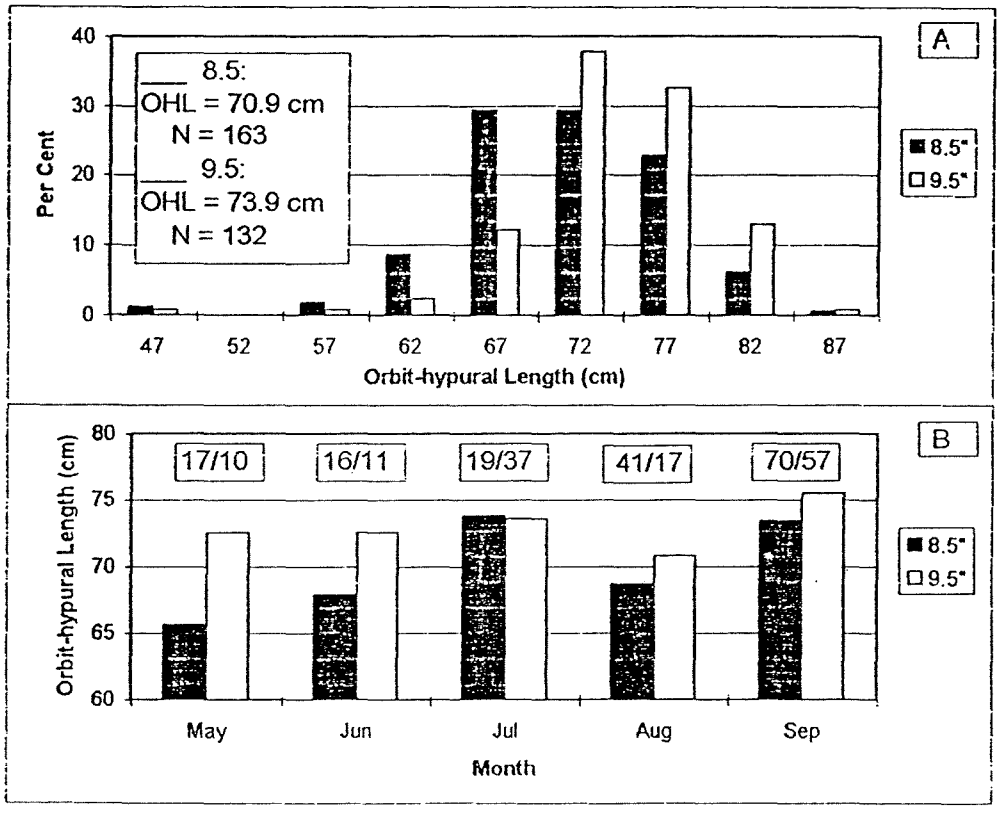
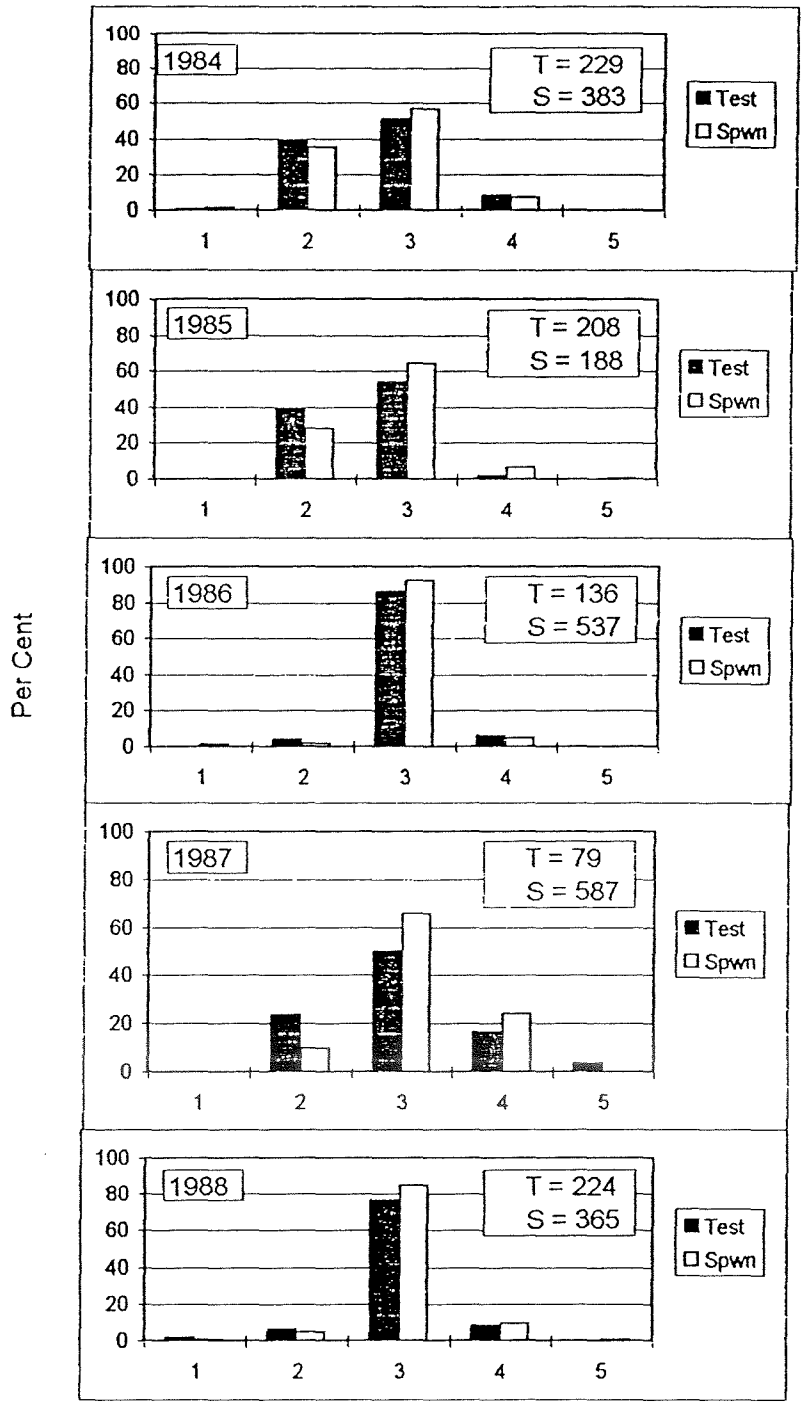


Figure 20. Age-frequencies (%), by year, of white-flesh chinook salmon, with ocean-type scales, in the test-fishery catch (T) on the lower Fraser River durng Septembr-October, and on spawning grunds (S) in the Harrison River, 1984-88. (Source: Appendix table 17)



Appendix table 1. Mean annual numbers, by month and 5-year period, of chinook salmon landed from the commercial gillnet fishery in the lower Fraser River, March-December 1952-94.

| Period | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1952-54 | | | | | | | | | | | |
| Mean | 1118 | 6220 | 10670 | 22900 | 29987 | 33135 | 48627 | 21383 | 336 | 122 | 174498 |
| % | .6 | 3.6 | 6.1 | 13.1 | 17.2 | 19.0 | 27.9 | 12.3 | .2 | .1 | 100 |
| 1955-59 | | | | | | | | | | | |
| Mean | 601 | 3695 | 7554 | 20598 | 26805 | 33432 | 49928 | 4940 | 136 | 37 | 147726 |
| % | .4 | 2.5 | 5.1 | 13.9 | 18.1 | 22.6 | 33.8 | 3.3 | .1 | .0 | 100 |
| 1960-64 | | | | | | | | | | | |
| Mean | 671 | 3956 | 7699 | 20207 | 25863 | 30610 | 24498 | 4951 | 83 | 61 | 118599 |
| % | .6 | 3.3 | 6.5 | 17.0 | 21.8 | 25.8 | 20.7 | 4.2 | .1 | .1 | 100 |
| 1965-69 | | | | | | | | | | | |
| Mean | 138 | 1473 | 5092 | 16688 | 31994 | 23309 | 15100 | 3310 | 30 | 1238 | 98372 |
| % | .1 | 1.5 | 5.2 | 17.0 | 32.5 | 23.7 | 15.3 | 3.4 | .0 | 1.3 | 100 |
| 1970-74 | | | | | | | | | | | |
| Mean | 203 | 2132 | 4338 | 10883 | 23009 | 26936 | 25609 | 14799 | 147 | 4 | 108060 |
| % | .2 | 2.0 | 4.0 | 10.1 | 21.3 | 24.9 | 23.7 | 13.7 | .1 | .0 | 100 |
| 1975-79 | | | | | | | | | | | |
| Mean | 25 | 1069 | 3335 | 8809 | 17986 | 14707 | 18086 | 5837 | 5 | 2 | 69861 |
| % | .0 | 1.5 | 4.8 | 12.6 | 25.7 | 21.1 | 25.9 | 8.4 | .0 | .0 | 100 |
| 1980-84 | | | | | | | | | | | |
| Mean | 0 | 179 | 553 | 241 | 3192 | 7562 | 13835 | 2389 | 6 | 1 | 27958 |
| % | 0 | .6 | 2.0 | .9 | 11.4 | 27.0 | 49.5 | 8.5 | .0 | .0 | 100 |
| 1985-89 | | | | | | | | | | | |
| Mean | 0 | 66 | 133 | 488 | 3378 | 14648 | 3474 | 2873 | 20 | 3 | 25083 |
| % | 0 | .3 | .5 | 1.9 | 13.5 | 58.4 | 13.9 | 11.5 | .1 | .0 | 100 |
| 1990-94 | | | | | | | | | | | |
| Mean | 0 | 39 | 85 | 585 | 3047 | 6762 | 1834 | 670 | 54 | 1 | 13077 |
| % | 0 | .3 | .6 | 4.5 | 23.3 | 51.7 | 14.0 | 5.1 | .4 | .0 | 100 |

Appendix table 2. Annual numbers of salmon landed, by month, week, and species, from the commercial gillnet fishery in the lower Fraser River, May-September 1964-66, and 1969. (Chinook categories: red flesh; white flesh; jack.)

| Year | MM | WW | Chinook | | | | Sockeye | Pink | Coho | Chum |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Red | White | Jack[a] | Total | | | | |
| 1964 | May | 1 | 1531 | 40 | 0 | | -- | -- | -- | -- |
| | | 2 | 1145 | 29 | 2 | | 1 | -- | -- | -- |
| | | 3 | 1874 | 70 | 1 | | -- | -- | -- | -- |
| | | 4 | 3059 | 138 | 2 | | -- | -- | -- | -- |
| | | T | 7609 | 277 | 5 | 7891 | 1 | 0 | 0 | 0 |
| | Jun | 1 | 1985 | 102 | 2 | | -- | -- | -- | -- |
| | | 2 | 2846 | 183 | 0 | | -- | -- | -- | -- |
| | | 3 | 6520 | 511 | 8 | | 1 | -- | -- | -- |
| | | 4 | 9050 | 1183 | 12 | | 32 | -- | 2 | -- |
| | | T | 20401 | 1979 | 22 | 22402 | 33 | 0 | 2 | 0 |
| | Jul | 1 | 8038 | 1819 | 20 | | 532 | 1 | 2 | 11 |
| | | 2 | 4468 | 1702 | 1 | | 625 | 0 | 0 | 1 |
| | | 3 | 2308 | 1142 | 336 | | 2440 | 0 | 8 | 1 |
| | | 4 | 5670 | 3066 | 631 | | 15773 | 25 | 19 | 4 |
| | | 5 | 7186 | 3557 | 1955 | | 76165 | 24 | 158 | 4 |
| | | T | 19632 | 9467 | 2923 | 32022 | 95003 | 49 | 185 | 10 |
| | Aug | 1 | 4860 | 2089 | 2150 | | 164857 | 56 | 430 | 15 |
| | | 2 | 8586 | 3147 | 6637 | | 131788 | 57 | 752 | 105 |
| | | 3 | 6347 | 2329 | 2689 | | 36036 | 29 | 1180 | 89 |
| | | 4 | 5533 | 3080 | 3589 | | 23504 | 25 | 5829 | 123 |
| | | T | 25326 | 10645 | 15065 | 51036 | 356185 | 167 | 8191 | 332 |
| | Sep | 1 | 2471 | 2580 | 2455 | | 6431 | 42 | 16470 | 158 |
| | | 2 | 1312 | 5239 | 1892 | | 3012 | 29 | 30436 | 261 |
| | | 3 | 12 | 122 | 1 | | 8 | 0 | 151 | 18 |
| | | 4 | 505 | 6454 | 624 | | 1331 | 1 | 30255 | 4809 |
| | | T | 4300 | 14395 | 4972 | 23667 | 10782 | 72 | 77312 | 5246 |
| 1964 | May-Sep | GT | 77268 | 36763 | 22987 | 137018 | 462004 | 288 | 85690 | 5588 |
| 1965 | May | 1 | 416 | 10 | 5 | | -- | -- | -- | -- |
| | | 2 | 1386 | 31 | 6 | | -- | -- | -- | -- |
| | | 3 | 1075 | 26 | 3 | | -- | -- | -- | -- |
| | | 4 | 1745 | 78 | 12 | | -- | -- | -- | -- |
| | | T | 4622 | 145 | 26 | 4793 | 0 | 0 | 0 | 0 |

Appemdix table 2 (cont.)

| Year | MM | WW | Chinook | | | | Sockeye | Pink | Coho | Chum |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Red | White | Jack[a] | | | | | |
| 1965 | Jun | 1 | 1638 | 73 | 3 | | -- | -- | -- | -- |
| | | 2 | 3180 | 220 | 20 | | 1 | -- | -- | -- |
| | | 3 | 4379 | 460 | 18 | | 2 | -- | -- | -- |
| | | 4 | 4852 | 680 | 33 | | 414 | -- | -- | -- |
| | | T | 14049 | 1433 | 74 | 15556 | 417 | 0 | 0 | 0 |
| | Jul | 1 | 4713 | 1172 | 744 | | 20596 | 0 | 15 | 4 |
| | | 2 | 3017 | 1060 | 949 | | 42159 | 5 | 143 | 2 |
| | | 3 | 2288 | 976 | 746 | | 24365 | 22 | 320 | 2 |
| | | 4 | 3820 | 1908 | 2454 | | 107618 | 207 | 477 | 3 |
| | | 5 | 2368 | 1162 | 2210 | | 336244 | 559 | 447 | 4 |
| | | T | 11493 | 5106 | 6359 | 22958 | 510386 | 793 | 1387 | 11 |
| | Aug | 1 | 2735 | 1028 | 1753 | | 237196 | 418 | 433 | 92 |
| | | 2 | 3930 | 1516 | 2963 | | 61105 | 1488 | 644 | 5 |
| | | 3 | 3352 | 1015 | 1141 | | 17513 | 1593 | 845 | 6 |
| | | 4 | 1474 | 728 | 330 | | 3900 | 750 | 2034 | 11 |
| | | T | 11491 | 4287 | 6187 | 21965 | 319714 | 4249 | 3956 | 114 |
| | Sep | 1 | 2166 | 1959 | 483 | | 4693 | 5093 | 8272 | 24 |
| | | 2 | 1010 | 5369 | 65 | | 436 | 5985 | 2656 | 56 |
| | | 3 | 8 | 90 | 2 | | 12 | 977 | 108 | 4 |
| | | 4 | 368 | 3391 | 171 | | 4466 | 57737 | 3873 | 443 |
| | | T | 3552 | 10809 | 721 | 15082 | 9607 | 69792 | 14909 | 527 |
| 1965 | May-Sep | GT | 45207 | 21780 | 13367 | 80354 | 840124 | 74834 | 20252 | 652 |
| 1966 | May | 1 | 882 | 14 | 9 | | -- | -- | -- | -- |
| | | 2 | 356 | 19 | 1 | | -- | -- | -- | -- |
| | | 3 | 759 | 7 | 2 | | -- | -- | -- | -- |
| | | 4 | 1471 | 40 | 15 | | 1 | -- | -- | -- |
| | | T | 3468 | 80 | 27 | 3575 | 1 | 0 | 0 | 0 |
| | Jun | 1 | 1641 | 66 | 4 | | -- | -- | -- | -- |
| | | 2 | 2656 | 168 | 12 | | 13 | -- | -- | -- |
| | | 3 | 2960 | 165 | 4 | | -- | -- | -- | -- |
| | | 4 | 4435 | 377 | 5 | | 24 | -- | -- | -- |
| | | T | 11692 | 776 | 25 | 12493 | 37 | 0 | 0 | 0 |

Appemdix table 2 (cont.)

| Year | MM | WW | Chinook | | | | Sockeye | Pink | Coho | Chum |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Red | White | Jack[a] | | | | | |
| 1966 | Jul | 1 | 5804 | 775 | 130 | | 2336 | -- | 9 | -- |
| | | 2 | 4470 | 964 | 638 | | 18949 | -- | 77 | -- |
| | | 3 | 4913 | 1596 | 720 | | 12173 | 1 | 71 | 2 |
| | | 4 | 3442 | 1428 | 827 | | 13312 | -- | 69 | -- |
| | | 5 | 3516 | 1464 | 1396 | | 56381 | 6 | 228 | 7 |
| | | T | 16341 | 5452 | 3581 | 25374 | 100815 | 7 | 445 | 9 |
| | Aug | 1 | 7238 | 2856 | 2181 | | 239126 | 36 | 327 | -- |
| | | 2 | 7949 | 2521 | 1980 | | 222900 | 32 | 188 | 4 |
| | | 3 | 891 | 227 | 9 | | 2097 | -- | 5 | -- |
| | | 4 | 2773 | 947 | 664 | | 29533 | 101 | 382 | 6 |
| | | T | 18851 | 6551 | 4834 | 30236 | 493656 | 169 | 902 | 10 |
| | Sep | 1 | 1998 | 1445 | 355 | | 6765 | 6 | 2136 | 5 |
| | | 2 | 1274 | 3423 | 542 | | 6733 | 7 | 6708 | 19 |
| | | 3 | 376 | 3528 | 46 | | 4250 | 3 | 1307 | 59 |
| | | 4 | 2 | 64 | 6 | | 2056 | 0 | 198 | 17 |
| | | T | 3650 | 8460 | 949 | 13059 | 19804 | 16 | 10349 | 100 |
| 1966 | May-Sep | GT | 54002 | 21319 | 9416 | 84737 | 614313 | 192 | 11696 | 119 |
| 1969 | May | 1 | 1257 | 33 | 11 | | -- | -- | -- | -- |
| | | 2 | 1266 | 35 | 13 | | 1 | -- | -- | -- |
| | | 3 | 1577 | 43 | 2 | | -- | -- | -- | -- |
| | | 4 | 1650 | 64 | 1 | | 0 | 0 | 0 | 5 |
| | | T | 5750 | 175 | 27 | 5952 | 1 | 0 | 0 | 5 |
| | Jun | 1 | 3978 | 127 | 2 | | -- | -- | -- | -- |
| | | 2 | 4204 | 218 | 10 | | -- | -- | -- | -- |
| | | 3 | 4909 | 324 | 24 | | 15 | -- | -- | -- |
| | | 4 | 4836 | 451 | 46 | | 945 | -- | 6 | -- |
| | | T | 17927 | 1120 | 82 | 19129 | 960 | 0 | 6 | 0 |
| | Jul | 1 | 1811 | 308 | 8 | | 3377 | -- | 6 | -- |
| | | 2 | 1964 | 568 | 12 | | 4580 | -- | 1 | -- |
| | | 3 | 2114 | 669 | 403 | | 20850 | 10 | 16 | -- |
| | | 4 | 3082 | 1104 | 1277 | | 122088 | 126 | 112 | 4 |
| | | 5 | 3202 | 1254 | 1928 | | 574601 | 519 | 1287 | 3 |
| | | T | 10362 | 3595 | 3620 | 17577 | 722119 | 655 | 1416 | 7 |

Appemdix table 2 (cont.)

| Year | MM | WW | Chinook | | | | Sockeye | Pink | Coho | Chum |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Red | White | Jack[a] | | | | | |
| 1969 | Aug | 1 | 2523 | 870 | 1012 | | 136762 | 221 | 246 | 5 |
| | | 2 | 3221 | 989 | 686 | | 47797 | 266 | 144 | 2 |
| | | 3 | 3704 | 944 | 1381 | | 13316 | 122 | 155 | 11 |
| | | 4 | 4825 | 1613 | 2219 | | 6552 | 251 | 1801 | 26 |
| | | T | 14273 | 4416 | 5298 | 23987 | 204427 | 860 | 2346 | 44 |
| | Sep | 1 | 2019 | 2893 | 61 | | 1377 | 895 | 1522 | 39 |
| | | 2 | 180 | 1434 | 839 | | 6653 | 100000 | 3620 | 732 |
| | | 3 | 2 | 12 | 5 | | 27 | 1853 | 114 | 1 |
| | | 4 | 265 | 2399 | 101 | | 556 | 55630 | 2229 | 1874 |
| | | T | 2466 | 6738 | 1006 | 10210 | 8613 | 158378 | 7485 | 2646 |
| 1969 | May-Sep | GT | 50778 | 16044 | 10033 | 76855 | 936120 | 159893 | 11253 | 2702 |

a. Red + white.

Appendix table 3. Incidence (%), by month and year, of red flesh, and stream-type scales (Str) by flesh color[a], among chinook salmon sampled from the commercial gillnet fishery in the lower Fraser River, March-October 1959-66 and 1969.

| Month | n[b] | %Red | %Str | | n[b] | %Red[c] | %Str | |
|---|---|---|---|---|---|---|---|---|
| | | | R | W | | | R | W |
| | 1959 | | | | 1960 | | | |
| March | 0 | -- | -- | -- | 0 | -- | -- | -- |
| April | 0 | -- | -- | -- | 0 | -- | -- | -- |
| May | 11 | 100 | 90.9 | -- | 41 | 97.6 | 100 | 38.0 |
| June | 47 | 85.1 | 97.5 | 100 | 260 | 73.5 | 76.8 | 78.5 |
| July | 55 | 98.2 | 92.6 | 100 | 646 | 74.3 | 79.5 | 67.5 |
| August | 73 | 57.5 | 28.6 | 38.7 | 501 | 70.9 | 19.2 | 18.0 |
| September | 70 | 18.6 | 7.7 | 8.8 | 480 | 21.3 | 0.8 | 8.8 |
| October | 0 | -- | -- | -- | 243 | 4.1 | 0.4 | 10.0 |
| Total | 256 | | | | 2171 | | | |
| | 1961 | | | | 1962 | | | |
| March | 0 | -- | -- | -- | 0 | -- | -- | -- |
| April | 0 | -- | -- | -- | 0 | -- | -- | -- |
| May | 0 | -- | -- | -- | 50 | 97.6 | 69.6 | 25.5 |
| June | 577 | 90.8 | 54.6 | 41.5 | 371 | 91.4 | 69.6 | 56.3 |
| July | 734 | 71.3 | 41.5 | 41.1 | 655 | 80.5 | 68.9 | 61.8 |
| August | 489 | 65.4 | 5.6 | 4.1 | 492 | 75.0 | 18.8 | 14.0 |
| September | 685 | 4.1 | 10.7 | 1.5 | 442 | 36.2 | 0 | 2.4 |
| October | 77 | 0 | 0 | 0 | 170 | 0 | 0 | 0 |
| Total | 2562 | | | | 2180 | | | |
| | 1963 | | | | 1964 | | | |
| March | 0 | -- | -- | -- | 18 | 77.8 | 92.9 | 100 |
| April | 0 | -- | -- | -- | 407 | 94.3 | 74.2 | 91.3 |
| May | 135 | 85.6 | 88.6 | 91.7 | 492 | 92.9 | 70.5 | 74.3 |
| June | 410 | 79.8 | 87.5 | 95.5 | 551 | 75.9 | 60.0 | 57.1 |
| July | 169 | 76.2 | 78.9 | 76.7 | 1053 | 63.3 | 82.3 | 80.3 |
| August | 450 | 70.5 | 12.6 | 28.1 | 1187 | 64.3 | 24.5 | 30.0 |
| September | 386 | 19.2 | 7.7 | 0.9 | 903 | 36.9 | 9.3 | 2.5 |
| October | 85 | 20.0 | 0 | 0 | 115 | 9.6 | 0[b] | 1.0 |
| Total | 1635 | | | | 4726 | | | |

Appendix table 3 (cont.)

| Month | n[b] | %Red | %Str R | %Str W | n[b] | %Red[c] | %Str R | %Str W |
|---|---|---|---|---|---|---|---|---|
| | 1965 | | | | 1966 | | | |
| March | 0 | -- | -- | -- | 12 | 100 | 100 | 0[d] |
| April | 109 | 91.7 | 90.0 | 100 | 15 | 100 | 100 | 0[d] |
| May | 242 | 94.2 | 95.6 | 92.9 | 95 | 97.9 | 97.8 | 100 |
| June | 649 | 88.1 | 86.9 | 81.8 | 419 | 90.0 | 55.7 | 57.1 |
| July | 1142 | 79.9 | 87.8 | 93.0 | 870 | 82.5 | 32.2 | 34.2 |
| August | 1022 | 72.7 | 25.2 | 39.4 | 696 | 70.3 | 18.8 | 30.0 |
| September | 938 | 27.7 | 6.9 | 1.5 | 561 | 49.2 | 5.8 | 3.2 |
| October | 0 | -- | -- | -- | 0 | -- | -- | -- |
| Total | 4102 | | | | 2668 | | | |
| | 1969 | | | | | | | |
| March | 0 | -- | -- | -- | | | | |
| April | 20 | 100[d] | 50.0 | -- | | | | |
| May | 185 | 100[d] | 58.4 | -- | | | | |
| June | 521 | 89.6 | 58.7 | 72.2 | | | | |
| July | 601 | 72.5 | 40.4 | 53.3 | | | | |
| August | 875 | 68.8 | 6.5 | 9.9 | | | | |
| September | 57 | 100[d] | 3.5 | -- | | | | |
| October | 0 | -- | -- | -- | | | | |
| Total | 2259 | | | | | | | |

a. R = red; W = white.
b. n = numbers sampled.
c. Flesh-color codes were confounded. Current values subtracted from 100.
d. White-flesh fish not sampled?

Appendix table 4. Mean orbit-hypural length (cm), by age, sex, year, and flesh color[a], of chinook salmon sampled from the commercial fishery in the lower Fraser River, July and August-September 1964-66 and 1969.

| Age[b] (y) | | July | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Male | | | | | | | | Female | | | | | | | |
| | | 1964 | | 1965 | | 1966 | | 1969 | | 1964 | | 1965 | | 1966 | | 1969 | |
| | | R | W | R | W | R | W | R | W | R | W | R | W | R | W | R | W |
| 21 | $\bar{L}$ | 38.3 | -- | 35.8 | -- | 43.9 | 42.9 | 43.0 | 41.5 | -- | -- | 39.2 | -- | 45.6 | -- | 46.9 | -- |
| | n[c] | 2 | 0 | 3 | 0 | 5 | 1 | 6 | 2 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 31 | $\bar{L}$ | 54.4 | 58.2 | 51.7 | 58.2 | 55.0 | 54.3 | 55.8 | 58.9 | 59.1 | 62.0 | 58.1 | 62.7 | 59.1 | 61.5 | 60.9 | 61.6 |
| | n[c] | 20 | 8 | 44 | 1 | 181 | 21 | 80 | 16 | 8 | 5 | 12 | 1 | 90 | 3 | 52 | 16 |
| 41 | $\bar{L}$ | 69.9 | 74.7 | 65.0 | 75.6 | 72.4 | 75.5 | 76.0 | 73.2 | 71.0 | 72.6 | 68.2 | 73.4 | 70.9 | 72.8 | 71.8 | 72.6 |
| | n[c] | 26 | 22 | 13 | 5 | 77 | 30 | 41 | 9 | 57 | 39 | 26 | 5 | 128 | 41 | 58 | 27 |
| 51 | $\bar{L}$ | 81.0 | 77.6 | 78.6 | 87.7 | 82.1 | 81.7 | 81.8 | 74.3 | 76.6 | -- | 76.4 | 76.9 | 75.3 | 75.7 | 76.5 | 77.3 |
| | n[c] | 2 | 2 | 5 | 1 | 2 | 3 | 12 | 1 | 3 | 0 | 7 | 3 | 3 | 1 | 10 | 6 |
| 61 | $\bar{L}$ | -- | -- | -- | -- | -- | -- | -- | -- | 86.0 | 73.3 | -- | -- | -- | -- | -- | -- |
| | n[c] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 32 | $\bar{L}$ | 43.4 | 43.8 | 42.1 | 45.2 | 46.1 | 45.2 | 43.1 | 44.0 | 44.3 | -- | 48.2 | 45.8 | -- | -- | -- | -- |
| | n[c] | 88 | 22 | 156 | 13 | 13 | 3 | 20 | 2 | 1 | 0 | 7 | 1 | 0 | 0 | 0 | 0 |
| 42 | $\bar{L}$ | 56.2 | 56.9 | 56.6 | 57.2 | 57.7 | 59.5 | 58.5 | 58.7 | 60.8 | 64.6 | 60.7 | 62.6 | 60.9 | 62.8 | 60.9 | 62.5 |
| | n[c] | 204 | 90 | 251 | 45 | 95 | 14 | 46 | 23 | 114 | 31 | 158 | 28 | 75 | 5 | 41 | 22 |
| 52 | $\bar{L}$ | 75.0 | 74.4 | 74.7 | 76.5 | 74.9 | 78.4 | 76.3 | 74.0 | 72.1 | 73.3 | 71.8 | 72.6 | 72.9 | 74.2 | 73.6 | 73.2 |
| | n[c] | 54 | 57 | 79 | 38 | 21 | 10 | 24 | 12 | 85 | 107 | 142 | 80 | 33 | 20 | 42 | 27 |
| 53 | $\bar{L}$ | -- | -- | -- | -- | -- | -- | 67.1 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | n[c] | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 62 | $\bar{L}$ | 65.3 | 80.9 | 84.8 | 84.2 | -- | -- | 82.7 | -- | -- | -- | 73.3 | 81.4 | 76.0 | -- | -- | 77.7 |
| | n[c] | 2 | 1 | 5 | 3 | 0 | 0 | 2 | 0 | 0 | 0 | 3 | 6 | 1 | 0 | 0 | 2 |
| | $n_t$ | 398 | 202 | 556 | 106 | 394 | 82 | 232 | 65 | 269 | 184 | 356 | 124 | 331 | 70 | 204 | 100 |

Appendix table 4 (cont.)

| Age[b] (y) | | August-September[d] | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Male | | | | | | | | Female | | | | | | | |
| | | 1964 | | 1965 | | 1966 | | 1969 | | 1964 | | 1965 | | 1966 | | 1969 | |
| | | R | W | R | W | R | W | R | W | R | W | R | W | R | W | R | W |
| 21 | $\bar{L}$ | 38.1 | 37.9 | 38.1 | 46.3 | 41.0 | 45.6 | 38.8 | 43.8 | -- | 61.1 | -- | 77.5 | -- | -- | -- | -- |
| | n[c] | 75 | 60 | 25 | 11 | 35 | 20 | 24 | 6 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| 31 | $\bar{L}$ | 51.2 | 53.2 | 54.0 | 61.6 | 55.0 | 58.9 | 54.2 | 53.8 | 60.2 | 64.2 | 61.2 | 67.5 | 59.4 | 67.7 | 60.6 | 60.9 |
| | n[c] | 230 | 49 | 176 | 135 | 189 | 91 | 322 | 137 | 20 | 7 | 48 | 41 | 32 | 15 | 82 | 10 |
| 41 | $\bar{L}$ | 68.0 | 71.5 | 68.8 | 74.4 | 70.5 | 74.0 | 71.0 | 72.2 | 69.6 | 68.0 | 69.3 | 74.4 | 70.2 | 74.0 | 71.1 | 71.3 |
| | n[c] | 89 | 57 | 155 | 196 | 106 | 89 | 36 | 21 | 150 | 110 | 302 | 382 | 253 | 185 | 117 | 48 |
| 51 | $\bar{L}$ | 78.3 | 83.0 | 76.9 | 82.1 | 78.9 | 81.4 | 76.4 | 76.8 | 74.0 | 78.4 | 75.5 | 77.8 | 76.2 | 77.8 | 76.4 | 75.4 |
| | n[c] | 3 | 3 | 22 | 15 | 9 | 5 | 6 | 3 | 9 | 10 | 70 | 56 | 33 | 16 | 31 | 21 |
| 32 | $\bar{L}$ | 44.5 | 42.4 | 42.6 | 48.6 | 46.2 | 42.5 | 39.1 | 43.5 | -- | -- | 72.8 | -- | -- | -- | -- | -- |
| | n[c] | 58 | 28 | 31 | 4 | 6 | 7 | 14 | 3 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 42 | $\bar{L}$ | 58.9 | 56.2 | 60.1 | 60.9 | 60.6 | 63.9 | 62.3 | 60.5 | 65.2 | 64.9 | 63.6 | 66.5 | 65.3 | 66.8 | 64.1 | 64.5 |
| | n[c] | 33 | 23 | 60 | 33 | 30 | 16 | 9 | 6 | 19 | 28 | 43 | 20 | 29 | 19 | 12 | 7 |
| 52 | $\bar{L}$ | 78.2 | 76.4 | 76.2 | 75.6 | 73.1 | 77.1 | 69.6 | 78.3 | 73.2 | 75.4 | 73.5 | 73.7 | 74.0 | 73.3 | 74.4 | 72.6 |
| | n[c] | 15 | 17 | 19 | 18 | 9 | 10 | 2 | 7 | 12 | 31 | 48 | 42 | 34 | 18 | 4 | 4 |
| 62 | $\bar{L}$ | -- | -- | 80.8 | 81.6 | -- | 85.1 | -- | -- | -- | -- | 81.9 | 73.4 | -- | -- | -- | -- |
| | n[c] | 0 | 0 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 |
| | n[c] | 503 | 237 | 489 | 414 | 384 | 239 | 413 | 183 | 210 | 187 | 514 | 543 | 381 | 253 | 246 | 90 |

a. Flesh color: R = red; W = white.
b. Gilbert-Rich method: 21 = $2_1$, etc.
c. n = numbers sampled.
d. August only, for 1964.

Appendix table 5. Age-frequencies (%), by month and year, of chinook salmon sampled from the commercial gillnet fishery in the lower Fraser River, May-September 1958-66 and 1969.

| Age[a] (y) | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 | 1965 | 1966 | 1969 |
|---|---|---|---|---|---|---|---|---|---|---|
| May: | | | | | | | | | | |
| 11 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 21 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 22.7 |
| 31 | -- | -- | 3.9 | -- | 4.9 | 8.7 | 4.3 | 2.8 | 2.1 | 17.8 |
| 41 | -- | -- | -- | -- | 24.5 | 2.6 | 24.2 | 1.7 | -- | 1.1 |
| 51 | -- | 9.1 | -- | -- | 2.1 | -- | 0.8 | -- | -- | -- |
| 61 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ST | 0 | 9.1 | 3.9 | 0 | 31.5 | 11.3 | 29.3 | 4.5 | 2.1 | 41.6 |
| 22 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 32 | -- | -- | 1.3 | -- | -- | 0.1 | 0.2 | 0.8 | 1.1 | -- |
| 42 | -- | 45.5 | 75.3 | -- | 36.1 | 75.4 | 30.7 | 57.1 | 54.7 | 33.0 |
| 52 | -- | 45.5 | 19.5 | -- | 32.4 | 13.1 | 39.6 | 36.8 | 41.1 | 25.4 |
| 62 | -- | -- | -- | -- | -- | -- | 0.2 | 0.4 | 1.1 | -- |
| 72 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 53 | -- | -- | -- | -- | -- | -- | -- | 0.4 | -- | -- |
| 63 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ST | 0 | 91.0 | 96.1 | 0 | 68.5 | 88.7 | 70.7 | 95.5 | 97.9 | 58.4 |
| T | 0 | 100.1 | 100 | 0 | 100 | 100 | 100 | 100 | 100 | 100 |
| n[b] | 0 | 11 | 77 | 0 | 50 | 135 | 492 | 242 | 95 | 185 |
| June: | | | | | | | | | | |
| 11 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 21 | -- | -- | 0.4 | 1.7 | 0.5 | -- | -- | 6.6 | -- | 0.2 |
| 31 | 2.5 | -- | 9.2 | 18.0 | 4.0 | 4.2 | 10.2 | 6.5 | 16.0 | 25.5 |
| 41 | 15.2 | 2.1 | 12.1 | 25.1 | 24.3 | 7.6 | 28.9 | 0.6 | 27.0 | 13.1 |
| 51 | -- | -- | 1.1 | 1.7 | 2.3 | -- | 1.6 | -- | 1.2 | 1.2 |
| 61 | -- | -- | -- | -- | 1.0 | -- | -- | -- | -- | -- |
| ST | 17.7 | 2.1 | 22.8 | 46.6 | 32.1 | 11.8 | 40.7 | 13.7 | 44.2 | 39.9 |
| 22 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 32 | 11.4 | 8.5 | 0.7 | 6.1 | 1.9 | 0.3 | -- | 1.4 | -- | 0.4 |
| 42 | 30.4 | 46.8 | 50.8 | 27.7 | 22.5 | 58.8 | 33.0 | 46.6 | 35.3 | 38.8 |
| 52 | 38.0 | 42.6 | 25.7 | 19.6 | 41.2 | 28.5 | 26.3 | 35.9 | 20.5 | 20.7 |
| 62 | 2.5 | -- | -- | -- | 2.2 | 0.7 | -- | 2.0 | -- | 0.2 |
| 72 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 53 | -- | -- | -- | -- | -- | -- | -- | 0.2 | -- | 0.2 |
| 63 | -- | -- | -- | -- | -- | -- | -- | 0.2 | -- | -- |

Appendix table 5 (cont.)

| Age[a] (y) | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 | 1965 | 1966 | 1969 |
|---|---|---|---|---|---|---|---|---|---|---|
| June: | | | | | | | | | | |
| ST | 82.3 | 97.9 | 77.2 | 53.4 | 67.8 | 88.2 | 59.3 | 86.3 | 55.8 | 60.1 |
| T | 100 | 100 | 100 | 100 | 99.9 | 100 | 100 | 100 | 100 | 100 |
| n[b] | 79 | 47 | 272 | 577 | 371 | 410 | 551 | 649 | 419 | 185 |
| July: | | | | | | | | | | |
| 11 | -- | -- | -- | 0.1 | -- | -- | -- | -- | -- | -- |
| 21 | -- | -- | 0.5 | 14.6 | 4.6 | -- | 0.2 | 0.4 | 0.8 | 1.5 |
| 31 | 5.4 | -- | 9.6 | 17.8 | 14.7 | 5.3 | 3.9 | 5.0 | 33.9 | 27.3 |
| 41 | 17.6 | 3.6 | 17.4 | 23.8 | 21.0 | 16.3 | 13.6 | 4.3 | 31.7 | 22.5 |
| 51 | -- | 3.6 | 1.9 | 2.6 | 4.1 | -- | 0.7 | 1.4 | 1.0 | 4.8 |
| 61 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ST | 23.0 | 7.2 | 29.4 | 58.9 | 44.4 | 21.6 | 18.4 | 11.1 | 67.5 | 56.1 |
| 22 | -- | -- | -- | -- | 0.2 | -- | -- | -- | -- | -- |
| 32 | 5.4 | -- | 4.5 | 13.9 | 13.4 | 0.7 | 10.5 | 15.5 | 1.8 | 3.7 |
| 42 | 40.5 | 21.4 | 38.5 | 15.3 | 28.4 | 49.2 | 41.7 | 42.2 | 20.9 | 22.0 |
| 52 | 29.7 | 66.1 | 27.5 | 11.7 | 13.2 | 28.5 | 28.8 | 29.7 | 9.7 | 17.5 |
| 62 | 1.4 | 3.6 | 0.2 | 0.3 | 0.5 | -- | 0.6 | 1.5 | 0.1 | 0.7 |
| 72 | -- | 1.8 | -- | -- | -- | -- | -- | -- | -- | -- |
| 53 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.2 |
| 63 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ST | 77.0 | 92.9 | 70.6 | 41.1 | 55.6 | 78.4 | 81.6 | 88.9 | 32.5 | 43.9 |
| T | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| n[b] | 74 | 56 | 647 | 734 | 658 | 169 | 1053 | 1142 | 870 | 601 |
| August: | | | | | | | | | | |
| 11 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 21 | 1.7 | -- | 5.3 | 22.3 | 14.4 | 13.3 | 11.5 | 1.6 | 2.0 | 3.4 |
| 31 | 22.4 | 13.7 | 15.9 | 13.5 | 21.7 | 39.5 | 25.8 | 16.2 | 23.4 | 61.4 |
| 41 | 25.9 | 42.4 | 56.7 | 48.7 | 34.9 | 27.0 | 34.2 | 42.8 | 46.4 | 21.4 |
| 51 | 6.9 | 11.0 | 6.2 | 10.4 | 11.4 | 3.0 | 2.1 | 10.3 | 6.0 | 6.3 |
| 61 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ST | 56.9 | 67.1 | 84.1 | 94.9 | 82.4 | 82.8 | 73.5 | 70.9 | 77.9 | 92.5 |

Appendix table 5 (cont.)

| Age[a] (y) | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 | 1965 | 1966 | 1969 |
|---|---|---|---|---|---|---|---|---|---|---|
| August: | | | | | | | | | | |
| 22 | -- | -- | -- 0.2 | -- | -- | -- | -- | -- | -- | -- |
| 32 | 6.0 | -- | 0.8 | 1.9 | 5.0 | 4.1 | 7.2 | 3.5 | 1.6 | 1.9 |
| 42 | 22.4 | 11.0 | 10.0 | 1.6 | 8.2 | 10.7 | 12.9 | 13.7 | 11.4 | 3.7 |
| 52 | 13.8 | 20.5 | 4.5 | 1.6 | 4.3 | 2.5 | 6.3 | 11.4 | 9.1 | 1.9 |
| 62 | 0.9 | 1.4 | 0.4 | -- | 0.1 | -- | -- | 0.5 | 0.1 | -- |
| 72 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 53 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 63 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ST | 43.1 | 32.9 | 15.9 | 5.1 | 17.6 | 17.3 | 26.5 | 29.1 | 22.1 | 7.5 |
| T | 100 | 100 | 100 | 100 | 100 | 100.1 | 100 | 100 | 100 | 100 |
| n[b] | 116 | 73 | 471 | 489 | 492 | 450 | 1187 | 1022 | 696 | 875 |
| September: | | | | | | | | | | |
| 11 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 21 | 1.5 | -- | 2.4 | 1.0 | 16.2 | 9.8 | 12.8 | 2.2 | 7.3 | -- |
| 31 | 43.1 | 12.5 | 5.5 | 19.6 | 41.6 | 42.1 | 41.5 | 24.9 | 29.2 | 24.6 |
| 41 | 43.1 | 67.2 | 76.5 | 60.3 | 37.4 | 44.8 | 37.9 | 63.7 | 55.3 | 61.4 |
| 51 | 6.2 | 10.9 | 12.4 | 17.1 | 3.3 | 2.2 | 2.8 | 6.2 | 3.7 | 10.5 |
| 61 | -- | -- | -- | 0.1 | -- | -- | -- | -- | -- | -- |
| ST | 93.8 | 90.6 | 96.7 | 98.1 | 98.5 | 98.9 | 95.0 | 97.0 | 95.5 | 96.5 |
| 22 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 32 | -- | -- | -- | 0.1 | 0.5 | -- | 1.2 | -- | 0.4 | -- |
| 42 | 4.7 | 1.6 | 2.2 | 0.6 | 0.5 | -- | 1.6 | 1.8 | 2.7 | 3.5 |
| 52 | 1.5 | 7.8 | 0.8 | 0.6 | 0.5 | 1.1 | 2.2 | 1.1 | 1.4 | -- |
| 62 | -- | -- | 0.4 | 0.6 | 0.1 | -- | -- | 0.1 | -- | -- |
| 72 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 53 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 63 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ST | 6.2 | 9.4 | 3.3 | 1.9 | 1.6 | 1.1 | 5.0 | 3.0 | 4.5 | 3.5 |
| T | 100 | 100 | 100 | 100 | 100.1 | 100 | 100 | 100 | 100 | 100 |
| n[b] | 65 | 64 | 510 | 685 | 442 | 386 | 903 | 938 | 561 | 57 |

a. Gilbert-Rich method: 21 = $2_1$, etc.
b. n = numbers sampled.

Appendix table 6. Age-frequencies (%), by month, year, and flesh color[a], of chinook salmon sampled from the commercial gillnet fishery in the lower Fraser River, May-September 1959-63.

| Age[b] | 1959 | | 1960 | | 1961 | | 1962 | | 1963 | |
|---|---|---|---|---|---|---|---|---|---|---|
| (y) | R | W | R | W | R | W | R | W | R | W |
| May: | | | | | | | | | | |
| 11 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 21 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 31 | -- | -- | -- | 5.0 | -- | -- | 4.3 | 25.3 | 9.0 | -- |
| 41 | -- | -- | -- | -- | -- | -- | 23.9 | 49.4 | 2.4 | 8.3 |
| 51 | 9.1 | -- | -- | -- | -- | -- | 2.2 | -- | -- | -- |
| 61 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ST | 9.1 | -- | -- | 5.0 | -- | -- | 30.4 | 74.7 | 11.4 | 8.3 |
| 22 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 32 | -- | -- | -- | 2.5 | -- | -- | -- | -- | -- | -- |
| 42 | 45.5 | -- | 100 | 60.0 | -- | -- | 37.0 | -- | 75.6 | 75.0 |
| 52 | 45.5 | -- | -- | 32.5 | -- | -- | 32.6 | 25.3 | 13.0 | 16.7 |
| 62 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 72 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ST | 91.0 | -- | 100 | 95.0 | -- | -- | 69.6 | 25.3 | 88.6 | 91.7 |
| T | 100.1 | -- | 100 | 100 | -- | -- | 100 | 100 | 100 | 100 |
| n[c] | 11 | 0 | 1 | 40 | 0 | 0 | 46 | 4 | 116 | 19 |
| June: | | | | | | | | | | |
| 11 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 21 | -- | -- | -- | 0.5 | 1.3 | 5.7 | -- | 5.6 | -- | -- |
| 31 | -- | -- | 14.5 | 6.3 | 17.4 | 24.5 | 2.5 | 19.7 | 4.2 | 4.5 |
| 41 | 2.5 | -- | 7.2 | 13.7 | 24.8 | 28.3 | 25.2 | 15.5 | 8.3 | -- |
| 51 | -- | -- | 1.4 | 1.0 | 1.9 | -- | 2.3 | 2.8 | -- | -- |
| 61 | -- | -- | -- | -- | -- | -- | 1.1 | -- | -- | -- |
| ST | 2.5 | | 23.2 | 21.5 | 45.4 | 58.5 | 31.1 | 43.7 | 12.5 | 4.5 |
| 22 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 32 | 7.5 | 14.3 | -- | 0.5 | 6.3 | 3.8 | | 22.5 | 0.3 | -- |
| 42 | 50.0 | 28.6 | 42.0 | 54.4 | 29.4 | 11.3 | 22.1 | 26.8 | 57.8 | 68.2 |
| 52 | 40.0 | 57.1 | 34.8 | 22.0 | 18.9 | 26.4 | 44.5 | 5.6 | 28.6 | 27.3 |
| 62 | -- | -- | -- | 1.6 | -- | -- | 2.3 | 1.4 | 0.8 | -- |
| 72 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ST | 97.5 | 100 | 76.8 | 78.5 | 54.6 | 41.5 | 68.9 | 56.3 | 87.5 | 95.5 |
| T | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| n[c] | 40 | 7 | 69 | 191 | 524 | 53 | 339 | 32 | 327 | 83 |

Appendix table 6 (cont.)

| Age[b] (y) | 1959 R | 1959 W | 1960 R | 1960 W | 1961 R | 1961 W | 1962 R | 1962 W | 1963 R | 1963 W |
|---|---|---|---|---|---|---|---|---|---|---|
| July: | | | | | | | | | | |
| 11 | -- | -- | -- | -- | 0.2 | -- | -- | -- | -- | -- |
| 21 | -- | -- | -- | 0.6 | 14.9 | 13.7 | 5.0 | 3.1 | -- | -- |
| 31 | -- | -- | 4.8 | 11.3 | 18.3 | 16.6 | 16.4 | 9.4 | 6.4 | 1.7 |
| 41 | 3.7 | -- | 13.9 | 18.7 | 23.2 | 25.2 | 20.0 | 23.9 | 14.7 | 21.6 |
| 51 | 3.7 | -- | 1.8 | 1.9 | 2.3 | 3.3 | 3.8 | 5.0 | -- | -- |
| 61 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ST | 7.4 | | 20.5 | 32.5 | 58.9 | 58.8 | 45.3 | 41.5 | 21.1 | 23.3 |
| 22 | -- | -- | -- | -- | -- | -- | -- | 0.6 | -- | -- |
| 32 | -- | -- | 3.0 | 4.8 | 13.4 | 15.2 | 14.0 | 11.3 | 0.9 | -- |
| 42 | 22.2 | -- | 39.2 | 38.3 | 17.2 | 10.3 | 28.3 | 28.9 | 50.5 | 45.0 |
| 52 | 64.8 | 100 | 37.3 | 24.2 | 10.3 | 15.2 | 12.0 | 17.0 | 27.5 | 31.7 |
| 62 | 3.7 | -- | -- | 0.2 | 0.2 | 0.5 | 0.4 | 0.6 | -- | -- |
| 72 | 1.9 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ST | 92.6 | 100 | 79.5 | 67.5 | 41.1 | 41.2 | 54.7 | 58.5 | 78.9 | 76.7 |
| T | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| n[c] | 54 | 1 | 166 | 480 | 523 | 211 | 499 | 159 | 129 | 40 |
| August: | | | | | | | | | | |
| 11 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 21 | -- | -- | 3.4 | 6.2 | 20.6 | 25.4 | 2.2 | 51.0 | 0.7 | 2.2 |
| 31 | 21.4 | 3.2 | 17.8 | 15.5 | 12.5 | 15.4 | 23.0 | 17.4 | 44.9 | 45.0 |
| 41 | 42.9 | 42.0 | 50.7 | 55.5 | 53.5 | 39.7 | 42.2 | 13.4 | 38.4 | 20.2 |
| 51 | 7.1 | 16.1 | 8.9 | 4.8 | 7.8 | 15.4 | 13.8 | 4.1 | 3.4 | 4.5 |
| 61 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ST | 71.4 | 61.3 | 80.8 | 82.0 | 94.4 | 95.9 | 81.2 | 86.0 | 87.4 | 71.9 |
| 22 | -- | -- | -- | 0.3 | -- | -- | -- | -- | -- | -- |
| 32 | -- | -- | 1.4 | 0.6 | 2.8 | | 3.4 | 9.9 | 1.4 | 2.2 |
| 42 | 11.9 | 9.7 | 9.6 | 13.7 | 0.6 | 3.5 | 9.9 | 3.1 | 8.8 | 21.4 |
| 52 | 14.3 | 29.0 | 7.5 | 3.1 | 2.2 | 0.6 | 5.5 | 0.7 | 2.4 | 4.5 |
| 62 | 2.4 | -- | 0.7 | 0.3 | -- | -- | -- | 0.3 | -- | -- |
| 72 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ST | 28.6 | 38.7 | 19.2 | 18.0 | 5.6 | 4.1 | 18.8 | 14.0 | 12.6 | 28.1 |
| T | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| n[c] | 42 | 31 | 146 | 355 | 320 | 169 | 369 | 123 | 317 | 133 |

Appendix table 6 (cont.)

| Age[b] (y) | 1959 R | 1959 W | 1960 R | 1960 W | 1961 R | 1961 W | 1962 R | 1962 W | 1963 R | 1963 W |
|---|---|---|---|---|---|---|---|---|---|---|
| September: | | | | | | | | | | |
| 11 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 21 | -- | -- | 2.1 | 2.0 | -- | 1.1 | -- | 25.4 | 1.5 | 3.4 |
| 31 | 7.7 | 12.3 | 4.2 | 5.9 | 10.7 | 19.9 | 77.7 | 21.2 | 30.8 | 40.1 |
| 41 | 46.1 | 75.4 | 78.9 | 74.5 | 71.5 | 59.8 | 17.8 | 48.4 | 56.9 | 53.0 |
| 51 | 38.5 | 3.5 | 14.0 | 8.8 | 7.1 | 17.5 | 4.5 | 2.6 | 3.1 | 2.6 |
| 61 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ST | 92.3 | 91.2 | 99.2 | 91.2 | 89.3 | 98.5 | 100 | 97.6 | 92.3 | 99.1 |
| 22 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 32 | -- | -- | -- | -- | -- | 0.2 | -- | 0.7 | -- | -- |
| 42 | -- | 1.8 | 0.8 | 3.9 | 7.1 | 0.3 | -- | 0.7 | 4.6 | -- |
| 52 | 7.7 | 7.0 | -- | 2.9 | 3.6 | 0.5 | -- | 0.7 | 3.1 | 0.9 |
| 62 | -- | -- | -- | 2.0 | -- | 0.6 | -- | 0.3 | -- | -- |
| 72 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ST | 7.7 | 8.8 | 0.8 | 8.8 | 10.7 | 1.5 | 0 | 2.4 | 7.7 | 0.9 |
| T | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| n[c] | 13 | 57 | 378 | 102 | 28 | 657 | 160 | 282 | 74 | 312 |

a. Color: R = red; W = white.
b. Gilbert-Rich method: 21 = $2_1$, etc.
c. n = numbers sampled.

Appendix table 7. Age-frequencies (%), by month, year, and flesh color[a], for chinook salmon sampled from the commercial gillnet fishery in the lower Fraser River, May-September 1964-66 and 1969.

| Age[b] (y) | 1964 | | 1965 | | 1966 | | 1969 | | Mean | |
|---|---|---|---|---|---|---|---|---|---|---|
| | R | W | R | W | R | W | R | W | R | W |
| May: | | | | | | | | | | |
| 21 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 31 | 4.6 | -- | 3.1 | -- | -- | -- | 22.7 | -- | 7.6 | -- |
| 41 | 24.2 | 22.8 | 1.3 | 7.1 | 2.2 | -- | 17.8 | -- | 11.3 | 9.9 |
| 51 | 0.7 | 2.9 | -- | -- | -- | -- | 1.1 | -- | 0.5 | 1.0 |
| ST | 29.5 | 25.7 | 4.4 | 7.1 | 2.2 | 0 | 41.6 | -- | 19.4 | 10.9 |
| 32 | 0.2 | -- | 0.9 | -- | 1.1 | -- | -- | -- | 0.6 | -- |
| 42 | 31.3 | 22.9 | 57.5 | 50.0 | 54.7 | 50.0 | 33.0 | -- | 44.1 | 41.0 |
| 52 | 38.8 | 51.4 | 36.4 | 42.9 | 40.9 | 50.0 | 25.4 | -- | 35.4 | 48.1 |
| 62 | 0.2 | -- | 0.4 | -- | 1.1 | -- | -- | -- | 0.4 | -- |
| 53 | -- | -- | 0.4 | -- | -- | -- | -- | -- | 0.1 | -- |
| 63 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ST | 70.5 | 74.3 | 95.6 | 92.9 | 97.8 | 100 | 58.4 | -- | 80.6 | 89.1 |
| T | 100 | 100 | 100 | 100 | 100 | 100 | 100 | -- | 100 | 100 |
| n[c] | 457 | 35 | 228 | 14 | 93 | 2 | 185 | 0 | 963 | 51 |
| June: | | | | | | | | | | |
| 21 | -- | -- | -- | -- | -- | -- | 0.2 | -- | 0.1 | -- |
| 31 | 10.0 | 10.5 | 6.8 | 5.2 | 17.2 | 4.8 | 26.7 | 14.8 | 15.2 | 8.8 |
| 41 | 28.6 | 30.1 | 5.6 | 13.0 | 26.6 | 31.0 | 13.3 | 11.1 | 18.5 | 21.4 |
| 51 | 1.4 | 2.3 | 0.7 | -- | 0.5 | 7.1 | 1.1 | 1.9 | 0.9 | 2.8 |
| ST | 40 | 42.9 | 13.1 | 18.2 | 44.3 | 42.9 | 41.3 | 27.8 | 34.7 | 33.0 |
| 32 | -- | -- | 1.2 | 2.6 | -- | -- | 0.4 | -- | 0.4 | 0.7 |
| 42 | 37.0 | 20.3 | 48.8 | 31.2 | 37.7 | 14.3 | 40.7 | 22.2 | 41.1 | 22.0 |
| 52 | -- | -- | 34.4 | 46.7 | 18.0 | 42.8 | 17.6 | 48.0 | 17.5 | 34.5 |
| 62 | -- | -- | 2.1 | 1.3 | -- | -- | -- | -- | 0.5 | 0.3 |
| 53 | 23.0 | 36.8 | 0.2 | -- | -- | -- | -- | -- | 5.8 | 9.2 |
| 63 | -- | -- | 0.2 | -- | -- | -- | -- | -- | 0.1 | -- |
| ST | 60.0 | 57.1 | 86.9 | 81.8 | 55.7 | 57.1 | 58.7 | 72.2 | 65.3 | 67.1 |
| T | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100.1 |
| n[c] | 418 | 133 | 572 | 77 | 377 | 42 | 467 | 54 | 1834 | 306 |

Appendix table 7 (cont.)

| Age[b] (y) | 1964 R | 1964 W | 1965 R | 1965 W | 1966 R | 1966 W | 1969 R | 1969 W | Mean R | Mean W |
|---|---|---|---|---|---|---|---|---|---|---|
| July: | | | | | | | | | | |
| 21 | 0.3 | -- | 0.4 | -- | 0.8 | 0.7 | 1.6 | 1.2 | 0.8 | 0.5 |
| 31 | 4.2 | 3.4 | 6.2 | 0.9 | 37.7 | 15.8 | 30.3 | 19.4 | 19.6 | 9.9 |
| 41 | 12.5 | 15.8 | 4.3 | 4.4 | 28.6 | 46.7 | 22.7 | 21.9 | 17.0 | 22.1 |
| 51 | 0.7 | 0.5 | 1.3 | 1.7 | 0.7 | 2.6 | 5.0 | 4.2 | 1.9 | 2.3 |
| ST | 17.7 | 19.7 | 12.2 | 7.0 | 67.8 | 65.8 | 59.6 | 46.7 | 39.3 | 34.8 |
| 32 | 13.3 | 5.7 | 17.9 | 6.1 | 1.8 | 2.0 | 4.6 | 1.2 | 9.4 | 3.8 |
| 42 | 47.8 | 31.3 | 44.8 | 31.7 | 22.8 | 12.5 | 20.0 | 27.3 | 33.8 | 25.7 |
| 52 | 20.8 | 42.5 | 24.2 | 51.3 | 7.5 | 19.7 | 15.1 | 23.6 | 16.9 | 34.2 |
| 62 | 0.4 | 0.8 | 0.9 | 3.9 | 0.1 | -- | 0.5 | 1.2 | 0.5 | 1.5 |
| 53 | -- | -- | -- | -- | -- | -- | 0.2 | -- | 0.1 | -- |
| 63 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ST | 82.3 | 80.3 | 87.8 | 93.0 | 32.2 | 34.2 | 40.4 | 53.3 | 60.7 | 65.2 |
| T | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| n[c] | 667 | 386 | 912 | 230 | 718 | 152 | 436 | 165 | 2733 | 933 |
| August: | | | | | | | | | | |
| 21 | 9.8 | 14.4 | 2.2 | -- | 1.6 | 2.9 | 4.0 | 2.2 | 4.4 | 4.9 |
| 31 | 32.8 | 13.2 | 17.4 | 13.3 | 26.8 | 15.5 | 64.8 | 53.8 | 35.5 | 24.0 |
| 41 | 31.3 | 39.3 | 46.2 | 33.7 | 46.3 | 46.8 | 19.6 | 25.3 | 35.8 | 36.2 |
| 51 | 1.6 | 3.1 | 9.0 | 13.6 | 6.5 | 4.8 | 5.1 | 8.8 | 5.6 | 7.6 |
| ST | 75.5 | 70.0 | 74.8 | 60.6 | 81.2 | 70.0 | 93.5 | 90.1 | 81.3 | 72.7 |
| 32 | 7.6 | 6.6 | 4.3 | 1.4 | 1.0 | 2.9 | 2.3 | 1.1 | 3.8 | 3.0 |
| 42 | 13.4 | 12.1 | 12.1 | 17.6 | 9.8 | 15.0 | 3.2 | 4.8 | 9.6 | 12.3 |
| 52 | 3.5 | 11.3 | 8.5 | 19.3 | 8.0 | 11.6 | 1.0 | 4.0 | 5.3 | 11.6 |
| 62 | -- | -- | 0.3 | 1.1 | -- | 0.5 | -- | -- | 0.1 | 0.4 |
| 53 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 63 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ST | 24.5 | 30.0 | 25.2 | 39.4 | 18.8 | 30 | 6.5 | 9.9 | 18.8 | 27.3 |
| T | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| n[c] | 763 | 424 | 743 | 279 | 489 | 207 | 603 | 273 | 2598 | 1183 |

Appendix table 7 (cont.)

| Age[b] (y) | 1964 R | 1964 W | 1965 R | 1965 W | 1966 R | 1966 W | 1969 R | 1969 W | Mean R | Mean W |
|---|---|---|---|---|---|---|---|---|---|---|
| September: | | | | | | | | | | |
| 21 | 8.4 | 15.4 | 3.5 | 1.8 | 9.8 | 4.9 | -- | -- | 5.4 | 7.4 |
| 31 | 27.9 | 49.5 | 36.5 | 20.5 | 32.6 | 26.0 | 24.6 | -- | 30.4 | 32.0 |
| 41 | 51.4 | 30.0 | 43.5 | 71.3 | 48.2 | 62.0 | 61.4 | -- | 51.1 | 54.4 |
| 51 | 3.0 | 2.6 | 9.6 | 4.9 | 3.6 | 3.9 | 10.5 | -- | 6.7 | 3.8 |
| ST | 90.7 | 97.5 | 93.1 | 98.5 | 94.2 | 96.8 | 96.5 | -- | 93.6 | 97.6 |
| 32 | 2.4 | 0.5 | -- | -- | 0.4 | 0.4 | -- | -- | 0.7 | 0.3 |
| 42 | 3.0 | 0.9 | 5.0 | 0.6 | 4.0 | 1.4 | 3.5 | -- | 3.9 | 1.0 |
| 52 | 3.9 | 1.1 | 1.5 | 0.9 | 1.4 | 1.4 | -- | -- | 1.7 | 1.1 |
| 62 | -- | -- | 0.4 | -- | -- | -- | -- | -- | 0.1 | -- |
| 53 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 63 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ST | 9.3 | 2.5 | 6.9 | 1.5 | 5.8 | 3.2 | 3.5 | -- | 6.4 | 2.4 |
| T | 100 | 100 | 100 | 100 | 100 | 100 | 100 | -- | 100 | 100 |
| n[c] | 333 | 570 | 260 | 678 | 276 | 285 | 57 | 0 | 926 | 1533 |

a. Flesh color: R = red; W = white.
b. Gilbert-Rich method: 21 = $2_1$, etc.
c. n = numbers sampled.

Appendix table 8A. Dixon-Massey tests of differences in proportions, for ocean-age-groups 2 and 3, between red-flesh and white-flesh chinook salmon sampled from the commercial gillnet fishery in the lower Fraser River, June-July 1960-66 and 1969. (Asterisks mark rejection of the hypothesis that $P_R - P_W = 0$.)

| Year | Red | | White | | $P_R - P_W$ | 95% confidence limits[a] | | |
|---|---|---|---|---|---|---|---|---|
| | $P^b$ | $N^c$ | $P^b$ | $N^c$ | | lower | upper | |
| | Ocean-age 2 | | | | | | | |
| June | | | | | | | | |
| 1960 | .565 | 69 | .607 | 191 | -.042 | -.178 | .094 | |
| 1961 | .468 | 524 | .358 | 53 | .110 | -.026 | .246 | |
| 1962 | .246 | 339 | .465 | 32 | -.219 | -.398 | -.040 | * |
| 1963 | .620 | 327 | .727 | 83 | -.107 | -.216 | .002 | |
| 1964 | .471 | 418 | .308 | 133 | .163 | .071 | .255 | * |
| 1965 | .558 | 572 | .364 | 77 | .194 | .079 | .309 | * |
| 1966 | .549 | 377 | .190 | 42 | .359 | .230 | .488 | * |
| 1969 | .675 | 467 | .370 | 54 | .305 | .169 | .441 | * |
| July | | | | | | | | |
| 1960 | .440 | 166 | .496 | 480 | -.056 | -.144 | .032 | |
| 1961 | .355 | 523 | .269 | 211 | .086 | .013 | .159 | * |
| 1962 | .447 | 499 | .383 | 159 | .064 | -.023 | .151 | |
| 1963 | .569 | 129 | .467 | 40 | .102 | -.075 | .279 | |
| 1964 | .519 | 667 | .347 | 386 | .172 | .111 | .233 | * |
| 1965 | .520 | 912 | .326 | 230 | .194 | .125 | .263 | * |
| 1966 | .604 | 718 | .283 | 152 | .321 | .241 | .401 | * |
| 1969 | .505 | 436 | .467 | 165 | .038 | -.051 | .127 | |
| | Ocean-age 3 | | | | | | | |
| June | | | | | | | | |
| 1960 | .420 | 69 | .357 | 191 | .063 | -.072 | .198 | |
| 1961 | .437 | 524 | .547 | 53 | -.110 | -.251 | .031 | |
| 1962 | .697 | 339 | .211 | 32 | .486 | .336 | .636 | * |
| 1963 | .369 | 327 | .273 | 83 | .096 | -.013 | .205 | |
| 1964 | .514 | 418 | .669 | 133 | -.155 | -.248 | -.062 | * |
| 1965 | .402 | 572 | .597 | 77 | -.195 | -.312 | -.078 | * |
| 1966 | .446 | 377 | .738 | 42 | -.292 | -.434 | -.150 | * |
| 1969 | .308 | 467 | .593 | 54 | -.285 | -.423 | -.147 | * |

Appendix table 8A (cont.)

| Year | Red | | White | | $P_R - P_W$ | 95% confidence limits[a] | | |
|---|---|---|---|---|---|---|---|---|
| | P | N[b] | P | N[b] | | lower | upper | |
| | Ocean-age 3 | | | | | | | |
| July | | | | | | | | |
| 1960 | .512 | 166 | .429 | 480 | .083 | -.005 | .171 | |
| 1961 | .335 | 523 | .404 | 211 | -.069 | -.147 | .009 | |
| 1962 | .320 | 499 | .220 | 159 | .100 | .024 | .176 | * |
| 1963 | .422 | 129 | .533 | 40 | -.111 | -.288 | .066 | |
| 1964 | .333 | 667 | .583 | 386 | -.250 | -.311 | -.189 | * |
| 1965 | .285 | 912 | .557 | 230 | -.272 | -.343 | -.201 | * |
| 1966 | .361 | 718 | .664 | 152 | -.303 | -.386 | -.220 | * |
| 1969 | .378 | 436 | .455 | 165 | -.077 | -.166 | .012 | |

a. Confidence limits of $P_R - P_W$. (Dixon & Massey 1969, p. 249)
b. P = proportion of item i.
c. N = numbers sampled.

Appendix table 8B. Dixon-Massey tests of differences in proportions, for ocean-age-groups 2 and 3, between red-flesh and white-flesh chinook salmon sampled from the commercial gillnet fishery in the lower Fraser River, August-September 1960-66 and 1969. (Asterisks mark rejection of the hypothesis that $P_R - P_W = 0$.)

| Year | Red | | White | | $P_R - P_W$ | 95% confidence limits[a] | | |
|---|---|---|---|---|---|---|---|---|
| | P | N[b] | P | N[b] | | lower | upper | |
| | | | Ocean-age 2 | | | | | |
| August | | | | | | | | |
| 1960 | .274 | 146 | .292 | 355 | -.018 | -.104 | .068 | |
| 1961 | .131 | 320 | .189 | 169 | -.058 | -.128 | .012 | |
| 1962 | .329 | 369 | .205 | 123 | .124 | .038 | .210 | * |
| 1963 | .537 | 317 | .664 | 133 | -.127 | -.224 | -.030 | * |
| 1964 | .461 | 763 | .252 | 424 | .209 | .155 | .263 | * |
| 1965 | .295 | 743 | .308 | 279 | -.013 | -.076 | .050 | |
| 1966 | .366 | 489 | .304 | 207 | .062 | -.014 | .138 | |
| 1969 | .679 | 602 | .586 | 273 | .093 | .024 | .162 | * |
| September | | | | | | | | |
| 1960 | .050 | 378 | .098 | 102 | -.048 | -.110 | .014 | |
| 1961 | .178 | 28 | .202 | 657 | -.024 | -.169 | .121 | |
| 1962 | .777 | 160 | .219 | 282 | .558 | .477 | .639 | * |
| 1963 | .354 | 74 | .401 | 312 | -.047 | -.169 | .075 | |
| 1964 | .309 | 333 | .504 | 570 | -.195 | -.259 | -.131 | * |
| 1965 | .415 | 260 | .211 | 678 | .204 | .137 | .271 | * |
| 1966 | .366 | 276 | .274 | 285 | .092 | .015 | .169 | * |
| 1969 | .281 | 57 | --- | 0 | | | | |
| | | | Ocean-age 3 | | | | | |
| August | | | | | | | | |
| 1960 | .582 | 146 | .586 | 355 | -.004 | -.099 | .091 | |
| 1961 | .557 | 320 | .403 | 169 | .154 | .062 | .246 | * |
| 1962 | .477 | 369 | .141 | 123 | .336 | .256 | .416 | * |
| 1963 | .408 | 317 | .247 | 133 | .161 | .070 | .252 | * |
| 1964 | .349 | 763 | .507 | 424 | -.158 | -.216 | -.100 | * |
| 1965 | .548 | 743 | .530 | 279 | .018 | -.051 | .087 | |
| 1966 | .542 | 489 | .585 | 207 | -.043 | -.123 | .037 | |
| 1969 | .206 | 602 | .293 | 273 | -.087 | -.150 | -.024 | * |

Appendix table 8B (cont.)

| Year | Red | | White | | $P_R - P_W$ | 95% confidence limits[a] | | |
|---|---|---|---|---|---|---|---|---|
| | P | N[b] | P | N[b] | | lower | upper | |
| September | | | | | | | | |
| 1960 | .789 | 378 | .774 | 102 | .015 | -.076 | .106 | |
| 1961 | .751 | 28 | .603 | 657 | .148 | -.016 | .312 | |
| 1962 | .178 | 160 | .491 | 282 | -.313 | -.396 | -.230 | * |
| 1963 | .600 | 74 | .539 | 312 | .061 | -.064 | .186 | |
| 1964 | .553 | 333 | .311 | 570 | .242 | .176 | .308 | * |
| 1965 | .450 | 260 | .723 | 678 | -.273 | -.342 | -.204 | * |
| 1966 | .496 | 276 | .635 | 285 | -.139 | -.220 | -.058 | * |
| 1969 | .614 | 57 | --- | 0 | | | | |

a. Confidence limits of $P_R - P_W$. (Dixon & Massey 1969, p. 249)
b. P = proportion of item i.
c. N = numbers sampled.

Appendix table 9. Sex ratios (% females), by age, month, year, and flesh color[a], of chinook salmon sampled from the commercial gillnet fishery in the lower Fraser River, May-September 1964-66 and 1969. (Excluded are age-color cells with n <10.)

| Age[b] | 1964 | | 1965 | | 1966 | | 1969 | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| (y) | R | W | R | W | R | W | R | W | R | W |
| **May** | | | | | | | | | | |
| 21 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 31 | 52 | -- | -- | -- | -- | -- | 67 | -- | 57 | -- |
| 41 | 71 | -- | -- | -- | -- | -- | 61 | -- | 69 | -- |
| 51 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 32 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 42 | 51 | -- | 51 | -- | 49 | -- | 59 | -- | 52 | 25 |
| 52 | 70 | 89 | 71 | -- | 71 | -- | 64 | -- | 69 | 76 |
| 62 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **June** | | | | | | | | | | |
| 21 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 31 | 43 | 43 | 21 | -- | 39 | 40 | 38 | -- | 36 | 36 |
| 41 | 66 | 60 | 59 | 80 | 67 | 62 | 58 | -- | 64 | 65 |
| 51 | -- | -- | -- | -- | -- | -- | -- | -- | 76 | -- |
| 32 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 42 | 44 | 44 | 42 | 17 | 45 | -- | 52 | 50 | 45 | 36 |
| 52 | 72 | 59 | 67 | 69 | 62 | 89 | 65 | 69 | 67 | 68 |
| 62 | -- | -- | 42 | -- | -- | -- | -- | -- | 42 | -- |
| **July** | | | | | | | | | | |
| 21 | -- | -- | -- | -- | -- | -- | -- | -- | 16 | 0 |
| 31 | 29 | 39 | 21 | -- | 33 | 13 | 39 | 50 | 33 | 35 |
| 41 | 69 | 64 | 67 | 50 | 62 | 58 | 59 | 75 | 63 | 63 |
| 51 | -- | -- | 58 | -- | -- | -- | 46 | -- | 52 | 59 |
| 32 | 1 | 0 | 4 | 7 | 0 | -- | 0 | -- | 3 | 2 |
| 42 | 36 | 26 | 39 | 38 | 46 | 26 | 47 | 49 | 40 | 33 |
| 52 | 61 | 65 | 64 | 68 | 61 | 67 | 64 | 69 | 63 | 67 |
| 62 | -- | -- | -- | -- | -- | -- | -- | -- | 36 | 71 |
| **August** | | | | | | | | | | |
| 21 | 0 | 2 | 0 | -- | -- | -- | 0 | -- | 0 | 0 |
| 31 | 8 | 13 | 26 | 16 | 14 | 25 | 19 | 7 | 16 | 49 |
| 41 | 63 | 66 | 69 | 69 | 73 | 73 | 75 | 70 | 69 | 64 |
| 51 | 75 | 76 | 75 | 66 | 81 | 70 | 94 | 88 | 80 | -- |

Appendix table 9 (cont.)

| Age[b] (y) | 1964 R | 1964 W | 1965 R | 1965 W | 1966 R | 1966 W | 1969 R | 1969 W | Total R | Total W |
|---|---|---|---|---|---|---|---|---|---|---|
| August (cont.) | | | | | | | | | | |
| 32 | 0 | 0 | 3 | -- | -- | -- | 0 | -- | 1 | 0 |
| 42 | 19 | 55 | 42 | 39 | 50 | 55 | 53 | 54 | 35 | 49 |
| 52 | 44 | 65 | 70 | 70 | 79 | 58 | -- | 36 | 67 | 64 |
| 62 | -- | -- | -- | -- | -- | -- | -- | -- | 50 | 25 |
| September | | | | | | | | | | |
| 21 | 0 | 0 | -- | 8 | 0 | 0 | -- | -- | 0 | 1 |
| 31 | 14 | 6 | 15 | 25 | 16 | 10 | 50 | -- | 16 | 12 |
| 41 | 61 | 57 | 57 | 66 | 67 | 64 | 80 | -- | 63 | 63 |
| 51 | 80 | 73 | 80 | 94 | 70 | 82 | -- | -- | 73 | 86 |
| 32 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 42 | 50 | -- | 39 | -- | 46 | -- | -- | -- | 47 | 23 |
| 52 | 77 | -- | -- | -- | -- | -- | -- | -- | 81 | 88 |
| 62 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

a. Flesh color: R = red; W = white.
b. Gilbert-Rich method: 21 = $2_1$, etc.

Appendix table 10. Age-frequencies (nos.), by mesh size (in) and month, for chinook salmon sampled from the test fishery in the lower Fraser River, April-September 1965.

| Age[a] (y) | Apr | May | Jun | Jul | Aug | Sep | Total n | Total % |
|---|---|---|---|---|---|---|---|---|
| 6.5" | | | | | | | | |
| 21 | -- | -- | 1 | 1 | 2 | 1 | 5 | 4.6 |
| 31 | -- | 4 | 8 | 3 | 7 | 11 | 33 | 30.3 |
| 41 | -- | 2 | 4 | 1 | 6 | 12 | 25 | 22.9 |
| 51 | -- | 1 | -- | -- | -- | 1 | 2 | 1.8 |
| 61 | -- | -- | 1 | -- | -- | -- | 1 | .9 |
| 32 | -- | 2 | -- | 3 | -- | -- | 5 | 4.6 |
| 42 | 3 | 13 | 12 | 1 | 3 | -- | 32 | 29.4 |
| 52 | -- | 3 | 2 | 1 | -- | -- | 6 | 5.5 |
| 62 | -- | -- | -- | -- | -- | -- | 0 | -- |
| T | 3 | 25 | 28 | 10 | 18 | 25 | 109 | 100 |
| 7.5" | | | | | | | | |
| 21 | -- | -- | -- | 1 | 2 | -- | 3 | 3.1 |
| 31 | -- | 2 | 4 | 5 | 1 | 10 | 22 | 22.4 |
| 41 | -- | 4 | 3 | 4 | 14 | 9 | 34 | 34.7 |
| 51 | -- | -- | 2 | -- | 4 | 3 | 9 | 9.2 |
| 61 | -- | -- | -- | -- | -- | -- | 0 | -- |
| 32 | -- | -- | 2 | 3 | -- | -- | 5 | 5.1 |
| 42 | -- | 4 | 9 | 1 | -- | -- | 14 | 14.3 |
| 52 | -- | -- | 4 | 3 | 4 | -- | 11 | 11.2 |
| 62 | -- | -- | -- | -- | -- | -- | 0 | -- |
| T | 0 | 10 | 24 | 17 | 25 | 22 | 98 | 100 |
| 8.5" | | | | | | | | |
| 21 | -- | -- | -- | -- | -- | -- | 0 | -- |
| 31 | -- | 1 | 1 | 1 | 1 | 5 | 9 | 9.4 |
| 41 | -- | 3 | 5 | 4 | 16 | 24 | 52 | 54.2 |
| 51 | -- | -- | 1 | | 3 | 7 | 11 | 11.5 |
| 61 | -- | -- | -- | -- | -- | -- | 0 | -- |
| 32 | -- | 1 | -- | -- | -- | -- | 1 | 1.0 |
| 42 | -- | 2 | 6 | 2 | 2 | -- | 12 | 12.5 |
| 52 | -- | 5 | 5 | -- | -- | 1 | 11 | 11.5 |
| 62 | -- | -- | -- | -- | -- | -- | 0 | -- |
| T | 0 | 12 | 18 | 7 | 22 | 37 | 96 | 100 |

Appendix table 10 (cont.)

| Age[a] (y) | Apr | May | Jun | Jul | Aug | Sep | Total n | Total % |
|---|---|---|---|---|---|---|---|---|
| 9.5" | | | | | | | | |
| 21 | -- | -- | -- | -- | -- | -- | 0 | -- |
| 31 | -- | -- | 2 | 1 | 1 | 3 | 7 | 8.2 |
| 41 | -- | 3 | 2 | 9 | 6 | 24 | 44 | 51.8 |
| 51 | -- | -- | 1 | 1 | 3 | 14 | 19 | 22.4 |
| 61 | -- | -- | -- | -- | -- | -- | 0 | -- |
| 32 | -- | 1 | -- | -- | -- | -- | 1 | 1.2 |
| 42 | -- | -- | 2 | 1 | -- | -- | 3 | 3.5 |
| 52 | 1 | 2 | 4 | 3 | -- | -- | 10 | 11.8 |
| 62 | -- | -- | 1 | -- | -- | -- | 1 | 1.2 |
| T | 1 | 6 | 12 | 15 | 10 | 41 | 85 | 100 |
| GT | 4 | 53 | 82 | 49 | 75 | 125 | 388 | |

| | 6.5" | 7.5" | 8.5" | 9.5" | Total n | Total % |
|---|---|---|---|---|---|---|
| 21 | 5 | 3 | 0 | 0 | 8 | 2.1 |
| 31 | 33 | 22 | 9 | 7 | 71 | 18.3 |
| 41 | 25 | 34 | 52 | 44 | 155 | 39.9 |
| 51 | 2 | 9 | 11 | 19 | 41 | 10.6 |
| 61 | 1 | 0 | 0 | 0 | 1 | .3 |
| 32 | 5 | 5 | 1 | 1 | 12 | 3.1 |
| 42 | 32 | 14 | 12 | 3 | 61 | 15.7 |
| 52 | 6 | 11 | 11 | 10 | 38 | 9.8 |
| 62 | 0 | 0 | 0 | 1 | 1 | .3 |
| T | 109 | 98 | 96 | 85 | 388 | 100 |

a. Gilbert-Rich method: 21 = $2_1$, etc.

Appendix table 11. Age-frequencies (nos.), by mesh size (in) and month, for chinook salmon sampled from the test fishery in the lower Fraser River, April-September 1966.

| Age[a] (y) | Apr | May | Jun | Jul | Aug | Sep | Total n | Total % |
|---|---|---|---|---|---|---|---|---|
| 6.5" | | | | | | | | |
| 21 | -- | -- | -- | -- | 1 | 5 | 6 | 7.1 |
| 31 | -- | -- | 2 | 1 | 6 | 13 | 22 | 25.9 |
| 41 | -- | -- | 2 | 4 | 6 | 7 | 19 | 22.4 |
| 51 | -- | -- | -- | -- | 1 | -- | 1 | 1.2 |
| 61 | -- | -- | -- | -- | -- | -- | 0 | -- |
| 32 | -- | -- | -- | 1 | 2 | -- | 3 | 3.5 |
| 42 | 2 | 5 | 7 | 9 | 3 | -- | 26 | 30.6 |
| 53 | -- | -- | -- | -- | 1 | -- | 1 | 1.2 |
| 52 | -- | 3 | 3 | -- | -- | -- | 6 | 7.1 |
| 62 | -- | -- | 1 | -- | -- | -- | 1 | 1.2 |
| T | 2 | 8 | 15 | 15 | 20 | 25 | 85 | 100 |
| 7.5" | | | | | | | | |
| 21 | -- | -- | -- | -- | -- | 3 | 3 | 2.2 |
| 31 | -- | -- | 2 | 5 | 13 | 13 | 33 | 23.7 |
| 41 | -- | -- | 5 | 10 | 8 | 12 | 35 | 25.2 |
| 51 | -- | -- | -- | -- | 1 | 1 | 2 | 1.4 |
| 61 | -- | -- | -- | -- | 1 | -- | 1 | .7 |
| 32 | -- | -- | -- | 2 | -- | -- | 2 | 1.4 |
| 42 | 3 | 16 | 16 | 9 | 5 | -- | 49 | 35.3 |
| 53 | -- | -- | -- | -- | 1 | -- | 1 | .7 |
| 52 | 6 | 4 | 2 | 1 | -- | -- | 13 | 9.4 |
| 62 | -- | -- | -- | -- | -- | -- | 0 | -- |
| T | 9 | 20 | 25 | 27 | 29 | 29 | 139 | 100 |
| 8.5" | | | | | | | | |
| 21 | -- | -- | -- | -- | -- | 4 | 4 | 2.5 |
| 31 | -- | -- | 1 | 5 | 4 | 9 | 19 | 11.9 |
| 41 | -- | 3 | 7 | 10 | 22 | 45 | 87 | 54.7 |
| 51 | -- | -- | -- | -- | 1 | 5 | 6 | 3.8 |
| 61 | -- | -- | -- | -- | -- | -- | 0 | -- |
| 32 | -- | -- | 1 | 2 | -- | -- | 3 | 1.9 |
| 42 | -- | 6 | 2 | 10 | 2 | -- | 20 | 12.6 |
| 53 | -- | -- | -- | -- | -- | -- | 0 | -- |
| 52 | 4 | 6 | 4 | 3 | 3 | -- | 20 | 12.6 |
| 62 | -- | -- | -- | -- | -- | -- | 0 | -- |
| T | 4 | 15 | 15 | 30 | 32 | 63 | 159 | 100 |

Appendix table 11 (cont.)

| Age[a] (y) | Apr | May | Jun | Jul | Aug | Sep | Total n | Total % |
|---|---|---|---|---|---|---|---|---|
| 9.5" | | | | | | | | |
| 21 | -- | -- | -- | -- | -- | 2 | 2 | 1.9 |
| 31 | -- | -- | -- | -- | 1 | 9 | 10 | 9.4 |
| 41 | -- | 2 | 3 | 17 | 11 | 33 | 66 | 62.3 |
| 51 | -- | 1 | -- | 1 | 1 | 3 | 6 | 5.7 |
| 61 | -- | -- | -- | -- | -- | -- | 0 | -- |
| 32 | -- | -- | 1 | -- | 1 | -- | 2 | 1.9 |
| 42 | -- | -- | -- | -- | 3 | -- | 3 | 2.8 |
| 53 | -- | -- | -- | -- | -- | -- | 0 | -- |
| 52 | 3 | 3 | 3 | 7 | -- | -- | 16 | 15.1 |
| 62 | -- | -- | -- | 1 | -- | -- | 1 | .9 |
| T | 3 | 6 | 7 | 26 | 17 | 47 | 106 | 100 |
| GT | 18 | 49 | 62 | 98 | 98 | 164 | 489 | |

| | 6.5" | 7.5" | 8.5" | 9.5" | Total N | Total % |
|---|---|---|---|---|---|---|
| 21 | 6 | 3 | 4 | 2 | 15 | 3.1 |
| 31 | 22 | 33 | 19 | 10 | 84 | 17.2 |
| 41 | 19 | 35 | 87 | 66 | 207 | 42.3 |
| 51 | 1 | 2 | 6 | 6 | 15 | 3.1 |
| 61 | 0 | 1 | 0 | 0 | 1 | .2 |
| 32 | 3 | 2 | 3 | 2 | 10 | 2.0 |
| 42 | 26 | 49 | 20 | 3 | 98 | 20.0 |
| 53 | 1 | 1 | 0 | 0 | 2 | .4 |
| 52 | 6 | 13 | 20 | 16 | 55 | 11.2 |
| 62 | 1 | 0 | 0 | 1 | 2 | .4 |
| T | 85 | 139 | 159 | 106 | 489 | 100 |

a. Gilbert-Rich method: 21 = $2_1$, etc.

Appendix table 12. Length-frequencies (nos.), by mesh size (in) and month, of chinook salmon sampled from the test fishery in the lower Fraser River, April-September 1965.

| OHL[a] (cm) | Apr-May | Jun | Jul | Aug | Sep | T | Apr-May | Jun | Jul | Aug | Sep | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mesh size: | | | 6.5" | | | | | | 7.0" | | | |
| 25-29 | -- | -- | 1 | -- | -- | 1 | -- | -- | -- | -- | -- | -- |
| 30-34 | 2 | -- | 1 | 1 | -- | 4 | -- | -- | -- | -- | -- | -- |
| 35-39 | 1 | 1 | 1 | 1 | -- | 4 | -- | -- | -- | -- | -- | -- |
| 40-44 | 0 | 0 | 2 | 0 | -- | 2 | -- | -- | -- | -- | -- | -- |
| 45-49 | 2 | 2 | 4 | 3 | 4 | 15 | 1 | -- | -- | -- | -- | 1 |
| 50-54 | 10 | 14 | 1 | 2 | 4 | 31 | 4 | -- | -- | -- | -- | 4 |
| 55-59 | 14 | 9 | 2 | 6 | 4 | 35 | 4 | -- | -- | 2 | -- | 6 |
| 60-64 | 6 | 5 | 4 | 6 | 3 | 24 | 2 | -- | -- | 1 | -- | 3 |
| 65-69 | 2 | 2 | 0 | 4 | 4 | 12 | 3 | -- | -- | -- | -- | 3 |
| 70-74 | 1 | 4 | 2 | 1 | 5 | 13 | 2 | -- | -- | -- | -- | 2 |
| 75-79 | 2 | 2 | 2 | 0 | 3 | 9 | -- | -- | -- | -- | -- | -- |
| 80-84 | -- | 1 | -- | 2 | 2 | 5 | -- | -- | -- | -- | -- | -- |
| 85-89 | -- | -- | -- | -- | 1 | 1 | -- | -- | -- | -- | -- | -- |
| Total | 40 | 40 | 20 | 26 | 30 | 156 | 16 | 0 | 0 | 3 | 0 | 19 |
| Mesh size: | | | 7.5" | | | | | | 8.5" | | | |
| 25-29 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 30-34 | -- | -- | -- | 1 | 1 | 2 | -- | -- | 1 | -- | -- | 1 |
| 35-39 | 1 | 3 | 3 | 0 | 0 | 7 | -- | -- | 0 | -- | 1 | 1 |
| 40-44 | 1 | 0 | 1 | 1 | 0 | 3 | -- | -- | 0 | -- | 0 | 0 |
| 45-49 | 1 | 2 | 2 | 0 | 1 | 6 | -- | 2 | 0 | -- | 1 | 3 |
| 50-54 | 1 | 2 | 3 | 1 | 1 | 8 | -- | 4 | 0 | 2 | 0 | 6 |
| 55-59 | 5 | 14 | 10 | 3 | 8 | 40 | 3 | 8 | 2 | 3 | 2 | 18 |
| 60-64 | 6 | 4 | 7 | 0 | 3 | 20 | 5 | 9 | 4 | 2 | 3 | 23 |
| 65-69 | 1 | 1 | 1 | 12 | 3 | 18 | 6 | 2 | 1 | 7 | 5 | 21 |
| 70-74 | 2 | 4 | 4 | 6 | 5 | 21 | 4 | 2 | 3 | 11 | 9 | 26 |
| 75-79 | 2 | 3 | 0 | 3 | 5 | 13 | -- | 2 | 3 | 5 | 13 | 23 |
| 80-84 | -- | 1 | 1 | 1 | 5 | 8 | -- | -- | -- | 1 | 8 | 9 |
| 85-89 | -- | 1 | -- | -- | -- | 1 | -- | -- | -- | -- | 1 | 1 |
| Total | 20 | 35 | 32 | 28 | 32 | 147 | 18 | 29 | 14 | 31 | 43 | 132 |

Appendix table 12 (cont.)

| OHL[a] (cm) | Apr-May | Jun | Jul | Aug | Sep | T | April-September (nos.) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mesh size: | | 9.5" | | | | | 6.5 | 7.0 | 7.5 | 8.5 | 9.5 | T |
| 25-29 | -- | -- | -- | -- | -- | -- | 1 | -- | -- | -- | -- | 1 |
| 30-34 | -- | -- | -- | -- | -- | -- | 4 | -- | 2 | 1 | -- | 7 |
| 35-39 | -- | -- | -- | -- | -- | -- | 4 | -- | 7 | 1 | -- | 12 |
| 40-44 | -- | -- | -- | -- | -- | -- | 2 | -- | 3 | 0 | -- | 5 |
| 45-49 | -- | -- | -- | 1 | -- | 1 | 15 | 1 | 6 | 3 | 1 | 26 |
| 50-54 | -- | -- | -- | 0 | -- | 0 | 31 | 4 | 8 | 6 | 0 | 49 |
| 55-59 | -- | 1 | 1 | 0 | -- | 2 | 35 | 6 | 40 | 18 | 2 | 101 |
| 60-64 | -- | 3 | 2 | 1 | -- | 6 | 24 | 3 | 20 | 23 | 6 | 76 |
| 65-69 | -- | 3 | 4 | 2 | 8 | 17 | 12 | 3 | 18 | 21 | 17 | 71 |
| 70-74 | 7 | 4 | 8 | 2 | 8 | 29 | 13 | 2 | 21 | 26 | 29 | 91 |
| 75-79 | 4 | 5 | 3 | 5 | 18 | 35 | 9 | -- | 13 | 23 | 35 | 80 |
| 80-84 | -- | 2 | 2 | 1 | 15 | 20 | 5 | -- | 8 | 9 | 20 | 42 |
| 85-89 | -- | 2 | -- | -- | 2 | 4 | 1 | -- | 1 | 1 | 4 | 7 |
| Total | 11 | 20 | 20 | 12 | 51 | 114 | 156 | 19 | 147 | 132 | 114 | 568 |
| | | | | | | | April-September (%) | | | | | |
| 25-29 | | | | | | | .6 | -- | -- | -- | -- | .2 |
| 30-34 | | | | | | | 2.6 | -- | 1.4 | .8 | -- | 1.2 |
| 35-39 | | | | | | | 2.6 | -- | 4.8 | .8 | -- | 2.1 |
| 40-44 | | | | | | | 1.3 | -- | 2.0 | 0 | -- | .9 |
| 45-49 | | | | | | | 9.6 | 5.3 | 4.1 | 2.3 | .9 | 4.6 |
| 50-54 | | | | | | | 19.9 | 21.1 | 5.4 | 4.5 | 0 | 8.6 |
| 55-59 | | | | | | | 22.4 | 31.6 | 27.2 | 13.6 | 1.8 | 17.8 |
| 60-64 | | | | | | | 15.4 | 15.8 | 13.6 | 17.4 | 5.3 | 13.4 |
| 65-69 | | | | | | | 7.7 | 15.8 | 12.2 | 15.9 | 14.9 | 12.5 |
| 70-74 | | | | | | | 8.3 | 10.5 | 14.3 | 19.7 | 25.4 | 16.0 |
| 75-79 | | | | | | | 5.8 | -- | 8.8 | 17.4 | 30.7 | 14.1 |
| 80-84 | | | | | | | 3.2 | -- | 5.4 | 6.8 | 17.5 | 7.4 |
| 85-89 | | | | | | | .6 | -- | .7 | .8 | 3.5 | 1.2 |
| Total | | | | | | | 100 | 100 | 100 | 100 | 100 | 100 |

a. Orbit-hypural length (nearest lower centimeter).

Appendix table 13. Length-frequencies (nos.), by mesh size (in) and month, of chinook salmon sampled from test fishery in the the lower Fraser River, April-September 1966.

| OHL[a] (cm) | Apr | May | Jun | Jul | Aug | Sep | T | Apr | May | Jun | Jul | Aug | Sep | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mesh size: | | | 6.5" | | | | | | | 7.5" | | | | |
| 25-29 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1 | -- | -- | 1 |
| 30-34 | -- | -- | -- | -- | -- | 1 | 1 | -- | -- | -- | 0 | -- | -- | 0 |
| 35-39 | -- | -- | 1 | -- | 2 | 0 | 3 | -- | -- | -- | 3 | 2 | 2 | 7 |
| 40-44 | -- | -- | 0 | 1 | 0 | 3 | 4 | 1 | -- | -- | 2 | 0 | 1 | 4 |
| 45-49 | 3 | -- | 3 | 0 | 1 | 3 | 10 | 1 | 2 | -- | 1 | 1 | 1 | 6 |
| 50-54 | 8 | 7 | 3 | 2 | 6 | 10 | 36 | 1 | 5 | 3 | 3 | 6 | 3 | 21 |
| 55-59 | 1 | 4 | 9 | 7 | 4 | 2 | 27 | 4 | 11 | 18 | 11 | 6 | 6 | 56 |
| 60-64 | -- | 2 | 1 | 4 | 4 | 2 | 13 | 2 | 7 | 9 | 7 | 12 | 3 | 40 |
| 65-69 | -- | 1 | 2 | 3 | 3 | 5 | 14 | 4 | 5 | 5 | 5 | 5 | 4 | 28 |
| 70-74 | -- | 1 | 4 | 5 | 6 | 1 | 17 | -- | -- | 4 | 7 | 6 | 9 | 26 |
| 75-79 | -- | -- | 1 | 2 | -- | 2 | 5 | -- | -- | 5 | 2 | 1 | 2 | 10 |
| 80-84 | -- | -- | -- | 1 | -- | 1 | 2 | -- | -- | 1 | -- | 1 | 2 | 4 |
| 85-89 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | 132 | | | | | | | 203 |
| Total | 12 | 15 | 24 | 25 | 26 | 30 | 132 | 13 | 30 | 45 | 42 | 40 | 33 | 203 |

| OHL[a] (cm) | Apr | May | Jun | Jul | Aug | Sep | T | Apr | May | Jun | Jul | Aug | Sep | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mesh size: | | | 8.5" | | | | | | | 9.5" | | | | |
| 25-29 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 30-34 | -- | -- | -- | -- | -- | 1 | 1 | -- | -- | 1 | -- | -- | -- | 1 |
| 35-39 | -- | -- | -- | 2 | 1 | 1 | 4 | -- | -- | 0 | 1 | 1 | 1 | 3 |
| 40-44 | 1 | -- | -- | 0 | 0 | 1 | 2 | -- | -- | 0 | 1 | 0 | 1 | 2 |
| 45-49 | 1 | 2 | -- | 0 | 1 | 1 | 5 | -- | -- | 0 | 0 | 0 | 0 | 0 |
| 50-54 | 2 | 2 | 4 | 2 | 0 | 2 | 12 | -- | -- | 1 | 0 | 1 | 0 | 2 |
| 55-59 | 0 | 5 | 3 | 6 | 2 | 2 | 18 | -- | -- | 0 | 1 | 1 | 0 | 2 |
| 60-64 | 1 | 5 | 2 | 11 | 6 | 7 | 32 | -- | 1 | 0 | 2 | 1 | 1 | 5 |
| 65-69 | 7 | 7 | 9 | 7 | 19 | 14 | 63 | 2 | 0 | 0 | 3 | 3 | 11 | 19 |
| 70-74 | 4 | 3 | 6 | 14 | 14 | 13 | 54 | 3 | 6 | 7 | 13 | 12 | 19 | 60 |
| 75-79 | -- | -- | -- | 5 | 3 | 19 | 27 | 1 | 2 | 6 | 15 | 4 | 11 | 39 |
| 80-84 | -- | -- | -- | -- | -- | 11 | 11 | -- | 1 | 0 | 5 | 1 | 9 | 16 |
| 85-89 | -- | -- | -- | -- | -- | 1 | 1 | -- | -- | 1 | 1 | -- | -- | 2 |
| | | | | | | | 230 | | | | | | | 151 |
| Total | 16 | 24 | 24 | 47 | 46 | 73 | 230 | 6 | 10 | 16 | 42 | 24 | 53 | 151 |

Appendix table 13 (cont.)

| OHL[a] (cm) | April-September (nos.) 6.5 | 7.5 | 8.5 | 9.5 | T | April-September (%) 6.5 | 7.5 | 8.5 | 9.5 | T |
|---|---|---|---|---|---|---|---|---|---|---|
| 25-29 | -- | 1 | -- | -- | 1 | -- | .5 | -- | -- | .1 |
| 30-34 | 1 | 0 | 1 | 1 | 3 | .8 | 0 | .4 | .7 | .4 |
| 35-39 | 3 | 7 | 4 | 3 | 17 | 2.3 | 3.4 | 1.7 | 2.0 | 2.4 |
| 40-44 | 4 | 4 | 2 | 2 | 12 | 3.0 | 2.0 | .9 | 1.3 | 1.7 |
| 45-49 | 10 | 6 | 5 | 0 | 21 | 7.6 | 3.0 | 2.2 | 0 | 2.9 |
| 50-54 | 36 | 21 | 12 | 2 | 71 | 27.3 | 10.3 | 5.2 | 1.3 | 9.9 |
| 55-59 | 27 | 56 | 18 | 2 | 103 | 20.5 | 27.6 | 7.8 | 1.3 | 14.4 |
| 60-64 | 13 | 40 | 32 | 5 | 90 | 9.8 | 19.7 | 13.9 | 3.3 | 12.6 |
| 65-69 | 14 | 28 | 63 | 19 | 124 | 10.6 | 13.8 | 27.4 | 12.6 | 17.3 |
| 70-74 | 17 | 26 | 54 | 60 | 157 | 12.9 | 12.8 | 23.5 | 39.7 | 21.9 |
| 75-79 | 5 | 10 | 27 | 39 | 81 | 3.8 | 4.9 | 11.7 | 25.8 | 11.3 |
| 80-84 | 2 | 4 | 11 | 16 | 33 | 1.5 | 2.0 | 4.8 | 10.6 | 4.6 |
| 85-89 | -- | -- | 1 | 2 | 3 | -- | -- | .4 | 1.3 | .4 |
| Total | 132 | 203 | 230 | 151 | 716 | 100 | 100 | 100 | 100 | 100 |

a. Orbit-hypural length (nearest lower centimeter).

Appendix table 14. Dixon-Massey tests of differences in proportions, for ocean-age-groups 2 and 3, between Fraser River chinook salmon sampled from the commercial gillnet fishery (CF) and the test fishery (TF), in the lower Fraser River, April-September 1965-66. (Asterisks mark rejection of the hypothesis that $P_{CF} - P_{TF} = 0$.)

| Year | CF | | TF | | $P_{CF} - P_{TF}$ | 95% confidence limits[a] | | |
|---|---|---|---|---|---|---|---|---|
| | P[b] | N[c] | P[b] | N[c] | | lower | upper | |
| **Ocean-age 2** | | | | | | | | |
| April | | | | | | | | |
| 1965[d] | .413 | 109 | .429 | 7 | --- | --- | --- | |
| 1966 | .692 | 39 | .278 | 18 | .414 | .161 | .667 | * |
| May | | | | | | | | |
| 1965 | .599 | 242 | .524 | 61 | .075 | -.065 | .215 | |
| 1966 | .547 | 95 | .551 | 49 | -.004 | -.176 | .168 | |
| June | | | | | | | | |
| 1965 | .473 | 649 | .538 | 82 | -.065 | -.180 | .050 | |
| 1966 | .513 | 419 | .484 | 62 | .029 | -.104 | .162 | |
| July | | | | | | | | |
| 1965 | .473 | 1142 | .306 | 49 | .167 | .035 | .299 | * |
| 1966 | .548 | 870 | .398 | 98 | .150 | .048 | .252 | * |
| August | | | | | | | | |
| 1965 | .298 | 1022 | .205 | 78 | .093 | -.001 | .187 | |
| 1966 | .348 | 696 | .398 | 98 | -.050 | -.153 | .053 | |
| September | | | | | | | | |
| 1965 | .267 | 938 | .232 | 125 | .035 | -.044 | .114 | |
| 1966 | .319 | 561 | .268 | 164 | .051 | -.027 | .129 | |
| **Ocean-age 3** | | | | | | | | |
| April | | | | | | | | |
| 1965[c] | .551 | 109 | .572 | 7 | --- | | | |
| 1966 | .256 | 39 | .722 | 18 | -.466 | -.714 | -.218 | * |

Appendix table 14 (cont.)

| Year | CF | | TF | | $P_{CF}-P_{TF}$ | 95% confidence limits[a] | | |
|---|---|---|---|---|---|---|---|---|
| | $P^b$ | $N^c$ | $P^b$ | $N^c$ | | lower | upper | |
| | Ocean-age 3 | | | | | | | |
| May | | | | | | | | |
| 1965 | .389 | 242 | .394 | 61 | -.005 | -.142 | .132 | |
| 1966 | .432 | 95 | .429 | 49 | .003 | -.168 | .174 | |
| June | | | | | | | | |
| 1965 | .340 | 649 | .354 | 82 | -.014 | -.124 | .096 | |
| 1966 | .475 | 419 | .468 | 62 | .007 | -.126 | .140 | |
| July | | | | | | | | |
| 1965 | .340 | 1142 | .510 | 49 | -.170 | -.313 | -.027 | * |
| 1966 | .414 | 870 | .530 | 98 | -.116 | -.220 | -.012 | * |
| August | | | | | | | | |
| 1965 | .543 | 1022 | .615 | 78 | -.072 | -.184 | .040 | |
| 1966 | .555 | 696 | .511 | 98 | .044 | -.062 | .150 | |
| September | | | | | | | | |
| 1965 | .647 | 938 | .560 | 125 | .087 | -.005 | .179 | |
| 1966 | .567 | 561 | .591 | 164 | -.024 | -.110 | .062 | |

a. Confidence limits of $P_C-P_T$. (Dixon & Massey 1969, p. 249)
b. P = proportion of item i.
c. N = numbers sampled.
d. No test. $(P_{CF})(N_{CF})<5$.

Appendix table 15. Age-frequencies (nos.), by month and year, of chinook salmon sampled from the catch of the test fishery in the lower Fraser River, April-October 1981-87.

| Age[a] (y) | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | Total n | Total % |
|---|---|---|---|---|---|---|---|---|---|
| April | | | | | | | | | |
| 21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -- |
| 31 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -- |
| 41 | 4 | 0 | 1 | 2 | 0 | 1 | 8 | 16 | 5.8 |
| 51 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | .7 |
| 61 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -- |
| 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -- |
| 42 | 0 | 2 | 1 | 3 | 1 | 3 | 2 | 12 | 4.3 |
| 52 | 20 | 15 | 35 | 25 | 22 | 31 | 84 | 232 | 84.1 |
| 62 | 0 | 0 | 1 | 1 | 1 | 7 | 4 | 14 | 5.1 |
| 53 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -- |
| 63 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -- |
| Total | 24 | 17 | 38 | 31 | 24 | 42 | 100 | 276 | 100 |
| May | | | | | | | | | |
| 21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -- |
| 31 | 0 | 2 | 1 | 1 | 0 | 0 | 1 | 5 | .6 |
| 41 | 3 | 3 | 2 | 2 | 1 | 0 | 8 | 19 | 2.3 |
| 51 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | .2 |
| 61 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -- |
| 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -- |
| 42 | 11 | 35 | 6 | 23 | 12 | 21 | 17 | 125 | 15.3 |
| 52 | 68 | 65 | 67 | 46 | 43 | 66 | 272 | 627 | 76.7 |
| 62 | 1 | 3 | 3 | 4 | 3 | 8 | 17 | 39 | 4.8 |
| 53 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -- |
| 63 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | .1 |
| Total | 83 | 108 | 80 | 76 | 59 | 95 | 317 | 818 | 100 |
| Jun | | | | | | | | | |
| 21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -- |
| 31 | 2 | 4 | 0 | 5 | 0 | 0 | 9 | 20 | 1.0 |
| 41 | 6 | 27 | 3 | 6 | 2 | 3 | 36 | 83 | 4.3 |
| 51 | 3 | 0 | 0 | 0 | 2 | 1 | 6 | 12 | .6 |
| 61 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -- |

Appendix table 15 (cont.)

| Age[a] (y) | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | Total n | Total % |
|---|---|---|---|---|---|---|---|---|---|
| Jun (cont.) | | | | | | | | | |
| 32 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | .1 |
| 42 | 52 | 46 | 35 | 58 | 64 | 46 | 69 | 370 | 19.3 |
| 52 | 113 | 80 | 173 | 136 | 124 | 110 | 594 | 1330 | 69.4 |
| 62 | 5 | 4 | 2 | 15 | 6 | 11 | 52 | 95 | 5.0 |
| 53 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | .1 |
| 63 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 4 | .2 |
| Total | 181 | 161 | 213 | 220 | 198 | 174 | 769 | 1916 | 100 |
| Jul | | | | | | | | | |
| 21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -- |
| 31 | 2 | 1 | 1 | 0 | 1 | 1 | 3 | 9 | .5 |
| 41 | 16 | 18 | 6 | 11 | 9 | 36 | 37 | 133 | 8.1 |
| 51 | 0 | 3 | 0 | 8 | 2 | 3 | 31 | 47 | 2.8 |
| 61 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -- |
| 32 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | .1 |
| 42 | 40 | 83 | 18 | 92 | 43 | 37 | 52 | 365 | 22.1 |
| 52 | 55 | 122 | 121 | 92 | 119 | 118 | 355 | 982 | 59.5 |
| 62 | 8 | 9 | 8 | 24 | 5 | 15 | 42 | 111 | 6.7 |
| 53 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 3 | .2 |
| 63 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -- |
| Total | 121 | 239 | 154 | 228 | 179 | 210 | 520 | 1651 | 100 |
| Aug | | | | | | | | | |
| 21 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | .1 |
| 31 | 7 | 4 | 0 | 3 | 5 | 0 | 1 | 20 | 2.3 |
| 41 | 74 | 46 | 33 | 50 | 52 | 85 | 53 | 393 | 44.4 |
| 51 | 15 | 8 | 5 | 20 | 12 | 16 | 35 | 111 | 12.5 |
| 61 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | .1 |
| 32 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 3 | .3 |
| 42 | 23 | 21 | 5 | 20 | 25 | 5 | 4 | 103 | 11.6 |
| 52 | 18 | 28 | 46 | 21 | 35 | 26 | 50 | 224 | 25.3 |
| 62 | 1 | 2 | 6 | 5 | 1 | 2 | 10 | 27 | 3.1 |
| 53 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | .1 |
| 63 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | .1 |
| Total | 138 | 110 | 95 | 121 | 132 | 134 | 155 | 885 | 100 |

Appendix table 15 (cont.)

| Age[a] (y) | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | Total n | Total % |
|---|---|---|---|---|---|---|---|---|---|
| Sep | | | | | | | | | |
| 21 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 4 | .4 |
| 31 | 40 | 55 | 26 | 68 | 74 | 2 | 24 | 289 | 25.5 |
| 41 | 64 | 159 | 132 | 102 | 117 | 66 | 52 | 692 | 61.0 |
| 51 | 5 | 11 | 15 | 13 | 5 | 7 | 22 | 78 | 6.9 |
| 61 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -- |
| 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -- |
| 42 | 3 | 4 | 0 | 3 | 6 | 0 | 1 | 17 | 1.5 |
| 52 | 6 | 4 | 9 | 0 | 10 | 7 | 6 | 42 | 3.7 |
| 62 | 2 | 0 | 2 | 2 | 1 | 2 | 3 | 12 | 1.1 |
| 53 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | .1 |
| 63 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -- |
| Total | 122 | 235 | 185 | 188 | 213 | 84 | 108 | 1135 | 100 |
| Oct | | | | | | | | | |
| 21 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | .5 |
| 31 | 4 | 3 | 3 | 32 | 18 | 4 | 6 | 70 | 19.1 |
| 41 | 27 | 12 | 22 | 46 | 34 | 77 | 41 | 259 | 70.8 |
| 51 | 1 | 0 | 1 | 11 | 1 | 8 | 7 | 29 | 7.9 |
| 61 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -- |
| 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -- |
| 42 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | .3 |
| 52 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 4 | 1.1 |
| 53 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -- |
| 62 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | .3 |
| 63 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -- |
| Total | 32 | 16 | 27 | 90 | 55 | 92 | 54 | 366 | 100 |

a. Gilbert-Rich method: 21 = $2_1$, etc.

Appendix table 16. Length-frequencies (nos.) and mean lengths (cm), by month (years combined) and mesh size (in), of OAG-3 chinook salmon sampled from the catch of the test fishery in the lower Fraser River, 1965-66.

| OHL[a] (cm) | May 6.5" | 7.5" | 8.5" | 9.5" | T | June 6.5" | 7.5" | 8.5" | 9.5" | T |
|---|---|---|---|---|---|---|---|---|---|---|
| 52 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 3 |
| 57 | 2 | 1 | 1 | 0 | 4 | 0 | 2 | 1 | 0 | 3 |
| 62 | 1 | 0 | 6 | 1 | 8 | 0 | 2 | 2 | 0 | 4 |
| 67 | 1 | 4 | 7 | 0 | 12 | 2 | 1 | 7 | 4 | 14 |
| 72 | 2 | 1 | 3 | 6 | 12 | 5 | 3 | 5 | 3 | 16 |
| 77 | 2 | 2 | 0 | 3 | 7 | 1 | 5 | 1 | 3 | 10 |
| 82 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 2 |
| T | 8 | 8 | 17 | 10 | 43 | 11 | 14 | 16 | 11 | 52 |
| $\bar{L}$ | 67.6 | 68.9 | 65.5 | 72.5 | 68.2 | 66.1 | 70.6 | 67.9 | 72.5 | 69.2 |

| | Jul 6.5" | 7.5" | 8.5" | 9.5" | T | Aug 6.5" | 7.5" | 8.5" | 9.5" | T |
|---|---|---|---|---|---|---|---|---|---|---|
| 47 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 |
| 52 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 57 | 0 | 2 | 0 | 1 | 3 | 1 | 2 | 1 | 0 | 4 |
| 62 | 2 | 2 | 0 | 1 | 5 | 1 | 2 | 0 | 1 | 4 |
| 67 | 0 | 3 | 3 | 3 | 9 | 6 | 9 | 1 | 2 | 18 |
| 72 | 1 | 9 | 9 | 16 | 35 | 3 | 6 | 2 | 8 | 19 |
| 77 | 2 | 2 | 5 | 13 | 22 | 0 | 0 | 19 | 5 | 24 |
| 82 | 1 | 0 | 1 | 2 | 4 | 1 | 2 | 14 | 0 | 17 |
| 87 | 0 | 0 | 1 | 1 | 2 | 0 | 0 | 4 | 0 | 0 |
| T | 6 | 18 | 19 | 37 | 80 | 12 | 22 | 41 | 17 | 89 |
| $\bar{L}$ | 72 | 68.9 | 73.8 | 73.6 | 72.5 | 68.3 | 67.7 | 68.7 | 70.8 | 72.3 |

| | Sep 6.5" | 7.5" | 8.5" | 9.5" | T | May | Jun | Jul | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|
| 47 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 1 |
| 52 | 1 | 1 | 0 | 0 | 2 | 0 | 3 | 0 | 1 | 2 |
| 57 | 2 | 1 | 0 | 0 | 3 | 4 | 3 | 3 | 4 | 3 |
| 62 | 0 | 1 | 4 | 0 | 5 | 8 | 4 | 5 | 6 | 5 |
| 67 | 6 | 2 | 12 | 7 | 27 | 12 | 14 | 9 | 36 | 27 |
| 72 | 1 | 9 | 17 | 17 | 44 | 12 | 16 | 35 | 31 | 44 |
| 77 | 5 | 3 | 27 | 19 | 54 | 7 | 10 | 22 | 9 | 54 |
| 82 | 3 | 4 | 9 | 14 | 30 | 0 | 2 | 4 | 3 | 30 |
| 87 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 1 |
| T | 19 | 21 | 70 | 57 | 167 | 43 | 52 | 80 | 92 | 167 |
| $\bar{L}$ | 71.5 | 72 | 73.4 | 75.5 | 73.7 | 68.2 | 69.2 | 72.5 | 68.8 | 73.7 |

Appendix table 16 (cont.)

| OHL[a] (cm) | May | Jun | Jul | Aug | Sep | 8.5" T | % |
|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 | 1 | 2 | 1.2 |
| 52 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 57 | 1 | 1 | 0 | 1 | 0 | 3 | 1.8 |
| 62 | 6 | 2 | 0 | 2 | 4 | 14 | 8.6 |
| 67 | 7 | 7 | 3 | 19 | 12 | 48 | 29.4 |
| 72 | 3 | 5 | 9 | 14 | 17 | 48 | 29.4 |
| 77 | 0 | 1 | 5 | 4 | 27 | 37 | 22.7 |
| 82 | 0 | 0 | 1 | 0 | 9 | 10 | 6.1 |
| 87 | 0 | 0 | 1 | 0 | 0 | 1 | .6 |
| T | 17 | 16 | 19 | 41 | 70 | 163 | 100 |
| $\bar{L}$ | 65.5 | 67.9 | 73.8 | 68.7 | 73.4 | 70.3 | |

| | May | Jun | Jul | Aug | Sep | 9.5" T | % |
|---|---|---|---|---|---|---|---|
| 47 | 0 | 0 | 0 | 1 | 0 | 1 | .8 |
| 52 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 57 | 0 | 0 | 1 | 0 | 0 | 1 | .8 |
| 62 | 1 | 0 | 1 | 1 | 0 | 3 | 2.3 |
| 67 | 0 | 4 | 3 | 2 | 7 | 16 | 12.1 |
| 72 | 6 | 3 | 16 | 8 | 17 | 50 | 37.9 |
| 77 | 3 | 3 | 13 | 5 | 19 | 43 | 32.6 |
| 82 | 0 | 1 | 2 | 0 | 14 | 17 | 12.9 |
| 87 | 0 | 0 | 1 | 0 | 0 | 1 | .8 |
| T | 10 | 11 | 37 | 17 | 57 | 132 | 100 |
| $\bar{L}$ | 72.5 | 72.5 | 73.6 | 70.8 | 75.5 | 73.9 | |

a. Orbit-hypural length (nearest lower cm): 47 = 45-49, etc.

Appendix table 17. Age-frequencies (%), by year, of white-flesh chinook salmon sampled from the catch of the test fishery (TF[a]) in the lower Fraser River, during September-October, and on the Harrison River spawning grounds (SG[b]), 1984-88.

| Age[c] (y) | 1984 | | 1985 | | 1986 | | 1987 | | 1988 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | TF | SG | TF | SG | TF | SG | TF | SG | TF | SG |
| 21 | .4 | 1.0 | 0 | 0 | 0 | .9 | 0 | .2 | 1.7 | .3 |
| 31 | 38.4 | 35.0 | 38.6 | 27.8 | 4.3 | 2.0 | 23.8 | 9.7 | 6.2 | 4.9 |
| 41 | 51.3 | 56.7 | 54.1 | 64.5 | 86.5 | 92.2 | 49.9 | 65.6 | 76.8 | 84.6 |
| 51 | 8.6 | 7.3 | 1.8 | 6.5 | 5.7 | 4.7 | 16.7 | 24.3 | 7.9 | 9.6 |
| 61 | 0 | 0 | 0 | .6 | 0 | .2 | 3.6 | .2 | 0 | .3 |
| ST | 98.7 | 100 | 94.5 | 99.4 | 96.5 | 100 | 94.0 | 100 | 92.6 | 99.7 |
| 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 42 | .9 | 0 | 1.4 | .6 | 0 | 0 | 1.2 | 0 | 1.7 | .3 |
| 52 | 0 | 0 | 3.6 | 0 | 3.5 | 0 | 3.6 | 0 | 4.9 | 0 |
| 62 | .4 | 0 | .5 | 0 | 0 | 0 | 1.2 | 0 | .8 | 0 |
| ST | 1.3 | 0 | 5.5 | .6 | 3.5 | 0 | 6.0 | 0 | 7.4 | .3 |
| T | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| n[d] | 232 | 383 | 220 | 169 | 141 | 537 | 84 | 567 | 242 | 366 |

a. TF sources: 1984-87, Schubert et al. (1988, Appendices 15e-18e); 1988, Starr & Schubert (1990, Appendix 4).
b. SG source: 1984-88, Starr & Schubert (1990, Appendix 3).
c. Gilbert-Rich method: 21 = $2_1$, etc.
d. n = numbers sampled.

Appendix table 18. Dixon-Massey tests of differences, for age-groups $3_1$, $4_1$, and $5_1$, of white-flesh chinook salmon, between proportions in the Fraser River test fishery (TF) during September-October, and on the Harrison River spawning grounds (SG), 1984-88. (Asterisks mark rejection of the hypothesis that $P_{TF}-P_{SG} = 0$.)

| Year | TF | | SG | | $P_{TF}-P_{SG}$ | 95% confidence limits[a] | | |
|---|---|---|---|---|---|---|---|---|
| | P[b] | N[c] | P[b] | N[c] | | lower | upper | |
| | | Age-group $3_1$ | | | | | | |
| 1984 | .383 | 232 | .350 | 383 | .033 | -.046 | .112 | |
| 1985 | .386 | 220 | .279 | 169 | .107 | .014 | .200 | * |
| 1986 | .043 | 141 | .020 | 537 | .023 | -.013 | .059 | |
| 1987 | .238 | 84 | .097 | 567 | .141 | .047 | .235 | * |
| 1988 | .062 | 242 | .049 | 366 | .013 | -.025 | .051 | |
| | | Age-group $4_1$ | | | | | | |
| 1984 | .532 | 232 | .567 | 383 | -.035 | -.116 | .046 | |
| 1985 | .562 | 220 | .649 | 169 | -.087 | -.184 | .010 | |
| 1986 | .813 | 141 | .924 | 537 | -.111 | -.179 | -.043 | * |
| 1987 | .574 | 84 | .657 | 567 | -.083 | -.196 | .030 | |
| 1988 | .769 | 242 | .847 | 366 | -.078 | -.143 | -.013 | * |
| | | Age-group $5_1$ | | | | | | |
| 1984 | .086 | 232 | .073 | 383 | .013 | -.032 | .058 | |
| 1985[d] | .018 | 220 | .065 | 169 | --- | --- | --- | |
| 1986 | .057 | 141 | .047 | 537 | .010 | -.032 | .052 | |
| 1987 | .167 | 84 | .243 | 567 | -.076 | -.163 | .011 | |
| 1988 | .079 | 242 | .096 | 366 | -.017 | -.062 | .028 | |

a. Confidence limits of $P_{TF}-P_{SG}$. (Dixon & Massey 1969, p. 249)
b. P = proportion of item i.
c. N = numbers sampled.
d. No test. $(P_{TF})(N_{SG})<5$.