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# Assessment of the NAFO Division 4T southern Gulf of St. Lawrence herring stocks in 1998

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## Abstract

The $F_{0.1}$ spring spawner fishing level for 1999 is 18,500t. This estimate is above the 13,000t projected for 1999 from the 1998 assessment. Reported 1998 landings of spring spawners were 15,653t compared to a TAC of 16,500t. Inshore catch rates calculated form the New Brunswick market co-ordinator program in Escuminac and southeast NB indicated a slight decrease in the overall abundance from 1997 to 1998. However, there was an increase in abundance of ages 4, 5, and 7. These catch rates are at the higher levels of the time series. The 1991 year-class is dominant in the population at this time; the incoming 1994 year-class is slightly above average, and age 4+ spring spawner biomass is above average at 86,000t in 1998. The age 4+ fishing mortality has been very close to the target exploitation rate of 24% in recent years. Abundance of herring that spawn during the spring in Chaleur Bay has declined during the last five years and continued to be low in 1998.

The best estimate of the $F_{0.1}$ fall spawner fishing level for 1999 is 60,500t. This level takes into account the tendency to over-estimate age 4 fall spawners. The 1993 year-class, which was estimated last year to be the highest since 1978, was estimated in this assessment to be above average and the fourth highest in the time series. The most recent year-class (1994, 4 year-olds) is now estimated to be the highest in the time series and is 38% of the 400,000t estimated age 4+ biomass in 1998. Without correcting for the tendency to over-estimate four year-olds, the 4+ biomass was the highest in the time series and the $F_{0.1}$ fishing level for 1999 would be 67,500t. Other indicators of fall spawner biomass do not support the estimate that 1998 4+ biomass is the highest in the time series. The acoustic and bottom trawl survey indices are at moderate levels and opinions of abundance expressed during the phone survey of the inshore fleet generally indicated declines in abundance from 1997 to 1998. Inshore catch rates were similar in 1997and 1998, and while not the highest in the time series, were above average. Reported 1998 landings of fall spawners were 43,023t compared to the fall spawner TAC of 54,248t. A major change in the fall fishery in 1998 was the lowest recorded catch (<100t) in the 4T overwintering fishery in 4Vn. Participants in the fishery reported that these low catches were the result of herring being inaccessible to the gear, rather than a problem with abundance. The age 4+ fishing mortalities have been below the target exploitation rate for each year since 1981, except for 1990 and 1995.



## Résumé

Le niveau des prises de géniteurs de printemps à $F_{0,1}$ pour 1999 se situe à 18 500 t, soit une estimation supérieure aux 13 000 t projetées pour 1999 dans l'évaluation de 1998. Les débarquements signalés pour 1998 s'élèvent à 15 653 t par rapport à un TAC de 16 500 t. Les taux de capture dans les eaux côtières tirés des données du programme des coordonnateurs du marché du Nouveau-Brunswick, à Escuminac et dans le Sud-Est de la province, indiquent une légère baisse de l'abondance totale entre 1997 et 1998; par contre, l'abondance du hareng de 4, 5 et 7 ans a augmenté. Ce sont là les taux de capture les plus élevés de la série chronologique. La classe d'âge de 1991 est la plus abondante dans la population à ce moment-ci, l'abondance de la classe d'âge de 1994 en recrutement se situe légèrement au-dessus de la moyenne tandis que la biomasse de géniteurs de printemps de 4 ans et plus, atteignant 86 000 t en 1998, s'inscrit au-dessus de la moyenne. La mortalité par pêche du hareng de 4 ans et plus se rapproche du taux d'exploitation ciblé de 24 % au cours des dernières années. L'abondance du hareng qui fraye dans la baie des Chaleurs au printemps a diminué au cours des cinq dernières années; elle continue d'être faible en 1998.

La quantité de 60 500 t est la meilleure estimation du niveau des prises de géniteurs d'automne à $F_{0,1}$ pour 1999, niveau tenant compte de la tendance à surestimer l'abondance des géniteurs d'automne de 4 ans et plus. L'abondance de la classe d'âge de 1993, estimée l'an dernier comme étant la plus forte depuis 1978, est considérée dans la présente évaluation comme étant au-dessus de la moyenne, en étant la quatrième plus élevée de la série chronologique. La classe d'âge la plus récente, soit celle de 1994 (hareng de 4 ans), est maintenant estimée comme étant la plus abondante de la série chronologique, représentant 38 % de la biomasse estimative de hareng de 4 ans et plus de 400 000 t pour 1998. Sans tenir compte de la tendance à surestimer l'abondance du hareng de 4 ans, la biomasse de 4 ans et plus est la plus élevée de la série chronologique et le niveau des prises à $F_{0,1}$ pour 1999 se situe à 67 500 t. D'autres indicateurs de la biomasse de géniteurs d'automne n'étayent pas l'estimation à l'effet que la biomasse de 4 ans et plus en 1998 est la plus élevée de la série chronologique. Les indices obtenus par relevé acoustique et au chalut de fond sont moyens, tandis que les opinions exprimées lors du sondage téléphonique des pêcheurs côtiers indiquent généralement une baisse de l'abondance entre 1997 et 1998. Les taux de capture dans les eaux côtières en 1997 et en 1998 sont semblables; bien qu'ils ne soient pas les plus élevés de la série chronologique, ils s'inscrivent tout de même au-dessus de la moyenne. Les débarquements signalés de géniteurs d'automne en 1998 se situent à 43 023 t par rapport au TAC de 54 248 t. La pêche d'automne en 1998 a été marquée par les plus faibles prises signalées de hareng d'hiver de 4T dans 4Vn, soit <100 t. Les participants à cette pêche sont d'avis que ces prises médiocres sont le résultat de la non-disponibilité du hareng aux engins de pêche employés plutôt que d'une faible abondance. La mortalité par pêche du hareng de 4 ans et plus est inférieure au taux d'exploitation ciblé pour chaque année depuis 1981, sauf en 1990 et 1995.

## 1. Introduction

This document provides an assessment of population biomass and fishing mortality for spring and fall spawning herring in NAFO 4T based on the 1998 fishery data and research projects.

Key analyses for **spring** spawners were:

Continued use of the catch rates that combine New Brunswick market co-ordinator (1990-1996), catch monitoring (1997), and dockside monitoring data (1998).

Examination of area-week interaction effects on the multiplicative model used to estimate spring catch rates.

An ADAPT-VPA is used to estimate population biomass using the catch rates described above as the main calibration index.

A new ADAPT-VPA formulation, estimating the ratio of fishing mortality between plus group and next youngest age, rather than forcing the ratio to be 1 as in previous years, was tested.

Inclusion of an acoustic survey abundance index based on strata consistently surveyed from 1994 to 1998.

Biomass indices from acoustic surveys completed by an inshore boat during the 1998 spring gillnet fishery were presented for the first time.

Key analyses for **fall** spawners were:

A comparison of the ADAPT model for fall spawners using a catch rate index from 1978-1998 and splitting the catch rate into two time series (1978-1991) and (1992-1998) to account for increased use of larger mesh sizes in the gillnet fishery in recent years.

A new ADAPT-VPA formulation, estimating the ratio of fishing mortality between plus group and next youngest age, rather than forcing the ratio to be 1 as in previous years, was tested for fall spawners, as it was for spring spawners.

Examination of area-week interaction effects on the multiplicative model used to estimate fall catch rates.

An examination of the relationship between acoustic data collected during regular fishing activity and catch rates in the Gulf Nova Scotia fall herring fishery are presented for the first time.

Inclusion of an acoustic survey abundance index in the ADAPT-VPA based on strata consistently surveyed from 1994 to 1998.

## 2. The Fishery

### 2.1 Landings

Southern Gulf of St. Lawrence (Fig. 1) herring are harvested by an inshore, primarily gillnet fleet, fishing in 4T and a purse seine fleet of six vessels (>65') in 4T and 4Vn. Five small seiners (<65') also participate in the inshore fishery. Unless specifically stated as small seiners, the terms purse seiners or seiners refer to the purse seine fleet with vessels > 65'. Two stocks of herring are harvested in these fisheries. The spring spawning stock spawns before July 1 and the fall spawning stock after July 1. During the spring and fall fishing seasons, seiners are prohibited from fishing in several areas set aside for exclusive fishing by the inshore fleet (Claytor et al 1998a).

Prior to 1967, southern Gulf of St. Lawrence herring were exploited mainly by gillnets and average landings from 1935 to 1966 were 34,000 tonnes. In the mid 60s, a purse seine fishery was introduced and average landings were 166,000 tonnes from 1967 to 1972. Quotas were introduced in 1972 at 166,000 tonnes and reduced to 40,000 tonnes in 1973. Separate quotas for spring and fall spawners began in 1985 (Table 1). Catches of spring and fall spawners combined have been below the TAC since 1988 (Fig. 2).

The spring spawner TAC was exceeded from 1994 to 1996 and was nearly caught in 1997 and 1998 (Fig. 3). The fall spawner TAC has not been exceeded since 1986 (Fig. 3). Since 1981, the inshore fixed gear component has had the majority of the catch of spring and fall spawners (Fig. 4).

Most of the spring spawner inshore catches occur during the spring season in areas 16C and E (Table 2, Fig. 1). Most of the fall spawner inshore catches come from 16B during the fall fishing season (Table 2, Fig. 1).

Spring inshore allocations were exceeded in 1998 but fall inshore catches were about 4,000t below the allocation and seiner catches were about 13,000t below their spring and fall allocation (Table 3). The fall seiner fishery in Chaleur Bay was one of the lowest in recent years, and the seiner catch in 4Vn was very low (52t). This 4Vn catch was far below any other year in which the fishery has occurred (Table 1).

Bait fishery licenses were similar in number in 1998 to 1997 in every province (Fig. 5)

Price in the fall inshore gillnet markets dropped 0.60 cents/lb from 1997 to 1998, while the inshore spring gillnet markets increased by 1.30 cents/lb (Table 4). Prices for the seiner market also dropped 0.60 cents/lb in 1998 (Table 4).

**2.2 Industry input**

Industry input for the assessment was acquired during workshops held in November, from a phone survey conducted from December to January, after the fall season, area surveys using inshore fishing boats in the spring in West PEI and southeast New Brunswick, area surveys in the fall using inshore boats in Gulf Nova Scotia and a seiner in Chaleur Bay, and by obtaining summarized comments from seiner captains participating in the 4Vn seiner fishery.

During workshops in 1998, the view of industry was that biomass was increasing, especially in the Magdalen Islands. Spring gillnetters in Chaleur Bay reported continued declines in spring stocks, especially in traditional spawning areas. For the fall, no one noted major increases or decreases in biomass.

The phone survey collects information on the fishery and opinions on abundance trends. The southern Gulf is divided into 8 areas corresponding to the major fisheries (Fig. 6). A subset of active commercial license holders are phoned and asked a series of questions concerning number and size of nets used, frequency of fishing and how the abundance in the current year compares to the previous year and the long term trend (LeBlanc and LeBlanc 1996).

In 1998, 128 spring gillnetters and 167 fall gillnetters responded out of a total of 2400 active licenses in spring and fall (Tables 5, 6).

Concerning abundance trends, spring gillnetters in the areas with the most landings, Escuminac, Southeast New Brunswick, Magdalen Islands, and West PEI felt abundance declined from 1997 to 1998 (Fig. 7). In the fall, except for the Magdalen Islands, survey respondents indicated that abundance was either the same or less in 1998 compared to 1997 (Fig. 8).

In 1998, landings in the 4T overwintering fishery in 4Vn were the lowest on record. Industry comments were that the fish were inaccessible to the gear rather than that there was a problem with abundance.

Summarized comments on the 4Vn purse seine fishery from the Gulf Seiner Association were as follows:

| Date | Comment |
|---|---|
| Nov 1-7 | Fish were on the bottom in 25-35 fathoms, impossible to catch, Nov. 2 surface water 9.1 C |
| Nov. 8-14 | Similar picture to previous week, Nov. 13 one try in Rocky Bay, released 50t, because of small fish, the vast majority, however, were big fish. During the remaining of the night fish were on the bottom. Surface water 8.2 C |
| Nov 15-21 | Nov. 17 one try in Aspy Bay, the amount of fish on the sonar, indicated that a catch of about 100t would be expected, but fish were down on the bottom and we were only able to catch 15t. Other nights it was impossible to seine as fish were on the bottom. During this week most of the fish were between Cape Egmont and Rocky Bay. Fish would come up at midnight but not enough to be caught. |
| Nov. 22-28 | Tried twice, but same scenario. Small school on bottom in Aspy Bay. Surface water 5 C |
| General | Searched in shallow water to deeper water every night approximately 12 miles from shore, fish on bottom. |

**2.3 Fishing Methods**

The fall and spring gillnet fisheries differ in the type of fishing and size of nets. For example, most spring gillnets are either 2 1/4" to 2 1/2" (Fig. 9). Most spring nets are 14 to 19 fathoms long (Table 7). At one time, 2 5/8" was the most commonly used mesh size throughout the southern Gulf fall inshore fishery (Fig. 10). Recently, in Escuminac, Nova Scotia, and West PEI there has been an increasing number of individuals using 2 3/4" or 2 7/8" mesh and is the reason the for the decline in the percentage of gillnetters using 2 5/8" mesh (Fig. 10). Most nets are 14 to 18 fathoms long (Table 7).

Type of fishing differs between the two seasons. For example, in the spring almost all nets are fished by anchoring overnight and hauling the next morning. In the fall, spawning schools are searched for, and nets are set when a school of sufficient size is found. In Escuminac, Quebec, Magdalen Islands, and Acadian Peninsula nets are fished with one end tied to the boat and the other anchored. In other areas, nets are anchored at both ends and two or more strings may be set (Table 8).

**2.4 Fishing Effort**

The number of nets used in the spring and fall fisheries, estimated by the phone survey, is an important part of the effort measurement used to formulate abundance indices for ADAPT-VPA models.

Numbers of nets have been estimated for the entire southern Gulf since 1978. In the late 1970s and early 1980s, about twice as many nets were used in the fall fishery as in recent years (Table 9). Since 1986, the number of nets has been estimated for statistical districts accounting for most of the landings. These estimates indicate that until recently fewer nets are used in the Acadian Peninsula (Statistical Districts 65-67, Fig. 6) than other areas in the fall (Table 10). Recently, the numbers of nets used in other areas has declined and are now equal or only slightly above the numbers used in the Acadian Peninsula (Table 10).

Numbers of nets used in the spring fishery declined compared to numbers used during the late 1970s and early 1980s with the exception of 1988 (Table 9). Numbers of nets in the spring have been estimated by area since 1986 and indicate that for the two major fishing areas, that fewer nets are used in Escuminac than southeast New Brunswick, except for 1998 (Table 11). At workshops, however, it was reported that the depth of nets in Escuminac is greater than in southeast New Brunswick.

**2.5 Catch and Weight-at-age matrices**

Separate spring and fall spawner catch and weight-at-age matrices were developed for all 4T herring including those caught by purse seiners in 4Vn. These were derived using age-length keys and length-weight relationships for each principal fishing area and season. In some cases, fishing activity within an area differed through the season and separate keys and relationships were developed for those cases. For example, the bait fishery in 4Tmn during July had a higher proportion of spring spawners than the roe fishery during August and September and a separate key was used. The keys, samples, spawning group assignment, and numbers of fish examined in detail in each of these is described in Table 12. When the number of fish sampled for detailed analysis was < 30, the overall length-weight relationship and age-length key nearest in gear, geography, and time that contained sufficient samples was used to estimate the catch-at-age. Spawning group assignment was made as in previous assessments using a gonadosomatic index (GSI) (McQuinn 1989) to assign maturity stage and a monthly key that linked maturity stage and month to spawning group (Cleary et al. 1982).

The distribution of sampling relative to daily catches for each key and relationship is in Tables 13-25. This information is provided so that the level of sampling relative to the amount and timing of the catch can be evaluated. It also provides a method for comparing run-timing among years, as this information is provided in previous assessments.

Catches of fall spawners were dominated by the 1992 (age 6) year-class for inshore and seiner fleets in 1998 (Fig. 11). The 1993 (age 5) and 1994 (age 4) year-classes were the next most important parts of the catch in both fleets for 1998. Low numbers of the 1989 (age 9) and the 1991 (age 7) year-classes continue to indicate the below average size of these year-classes. The once dominant 1987 (age 11) and 1988 (age 10) year-classes no longer contribute appreciably to the fishery (Fig. 11, Tables 26, 28).

Catches of spring spawners were dominated by the 1991 year-class (age 7 in 1998) as they were in 1997 and 1996 (Fig. 12). Low numbers of the 1990 (age 8) and the 1992 (age 6) year-classes continued to indicate that these year-classes are below average. The very large 1988 (age 10) year-class no longer contributes appreciably to the fishery (Fig. 12, Tables 29, 31).

**2.6 Aging Consistency Test**

A reference collection was selected from herring otolith samples collected from 1990 to 1997. This collection was selected so that there was approximately equal representation from all times, areas, gears, and survey types sampled during the year. There was no effort to ensure that otoliths were of a particular clarity; but otoliths that had not been aged because of problems in their storage media were excluded. The reference collection contained approximately 4,000 otolith pairs.

To ensure that all ages were represented in this test, the ages were divided into four groups: 0 to 2, 3 to 5, 6 to 8, and 9 to 11+ with 11+ being composed of all ages ≥ 11.

The average coefficient of variation (cv) for this data set was 2.2%. (Table 32). The percent agreement overall was 81%.

There was no bias in the test data (Fig. 13).

**2.7 Mean weights**

Mean weights at age for fall spawners have been generally less since 1990 than they were during the late 1980s and early 1990s (Tables 27, 28; Fig. 14). For fall spawners, herring caught by the purse seiners are smaller at age than those caught by inshore gear (Fig. 14). Most fall spawners caught by the inshore are on spawning beds and are heavier at age because their gonads are more ripe.

Mean weights at age for spring spawners are generally less in recent years than they were during the late 1980s and early 1990s (Tables 30, 31; Fig. 15). Spring spawning herring caught by purse seiners are larger than those caught by the inshore fleet. Purse seiners catch most of their spring spawners during the fall, while most inshore spring spawners are caught during the fall season. The greater weight at age for the purse seine spring spawner catch could be the result of a season's growth more than making up for the weight loss of gonads during spawning of the fish caught in the spring by the inshore fleet. The declines observed in recent years seem to have stabilized or slightly reversed for both spawning groups (Figs. 14, 15).

## 3. Spring Spawner Abundance Indices

### 3.1 Commercial Fishery CUE Index

Spring spawner abundance indices were derived by combining two data sets. The first consists of dockside monitoring in Escuminac and Southeast New Brunswick by the Province of New Brunswick from 1990 to 1996. The second consists of the dockside monitoring conducted throughout the 4T spring fishery in 1997 and 1998 as directed by the Herring Management Plan. The rationale and method for combining and using these data sets were described in last year's assessment (Claytor et al. 1998a).

Effort was estimated as the number of fishers fishing each day multiplied by the average number of nets/fisher as estimated from the phone survey for each area (Table 11). Thus, the unit of measurement for effort is nets/day.

A multiplicative model with 10 day-period, area (Escuminac, Southeast New Brunswick), and year effects was used to estimate an annual abundance index using the dockside monitoring data from 1990 to 1998. The model was significant (r2 = 0.33, p = 0.0001) (Table 33). From the residual, and DFITTS plots, there are no indications of violation of model assumptions nor influential points (Fig. 16). Catch rates forming the index are kg/net/day (Fig. 17).

The time period used was April 20 to June 29, however, about 30% of the cells were empty (Table 34). The analysis was re-run using only ten-day periods, 3-6, reducing the number of cells to 13% (Table 34). The catch rates formed using these two analyses were nearly identical and the original catch rates using ten-day perioeds 2-7 were retained (Fig. 18).

The catch rate index used as an abundance index for ages 4-10 and years 1978 to 1997 in units of numbers/net/day was derived as follows:

Effort = Catch biomass from inshore gear/ CUE fixed gear

Abundance index = Catch numbers from inshore gear/ Effort.

This index (Table 35) was used to calibrate or tune the ADAPT-VPA population model used to estimate biomass.

There are differences in timing between the two areas (Table 34) forming the catch rate index. Because of these differences, there was potential for a greater proportion of the variation to be explained by including area by week interaction effects in the model. Including these effects in the model explained about 41% of the variation (Table 36), compared to 33% for the model without interaction (not shown). As a result a second catch rate index, using weeks 2-7 was calculated and used to estimate biomass using the ADAPT-VPA population model.

### 3.2 Phone Survey

Responses to the phone survey indicate that in Escuminac and Southeast New Brunswick, herring abundance was felt to be less in 1998 than in 1997 (Fig. 7). These are the two areas used to formulate the catch rate abundance index described above. In West PEI and the Magdalen

Islands, the other major spring areas, abundance was also thought to have decreased from 1997 to 1998 (Fig. 7).

### 3.3 Acoustic Survey Index

For the first time, a standard abundance index from the annual acoustic survey is used in an ADAPT-VPA formulation. This index includes Chaleur-Miscou strata surveyed consistently from 1994 to 1998. This time period corresponds to when the survey began with the F. Creed and when all transects were covered at night (Table 37). Methods and detailed results from these surveys are provided in (LeBlanc et al. 1993; LeBlanc and Dale 1994; LeBlanc et al. 1995; LeBlanc and Dale 1996; Claytor et al. 1997, 1998a) for 1990 to 1997 and in Appendix 1a-e for 1998.

In 1998, the acoustic survey covered two major areas of the 4T stock, Chaleur - Miscou (Fig. 19) and Cape Breton (Fig. 20). Sampling to determine biological characteristics and to estimate target strength was carried out wherever major concentrations were observed (Fig. 21) .

In general, 50 to 100% of the fall spawners have been observed in Chaleur-Miscou strata (Table 38), including years when North PEI and Cape Breton, as well as, Chaleur Miscou have been surveyed.

In contrast, the percentage of spring spawners found in Chaleur-Miscou strata has varied from 80 to 100% in all years, including years when North PEI, and/or Cape Breton, as well as Chaleur-Miscou strata were surveyed (Table 38).

The biomass index for combined spring and fall spawners declined from 1997 to 1998 for all strata and strata consistently surveyed (Fig. 22). The 1998 index, however, was still slightly higher than the previous lows in 1991 and 1995 (Fig. 22).

The acoustic survey catch-at-age (Table 39) was estimated using samples collected from each strata. The catch-at-age for the survey was weighted by the signal strength in each strata. The numbers at age, scaled to the catch rate index formed the age dis-aggregated abundance index from this survey.

### 3.4 Bottom Trawl Survey

The annual bottom trawl survey provides a third abundance index of 4T herring throughout the southern Gulf of St. Lawrence. The survey has occurred consistently during the month of September from 1971 to 1998. During the 1990s herring have been found primarily along the north coast of Prince Edward Island and through the Northumberland Strait (Fig. 23). The abundance index from this survey indicates the same general low to high shift in population level as the Fall CUE index (Figs. 24, 48) and has ranged from 24,000 to 100,000 t from 1984 to 1998, with the exception of 1996 which was 7700 t. These estimates are higher compared to 1971 to 1983 when the stock was at a low level and estimates ranged from 300 to 33,000 t (Fig. 24). These comparisons have been made excluding strata 401-403 which were added to the survey in 1985.

Detailed herring samples to construct a catch-at-age by spawning group have been collected since 1994 and are compared to the ADAPT-VPA results in the assessment results.

## 4. Spring Spawner Assessment

### 4.1 Estimation of Stock Parameters

#### 4.1.1 CUE index

A new formulation of the ADAPT model was tested this year. The difference between this model and the one used last year was that the ratio of the fishing mortality between the 11+ group and 10 year olds was estimated, rather than forced to be 1. The FRATIO function of ADAPT V 2.1 (Gavaris 1999) was used to estimate the fishing mortality ratio. The model used last year was designated as F-OLD. All other aspects of the model were the same as last year. Calibration ages were 4-10, calibration years were 1990 to 1998.

Parameter estimates from the F-OLD formulation had cv's ranging from 0.35 to 0.49 for population numbers and from 0.15 to 0.17 for catchability coefficients, similar to last year. The highest parameter correlations were < 0.40 (Table 40). Bias was 12.5%, similar to last year. Annual residuals were within +/- 1.5, with trends for ages 4, 7, and 10. Ages 4, 7, and 10 had annual trends in these residuals. All residuals for 1990 were negative except for age 4 (Fig. 25). These patterns do not indicate major violation in model assumptions.

Parameter estimates from the FRATIO formulation had cv's ranging from 0.35 to 0.49 for population numbers, 0.49 for the fishing mortality ratio, and 0.16 to 0.20 for the catchability coefficients (Table 41). These cv's were similar to those for the F-OLD formulation (Table 40). Relative bias was 13.2% (Table 41). The highest parameter correlations were 0.45 to 0.55 for the oldest ages and the FRATIO estimate (Table 42). The remainder of the parameter correlations were < 0.40 (Table 42). Annual residuals were within +/- 1.5 with trends for ages 4, 7, and 10. The two methods provided similar results in these respects. All residuals for 1990 were negative except for age 4 (Fig. 26). These patterns, do not indicate major violation in model assumptions and were the same as those for F-OLD (Fig. 25).

A retrospective comparison of the results from the two formulations indicates a similar pattern for each model for the last three years. However, when the fourth year is deleted the FRATIO model performs better than the F-OLD model (Fig. 27). An age by age retrospective comparison of these models indicates similar results except for the older ages (7-11+). For these ages the FRATIO model performs better (Fig. 28).

A comparison of population numbers by age between the two models indicates very similar estimates for each age. Differences are most noticeable for the two oldest ages (10, 11+) and the F-OLD formulation provides the higher estimate of the two for oldest ages (Fig. 29). These ages, however, contribute little to the fishery.

Results from the two models were similar. The retospective analysis indicates the FRATIO method was somewhat better for the older ages; residual patterns, cv's, and parameter correlations were similar with the two models. The FRATIO model was used to estimate biomass because of the better retrospective analysis and the ability to estimate rather than apply an assumed value for the fishing mortality ratio between 11+ and age 10.

### 4.1.2 Acoustic and CUE indices

A second ADAPT formulation using the acoustic index as well as the commercial CUE was used to estimate population numbers, biomass, and fishing mortality. The FRATIO model was used for this estimation. The acoustic index calibrated ages 4-8.

The relative bias from this analysis was 11.9%, slightly less than using the CUE index alone and cv's for population numbers ranged from 0.35 to 0.46, slightly less than using CUE alone. The f ratio between age 10 and 11+ was 1.68 (Table 43) compared to 1.5 using the CUE index alone (Table 41). The highest parameter correlations were also similar ranging from 0.42 to 0.52 (Table 44).

Residual patterns showed no trends except for age 8 (Fig. 30).

Retrospective analysis of the population biomass indicate a similarity between estimates based on data up to 1997 and 1998, but estimates based on data only to 1996 are lower (Fig. 31). Because the acoustic index includes only years 1994-1998, stability for more than two years in the past is not expected. Similar patterns are shown for age by age retrospectives (Fig. 32).

A comparison of numbers estimated at each age using the CUE index alone and with the acoustic index indicate similar estimates for the two methods (Fig. 33). Estimates for 5+ biomass in 1999 are similar for both analyses but the CUE index alone estimated lower biomass from 1996 to 1998

(Fig. 34). Both analyses indicate the same relative year-class strengths; the combined acoustic and CUE model estimates the 1991 year-class as more numerous than the model with CUE as the only calibration index, but the 1994 year-class is estimated higher using the CUE index alone (Fig. 34).

## 5.2 Spring Spawner - Assessment Results

### 5.2.1 CUE index

Spring spawner 1998 4+ biomass was estimated at about 86,000 tonnes and 5+ biomass at about 60,000 tonnes (Table 45). These estimates are higher than the 71,000 tonnes estimated for 4+ biomass and 52,000 tonnes for 5+ biomass predicted for 1998 last year (Fig. 35). The biggest changes are an increased estimate for the 1991 year-class and slightly higher estimates for the 1993 year-class (Fig. 35).

This year's analysis continues to indicate that the 1992 year-class, (age 6 in 1998) was one of the poorest since 1978. The 1993 and 1994 year-classes are slightly above average but are about 50% of the large 1991 year-class which has supported the fishery in the last few years (Fig. 36).

Estimates of 4+ numbers using the interaction and non-interaction models were very similar (Fig. 37) and indicate that using the non-interaction model is appropriate and is used throughout the assessment to estimate spring spawner population abundance.

Results using the CUE index indicate that weighted 4+ fishing mortality has been under the target 24% in recent years (Fig. 38). The relationship between 4+ fishing mortality and effort over the levels of effort observed is significantly linear, though the influence of the 1994 data point has not been checked (Fig. 39). Fishing mortalities for the 1990 cohort and earlier sum to 2.0 or greater, indicating convergence for these parts of the matrix (Table 46).

### 5.2.2 Acoustic and CUE indices

Spring spawner 4+ biomass was estimated at about 88,000 tonnes and 5+ biomass at about 70,000 tonnes (Table 47). These estimates are higher than the 86,000 tonnes estimated for 4+ biomass and 60,000 tonnes for 5+ biomass estimated using CUE alone (Fig. 34).

This analysis also indicates that the 1992 year-class, (age 6 I 1998) was one of the poorest since 1978. The 1993 and 1994 year-classes are slightly above average but are about 50% of the large 1991 year-class which has supported the fishery in the last few years (Fig. 46).

### 5.2.3 Age structure comparisons

Catch-at-age from experimental nets fished during the spring fishery, from roe-on-kelp experiments in Escuminac, the September bottom trawl survey, and January bottom trawl surveys was estimated and compared to the population age structure estimated using ADAPT-VPA models.

During the spring fishery, acoustic data were collected by a fishing boat from southeast New Brunswick which conducted surveys, and one fishing boat from western PEI which collected data during regular fishing activity (Appendix 2a). In total, 7 surveys were completed and biomass estimates from these surveys range from 34 to 1100 t (Appendix 2b). Biomass estimates were made following procedures outlined in the 1998 assessment documents (Clay and Claytor 1998, Claytor et a. 1998ab).

During these surveys, experimental gillnets were fished to provide samples for determining target strength relationships, data for estimating recruitment strength, and data for estimating mesh size selectivity. The nets consisted of panels of different mesh sizes (1 ½", 2", 2 ¼", 2 3/8", 2 ½", 2 ¾"). Each panel was about 8 feet long, and equivalent to 100 meshes of 2 ¼" meshes deep; panels were spread 3 feet apart. Sampling from these panels was identical to that in the commercial fishery, in that 2 fish from each 0.5 cm length group were retained for detailed sampling. Ages from these samples indicated that age 7 were dominant in the population and may be caught in all mesh sizes, though are most likely caught at sizes between 2 ¼" and 2 ½" (Fig. 40).

Catch-at-age from the September and January bottom trawl surveys was estimated following the same procedures as those used for groundfish catch-at-age. Spring spawner numbers at age were relatively low compared to fall spawners in the September survey. Spring spawners in the catch at age were predominately juveniles (Fig. 41). Dominant year classes in the spring spawners from the January bottom trawl survey catch-at-age varied annually (Fig. 42).

Examination of the Escuminac roe-on-kelp ages indicates that the dominant age 7s in the fishery were also dominant in the roe-on-kelp trap at the time of the fishery, but that younger ages predominate later in the season (Fig. 43).

A comparison of the age structure from the population model based on the fishery index to the age structure derived independently from the acoustic survey indicates general agreement between these two estimates (Fig. 44) In addition, sampling from a trapnet designed to capture spawners for a roe-on-kelp project in Escuminac, shows a similar age structure to the acoustic and population estimates from 1996 to 1998 (Fig. 44). Age structure of the September survey using a bottom trawl and the experimental nets show a similar age structure to the 4T population estimated using ADAPT but the January survey age structure is not very similar to the 4T ADAPT population age structure (Fig. 45).

### 5.3 Spring Spawner - Future Prospects

Projections for 1999 and 2000 were made by taking the 1998 beginning of the year biomass at age and subtracting losses from natural mortality and fishing to determine expected beginning of the year numbers for each of these years as in previous assessments (Claytor et al. 1998a). The target fishing mortality of $F_{0.1}$=0.44 (fully recruited age) was applied to these numbers to determine the $F_{0.1}$ fishing level.

Input parameters were partial recruitment at age, average weights-at-age, and recruitment at ages 2, 3, and 4. Partial recruitment values were derived from average fishing mortalities from 1996 to 1998. Age 2 ,3 and 4 recruitments were the geometric mean from 1978 to 1995 for age 2 and to 1996 for age 3 and to 1997 for age 4. The $F_{0.1}$ fishing level for 1999 is 18,600t and for 2000 16,000t (Table 48).

## 6. Fall Spawner Abundance Indices

### 6.1 Commercial Fishery CUE Index

The principal fall spawner abundance index is the catch per unit effort (CUE) from the fall season gillnet fishery. The CUE is defined as catch kg/nets/trip/day. The catch information comes from purchase slips and dockside monitoring. Effort information consists of trips from purchase slip and dockside monitoring records and the number of nets/trip is estimated from a phone survey of active gillnetters. The number of nets per trip used in the principal landing areas has been estimated by statistical district since 1986 (Table 10) and was used to derive the index for those years. Prior to 1986, the average number of nets for the combined areas of the southern Gulf of St. Lawrence was used (Table 9). Methods for estimating these indices are described in LeBlanc and LeBlanc (1996).

A multiplicative model with year, district, and 10-day periods was used to estimate an abundance index for each fall since 1978. This model was identical to those used in past assessments. The model was statistically significant ($p<0.0001$, $r2 = 0.59$) (Table 49). From the residual, and DFITTS plots, there are no indications of violation of model assumptions nor influential points (Fig.47).

The results indicate catch rates in 1998 were above those for 1995 and 1996 but very similar to those in 1997 (Fig. 48). Effort levels were similar to those in the early 1980s and below the high levels in 1987 and 1990 (Fig. 48). Analyses completed in the assessment of the 1996 fishery indicated that catch rates were independent of effort (Claytor et al. 1997).

The catch rate index used as an abundance index for ages 4-10 and years 1978 to 1997 in units of numbers/net/trip/day was derived as follows:

Effort = Catch biomass from inshore gear/ CUE fixed gear

Abundance index = Catch numbers inshore gear/ Effort.

This index (Table 50) was used to calibrate or tune the ADAPT-VPA population model used to estimate biomass.

Interaction between area and week effects were significant but explained less than an additional 5% of the variation (Table 51) and so the non-interaction model was used for all subsequent analyses.

**6.2 Acoustic Survey**

An abundance index from the acoustic survey (Table 50) was derived which included only those strata consistently surveyed from 1994 to 1998, as was done for the spring.

**3.4 Phone survey**

The phone survey provides a fourth index of abundance (including the bottom trawl survey discussed above) for fall spawners in the southern Gulf of St. Lawrence. During the survey gillnetters are asked to compare abundance in the current year to last year and overall. In the fall, survey respondents indicated that abundance was either the same or less in 1998 compared to 1997 (Fig. 8).

**5.3 Bottom Trawl Survey**

Bottom trawl survey results are reported for spring and fall spawners combined (Figs. 23, 24) and are reported in section 3.4 on spring spawners.

**6. Fall Spawner Assessment**

**6.1 Estimation of Stock Parameters**

**6.1.1 CUE Index**

Last year a new ADAPT formulation for the estimation of fall spawners was developed and accepted that incorporated the change towards a larger mesh size that has occurred in the 4T fall gillnet fishery from 1992 to 1998. This change was incorporated into the assessment by splitting the CUE index into two parts. The first part was from 1978 to 1991 and covered the period when most of the gillnetters used 2 5/8" mesh. The second part was from 1992 to the present and covered the period when gillnetters in several areas of 4T began to use larger mesh size. The first step in the analysis of this year's data was to determine if the poor residual fit for 4 year olds still applied and if the new model splitting the index was still the most appropriate. In each of the models described below, calibration for the CUE index was for ages 4-10.

The first step in testing the model was to add 1998 to the CUE index has in previous assessments when the CUE was not split and was considered as one time series from 1978 to 1998. This ADAPT run was completed using the F-OLD method as in previous assessments. While cv's and parameter correlations were acceptable (Table 52), the residuals for 4 year olds still exhibited the same pattern which caused concerns in last year's assessment (Fig. 49). Therefore, the model using the split CUE index was used to calibrate ADAPT population estimates for this assessment.

As for the spring, a comparison between the F-OLD and FRATIO models was made. Using F-OLD, cv's ranged from 0.29 to 0.44 for population number parameters and relative bias ranged from 3.5 to 10.4% (Table 53). The highest parameter correlations were 0.35 to 0.42 but most were < 0.3 (Table 53). Residual patterns were much improved over those for the single CUE model (Fig. 50). These results indicated that the split CUE model was the most appropriate of those tried.

Using the FRATIO method, cv's ranged from 0.33 to 0.43 for population parameters and relative bias ranged from 5.2 to 10.4% (Table 54). The FRATIO was estimated as 1.23 (Table 54). Parameter correlations were > 0.5 at the oldest age but the remaining correlations were all < 0.30 (Table 55). Residual patterns were similar to those for F-OLD (Fig. 51).

A retrospective analysis of both models indicated greater stability for the FRATIO model (Fig. 52). The difference in estimated numbers was less from year to year using the FRATIO compared to the F-OLD method. This effect was primarily observed in the older ages (Fig. 53).

Estimated population numbers were similar for both methods except that F-OLD provided higher population estimates for 11+ (Fig. 54).

**6.1.2 Acoustic and CUE Index**

The acoustic index calibrating ages 4-9 was combined with the CUE index calibrating ages 4-10 and the FRATIO method was used to estimate population numbers. The cv's for the population parameter estimates ranged from 0.29 to 0.38 and the relative bias ranged from 4.9 to 8.3%. The f ratio was estimated as 1.23 (Table 56). The cv's and bias estimates are less than for the CUE index alone. The highest parameter correlations were from 0.43 to 0.66 on the oldest ages but most were less than 0.30 (Table 57).

Residuals for the acoustic index were within +/- 1.5. Ages 5, 6, and 7 had a declining trend in the last three yeas but other ages were well balanced (Fig. 55).

Population numbers estimated using the acoustic and CUE indices in the FRATIO model were generally lower than those using only the CUE index. The exception was a similarity in 11+ numbers for both models (Fig. 56).

**6.2 Fall - Assessment Results**

**6.2.1 CUE index**

Fall spawner 1998 4+ biomass, using the split CUE model, is about 400,000t and 5+ biomass is about 250,000t (Table 58).

Results of the split CUE analysis indicates that the 1994 year-class is the largest observed since 1978. Three of the last four year-classes are estimated to be above average (Fig. 57). The FRATIO and F-OLD methods provide similar 5+ biomass estimates (fig. 58). The 1998 projection based on last year's assessment was higher than the 1998 estimate provided with the updated information. The 1999 projection based on this year's analysis is above the projection for 1999 based on last year's assessment (Fig. 58).

Last year, a precautionary approach was advised, because of the high estimate of 4 year-olds and the large percentage of biomass accounted for by that group and the new assessment model. The analysis using this year's data provides an estimate of this year-class that is about 5/8 that estimated last year. This supports the precautionary approach applied last year (Fig. 58). It also implies that the same consideration might be necessary for 1999.

Results using the single CUE ADAPT model indicate weighted 4+ fishing mortalities have been below the 0.25 target or 20% exploitation rate each year since 1981, except 1990 and 1995 (Fig. 59).

The fishing mortalities summed along the cohorts is close to 2 for years to 1989 and then drops below 1.5 for all subsequent years (Table 59) indicating that this portion of the matrix has converged.

Fishing mortality is significantly correlated with effort (Fig. 60).

### 6.2.2 Age structure comparisons

Catch-at-age from experimental nets fished during the fall Gulf Nova Scotia fishery, the September bottom trawl survey, and January bottom trawl surveys were estimated and compared to the population age structure estimated using ADAPT-VPA models.

During the fall fishery, acoustic data were collected by two inshore fishing boats from Gulf Nova Scotia during regular fishing activity (Appendix 3a). This acoustic data collection is part of a larger study to investigate methods for estimating local abundance and includes purse seine vessels which have been collecting data since 1995 (Appendix 3b).

During the Gulf Nova Scotia acoustic data collection, experimental gillnets were fished to provide samples for determining target strength relationships, data for estimating recruitment strength, and data for estimating mesh size selectivity. The nets consisted of panels of different mesh sizes. These sizes were 1 ½", 2", 2 ¼", 2 ½", 2 5/8", and 2 ¾". Each panel was about 8 feet long by 100 meshes of 2" mesh and was separated by 3 feet. Sampling from these panels was identical to that in the commercial fishery, in that 2 fish from each 0.5 cm length group were retained for detailed samples. Ages from these samples, considering the selectivity patterns expected at each mesh, indicate that fish from the 1993 year-class which were previously estimated to be the most abundant year-class since 1978 are not as abundant as the 1992 or 1990 year-class (Fig. 61). Relative abundance of other year-classes are as expected from the sampling of the fishery. The incoming year-class (age 4, 1994 year-class) appears to be at least above average (Fig. 61).

Catch-at-age from the September and January bottom trawl surveys were estimated following the same procedures as those used for groundfish catch-at-age from these surveys. Numbers at age from the September survey also indicate that the 1993 year-class is not as abundant as estimated in last year's assessment but that the 1994 year-class is at least above average (Fig. 62). Numbers-at-age from the January bottom trawl survey have few similarities among the various areas surveyed (Fig. 63) which were usually located north of Cape North, Aspy Bay, and south of Cape Smoky (Claytor and LeBlanc 1998).

A comparison of the age structure estimated using the population model based on the fishery index to the age structure derived independently from the acoustic survey indicates general agreement between these two estimates (Fig. 64). There are similarities in the age structures estimated from the population model, the commercial fishery, and the experimental nets. The higher proportion of age 4s in the population compared to the commercial catch are a function of the partial recruitment of this age to the gillnets used in the inshore fishery (Fig. 64). Age structure of the September bottom trawl survey show a similar age structure to the 4T population estimated using ADAPT but the January survey is not very similar to the 4T age structure (Fig. 65).

### 6.2.3 Acoustic and CUE index

Including the acoustic index in the model provides a much lower biomass estimate for recent years than using the CUE index alone (Fig. 66). The 1998 4+ biomass estimate is 200,000 t while that for 5+ biomass is 160,000 (Fig. 66). The estimate of the last three year-classes is much less when the acoustic survey is added to the model (Fig. 66).

There is a retrospective pattern in thin model (Fig. 67), most noticeable for ages 4, 9, 10, and 11 (Fig. 68).

With the acoustic index in the model, three of the last four year-classes are still above average but the 1994 year-class is only average (Fig. 69). The 1994 year-class was the largest since 1978 when the split CUE index was used as the calibration index (Fig. 57).

As a result of this retrospective pattern and because of the short time series of the acoustic survey, projections were made using the results from the split CUE model. The results from the model that included the acoustic survey support the need for a precautionary approach for 1999.

### 6.3 Fall - Future Prospects

As for spring spawners, projections for 1999 and 2000 were made by taking the beginning of the year biomass by age and subtracting losses from natural mortality and fishing to determine expected beginning of the year numbers for each of these years as in previous assessments (Claytor et al. 1997). The target fishing mortality of $F_{0.1}$=0.30 (fully recruited) was applied to these numbers to determine the $F_{0.1}$ fishing level.

Input parameters were partial recruitment by age, average weights-at-age, and recruitments at ages 2, 3, and 4. Partial recruitment values were derived from average fishing mortalities from 1996 to 1998. Age 2, 3, and 4 recruitments were the geometric mean for 1978 to 1995 for age 2, to 1996 for age 3, and to 1997 for age 4. The $F_{0.1}$ fishing level for 1999 is 67,500t and for 2000 is 63,000t (Table 60).

A retrospective projection was done using the updated population estimate for 1997 to determine what the $F_{0.1}$ level would have been for 1998. The $F_{0.1}$ level for this updated version is 63,000 t. The $F_{0.1}$ level estimated from last year's assessment was 66,000 t but was reduced to 60,000 t because of precautionary considerations (Table 61).

If the age 4's in this assessment are over-estimated to the same extent that they were last year, the estimated $F_{0.1}$ level for 1999 would be 60,500 t (Table 62).

### 7. Area Projects – Spring and Fall

Area projects combining the collection of acoustic data during surveys and fishing, combined with the fishing of experimental nets began in the spring fishery for the first time in 1998. These data are just starting to be analyzed. Preliminary results indicate that biomass estimates can be obtained for spring schools using surveys and that in general, spring spawning schools are smaller than those in the fall. Spring schools also occur over a broader area than fall spawning schools and that the most appropriate method for surveying and estimating spring spawning schools has not yet been determined. The projects undertaken in the Northumberland Strait are being repeated in 1999 and a new project in the Magdalen Islands was begun in 1999.

Area projects in the fall have a longer history, and data have been collected from purse seiners since 1995. Inshore projects began in 1996 with two boats from Chaleur Bay, expanded in 1997 to 6 boats, 2 each from Escuminac, West PEI, and Gulf Nova Scotia, and in 1998 two boats from Gulf Nova Scotia participated (Claytor et al. 1998b). To date preliminary maps of biomass densities have been made for all projects.

Biomass estimates have been obtained using the data collected during regular fishing activity by one of the 1997 Gulf Nova Scotia inshore boats. These estimates were made using kriging and the arithmetic average. For two of the days, estimates were also obtained using inverse distance weighting and natural neighbor analysis (Appendix 3c). Differences between the arithmetic and kriging estimates averaged –13%, so that the kriging estimates were on average less than the arithmetic averages. Data points in these cases consisted of the average density estimates along a 100m fishing track. The methods for partitioning the fishing track and converting acoustic signal to density are described in (Clay and Claytor 1998, and Claytor et al. 1998b).

The relationship between landings and the biomass estimates obtained by kriging has been examined in both arithmetic and logarithmic scales. These indicate that for the individual boat collecting the data landings are not linearly related to biomass and catches equal to the nightly limit (7,000 kg) can be caught even on small schools. These landings would be equivalent to catch rates for this individual boat because the same number of nets was used each night, and each night's fishing consisted of one trip. However, when schools are above a threshold size, the nightly limit was regularly caught by this boat (Appendix 3d). Alternatively, when the entire Gulf

Nova Scotia fleet was considered, the relationship between catch rates and biomass indices was significantly linear in the logarithmic scale (Appendix 3e). There was, however, some indication that this relationship may also be non-linear. These relationships need additional investigation because a linear relationship between catch rate and abundance is one of the key assumptions in the ADAPT-VPA model used to assess this stock.

An exploitation index can be estimated from these data by dividing the catch for the Gulf Nova Scotia fleet by the biomass index obtained by kriging. This index compared over time with the biomass index over time provides an indication of the abundance trends and exploitation rates over the fishing season. These trends indicate three peaks in exploitation rate, one each at the beginning and end of the season and one near the end of the season just prior to the peak biomass estimates (Appendix 3f). The two highest peaks in biomass occur at the end of the season (Appendix 3f). These results imply that there is a 6-10 day period between peaks in biomass and that the greatest exploitation rates occur at the lowest biomass.

An examination of the relationship between exploitation and biomass indices indicates there is a significant inverse linear relationship between the log of the exploitation rate and biomass index (Appendix 3g). This relationship indicates that the highest exploitation rates consistently occur on the smallest schools. A management objective identified for herring stocks is to equalize exploitation rate in time and space. Reducing exploitation rates when schools are small is an important management problem to solve in this fishery.

## 8. Discussion

Estimates of 4+ spring spawner biomass peaked in 1995, when the 1991 year-class, that was the largest on record, entered the fishery (Fig. 36). This year-class has been supporting the fishery since it first appeared in 1995. The 1992 year-class was among the lowest since 1978 but the two most recently estimated year-classes, 1993 and 1994, have been above average. The result of these trends in year-class strength are that the biomass levels have been relatively stable for the past four years (Fig. 36). The history of recruitment since the stock started to rebuild in 1983 is that incoming 4 year-olds have ranged from 50 to 150 million individuals. Two very strong year-classes, 1988 and 1991, consisted of greater than 300 million individuals. It is only the influence of these year-classes which increased 4+ biomass levels to above 80,000 t (Fig. 36) and unless year-classes of this size appear again, no major increases in biomass or $F_{0.1}$ levels can be expected.

Prior to 1998, estimates of 4+ fall spawner biomass peaked in 1991, when the very large 1987 year-class appeared in the fishery. The population declined until 1996, when the large 1992 year-class appeared in the fishery. Since then, year-classes have been above average and the population is growing. A major uncertainty still remains in the assessment of fall spawners in the tendency to over-estimate four year-olds. The use of experimental nets to predict recruitment may help with this problem.

This assessment was the first one in which standardized strata from the acoustic survey were used to calculate an abundance index. The results from including this index in the population model supported the catch rate index results for spring spawners but not for fall spawners. The reason for this difference needs to be investigated.

## 9. Acknowledgments

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Brunswick program from the Maritime Fisherman's Union, and for the West PEI program from the PEI provincial government.

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Table 1. Catch (t) of 4T herring caught in spring and fall, by gear (fixed and mobile) and spawning group (as calculated by the GSI method). Catch (t) in 4Vn from the purse seine fishery (Nov-Mar) is assigned to a spawning group according to otolith characteristics up to 1991 inclusive.

| YEAR | SPAWNING GROUP a | 4T SPRING | | 4T FALL | | 4T CATCH | 4T TAC | 4Vn CATCH | 4Vn TAC | BIOMASS | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Fixed | Mobile | Fixed | Mobile | | | | | Fall 4+ | Spring 4+ |
| 1978 | P | 8,098 | 6,277 | 109 | 8,047 | 22,531 | | 1,168 | | | |
| | A | 449 | 1,770 | 5,032 | 23,708 | 30,959 | | 1,681 | | | |
| | **Total** | **8,547** | **8,047** | **5,141** | **31,755** | **53,490** | **55,000** | **2,849** | **8,000** | 71,611 | 44,364 |
| 1979 | P | 7,089 | 6,951 | 282 | 5,821 | 20,143 | | 1,426 | | | |
| | A | 535 | 6,951 | 5,793 | 14,798 | 28,077 | | 1,484 | | | |
| | **Total** | **7,624** | **13,902** | **6,075** | **20,619** | **48,220** | **55,000** | **2,910** | **3,000** | 55,460 | 30,158 |
| 1980 | P | 7,216 | 6,123 | 306 | 4,519 | 18,164 | | 1,348 | | | |
| | A | 56 | 7,794 | 6,239 | 10,293 | 24,382 | | 2,503 | | | |
| | **Total** | **7,272** | **13,917** | **6,545** | **14,812** | **42,546** | **55,000** | **3,851** | **4,500** | 39,308 | 19,409 |
| 1981 | P | 7,028 | 10 | 665 | 938 | 8,641 | | 1,374 | | | |
| | A | 473 | 11 | 10,560 | 2,250 | 13,294 | | 2,060 | | | |
| | **Total** | **7,501** | **21** | **11,225** | **3,188** | **21,935** | **16,000** | **3,434** | **3,000** | 58,970 | 10,011 |
| 1982 | P | 5,872 | 29 | 332 | 335 | 6,568 | | 1,549 | | | |
| | A | 51 | 33 | 12,650 | 2,243 | 14,977 | | 1,971 | | | |
| | **Total** | **5,923** | **62** | **12,982** | **2,578** | **21,545** | **15,000** | **3,520** | **3,000** | 95,894 | 8,035 |
| 1983 | P | 8,211 | 9 | 425 | 1,047 | 9,692 | | 1,154 | | | |
| | A | 312 | 10 | 13,415 | 2,442 | 16,179 | | 2,826 | | | |
| | **Total** | **8,523** | **19** | **13,840** | **3,489** | **25,871** | **20,000** | **3,980** | **5,000** | 145,398 | 22,401 |
| 1984 | P | 5,001 | 2 | 481 | 387 | 5,871 | | 1,138 | | | |
| | A | 281 | 2 | 15,493 | 1,891 | 17,667 | | 2,787 | | | |
| | **Total** | **5,282** | **4** | **15,974** | **2,278** | **23,538** | **19,000** | **3,925** | **3,500** | 224,301 | 39,027 |
| 1985 | P | 6,535 | 0 | 4,018 | 2,036 | 12,589 | 6,000 | 1,006 | | | |
| | A | 682 | 0 | 19,689 | 4,986 | 25,357 | 26,500 | 2,464 | | | |
| | **Total** | **7,217** | **0** | **23,707** | **7,022** | **37,946** | **32,500** | **3,470** | **3,500** | 265,488 | 62,199 |
| 1986 | P | 8,015 | 0 | 3,249 | 4,026 | 15,290 | 7,200 | 1,262 | | | |
| | A | 535 | 0 | 36,642 | 6,889 | 44,066 | 36,200 | 3,090 | | | |
| | **Total** | **8,550** | **0** | **39,891** | **10,915** | **59,356** | **43,400** | **4,352** | **4,200** | 290,984 | 84,234 |
| 1987 | P | 10,789 | 0 | 2,417 | 4,393 | 17,599 | 8,200 | 332 | | | |
| | A | 970 | 0 | 49,711 | 9,341 | 60,022 | 64,600 | 2,040 | | | |
| | **Total** | **11,759** | **0** | **52,128** | **13,734** | **77,621** | **72,800** | **2,372** | **4,200** | 311,790 | 78,712 |

a P: Spring/Printemps; A: Fall/Automne

Table 1 (cont'd). Catch (t) of 4T herring caught in spring and fall, by gear and spawning group.

| Year | Spawning Group | 4T Spring Fixed | Mobile | 4T Fall Fixed | Mobile | 4T Catch | 4T TAC | 4Vn Catch | 4Vn TAC | Fall 4+ Biomass | Spring 4+ Bioimass |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1988 | P | 11,541 | 0 | 3,278 | 6,644 | 21,463 | 12,800 | 257 | | | |
| | A | 1,346 | 1 | 37,933 | 10,887 | 50,167 | 66,100 | 2,315 | | | |
| | **Total** | **12,887** | **1** | **41,211** | **17,531** | **71,630** | **78,900** | **2,572** | **4,200** | 313,437 | 70,009 |
| 1989 | P | 10,441 | 0 | 1,564 | 4,138 | 16,143 | 16,800 | 212 | | | |
| | A | 652 | 0 | 32,285 | 10,131 | 43,068 | 70,100 | 1,905 | | | |
| | **Total** | **11,093** | **0** | **33,849** | **14,269** | **59,211** | **86,900** | **2,117** | **4,200** | 280,479 | 62,727 |
| 1990 | P | 8,520 | 1 | 1,331 | 3,815 | 13,667 | 21,000 | 706 | | | |
| | A | 540 | 0 | 55,790 | 6,494 | 62,824 | 65,900 | 4,005 | | | |
| | **Total** | **9,060** | **1** | **57,121** | **10,309** | **76,491** | **86,900** | **4,711** | **4,200** | 258,118 | 62,276 |
| 1991 | P | 12,586 | 17 | 178 | 2,095 | 14,876 | 21,000 | 957 | | | |
| | A | 306 | 1 | 26,966 | 5,964 | 33,237 | 65,900 | 3,832 | | | |
| | **Total** | **12,892** | **18** | **27,144** | **8,059** | **48,113** | **86,900** | **4,789** | **4,200** | 327,476 | 68,553 |
| 1992 | P | 12,438 | 952 | 239 | 1,850 | 15,479 | 21,000 | 296 | | | |
| | A | 37 | 168 | 32,840 | 5,265 | 38,310 | 65,900 | 3,932 | | | |
| | **Total** | **12,475** | **1,121** | **33,079** | **7,115** | **53,790** | **86,900** | **4,228** | **4,200** | 344,364 | 102,137 |
| 1993 | P | 14,584 | 2,175 | 917 | 1,388 | 19,064 | 21,000 | 219 | | | |
| | A | 598 | 541 | 22,181 | 4,840 | 28,160 | 80,800 | 3,736 | | | |
| | **Total** | **15,182** | **2,716** | **23,098** | **6,228** | **47,224** | **101,800** | **3,955** | **4,200** | 291,024 | 103,381 |
| 1994 | P | 18,754 | 2,910 | 1,422 | 1,879 | 24,965 | 21,000 | 324 | | | |
| | A | 260 | 1,023 | 52,390 | 5,081 | 58,754 | 80,800 | 2,920 | | | |
| | **Total** | **19,014** | **3,933** | **53,812** | **6,960** | **83,719** | **101,800** | **3,244** | **4,200** | 300,433 | 89,251 |
| 1995 | P | 13,970 | 1,406 | 1,798 | 5,775 | 22,950 | 21,000 | 153 | | | |
| | A | 31 | 436 | 52,937 | 9,567 | 62,982 | 80,800 | 3,990 | | | |
| | **Total** | **14,001** | **1,842** | **54,735** | **15,342** | **85,932** | **101,800** | **4,143** | **4,200** | 244,835 | 118,897 |
| 1996 | P | 15,536 | 1,280 | 1,061 | 3,500 | 21,378 | 17,000 | 734 | | | |
| | A | 548 | 627 | 44,733 | 4,406 | 50,313 | 51,140 | 3,551 | | | |
| | **Total** | **16,084** | **1,907** | **45,794** | **7,906** | **71,690** | **68,140** | **4,285** | **6,423** | 268,918 | 90,144 |
| 1997 | P | 13,164 | 1,252 | 147 | 1,651 | 16,213 | 16,500 | 150 | | | |
| | A | 16 | 226 | 34,937 | 4,156 | 39,336 | 50,000 | 3,381 | | | |
| | **Total** | **13,180** | **1,478** | **35,085** | **5,806** | **55,549** | **66,500** | **3,531** | **4,200** | 310,392 | 84,144 |
| 1998 | P | 13,785 | 761 | 131 | 973 | 15,650 | 16,500 | 3 | | | |
| | A | 125 | 243 | 39,002 | 3,604 | 42,974 | 54,248 | 49 | | | |
| | **Total** | **13,910** | **1,004** | **39,133** | **4,577** | **58,624** | **70,748** | **52** | **4,200** | 401,903 | 85,577 |

a P: Spring/Printemps; A: Fall/Automne

Table 2. Catch (tonnes) by season in fixed gear for 4T Southern Gulf of St. Lawrence herring. Catches compiled using ZIFF raw data files for 1986, and 1988-1998 spring. For 1987 and 1998 fall, purchase slip files were used.

**SPRING SEASON - FIXED GEAR**

| | Area | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Year | 16A | 16B | 16C | 16D | 16E | 16F | 16G | Total |
| 86 | 234 | 1439 | 2282 | 328 | 3731 | 66 | 266 | 8347 |
| 87 | 206 | 4089 | 3082 | 106 | 3841 | 134 | 38 | 11496 |
| 88 | 78 | 6616 | 3560 | 108 | 2041 | 158 | 122 | 12682 |
| 89 | 88 | 3827 | 1556 | 74 | 5080 | 134 | 62 | 10822 |
| 90 | 62 | 1715 | 2232 | 167 | 4285 | 141 | 17 | 8618 |
| 91 | 26 | 2139 | 5159 | 193 | 5018 | 127 | 16 | 12678 |
| 92 | 26 | 2856 | 4348 | 243 | 4699 | 146 | 54 | 12372 |
| 93 | 34 | 2377 | 4533 | 885 | 6893 | 200 | 124 | 15047 |
| 94 | 129 | 1550 | 6187 | 218 | 10499 | 154 | 71 | 18809 |
| 95 | 13 | 1029 | 4799 | 1039 | 6993 | 95 | 27 | 13995 |
| 96 | 123 | 460 | 5380 | 1628 | 8428 | 37 | 40 | 16096 |
| 97 | 23 | 274 | 3072 | 619 | 9221 | 18 | 2 | 13229 |
| 98 | 60 | 219 | 3023 | 1907 | 7541 | 176 | 607 | 13533 |
| Mean 93-97 | 64 | 1138 | 4794 | 878 | 8407 | 101 | 53 | 15435 |

**FALL SEASON - FIXED GEAR**

| | Area | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Year | 16A | 16B | 16C | 16D | 16E | 16F | 16G | Total |
| 86 | 124 | 25959 | 93 | 0 | 1570 | 5816 | 6638 | 40199 |
| 87 | 208 | 31653 | 902 | 1 | 1090 | 9495 | 8660 | 52009 |
| 88 | 68 | 22111 | 1254 | 9 | 2591 | 9141 | 6102 | 41276 |
| 89 | 95 | 26431 | 1015 | 0 | 517 | 3160 | 2905 | 34123 |
| 90 | 110 | 31926 | 753 | 2 | 2405 | 10343 | 10957 | 56496 |
| 91 | 34 | 17181 | 1559 | 1 | 3242 | 1906 | 3122 | 27044 |
| 92 | 35 | 23559 | 1789 | 18 | 2540 | 1919 | 3160 | 33019 |
| 93 | 87 | 14597 | 3062 | 618 | 1977 | 935 | 1786 | 23062 |
| 94 | 74 | 34473 | 4086 | 1460 | 2118 | 8095 | 3483 | 53789 |
| 95 | 77 | 29448 | 5164 | 1901 | 4216 | 10113 | 3816 | 54735 |
| 96 | 86 | 21381 | 2817 | 1448 | 4688 | 7754 | 7608 | 45782 |
| 97 | 17 | 16540 | 2008 | 163 | 3969 | 6218 | 6132 | 35047 |
| 98 | 10 | 17845 | 1844 | 1213 | 5215 | 5466 | 7204 | 38797 |
| Mean 93-97 | 67 | 23210 | 3468 | 1118 | 3347 | 6664 | 4514 | 42388 |

Table 3. Catch (tonnes) by season in 1998 fixed gear for 4T Southern Gulf of St. Lawrence herring. Catches are from purchase slip files except for fall bait, small seiner catches, and seiner (>65') catches outside Chaleur Bay which are from quota monitoring. Fall 4T includes allocation for 4Vn inshore.

**1998 SOUTHERN GULF OF ST. LAWRENCE TACs and QUOTA ALLOCATIONS**

| Fishing Area | TAC (t) | Sharing TAC | | Inshore | | Seiners (>65') | |
|---|---|---|---|---|---|---|---|
| | | Inshore | Seiners | Allocation | Catch | Allocation | Catch |
| Spring 4T | 16,500 | 77% | 23% | 12,708 | 13,907 | 3,792 | 1,004 |
| Fall 4T | 54,248 | 79% | 21% | 43,045 | 39,129 | 11,203 | 4,575 |
| Winter 4Vn | 4,200 | | 100% | | | 4,200 | 52 |
| Total Fall | 58,448 | 74% | 26% | 43,045 | 39,129 | 15,403 | 4,627 |
| Total (Spring + Fall) | 74,948 | 74% | 26% | 55,753 | 53,036 | 19,195 | 5,631 |

**1998 SPRING FISHERY**

| Area | Season | TAC (t) | Catch (t) |
|---|---|---|---|
| **INSHORE** | | | |
| Isle Verte 16A | Jan – June 15 | 130 | 52 |
| Chaleur Bay 16B | Jan – June 15 | 800 | 152 |
| Escuminac 16C | Jan 1-May 31 | 4,100 | 2,982 |
| Magdalen Islands 16D | Jan – June 15 | 1,200 | 1,887 |
| Southeast NB – West PEI 16E | Jan – May 31 | 5,100 | 7,498 |
| Guilf Nova Scotia 16F | Jan – June 15 | 300 | 148 |
| East PEI 16G | Jan – June 15 | 200 | 456 |
| Bait and Roe Fisheries all 4T | Jan – June 15 | 745 | 732 |
| 4Vn | | 133 | 66 |
| **Total Inshore** | | 12,708 | 13,973 |
| **SEINERS (>65')** | | | |
| All 4T | Ap 1 - June 30 | 3,792 | 1,004 |
| **Grand Total** | | 16,500 | 14,977 |

**1998 FALL FISHERY**

| Area | Season | Consistent Weekend Closure | Vessel Limit (lb) | TAC (t) | Catch (t) |
|---|---|---|---|---|---|
| **INSHORE** | | | | | |
| Isle Verte 16A | July 1-Dec 31 | none | 20,000 | 330 | 10 |
| Chaleur Bay 16B | Aug 1-Dec 31 | 2 days | 20,000 | 18,399 | 17,805 |
| Chaleur Bay 16B Bait | Jul 1-Dec 31 | | | 880 | 40 |
| Escuminac 16C - Wst PEI 16E | Aug 1-Dec 31 | none | 20,000 | 7,260 | 7,059 |
| Magdalen 16D | Aug 1-Dec 31 | 1 day | 20,000 | 1,375 | 1,213 |
| Pictou 16F | Jul 1-Dec 31 | 2 days | 15,000 | 6,820 | 5,466 |
| Fisherman's Bank 16G | Aug 1-Dec 31 | 2 days | 15,000 | 6,820 | 7,204 |
| Quebec Small Seiners | Aug 1-Dec 31 | | | 605 | 332 |
| 4Vn | | | | 556 | 154 |
| **Total Inshore** | | | | 42,165 | 39,283 |
| **SEINERS (>65')** | | | | | |
| Within Chaleur Bay | Sept - Dec | | | 9,464 | 3,597 |
| Outside Chaleur Bay | Sept - Dec | | | 1,739 | 978 |
| All 4T | | | | 11,203 | 4,575 |
| 4Vn | Nov - Mar | | | 4,200 | 52 |
| **Total Seiners** | | | | 15,403 | 4,627 |
| **Grand Total** | | | | 57,568 | 43,910 |

Table 4. Average price paid per pound to purse seiners and gillnetters in the Gulf Region, spring and fall fisheries. Na = not available.

| Year | Spring and Fall Purse Seine (cents/lb) | Spring and Fall Gillnets (cents/lb) | Fall Gillnets (cents/lb) | Spring Gillnets (cents/lb) |
|---|---|---|---|---|
| 83 | 9.44 | Na | | |
| 84 | 8.08 | Na | | |
| 85 | 9.10 | Na | | |
| 86 | 8.07 | Na | | |
| 87 | 9.04 | 12.00 | | |
| 88 | 7.15 | 8.00 | | |
| 89 | 5.00 | 3.00-4.00 | | |
| 90 | 6.21 | 5.00-6.00 | | |
| 91 | 5.65 | 3.00-4.00 | | |
| 92 | 5.60 | 3.00-4.00 | | |
| 93 | 5.00 | 3.00-4.00 | | |
| 94 | 5.50 | 6.00-8.00 | | |
| 95 | 6.50 | 10.00-12.00 | | |
| 96 | 7.60 | 14-20 | | |
| 97 | 7.90 | | 7.60 | 6.90 |
| 98 | 7.30 | | 7.00 | 8.20 |

Table 5. Number of respondents by area, homeport, and area of fishing activity for spring gillnetters called during the phone survey. See Fig. 6 for area locations. Total number surveyed for spring was 128.

| | Fishing Location | | | | | | |
|---|---|---|---|---|---|---|---|
| Home Area | Mag Is | Quebec | Acad Pen | Esc | SE N.B. | N. S. | West PEI |
| Magdalen Is | 19 | | | | | | |
| Quebec | | 12 | | | | | |
| Acadian Pen | | 1 | 5 | 2 | | | |
| Escuminac | | | | 17 | 12 | | |
| SE N.B. | | | | | 24 | | |
| Nova Scotia | | | | | 1 | 3 | |
| West PEI | | | | | | | 32 |

Table 6. Number of respondents by area, homeport, and area of fishing activity for fall gillnetters called during the phone survey. See Fig. 6 for area locations. Total number surveyed for fall was 167.

| Home Area | Fishing Location<br>Mag Is | Quebec | Ac. Pen | Esc | SE N.B. | N. S. | West PEI | East PEI |
|---|---|---|---|---|---|---|---|---|
| Magdalen Is | 6 | | | | | | | |
| Quebec | | 9 | | | | | | |
| Acadian Pen | | 20 | 55 | 4 | | | | |
| Escuminac | | | | 4 | | | | |
| SE N.B. | | | | | 1 | | | |
| Nova Scotia | | | | | | 31 | | |
| West PEI | | | | | | | 20 | |
| East PEI | | | | | | | | 17 |

Table 7. Average length of gillnets (fathoms) used in the 1998 herring fishery. See Fig. 6 for area locations.

| Area | Spring | Fall |
|---|---|---|
| Mag Is. | 17.3 | 17.8 |
| Quebec | 19.1 | 16.3 |
| Ac Pen. | 16.2 | 15.7 |
| Escuminac | 14.1 | 15.0 |
| SE NB | 14.0 | 17.0 |
| NS\NE | 21.7 | 13.1 |
| EPEI | - | 18.0 |
| WPEI | 13.4 | 14.4 |

Table 8. Percent distribution of gillnet types used in the 1998 herring fishery. See Fig. 6 for area locations.

| | Spring % | | Fall % | |
|---|---|---|---|---|
| Area | Set | Modified | Set | Modified |
| Mag Is | 98 | 2 | 0 | 100 |
| Quebec | 100 | 0 | 8 | 92 |
| Ac Pen. | 43 | 57 | 3 | 97 |
| Escuminac | 100 | 0 | 16 | 84 |
| SE NB | 100 | 0 | 100 | 0 |
| NS\NE | 100 | 0 | 100 | 0 |
| EPEI | - | - | 100 | 0 |
| WPEI | 100 | 0 | 100 | 0 |

Table 9. Number of nets used in 4T during fall and spring herring gillnet fisheries.

| Year | Fall | Spring |
|---|---|---|
| 78 | 11.4 | 29.4 |
| 79 | 11.9 | 34.4 |
| 80 | 10.4 | 20.2 |
| 81 | 9.6 | 18.6 |
| 82 | 6.0 | 20.4 |
| 83 | 7.3 | 22.5 |
| 84 | 5.3 | 26.5 |
| 85 | 5.2 | 37.2 |
| 86 | 5.2 | 26.6 |
| 87 | 4.7 | 23.9 |
| 88 | 5.0 | 19.9 |
| 89 | 5.3 | 26.6 |
| 90 | 5.2 | 29.4 |
| 91 | 5.0 | 27.6 |
| 92 | 5.0 | 22.7 |
| 93 | 5.4 | 24.0 |
| 94 | 5.4 | 22.9 |
| 95 | 5.5 | 21.7 |
| 96 | 4.8 | 20.7 |
| 97 | 5.2 | 20.2 |
| 98 | 5.5 | 24.5 |

Table 10. Average number of nets used during the fall inshore fishery in statistical districts accounting for most of the fall inshore catch.

| | Statistical District | | | | | | |
|---|---|---|---|---|---|---|---|
| | Gulf Nova Scotia | | Acadian Peninsula | | | PEI | |
| Year | 11 | 13 | 65 | 66 | 67 | 87 | 92 |
| 86 | 10 | 12 | 9 | 5 | 8 | 10 | 10 |
| 87 | 10 | 9 | 5 | 5 | 6 | 8 | 8 |
| 88 | 9 | 8 | 9 | 6 | 7 | 10 | 10 |
| 89 | 6 | 7 | 6 | 6 | 7 | 8 | 11 |
| 90 | 7 | 8 | 6 | 6 | 6 | 10 | 7 |
| 91 | 10 | 5 | 5 | 5 | 6 | 12 | 7 |
| 92 | 9 | 4 | 7 | 5 | 7 | 7 | 9 |
| 93 | 5 | 8 | 7 | 6 | 6 | 7 | 9 |
| 94 | 6 | 6 | 10 | 5 | 5 | 7 | 12 |
| 95 | 7 | 6 | 7 | 5 | 5 | 8 | 8 |
| 96 | 6 | 6 | 5 | 5 | 5 | 8 | 8 |
| 97 | 5 | 5 | 6 | 5 | 5 | 7 | 7 |
| 98 | 6 | 6 | 6 | 6 | 5 | 8 | 7 |

Table 11. Average number of nets used during the spring fishery in Escuminac, NB (16C) and Southeast New Brunswick (16E).

| Year / Année | Escuminac | Southeast New Brunswick |
|---|---|---|
| 86 | 25 | 28 |
| 87 | 21 | 40 |
| 88 | 19 | 33 |
| 89 | 20 | 31 |
| 90 | 20 | 35 |
| 91 | 16 | 37 |
| 92 | 15 | 30 |
| 93 | 18 | 31 |
| 94 | 15 | 31 |
| 95 | 22 | 34 |
| 96 | 18 | 29 |
| 97 | 19 | 27 |
| 98 | 26 | 26 |

Table 12. Age-length keys and length-weight relationships used to derive 1998 catch and weight-at-age matrices for 4T herring. Individual keys are compiled by North, Middle, Southern, and 4Vn regions. A * indicates that all the spring spawners caught during the fall season, and a ** indicates that all the fall spawners caught during the spring season, were used to determine the length-weight relationship.

| | | | | | | Intercept | Transformed | Slope | Number of fish | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Season | Gear | Region | Fishery | Area | Sp Grp | a | a | b | Aut | Prin | No.samples | Landings(t) |
| Fall | Fixed | North | Gaspe (16A) | 4Topq | Prin | insuf. data | | | | | | 10 |
| | | North | Chaleur (16B) - Bait | 4Tmn | Aut | -5.24 | 0.00000570 | 3.118 | | | | |
| | | North | Chaleur (16B) - Bait | 4Tmn | Prin | -5.78 | 0.00000165 | 3.438 | 36 | 44 | 3 | 40 |
| | | North | Chaleur (16B) - Roe | 4Tmn | Aut | -5.24 | 0.00000570 | 3.118 | | | | |
| | | North | Chaleur (16B) - Roe | 4Tmn | Prin | -5.78 | 0.00000165 | 3.438 | 576 | 5 | 19 | 17805 |
| | | Middle | Esc - WPEI (16CE) | 4Tl | Aut | -4.82 | 0.00001509 | 2.843 | 289 | 0 | 8 | 7059 |
| | | South | Iles-de-la-Mad (16D) | 4Tf | Aut | -4.55 | 0.00002828 | 2.642 | 188 | 0 | 5 | 1213 |
| | | South | Fish. Bank (16G) | 4Tg | Aut | -4.72 | 0.00001906 | 2.765 | | | | |
| | | South | Fish. Bank (16G) | 4Tg | Prin | -5.80 | 0.00000158 | 3.464 * | 395 | 2 | 11 | 7204 |
| | | South | Pictou (16F) | 4Th | Aut | -4.83 | | 2.839 | 424 | 0 | 11 | 5466 |
| | Mobile | North | Purse Seine | 4Tmno | Aut | -5.88 | 0.00000131 | 3.511 | | | | |
| | | North | Purse Seine | 4Tmno | Prin | -5.97 | 0.00000108 | 3.584 | 296 | 5 | 11 | 3598 |
| | | Middle | Purse Seine | 4Tl | one a and b for all fall mobile samples | | | | 31 | 1 | 1 | 978 |
| | | 4Vn | Purse Seine | 4Vn | | " | | | 29 | 6 | 1 | 52 |
| Spring | Fixed | North | Gaspe (16A) | 4Topq | Aut | -5.20 | 0.00000626 | 3.087 ** | | | | |
| | | North | Gaspe (16A) | 4Topq | Prin | -4.73 | 0.00001875 | 2.725 | 2 | 102 | 3 | 56 |
| | | North | Chaleur (16B) | 4Tmn | Aut | -5.20 | 0.00000626 | 3.087 ** | | | | |
| | | North | Chaleur (16B) | 4Tmn | Prin | -6.02 | 0.00000095 | 3.597 | 1 | 126 | 4 | 182 |
| | | Middle | Esc - WPEI-May | 4Tl | Aut | -5.20 | 0.00000626 | 3.087 ** | | | | |
| | | Middle | Esc - WPEI-May | 4Tl | Prin | -5.80 | 0.00000159 | 3.449 | 3 | 287 | 11 | 7304 |
| | | Middle | Esc - WPEI-June | 4Tl | Prin | -5.98 | 0.00000104 | 3.574 | 0 | 96 | 3 | 248 |
| | | South | Iles-de-la-Mad (16D) | 4Tf | Aut | -5.20 | 0.00000626 | 3.087 ** | | | | |
| | | South | Iles-de-la-Mad (16D) | 4Tf | Prin | -5.48 | 0.00000334 | 3.225 | 4 | 168 | 6 | 1900 |
| | | South | 16E,16F,16G-May | 4Tghjk | Aut | -5.20 | 0.00000626 | 3.087 ** | | | | |
| | | South | 16E,16F,16G-May | 4Tghjk | Prin | -5.77 | 0.00000168 | 3.424 | 1 | 350 | 13 | 3421 |
| | | South | 16E,16F,16G-June | 4Tghjk | Prin | -5.47 | 0.00000339 | 3.232 | 0 | 155 | 5 | 798 |
| | Mobile | South | Purse Seine | 4Tg | Aut | -5.20 | 0.00000626 | 3.087 ** | | | | |
| | | South | Purse Seine | 4Tg | Prin | -5.61 | 0.00000248 | 3.338 | 40 | 147 | 4 | 1004 |

Table 13. Cumulative catch(t) and effort (trips) for spring fisheries in 16A and 16D. Sp. Group is number of fish sampled in each spawning group. Data in this table comes from the raw ZIF files.

| 16D | | | Cumulative | | Sp. Group | | | 16A | 4To | 4Tpq | total | 4To | 4Tpq | total | Cumulative | | Sp. Group | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Catch | Effort | Catch | Effort | Fall | Spring | Samples | | Catch | Catch | Catch | Effort | Effort | Effort | Catch | Effort | Fall | Spring | Samples |
| 402 | 0 | 0 | 0 | 0 | | | | 402 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 404 | 0 | 0 | 0 | 0 | | | | 404 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 405 | 0 | 0 | 0 | 0 | | | | 405 | 2 | 0 | 2 | 2 | 0 | 2 | 2 | 2 | | | |
| 406 | 3 | 1 | 3 | 1 | | | | 406 | 0 | 0 | 0 | 2 | 0 | 2 | 2 | 4 | | | |
| 407 | 1 | 1 | 4 | 2 | | | | 407 | 3 | 0 | 3 | 4 | 0 | 4 | 5 | 8 | | | |
| 408 | 8 | 4 | 12 | 6 | | | | 408 | 0 | 0 | 0 | 5 | 0 | 5 | 5 | 13 | | | |
| 409 | 6 | 4 | 18 | 10 | | | | 409 | 0 | 0 | 0 | 5 | 0 | 5 | 5 | 18 | | | |
| 410 | 3 | 1 | 21 | 11 | | | | 410 | 0 | 0 | 0 | 5 | 0 | 5 | 5 | 23 | | | |
| 413 | 54 | 26 | 75 | 37 | | | | 413 | 1 | 0 | 1 | 5 | 0 | 5 | 6 | 28 | | | |
| 414 | 45 | 14 | 120 | 51 | | | | 414 | 0 | 0 | 0 | 6 | 0 | 6 | 6 | 34 | | | |
| 415 | 101 | 38 | 221 | 89 | | | | 415 | 0 | 0 | 0 | 6 | 0 | 6 | 6 | 40 | | | |
| 416 | 85 | 35 | 306 | 124 | | 23 | 1 | 416 | 0 | 0 | 0 | 6 | 0 | 6 | 6 | 46 | | | |
| 417 | 56 | 29 | 362 | 153 | | | | 417 | 0 | 0 | 0 | 6 | 0 | 6 | 6 | 52 | | | |
| 418 | 12 | 7 | 374 | 160 | | | | 418 | 0 | 0 | 0 | 7 | 0 | 7 | 6 | 59 | | | |
| 420 | 218 | 76 | 592 | 236 | | | | 420 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 59 | | | |
| 421 | 165 | 44 | 757 | 280 | | | | 421 | 0 | 0 | 0 | 7 | 0 | 7 | 6 | 66 | | | |
| 422 | 301 | 85 | 1058 | 365 | | 30 | 1 | 422 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 66 | | | |
| 423 | 189 | 76 | 1247 | 441 | | | | 423 | 0 | 0 | 0 | 7 | 0 | 7 | 6 | 73 | | | |
| 424 | 78 | 40 | 1325 | 481 | | | | 424 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 73 | | | |
| 425 | 27 | 3 | 1352 | 484 | | | | 425 | 0 | 0 | 0 | 7 | 0 | 7 | 6 | 80 | | | |
| 427 | 387 | 73 | 1739 | 557 | | | | 426 | 0 | 0 | 0 | 8 | 0 | 8 | 6 | 88 | | | |
| 428 | 102 | 17 | 1841 | 574 | 4 | 23 | 1 | 430 | 1 | 0 | 1 | 9 | 0 | 9 | 7 | 97 | | | |

Table 13. cont.

| 16D | | | Cumulative | | Sp. Group | | | 16A | 4To | 4Tpq | total | 4To | 4Tpq | Total | Cumulative | | Sp. Group | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Catch | Effort | Catch | Effort | Fall | Spring | Samples | | Catch | Catch | Catch | Effort | Effort | Effort | Catch | Effort | Fall | Spring | Samples |
| 501 | 0 | 0 | 1841 | 574 | | | | 501 | 1 | 0 | 1 | 9 | 0 | 9 | 8 | 106 | | | |
| 503 | 0 | 0 | 1841 | 574 | | | | 503 | 0 | 1 | 1 | 9 | 1 | 10 | 9 | 116 | | | |
| 504 | 0 | 0 | 1841 | 574 | | | | 504 | 2 | 1 | 3 | 12 | 2 | 14 | 12 | 130 | | 35 | 1 |
| 505 | 1 | 1 | 1842 | 575 | | | | 505 | 0 | 1 | 1 | 0 | 2 | 2 | 13 | 132 | | 33 | 1 |
| 506 | 0 | 0 | 1842 | 575 | | | | 506 | 0 | 1 | 1 | 0 | 3 | 3 | 14 | 135 | | | |
| 507 | 0 | 0 | 1842 | 575 | | 26 | 1 | 507 | 0 | 1 | 1 | 12 | 4 | 16 | 15 | 151 | | | |
| 508 | 0 | 0 | 1842 | 575 | | | | 508 | 1 | 1 | 2 | 13 | 5 | 18 | 17 | 169 | | | |
| 509 | 0 | 0 | 1842 | 575 | | | | 509 | 0 | 1 | 1 | 13 | 6 | 19 | 18 | 188 | | | |
| 510 | 0 | 0 | 1842 | 575 | | | | 510 | 0 | 0 | 0 | 14 | 6 | 20 | 18 | 208 | | | |
| 512 | 0 | 0 | 1842 | 575 | | | | 512 | 0 | 0 | 0 | 14 | 6 | 20 | 18 | 228 | | | |
| 513 | 0 | 0 | 1842 | 575 | | | | 513 | 2 | 0 | 2 | 16 | 6 | 22 | 20 | 250 | | | |
| 514 | 0 | 0 | 1842 | 575 | | | | 514 | 0 | 0 | 0 | 16 | 0 | 16 | 20 | 266 | | | |
| 515 | 2 | 1 | 1844 | 576 | | | | 515 | 0 | 0 | 0 | 17 | 0 | 17 | 20 | 283 | | | |
| 516 | 14 | 2 | 1858 | 578 | | | | 518 | 0 | 1 | 1 | 0 | 7 | 7 | 21 | 290 | | | |
| 517 | 5 | 3 | 1863 | 581 | | | | 519 | 0 | 1 | 1 | 0 | 8 | 8 | 22 | 298 | | | |
| 520 | 6 | 2 | 1869 | 583 | | | | 520 | 0 | 1 | 1 | 0 | 9 | 9 | 23 | 307 | | | |
| 521 | 0 | 1 | 1869 | 584 | | | | 521 | 0 | 1 | 1 | 0 | 10 | 10 | 24 | 317 | | | |
| 522 | 6 | 1 | 1875 | 585 | | 34 | 1 | 524 | 0 | 1 | 1 | 0 | 11 | 11 | 25 | 328 | | | |
| 523 | 12 | 2 | 1887 | 587 | | | | 525 | 0 | 2 | 2 | 0 | 13 | 13 | 27 | 341 | | | |
| 526 | 0 | 0 | 1887 | 587 | | | | 526 | 0 | 0 | 0 | 0 | 13 | 13 | 27 | 354 | | | |
| 527 | 0 | 0 | 1887 | 587 | | 32 | 1 | 527 | 1 | 1 | 2 | 18 | 14 | 32 | 29 | 386 | | | |
| 528 | 0 | 0 | 1887 | 587 | | | | 528 | 0 | 1 | 1 | 0 | 15 | 15 | 30 | 401 | | | |
| 529 | 0 | 0 | 1887 | 587 | | | | 529 | 0 | 0 | 0 | 0 | 0 | 0 | 30 | 401 | | | |
| 530 | 0 | 0 | 1887 | 587 | | | | 530 | 0 | 2 | 2 | 18 | 17 | 35 | 32 | 436 | | | |
| 531 | 0 | 0 | 1887 | 587 | | | | 531 | 1 | 5 | 6 | 19 | 22 | 41 | 38 | 477 | | | |
| 601 | 0 | 0 | 1887 | 587 | | | | 601 | 0 | 1 | 1 | 0 | 23 | 23 | 39 | 500 | | | |
| 602 | 0 | 0 | 1887 | 587 | | | | 602 | 0 | 1 | 1 | 0 | 24 | 24 | 40 | 524 | | | |
| 603 | 0 | 0 | 1887 | 587 | | | | 603 | 0 | 0 | 0 | 0 | 25 | 25 | 40 | 549 | | | |
| 604 | 0 | 0 | 1887 | 587 | | | | 604 | 4 | 1 | 5 | 23 | 25 | 48 | 45 | 597 | 2 | 34 | 1 |
| 605 | 0 | 0 | 1887 | 587 | | | | 605 | 3 | 3 | 6 | 25 | 28 | 53 | 51 | 650 | | | |
| 606 | 0 | 0 | 1887 | 587 | | | | 606 | 0 | 0 | 0 | 25 | 28 | 53 | 51 | 703 | | | |
| 616 | 0 | 0 | 1887 | 587 | | | | 616 | 1 | 0 | 1 | 27 | 0 | 27 | 52 | 730 | | | |
| 618 | 0 | 2 | 1887 | 589 | | | | 618 | 2 | 0 | 2 | 28 | 0 | 28 | 54 | 758 | | | |
| 619 | 10 | 7 | 1897 | 596 | | | | 619 | 0 | 0 | 0 | 0 | 0 | 0 | 54 | 758 | | | |
| 620 | 0 | 2 | 1897 | 598 | | | | 620 | 2 | 0 | 2 | 31 | 0 | 31 | 56 | 789 | | | |
| 623 | 1 | 4 | 1898 | 602 | | | | 623 | 0 | 0 | 0 | 0 | 0 | 0 | 56 | 789 | | | |
| 625 | 0 | 4 | 1898 | 606 | | | | 625 | 0 | 0 | 0 | 0 | 0 | 0 | 56 | 789 | | | |
| 627 | 2 | 2 | 1900 | 608 | | | | 627 | 0 | 0 | 0 | 0 | 0 | 0 | 56 | 789 | | | |
| **Total** | **1900** | **612** | | | **4** | **168** | **6** | | **27** | **29** | **56** | **456** | **333** | **789** | | | **2** | **102** | **3** |

Table 14. Cumulative catch(t) and effort (trips) for spring 16B inshore fishery. Data is from purchase slip files. Date is MDD. PS-Day is a purchase slip record recorded by day.

| 16B | Catch | | | | | Effort | | | | | Cumulative | | Samples | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | NB PS-Day | NB Week | NB Total | PQ PS-Day | Total NB+PQ | NB PS-Day | NB Week | NB Total | PQ PS-Day | Total NB+PQ | Catch | Effort | Sp. Group Fall | Sp. Group Spring | Samples |
| 410 | 0 | | 0 | 0 | 0 | 0 | | 0 | 1 | 1 | 0 | 0 | | | |
| 422 | 0 | | 0 | 1 | 1 | 0 | | 0 | 1 | 1 | 1 | 1 | | | |
| 425 | 0 | | 0 | 1 | 1 | 0 | | 0 | 2 | 2 | 2 | 3 | | | |
| 426 | 0 | | 0 | 1 | 1 | 0 | | 0 | 1 | 1 | 3 | 4 | | | |
| 502 | 0 | | 0 | 4 | 4 | 0 | | 0 | 7 | 7 | 7 | 11 | | | |
| 503 | 0 | | 0 | 3 | 3 | 0 | | 0 | 3 | 3 | 10 | 14 | | | |
| 504 | 0 | | 0 | 0 | 0 | 0 | | 0 | 1 | 1 | 10 | 15 | | | |
| 505 | 0 | | 0 | 1 | 1 | 0 | | 0 | 4 | 4 | 11 | 19 | | | |
| 506 | 0 | | 0 | 13 | 13 | 0 | | 0 | 10 | 10 | 24 | 29 | | | |
| 507 | 0 | | 0 | 4 | 4 | 0 | | 0 | 8 | 8 | 28 | 37 | | | |
| 509 | 0 | | 0 | 18 | 18 | 0 | | 0 | 10 | 10 | 46 | 47 | | | |
| 510 | 0 | | 0 | 26 | 26 | 0 | | 0 | 9 | 9 | 72 | 56 | | | |
| 511 | 0 | | 0 | 26 | 26 | 0 | | 0 | 8 | 8 | 98 | 64 | | 32 | 1 |
| 512 | 0 | | 0 | 1 | 1 | 0 | | 0 | 2 | 2 | 99 | 66 | | | |
| 516 | 0 | 2 | 2 | 0 | 2 | 0 | 2 | 2 | 0 | 2 | 101 | 68 | | | |
| 518 | 0 | | 0 | 0 | 0 | 0 | | 0 | 2 | 2 | 101 | 70 | | | |
| 522 | 0 | | 0 | 0 | 0 | 0 | | 0 | 1 | 1 | 101 | 71 | | | |
| 523 | 0 | | 0 | 10 | 10 | 0 | | 0 | 1 | 1 | 111 | 72 | | | |
| 525 | 0 | | 0 | 0 | 0 | 0 | | 0 | 1 | 1 | 111 | 73 | | | |
| 527 | 0 | | 0 | 0 | 0 | 0 | | 0 | 1 | 1 | 111 | 74 | | | |
| 529 | 0 | | 0 | 3 | 3 | 0 | | 0 | 1 | 1 | 114 | 75 | | | |
| 530 | 0 | | 0 | 11 | 11 | 0 | | 0 | 3 | 3 | 125 | 78 | | | |
| 531 | 0 | | 0 | 0 | 0 | 0 | | 0 | 1 | 1 | 125 | 79 | | | |
| 601 | 0 | | 0 | 2 | 2 | 0 | | 0 | 1 | 1 | 127 | 80 | | | |
| 602 | 0 | | 0 | 1 | 1 | 0 | | 0 | 1 | 1 | 128 | 81 | 1 | 31 | 1 |
| 606 | 0 | | 0 | 0 | 0 | 0 | | 0 | 2 | 2 | 128 | 83 | | | |
| 607 | 0 | | 0 | 0 | 0 | 0 | | 0 | 3 | 3 | 128 | 86 | | | |
| 608 | 0 | | 0 | 5 | 5 | 0 | | 0 | 6 | 6 | 133 | 92 | | | |
| 609 | 0 | | 0 | 0 | 0 | 0 | | 0 | 2 | 2 | 133 | 94 | | 33 | 1 |

Table 14 (cont).

| 16B | Catch | | | | | Effort | | | | | | | Samples | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | NB PS-Day | NB Week | NB Total | PQ PS-Day | Total NB+PQ | NB PS-Day | NB Week | NB Total | PQ PS-Day | Total NB+PQ | Cumulative Catch | Cumulative Effort | Sp. Group Fall | Sp. Group Spring | Samples |
| 610 | 0 | | 0 | 4 | 4 | 0 | | 0 | 3 | 3 | 137 | 97 | | | |
| 611 | 0 | | 0 | 4 | 4 | 0 | | 0 | 2 | 2 | 141 | 99 | | | |
| 612 | 0 | | 0 | 4 | 4 | 0 | | 0 | 2 | 2 | 145 | 101 | | | |
| 613 | 0 | | 0 | 7 | 7 | 1 | | 1 | 7 | 8 | 152 | 109 | | | |
| 614 | 0 | | 0 | 0 | 0 | 1 | | 1 | 1 | 2 | 152 | 111 | | | |
| 615 | 0 | | 0 | 0 | 0 | 0 | | 0 | 1 | 1 | 152 | 112 | | | |
| 616 | 9 | | 9 | 5 | 14 | 2 | | 2 | 2 | 4 | 166 | 116 | | | |
| 617 | 0 | | 0 | 0 | 0 | 1 | | 1 | 1 | 2 | 166 | 118 | | | |
| 618 | 0 | | 0 | 0 | 0 | 0 | | 0 | 2 | 2 | 166 | 120 | | | |
| 619 | 0 | | 0 | 0 | 0 | 1 | | 1 | 2 | 3 | 166 | 123 | | | |
| 620 | 0 | | 0 | 0 | 0 | 2 | | 2 | 1 | 3 | 166 | 126 | | | |
| 621 | 0 | | 0 | 16 | 16 | 0 | | 0 | 1 | 1 | 182 | 127 | | | |
| 622 | 0 | | 0 | 0 | 0 | 1 | | 1 | 0 | 1 | 182 | 128 | | 30 | 1 |
| 623 | 0 | | 0 | 0 | 0 | 0 | | 0 | 1 | 1 | 182 | 129 | | | |
| 627 | 0 | | 0 | 0 | 0 | 0 | | 0 | 2 | 2 | 182 | 131 | | | |
| 628 | 0 | | 0 | 0 | 0 | 0 | | 0 | 1 | 1 | 182 | 132 | | | |
| 629 | 0 | | 0 | 0 | 0 | 1 | | 1 | 3 | 4 | 182 | 136 | | | |
| 630 | 0 | | 0 | 0 | 0 | 1 | | 1 | 3 | 4 | 182 | 140 | | | |
| **Total** | **9** | **2** | **11** | **171** | **182** | **11** | **2** | **13** | **128** | **141** | | | **1** | **126** | **4** |

Table 15. Cumulative catch(t) and effort(trips) in 16C spring inshore fishery. Date is month day. PS-Day are daily purchase slip records, PS-Week are purchase slip records reported by week. Supp-B are fishery officer reports.

| **Date** | **Catch** | | | | **Effort** | | | | **Cumulative** | | **Sp. Group** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PS-Day | PS-Week | Supp-B | Total | PS-Day | PS-Week | Supp-B | Total | Catch | Effort | Fall | Spring | | Samples |
| 425 | 1 | | | 1 | 1 | | | 1 | 1 | 1 | | | | |
| 426 | 1 | | | 1 | 4 | | | 4 | 3 | 5 | | | | |
| 427 | 15 | | | 15 | 10 | | | 10 | 18 | 15 | | | | |
| 428 | 67 | | | 67 | 35 | | | 35 | 85 | 50 | | 25 | 1 | |
| 429 | 153 | | | 153 | 42 | | | 42 | 238 | 92 | | | | |
| 430 | 399 | | 9 | 408 | 65 | | 2 | 67 | 646 | 159 | | 22 | 1 | |
| 501 | 457 | | | 457 | 61 | | | 61 | 1103 | 220 | | | | |
| 502 | 19 | | | 19 | 5 | | | 5 | 1122 | 225 | | | | |
| 503 | 107 | | | 107 | 26 | | | 26 | 1229 | 251 | | | | |
| 504 | 589 | | | 589 | 82 | | | 82 | 1818 | 333 | 1 | 44 | 2 | |
| 505 | 262 | | | 262 | 52 | | | 52 | 2080 | 385 | | 22 | 1 | |
| 506 | 357 | | | 357 | 60 | | | 60 | 2437 | 445 | 1 | 30 | 1 | |
| 507 | 169 | | | 169 | 50 | | | 50 | 2606 | 495 | | | | |
| 509 | 5 | | | 5 | 1 | | | 1 | 2611 | 496 | | | | |
| 513 | 16 | | | 16 | 7 | | | 7 | 2627 | 503 | | | | |
| 514 | 166 | | | 166 | 55 | | | 55 | 2793 | 558 | | 33 | 1 | |
| 515 | 110 | | | 110 | 47 | | | 47 | 2903 | 605 | | 29 | 1 | |
| 519 | 69 | | | 69 | 25 | | | 25 | 2972 | 630 | | 31 | 1 | |
| 527 | | | | | | | | | 2972 | 630 | | 35 | 1 | Bait |
| 528 | | | | | | | | | 2972 | 630 | | 30 | 1 | Bait |
| 530 | 0 | | 1 | 1 | 0 | | 1 | 1 | 2973 | 631 | | | | |
| 531 | 0 | | 9 | 9 | 0 | | 4 | 4 | 2982 | 635 | | | | |
| 601 | | | | | | | | | 2982 | 635 | | 31 | 1 | Bait |
| 603 | 0 | | | 0 | 3 | | | 3 | 2982 | 638 | | | | |
| 605 | 7 | | | 7 | 1 | | | 1 | 2989 | 639 | | | | |
| 607 | 1 | | | 1 | 4 | | | 4 | 2990 | 643 | | | | |
| 608 | 1 | | | 1 | 5 | | | 5 | 2991 | 648 | | | | |
| 609 | 0 | | | 0 | 2 | | | 2 | 2991 | 650 | | | | |
| 610 | 0 | | | 0 | 2 | | | 2 | 2991 | 652 | | | | |
| 611 | 1 | | | 1 | 5 | | | 5 | 2992 | 657 | | | | |
| 612 | 1 | | | 1 | 11 | | | 11 | 2993 | 668 | | | | |
| 613 | 3 | | | 3 | 15 | | | 15 | 2996 | 683 | | | | |
| 616 | 0 | | | 0 | 2 | | | 2 | 2996 | 685 | | | | |
| 617 | 0 | | | 0 | 1 | | | 1 | 2996 | 686 | | | | |
| 630 | 0 | | 24 | 24 | 0 | | 5 | 5 | 3020 | 691 | | | | |
| **Total** | **2976** | **0** | **43** | **3020** | **679** | **0** | **12** | **691** | | | **2** | **332** | **12** | |

Table 16. Cumulative catch(t) and effort(trips) for 16E spring inshore fishery. Date is month, day. Samp = samples. PS-Day and PS-Week are purchase slip daily and weekly reports.

**SENB**

| Date | Catch PS-Day | Catch PS-Week | Catch Supp-B | Catch Total | Effort PS-Day | Effort PS-Week | Effort Supp-B | Effort Total | Cumulative Catch | Cumulative Effort | Sp. Group Fall | Sp. Group Spring | Samp |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 425 | 0 | | | 0 | 0 | | | 0 | 0 | 0 | | | |
| 426 | 38 | | | 38 | 24 | | | 24 | 38 | 24 | | | |
| 427 | 69 | | | 69 | 57 | | | 57 | 107 | 81 | | | |
| 428 | 49 | | | 49 | 49 | | | 49 | 156 | 130 | | | |
| 429 | 92 | | | 92 | 68 | | | 68 | 248 | 198 | | 23 | 1 |
| 430 | 507 | | | 507 | 130 | | | 130 | 754 | 328 | | | |
| 501 | 1021 | | | 1021 | 178 | | | 178 | 1775 | 506 | | | |
| 502 | 439 | | | 439 | 107 | | | 107 | 2214 | 613 | | | |
| 503 | 357 | | | 357 | 92 | | | 92 | 2571 | 705 | | | |
| 504 | 571 | | | 571 | 115 | | | 115 | 3141 | 820 | | | |
| 505 | 291 | | | 291 | 100 | | | 100 | 3432 | 920 | | 53 | 2 |
| 506 | 85 | | | 85 | 39 | | | 39 | 3518 | 959 | | | |
| 507 | 154 | | | 154 | 58 | | | 58 | 3671 | 1017 | | | |
| 508 | 198 | | | 198 | 65 | | | 65 | 3869 | 1082 | | 27 | 1 |
| 511 | 1 | | | 1 | 1 | | | 1 | 3870 | 1083 | | | |
| 513 | 3 | | | 3 | 2 | | | 2 | 3873 | 1085 | | | |
| 514 | 168 | | | 168 | 58 | | | 58 | 4041 | 1143 | | 80 | 3 |
| 515 | 73 | | | 73 | 48 | | | 48 | 4114 | 1191 | | 31 | 1 |
| 518 | 2 | | | 2 | 1 | | | 1 | 4116 | 1192 | | | |
| 525 | 0 | | | 0 | 1 | | | 1 | 4116 | 1193 | | | |
| 528 | 0 | | | 0 | 0 | | | 0 | 4116 | 1193 | | | |
| 601 | 15 | | | 15 | 5 | | | 5 | 4131 | 1198 | | | |
| 602 | 20 | | | 20 | 8 | | | 8 | 4151 | 1206 | | 29 | 1 |
| 603 | 13 | | | 13 | 10 | | | 10 | 4164 | 1216 | | | |
| 604 | 0 | | | 0 | 0 | | | 0 | 4164 | 1216 | | | |
| 605 | 0 | | | 0 | 0 | | | 0 | 4164 | 1216 | | | |
| 606 | 0 | | | 0 | 0 | | | 0 | 4164 | 1216 | | | |
| 607 | 4 | | | 4 | 3 | | | 3 | 4168 | 1219 | | | |

**WPEI**

| Date | Catch PS-Day | Catch PS-Week | Catch Supp-B | Catch Total | Effort PS-Day | Effort PS-Week | Effort Supp-B | Effort Total | Cumulative Catch | Cumulative Effort | Sp. Group Fall | Sp. Group Spring | Samp |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 425 | 6 | | | 6 | 5 | | | 5 | 6 | 5 | | | |
| 426 | 48 | | | 48 | 32 | | | 32 | 53 | 37 | | | |
| 427 | 53 | | | 53 | 40 | | | 40 | 106 | 77 | | | |
| 428 | 71 | | | 71 | 63 | | | 63 | 177 | 140 | 1 | 46 | 2 |
| 429 | 53 | | | 53 | 34 | | | 34 | 230 | 174 | | | |
| 430 | 183 | | | 183 | 45 | | | 45 | 413 | 219 | | | |
| 501 | 498 | 11 | | 509 | 73 | 1 | | 74 | 923 | 294 | | | |
| 502 | 235 | | | 235 | 57 | | | 57 | 1158 | 351 | | | |
| 503 | 259 | | | 259 | 80 | | | 80 | 1417 | 431 | | | |
| 504 | 356 | | | 356 | 113 | | | 113 | 1773 | 544 | | | |
| 505 | 359 | | | 359 | 94 | | | 94 | 2132 | 638 | | 27 | 1 |
| 506 | 129 | | | 129 | 57 | | | 57 | 2261 | 695 | 1 | 26 | 1 |
| 507 | 296 | | | 296 | 85 | | | 85 | 2557 | 780 | | 25 | 1 |
| 508 | 407 | 3 | | 410 | 88 | 1 | | 89 | 2967 | 869 | | | |
| 509 | 0 | | | 0 | 1 | | | 1 | 2967 | 870 | | | |
| 513 | 65 | | | 65 | 23 | | | 23 | 3032 | 893 | | | |
| 514 | 180 | | | 180 | 76 | | | 76 | 3212 | 969 | | 29 | 1 |
| 515 | 86 | | | 86 | 65 | | | 65 | 3298 | 1034 | | 34 | 1 |
| 519 | 64 | | | 64 | 24 | | | 24 | 3362 | 1058 | | | |
| 521 | 3 | | | 3 | 3 | | | 3 | 3365 | 1061 | | | |
| 528 | 17 | | | 17 | 3 | | | 3 | 3382 | 1064 | | | |
| 601 | 41 | | | 41 | 11 | | | 11 | 3423 | 1075 | | | |
| 602 | 79 | | | 79 | 49 | | | 49 | 3502 | 1124 | | | |
| 603 | 93 | | | 93 | 74 | | | 74 | 3595 | 1198 | | 33 | 1 |
| 604 | 3 | | | 3 | 6 | | | 6 | 3598 | 1204 | | | |
| 605 | 0 | | | 0 | 1 | | | 1 | 3598 | 1205 | | | |
| 606 | 0 | | | 0 | 1 | | | 1 | 3598 | 1206 | | | |
| 607 | 1 | | | 1 | 13 | | | 13 | 3599 | 1219 | | | |

Table 16. (cont.)

| | SENB | | | | | | | | | | | | | | WPEI | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Catch | | | | Effort | | | | Cumulative | | Sp. Group | | | Date | Catch | | | | Effort | | | | Cumulative | | Sp. Group | | |
| | PS-Day | PS-Week | Supp-B | Total | PS-Day | PS-Week | Supp-B | Total | Catch | Effort | Fall | Spring | Samp | | PS-Day | PS-Week | Supp-B | Total | PS-Day | PS-Week | Supp-B | Total | Catch | Effort | Fall | Spring | Samp |
| 608 | 0 | | | 0 | 4 | | | 4 | 4169 | 1223 | | | | 608 | 1 | | | 1 | 17 | | | 17 | 3600 | 1236 | | | |
| 609 | 0 | | | 0 | 3 | | | 3 | 4169 | 1226 | | | | 609 | 3 | | | 3 | 19 | | | 19 | 3603 | 1255 | | | |
| 610 | 2 | | | 2 | 5 | | | 5 | 4171 | 1231 | | | | 610 | 42 | | | 42 | 35 | | | 35 | 3645 | 1290 | | 33 | 1 |
| 611 | 0 | | | 0 | 1 | | | 1 | 4171 | 1232 | | 60 | 2 | 611 | 5 | | | 5 | 30 | | | 30 | 3650 | 1320 | | | |
| 612 | 0 | | | 0 | 0 | | | 0 | 4171 | 1232 | | | | 612 | 8 | | | 8 | 25 | | | 25 | 3658 | 1345 | | | |
| 613 | 0 | | | 0 | 0 | | | 0 | 4171 | 1232 | | | | 613 | 7 | | | 7 | 25 | | | 25 | 3665 | 1370 | | | |
| 614 | 0 | | | 0 | 0 | | | 0 | 4171 | 1232 | | | | 614 | 1 | | | 1 | 4 | | | 4 | 3666 | 1374 | | | |
| 615 | 0 | | | 0 | 0 | | | 0 | 4171 | 1232 | | | | 615 | 2 | | | 2 | 21 | | | 21 | 3668 | 1395 | | | |
| 616 | 0 | | | 0 | 0 | | | 0 | 4171 | 1232 | | | | 616 | 19 | | | 19 | 5 | | | 5 | 3687 | 1400 | | | |
| 617 | 0 | | | 0 | 0 | | | 0 | 4171 | 1232 | | | | 617 | 13 | | | 13 | 4 | | | 4 | 3700 | 1404 | | | |
| 618 | 0 | | | 0 | 1 | | | 1 | 4171 | 1233 | | | | 618 | 20 | | | 20 | 9 | | | 9 | 3720 | 1413 | | | |
| 619 | 0 | | | 0 | 0 | | | 0 | 4171 | 1233 | | | | 619 | 12 | | | 12 | 20 | | | 20 | 3732 | 1433 | | | |
| 620 | 0 | | | 0 | 0 | | | 0 | 4171 | 1233 | | | | 620 | 9 | | | 9 | 7 | | | 7 | 3741 | 1440 | | | |
| 621 | 0 | | | 0 | 0 | | | 0 | 4171 | 1233 | | | | 621 | 10 | | | 10 | 2 | | | 2 | 3751 | 1442 | | | |
| 622 | 0 | | | 0 | 0 | | | 0 | 4171 | 1233 | | | | 622 | 21 | | | 21 | 12 | | | 12 | 3772 | 1454 | | | |
| 623 | 0 | | | 0 | 0 | | | 0 | 4171 | 1233 | | | | 623 | 6 | | | 6 | 12 | | | 12 | 3778 | 1466 | | | |
| 624 | 0 | | | 0 | 0 | | | 0 | 4171 | 1233 | | | | 624 | 2 | | | 2 | 2 | | | 2 | 3780 | 1468 | | | |
| 625 | 0 | | | 0 | 0 | | | 0 | 4171 | 1233 | | | | 625 | 2 | | | 2 | 3 | | | 3 | 3782 | 1471 | | | |
| 626 | 0 | | | 0 | 0 | | | 0 | 4171 | 1233 | | | | 626 | 0 | | | 0 | 1 | | | 1 | 3782 | 1472 | | | |
| 630 | 0 | | | 0 | 0 | | | 0 | 4171 | 1233 | | | | 630 | 0 | | | 0 | 2 | | | 2 | 3782 | 1474 | | | |
| Total | 4172 | 0 | 0 | 4172 | 1233 | 0 | 0 | 1233 | | | 0 | 303 | 11 | | 3768 | 14 | 0 | 3782 | 1471 | 2 | 0 | 1473 | | | 2 | 253 | 9 |

Table 17. Cumulative catch(t) and effort(trips) for 16F and 16G spring inshore fisheries. Date is month, day. PS-Day and PS-Week are purchase slip daily and weekly reports. No samples were collected from the spring fishery in these areas.

| | 16F Gulf Nova Scotia | | | | | | | | | 16G East PEI | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Catch | | | | Effort | | | Cumulative | | Catch | | | | Effort | | | | Cumulative | |
| Date | PS-Day | Supp-B | Week | Total | PS-Day | Supp-B | Total | Catch | Effort | PS-Day | Supp-B | Week | Total | PS-Day | Supp-B | Week | Total | Catch | Effort |
| 415 | | | | | | | | | | 1 | | | 1 | 1 | | | 1 | 1 | 1 |
| 418 | | | | | | | | | | 1 | | | 1 | 1 | | | 1 | 2 | 2 |
| 420 | 3 | | | 3 | 4 | | 4 | 3 | 4 | 5 | | | 5 | 1 | | | 1 | 7 | 3 |
| 421 | 7 | | | 7 | 7 | | 7 | 10 | 11 | 2 | | | 2 | 1 | | | 1 | 9 | 4 |
| 422 | 8 | | | 8 | 8 | | 8 | 18 | 19 | 6 | | | 6 | 1 | | | 1 | 15 | 5 |
| 423 | 9 | | | 9 | 9 | | 9 | 27 | 28 | 4 | | | 4 | 2 | | | 2 | 19 | 7 |
| 424 | 8 | | | 8 | 7 | | 7 | 35 | 35 | 9 | | | 9 | 1 | | | 1 | 28 | 8 |
| 425 | 9 | | | 9 | 11 | | 11 | 44 | 46 | 3 | | | 3 | 1 | | | 1 | 31 | 9 |
| 426 | 3 | | | 3 | 6 | | 6 | 47 | 52 | 6 | | | 6 | 1 | | | 1 | 37 | 10 |
| 427 | 8 | | | 8 | 9 | | 9 | 55 | 61 | 16 | | | 16 | 5 | | | 5 | 53 | 15 |
| 428 | 5 | | | 5 | 10 | | 10 | 60 | 71 | 4 | | | 4 | 2 | | | 2 | 57 | 17 |
| 429 | 6 | | | 6 | 10 | | 10 | 66 | 81 | 0 | | | 0 | 0 | | | 0 | 57 | 17 |
| 430 | 5 | 18 | | 23 | 10 | 23 | 33 | 89 | 114 | 0 | 119 | | 119 | 0 | 22 | | 22 | 176 | 39 |
| 501 | 3 | | | 3 | 7 | | 7 | 92 | 121 | 0 | | 1 | 1 | 1 | | 1 | 2 | 177 | 41 |
| 502 | 1 | | | 1 | 2 | | 2 | 93 | 123 | 0 | | | 0 | 0 | | | 0 | 177 | 41 |
| 503 | 0 | | | 0 | 2 | | 2 | 93 | 125 | 0 | | | 0 | 0 | | | 0 | 177 | 41 |
| 504 | 3 | | | 3 | 9 | | 9 | 96 | 134 | 0 | | | 0 | 0 | | | 0 | 177 | 41 |
| 505 | 0 | | | 0 | 1 | | 1 | 96 | 135 | 0 | | | 0 | 0 | | | 0 | 177 | 41 |
| 506 | | | | | | | | | | 0 | | | 0 | 1 | | | 1 | 177 | 42 |
| 508 | | | | | | | | | | 0 | | 1 | 1 | 0 | | 1 | 1 | 178 | 43 |
| 516 | 0 | | | 0 | 1 | | 1 | 96 | 136 | 0 | | | 0 | 0 | | | 0 | 178 | 43 |
| 520 | 0 | | | 0 | 2 | | 2 | 96 | 138 | 0 | | | 0 | 0 | | | 0 | 178 | 43 |
| 522 | 1 | | | 1 | 1 | | 1 | 97 | 139 | 0 | | | 0 | 0 | | | 0 | 178 | 43 |
| 525 | 1 | | | 1 | 1 | | 1 | 98 | 140 | 0 | | | 0 | 0 | | | 0 | 178 | 43 |
| 527 | 0 | | | 0 | 1 | | 1 | 98 | 141 | 0 | | | 0 | 0 | | | 0 | 178 | 43 |
| 528 | 1 | | | 1 | 2 | | 2 | 99 | 143 | 0 | | | 0 | 0 | | | 0 | 178 | 43 |
| 529 | 1 | | | 1 | 2 | | 2 | 100 | 145 | 0 | | | 0 | 0 | | | 0 | 178 | 43 |
| 530 | 0 | 13 | | 13 | 2 | 5 | 7 | 113 | 152 | 0 | 43 | | 43 | 0 | 3 | | 3 | 221 | 46 |
| 531 | 0 | 28 | | 28 | 1 | 21 | 22 | 141 | 174 | 0 | 177 | | 177 | 0 | 20 | | 20 | 398 | 66 |

Table 17. (cont.)

| | 16F Gulf Nova Scotia | | | | | | | | | 16G East PEI | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Catch | | | | Effort | | | Cumulative | | Catch | | | | Effort | | | | Cumulative | |
| Date | PS-Day | Supp-B | Week | Total | PS-Day | Supp-B | Total | Catch | Effort | PS-Day | Supp-B | Week | Total | PS-Day | Supp-B | Week | Total | Catch | Effort |
| 601 | 0 | | | 0 | 1 | | 1 | 141 | 175 | 1 | | | 1 | 2 | | | 2 | 399 | 68 |
| 602 | 1 | | | 1 | 2 | | 2 | 142 | 177 | 3 | | | 3 | 5 | | | 5 | 402 | 73 |
| 603 | | | | | | | | | | 16 | | | 16 | 9 | | | 9 | 418 | 82 |
| 604 | 1 | | | 1 | 1 | | 1 | 143 | 178 | 1 | | | 1 | 1 | | | 1 | 419 | 83 |
| 605 | 0 | | | 0 | 1 | | 1 | 143 | 179 | 0 | | | 0 | 0 | | | 0 | 419 | 83 |
| 606 | 0 | | | 0 | 1 | | 1 | 143 | 180 | 5 | | | 5 | 5 | | | 5 | 424 | 88 |
| 607 | 0 | | | 0 | 1 | | 1 | 143 | 181 | 0 | | | 0 | 0 | | | 0 | 424 | 88 |
| 608 | 1 | | | 1 | 2 | | 2 | 144 | 183 | 1 | | | 1 | 6 | | | 6 | 425 | 94 |
| 609 | 0 | | | 0 | 1 | | 1 | 144 | 184 | 2 | | | 2 | 6 | | | 6 | 427 | 100 |
| 610 | 1 | | | 1 | 1 | | 1 | 145 | 185 | 5 | | | 5 | 8 | | | 8 | 432 | 108 |
| 611 | | | | | | | | | | 9 | | | 9 | 8 | | | 8 | 441 | 116 |
| 612 | 0 | | | 0 | 1 | | 1 | 145 | 186 | 12 | | | 12 | 7 | | | 7 | 453 | 123 |
| 613 | 1 | 2 | | 3 | 3 | 2 | 5 | 148 | 191 | 2 | | | 2 | 3 | | | 3 | 455 | 126 |
| 615 | 0 | | | 0 | 1 | | 1 | 148 | 192 | 1 | | | 1 | 4 | | | 4 | 456 | 130 |
| 616 | 0 | | | 0 | 1 | | 1 | 148 | 193 | 0 | | | 0 | 0 | | | 0 | 456 | 130 |
| 617 | 3 | | | 3 | 5 | | 5 | 151 | 198 | 0 | | | 0 | 0 | | | 0 | 456 | 130 |
| 618 | 1 | | | 1 | 4 | | 4 | 152 | 202 | 7 | | | 7 | 3 | | | 3 | 463 | 133 |
| 619 | 0 | | | 0 | 1 | | 1 | 152 | 203 | 8 | | | 8 | 8 | | | 8 | 471 | 141 |
| 620 | 1 | | | 1 | 1 | | 1 | 153 | 204 | 4 | | | 4 | 5 | | | 5 | 475 | 146 |
| 621 | | | | | | | | | | 0 | | | 0 | 1 | | | 1 | 475 | 147 |
| 622 | 2 | | | 2 | 6 | | 6 | 155 | 210 | 0 | | | 0 | 3 | | | 3 | 475 | 150 |
| 623 | 2 | | | 2 | 5 | | 5 | 157 | 215 | 5 | | | 5 | 7 | | | 7 | 480 | 157 |
| 624 | 1 | | | 1 | 3 | | 3 | 158 | 218 | 8 | | | 8 | 3 | | | 3 | 488 | 160 |
| 626 | 0 | | | 0 | 1 | | 1 | 158 | 219 | 2 | | | 2 | 2 | | | 2 | 490 | 162 |
| 630 | 0 | 13 | | 13 | 0 | 15 | 15 | 171 | 234 | 0 | 135 | | 135 | 0 | 28 | | 28 | 625 | 190 |
| Total | 97 | 74 | | 171 | 168 | 66 | 234 | | | 149 | 474 | 2 | 625 | 115 | 73 | 2 | 190 | | |

Table 18. Cumulative catch and effort for spring purse seine fishery in 16D and 16G combined.

| Date | Catch | Effort | Cumulative Catch | Cumulative Effort | Sp. Group Fall | Sp. Group Spring | Samples |
|---|---|---|---|---|---|---|---|
| 529 | 33 | 2 | 33 | 2 | | | |
| 603 | 151 | 2 | 185 | 4 | 4 | 39 | 1 |
| 608 | 200 | 3 | 385 | 7 | | | |
| 609 | 99 | 2 | 484 | 9 | 14 | 31 | 1 |
| 610 | 17 | 1 | 501 | 10 | | | |
| 611 | 150 | 4 | 652 | 14 | 22 | 77 | 2 |
| 612 | 59 | 2 | 711 | 16 | | | |
| Total | 709 | 16 | | | 40 | 147 | 4 |

Table 19. Cumulative catch and effort and sampling dates for 16A fall inshore fishery. Date is month, day.

| | 4To | 4Tpq | total Catch | 4To | 4Tpq | Total Effort | Cumulative Catch | Cumulative Effort | Samples |
|---|---|---|---|---|---|---|---|---|---|
| 812 | 1 | | 1 | 1 | | 1 | 1 | 1 | none |
| 814 | | 0 | 0 | | 1 | 1 | 1 | 2 | |
| 819 | 3 | | 3 | 2 | | 2 | 4 | 4 | |
| 831 | | 0 | 0 | | 1 | 1 | 4 | 5 | |
| 912 | 0 | | 0 | 1 | | 1 | 4 | 6 | |
| 919 | 1 | | 1 | 1 | | 1 | 5 | 7 | |
| 928 | 0 | | 0 | 1 | | 1 | 5 | 8 | |
| 930 | 0 | | 0 | 1 | | 1 | 5 | 9 | |
| 1002 | 0 | | 0 | 1 | | 1 | 5 | 10 | |
| 1006 | 1 | | 1 | 1 | | 1 | 6 | 11 | |
| 1008 | 0 | | 0 | 1 | | 1 | 6 | 12 | |
| 1010 | 0 | | 0 | 1 | | 1 | 6 | 13 | |
| 1012 | 1 | | 1 | 1 | | 1 | 7 | 14 | |
| 1014 | 1 | | 1 | 1 | | 1 | 8 | 15 | |
| 1016 | 1 | | 1 | 1 | | 1 | 9 | 16 | |
| 1017 | 0 | | 0 | 1 | | 1 | 9 | 17 | |
| 1019 | 0 | | 0 | 1 | | 1 | 9 | 18 | |
| 1021 | 1 | | 1 | 1 | | 1 | 10 | 19 | |
| 1023 | 0 | | 0 | 1 | | 1 | 10 | 20 | |
| Total | 10 | 0 | 10 | 18 | 2 | 20 | | | |

Table 19. Cumulative catch(t) and effort(trips) and sampling dates for 16A fall inshore fishery. Date is month, day. Data is from ZIF files.

| | 4To | 4Tpq | total Catch | 4To | 4Tpq | Total Effort | Cumulative Catch | Cumulative Effort | Samples |
|---|---|---|---|---|---|---|---|---|---|
| 812 | 1 | | 1 | 1 | | 1 | 1 | 1 | none |
| 814 | | 0 | 0 | | 1 | 1 | 1 | 2 | |
| 819 | 3 | | 3 | 2 | | 2 | 4 | 4 | |
| 831 | | 0 | 0 | | 1 | 1 | 4 | 5 | |
| 912 | 0 | | 0 | 1 | | 1 | 4 | 6 | |
| 919 | 1 | | 1 | 1 | | 1 | 5 | 7 | |
| 928 | 0 | | 0 | 1 | | 1 | 5 | 8 | |
| 930 | 0 | | 0 | 1 | | 1 | 5 | 9 | |
| 1002 | 0 | | 0 | 1 | | 1 | 5 | 10 | |
| 1006 | 1 | | 1 | 1 | | 1 | 6 | 11 | |
| 1008 | 0 | | 0 | 1 | | 1 | 6 | 12 | |
| 1010 | 0 | | 0 | 1 | | 1 | 6 | 13 | |
| 1012 | 1 | | 1 | 1 | | 1 | 7 | 14 | |
| 1014 | 1 | | 1 | 1 | | 1 | 8 | 15 | |
| 1016 | 1 | | 1 | 1 | | 1 | 9 | 16 | |
| 1017 | 0 | | 0 | 1 | | 1 | 9 | 17 | |
| 1019 | 0 | | 0 | 1 | | 1 | 9 | 18 | |
| 1021 | 1 | | 1 | 1 | | 1 | 10 | 19 | |
| 1023 | 0 | | 0 | 1 | | 1 | 10 | 20 | |
| Total | 10 | 0 | 10 | 18 | 2 | 20 | | | |

Table 20. Cumulative catch(t) and effort(trips) with sampling dates for 16B fall inshore fishery. Date is month, day. PS-Day are daily purchase slip reports.

| Date | Catch | | | Effort | | | Cumulative | | Samples | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | NB PS-Day | PQ PS-Day | Total NB+PQ | NB PS-Day | PQ PS-Day | Total NB+PQ | Catch | Effort | Sp. Group Fall | Spring | Number |
| 701 | 0 | 0 | 0 | 1 | 2 | 3 | 0 | 3 | | | |
| 702 | | 4 | 4 | | 2 | 2 | 4 | 5 | | | |
| 703 | 0 | 0 | 0 | 2 | 2 | 4 | 4 | 9 | | | |
| 704 | 0 | 0 | 0 | 5 | 2 | 7 | 4 | 16 | | | |
| 705 | | 0 | 0 | | 1 | 1 | 4 | 17 | | | |
| 706 | 0 | 0 | 0 | 1 | 1 | 2 | 4 | 19 | | | |
| 707 | | 0 | 0 | | 3 | 3 | 4 | 22 | | | |
| 709 | | 1 | 1 | | 1 | 1 | 5 | 23 | | | |
| 711 | | 2 | 2 | | 2 | 2 | 7 | 25 | | | |
| 712 | 0 | | 0 | 2 | | 2 | 7 | 27 | | | |
| 714 | 0 | 0 | 0 | 1 | 1 | 2 | 7 | 29 | | | |
| 715 | 0 | | 0 | 1 | | 1 | 7 | 30 | | | |
| 716 | 0 | | 0 | 2 | | 2 | 7 | 32 | | | |
| 717 | 0 | | 0 | 1 | | 1 | 7 | 33 | | | |
| 720 | 0 | 0 | 0 | 2 | 1 | 3 | 7 | 36 | | | |
| 721 | 0 | | 0 | 2 | | 2 | 7 | 38 | 6 | 23 | 1 |
| 722 | 0 | 0 | 0 | 1 | 1 | 2 | 7 | 40 | 11 | 12 | 1 |
| 724 | 0 | 1 | 1 | 1 | 1 | 2 | 8 | 42 | | | |
| 725 | 4 | 3 | 7 | 1 | 2 | 3 | 15 | 45 | | | |
| 807 | 0 | | 0 | 1 | | 1 | 15 | 46 | 19 | 9 | 1 |
| 812 | 0 | | 0 | 1 | | 1 | 15 | 47 | | | |
| 820 | 4 | 0 | 4 | 1 | 1 | 2 | 19 | 49 | | | |
| 821 | 9 | 0 | 9 | 1 | 1 | 2 | 28 | 51 | | | |
| 823 | 5 | 7 | 12 | 1 | 1 | 2 | 40 | 53 | | | |
| 824 | 2020 | 80 | 2100 | 251 | 16 | 267 | 2140 | 320 | 70 | 1 | 2 |
| 825 | 1007 | 63 | 1070 | 227 | 17 | 244 | 3210 | 564 | 30 | 1 | 1 |
| 826 | 206 | 11 | 217 | 109 | 9 | 118 | 3427 | 682 | 30 | 1 | 1 |
| 827 | 62 | 1 | 63 | 30 | 2 | 32 | 3490 | 714 | 33 | 0 | 1 |
| 828 | 389 | 23 | 412 | 119 | 6 | 125 | 3902 | 839 | | | |
| 829 | 25 | 16 | 41 | 2 | 2 | 4 | 3943 | 843 | | | |
| 830 | 14 | | 14 | 1 | | 1 | 3957 | 844 | | | |
| 831 | 1515 | 129 | 1644 | 196 | 23 | 219 | 5601 | 1063 | 55 | 1 | 2 |
| 901 | 1931 | 134 | 2065 | 249 | 26 | 275 | 7666 | 1338 | 63 | 0 | 2 |
| 902 | 1185 | 71 | 1256 | 237 | 20 | 257 | 8922 | 1595 | 63 | 0 | 2 |
| 903 | 101 | 126 | 227 | 17 | 21 | 38 | 9149 | 1633 | 59 | 0 | 2 |
| 904 | 115 | 41 | 156 | 36 | 13 | 49 | 9305 | 1682 | | | |
| 905 | 20 | | 20 | 2 | | 2 | 9325 | 1684 | | | |
| 906 | 16 | | 16 | 1 | | 1 | 9341 | 1685 | | | |
| 907 | 334 | 122 | 456 | 64 | 25 | 89 | 9797 | 1774 | | | |
| 908 | 282 | 87 | 369 | 86 | 30 | 116 | 10166 | 1890 | 30 | 0 | 1 |
| 909 | 20 | 9 | 29 | 7 | 4 | 11 | 10195 | 1901 | | | |
| 910 | 284 | 92 | 376 | 66 | 30 | 96 | 10571 | 1997 | 29 | 1 | 1 |
| 911 | 35 | 39 | 74 | 20 | 14 | 34 | 10645 | 2031 | | | |
| 913 | 23 | | 23 | 3 | | 3 | 10668 | 2034 | | | |
| 914 | 2061 | 199 | 2260 | 235 | 27 | 262 | 12928 | 2296 | | | |
| 915 | 2091 | 159 | 2250 | 230 | 29 | 259 | 15178 | 2555 | 84 | 0 | 3 |
| 916 | 1564 | 61 | 1625 | 204 | 13 | 217 | 16803 | 2772 | | | |
| 917 | 614 | | 614 | 75 | | 75 | 17417 | 2847 | | | |
| 918 | 4 | | 4 | 5 | | 5 | 17421 | 2852 | 30 | 0 | 1 |

Table 20 (cont.)

| Date | Catch | | | Effort | | | Cumulative | | Samples | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | NB PS-Day | PQ PS-Day | Total NB+PQ | NB PS-Day | PQ PS-Day | Total NB+PQ | Catch | Effort | Sp. Group Fall | Spring | Number |
| 922 | | 45 | 45 | | 12 | 12 | 17466 | 2864 | | | |
| 923 | 57 | 33 | 90 | 15 | 12 | 27 | 17556 | 2891 | | | |
| 925 | 10 | | 10 | 3 | | 3 | 17566 | 2894 | | | |
| 926 | 10 | | 10 | 6 | | 6 | 17576 | 2900 | | | |
| 927 | 12 | | 12 | 5 | | 5 | 17588 | 2905 | | | |
| 928 | 1 | | 1 | 1 | | 1 | 17589 | 2906 | | | |
| 929 | 38 | 76 | 114 | 4 | 10 | 14 | 17703 | 2920 | | | |
| 930 | 3 | 10 | 13 | 4 | 2 | 6 | 17716 | 2926 | | | |
| 1001 | 14 | 0 | 14 | 4 | 1 | 5 | 17730 | 2931 | | | |
| 1007 | 5 | | 5 | 1 | | 1 | 17735 | 2932 | | | |
| 1008 | 72 | | 72 | 11 | | 11 | 17807 | 2943 | | | |
| 1009 | 17 | | 17 | 5 | | 5 | 17824 | 2948 | | | |
| 1010 | 5 | | 5 | 1 | | 1 | 17829 | 2949 | | | |
| 1013 | 10 | | 10 | 1 | | 1 | 17839 | 2950 | | | |
| 1014 | 6 | | 6 | 4 | | 4 | 17845 | 2954 | | | |
| Total | 16200 | 1645 | 17845 | 2565 | 389 | 2954 | | | 612 | 49 | 22 |

Table 21. Cumulative catch(t) and effort(trips) with sampling dates for 16CE fall inshore fishery. Dates are month, day. PS-Day are daily purchase slip reports. Supp-B are fishery officer reports.

| 16C | | | | | | | | | | | | 16E | | | | | | | | 16CE | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Catch | | | Effort | | | Cumulative | | Sp. Group | | | | Cat | Eff | Cumulative | | Sp. Group | | | Catch | Effort | | | Sp. Group | | |
| Date | PS-Day | Supp-B | Total | PS-Day | Supp-B | Total | Cat | Eff | Fall | Spr | Sam | Date | PS-Day | PS-Day | Cat | Eff | Fall | Spr | Sam | PS-Day | PS-Day | Cat | Eff | Fall | Spr | Sam |
| 702 | | | 0 | | | 0 | 0 | 0 | | | | 702 | 0 | 1 | 0 | 1 | | | | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 703 | | | 0 | | | 0 | 0 | 0 | | | | 703 | 0 | 1 | 0 | 2 | | | | 0 | 1 | 0 | 2 | 0 | 0 | 0 |
| 726 | 2 | | 2 | 1 | | 1 | 2 | 1 | | | | 726 | 0 | 0 | 0 | 2 | | | | 2 | 1 | 2 | 3 | 0 | 0 | 0 |
| 731 | | 1 | 1 | | 2 | 2 | 3 | 3 | | | | 731 | 0 | 0 | 0 | 2 | | | | 1 | 2 | 3 | 5 | 0 | 0 | 0 |
| 807 | | | 0 | | | 0 | 3 | 3 | | | | 807 | 0 | 1 | 0 | 3 | | | | 0 | 1 | 3 | 6 | 0 | 0 | 0 |
| 814 | | | 0 | | | 0 | 3 | 3 | | | | 814 | 1 | 1 | 1 | 4 | | | | 1 | 1 | 4 | 7 | 0 | 0 | 0 |
| 815 | | | 0 | | | 0 | 3 | 3 | | | | 815 | 0 | 1 | 1 | 5 | | | | 0 | 1 | 4 | 8 | 0 | 0 | 0 |
| 818 | | | 0 | | | 0 | 3 | 3 | | | | 818 | 0 | 1 | 1 | 6 | | | | 0 | 1 | 4 | 9 | 0 | 0 | 0 |
| 820 | | | 0 | | | 0 | 3 | 3 | | | | 820 | 0 | 1 | 1 | 7 | | | | 0 | 1 | 4 | 10 | 0 | 0 | 0 |
| 821 | | | 0 | | | 0 | 3 | 3 | | | | 821 | 0 | 3 | 1 | 10 | | | | 0 | 3 | 4 | 13 | 0 | 0 | 0 |
| 822 | | | 0 | | | 0 | 3 | 3 | | | | 822 | 0 | 1 | 1 | 11 | | | | 0 | 1 | 4 | 14 | 0 | 0 | 0 |
| 823 | | | 0 | | | 0 | 3 | 3 | | | | 823 | 0 | 3 | 1 | 14 | | | | 0 | 3 | 4 | 17 | 0 | 0 | 0 |
| 826 | 14 | | 14 | 2 | | 2 | 17 | 5 | | | | 826 | 93 | 25 | 94 | 39 | | | | 107 | 27 | 111 | 44 | 0 | 0 | 0 |
| 827 | | | 0 | | | 0 | 17 | 5 | | | | 827 | 14 | 6 | 108 | 45 | | | | 14 | 6 | 125 | 50 | 0 | 0 | 0 |
| 828 | 58 | | 58 | 8 | | 8 | 75 | 13 | | | | 828 | 68 | 29 | 176 | 74 | 36 | | 1 | 126 | 37 | 251 | 87 | 36 | 0 | 1 |
| 829 | 15 | | 15 | 2 | | 2 | 90 | 15 | | | | 829 | 302 | 40 | 478 | 114 | | | | 317 | 42 | 568 | 129 | 0 | 0 | 0 |
| 831 | 53 | 7 | 60 | 16 | 5 | 21 | 150 | 36 | 24 | | 1 | 831 | 168 | 26 | 646 | 140 | | | | 228 | 47 | 796 | 176 | 24 | 0 | 1 |
| 901 | | | 0 | | | 0 | 150 | 36 | | | | 901 | 58 | 18 | 704 | 158 | 36 | | 1 | 58 | 18 | 854 | 194 | 36 | 0 | 1 |
| 902 | 13 | | 13 | 2 | | 2 | 163 | 38 | | | | 902 | 195 | 39 | 899 | 197 | | | | 208 | 41 | 1062 | 235 | 0 | 0 | 0 |
| 903 | | | 0 | | | 0 | 163 | 38 | | | | 903 | 17 | 4 | 916 | 201 | | | | 17 | 4 | 1079 | 239 | 0 | 0 | 0 |
| 904 | | | 0 | | | 0 | 163 | 38 | | | | 904 | 75 | 20 | 991 | 221 | | | | 75 | 20 | 1154 | 259 | 0 | 0 | 0 |
| 905 | | | 0 | | | 0 | 163 | 38 | | | | 905 | 176 | 25 | 1167 | 246 | | | | 176 | 25 | 1330 | 284 | 0 | 0 | 0 |
| 906 | | | 0 | | | 0 | 163 | 38 | | | | 906 | 68 | 12 | 1235 | 258 | | | | 68 | 12 | 1398 | 296 | 0 | 0 | 0 |
| 907 | 45 | | 45 | 16 | | 16 | 208 | 54 | | | | 907 | 162 | 32 | 1397 | 290 | | | | 207 | 48 | 1605 | 344 | 0 | 0 | 0 |
| 908 | 72 | | 72 | 16 | | 16 | 280 | 70 | | | | 908 | 164 | 35 | 1561 | 325 | | | | 236 | 51 | 1841 | 395 | 0 | 0 | 0 |
| 909 | | | 0 | | | 0 | 280 | 70 | | | | 909 | 145 | 25 | 1706 | 350 | | | | 145 | 25 | 1986 | 420 | 0 | 0 | 0 |

Table 21 (cont.)

| | 16C | | | | | | | | | | | | 16E | | | | | | | | 16CE | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Catch | | | Effort | | | Cumulative | | Sp. Group | | | | Cat | Eff | Cumulative | | Sp. Group | | | | Catch | Effort | | | Sp. Group | | |
| Date | PS-Day | Supp-B | Total | PS-Day | Supp-B | Total | Cat | Eff | Fall | Spr | Sam | Date | PS-Day | PS-Day | Cat | Eff | Fall | Spr | Sam | | PS-Day | PS-Day | Cat | Eff | Fall | Spr | Sam |
| 910 | | | 0 | | | 0 | 280 | 70 | | | | 910 | 115 | 22 | 1821 | 372 | | | | | 115 | 22 | 2101 | 442 | 0 | 0 | 0 |
| 911 | 29 | | 29 | 4 | | 4 | 309 | 74 | | | | 911 | 317 | 51 | 2138 | 423 | 43 | | 1 | | 346 | 55 | 2447 | 497 | 43 | 0 | 1 |
| 913 | 110 | | 110 | 14 | | 14 | 419 | 88 | | | | 913 | 372 | 45 | 2510 | 468 | | | | | 482 | 59 | 2929 | 556 | 0 | 0 | 0 |
| 914 | 244 | | 244 | 27 | | 27 | 663 | 115 | | | | 914 | 473 | 56 | 2983 | 524 | | | | | 717 | 83 | 3646 | 639 | 0 | 0 | 0 |
| 915 | 292 | | 292 | 32 | | 32 | 955 | 147 | | | | 915 | 575 | 66 | 3558 | 590 | | | | | 867 | 98 | 4513 | 737 | 0 | 0 | 0 |
| 916 | 181 | | 181 | 22 | | 22 | 1136 | 169 | | | | 916 | 326 | 47 | 3884 | 637 | 35 | | 1 | | 507 | 69 | 5020 | 806 | 35 | 0 | 1 |
| 919 | 7 | | 7 | 1 | | 1 | 1143 | 170 | | | | 919 | 462 | 60 | 4346 | 697 | | | | | 469 | 61 | 5489 | 867 | 0 | 0 | 0 |
| 920 | | | 0 | | | 0 | 1143 | 170 | | | | 920 | 82 | 16 | 4428 | 713 | | | | | 82 | 16 | 5571 | 883 | 0 | 0 | 0 |
| 921 | 173 | | 173 | 25 | | 25 | 1316 | 195 | | | | 921 | 419 | 52 | 4847 | 765 | | | | | 592 | 77 | 6163 | 960 | 0 | 0 | 0 |
| 922 | 39 | | 39 | 6 | | 6 | 1355 | 201 | | | | 922 | 25 | 11 | 4872 | 776 | | | | | 64 | 17 | 6227 | 977 | 0 | 0 | 0 |
| 924 | 54 | | 54 | 8 | | 8 | 1409 | 209 | | | | 924 | 0 | 0 | 4872 | 776 | | | | | 54 | 8 | 6281 | 985 | 0 | 0 | 0 |
| 925 | 145 | | 145 | 20 | | 20 | 1554 | 229 | 33 | | 1 | 925 | 160 | 29 | 5032 | 805 | 82 | | 2 | | 305 | 49 | 6586 | 1034 | 115 | 0 | 3 |
| 926 | 164 | | 164 | 19 | | 19 | 1718 | 248 | | | | 926 | 175 | 26 | 5207 | 831 | | | | | 339 | 45 | 6925 | 1079 | 0 | 0 | 0 |
| 927 | 110 | | 110 | 13 | | 13 | 1828 | 261 | | | | 927 | 3 | 2 | 5210 | 833 | | | | | 113 | 15 | 7038 | 1094 | 0 | 0 | 0 |
| 928 | 2 | | 2 | 3 | | 3 | 1830 | 264 | | | | 928 | 0 | 0 | 5210 | 833 | | | | | 2 | 3 | 7040 | 1097 | 0 | 0 | 0 |
| 930 | | 9 | 9 | | 4 | 4 | 1839 | 268 | | | | 930 | 5 | 1 | 5215 | 834 | | | | | 14 | 5 | 7054 | 1102 | 0 | 0 | 0 |
| 1031 | 0 | 5 | 5 | 0 | 4 | 4 | 1844 | 272 | | | | 1031 | 0 | 0 | 5215 | 834 | | | | | 5 | 4 | 7059 | 1106 | 0 | 0 | 0 |
| **Total** | **1822** | **22** | **1844** | **257** | **15** | **272** | | | **57** | **0** | **2** | **Total** | **5215** | **834** | | | **232** | **0** | **6** | | **7059** | **1106** | | | **289** | **0** | **8** |

Table 22. Cumulative catch(t) and effort(trips) with sampling dates for 16D fall inshore fishery. Date is month, day. PS-Day are purchase slip daily reports.

| | PS-Day | | Cumulative | | Spawning Group | | Sample Number |
|---|---|---|---|---|---|---|---|
| Date | Catch | Effort | Catch | Effort | Fall | Spring | |
| 806 | 0 | 1 | 0 | 1 | | | |
| 810 | 0 | 1 | 0 | 2 | | | |
| 814 | 5 | 1 | 6 | 3 | | | |
| 815 | 2 | 3 | 8 | 6 | | | |
| 817 | 1 | 1 | 9 | 7 | | | |
| 820 | 0 | 1 | 9 | 8 | | | |
| 824 | 1 | 2 | 10 | 10 | | | |
| 826 | 0 | 1 | 11 | 11 | | | |
| 907 | 135 | 18 | 145 | 29 | | | |
| 908 | 292 | 40 | 438 | 69 | | | |
| 909 | 126 | 22 | 564 | 91 | | | |
| 910 | 209 | 25 | 773 | 116 | 39 | | 1 |
| 911 | 129 | 37 | 902 | 153 | 31 | | 1 |
| 914 | 234 | 43 | 1136 | 196 | 78 | | 2 |
| 915 | 76 | 16 | 1212 | 212 | 40 | | 1 |
| 1103 | 1 | 1 | 1213 | 213 | | | |
| 1109 | 0 | 1 | 1213 | 214 | | | |
| Total | 1211 | 214 | | | 188 | 0 | 5 |

Table 23. Cumulative catch(t) and effort(trips) with sampling dates for 16F fall inshore fishery. Dates are month, day. PS-Day are purchase slip daily reports, Supp-B are fishery officer reports.

| | Catch | | | Effort | | | Cumulative | | Sp. Group | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | PS-Day | Supp - B | Total | PS-Day | Supp - B | Total | Catch | Effort | Fall | Spring | Samp |
| 703 | 0 | | 0 | 2 | | 2 | 0 | 2 | | | |
| 704 | 0 | | 0 | 2 | | 2 | 0 | 4 | | | |
| 706 | 0 | | 0 | 3 | | 3 | 0 | 7 | | | |
| 709 | 6 | | 6 | 1 | | 1 | 6 | 8 | | | |
| 710 | 7 | | 7 | 1 | | 1 | 13 | 9 | | | |
| 711 | 0 | | 0 | 1 | | 1 | 13 | 10 | | | |
| 731 | | 10 | 10 | | 5 | 5 | 23 | 15 | | | |
| 806 | | | 0 | | | 0 | 23 | 15 | | | |
| 807 | | | 0 | | | 0 | 23 | 15 | | | |
| 808 | | | 0 | | | 0 | 23 | 15 | | | |
| 809 | | | 0 | | | 0 | 23 | 15 | | | |
| 810 | | | 0 | | | 0 | 23 | 15 | | | |
| 811 | | | 0 | | | 0 | 23 | 15 | | | |
| 812 | | | 0 | | | 0 | 23 | 15 | | | |
| 815 | | | 0 | | | 0 | 23 | 15 | | | |
| 817 | | | 0 | | | 0 | 23 | 15 | | | |
| 818 | | | 0 | | | 0 | 23 | 15 | | | |
| 819 | | | 0 | | | 0 | 23 | 15 | | | |
| 821 | | | 0 | | | 0 | 23 | 15 | | | |
| 822 | 7 | | 7 | 1 | | 1 | 30 | 16 | | | |
| 824 | | | 0 | | | 0 | 30 | 16 | | | |
| 825 | | | 0 | | | 0 | 30 | 16 | | | |
| 826 | | | 0 | | | 0 | 30 | 16 | | | |
| 827 | | | 0 | | | 0 | 30 | 16 | | | |
| 828 | | | 0 | | | 0 | 30 | 16 | | | |
| 830 | | | 0 | | | 0 | 30 | 16 | | | |
| 831 | | 10 | 10 | | 5 | 5 | 40 | 21 | | | |
| 901 | | | 0 | | | 0 | 40 | 21 | | | |
| 902 | | | 0 | | | 0 | 40 | 21 | | | |
| 903 | | | 0 | | | 0 | 40 | 21 | | | |
| 904 | | | 0 | | | 0 | 40 | 21 | | | |
| 905 | | | 0 | | | 0 | 40 | 21 | | | |
| 907 | | | 0 | | | 0 | 40 | 21 | | | |
| 908 | 6 | | 6 | 1 | | 1 | 46 | 22 | | | |
| 909 | 179 | | 179 | 29 | | 29 | 225 | 51 | | | |
| 910 | 164 | | 164 | 35 | | 35 | 389 | 86 | 38 | | 1 |
| 911 | 391 | | 391 | 70 | | 70 | 780 | 156 | 36 | | 1 |
| 912 | 7 | | 7 | 1 | | 1 | 787 | 157 | | | |
| 914 | 130 | | 130 | 39 | | 39 | 917 | 196 | | | |
| 915 | 579 | | 579 | 108 | | 108 | 1496 | 304 | 38 | | 1 |
| 916 | 448 | | 448 | 86 | | 86 | 1944 | 390 | 70 | | 2 |
| 917 | | | 0 | | | 0 | 1944 | 390 | | | |
| 918 | 80 | | 80 | 26 | | 26 | 2024 | 416 | | | |
| 921 | 869 | | 869 | 131 | | 131 | 2893 | 547 | 82 | | 2 |
| 922 | 524 | | 524 | 106 | | 106 | 3417 | 653 | 81 | | 2 |
| 923 | 651 | | 651 | 121 | | 121 | 4068 | 774 | | | |
| 924 | | | 0 | | | 0 | 4068 | 774 | | | |
| 925 | 643 | | 643 | 107 | | 107 | 4711 | 881 | | | |
| 926 | | | 0 | | | 0 | 4711 | 881 | | | |

Table 23 (cont.)

| Date | Catch | | | Effort | | | Cumulative | | Sp. Group | | Samp |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | PS-Day | Supp - B | Total | PS-Day | Supp - B | Total | Catch | Effort | Fall | Spring | |
| 927 | 7 | | 7 | 1 | | 1 | 4718 | 882 | | | |
| 928 | 228 | | 228 | 49 | | 49 | 4946 | 931 | 39 | | 1 |
| 929 | 320 | | 320 | 91 | | 91 | 5266 | 1022 | | | |
| 930 | 45 | 39 | 84 | 23 | 6 | 29 | 5350 | 1051 | | | |
| 1008 | 87 | | 87 | 19 | | 19 | 5437 | 1070 | 40 | | 1 |
| 1009 | 29 | | 29 | 10 | | 10 | 5466 | 1080 | | | |
| Total | 5407 | 59 | 5466 | 1064 | 16 | 1080 | | | 424 | 0 | 11 |

Table 24. Cumulative catch(t) and effort(trips) with sampling dates for 16G fall inshore fishery. Dates are month, day. PS-Day are purchase slip daily reports, Supp-B are fishery officer reports.

| | Catch | | | Effort | | | Cumulative | | Spawning Group | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | PS-Day | Supp - B | Total | PS-Day | Supp - B | Total | Catch | Effort | Fall | Spring | Samp |
| 703 | | | 0 | | | 0 | 0 | 0 | | | |
| 704 | | | 0 | | | 0 | 0 | 0 | | | |
| 706 | 0 | | 0 | 1 | | 1 | 0 | 1 | | | |
| 709 | 0 | | 0 | 1 | | 1 | 0 | 2 | | | |
| 710 | | | 0 | | | 0 | 0 | 2 | | | |
| 711 | | | 0 | | | 0 | 0 | 2 | | | |
| 731 | | 406 | 406 | | 18 | 18 | 406 | 20 | | | |
| 806 | 16 | | 16 | 6 | | 6 | 422 | 26 | | | |
| 807 | 21 | | 21 | 16 | | 16 | 443 | 42 | | | |
| 808 | 28 | | 28 | 9 | | 9 | 471 | 51 | | | |
| 809 | 11 | | 11 | 4 | | 4 | 482 | 55 | | | |
| 810 | 19 | | 19 | 17 | | 17 | 501 | 72 | | | |
| 811 | 11 | | 11 | 20 | | 20 | 512 | 92 | | | |
| 812 | 0 | | 0 | 1 | | 1 | 512 | 93 | | | |
| 815 | 12 | | 12 | 3 | | 3 | 524 | 96 | | | |
| 817 | 92 | | 92 | 18 | | 18 | 616 | 114 | | | |
| 818 | 17 | | 17 | 6 | | 6 | 633 | 120 | 25 | 1 | 1 |
| 819 | 4 | | 4 | 4 | | 4 | 637 | 124 | | | |
| 821 | 32 | | 32 | 13 | | 13 | 669 | 137 | | | |
| 822 | 1 | | 1 | 1 | | 1 | 670 | 138 | | | |
| 824 | 85 | | 85 | 27 | | 27 | 755 | 165 | | | |
| 825 | 9 | | 9 | 4 | | 4 | 764 | 169 | | | |
| 826 | 175 | | 175 | 36 | | 36 | 939 | 205 | 37 | | 1 |
| 827 | 167 | | 167 | 36 | | 36 | 1106 | 241 | 31 | | 1 |
| 828 | 131 | | 131 | 35 | | 35 | 1237 | 276 | | | |
| 830 | 13 | | 13 | 2 | | 2 | 1250 | 278 | | | |
| 831 | 333 | 406 | 739 | 55 | 18 | 73 | 1989 | 351 | | | |
| 901 | 336 | | 336 | 57 | | 57 | 2325 | 408 | | | |
| 902 | 320 | | 320 | 57 | | 57 | 2645 | 465 | 37 | | 1 |
| 903 | 29 | | 29 | 6 | | 6 | 2674 | 471 | 34 | | 1 |
| 904 | 348 | | 348 | 57 | | 57 | 3022 | 528 | 35 | | 1 |
| 905 | 7 | | 7 | 2 | | 2 | 3029 | 530 | | | |
| 907 | 40 | | 40 | 22 | | 22 | 3069 | 552 | | | |
| 908 | 213 | | 213 | 42 | | 42 | 3282 | 594 | | | |
| 909 | 407 | | 407 | 63 | | 63 | 3689 | 657 | 41 | 1 | 1 |
| 910 | 51 | | 51 | 13 | | 13 | 3740 | 670 | 34 | | 1 |
| 911 | 400 | | 400 | 73 | | 73 | 4140 | 743 | | | |
| 912 | | | 0 | | | 0 | 4140 | 743 | | | |
| 914 | 536 | | 536 | 84 | | 84 | 4676 | 827 | | | |
| 915 | 505 | | 505 | 85 | | 85 | 5181 | 912 | | | |
| 916 | 183 | | 183 | 57 | | 57 | 5364 | 969 | | | |
| 917 | 27 | | 27 | 5 | | 5 | 5391 | 974 | | | |
| 918 | 68 | | 68 | 20 | | 20 | 5459 | 994 | | | |
| 921 | 483 | | 483 | 74 | | 74 | 5942 | 1068 | | | |
| 922 | 343 | | 343 | 63 | | 63 | 6285 | 1131 | 39 | | 1 |
| 923 | 334 | | 334 | 66 | | 66 | 6619 | 1197 | 40 | | 1 |
| 924 | 50 | | 50 | 10 | | 10 | 6669 | 1207 | | | |
| 925 | 47 | | 47 | 25 | | 25 | 6716 | 1232 | | | |
| 926 | 5 | | 5 | 1 | | 1 | 6721 | 1233 | | | |

Table 24 (cont.)

| | Catch | | | Effort | | | Cumulative | | Spawning Group | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | PS-Day | Supp - B | Total | PS-Day | Supp - B | Total | Catch | Effort | Fall | Spring | Samp |
| 927 | 6 | | 6 | 1 | | 1 | 6727 | 1234 | | | |
| 928 | | | 0 | | | 0 | 6727 | 1234 | | | |
| 929 | 156 | | 156 | 24 | | 24 | 6883 | 1258 | | | |
| 930 | 26 | 295 | 321 | 15 | 17 | 32 | 7204 | 1290 | 42 | | 1 |
| 1008 | | | 0 | | | 0 | 7204 | 1290 | | | |
| 1009 | 0 | | 0 | | | 0 | 7204 | 1290 | | | |
| Total | 6097 | 1107 | 7204 | 1237 | 53 | 1290 | | | 395 | 2 | 11 |

Table 25. Cumulative catch(t) and effort (trips) and sampling dates for fall 4T purse seine fishery.

| Date | Catch | Effort | Cumulative Catch | Cumulative Effort | Spawning Group Fall | Spawning Group Spring | Samples | NAFO Area |
|---|---|---|---|---|---|---|---|---|
| 901 | 83 | 4 | 83 | 4 | 24 | 7 | 1 | 4TMN |
| 902 | 288 | 5 | 371 | 9 | | | | |
| 903 | 198 | 5 | 569 | 14 | 27 | 6 | 1 | 4TMN |
| 904 | 227 | 4 | 796 | 18 | 25 | 15 | 1 | 4TMN |
| 905 | 162 | 4 | 958 | 22 | | | | |
| 906 | 66 | 1 | 1025 | 23 | | | | |
| 907 | 163 | 5 | 1188 | 28 | | | | |
| 910 | 188 | 4 | 1376 | 32 | 25 | 11 | 1 | 4TMN |
| 911 | 148 | 4 | 1524 | 36 | | | | |
| 913 | 202 | 4 | 1726 | 40 | | | | |
| 914 | 513 | 5 | 2239 | 45 | | | | |
| 915 | 204 | 3 | 2443 | 48 | 31 | 1 | 1 | 4TL |
| 916 | 108 | 2 | 2551 | 50 | | | | |
| 918 | 50 | 2 | 2601 | 52 | | | | |
| 919 | 4 | 1 | 2605 | 53 | | | | |
| 920 | 4 | 1 | 2608 | 54 | | | | |
| 921 | 94 | 4 | 2703 | 58 | | | | |
| 924 | 23 | 1 | 2726 | 59 | | | | |
| 926 | 138 | 5 | 2864 | 64 | 19 | 13 | 1 | 4TO |
| 927 | 18 | 2 | 2883 | 66 | | | | |
| 929 | 50 | 4 | 2932 | 70 | 23 | 16 | 1 | 4TMN |
| 1001 | 24 | 2 | 2957 | 72 | | | | |
| 1005 | 84 | 3 | 3041 | 75 | | | | |
| 1007 | 194 | 4 | 3235 | 79 | 63 | 19 | 2 | 4TMN |
| 1008 | 13 | 1 | 3248 | 80 | | | | |
| 1009 | 3 | 1 | 3251 | 81 | 39 | 9 | 1 | 4TMN |
| 1011 | 35 | 1 | 3286 | 82 | | | | |
| 1013 | 164 | 5 | 3449 | 87 | | | | |
| 1014 | 462 | 4 | 3911 | 91 | 27 | 11 | 1 | 4TMN |
| 1015 | 98 | 4 | 4009 | 95 | 24 | 10 | 1 | 4TMN |
| Total 4T | 4008 | 95 | | | 327 | 118 | 12 | |
| 1118 | 52 | 2 | 52 | 2 | 29 | 6 | 1 | 4Vn |

Table 26. Catch-at-age for 4T fall spawning herring, including those caught in 4Vn. Numbers are in thousands of fish.

## Fixed Gear

| AGE | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 904 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 82 | 8 | 64 | 322 | 0 | 0 | 0 | 0 | 253 | 15 | 0 | 0 | 19 | 0 | 52 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 3592 | 474 | 7965 | 5753 | 2154 | 720 | 963 | 1117 | 1627 | 8010 | 1165 | 294 | 3706 | 158 | 325 | 78 | 0 | 53 | 9 | 947 | 72 |
| 4 | 5548 | 9986 | 5224 | 24124 | 14985 | 20231 | 24882 | 8816 | 32871 | 38205 | 20432 | 14113 | 22572 | 39459 | 12879 | 2440 | 9158 | 3483 | 19846 | 17675 | 23133 |
| 5 | 3484 | 5132 | 6097 | 6313 | 16883 | 9570 | 13445 | 24441 | 16497 | 30249 | 41943 | 22056 | 19815 | 10235 | 54288 | 29704 | 12264 | 38155 | 19745 | 64160 | 32658 |
| 6 | 816 | 2924 | 994 | 2477 | 4922 | 13180 | 8306 | 14860 | 34428 | 20712 | 20253 | 29673 | 28214 | 7309 | 12201 | 36482 | 48412 | 14500 | 45273 | 13050 | 46943 |
| 7 | 745 | 865 | 1733 | 1027 | 2523 | 2168 | 5978 | 9498 | 19251 | 36337 | 13240 | 14057 | 54225 | 10784 | 7345 | 6034 | 69790 | 47315 | 10111 | 20135 | 11486 |
| 8 | 3911 | 1065 | 373 | 597 | 1050 | 1632 | 1335 | 4495 | 8212 | 15518 | 14266 | 7133 | 17002 | 13296 | 8943 | 3168 | 12224 | 42105 | 23761 | 3792 | 16607 |
| 9 | 117 | 879 | 232 | 258 | 371 | 486 | 456 | 1212 | 4666 | 9382 | 6953 | 9021 | 9163 | 4840 | 9347 | 3661 | 9658 | 7986 | 24446 | 6895 | 3092 |
| 10 | 157 | 278 | 304 | 239 | 117 | 124 | 200 | 727 | 341 | 4563 | 2738 | 3324 | 9958 | 2409 | 4554 | 1949 | 9640 | 5643 | 5291 | 6374 | 5927 |
| 11+ | 1903 | 545 | 96 | 102 | 62 | 160 | 91 | 159 | 692 | 1878 | 1623 | 2593 | 5404 | 4538 | 6705 | 2785 | 14115 | 14055 | 11126 | 3725 | 8681 |
| | 20355 | 23060 | 23082 | 41212 | 43067 | 48271 | 55656 | 65325 | 118838 | 164869 | 122613 | 102264 | 170079 | 93028 | 116639 | 86301 | 185262 | 173295 | 159607 | 136753 | 148599 |

## Purse Seine

| AGE | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 240 | 140 | 0 | 0 | 0 | 0 | 0 | 5 | 20 | 77 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 1464 | 8555 | 2970 | 455 | 2088 | 1479 | 1031 | 1080 | 761 | 863 | 4283 | 752 | 43 | 0 | 61 | 47 | 15 | 14 | 311 | 222 | 44 |
| 3 | 22001 | 15905 | 39638 | 5059 | 8169 | 7995 | 3883 | 4024 | 3507 | 2526 | 3483 | 1399 | 4123 | 6448 | 565 | 2066 | 310 | 2977 | 2670 | 4693 | 1488 |
| 4 | 29044 | 21322 | 17650 | 11260 | 5597 | 8339 | 6727 | 8223 | 7400 | 5754 | 4028 | 4592 | 5475 | 22717 | 5682 | 2810 | 9164 | 4524 | 13885 | 6617 | 2784 |
| 5 | 24187 | 16923 | 12979 | 1315 | 3891 | 4192 | 5704 | 8085 | 8729 | 4032 | 6081 | 6959 | 7433 | 6142 | 15818 | 6033 | 3398 | 26780 | 5129 | 10307 | 4603 |
| 6 | 4902 | 16786 | 7906 | 699 | 681 | 1629 | 2387 | 5824 | 8079 | 9035 | 5667 | 7497 | 3402 | 1939 | 4258 | 10570 | 7957 | 8576 | 11130 | 2691 | 4398 |
| 7 | 4947 | 4734 | 8118 | 317 | 268 | 400 | 941 | 2540 | 8102 | 8593 | 9403 | 4483 | 5003 | 1947 | 2909 | 3667 | 11043 | 9877 | 4413 | 6893 | 750 |
| 8 | 10893 | 3702 | 6168 | 297 | 135 | 95 | 163 | 1826 | 3828 | 6883 | 8227 | 7390 | 2404 | 1964 | 1753 | 2738 | 2485 | 10657 | 3108 | 1202 | 2415 |
| 9 | 1898 | 5277 | 4233 | 503 | 149 | 108 | 91 | 731 | 1352 | 2326 | 4500 | 4737 | 4434 | 1788 | 1724 | 2002 | 1433 | 1924 | 2091 | 1917 | 274 |
| 10 | 1017 | 1249 | 2259 | 116 | 38 | 30 | 14 | 449 | 510 | 364 | 1417 | 2407 | 3534 | 995 | 1708 | 3571 | 1389 | 1415 | 1083 | 1185 | 937 |
| 11+ | 11937 | 10464 | 1389 | 64 | 178 | 57 | 20 | 420 | 217 | 82 | 2441 | 1658 | 3330 | 2235 | 5417 | 5739 | 2951 | 2335 | 843 | 1012 | 903 |
| | 112290 | 105157 | 103450 | 20085 | 21194 | 24324 | 20961 | 33202 | 42490 | 40478 | 49607 | 41874 | 39181 | 46175 | 39895 | 39243 | 40145 | 69077 | 44664 | 36741 | 18597 |

## All Gears

| AGE | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 1144 | 143 | 0 | 0 | 0 | 0 | 0 | 5 | 20 | 77 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 1546 | 8563 | 3085 | 777 | 2088 | 1478 | 1031 | 1080 | 1014 | 879 | 4283 | 752 | 63 | 0 | 113 | 48 | 15 | 14 | 311 | 222 | 44 |
| 3 | 25594 | 16379 | 48009 | 10813 | 10324 | 8715 | 4847 | 5141 | 5134 | 10536 | 4649 | 1693 | 7830 | 6605 | 890 | 2145 | 309 | 3030 | 2679 | 5867 | 1560 |
| 4 | 34592 | 31309 | 23000 | 35384 | 20582 | 28585 | 31610 | 17039 | 40271 | 43959 | 24460 | 18705 | 28047 | 62176 | 18561 | 5251 | 18322 | 8007 | 33730 | 24610 | 25918 |
| 5 | 27672 | 22055 | 19127 | 7629 | 20775 | 13764 | 19149 | 32527 | 25225 | 34280 | 48025 | 29015 | 27248 | 16378 | 70106 | 35736 | 15662 | 64935 | 24874 | 75358 | 37260 |
| 6 | 5718 | 19709 | 8926 | 3175 | 5603 | 14811 | 10693 | 20685 | 42507 | 29747 | 25921 | 37170 | 31616 | 9248 | 16459 | 47052 | 56369 | 23076 | 56404 | 15781 | 51341 |
| 7 | 5692 | 5598 | 9984 | 1344 | 2792 | 2568 | 6919 | 12037 | 27353 | 44930 | 22644 | 18540 | 59229 | 12730 | 10254 | 9698 | 80833 | 57192 | 14524 | 27143 | 12236 |
| 8 | 14803 | 4766 | 6656 | 894 | 1186 | 1727 | 1498 | 6321 | 12040 | 22400 | 22494 | 14523 | 19406 | 15260 | 10696 | 5906 | 14710 | 52762 | 26869 | 5004 | 19023 |
| 9 | 2015 | 6156 | 4524 | 762 | 520 | 594 | 547 | 1943 | 6017 | 11708 | 11454 | 13758 | 13597 | 6627 | 11071 | 5663 | 11091 | 9910 | 26538 | 8874 | 3366 |
| 10 | 1174 | 1527 | 2595 | 355 | 155 | 154 | 214 | 1175 | 852 | 4926 | 4155 | 5731 | 13492 | 3404 | 6262 | 5519 | 11029 | 7058 | 6374 | 7597 | 6865 |
| 11+ | 13840 | 10409 | 1499 | 167 | 241 | 217 | 111 | 579 | 909 | 1960 | 4063 | 4251 | 8734 | 6773 | 12122 | 8524 | 17067 | 16390 | 11969 | 4769 | 9584 |
| | 132646 | 127615 | 127548 | 61300 | 64266 | 72613 | 76619 | 98527 | 161327 | 205345 | 172225 | 144138 | 209261 | 139202 | 156534 | 125542 | 225408 | 242374 | 204272 | 175225 | 167196 |

Table 27. Weight-at-age (kg) for 4T fall spawners including those caught in 4Vn.

## Fixed Gear

| AGE | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0000 | 0.0231 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 2 | 0.0787 | 0.1066 | 0.2115 | 0.1288 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.1793 | 0.1328 | 0.0000 | 0.0000 | 0.2675 | 0.0000 | 0.0658 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 3 | 0.1344 | 0.2015 | 0.2068 | 0.2048 | 0.2220 | 0.1908 | 0.2362 | 0.2573 | 0.1958 | 0.2347 | 0.2309 | 0.2260 | 0.2102 | 0.1959 | 0.1421 | 0.1596 | 0.0000 | 0.1247 | 0.0000 | 0.1711 | 0.1594 |
| 4 | 0.2371 | 0.2554 | 0.2577 | 0.2468 | 0.2660 | 0.2519 | 0.2484 | 0.2541 | 0.2485 | 0.2470 | 0.2645 | 0.2602 | 0.2499 | 0.2339 | 0.2202 | 0.2127 | 0.2085 | 0.2023 | 0.2208 | 0.2060 | 0.2121 |
| 5 | 0.2822 | 0.2934 | 0.3118 | 0.3101 | 0.3006 | 0.2853 | 0.2863 | 0.2917 | 0.2896 | 0.2789 | 0.2902 | 0.2955 | 0.2855 | 0.2675 | 0.2551 | 0.2349 | 0.2339 | 0.2296 | 0.2455 | 0.2347 | 0.2326 |
| 6 | 0.3074 | 0.3201 | 0.3587 | 0.3679 | 0.3370 | 0.3169 | 0.3219 | 0.3352 | 0.3248 | 0.3164 | 0.3252 | 0.3255 | 0.3248 | 0.3025 | 0.2818 | 0.2599 | 0.2583 | 0.2500 | 0.2574 | 0.2619 | 0.2587 |
| 7 | 0.3191 | 0.3553 | 0.3490 | 0.3950 | 0.3739 | 0.3493 | 0.3480 | 0.3611 | 0.3672 | 0.3434 | 0.3538 | 0.3532 | 0.3478 | 0.3360 | 0.3054 | 0.2822 | 0.2867 | 0.2799 | 0.2828 | 0.2766 | 0.2840 |
| 8 | 0.3687 | 0.3982 | 0.3672 | 0.4200 | 0.3825 | 0.3652 | 0.3974 | 0.3742 | 0.3848 | 0.3673 | 0.3794 | 0.3731 | 0.3684 | 0.3545 | 0.3423 | 0.3300 | 0.3150 | 0.2988 | 0.3055 | 0.3114 | 0.2951 |
| 9 | 0.3711 | 0.4171 | 0.4020 | 0.4585 | 0.3927 | 0.3724 | 0.4128 | 0.4102 | 0.4013 | 0.3818 | 0.4073 | 0.3847 | 0.3878 | 0.3732 | 0.3491 | 0.3520 | 0.3426 | 0.3335 | 0.3255 | 0.3289 | 0.3261 |
| 10 | 0.3479 | 0.4274 | 0.4354 | 0.4717 | 0.3700 | 0.4495 | 0.3794 | 0.4055 | 0.4315 | 0.3855 | 0.4095 | 0.4062 | 0.4038 | 0.3917 | 0.3640 | 0.3497 | 0.3589 | 0.3634 | 0.3628 | 0.3442 | 0.3443 |
| 11+ | 0.4324 | 0.4366 | 0.4310 | 0.5211 | 0.4674 | 0.4295 | 0.4896 | 0.4969 | 0.4337 | 0.4257 | 0.4381 | 0.4065 | 0.4319 | 0.4114 | 0.3987 | 0.3826 | 0.3837 | 0.3798 | 0.3954 | 0.3962 | 0.3660 |
| | 0.2770 | 0.2847 | 0.2718 | 0.2665 | 0.2963 | 0.2859 | 0.2848 | 0.3157 | 0.3117 | 0.3071 | 0.3196 | 0.3268 | 0.3309 | 0.2920 | 0.2835 | 0.2639 | 0.2878 | 0.2826 | 0.2837 | 0.2557 | 0.2628 |

## Mobile Gear

| AGE | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0000 | 0.0692 | 0.0308 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0378 | 0.0389 | 0.0690 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 2 | 0.1023 | 0.1107 | 0.1089 | 0.0861 | 0.1154 | 0.1381 | 0.1253 | 0.1116 | 0.0925 | 0.0787 | 0.0959 | 0.1054 | 0.1081 | 0.0000 | 0.0661 | 0.0522 | 0.0912 | 0.0854 | 0.0965 | 0.0818 | 0.0729 |
| 3 | 0.1501 | 0.1554 | 0.1426 | 0.1801 | 0.1802 | 0.1831 | 0.1960 | 0.1948 | 0.1509 | 0.1658 | 0.1636 | 0.1608 | 0.1765 | 0.1509 | 0.1279 | 0.1413 | 0.1372 | 0.1202 | 0.1514 | 0.1439 | 0.1248 |
| 4 | 0.2202 | 0.1865 | 0.1777 | 0.2155 | 0.2248 | 0.2211 | 0.2299 | 0.2299 | 0.1930 | 0.2021 | 0.2205 | 0.2134 | 0.2062 | 0.1898 | 0.1738 | 0.1631 | 0.1624 | 0.1659 | 0.1680 | 0.1703 | 0.1662 |
| 5 | 0.2574 | 0.2209 | 0.2317 | 0.2662 | 0.2594 | 0.2483 | 0.2508 | 0.2607 | 0.2428 | 0.2483 | 0.2489 | 0.2469 | 0.2375 | 0.2199 | 0.2112 | 0.1949 | 0.1793 | 0.1778 | 0.1853 | 0.1930 | 0.1801 |
| 6 | 0.2848 | 0.2517 | 0.2459 | 0.3106 | 0.2883 | 0.2888 | 0.2704 | 0.2854 | 0.2728 | 0.2862 | 0.2862 | 0.2803 | 0.2811 | 0.2503 | 0.2307 | 0.2149 | 0.2131 | 0.1992 | 0.2240 | 0.2230 | 0.2192 |
| 7 | 0.3009 | 0.2648 | 0.2723 | 0.3410 | 0.3454 | 0.3214 | 0.3097 | 0.3169 | 0.2868 | 0.3082 | 0.3304 | 0.2942 | 0.2959 | 0.2715 | 0.2537 | 0.2327 | 0.2295 | 0.2194 | 0.2288 | 0.2383 | 0.2432 |
| 8 | 0.3408 | 0.2965 | 0.2658 | 0.3758 | 0.3568 | 0.3637 | 0.3406 | 0.3375 | 0.3150 | 0.3317 | 0.3236 | 0.3083 | 0.3244 | 0.3015 | 0.2803 | 0.2366 | 0.2416 | 0.2368 | 0.2567 | 0.2497 | 0.2404 |
| 9 | 0.3476 | 0.3440 | 0.3038 | 0.3325 | 0.3356 | 0.3954 | 0.3631 | 0.3761 | 0.3419 | 0.3425 | 0.3764 | 0.3307 | 0.3290 | 0.3041 | 0.2905 | 0.2870 | 0.2800 | 0.2687 | 0.2744 | 0.2723 | 0.3037 |
| 10 | 0.3430 | 0.3343 | 0.3231 | 0.2620 | 0.4223 | 0.2639 | 0.3278 | 0.4055 | 0.3276 | 0.3887 | 0.3975 | 0.3597 | 0.3401 | 0.3188 | 0.2928 | 0.2750 | 0.2889 | 0.2990 | 0.2714 | 0.3024 | 0.2906 |
| 11+ | 0.3919 | 0.3823 | 0.3857 | 0.2624 | 0.4364 | 0.4322 | 0.4086 | 0.4348 | 0.4110 | 0.4306 | 0.4095 | 0.3774 | 0.3529 | 0.3543 | 0.3326 | 0.3139 | 0.3223 | 0.3350 | 0.3052 | 0.3229 | 0.3686 |
| | 0.2525 | 0.2278 | 0.1979 | 0.2180 | 0.2105 | 0.2163 | 0.2341 | 0.2598 | 0.2495 | 0.2753 | 0.2829 | 0.2808 | 0.2726 | 0.2143 | 0.2361 | 0.2308 | 0.2173 | 0.2026 | 0.1947 | 0.2066 | 0.2095 |

## All Gears

| AGE | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0000 | 0.0328 | 0.0308 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0378 | 0.0389 | 0.0690 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 2 | 0.1011 | 0.1107 | 0.1110 | 0.1038 | 0.1154 | 0.1381 | 0.1253 | 0.1116 | 0.1142 | 0.0797 | 0.0959 | 0.1054 | 0.1576 | 0.0000 | 0.0661 | 0.0522 | 0.0912 | 0.0854 | 0.0965 | 0.0818 | 0.0729 |
| 3 | 0.1479 | 0.1567 | 0.1536 | 0.1932 | 0.1889 | 0.1837 | 0.2040 | 0.2083 | 0.1651 | 0.2182 | 0.1805 | 0.1719 | 0.1925 | 0.1520 | 0.1385 | 0.1419 | 0.1373 | 0.1202 | 0.1509 | 0.1480 | 0.1264 |
| 4 | 0.2229 | 0.2084 | 0.1962 | 0.2369 | 0.2548 | 0.2429 | 0.2445 | 0.2424 | 0.2383 | 0.2411 | 0.2572 | 0.2484 | 0.2414 | 0.2178 | 0.2077 | 0.1862 | 0.1854 | 0.1817 | 0.1991 | 0.1957 | 0.2072 |
| 5 | 0.2605 | 0.2378 | 0.2574 | 0.3024 | 0.2930 | 0.2740 | 0.2758 | 0.2839 | 0.2734 | 0.2753 | 0.2850 | 0.2837 | 0.2724 | 0.2496 | 0.2455 | 0.2281 | 0.2221 | 0.2083 | 0.2331 | 0.2288 | 0.2261 |
| 6 | 0.2880 | 0.2619 | 0.2586 | 0.3553 | 0.3311 | 0.3138 | 0.3104 | 0.3212 | 0.3149 | 0.3072 | 0.3167 | 0.3162 | 0.3201 | 0.2916 | 0.2689 | 0.2498 | 0.2519 | 0.2311 | 0.2508 | 0.2551 | 0.2553 |
| 7 | 0.3033 | 0.2787 | 0.2855 | 0.3823 | 0.3711 | 0.3449 | 0.3428 | 0.3518 | 0.3433 | 0.3367 | 0.3441 | 0.3388 | 0.3434 | 0.3261 | 0.2908 | 0.2635 | 0.2789 | 0.2694 | 0.2664 | 0.2666 | 0.2815 |
| 8 | 0.3482 | 0.3192 | 0.2712 | 0.4052 | 0.3796 | 0.3651 | 0.3912 | 0.3636 | 0.3626 | 0.3564 | 0.3590 | 0.3399 | 0.3629 | 0.3477 | 0.3321 | 0.2867 | 0.3026 | 0.2863 | 0.2998 | 0.2965 | 0.2882 |
| 9 | 0.3490 | 0.3544 | 0.3082 | 0.3750 | 0.3763 | 0.3766 | 0.4045 | 0.3974 | 0.3880 | 0.3740 | 0.3952 | 0.3659 | 0.3686 | 0.3546 | 0.3400 | 0.3290 | 0.3345 | 0.3209 | 0.3215 | 0.3163 | 0.3243 |
| 10 | 0.3436 | 0.3512 | 0.3356 | 0.4032 | 0.3827 | 0.4137 | 0.3762 | 0.4055 | 0.3693 | 0.3858 | 0.4053 | 0.3865 | 0.3871 | 0.3704 | 0.3446 | 0.3014 | 0.3501 | 0.3505 | 0.3473 | 0.3374 | 0.3370 |
| 11+ | 0.3976 | 0.3839 | 0.3882 | 0.4208 | 0.4444 | 0.4302 | 0.4747 | 0.4518 | 0.4282 | 0.4259 | 0.4209 | 0.3949 | 0.4018 | 0.3926 | 0.3692 | 0.3364 | 0.3731 | 0.3734 | 0.3890 | 0.3807 | 0.3663 |
| | 0.2563 | 0.2373 | 0.2114 | 0.2506 | 0.2680 | 0.2625 | 0.2709 | 0.2968 | 0.2953 | 0.3008 | 0.3091 | 0.3132 | 0.3200 | 0.2662 | 0.2724 | 0.2536 | 0.2753 | 0.2598 | 0.2642 | 0.2449 | 0.2569 |

Table 28. Catch-at-age and weight-at-age (kg) for 4T fall spawners caught in 4Vn. Numbers are in thousands of fish.

**Mobile Gear**

| AGE | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 20 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 42 | 5827 | 628 | 377 | 1888 | 1352 | 997 | 827 | 604 | 816 | 441 | 26 | 0 | 0 | 0 | 25 | 15 | 14 | 237 | 166 | 0 |
| 3 | 563 | 2622 | 2865 | 541 | 3147 | 4652 | 3551 | 1987 | 2533 | 1613 | 833 | 559 | 697 | 2105 | 20 | 159 | 280 | 137 | 1335 | 3648 | 23 |
| 4 | 1601 | 656 | 2602 | 6800 | 3103 | 3651 | 4271 | 3920 | 5162 | 4138 | 1103 | 1408 | 2264 | 5406 | 1096 | 456 | 1964 | 551 | 7966 | 3134 | 154 |
| 5 | 1092 | 167 | 888 | 693 | 1428 | 2114 | 2790 | 2982 | 2394 | 1413 | 3328 | 1130 | 1524 | 2547 | 3273 | 1814 | 722 | 4374 | 2560 | 6276 | 74 |
| 6 | 842 | 100 | 655 | 591 | 359 | 584 | 775 | 927 | 1375 | 735 | 2394 | 2443 | 413 | 750 | 1427 | 4357 | 2426 | 1266 | 3309 | 957 | 23 |
| 7 | 628 | 324 | 663 | 0 | 158 | 218 | 377 | 590 | 1770 | 1040 | 575 | 460 | 2716 | 856 | 1474 | 1687 | 3193 | 3844 | 1657 | 1560 | 8 |
| 8 | 366 | 0 | 636 | 206 | 40 | 50 | 66 | 66 | 967 | 620 | 734 | 684 | 642 | 1266 | 990 | 1473 | 984 | 3294 | 1176 | 561 | 0 |
| 9 | 449 | 0 | 905 | 236 | 47 | 83 | 58 | 130 | 245 | 165 | 346 | 429 | 857 | 1309 | 1379 | 1594 | 695 | 967 | 887 | 843 | 0 |
| 10 | 280 | 0 | 638 | 0 | 0 | 0 | 0 | 0 | 75 | 75 | 183 | 123 | 1686 | 539 | 983 | 1564 | 829 | 909 | 579 | 519 | 0 |
| 11+ | 156 | 0 | 493 | 0 | 57 | 38 | 19 | 48 | 7 | 22 | 79 | 292 | 3033 | 1699 | 4317 | 2587 | 1689 | 1732 | 589 | 635 | 0 |
| | 6019 | 9696 | 10973 | 9444 | 10227 | 12742 | 12904 | 11477 | 15137 | 10657 | 10028 | 7554 | 13832 | 16477 | 14959 | 15716 | 12797 | 17088 | 20295 | 18299 | 281 |

**Mobile Gear**

| AGE | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0380 | 0.0390 | 0.0350 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 2 | 0.1930 | 0.1070 | 0.1300 | 0.0800 | 0.1180 | 0.1410 | 0.1260 | 0.1140 | 0.0890 | 0.0750 | 0.0960 | 0.1200 | 0.0000 | 0.0000 | 0.0000 | 0.0280 | 0.0910 | 0.0850 | 0.0850 | 0.0860 | 0.0000 |
| 3 | 0.1830 | 0.1760 | 0.1650 | 0.1900 | 0.1950 | 0.1900 | 0.1990 | 0.2010 | 0.1480 | 0.1450 | 0.1590 | 0.1640 | 0.1730 | 0.1440 | 0.1320 | 0.1180 | 0.1390 | 0.1280 | 0.1220 | 0.1430 | 0.1285 |
| 4 | 0.2470 | 0.2260 | 0.2330 | 0.2090 | 0.2360 | 0.2380 | 0.2410 | 0.2470 | 0.1840 | 0.1860 | 0.2090 | 0.2080 | 0.2030 | 0.1920 | 0.1800 | 0.1530 | 0.1610 | 0.1610 | 0.1460 | 0.1688 | 0.1609 |
| 5 | 0.3040 | 0.2740 | 0.3040 | 0.2810 | 0.2570 | 0.2620 | 0.2660 | 0.2690 | 0.2200 | 0.2110 | 0.2400 | 0.2360 | 0.2240 | 0.2230 | 0.2090 | 0.1780 | 0.1800 | 0.1920 | 0.1650 | 0.1869 | 0.1872 |
| 6 | 0.3320 | 0.2980 | 0.3370 | 0.3150 | 0.2940 | 0.2960 | 0.2930 | 0.2980 | 0.2540 | 0.2540 | 0.2610 | 0.2740 | 0.2650 | 0.2480 | 0.2380 | 0.2040 | 0.2120 | 0.2130 | 0.1860 | 0.2197 | 0.2357 |
| 7 | 0.3560 | 0.3460 | 0.3660 | 0.0000 | 0.3250 | 0.3240 | 0.3190 | 0.3170 | 0.2600 | 0.2610 | 0.2940 | 0.2910 | 0.2920 | 0.2630 | 0.2470 | 0.2270 | 0.2300 | 0.2200 | 0.2060 | 0.2239 | 0.2401 |
| 8 | 0.3740 | 0.0000 | 0.3920 | 0.4280 | 0.3610 | 0.3600 | 0.3540 | 0.3510 | 0.2930 | 0.2970 | 0.3190 | 0.3100 | 0.3150 | 0.2970 | 0.2760 | 0.2460 | 0.2470 | 0.2490 | 0.2280 | 0.2472 | 0.0000 |
| 9 | 0.3880 | 0.0000 | 0.4000 | 0.4140 | 0.3960 | 0.4050 | 0.3590 | 0.3790 | 0.3280 | 0.3300 | 0.3330 | 0.3410 | 0.3360 | 0.3070 | 0.2860 | 0.2690 | 0.2820 | 0.2670 | 0.2380 | 0.2568 | 0.0000 |
| 10 | 0.3990 | 0.0000 | 0.4140 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.3200 | 0.3180 | 0.3520 | 0.3370 | 0.3420 | 0.3210 | 0.2850 | 0.2830 | 0.2990 | 0.2900 | 0.2630 | 0.2913 | 0.0000 |
| 11+ | 0.4290 | 0.0000 | 0.4350 | 0.0000 | 0.4210 | 0.4190 | 0.4080 | 0.4210 | 0.4460 | 0.3920 | 0.3700 | 0.3480 | 0.3470 | 0.3540 | 0.3300 | 0.3110 | 0.3240 | 0.3390 | 0.3220 | 0.3464 | 0.0000 |
| | 0.3050 | 0.1460 | 0.2720 | 0.2250 | 0.2100 | 0.2200 | 0.2330 | 0.2460 | 0.2050 | 0.1960 | 0.2430 | 0.2590 | 0.2850 | 0.2350 | 0.2640 | 0.2370 | 0.2320 | 0.2340 | 0.1750 | 0.1944 | 0.1734 |

Table 29. Catch-at-age for 4T spring spawners, including those caught in 4Vn. Numbers are in thousands of fish.

**Fixed Gear**

| AGE | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 425 | 0 | 14 | 10 | 0 | 0 | 0 | 0 | 0 | 59 | 0 | 0 | 0 | 53 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 14 | 198 | 169 | 394 | 162 | 248 | 84 | 330 | 10 | 271 | 501 | 0 | 104 | 65 | 619 | 6 | 0 | 0 | 0 | 1 | 0 |
| 3 | 5644 | 6922 | 10538 | 13093 | 23717 | 16174 | 4538 | 6009 | 3593 | 1684 | 4012 | 4093 | 2897 | 6293 | 2725 | 280 | 1817 | 331 | 320 | 155 | 1187 |
| 4 | 25469 | 3140 | 6746 | 8353 | 4509 | 25937 | 13994 | 15844 | 18110 | 8051 | 8626 | 16434 | 14297 | 12101 | 30568 | 6477 | 5278 | 12469 | 1511 | 5456 | 8735 |
| 5 | 1255 | 17307 | 2632 | 2688 | 1066 | 2097 | 8044 | 14353 | 12735 | 22119 | 11447 | 6223 | 10323 | 14809 | 11750 | 37705 | 26443 | 11120 | 46691 | 4213 | 16037 |
| 6 | 1831 | 641 | 8501 | 1818 | 493 | 460 | 376 | 5198 | 11482 | 11213 | 15722 | 6114 | 3415 | 9180 | 7680 | 17143 | 47296 | 16846 | 8154 | 37461 | 2303 |
| 7 | 1391 | 1242 | 1824 | 3363 | 323 | 102 | 58 | 1304 | 2932 | 8669 | 9255 | 7153 | 3074 | 3488 | 3497 | 6448 | 9030 | 24526 | 13512 | 7905 | 30757 |
| 8 | 259 | 274 | 942 | 486 | 337 | 0 | 49 | 696 | 444 | 3676 | 7012 | 4491 | 4865 | 3201 | 1745 | 2676 | 4437 | 4948 | 9769 | 5149 | 3563 |
| 9 | 447 | 136 | 851 | 454 | 123 | 0 | 4 | 61 | 32 | 516 | 1651 | 2635 | 2609 | 4764 | 1888 | 1954 | 1198 | 2003 | 3399 | 3789 | 2339 |
| 10 | 1375 | 302 | 462 | 195 | 91 | 0 | 5 | 0 | 130 | 331 | 89 | 901 | 1000 | 2261 | 1888 | 1614 | 1225 | 1029 | 989 | 1287 | 1982 |
| 11+ | 1496 | 1454 | 699 | 961 | 571 | 0 | 0 | 1 | 205 | 162 | 530 | 283 | 265 | 1138 | 1738 | 2023 | 1599 | 2088 | 1598 | 249 | 864 |
| Total | 39181 | 32041 | 33364 | 31819 | 31402 | 45018 | 27152 | 43796 | 49673 | 56692 | 58904 | 48327 | 42849 | 57300 | 64151 | 76326 | 98323 | 75359 | 85943 | 65666 | 67768 |

**Mobile Gear**

| AGE | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1479 | 12367 | 965 | 595 | 1525 | 302 | 522 | 826 | 167 | 73 | 2447 | 332 | 38 | 0 | 61 | 17 | 0 | 0 | 0 | 43 | 4 |
| 2 | 15379 | 14047 | 10852 | 4683 | 3790 | 4120 | 1850 | 1963 | 2362 | 409 | 4987 | 396 | 3463 | 1372 | 862 | 741 | 39 | 995 | 272 | 410 | 327 |
| 3 | 5909 | 16513 | 13124 | 3136 | 2821 | 5201 | 1989 | 2619 | 5218 | 1224 | 1515 | 1650 | 3521 | 4682 | 2742 | 597 | 3085 | 1235 | 3273 | 1516 | 737 |
| 4 | 16315 | 12113 | 12773 | 137 | 715 | 1519 | 1480 | 2090 | 5536 | 1966 | 1005 | 2100 | 2574 | 2481 | 4719 | 1968 | 2269 | 10147 | 2018 | 3505 | 1256 |
| 5 | 2673 | 12527 | 5335 | 443 | 372 | 462 | 815 | 998 | 3132 | 4683 | 1362 | 856 | 2079 | 1378 | 2328 | 3520 | 5807 | 4633 | 10131 | 956 | 862 |
| 6 | 4929 | 3627 | 6435 | 101 | 6 | 1 | 20 | 511 | 2634 | 3889 | 4768 | 2317 | 1165 | 771 | 1754 | 2620 | 8184 | 5268 | 3908 | 4739 | 377 |
| 7 | 5128 | 1772 | 3526 | 229 | 4 | 16 | 0 | 58 | 719 | 3148 | 2874 | 4075 | 715 | 674 | 374 | 1265 | 2015 | 7577 | 2695 | 345 | 1586 |
| 8 | 1303 | 1672 | 1783 | 389 | 19 | 36 | 15 | 0 | 495 | 1225 | 2411 | 1768 | 1925 | 1355 | 329 | 764 | 1886 | 1724 | 1837 | 891 | 549 |
| 9 | 1328 | 411 | 1280 | 1 | 67 | 0 | 0 | 113 | 194 | 0 | 1617 | 1413 | 1034 | 336 | 453 | 1283 | 641 | 504 | 297 | 713 | 552 |
| 10 | 1107 | 145 | 295 | 252 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 428 | 425 | 364 | 342 | 1360 | 326 | 932 | 562 | 200 | 473 |
| 11+ | 5628 | 1450 | 340 | 3 | 8 | 0 | 0 | 145 | 45 | 37 | 570 | 23 | 176 | 344 | 250 | 1621 | 811 | 1237 | 357 | 349 | 513 |
| Total | 61178 | 76644 | 56708 | 9969 | 9328 | 11657 | 6691 | 9323 | 20502 | 16654 | 23556 | 15358 | 17115 | 13757 | 14214 | 15756 | 25063 | 34252 | 25349 | 13668 | 7235 |

**All Gears**

| AGE | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1479 | 12792 | 965 | 609 | 1535 | 302 | 522 | 826 | 167 | 73 | 2506 | 332 | 38 | 0 | 114 | 17 | 0 | 0 | 0 | 43 | 4 |
| 2 | 15393 | 14245 | 11021 | 5077 | 3952 | 4368 | 1934 | 2293 | 2372 | 680 | 5488 | 396 | 3567 | 1437 | 1481 | 747 | 39 | 995 | 272 | 411 | 327 |
| 3 | 11553 | 23435 | 23662 | 16229 | 26538 | 21375 | 6527 | 8628 | 8811 | 2908 | 5527 | 5743 | 6418 | 10975 | 5467 | 877 | 4902 | 1566 | 3593 | 1671 | 1924 |
| 4 | 41784 | 15253 | 19519 | 8490 | 5224 | 27456 | 15474 | 17934 | 23646 | 10017 | 9631 | 18534 | 16871 | 14582 | 35287 | 8445 | 7547 | 22616 | 3529 | 8961 | 9991 |
| 5 | 3928 | 29834 | 7967 | 3131 | 1438 | 2559 | 8859 | 15351 | 15867 | 26802 | 12809 | 7079 | 12402 | 16187 | 14078 | 41225 | 32250 | 15753 | 56822 | 5169 | 16899 |
| 6 | 6760 | 4268 | 14936 | 1919 | 499 | 461 | 396 | 5709 | 14116 | 15102 | 20490 | 8431 | 4580 | 9951 | 9434 | 19763 | 55480 | 22114 | 12061 | 42201 | 2680 |
| 7 | 6519 | 3014 | 5350 | 3592 | 327 | 118 | 58 | 1362 | 3651 | 11817 | 12129 | 11228 | 3789 | 4162 | 3871 | 7713 | 11045 | 32102 | 16207 | 8250 | 32343 |
| 8 | 1562 | 1946 | 2725 | 875 | 356 | 36 | 64 | 696 | 939 | 4901 | 9423 | 6259 | 6790 | 4556 | 2074 | 3440 | 6323 | 6672 | 11606 | 6040 | 4112 |
| 9 | 1775 | 547 | 2131 | 455 | 190 | 0 | 4 | 174 | 226 | 516 | 3268 | 4048 | 3643 | 5100 | 2341 | 3237 | 1839 | 2507 | 3696 | 4503 | 2891 |
| 10 | 2482 | 447 | 757 | 447 | 92 | 0 | 5 | 0 | 130 | 331 | 89 | 1329 | 1425 | 2625 | 2230 | 2974 | 1551 | 1960 | 1551 | 1488 | 2455 |
| 11+ | 7124 | 2904 | 1039 | 964 | 579 | 0 | 0 | 146 | 250 | 199 | 1100 | 306 | 441 | 1482 | 1988 | 3644 | 2410 | 3325 | 1955 | 598 | 1377 |
| Total | 100359 | 108685 | 90072 | 41788 | 40730 | 56675 | 33843 | 53119 | 70175 | 73346 | 82460 | 63685 | 59964 | 71057 | 78365 | 92082 | 123386 | 109611 | 111292 | 79335 | 75003 |

Table 30. Weight-at-age (kg) for 4T spring spawners, including those caught in 4Vn.

## Fixed Gear

| AGE | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0000 | 0.0195 | 0.0000 | 0.1005 | 0.0366 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0379 | 0.0000 | 0.0000 | 0.0000 | 0.0501 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 2 | 0.1418 | 0.1608 | 0.1816 | 0.1397 | 0.1953 | 0.1721 | 0.0933 | 0.2132 | 0.1073 | 0.1513 | 0.0798 | 0.0000 | 0.1495 | 0.1483 | 0.1111 | 0.1240 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 3 | 0.1478 | 0.1698 | 0.1674 | 0.1834 | 0.1745 | 0.1554 | 0.1764 | 0.1836 | 0.1603 | 0.1880 | 0.1605 | 0.1658 | 0.1599 | 0.1452 | 0.1421 | 0.1405 | 0.1494 | 0.1242 | 0.1374 | 0.1376 | 0.1312 |
| 4 | 0.1888 | 0.2139 | 0.1861 | 0.2358 | 0.2105 | 0.2084 | 0.1957 | 0.2161 | 0.1959 | 0.1959 | 0.2031 | 0.2019 | 0.1957 | 0.1812 | 0.1710 | 0.1667 | 0.1546 | 0.1597 | 0.1728 | 0.1616 | 0.1598 |
| 5 | 0.2109 | 0.2291 | 0.2284 | 0.2848 | 0.2640 | 0.2423 | 0.2137 | 0.2456 | 0.2419 | 0.2175 | 0.2402 | 0.2315 | 0.2242 | 0.2182 | 0.2002 | 0.1864 | 0.1773 | 0.1830 | 0.1730 | 0.1799 | 0.1850 |
| 6 | 0.2562 | 0.2441 | 0.2691 | 0.3269 | 0.3171 | 0.2675 | 0.2683 | 0.2789 | 0.2561 | 0.2520 | 0.2662 | 0.2552 | 0.2584 | 0.2437 | 0.2309 | 0.2069 | 0.1985 | 0.2037 | 0.1892 | 0.1997 | 0.2054 |
| 7 | 0.3221 | 0.3046 | 0.3067 | 0.3362 | 0.3717 | 0.3269 | 0.3029 | 0.3499 | 0.3194 | 0.2705 | 0.2875 | 0.2807 | 0.2640 | 0.2576 | 0.2537 | 0.2395 | 0.2183 | 0.2200 | 0.2096 | 0.2119 | 0.2195 |
| 8 | 0.3076 | 0.3362 | 0.3319 | 0.3393 | 0.3794 | 0.0000 | 0.3843 | 0.3705 | 0.3392 | 0.2781 | 0.3038 | 0.2939 | 0.2885 | 0.2855 | 0.2601 | 0.2505 | 0.2567 | 0.2397 | 0.2330 | 0.2314 | 0.2384 |
| 9 | 0.3114 | 0.3430 | 0.3678 | 0.3787 | 0.4026 | 0.0000 | 0.4429 | 0.4001 | 0.3486 | 0.2959 | 0.3233 | 0.3124 | 0.3060 | 0.2992 | 0.2886 | 0.2747 | 0.2942 | 0.2768 | 0.2360 | 0.2464 | 0.2461 |
| 10 | 0.3308 | 0.3174 | 0.3630 | 0.3986 | 0.4060 | 0.0000 | 0.3713 | 0.0000 | 0.3159 | 0.2964 | 0.3754 | 0.3238 | 0.3072 | 0.3041 | 0.3015 | 0.2864 | 0.2944 | 0.2847 | 0.2818 | 0.2400 | 0.2580 |
| 11+ | 0.3671 | 0.3529 | 0.3731 | 0.4082 | 0.4460 | 0.0000 | 0.0000 | 0.4913 | 0.4181 | 0.3913 | 0.3367 | 0.2978 | 0.3306 | 0.3208 | 0.3198 | 0.2949 | 0.3212 | 0.3190 | 0.3037 | 0.2902 | 0.2718 |
| Total | 0.2054 | 0.2227 | 0.2264 | 0.2428 | 0.1957 | 0.1916 | 0.1991 | 0.2354 | 0.2289 | 0.2338 | 0.2531 | 0.2385 | 0.2306 | 0.2247 | 0.1999 | 0.2031 | 0.1983 | 0.2069 | 0.1931 | 0.1934 | 0.2053 |

## Mobile Gear

| AGE | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0787 | 0.0967 | 0.1070 | 0.1057 | 0.0995 | 0.1183 | 0.0991 | 0.0886 | 0.0650 | 0.0571 | 0.0810 | 0.0882 | 0.0789 | 0.0000 | 0.0511 | 0.0587 | 0.0000 | 0.0000 | 0.0704 | 0.0604 | 0.0756 |
| 2 | 0.1305 | 0.1520 | 0.1532 | 0.1794 | 0.1607 | 0.1635 | 0.1678 | 0.1632 | 0.1293 | 0.1518 | 0.1132 | 0.1716 | 0.1724 | 0.1417 | 0.1190 | 0.1157 | 0.1456 | 0.0889 | 0.1131 | 0.1151 | 0.1126 |
| 3 | 0.1817 | 0.1483 | 0.1618 | 0.2233 | 0.2186 | 0.1950 | 0.2183 | 0.2166 | 0.1678 | 0.1703 | 0.1740 | 0.2131 | 0.1990 | 0.1767 | 0.1471 | 0.1370 | 0.1513 | 0.1310 | 0.1595 | 0.1490 | 0.1504 |
| 4 | 0.2523 | 0.1774 | 0.2141 | 0.2389 | 0.2512 | 0.2290 | 0.2369 | 0.2415 | 0.2365 | 0.2541 | 0.2367 | 0.2516 | 0.2437 | 0.1969 | 0.1995 | 0.1749 | 0.1776 | 0.1764 | 0.1812 | 0.1921 | 0.1791 |
| 5 | 0.2556 | 0.2486 | 0.2470 | 0.3678 | 0.2885 | 0.2933 | 0.2742 | 0.2971 | 0.2816 | 0.2972 | 0.3044 | 0.2626 | 0.2789 | 0.2335 | 0.2439 | 0.1893 | 0.1955 | 0.1976 | 0.2174 | 0.2090 | 0.2241 |
| 6 | 0.2822 | 0.2513 | 0.2731 | 0.4102 | 0.3241 | 0.2731 | 0.3031 | 0.3112 | 0.3070 | 0.3282 | 0.3226 | 0.3126 | 0.2988 | 0.2528 | 0.2729 | 0.2242 | 0.2218 | 0.2254 | 0.2256 | 0.2431 | 0.2287 |
| 7 | 0.3026 | 0.2820 | 0.2633 | 0.3286 | 0.3796 | 0.2455 | 0.0000 | 0.2824 | 0.3241 | 0.3375 | 0.3588 | 0.3410 | 0.3365 | 0.2889 | 0.2805 | 0.2628 | 0.2640 | 0.2489 | 0.2356 | 0.2401 | 0.2570 |
| 8 | 0.3040 | 0.3122 | 0.2812 | 0.2846 | 0.3337 | 0.2375 | 0.3189 | 0.0000 | 0.3003 | 0.3671 | 0.3889 | 0.3496 | 0.3214 | 0.2909 | 0.3068 | 0.3308 | 0.2570 | 0.2701 | 0.2656 | 0.2780 | 0.2634 |
| 9 | 0.3139 | 0.3525 | 0.3377 | 0.3839 | 0.3221 | 0.0000 | 0.0000 | 0.5884 | 0.2910 | 0.0000 | 0.4024 | 0.3671 | 0.3435 | 0.3392 | 0.3332 | 0.3655 | 0.2988 | 0.2928 | 0.3153 | 0.3145 | 0.3071 |
| 10 | 0.3759 | 0.3115 | 0.3820 | 0.3251 | 0.4328 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.3829 | 0.3927 | 0.3412 | 0.3412 | 0.3082 | 0.3274 | 0.3329 | 0.3086 | 0.3257 | 0.3320 |
| 11+ | 0.3618 | 0.3917 | 0.3589 | 0.4081 | 0.4472 | 0.0000 | 0.0000 | 0.3466 | 0.3933 | 0.5328 | 0.4281 | 0.3838 | 0.3288 | 0.3509 | 0.3731 | 0.3254 | 0.3330 | 0.3073 | 0.3417 | 0.3641 | 0.4026 |
| Total | 0.2322 | 0.1792 | 0.2080 | 0.2116 | 0.1822 | 0.1904 | 0.2064 | 0.2203 | 0.2267 | 0.2987 | 0.2581 | 0.3012 | 0.2510 | 0.2162 | 0.2156 | 0.2391 | 0.2159 | 0.2141 | 0.2175 | 0.2235 | 0.2401 |

## All Gears

| AGE | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0787 | 0.0941 | 0.1070 | 0.1056 | 0.0991 | 0.1183 | 0.0991 | 0.0886 | 0.0650 | 0.0571 | 0.0800 | 0.0882 | 0.0789 | 0.0000 | 0.0506 | 0.0587 | 0.0000 | 0.0000 | 0.0704 | 0.0604 | 0.0756 |
| 2 | 0.1305 | 0.1521 | 0.1537 | 0.1763 | 0.1621 | 0.1640 | 0.1645 | 0.1704 | 0.1292 | 0.1516 | 0.1102 | 0.1716 | 0.1717 | 0.1420 | 0.1157 | 0.1158 | 0.1456 | 0.0889 | 0.1131 | 0.1148 | 0.1126 |
| 3 | 0.1651 | 0.1546 | 0.1643 | 0.1911 | 0.1792 | 0.1650 | 0.1891 | 0.1936 | 0.1647 | 0.1805 | 0.1642 | 0.1794 | 0.1814 | 0.1586 | 0.1447 | 0.1381 | 0.1506 | 0.1296 | 0.1575 | 0.1479 | 0.1385 |
| 4 | 0.2136 | 0.1849 | 0.2044 | 0.2359 | 0.2160 | 0.2096 | 0.1997 | 0.2190 | 0.2054 | 0.2073 | 0.2066 | 0.2075 | 0.2031 | 0.1839 | 0.1748 | 0.1686 | 0.1615 | 0.1672 | 0.1776 | 0.1735 | 0.1622 |
| 5 | 0.2414 | 0.2373 | 0.2409 | 0.2966 | 0.2703 | 0.2515 | 0.2193 | 0.2490 | 0.2497 | 0.2314 | 0.2470 | 0.2353 | 0.2334 | 0.2195 | 0.2075 | 0.1866 | 0.1805 | 0.1873 | 0.1809 | 0.1853 | 0.1870 |
| 6 | 0.2752 | 0.2502 | 0.2708 | 0.3313 | 0.3172 | 0.2675 | 0.2701 | 0.2818 | 0.2656 | 0.2716 | 0.2793 | 0.2710 | 0.2687 | 0.2444 | 0.2387 | 0.2092 | 0.2020 | 0.2089 | 0.2010 | 0.2046 | 0.2087 |
| 7 | 0.3068 | 0.2913 | 0.2781 | 0.3357 | 0.3718 | 0.3159 | 0.3029 | 0.3470 | 0.3203 | 0.2883 | 0.3044 | 0.3026 | 0.2777 | 0.2627 | 0.2563 | 0.2433 | 0.2267 | 0.2268 | 0.2140 | 0.2130 | 0.2214 |
| 8 | 0.3046 | 0.3156 | 0.2987 | 0.3150 | 0.3770 | 0.2375 | 0.3690 | 0.3705 | 0.3187 | 0.3003 | 0.3256 | 0.3096 | 0.2978 | 0.2871 | 0.2675 | 0.2684 | 0.2568 | 0.2476 | 0.2381 | 0.2382 | 0.2418 |
| 9 | 0.3132 | 0.3501 | 0.3497 | 0.3787 | 0.3742 | 0.0000 | 0.4429 | 0.5224 | 0.2992 | 0.2959 | 0.3624 | 0.3315 | 0.3167 | 0.3019 | 0.2972 | 0.3107 | 0.2958 | 0.2800 | 0.2424 | 0.2572 | 0.2577 |
| 10 | 0.3509 | 0.3155 | 0.3704 | 0.3572 | 0.4063 | 0.0000 | 0.3713 | 0.0000 | 0.3159 | 0.2964 | 0.3754 | 0.3428 | 0.3327 | 0.3093 | 0.3076 | 0.2964 | 0.3013 | 0.3076 | 0.2915 | 0.2516 | 0.2722 |
| 11+ | 0.3629 | 0.3723 | 0.3685 | 0.4082 | 0.4460 | 0.0000 | 0.0000 | 0.3476 | 0.4136 | 0.4176 | 0.3841 | 0.3043 | 0.3299 | 0.3278 | 0.3265 | 0.3085 | 0.3252 | 0.3146 | 0.3106 | 0.3333 | 0.3205 |
| Total | 0.2217 | 0.1920 | 0.2148 | 0.2354 | 0.1926 | 0.1914 | 0.2006 | 0.2328 | 0.2282 | 0.2485 | 0.2546 | 0.2536 | 0.2364 | 0.2231 | 0.2027 | 0.2093 | 0.2019 | 0.2091 | 0.1987 | 0.1986 | 0.2087 |

Table 31. Catch-at-age and weights-at-age (kg) for 4T spring spawners caught in 4Vn. Numbers are in thousands of fish.

**Mobile Gear – Numbers-at-age**

| AGE | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 58 | 5679 | 349 | 595 | 1525 | 302 | 522 | 615 | 117 | 73 | 0 | 0 | 8 | 0 | 0 | 16 | 0 | 0 | 0 | 20 | 0 |
| 2 | 809 | 5007 | 2614 | 2829 | 3074 | 3383 | 1759 | 953 | 929 | 226 | 214 | 0 | 218 | 167 | 28 | 43 | 35 | 36 | 72 | 61 | 6 |
| 3 | 978 | 383 | 901 | 1833 | 1994 | 1561 | 1702 | 1129 | 4064 | 827 | 132 | 105 | 552 | 108 | 11 | 27 | 474 | 13 | 551 | 88 | 0 |
| 4 | 358 | 0 | 143 | 0 | 667 | 526 | 636 | 636 | 1466 | 441 | 145 | 180 | 608 | 990 | 74 | 51 | 187 | 289 | 209 | 37 | 0 |
| 5 | 330 | 0 | 117 | 438 | 362 | 289 | 371 | 418 | 0 | 0 | 127 | 99 | 701 | 289 | 182 | 176 | 138 | 104 | 1442 | 19 | 0 |
| 6 | 455 | 298 | 277 | 0 | 0 | 0 | 0 | 0 | 265 | 64 | 0 | 219 | 333 | 134 | 573 | 265 | 208 | 113 | 932 | 156 | 0 |
| 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 59 | 0 | 218 | 381 | 0 | 150 | 183 | 141 | 79 | 10 | 9 |
| 8 | 114 | 0 | 43 | 0 | 0 | 0 | 0 | 0 | 413 | 67 | 29 | 109 | 35 | 1157 | 0 | 120 | 53 | 27 | 27 | 43 | 0 |
| 9 | 14 | 0 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 47 | 186 | 0 | 0 | 83 | 4 | 96 | 116 | 0 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 99 | 186 | 0 | 0 | 0 | 8 | 4 | 31 | 0 |
| 11+ | 32 | 0 | 55 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 194 | 148 | 0 | 0 | 20 | 64 | 51 | 0 |
| Total | 3148 | 11367 | 4516 | 5695 | 7622 | 6061 | 4990 | 3751 | 7254 | 1698 | 706 | 712 | 2819 | 3792 | 1016 | 848 | 1361 | 755 | 3477 | 631 | 15 |

Mobile Gear – Weight-at-age

| AGE | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.071 | 0.097 | 0.110 | 0.106 | 0.100 | 0.118 | 0.099 | 0.090 | 0.056 | 0.057 | 0.000 | 0.000 | 0.079 | 0.000 | 0.000 | 0.059 | 0.000 | 0.000 | 0.070 | 0.0695 | 0.0000 |
| 2 | 0.174 | 0.154 | 0.156 | 0.182 | 0.166 | 0.168 | 0.169 | 0.168 | 0.121 | 0.121 | 0.123 | 0.000 | 0.157 | 0.094 | 0.140 | 0.099 | 0.151 | 0.108 | 0.103 | 0.0957 | 0.1192 |
| 3 | 0.228 | 0.181 | 0.215 | 0.230 | 0.221 | 0.220 | 0.224 | 0.234 | 0.156 | 0.158 | 0.181 | 0.145 | 0.217 | 0.113 | 0.179 | 0.163 | 0.149 | 0.126 | 0.136 | 0.1401 | 0.0000 |
| 4 | 0.290 | 0.000 | 0.275 | 0.000 | 0.252 | 0.254 | 0.257 | 0.263 | 0.192 | 0.188 | 0.198 | 0.177 | 0.242 | 0.181 | 0.207 | 0.222 | 0.195 | 0.177 | 0.183 | 0.1911 | 0.0000 |
| 5 | 0.323 | 0.000 | 0.314 | 0.369 | 0.289 | 0.301 | 0.300 | 0.313 | 0.000 | 0.000 | 0.242 | 0.213 | 0.279 | 0.228 | 0.243 | 0.233 | 0.187 | 0.199 | 0.221 | 0.1958 | 0.0000 |
| 6 | 0.370 | 0.364 | 0.383 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.228 | 0.228 | 0.000 | 0.274 | 0.280 | 0.245 | 0.294 | 0.269 | 0.220 | 0.218 | 0.228 | 0.2447 | 0.0000 |
| 7 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.287 | 0.000 | 0.319 | 0.265 | 0.000 | 0.296 | 0.296 | 0.241 | 0.265 | 0.2771 | 0.2892 |
| 8 | 0.363 | 0.000 | 0.387 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.293 | 0.294 | 0.390 | 0.279 | 0.279 | 0.282 | 0.000 | 0.342 | 0.254 | 0.239 | 0.324 | 0.2859 | 0.0000 |
| 9 | 0.480 | 0.000 | 0.483 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.360 | 0.335 | 0.000 | 0.000 | 0.296 | 0.321 | 0.310 | 0.3151 | 0.0000 |
| 10 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.341 | 0.335 | 0.000 | 0.000 | 0.000 | 0.317 | 0.314 | 0.3129 | 0.0000 |
| 11+ | 0.433 | 0.000 | 0.441 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.329 | 0.392 | 0.000 | 0.000 | 0.314 | 0.318 | 0.3621 | 0.0000 |
| Total | 0.257 | 0.132 | 0.193 | 0.204 | 0.180 | 0.193 | 0.201 | 0.207 | 0.167 | 0.165 | 0.195 | 0.223 | 0.256 | 0.243 | 0.287 | 0.258 | 0.203 | 0.202 | 0.211 | 0.2479 | 0.2249 |

Table 32. Agreement in aging between original and test ages.

| | Test Ages | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Original Age | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | Total |
| 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| 1 | 0 | 7 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| 2 | 0 | 0 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17 |
| 3 | 0 | 0 | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 |
| 4 | 0 | 0 | 0 | 1 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19 |
| 5 | 0 | 0 | 0 | 0 | 3 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 18 |
| 6 | 0 | 0 | 0 | 0 | 0 | 4 | 22 | 1 | 0 | 0 | 0 | 0 | 27 |
| 7 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 5 | 1 | 0 | 0 | 0 | 7 |
| 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 6 | 4 | 0 | 0 | 12 |
| 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 15 | 1 | 2 | 20 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 2 | 6 |
| 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 9 | 11 |
| Total | 10 | 7 | 18 | 12 | 21 | 19 | 23 | 8 | 9 | 23 | 3 | 13 | 166 |

Table 33. Results from mulitplicative model of spring spawners CUE for weeks 2-7.

Model: MODEL1
Dependent Variable: CPUE

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Prob>F |
|---|---|---|---|---|---|
| Model | 14 | 217.60873 | 15.54348 | 16.015 | 0.0001 |
| Error | 448 | 434.80055 | 0.97054 | | |
| C Total | 462 | 652.40928 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 0.98516 | R-square | 0.3335 |
| Dep Mean | 4.56211 | Adj R-sq | 0.3127 |
| C.V. | 21.59434 | | |

Parameter Estimates

| Variable | DF | Parameter Estimate | Standard Error | T for H0: Parameter=0 | Prob > \|T\| |
|---|---|---|---|---|---|
| INTERCEP | 1 | 5.617676 | 0.14718638 | 38.167 | 0.0001 |
| YY90 | 1 | -1.122700 | 0.24128287 | -4.653 | 0.0001 |
| YY91 | 1 | -0.483164 | 0.19060460 | -2.535 | 0.0116 |
| YY92 | 1 | -0.325548 | 0.18474613 | -1.762 | 0.0787 |
| YY93 | 1 | -0.225246 | 0.17653652 | -1.276 | 0.2026 |
| YY95 | 1 | -0.507799 | 0.18559129 | -2.736 | 0.0065 |
| YY96 | 1 | -0.738259 | 0.19194205 | -3.846 | 0.0001 |
| YY97 | 1 | -0.036149 | 0.15236260 | -0.237 | 0.8126 |
| YY98 | 1 | -0.239167 | 0.20660427 | -1.158 | 0.2476 |
| A2 | 1 | -1.126793 | 0.09254623 | -12.175 | 0.0001 |
| W2 | 1 | -0.876654 | 0.20007565 | -4.382 | 0.0001 |
| W3 | 1 | -0.185161 | 0.13067618 | -1.417 | 0.1572 |
| W5 | 1 | -0.258137 | 0.13416562 | -1.924 | 0.0550 |
| W6 | 1 | -0.268055 | 0.16120634 | -1.663 | 0.0971 |
| W7 | 1 | 0.491488 | 0.28918855 | 1.700 | 0.0899 |

Table 34. Catch by week (10-day period) as used in the multiplicative catch rate model for spring spawners using data from Escuminac and southeast New Brunswick. Figures in bold represent the week with the highest catch rates.

**Escuminac**

| | Week by Date and Number Code | | | | | | |
|---|---|---|---|---|---|---|---|
| | Ap20-29 | Ap 30-May 9 | May 10-19 | May 20-29 | May 30-June8 | June 9-19 | |
| Year | 2 | 3 | 4 | 5 | 6 | 7 | Grand Total |
| 90 | | **660** | 569 | | | | 1229 |
| 91 | | 1540 | **2732** | 478 | 7 | | 4757 |
| 92 | | 534 | **1980** | 1463 | 175 | | 4151 |
| 93 | | 368 | **1642** | 632 | 88 | | 2731 |
| 94 | 342 | 1111 | **2057** | 1119 | 816 | 1498 | **6943** |
| 95 | | 33 | **1733** | 1164 | 538 | | 3468 |
| 96 | 20 | 738 | **1195** | 202 | | | 2155 |
| 97 | 31 | 1459 | **1994** | 442 | 221 | 7 | 4153 |
| 98 | 307 | **3735** | 372 | | | | 4414 |
| Total | 700 | 10178 | **14274** | 5500 | 1845 | 1504 | |

**Southeast New Brunswick**

| | Week by Date and Number Code | | | | | | |
|---|---|---|---|---|---|---|---|
| | Ap20-29 | Ap 30-May 9 | May 10-19 | May 20-29 | May 30-June8 | June 9-19 | |
| Year | 2 | 3 | 4 | 5 | 6 | 7 | Grand Total |
| 90 | | **1504** | 244 | | | | 1747 |
| 91 | | 165 | **767** | 358 | 51 | | 1341 |
| 92 | | | 372 | **579** | 285 | 103 | 1339 |
| 93 | | **1066** | 951 | 544 | 239 | | 2801 |
| 94 | 1955 | **1994** | 774 | 178 | 111 | | **5012** |
| 95 | | | **1508** | 234 | | | 1741 |
| 96 | 285 | **1906** | 845 | 209 | | | 3245 |
| 97 | 27 | **2394** | 205 | 117 | 76 | 16 | 2835 |
| 98 | 147 | **1681** | 222 | | 18 | 121 | 2188 |
| Total | 2413 | **10710** | 5886 | 2219 | 780 | 240 | |

Table 35. CUE catch rate index by age for spring spawners, used in ADAPT-VPA population models. The purpose of the 0.4 designation in year indicates that the index relates to that proportion of the year.

| | Age | | | | | | |
|---|---|---|---|---|---|---|---|
| Year | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1990.4 | 205 | 148 | 49 | 44 | 70 | 37 | 14 |
| 1991.4 | 256 | 313 | 194 | 74 | 68 | 101 | 48 |
| 1992.4 | 758 | 291 | 190 | 87 | 43 | 47 | 47 |
| 1993.4 | 147 | 856 | 389 | 146 | 61 | 44 | 37 |
| 1994.4 | 120 | 601 | 1074 | 205 | 101 | 27 | 28 |
| 1995.4 | 213 | 190 | 287 | 418 | 84 | 34 | 18 |
| 1996.4 | 19 | 591 | 103 | 171 | 124 | 43 | 13 |
| 1997.4 | 175 | 135 | 1203 | 254 | 165 | 122 | 41 |
| 1998.4 | 217 | 398 | 57 | 763 | 88 | 58 | 49 |

Table 36. Results from multiplicative model for spring catch rates which includes an area by week interaction effect.

General Linear Models Procedure

Dependent Variable: CPUE

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 19 | 274.00603168 | 14.42137009 | 16.88 | 0.0001 |
| Error | 443 | 378.40324980 | 0.85418341 | | |
| Corrected Total | 462 | 652.40928148 | | | |

| R-Square | C.V. | Root MSE | CPUE Mean |
|---|---|---|---|
| 0.419991 | 20.25860 | 0.92422043 | 4.56211292 |

| Source | DF | Type I SS | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| YC | 8 | 42.74604932 | 5.34325617 | 6.26 | 0.0001 |
| AC | 1 | 147.54205406 | 147.54205406 | 172.73 | 0.0001 |
| WC | 5 | 27.32062589 | 5.46412518 | 6.40 | 0.0001 |
| AC*WC | 5 | 56.39730241 | 11.27946048 | 13.20 | 0.0001 |

| Source | DF | Type II SS | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| YC | 8 | 38.12373472 | 4.76546684 | 5.58 | 0.0001 |
| AC | 1 | 143.87428684 | 143.87428684 | 168.43 | 0.0001 |
| WC | 5 | 27.32062589 | 5.46412518 | 6.40 | 0.0001 |
| AC*WC | 5 | 56.39730241 | 11.27946048 | 13.20 | 0.0001 |

| Source | DF | Type III SS | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| YC | 8 | 38.12373472 | 4.76546684 | 5.58 | 0.0001 |
| AC | 1 | 72.21343991 | 72.21343991 | 84.54 | 0.0001 |
| WC | 5 | 30.09278493 | 6.01855699 | 7.05 | 0.0001 |
| AC*WC | 5 | 56.39730241 | 11.27946048 | 13.20 | 0.0001 |

| Source | DF | Type IV SS | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| YC | 8 | 38.12373472 | 4.76546684 | 5.58 | 0.0001 |
| AC | 1 | 72.21343991 | 72.21343991 | 84.54 | 0.0001 |
| WC | 5 | 30.09278493 | 6.01855699 | 7.05 | 0.0001 |
| AC*WC | 5 | 56.39730241 | 11.27946048 | 13.20 | 0.0001 |

Table 36. (cont.).

| Parameter | | Estimate | T for H0: Parameter=0 | Pr > \|T\| | Std Error of Estimate |
|---|---|---|---|---|---|
| INTERCEPT | | 5.882453556 B | 37.70 | 0.0001 | 0.15605096 |
| YC | 90 | -1.171982823 B | -5.16 | 0.0001 | 0.22732082 |
| | 91 | -0.481117413 B | -2.68 | 0.0077 | 0.17977060 |
| | 92 | -0.173332083 B | -0.98 | 0.3271 | 0.17669449 |
| | 93 | -0.199584769 B | -1.20 | 0.2313 | 0.16650991 |
| | 95 | -0.484869551 B | -2.76 | 0.0061 | 0.17591773 |
| | 96 | -0.733806039 B | -4.06 | 0.0001 | 0.18096116 |
| | 97 | -0.072850010 B | -0.50 | 0.6140 | 0.14433092 |

Dependent Variable: CPUE

| Parameter | | Estimate | T for H0: Parameter=0 | Pr > \|T\| | Std Error of Estimate |
|---|---|---|---|---|---|
| YC | 98 | -0.203852263 B | -1.01 | 0.3112 | 0.20105618 |
| | 940 | 0.000000000 B | . | . | . |
| AC | 2 | -1.675192201 B | -9.99 | 0.0001 | 0.16766329 |
| | 10 | 0.000000000 B | . | . | . |
| WC | 2 | -1.623831282 B | -5.95 | 0.0001 | 0.27269619 |
| | 3 | -0.929396932 B | -5.58 | 0.0001 | 0.16649786 |
| | 5 | -0.258194377 B | -1.49 | 0.1374 | 0.17350405 |
| | 6 | -0.422959185 B | -2.03 | 0.0432 | 0.20857695 |
| | 7 | 0.352314455 B | 0.87 | 0.3836 | 0.40398792 |
| | 40 | 0.000000000 B | . | . | . |
| AC*WC | 2 2 | 1.392261730 B | 3.90 | 0.0001 | 0.35736851 |
| | 2 3 | 1.569887842 B | 6.58 | 0.0001 | 0.23874507 |
| | 2 5 | -0.036997322 B | -0.15 | 0.8795 | 0.24383295 |
| | 2 6 | 0.261683637 B | 0.90 | 0.3710 | 0.29220086 |
| | 2 7 | 0.277641532 B | 0.51 | 0.6115 | 0.54627800 |
| | 2 40 | 0.000000000 B | . | . | . |
| | 10 2 | 0.000000000 B | . | . | . |
| | 10 3 | 0.000000000 B | . | . | . |
| | 10 5 | 0.000000000 B | . | . | . |
| | 10 6 | 0.000000000 B | . | . | . |
| | 10 7 | 0.000000000 B | . | . | . |
| | 10 40 | 0.000000000 B | . | . | . |

Table 37. Acoustic survey areas and dates and proportion of transects covered during night hours (PN). Transceiver for all years was Simrand EY200. A ball calibration was completed in all years except 1991. In 1991, the calibration from 1992 was used. From 1994 to 1998 all transects have been done during night hours (1900-0700). The strata surveyed in each area have not been consistent each year. To see which strata are surveyed each year, individual reports must be consulted.

| | 91 | | 92 | | 93 | | 94 | 95 | 96 | 97 | 98 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Area | Date | PN | Date | PN | Date | PN | | | | | |
| Chaleur-Miscou | Oct. 10-19 | 53 | Oct. 1-15 | 54 | Oct. 2-14 | 56 | Oct. 16-28 | Sep 30 – Oct. 8 | Sep 24 – Oct. 5 | Sep 21-28 | Sep 19-30 |
| Tracadie | | | | | | | | Sep 28-29 | Oct. 6-7 | Sep 28-29 | |
| North PEI | | | | | | | | | Oct. 8-10 | Oct. 2-4 | |
| Milne Bank | | | Oct. 16 | 63 | Oct. 15 | 40 | | Sep 23 | Oct. 10 | Oct. 4 | |
| NS – East PEI | | | | | | | | Sep 23-24 | Oct. 10-13 | | |
| Magdalen Is. | | | | | | | | | | Oct. 5-7 | |
| Cape Breton | Oct. 22-24 | 61 | Oct. 16-22 | 46 | Oct 15-20 | 53 | | Sep 25-27 | Oct 14-16 | Oct 9-11 | Oct 7-10 |
| Vessels | A. Needler | | E.E. Prince | | A. Needler | | F. Creed and J.L. Hart | F. Creed and Calanus II | F. Creed and Calanus II | F. Creed and Calanus II | F. Creed and Calanus II |
| Transducer mount | Towed body and cable | | Towed body and cable | | Towed body and cable | | Torpedo between hulls | Hull | Hull | Hull | Hull |
| Problems and changes | Towed body cable caught in bouey, spliced and repaired. Motherboard in EY200 replaced | | Prior to survey, motherboard in EY200 replaced | | Replacement of faulty power supply in EY200 | | | | | | Shorter transects Gaspe + G. Riv + NE, SE Misc + C. Breton. New smaller midwater trawl. |

Table 38. Biomass indices from major areas of acoustic survey for spring and fall spawners. See Table 37 for areas that were done each year.

| | Biomass Index (t) | | | | | | | | | Percentage in each area | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Area | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 |
| **Fall Spawners** | | | | | | | | | | | | | | | | | | |
| Chaleur-Miscou | 302765 | 27158 | 102836 | 74552 | 122008 | 43300 | 134003 | 107458 | 50684 | 70.9 | 86.1 | 70.5 | 86.6 | 100 | 87.4 | 70.4 | 65.7 | 54.3 |
| North P.E.I. | ns | ns | ns | ns | ns | ns | 35115 | 38912 | ns | ns | ns | ns | ns | ns | ns | 18.5 | 23.8 | ns |
| Cape Breton | 124429 | 4374 | 43051 | 11511 | ns | 6254 | 21093 | 17114 | 42631 | 29.1 | 13.9 | 29.5 | 13.4 | ns | 12.6 | 11.1 | 10.5 | 45.7 |
| Total | 427194 | 31532 | 145888 | 86063 | 122008 | 49554 | 190211 | 163484 | 93315 | | | | | | | | | |
| **Spring Spawners** | | | | | | | | | | | | | | | | | | |
| Chaleur-Miscou | 643376 | 12780 | 42004 | 43784 | 57415 | 20376 | 89332 | 66596 | 60087 | 98.3 | 99.7 | 95.9 | 97.8 | 100 | 95.7 | 88.7 | 79.8 | 97.5 |
| North P.E.I. | ns | ns | ns | ns | ns | ns | 10562 | 16518 | ns | ns | ns | ns | ns | ns | ns | 10.5 | 19.8 | ns |
| Cape Breton | 10820 | 44 | 1794 | 1001 | ns | 913 | 777 | 349 | 1564 | 1.7 | 0.3 | 4.1 | 2.2 | ns | 4.3 | 0.8 | 0.4 | 2.5 |
| Total | 654196 | 12824 | 43797 | 44785 | 57415 | 21289 | 100671 | 83463 | 61651 | | | | | | | | | |

Table 39. Acoustic survey same strata coverage, fall and spring spawner numbers-at-age (x 1000) in Chaleur – Miscou strata.

**Fall Spawners**

| Age | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 3962 | 59 | 29739 | 0 | 0 |
| 2 | 2950 | 16977 | 104533 | 155032 | 62339 |
| 3 | 8997 | 22111 | 113177 | 231524 | 129460 |
| 4 | 333790 | 12927 | 213907 | 175468 | 40101 |
| 5 | 105154 | 91421 | 36016 | 75343 | 33932 |
| 6 | 101952 | 17178 | 114055 | 15356 | 13925 |
| 7 | 104507 | 36164 | 23120 | 40463 | 4690 |
| 8 | 13266 | 35111 | 8826 | 18301 | 14347 |
| 9 | 7096 | 4557 | 14376 | 13442 | 2883 |
| 10 | 0 | 956 | 7924 | 7154 | 5553 |
| 11 | 4466 | 487 | 0 | 3419 | 2295 |
| Total | 686140 | 237949 | 665674 | 735503 | 309525 |
| 4+ | 670230 | 198802 | 418226 | 348946 | 117726 |

**Spring Spawners**

| Age | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|
| 0 | 28557 | 186 | 43891 | 0 | 18591 |
| 1 | 736 | 17561 | 33927 | 9549 | 29542 |
| 2 | 3927 | 57445 | 269798 | 104184 | 184347 |
| 3 | 140874 | 6338 | 94420 | 67787 | 26545 |
| 4 | 55287 | 34369 | 17820 | 62523 | 23397 |
| 5 | 47146 | 2623 | 74019 | 5245 | 12863 |
| 6 | 40883 | 13666 | 3713 | 82462 | 5094 |
| 7 | 10046 | 8205 | 12273 | 14769 | 37471 |
| 8 | 556 | 2884 | 5061 | 14441 | 7241 |
| 9 | 3538 | 1242 | 0 | 14029 | 2949 |
| 10 | 1673 | 0 | 0 | 0 | 3994 |
| 11 | 1738 | 0 | 0 | 0 | 1098 |
| Total | 334959 | 144520 | 554921 | 374990 | 353133 |
| 4+ | 160865 | 62991 | 112886 | 193469 | 94107 |

Table 40. ADAPT-VPA (F-OLD) results for spring using New Brunswick catch rates 1990-1998.

approximate statistics assuming linearity near solution

orthogonality offset 0.00247

mean square residuals 0.19971

| | par est | std err | cv | t-stat | % bias |
|---|---|---|---|---|---|
| 4 | 148790.277 | 73555.0524 | 0.494354 | 2.022842 | 12.576741 |
| 5 | 83129.9561 | 32689.9990 | 0.393240 | 2.542978 | 7.448079 |
| 6 | 9808.78729 | 3750.29454 | 0.382340 | 2.615471 | 6.314717 |
| 7 | 74227.9882 | 29179.7869 | 0.393110 | 2.543815 | 5.954912 |
| 8 | 12386.7066 | 4672.17964 | 0.377193 | 2.651162 | 5.368907 |
| 9 | 10912.8694 | 4018.05431 | 0.368194 | 2.715959 | 5.092694 |
| 10 | 10025.4823 | 3586.15226 | 0.357704 | 2.795610 | 4.767479 |
| 4 | 0.001256 | 0.000214 | 0.170490 | 5.865430 | 0.772837 |
| 5 | 0.003869 | 0.000630 | 0.162805 | 6.142311 | 0.829456 |
| 6 | 0.004737 | 0.000761 | 0.160664 | 6.224164 | 0.970946 |
| 7 | 0.005302 | 0.000847 | 0.159706 | 6.261494 | 1.122335 |
| 8 | 0.004947 | 0.000786 | 0.158897 | 6.293401 | 1.260361 |
| 9 | 0.005052 | 0.000792 | 0.156702 | 6.381521 | 1.326338 |
| 10 | 0.005525 | 0.000846 | 0.153172 | 6.528601 | 1.281100 |

parameter correltion matrix

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.10 | 0.08 | 0.06 | 0.05 | 0.04 | 0.02 | -0.36 | -0.05 | -0.04 | -0.03 | -0.02 | -0.01 | -0.01 |
| 2 | 0.10 | 1.00 | 0.11 | 0.09 | 0.07 | 0.05 | 0.04 | -0.27 | -0.29 | -0.06 | -0.04 | -0.03 | -0.02 | -0.01 |
| 3 | 0.08 | 0.11 | 1.00 | 0.12 | 0.09 | 0.07 | 0.05 | -0.21 | -0.24 | -0.27 | -0.06 | -0.04 | -0.02 | -0.01 |
| 4 | 0.06 | 0.09 | 0.12 | 1.00 | 0.12 | 0.09 | 0.06 | -0.18 | -0.19 | -0.22 | -0.27 | -0.05 | -0.03 | -0.01 |
| 5 | 0.05 | 0.07 | 0.09 | 0.12 | 1.00 | 0.11 | 0.08 | -0.14 | -0.16 | -0.18 | -0.22 | -0.26 | -0.04 | -0.02 |
| 6 | 0.04 | 0.05 | 0.07 | 0.09 | 0.11 | 1.00 | 0.11 | -0.10 | -0.11 | -0.13 | -0.17 | -0.22 | -0.25 | -0.02 |
| 7 | 0.02 | 0.04 | 0.05 | 0.06 | 0.08 | 0.11 | 1.00 | -0.07 | -0.08 | -0.09 | -0.13 | -0.17 | -0.21 | -0.23 |
| 8 | -0.36 | -0.27 | -0.21 | -0.18 | -0.14 | -0.10 | -0.07 | 1.00 | 0.15 | 0.11 | 0.08 | 0.06 | 0.04 | 0.02 |
| 9 | -0.05 | -0.29 | -0.24 | -0.19 | -0.16 | -0.11 | -0.08 | 0.15 | 1.00 | 0.12 | 0.09 | 0.07 | 0.04 | 0.02 |
| 10 | -0.04 | -0.06 | -0.27 | -0.22 | -0.18 | -0.13 | -0.09 | 0.11 | 0.12 | 1.00 | 0.11 | 0.08 | 0.05 | 0.02 |
| 11 | -0.03 | -0.04 | -0.06 | -0.27 | -0.22 | -0.17 | -0.13 | 0.08 | 0.09 | 0.11 | 1.00 | 0.10 | 0.06 | 0.03 |
| 12 | -0.02 | -0.03 | -0.04 | -0.05 | -0.26 | -0.22 | -0.17 | 0.06 | 0.07 | 0.08 | 0.10 | 1.00 | 0.08 | 0.04 |
| 13 | -0.01 | -0.02 | -0.02 | -0.03 | -0.04 | -0.25 | -0.21 | 0.04 | 0.04 | 0.05 | 0.06 | 0.08 | 1.00 | 0.05 |
| 14 | -0.01 | -0.01 | -0.01 | -0.01 | -0.02 | -0.02 | -0.23 | 0.02 | 0.02 | 0.02 | 0.03 | 0.04 | 0.05 | 1.00 |

Table 41. Parameter estimates from ADAPT-VPA FRATIO model using CUE index for spring spawners.

APPROXIMATE STATISTICS ASSUMING LINEARITY NEAR SOLUTION

ORTHOGONALITY OFFSET......... 0.000445
MEAN SQUARE RESIDUALS ....... 0.200312

Estimates for parameters

| PAR. EST. | STD. ERR. | REL. ERR. | BIAS | REL. BIAS |
|---|---|---|---|---|
| 1.19E1 | 4.97E-1 | 0.042 | 8.60E-3 | 0.001 |
| 1.13E1 | 3.98E-1 | 0.035 | 3.44E-3 | 0.000 |
| 9.16E0 | 3.89E-1 | 0.042 | -1.26E-3 | 0.000 |
| 1.12E1 | 4.03E-1 | 0.036 | -6.00E-3 | -0.001 |
| 9.39E0 | 3.89E-1 | 0.041 | -2.44E-3 | 0.000 |
| 9.25E0 | 3.84E-1 | 0.042 | 2.21E-3 | 0.000 |
| 9.55E0 | 3.58E-1 | 0.038 | 3.24E-2 | 0.003 |
| 4.11E-1 | 4.94E-1 | 1.201 | 2.65E-2 | 0.064 |
| -6.67E0 | 1.72E-1 | -0.026 | -1.23E-2 | 0.002 |
| -5.55E0 | 1.65E-1 | -0.030 | -1.16E-2 | 0.002 |
| -5.34E0 | 1.64E-1 | -0.031 | -1.19E-2 | 0.002 |
| -5.23E0 | 1.65E-1 | -0.031 | -1.24E-2 | 0.002 |
| -5.29E0 | 1.68E-1 | -0.032 | -1.37E-2 | 0.003 |
| -5.26E0 | 1.74E-1 | -0.033 | -1.66E-2 | 0.003 |
| -5.12E0 | 1.98E-1 | -0.039 | -2.48E-2 | 0.005 |

Parameters in linear scale

| PAR. EST. | STD. ERR. | REL. ERR. | BIAS | REL. BIAS |
|---|---|---|---|---|
| 1.46E5 | 7.27E4 | 0.497 | 1.93E4 | 0.132 |
| 8.13E4 | 3.23E4 | 0.398 | 6.71E3 | 0.082 |
| 9.55E3 | 3.71E3 | 0.389 | 7.10E2 | 0.074 |
| 7.20E4 | 2.90E4 | 0.403 | 5.41E3 | 0.075 |
| 1.20E4 | 4.65E3 | 0.389 | 8.75E2 | 0.073 |
| 1.04E4 | 4.01E3 | 0.384 | 7.94E2 | 0.076 |
| 1.40E4 | 5.02E3 | 0.358 | 1.35E3 | 0.097 |
| 1.51E0 | 7.45E-1 | 0.494 | 2.24E-1 | 0.148 |
| 1.27E-3 | 2.19E-4 | 0.172 | 3.22E-6 | 0.003 |
| 3.90E-3 | 6.44E-4 | 0.165 | 7.95E-6 | 0.002 |
| 4.78E-3 | 7.82E-4 | 0.164 | 7.02E-6 | 0.001 |
| 5.35E-3 | 8.81E-4 | 0.165 | 5.94E-6 | 0.001 |
| 5.02E-3 | 8.42E-4 | 0.168 | 1.80E-6 | 0.000 |
| 5.22E-3 | 9.10E-4 | 0.174 | -7.42E-6 | -0.001 |
| 5.95E-3 | 1.18E-3 | 0.198 | -3.06E-5 | -0.005 |

Table 42. Parameter correlations from ADAPT-VPA spring spawner FRATIO model.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.00 | 0.10 | 0.08 | 0.07 | 0.06 | 0.05 | 0.06 | -0.03 | -0.36 | -0.06 | -0.05 | -0.04 | -0.04 | -0.03 | -0.03 |
| 0.10 | 1.00 | 0.12 | 0.10 | 0.08 | 0.07 | 0.08 | -0.04 | -0.28 | -0.30 | -0.07 | -0.06 | -0.05 | -0.05 | -0.05 |
| 0.08 | 0.12 | 1.00 | 0.13 | 0.11 | 0.09 | 0.11 | -0.04 | -0.22 | -0.25 | -0.29 | -0.08 | -0.07 | -0.06 | -0.06 |
| 0.07 | 0.10 | 0.13 | 1.00 | 0.14 | 0.11 | 0.14 | -0.06 | -0.19 | -0.21 | -0.24 | -0.29 | -0.09 | -0.08 | -0.08 |
| 0.06 | 0.08 | 0.11 | 0.14 | 1.00 | 0.15 | 0.18 | -0.08 | -0.16 | -0.18 | -0.20 | -0.25 | -0.30 | -0.11 | -0.11 |
| 0.05 | 0.07 | 0.09 | 0.11 | 0.15 | 1.00 | 0.24 | -0.12 | -0.13 | -0.14 | -0.17 | -0.21 | -0.27 | -0.32 | -0.15 |
| 0.06 | 0.08 | 0.11 | 0.14 | 0.18 | 0.24 | 1.00 | -0.31 | -0.16 | -0.17 | -0.21 | -0.27 | -0.35 | -0.45 | -0.55 |
| -0.03 | -0.04 | -0.04 | -0.06 | -0.08 | -0.12 | -0.31 | 1.00 | 0.07 | 0.08 | 0.08 | 0.10 | 0.15 | 0.28 | 0.52 |
| -0.36 | -0.28 | -0.22 | -0.19 | -0.16 | -0.13 | -0.16 | 0.07 | 1.00 | 0.17 | 0.13 | 0.11 | 0.10 | 0.09 | 0.09 |
| -0.06 | -0.30 | -0.25 | -0.21 | -0.18 | -0.14 | -0.17 | 0.08 | 0.17 | 1.00 | 0.15 | 0.12 | 0.11 | 0.10 | 0.10 |
| -0.05 | -0.07 | -0.29 | -0.24 | -0.20 | -0.17 | -0.21 | 0.08 | 0.13 | 0.15 | 1.00 | 0.14 | 0.13 | 0.12 | 0.12 |
| -0.04 | -0.06 | -0.08 | -0.29 | -0.25 | -0.21 | -0.27 | 0.10 | 0.11 | 0.12 | 0.14 | 1.00 | 0.16 | 0.16 | 0.15 |
| -0.04 | -0.05 | -0.07 | -0.09 | -0.30 | -0.27 | -0.35 | 0.15 | 0.10 | 0.11 | 0.13 | 0.16 | 1.00 | 0.20 | 0.21 |
| -0.03 | -0.05 | -0.06 | -0.08 | -0.11 | -0.32 | -0.45 | 0.28 | 0.09 | 0.10 | 0.12 | 0.16 | 0.20 | 1.00 | 0.30 |
| -0.03 | -0.05 | -0.06 | -0.08 | -0.11 | -0.15 | -0.55 | 0.52 | 0.09 | 0.10 | 0.12 | 0.15 | 0.21 | 0.30 | 1.00 |

Table 43. Parameter estimates, standard errors, and relative bias from spring spawner ADAPT-VPA using acoustic index to tune ages 4-8 and New Brunswick catch rates to tune ages 4-10.

APPROXIMATE STATISTICS ASSUMING LINEARITY NEAR SOLUTION

ORTHOGONALITY OFFSET......... 0.000695
MEAN SQUARE RESIDUALS ....... 0.313883

Estimates for parameters

| PAR. EST. | STD. ERR. | REL. ERR. | BIAS | REL. BIAS |
|---|---|---|---|---|
| 1.15E1 | 4.59E-1 | 0.040 | 1.38E-2 | 0.001 |
| 1.14E1 | 3.60E-1 | 0.032 | 1.17E-2 | 0.001 |
| 9.63E0 | 3.26E-1 | 0.034 | 1.17E-2 | 0.001 |
| 1.14E1 | 3.45E-1 | 0.030 | 9.37E-3 | 0.001 |
| 9.54E0 | 3.46E-1 | 0.036 | 1.13E-2 | 0.001 |
| 9.73E0 | 3.52E-1 | 0.036 | 1.11E-2 | 0.001 |
| 9.41E0 | 4.42E-1 | 0.047 | 3.54E-2 | 0.004 |
| 4.78E-1 | 6.05E-1 | 1.267 | 5.02E-2 | 0.105 |
| -5.76E0 | 2.95E-1 | -0.051 | -1.79E-2 | 0.003 |
| -6.35E0 | 2.86E-1 | -0.045 | -1.74E-2 | 0.003 |
| -5.93E0 | 2.83E-1 | -0.048 | -1.80E-2 | 0.003 |
| -5.66E0 | 2.92E-1 | -0.052 | -1.92E-2 | 0.003 |
| -6.01E0 | 3.00E-1 | -0.050 | -2.09E-2 | 0.003 |
| -6.70E0 | 2.08E-1 | -0.031 | -1.50E-2 | 0.002 |
| -5.62E0 | 2.02E-1 | -0.036 | -1.45E-2 | 0.003 |
| -5.43E0 | 2.00E-1 | -0.037 | -1.56E-2 | 0.003 |
| -5.28E0 | 2.02E-1 | -0.038 | -1.63E-2 | 0.003 |
| -5.33E0 | 2.05E-1 | -0.038 | -1.77E-2 | 0.003 |
| -5.28E0 | 2.11E-1 | -0.040 | -2.10E-2 | 0.004 |
| -5.08E0 | 2.37E-1 | -0.047 | -3.14E-2 | 0.006 |

Parameters in linear scale

| PAR. EST. | STD. ERR. | REL. ERR. | BIAS | REL. BIAS |
|---|---|---|---|---|
| 1.01E5 | 4.65E4 | 0.459 | 1.21E4 | 0.119 |
| 9.00E4 | 3.24E4 | 0.360 | 6.89E3 | 0.077 |
| 1.53E4 | 4.97E3 | 0.326 | 9.87E2 | 0.065 |
| 9.16E4 | 3.16E4 | 0.345 | 6.32E3 | 0.069 |
| 1.39E4 | 4.80E3 | 0.346 | 9.86E2 | 0.071 |
| 1.68E4 | 5.89E3 | 0.352 | 1.22E3 | 0.073 |
| 1.22E4 | 5.39E3 | 0.442 | 1.62E3 | 0.133 |
| 1.61E0 | 9.76E-1 | 0.605 | 3.76E-1 | 0.233 |
| 3.15E-3 | 9.29E-4 | 0.295 | 8.08E-5 | 0.026 |
| 1.75E-3 | 5.01E-4 | 0.286 | 4.10E-5 | 0.023 |
| 2.66E-3 | 7.53E-4 | 0.283 | 5.86E-5 | 0.022 |
| 3.49E-3 | 1.02E-3 | 0.292 | 8.17E-5 | 0.023 |
| 2.46E-3 | 7.38E-4 | 0.300 | 5.94E-5 | 0.024 |
| 1.23E-3 | 2.57E-4 | 0.208 | 8.22E-6 | 0.007 |
| 3.61E-3 | 7.30E-4 | 0.202 | 2.12E-5 | 0.006 |
| 4.39E-3 | 8.80E-4 | 0.200 | 1.98E-5 | 0.005 |
| 5.09E-3 | 1.03E-3 | 0.202 | 2.05E-5 | 0.004 |
| 4.85E-3 | 9.93E-4 | 0.205 | 1.58E-5 | 0.003 |
| 5.11E-3 | 1.08E-3 | 0.211 | 6.80E-6 | 0.001 |
| 6.21E-3 | 1.47E-3 | 0.237 | -2.09E-5 | -0.003 |

Table 44. Parameter correlations from ADAPT-VPA spring spawners using FRATIO method and acoustic index to tune ages 4-8 and New Brunswick catch rates to tune ages 4-10.

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.00 | 0.17 | 0.15 | 0.14 | 0.12 | 0.09 | 0.09 | -0.03 | -0.39 | -0.11 | -0.09 | -0.08 | -0.07 | -0.31 | -0.09 | -0.07 | -0.06 | -0.05 | -0.05 | -0.05 |
| 0.17 | 1.00 | 0.22 | 0.19 | 0.17 | 0.14 | 0.13 | -0.05 | -0.33 | -0.34 | -0.13 | -0.12 | -0.11 | -0.27 | -0.26 | -0.10 | -0.09 | -0.08 | -0.07 | -0.07 |
| 0.15 | 0.22 | 1.00 | 0.24 | 0.22 | 0.19 | 0.17 | -0.06 | -0.29 | -0.32 | -0.33 | -0.16 | -0.14 | -0.24 | -0.24 | -0.25 | -0.11 | -0.10 | -0.09 | -0.09 |
| 0.14 | 0.19 | 0.24 | 1.00 | 0.27 | 0.24 | 0.24 | -0.08 | -0.26 | -0.28 | -0.31 | -0.36 | -0.18 | -0.22 | -0.22 | -0.24 | -0.26 | -0.14 | -0.13 | -0.13 |
| 0.12 | 0.17 | 0.22 | 0.27 | 1.00 | 0.30 | 0.32 | -0.12 | -0.22 | -0.25 | -0.29 | -0.35 | -0.38 | -0.20 | -0.21 | -0.22 | -0.25 | -0.28 | -0.17 | -0.17 |
| 0.09 | 0.14 | 0.19 | 0.24 | 0.30 | 1.00 | 0.34 | -0.14 | -0.14 | -0.23 | -0.27 | -0.33 | -0.37 | -0.18 | -0.19 | -0.21 | -0.24 | -0.28 | -0.30 | -0.19 |
| 0.09 | 0.13 | 0.17 | 0.24 | 0.32 | 0.34 | 1.00 | -0.32 | -0.13 | -0.16 | -0.23 | -0.35 | -0.46 | -0.18 | -0.19 | -0.22 | -0.27 | -0.34 | -0.42 | -0.52 |
| -0.03 | -0.05 | -0.06 | -0.08 | -0.12 | -0.14 | -0.32 | 1.00 | 0.05 | 0.06 | 0.05 | 0.13 | 0.19 | 0.07 | 0.07 | 0.07 | 0.09 | 0.13 | 0.25 | 0.47 |
| -0.39 | -0.33 | -0.29 | -0.26 | -0.22 | -0.14 | -0.13 | 0.05 | 1.00 | 0.21 | 0.17 | 0.14 | 0.12 | 0.23 | 0.16 | 0.13 | 0.11 | 0.09 | 0.07 | 0.07 |
| -0.11 | -0.34 | -0.32 | -0.28 | -0.25 | -0.23 | -0.16 | 0.06 | 0.21 | 1.00 | 0.19 | 0.18 | 0.15 | 0.18 | 0.18 | 0.15 | 0.13 | 0.11 | 0.10 | 0.09 |
| -0.09 | -0.13 | -0.33 | -0.31 | -0.29 | -0.27 | -0.23 | 0.05 | 0.17 | 0.19 | 1.00 | 0.21 | 0.19 | 0.15 | 0.16 | 0.17 | 0.15 | 0.14 | 0.13 | 0.11 |
| -0.08 | -0.12 | -0.16 | -0.36 | -0.35 | -0.33 | -0.35 | 0.13 | 0.14 | 0.18 | 0.21 | 1.00 | 0.26 | 0.15 | 0.15 | 0.17 | 0.19 | 0.19 | 0.19 | 0.19 |
| -0.07 | -0.11 | -0.14 | -0.18 | -0.38 | -0.37 | -0.46 | 0.19 | 0.12 | 0.15 | 0.19 | 0.26 | 1.00 | 0.14 | 0.14 | 0.16 | 0.19 | 0.23 | 0.23 | 0.25 |
| -0.31 | -0.27 | -0.24 | -0.22 | -0.20 | -0.18 | -0.18 | 0.07 | 0.23 | 0.18 | 0.15 | 0.15 | 0.14 | 1.00 | 0.14 | 0.12 | 0.11 | 0.10 | 0.10 | 0.10 |
| -0.09 | -0.26 | -0.24 | -0.22 | -0.21 | -0.19 | -0.19 | 0.07 | 0.16 | 0.18 | 0.16 | 0.15 | 0.14 | 0.14 | 1.00 | 0.12 | 0.11 | 0.11 | 0.10 | 0.10 |
| -0.07 | -0.10 | -0.25 | -0.24 | -0.22 | -0.21 | -0.22 | 0.07 | 0.13 | 0.15 | 0.17 | 0.17 | 0.16 | 0.12 | 0.12 | 1.00 | 0.12 | 0.12 | 0.11 | 0.11 |
| -0.06 | -0.09 | -0.11 | -0.26 | -0.25 | -0.24 | -0.27 | 0.09 | 0.11 | 0.13 | 0.15 | 0.19 | 0.19 | 0.11 | 0.11 | 0.12 | 1.00 | 0.14 | 0.14 | 0.14 |
| -0.05 | -0.08 | -0.10 | -0.14 | -0.28 | -0.28 | -0.34 | 0.13 | 0.09 | 0.11 | 0.14 | 0.19 | 0.23 | 0.10 | 0.11 | 0.12 | 0.14 | 1.00 | 0.17 | 0.19 |
| -0.05 | -0.07 | -0.09 | -0.13 | -0.17 | -0.30 | -0.42 | 0.25 | 0.07 | 0.10 | 0.13 | 0.19 | 0.23 | 0.10 | 0.10 | 0.11 | 0.14 | 0.17 | 1.00 | 0.26 |
| -0.05 | -0.07 | -0.09 | -0.13 | -0.17 | -0.19 | -0.52 | 0.47 | 0.07 | 0.09 | 0.11 | 0.19 | 0.25 | 0.10 | 0.10 | 0.11 | 0.14 | 0.19 | 0.26 | 1.00 |

Table 45. Beginning of year population numbers, biomass, and annual fishing mortality estimated for spring spawners using ADAPT-VPA FRATIO model with catch rates alone as the calibration index. Numbers x 1000, Biomass in tonnes.

| Numbers | | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2 | 91437 | 78042 | 58936 | 175084 | 237163 | 226404 | 277188 | 152533 | 107288 | 140234 | 170045 | 219636 | 519408 | 272186 | 160850 | 578948 | 48878 | 220609 | | | | |
| | 3 | 50530 | 61004 | 51075 | 38335 | 138763 | 190604 | 181419 | 225195 | 122813 | 85698 | 114200 | 134266 | 179465 | 422034 | 221549 | 130355 | 473328 | 39982 | 179720 | | | |
| | 4 | 122131 | 30984 | 28966 | 20688 | 16875 | 89731 | 136787 | 142642 | 176586 | 92602 | 67538 | 88511 | 104744 | 141140 | 335623 | 176453 | 105934 | 383101 | 31321 | 143898 | 166096 | 90946 |
| | 5 | 21219 | 62540 | 11762 | 6449 | 9344 | 9129 | 48831 | 98044 | 100625 | 123273 | 66787 | 46620 | 55797 | 70567 | 102410 | 242974 | 136846 | 79923 | 293249 | 22463 | 109729 | 126973 |
| | 6 | 16971 | 13838 | 24577 | 2584 | 2487 | 6355 | 5177 | 32006 | 66448 | 68097 | 76826 | 43155 | 31794 | 34531 | 43223 | 71163 | 161818 | 83052 | 51263 | 188967 | 13744 | 74620 |
| | 7 | 14711 | 7845 | 7500 | 6864 | 426 | 1587 | 4787 | 3881 | 21066 | 41708 | 42174 | 44496 | 27747 | 21906 | 19339 | 26905 | 40518 | 82758 | 48135 | 31129 | 116769 | 8842 |
| | 8 | 5140 | 6219 | 3725 | 1420 | 2419 | 61 | 1193 | 3867 | 1957 | 13961 | 23539 | 23641 | 26342 | 19304 | 14190 | 12351 | 15104 | 23255 | 39021 | 24880 | 18076 | 66561 |
| | 9 | 3088 | 2807 | 3346 | 648 | 386 | 1660 | 18 | 919 | 2540 | 764 | 7038 | 10840 | 13734 | 15467 | 11709 | 9749 | 7024 | 6712 | 13050 | 21532 | 14942 | 11103 |
| | 10 | 4873 | 950 | 1806 | 851 | 129 | 146 | 1358 | 11 | 596 | 1876 | 169 | 2845 | 5250 | 7972 | 8091 | 7481 | 5080 | 4098 | 3250 | 7366 | 13579 | 9633 |
| | 11 | 11960 | 5233 | 2078 | 1575 | 731 | 114 | 212 | 1280 | 924 | 903 | 1798 | 555 | 1323 | 3706 | 5879 | 7651 | 6470 | 5904 | 3478 | 2382 | 6104 | 12667 |
| 4+ | | 200092 | 130416 | 83760 | 41078 | 32796 | 108784 | 198362 | 282650 | 370742 | 343184 | 285869 | 260663 | 266732 | 314593 | 540464 | 554728 | 478793 | 668802 | 482767 | 442617 | 459040 | 401345 |
| 5+ | | 77961 | 99432 | 54794 | 20390 | 15921 | 19053 | 61576 | 140009 | 194156 | 250582 | 218331 | 172152 | 161988 | 173453 | 204841 | 378275 | 372860 | 285702 | 451446 | 298719 | 292944 | 310399 |
| 7+ | | 39772 | 23055 | 18455 | 11357 | 4090 | 3569 | 7568 | 9958 | 27083 | 59212 | 74718 | 82377 | 74397 | 68355 | 59208 | 64137 | 74196 | 122727 | 106934 | 87289 | 169471 | 108806 |

| Biomass | | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2 | 8846 | 8151 | 6188 | 19688 | 25572 | 24555 | 30109 | 16863 | 10328 | 14623 | 15118 | 24367 | 57640 | 27469 | 14653 | 52763 | 4995 | 17613 | | | | |
| | 3 | 7942 | 8665 | 8074 | 6570 | 24664 | 31172 | 31949 | 40188 | 20574 | 13087 | 18018 | 18879 | 31663 | 69644 | 32282 | 16478 | 62507 | 5491 | 21261 | | | |
| | 4 | 22364 | 5414 | 5149 | 4073 | 3428 | 17390 | 24830 | 29028 | 35214 | 17111 | 13042 | 16338 | 19994 | 25779 | 55882 | 27561 | 15820 | 60794 | 4751 | 23785 | 25140 | 14198 |
| | 5 | 4827 | 14080 | 2482 | 1588 | 2359 | 2128 | 10469 | 21863 | 23531 | 26875 | 15113 | 10279 | 12279 | 14899 | 20005 | 43882 | 23873 | 13900 | 51002 | 4043 | 19763 | 22601 |
| | 6 | 4422 | 3401 | 6230 | 730 | 763 | 1709 | 1349 | 7957 | 17088 | 17734 | 19531 | 11165 | 7995 | 8247 | 9894 | 14827 | 31417 | 16126 | 9945 | 36361 | 2681 | 14464 |
| | 7 | 4160 | 2221 | 1978 | 2069 | 149 | 502 | 1363 | 1188 | 6329 | 11541 | 12126 | 12936 | 7612 | 5820 | 4840 | 6484 | 8824 | 17715 | 10175 | 6454 | 24856 | 1861 |
| | 8 | 1546 | 1935 | 1099 | 420 | 861 | 18 | 407 | 1295 | 651 | 4330 | 7212 | 7258 | 7908 | 5451 | 3762 | 3239 | 3775 | 5509 | 9069 | 5621 | 4111 | 15215 |
| | 9 | 1024 | 917 | 1112 | 218 | 132 | 554 | 6 | 403 | 846 | 235 | 2322 | 3561 | 4301 | 4638 | 3420 | 2811 | 1979 | 1800 | 3197 | 5322 | 3705 | 2739 |
| | 10 | 1669 | 299 | 650 | 301 | 50 | 55 | 520 | 4 | 242 | 559 | 56 | 1003 | 1744 | 2495 | 2466 | 2220 | 1554 | 1236 | 928 | 1818 | 3589 | 2558 |
| | 11 | 4351 | 1892 | 709 | 612 | 292 | 45 | 83 | 460 | 334 | 328 | 607 | 188 | 445 | 1224 | 1868 | 2357 | 2009 | 1818 | 1075 | 740 | 1733 | 3816 |
| 4+ | | 44364 | 30158 | 19409 | 10011 | 8035 | 22401 | 39027 | 62199 | 84234 | 78712 | 70009 | 62727 | 62276 | 68553 | 102137 | 103381 | 89251 | 118897 | 90144 | 84144 | 85577 | 77452 |
| 5+ | | 21999 | 24744 | 14260 | 5939 | 4607 | 5011 | 14197 | 33171 | 49020 | 61601 | 56967 | 46389 | 42282 | 42774 | 46255 | 75820 | 73430 | 58103 | 85392 | 60359 | 60437 | 63254 |
| 7+ | | 12750 | 7263 | 5548 | 3621 | 1485 | 1174 | 2379 | 3351 | 8401 | 16992 | 22323 | 24945 | 22009 | 19627 | 16356 | 17111 | 18141 | 28078 | 24445 | 19956 | 37993 | 26189 |

| F | | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2 | 0.205 | 0.224 | 0.23 | 0.032 | 0.019 | 0.022 | 0.008 | 0.017 | 0.025 | 0.005 | 0.036 | 0.002 | 0.008 | 0.006 | 0.01 | 0.001 | 0.001 | 0.005 | 0.001 | 0.006 | 0.006 |
| | 3 | 0.289 | 0.545 | 0.704 | 0.621 | 0.236 | 0.132 | 0.04 | 0.043 | 0.082 | 0.038 | 0.055 | 0.048 | 0.04 | 0.029 | 0.028 | 0.007 | 0.011 | 0.044 | 0.022 | 0.009 | 0.034 |
| | 4 | 0.469 | 0.769 | 1.302 | 0.595 | 0.414 | 0.408 | 0.133 | 0.149 | 0.159 | 0.127 | 0.171 | 0.261 | 0.195 | 0.121 | 0.123 | 0.054 | 0.082 | 0.067 | 0.132 | 0.071 | 0.069 |
| | 5 | 0.227 | 0.734 | 1.316 | 0.753 | 0.185 | 0.367 | 0.222 | 0.189 | 0.19 | 0.273 | 0.237 | 0.183 | 0.28 | 0.29 | 0.164 | 0.206 | 0.299 | 0.244 | 0.239 | 0.291 | 0.186 |
| | 6 | 0.572 | 0.412 | 1.076 | 1.604 | 0.249 | 0.083 | 0.088 | 0.218 | 0.266 | 0.279 | 0.346 | 0.242 | 0.173 | 0.38 | 0.274 | 0.363 | 0.471 | 0.345 | 0.299 | 0.281 | 0.241 |
| | 7 | 0.661 | 0.545 | 1.465 | 0.843 | 1.743 | 0.085 | 0.013 | 0.485 | 0.211 | 0.372 | 0.379 | 0.324 | 0.163 | 0.234 | 0.248 | 0.377 | 0.355 | 0.552 | 0.46 | 0.344 | 0.362 |
| | 8 | 0.405 | 0.42 | 1.549 | 1.103 | 0.177 | 1.023 | 0.061 | 0.22 | 0.74 | 0.485 | 0.575 | 0.343 | 0.332 | 0.3 | 0.175 | 0.364 | 0.611 | 0.378 | 0.395 | 0.31 | 0.287 |
| | 9 | 0.979 | 0.241 | 1.169 | 1.416 | 0.769 | 0.001 | 0.281 | 0.233 | 0.103 | 1.306 | 0.706 | 0.525 | 0.344 | 0.448 | 0.248 | 0.452 | 0.339 | 0.525 | 0.372 | 0.261 | 0.239 |
| | 10 | 0.809 | 0.719 | 0.612 | 0.848 | 1.471 | 0.008 | 0.004 | 0.104 | 0.274 | 0.216 | 0.847 | 0.712 | 0.353 | 0.447 | 0.36 | 0.57 | 0.407 | 0.737 | 0.734 | 0.251 | 0.222 |
| 11+ | | 1.039 | 0.924 | 0.787 | 1.089 | 1.889 | 0.01 | 0.005 | 0.134 | 0.352 | 0.277 | 1.088 | 0.915 | 0.454 | 0.574 | 0.462 | 0.732 | 0.523 | 0.946 | 0.943 | 0.322 | 0.285 |
| ave 5-9 | | 0.57 | 0.47 | 1.32 | 1.14 | 0.62 | 0.31 | 0.13 | 0.27 | 0.30 | 0.54 | 0.45 | 0.32 | 0.26 | 0.33 | 0.22 | 0.35 | 0.42 | 0.41 | 0.35 | 0.30 | 0.26 |
| wt 4+ | | 0.47 | 0.67 | 1.26 | 0.77 | 0.34 | 0.37 | 0.15 | 0.18 | 0.19 | 0.26 | 0.31 | 0.27 | 0.23 | 0.23 | 0.15 | 0.19 | 0.32 | 0.20 | 0.28 | 0.22 | 0.20 |
| Ave 5-9 ER | | 0.40 | 0.34 | .068 | 0.63 | 0.43 | 0.24 | 0.11 | 0.21 | 0.24 | 0.38 | 0.33 | 0.25 | 0.21 | 0.26 | 0.18 | 0.27 | 0.31 | 0.31 | 0.27 | 0.23 | 0.21 |
| Wt 4+ ER | | 0.34 | 0.45 | 0.66 | 0.49 | 0.26 | 0.29 | 0.13 | 0.15 | 0.16 | 0.21 | 0.24 | 0.22 | 0.19 | 0.18 | 0.13 | 0.16 | 0.25 | 0.16 | 0.22 | 0.18 | 0.16 |

Table 46. Sum of fishing mortalities along cohorts to determine which add up to 2 or more. Numbers under year refer to sum of cohort starting with age two. For example, 1978 = 3.98 which is the sum of age 2 in 1978, age 3 in 1979, and continuing to 11+.

| | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 0.21 | 0.22 | 0.23 | 0.03 | 0.02 | 0.02 | 0.01 | 0.02 | 0.03 | 0.01 | 0.04 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.01 |
| 3 | 0.29 | 0.55 | 0.70 | 0.62 | 0.24 | 0.13 | 0.04 | 0.04 | 0.08 | 0.04 | 0.06 | 0.05 | 0.04 | 0.03 | 0.03 | 0.01 | 0.01 | 0.04 | 0.02 | 0.01 | 0.03 |
| 4 | 0.47 | 0.77 | 1.30 | 0.60 | 0.41 | 0.41 | 0.13 | 0.15 | 0.16 | 0.13 | 0.17 | 0.26 | 0.20 | 0.12 | 0.12 | 0.05 | 0.08 | 0.07 | 0.13 | 0.07 | 0.07 |
| 5 | 0.23 | 0.73 | 1.32 | 0.75 | 0.19 | 0.37 | 0.22 | 0.19 | 0.19 | 0.27 | 0.24 | 0.18 | 0.28 | 0.29 | 0.16 | 0.21 | 0.30 | 0.24 | 0.24 | 0.29 | 0.19 |
| 6 | 0.57 | 0.41 | 1.08 | 1.60 | 0.25 | 0.08 | 0.09 | 0.22 | 0.27 | 0.28 | 0.35 | 0.24 | 0.17 | 0.38 | 0.27 | 0.36 | 0.47 | 0.35 | 0.30 | 0.28 | 0.24 |
| 7 | 0.66 | 0.55 | 1.47 | 0.84 | 1.74 | 0.09 | 0.01 | 0.49 | 0.21 | 0.37 | 0.38 | 0.32 | 0.16 | 0.23 | 0.25 | 0.38 | 0.36 | 0.55 | 0.46 | 0.34 | 0.36 |
| 8 | 0.41 | 0.42 | 1.55 | 1.10 | 0.18 | 1.02 | 0.06 | 0.22 | 0.74 | 0.49 | 0.58 | 0.34 | 0.33 | 0.30 | 0.18 | 0.36 | 0.61 | 0.38 | 0.40 | 0.31 | 0.29 |
| 9 | 0.98 | 0.24 | 1.17 | 1.42 | 0.77 | 0.00 | 0.28 | 0.23 | 0.10 | 1.31 | 0.71 | 0.53 | 0.34 | 0.45 | 0.25 | 0.45 | 0.34 | 0.53 | 0.37 | 0.26 | 0.24 |
| 10 | 0.81 | 0.72 | 0.61 | 0.85 | 1.47 | 0.01 | 0.00 | 0.10 | 0.27 | 0.22 | 0.85 | 0.71 | 0.35 | 0.45 | 0.36 | 0.57 | 0.41 | 0.74 | 0.73 | 0.25 | 0.22 |
| 11 | 1.04 | 0.92 | 0.79 | 1.09 | 1.89 | 0.01 | 0.01 | 0.13 | 0.35 | 0.28 | 1.09 | 0.92 | 0.45 | 0.57 | 0.46 | 0.73 | 0.52 | 0.95 | 0.94 | 0.32 | 0.29 |
| Sum | 3.98 | 3.43 | 6.01 | 3.68 | 3.14 | 2.66 | 3.03 | 2.51 | 2.80 | 3.61 | 3.41 | 2.33 | 2.27 | 1.74 | 1.27 | 0.96 | 0.71 | 0.28 | 0.08 | 0.04 | 0.01 |

Table 47. Beginning of year population numbers, biomass, and annual fishing mortality estimates for spring spawners using ADAPT-VPA FRATIO model with acoustic and catch rate indices for calibration.

**Numbers**

| Age | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 91458 | 78068 | 58931 | 175389 | 237727 | 226839 | 277255 | 152338 | 106934 | 139813 | 169404 | 216296 | 509801 | 301608 | 168057 | 641207 | 63649 | 239582 | 181711 | | | |
| 3 | 50530 | 61022 | 51096 | 38331 | 139013 | 191066 | 181776 | 225251 | 122653 | 85409 | 113855 | 133741 | 176730 | 414168 | 245638 | 136256 | 524301 | 52076 | 195254 | 148526 | | |
| 4 | 122270 | 30984 | 28980 | 20705 | 16872 | 89935 | 137165 | 142934 | 176631 | 92472 | 67301 | 88229 | 104315 | 138901 | 329183 | 196175 | 110765 | 424834 | 41223 | 156616 | 120094 | 90946 |
| 5 | 21241 | 62653 | 11762 | 6461 | 9358 | 9127 | 48998 | 98354 | 100864 | 123310 | 66680 | 46426 | 55566 | 70215 | 100577 | 237703 | 152992 | 83878 | 327416 | 30568 | 120140 | 89314 |
| 6 | 16972 | 13856 | 24669 | 2584 | 2496 | 6366 | 5175 | 32143 | 66702 | 68292 | 76856 | 43067 | 31636 | 34343 | 42936 | 69664 | 157506 | 96254 | 54498 | 216917 | 20373 | 83140 |
| 7 | 14697 | 7846 | 7515 | 6937 | 425 | 1595 | 4797 | 3880 | 21178 | 41915 | 42334 | 44521 | 27675 | 21776 | 19185 | 26670 | 39293 | 79240 | 58926 | 33774 | 139627 | 14266 |
| 8 | 5121 | 6208 | 3726 | 1431 | 2479 | 61 | 1199 | 3875 | 1956 | 14052 | 23708 | 23772 | 26363 | 19245 | 14083 | 12225 | 14912 | 22254 | 36156 | 33691 | 20238 | 85242 |
| 9 | 3072 | 2791 | 3337 | 649 | 395 | 1709 | 18 | 924 | 2546 | 763 | 7113 | 10978 | 13841 | 15484 | 11662 | 9663 | 6921 | 6555 | 12233 | 19193 | 22148 | 12871 |
| 10 | 4811 | 938 | 1793 | 843 | 129 | 154 | 1398 | 11 | 600 | 1881 | 169 | 2905 | 5362 | 8060 | 8104 | 7442 | 5009 | 4014 | 3123 | 6699 | 11666 | 15528 |
| 11 | 12097 | 5296 | 2119 | 1598 | 744 | 125 | 226 | 1325 | 961 | 936 | 1829 | 580 | 1393 | 3855 | 6072 | 7820 | 6577 | 5934 | 3435 | 2245 | 5447 | 10565 |
| 4+ | 200281 | 130572 | 83900 | 41208 | 32898 | 109071 | 198975 | 283444 | 371437 | 343622 | 285990 | 260478 | 266150 | 311878 | 531802 | 567361 | 493974 | 722964 | 537009 | 499702 | 459734 | 401872 |
| 5+ | 78011 | 99588 | 54920 | 20503 | 16026 | 19136 | 61811 | 140510 | 194806 | 251150 | 218688 | 172249 | 161835 | 172977 | 202619 | 371186 | 383209 | 298130 | 495786 | 343086 | 339640 | 310926 |
| 7+ | 39798 | 23079 | 18489 | 11459 | 4173 | 3643 | 7638 | 10014 | 27240 | 59548 | 75153 | 82755 | 74634 | 68419 | 59107 | 63819 | 72712 | 117998 | 113873 | 95602 | 199126 | 138472 |

**Biomass**

| Age | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 8848 | 8154 | 6187 | 19722 | 25633 | 24602 | 30116 | 16841 | 10294 | 14579 | 15061 | 23996 | 56574 | 30438 | 15309 | 58437 | 6504 | 19127 | | | | 16427 |
| 3 | 7942 | 8667 | 8077 | 6569 | 24709 | 31248 | 32011 | 40198 | 20548 | 13043 | 17963 | 18805 | 31181 | 68346 | 35792 | 17223 | 69239 | 7152 | 23099 | | | 16719 |
| 4 | 22390 | 5414 | 5152 | 4076 | 3428 | 17430 | 24899 | 29087 | 35223 | 17087 | 12997 | 16286 | 19912 | 25370 | 54810 | 30641 | 16542 | 67417 | 6253 | 25887 | 18177 | 14198 |
| 5 | 4832 | 14106 | 2482 | 1591 | 2363 | 2127 | 10505 | 21932 | 23587 | 26883 | 15088 | 10236 | 12228 | 14825 | 19647 | 42930 | 26689 | 14588 | 56945 | 5501 | 21638 | 22601 |
| 6 | 4423 | 3405 | 6253 | 730 | 766 | 1712 | 1349 | 7990 | 17153 | 17785 | 19539 | 11142 | 7955 | 8202 | 9828 | 14514 | 30579 | 18689 | 10573 | 41739 | 3974 | 14464 |
| 7 | 4156 | 2222 | 1982 | 2092 | 149 | 505 | 1365 | 1188 | 6362 | 11599 | 12172 | 12943 | 7592 | 5785 | 4802 | 6427 | 8557 | 16962 | 12456 | 7003 | 29721 | 1861 |
| 8 | 1540 | 1932 | 1099 | 424 | 882 | 18 | 409 | 1298 | 650 | 4358 | 7264 | 7298 | 7914 | 5434 | 3733 | 3206 | 3727 | 5272 | 8403 | 7611 | 4603 | 15215 |
| 9 | 1019 | 911 | 1109 | 218 | 136 | 570 | 6 | 406 | 848 | 234 | 2346 | 3607 | 4334 | 4643 | 3406 | 2786 | 1950 | 1758 | 2997 | 4744 | 5492 | 2739 |
| 10 | 1648 | 295 | 646 | 298 | 51 | 57 | 535 | 4 | 244 | 560 | 56 | 1024 | 1781 | 2522 | 2470 | 2209 | 1533 | 1211 | 892 | 1653 | 3083 | 2558 |
| 11 | 4400 | 1914 | 722 | 621 | 297 | 49 | 89 | 476 | 347 | 340 | 617 | 196 | 468 | 1273 | 1930 | 2409 | 2042 | 1827 | 1062 | 698 | 1546 | 3816 |
| 4+ | 44408 | 30198 | 19445 | 10050 | 8071 | 22469 | 39157 | 62381 | 84414 | 78846 | 70080 | 62732 | 62184 | 68055 | 100626 | 105122 | 91619 | 127723 | 99581 | 94836 | 88234 | 77452 |
| 5+ | 22018 | 24784 | 14294 | 5974 | 4643 | 5039 | 14258 | 33294 | 49192 | 61759 | 57083 | 46446 | 42272 | 42685 | 45816 | 74481 | 75077 | 60306 | 93328 | 68949 | 70057 | 63254 |
| 7+ | 12764 | 7274 | 5558 | 3653 | 1514 | 1200 | 2405 | 3371 | 8451 | 17091 | 22456 | 25067 | 22089 | 19658 | 16341 | 17037 | 17809 | 27030 | 25810 | 21709 | 44444 | 26189 |

**F**

| Age | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 0.20 | 0.22 | 0.23 | 0.03 | 0.02 | 0.02 | 0.01 | 0.02 | 0.02 | 0.01 | 0.04 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 |
| 3 | 0.29 | 0.54 | 0.70 | 0.62 | 0.24 | 0.13 | 0.04 | 0.04 | 0.08 | 0.04 | 0.05 | 0.05 | 0.04 | 0.03 | 0.02 | 0.01 | 0.01 | 0.03 | 0.02 | 0.01 | 0.03 |
| 4 | 0.47 | 0.77 | 1.30 | 0.59 | 0.41 | 0.41 | 0.13 | 0.15 | 0.16 | 0.13 | 0.17 | 0.26 | 0.20 | 0.12 | 0.13 | 0.05 | 0.08 | 0.06 | 0.10 | 0.07 | 0.10 |
| 5 | 0.23 | 0.73 | 1.32 | 0.75 | 0.19 | 0.37 | 0.22 | 0.19 | 0.19 | 0.27 | 0.24 | 0.18 | 0.28 | 0.29 | 0.17 | 0.21 | 0.26 | 0.23 | 0.21 | 0.21 | 0.17 |
| 6 | 0.57 | 0.41 | 1.07 | 1.60 | 0.25 | 0.08 | 0.09 | 0.22 | 0.26 | 0.28 | 0.35 | 0.24 | 0.17 | 0.38 | 0.28 | 0.37 | 0.49 | 0.29 | 0.28 | 0.24 | 0.16 |
| 7 | 0.66 | 0.54 | 1.46 | 0.83 | 1.74 | 0.09 | 0.01 | 0.48 | 0.21 | 0.37 | 0.38 | 0.32 | 0.16 | 0.24 | 0.25 | 0.38 | 0.37 | 0.58 | 0.36 | 0.31 | 0.29 |
| 8 | 0.41 | 0.42 | 1.55 | 1.09 | 0.17 | 1.02 | 0.06 | 0.22 | 0.74 | 0.48 | 0.57 | 0.34 | 0.33 | 0.30 | 0.18 | 0.37 | 0.62 | 0.40 | 0.43 | 0.22 | 0.25 |
| 9 | 0.99 | 0.24 | 1.18 | 1.41 | 0.74 | 0.00 | 0.28 | 0.23 | 0.10 | 1.31 | 0.70 | 0.52 | 0.34 | 0.45 | 0.25 | 0.46 | 0.34 | 0.54 | 0.40 | 0.30 | 0.16 |
| 10 | 0.82 | 0.73 | 0.62 | 0.86 | 1.46 | 0.01 | 0.00 | 0.10 | 0.27 | 0.22 | 0.85 | 0.69 | 0.34 | 0.44 | 0.36 | 0.57 | 0.41 | 0.76 | 0.78 | 0.28 | 0.26 |
| 11 | 1.02 | 0.91 | 0.76 | 1.06 | 1.80 | 0.01 | 0.00 | 0.13 | 0.34 | 0.27 | 1.06 | 0.85 | 0.43 | 0.55 | 0.44 | 0.71 | 0.51 | 0.94 | 0.96 | 0.35 | 0.32 |
| **ave 5-9** | **0.57** | **0.47** | **1.31** | **1.14** | **0.62** | **0.31** | **0.13** | **0.27** | **0.30** | **0.54** | **0.45** | **0.32** | **0.26** | **0.33** | **0.22** | **0.36** | **0.42** | **0.41** | **0.34** | **0.26** | **0.21** |
| **wt 4+** | **0.47** | **0.67** | **1.25** | **0.76** | **0.34** | **0.37** | **0.15** | **0.18** | **0.19** | **0.26** | **0.31** | **0.27** | **0.23** | **0.23** | **0.15** | **0.19** | **0.31** | **0.18** | **0.25** | **0.19** | **0.19** |
| **Ave 5-9 ER** | **0.40** | **0.34** | **0.68** | **0.63** | **0.42** | **0.24** | **0.11** | **0.21** | **0.24** | **0.38** | **0.33** | **0.25** | **0.21** | **0.26** | **0.18** | **0.27** | **0.31** | **0.31** | **0.26** | **0.20** | **0.17** |
| **Wt 4+ ER** | **0.34** | **0.45** | **0.66** | **0.49** | **0.26** | **0.28** | **0.13** | **0.15** | **0.16** | **0.21** | **0.24** | **0.22** | **0.19** | **0.19** | **0.13** | **0.16** | **0.25** | **0.15** | **0.20** | **0.16** | **0.16** |

Table 48. Spring spawner projections using results from ADAPT-VPA with catch rates as calibration index.

| | | Weights | | | Numbers | | | Biomass | | | Projections Catch (t) F – Fully Recruited | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 0.44 | 0.44 |
| | Age | Beginning | Catch | Ave PR | 1998 | 1999 | 2000 | 1998 | 1999 | 2000 | 1999 | 2000 |
| | 2 | 0.0954 | 0.1276 | 0.01 | 172229 | 172229 | 172229 | 16427 | 16427 | 16427 | 123 | 123 |
| | 3 | 0.1308 | 0.1457 | 0.06 | 127865 | 127865 | 140137 | 16719 | 16719 | 18324 | 423 | 464 |
| | 4 | 0.1561 | 0.1711 | 0.22 | 166096 | 90946 | 102065 | 25140 | 14198 | 15934 | 1280 | 1436 |
| | 5 | 0.1780 | 0.1834 | 0.65 | 109729 | 126973 | 67714 | 19763 | 22601 | 12053 | 5264 | 2807 |
| | 6 | 0.1938 | 0.2048 | 0.72 | 13744 | 74620 | 78153 | 2681 | 14464 | 15149 | 3795 | 3975 |
| | 7 | 0.2105 | 0.2164 | 1 | 116769 | 8842 | 44439 | 24856 | 1861 | 9356 | 622 | 3126 |
| | 8 | 0.2286 | 0.2395 | 0.85 | 18076 | 66561 | 4662 | 4111 | 15215 | 1066 | 4533 | 317 |
| | 9 | 0.2467 | 0.2522 | 0.73 | 14942 | 11103 | 37504 | 3705 | 2739 | 9252 | 700 | 2365 |
| | 10 | 0.2656 | 0.2717 | 0.85 | 13579 | 9633 | 6596 | 3589 | 2558 | 1752 | 747 | 511 |
| | 11 | 0.3012 | 0.3208 | 0.85 | 6104 | 12667 | 12546 | 1733 | 3816 | 3779 | 1159 | 1148 |
| 2+ | | | | | 759134 | 701439 | 666045 | 118723 | 110598 | 103092 | 18646 | 16272 |
| 4+ | | | | | 459040 | 401345 | 353679 | 85577 | 77452 | 68341 | 18100 | 15685 |

Table 49. Fall Spawner multiplicative analysis results.

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Prob>F |
|---|---|---|---|---|---|
| Model | 31 | 3665.49999 | 118.24194 | 150.101 | 0.0001 |
| Error | 3183 | 2507.40326 | 0.78775 | | |
| C Total | 3214 | 6172.90324 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 0.88755 | R-square | 0.5938 |
| Dep Mean | 5.89634 | Adj R-sq | 0.5898 |
| C.V. | 15.05260 | | |

Parameter Estimates

| Variable | DF | Parameter Estimate | Standard Error | T for H0: Parameter=0 | Prob > \|T\| |
|---|---|---|---|---|---|
| INTERCEP | 1 | 7.207942 | 0.08213787 | 87.754 | 0.0001 |
| YY78 | 1 | -1.119388 | 0.14239979 | -7.861 | 0.0001 |
| YY79 | 1 | -1.878909 | 0.11107199 | -16.916 | 0.0001 |
| YY80 | 1 | -1.973132 | 0.10911079 | -18.084 | 0.0001 |
| YY81 | 1 | -1.316857 | 0.09147782 | -14.395 | 0.0001 |
| YY82 | 1 | -1.314173 | 0.09322949 | -14.096 | 0.0001 |
| YY83 | 1 | -0.931754 | 0.09278774 | -10.042 | 0.0001 |
| YY84 | 1 | -0.409107 | 0.09704121 | -4.216 | 0.0001 |
| YY85 | 1 | 0.203225 | 0.10048403 | 2.022 | 0.0432 |
| YY86 | 1 | -0.163625 | 0.10200408 | -1.604 | 0.1088 |
| YY88 | 1 | -0.165646 | 0.10228778 | -1.619 | 0.1055 |
| YY89 | 1 | 0.244500 | 0.10722860 | 2.280 | 0.0227 |
| YY90 | 1 | 0.243038 | 0.09751348 | 2.492 | 0.0127 |
| YY91 | 1 | 0.358345 | 0.10488892 | 3.416 | 0.0006 |
| YY92 | 1 | 0.315899 | 0.10004737 | 3.157 | 0.0016 |
| YY93 | 1 | 0.219805 | 0.10288787 | 2.136 | 0.0327 |
| YY94 | 1 | 0.274573 | 0.09062481 | 3.030 | 0.0025 |
| YY95 | 1 | 0.042081 | 0.09219492 | 0.456 | 0.6481 |
| YY96 | 1 | -0.064682 | 0.10523596 | -0.615 | 0.5388 |
| YY97 | 1 | 0.182488 | 0.11061852 | 1.650 | 0.0991 |
| YY98 | 1 | 0.150165 | 0.10688016 | 1.405 | 0.1601 |
| D11 | 1 | -0.835927 | 0.05513475 | -15.162 | 0.0001 |
| D13 | 1 | -1.163133 | 0.08723457 | -13.333 | 0.0001 |
| D65 | 1 | -1.066932 | 0.05023554 | -21.239 | 0.0001 |
| D67 | 1 | -0.191327 | 0.05622255 | -3.403 | 0.0007 |
| D87 | 1 | -0.501045 | 0.05532449 | -9.056 | 0.0001 |
| D92 | 1 | -1.051245 | 0.06077689 | -17.297 | 0.0001 |
| W1 | 1 | -1.205122 | 0.05349332 | -22.528 | 0.0001 |
| W2 | 1 | -0.299292 | 0.05305562 | -5.641 | 0.0001 |
| W3 | 1 | -0.121398 | 0.04887710 | -2.484 | 0.0131 |
| W5 | 1 | -0.050557 | 0.05374523 | -0.941 | 0.3469 |
| W6 | 1 | -0.510273 | 0.07197790 | -7.089 | 0.0001 |

Table 50. Fall spawner catch rates, split into two time periods according to change in mesh, used to calibrate ADAPT-VPA model. Number (x 1000)/net/trip/day. The 0.75 portion of the year indicates the month of the year to which the index refers in decimal format.

a) CUE index

| CUE_1 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|
| 1978.75 | 637 | 400 | 94 | 86 | 449 | 13 | 18 |
| 1979.75 | 463 | 238 | 136 | 40 | 49 | 41 | 13 |
| 1980.75 | 231 | 269 | 44 | 77 | 16 | 10 | 13 |
| 1981.75 | 1175 | 307 | 121 | 50 | 29 | 13 | 12 |
| 1982.75 | 630 | 710 | 207 | 106 | 44 | 16 | 5 |
| 1983.75 | 1152 | 545 | 751 | 123 | 93 | 28 | 7 |
| 1984.75 | 2080 | 1124 | 694 | 500 | 112 | 38 | 17 |
| 1985.75 | 1045 | 2896 | 1761 | 1126 | 533 | 144 | 86 |
| 1986.75 | 1503 | 754 | 1574 | 880 | 375 | 213 | 16 |
| 1987.75 | 1506 | 1192 | 816 | 1432 | 612 | 370 | 180 |
| 1988.75 | 881 | 1809 | 873 | 571 | 615 | 300 | 118 |
| 1989.75 | 1075 | 1680 | 2261 | 1071 | 543 | 687 | 253 |
| 1990.75 | 1020 | 896 | 1276 | 2451 | 769 | 414 | 450 |
| 1991.75 | 4145 | 1075 | 768 | 1133 | 1397 | 508 | 253 |
| | | | | | | | |
| CUE_2 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1992.75 | 1066 | 4492 | 1009 | 608 | 740 | 773 | 377 |
| 1993.75 | 266 | 3241 | 3981 | 658 | 346 | 399 | 213 |
| 1994.75 | 451 | 604 | 2385 | 3439 | 602 | 476 | 475 |
| 1995.75 | 148 | 1622 | 616 | 2011 | 1790 | 340 | 240 |
| 1996.75 | 819 | 815 | 1869 | 417 | 981 | 1009 | 218 |
| 1997.75 | 1209 | 4389 | 893 | 1377 | 259 | 472 | 436 |
| 1998.75 | 1372 | 1937 | 2785 | 681 | 985 | 183 | 352 |

b) Acoustic Index, Numbers x 100,000 to scale them to same level as CUE indices.

| Acoustic | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|
| 1994.8 | 3338 | 1052 | 1020 | 1045 | 133 | 71 |
| 1995.8 | 129 | 914 | 172 | 362 | 351 | 46 |
| 1996.8 | 2139 | 360 | 1141 | 231 | 88 | 144 |
| 1997.8 | 1755 | 753 | 154 | 405 | 183 | 134 |
| 1998.8 | 401 | 339 | 139 | 47 | 143 | 29 |

Table 51. Fall spawner multiplicative model results with area by week interaciton.

General Linear Models Procedure

Dependent Variable: CPUE

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 61 | 3908.53807572 | 64.07439468 | 89.22 | 0.0001 |
| Error | 3153 | 2264.36516917 | 0.71816212 | | |
| Corrected Total | 3214 | 6172.90324489 | | | |

| R-Square | C.V. | Root MSE | CPUE Mean |
|---|---|---|---|
| 0.633177 | 14.37239 | 0.84744447 | 5.89633615 |

| Source | DF | Type III SS | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| YC | 20 | 1176.94166461 | 58.84708323 | 81.94 | 0.0001 |
| SDC | 6 | 519.26353984 | 86.54392331 | 120.51 | 0.0001 |
| WC | 5 | 449.87151703 | 89.97430341 | 125.28 | 0.0001 |
| WC*SDC | 30 | 243.03809064 | 8.10126969 | 11.28 | 0.0001 |

| Parameter | | Estimate | T for H0: Parameter=0 | Pr > \|T\| | Std Error of Estimate |
|---|---|---|---|---|---|
| INTERCEPT | | 6.994771642 B | 68.41 | 0.0001 | 0.10224613 |
| YC | 78 | -1.131319922 B | -8.20 | 0.0001 | 0.13794306 |
| | 79 | -1.673950755 B | -15.25 | 0.0001 | 0.10977516 |
| | 80 | -1.873347782 B | -17.59 | 0.0001 | 0.10652042 |
| | 81 | -1.207449147 B | -13.67 | 0.0001 | 0.08830818 |
| | 82 | -1.251580582 B | -13.87 | 0.0001 | 0.09022774 |
| | 83 | -0.928730794 B | -10.30 | 0.0001 | 0.09014723 |
| YC | 84 | -0.314205806 B | -3.37 | 0.0008 | 0.09324287 |
| | 85 | 0.253463940 B | 2.63 | 0.0087 | 0.09647945 |
| | 86 | -0.088268295 B | -0.90 | 0.3686 | 0.09816161 |
| | 88 | -0.086513360 B | -0.87 | 0.3837 | 0.09929598 |
| | 89 | 0.306992078 B | 2.98 | 0.0029 | 0.10311028 |
| | 90 | 0.290639686 B | 3.11 | 0.0019 | 0.09354694 |
| | 91 | 0.428195561 B | 4.26 | 0.0001 | 0.10059940 |
| | 92 | 0.370986100 B | 3.85 | 0.0001 | 0.09633489 |

| | | | | | |
|---|---|---|---|---|---|
| | 93 | 0.279966562 B | 2.82 | 0.0048 | 0.09918915 |
| | 94 | 0.371034774 B | 4.25 | 0.0001 | 0.08728624 |
| | 95 | 0.146750087 B | 1.65 | 0.0988 | 0.08887111 |
| | 96 | 0.060186162 B | 0.60 | 0.5516 | 0.10107130 |
| | 97 | 0.222452000 B | 2.10 | 0.0360 | 0.10604927 |
| | 98 | 0.166004848 B | 1.62 | 0.1053 | 0.10245842 |
| | 870 | 0.000000000 B | . | . | . |
| SDC | 11 | -0.845451794 B | -7.74 | 0.0001 | 0.10916274 |
| | 13 | -0.853604885 B | -5.10 | 0.0001 | 0.16722400 |
| | 65 | -0.828189272 B | -7.66 | 0.0001 | 0.10811619 |
| | 67 | 0.022043828 B | 0.19 | 0.8513 | 0.11759435 |
| | 87 | -0.501145367 B | -4.17 | 0.0001 | 0.12014537 |
| | 92 | -0.603584737 B | -4.97 | 0.0001 | 0.12150229 |
| | 660 | 0.000000000 B | . | . | . |
| WC | 1 | -0.669148030 B | -5.43 | 0.0001 | 0.12330215 |
| | 2 | -0.149990718 B | -1.36 | 0.1754 | 0.11066533 |
| | 3 | 0.033323669 B | 0.31 | 0.7553 | 0.10689179 |
| | 5 | -0.114531411 B | -0.92 | 0.3588 | 0.12480285 |
| | 6 | -0.459494845 B | -3.11 | 0.0019 | 0.14790278 |
| | 40 | 0.000000000 B | . | . | . |

Table 52. Fall spawner ADAPT-VPA results using single CUE index to calibrate model.

orthogonality offset 0.00697

mean square residuals 0.20017

| | par est | std err | cv | t-stat | % bias |
|---|---|---|---|---|---|
| 4 | 329898.785 | 153815.933 | 0.466252 | 2.144763 | 10.945353 |
| 5 | 220516.821 | 78398.3663 | 0.355521 | 2.812773 | 6.019023 |
| 6 | 221938.195 | 71988.4962 | 0.324363 | 3.082968 | 4.627368 |
| 7 | 38409.9007 | 12313.1100 | 0.320571 | 3.119431 | 4.166245 |
| 8 | 57920.5194 | 18525.0221 | 0.319835 | 3.126610 | 3.964941 |
| 9 | 12718.1669 | 3926.11446 | 0.308701 | 3.239378 | 3.673233 |
| 10 | 29496.0192 | 8704.47300 | 0.295107 | 3.388605 | 3.331420 |
| 4 | 0.003888 | 0.000399 | 0.102671 | 9.739807 | 0.329912 |
| 5 | 0.007654 | 0.000772 | 0.100892 | 9.911590 | 0.376307 |
| 6 | 0.008957 | 0.000899 | 0.100334 | 9.966679 | 0.426236 |
| 7 | 0.011051 | 0.001107 | 0.100158 | 9.984255 | 0.483300 |
| 8 | 0.012141 | 0.001213 | 0.099915 | 10.008538 | 0.530935 |
| 9 | 0.011735 | 0.001166 | 0.099334 | 10.067004 | 0.543186 |
| 10 | 0.012792 | 0.001261 | 0.098557 | 10.146371 | 0.527600 |

parameter correltion matrix

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.04 | 0.03 | 0.02 | 0.02 | 0.01 | 0.01 | -0.22 | -0.01 | -0.01 | -0.01 | -0.00 | -0.00 | -0.00 |
| 2 | 0.04 | 1.00 | 0.04 | 0.03 | 0.02 | 0.02 | 0.01 | -0.16 | -0.17 | -0.01 | -0.01 | -0.01 | -0.00 | -0.00 |
| 3 | 0.03 | 0.04 | 1.00 | 0.04 | 0.03 | 0.02 | 0.02 | -0.12 | -0.14 | -0.16 | -0.01 | -0.01 | -0.01 | -0.00 |
| 4 | 0.02 | 0.03 | 0.04 | 1.00 | 0.04 | 0.03 | 0.03 | -0.09 | -0.11 | -0.13 | -0.15 | -0.01 | -0.01 | -0.00 |
| 5 | 0.02 | 0.02 | 0.03 | 0.04 | 1.00 | 0.04 | 0.03 | -0.07 | -0.08 | -0.10 | -0.12 | -0.15 | -0.01 | -0.00 |
| 6 | 0.01 | 0.02 | 0.02 | 0.03 | 0.04 | 1.00 | 0.04 | -0.05 | -0.06 | -0.07 | -0.10 | -0.12 | -0.15 | -0.01 |
| 7 | 0.01 | 0.01 | 0.02 | 0.03 | 0.03 | 0.04 | 1.00 | -0.04 | -0.05 | -0.06 | -0.08 | -0.10 | -0.12 | -0.14 |
| 8 | -0.22 | -0.16 | -0.12 | -0.09 | -0.07 | -0.05 | -0.04 | 1.00 | 0.06 | 0.04 | 0.03 | 0.02 | 0.01 | 0.01 |
| 9 | -0.01 | -0.17 | -0.14 | -0.11 | -0.08 | -0.06 | -0.05 | 0.06 | 1.00 | 0.04 | 0.03 | 0.02 | 0.01 | 0.01 |
| 10 | -0.01 | -0.01 | -0.16 | -0.13 | -0.10 | -0.07 | -0.06 | 0.04 | 0.04 | 1.00 | 0.04 | 0.03 | 0.02 | 0.01 |
| 11 | -0.01 | -0.01 | -0.01 | -0.15 | -0.12 | -0.10 | -0.08 | 0.03 | 0.03 | 0.04 | 1.00 | 0.04 | 0.02 | 0.01 |
| 12 | -0.00 | -0.01 | -0.01 | -0.01 | -0.15 | -0.12 | -0.10 | 0.02 | 0.02 | 0.03 | 0.04 | 1.00 | 0.03 | 0.01 |
| 13 | -0.00 | -0.00 | -0.01 | -0.01 | -0.01 | -0.15 | -0.12 | 0.01 | 0.01 | 0.02 | 0.02 | 0.03 | 1.00 | 0.02 |
| 14 | -0.00 | -0.00 | -0.00 | -0.00 | -0.00 | -0.01 | -0.14 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 1.00 |

Table 53. Fall spawner ADAPT-VPA results using split cue indices, F-OLD model.

orthogonality offset 0.0034

mean square residuals 0.15358

| | par est | std err | cv | t-stat | % bias |
|---|---|---|---|---|---|
| 4 | 756724.655 | 330940.557 | 0.437333 | 2.286588 | 10.420605 |
| 5 | 327208.884 | 108489.953 | 0.331562 | 3.016029 | 5.995344 |
| 6 | 253068.451 | 77638.4343 | 0.306788 | 3.259577 | 4.793962 |
| 7 | 37877.7145 | 11773.2898 | 0.310824 | 3.217258 | 4.456474 |
| 8 | 53703.7577 | 16883.7588 | 0.314387 | 3.180794 | 4.242432 |
| 9 | 10746.7081 | 3312.41479 | 0.308226 | 3.244373 | 3.921310 |
| 10 | 24400.8629 | 7164.39054 | 0.293612 | 3.405853 | 3.458663 |
| 4 | 0.005418 | 0.000570 | 0.105262 | 9.500121 | 0.558557 |
| 5 | 0.007281 | 0.000766 | 0.105262 | 9.500121 | 0.558557 |
| 6 | 0.007883 | 0.000830 | 0.105262 | 9.500121 | 0.558557 |
| 7 | 0.010027 | 0.001055 | 0.105262 | 9.500121 | 0.558557 |
| 8 | 0.011673 | 0.001229 | 0.105262 | 9.500121 | 0.558557 |
| 9 | 0.010616 | 0.001117 | 0.105262 | 9.500121 | 0.558557 |
| 10 | 0.012070 | 0.001270 | 0.105262 | 9.500121 | 0.558557 |
| 4 | 0.001709 | 0.000313 | 0.182971 | 5.465343 | 0.847813 |
| 5 | 0.008038 | 0.001378 | 0.171493 | 5.831138 | 0.854002 |
| 6 | 0.011647 | 0.001950 | 0.167391 | 5.974038 | 0.979437 |
| 7 | 0.013912 | 0.002307 | 0.165805 | 6.031184 | 1.159437 |
| 8 | 0.013742 | 0.002248 | 0.163588 | 6.112934 | 1.314735 |
| 9 | 0.014983 | 0.002387 | 0.159326 | 6.276437 | 1.356687 |
| 10 | 0.014745 | 0.002273 | 0.154134 | 6.487851 | 1.294718 |

parameter correltion matrix

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | 0.15 | 0.13 | 0.11 | 0.09 | 0.07 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.42 | -0.10 | -0.08 | -0.06 | -0.05 | -0.03 | -0.02 |
| 2 | 0.15 | 1.00 | 0.17 | 0.15 | 0.12 | 0.10 | 0.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.35 | -0.35 | -0.11 | -0.08 | -0.06 | -0.04 | -0.02 |
| 3 | 0.13 | 0.17 | 1.00 | 0.18 | 0.15 | 0.12 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.30 | -0.31 | -0.33 | -0.10 | -0.08 | -0.05 | -0.03 |
| 4 | 0.11 | 0.15 | 0.18 | 1.00 | 0.18 | 0.15 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.25 | -0.27 | -0.29 | -0.32 | -0.10 | -0.06 | -0.03 |
| 5 | 0.09 | 0.12 | 0.15 | 0.18 | 1.00 | 0.18 | 0.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.21 | -0.22 | -0.25 | -0.28 | -0.32 | -0.08 | -0.04 |
| 6 | 0.07 | 0.10 | 0.12 | 0.15 | 0.18 | 1.00 | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.17 | -0.17 | -0.20 | -0.24 | -0.27 | -0.30 | -0.04 |
| 7 | 0.06 | 0.08 | 0.10 | 0.12 | 0.15 | 0.17 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.14 | -0.14 | -0.16 | -0.19 | -0.23 | -0.25 | -0.26 |
| 8 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 9 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 13 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 14 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 15 | -0.42 | -0.35 | -0.30 | -0.25 | -0.21 | -0.17 | -0.14 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.24 | 0.18 | 0.14 | 0.11 | 0.07 | 0.04 |
| 16 | -0.10 | -0.35 | -0.31 | -0.27 | -0.22 | -0.17 | -0.14 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.24 | 1.00 | 0.19 | 0.15 | 0.11 | 0.07 | 0.04 |
| 17 | -0.08 | -0.11 | -0.33 | -0.29 | -0.25 | -0.20 | -0.16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.18 | 0.19 | 1.00 | 0.17 | 0.13 | 0.08 | 0.04 |
| 18 | -0.06 | -0.08 | -0.10 | -0.32 | -0.28 | -0.24 | -0.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.14 | 0.15 | 0.17 | 1.00 | 0.15 | 0.10 | 0.05 |
| 19 | -0.05 | -0.06 | -0.08 | -0.10 | -0.32 | -0.27 | -0.23 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.11 | 0.11 | 0.13 | 0.15 | 1.00 | 0.12 | 0.06 |
| 20 | -0.03 | -0.04 | -0.05 | -0.06 | -0.08 | -0.30 | -0.25 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.07 | 0.07 | 0.08 | 0.10 | 0.12 | 1.00 | 0.06 |
| 21 | -0.02 | -0.02 | -0.03 | -0.03 | -0.04 | -0.04 | -0.26 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.04 | 0.04 | 0.05 | 0.06 | 0.06 | 1.00 |

Table 54. Fall spawner ADAPT-VPA results using split CUE FRATIO model.

APPROXIMATE STATISTICS ASSUMING LINEARITY NEAR SOLUTION

ORTHOGONALITY OFFSET......... 0.001654
MEAN SQUARE RESIDUALS ....... 0.148121

Estimates for parameters

| PAR. EST. | STD. ERR. | REL. ERR. | BIAS | REL. BIAS |
|---|---|---|---|---|
| 1.36E1 | 4.30E-1 | 0.032 | 1.18E-2 | 0.001 |
| 1.27E1 | 3.29E-1 | 0.026 | 9.42E-3 | 0.001 |
| 1.25E1 | 3.08E-1 | 0.025 | 6.68E-3 | 0.001 |
| 1.06E1 | 3.17E-1 | 0.030 | 3.64E-3 | 0.000 |
| 1.09E1 | 3.29E-1 | 0.030 | 1.64E-3 | 0.000 |
| 9.31E0 | 3.33E-1 | 0.036 | 8.44E-4 | 0.000 |
| 1.11E1 | 3.34E-1 | 0.030 | -3.63E-3 | 0.000 |
| 2.07E-1 | 1.05E-1 | 0.509 | 5.50E-3 | 0.027 |
| -5.19E0 | 1.05E-1 | -0.020 | -2.54E-3 | 0.000 |
| -4.88E0 | 1.06E-1 | -0.022 | -2.51E-3 | 0.001 |
| -4.79E0 | 1.07E-1 | -0.022 | -2.52E-3 | 0.001 |
| -4.53E0 | 1.09E-1 | -0.024 | -2.69E-3 | 0.001 |
| -4.35E0 | 1.13E-1 | -0.026 | -2.92E-3 | 0.001 |
| -4.41E0 | 1.22E-1 | -0.028 | -3.48E-3 | 0.001 |
| -4.27E0 | 1.28E-1 | -0.030 | -4.09E-3 | 0.001 |
| -6.39E0 | 1.85E-1 | -0.029 | -1.24E-2 | 0.002 |
| -4.84E0 | 1.77E-1 | -0.037 | -1.12E-2 | 0.002 |
| -4.47E0 | 1.77E-1 | -0.040 | -1.04E-2 | 0.002 |
| -4.29E0 | 1.83E-1 | -0.043 | -9.64E-3 | 0.002 |
| -4.31E0 | 1.91E-1 | -0.044 | -8.65E-3 | 0.002 |
| -4.22E0 | 1.99E-1 | -0.047 | -7.75E-3 | 0.002 |
| -4.23E0 | 2.09E-1 | -0.049 | -7.33E-3 | 0.002 |

Parameters in linear scale

| PAR. EST. | STD. ERR. | REL. ERR. | BIAS | REL. BIAS |
|---|---|---|---|---|
| 7.69E5 | 3.31E5 | 0.430 | 8.03E4 | 0.104 |
| 3.32E5 | 1.09E5 | 0.329 | 2.11E4 | 0.064 |
| 2.57E5 | 7.90E4 | 0.308 | 1.39E4 | 0.054 |
| 3.85E4 | 1.22E4 | 0.317 | 2.07E3 | 0.054 |
| 5.48E4 | 1.80E4 | 0.329 | 3.05E3 | 0.056 |
| 1.10E4 | 3.67E3 | 0.333 | 6.20E2 | 0.056 |
| 6.50E4 | 2.17E4 | 0.334 | 3.39E3 | 0.052 |
| 1.23E0 | 1.29E-1 | 0.105 | 1.36E-2 | 0.011 |
| 5.59E-3 | 5.87E-4 | 0.105 | 1.67E-5 | 0.003 |
| 7.59E-3 | 8.00E-4 | 0.106 | 2.32E-5 | 0.003 |
| 8.32E-3 | 8.86E-4 | 0.107 | 2.62E-5 | 0.003 |
| 1.08E-2 | 1.17E-3 | 0.109 | 3.48E-5 | 0.003 |
| 1.29E-2 | 1.45E-3 | 0.113 | 4.47E-5 | 0.003 |
| 1.21E-2 | 1.47E-3 | 0.122 | 4.76E-5 | 0.004 |
| 1.40E-2 | 1.79E-3 | 0.128 | 5.71E-5 | 0.004 |
| 1.68E-3 | 3.12E-4 | 0.185 | 7.91E-6 | 0.005 |
| 7.93E-3 | 1.40E-3 | 0.177 | 3.47E-5 | 0.004 |
| 1.15E-2 | 2.04E-3 | 0.177 | 6.06E-5 | 0.005 |
| 1.37E-2 | 2.50E-3 | 0.183 | 9.75E-5 | 0.007 |
| 1.34E-2 | 2.56E-3 | 0.191 | 1.29E-4 | 0.010 |
| 1.47E-2 | 2.91E-3 | 0.199 | 1.76E-4 | 0.012 |
| 1.45E-2 | 3.03E-3 | 0.209 | 2.10E-4 | 0.014 |

Table 55. Fall spawner parameter correlations from ADAPT-VPA using split CUE FRATIO model.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 0.16 | 0.15 | 0.13 | 0.12 | 0.11 | 0.12 | -0.02 | -0.02 | -0.02 | -0.02 | -0.02 | -0.02 | -0.02 | -0.02 | -0.43 | -0.13 | -0.11 | -0.11 | -0.1 | -0.09 | -0.09 |
| 2 | 0.16 | 1 | 0.21 | 0.19 | 0.17 | 0.16 | 0.18 | -0.03 | -0.03 | -0.03 | -0.02 | -0.02 | -0.02 | -0.03 | -0.03 | -0.38 | -0.38 | -0.16 | -0.15 | -0.14 | -0.14 | -0.13 |
| 3 | 0.15 | 0.21 | 1 | 0.24 | 0.22 | 0.21 | 0.24 | -0.05 | -0.04 | -0.03 | -0.03 | -0.03 | -0.03 | -0.04 | -0.04 | -0.34 | -0.36 | -0.38 | -0.2 | -0.19 | -0.18 | -0.17 |
| 4 | 0.13 | 0.19 | 0.24 | 1 | 0.27 | 0.26 | 0.31 | -0.06 | -0.05 | -0.04 | -0.04 | -0.04 | -0.04 | -0.05 | -0.05 | -0.31 | -0.34 | -0.37 | -0.41 | -0.24 | -0.23 | -0.22 |
| 5 | 0.12 | 0.17 | 0.22 | 0.27 | 1 | 0.31 | 0.38 | -0.08 | -0.06 | -0.05 | -0.05 | -0.05 | -0.06 | -0.06 | -0.07 | -0.28 | -0.31 | -0.36 | -0.4 | -0.44 | -0.28 | -0.27 |
| 6 | 0.11 | 0.16 | 0.21 | 0.26 | 0.31 | 1 | 0.46 | -0.1 | -0.07 | -0.07 | -0.06 | -0.06 | -0.07 | -0.08 | -0.08 | -0.26 | -0.29 | -0.33 | -0.39 | -0.44 | -0.48 | -0.33 |
| 7 | 0.12 | 0.18 | 0.24 | 0.31 | 0.38 | 0.46 | 1 | -0.26 | -0.16 | -0.15 | -0.15 | -0.15 | -0.17 | -0.19 | -0.2 | -0.28 | -0.34 | -0.41 | -0.49 | -0.58 | -0.65 | -0.72 |
| 8 | -0.02 | -0.03 | -0.05 | -0.06 | -0.08 | -0.1 | -0.26 | 1 | 0.16 | 0.2 | 0.25 | 0.32 | 0.41 | 0.53 | 0.59 | 0.05 | 0.06 | 0.08 | 0.1 | 0.13 | 0.16 | 0.2 |
| 9 | -0.02 | -0.03 | -0.04 | -0.05 | -0.06 | -0.07 | -0.16 | 0.16 | 1 | 0.04 | 0.05 | 0.06 | 0.07 | 0.09 | 0.1 | 0.04 | 0.05 | 0.06 | 0.08 | 0.09 | 0.1 | 0.12 |
| 10 | -0.02 | -0.03 | -0.03 | -0.04 | -0.05 | -0.07 | -0.15 | 0.2 | 0.04 | 1 | 0.06 | 0.07 | 0.09 | 0.11 | 0.12 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.1 | 0.11 |
| 11 | -0.02 | -0.02 | -0.03 | -0.04 | -0.05 | -0.06 | -0.15 | 0.25 | 0.05 | 0.06 | 1 | 0.08 | 0.11 | 0.14 | 0.15 | 0.04 | 0.04 | 0.05 | 0.07 | 0.08 | 0.09 | 0.11 |
| 12 | -0.02 | -0.02 | -0.03 | -0.04 | -0.05 | -0.06 | -0.15 | 0.32 | 0.06 | 0.07 | 0.08 | 1 | 0.14 | 0.17 | 0.19 | 0.04 | 0.04 | 0.06 | 0.07 | 0.08 | 0.1 | 0.11 |
| 13 | -0.02 | -0.02 | -0.03 | -0.04 | -0.06 | -0.07 | -0.17 | 0.41 | 0.07 | 0.09 | 0.11 | 0.14 | 1 | 0.22 | 0.25 | 0.04 | 0.05 | 0.06 | 0.07 | 0.09 | 0.1 | 0.13 |
| 14 | -0.02 | -0.03 | -0.04 | -0.05 | -0.06 | -0.08 | -0.19 | 0.53 | 0.09 | 0.11 | 0.14 | 0.17 | 0.22 | 1 | 0.32 | 0.04 | 0.05 | 0.07 | 0.08 | 0.1 | 0.12 | 0.15 |
| 15 | -0.02 | -0.03 | -0.04 | -0.05 | -0.07 | -0.08 | -0.2 | 0.59 | 0.1 | 0.12 | 0.15 | 0.19 | 0.25 | 0.32 | 1 | 0.04 | 0.05 | 0.07 | 0.09 | 0.1 | 0.13 | 0.15 |
| 16 | -0.43 | -0.38 | -0.34 | -0.31 | -0.28 | -0.26 | -0.28 | 0.05 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 1 | 0.3 | 0.26 | 0.24 | 0.23 | 0.21 | 0.2 |
| 17 | -0.13 | -0.38 | -0.36 | -0.34 | -0.31 | -0.29 | -0.34 | 0.06 | 0.05 | 0.05 | 0.04 | 0.04 | 0.05 | 0.05 | 0.05 | 0.3 | 1 | 0.29 | 0.28 | 0.26 | 0.25 | 0.24 |
| 18 | -0.11 | -0.16 | -0.38 | -0.37 | -0.36 | -0.33 | -0.41 | 0.08 | 0.06 | 0.06 | 0.05 | 0.06 | 0.06 | 0.07 | 0.07 | 0.26 | 0.29 | 1 | 0.32 | 0.31 | 0.3 | 0.29 |
| 19 | -0.11 | -0.15 | -0.2 | -0.41 | -0.4 | -0.39 | -0.49 | 0.1 | 0.08 | 0.07 | 0.07 | 0.07 | 0.07 | 0.08 | 0.09 | 0.24 | 0.28 | 0.32 | 1 | 0.37 | 0.36 | 0.35 |
| 20 | -0.1 | -0.14 | -0.19 | -0.24 | -0.44 | -0.44 | -0.58 | 0.13 | 0.09 | 0.08 | 0.08 | 0.08 | 0.09 | 0.1 | 0.1 | 0.23 | 0.26 | 0.31 | 0.37 | 1 | 0.42 | 0.41 |
| 21 | -0.09 | -0.14 | -0.18 | -0.23 | -0.28 | -0.48 | -0.65 | 0.16 | 0.1 | 0.1 | 0.09 | 0.1 | 0.1 | 0.12 | 0.13 | 0.21 | 0.25 | 0.3 | 0.36 | 0.42 | 1 | 0.47 |
| 22 | -0.09 | -0.13 | -0.17 | -0.22 | -0.27 | -0.33 | -0.72 | 0.2 | 0.12 | 0.11 | 0.11 | 0.11 | 0.13 | 0.15 | 0.15 | 0.2 | 0.24 | 0.29 | 0.35 | 0.41 | 0.47 | 1 |

Table 56. Fall spawner ADAPT-VPA FRATIO split CUE (ages 4-10) and acoustic (ages 4-9).

APPROXIMATE STATISTICS ASSUMING LINEARITY NEAR SOLUTION

ORTHOGONALITY OFFSET......... 0.001745
MEAN SQUARE RESIDUALS ....... 0.209665

Estimates for parameters

| PAR. EST. | STD. ERR. | REL. ERR. | BIAS | REL. BIAS |
|---|---|---|---|---|
| 1.24E1 | 3.76E-1 | 0.030 | 1.23E-2 | 0.001 |
| 1.21E1 | 2.97E-1 | 0.025 | 1.05E-2 | 0.001 |
| 1.16E1 | 3.10E-1 | 0.027 | 7.37E-3 | 0.001 |
| 9.83E0 | 3.32E-1 | 0.034 | 5.02E-3 | 0.001 |
| 1.09E1 | 2.97E-1 | 0.027 | 6.46E-3 | 0.001 |
| 9.56E0 | 2.91E-1 | 0.030 | 6.33E-3 | 0.001 |
| 1.08E1 | 3.73E-1 | 0.034 | -6.68E-3 | -0.001 |
| 2.11E-1 | 1.25E-1 | 0.592 | 7.82E-3 | 0.037 |
| -5.60E0 | 2.40E-1 | -0.043 | -1.39E-2 | 0.002 |
| -5.48E0 | 2.34E-1 | -0.043 | -1.33E-2 | 0.002 |
| -5.68E0 | 2.39E-1 | -0.042 | -1.28E-2 | 0.002 |
| -5.49E0 | 2.49E-1 | -0.045 | -1.15E-2 | 0.002 |
| -5.73E0 | 2.58E-1 | -0.045 | -1.10E-2 | 0.002 |
| -5.95E0 | 2.69E-1 | -0.045 | -1.01E-2 | 0.002 |
| -5.18E0 | 1.24E-1 | -0.024 | -2.65E-3 | 0.001 |
| -4.87E0 | 1.25E-1 | -0.026 | -2.68E-3 | 0.001 |
| -4.78E0 | 1.26E-1 | -0.026 | -2.77E-3 | 0.001 |
| -4.52E0 | 1.29E-1 | -0.028 | -3.01E-3 | 0.001 |
| -4.35E0 | 1.33E-1 | -0.031 | -3.33E-3 | 0.001 |
| -4.41E0 | 1.43E-1 | -0.033 | -4.07E-3 | 0.001 |
| -4.26E0 | 1.50E-1 | -0.035 | -4.90E-3 | 0.001 |
| -6.03E0 | 1.99E-1 | -0.033 | -1.29E-2 | 0.002 |
| -4.61E0 | 1.96E-1 | -0.042 | -1.20E-2 | 0.003 |
| -4.28E0 | 1.99E-1 | -0.047 | -1.14E-2 | 0.003 |
| -4.19E0 | 2.06E-1 | -0.049 | -1.06E-2 | 0.003 |
| -4.29E0 | 2.12E-1 | -0.049 | -1.01E-2 | 0.002 |
| -4.18E0 | 2.19E-1 | -0.052 | -9.30E-3 | 0.002 |
| -4.13E0 | 2.31E-1 | -0.056 | -8.08E-3 | 0.002 |

Parameters in linear scale

| PAR. EST. | STD. ERR. | REL. ERR. | BIAS | REL. BIAS |
|---|---|---|---|---|
| 2.32E5 | 8.73E4 | 0.376 | 1.93E4 | 0.083 |
| 1.85E5 | 5.50E4 | 0.297 | 1.01E4 | 0.055 |
| 1.11E5 | 3.45E4 | 0.310 | 6.17E3 | 0.055 |
| 1.87E4 | 6.19E3 | 0.332 | 1.12E3 | 0.060 |
| 5.47E4 | 1.63E4 | 0.297 | 2.77E3 | 0.051 |
| 1.42E4 | 4.12E3 | 0.291 | 6.88E2 | 0.049 |
| 5.15E4 | 1.92E4 | 0.373 | 3.24E3 | 0.063 |
| 1.23E0 | 1.54E-1 | 0.125 | 1.93E-2 | 0.016 |
| 3.70E-3 | 8.89E-4 | 0.240 | 5.53E-5 | 0.015 |
| 4.17E-3 | 9.75E-4 | 0.234 | 5.86E-5 | 0.014 |
| 3.43E-3 | 8.20E-4 | 0.239 | 5.43E-5 | 0.016 |
| 4.12E-3 | 1.03E-3 | 0.249 | 8.04E-5 | 0.019 |
| 3.25E-3 | 8.37E-4 | 0.258 | 7.24E-5 | 0.022 |
| 2.61E-3 | 7.03E-4 | 0.269 | 6.80E-5 | 0.026 |
| 5.64E-3 | 7.01E-4 | 0.124 | 2.86E-5 | 0.005 |
| 7.64E-3 | 9.54E-4 | 0.125 | 3.91E-5 | 0.005 |
| 8.38E-3 | 1.06E-3 | 0.126 | 4.33E-5 | 0.005 |
| 1.08E-2 | 1.39E-3 | 0.129 | 5.70E-5 | 0.005 |
| 1.29E-2 | 1.73E-3 | 0.133 | 7.22E-5 | 0.006 |
| 1.22E-2 | 1.75E-3 | 0.143 | 7.56E-5 | 0.006 |
| 1.41E-2 | 2.12E-3 | 0.150 | 9.01E-5 | 0.006 |
| 2.40E-3 | 4.79E-4 | 0.199 | 1.68E-5 | 0.007 |
| 9.93E-3 | 1.94E-3 | 0.196 | 7.05E-5 | 0.007 |
| 1.39E-2 | 2.77E-3 | 0.199 | 1.18E-4 | 0.008 |
| 1.52E-2 | 3.14E-3 | 0.206 | 1.62E-4 | 0.011 |
| 1.37E-2 | 2.91E-3 | 0.212 | 1.69E-4 | 0.012 |
| 1.52E-2 | 3.34E-3 | 0.219 | 2.24E-4 | 0.015 |
| 1.60E-2 | 3.70E-3 | 0.231 | 2.97E-4 | 0.019 |

Table 57. Fall spawner ADAPT-VPA FRATIO split CUE and acoustic parameter correlations.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 0.19 | 0.17 | 0.15 | 0.15 | 0.13 | 0.13 | -0.02 | -0.4 | -0.12 | -0.11 | -0.11 | -0.1 | -0.09 | -0.02 | -0.01 | -0.01 | -0.01 | -0.01 | -0.02 | -0.02 | -0.35 | -0.12 | -0.11 | -0.1 | -0.09 | -0.09 | -0.09 |
| 2 | 0.19 | 1 | 0.24 | 0.22 | 0.22 | 0.2 | 0.2 | -0.03 | -0.34 | -0.36 | -0.16 | -0.16 | -0.15 | -0.14 | -0.02 | -0.02 | -0.02 | -0.02 | -0.02 | -0.02 | -0.03 | -0.31 | -0.32 | -0.16 | -0.15 | -0.14 | -0.13 | -0.13 |
| 3 | 0.17 | 0.24 | 1 | 0.29 | 0.29 | 0.27 | 0.27 | -0.05 | -0.29 | -0.33 | -0.38 | -0.21 | -0.21 | -0.2 | -0.03 | -0.03 | -0.03 | -0.03 | -0.03 | -0.03 | -0.04 | -0.28 | -0.3 | -0.35 | -0.2 | -0.19 | -0.18 | -0.18 |
| 4 | 0.15 | 0.22 | 0.29 | 1 | 0.35 | 0.34 | 0.36 | -0.06 | -0.25 | -0.29 | -0.35 | -0.43 | -0.26 | -0.26 | -0.04 | -0.04 | -0.04 | -0.04 | -0.04 | -0.05 | -0.05 | -0.26 | -0.28 | -0.33 | -0.39 | -0.25 | -0.24 | -0.24 |
| 5 | 0.15 | 0.22 | 0.29 | 0.35 | 1 | 0.41 | 0.46 | -0.08 | -0.25 | -0.29 | -0.35 | -0.41 | -0.45 | -0.32 | -0.05 | -0.05 | -0.05 | -0.05 | -0.05 | -0.06 | -0.06 | -0.26 | -0.29 | -0.34 | -0.38 | -0.42 | -0.3 | -0.3 |
| 6 | 0.13 | 0.2 | 0.27 | 0.34 | 0.41 | 1 | 0.55 | -0.11 | -0.18 | -0.26 | -0.34 | -0.41 | -0.46 | -0.49 | -0.07 | -0.06 | -0.06 | -0.06 | -0.07 | -0.08 | -0.08 | -0.25 | -0.28 | -0.33 | -0.39 | -0.43 | -0.45 | -0.36 |
| 7 | 0.13 | 0.2 | 0.27 | 0.36 | 0.46 | 0.55 | 1 | -0.27 | -0.19 | -0.24 | -0.34 | -0.44 | -0.54 | -0.62 | -0.13 | -0.12 | -0.12 | -0.13 | -0.15 | -0.18 | -0.19 | -0.25 | -0.3 | -0.37 | -0.45 | -0.53 | -0.59 | -0.66 |
| 8 | -0.02 | -0.03 | -0.05 | -0.06 | -0.08 | -0.11 | -0.27 | 1 | 0.03 | 0.04 | 0.05 | 0.07 | 0.1 | 0.12 | 0.15 | 0.18 | 0.23 | 0.3 | 0.4 | 0.52 | 0.58 | 0.04 | 0.05 | 0.07 | 0.08 | 0.1 | 0.13 | 0.17 |
| 9 | -0.4 | -0.34 | -0.29 | -0.25 | -0.25 | -0.18 | -0.19 | 0.03 | 1 | 0.21 | 0.18 | 0.17 | 0.15 | 0.13 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.03 | 0.26 | 0.19 | 0.17 | 0.16 | 0.14 | 0.13 | 0.12 |
| 10 | -0.12 | -0.36 | -0.33 | -0.29 | -0.29 | -0.26 | -0.24 | 0.04 | 0.21 | 1 | 0.22 | 0.21 | 0.19 | 0.18 | 0.03 | 0.03 | 0.02 | 0.02 | 0.03 | 0.03 | 0.03 | 0.21 | 0.22 | 0.2 | 0.19 | 0.18 | 0.17 | 0.16 |
| 11 | -0.11 | -0.16 | -0.38 | -0.35 | -0.35 | -0.34 | -0.34 | 0.05 | 0.18 | 0.22 | 1 | 0.26 | 0.25 | 0.24 | 0.04 | 0.04 | 0.03 | 0.03 | 0.04 | 0.04 | 0.04 | 0.19 | 0.22 | 0.25 | 0.25 | 0.24 | 0.23 | 0.22 |
| 12 | -0.11 | -0.16 | -0.21 | -0.43 | -0.41 | -0.41 | -0.44 | 0.07 | 0.17 | 0.21 | 0.26 | 1 | 0.32 | 0.31 | 0.05 | 0.05 | 0.04 | 0.05 | 0.05 | 0.06 | 0.06 | 0.19 | 0.22 | 0.26 | 0.31 | 0.3 | 0.29 | 0.29 |
| 13 | -0.1 | -0.15 | -0.21 | -0.26 | -0.45 | -0.46 | -0.54 | 0.1 | 0.15 | 0.19 | 0.25 | 0.32 | 1 | 0.37 | 0.07 | 0.06 | 0.06 | 0.06 | 0.06 | 0.07 | 0.08 | 0.19 | 0.22 | 0.26 | 0.31 | 0.35 | 0.35 | 0.36 |
| 14 | -0.09 | -0.14 | -0.2 | -0.26 | -0.32 | -0.49 | -0.62 | 0.12 | 0.13 | 0.18 | 0.24 | 0.31 | 0.37 | 1 | 0.08 | 0.07 | 0.07 | 0.07 | 0.08 | 0.09 | 0.1 | 0.18 | 0.21 | 0.26 | 0.31 | 0.36 | 0.4 | 0.41 |
| 15 | -0.02 | -0.02 | -0.03 | -0.04 | -0.05 | -0.07 | -0.13 | 0.15 | 0.02 | 0.03 | 0.04 | 0.05 | 0.07 | 0.08 | 1 | 0.03 | 0.04 | 0.05 | 0.06 | 0.08 | 0.09 | 0.03 | 0.04 | 0.04 | 0.05 | 0.06 | 0.07 | 0.09 |
| 16 | -0.01 | -0.02 | -0.03 | -0.04 | -0.05 | -0.06 | -0.12 | 0.18 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.03 | 1 | 0.05 | 0.06 | 0.08 | 0.1 | 0.11 | 0.03 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 |
| 17 | -0.01 | -0.02 | -0.03 | -0.04 | -0.05 | -0.06 | -0.12 | 0.23 | 0.02 | 0.02 | 0.03 | 0.04 | 0.06 | 0.07 | 0.04 | 0.05 | 1 | 0.07 | 0.09 | 0.12 | 0.14 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 |
| 18 | -0.01 | -0.02 | -0.03 | -0.04 | -0.05 | -0.06 | -0.13 | 0.3 | 0.02 | 0.02 | 0.03 | 0.05 | 0.06 | 0.07 | 0.05 | 0.06 | 0.07 | 1 | 0.12 | 0.16 | 0.18 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.09 |
| 19 | -0.01 | -0.02 | -0.03 | -0.04 | -0.05 | -0.07 | -0.15 | 0.4 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.08 | 0.06 | 0.08 | 0.09 | 0.12 | 1 | 0.21 | 0.23 | 0.03 | 0.03 | 0.04 | 0.05 | 0.06 | 0.08 | 0.1 |
| 20 | -0.02 | -0.02 | -0.03 | -0.05 | -0.06 | -0.08 | -0.18 | 0.52 | 0.02 | 0.03 | 0.04 | 0.06 | 0.07 | 0.09 | 0.08 | 0.1 | 0.12 | 0.16 | 0.21 | 1 | 0.3 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.09 | 0.12 |
| 21 | -0.02 | -0.03 | -0.04 | -0.05 | -0.06 | -0.08 | -0.19 | 0.58 | 0.03 | 0.03 | 0.04 | 0.06 | 0.08 | 0.1 | 0.09 | 0.11 | 0.14 | 0.18 | 0.23 | 0.3 | 1 | 0.03 | 0.04 | 0.05 | 0.07 | 0.08 | 0.1 | 0.12 |
| 22 | -0.35 | -0.31 | -0.28 | -0.26 | -0.26 | -0.25 | -0.25 | 0.04 | 0.26 | 0.21 | 0.19 | 0.19 | 0.19 | 0.18 | 0.03 | 0.03 | 0.02 | 0.02 | 0.03 | 0.03 | 0.03 | 1 | 0.2 | 0.19 | 0.18 | 0.18 | 0.17 | 0.16 |
| 23 | -0.12 | -0.32 | -0.3 | -0.28 | -0.29 | -0.28 | -0.3 | 0.05 | 0.19 | 0.22 | 0.22 | 0.22 | 0.22 | 0.21 | 0.04 | 0.03 | 0.03 | 0.03 | 0.03 | 0.04 | 0.04 | 0.2 | 1 | 0.21 | 0.21 | 0.2 | 0.2 | 0.2 |
| 24 | -0.11 | -0.16 | -0.35 | -0.33 | -0.34 | -0.33 | -0.37 | 0.07 | 0.17 | 0.2 | 0.25 | 0.26 | 0.26 | 0.26 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.05 | 0.05 | 0.19 | 0.21 | 1 | 0.25 | 0.25 | 0.24 | 0.24 |
| 25 | -0.1 | -0.15 | -0.2 | -0.39 | -0.38 | -0.39 | -0.45 | 0.08 | 0.16 | 0.19 | 0.25 | 0.31 | 0.31 | 0.31 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.06 | 0.07 | 0.18 | 0.21 | 0.25 | 1 | 0.29 | 0.29 | 0.3 |
| 26 | -0.09 | -0.14 | -0.19 | -0.25 | -0.42 | -0.43 | -0.53 | 0.1 | 0.14 | 0.18 | 0.24 | 0.3 | 0.35 | 0.36 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.07 | 0.08 | 0.18 | 0.2 | 0.25 | 0.29 | 1 | 0.34 | 0.35 |
| 27 | -0.09 | -0.13 | -0.18 | -0.24 | -0.3 | -0.45 | -0.59 | 0.13 | 0.13 | 0.17 | 0.23 | 0.29 | 0.35 | 0.4 | 0.07 | 0.07 | 0.07 | 0.07 | 0.08 | 0.09 | 0.1 | 0.17 | 0.2 | 0.24 | 0.29 | 0.34 | 1 | 0.39 |
| 28 | -0.09 | -0.13 | -0.18 | -0.24 | -0.3 | -0.36 | -0.66 | 0.17 | 0.12 | 0.16 | 0.22 | 0.29 | 0.36 | 0.41 | 0.09 | 0.08 | 0.08 | 0.09 | 0.1 | 0.12 | 0.12 | 0.16 | 0.2 | 0.24 | 0.3 | 0.35 | 0.39 | 1 |

Table 58. Fall spawner population beginning of year numbers, biomass, and annual fishing mortality from ADAPT-VPA split CUE FRATIO model.

## Numbers

| | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 136355 | 368380 | 316616 | 496143 | 748620 | 461266 | 494853 | 707008 | 471016 | 323739 | 351015 | 1164018 | 769995 | 225689 | 661267 | 259373 | 995975 | 810363 | | | | |
| 3 | 142415 | 110242 | 293872 | 256437 | 405506 | 611032 | 376317 | 404220 | 577874 | 384719 | 264261 | 283519 | 952338 | 630362 | 184777 | 541297 | 212313 | 815422 | 663457 | | | |
| 4 | 96022 | 93564 | 75506 | 197377 | 200193 | 322679 | 492400 | 303725 | 326304 | 468486 | 305469 | 212160 | 230596 | 772637 | 510131 | 150479 | 441239 | 173548 | 664874 | 540772 | 870240 | 264107 |
| 5 | 77463 | 47626 | 48534 | 41182 | 129751 | 145349 | 238409 | 374624 | 233294 | 230865 | 343926 | 228035 | 156834 | 163521 | 576503 | 400905 | 118461 | 344718 | 134862 | 513913 | 420535 | 689093 |
| 6 | 27348 | 38628 | 19299 | 22619 | 26852 | 87525 | 106591 | 177922 | 277382 | 168266 | 158142 | 238321 | 160555 | 103878 | 119114 | 408823 | 296007 | 82877 | 223799 | 88031 | 352882 | 310704 |
| 7 | 21917 | 17248 | 14058 | 7831 | 15659 | 16945 | 58326 | 77629 | 127027 | 188821 | 110990 | 106138 | 161649 | 103007 | 76708 | 82695 | 292308 | 191629 | 47134 | 132553 | 57870 | 242671 |
| 8 | 29030 | 12831 | 9101 | 2697 | 5201 | 10307 | 11560 | 41518 | 52717 | 79403 | 114211 | 70502 | 70210 | 79295 | 72864 | 53565 | 58964 | 166739 | 105567 | 25560 | 84110 | 36375 |
| 9 | 4683 | 10572 | 6237 | 1585 | 1407 | 3192 | 6884 | 8115 | 28299 | 32337 | 44899 | 73270 | 44659 | 40058 | 51191 | 50022 | 38532 | 35058 | 89188 | 62291 | 16424 | 51760 |
| 10 | 2854 | 2033 | 3185 | 1117 | 618 | 686 | 2079 | 5143 | 4898 | 17758 | 15987 | 26469 | 47608 | 24363 | 26830 | 31956 | 35850 | 21591 | 19806 | 49205 | 43006 | 10419 |
| 11 | 29240 | 12870 | 1737 | 450 | 815 | 818 | 898 | 2144 | 4389 | 6019 | 13284 | 16585 | 26275 | 40541 | 43974 | 41451 | 47462 | 43016 | 31885 | 25880 | 50339 | 61617 |
| 4+ | 288557 | 235373 | 177658 | 274858 | 380496 | 587500 | 917148 | 990819 | 1054311 | 1191956 | 1106908 | 971481 | 898386 | 1327299 | 1477313 | 1219895 | 1328824 | 1059176 | 1317116 | 1438205 | 1895406 | 1666746 |
| 5+ | 192535 | 141809 | 102151 | 77482 | 180303 | 264822 | 424747 | 687094 | 728007 | 723470 | 801439 | 759321 | 667790 | 554662 | 967182 | 1069416 | 887585 | 885628 | 652242 | 897432 | 1025167 | 1402639 |
| 7+ | 87724 | 55554 | 34317 | 13681 | 23700 | 31948 | 79747 | 134548 | 217331 | 324338 | 299371 | 292965 | 350401 | 287264 | 271566 | 259688 | 473116 | 458033 | 293580 | 295489 | 251750 | 402842 |

## Biomass

| | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 13785 | 40780 | 35144 | 51500 | 86391 | 63701 | 62005 | 78902 | 53790 | 25802 | 33662 | 122688 | 121351 | 18967 | 43710 | 13539 | 90833 | 69205 | | | | |
| 3 | 19117 | 13876 | 38320 | 37553 | 56782 | 88965 | 63164 | 65304 | 78440 | 60730 | 31696 | 36402 | 135652 | 97564 | 23247 | 52424 | 17974 | 85390 | 75311 | | | |
| 4 | 17337 | 16426 | 13239 | 37651 | 44417 | 69119 | 104355 | 67540 | 72699 | 93469 | 72365 | 44924 | 46974 | 158205 | 90640 | 24165 | 71568 | 27413 | 102872 | 92937 | 152455 | 44174 |
| 5 | 18214 | 10965 | 11241 | 10031 | 34184 | 38405 | 61707 | 98700 | 60058 | 59132 | 90154 | 61598 | 40796 | 40139 | 133308 | 87261 | 24090 | 67735 | 27754 | 109741 | 88476 | 144647 |
| 6 | 7399 | 10090 | 4786 | 6840 | 8497 | 26539 | 31085 | 52956 | 82937 | 48765 | 46695 | 71543 | 48383 | 29276 | 30859 | 101241 | 70954 | 18778 | 51147 | 21469 | 85330 | 73971 |
| 7 | 6365 | 4887 | 3844 | 2462 | 5686 | 5726 | 19130 | 25653 | 42181 | 61484 | 36086 | 34767 | 53266 | 33280 | 22337 | 22012 | 77154 | 49924 | 11696 | 34267 | 15511 | 62665 |
| 8 | 8962 | 3992 | 2502 | 917 | 1981 | 3794 | 4246 | 14658 | 18829 | 27774 | 39708 | 24111 | 24619 | 27400 | 23978 | 15467 | 16650 | 47114 | 30006 | 7187 | 23308 | 10216 |
| 9 | 1536 | 3714 | 1956 | 506 | 549 | 1237 | 2646 | 3200 | 10629 | 11908 | 16850 | 26556 | 15807 | 14370 | 17601 | 16535 | 11932 | 10925 | 27057 | 19186 | 5095 | 15901 |
| 10 | 996 | 712 | 1098 | 394 | 234 | 251 | 774 | 1897 | 1876 | 6871 | 6224 | 10345 | 17917 | 9002 | 9379 | 10230 | 12167 | 7393 | 6612 | 16193 | 14043 | 3437 |
| 11 | 10802 | 4674 | 641 | 169 | 345 | 327 | 359 | 884 | 1775 | 2387 | 5353 | 6635 | 10354 | 15804 | 16261 | 14113 | 15916 | 15553 | 11774 | 9412 | 17683 | 22269 |
| 4+ | **71611** | **55460** | **39308** | **58970** | **95894** | **145398** | **224301** | **265488** | **290984** | **311790** | **313437** | **280479** | **258118** | **327476** | **344364** | **291024** | **300433** | **244835** | **268918** | **310392** | **401903** | **377280** |
| 5+ | **54274** | **39033** | **26069** | **21320** | **51477** | **76279** | **119947** | **197947** | **218285** | **218321** | **241071** | **235555** | **211144** | **169272** | **253724** | **266858** | **228865** | **217422** | **166046** | **217455** | **249448** | **333106** |
| 7+ | **28661** | **17979** | **10042** | **4448** | **8796** | **11334** | **27154** | **46291** | **75291** | **110424** | **104222** | **102414** | **121964** | **99856** | **89557** | **78356** | **133820** | **130910** | **87145** | **86245** | **75641** | **114488** |

## Fishing Mortality

| | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 0.013 | 0.026 | 0.011 | 0.002 | 0.003 | 0.004 | 0.002 | 0.002 | 0.002 | 0.003 | 0.014 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.002 | 0.000 |
| 3 | 0.220 | 0.178 | 0.198 | 0.048 | 0.028 | 0.016 | 0.014 | 0.014 | 0.010 | 0.031 | 0.020 | 0.007 | 0.009 | 0.012 | 0.005 | 0.004 | 0.002 | 0.004 | 0.004 | 0.006 | 0.014 |
| 4 | 0.501 | 0.456 | 0.406 | 0.219 | 0.120 | 0.103 | 0.073 | 0.064 | 0.146 | 0.109 | 0.092 | 0.102 | 0.144 | 0.093 | 0.041 | 0.039 | 0.047 | 0.052 | 0.058 | 0.051 | 0.033 |
| 5 | 0.496 | 0.703 | 0.563 | 0.228 | 0.194 | 0.110 | 0.093 | 0.101 | 0.127 | 0.178 | 0.167 | 0.151 | 0.212 | 0.117 | 0.144 | 0.103 | 0.157 | 0.232 | 0.227 | 0.176 | 0.103 |
| 6 | 0.261 | 0.811 | 0.702 | 0.168 | 0.260 | 0.206 | 0.117 | 0.137 | 0.185 | 0.216 | 0.199 | 0.188 | 0.244 | 0.103 | 0.165 | 0.135 | 0.235 | 0.364 | 0.324 | 0.219 | 0.174 |
| 7 | 0.335 | 0.439 | 1.451 | 0.209 | 0.218 | 0.182 | 0.140 | 0.187 | 0.270 | 0.303 | 0.254 | 0.213 | 0.512 | 0.146 | 0.159 | 0.138 | 0.361 | 0.396 | 0.412 | 0.255 | 0.264 |
| 8 | 0.810 | 0.521 | 1.548 | 0.451 | 0.288 | 0.204 | 0.154 | 0.183 | 0.289 | 0.370 | 0.244 | 0.257 | 0.361 | 0.238 | 0.176 | 0.129 | 0.320 | 0.426 | 0.328 | 0.242 | 0.285 |
| 9 | 0.634 | 1.000 | 1.520 | 0.742 | 0.518 | 0.229 | 0.092 | 0.305 | 0.266 | 0.504 | 0.328 | 0.231 | 0.406 | 0.201 | 0.271 | 0.133 | 0.379 | 0.371 | 0.395 | 0.170 | 0.255 |
| 10 | 0.597 | 1.647 | 2.048 | 0.428 | 0.322 | 0.283 | 0.120 | 0.289 | 0.212 | 0.363 | 0.336 | 0.272 | 0.372 | 0.167 | 0.296 | 0.211 | 0.411 | 0.443 | 0.435 | 0.186 | 0.193 |
| 11+ | 0.726 | 2.003 | 2.491 | 0.520 | 0.392 | 0.344 | 0.146 | 0.351 | 0.258 | 0.441 | 0.408 | 0.330 | 0.453 | 0.203 | 0.360 | 0.256 | 0.500 | 0.539 | 0.529 | 0.226 | 0.235 |
| Ave 5-9 F | 0.51 | 0.69 | 1.16 | 0.36 | 0.30 | 0.19 | 0.12 | 0.18 | 0.23 | 0.31 | 0.24 | 0.21 | 0.35 | 0.16 | 0.18 | 0.13 | 0.29 | 0.36 | 0.34 | 0.21 | 0.22 |
| Wt 4+ F | 0.50 | 0.61 | 0.69 | 0.22 | 0.16 | 0.13 | 0.09 | 0.11 | 0.18 | 0.20 | 0.18 | 0.17 | 0.29 | 0.11 | 0.12 | 0.11 | 0.20 | 0.28 | 0.19 | 0.14 | 0.10 |
| Ave 5-9 ER | 0.36 | 0.46 | 0.63 | 0.28 | 0.23 | 0.15 | 0.10 | 0.15 | 0.19 | 0.25 | 0.19 | 0.17 | 0.27 | 0.14 | 0.15 | 0.11 | 0.23 | 0.27 | 0.26 | 0.17 | 0.18 |
| Wt 4+ ER | 0.36 | 0.42 | 0.46 | 0..16 | 0.14 | 0.11 | 0.08 | 0.09 | 0.15 | 0.17 | 0.15 | 0.14 | 0.23 | 0.10 | 0.10 | 0.10 | 0.17 | 0.23 | 0.15 | 0.12 | 0.09 |

Table 59. Fall spawner sum of fishing mortality along cohorts.

| | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 0.01 | 0.03 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3 | 0.22 | 0.18 | 0.20 | 0.05 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 |
| 4 | 0.50 | 0.46 | 0.41 | 0.22 | 0.12 | 0.10 | 0.07 | 0.06 | 0.15 | 0.11 | 0.09 | 0.10 | 0.14 | 0.09 | 0.04 | 0.04 | 0.05 | 0.05 | 0.06 | 0.05 | 0.03 |
| 5 | 0.50 | 0.70 | 0.56 | 0.23 | 0.19 | 0.11 | 0.09 | 0.10 | 0.13 | 0.18 | 0.17 | 0.15 | 0.21 | 0.12 | 0.14 | 0.10 | 0.16 | 0.23 | 0.23 | 0.18 | 0.10 |
| 6 | 0.26 | 0.81 | 0.70 | 0.17 | 0.26 | 0.21 | 0.12 | 0.14 | 0.19 | 0.22 | 0.20 | 0.19 | 0.24 | 0.10 | 0.17 | 0.14 | 0.24 | 0.36 | 0.32 | 0.22 | 0.17 |
| 7 | 0.34 | 0.44 | 1.45 | 0.21 | 0.22 | 0.18 | 0.14 | 0.19 | 0.27 | 0.30 | 0.25 | 0.21 | 0.51 | 0.15 | 0.16 | 0.14 | 0.36 | 0.40 | 0.41 | 0.26 | 0.26 |
| 8 | 0.81 | 0.52 | 1.55 | 0.45 | 0.29 | 0.20 | 0.15 | 0.18 | 0.29 | 0.37 | 0.24 | 0.26 | 0.36 | 0.24 | 0.18 | 0.13 | 0.32 | 0.43 | 0.33 | 0.24 | 0.29 |
| 9 | 0.63 | 1.00 | 1.52 | 0.74 | 0.52 | 0.23 | 0.09 | 0.31 | 0.27 | 0.50 | 0.33 | 0.23 | 0.41 | 0.20 | 0.27 | 0.13 | 0.38 | 0.37 | 0.40 | 0.17 | 0.26 |
| 10 | 0.60 | 1.65 | 2.05 | 0.43 | 0.32 | 0.28 | 0.12 | 0.29 | 0.21 | 0.36 | 0.34 | 0.27 | 0.37 | 0.17 | 0.30 | 0.21 | 0.41 | 0.44 | 0.44 | 0.19 | 0.19 |
| 11+ | 0.73 | 2.00 | 2.49 | 0.52 | 0.39 | 0.34 | 0.15 | 0.35 | 0.26 | 0.44 | 0.41 | 0.33 | 0.45 | 0.20 | 0.36 | 0.26 | 0.50 | 0.54 | 0.53 | 0.23 | 0.24 |
| Ave 5-9 F | 0.51 | 0.69 | 1.16 | 0.36 | 0.30 | 0.19 | 0.12 | 0.18 | 0.23 | 0.31 | 0.24 | 0.21 | 0.35 | 0.16 | 0.18 | 0.13 | 0.29 | 0.36 | 0.34 | 0.21 | 0.22 |
| Wt 4+ F | 0.50 | 0.61 | 0.69 | 0.22 | 0.16 | 0.13 | 0.09 | 0.11 | 0.18 | 0.20 | 0.18 | 0.17 | 0.29 | 0.11 | 0.12 | 0.11 | 0.20 | 0.28 | 0.19 | 0.14 | 0.10 |
| Ave 5-9 ER | 40 | 50 | 69 | 30 | 26 | 17 | 11 | 17 | 20 | 27 | 21 | 19 | 29 | 15 | 17 | 12 | 25 | 30 | 29 | 19 | 19 |
| Wt 4+ ER | 39 | 46 | 50 | 20 | 15 | 12 | 9 | 10 | 16 | 18 | 16 | 16 | 25 | 11 | 11 | 11 | 19 | 25 | 17 | 13 | 10 |
| F Sum | 2.38 | 2.20 | 2.05 | 2.06 | 1.73 | 1.87 | 1.87 | 2.21 | 1.93 | 2.08 | 1.94 | 1.99 | 1.48 | 1.47 | 1.15 | 0.76 | 0.41 | 0.16 | 0.04 | 0.02 | 0.00 |

Table 60. Fall spawner projections with no adjustment for tendency to over-estimate four year olds showing beginning of year weights, biomass, and numbers.

| | Weight | | | Biomass (t) | | | Numbers (millions) | | | $F_{0.1}$ Catch | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Age | Beginning of Year | Catch | Ave. PR | 1998 | 1999 | 2000 | 1998 | 1999 | 2000 | 1999 | 2000 |
| 2 | 0.0543 | 0.0845 | 0.00 | 440721 | 440721 | 440721 | 22286 | 23951 | 23951 | 0 | 0 |
| 3 | 0.1120 | 0.1418 | 0.03 | 339943 | 339943 | 339943 | 35033 | 38089 | 38089 | 377 | 377 |
| 4 | 0.1673 | 0.2007 | 0.16 | 870240 | 264107 | 264107 | 152455 | 44174 | 44174 | 2201 | 2201 |
| 5 | 0.2099 | 0.2294 | 0.55 | 420535 | 689364 | 206331 | 88476 | 144703 | 43311 | 21728 | 6503 |
| 6 | 0.2381 | 0.2538 | 0.77 | 352882 | 310607 | 479077 | 85330 | 73948 | 114057 | 14784 | 22803 |
| 7 | 0.2582 | 0.2715 | 1.00 | 57870 | 242774 | 201878 | 15511 | 62692 | 52131 | 15559 | 12938 |
| 8 | 0.2808 | 0.2949 | 1.00 | 84110 | 36387 | 147250 | 23308 | 10219 | 41354 | 2534 | 10253 |
| 9 | 0.3072 | 0.3207 | 1.00 | 16424 | 51786 | 22070 | 5095 | 15909 | 6780 | 3921 | 1671 |
| 10 | 0.3298 | 0.3404 | 1.00 | 43006 | 10420 | 31410 | 14043 | 3437 | 10360 | 837 | 2524 |
| 11 | 0.3614 | 0.3787 | 1.00 | 50339 | 61613 | 43691 | 17683 | 22267 | 15790 | 5509 | 3906 |
| 2+ | | | | 2676070 | 2447722 | 2176476 | 459222 | 439389 | 389996 | 67450 | 63176 |
| 4+ | | | | 1895406 | 1667058 | 1395813 | 401903 | 377349 | 327955 | 67073 | 62799 |

Table 61. Fall spawner retrospective projection for 1998 using updated input data from this assessment showing beginning of year weights, biomass, and numbers.

| | Weight | | | Biomass (t) | | | Numbers (millions) | | | $F_{0.1}$ Catch | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Age | Beginning of Year | Catch | Ave. PR | 1997 | 1998 | 1999 | 1997 | 1998 | 1999 | 1998 | 1999 |
| 2 | 0.0557 | 0.0886 | 0.02 | 433072 | 433072 | 433072 | 23513 | 24137 | 24137 | 221 | 221 |
| 3 | 0.1126 | 0.1398 | 0.04 | 335262 | 335262 | 335262 | 40086 | 37750 | 37750 | 537 | 537 |
| 4 | 0.1615 | 0.1922 | 0.14 | 798148 | 870240 | 271016 | 137170 | 140556 | 43773 | 6427 | 2002 |
| 5 | 0.2053 | 0.2234 | 0.71 | 534764 | 420535 | 682304 | 114194 | 86326 | 140061 | 16372 | 26564 |
| 6 | 0.2330 | 0.2457 | 1.00 | 77057 | 352882 | 278350 | 18792 | 82220 | 64855 | 20470 | 16147 |
| 7 | 0.2557 | 0.2674 | 1.00 | 115616 | 57870 | 214034 | 29889 | 14799 | 54734 | 3654 | 13513 |
| 8 | 0.2827 | 0.2943 | 1.00 | 24324 | 84110 | 35100 | 6839 | 23774 | 9921 | 5844 | 2439 |
| 9 | 0.3077 | 0.3196 | 1.00 | 55616 | 16424 | 51015 | 17130 | 5053 | 15696 | 1239 | 3849 |
| 10 | 0.3351 | 0.3449 | 1.00 | 51425 | 43006 | 9962 | 16924 | 14412 | 3338 | 3502 | 811 |
| 11 | 0.3648 | 0.3811 | 1.00 | 32102 | 50339 | 56617 | 11674 | 18365 | 20656 | 4529 | 5094 |
| 2+ | | | | 2457386 | 2663740 | 2366731 | 416211 | 447393 | 414921 | 62795 | 71176 |
| 4+ | | | | 1689052 | 1895406 | 1598397 | 352612 | 385506 | 353033 | 62037 | 70418 |

Table 62. Fall spawner retrospective projection for 1998 adjusting for tendency to over-estimate 4 year-olds showing beginning of year weights, biomass, and numbers.

| | Weight | | | Biomass (t) | | | Numbers (millions) | | | $F_{0.1}$ Catch | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Age | Beginning of Year | Catch | Ave. PR | 1998 | 1999 | 2000 | 1998 | 1999 | 2000 | 1999 | 2000 |
| 2 | 0.0543 | 0.0845 | 0.00 | 440721 | 440721 | 440721 | 22286 | 23951 | 23951 | 0 | 0 |
| 3 | 0.1120 | 0.1418 | 0.03 | 339943 | 339943 | 339943 | 35033 | 38089 | 38089 | 377 | 377 |
| 4 | 0.1673 | 0.2007 | 0.16 | 589617 | 264107 | 264107 | 103294 | 44174 | 44174 | 2201 | 2201 |
| 5 | 0.2099 | 0.2294 | 0.55 | 420535 | 467067 | 206331 | 88476 | 98042 | 43311 | 14722 | 6503 |
| 6 | 0.2381 | 0.2538 | 0.77 | 352882 | 310607 | 324591 | 85330 | 73948 | 77277 | 14784 | 15450 |
| 7 | 0.2582 | 0.2715 | 1.00 | 57870 | 242774 | 201878 | 15511 | 62692 | 52131 | 15559 | 12938 |
| 8 | 0.2808 | 0.2949 | 1.00 | 84110 | 36387 | 147250 | 23308 | 10219 | 41354 | 2534 | 10253 |
| 9 | 0.3072 | 0.3207 | 1.00 | 16424 | 51786 | 22070 | 5095 | 15909 | 6780 | 3921 | 1671 |
| 10 | 0.3298 | 0.3404 | 1.00 | 43006 | 10420 | 31410 | 14043 | 3437 | 10360 | 837 | 2524 |
| 11 | 0.3614 | 0.3787 | 1.00 | 50339 | 61613 | 43691 | 17683 | 22267 | 15790 | 5509 | 3906 |
| 2+ | | | | 2395447 | 2225425 | 2021990 | 410060 | 392727 | 353216 | 60443 | 55823 |
| 4+ | | | | 1614784 | 1444762 | 1241327 | 352741 | 330687 | 291176 | 60066 | 55446 |