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An assessment of American plaice in NAFO Div. 3LNO

by

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Abstract

Catches from this stock were generally in the range of 40,000 to 50,000 t per year throughout the 1970's and 1980's, before declining to low levels in the early 1990's. There has been no directed fishing on this stock since 1993. The TACs in 1995-2010 have been set at 0. Catch has been lower in recent years than in prior years; in 2009 it was 3, 015 t, slightly higher than 2008. Catch was mainly taken in the NAFO regulatory area (NRA). The Canadian spring surveys show a large decline in abundance and biomass from the mid to late 1980s to the mid 1990s with the average biomass index of the last 2 years (expressed as mean weight per tow) being only 17% of that of the mid 1980s. The Canadian fall survey biomass has also shown large declines since 1990. There may be a slight increase in both surveys since the mid 1990s. By Division, the largest decrease in both surveys for biomass and abundance has been in Div. 3L but has been stable since the mid-1990s. In general, there has been an increase in biomass in Divs. 3NO since the mid-1990s and abundance in these Divisions may be at or near levels of the late 1980s-early 1990s. Biomass and abundance declined in both Canadian spring and fall surveys from 2008 to 2009. Mortality on younger (less than 5) ages has remained high throughout the time series. For older ages mortality was high in the mid-1990s, was lower since about 2002 in both surveys, but has increased in the past two years for most ages. Output from a VPA analyses including data from Canadian spring and fall surveys, as well as the EU-Spain Div. 3NO survey indicated that population abundance and biomass declined fairly steadily from the mid 1970's but have been slowly increasing since the moratorium in 1994. F increased fairly steadily from 1995 to 2000 but has generally been declining since then. Average F on ages 9-14 in 2009 was 0.13. Since 2001 the SSB has been gradually increasing and is 33, 000 t in the current year, and is still approaching 50, 000 t, the B*lim* for this stock, though more slowly than predicted by the model in the assessment from last year. Recruitment has been generally poor since the 1986 year class; however, the 2003 year class is the largest it has been for the past two decades. Although still considered large, it was overestimated by the VPA in 2009 and has been downgraded in the model since then.

TAC regulation

This stock has been under TAC regulation since 1973 when a TAC of 60,000 t was established. From 1973-87, the TAC varied from 47,000 t to 60,000 t (Table 1) but was lowered to 33,585 t in 1988. Further reductions followed, bringing the TAC to 10,500 t in 1993. In 1994, a TAC of 4,800 t was implemented, but the Fisheries Commission of NAFO stated that no directed fisheries were to take place on this stock. The TAC has been set at 0 t since then.

Catch trends

Catches increased from about 20,000 t in the early 1960s to a peak of 94,000 t in 1967, were relatively stable around 45,000-50,000 t in 1973-82, then declined to 39,000 t in 1984-85 (Table 1, Fig. 1). Catches increased to 65,000 t

in 1986 and then declined rapidly thereafter, to about 7,400 t in 1994. Following the moratorium in 1995, the catch (bycatch in other fisheries, mainly yellowtail flounder) declined for a couple of years but then began to increase. Catches reached a high of 8 000 t, in 2003, and has been lower since. In 2006, the bycatch value was lower, due mainly to a lack of fishing of yellowtail flounder in that year, but since then bycatch has been gradually rising, reaching a value of 2,515 t in 2008 and 3,015 t in 2009. In 2008, the Canadian catch totalled about 878 t and in 2009, it was about 1, 077 t (20% of the yellowtail flounder catch). The remainder of the catch occurred as by-catch in the skate, redfish and Greenland halibut fisheries in the NRA.

From 1977 to 1982, the catch was taken almost exclusively by Canadian vessels, but the catch by other nations increased rapidly from less than 2,000 t in 1981-82 to over 30,000 t in 1986 as new fisheries were developed in the Regulatory Area (Table 1). Considerable doubts have arisen about some nominal catches in the 1985 to 1994 period, resulting in various catch estimates being used. These include surveillance estimates, breakdowns of unspecified flounder catches by S. Korea prior to 1991 based on reported flounder catches, and any other estimates deemed by Scientific Council to be reliable. There is also some uncertainty regarding catches prior to 1973, when large amounts of unspecified flounder catches from some nations were broken down by species based on estimates of species composition. As well, estimates of discards are not available, and are believed to be substantial during some periods. In recent years there have been some problems in resolving catches, resulting in variation in estimates.

The amount of plaice caught as by-catch in the shrimp fishery was reviewed by Orr et al. (2008). The shrimp fishing area corresponding to Div. 3L is shrimp fishing area 7 (very little shrimp fishing occurs in Div. 3NO). For 2004-2007, the average amount of plaice taken annually in this fishery in this area was 3.3 t. It has increased slightly over that time period. There was only one length frequency available from 2004 and there were only 35 fish measured (all fish were less than 31 cm).

Canadian research vessel surveys

Poor Survey Coverage

In recent years there have been several problems with coverage and timing of the Canadian research vessel surveys, which has caused some data points to be excluded from the assessment model. Poor survey coverage has been an issue for the 2004 fall (incomplete coverage in Div. 3L) and the 2006 spring multi-species survey (no otoliths collected and incomplete survey in Div. 3NO) (Healey and Dwyer 2005; Dwyer *et al.* 2007). In 2007, Dwyer *et al.* (2007) removed the Canadian RV Autumn 2004 survey value from the analytical assessment. Although shown to produce very little change in the outcome of the assessment, examination of the age by age abundance indicated that the strata not surveyed significantly changed the age composition for that data point. There have also been years whereby the survey could not be completed in the fall and has run over into January (1995, 2002, 2003, 2004 and 2005). In addition, in fall 2007 and 2008 the number of strata surveyed was substantially reduced, and in 2008 there were no deep strata surveyed in Div. 3L (see Healey and Brodie 2009 for a detailed examination of survey problems).

Spring

Stratified-random surveys have been carried out on the Grand Bank by Canadian research vessels in the spring (April to June period) of each year from 1971 to 2008, with the exception of 1983. The stratification scheme used is shown in Figure 2. The data can be split into 3 time periods, based on the trawl used in each period: 1971-82 was Yankee 36, 1983-95 was Engel 145, and 1996-2008 was Campelen 1800 (see McCallum and Walsh (1996) for a description of the various trawls). Conversions exist for the first to second series (Gavaris and Brodie 1984), and from the second to the third (Morgan et al. 1998). However, data from the first series have not been converted to be comparable with the third series. Thus comparable data exist for 1971-95, and for 1984 to 2009. A full comparison between the Engel and Campelen data series is given in Brodie et al. (1998).

Biomass estimates for each Division by stratum and depth for 1996 to 2009 are given in Tables 2-4. Please note the shaded columns which represent years that survey coverage was inadequate. In 2008, the spring survey biomass estimates for 3L, 3N and 3O were 50, 000, 132, 500 and 51, 600 t. Biomass estimates for these Divisions in 2009 were 20, 600, 61,100 and 41, 000 t. From 1996 to 1998 the estimate for Div. 3N biomass was approximately half of the estimate for Div. 3O while from 1999 to 2004 the estimates in the two divisions are about equal. However, from 2005

onwards the biomass estimate from Div. 3N is at least double the biomass estimate from Div. 3O. This is slightly less than double in 2009. The biomass estimates in Div. 3L have generally been higher in recent years (please note the 2006 data point should not be considered as part of this assessment) but is lower again in 2009. In 2008, biomass in Div. 3LNO combined was the highest it had been since 1996 but in 2009 this dropped back down to levels of the late 1990s and is currently only 17% of that of the mid 1980s (Fig. 3).

In Figure 4 and 5 the biomass index is shown as mean weight per tow. In Figure 4 the index is presented by division and in Figure 5 for Div. 3LNO combined (top panel). Overall the combined index shows the same trend as the swept area estimate of biomass with a large decline in the late 1980s (which has been greatest in Div. 3L) followed by a slight increase since 1996. The average mean weight per tow for Div. 3LNO combined in 2009 is only 17% of the average of the mid 1980s. The average mean weight per tow for Div. 3LNO combined in the last 2 years is 25% of the average of the mid 1980s. In 2008, the mean weight per tow in Div. 3N had increased to the level it was at in the 1980s but is now down compared to 2008 by almost 50% (Fig. 4).

Figure 6 shows the abundance for Div. 3LNO combined from 1985 to 2009 (top panel). The total abundance has fluctuated since 1996 with a slight increase over the period. Mean number per tow for Div. 3LNO combined shows the same trend (Fig. 7, top panel). As with the biomass estimate, mean number per tow has shown the greatest decline in Div. 3L (Fig. 8) since the beginning of the time series. Levels in Div. 3N in 2009 dropped by 45% compared to 2008.

Tables 5-8 and Figure 9 show the abundance at age from the Canadian spring surveys by division and for Div. 3LNO combined. Although the proportion of fish that are ages 0 to 5 was lower in 2004, in recent years has been consistently above average for the time series. The abundance estimate in 2008 was among the highest estimates since 1991 (Table 8). In addition, the 1998 (somewhat smaller) and 2003 year classes (YC) are evident in Figure 9. In 2009, the 2003 YC does not appear as strong as it did in 2007 and 2008, but the 2006 YC may be stronger than average.

Figures 10 and 11 show the distribution plots (kg/tow standardized to tow length) of American plaice for 2005-2009. The largest concentrations of plaice seem to be in Div. 3N, mainly outside the 200-mile limit. Compared to 2008, the catches of American plaice on the shelf of the Grand Bank are smaller.

Fall

Stratified-random surveys have been conducted in Div. 3L in the fall from 1981 to 2009, usually in October-November, but in recent years this has been occurring later. From 1990 to 2009, fall surveys were also carried out in Div. 3NO. Surveys from 1983 to 1994 were done with the Engel trawl and starting in fall 1995, a Campelen 1800 trawl was used.

Biomass estimates by stratum and depth are given for each Division in Tables 9-11. In 2008, biomass estimates from the fall survey were 61, 200, 169, 000 and 103, 100 t for Div. 3L, 3N and 3O respectively. Biomass estimates from 2009 for these Divisions were 33,500, 141, 200, and 79, 400 t. Over the past number of years, there has been a large biomass estimate in Div. 3N fairly consistently, which is heavily influenced by large sets in stratum 360 (Table 10). In 2009 the estimate for Div. 3O dropped from high levels of 2008. During 1995 to 1997, Div. 3N constituted on average 40% of the Div. 3NO total while the average since 2000 has been about 70% of the Div. 3NO total.

The overall biomass for Div. 3LNO in the fall has shown a slight increasing trend since 1995 (Fig. 3). The current biomass index remains well below that of 1990 with the average of the 2009 index representing only about 40% of that of 1990. The biomass index expressed as mean weight per tow shows the same overall trend with the average of the last 3 years being 40% of the level of 1990 (Fig. 5). Mean weight per tow has shown the largest decline in Div. 3L (Fig. 12). Mean weight per tow estimates from Div. 3N are at or above levels seen in 1996, while mean weight per tow in Div. 3O has not shown any real improvement, though the value in 2008 was higher than that seen for the past 14 years (Fig. 12). However, in 2009, this value declined again.

Figure 6 shows the abundance for Div. 3LNO combined from 1990 to 2009. Abundance showed a substantial decline from 1990 to 1998 but has been increasing since 1998. Mean numbers per tow show the same pattern (Fig. 7). By Division, the largest decline was once again in Div. 3L (Fig. 13) but although increases were shown in both Division 3N and especially in Div. 3O, the 2009 value dropped to 73% of the 2008 value (Fig. 13).

Tables 12-15 and Figure 14 show the abundance by age for 1990 to 2009. Abundance in Div. 3L declined in each year since 1995 to 2000 but increased in 2001 and has remained at that level ever since (with the exception of 2004, which was poorly covered by the survey). The age composition has seen younger ages making up a higher proportion of the population in the last few years (Table 15). The 2003 year class appears to be large in this survey (Figure 14) but has largely dropped out by 2009. The 2006 YC also looks to be stronger than average.

Plots of distribution by weight (Fig. 15 and 16) for the fall surveys for 2005-2009 show that American plaice are distributed throughout the Div. 3LNO area. However the area of highest concentration is southern 3NO, particularly on the tail of the bank in Div. 3N. It appears there are fewer large catches in Div. 3N.

Abundance and biomass estimates from both Canadian surveys in all divisions were down considerably in 2009 compared to 2008.

Comparison of Spring and Fall Surveys

Biomass and abundance from the spring and fall surveys can be seen in Figures 3 and 6. Overall, abundance and biomass estimated from spring and fall surveys show similar trends. Generally there is an increasing trend; however, in the past 3 years, the fall survey continued to rise and in 2009 dropped, whereas the spring survey remained stable but also dropped in 2009. This may be due to survey timing changes and fish moving into and out of the survey area. Overall, abundance and biomass estimated from spring and fall surveys show an increasing trend, except in the most recent years, when the autumn survey index has continued to increase while the spring survey was stable, possibly due to survey timing changes and fish moving into and out of the survey area. However in 2009, both values declined. Historically, both surveys have shown the largest decline in Div. 3L. There are some larger catches off the Grand Banks in Div. 3L in the fall but overall, distribution is also similar between the two surveys, with the majority of the fish being distributed in southern Div. 3NO (Figs. 10, 11, 15 and 16).

Catch to RV Biomass ratio

Examination of the catch/biomass ratios from Campelen data from 1985 to 2009 is shown in Figure 17. The Campelen ratios were highest in the 1991-94 period, and were reduced from 1995-1999, reflecting a period of reduced catches (Table 1). The catch/biomass ratios increased substantially over the 1999 to 2004 period, but were lower since then. Catch/biomass ratio in 2009 was slightly higher than in recent years due to the decrease in biomass and slight increase in catch.

Maturities

Age and length at 50% maturity were produced from spring RV data. Maturity data were collected during research vessel surveys from 1960-2009. Stratified random surveys were used where possible (1971-2009). Data from earlier years came from surveys that were conducted mainly as line transects. The coverage of a stock area would generally not be as complete as the stratified random surveys. For the period of the stratified random surveys, observed proportion mature at age was calculated according to the method of Morgan and Hoenig (1997) to account for the length stratified method of sampling. Prior to this, only data from the aged fish was used without weighting by the length frequencies. This should not have a large impact on the model estimates (Morgan and Hoenig 1997). Data from 1985-1995 were converted to Campelen equivalents.

Estimates were produced by cohort. For males, A_{50} were fairly stable for cohorts of the 1960's to mid 1970's, with perhaps a slight increase over that time period. Male A_{50} then began a fairly steady decline to the 1991 cohort which had an A_{50} of just over 3 years. Male A_{50} has increased somewhat but is still below the 1960's and 1970's with an A_{50} of about 4 years compared to 6 years at the beginning of the time series (Fig. 18). For females, estimates of A_{50} have shown a large, almost continuous decline, since the beginning of the time series. For females the A_{50} for recent cohorts is about 8 years compared to 11 years for cohorts at the beginning of the time series (Fig. 18). In 2010, additional data on the recent cohorts resulted in a decrease in their estimated proportion mature.

Estimates of maturity at length were produced using the data described above and are presented by cohort in Figure 19. L_{50} declined for both sexes but recovered in recent cohorts. The current L_{50} for males of about 20 cm is 2 to 3 cm lower than the earliest cohorts estimated. The L_{50} of most recent cohorts for females is in the range of 34-35 cm, somewhat lower than the 39 cm of the earliest cohorts (Fig. 19).

Weights and lengths-at -age

Mean weights-at-age and mean lengths-at-age were calculated for male and female American plaice for Div. 3LNO using spring survey data from 1990 to 2009, except for 2006 when survey coverage was too poor to be considered representative. Means were calculated accounting for the length stratified sampling design. Although there is variation in both length and weight-at-age there is little indication of any long-term trend for either males or females (Fig. 20 and 21).

Mortality

Estimates of total mortality (Z) from the Campelen or equivalent, spring and fall survey data were calculated for ages 1 to 16 (Fig. 22 and 23). A Lowess smoother is plotted to help illustrate trends. The smoothing windows were chosen by Aikaike information criteria. The spring survey indicates an increase in mortality up to the mid 1990's for most ages. This trend is also in the fall data but is not as evident. Mortality declined after the mid 1990's in both surveys. This was followed by an increase in the early 2000's. In both surveys, estimates are lower in the mid 2000's for most ages. In the fall survey, the last two estimates of Z, and in the spring survey the last estimate of Z, were higher for most ages. For many ages, these most recent estimates of Z were at or near the level of those from the early 1990's.

EU-Spain Div. 3NO survey

Abundance and Biomass Trends

There has been a general increase in this index for both biomass and abundance since the beginning of the time series. However the most recent year has seen a large drop in both biomass and abundance, similar to the Canadian survey series (González-Troncoso et al., 2010).

Numbers at Age

Since 1995, Spain has carried out a stratified random spring bottom trawl survey in Div. 3NO of the NAFO Regulatory Area. In 2001, the trawl vessel (C/V *Playa de Menduiña*) and gear (*Pedreira*) were replaced by the R/V *Vizconde de Eza* using a *Campelen* trawl. Canadian spring RV age length keys (for Div. 3N only, as the Survey by EU-Spain Div. 3NO survey only covers a small portion of Div. 3O) were applied to EU-Spain length frequency data (separate sexes, mean number per tow) from 1998-2000 converted data and 2001-2009 Campelen data (González-Troncoso et al., 2010). Combined spring Canadian ALKs from 1997-2005 were applied to the 2006 length frequencies, as there were no otoliths collected from the Canadian 2006 spring survey. This resulting mean numbers per tow at age data is found in Table 25 and is used as input into the assessment. The 2003 year class (and to a lesser extent the 2006 YC) is also evident in this survey (Figure 24). Overall, age composition for this survey was similar to the Canadian RV spring survey, except at ages 6 and 7 (Figure 25).

Catch at age

Catch at age from Canadian fisheries in 2009

Results of the catch at age calculations for American plaice catches in 1993-2008 are given in detail in Morgan et al. (1999a, b; 2001; 2002, 2003,) and Dwyer et al. (2005, 2007, 2009). In 2009, sampling data collected by observers were available from by-catch of A. plaice in Canadian fisheries targeting yellowtail flounder in Div. 3LNO. In 2009, the Canadian catch of A. plaice in Div. 3LNO was 1076 t, and almost all (99.6%) of this catch came from the directed fishery for yellowtail flounder. This percentage was similar in 2007-08, i.e. greater than 96% in both years. The by-catch percentage of A. plaice caught in the yellowtail fishery was about double in 2009 compared to 2008.

Since the beginning of 2000, fishing for yellowtail has been permitted in Div. 3L, resulting in some by-catch of American plaice there, although most of the catch in recent years, including 2009 (73%) has come from Division 3N. There were also seasonal differences between 2007, 2008 and 2009, with most of the catch in 2007 and 2009 (73% in 2009) occurring in the last 4 months of the year. In 2008, catches were more evenly spread throughout the year, with 51% being taken in May to July. By-catch of A.plaice in the yellowtail fishery has usually been highest in this spring period. Catches are often lower during the summer as there has usually been a closure of the yellowtail fishery during mid June to late July, which is intended to cover the spawning period for yellowtail.

Sampling of the Canadian catch of A. plaice in 2009 (1076 t) consisted of 3870 length measurements, and only 240 otoliths. These levels were considerably lower than the sampling in 2007-08 (2007: 434 t, 9825 length measurements, 627 otoliths; 2008: 880 t, 15,497 measurements, 808 otoliths). The 2007-08 sampling levels (measurements/ton) were similar to the 2005 level (2007 was higher and 2008 lower), but lower than 2004, which was the last full year where 100% observer coverage existed in the yellowtail fishery. There was virtually no fishery during 2006. The low level of otolith sampling in 2009 is a concern, particularly given that most of the otoliths were collected in Q1 while most of the catch occurred in Q4. It was not possible to calculate age compositions by Division in 2009.

The same weight-length relationship was used as in recent years (log weight = 3.3247 log length – 5.553) and the sum of products check in 2009 was within 1% of the catch. The Canadian catch in 2009 consisted of about 1.35 million A. plaice, compared to 1.38 million for the 2008 catch. Ages in the 2009 catch ranged from 5 to 20, and catch was comprised mainly of fish aged 7 to 11 years old, with the peak being the 2000 year class. The peak age in the catch numbers declined from 9 or 10 in 1999-2001 to age 8 in 2002-03 and to age 7 in 2004-05, but has increased in 2008 and 2009 to age 9 again. Age 6 comprised less than 3% of the annual catch in numbers during 2007-09, compared to about 7% for this age in 2005, and almost 20% in 2004. Fluctuations such as these are not uncommon, depending on year class strengths as well as the location and timing of the by catches. Overall, the catch at age in 2007-09 was similar to that calculated for 1999-2005, as well as that from the Canadian fishery for A. plaice on the Grand Bank in the early 1990's (Brodie et al. 1994).

The mean fish weight in the 2009 catch (0.802 kg/fish) was the highest in the recent period, but similar to the 2005 and 2007 levels of about 0.75 kg. Individual weights at age in 2009 were within the range of values observed recently (values at ages 8-11 differed by 7% or less from the 2004-08 average), but were higher at almost all ages in 2009 compared to 2008. Reasons for the differences between the values for 2008 and 2009 are likely due to the seasonal and temporal differences in the catches in these years, as noted above. However, the reduced sampling levels in 2009 add uncertainty to the age composition and weights at age.

Catch at age from other fisheries in 2009

For 2009 length frequency data were available from Portugal and Spain (there was only one length frequency from Russia). Details on the sampling levels and descriptions of the fisheries are contained in Vargas et al. (2010), González-Costas et al. (2010) and Skryabin and Pochtar (2010). In all cases, age-length keys from the Canadian spring surveys in Div. 3LNO in 2009 were used to derive age compositions, which were then combined and adjusted to the total catch to account for all non-sampled catches. Catch at age, weight at age (using the weight-length relationship used above) and sum of products (SOP) for 2009 are given in Table 18.

In 2009, catch from all countries indicated a peak at age 6 and a larger peak at ages 8 and 9. Age 6 (2003 YC) was the most abundant age in the Spanish and Portuguese catches, but there were also a large amount of age 8-11 fish in the catch. There was also a mode of 14-16 year-olds in the Spanish fleets. A similar but smaller mode exists at ages 14-16 in the Portuguese catch. Mean lengths and weights at age in the Canadian fishery were slightly higher at younger ages (except for age 5, which was only one fish) than in international catches, likely a result of larger mesh size used in the Canadian fishery and also the use of research vessel age-length keys for the catches of non-Canadian fleets (Table 17).

Virtual Population Analysis (VPA)

A formulation of ADAPT using the same base structure that was used in the accepted VPA from the 2009 assessment (Dwyer et al., 2007, 2008, 2009) was run. The ADAPT used catch–at-age for ages 5 to 14 with an age 15 plus group which included all catch from ages 15 to 22 (Table 20). The ratio of F on the plus group to F on the last true age was set

at 1.0. M was set at 0.2 except at 0.53 for all ages from 1989 to 1996 (Morgan and Brodie, 2001; Dwyer et al., 2008, 2009). Beginning of the year weights-at-age and maturities-at-age are given in Tables 21 and 22. The calibration matrix consisted of the following input data:

- Canadian spring RV survey (1985-2009) (no 2006 data point) abundance at age (ages 5-14);
- Canadian autumn RV survey (1990-2009) (no 2004 data point) abundance at age (ages 5-14); and
- EU-Spain Div. 3NO survey (1998-2009) MNPT (ages 5-14) (Table 19a, b, c).

Standardized age by age abundance (using mean and standard deviation of each index) was plotted. For each survey-age, the survey data are standardized to have a mean of 0 and a variance of 1 (Fig. 25). Surveys seemed to show the same trends in abundance at age, except the EU-Spain survey estimated higher levels of ages 6 and 7s; trends are somewhat less similar at older ages. Appendix A shows some plots which compare ages and surveys over the survey time periods, as well as some internal and between survey correlations. (See section at end of document for information.)

The results of an ADAPT run using the formulation described above are given in Table 23 and Figures 26-29. The model provides a good fit to the data. The mean square of the residuals was 0.28. Relative errors on the population estimates ranged from 0.15 to 0.32. The relative errors on the catchabilities (q) were all less than 0.2. The residuals from the Canadian spring survey showed an increasing trend over the time series, with more negative residuals at the beginning of the time series, except in the last year; whereas the Canadian fall survey appears to decline slightly over time. The residuals from the EU-Spain Div. 3NO survey showed very little pattern (Fig. 26). There is some tendency for there to be a lag between the predicted and observed survey estimates at age for the fall survey (especially in recent years there is not a good fit) but a better fit for the spring survey, except in the most recent year. The fit of predicted and observed survey estimates is not a good fit for the EU-Spain Div. 3NO survey (Fig. 27). Residuals are larger for the older ages in the fall survey but are fairly low overall (Fig 28). The value for age 5s in the EU-Spain Div. 3NO survey is also high. Survey qs showed that q is lower for the youngest fish and also older fish but is fairly constant across age (Fig. 29). Fall surveys catch more small fish than spring surveys. Qs from the EU-Spain Div. 3NO survey show a different pattern than the other surveys and may catch a larger proportion of older fish.

Population numbers and F from this run are shown in Tables 24 and 25. Biomass was calculated by multiplying the population numbers at age by the beginning of the year weights at age. The VPA analyses showed that population abundance and biomass declined fairly steadily from the mid 1970's. Biomass has been relatively stable since 1995 (Fig. 30), increasing over the last number of years. Average F on ages 9 to 14 showed an increasing trend from about 1965 to 1985. There was a large peak in F in 1993, which may be an artifact of extremely low catches during the moratorium. F since 1995 has been generally lower than in the earlier period but increased fairly steadily from 1995 to 2000. F has been decreasing since then. Average F on ages 9-14 in 2009 was 0.13 (Table 25, Fig. 30).

Spawning stock biomass was calculated by multiplying the biomass at age by the female maturity ogive (Table 22). SSB has shown 2 peaks, one in the mid 1960s and another in the early to mid 1980s. It declined to a very low level (less than 10 000 t) in 1994 and 1995 (Figure 31, Table 26). Since then, SSB has been increasing; however, in the 2009 assessment, SSB was estimated at 41, 000 t in 2009 (January 1), but this appears to have been overestimated for the past three years. There is a different perception of SSB between surveys (see below for more information), which is compounded by a retrospective pattern in the maturity ogive (proportion mature for most of the youngest ages in most recent year is lower than the year before). SSB at the beginning of 2010 is estimated to be 33, 000 t. SSB is still in an upward trajectory but appears to be taking longer to reach B_{lim} (50, 000 t) than was estimated by the prior assessment. Recruitment has been poor since the 1986 year-class but the 2003 year class is well above average for the recent time period (Figure 31). An examination of the stock recruit scatter shows that there has been only good recruitment observed above 155 000 t and no good recruitment observed at SSB below 50 000 tons (B_{lim}) (Fig. 32). The most recent (2004) year class is in the lower left of the plot. The 2003 YC has also been downgraded since the last assessment.

Why the change from 2009 to 2010?

The perception of the stock is different from the current assessment compared to last year's assessment, with the estimate of SSB in 2009 (41 000 t) from the 2009 assessment being revised downward by 37% in the 2010 assessment. The major reason for this change is that the tuning indices added to the VPA in 2010 showed a decline

in 2009. Additionally, the 2008 catch at age was revised and numbers at age from the Canadian fall survey in 2008 were added. In the fall 2008 and 2009 surveys, the 1998 cohort did not appear as strong as it did previously at younger ages. In addition, stock weights and maturities now appear to be reduced compared to values used in the last assessment.

Single Index Runs

The ADAPT was run using only one survey index at a time to tune the VPA in order to try and understand some of the differences in the assessment between 2009 and 2010. It can be seen from Figure 34 that the single index runs from the Canadian spring and EU-Spain surveys give similar estimates of SSB but the Canadian fall survey gives a much lower estimate of SSB. The MSE from the output of ADAPT gives the fit of each of the single index runs of Can. Fall, EU-Spain and Can. Spring to be 0.30, 0.36 and 0.21 respectively. The estimates of SSB diverge after 2003, the year when the 1998 year class would have initially entered the SSB.

One Year Retrospective Analysis

A retrospective analysis was conducted by sequentially removing one year of data from the most recent year for a comparison of 5 years. The results of this analysis are shown in Figure 27 to 29 and Tables 33 to 35. There is a retrospective pattern present that was more obvious than the retrospective pattern from the 2009 assessment (Tables 29 and 30 and Figures 35 and 36); this appeared to be due to a combination of factors. The 2009 ADAPT did not include the 2008 Canadian fall survey, which wasn't in agreement with the strength of the 1998 cohort suggested by previous surveys and led to a lower estimate of SSB for 1 January 2009.

The 2009 indices all suggest that the stock declined from 2008 levels. Thus when the 2009 survey indices were added to the VPA, the estimated stock size for several cohorts was less optimistic than in the previous assessment.

Stochastic Projections

Simulations were carried out to examine the trajectory of the stock under 3 scenarios of fishing mortality: F = 0, F= F_{2009} (0.13), and $F_{0.1}$ (0.2). F_{max} is difficult to determine for this stock and highly labile so estimates were not provided under this scenario. For these simulations the results of the VPA and the covariance of these population estimates were used. The following assumptions were made:

Age	Estimate of 2010 population numbers ('000)	CV on population estimate	Weight-at-age mid-year (avg. 2007-2009)	Weight-at-age beginning of year (avg. 2007-2009)	Maturity-at-age (avg. 2007-2009)	Rescaled PR relative to ages 9-14 (avg. 2007-2009)
5			0.197	0.169	0.023	0.021
6	23373	0.318	0.278	0.230	0.064	0.054
7	42528	0.227	0.376	0.326	0.232	0.168
8	14869	0.189	0.485	0.443	0.489	0.371
9	7321	0.181	0.579	0.548	0.775	0.415
10	8664	0.166	0.721	0.662	0.934	0.450
11	7281	0.160	0.870	0.801	0.986	0.685
12	6678	0.150	1.163	1.044	0.997	1.339
13	1602	0.167	1.313	1.253	1	1.388
14	481	0.202	1.474	1.385	1	1.723
15	1074	0.197	1.795	1.653	1	1.723

Simulations were limited to a 5-year period. Recruitment was resampled from three sections of the estimated stock recruit scatter, depending on SSB. The three sections were 50 000 tons of SSB and below (only low recruitment), greater than 50 000 tons to 155 000 tons (low and high recruitment), and greater than 155 000 tons (only high recruitment). The simulations contained a plus group at age 15. At F = 0 spawning stock biomass is

estimated to increase and there is a 50% probability that SSB will surpass B_{lim} by 2012. Under $F_{current}$ and $F_{0.1}$ the population is estimated to grow more slowly and there is a less than 50% probability that SSB will read B_{lim} by 2015 (Table 31 and Fig. 37). Yield is estimated to increase over the 5-year time period under $F_{current}$ and $F_{0.1}$.

Appendix A

Some exploratory analyses were conducted to evaluate the internal consistency in each survey index series, the consistency of the contribution of each year-class to the total survey index, and the consistency of the age-specific information across the survey series.

Pair-wise plots of the each of the survey indices (by cohort on the log-scale) are presented in Appendix A.1 – A.3. The data points in the panels below the numbered diagonal compare the logarithm of survey data at different ages for a common cohort. The solid line in each panel is the linear least squares regression line. Numeric values in the panels above the diagonal provide the correlation coefficient between the survey data at these ages. The p-values for testing whether or not the correlation is significantly different in each panel are indicated by the key shown on the right hand side. Regression and correlations are only computed if there are at least 5 points (i.e. cohorts) available for a given pair of ages. The scatter plots reveal that some of the lower correlation values at some of the ages for some of the survey indices are partially due to one or two outlying points; mostly there are high correlations of ages between cohorts for all surveys.

A comparison of standardized indices illustrating the consistency of dataset currently used to calibrate the analytical assessment is presented in Figure Appendix A.4. Note: this is the same as Figure 25. In these figures each survey-age time-series is standardized to have mean 0 and variance 1 and are directly comparable. The survey data used to calibrate the VPA appears to be fairly consistent through time over most age groups, though the number of age 6s in 2004, age 7s in 2005-2007 and age 14s in 2004 are higher than the Canadian surveys, with less consistency overall in the recent period.

Plots of the standardized proportions by age across years (SPAY) provide additional perspective on the cohort consistency within each of the survey indices (Figures A.5). In the SPAY plots, the annual index proportions were standardized at each age to have a mean of 0 and a variance of 1. (Cohorts are identified with text labels in the margin.) Cohorts can be tracked in all surveys, but especially at the youngest ages in the Canadian fall surveys. In the more recent period, both the 1998 and 2003 year classes are strong, but the 1998 cohort appears less strong in the two most recent years in the fall 2008 and 2009 surveys.

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Table 1. Nominal catches (t) of American plaice for NAFO Divisions 3LNO, 1960-2003 and TACs from 1973 to 2009.

Year	Canada	Other	Total	STACFIS[a]	TAC
1960	21,353	20	21,373		-
1961	14,897	1,476	16,373		-
1962	15,210	982	16,192		-
1963	24,591	1,594	25,719		-
1964	35,474	3,773	38,567		-
1965	45,365	12,440	53,261		-
1966	51,225	25,270	65,011		-
1967	54,190	75,362	94,413		-
1968	48,674	48,244	73,167		-
1969	64,815	29,115	79,437		-
1970	54,929	21,956	66,653		-
1971	49,394	36,105	67,888		-
1972	41,605	32,175	59,361		-
1973	38,586	26,773	52,843		60,000
1974	35,101	21,270	46,297		60,000
1975	34,015	17,317	43,221		60,000
1976	47,806	7,726	51,824		47,000
1977	42,579	2,700	43,981		47,000
1978	48,634	2,491	50,021		47,000
1979	47,131	2,752	48,568		47,000
1980	48,296	1,391	49,086		47,000
1981	48,177	3,723	50,158		55,000
1982	49,620	1,253	50,337		55,000
1983	35,907	3,582	37,720		55,000
1984	33,756	4,363	36,028		55,000
1985	40,024	13,600	48,018	54,212	49,000
1986	33,409	45,350	57,449	64,570	55,000
1987	33,967	36,529	53,457	55,012	48,000
1988	26,832	22,080	38,925	40,835	33,585[c]
1989	27,901	24,803	41,206	43,369	30,300
1990	22,600	2,073	24,006	32,501	24,900
1991	22,510	4,026	25,503	34,681	25,800
1992	9,663	1,808	10,870	13,350	25,800
1993[b]	7,454	761	7,916	17,122	10,500
1994	73	973	560	7,378	4,800[d]
1995	67	962	548	637	0
1996	49	1,641	875	913	0
1997	75	2,573	1,365	1,401	0
1998	227	2,640	1,560	1,618	0
1999	323	4,203	2,436	2,565	0
2000[e]	623	3,932	2,600	5,176	0
2001	1,618	2,753	2,998	5,739	0
2002	1,343	3,452	3,117	4,870	0
2003[e]	1,607	2,215	3,822	8,727	0
2004	1,295	1,563	2,858	6,158	0
2005	1,472	2,638	4,110	4,110	0
2006	94	2,734	2,828	2,828	0
2007	435	3,172	3,607	3,606	0
2008	874	1,641	2,515	2,515	0
2009	1,077	1,938	3,015	3,015	0
2010					

Table 2 . Biomass estimates ('000t) of A.plaice, by stratum and depth zone (m), from Canadian spring surveys in Div. 3L in 1996-2009 (Campelen). (+) indicates biomass <50 t, (-) means stratum not surveyed.

		Biomass													
Depth	Stratum	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
30-56	784	-	-	0.2	+	-	+	0.0	-	-	-	-	-	-	-
	Total	-	-	0.2	+	-	+	0.0	-	-	-	-	-	-	-
57-92	350	0.6	0.3	0.3	6.1	1.8	0.4	0.2	0.7	0.7	1.2	1.7	2.3	3.1	0.6
	363	2.3	0.8	0.0	3.2	6.2	0.6	0.1	3.4	2.1	4.1	4.5	4.4	6.0	1.3
	371	0.9	0.2	0.1	2.4	0.9	0.1	+	0.2	0.5	1.3	1.3	1.4	1.9	+
	372	1.4	0.8	1.3	2.7	3.7	1.2	0.3	2.2	1.2	1.8	2.5	1.6	1.8	0.8
	384	0.7	0.9	0.2	0.8	1.2	0.3	0.4	0.3	0.5	0.9	1.6	1.6	2.5	0.1
	785	-	-	0.2	0.5	-	0.7	+	-	+	-	-	-	-	-
	Total	5.9	3.0	2.1	15.7	13.8	3.3	1.0	6.9	5.0	9.2	11.5	11.3	15.4	2.8
93-183	328	0.5	0.5	0.1	2.4	0.9	1.3	0.5	0.2	0.6	3.6	1.6	1.4	-	2.9
	341	1.8	0.5	0.7	4.5	0.8	1.5	0.2	0.6	0.6	2.3	1.7	1.2	4.4	0.9
	342	0.1	0.1	0.4	0.4	0.2	0.1	+	0.1	+	0.1	0.6	0.8	0.1	0.1
	343	0.3	0.0	+	0.6	0.2	+	+	0.1	+	0.1	0.3	0.1	0.0	0.2
	348	1.4	0.8	1.2	2.8	1.5	0.4	0.3	0.4	1.3	1.5	7.0	2.7	0.8	0.2
	349	0.8	0.3	0.2	4.4	1.3	0.5	0.3	0.6	1.1	1.1	3.6	1.6	1.8	0.3
	364	2	1.0	0.9	5.6	1.3	1.5	1.2	0.7	1.7	5.8	7.5	0.7	3.5	0.4
	365	1.1	0.5	0.9	1.4	1.2	0.3	0.6	0.6	0.5	1.3	6.2	2.3	2.5	0.3
	370	1.3	0.6	1.6	2.4	1.9	0.9	0.6	0.5	1.1	4.0	5.1	0.8	3.1	0.4
	385	5.6	0.9	0.5	2.5	1.9	1.4	0.7	0.4	1.4	2.4	4.0	1.7	3.9	0.8
	390	0.6	0.4	0.5	0.3	0.3	0.4	1.0	0.3	0.2	0.9	0.9	1.8	2.6	0.1
	786	-	-	0.3	0.5	-	0.4	-	-	0.1	-	-	-	-	-
	787	-	-	0.5	0.8	-	0.1	-	-	+	-	-	-	-	-
	788	-	-	-	0.3	-	-	-	-	-	-	-	-	-	-
	790	-	-	-	+	-	-	-	-	-	-	-	-	-	-
	793	-	-	-	+	-	-	-	-	-	-	-	-	-	-
	794	-	-	-	+	-	-	-	+	-	-	-	-	-	-
	797	-	-	-	+	-	-	-	+	-	-	-	-	-	-
	799	-	-	-	-	-	-	-	-	+	-	-	-	-	-
	Total	15.5	5.5	7.8	28.9	11.5	8.8	5.4	4.5	8.6	23.2	38.5	15.0	22.7	6.5
184-274	344	1	0.3	0.8	1.8	0.5	0.3	0.2	0.3	0.3	1.7	2.9	1.7	0.5	0.3
	347	0.6	0.2	0.6	0.6	0.2	0.4	0.1	0.5	0.3	1.7	1.7	5.3	0.2	0.5
	366	0.4	0.3	0.3	0.5	0.7	0.7	0.9	0.6	0.6	1.3	3.0	3.3	0.7	0.7
	369	0.3	0.2	0.2	1.2	0.7	0.9	0.8	0.4	0.5	2.8	4.4	2.0	0.7	0.8
	386	0.5	0.2	0.4	1.4	1.7	0.4	0.5	0.4	0.5	2.0	2.6	2.5	0.9	0.5
	389	0.4	0.2	0.4	0.6	0.8	0.8	0.3	0.4	0.7	0.4	1.1	0.7	0.7	0.2
	391	0.3	0.1	0.2	0.1	+	0.2	0.2	0.2	0.1	0.1	0.1	0.4	0.6	0.1
	789	-	-	-	0.5	-	-	-	+	-	-	-	-	-	-
	791*	-	-	-	0.3	-	-	-	-	0.1	-	-	-	-	-
	795	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-
	798	-	-	-	0.1	-	-	-	+	-	-	-	-	-	-
	Total	3.5	1.5	2.9	7.2	4.6	3.7	3.0	2.8	3.0	10.0	15.8	16.0	4.2	3.1
275-366	345	0.5	0.2	0.3	1.5	0.5	0.7	0.7	0.2	0.4	2.9	1.4	1.9	0.7	1.2
	346	0.4	0.3	0.2	0.2	0.5	0.1	0.8	0.8	0.9	1.6	0.7	1.2	0.8	1.0
	368	0.3	0.0	0.1	0.3	0.4	0.2	0.2	0.2	0.2	0.1	0.1	0.0	0.5	0.7
	387	0.6	0.6	0.8	0.4	1.6	0.8	0.1	0.4	0.4	0.7	0.6	0.5	1.8	0.2
	388	0.6	0.2	0.2	0.8	0.3	0.4	0.1	0.1	0.1	0.1	0.1	0.2	0.9	0.2
	392	0.5	0.1	0.4	0.2	0.1	0.1	0.3	0.1	0.2	+	0	0.0	0.0	0.3
	792	-	-	-	+	-	0.1	-	0.1	-	-	-	-	-	-
	796	-	-	-	0.1	-	-	-	0.1	-	-	-	-	-	-
	800	-	-	-	0.2	-	-	-	-	0.1	-	-	-	-	-
	Total	2.9	1.4	2.0	3.7	3.4	2.4	2.2	1.8	2.4	5.5	2.9	3.9	4.6	3.6
367-549	729	0.2	0.6	2.2	0.1	1.3	1.1	1.3	1.2	+	+	0.0	0.0	0.0	1.5
	731	0.5	0.1	+	0.1	1.2	0.3	0.2	0.1	0.1	0.0	0.0	0.1	0.0	0.4
	733	0.7	0.0	0.3	1	0.1	2.3	0.5	2.1	0.3	+	0.1	0.0	0.5	+
	735	1.4	1.6	1.2	0.6	1.2	2.1	1.2	4.9	-	+	+	0.1	2.3	0.9
	Total	2.8	2.4	3.7	1.8	3.8	5.8	3.2	8.3	0.4	0.0	0.1	0.2	2.9	2.8
550-731	730	+	0.0	0.2	+	0.1	0.1	0.3	+	+	0.0	-	0.0	0.0	+
	732	+	0.0	0.0	+	0.3	3.4	0.6	0.6	0.0	0.0	-	0.0	0.0	0.2
	734	+	0.0	0.1	0	0	0.1	0.9	0.5	0.0	0.0	-	0.0	-	1.2
	736	+	0.1	0.0	+	+	+	0.5	0.1	+	+	-	0.0	0.1	0.5
	Total	0.1	0.1	0.3	+	0.4	3.6	2.3	1.2	0.0	0.0	0.0	0.0	0.1	1.9
732-914	737	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	741	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	745	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	748	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-
915-1097	738	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	742	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	746	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	749	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1098-1280	739	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	743	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	747	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	750	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1281-1463	740	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	744	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	751	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grand Total		30.7	13.8	19.0	57.3	37.5	27.6	17.1	25.4	19.3	47.9	68.8	46.3	50.0	20.6

in 1996 had a depth range of 184-366

Table 3. Biomass estimates ('000t) of A.plaice, by stratum and depth zone (m), from Canadian spring surveys in Div. 3N in 1996-2008 (Campelen). (+) indicates biomass <50 t, (-) means stratum not surveyed.

Biomass

Depth	Stratum	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
≤ 56	375	2.9	2.2	1.1	1.8	5.1	2.1	3.9	2.1	2.3	0.6	4.5	3.7	6.3	2.2
	376	0.8	1.8	2.0	3.2	5.1	9.3	8.6	9.6	11.7	37.2	32.1	7.5	7.9	9.7
	Total	3.7	4.0	3.1	5.0	10.2	11.4	12.5	11.8	14.1	37.8	36.5	11.2	14.3	11.9
57-92	360	8.8	8.6	7.9	27.4	22.8	50.3	28.0	29.6	29.2	37.5	54.2	100.7	78.3	17.8
	361	3.8	1.9	2.0	5.5	4.2	9.0	6.0	9.3	8.3	4.7	3.8	2.8	3.1	2.1
	362	2.8	5.5	4.0	4.6	6.6	7.0	2.7	4.7	2.5	5.7	4.5	4.2	4.5	2.4
	373	1.6	0.5	0.9	8.3	3.2	2.5	0.4	2.7	1.1	2.7	-	3.0	10.2	1.5
	374	1.1	0.4	0.3	1.7	0.9	1.0	0.6	3.2	2.1	3.5	0.1	5.0	5.0	2.9
	383	0.5	0.1	+	1.0	0.2	0.1	+	0.3	0.5	1.8	-	2.7	2.6	0.2
	Total	18.6	17.0	15.1	48.5	37.9	69.9	37.7	49.7	43.7	55.7	62.6	118.4	103.7	26.8
93-183	359	1.1	1.1	1.6	3.3	5.1	5.1	0.6	7.0	3.7	15.3	-	4.1	9.3	4.5
	377	0.2	0.1	+	0.2	+	0.9	0.1	0.2	0.2	0.4	-	4.8	2.0	0.8
	382	0.1	0.1	0.7	0.2	0.4	0.1	0.1	0.1	0.1	3.9	-	0.1	1.6	+
	Total	1.4	1.3	2.3	3.7	5.5	6.1	0.8	7.3	4.0	19.6	-	9.0	12.9	5.3
184-274	358	0.1	0.1	1.4	0.3	0.6	0.5	0.1	0.3	0.3	0.4	-	0.7	0.5	1.5
	378	0.1	0.2	0.2	0.9	+	0.1	0.1	0.5	0.4	0.1	-	0.4	0.3	9.0
	381	0.3	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.8	0.1	-	0.7	0.8	0.2
	Total	0.5	0.4	1.7	1.4	0.7	0.7	0.3	1.0	1.5	0.6	-	1.8	1.6	10.7
275-366	357	0.1	0.1	0.1	+	0.1	0.1	0.1	0.1	0.1	0.1	-	0.1	0.0	0.4
	379	+	0.1	0.1	0.1	0.1	0.1	0.1	0.3	+	+	-	+	0.0	0.2
	380	0.2	0.8	0.1	0.2	+	0.1	+	0.4	0.2	0.0	-	0.0	0.1	0.3
	Total	0.3	1.0	0.3	0.3	0.2	0.3	0.2	0.9	0.3	0.1	-	0.1	0.1	0.9
367-549	723	0.2	0.4	0.3	+	0.0	0.1	0.3	1.1	0.1	0.1	-	+	0.0	+
	725	0.1	0.5	0.2	+	0.4	0.1	+	0.3	+	+	-	0.0	0.0	0.0
	727	0.5	2.2	2.0	0.4	1.2	2.5	0.1	0.5	0.4	+	-	+	+	1.7
	Total	0.8	3.1	2.5	0.4	1.6	2.7	0.4	1.8	0.6	0.1	-	0.0	0.0	1.7
550-731	724	0.2	0.5	0.2	+	0.1	0.1	0.5	0.1	+	0.1	-	0.0	-	0.0
	726	+	0.1	+	+	0.1	+	+	+	+	0.0	-	0.0	0.0	0.0
	728	0.5	-	0.3	0.2	0.5	1.0	0.4	0.1	+	0.1	-	0.0	0.0	3.8
	Total	0.7	0.5	0.5	0.2	0.7	1.1	0.9	0.3	+	0.2	-	0.0	0.0	3.8
732-914	752	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	756	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	760	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total			-	-	-	-	-	-	-	-	-	-	-	-
915-1097	753	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	757	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	761	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1098-1280	754	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	758	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1281-1463	755	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	759	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grand Total		26.0	27.4	25.5	59.5	56.8	92.1	52.8	72.7	64.1	114.2	99.1	140.4	132.5	61.1

Table 4. Biomass estimates ('000t) of A.plaice, by stratum and depth zone (m), from Canadian spring surveys in Div. 3O in 1996-2008 (Campelen). (+) indicates biomass <50 t, (-) means stratum not surveyed.

Biomass

Depth	Stratum	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
57-92	330	3.8	0.8	6.9	3.5	5.9	4.2	2.1	1.3	2.9	6.5	4.9	4.7	6.5	3.2
	331	1.4	0.3	0.3	2.7	2.3	2.6	2.2	2.6	0.8	0.9	-	2.5	1.9	0.4
	338	6.0	5.7	6.0	4.0	2.3	6.0	3.1	5.0	4.3	4.5	6.4	3.2	2.5	3.2
	340	2.2	1.7	1.8	2.9	1.9	1.7	0.5	1.5	0.7	1.7	1.4	2.4	3.5	1.4
	351	2.9	4.4	3.8	4.6	3.4	6.5	3.2	2.4	3.5	4.5	3.2	6.0	4.4	0.6
	352	9.1	13.8	10.6	14.2	13.4	17.5	18.6	10.1	10.0	13.2	10.7	8.9	4.9	2.0
	353	7.8	8.3	10.9	21.5	21.1	20.6	14.8	25.2	21.2	10.1	15.9	7.8	10.6	15.7
	Total	33.2	34.9	40.3	53.4	50.3	59.1	44.5	48.0	43.4	41.3	42.5	35.6	34.3	26.5
93-183	329	1.6	1.4	4.4	4.7	3.9	1.9	1.4	1.8	3.1	2.3	-	2.8	3.4	2.2
	332	3.9	2.5	3.8	2.2	0.9	2.2	3.1	1.4	1.9	2.2	-	1.0	3.1	3.6
	337	4.6	1.9	3.2	2.7	1.5	1.2	1.4	1.4	1.6	2.5	-	0.7	2.5	1.1
	339	1.4	0.8	0.8	2.1	2.1	2.6	0.9	0.9	0.7	1.7	1.2	1.0	1.3	2.3
	354	1.6	1.1	5.0	9.0	1.3	1.6	6.4	5.3	8.1	1.9	-	2.7	6.9	5.1
	Total	13.1	7.8	17.2	20.7	9.7	9.5	13.2	10.9	15.3	10.7	1.2	8.2	17.2	14.3
184-274	333	+	0.3	0.1	0.1	+	+	0.3	+	+	0.2	-	0.1	+	+
	336	0.2	0.3	+	0.2	+	0.1	+	+	+	0.1	-	0.2	+	+
	355	0.5	0.3	0.1	0.1	0.1	0.4	0.4	0.6	0.3	0.2	-	0.2	+	0.2
	Total	0.7	0.9	0.2	0.4	0.1	0.5	0.7	0.6	0.3	0.5	0.0	0.5	0.0	0.2
275-366	334	0.2	0.8	0.0	0.1	+	+	0.2	0.2	+	+	-	0.1	+	+
	335	0.2	0.2	0.0	+	+	+	+	+	+	+	-	0.0	+	+
	356	0.1	+	+	0.1	+	+	+	0.4	+	+	-	0.1	+	0.1
	Total	0.5	1.0	+	0.2	+	+	0.2	0.5	+	0.1	0.0	0.1	0.0	0.1
367-549	717	0.2	1.7	+	0.1	0.0	+	0.4	0.2	0.0	0.1	-	0.0	0.0	0.0
	719	0.1	0.5	+	+	0.0	+	+	+	+	+	-	0.0	0.0	0.0
	721	0.2	0.1	+	0.1	+	0.2	+	0.1	0.0	+	-	0.0	0.0	+
	Total	0.5	2.2	+	0.2	+	0.2	0.4	0.3	0.0	0.1	-	0.0	0.0	0.0
550-731	718	+	0.1	+	+	0.0	+	+	0.3	0.0	0.0	-	0.0	0.0	+
	720	+	0.1	+	+	0.0	0.1	0.0	+	0.0	0.0	-	+	0.0	0.0
	722	1.0	4.2	0.0	0.2	0.1	0.2	0.1	0.2	0.0	0.0	-	+	0.0	0.0
	Total	1.0	4.4	+	0.2	0.1	0.2	0.1	0.2	0.0	0.0	-	0.0	0.0	0.0
732-914	764	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	768	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	772	-	-	-	-	-	-	-	-	-	-	-	-	-	-
											-	-	-	-	-
	Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-
											-	-	-	-	-
915-1097	765	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	769	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	773	-	-	-	-	-	-	-	-	-	-	-	-	-	-
											-	-	-	-	-
	Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grand Total		49.0	51.2	57.7	75.1	60.2	69.5	59.1	60.5	59.0	52.6	43.7	44.4	51.5	41.0

Table 5. Abundance index at age (millions) for American plaice in NAFO Div. 3L from Canadian spring surveys from 1985 to 2009.

Age/Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
0	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00
1	0.00	0.00	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.11	0.00	2.29	1.15	0.00	0.13	0.05	1.42	-	1.64	4.33	0.63
2	0.00	1.32	5.23	4.10	1.86	0.00	1.32	0.00	0.30	0.00	0.00	8.40	0.63	0.68	1.89	17.73	37.91	7.65	1.66	3.76	10.61	-	18.24	27.16	79.34
3	8.11	4.55	11.39	18.84	17.35	5.24	3.23	1.74	2.26	0.36	0.40	29.93	5.44	3.14	5.42	12.32	32.83	34.07	20.64	9.38	31.58	-	28.17	39.19	71.37
4	25.76	23.56	50.30	80.86	80.96	70.17	14.00	5.14	5.75	7.48	0.82	91.96	14.04	10.24	6.59	4.94	15.63	18.24	29.59	24.62	39.64	-	34.52	36.20	28.94
5	146.34	115.41	242.76	279.24	174.03	137.97	110.19	46.07	22.68	31.03	11.84	82.54	31.70	21.10	25.82	8.95	5.95	7.98	17.73	35.53	95.80	-	16.60	35.83	21.11
6	349.77	451.71	566.10	554.37	416.73	231.75	178.00	61.69	59.15	46.46	17.43	48.50	26.57	36.67	42.99	29.81	9.41	5.19	8.55	14.35	72.72	-	19.83	28.83	14.26
7	513.51	496.70	553.70	501.15	351.42	277.32	102.04	89.33	37.42	44.40	31.75	26.16	14.58	30.44	66.66	28.55	18.61	9.46	7.73	8.27	25.87	-	42.04	27.25	8.24
8	317.45	260.25	333.72	277.15	208.59	152.33	79.23	33.11	16.71	13.72	31.28	8.01	6.83	19.43	65.01	27.47	16.40	9.72	11.96	4.93	11.24	-	42.47	30.88	7.44
9	152.45	156.89	132.67	188.17	143.33	94.21	43.70	18.53	5.56	6.13	17.63	3.62	2.42	6.38	39.59	18.83	17.27	8.67	10.35	5.64	9.96	-	17.46	18.93	9.55
10	85.19	66.89	65.65	60.04	52.54	55.70	19.02	7.07	2.96	1.38	5.28	0.64	0.69	2.90	19.36	10.78	15.22	6.50	6.90	4.66	6.98	-	4.56	6.23	5.99
11	44.66	27.01	22.24	32.65	26.90	18.40	10.45	2.88	1.23	0.83	1.14	0.09	0.39	1.60	10.42	5.46	7.50	4.22	4.04	3.62	6.50	-	4.72	4.58	2.26
12	22.13	18.07	19.32	20.02	14.77	9.59	6.61	1.44	0.43	0.14	0.21	0.03	0.09	0.64	3.36	1.31	2.97	1.00	2.42	1.92	2.47	-	1.71	2.48	0.49
13	12.34	11.84	9.13	10.11	8.57	6.33	2.57	0.64	0.29	0.15	0.06	0.03	0.02	0.17	1.34	0.25	0.81	0.35	0.73	0.69	0.99	-	2.00	1.61	0.12
14	5.99	4.40	3.93	5.87	4.85	2.40	1.39	0.38	0.13	0.05	0.00	0.00	0.00	0.00	0.18	0.09	0.13	0.14	0.23	0.21	0.00	-	2.04	0.82	0.76
15	2.99	2.64	2.00	3.27	3.36	1.57	0.99	0.19	0.03	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.05	0.00	0.00	0.00	0.00	-	1.00	0.11	0.17
16	1.91	1.58	0.74	1.54	1.07	1.04	0.48	0.06	0.03	0.00	0.00	0.00	0.00	0.02	0.09	0.07	0.10	0.00	0.00	0.01	0.04	-	1.42	0.38	0.76
17	0.39	0.44	0.24	0.36	0.43	0.58	0.18	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	-	1.25	0.00	0.07
18	0.03	0.22	0.02	0.00	0.09	0.00	0.03	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	0.00	-	0.49	0.05	0.14
19	0.03	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	-	0.31	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.10	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	0.00	-	0.11	0.00	0.00
unk1	0.23	0.51	0.00	0.45	0.05	3.04	0.03	0.01	0.69	0.00	0.00	0.00	0.00	0.12	0.04	0.01	0.05	0.16	0.04	0.17	0.00	-	0.34	0.53	5.24
Ages 0+	1689.25	1643.96	2019.37	2038.19	1506.93	1067.63	573.54	268.29	155.67	152.11	117.84	300.15	103.40	133.65	288.81	168.87	182.03	113.35	122.68	117.81	315.90	-	240.92	265.38	256.87
Ages 6+	1508.82	1498.62	1709.47	1654.71	1232.68	851.22	444.78	215.33	123.99	113.25	104.78	87.08	51.60	98.26	249.04	122.63	88.51	45.24	52.90	44.30	136.84	-	141.41	122.14	50.24
Ages 9+	328.09	289.97	255.94	322.03	255.94	189.82	85.51	31.20	10.71	8.67	24.32	4.41	3.61	11.72	74.38	36.80	44.09	20.87	24.66	16.75	27.01	-	37.07	35.19	20.30
Ages 12+	45.79	39.19	35.39	41.18	33.17	21.50	12.34	2.72	0.95	0.33	0.27	0.06	0.11	0.84	5.01	1.72	4.10	1.48	3.38	2.83	3.57	-	10.32	5.45	2.51

Table 6. Abundance index at age (millions) for American plaice in NAFO Div. 3N from Canadian spring surveys from 1985 to 2009.

Age/Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
0	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00
1	0.26	0.00	0.00	0.00	0.00	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.71	0.46	1.31	0.00	0.00	3.34	0.44	-	6.23	1.52	1.79
2	2.33	2.52	17.27	3.67	4.37	4.30	0.43	0.41	0.78	0.00	0.00	2.06	0.15	0.24	17.60	12.74	16.04	3.61	1.02	2.68	24.36	-	0.38	24.59	2.74
3	33.52	13.39	72.32	45.69	49.06	29.60	2.54	3.15	3.84	1.24	0.74	6.01	1.51	0.24	6.98	44.81	155.19	15.10	10.97	2.76	46.38	-	8.33	6.41	18.24
4	109.11	46.72	113.73	87.97	312.98	165.10	30.46	24.50	74.10	4.10	4.08	6.01	4.28	3.00	1.78	20.53	47.80	34.75	18.51	11.47	6.71	-	197.39	14.21	5.50
5	60.97	106.13	84.60	62.94	106.44	282.87	117.51	38.48	75.44	29.51	14.99	15.58	5.46	3.99	4.19	3.95	4.18	14.76	75.91	25.09	18.09	-	122.05	112.44	26.39
6	60.72	72.84	57.12	27.63	38.68	35.98	75.70	51.69	68.23	12.91	13.29	26.37	16.84	6.12	12.40	6.59	7.98	7.29	28.56	67.31	47.79	-	43.72	62.05	43.70
7	30.06	41.09	32.02	17.23	17.28	11.61	12.85	22.66	54.04	12.31	8.39	20.45	24.42	11.92	12.19	17.71	22.99	7.95	16.07	18.39	78.87	-	76.16	27.65	18.94
8	25.11	17.90	18.64	13.31	18.09	8.03	5.62	5.58	30.27	7.68	4.62	6.89	15.66	19.74	17.65	15.26	21.47	16.35	16.26	7.18	32.98	-	55.78	59.84	12.71
9	20.17	14.53	16.04	11.16	14.71	8.86	5.64	2.67	9.35	4.18	2.45	3.88	5.92	12.52	27.81	21.08	23.17	10.66	18.41	6.61	15.60	-	47.84	32.54	10.67
10	20.35	13.21	11.42	8.69	6.77	5.09	5.47	1.25	4.18	1.30	0.81	0.84	1.70	4.96	24.97	16.79	17.00	6.91	6.86	6.80	6.62	-	6.47	28.47	12.21
11	15.38	7.30	6.89	4.90	5.23	4.00	3.41	1.04	2.68	1.02	0.28	0.54	0.86	2.07	11.01	9.95	18.15	8.76	6.04	3.22	4.81	-	3.81	8.98	10.68
12	9.12	6.11	5.35	3.57	4.34	2.64	1.97	0.72	1.41	0.22	0.05	0.87	0.52	0.80	5.01	4.75	7.67	6.70	6.37	4.48	4.48	-	1.60	3.94	4.49
13	4.80	4.16	4.46	2.95	3.70	2.24	1.77	0.27	0.51	0.45	0.00	0.14	0.20	0.45	2.59	2.08	2.28	1.82	2.15	2.57	3.81	-	1.14	1.49	1.16
14	2.93	2.17	3.36	2.00	2.69	2.21	1.16	0.33	0.52	0.60	0.00	0.07	0.04	0.18	0.78	0.33	1.17	1.39	1.04	1.93	3.69	-	1.17	2.00	1.02
15	2.39	2.13	3.00	1.92	2.96	2.34	1.18	0.45	0.16	0.34	0.00	0.11	0.04	0.06	0.38	0.59	0.82	0.13	0.54	0.50	3.47	-	0.93	1.54	1.59
16	0.71	1.27	1.67	0.91	1.11	1.43	0.67	0.30	0.25	0.17	0.00	0.00	0.00	0.06	0.19	0.37	0.35	0.26	0.21	0.12	1.71	-	0.39	1.34	1.64
17	0.19	0.98	0.66	0.79	0.96	0.79	0.53	0.03	0.18	0.00	0.00	0.00	0.00	0.00	0.19	0.10	0.34	0.04	0.08	0.00	0.25	-	0.21	0.44	1.29
18	0.00	0.18	0.38	0.29	0.43	0.37	0.23	0.03	0.05	0.00	0.00	0.00	0.00	0.00	0.17	0.05	0.22	0.00	0.04	0.11	0.92	-	0.26	0.00	0.87
19	0.00	0.05	0.05	0.06	0.11	0.09	0.09	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.04	0.00	0.00	0.12	-	0.00	0.19	0.28
20	0.00	0.00	0.03	0.00	0.00	0.10	0.11	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.04	0.00	0.00	-	0.07	0.00	0.12
21	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00	0.05	0.00
unk1	0.26	0.23	0.88	0.07	0.03	0.46	0.00	0.32	0.14	0.00	0.00	0.11	0.00	0.00	0.04	0.00	0.08	0.08	0.54	0.52	0.33	-	0.22	0.05	0.06
Ages 0+	398.36	352.91	449.91	295.75	589.93	568.36	267.31	153.98	326.18	76.04	49.70	89.93	77.59	66.41	146.71	178.15	348.31	136.60	209.62	165.06	301.42	-	574.14	389.72	176.09
Ages 6+	191.92	183.91	161.11	95.41	117.04	85.75	116.37	87.12	171.87	41.19	29.89	60.16	66.19	58.88	115.41	95.66	123.71	68.30	102.68	119.20	205.11	-	239.53	230.46	121.37
Ages 9+	76.02	52.08	53.32	37.24	42.99	30.14	22.21	7.19	19.34	8.28	3.59	6.44	9.27	21.10	73.18	56.10	71.26	36.71	41.79	26.33	45.47	-	63.88	80.92	46.02
Ages 12+	20.13	17.05	18.97	12.49	16.29	12.21	7.69	2.23	3.14	1.78	0.05	1.19	0.79	1.56	9.38	8.28	12.93	10.38	10.49	9.70	18.45	-	5.76	10.93	12.46

Table 7. Abundance index at age (millions) for American plaice in NAFO Div. 3O from Canadian spring surveys from 1985 to 2009.

Age/Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
0	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00
1	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.08	0.37	7.72	2.00	2.76	0.31	0.10	3.66	3.21	-	9.03	4.86	5.08
2	0.00	0.58	5.38	0.69	0.00	5.45	0.00	4.09	1.30	0.00	0.00	35.87	5.79	8.83	22.96	24.10	47.02	26.61	5.19	11.26	96.22	-	9.14	81.19	33.30
3	8.60	13.38	16.95	15.85	20.37	10.62	24.86	28.66	3.39	0.94	0.89	63.90	33.35	7.29	22.70	92.19	87.85	49.52	42.95	17.01	145.20	-	30.40	52.61	100.11
4	24.12	39.55	57.58	22.47	51.19	113.04	39.65	30.20	40.67	9.53	6.22	27.81	36.80	39.43	14.11	47.07	49.56	97.60	46.99	41.71	32.14	-	88.28	51.28	47.76
5	56.50	34.46	132.85	26.43	55.67	197.91	170.49	25.73	39.93	38.68	15.08	35.55	28.12	44.71	36.73	22.08	18.72	33.76	94.61	35.92	35.77	-	55.20	90.71	24.80
6	44.06	36.82	124.23	34.62	96.36	110.17	110.46	76.76	52.76	46.67	26.80	55.64	40.99	26.40	49.12	30.61	18.95	28.85	35.39	80.28	43.32	-	26.09	25.58	72.19
7	52.08	39.37	70.48	25.50	101.47	82.08	65.32	38.93	68.61	28.66	19.75	50.51	40.32	34.39	26.02	31.75	32.26	34.53	22.26	24.63	39.13	-	26.27	37.05	17.55
8	47.24	28.92	45.95	24.51	47.05	39.90	28.07	24.72	42.46	21.87	14.04	24.61	26.23	40.22	28.86	21.84	24.57	27.75	21.53	17.22	10.88	-	17.24	26.31	13.87
9	35.38	22.23	35.93	18.52	29.60	27.41	18.21	12.92	17.32	9.69	7.40	8.69	10.60	29.01	39.91	19.25	17.98	18.93	11.21	7.67	6.30	-	17.31	18.67	16.50
10	34.70	18.02	24.03	16.56	15.36	16.74	10.70	9.18	9.37	2.72	2.25	3.02	3.66	11.70	20.99	19.62	12.82	11.01	4.32	4.10	2.91	-	5.76	7.89	6.78
11	24.27	11.65	12.70	11.09	7.72	9.99	8.40	5.53	3.72	2.10	1.25	1.32	1.42	6.26	9.09	12.52	8.91	7.05	3.69	2.37	2.37	-	2.40	1.24	3.18
12	13.96	10.20	9.14	8.99	7.96	9.23	4.78	3.24	2.42	1.04	0.28	1.33	1.22	1.84	4.65	3.47	5.37	4.86	2.67	1.80	1.28	-	1.74	0.88	1.10
13	5.58	5.74	6.33	5.68	4.56	5.87	2.89	2.43	0.98	0.64	0.03	0.35	0.34	1.00	2.58	1.70	2.45	1.84	1.62	1.23	1.42	-	1.24	0.70	0.46
14	5.06	2.33	3.84	4.10	2.11	4.20	2.98	1.06	0.68	0.35	0.04	0.18	0.14	0.27	0.93	0.48	1.47	0.48	0.89	0.57	0.97	-	0.62	0.51	0.16
15	4.00	2.30	3.03	2.36	2.19	2.04	1.89	1.78	0.49	0.13	0.00	0.10	0.13	0.41	0.74	0.63	1.10	0.40	0.49	0.29	0.51	-	0.22	0.36	0.55
16	1.59	0.92	1.83	2.31	1.82	1.71	1.03	1.25	0.55	0.09	0.00	0.17	0.13	0.05	0.59	0.19	0.61	0.44	0.34	0.20	0.28	-	0.31	0.48	0.29
17	0.31	0.72	0.97	0.48	1.07	1.22	0.58	0.24	0.36	0.00	0.00	0.00	0.00	0.00	0.32	0.29	0.38	0.17	0.16	0.00	0.22	-	0.20	0.19	0.10
18	0.03	0.18	0.46	0.51	0.43	0.55	0.44	0.51	0.09	0.00	0.00	0.00	0.00	0.00	0.25	0.14	0.15	0.10	0.09	0.01	0.00	-	0.24	0.18	0.23
19	0.00	0.05	0.20	0.03	0.03	0.22	0.24	0.13	0.08	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.04	0.00	0.19	0.00	0.00	-	0.00	0.00	0.11
20	0.29	0.00	0.00	0.03	0.03	0.00	0.08	0.13	0.05	0.00	0.00	0.00	0.00	0.00	0.04	0.11	0.04	0.00	0.00	0.00	0.00	-	0.08	0.26	0.00
unk1	0.06	0.00	0.00	0.66	0.27	0.00	2.46	0.87	0.39	0.04	0.00	0.05	0.00	0.14	0.03	0.04	0.71	0.24	0.00	0.29	0.50	-	0.22	0.13	0.04
Ages 0+	357.82	267.40	552.13	221.37	445.23	638.34	493.54	268.34	285.62	163.15	94.01	309.22	229.31	252.31	288.54	330.07	333.74	344.45	294.69	250.21	422.62	-	292.02	401.08	344.18
Ages 6+	268.54	179.43	339.10	155.28	317.74	311.33	256.07	178.79	199.94	113.96	71.83	145.93	125.16	151.55	184.28	142.60	127.12	136.41	104.86	140.35	109.60	-	99.74	120.29	133.08
Ages 9+	125.16	74.34	98.45	70.65	72.87	79.17	52.23	38.39	36.10	16.76	11.24	15.17	17.63	50.53	80.28	58.40	51.34	45.28	25.68	18.23	16.26	-	30.14	31.35	29.47
Ages 12+	30.81	22.43	25.79	24.48	20.19	25.03	14.91	10.77	5.70	2.26	0.35	2.13	1.95	3.57	10.29	7.01	11.62	8.29	6.46	4.09	4.68	-	4.66	3.55	3.00

Table 8. Abundance index at age (millions) for American plaice in NAFO Div. 3LNO from Canadian spring surveys from 1985 to 2009.

Age/Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
0	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00
1	0.26	0.00	0.48	0.00	0.00	0.27	0.00	0.00	0.00	0.00	0.00	0.35	0.08	0.54	8.43	4.76	5.22	0.31	0.22	7.05	5.07	-	16.91	10.72	7.50
2	2.33	4.42	27.88	8.47	6.23	9.74	1.75	4.50	2.38	0.00	0.00	46.33	6.57	9.75	42.46	54.56	100.97	37.86	7.86	17.71	131.19	-	27.76	132.94	115.38
3	50.22	31.32	100.65	80.37	86.77	45.46	30.62	33.55	9.50	2.54	2.02	99.84	40.30	10.67	35.10	149.32	275.88	98.69	74.56	29.15	223.16	-	66.90	98.21	189.72
4	158.99	109.83	221.62	191.29	445.13	348.31	84.11	59.84	120.53	21.11	11.12	125.79	55.12	52.67	22.49	72.54	112.98	150.59	95.08	77.80	78.49	-	320.19	101.68	82.20
5	263.81	256.00	460.21	368.61	336.14	618.75	398.19	110.28	138.05	99.22	41.91	133.68	65.28	69.80	66.74	34.98	28.85	56.50	188.24	96.53	149.66	-	193.86	238.97	72.30
6	454.55	561.36	747.45	616.62	551.77	377.90	364.16	190.14	180.14	106.04	57.52	130.51	84.40	69.20	104.51	67.01	36.35	41.33	72.50	161.94	163.83	-	89.64	116.46	130.15
7	595.65	577.16	656.21	543.88	470.17	371.00	180.21	150.92	160.06	85.37	59.88	97.12	79.31	76.74	104.87	78.01	73.86	51.94	46.06	51.28	143.87	-	144.47	91.95	44.73
8	389.80	307.06	398.31	314.97	273.73	200.26	112.92	63.40	89.45	43.27	49.94	39.51	48.72	79.39	111.52	64.57	62.44	53.82	49.75	29.34	55.10	-	115.49	117.02	34.02
9	208.01	193.65	184.64	217.85	187.64	130.48	67.54	34.12	32.23	19.99	27.48	16.19	18.94	47.91	107.31	59.16	58.43	38.25	39.97	19.92	31.86	-	82.61	70.14	36.72
10	140.24	98.12	101.10	85.29	74.68	77.52	35.19	17.50	16.51	5.40	8.34	4.50	6.05	19.56	65.32	47.19	45.04	24.42	18.07	15.56	16.51	-	16.80	42.58	24.99
11	84.30	45.96	41.83	48.63	39.84	32.39	22.26	9.45	7.63	3.95	2.66	1.94	2.68	9.93	30.52	27.93	34.57	20.03	13.76	9.21	13.68	-	10.94	14.80	16.12
12	45.20	34.38	33.80	32.58	27.07	21.46	13.36	5.40	4.26	1.40	0.54	2.23	1.82	3.28	13.02	9.54	16.02	12.56	11.46	8.20	8.24	-	5.06	7.29	6.08
13	22.72	21.74	19.93	18.75	16.83	14.43	7.22	3.34	1.78	1.24	0.09	0.52	0.56	1.62	6.51	4.04	5.54	4.01	4.51	4.49	6.22	-	4.37	3.80	1.74
14	13.98	8.90	11.14	11.97	9.65	8.81	5.53	1.77	1.33	1.00	0.04	0.25	0.17	0.45	1.89	0.90	2.77	2.01	2.17	2.71	4.66	-	3.82	3.32	1.93
15	9.37	7.07	8.03	7.56	8.51	5.95	4.05	2.42	0.67	0.47	0.00	0.21	0.16	0.47	1.16	1.22	1.96	0.53	1.03	0.78	3.98	-	2.15	2.01	2.32
16	4.20	3.76	4.24	4.76	3.99	4.17	2.18	1.61	0.84	0.26	0.00	0.17	0.13	0.14	0.88	0.63	1.05	0.70	0.55	0.33	2.03	-	2.12	2.20	2.69
17	0.89	2.14	1.87	1.63	2.45	2.60	1.28	0.27	0.59	0.00	0.00	0.00	0.00	0.00	0.51	0.39	0.72	0.21	0.25	0.00	0.53	-	1.66	0.63	1.45
18	0.06	0.58	0.86	0.79	0.94	0.92	0.70	0.54	0.14	0.00	0.00	0.00	0.00	0.00	0.42	0.19	0.37	0.10	0.13	0.12	0.92	-	0.99	0.23	1.24
19	0.03	0.10	0.25	0.10	0.18	0.31	0.33	0.13	0.13	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.18	0.04	0.19	0.00	0.12	-	0.31	0.19	0.39
20	0.29	0.00	0.03	0.03	0.03	0.10	0.29	0.22	0.05	0.00	0.00	0.00	0.00	0.00	0.11	0.11	0.04	0.00	0.04	0.00	0.00	-	0.26	0.26	0.12
21	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00	0.71	0.07
unk1	0.55	0.74	0.88	1.19	0.35	3.50	2.50	1.20	1.22	0.04	0.00	0.16	0.00	0.26	0.10	0.05	0.83	0.48	0.58	0.98	0.83	-	0.78	0.71	5.34
Ages 0+	2445.43	2264.27	3021.41	2555.32	2542.09	2274.33	1334.39	690.61	767.46	391.30	261.55	699.29	410.29	452.37	724.06	677.09	864.08	594.40	626.99	533.08	1039.95	-	1107.08	1056.84	777.21
Ages 6+	1969.28	1861.97	2209.69	1905.39	1667.46	1248.30	817.22	481.25	495.80	268.39	206.50	293.16	242.94	308.69	548.73	360.89	339.33	249.95	260.44	303.86	451.55	-	480.68	472.89	304.69
Ages 9+	529.27	416.39	407.71	429.92	371.80	299.13	159.94	76.79	66.15	33.71	39.15	26.02	30.51	83.36	227.84	151.30	166.69	102.86	92.13	61.31	88.74	-	131.08	147.46	95.79
Ages 12+	96.73	78.67	80.14	78.15	69.64	58.74	34.95	15.72	9.79	4.37	0.67	3.38	2.84	5.96	24.69	17.02	28.65	20.16	20.33	16.63	26.70	-	20.74	19.94	17.97
proportion 0 to 5	0.19	0.18	0.27	0.25	0.34	0.45	0.39	0.30	0.35	0.31	0.21	0.58	0.41	0.32	0.24	0.47	0.61	0.58	0.58	0.43	0.56		0.57	0.55	0.60
proportion 9+	0.22	0.18	0.13	0.17	0.15	0.13	0.12	0.11	0.09	0.09	0.15	0.04	0.07	0.18	0.31	0.22	0.19	0.17	0.15	0.12	0.09		0.12	0.14	0.12

Table 9. Biomass estimates ('000t) of A.plaice, by stratum and depth zone (m), from Canadian fall surveys in Div. 3L in 1995-2009 (Campelen). (+) indicates biomass <50 t, (-) means stratum not surveyed.

Biomass

Depth	Stratum	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
30-56	784	-	+	+	0.0	-	+	+	+	+	+	0.0	-	-	-	-
	Total	-	+	+	0.0	-	+	+	+	+	+	0.0	-	-	-	-
57-92	350	0.8	0.9	0.5	1.1	1.0	0.5	7.7	0.5	0.2	0.4	0.2	0.7	0.1	0.8	0.3
	363	3.1	2.0	1.4	2.1	1.9	2.3	3.7	0.7	0.3	0.5	0.6	2.3	1.1	0.7	1.5
	371	1.2	1.1	0.2	0.5	0.4	0.8	0.8	1.8	0.3	0.2	0.3	0.1	1.3	0.7	0.8
	372	1.4	1.6	1.5	0.3	1.7	0.6	2.5	0.9	1.1	0.4	0.3	0.9	0.5	0.6	0.6
	384	1.6	1.6	0.5	0.2	1.5	0.1	1.3	2.2	0.1	0.1	0.1	0.6	0.1	0.5	0.9
	785	-	+	+	+	-	+	0.1	0.1	0.1	+	0.3	-			
	Total	8.1	7.2	4.0	4.2	6.5	4.3	16.1	6.2	2.2	1.5	1.8	4.6	3.1	3.2	4.2
93-183	328	3.0	1.6	0.9	0.5	2.0	0.8	1.6	7.3	0.7	1.1	2.5	2.9	0.3	0.6	0.8
	341	1.6	2.8	0.8	2.1	0.6	0.7	0.9	0.8	0.4	0.3	1.3	2.2	0.9	2.8	0.3
	342	0.6	+	0.4	0.2	-	0.2	0.1	0.1	0.2	0.1	0.2	0.2	0.1	0.0	0.0
	343	0.7	0.1	0.0	0.1	-	+	0.1	0.1	0.1	+	0.1	0.1	0.0	0.1	0.1
	348	3.1	1.8	1.3	1.5	1.4	0.4	0.6	1.0	0.6	1.0	1.9	2.0	2.3	2.3	0.9
	349	3.4	1.4	1.5	0.8	0.4	0.3	0.6	0.1	0.7	1.3	1.6	2.7	0.9	1.2	0.7
	364	2.8	3.6	2.8	5.2	1.2	1.8	2.9	2.1	1.0	0.7	2.1	5.1	3.8	6.3	0.8
	365	1.7	1.1	1.0	1.4	1.0	-	0.4	0.6	0.5	-	3.2	2.1	1.9	2.4	0.4
	370	2.0	6.3	1.3	4.6	3.9	1.1	2.2	3.7	0.8	-	0.8	2.4	2.4	2.0	0.8
	385	3.9	7.6	1.9	4.0	2.9	0.8	3.5	5.4	3.3	6.5	1.4	3.2	4.0	4.2	3.5
	390	1.7	1.6	2.2	3.3	2.1	0.7	3.1	1.0	0.5	0.6	0.5	0.7	0.5	1.4	2.2
	786	-	0.3	0.1	0.1	-	0.1	0.2	0.1	0.1	0.1	0.3	-	-	-	-
	787	-	0.4	0.5	0.1	-	0.1	0.1	0.1	0.1	0.1	0.2	0.2	-	-	-
	788	-	0.3	0.3	0.1	-	0.1	+	0.3	+	0.2	0.3	0.4	-	-	-
	790	-	0.2	0.2	+	-	+	+	+	+	0.1	0.0	-	-	-	-
	793	-	0.1	0.1	0.1	-	+	0.1	+	+	0.1	0.1	-	-	-	-
	794	-	+	0.1	+	-	-	+	+	+	+	0.1	0.1	-	-	-
	797	-	0.1	0.1	+	-	+	+	0.1	+	+	0.1	0.1	-	-	-
	799	-	0.1	0.1	+	-	+	+	0.4	+	+	0.1	0.1	-	-	-
	Total	24.5	29.4	15.6	24.1	15.5	7.1	16.4	23.2	9.1	12.1	16.9	24.4	17.2	23.3	10.5
184-274	344	1.0	1.1	0.1	0.5	0.5	0.4	0.6	0.7	0.3	0.8	1.8	1.2	1.6	2.3	0.7
	347	1.8	0.7	0.3	0.8	0.5	0.4	0.4	0.7	0.2	0.7	2.0	1.5	0.6	4.3	0.4
	366	1.6	1.2	0.5	0.8	1.7	0.5	0.3	0.4	0.7	-	2.9	5.7	5.4	7.6	0.5
	369	1.0	1.6	0.5	1.8	1.6	0.8	2.7	1.1	0.3	-	1.1	2.6	3.1	4.2	1.4
	386	1.8	2.6	1.0	0.9	1.2	0.4	1.3	2.3	0.9	-	0.8	2.5	1.1	2.6	1.1
	389	0.6	0.6	0.6	0.7	0.6	0.4	1.4	0.4	0.6	0.4	0.5	0.7	1.0	1.3	1.7
	391	0.4	0.2	0.2	0.2	0.3	+	0.1	0.1	0.4	0.1	0.2	0.2	0.4	0.3	0.2
	789	-	0.2	0.2	0.1	-	0.1	0.2	0.1	+	+	0.2	0.1	-	-	-
	791*	-	0.5	0.4	0.1	-	0.3	0.3	0.7	+	0.1	0.5	-	-	-	-
	795	-	+	0.2	0.4	-	+	+	0.1	0.2	0.2	0.2	+	-	-	-
	798	-	0.2	0.7	0.3	-	+	0.2	+	+	0.3	0.1	-	-	-	-
	Total	8.2	8.9	4.6	6.6	6.4	3.3	7.5	6.6	3.6	2.6	10.4	14.5	13.1	22.6	6.1
275-366	345	4.1	2.4	0.8	2.5	1.3	0.6	0.8	1.3	0.6	1.9	1.4	3.7	1.8	2.4	1.1
	346	2.8	1.1	2.2	1.7	1.7	0.4	0.9	0.8	0.5	1.4	2.1	2.1	4.6	2.4	1.1
	368	0.2	0.3	0.2	0.4	0.7	0.6	0.3	0.5	0.1	-	0.2	0.4	0.7	1.2	1.2
	387	0.4	0.7	0.7	0.2	1.8	1.0	0.4	0.2	0.5	-	0.3	0.8	2.4	0.9	0.8
	388	0.3	0.1	0.4	+	0.9	0.4	0.1	0.1	0.1	0.1	0.1	0.2	0.6	0.7	0.7
	392	+	+	0.2	0.1	0.5	0.2	0.1	0.1	0.1	+	0.1	0.3	0.1	0.3	+
	796	-	0.6	0.9	0.4	-	-	0.2	0.1	0.1	0.1	0.3	0.2	-	-	-
	800	-	-	-	0.2	-	0.2	0.3	0.3	0.2	0.2	0.2	-	-	-	0.1
	Total	7.8	5.2	5.5	5.5	6.9	3.4	3.1	3.4	2.2	3.8	4.6	7.6	10.2	7.9	4.9
367-549	729	+	+	0.2	0.1	0.7	1.6	0.4	+	0.1	0.1	+	0.2	0.2	0.6	0.4
	731	0.2	-	0.6	0.1	1.0	1.1	0.1	+	0.1	0.1	+	+	0.3	0.2	0.3
	733	0.2	0.2	0.5	0.6	0.3	1.0	0.6	0.3	0.4	0.2	0.4	0.6	2.6	0.3	0.4
	735	0.7	0.7	0.3	0.8	1.9	2.1	1.6	1.1	0.1	-	0.1	0.8	1.2	1.3	2.9
	792	-	0.2	1.9	0.3	-	0.2	0.6	0.1	0.2	0.1	0.1	-	-	-	-
	Total	1.1	1.1	3.6	1.9	3.9	6.0	3.3	1.5	0.9	0.5	0.5	1.7	4.2	2.4	3.9
550-731	730	+	0.0	0.5	0.1	0.2	0.4	0.9	0.1	+	0.5	+	2.1	2.1	1.0	1.8
	732	+	+	1.3	0.2	1.9	0.7	1.3	+	+	0.1	0.1	+	0.5	0.5	0.2
	734	0.0	0.2	0.3	0.1	0.1	0.1	+	+	0.0	-	0.0	0.1	0.1	0.0	0.6
	736	0.2	0.5	0.8	0.6	0.6	1.5	1.3	1.7	0.3	-	0.1	0.9	0.3	0.3	0.5
	Total	0.2	0.7	2.8	1.0	2.8	2.7	3.5	1.8	0.3	0.6	0.2	3.1	3.0	1.8	3.1
732-914	737	0.4	1.5	1.8	3.3	0.8	0.7	1.4	1.0	1.1	-	2.0	1.1	0.1	-	+
	741	-	1.0	2.3	1.7	0.1	0.0	0.0	0.6	0.1	-	-	0.0	0.0	-	0.8
	745	-	0.1	2.2	0.1	0.7	0.0	0.0	0.0	0.3	-	-	0.0	0.0	-	+
	748	-	1.4	0.7	0.0	1.1	0.0	0.0	+	1.1	-	-	0.5	0.0	-	+
	Total	0.4	4.0	7.0	5.1	2.7	0.7	1.4	1.6	2.6	-	2.0	1.6	0.1	-	0.8
915-1097	738	0.6	0.2	0.0	0.0	0.0	0.0	+	+	2.2	-	-	0.0	0.0	-	0.0
	742	-	0.1	0.0	0.0	+	0.0	0.0	0.0	3.5	-	-	0.0	0.0	-	0.0
	746	-	0.1	0.0	+	0.0	0.0	0.0	0.0	0.0	-	-	0.0	0.0	-	0.0
	749	-	+	0.2	0.0	-	0.0	0.0	0.0	+	-	-	-	0.0	-	0.0
	Total	0.6	0.4	0.2	+	+	0.0	+	+	5.7	-	-	0.0	0.0	-	-
1098-1280	739	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0
	743	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	0.0	-	0.0
	747	-	0.0	0.0	0.1	+	0.0	0.0	0.0	0.0	-	-	0.1	0.0	-	0.0
	750	-	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	0.0	-	0.0
	Total	-	0.1	0.0	0.1	+	0.0	0.0	0.0	0.0	-	-	0.1	0.0	-	-
1281-1463	740	-	0.0	0.0	0.0	0.1	0.0	0.0	0.0	+	-	0.0	0.0	0.0	-	0.0
	744	-	0.5	0.0	0.1	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	-	0.0
	751	-	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	-	-	0.0	-	0.0
	Total	-	0.5	0.0	0.1	0.1	0.0	0.0	0.0	+	-	-	0.0	0.0	-	-
Grand Total		50.9	57.5	43.3	48.6	44.8	27.5	51.3	44.3	26.4	21.0	36.4	57.6	50.9	61.2	33.5

* in 1996 stratum 791 covered a depth range of 184-366 m

Table 10. Biomass estimates ('000t) of A.plaice, by stratum and depth zone (m), from Canadian fall surveys in Div. 3N in 1995-2009 (Campelen). (+) indicates biomass <50 t, (-) means stratum not surveyed.

Biomass

Depth	Stratum	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
≤ 56	375	1.9	1.1	3.9	5.2	0.6	1.7	0.6	9.8	2.3	2.3	3.0	2.2	2.8	7.3	3.4
	376	4.7	2.4	7.7	4.4	4.3	35.8	15.4	34.1	6.4	11.1	20.3	16.0	11.0	9.0	1.8
	Total	6.6	3.5	11.6	9.6	4.9	37.5	16.0	43.9	8.7	13.4	23.4	18.2	13.8	16.3	5.2
57-92	360	22.3	7.4	28.4	39.2	43.4	96.4	46.0	67.4	99.9	105.5	80.6	67.6	65.4	118.5	105.7
	361	3.5	4.1	3.3	2.1	1.8	3.9	2.3	9.2	3.1	7.2	2.8	2.9	9.0	1.7	2.2
	362	5.0	1.1	5.1	2.9	2.9	2.6	5.3	6.1	2.6	2.2	6.2	3.1	2.4	3.4	2.5
	373	1.8	0.2	2.3	1.7	4.2	1.7	6.9	2.9	1.9	0.5	2.6	2.4	1.2	3.7	1.0
	374	2.4	0.4	1.8	1.3	2.7	1.7	3.7	0.5	0.6	0.6	4.4	4.0	3.3	9.9	7.6
	383	-	0.3	0.5	0.8	0.8	+	0.5	0.5	0.1	+	0.4	0.3	0.7	2.2	1.4
	Total	35.0	13.5	41.4	48.0	55.8	106.3	64.7	86.6	108.2	116.0	97.0	80.3	82.0	139.3	120.3
93-183	359	2.2	0.3	3.8	11.6	9.8	32.2	4.0	17.5	7.1	9.2	1.2	14.1	3.9	4.4	6.0
	377	0.5	0.4	2.3	1.1	0.9	0.7	3.0	6.1	1.9	1.4	3.8	5.0	6.1	2.6	2.3
	382	0.3	0.3	0.8	6.1	2.7	1.0	3.5	2.2	0.0	0.2	0.9	0.5	7.8	3.3	4.5
	Total	3.0	1.0	6.9	18.8	13.4	33.9	10.5	25.8	9.0	10.9	6.0	19.7	17.8	10.2	12.9
184-274	358	0.8	0.2	0.4	0.3	0.3	0.6	1.0	0.2	0.0	0.4	+	0.1	0.5	0.4	1.2
	378	0.1	0.2	0.1	0.1	0.4	0.2	0.1	0.4	0.5	0.3	0.2	0.4	0.9	0.5	0.6
	381	0.1	0.4	0.2	0.1	0.3	0.3	0.3	0.1	0.5	0.6	0.6	0.6	4.6	0.5	0.3
	Total	1.0	0.8	0.7	0.5	1.0	1.1	1.4	0.7	1.0	1.3	0.8	1.1	6.0	1.4	2.1
275-366	357	0.1	0.1	0.0	+	-	+	+	+	0.0	+	0.2	+	0.1	+	+
	379	+	0.2	0.1	+	0.3	+	0.1	+	0.0	0.5	+	0.0	+	0.4	+
	380	0.1	0.2	0.1	0.1	0.7	0.3	0.1	+	0.1	0.1	0.1	0.2	4.2	+	0.2
	Total	0.2	0.5	0.2	0.1	1.0	0.3	0.2	+	0.1	0.6	0.1	0.2	4.2	0.4	0.2
367-549	723	+	+	0.0	0.1	+	+	+	0.0	+	+	+	0.0	+	0.1	0.0
	725	0.1	0.1	0.0	+	0.1	0.2	+	0.0	+	-	0.1	+	0.0	0.1	0.0
	727	+	0.1	0.1	0.1	1.5	0.4	0.1	0.3	0.3	0.2	0.2	0.1	0.1	+	+
	Total	0.1	0.2	0.2	0.2	1.6	0.6	0.1	0.3	0.3	0.2	0.4	0.1	0.1	0.2	0.0
550-731	724	0.1	0.3	0.0	0.0	0.1	0.0	0.0	0.0	-	+	+	0.0	0.0	0.0	0.0
	726	+	0.3	0.1	+	+	+	+	0.0	+	+	0.0	0.0	0.0	0.0	+
	728	+	0.8	0.1	0.1	0.3	0.6	+	0.1	+	1.1	0.2	+	1.7	1.2	0.5
	Total	0.1	1.4	0.2	0.1	0.4	0.6	+	0.1	0.0	1.1	0.2	0.0	1.7	1.2	0.5
732-914	752	-	-	-	1.5	-	0.0	0.0	0.0	-	-	-	-	0.0	-	-
	756	-	-	-	0.1	-	-	0.0	0.0	-	-	0.0	-	0.0	-	-
	760	-	-	-	0.0	-	-	0.0	0.0	-	-	0.0	-	0.0	-	0.0
	Total				0.0	-	0.0	0.0	0.0	-	-	-	-	0.0	-	-
915-1097	753	-	-	-	+	-	0.0	0.0	0.0	-	-	-	-	0.0	-	-
	757	-	-	-	0.0	-	-	0.0	0.0	-	-	0.0	-	0.0	-	-
	761	-	-	-	0.0	-	-	0.0	0.0	-	-	0.0	-	0.0	-	0.0
	Total	-	-	-	+	-	0.0	0.0	0.0	-	-	-	-	0.0	-	-
1098-1280	754	-	-	-	0.0	-	0.0	0.0	0.0	-	-	-	-	0.0	-	-
	758	-	-	-	0.0	-	0.0	0.0	0.0	-	-	0.0	-	0.0	-	-
	762	-	-	-	-	-	-	0.0	0.0	-	-	0.0	-	0.0	-	0.0
	Total	-	-	-	0.0	-	0.0	0.0	0.0	-	-	-	-	0.0	-	0.0
1281-1463	755	-	-	-	0.0	-	0.0	0.0	0.0	-	-	-	-	0.0	-	-
	759	-	-	-	0.0	-	-	0.0	0.0	-	-	0.0	-	0.0	-	-
	763	-	-	-	-	-	-	0.0	0.0	-	-	0.0	-	0.0	-	0.0
	Total	-	-	-	0.0	-	0.0	0.0	0.0	-	-	-	-	0.0	-	0.0
Grand Total		46.0	20.9	61.0	77.3	78.1	180.3	92.9	157.4	127.3	143.4	127.8	119.5	125.6	169.0	141.2

Table 11. Biomass estimates ('000t) of A.plaice, by stratum and depth zone (m), from Canadian fall surveys in Div. 3O in 1995-2009 (Campelen). (+) indicates biomass <50 t, (-) means stratum not surveyed.

Biomass

Depth	Stratum	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
57-92	330	7.7	0.8	5.5	5.9	5.4	5.3	5.9	4.5	4.0	5.6	4.5	6.6	4.2	8.4	9.2
	331	1.2	0.3	0.9	1.8	1.0	1.0	1.1	1.2	1.5	1.0	1.6	1.0	2.0	0.6	1.2
	338	6.6	3.3	6.4	3.4	3.8	2.1	4.4	-	6.7	5.3	5.4	2.8	2.8	10.6	6.5
	340	7.2	0.4	3.2	1.1	2.8	2.2	1.7	3.7	0.9	2.6	2.6	1.7	5.5	11.1	6.3
	351	1.7	0.9	5.2	3.3	2.9	6.4	4.3	2.9	3.7	3.9	2.2	3.5	6.2	4.2	1.9
	352	4.6	9.1	6.9	8.4	3.2	8.4	8.0	6.7	7.7	10.9	11.3	6.9	3.6	11.2	10.2
	353	5.6	14.4	14.8	19.3	10.3	14.5	13.9	11.2	14.4	24.6	15.6	21.0	27.9	29.1	29.3
	Total	34.6	29.2	42.9	43.2	29.4	39.9	39.3	30.2	38.8	54.0	43.2	43.4	52.2	75.2	64.5
93-183	329	3.2	1.5	2.7	5.0	6.6	8.0	7.6	3.7	1.6	5.2	3.6	2.5	2.0	9.3	4.3
	332	3.5	3.9	1.6	3.9	1.9	2.8	1.3	2.5	3.0	3.7	4.1	4.7	2.1	5.2	0.8
	337	2.4	25.3	2.5	1.5	1.4	1.8	0.5	1.3	0.6	1.1	2.2	1.7	2.2	6.6	1.3
	339	6.5	0.9	5.1	1.4	-	3.8	2.4	3.2	3.3	2.2	4.9	1.2	2.9	3.8	2.7
	354	4.5	8.0	2.4	3.7	27.0	3.8	2.7	3.0	21.1	1.9	0.8	2.1	3.4	2.6	5.8
	Total	20.1	39.6	14.4	15.5	36.9	20.2	14.5	13.7	29.6	14.1	15.6	12.0	12.6	27.6	14.8
184-274	333	+	-	+	+	0.1	+	0.0	0.1	+	+	+	+	+	+	+
	336	+	0.1	0.1	+	0.1	0.1	+	0.1	+	+	+	0.1	0.3	0.1	-
	355	0.2	5.4	0.1	+	0.3	+	0.1	0.1	+	0.1	0.1	0.1	0.2	0.3	0.1
	Total	0.2	5.5	0.2	+	0.5	0.1	0.1	0.3	+	0.1	0.1	0.2	0.5	0.4	0.1
275-366	334	0.0	-	+	+	+	0.0	0.0	0.0	0.0	+	+	+	+	+	0.0
	335	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	356	0.0	0.1	+	+	+	+	0.0	0.0	+	+	+	+	+	+	+
	Total	+	0.1	0.1	+	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
367-549	717	0.0	-	+	0.0	+	+	+	0.0	0.0	0.0	0.0	+	+	+	0.0
	719	+	0.2	0.0	+	+	+	0.0	0.0	+	+	+	+	+	0.0	+
	721	+	0.6	0.0	0.0	+	+	0.0	0.0	0.0	0.0	0.0	+	+	0.0	+
	Total	+	0.8	+	+	+	+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
550-731	718	0.0	-	0.0	+	0.0	0.0	0.0	0.0	0.0	0.0	+	-	0.0	+	0.0
	720	0.0	+	-	+	+	+	0.0	0.0	0.0	0.0	0.0	+	0.0	0.0	+
	722	0.0	+	0.0	0.0	+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	0.0	+	0.0	+	+	+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
732-914	764	-	-	-	0.0	-	-	0.0	0.0	-	-	0.0	-	0.0	-	0.0
	768	-	-	-	0.0	-	-	0.0	0.0	-	-	0.0	-	0.0	-	0.0
	772	-	-	-	0.0	-	-	-	0.0	0.0	-	0.0	-	0.0	-	0.0
	Total	-	-	-	0.0	-	-	0.0	0.0	0.0	-	0.0	-	0.0	-	0.0
915-1097	765	-	-	-	0.0	-	-	0.0	0.0	-	-	0.0	-	0.0	-	0.0
	769	-	-	-	0.0	-	-	0.0	0.0	-	-	0.0	-	0.0	-	0.0
	773	-	-	-	0.0	-	-	0.0	0.0	0.0	-	0.0	-	0.0	-	0.0
	Total	-	-	-	0.0	-	-	0.0	0.0	0.0	-	0.0	-	0.0	-	0.0
1098-1280	766	-	-	-	-	-	0.0	0.0	0.0	-	-	0.0	-	0.0	-	0.0
	770	-	-	-	-	-	0.0	0.0	0.0	-	-	0.0	-	0.0	-	0.0
	774	-	-	-	-	-	0.0	0.0	0.0	0.0	-	0.0	-	0.0	-	0.0
	Total	-	-	-	-	-	0.0	0.0	0.0	0.0	-	0.0	-	0.0	-	0.0
1281-1463	767	-	-	-	-	-	0.0	0.0	0.0	-	-	0.0	-	0.0	-	0.0
	771	-	-	-	-	-	0.0	0.0	0.0	-	-	0.0	-	0.0	-	0.0
	775	-	-	-	-	-	0.0	0.0	0.0	0.0	-	0.0	-	0.0	-	0.0
	Total	-	-	-	-	-	0.0	0.0	0.0	0.0	-	0.0	-	0.0	-	0.0
Grand Total		54.9	75.2	57.5	58.7	66.9	60.2	53.9	44.2	68.4	68.1	58.8	55.6	65.3	103.1	79.4

Table 12. Abundance index (millions) at age for A. plaice in Div. 3L from Canadian fall surveys from 1990 to 2009.

Age/Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.34	0.00	0.00	0.00	0.00	0.00	0.51	0.05	0.04	0.72	2.09
1	0.78	0.12	0.00	0.00	0.00	0.45	1.12	0.17	2.71	14.04	16.17	8.93	3.06	1.22	3.53	11.78	11.44	22.61	41.78	20.02
2	2.39	2.09	0.75	3.10	0.00	11.05	16.62	1.52	3.84	19.86	31.38	102.85	66.37	18.37	9.68	27.80	34.76	60.08	107.63	133.02
3	26.07	14.38	12.54	21.10	0.00	25.11	57.94	21.44	6.89	10.52	26.11	70.83	119.40	78.66	30.78	33.21	42.72	61.53	73.96	96.84
4	309.25	91.21	52.65	71.20	14.48	59.35	170.16	63.91	28.35	7.92	8.33	34.69	35.23	77.90	72.68	54.99	31.70	52.93	51.83	50.36
5	597.38	295.78	171.91	123.36	25.75	198.76	149.44	105.70	64.67	29.39	27.69	20.68	16.94	26.20	42.61	73.01	35.44	31.14	61.54	30.54
6	548.02	372.37	269.73	218.20	42.96	187.22	84.67	84.48	90.34	50.01	34.64	21.12	14.52	9.13	11.30	55.65	72.86	31.96	35.06	30.19
7	303.10	164.87	102.93	138.57	54.51	101.25	31.85	35.87	57.37	46.36	22.80	34.07	21.47	7.27	4.65	21.36	68.18	45.03	32.66	10.55
8	145.95	77.59	32.27	27.74	28.54	36.23	6.04	10.59	25.21	37.97	12.56	31.22	25.94	8.56	3.82	10.80	27.59	35.87	41.08	8.49
9	95.12	43.16	10.42	7.96	8.82	19.26	2.46	5.73	14.46	24.81	8.54	25.12	18.13	5.09	3.95	3.94	5.26	10.21	28.36	8.67
10	36.73	18.31	5.51	2.65	1.88	3.65	0.83	1.27	3.74	8.91	2.73	10.85	10.36	4.51	0.88	4.49	3.53	5.10	7.15	4.05
11	17.48	8.27	1.87	1.13	0.29	0.36	0.14	0.82	1.26	4.64	1.77	8.38	7.94	2.73	0.75	1.52	1.81	1.94	1.91	1.60
12	9.06	5.12	1.63	0.29	0.06	0.10	0.06	0.19	0.41	2.10	0.33	3.24	2.04	0.87	0.12	2.35	3.66	1.43	1.33	1.06
13	5.46	1.95	0.46	0.09	0.02	0.00	0.05	0.14	0.06	0.63	0.12	0.55	0.25	0.33	0.11	1.64	1.47	0.43	0.93	0.73
14	3.94	1.51	0.26	0.07	0.07	0.00	0.00	0.00	0.00	0.22	0.00	0.32	0.05	0.04	0.00	0.72	1.22	1.13	0.44	0.41
15	1.52	0.88	0.12	0.24	0.00	0.00	0.00	0.01	0.00	0.03	0.05	0.07	0.00	0.00	0.00	0.93	1.73	0.43	0.52	0.23
16	0.51	0.23	0.04	0.06	0.00	0.00	0.00	0.00	0.00	0.03	0.05	0.00	0.00	0.00	0.00	0.30	1.13	0.50	0.32	0.09
17	0.00	0.19	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	0.05	0.15	0.52	0.13	0.15
18	0.00	0.01	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	0.11	0.01	0.44	0.43	0.02
19	0.00	0.01	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	0.00	0.00	0.33	0.00	0.00
20	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	0.00	0.00	0.00	0.00	0.24	0.06	0.00
21	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00
unk	0.31	0.01	0.00	0.00	0.00	1.69	0.00	0.50	0.27	0.08	0.17	0.46	0.22	0.02	0.05	0.04	0.18	1.04	0.24	2.17
Ages 0+	2103.06	1098.06	663.07	615.76	177.38	644.47	521.37	332.31	299.68	257.85	193.46	373.37	341.93	240.92	184.91	305.20	344.85	364.91	488.08	401.29
Ages 6+	1166.89	694.48	425.23	397.01	137.15	348.06	126.10	139.08	192.86	175.70	83.59	134.94	100.71	38.54	25.57	103.85	188.58	135.55	150.38	66.25
Ages 9+	169.82	79.65	20.29	12.50	11.14	23.36	3.54	8.15	19.94	41.36	13.59	48.53	38.79	13.57	5.81	16.05	115.91	104.62	115.55	38.23
Ages 12+	20.50	9.90	2.49	0.75	0.15	0.10	0.11	0.33	0.48	3.00	0.56	4.17	2.35	1.24	0.23	6.10	392.58	424.50	570.97	428.96

Table 13. Abundance index (millions) at age for A. plaice in Div. 3N from Canadian fall surveys from 1990 to 2009.

Age/Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
0	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	0.05	0.00	0.12	0.00	0.00	0.00	0.07
1	2.34	0.82	5.84	0.00	0.00	1.97	0.11	1.81	1.93	46.35	20.47	8.24	1.79	7.76	102.60	5.35	1.04	30.08	28.54	59.96
2	40.24	84.64	78.12	1.90	0.00	17.53	1.70	1.34	1.38	69.91	158.97	19.95	25.17	6.13	16.43	257.10	4.64	14.88	135.89	64.49
3	134.78	193.91	161.07	52.32	16.51	15.09	4.08	8.06	0.86	11.42	264.89	130.79	50.82	41.45	13.52	61.80	47.24	27.72	37.39	92.21
4	295.80	284.75	130.72	283.60	65.29	16.40	3.31	14.95	11.62	2.61	53.91	42.75	190.06	95.11	100.92	12.17	21.36	128.44	137.17	68.40
5	169.59	288.82	130.17	135.26	96.33	27.70	9.34	8.33	18.51	7.83	22.80	5.07	63.36	196.95	127.87	47.15	14.79	31.08	260.68	112.38
6	30.73	72.35	131.01	67.76	43.86	62.43	13.60	29.97	11.44	12.62	38.99	17.05	11.46	39.70	118.56	85.32	31.63	14.95	62.42	109.10
7	9.34	19.55	53.35	74.65	23.60	15.42	12.65	41.44	25.97	12.16	59.27	27.83	26.02	19.89	34.00	76.49	35.33	31.80	41.76	40.02
8	3.83	10.86	12.33	23.64	14.33	9.03	4.55	24.91	35.67	29.10	53.08	22.08	29.25	13.36	10.03	18.79	63.03	42.04	34.70	20.98
9	6.62	10.35	8.02	8.78	7.29	6.09	1.82	8.00	37.85	25.04	39.83	12.52	17.22	7.71	8.34	5.66	16.67	45.05	28.03	14.02
10	3.31	7.24	3.71	4.70	1.97	2.21	0.79	3.60	8.76	18.08	39.29	9.91	13.31	6.11	6.79	5.71	3.76	17.24	14.65	12.14
11	2.53	5.98	2.20	2.20	0.78	0.72	0.36	1.64	3.54	9.46	19.14	13.06	16.11	5.38	2.41	4.17	6.70	5.82	5.22	8.03
12	1.71	3.26	1.74	1.65	1.00	0.71	0.27	0.43	1.21	7.39	5.20	6.16	11.43	4.00	2.72	1.50	4.16	5.75	2.64	2.21
13	1.60	4.31	1.45	0.88	0.42	0.25	0.00	0.49	0.61	2.75	2.49	1.39	6.35	1.25	0.74	2.23	3.01	0.32	1.10	1.59
14	1.53	2.50	1.23	0.78	0.69	0.02	0.00	0.34	0.52	0.58	0.68	0.58	0.54	0.33	0.94	2.10	1.83	3.12	1.77	1.67
15	1.49	1.45	0.33	0.66	0.29	0.00	0.06	0.15	0.08	0.06	0.34	0.27	1.05	0.27	0.17	0.77	2.22	3.72	1.13	1.40
16	1.59	1.05	0.46	0.34	0.00	0.00	0.00	0.04	0.24	0.36	0.00	0.11	1.06	0.18	0.14	0.29	0.74	2.32	0.46	2.07
17	0.47	0.48	0.29	0.10	0.00	0.00	0.00	0.00	0.13	0.30	0.34	0.12	0.00	0.00	0.00	0.15	0.70	1.34	0.44	0.55
18	0.13	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.40	0.26	0.55
19	0.00	0.04	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.23	0.00
20	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	0.05	0.00	0.00	0.05	0.00	0.06	0.00
21	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	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	0.00	0.00	0.00	0.00	0.00	0.06	0.00
unk	0.16	0.06	1.73	0.21	0.09	0.07	0.00	0.19	0.12	0.00	0.00	0.18	0.08	0.23	12.11	0.17	0.32	0.43	1.15	3.20
Ages 0+	707.78	992.55	723.78	659.44	272.46	175.66	52.65	145.70	160.43	256.19	779.70	318.07	465.09	445.89	558.28	587.03	259.45	406.83	795.75	615.03
Ages 6+	64.87	139.55	216.12	186.17	94.24	96.89	34.10	111.02	126.02	118.06	258.66	111.09	133.81	98.22	184.84	203.17	170.05	174.18	194.94	214.32
Ages 9+	20.97	36.80	19.43	20.11	12.44	10.01	3.30	14.70	52.93	64.19	107.32	44.12	67.08	25.27	22.25	22.57	40.07	85.39	56.06	44.22
Ages 12+	8.51	13.22	5.50	4.43	2.40	0.98	0.33	1.45	2.79	11.60	9.07	8.63	20.44	6.08	4.72	7.03	12.94	17.28	8.16	10.03

Table 14. Abundance index (millions) at age for A. plaice in Div. 3O from Canadian fall surveys from 1990 to 2009.

Age/Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.61	1.38	0.00	0.00	0.08	0.05	0.15	0.27	0.10	0.00	0.00	0.00
1	8.24	0.63	0.00	0.00	0.00	35.77	2.28	1.32	17.60	93.19	54.15	28.67	5.95	8.76	411.47	52.52	5.38	151.39	99.68	139.86
2	10.51	12.10	2.58	5.10	0.00	97.32	80.15	16.68	21.30	80.38	139.26	61.24	58.23	22.83	101.14	200.34	97.71	66.49	375.72	122.36
3	25.25	56.20	44.10	42.54	3.02	20.35	74.47	71.61	9.03	49.89	124.51	100.89	53.27	56.51	50.20	70.54	175.59	88.31	81.82	274.80
4	100.36	73.88	74.88	143.08	23.98	35.12	54.27	67.87	77.71	13.19	60.63	39.78	70.08	101.12	77.66	46.91	53.84	147.13	167.21	54.22
5	86.13	139.80	65.85	101.84	68.22	69.48	49.52	39.82	37.99	55.24	23.18	28.22	25.26	101.92	80.72	50.30	24.05	55.84	193.42	86.29
6	64.11	134.09	98.45	86.11	64.26	86.70	75.81	45.40	27.31	30.79	58.38	29.01	16.41	36.55	44.02	55.96	36.64	21.07	48.93	91.38
7	57.19	64.96	69.79	103.34	56.80	35.29	37.70	42.67	29.30	21.05	33.52	35.87	25.42	21.92	17.32	34.11	34.80	51.60	43.09	27.79
8	41.89	27.82	32.12	52.74	46.38	16.19	10.77	17.73	22.54	31.85	18.15	10.36	20.70	13.07	11.28	8.45	18.15	43.26	27.88	22.71
9	22.78	28.33	17.21	16.26	12.54	14.17	4.54	9.60	16.11	22.84	13.45	11.07	5.70	6.15	7.17	4.21	4.39	18.84	12.73	18.88
10	15.16	18.75	8.47	7.97	3.97	4.89	1.46	2.43	5.45	6.67	6.91	6.58	3.13	1.72	2.18	3.02	1.91	2.07	6.41	5.12
11	9.19	11.66	4.38	3.47	1.60	0.80	1.29	0.76	2.14	4.75	4.47	4.91	2.93	2.89	2.78	1.58	1.95	1.29	1.14	4.78
12	6.66	5.48	3.48	3.15	0.67	0.50	0.26	0.59	2.01	2.82	1.53	2.29	2.28	1.45	1.32	1.25	2.11	1.45	0.69	0.47
13	4.99	5.96	1.43	2.11	0.48	0.20	0.05	0.22	1.37	1.51	0.48	0.90	1.24	0.21	1.30	0.96	1.11	1.98	0.56	0.75
14	3.85	2.96	1.67	1.53	0.41	0.28	0.12	0.26	0.32	0.27	0.16	0.23	0.40	0.47	0.28	0.50	0.57	0.62	0.48	0.27
15	2.41	2.12	0.70	0.79	0.10	0.05	0.28	0.31	0.10	0.08	0.13	0.16	0.31	0.30	0.11	0.62	0.81	0.69	0.73	0.31
16	2.36	1.05	0.67	0.96	0.00	0.00	0.00	0.03	0.14	0.32	0.19	0.27	0.27	0.34	0.20	0.05	0.55	0.25	0.77	0.54
17	1.17	0.33	0.24	0.18	0.00	0.00	0.00	0.00	0.31	0.28	0.37	0.11	0.18	0.00	0.00	0.00	0.27	0.18	0.08	0.53
18	0.08	0.28	0.27	0.31	0.00	0.00	0.00	0.00	0.05	0.05	0.00	0.16	0.00	0.13	0.00	0.00	0.24	0.14	0.00	0.16
19	0.00	0.11	0.06	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.13	0.03	0.00	0.09
20	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	0.00	0.00	0.00	0.05	0.03	0.04	0.00
21	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	0.00	0.00	0.00	0.07	0.00	0.00	0.08
22	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	0.00	0.00	0.00	0.04	0.00	0.00	0.00
unk	0.17	1.31	0.13	1.45	0.00	0.00	0.00	0.37	0.81	1.20	0.09	0.10	0.00	0.25	0.92	0.20	1.51	0.54	1.76	4.46
Ages 0+	462.49	587.83	426.46	573.11	282.41	417.10	392.95	317.68	273.20	417.77	539.57	360.85	291.88	376.63	810.23	531.80	461.96	653.20	1063.15	855.87
Ages 6+	231.82	303.91	238.92	279.10	187.20	159.07	132.27	120.01	107.15	123.29	137.74	101.94	79.02	85.20	87.97	110.71	103.78	143.51	143.53	173.87
Ages 9+	68.64	77.04	38.57	36.91	19.77	20.90	7.99	14.21	28.00	39.59	27.69	26.69	16.48	13.65	15.34	12.19	14.18	27.58	23.63	31.99
Ages 12+	21.51	18.30	8.51	9.22	1.65	1.04	0.71	1.42	4.31	5.33	2.86	4.12	4.73	2.89	3.21	3.38	5.94	5.38	3.35	3.21

Table 15. Abundance index (millions) at age for A. plaice in Div. 3LNO from Canadian fall surveys from 1990 to 2009.

Age/Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.70	1.72	0.00	0.00	0.08	0.10	0.15	0.91	0.14	0.04	0.72	2.16
1	11.36	1.56	5.84	0.00	0.00	38.19	3.52	3.30	22.23	153.58	90.79	45.83	10.80	17.74	517.61	69.65	17.86	204.09	170.00	219.84
2	53.13	98.83	81.45	10.10	0.00	125.90	98.46	19.54	26.52	170.15	329.62	184.04	149.76	47.32	127.24	485.24	137.11	141.45	619.24	319.87
3	186.10	264.49	217.71	115.95	19.53	60.55	136.49	101.12	16.78	71.84	415.51	302.51	223.50	176.62	94.50	165.55	265.55	177.56	193.18	463.85
4	705.41	449.84	258.26	497.88	103.74	110.88	227.74	146.72	117.67	23.72	122.87	117.22	295.37	274.14	251.26	114.07	106.89	328.50	356.21	172.98
5	853.10	724.40	367.93	360.45	190.30	295.94	208.29	153.85	121.17	92.46	73.67	53.98	105.56	325.07	251.20	170.46	74.28	118.06	515.63	229.21
6	642.86	578.81	499.19	372.08	151.09	336.35	174.08	159.85	129.09	93.43	132.01	67.18	42.39	85.38	173.88	196.94	141.13	67.98	146.42	230.66
7	369.63	249.38	226.08	316.57	134.91	151.96	82.20	119.98	112.64	79.57	115.59	97.77	72.91	49.09	55.97	131.95	138.30	128.43	117.52	78.37
8	191.67	116.27	76.71	104.12	89.25	61.45	21.37	53.22	83.42	98.92	83.79	63.67	75.89	34.99	25.13	38.04	108.77	121.17	103.65	52.18
9	124.52	81.84	35.65	33.00	28.65	39.52	8.82	23.33	68.42	72.70	61.82	48.71	41.05	18.96	19.45	13.81	26.31	74.10	69.11	41.57
10	55.20	44.30	17.68	15.32	7.82	10.75	3.08	7.30	17.95	33.66	48.92	27.34	26.80	12.33	9.85	13.23	9.19	24.41	28.22	21.31
11	29.20	25.92	8.45	6.80	2.67	1.88	1.78	3.22	6.94	18.85	25.38	26.36	26.98	11.00	5.94	7.26	10.46	9.05	8.28	14.41
12	17.43	13.86	6.85	5.10	1.72	1.31	0.59	1.21	3.63	12.31	7.07	11.69	15.76	6.32	4.16	5.10	9.92	8.62	4.66	3.75
13	12.05	12.21	3.33	3.08	0.92	0.45	0.10	0.85	2.04	4.89	3.09	2.83	7.85	1.79	2.16	4.83	5.59	2.72	2.59	3.08
14	9.32	6.98	3.15	2.38	1.17	0.31	0.12	0.60	0.84	1.08	0.84	1.13	0.99	0.83	1.21	3.32	3.62	4.87	2.69	2.35
15	5.42	4.45	1.15	1.68	0.40	0.05	0.35	0.48	0.18	0.16	0.53	0.50	1.36	0.57	0.28	2.31	4.76	4.84	2.38	1.93
16	4.45	2.34	1.17	1.36	0.00	0.00	0.00	0.08	0.38	0.71	0.24	0.38	1.33	0.52	0.33	0.64	2.42	3.07	1.55	2.71
17	1.64	1.00	0.52	0.27	0.00	0.00	0.00	0.00	0.45	0.58	0.71	0.23	0.18	0.00	0.00	0.20	1.11	2.04	0.65	1.23
18	0.21	0.42	0.27	0.31	0.00	0.00	0.00	0.00	0.05	0.12	0.00	0.16	0.00	0.13	0.00	0.11	0.48	0.98	0.70	0.73
19	0.00	0.17	0.06	0.22	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.04	0.00	0.00	0.00	0.13	0.67	0.23	0.09
20	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	0.00	0.00	0.00	0.10	0.28	0.16	0.00
21	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	0.05	0.00	0.00	0.07	0.00	0.00	0.08
22	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	0.00	0.00	0.00	0.04	0.00	0.06	0.00
unk	0.64	1.38	1.86	1.65	0.09	1.77	0.00	1.05	1.20	1.28	0.27	0.74	0.30	0.49	13.08	0.42	2.02	2.01	3.15	9.83
Ages 0+	3273.32	2678.44	1813.31	1848.32	732.25	1237.23	966.97	795.69	733.31	931.81	1512.72	1052.28	1098.91	1063.43	1553.42	1424.03	1066.26	1424.94	2346.98	1871.71
Ages 6+	1463.58	1137.94	880.27	862.28	418.59	604.02	292.47	370.11	426.03	417.05	479.99	347.97	313.54	221.95	298.38	417.74	462.41	453.23	488.86	454.44
Ages 9+	259.43	193.48	78.29	69.52	43.34	54.26	14.83	37.06	100.88	145.14	148.60	119.34	122.35	52.50	43.40	50.81	74.21	135.66	121.27	93.23
Ages 12+	50.51	41.42	16.50	14.40	4.21	2.12	1.15	3.20	7.57	19.93	12.49	16.93	27.51	10.21	8.16	16.51	28.25	28.10	15.66	15.95
proportion 0 to 5	0.55	0.57	0.51	0.53	0.43	0.51	0.70	0.53	0.42	0.55	0.68	0.67	0.71	0.79	0.80	0.71	0.56	0.68	0.79	0.75
proportion 9+	0.08	0.07	0.04	0.04	0.06	0.04	0.02	0.05	0.14	0.16	0.10	0.11	0.11	0.05	0.03	0.04	0.07	0.10	0.05	0.05

Table 16. Canadian catches of A. plaice by Division, month and gear during 2009.

	3L		3N	3O	3LNO
	OT	Gillnet	OT	OT	Total
Jan			20		20
Feb			11		11
Mar			6		6
Apr			15		15
May	2		2	118	122
Jun	18		29	25	72
Jul		1			1
Aug	1	1	6	32	40
Sep			147	35	182
Oct			147	17	164
Nov	1		210	30	241
Dec			192	10	202
Total	**22**	**2**	**785**	**267**	**1076**

Summaries:

GN=2
OT=1074

3L=24
3N=785
3O=267

By-catch in directed yellowtail fishery = 1072
By-catch in directed G.halibut fishery = 4
By-catch in other directed fisheries = <1

Table 17. Catch at age (000 of fish) and mean length (cm) and weights (kg) at age from the Canadian catch of A. plaice in Div. 3LNO in 2009. S.O.P. is catch numbers x mean weights. An asterisk indicates catch of less than 500 fish.

						2009		3LNO	
Age	3L	3N	3O	Total	Pctg	Mean len	Mean wgt	S.O.P. (t)	
4				0	0.00			0.0	
5				0.8	0.06	26.5	(0.151)	0.1	only 1 ot at age 5
6	Sampling data not adequate to allow catch at age to be calc'ed by Division in 2009			40	2.95	32.9	0.315	12.6	
7				136	10.04	35.4	0.399	54.3	
8				268	19.79	38.8	0.541	145.0	
9				350	25.85	41.0	0.652	228.2	
10				249	18.39	44.4	0.855	212.9	
11				132	9.75	46.7	0.998	131.7	
12				47	3.47	48.4	1.138	53.5	
13				35	2.58	54.7	1.708	59.8	
14				31	2.29	54.0	1.638	50.8	
15				17	1.26	55.3	1.782	30.3	
16				25	1.85	58.4	2.106	52.7	
17				9	0.66	59.1	2.176	19.6	
18				9	0.66	59.7	2.248	20.2	
19				2.9	0.21	62.5	2.624	7.6	
20				2.5	0.18	64.5	2.906	7.3	
21				0	0.00			0.0	
22				0	0.00			0.0	
Total				1354	100.00			1086	**1.01 SOP/catch**
							catch=	1076	

Table 18. Catch at age for all fleets Div. 3LNO American plaice for 2009. Note that total catch adjusted for catch with no length frequencies.

	2009																			
	Spain				Portugal				Canada				Overall (LF data available)				Russia	Estonia	Faroes	France (SP)	Total (000s)
	3LNO	Mean len	Mean wgt	S.O.P.	3LNO	Mean len	Mean wgt	S.O.P.	3LNO	Mean len	Mean wgt	S.O.P.	3LNO	Mean len	Mean wgt	S.O.P.					
1	0	0.0	0.000	0	0	0.0	0.000	0					0	0.0	0.000	0					0
2	336	12.7	0.013	4	0	0.0	0.000	0					336	12.7	0.013	4					0
3	11911	18.5	0.045	541	1119	23.8	0.106	118					13031	19.1	0.051	659					13
4	15321	21.1	0.071	1081	1557	24.1	0.110	172				0	16878	21.4	0.074	1253					17
5	130858	27.5	0.171	22352	53257	29.6	0.217	11552	800	26.5	0.151	121	184915	28.1	0.184	34025					189
6	376454	29.6	0.219	82370	257058	31.8	0.277	71253	40000	32.9	0.315	12600	673513	30.7	0.247	166223					689
7	201377	31.4	0.265	53306	194624	33.9	0.341	66424	136000	35.4	0.399	54264	532000	33.4	0.327	173994					545
8	185465	33.4	0.326	60433	221525	35.5	0.398	88125	268000	38.8	0.541	144988	674989	36.4	0.435	293546					691
9	216143	34.8	0.372	80471	202874	36.9	0.455	92349	350000	41.0	0.652	228200	769017	38.5	0.521	401021					787
10	184124	39.0	0.543	100024	197402	39.1	0.552	108869	249000	44.4	0.855	212895	630526	41.5	0.669	421789					645
11	155219	42.6	0.729	113219	174102	41.6	0.675	117561	132000	46.7	0.998	131736	461321	43.5	0.786	362516					472
12	78197	46.3	0.963	75290	84104	45.9	0.934	78582	47000	48.4	1.138	53486	209301	46.7	0.991	207358					214
13	25424	48.3	1.114	28330	25974	47.9	1.078	27997	35000	54.7	1.708	59780	86398	51.1	1.344	116107					88
14	36194	53.0	1.513	54763	18127	50.4	1.280	23205	31000	54.0	1.638	50778	85321	53.0	1.509	128745					87
15	37830	51.2	1.351	51105	24393	48.8	1.146	27951	17000	55.3	1.782	30294	79224	51.6	1.380	109350					81
16	50824	53.9	1.599	81285	34677	51.5	1.378	47799	25000	58.4	2.106	52650	110501	54.4	1.645	181734					113
17	60184	58.5	2.098	126279	7400	53.8	1.591	11771	9000	59.1	2.176	19584	76584	58.1	2.058	157634					78
18	40911	58.7	2.125	86954	2323	55.9	1.809	4202	9000	59.7	2.248	20232	52233	58.8	2.133	111388					53
19	8177	57.2	1.949	15939	5659	48.6	1.137	6434	2900	62.5	2.624	7610	16736	55.8	1.792	29983					17
20	9117	65.6	3.073	28011	0	0.0	0.000	0	2500	64.5	2.906	7265	11617	65.4	3.037	35276					12
21	221	56.5	1.872	413	19	56.5	1.872	36				0	240	56.5	1.872	449					0
22	56	62.5	2.618	147	0	0.0	0.000	0				0	56	62.5	2.618	147					0
23	588	60.5	2.349	1382	0	0.0	0.000	0					588	60.5	2.349	1382					1
UNK	5778	69.7	3.766	21762	0	0.0	0.000	0					5778	69.7	3.766	21762					6
Total SOP				1085464				784400				1086482				2956346					1.02
Catch				1085464				784400									31000	18000	12000	9000	

Table 19. Numbers at age of American plaice from the Canadian spring RV survey (1985-2009 (no 2006)) (a), Canadian fall RV survey (1990-2009) (no 2004) (b) and EU-Spain Div. 3NO survey from 1998-2009 (c).

a. Canadian spring survey

Spring	5	6	7	8	9	10	11	12	13	14
1985.5	263.811	454.551	595.652	389.798	208.007	140.238	84.297	45.199	22.716	13.977
1986.5	256.002	561.361	577.156	307.058	193.651	98.117	45.955	34.378	21.735	8.903
1987.5	460.214	747.454	656.206	398.314	184.639	101.101	41.829	33.798	19.928	11.136
1988.5	368.612	616.621	543.875	314.972	217.849	85.292	48.628	32.575	18.745	11.969
1989.5	336.143	551.765	470.169	273.725	187.637	74.679	39.843	27.071	16.825	9.650
1990.5	618.749	377.901	371.001	200.264	130.479	77.524	32.385	21.463	14.428	8.809
1991.5	398.190	364.155	180.205	112.916	67.544	35.190	22.260	13.356	7.224	5.529
1992.5	110.276	190.141	150.915	63.403	34.120	17.503	9.447	5.402	3.343	1.767
1993.5	138.054	180.137	160.064	89.449	32.226	16.510	7.626	4.264	1.783	1.325
1994.5	99.220	106.040	85.372	43.270	19.992	5.397	3.952	1.396	1.241	0.996
1995.5	41.914	57.524	59.883	49.937	27.484	8.339	2.664	0.539	0.093	0.035
1996.5	133.678	130.513	97.122	39.511	16.189	4.502	1.942	2.233	0.518	0.250
1997.5	65.278	84.402	79.311	48.718	18.944	6.047	2.678	1.819	0.562	0.174
1998.5	69.797	69.196	76.743	79.391	47.909	19.560	9.928	3.281	1.624	0.445
1999.5	66.741	104.510	104.869	111.518	107.309	65.322	30.521	13.021	6.508	1.894
2000.5	34.977	67.015	78.009	64.565	59.164	47.188	27.929	9.536	4.042	0.900
2001.5	28.853	36.351	73.856	62.438	58.427	45.042	34.569	16.018	5.541	2.771
2002.5	56.503	41.334	51.938	53.824	38.253	24.420	20.028	12.561	4.006	2.010
2003.5	188.242	72.503	46.058	49.745	39.965	18.074	13.764	11.463	4.506	2.168
2004.5	96.532	161.935	51.282	29.336	19.920	15.555	9.207	8.200	4.490	2.707
2005.5	149.659	163.831	143.874	55.103	31.863	16.505	13.679	8.236	6.219	4.662
2007.5	193.863	89.640	144.469	115.486	82.606	16.796	10.938	5.057	4.373	3.821
2008.5	238.975	116.455	91.953	117.024	70.142	42.584	14.799	7.295	3.804	3.320
2009.5	72.302	130.149	44.734	34.017	36.716	24.987	16.124	6.078	1.739	1.933

b. Canadian fall survey

Fall	5	6	7	8	9	10	11	12	13	14
1990.9	853.098	642.862	369.626	191.668	124.519	55.198	29.201	17.430	12.054	9.316
1991.9	724.397	578.812	249.380	116.271	81.837	44.303	25.916	13.857	12.207	6.977
1992.9	367.927	499.192	226.077	76.712	35.653	17.680	8.451	6.848	3.333	3.151
1993.9	360.452	372.076	316.567	104.116	33.000	15.316	6.798	5.095	3.077	2.383
1994.9	190.297	151.085	134.913	89.251	28.649	7.822	2.667	1.723	0.919	1.168
1995.9	295.940	336.345	151.960	61.447	39.520	10.745	1.880	1.308	0.452	0.307
1996.9	208.293	174.079	82.201	21.365	8.820	3.077	1.781	0.587	0.098	0.116
1997.9	153.853	159.848	119.979	53.224	23.331	7.304	3.217	1.208	0.849	0.595
1998.9	121.174	129.090	112.639	83.420	68.417	17.949	6.944	3.630	2.041	0.844
1999.9	92.461	93.426	79.565	98.916	72.701	33.661	18.853	12.311	4.889	1.076
2000.9	73.671	132.006	115.595	83.788	61.816	48.924	25.380	7.069	3.091	0.843
2001.9	53.977	67.182	97.770	63.670	48.712	27.344	26.360	11.691	2.834	1.128
2002.9	105.561	42.394	72.913	75.893	41.055	26.800	26.982	15.759	7.846	0.989
2003.9	325.025	85.303	49.333	35.469	19.314	12.574	11.135	6.373	1.987	0.857
2005.9	170.458	196.940	131.951	38.038	13.807	13.226	7.264	5.099	4.833	3.319
2006.9	74.278	141.128	138.301	108.766	26.315	9.192	10.458	9.922	5.594	3.616
2007.9	118.060	67.983	128.426	121.169	74.096	24.413	9.052	8.624	2.724	4.867
2008.9	515.631	146.418	117.517	103.649	69.111	28.220	8.278	4.662	2.591	2.692
2009.9	229.210	230.664	78.367	52.176	41.569	21.308	14.410	3.746	3.075	2.354

c. EU-Spain Div. 3NO survey

Span	5	6	7	8	9	10	11	12	13	14
1998.5	8.582	14.252	29.988	48.494	33.834	13.683	5.388	1.968	0.950	1.028
1999.5	12.890	37.921	32.147	42.532	60.516	50.117	20.463	9.189	5.005	1.871
2000.5	10.996	19.645	49.713	39.491	51.904	46.981	29.088	13.556	6.375	0.973
2001.5	4.815	11.438	30.592	28.505	27.167	20.443	21.202	8.264	2.273	0.962
2002.5	38.405	11.404	10.045	18.840	14.277	8.863	10.671	7.449	1.841	1.030
2003.5	235.167	56.430	22.530	16.910	19.425	8.112	8.500	10.412	3.875	1.732
2004.5	76.802	204.706	47.136	12.832	11.172	11.953	6.443	7.897	4.393	3.803
2005.5	40.627	91.456	121.134	42.371	17.815	6.106	4.385	4.292	3.295	2.381
2006.5	105.848	85.837	92.851	78.663	57.880	25.601	11.867	6.464	3.468	2.280
2007.5	97.644	33.625	61.137	45.089	56.795	10.917	3.752	3.071	2.240	2.266
2008.5	282.606	121.995	36.946	75.106	38.907	32.571	8.910	4.688	1.692	2.441
2009.5	50.506	97.163	35.078	19.649	17.171	23.130	20.538	8.018	1.498	1.107

Table 20. Catch at age used in the virtual population analyses. Age 15 is a plus group. Please note there have been some corrections to the catch at age in the most recent years.

Catch	5	6	7	8	9	10	11	12	13	14	15
1960	44.7	318.8	841.8	1365.9	1738.3	2280.0	2540.0	3473.6	2752.5	2564.7	4588.8
1961	28.1	200.4	531.2	1230.9	2463.9	3174.2	2467.1	2272.0	3894.1	2579.4	5102.7
1962	62.4	445.1	657.2	1096.1	1184.5	1669.1	2432.4	2697.6	2409.5	3276.8	5958.8
1963	144.3	1029.7	1866.4	1434.1	1546.8	2237.6	3104.3	4174.8	3896.9	3851.9	5622.8
1964	268.6	1916.7	4997.5	3253.4	6174.5	8768.6	6960.2	6149.8	3245.9	3033.6	5552.8
1965	475.5	3157.0	7234.8	9305.9	7048.0	7562.9	5731.6	5790.8	5214.6	4333.2	6510.2
1966	1759.8	6271.7	10036.6	11132.5	9516.7	7266.3	7106.4	5667.6	5731.0	5009.8	8475.7
1967	433.9	3345.3	10834.8	7647.2	9504.5	13713.2	13672.7	14564.6	9495.5	6572.1	13247.8
1968	275.8	2342.3	4139.2	9785.9	11210.5	11631.0	7735.4	13842.2	8778.0	6339.2	8419.3
1969	690.3	2453.1	7875.0	14186.6	18181.9	12778.9	12735.3	10396.6	7053.8	5305.1	7666.2
1970	115.9	2172.2	2554.1	10006.8	13536.7	11286.1	11179.1	8248.5	5556.4	4661.3	9285.0
1971	1135.9	1749.6	8411.7	10457.6	15504.1	14164.8	10993.1	9026.5	5195.2	3720.6	7130.5
1972	578.2	2573.8	2367.8	7696.8	11301.7	12765.9	12718.0	10706.0	6783.8	4354.0	7033.1
1973	46.4	1079.1	6329.1	10518.1	13016.7	10042.3	9980.4	6762.3	6589.6	3733.8	7013.8
1974	354.0	5955.0	10475.0	10069.0	7768.0	9004.0	7086.0	4596.0	3809.0	2278.0	2164.0
1975	883.0	3128.0	7220.0	9433.0	9234.0	7903.0	5701.0	4732.0	3788.0	2617.0	2933.0
1976	837.0	3907.0	8781.0	19363.0	16597.0	12338.0	8323.0	5156.0	3024.0	2309.0	2241.0
1977	974.0	6723.0	8743.0	11730.0	13559.0	11157.0	6520.0	4257.0	2369.0	1493.0	1625.0
1978	1558.0	4467.0	9195.0	10397.0	12743.0	13881.0	9938.0	6823.0	3655.0	2239.0	2440.0
1979	1257.0	6551.0	13532.0	18747.0	14977.0	12506.0	8791.0	3775.0	1843.0	714.0	580.0
1980	263.0	2977.0	9531.0	12578.0	14111.0	14212.0	11288.0	8088.0	3732.0	1565.0	1022.0
1981	154.0	554.0	2248.0	4786.0	7921.0	11425.0	13565.0	11872.0	8693.0	5591.0	4697.0
1982	27.0	314.0	1814.0	4799.0	8946.0	12836.0	15801.0	14489.0	7942.0	4224.0	2943.0
1983	119.0	991.0	3053.0	5797.0	8343.0	7707.0	8493.0	7517.0	4588.0	2480.0	1771.0
1984	48.0	397.0	1516.0	3311.0	5853.0	9958.0	12887.0	8964.0	5072.0	2515.0	1602.0
1985	296.0	788.0	2362.0	5652.0	10694.0	15741.0	14528.0	9233.0	4108.0	1969.0	1792.0
1986	4407.0	9707.0	12556.0	12530.0	13372.0	13874.0	14246.0	10376.0	5947.0	2637.0	2155.0
1987	2237.0	4941.0	7691.0	10893.0	15867.0	17640.0	11404.0	6986.0	3076.0	1303.0	1046.0
1988	2908.0	3213.0	4853.0	7269.0	10123.0	10325.0	9260.0	6040.0	2692.0	1156.0	962.0
1989	12745.0	11553.0	11432.0	9652.0	14180.0	12387.0	8405.0	4972.0	2029.0	1027.0	715.0
1990	15134.0	7694.0	4489.0	4604.0	8666.0	8666.0	6452.0	3633.0	1702.0	945.0	548.0
1991	6103.0	12152.0	7846.0	9331.0	7856.0	6589.0	4394.0	2294.0	811.0	364.0	484.0
1992	148.0	1023.0	2591.0	3395.0	3618.0	2154.0	1507.0	875.0	576.0	513.0	579.0
1993	1172.4	3712.9	8820.9	11590.5	5720.0	3376.9	1853.1	1002.5	526.9	354.7	526.8
1994	4316.3	3837.1	5426.1	4459.7	2777.0	736.9	475.6	162.8	120.9	54.7	27.7
1995	99.2	313.9	453.2	333.0	203.3	65.5	13.6	4.1	0.1	0.1	0.4
1996	180.9	742.8	975.0	452.7	211.1	51.9	10.4	8.1	2.3	1.0	1.3
1997	19.4	134.9	543.7	719.4	409.4	149.3	93.5	56.8	26.2	1.4	1.4
1998	10.6	54.8	272.7	767.1	804.9	455.5	278.5	117.3	69.0	49.2	18.3
1999	26.0	174.5	268.4	579.2	1029.9	1079.4	627.4	278.1	125.6	39.6	38.3
2000	15.2	226.3	726.8	915.1	1442.7	1532.7	979.1	429.1	195.2	43.9	116.6
2001	111.0	331.5	1139.1	1413.3	1583.8	1595.5	1403.9	665.1	232.4	86.1	109.1
2002	312.2	308.3	609.9	1488.3	1431.7	1082.1	1059.3	605.2	203.5	62.4	60.6
2003	1212.4	983.0	1104.7	1707.9	1993.6	1201.8	999.9	879.7	358.2	156.5	131.8
2004	346.2	1898.8	1215.9	967.5	1086.1	1013.6	739.9	591.1	320.1	201.4	124.4
2005	58.6	289.0	999.0	842.9	778.7	579.7	536.2	341.9	260.0	178.0	250.4
2006	76.1	228.4	637.2	558.5	469.0	354.4	311.7	252.7	210.7	154.5	238.8
2007	53.9	73.3	375.1	627.6	738.8	366.3	283.3	249.6	247.8	247.3	564.6
2008	82.3	136.2	292.8	722.4	736.4	511.0	226.9	198.8	111.5	101.3	227.8
2009	189.3	689.5	544.6	691.0	787.2	645.5	472.2	214.3	88.4	87.3	356.0

Table 21. Stock weight-at-age for Div. 3LNO American plaice (Jan. 1).

beg of year	5	6	7	8	9	10	11	12	13	14	15+
1960	0.227	0.198	0.232	0.320	0.423	0.539	0.663	0.775	0.872	1.041	1.274
1961	0.227	0.198	0.232	0.320	0.423	0.539	0.663	0.775	0.872	1.041	1.274
1962	0.201	0.192	0.227	0.326	0.441	0.549	0.663	0.810	0.885	1.035	1.281
1963	0.179	0.218	0.229	0.326	0.447	0.569	0.668	0.790	0.876	1.021	1.357
1964	0.178	0.244	0.293	0.382	0.458	0.579	0.687	0.789	0.882	1.023	1.352
1965	0.182	0.246	0.323	0.434	0.554	0.620	0.727	0.813	0.891	1.076	1.420
1966	0.178	0.241	0.327	0.427	0.565	0.702	0.828	0.904	0.925	1.095	1.444
1967	0.182	0.245	0.326	0.416	0.552	0.710	0.817	1.003	1.025	1.161	1.563
1968	0.177	0.240	0.316	0.415	0.531	0.652	0.819	0.916	1.052	1.219	1.612
1969	0.182	0.246	0.303	0.379	0.504	0.635	0.740	0.914	1.020	1.227	1.623
1970	0.188	0.240	0.309	0.363	0.470	0.619	0.730	0.813	1.012	1.106	1.495
1971	0.181	0.233	0.302	0.365	0.443	0.573	0.725	0.850	0.933	1.087	1.354
1972	0.193	0.241	0.310	0.400	0.461	0.557	0.679	0.818	0.922	1.102	1.365
1973	0.190	0.226	0.285	0.376	0.501	0.576	0.716	0.885	1.038	1.117	1.466
1974	0.191	0.229	0.288	0.349	0.465	0.600	0.759	0.951	1.190	1.396	1.705
1975	0.192	0.231	0.296	0.376	0.484	0.627	0.789	0.994	1.208	1.439	1.817
1976	0.183	0.236	0.296	0.380	0.482	0.610	0.757	0.955	1.109	1.332	1.683
1977	0.187	0.234	0.305	0.386	0.504	0.612	0.761	0.919	1.119	1.271	1.631
1978	0.152	0.233	0.305	0.384	0.469	0.614	0.718	0.897	1.098	1.303	1.626
1979	0.167	0.251	0.312	0.400	0.476	0.558	0.657	0.847	1.061	1.414	1.681
1980	0.155	0.262	0.362	0.425	0.495	0.560	0.629	0.720	0.958	1.290	1.757
1981	0.175	0.281	0.365	0.430	0.484	0.538	0.560	0.663	0.765	0.993	1.446
1982	0.210	0.250	0.369	0.416	0.469	0.509	0.565	0.638	0.812	1.005	1.336
1983	0.290	0.313	0.375	0.447	0.530	0.582	0.610	0.671	0.842	1.091	1.502
1984	0.245	0.306	0.382	0.466	0.553	0.609	0.676	0.771	0.923	1.177	1.638
1985	0.222	0.298	0.367	0.425	0.503	0.601	0.679	0.849	1.120	1.463	1.921
1986	0.079	0.203	0.302	0.420	0.509	0.605	0.713	0.901	1.195	1.570	2.082
1987	0.219	0.189	0.278	0.349	0.452	0.599	0.749	0.925	1.175	1.500	2.017
1988	0.163	0.242	0.317	0.421	0.463	0.547	0.712	0.934	1.229	1.560	2.062
1989	0.065	0.178	0.257	0.365	0.467	0.545	0.696	0.909	1.223	1.572	2.070
1990	0.103	0.158	0.253	0.341	0.464	0.586	0.745	0.986	1.317	1.697	2.049
1991	0.168	0.215	0.321	0.408	0.520	0.661	0.845	1.104	1.478	1.880	2.224
1992	0.234	0.238	0.330	0.415	0.514	0.667	0.861	1.096	1.412	1.806	2.327
1993	0.088	0.228	0.279	0.358	0.453	0.568	0.730	0.926	1.205	1.466	2.008
1994	0.084	0.148	0.244	0.320	0.441	0.613	0.727	0.906	1.163	1.444	1.792
1995	0.166	0.168	0.252	0.341	0.515	0.742	1.102	1.226	1.313	1.849	1.776
1996	0.116	0.194	0.265	0.386	0.537	0.807	1.058	1.457	1.625	2.109	2.353
1997	0.162	0.189	0.266	0.379	0.542	0.745	0.953	1.187	1.531	1.924	2.613
1998	0.136	0.165	0.255	0.350	0.495	0.633	0.806	0.985	1.260	1.732	2.014
1999	0.153	0.212	0.227	0.316	0.411	0.553	0.673	0.860	1.064	1.356	1.809
2000	0.119	0.238	0.313	0.360	0.445	0.566	0.716	0.896	1.147	1.356	1.756
2001	0.185	0.231	0.345	0.426	0.468	0.584	0.750	0.932	1.164	1.391	1.789
2002	0.185	0.268	0.356	0.435	0.510	0.581	0.723	0.940	1.128	1.404	1.742
2003	0.209	0.273	0.369	0.444	0.541	0.637	0.760	0.943	1.201	1.407	1.883
2004	0.177	0.280	0.373	0.468	0.570	0.709	0.838	0.976	1.204	1.535	1.978
2005	0.167	0.276	0.386	0.486	0.581	0.709	0.857	1.012	1.220	1.461	1.931
2006	0.123	0.228	0.377	0.498	0.587	0.687	0.876	0.996	1.208	1.516	1.862
2007	0.215	0.225	0.336	0.469	0.580	0.679	0.813	1.111	1.211	1.382	1.708
2008	0.171	0.260	0.344	0.476	0.587	0.718	0.841	1.097	1.315	1.476	1.629
2009	0.144	0.218	0.306	0.411	0.528	0.658	0.804	0.964	1.332	1.452	1.713
2010	0.177	0.234	0.329	0.452	0.565	0.685	0.819	1.057	1.286	1.437	1.683

Table 22. Estimated proportion mature-at-age for Div. 3LNO American plaice.

	5	6	7	8	9	10	11	12	13	14	15
1960	0.002	0.004	0.016	0.040	0.127	0.232	0.561	0.810	0.932	0.977	0.992
1961	0.003	0.005	0.014	0.046	0.105	0.333	0.564	0.810	0.932	0.977	0.992
1962	0.002	0.009	0.013	0.041	0.126	0.250	0.632	0.847	0.932	0.977	0.992
1963	0.001	0.006	0.027	0.037	0.117	0.298	0.486	0.855	0.960	0.977	0.992
1964	0.001	0.002	0.019	0.082	0.100	0.291	0.556	0.728	0.953	0.990	0.992
1965	0.005	0.004	0.009	0.056	0.218	0.240	0.559	0.787	0.884	0.986	0.998
1966	0.013	0.016	0.017	0.038	0.158	0.468	0.474	0.797	0.916	0.956	0.996
1967	0.005	0.033	0.050	0.063	0.141	0.371	0.735	0.720	0.924	0.970	0.984
1968	0.003	0.012	0.082	0.143	0.209	0.404	0.649	0.897	0.880	0.974	0.990
1969	0.003	0.008	0.031	0.190	0.346	0.509	0.737	0.853	0.965	0.955	0.991
1970	0.001	0.009	0.023	0.078	0.381	0.627	0.802	0.921	0.948	0.989	0.984
1971	0.000	0.002	0.025	0.062	0.183	0.618	0.842	0.941	0.980	0.983	0.996
1972	0.000	0.002	0.008	0.065	0.160	0.372	0.809	0.944	0.984	0.995	0.994
1973	0.000	0.001	0.007	0.026	0.158	0.353	0.610	0.918	0.982	0.996	0.999
1974	0.002	0.001	0.006	0.025	0.086	0.338	0.611	0.806	0.967	0.994	0.999
1975	0.002	0.006	0.007	0.025	0.085	0.248	0.581	0.818	0.917	0.987	0.998
1976	0.002	0.007	0.021	0.029	0.108	0.258	0.537	0.790	0.928	0.967	0.995
1977	0.001	0.007	0.023	0.070	0.121	0.359	0.563	0.803	0.911	0.974	0.987
1978	0.000	0.004	0.023	0.073	0.212	0.386	0.723	0.827	0.935	0.965	0.991
1979	0.001	0.001	0.015	0.070	0.209	0.491	0.742	0.924	0.947	0.980	0.987
1980	0.001	0.004	0.008	0.057	0.193	0.469	0.775	0.929	0.983	0.985	0.994
1981	0.002	0.006	0.024	0.047	0.192	0.432	0.747	0.925	0.984	0.996	0.996
1982	0.000	0.010	0.031	0.122	0.224	0.483	0.707	0.908	0.978	0.996	0.999
1983	0.001	0.003	0.051	0.152	0.442	0.628	0.786	0.884	0.971	0.994	0.999
1984	0.000	0.009	0.030	0.229	0.501	0.818	0.908	0.936	0.960	0.991	0.998
1985	0.004	0.005	0.064	0.228	0.620	0.850	0.962	0.983	0.983	0.987	0.997
1986	0.008	0.022	0.055	0.345	0.738	0.900	0.970	0.993	0.997	0.996	0.996
1987	0.004	0.036	0.112	0.424	0.803	0.964	0.980	0.994	0.999	1.000	0.999
1988	0.002	0.018	0.155	0.412	0.904	0.969	0.996	0.996	0.999	1.000	1.000
1989	0.002	0.010	0.077	0.474	0.796	0.992	0.996	1.000	0.999	1.000	1.000
1990	0.003	0.009	0.050	0.272	0.815	0.956	0.999	0.999	1.000	1.000	1.000
1991	0.006	0.013	0.052	0.209	0.626	0.956	0.992	1.000	1.000	1.000	1.000
1992	0.001	0.022	0.059	0.241	0.573	0.883	0.991	0.999	1.000	1.000	1.000
1993	0.005	0.008	0.082	0.232	0.647	0.872	0.971	0.998	1.000	1.000	1.000
1994	0.026	0.034	0.067	0.260	0.595	0.914	0.972	0.993	1.000	1.000	1.000
1995	0.075	0.106	0.195	0.377	0.579	0.877	0.984	0.994	0.999	1.000	1.000
1996	0.009	0.173	0.345	0.627	0.837	0.843	0.972	0.997	0.999	1.000	1.000
1997	0.004	0.040	0.349	0.701	0.921	0.977	0.954	0.994	1.000	1.000	1.000
1998	0.018	0.026	0.159	0.578	0.913	0.988	0.997	0.988	0.999	1.000	1.000
1999	0.016	0.066	0.137	0.463	0.779	0.979	0.998	1.000	0.997	1.000	1.000
2000	0.008	0.065	0.217	0.488	0.797	0.900	0.995	1.000	1.000	0.999	1.000
2001	0.045	0.044	0.234	0.521	0.851	0.947	0.959	0.999	1.000	1.000	1.000
2002	0.053	0.145	0.213	0.574	0.810	0.972	0.988	0.983	1.000	1.000	1.000
2003	0.079	0.155	0.382	0.614	0.856	0.943	0.995	0.997	0.993	1.000	1.000
2004	0.020	0.197	0.378	0.692	0.903	0.963	0.985	0.999	0.999	0.997	1.000
2005	0.059	0.064	0.414	0.668	0.891	0.982	0.991	0.996	1.000	1.000	0.999
2006	0.015	0.140	0.187	0.671	0.870	0.967	0.997	0.998	0.999	1.000	1.000
2007	0.012	0.057	0.298	0.438	0.854	0.957	0.991	0.999	1.000	1.000	1.000
2008	0.029	0.052	0.198	0.526	0.726	0.944	0.987	0.997	1.000	1.000	1.000
2009	0.029	0.083	0.200	0.502	0.744	0.900	0.980	0.996	0.999	1.000	1.000
2010	0.029	0.083	0.232	0.532	0.804	0.884	0.968	0.993	0.999	1.000	1.000

Table 23. Results of ADAPT for Div. 3LNO American plaice using Canadian Div. 3LNO spring and fall surveys and EU-Spain Div. 3NO survey.

ORTHOGONALITY OFFSET 0.000027
MEAN SQUARE RESIDUALS 0.281659

Parameter	Estimate	Standard Error	Bias	Rel. Err.	Rel.Bias
N[2010 6]	2.465E+04	7.840E+03	1.273E+03	0.318	0.052
N[2010 7]	4.370E+04	9.933E+03	1.169E+03	0.227	0.027
N[2010 8]	1.515E+04	2.871E+03	2.817E+02	0.189	0.019
N[2010 9]	7.443E+03	1.348E+03	1.214E+02	0.181	0.016
N[2010 10]	8.782E+03	1.456E+03	1.185E+02	0.166	0.013
N[2010 11]	7.372E+03	1.182E+03	9.113E+01	0.160	0.012
N[2010 12]	6.751E+03	1.014E+03	7.337E+01	0.150	0.011
N[2010 13]	1.622E+03	2.711E+02	1.959E+01	0.167	0.012
N[2010 14]	4.891E+02	9.855E+01	7.941E+00	0.202	0.016
N[2010 15]	1.088E+03	2.142E+02	1.351E+01	0.197	0.012
q ID#[1]	7.582E-03	9.536E-04	5.165E-05	0.126	0.007
q ID#[2]	8.848E-03	1.102E-03	5.964E-05	0.125	0.007
q ID#[3]	9.507E-03	1.179E-03	6.473E-05	0.124	0.007
q ID#[4]	8.542E-03	1.058E-03	5.925E-05	0.124	0.007
q ID#[5]	7.470E-03	9.241E-04	5.142E-05	0.124	0.007
q ID#[6]	5.938E-03	7.352E-04	4.109E-05	0.124	0.007
q ID#[7]	5.981E-03	7.436E-04	4.179E-05	0.124	0.007
q ID#[8]	6.756E-03	8.471E-04	4.898E-05	0.125	0.007
q ID#[9]	6.281E-03	7.970E-04	4.739E-05	0.127	0.008
q ID#[10]	6.891E-03	8.886E-04	5.475E-05	0.129	0.008
q ID#[11]	3.184E-03	3.535E-04	1.678E-05	0.111	0.005
q ID#[12]	4.899E-03	5.398E-04	2.570E-05	0.110	0.005
q ID#[13]	6.107E-03	6.703E-04	3.223E-05	0.110	0.005
q ID#[14]	6.067E-03	6.647E-04	3.228E-05	0.110	0.005
q ID#[15]	5.596E-03	6.128E-04	3.003E-05	0.110	0.005
q ID#[16]	4.419E-03	4.845E-04	2.410E-05	0.110	0.005
q ID#[17]	4.380E-03	4.807E-04	2.376E-05	0.110	0.005
q ID#[18]	4.885E-03	5.384E-04	2.702E-05	0.110	0.006
q ID#[19]	4.590E-03	5.102E-04	2.620E-05	0.111	0.006
q ID#[20]	4.782E-03	5.370E-04	2.818E-05	0.112	0.006
q ID#[21]	1.845E-03	2.977E-04	2.106E-05	0.161	0.011
q ID#[22]	2.482E-03	3.942E-04	2.751E-05	0.159	0.011
q ID#[23]	3.073E-03	4.842E-04	3.380E-05	0.158	0.011
q ID#[24]	3.512E-03	5.514E-04	3.874E-05	0.157	0.011
q ID#[25]	4.250E-03	6.662E-04	4.706E-05	0.157	0.011
q ID#[26]	4.036E-03	6.335E-04	4.498E-05	0.157	0.011
q ID#[27]	4.173E-03	6.577E-04	4.704E-05	0.158	0.011
q ID#[28]	5.017E-03	7.988E-04	5.851E-05	0.159	0.012
q ID#[29]	3.798E-03	6.142E-04	4.636E-05	0.162	0.012
q ID#[30]	3.773E-03	6.224E-04	4.852E-05	0.165	0.013

Table 24. Bias adjusted population numbers (000 t) from VPA.

Pop #s Bias Adj(a	5	6	7	8	9	10	11	12	13	14	15
1960	299711	215972	141212	120313	90754	59599	48429	34426	21984	16264	29100
1961	283342	245342	176535	114854	97270	72734	46737	37358	25054	15519	30700
1962	265661	231955	200688	144055	92923	77414	56684	36039	28536	17006	30925
1963	270974	217448	189507	163716	116952	75009	61874	44214	27073	21190	30932
1964	260403	221724	177102	153470	132744	94355	59392	47856	32435	18655	34147
1965	288220	212957	179802	140486	122713	103109	69345	42353	33640	23629	35500
1966	250042	235545	171504	140679	106625	94109	77596	51606	29459	22846	38652
1967	223369	203128	187185	131359	105137	78715	70496	57122	37142	18963	38224
1968	176502	182487	163286	143478	100647	77508	52103	45415	33683	21879	29058
1969	174804	144258	147292	129950	108641	72298	52983	35691	24763	19692	28456
1970	164081	142494	115893	113486	93606	72579	47691	31933	19890	13941	27770
1971	204824	134234	114703	92579	83891	64445	49259	28997	18734	11295	21647
1972	242725	166670	108321	86323	66372	54731	40026	30446	15643	10674	17241
1973	292802	198204	134134	86548	63734	44166	33335	21363	15334	6744	12668
1974	280066	239684	161301	104107	61381	40472	27132	18336	11425	6663	6330
1975	293987	228979	190860	122612	76157	43255	25040	15849	10883	5939	6656
1976	276669	239899	184647	149745	91877	54031	28301	15376	8729	5515	5353
1977	232206	225761	192884	143251	105155	60285	33145	15701	7966	4437	4829
1978	218530	189235	178768	150029	106705	73876	39317	21271	9032	4396	4791
1979	200740	177510	150899	138065	113454	75878	47994	23261	11295	4125	3351
1980	193526	163216	139419	111343	96149	79394	50864	31382	15646	7589	4956
1981	188492	158208	130942	105548	79823	66010	52211	31495	18428	9455	7943
1982	191279	154185	129029	105176	82096	58212	43760	30561	15155	7327	5105
1983	189856	156582	125953	104002	81780	59151	36118	21673	12089	5332	3808
1984	191476	155333	127303	100365	79918	59434	41484	21937	11007	5790	3688
1985	187352	156724	126818	102858	79182	60152	39695	22403	9942	4483	4080
1986	159610	153123	127603	101697	79113	55195	35109	19487	10084	4465	3649
1987	141929	126699	116609	93152	71971	52734	32724	15999	6713	2972	2386
1988	161877	114181	99272	88532	66449	44657	27360	16572	6856	2749	2288
1989	188770	129907	90583	76897	65928	45287	27281	14099	8158	3204	2230
1990	184260	101485	67750	44715	37999	28202	17435	9819	4623	3288	1907
1991	91835	97036	53926	36487	22850	15892	10167	5500	3098	1465	1948
1992	62210	49445	47971	25845	14521	7637	4513	2762	1552	1219	1376
1993	53619	36505	28329	26278	12659	5848	2893	1540	977	489	726
1994	59826	30673	18689	10129	6974	3265	1011	382	194	193	98
1995	54520	31955	15167	6967	2694	2061	1371	248	106	28	110
1996	36191	32016	18571	8584	3849	1432	1164	797	143	62	81
1997	23630	21165	18282	10194	4710	2106	804	677	463	82	82
1998	21685	19329	17207	14477	7697	3487	1589	574	503	355	132
1999	21469	17745	15776	13841	11161	5576	2445	1051	364	350	338
2000	14261	17554	14371	12674	10810	8209	3594	1438	610	186	493
2001	12565	11662	14168	11110	9551	7550	5342	2063	792	325	411
2002	17325	10187	9249	10572	7822	6394	4747	3112	1093	440	427
2003	38809	13903	8062	7022	7315	5116	4261	2934	2004	712	599
2004	30993	30680	10496	5606	4214	4199	3108	2589	1613	1318	814
2005	27921	25062	23405	7497	3719	2475	2527	1880	1589	1032	1452
2006	18345	22807	20258	18261	5379	2344	1505	1587	1231	1067	1649
2007	28232	14951	18467	16011	14446	3981	1600	952	1071	819	1869
2008	64464	23066	12175	14780	12542	11161	2929	1055	555	654	1472
2009	28757	52704	18762	9703	11449	9604	8677	2193	685	354	1444
2010	37405	23373	42528	14869	7321	8664	7281	6678	1602	481	1074

Table 25. Bias adjusted fishing mortalities from VPA.

F Bias Adj(analyt	5	6	7	8	9	10	11	12	13	14	15
1960	0.000	0.002	0.007	0.013	0.021	0.043	0.060	0.118	0.148	0.190	0.190
1961	0.000	0.001	0.003	0.012	0.028	0.049	0.060	0.069	0.187	0.202	0.202
1962	0.000	0.002	0.004	0.008	0.014	0.024	0.048	0.086	0.098	0.238	0.238
1963	0.001	0.005	0.011	0.010	0.015	0.033	0.057	0.110	0.172	0.223	0.223
1964	0.001	0.010	0.032	0.024	0.053	0.108	0.138	0.152	0.117	0.197	0.197
1965	0.002	0.016	0.045	0.076	0.065	0.084	0.095	0.163	0.187	0.225	0.225
1966	0.008	0.030	0.067	0.091	0.103	0.089	0.106	0.129	0.241	0.276	0.276
1967	0.002	0.018	0.066	0.066	0.105	0.213	0.240	0.328	0.329	0.477	0.477
1968	0.002	0.014	0.028	0.078	0.131	0.180	0.178	0.407	0.337	0.382	0.382
1969	0.004	0.019	0.061	0.128	0.203	0.216	0.306	0.385	0.374	0.350	0.350
1970	0.001	0.017	0.025	0.102	0.173	0.188	0.298	0.333	0.366	0.456	0.456
1971	0.006	0.014	0.084	0.133	0.227	0.276	0.281	0.417	0.363	0.447	0.447
1972	0.003	0.017	0.024	0.103	0.207	0.296	0.428	0.486	0.641	0.590	0.590
1973	0.000	0.006	0.053	0.144	0.254	0.287	0.398	0.426	0.633	0.921	0.921
1974	0.001	0.028	0.074	0.113	0.150	0.280	0.338	0.322	0.454	0.469	0.469
1975	0.003	0.015	0.043	0.089	0.143	0.224	0.288	0.396	0.480	0.656	0.656
1976	0.003	0.018	0.054	0.154	0.221	0.289	0.389	0.458	0.477	0.611	0.611
1977	0.005	0.033	0.051	0.095	0.153	0.227	0.244	0.353	0.394	0.460	0.460
1978	0.008	0.026	0.058	0.079	0.141	0.231	0.325	0.433	0.584	0.809	0.809
1979	0.007	0.042	0.104	0.162	0.157	0.200	0.225	0.197	0.198	0.211	0.211
1980	0.002	0.020	0.078	0.133	0.176	0.219	0.279	0.332	0.304	0.257	0.257
1981	0.001	0.004	0.019	0.051	0.116	0.211	0.336	0.531	0.722	1.026	1.026
1982	0.000	0.002	0.016	0.052	0.128	0.277	0.503	0.727	0.845	0.983	0.983
1983	0.001	0.007	0.027	0.063	0.119	0.155	0.299	0.478	0.536	0.708	0.708
1984	0.000	0.003	0.013	0.037	0.084	0.204	0.416	0.591	0.698	0.643	0.643
1985	0.002	0.006	0.021	0.062	0.161	0.338	0.511	0.598	0.600	0.653	0.653
1986	0.031	0.072	0.115	0.146	0.206	0.323	0.586	0.866	1.022	1.024	1.024
1987	0.018	0.044	0.075	0.138	0.277	0.456	0.480	0.647	0.693	0.651	0.651
1988	0.020	0.032	0.055	0.095	0.183	0.293	0.463	0.509	0.561	0.615	0.615
1989	0.091	0.121	0.176	0.175	0.319	0.425	0.492	0.585	0.379	0.517	0.517
1990	0.111	0.102	0.089	0.141	0.342	0.490	0.624	0.624	0.619	0.451	0.451
1991	0.089	0.174	0.206	0.391	0.566	0.729	0.773	0.735	0.403	0.378	0.378
1992	0.003	0.027	0.072	0.184	0.379	0.441	0.545	0.510	0.626	0.744	0.744
1993	0.029	0.140	0.498	0.796	0.825	1.225	1.494	1.544	1.090	1.988	1.988
1994	0.097	0.174	0.457	0.794	0.689	0.338	0.876	0.757	1.420	0.442	0.442
1995	0.002	0.013	0.039	0.063	0.102	0.042	0.013	0.022	0.001	0.005	0.005
1996	0.006	0.030	0.070	0.070	0.073	0.048	0.012	0.013	0.021	0.021	0.021
1997	0.001	0.007	0.033	0.081	0.101	0.081	0.137	0.097	0.064	0.019	0.019
1998	0.001	0.003	0.018	0.060	0.122	0.155	0.214	0.254	0.164	0.165	0.165
1999	0.001	0.011	0.019	0.047	0.107	0.239	0.331	0.343	0.474	0.133	0.133
2000	0.001	0.014	0.057	0.083	0.159	0.230	0.355	0.396	0.431	0.301	0.301
2001	0.010	0.032	0.093	0.151	0.201	0.264	0.340	0.436	0.388	0.344	0.344
2002	0.020	0.034	0.075	0.168	0.225	0.206	0.281	0.240	0.229	0.170	0.170
2003	0.035	0.081	0.163	0.311	0.355	0.298	0.298	0.398	0.219	0.276	0.276
2004	0.012	0.071	0.136	0.210	0.332	0.308	0.303	0.289	0.246	0.184	0.184
2005	0.002	0.013	0.048	0.132	0.261	0.297	0.265	0.223	0.198	0.210	0.210
2006	0.005	0.011	0.035	0.034	0.101	0.182	0.258	0.193	0.208	0.174	0.174
2007	0.002	0.005	0.023	0.044	0.058	0.107	0.216	0.339	0.293	0.402	0.402
2008	0.001	0.007	0.027	0.055	0.067	0.052	0.089	0.232	0.249	0.187	0.187
2009	0.007	0.015	0.033	0.082	0.079	0.077	0.062	0.114	0.153	0.315	0.315

Table 26. Spawning stock biomass from VPA output.

	5	6	7	8	9	10	11	12	13	14	15
1960	114	190	532	1528	4864	7455	18016	21629	17877	16539	36787
1961	183	230	558	1707	4321	13049	17502	23471	20374	15781	38809
1962	103	396	611	1923	5158	10610	23763	24732	23535	17199	39328
1963	27	286	1191	1991	6105	12732	20081	29864	22759	21145	41669
1964	51	125	971	4777	6068	15880	22698	27483	27258	18906	45816
1965	274	228	550	3442	14844	15363	28181	27097	26474	25062	50291
1966	569	929	945	2286	9515	30903	30497	37174	24957	23912	55593
1967	184	1632	3058	3445	8164	20721	42310	41263	35185	21347	58774
1968	87	521	4221	8537	11165	20415	27685	37325	31202	25983	46357
1969	110	283	1377	9330	18961	23351	28888	27827	24371	23068	45793
1970	19	317	808	3207	16744	28173	27925	23887	19080	15249	40849
1971	18	67	859	2100	6786	22793	30045	23193	17114	12062	29198
1972	12	73	254	2234	4894	11342	21987	23514	14194	11706	23411
1973	18	53	257	847	5050	8983	14578	17356	15626	7501	18545
1974	87	79	257	890	2448	8205	12583	14049	13145	9245	10779
1975	119	307	371	1164	3151	6724	11469	12888	12054	8438	12074
1976	120	397	1122	1665	4765	8492	11502	11597	8986	7104	8962
1977	43	394	1360	3855	6423	13259	14210	11577	8119	5492	7777
1978	8	170	1270	4216	10607	17528	20426	15790	9267	5531	7718
1979	25	64	708	3880	11304	20790	23382	18204	11349	5717	5560
1980	30	183	423	2685	9205	20879	24815	21005	14724	9643	8659
1981	59	250	1140	2137	7416	15355	21864	19316	13867	9358	11440
1982	14	373	1467	5345	8631	14329	17485	17710	12039	7337	6815
1983	63	158	2416	7048	19146	21630	17313	12866	9878	5782	5713
1984	17	417	1460	10697	22162	29598	25456	15815	9762	6752	6028
1985	168	211	2981	9970	24657	30712	25958	18696	10942	6475	7814
1986	95	688	2107	14762	29734	30025	24269	17429	12015	6978	7566
1987	127	863	3625	13787	26113	30462	24032	14720	7876	4455	4807
1988	53	501	4877	15369	27827	23654	19405	15415	8416	4289	4718
1989	20	236	1790	13285	24478	24489	18909	12814	9968	5035	4616
1990	50	151	852	4143	14362	15801	12982	9672	6088	5580	3907
1991	90	265	901	3115	7446	10037	8519	6070	4578	2754	4332
1992	15	265	932	2588	4277	4498	3850	3021	2192	2202	3203
1993	24	70	653	2187	3707	2895	2052	1424	1177	716	1457
1994	130	153	305	844	1827	1828	714	344	225	279	175
1995	679	568	745	896	802	1341	1487	302	138	51	196
1996	38	1073	1700	2076	1729	974	1197	1157	232	131	190
1997	17	160	1695	2712	2351	1533	731	799	708	158	215
1998	52	82	701	2935	3476	2180	1277	558	633	615	266
1999	51	249	489	2026	3575	3018	1642	903	386	474	612
2000	13	271	977	2226	3830	4180	2561	1288	700	252	866
2001	105	118	1143	2464	3800	4176	3844	1921	922	452	736
2002	170	396	702	2640	3229	3613	3388	2877	1232	618	745
2003	640	588	1136	1913	3389	3072	3222	2759	2389	1001	1128
2004	110	1690	1481	1814	2168	2868	2565	2526	1940	2017	1610
2005	276	442	3741	2433	1925	1723	2145	1894	1937	1508	2802
2006	34	728	1427	6098	2745	1558	1315	1577	1486	1617	3069
2007	73	192	1848	3289	7158	2588	1289	1056	1297	1132	3192
2008	316	312	830	3698	5347	7565	2431	1154	730	966	2397
2009	119	955	1147	2003	4496	5687	6841	2105	912	514	2475
2010	190	455	3241	3575	3326	5247	5775	7010	2059	691	1808

Table 27. Retrospective comparison of SSB at age estimated from ADAPT. Table entries provide the ratio of the estimated numbers from the current assessment to those estimated with from last year's assessment (model formulation unchanged). Shaded entries highlight changes in excess of +/- 10%.

Retro matrix

2010/2009 final run	5	6	7	8	9	10	11	12	13	14	15
1960	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1961	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1962	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1963	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1964	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1965	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1966	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1967	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1968	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1969	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1970	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1971	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1972	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1973	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1974	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1975	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1976	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1977	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1978	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1979	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1980	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1981	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1982	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1983	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1984	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1985	1.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1986	1.000	1.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1987	1.001	1.000	1.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1988	1.001	1.001	1.000	1.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1989	1.004	1.001	1.001	1.000	1.001	1.000	1.000	1.000	1.000	1.000	1.000
1990	1.004	1.005	1.001	1.001	1.000	1.001	1.000	1.000	1.000	1.001	1.001
1991	1.003	1.004	1.005	1.002	1.001	1.000	1.002	1.001	1.001	1.001	1.001
1992	1.008	1.004	1.005	1.007	1.002	1.002	1.001	1.004	1.001	1.001	1.001
1993	1.013	1.008	1.004	1.006	1.008	1.003	1.003	1.002	1.006	1.003	1.003
1994	1.016	1.013	1.009	1.006	1.012	1.018	1.011	1.012	1.007	1.017	1.017
1995	1.031	1.018	1.016	1.015	1.013	1.024	1.025	1.026	1.026	1.026	1.026
1996	1.032	1.031	1.018	1.017	1.016	1.015	1.025	1.025	1.026	1.026	1.026
1997	1.045	1.032	1.032	1.019	1.018	1.017	1.015	1.025	1.026	1.027	1.027
1998	1.045	1.045	1.032	1.033	1.021	1.020	1.019	1.018	1.028	1.027	1.027
1999	1.034	1.045	1.045	1.033	1.036	1.024	1.023	1.023	1.023	1.033	1.033
2000	0.951	1.034	1.046	1.046	1.035	1.040	1.030	1.032	1.033	1.037	1.037
2001	1.264	0.948	1.033	1.049	1.050	1.041	1.051	1.044	1.049	1.051	1.051
2002	1.061	1.085	0.949	1.038	1.057	1.063	1.054	1.072	1.069	1.073	1.073
2003	0.819	0.920	0.965	0.946	1.046	1.072	1.078	1.072	1.093	1.088	1.088
2004	1.375	0.783	0.827	0.918	0.927	1.066	1.099	1.107	1.111	1.119	1.119
2005	2.189	1.070	0.756	0.790	0.918	0.901	1.091	1.139	1.149	1.147	1.147
2006	0.338	1.129	0.849	0.747	0.789	0.915	0.872	1.123	1.180	1.187	1.188
2007	0.197	0.409	0.665	0.738	0.746	0.789	0.908	0.840	1.153	1.231	1.229
2008	0.552	0.275	0.518	0.583	0.772	0.783	0.790	0.914	0.835	1.290	1.423
2009	0.415	0.340	0.329	0.564	0.563	0.748	0.708	0.712	0.988	0.796	1.441

Table 28. Retrospective comparison of 2010 maturity ogive and 2009 maturity ogive. Table entries provide the ratio of the estimated numbers of proportion mature from 2010 to those estimated from the 2009 maturity ogive. Shaded entries highlight changes in excess of +/- 10%.

Year/Age	5	6	7	8	9	10	11	12	13	14
1960	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1961	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1962	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1963	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1964	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1965	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1966	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1967	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1968	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1969	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1970	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1971	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1972	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1973	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1974	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1975	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1976	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1977	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1978	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1979	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1980	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1981	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1982	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1983	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1984	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1985	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1986	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1987	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1988	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1989	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1990	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1991	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1992	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1993	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1994	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1995	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1996	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1997	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1998	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1999	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2001	1.32	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2002	1.23	1.13	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2003	1.04	1.07	1.01	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2004	1.66	1.00	0.97	0.96	1.00	1.00	1.00	1.00	1.00	1.00
2005	2.82	1.29	0.98	0.95	0.98	1.00	1.00	1.00	1.00	1.00
2006	0.41	1.46	1.03	0.98	0.97	0.99	1.00	1.00	1.00	1.00
2007	0.33	0.50	0.86	0.90	0.99	0.99	1.00	1.00	1.00	1.00
2008	0.79	0.46	0.62	0.73	0.91	0.99	0.99	1.00	1.00	1.00
2009	0.79	0.73	0.63	0.79	0.80	0.95	1.00	1.00	1.00	1.00

Table 29. Retrospective comparison (one year) of SSB at age estimated from ADAPT. Table entries provide the ratio of the estimated numbers from the current assessment to those estimated with one year removed (model formulation unchanged). Shaded entries highlight changes in excess of +/- 10%.

Retro matrix

2010/2009	5	6	7	8	9	10	11	12	13	14	15
1960	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1961	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1962	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1963	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1964	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1965	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1966	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1967	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1968	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1969	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1970	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1971	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1972	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1973	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1974	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1975	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1976	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1977	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1978	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1979	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1980	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1981	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1982	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1983	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1984	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1985	1.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1986	1.000	1.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1987	1.001	1.000	1.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1988	1.001	1.001	1.000	1.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1989	1.004	1.001	1.001	1.000	1.001	1.000	1.000	1.000	1.000	1.000	1.000
1990	1.003	1.004	1.001	1.001	1.000	1.001	1.000	1.000	1.000	1.001	1.001
1991	1.003	1.004	1.005	1.001	1.001	1.000	1.002	1.001	1.001	1.001	1.001
1992	1.007	1.003	1.005	1.006	1.002	1.002	1.001	1.003	1.001	1.001	1.001
1993	1.012	1.007	1.003	1.005	1.007	1.003	1.003	1.001	1.005	1.002	1.002
1994	1.014	1.012	1.008	1.005	1.011	1.016	1.010	1.011	1.006	1.015	1.015
1995	1.028	1.016	1.014	1.013	1.012	1.021	1.022	1.023	1.023	1.023	1.023
1996	1.028	1.028	1.016	1.015	1.014	1.013	1.022	1.023	1.023	1.023	1.023
1997	1.040	1.029	1.029	1.017	1.016	1.015	1.014	1.022	1.023	1.024	1.024
1998	1.040	1.040	1.029	1.030	1.019	1.018	1.017	1.016	1.025	1.024	1.024
1999	1.039	1.040	1.040	1.029	1.032	1.021	1.021	1.021	1.021	1.029	1.029
2000	0.958	1.040	1.041	1.041	1.031	1.035	1.027	1.029	1.029	1.033	1.033
2001	0.973	0.958	1.040	1.043	1.045	1.036	1.045	1.039	1.043	1.045	1.045
2002	0.908	0.973	0.957	1.044	1.050	1.055	1.048	1.064	1.061	1.065	1.065
2003	0.850	0.906	0.972	0.954	1.053	1.064	1.069	1.064	1.083	1.078	1.078
2004	0.860	0.845	0.899	0.967	0.938	1.077	1.088	1.095	1.098	1.105	1.105
2005	0.803	0.858	0.836	0.886	0.959	0.916	1.107	1.122	1.131	1.129	1.129
2006	0.830	0.803	0.857	0.829	0.872	0.948	0.890	1.144	1.158	1.164	1.164
2007	0.682	0.829	0.801	0.852	0.824	0.860	0.938	0.862	1.180	1.201	1.201
2008	0.585	0.681	0.828	0.798	0.847	0.816	0.847	0.924	0.817	1.257	1.333
2009	0.618	0.585	0.680	0.824	0.788	0.838	0.808	0.835	0.907	0.776	1.381

Table 29. Retrospective comparison (one year) of fishing mortality (F at age) estimated from ADAPT. Table entries provide the ratio of the estimated fishing mortality from the current assessment to those estimated with one year's less data (model formulation unchanged). Shaded entries highlight changes in excess of +/- 10%.

Retro matrix

2010/2009	5	6	7	8	9	10	11	12	13	14	15
1960	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1961	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1962	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1963	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1964	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1965	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1966	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1967	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1968	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1969	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1970	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1971	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1972	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1973	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1974	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1975	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1976	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1977	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1978	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1979	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1980	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1981	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1982	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1983	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1984	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1985	0.999	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1986	1.000	0.999	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1987	0.999	1.000	0.999	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1988	0.999	0.999	1.000	0.999	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1989	0.996	0.999	0.999	1.000	0.999	1.000	1.000	1.000	1.000	1.000	1.000
1990	0.996	0.995	0.999	0.999	1.000	0.999	1.000	0.999	0.999	0.999	0.999
1991	0.997	0.996	0.995	0.998	0.999	0.999	0.998	0.999	0.999	0.999	0.999
1992	0.993	0.997	0.995	0.994	0.998	0.998	0.999	0.996	0.998	0.998	0.998
1993	0.988	0.992	0.996	0.993	0.990	0.995	0.994	0.997	0.991	0.994	0.994
1994	0.985	0.987	0.990	0.992	0.985	0.982	0.985	0.984	0.988	0.982	0.982
1995	0.973	0.984	0.986	0.987	0.988	0.979	0.978	0.977	0.977	0.977	0.977
1996	0.972	0.972	0.984	0.985	0.986	0.987	0.978	0.978	0.977	0.977	0.977
1997	0.961	0.972	0.972	0.982	0.984	0.984	0.985	0.977	0.977	0.976	0.976
1998	0.961	0.961	0.972	0.970	0.981	0.981	0.982	0.982	0.974	0.974	0.974
1999	0.962	0.961	0.961	0.971	0.968	0.977	0.976	0.976	0.975	0.970	0.970
2000	1.044	0.962	0.960	0.959	0.968	0.962	0.969	0.966	0.965	0.963	0.963
2001	1.028	1.044	0.960	0.956	0.953	0.960	0.949	0.954	0.950	0.949	0.949
2002	1.102	1.029	1.047	0.954	0.946	0.942	0.948	0.932	0.936	0.934	0.934
2003	1.180	1.108	1.032	1.057	0.940	0.931	0.925	0.927	0.915	0.917	0.917
2004	1.164	1.189	1.120	1.038	1.078	0.917	0.906	0.900	0.899	0.896	0.896
2005	1.245	1.166	1.201	1.137	1.048	1.107	0.890	0.878	0.872	0.873	0.873
2006	1.206	1.247	1.170	1.209	1.154	1.060	1.141	0.862	0.849	0.847	0.847
2007	1.468	1.207	1.251	1.177	1.219	1.171	1.073	1.189	0.823	0.795	0.795
2008	1.710	1.470	1.210	1.261	1.187	1.232	1.189	1.092	1.254	0.776	0.776

Table 30. American plaice in Div. 3LNO: Results of stochastic projections under various fishing mortality options. Labels p5, p50 and p95 refer to 5th, 50th and 95th percentiles of each quantity.

	F=0		
	SSB ('000 t)		
	p5	p50	p95
2010	30	34	38
2011	37	42	48
2012	44	52	60
2013	50	60	70
2014	55	69	84
2015	61	81	112

	F_{2009} = 0.13					
	SSB ('000 t)			Yield ('000 t)		
	p5	p50	p95	p5	p50	p95
2010	30	34	38	3.3	3.7	4.2
2011	34	39	44	3.9	4.5	5.1
2012	37	44	51	4.3	4.9	5.6
2013	39	46	56	4.5	5.1	6.0
2014	40	47	61	4.8	5.5	6.8
2015	40	48	71	5.2	6.2	8.7

	$F_{0.1}$ = 0.2					
	SSB ('000 t)			Yield ('000 t)		
	p5	p50	p95	p5	p50	p95
2010	30	33	38	4.9	5.5	6.3
2011	33	37	43	5.6	6.3	7.2
2012	35	40	47	5.8	6.6	7.6
2013	35	41	49	5.7	6.5	7.5
2014	35	41	51	5.9	6.8	8.1
2015	34	41	53	6.4	7.5	9.3

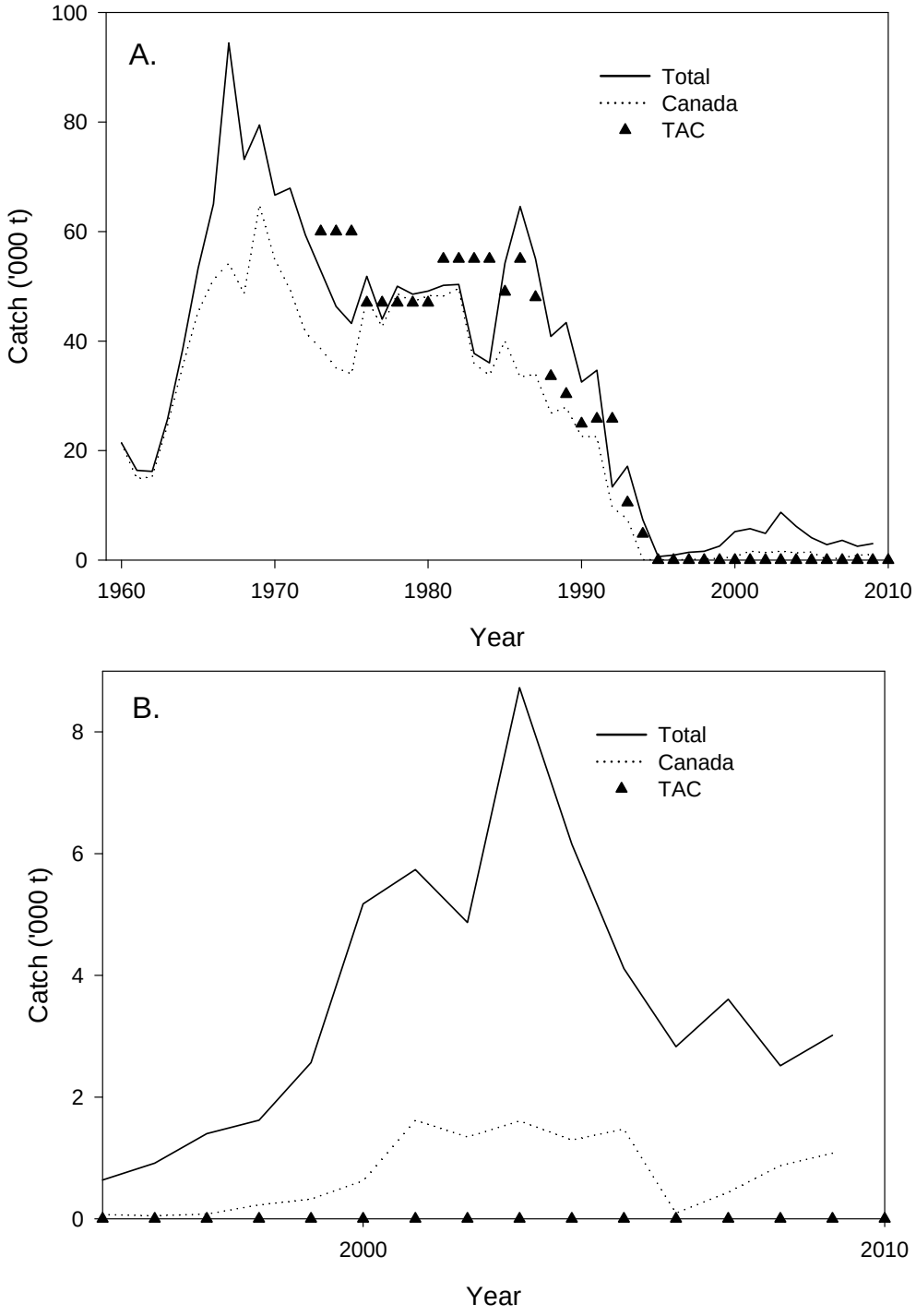


Figure 1. American plaice catches (‘000 tons) from 1960 – 2009 (A) and since the moratorium (1995-2009) (B)

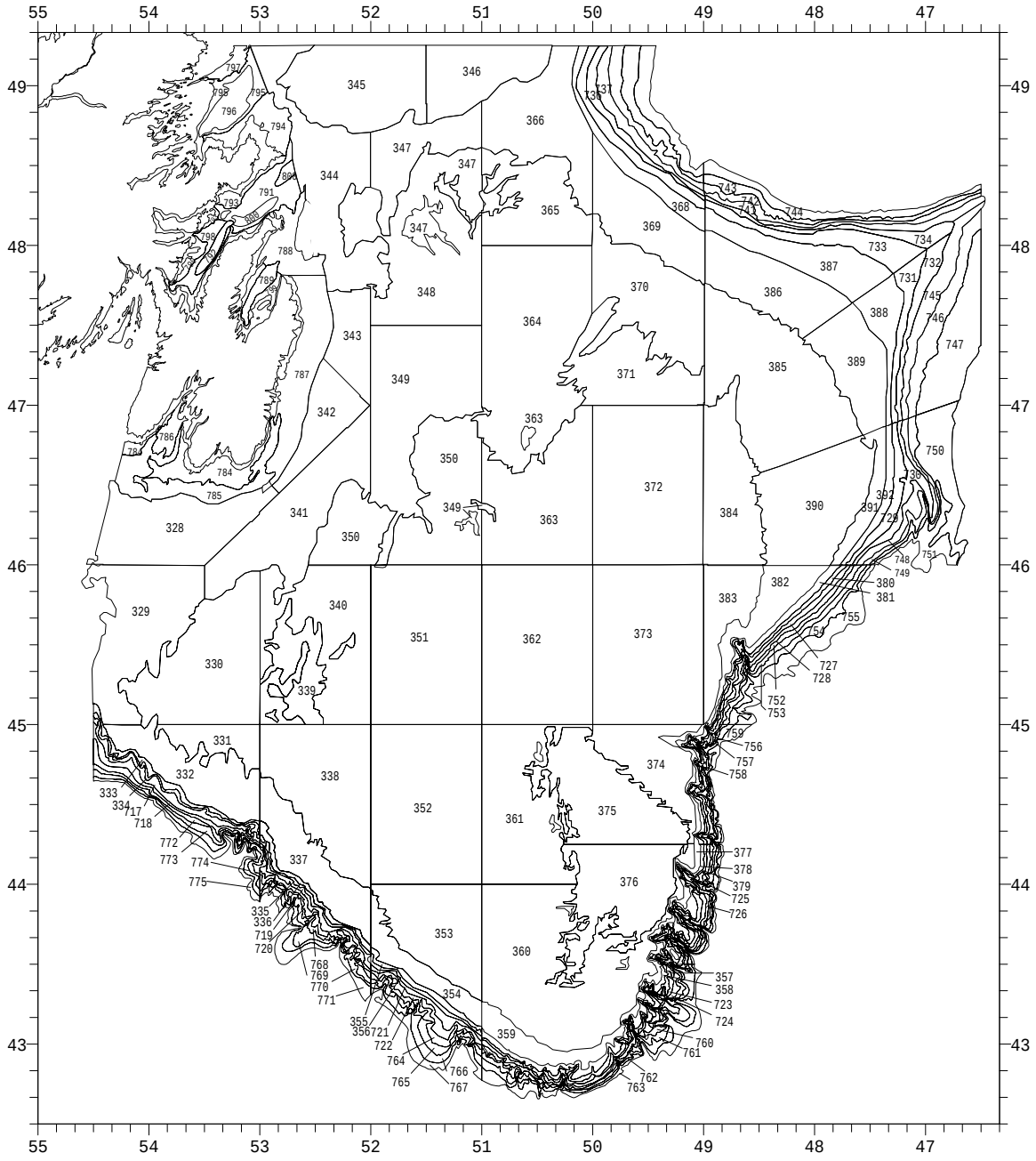


Figure 2. Stratification scheme used in Canadian research vessel surveys of Div. 3LNO.

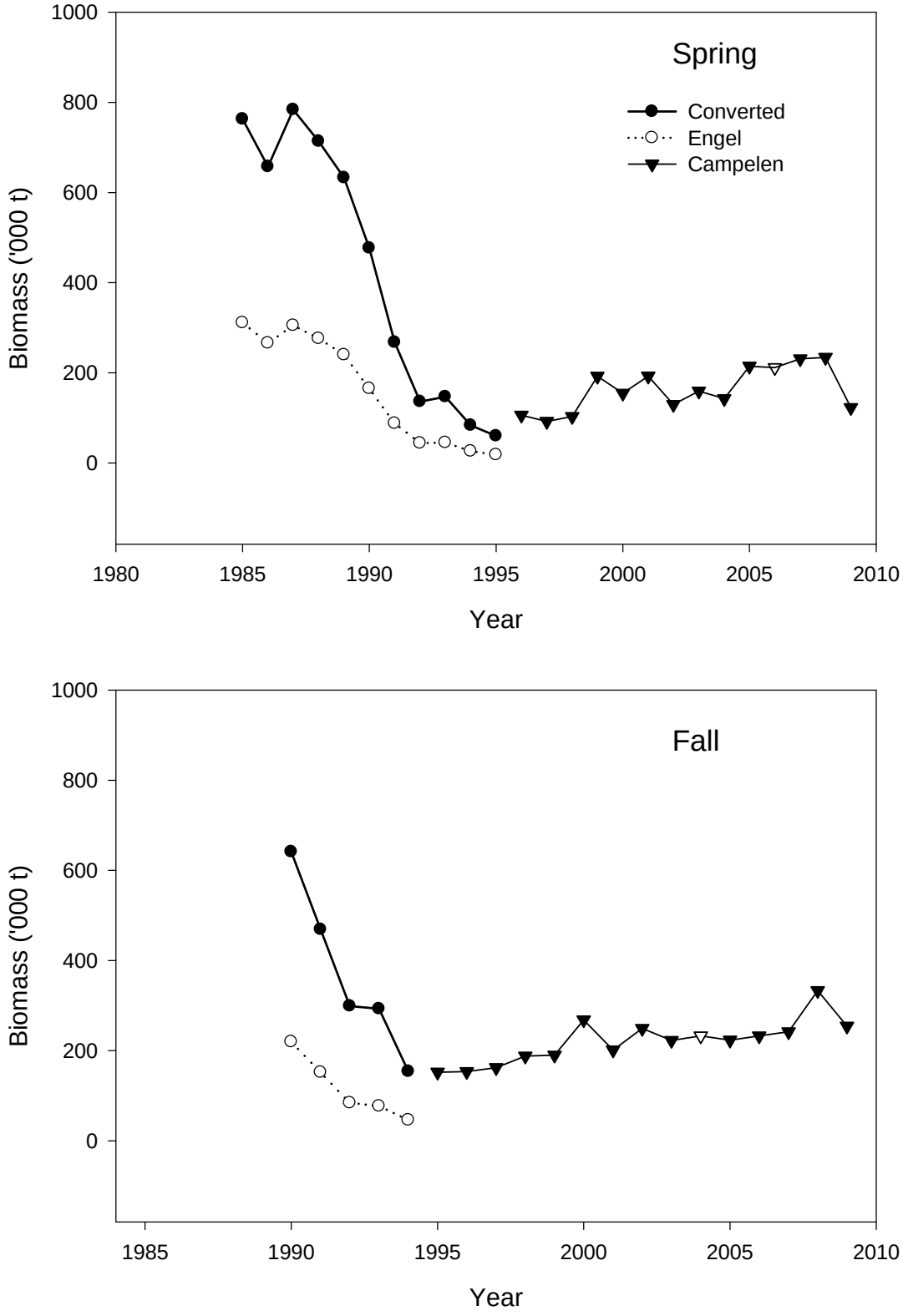


Figure 3. Biomass ('000 tons) of American plaice from spring and fall Canadian surveys in Div. 3LNO combined. Note that open symbol represents years when survey coverage was poor.

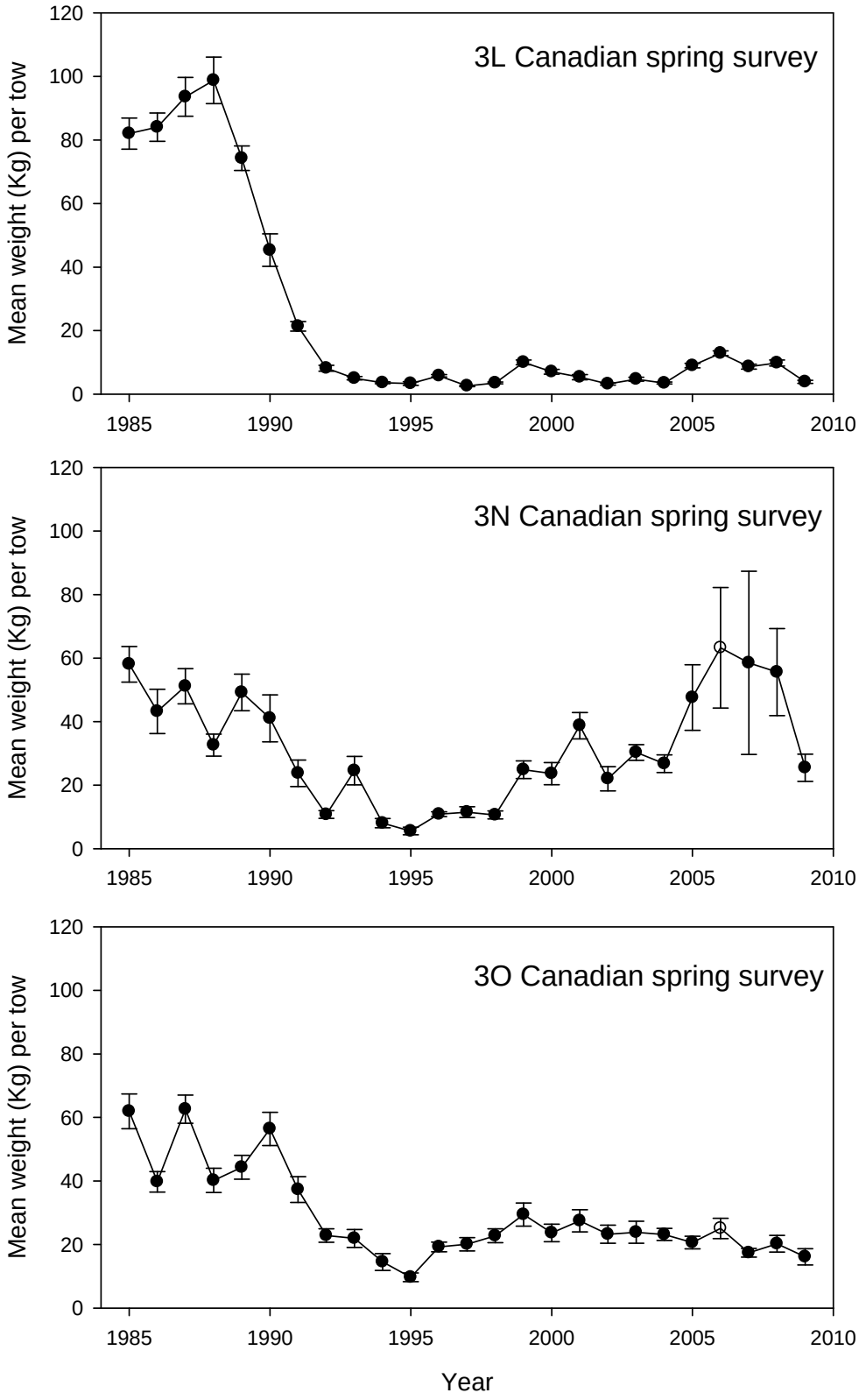
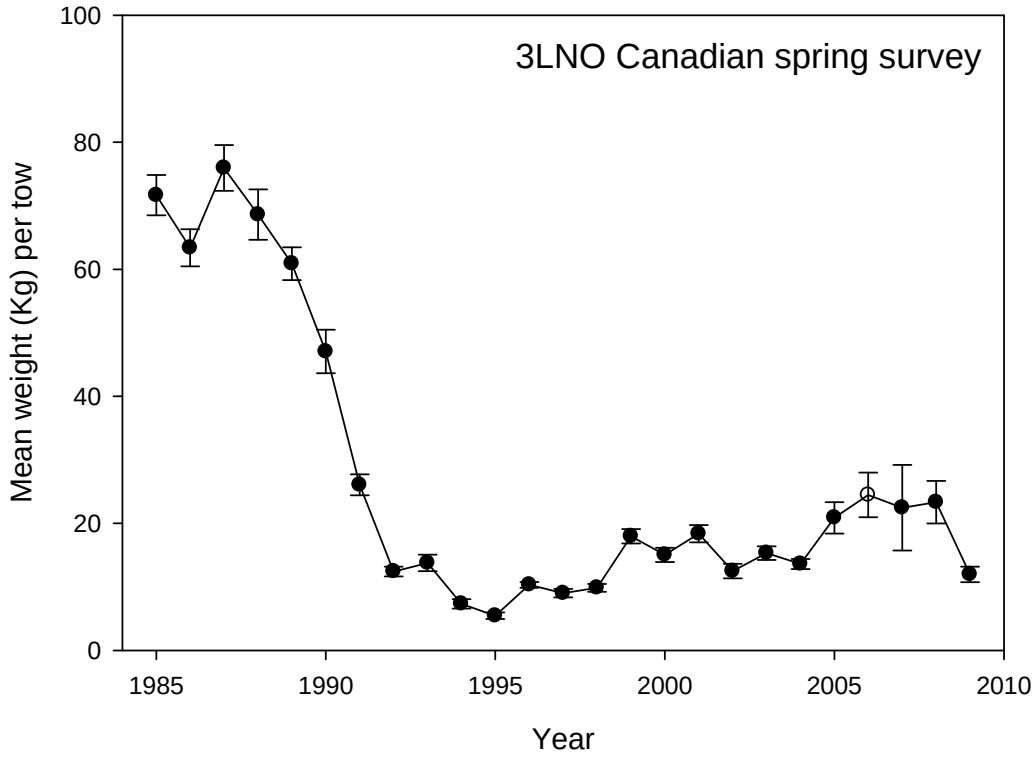


Figure 4. Mean (± 1 Std. dev.) weight per tow (Kg) of American plaice from Canadian spring surveys inDiv. 3L, 3N and 3O. Note that open symbol represents years when survey coverage was poor.



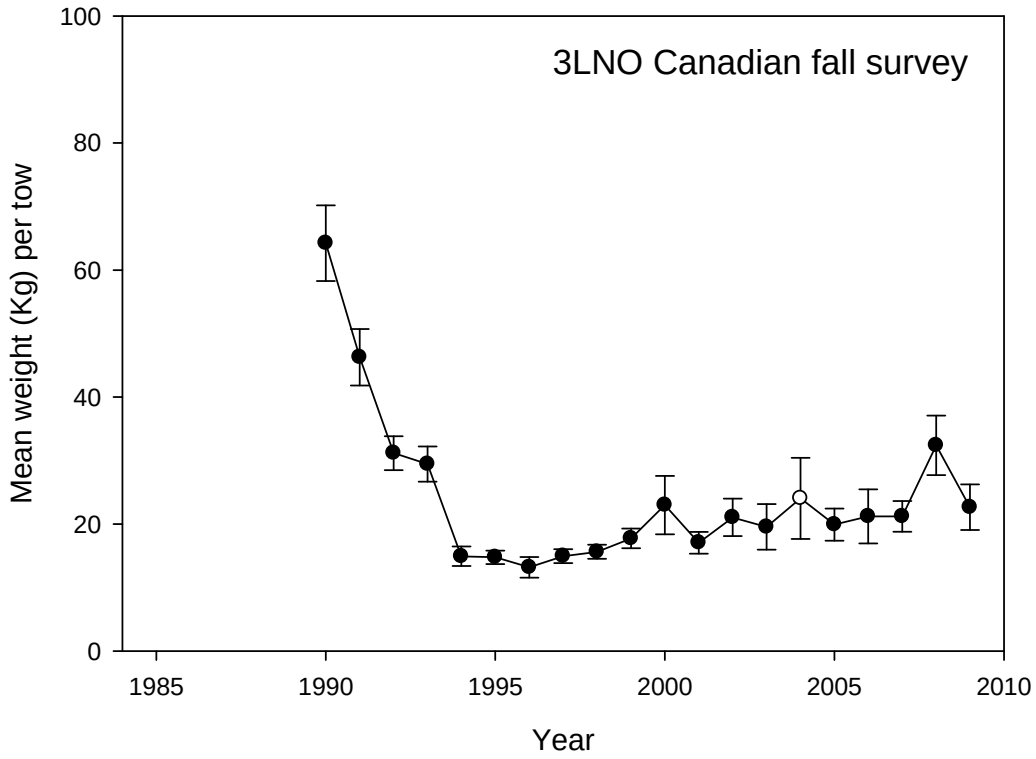
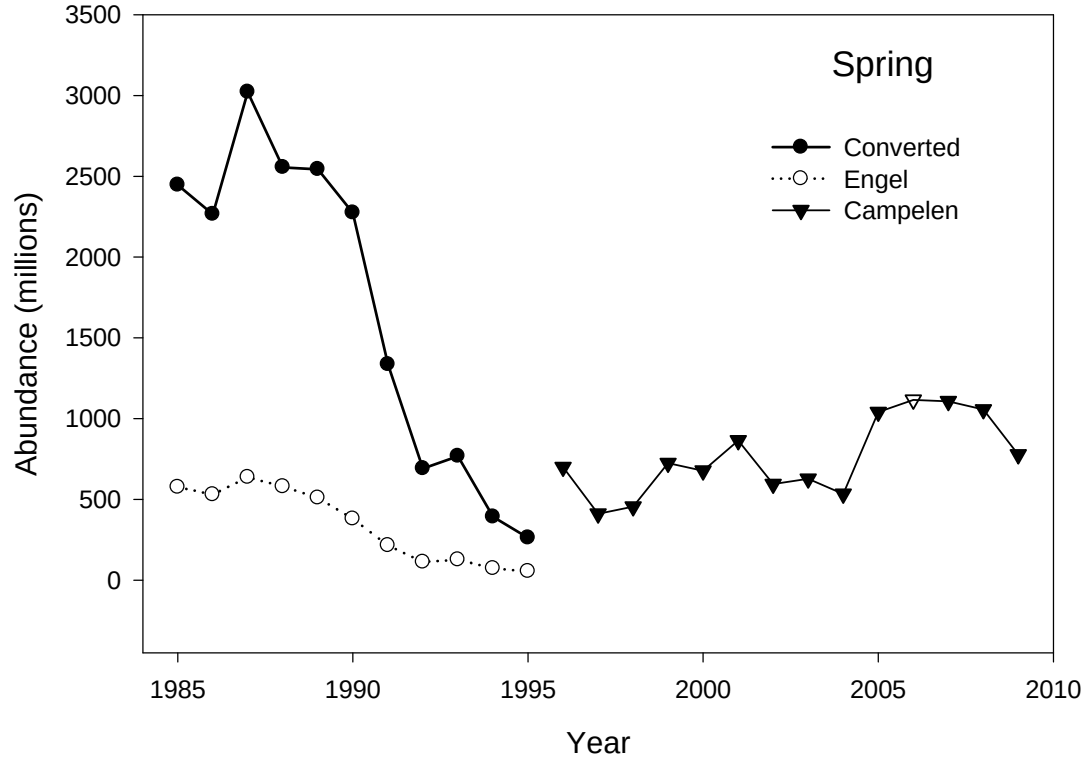


Figure 5. Mean weight per tow (± 1 Std. dev.) of American plaice from Canadian spring and fall surveys of Div. 3LNO combined. Note that open symbol represents years when survey coverage was poor.



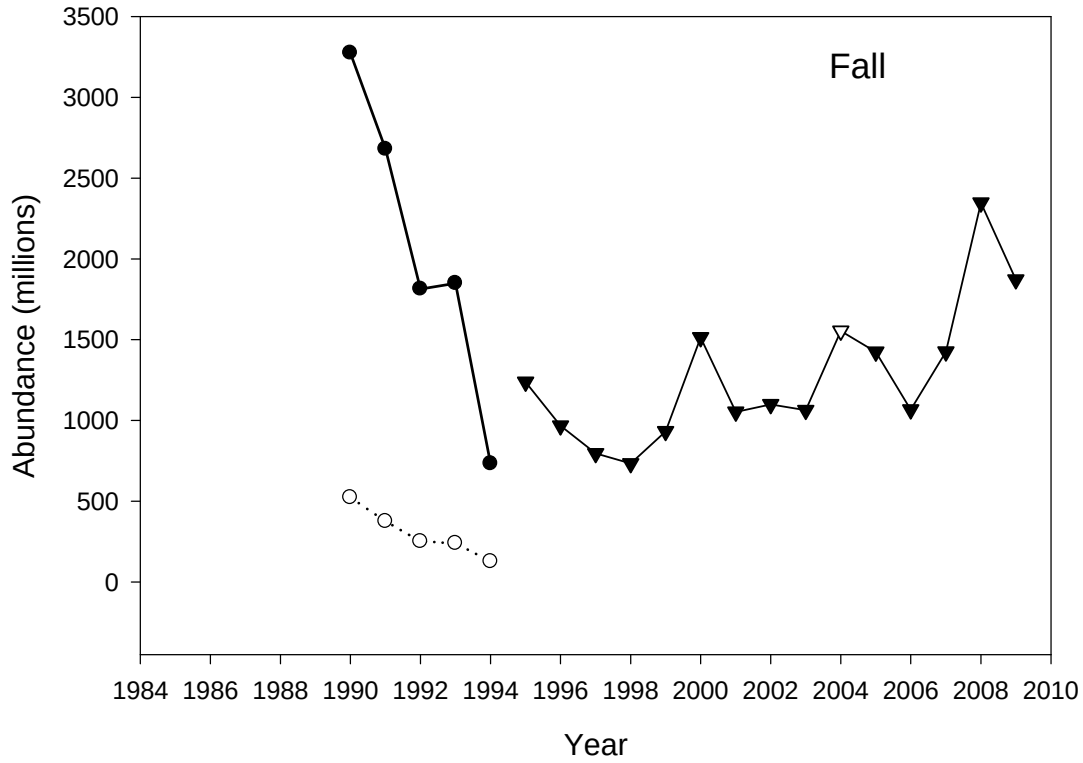
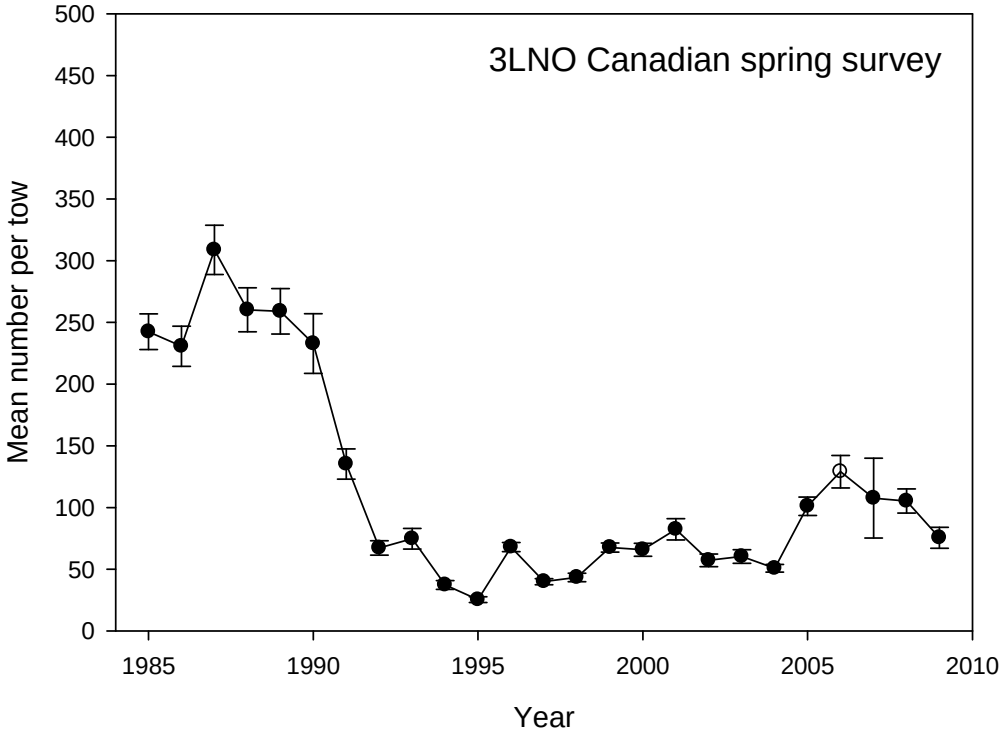


Figure 6. Abundance (millions) of American plaice from spring and fall Canadian surveys in Div. 3LNO combined. Note that open symbol represents years when survey coverage was poor.



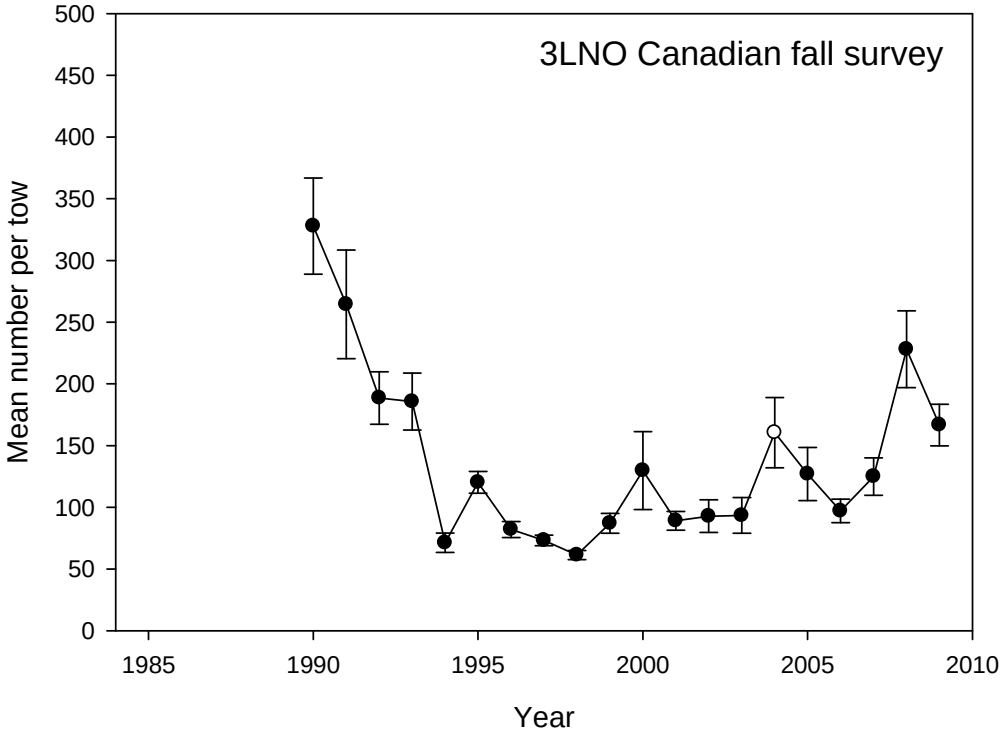


Figure 7. Mean (± 1 Std. Dev.) number per tow of American plaice from Canadian spring and fall surveys of Div. 3LNO combined. Note that open symbol represents years when survey coverage was poor.

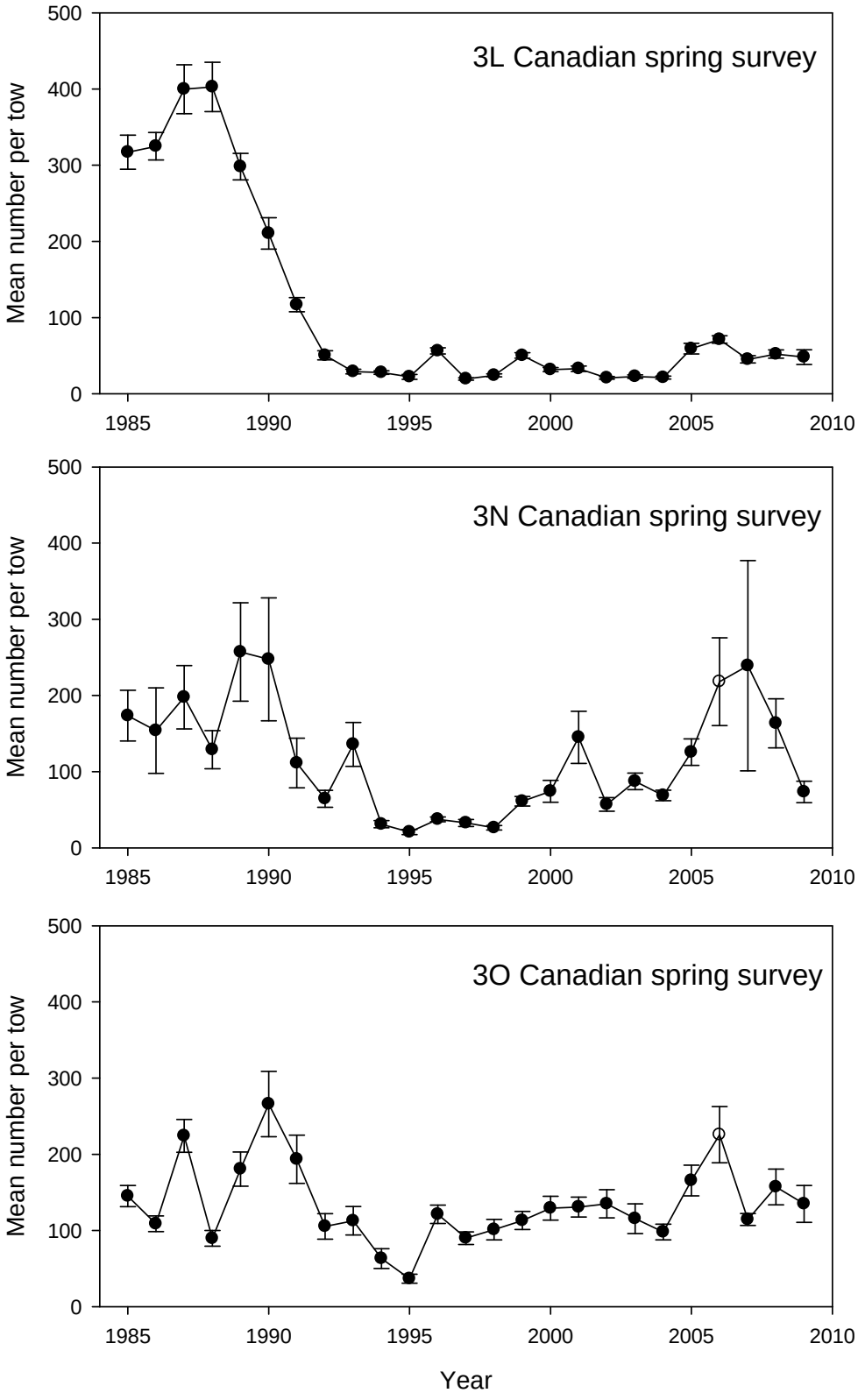


Figure 8. Mean (± 1 Std. Dev.) number per tow of American plaice from Canadian spring surveys of Div. 3L, 3N and 3O. Note that open symbol represents years when survey coverage was poor.

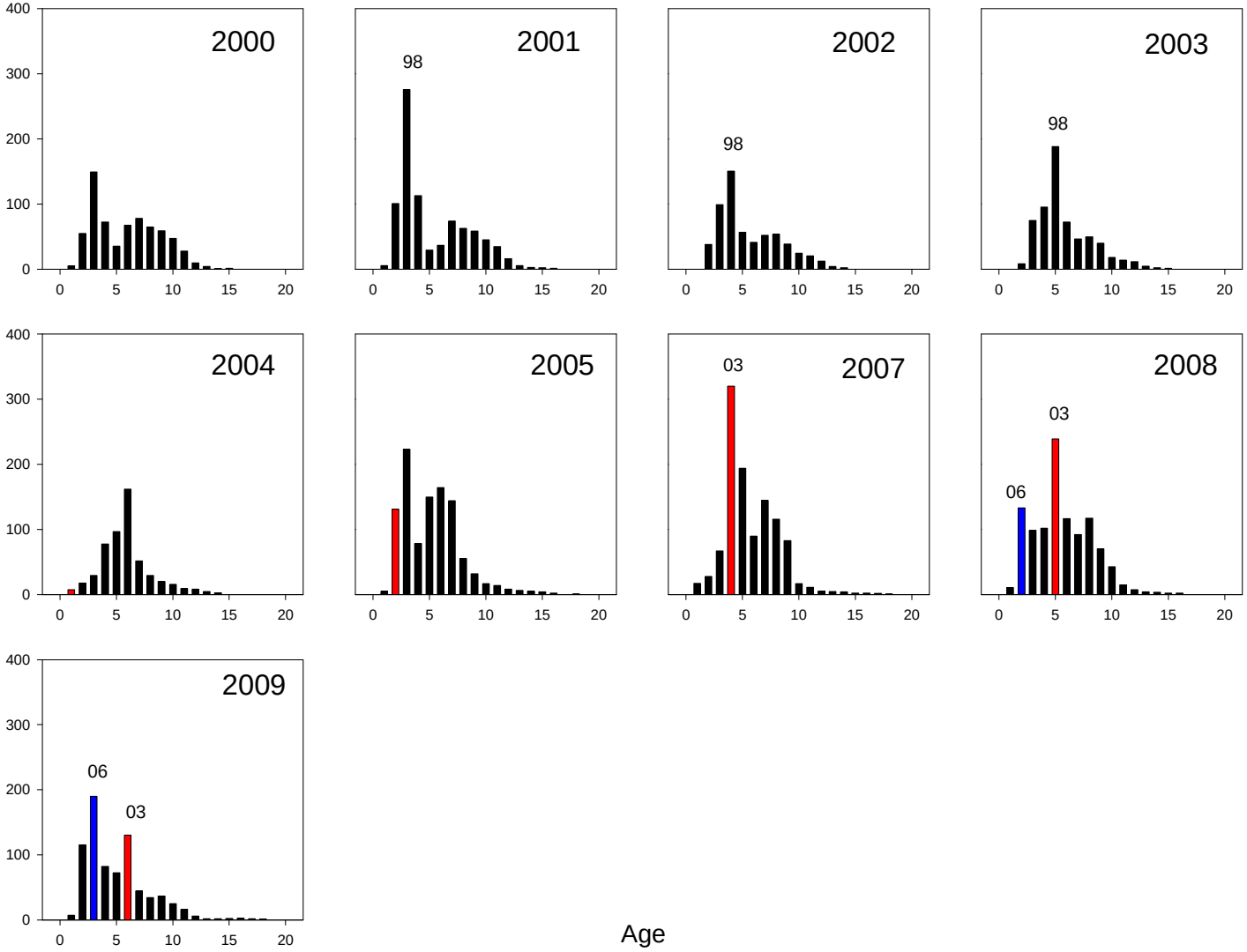


Figure 9. Abundance at age (millions of fish) from 2000 – 2009 in the Canadian spring surveys. Note the survey from 2006 is not present. The 1998, 2003 and 2006 year classes are labelled.

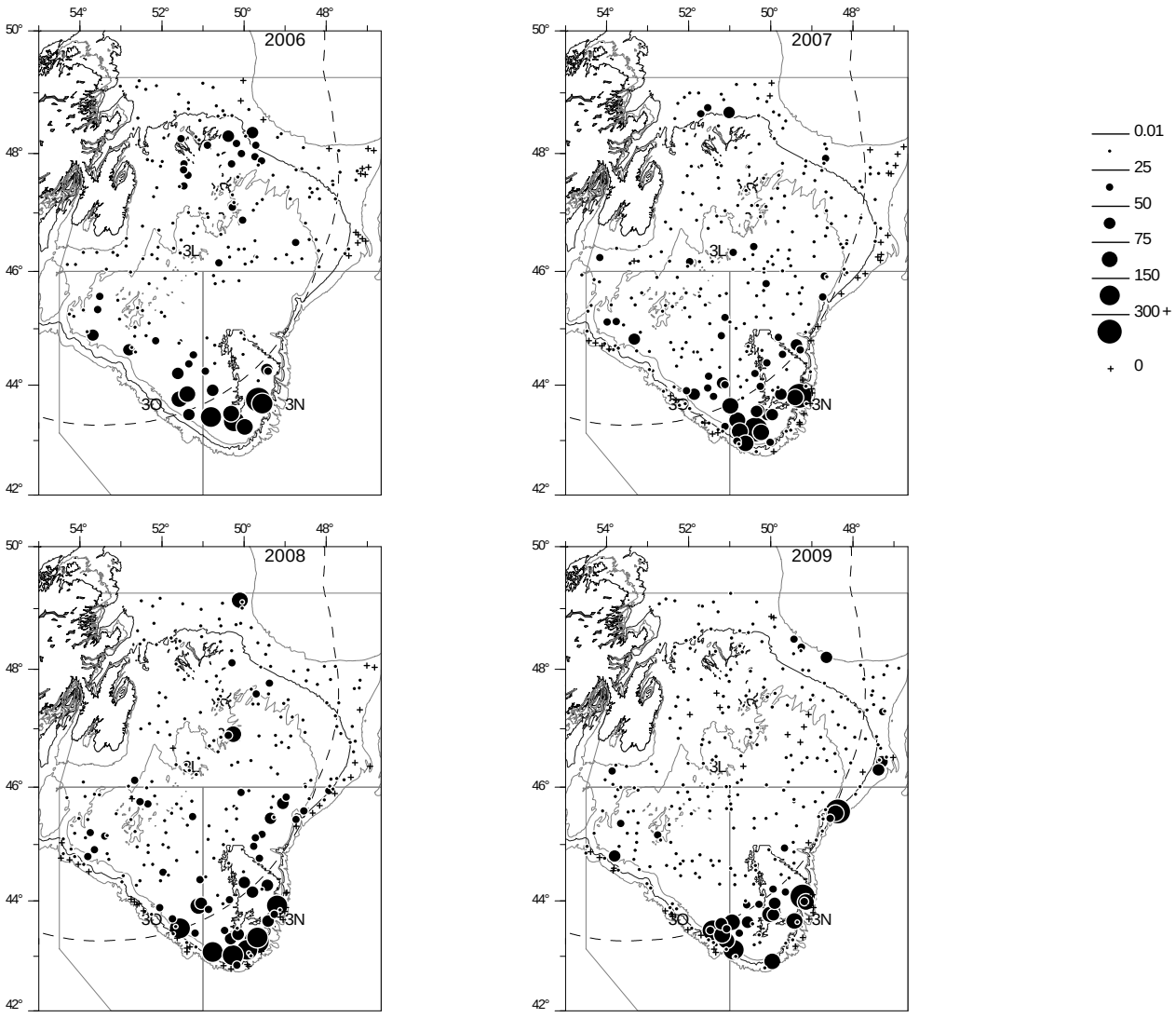


Figure 10. Distribution of American plaice (kg per tow) from Canadian spring surveys in NAFO Divisions 3LNO from 2006-2009. Note survey coverage in 2006 in Div. 3NO.

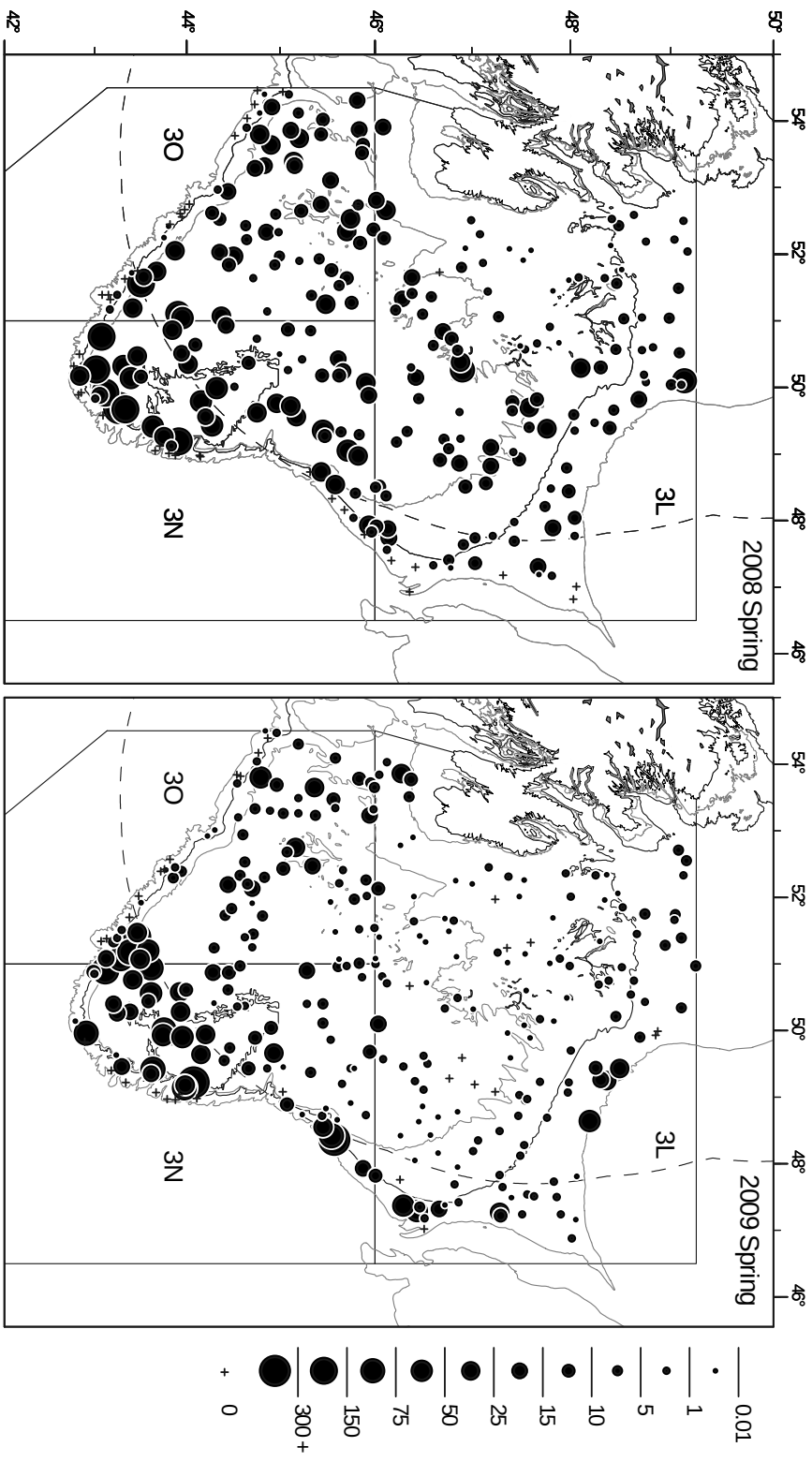


Figure 11. Distribution of American plaice (kg per tow) from Canadian spring surveys in NAFO Divisions 3LNO in 2008 and 2009.

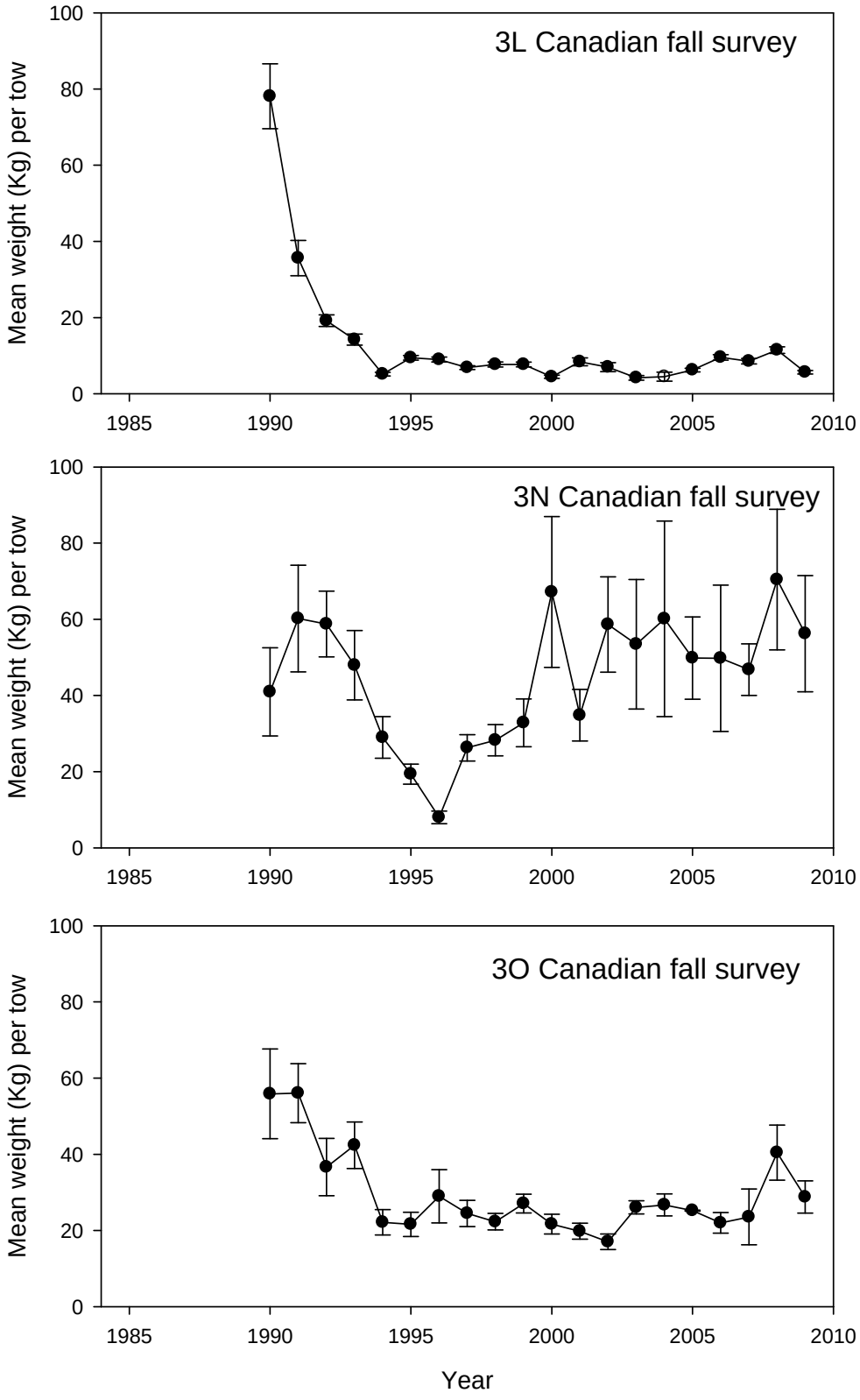


Figure 12. Mean (± 1 Std. Dev.) weight (Kg) per tow of American plaice from Canadian fall surveys in Div. 3L, 3N and 3O. Note that open symbol represents years when survey coverage was poor.

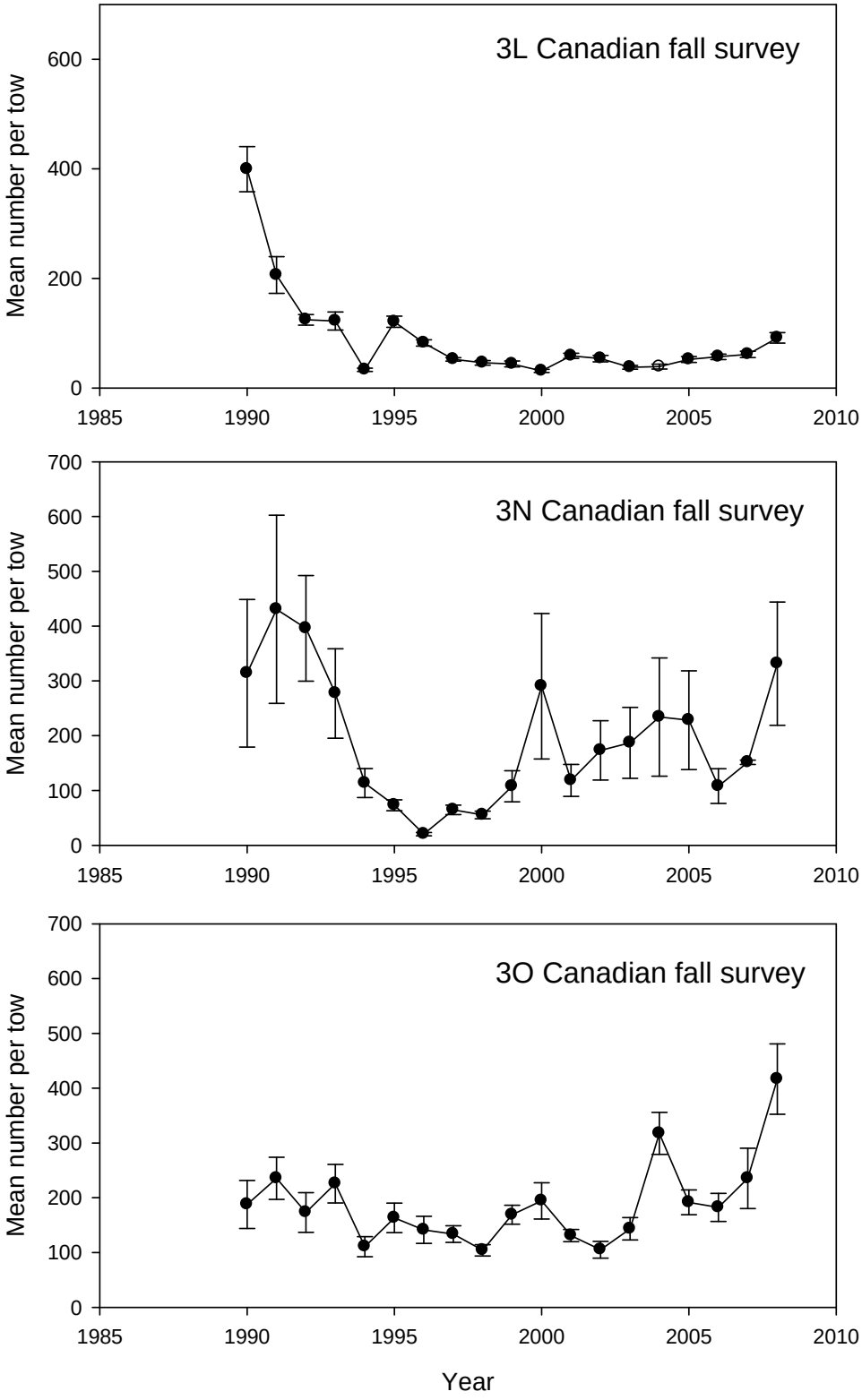


Figure 13. Mean (± 1 Std. Dev.) number per tow of American plaice from Canadian fall surveys of Div. 3L, 3N and 3O. Note that open symbol represents years when survey coverage was poor and are not included in 2009 assessment.

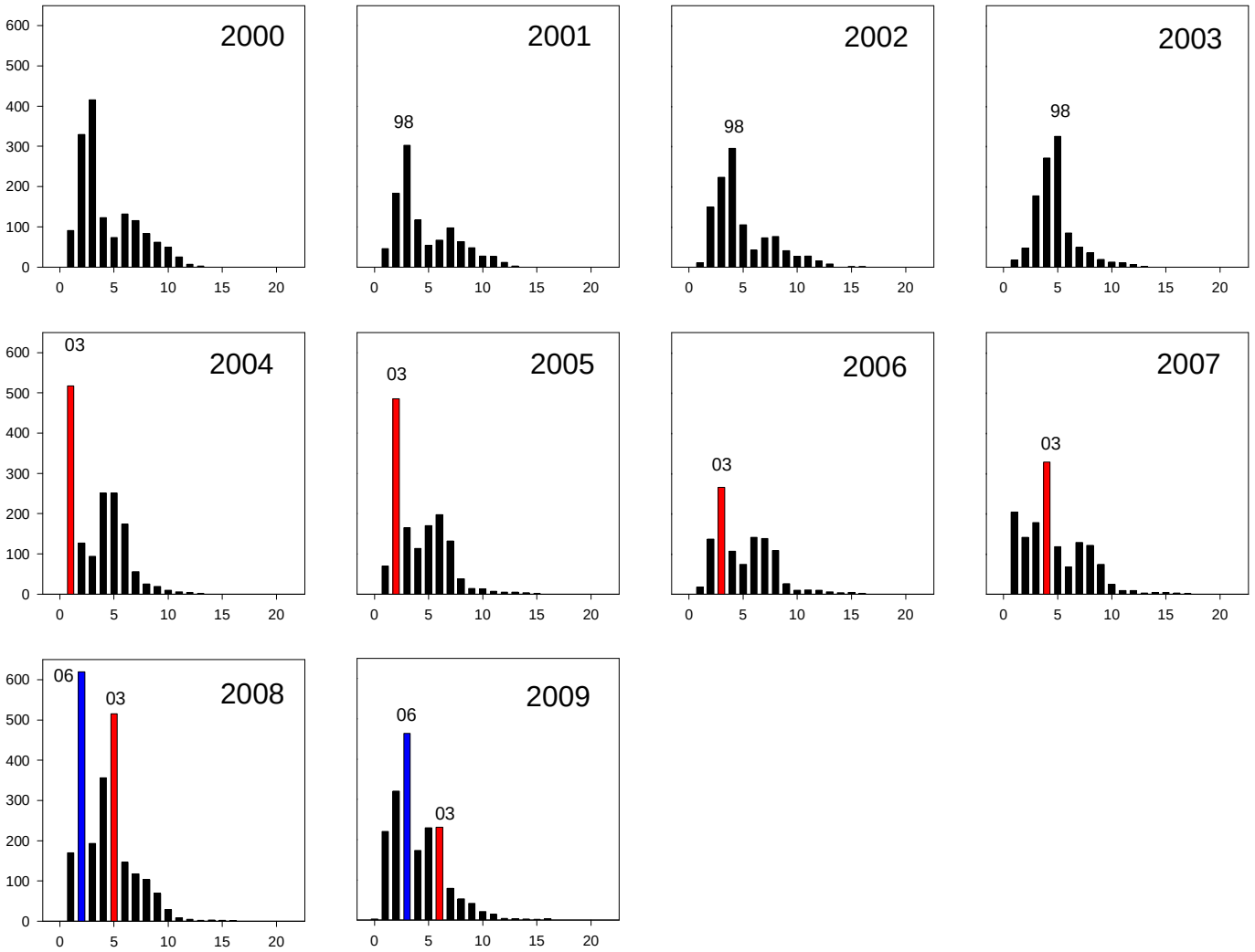


Figure 14. Abundance at age (millions of fish) from 2000 – 2009 in the Canadian fall surveys. The 1998, 2003 and 2006 year classes are labelled

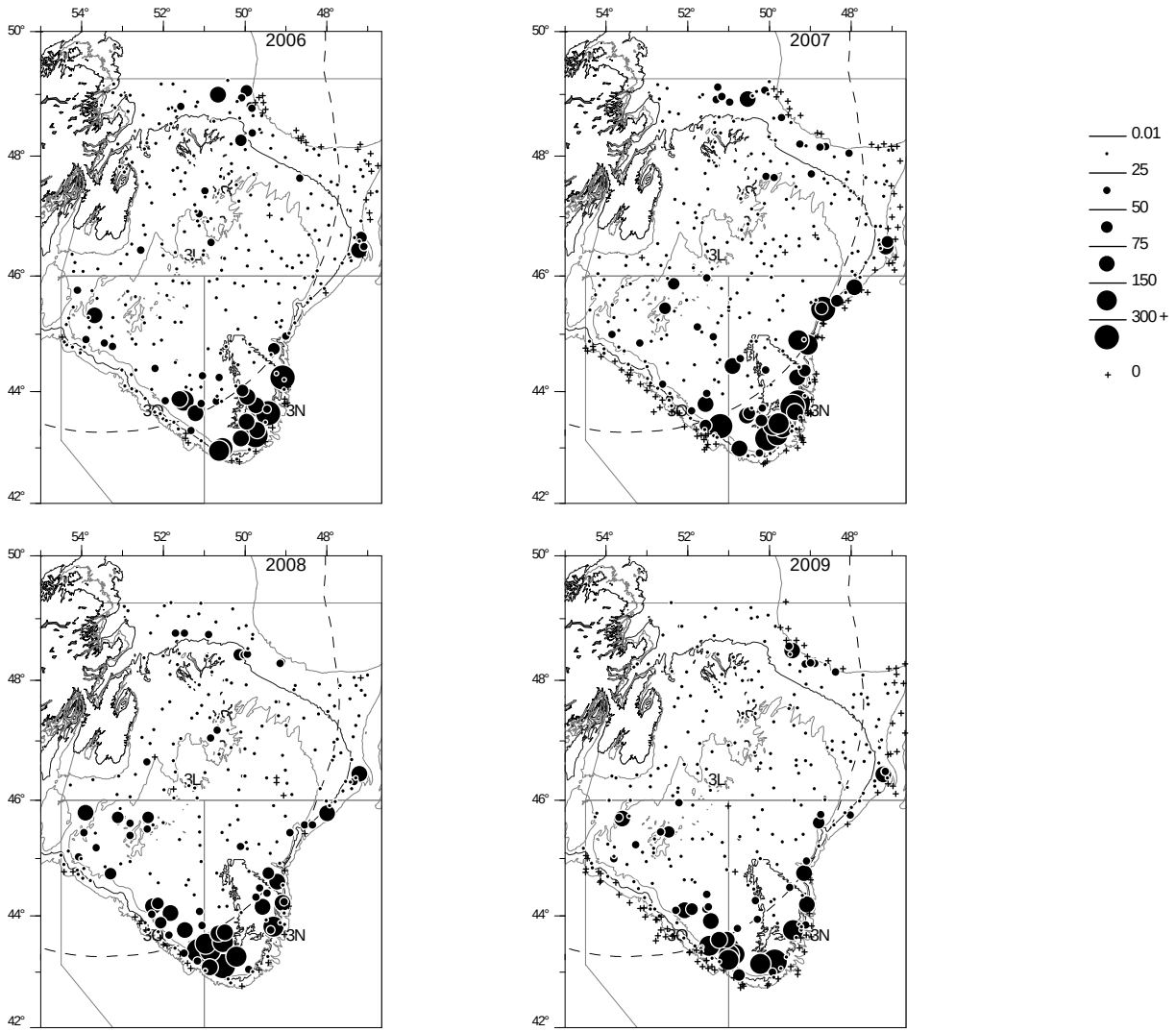


Figure 15. Distribution of American plaice (kg per tow) from Canadian spring surveys in NAFO Divisions 3LNO from 2006-2009.

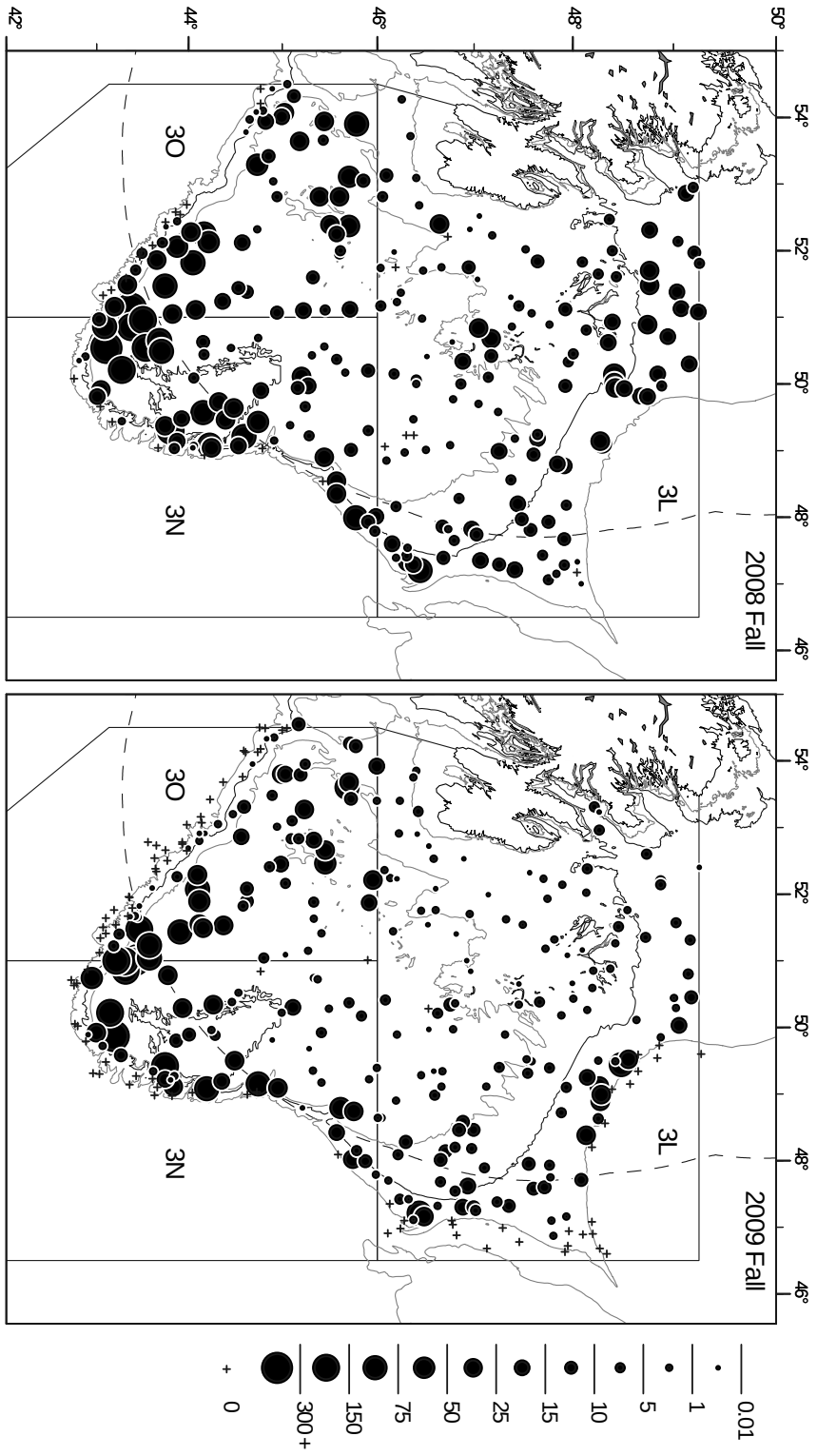


Figure 16. Distribution of American plaice (kg per tow) from Canadian fall surveys in NAFO Divisions 3LNO for 2008 and 2009.

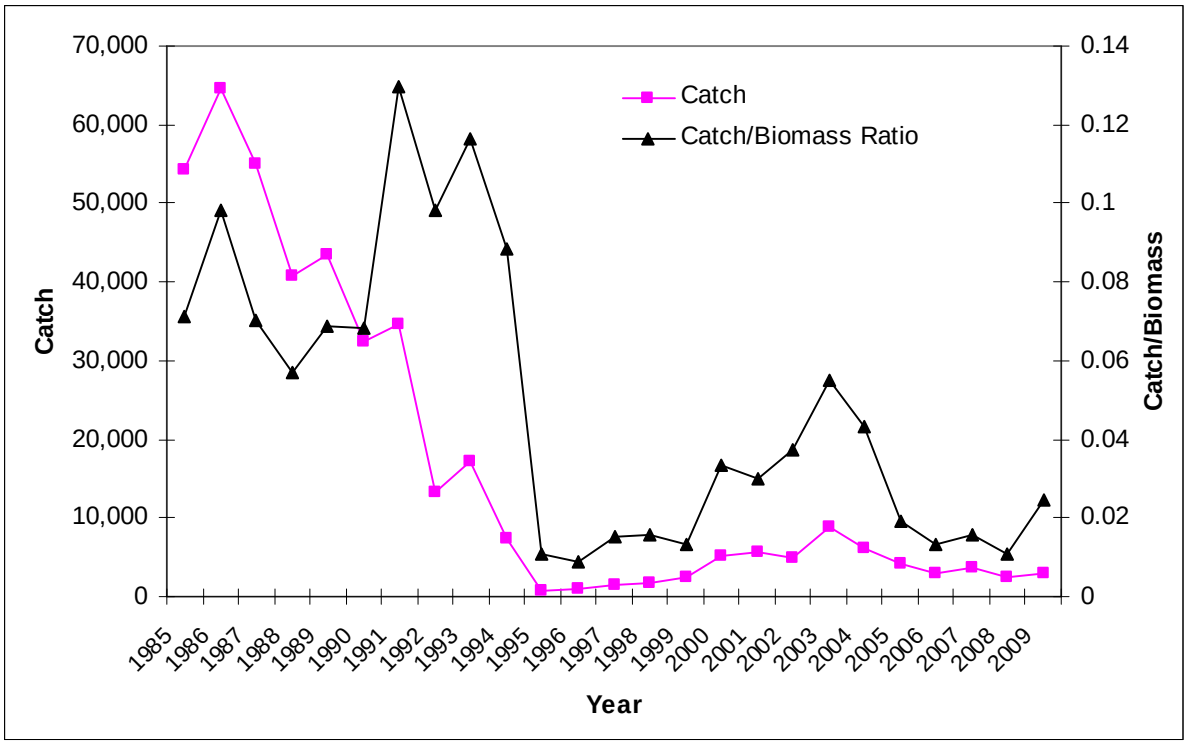


Figure 17. Total catch from 1985 to 2009 and the catch/biomass ratio for the same period.

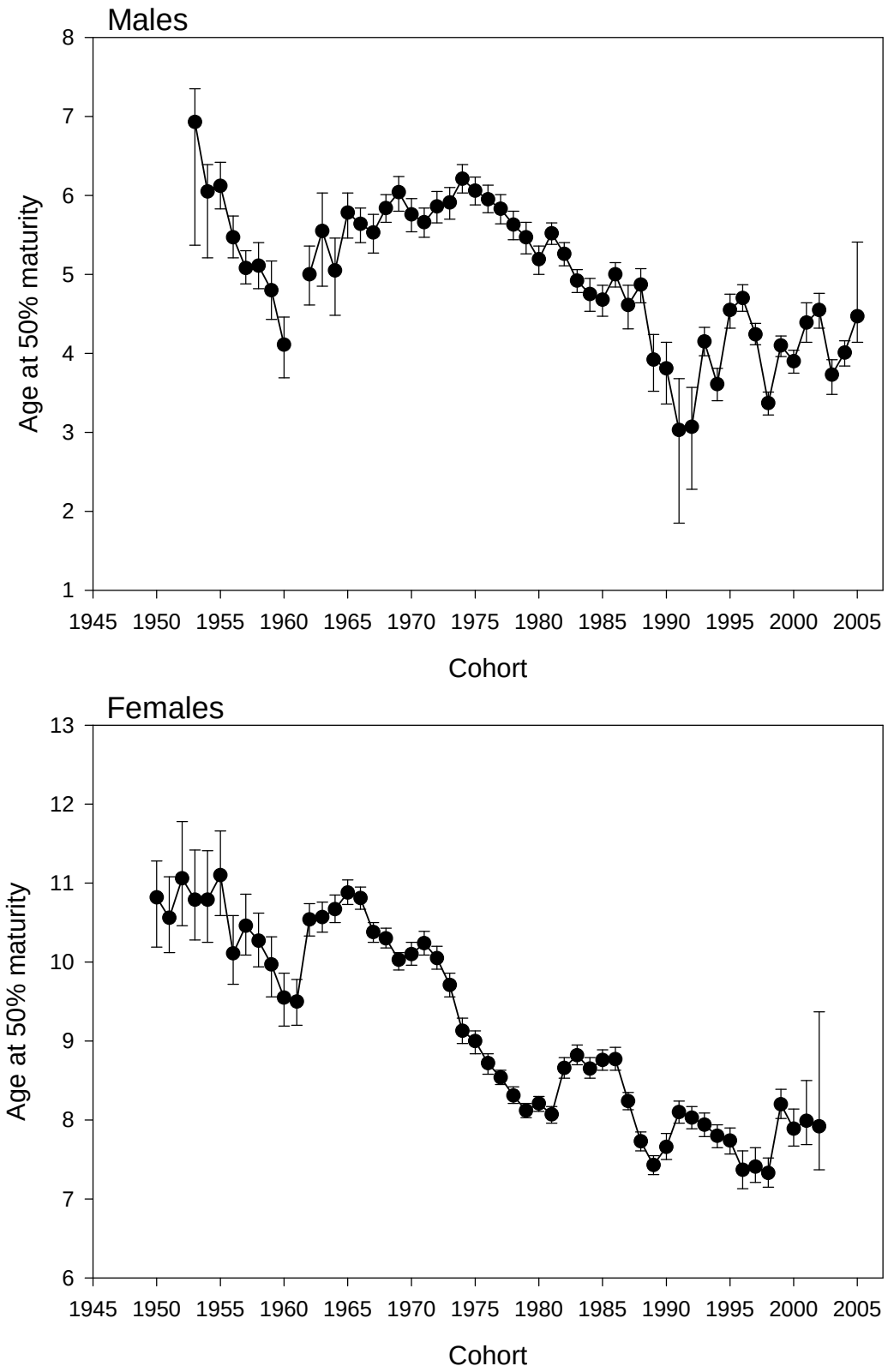


Figure 18. Age at 50% maturity (± 95% fiducial limits) by cohort for male and female American plaice in NAFO Div. 3LNO.

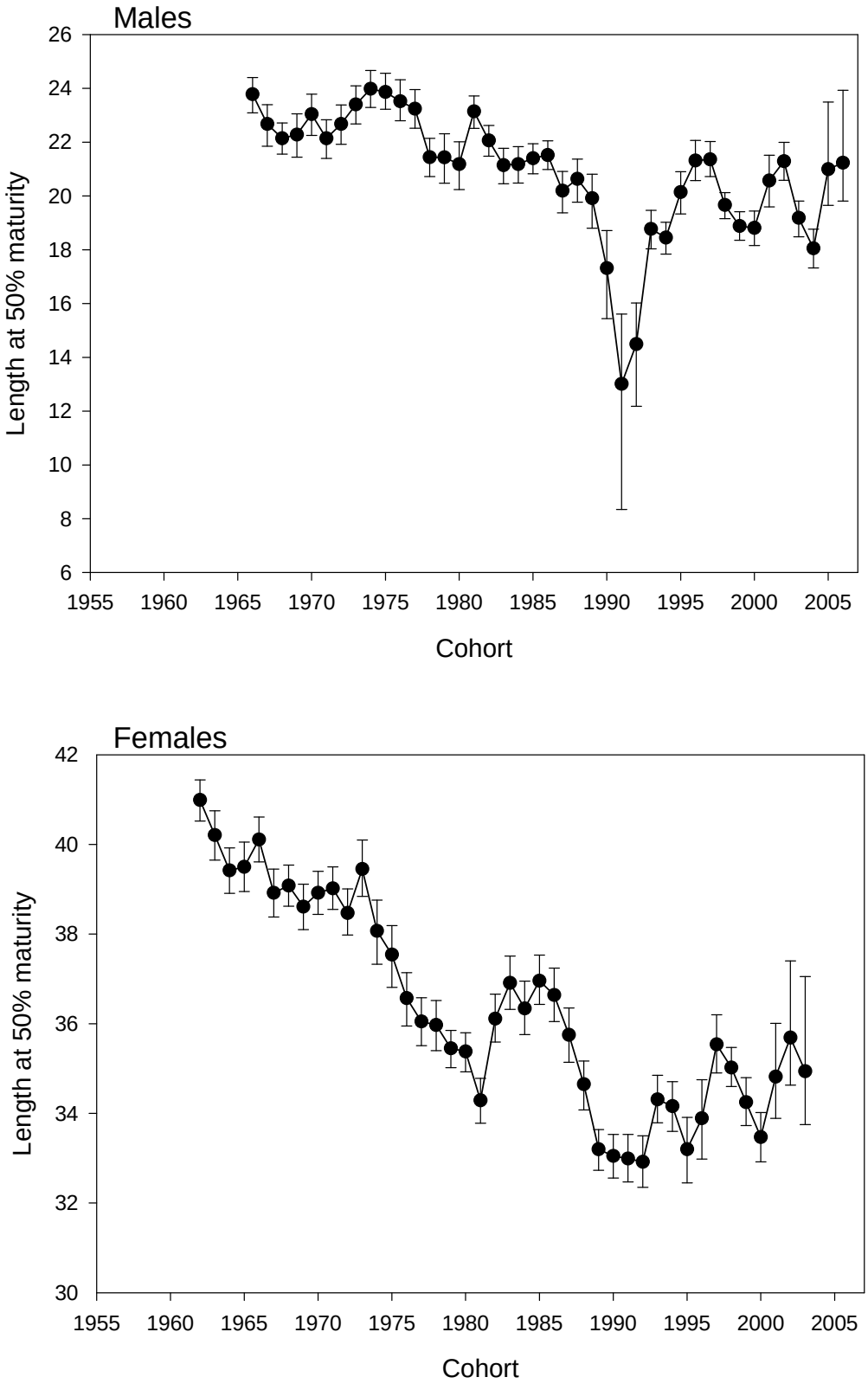


Figure 19. Length at 50% maturity (± 95% fiducial limits) by cohort for male and female American plaice in NAFO Div. 3LNO.

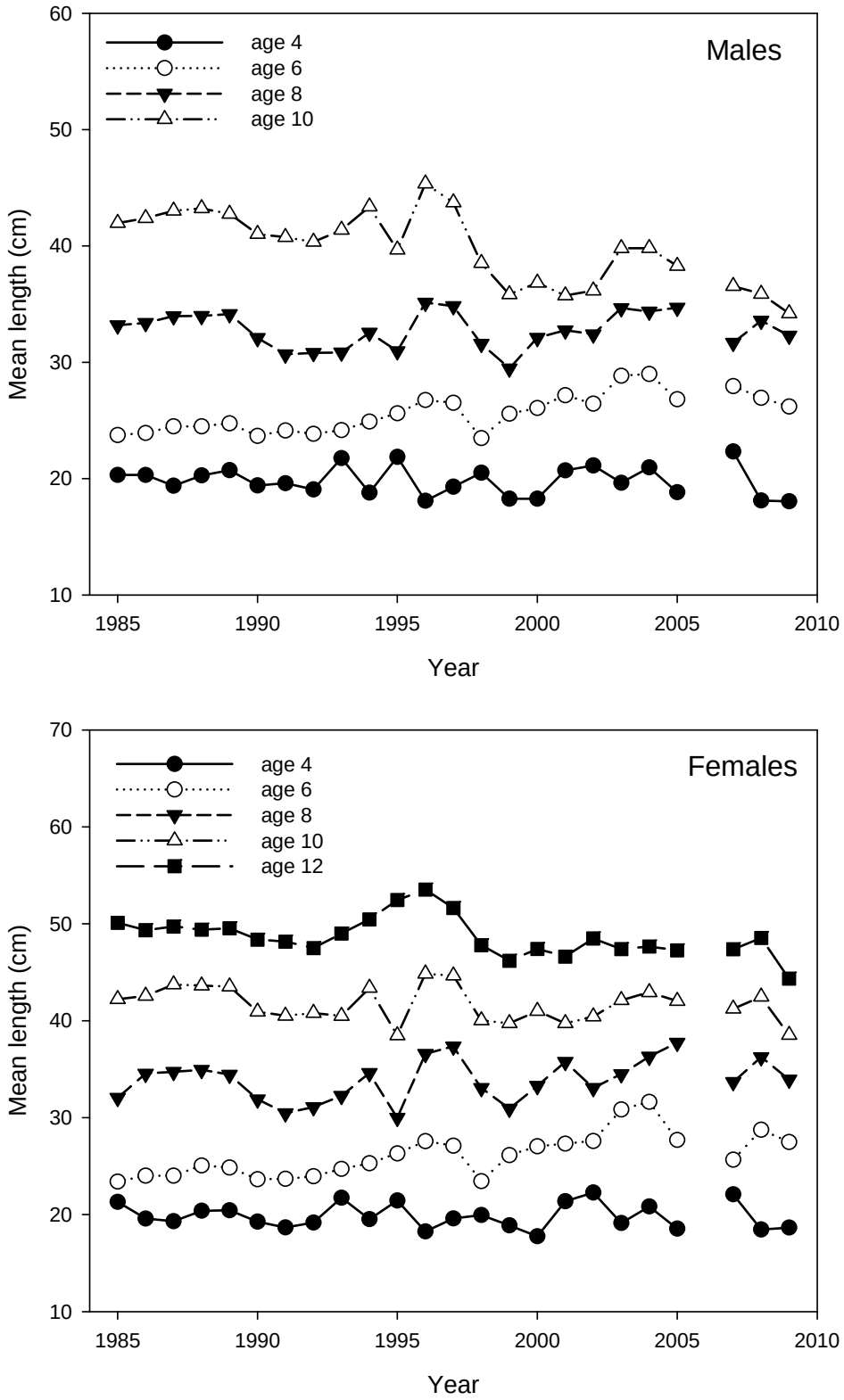


Figure 20. Mean length-at-age for selected ages of Div. 3LNO American plaice from Canadian spring RV surveys.

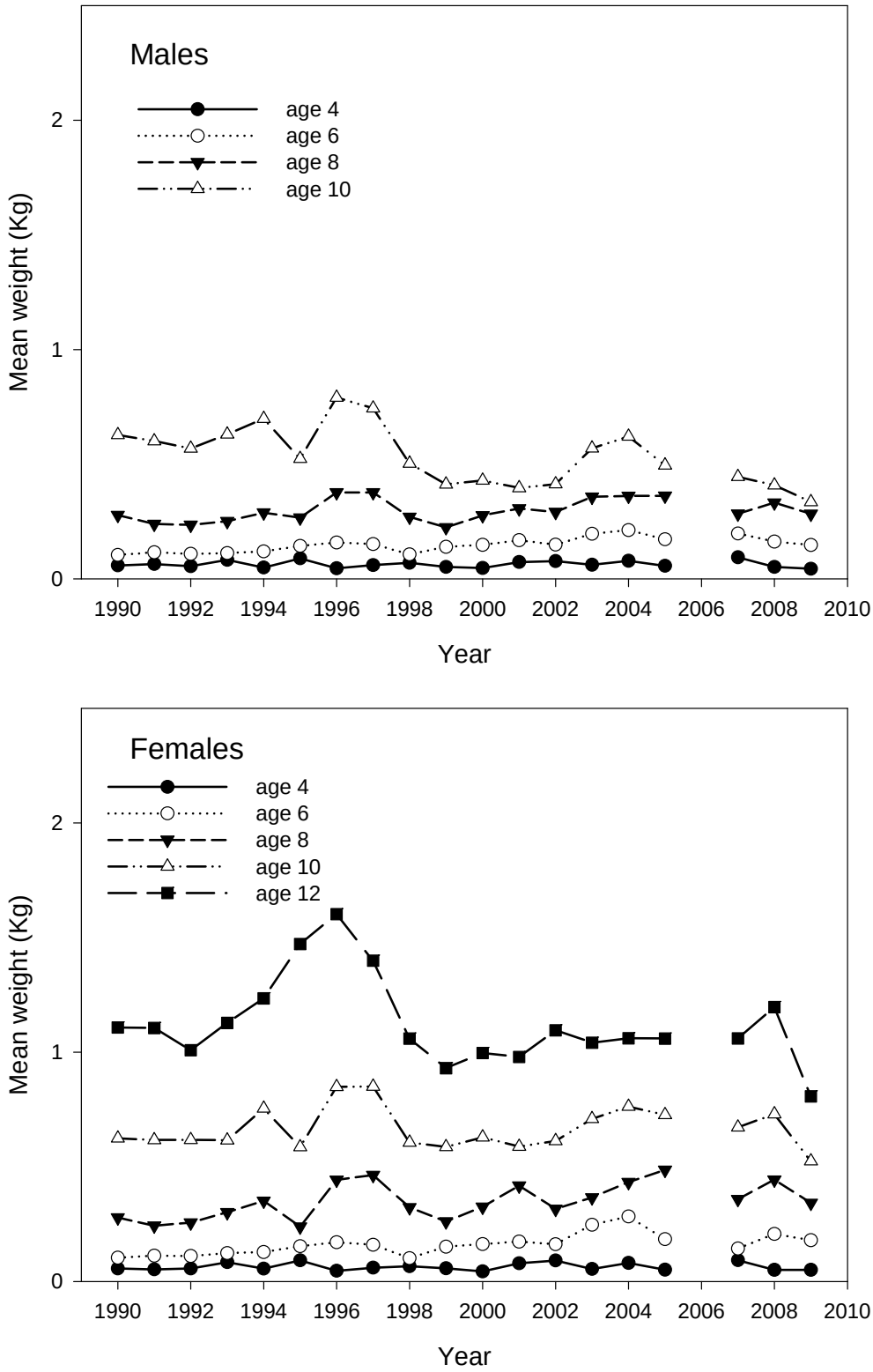


Figure 21. Mean weight-at-age for selected ages of Div. 3LNO American plaice from Canadian spring RV surveys.

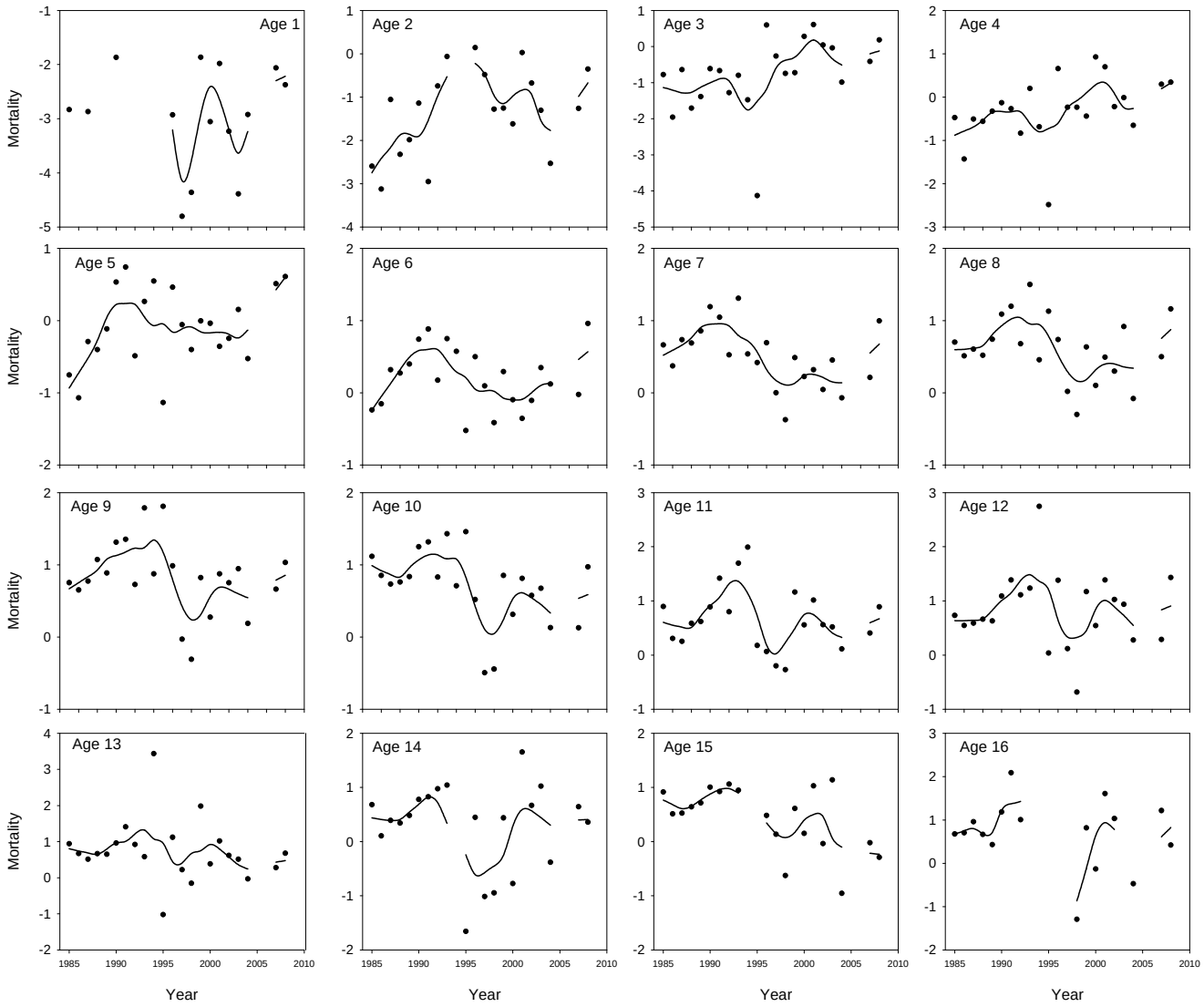


Figure 22. Estimates of mortality for ages 1 to 16 from Canadian spring surveys from 1985 to 2009.

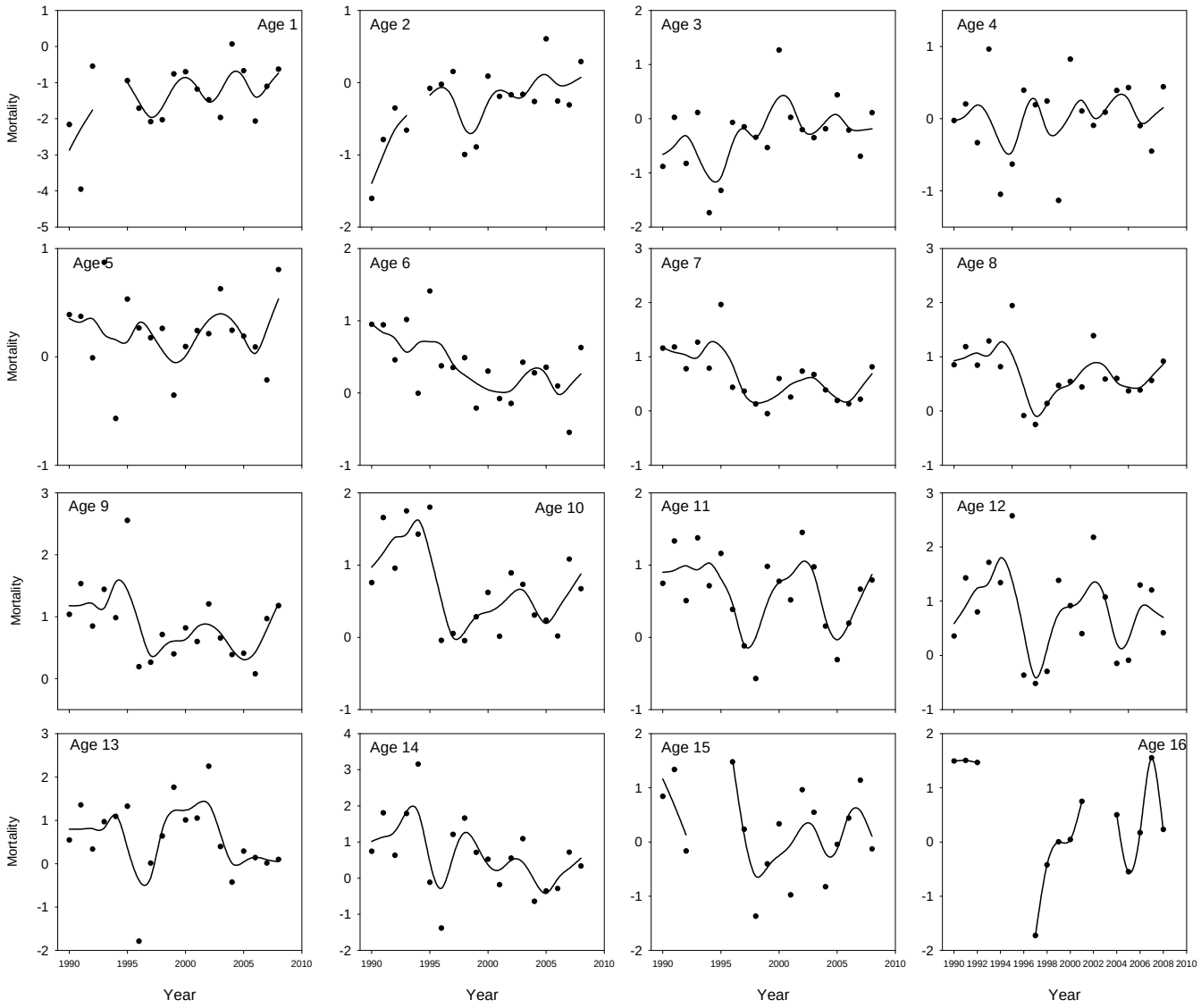


Figure 23. Estimates of mortality for ages 1 to 16 from Canadian fall surveys from 1990 to 2009.

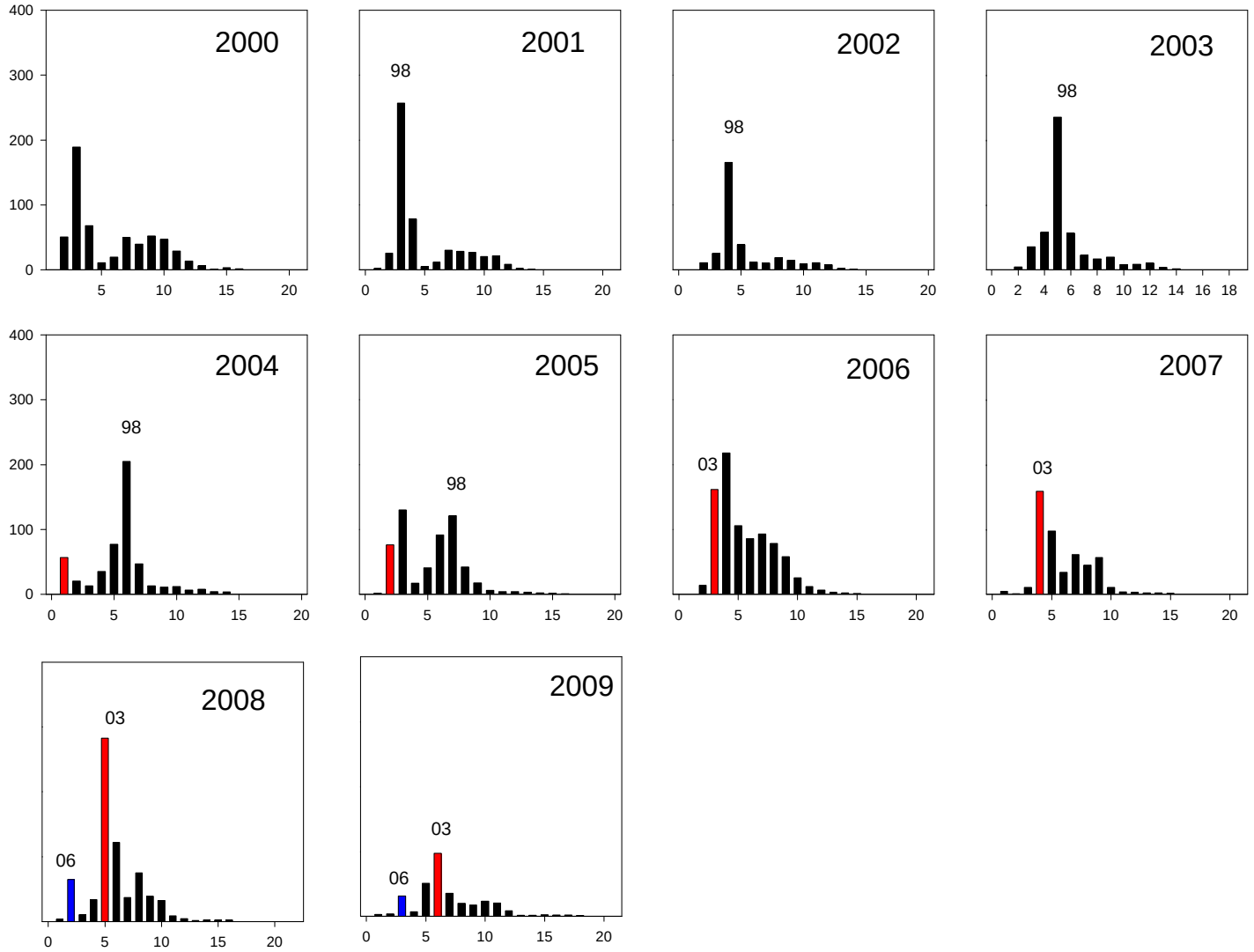


Figure 24. Abundance at age (millions of fish) from 2000 – 2009 in the EU-Spain Div. 3NO spring surveys. The 1998, 2003 and 2006 year classes are labelled.

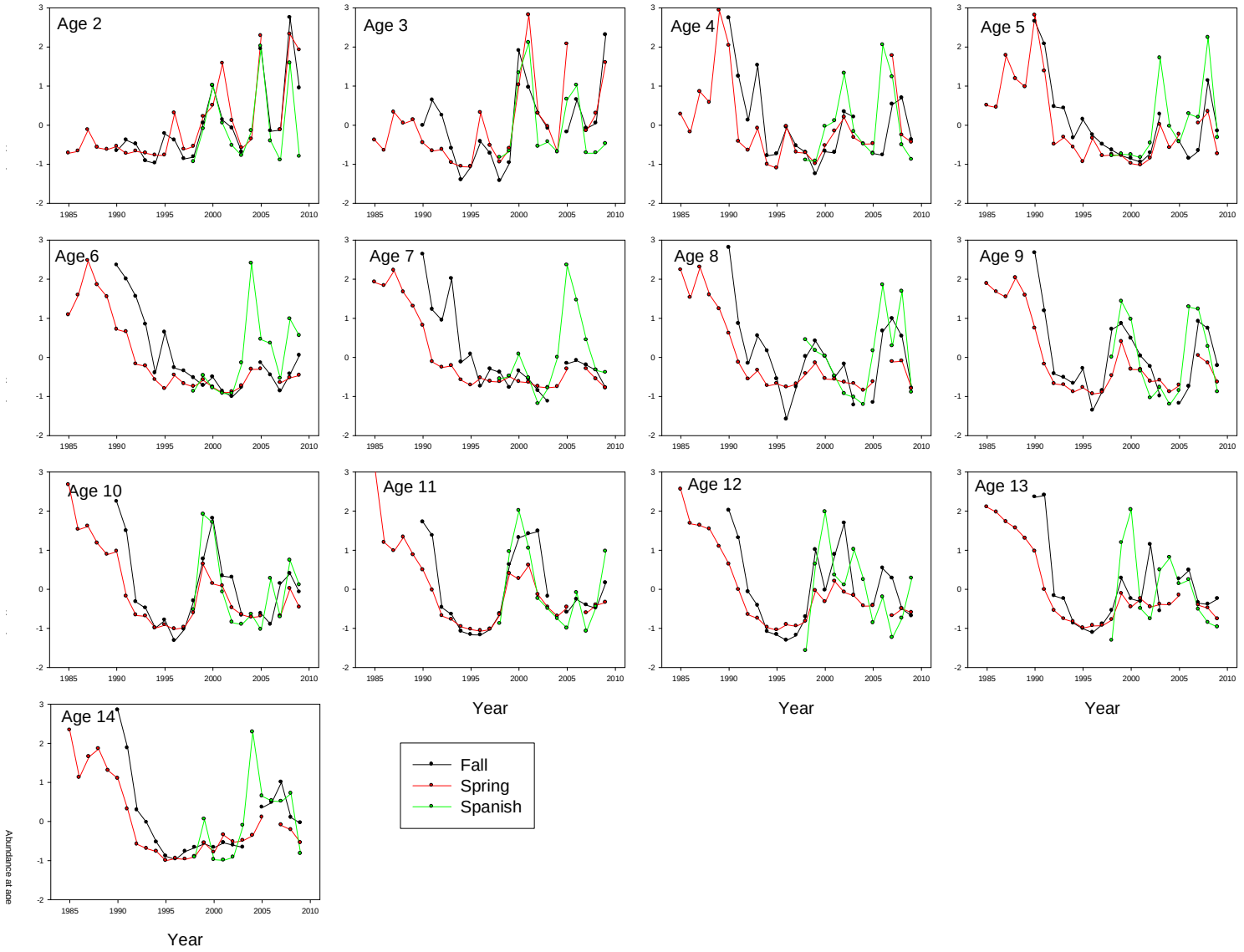


Figure 25. Standardized age by age abundance between surveys. Only the surveys used to calibrate the VPA are included.

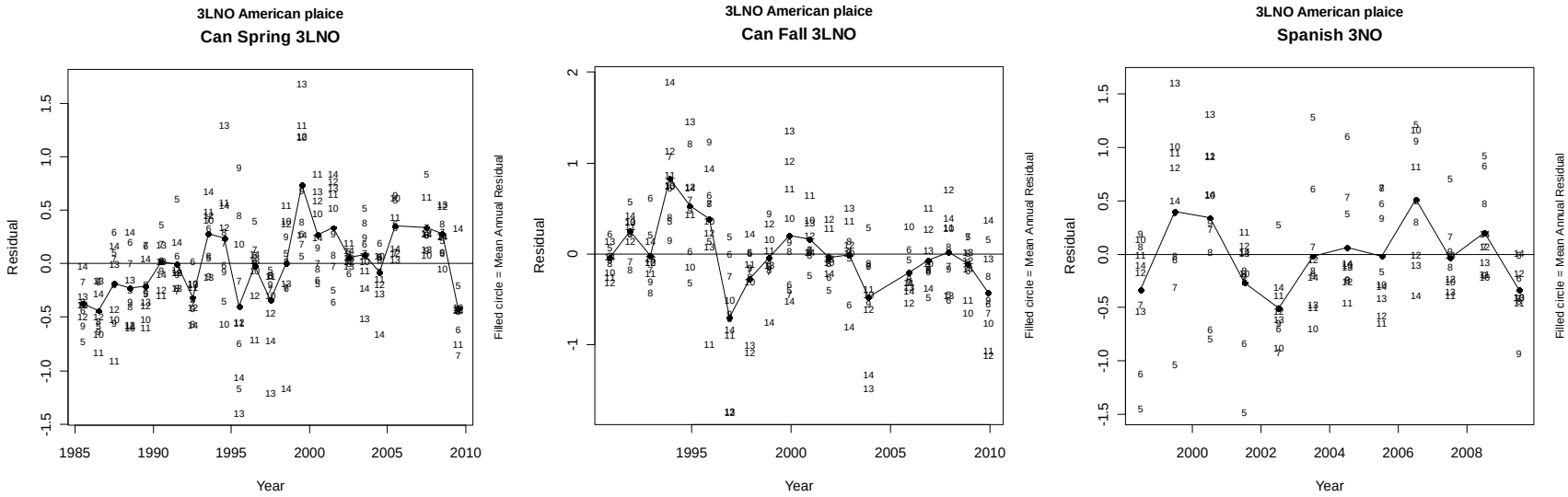


Figure 26. Residuals by year and month (numbers represent ages) for Canadian spring survey (top left), fall survey (middle) and EU-Spain Div. 3NO survey (right). Filled circle is the mean annual residual. Note the scales are different for each plot.

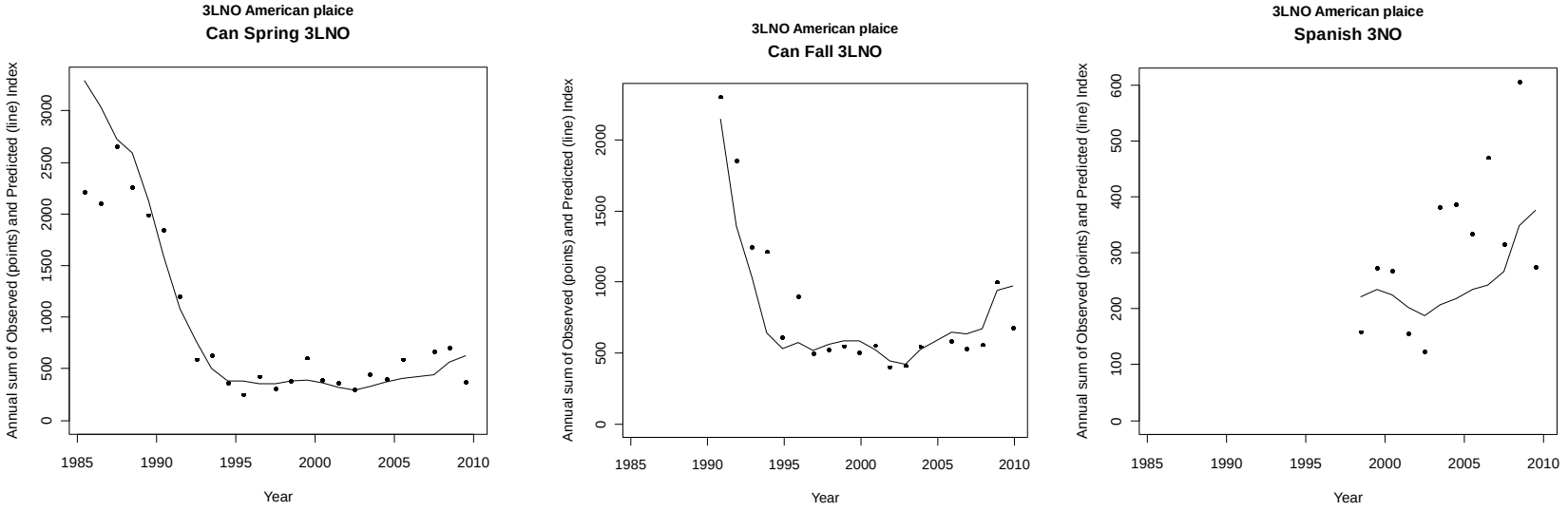


Figure 27. Observed versus predicted abundance for Canadian Div. 3LNO fall and spring and EU-Spain Div. 3NO indices over time.

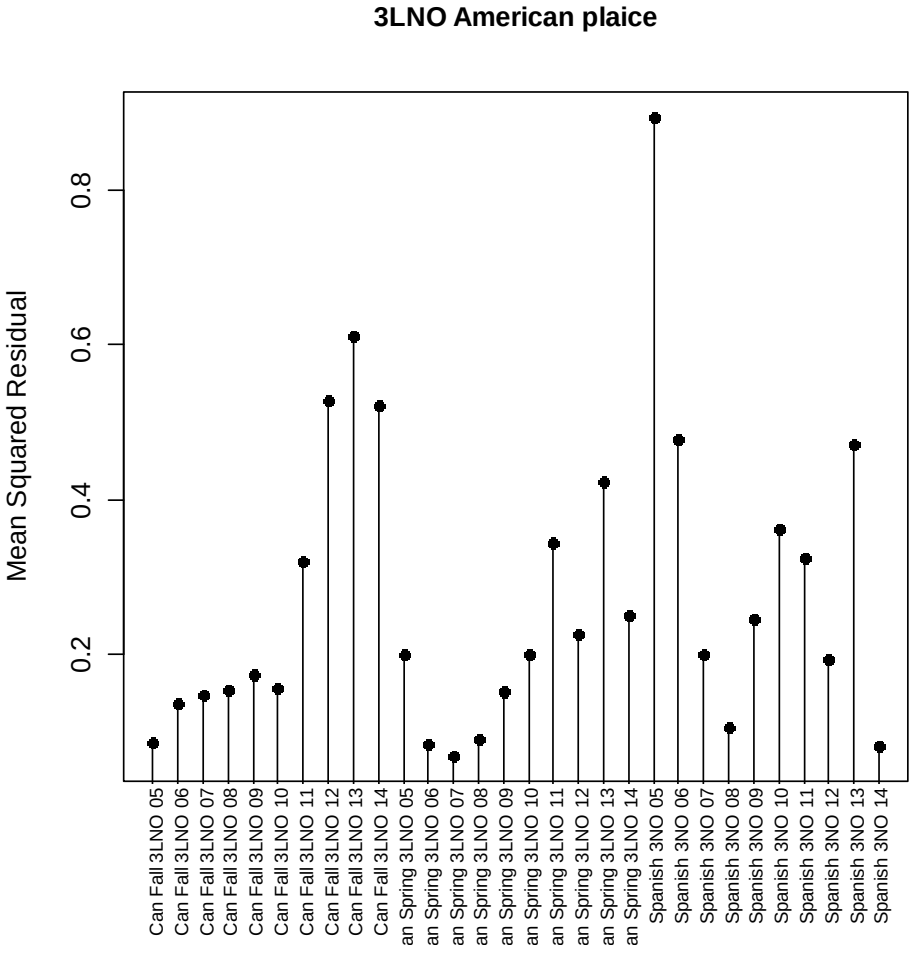


Figure 28. Mean squared residuals by age for fall, spring and EU-Spain Div. 3NO surveys.

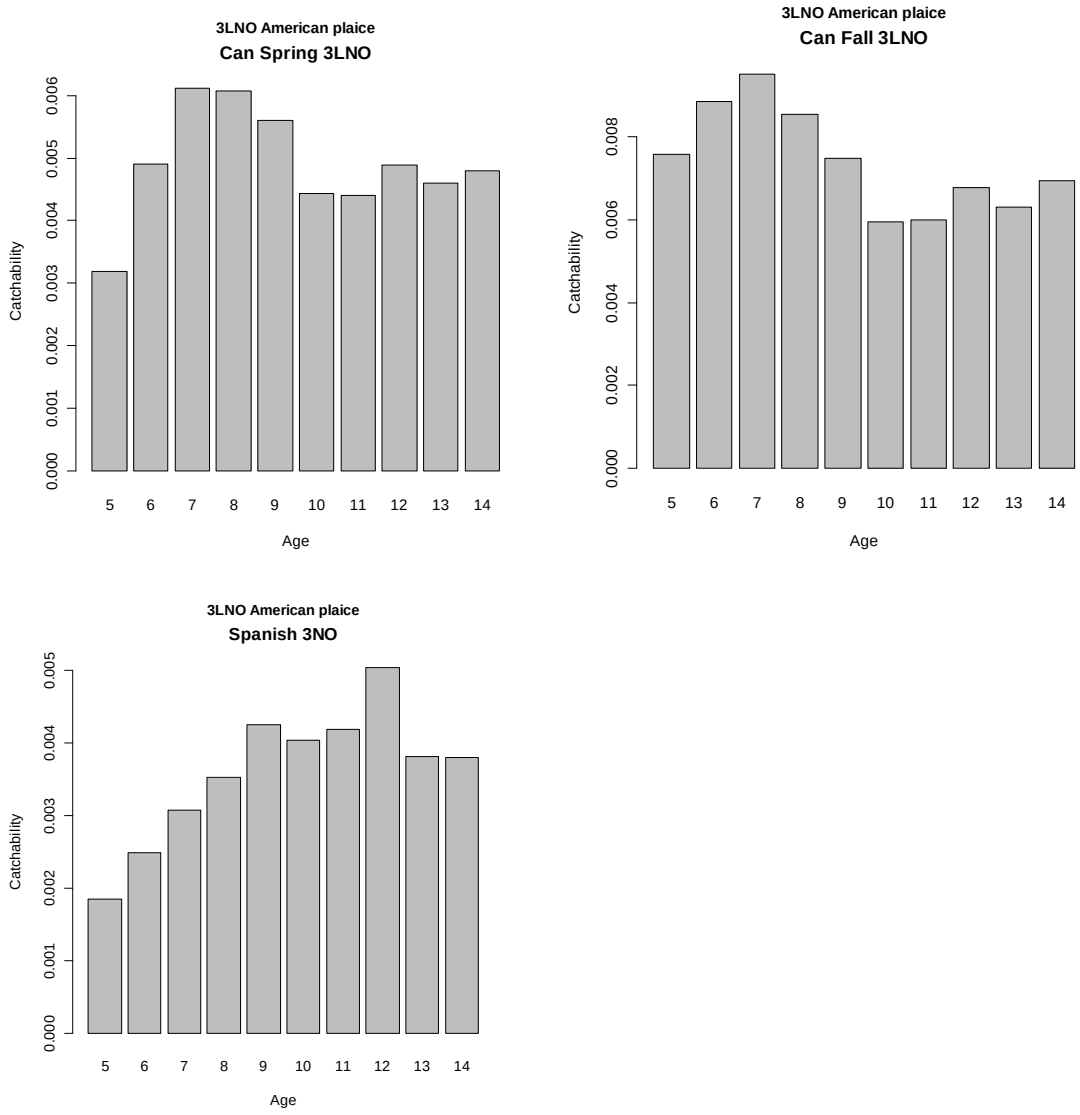


Figure 29. Bottom panel shows the survey catchabilities (q) for each survey by age. Please note EU-Spain Div. 3NO survey in mean numbers per tow at age, other surveys abundance at age.

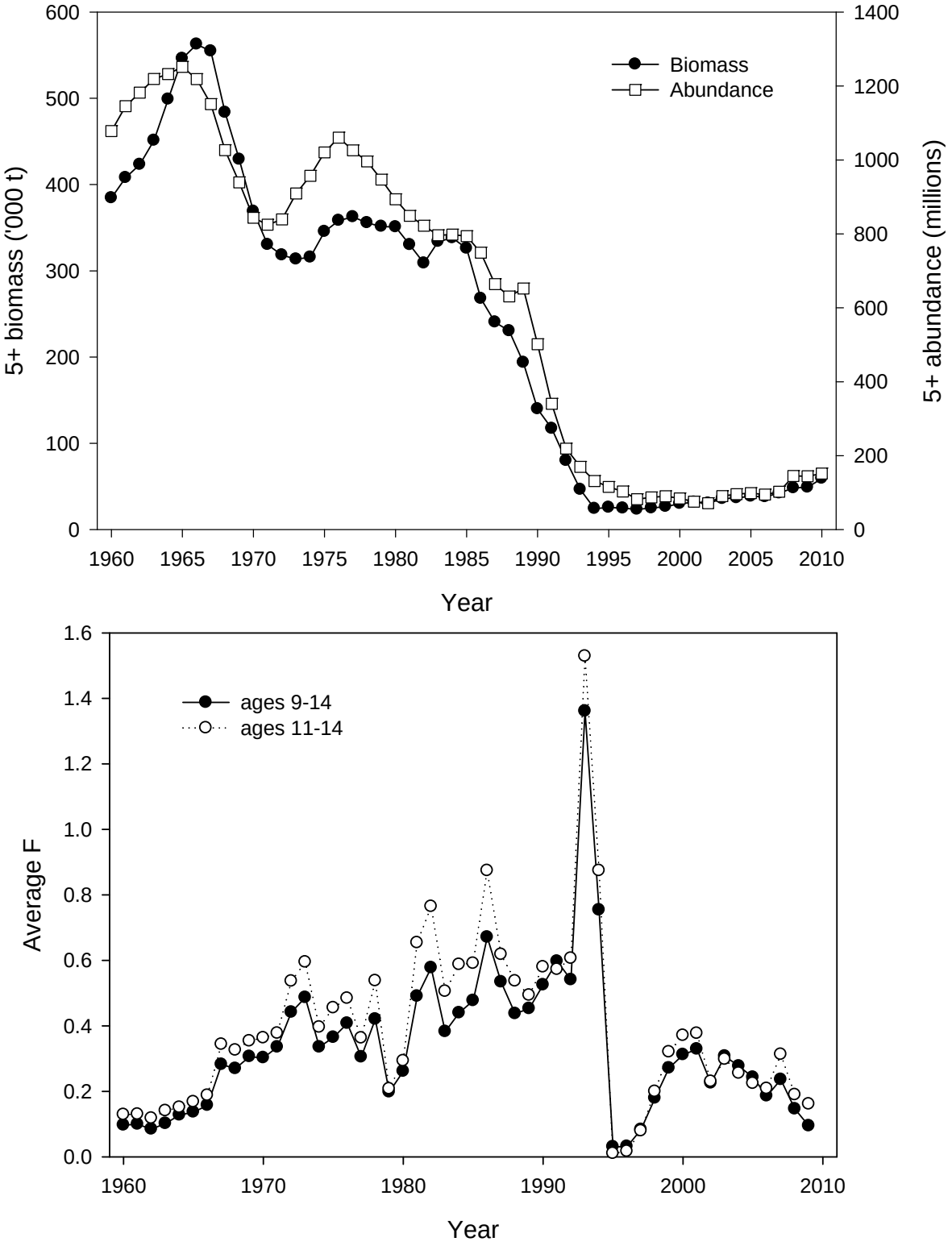


Figure 30. 5+ biomass and abundance (top) and average fishing mortality on ages 9 to 14 and ages 11 to 14 (bottom) from VPA.

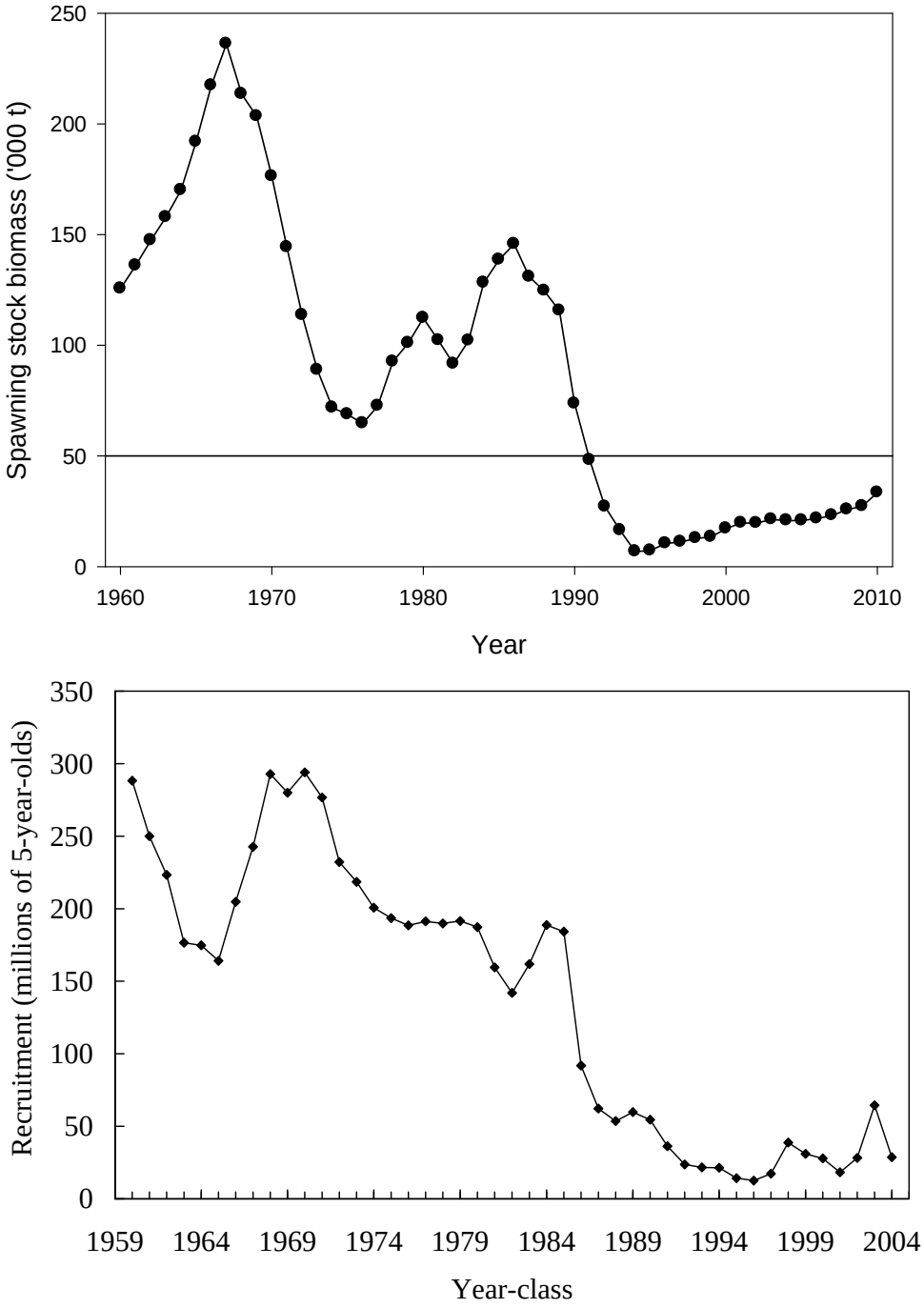


Figure 31. Spawning stock biomass ('000 t) (top panel) and age 5 recruits (year-class) (bottom panel) from VPA. Horizontal line represents B_{lim}.(50 000 t)

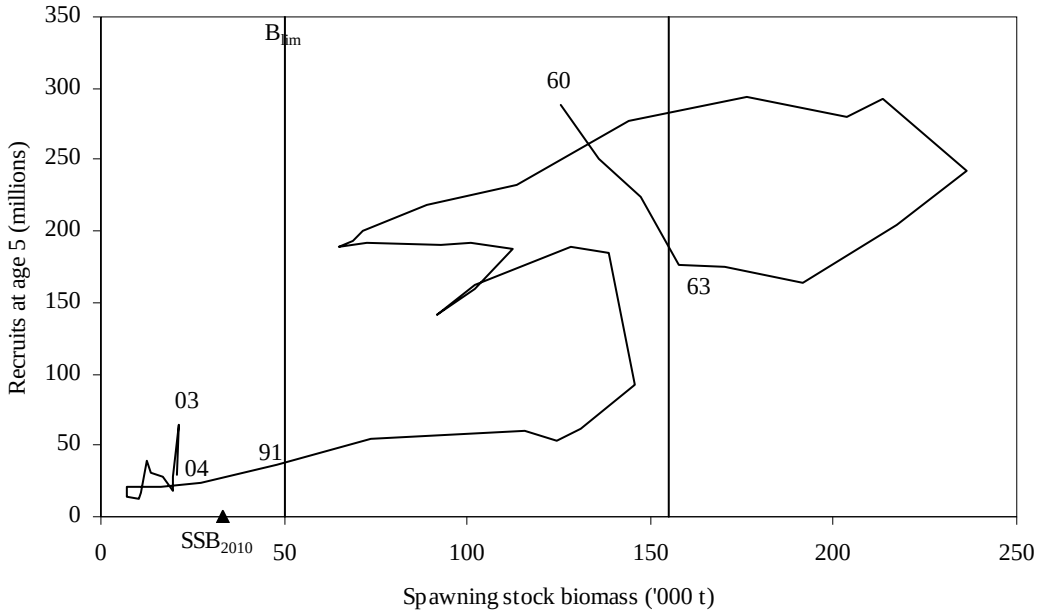


Figure 32. Observed stock recruit trajectory. Vertical line at 50, 000 t illustrates Blim, vertical line at 155, 000 t indicates SSB above which recruitment has been very good.

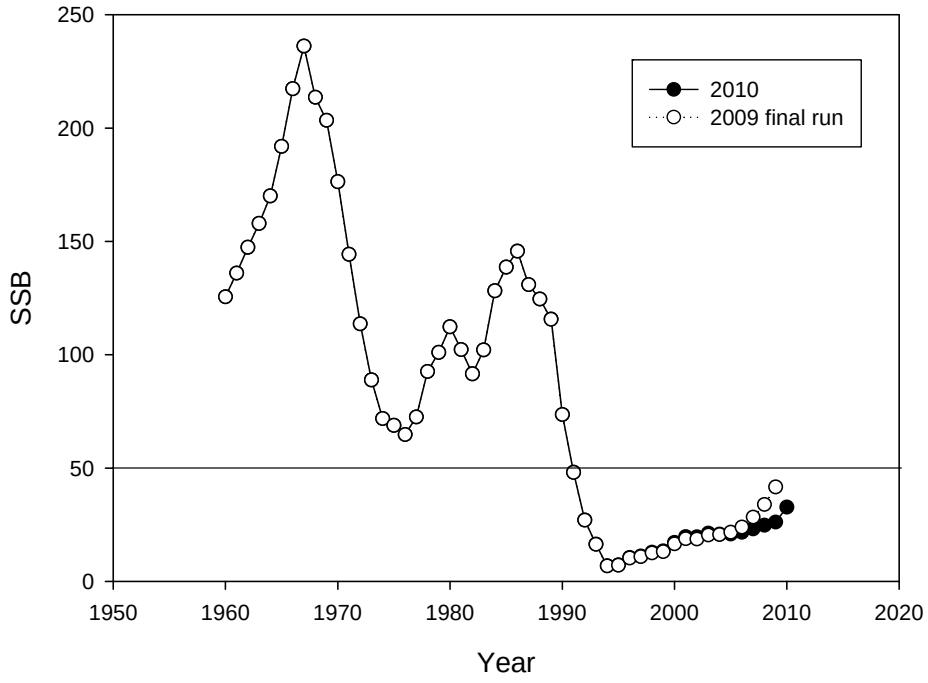


Figure 33. Comparison of estimate of spawning stock biomass from the 2010 assessment and last year's assessment.

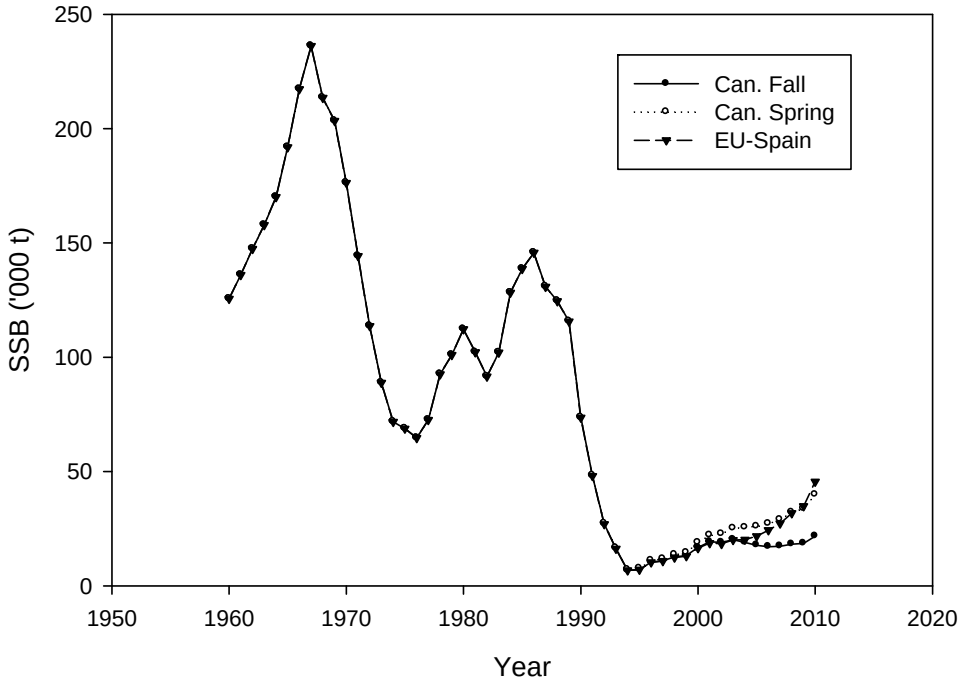


Figure 34. Comparison of estimate of spawning stock biomass single index runs from the 2010 assessment.

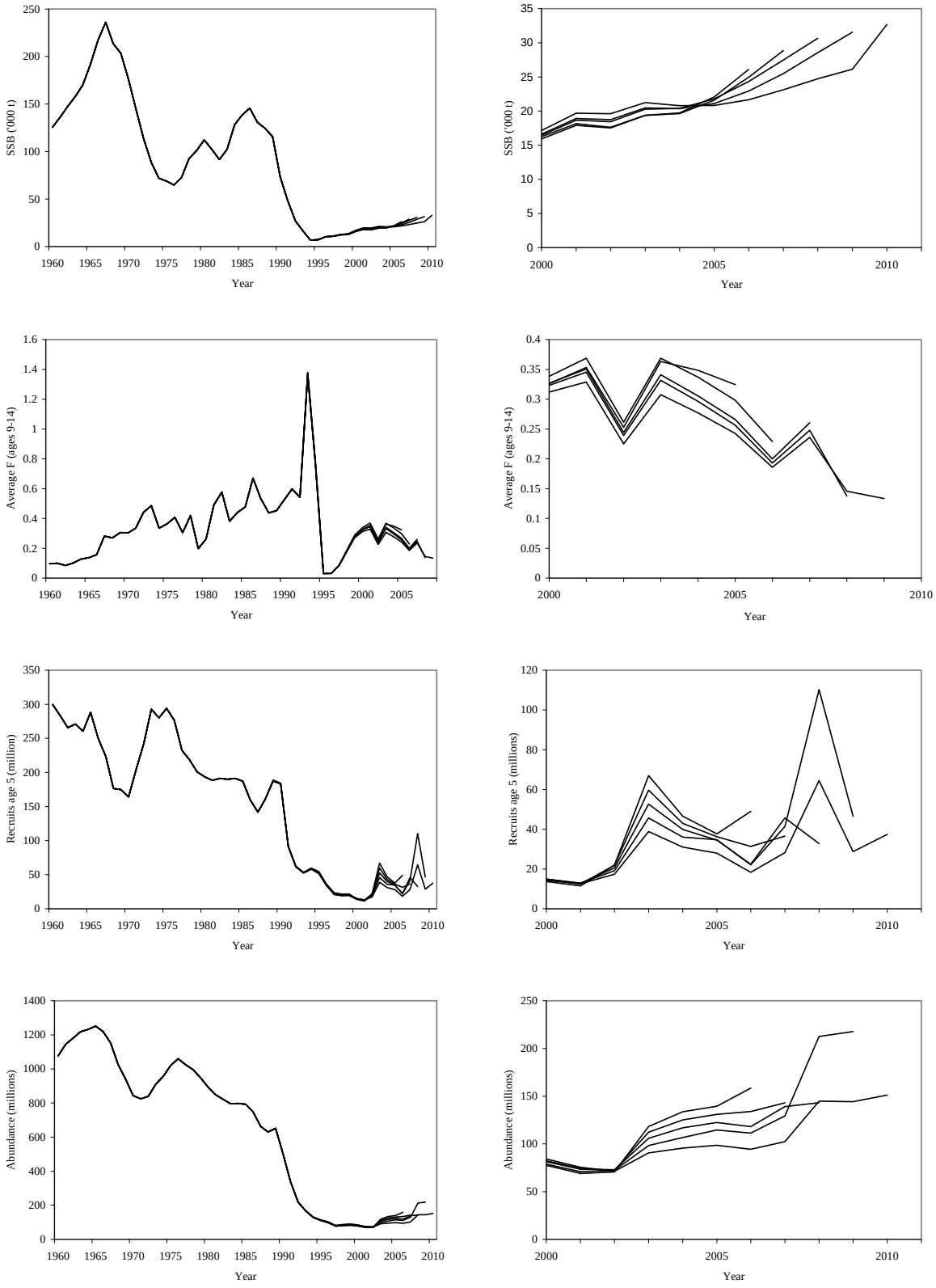


Figure 35. Results of retrospective analysis for Div. 3LNO American plaice. Top panel shows SSB, next panel shows fishing mortality on ages 9-14, below is recruitment (age 5) and bottom panel is abundance.

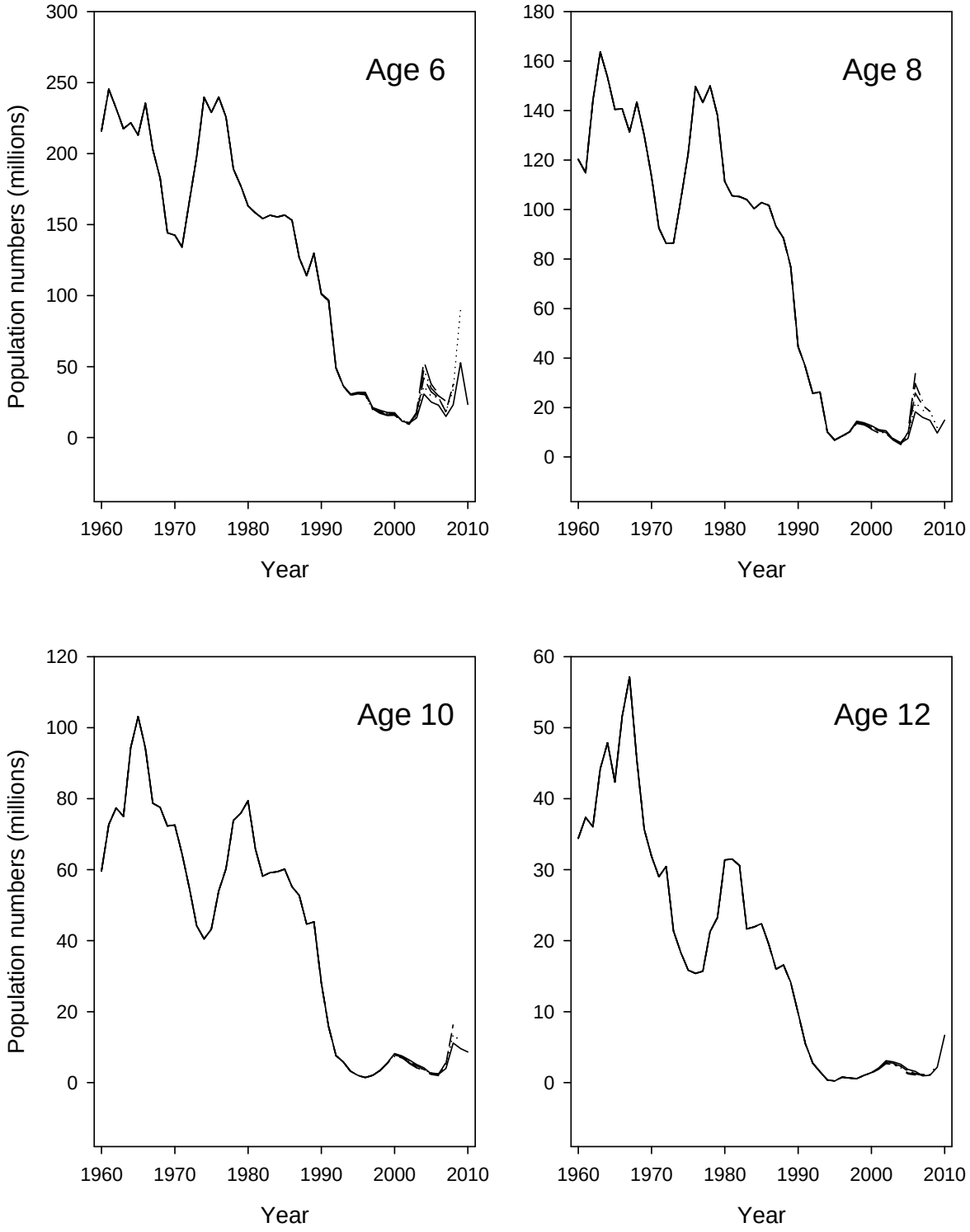
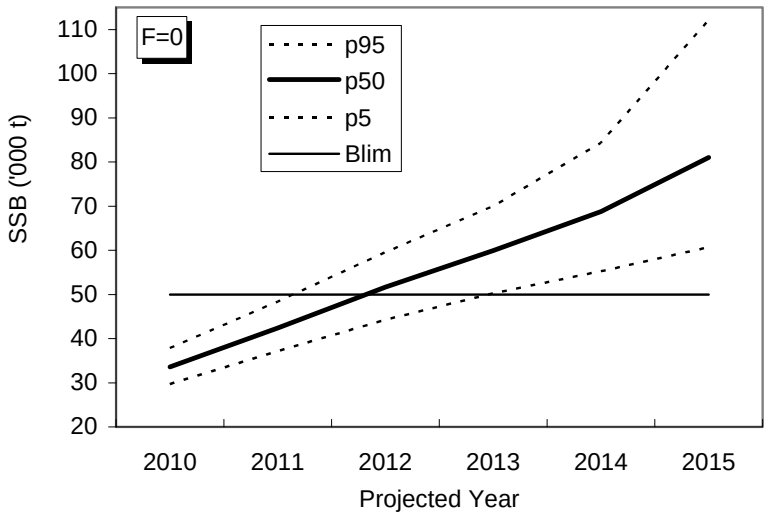
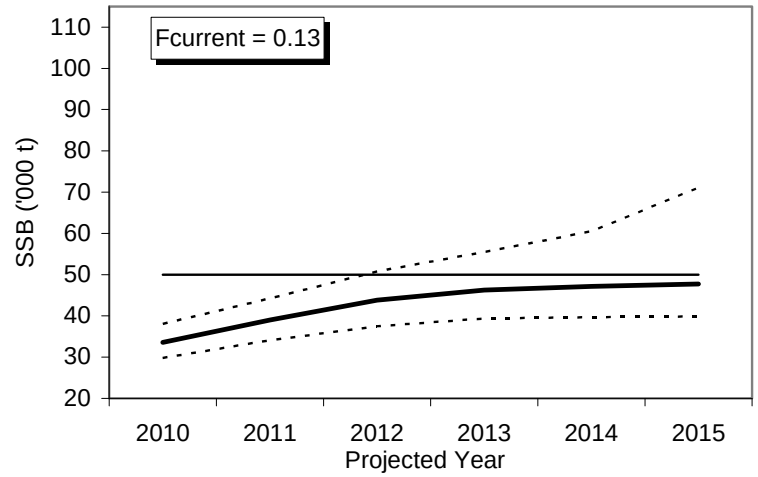


Figure 36. Results of retrospective analysis for Div. 3LNO American plaice population numbers (millions).





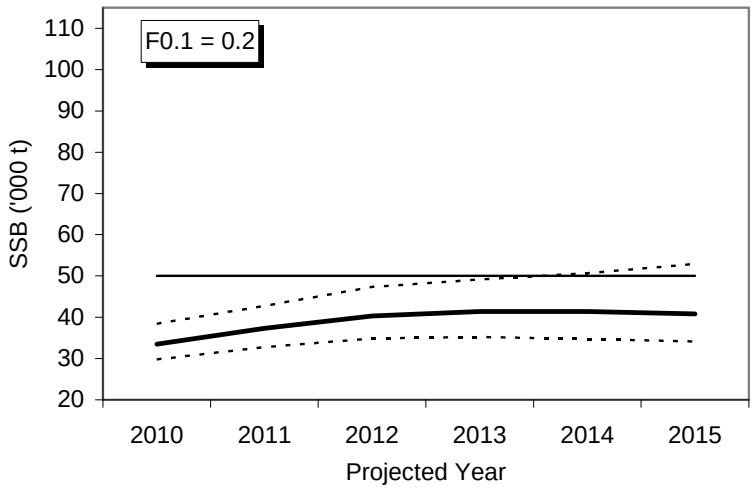


Figure 37. Median spawning stock biomass and yield from projections along with various percentiles at F=0, F_{2009} and $F_{0.1}$.

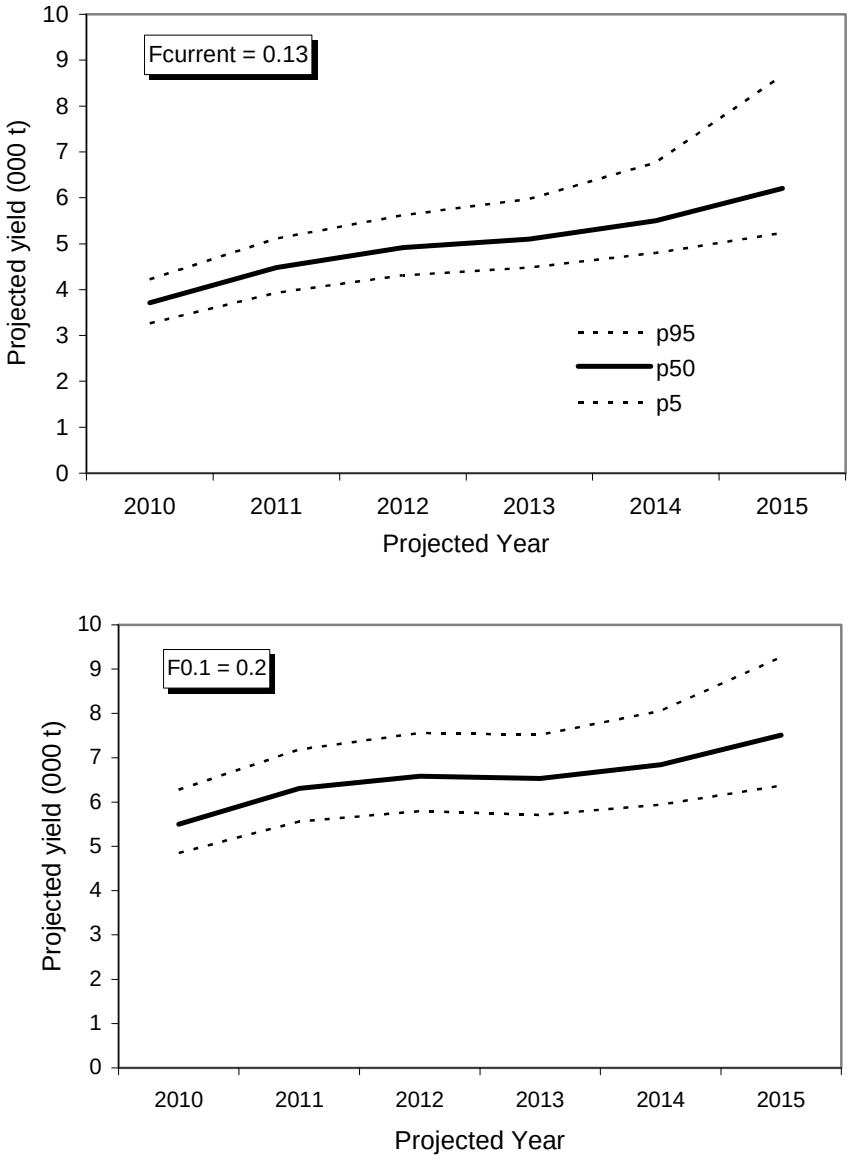


Figure 37 (continued). Median spawning stock biomass and yield from projections along with various percentiles at F=0, F_{2009} and $F_{0.1}$.

Appendix A – Analysis of surveys used to calibrate data

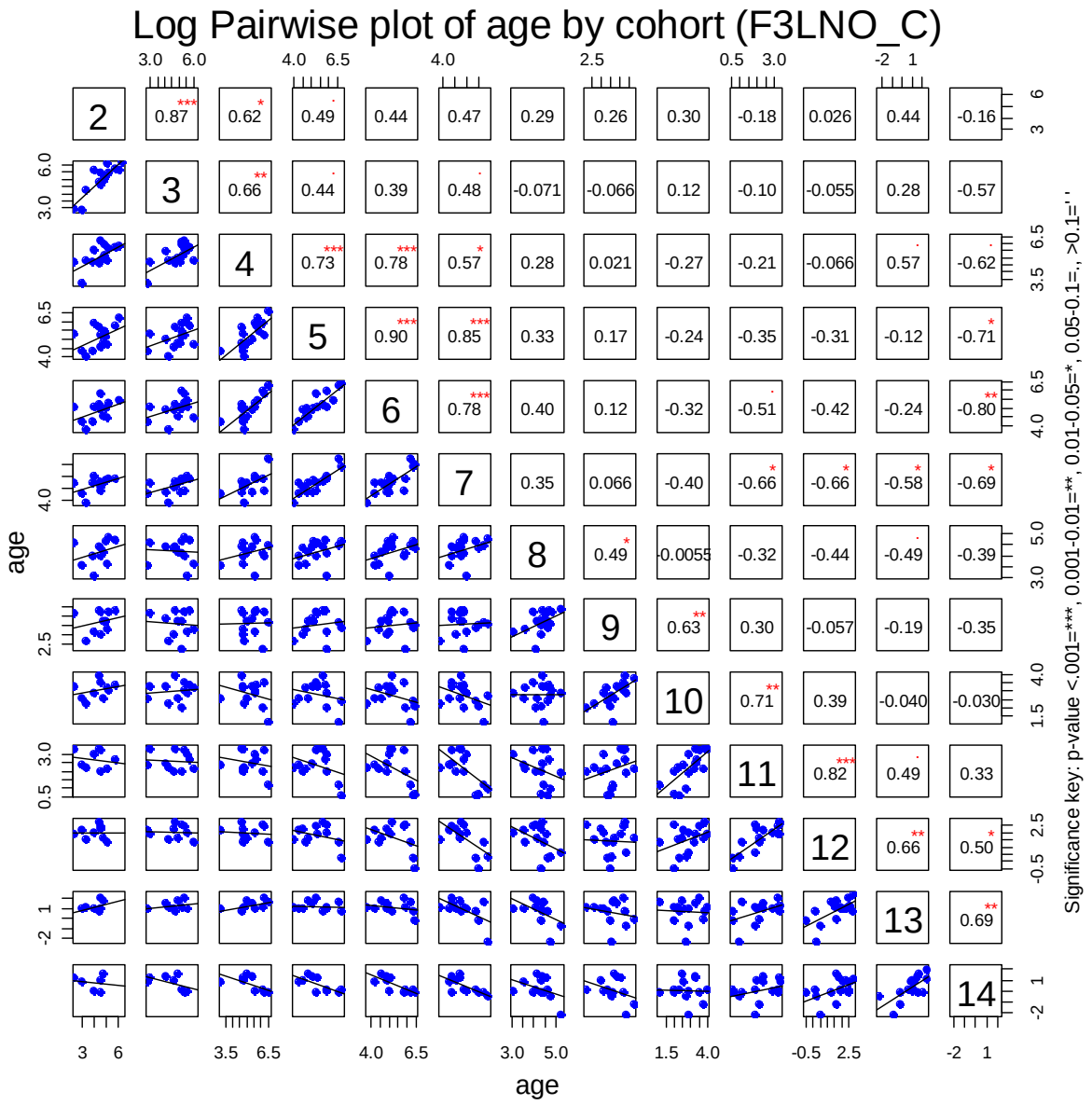


Figure A.1 Pairwise plots of each of the survey indices (Canadian fall survey) by cohort on the log scale.

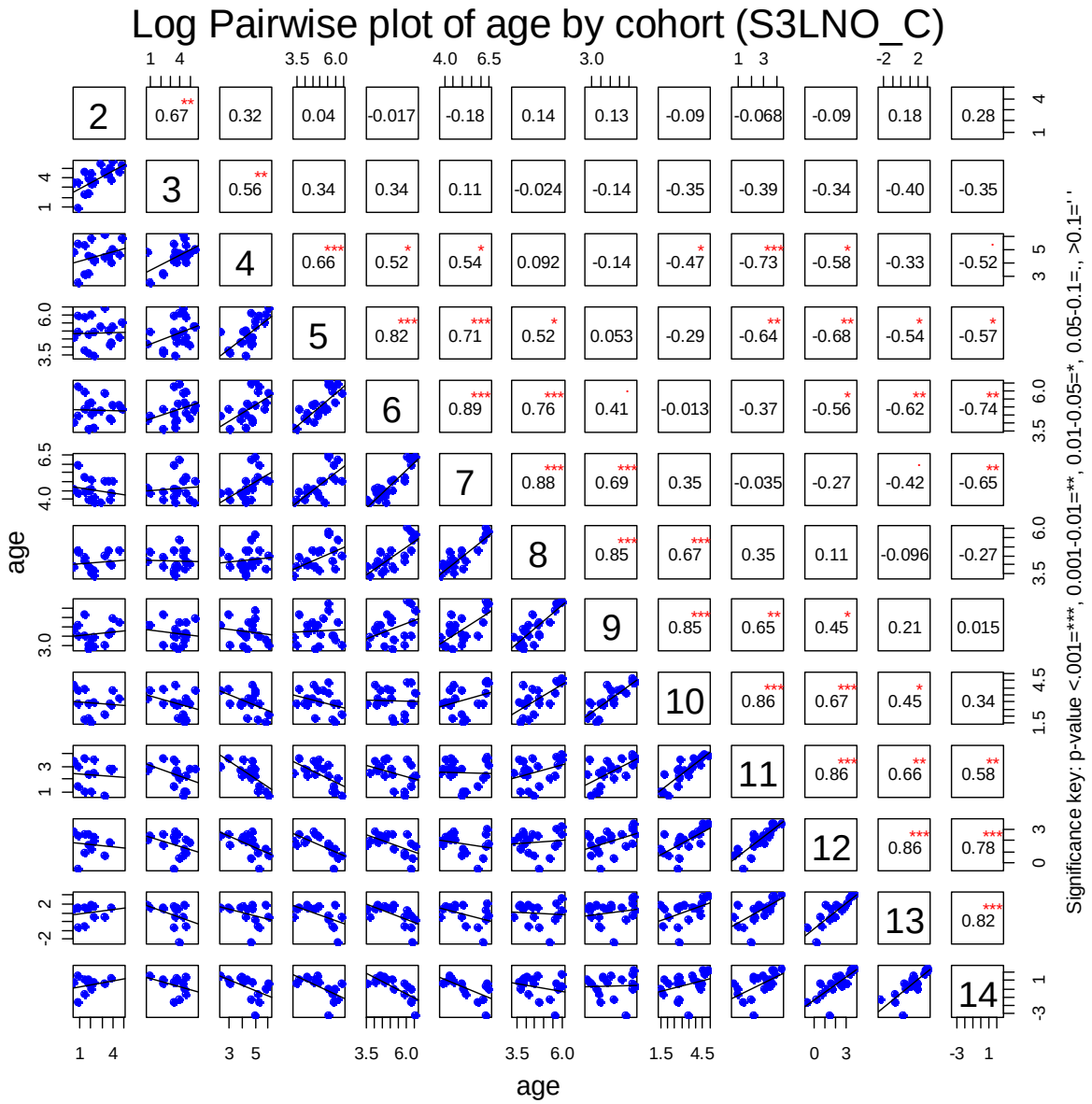
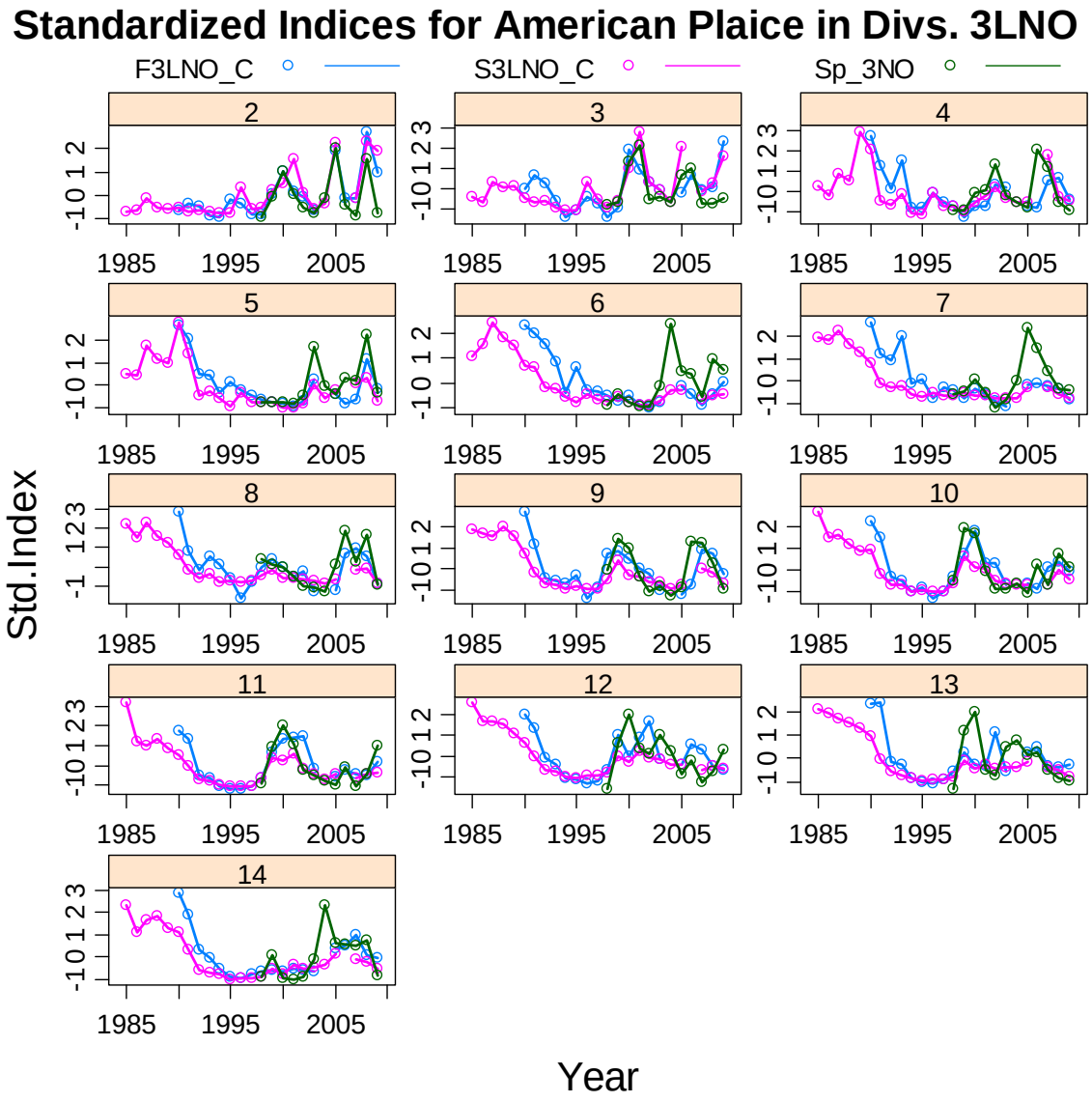
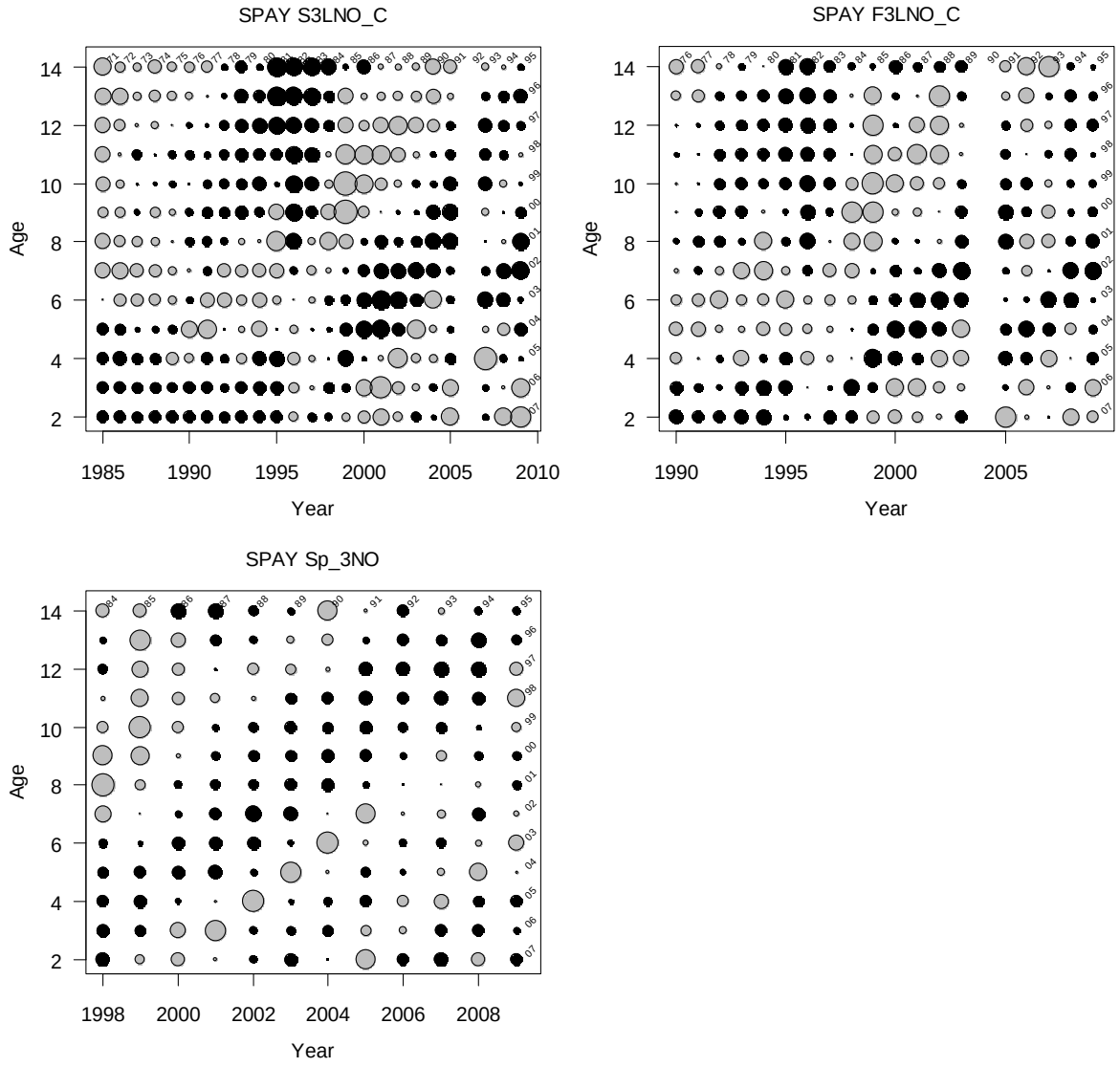


Figure A.2 Pairwise plots of each of the survey indices (Canadian spring survey) by cohort on the log scale.

Figure A.3 Pairwise plots of each of the survey indices (EU-Spain survey) by cohort on the log scale.



Appendix A.4 Standardized age by age abundance between surveys. Only the surveys used to calibrate the VPA are included.



Appendix A.5 Plots of standardized proportions by age across years (SPAY) for Can. Fall, Can. Spring and EU-Spain surveys.