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An update of the status of the cod (*Gadus morhua*) stock in NAFO Divisions 2J+3KL in March 2004

Mise à jour de l'état du stock de morue (*Gadus morhua*) des divisions 2J+3KL de l'OPANO en mars 2004

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ABSTRACT

The directed fishery for northern (2J+3KL) cod was closed in 1992, reopened for small boats in the inshore alone during 1998-2002, and closed again to directed commercial and recreational fishing in 2003. Reported landings in 2003 were approximately 970 t, 90 t of which came from the sentinel surveys and the rest (880 t) from the commercial fishery. Most (780 t) of the latter came from a mass mortality of cod in Smith Sound on Newfoundland's east coast during April. The rest of the reported commercial landings came from by-catch in fisheries directed at other species, most notably winter (blackback) flounder. Because the dynamics of populations of cod in the inshore have been different from those in the offshore since about the mid-1990s, and the 1998-2002 fishery was conducted in the inshore alone, the status of populations in the inshore and populations in the offshore are reported separately. Populations in the offshore remain broadly distributed at very low density. The indices of biomass from research bottom-trawl surveys in autumn (2J3KL) and spring (3L only) are at 1% or less of their levels during the 1980s. Population trends of cod in the inshore have been monitored by fixed-gear sentinel surveys since 1995. Catch rates in sentinel surveys have been consistently low in 2J and northern 3K, but considerably higher at some times in many areas of southern 3K and 3L. After the fishery opened in 1998, catch rates declined in both southern 3K and southern 3L, and remained high only in northern 3L, most notably in southern Bonavista Bay and northern Trinity Bay. Standardized sentinel catch rates increased from 1995 to 1997-1998, but then declined below 1995 levels. The point estimates of the catch rates in 2003 were above the minimum levels observed in the time-series, but remain at or below 1995 levels. Hydroacoustic surveys of the Smith Sound overwintering aggregation, which is thought to be by far the largest overwintering aggregation remaining in the stock area, provided average indices of biomass that increased from less than 20,000 t in the 1990s to a peak of 26,000 t in 2001 and then declined to 18,000 t in 2004.

RÉSUMÉ

La pêche dirigée de la morue du Nord (2J+3KL) a été fermée en 1992, rouverte aux petits bateaux côtiers seulement de 1998 à 2002 puis fermée à nouveau, tant à l’échelon commercial que récréatif, en 2003. Les prises déclarées en 2003 se chiffraient à quelque 970 t, dont 90 t provenaient des relevés par pêche sentinelle et le reste (880 t), de la pêche commerciale. La plus grande partie de ces dernières (780 t) étaient dues à une mortalité massive de morue survenue dans le détroit de Smith, situé sur la côte est de Terre-Neuve, en avril, et le reste étaient des prises accessoires de la pêche dirigée d’autres espèces, notamment de la plie rouge. Étant donné que la dynamique de la composante côtière et de la composante hauturière de ce stock diffère depuis environ le milieu des années 1990 et que, de 1998 à 2002, la pêche n’a été pratiquée que dans les eaux côtières, l’état des composantes côtière et hauturière est établi séparément. La morue du large demeure répartie sur un vaste territoire marin, mais à très faible densité. Les indices de biomasse provenant des relevés de recherche au chalut de fond effectués en automne (2J+3KL) et au printemps (3L seulement) se situent à 1 % ou moins des niveaux des années 1980. Les tendances démographiques de la composante côtière sont suivies depuis 1995 par le biais de relevés par pêche sentinelle aux engins fixes. Les taux de capture obtenus dans 2J et dans le nord de 3K lors de ces relevés étaient invariablement faibles, bien que nettement plus élevés à certains moments dans de nombreux secteurs du sud de 3K et 3L. Après l’ouverture de la pêche en 1998, les taux de capture ont diminué dans le sud de 3K et 3L, ne demeurant élevés que dans le nord de 3L, plus particulièrement dans le sud de la baie de Bonavista et dans le nord de la baie de la Trinité. Les taux de capture normalisés des relevés par pêche sentinelle ont augmenté de 1995 à 1997-1998, puis ont chuté sous les niveaux de 1995. Les estimations ponctuelles des taux de capture en 2003 se chiffraient au-dessus des niveaux minimums observés dans la série chronologique, mais sont demeurées au niveau de 1995 ou au-dessous de celui-ci. Les relevés hydroacoustiques du banc de morue qui passe l’hiver dans le détroit de Smith, considérés comme étant de loin le plus grand banc hivernant qui reste dans la zone du stock, ont fourni des indices de biomasse moyens; la biomasse a passé de moins de 20 000 t dans les années 1990 à un pic de 26 000 t en 2001, pour ensuite diminué, se chiffrant à 18 000 t en 2004.

Introduction

The northern (2J+3KL) stock of Atlantic cod (*Gadus morhua*) occupies the area from the southern Labrador Shelf to the northern Grand Bank (Fig. 1), where it occurs from the coast to 500-600 m, and occasionally to 900 m, on the upper continental slope. Historically, much of the cod overwintered near the shelf break in 300-500 m from Hamilton Bank in Div. 2J to the Nose of the Bank in Div. 3L. At some time in the spring most of these fish moved onto the shelf, and many of them migrated during late spring and summer into the shallow, coastal waters where they fed on capelin (*Mallotus villosus*) that had approached the coast to spawn (Templeman 1966). The cod then moved back across the shelf during the autumn. Not all cod had this offshore-inshore migration pattern. For example, some cod moved during summer to feeding areas on the plateau of Grand Bank. Others spent the whole year in inshore waters, moving from deep inlets during winter to shallow feeding areas in summer. The aggregation that overwinters in Smith Sound moves northward during late spring and summer, and returns to the sound in late autumn or early winter.

The northern cod has been exploited for centuries (Lear and Parsons 1993; Hutchings and Myers 1995; Lear 1998). Annual landings increased through the 18th and 19th centuries to about 300,000 tonnes during the early decades of the 20th century. The early fishery was limited to shallow water. Deep waters ceased to be refugia in the 1950s, when longliners were introduced to nearshore waters and distant water trawlers from Europe located and exploited dense aggregations of cod overwintering along the shelf break. Total landings escalated from 360,000 t in 1959 to 810,000 t in 1968 (Table 1; Fig. 2), and then plummeted to 140,000 t in 1978. Mathematical reconstruction of the population in later years (e.g. Bishop *et al*. 1993) indicated that this severe overfishing had caused a decline in biomass (ages 3 and older) from about 3,000,000 t in 1962 to about 500,000 t in 1978. The landings by distant water fleets declined substantially when Canada declared a 200 mile fishing zone in 1977. With the reduced fishing mortality, improved recruitment and an increase in individual growth rate, the population biomass started to rise. Canadian trawlers soon replaced the non-Canadian fleets on the winter fishing grounds, and catches once again rose to above 200,000 t. In 1988-1989 it was recognized that the stock size had been overestimated for several years, and that fishing mortality during the 1980s had been higher than intended. Quotas were reduced, but not sufficiently to prevent an increase in fishing mortality. In addition, oceanographic conditions became particularly severe during the early 1990s following two decades of low temperatures (Drinkwater 2002). The survey index declined precipitously in the early 1990s. The stock appeared to be declining rapidly, and in July 1992 Canada declared a moratorium on directed cod fishing. The survey index continued to decline, reaching an extremely low level by 1994. There has been almost no sign of improvement in the offshore during the subsequent decade.

After the stock as a whole collapsed in the early 1990s, it became clear that some aggregations of cod could still be found inshore. This engendered much interest in the stock affinities of these inshore fish. Numerous studies have indicated the likelihood of substock structure within the northern cod stock complex (see, for example, overviews by Lear 1986; deYoung and Rose 1993; Smedbol and Wroblewski 2002), and several sources of information support the hypothesis that fish overwintering inshore are functionally distinct from populations in the offshore (reviewed by Lilly *et al*. 1999). Genetic studies suggest that the northern cod conforms to an isolation-by-distance structure, with cod from more distant locations tending to be more distinct (Beacham *et al*. 2002). There appear to be differences between the inshore and the offshore, and among various areas of the offshore (Ruzzante *et al*. 1998; Beacham *et al*. 2002; but see Carr *et al*. 1995). Subpopulation structure at the level of individual bays is less strongly supported. Tagging studies conducted during the collapse period indicate that the inshore of 3KL is currently inhabited by at least two groups of cod: (1) a northern resident coastal group in northern 3L and southern 3K and (2) a migrant group from inshore and offshore areas of 3Ps that moves into 3L during late spring and summer and returns to 3Ps during the autumn. A third group, the migrants from offshore 2J3KL that historically supported the bulk of the inshore catch, appears to contribute little if any biomass to inshore waters during summer.

The inshore populations appear to have been more productive than the offshore populations since at least the mid-1990s. In 1998 a directed fishery was reopened for small (< 65 feet) vessels operating in the inshore, but the inshore populations declined during the next few years, and all directed fishing was closed once again in 2003.

Assessments of the status of 2J+3KL cod have been conducted since 1972 (Bishop and Shelton 1997). The basis for the computation of population size has been sequential population analysis (SPA) of the stock as a whole. These analyses became problematic during the early 1990s because of a poor fit between model output and the index of abundance derived from the DFO bottom-trawl surveys. Attempts at fitting whole stock SPAs were continued during the latter half of the 1990s and early 2000s (Lilly *et al*. 2003), but the models were considered to be only “illustrative” of the population dynamics, and not sufficiently well estimated to allow the projection of population size. In addition to the poor model fit in the early 1990s, a second problem arose during the mid-1990s when it became clear that the inshore populations were more productive than populations in the offshore. The landings during 1998-2002 came almost entirely from the inshore, and included many fish of ages and sizes beyond those captured in the offshore surveys. It was felt that the offshore bottom-trawl index was not representative of the inshore populations and was not appropriate for tuning the SPA.

Since the late 1990s, information on the status of 2J+3KL cod has been presented for the offshore and inshore separately, without losing sight of the severely depleted status of the stock as a whole (Lilly *et al*. 2003). The most recent full assessment of stock status, conducted during February 2003 (DFO 2003; Lilly *et al*. 2003; Rice and Rivard 2003), continued this approach. The status of cod in the offshore was assessed on the basis of abundance/biomass indices from the DFO bottom-trawl surveys in 2J3KL in autumn and 3L in spring, and from hydroacoustic studies in specific areas. The status of cod in the inshore was assessed on the basis of indices of abundance/biomass from the sentinel surveys, hydroacoustic surveys in Smith Sound, exploitation rates and biomass estimates from tagging studies, catches from the commercial and recreational fisheries, and catch rates from the commercial fishery. A new SPA was constructed based on catches and indices from the inshore alone.

Because the fishery had been closed indefinitely in 2003, it was requested that an update for 2004 be based simply on a review of by-catch landings in 2003 and an appraisal of major indices of stock abundance. These indices, which were to be analyzed in an age-aggregated form, were the bottom-trawl surveys in the offshore, the sentinel surveys in the inshore, and the hydroacoustic survey of Smith Sound. The present document provides information in support of the stock status update (DFO 2004).

The fishery

Landings prior to 2003

Landings of 2J+3KL cod increased during the 1960s to a peak of over 800,000 t in 1968, declined to a low of 140,000 t in 1978, recovered to about 240,000 t through much of the 1980s, and then declined rapidly in the early 1990s in advance of a moratorium on directed commercial fishing in 1992 (Table 1; Fig. 2).

An overview of management advice, total allowable catches (TACs) and reported landings during 1992-2002 is provided by Lilly *et al*. (2003). Landings during 1993-1997 came from by-catches in fisheries directed at other species, food/recreational fisheries, and DFO-industry sentinel surveys that started in 1995.

A small index/commercial fishery limited to fixed gear deployed from small (< 65 feet) vessels commenced in 1998. Landings from 1998 to 2002 came from directed cod fisheries, by-catches, sentinel surveys and food/recreational fisheries (Table 1, 2; Fig. 3).

Landings in 2003

The 2J3KL area was closed to directed commercial and recreational fisheries in 2003. Reported landings during 2003 were approximately 880 t from commercial fisheries and 90 t from the sentinel surveys, for a total of 970 t.

Most (780 t) of the commercial catch came from a mass mortality of cod in Smith Sound, Trinity Bay, during April. The exact cause of the event remains uncertain, but it was clearly associated with unusually cold water within the Sound (Colbourne *et al*. 2003). The cod were collected from the surface of the water by gaff and dipnet. Many of these fish were frozen, whereas others were torpid but still alive. The fish were generally large, with a high proportion in the range 55-85 cm.

NOTE: The landings of cod from Smith Sound in April 2003 are, at the time of writing, entered into DFO's statistical data base against the code for handline. It is emphasized that these fish were not caught by handline. They were collected from the surface with either gaff or dipnet. It is also somewhat uncertain whether these fish should be considered commercial landings or natural mortality. A high proportion of the fish were dead when collected from the surface, but many, especially during the second half of the event, were alive when taken from the water.

The rest of the reported catch was by-catch in fisheries directed at other species. Most (84 t) of this came from gillnets set for blackback (winter) flounder. The bulk of this catch came from Bonavista Bay and Trinity Bay.

There are no estimates of discards from inshore fisheries. In addition, there are no estimates of the quantity of cod taken in illegal fishing, but such fishing is known to exist.

The by-catch from Canadian trawlers was 3 t.

An estimate is not yet available for the 2003 by-catch by non-Canadian trawlers outside the 200 nautical mile limit on the Nose of the Bank (Div. 3L). The Scientific Council of the Northwest Atlantic Fisheries Organization (NAFO) determined that catches during 2000-2002 were 50-80 t annually (Table 1).

Catch at age in 2003

The age composition and mean length-at-age of the landings were initially calculated by gear, unit area and quarter as described in Gavaris and Gavaris (1983). The following relationship was applied in deriving average weight-at-age:

$$\log(\text{weight}) = 3.0879*\log(\text{length}) - 5.2106.$$

In terms of numbers of fish, the landings in 2003 were dominated by the mass mortality at Smith Sound (68%), followed by gillnets of mesh size 5.5 inches or greater (28%), and small mesh gillnet from the sentinel survey (4%) (Table 3).

The total catch-at-age in 2003 comprised a range of ages, with ages 3 to 14 each contributing at least 2% by number and age 6 most prominent (Table 3; Fig 4). The age composition does not represent a regular progression from the age compositions seen over the previous 5 years (see Fig. 7c of Lilly *et al*. 2003). Specifically, older ages (11-14) are much more strongly represented than would be expected. This is a result of the small contribution of gillnet (5.5 – 6.5 inch mesh) and hook and line gears to the total landings. Instead, the landings were dominated by the fish from the Smith Sound mass mortality. Sampling associated with hydroacoustic studies in Smith Sound have shown that the cod that occur in the dense overwintering aggregations within the sound are primarily of ages 3-4 and older, and that the 1990 and 1992 year-classes are well represented (Rose 2003). The sampling of fish taken to fish plants during the 2003 mass mortality shows the 1990 and 1992 year-classes to be very well represented (Table 3; Fig. 4), and the 1991 year-class to be stronger relative to the 1990 and 1992 year-classes than it appears in sampling associated with the acoustic surveys (Rose 2003).

Landings from gillnets (5.5 inches and greater) were dominated by cod of ages 6 and 7 and landings from sentinel small mesh gillnets were dominated by ages 3 and 4. This corresponds to observations in many previous years (Figs. 7a,b and 20 of Lilly *et al*. 2003).

It was noted by Lilly *et al*. (2003) that the age compositions of the total landings from 1998 to 2002 illustrate the broadening of the age composition of the populations currently inshore. There had been a severe truncation of the age composition by the mid-1990s. When the index fishery opened in 1998, there were very few fish older than age 9 (the 1989 year-class). However, the 1990 and 1992 year-classes were moderately strong in the inshore and have persisted to the present, so that by 2002 there was good representation to age 12, and there were even some age 13’s. The age composition from the Smith Sound mass mortality in 2003 may be interpreted as indicating that the older (1990-1992) year-classes are even better represented in the Smith Sound overwintering aggegation than in the 2002 catch for 2J3KL as a whole. This interpretation must be treated with caution, however, because it is possible that older cod experienced higher mortality than younger cod during the Smith Sound event. At present there is insufficient additional data to inform the issue.

Earlier documents supporting the assessment of 2J+3KL cod have presented tables of catch numbers at age, catch weights-at-age, and catch biomass at age, going back to 1962 (see, for example, Tables 7-9 in Lilly *et al*. 2003). These tables are not updated in the present document, pending a decision on how best to consider the landings from the mass mortality in Smith Sound. It is not clear whether these fish should be considered catch or natural mortality.

Industry perspective

For several years, a perspective on various aspects of the sentinel survey and the commercial index fishery was available from the responses to a questionnaire prepared by the Fish, Food and Allied Workers Union (FFAW). For example, in 2001 this questionnaire was sent to the Fish Harvester Committees representing the 55 sites where a sentinel survey was conducted by the FFAW during 2000 (Jarvis and Stead 2001). In 2002 and 2003 the questionnaire was sent to all Fish Harvester committees in 2J3KL. Responses were received from about 50% of those committees in each year. Jarvis (2002) and Jarvis and Dalley (2003) provide unpublished summaries of the reponses and a compilation of the comments provided by the fish harvesters in individual communities.

A perspective on the status of northern cod in 2003 was gathered during winter 2004 in FFAW-sponsored meetings between fish harvesters and scientists and through responses to a questionnaire sent to Fish Harvester Committees by the FFAW. A report on these two exercises has not been written. It was generally agreed that the overall biomass of northern cod is significantly less than it was historically, but that cod abundance is high in some areas of the inshore. There are good signs of recruitment in almost all inshore areas.

Population indices

Bottom-trawl surveys

Survey design

Research vessel surveys have been conducted by Canada during the autumn in Divisions 2J, 3K and 3L since 1977, 1978 and 1981 respectively. No survey was conducted in Division 3L in 1984, but the results of a summer (August-September) survey in 1984 have been used for some analyses. The 1995, 2002 and 2003 autumn surveys continued into late January of the following years. Spring surveys have been conducted by Canada in Division 3L during the years 1971-1982 and 1985-present.

The autumn surveys in Divisions 2J and 3K were conducted by RV *Gadus Atlantica* until 1994. In 1995-2000 they were conducted mainly by RV *Teleost*, although RV *Wilfred Templeman* surveyed part of Division 3K. Surveys in Division 3L were conducted by RV *A.T. Cameron* (1971-1982) and RV *Wilfred Templeman* or its sister ship RV *Alfred Needler* (1985-2000 for spring and 1983-2000 for autumn). In recent years, RV *Teleost* occupied some of the 3L stations, particularly those in deep water. The surveying in Divisions 2J and 3K became increasingly complex in 2001, 2002, and 2003, with more individual trips required to complete the surveys and increased incidence of more than one ship contributing to the surveying of each Division.

During the autumn of 1995 both ships used for the first time the Campelen 1800 shrimp trawl with rockhopper footgear, replacing the Engel 145 Hi-rise trawl that had been used since the start of the surveys in 2J and 3K and since the change to the RV *Wilfred Templeman* in Division 3L. In addition, the Campelen trawl was towed at 3.0 knots for 15 min instead of 3.5 knots for 30 min. The selectivities of the two nets were found through comparative fishing experiments in 1995 and 1996 to be markedly different, with the Campelen being far more effective at catching small cod (Warren 1997; Warren *et al*. 1997). There were limited data for the comparison of larger cod. Conversion of Engel catches to Campelen equivalent catches was reported by Stansbury (1996, 1997).

The survey stratification scheme, illustrated in Fig. 5-7, is based on depth intervals intersected by lines of latitude and longitude (Doubleday 1981; Bishop 1994). The strata used in 1996 were similar to those in previous years except that the survey was extended to 1500 m and 25 new strata were added to the inshore in Divisions 3K and 3L to obtain an estimate of the cod landward of the standard survey area. The survey in 1997 was similar to that in 1996, except that some of the new inshore strata were modified and one stratum was added. The survey in 1998 was as in 1997. The survey in 1999 was as in 1997 and 1998 except that the new inshore strata were not fished. The surveys in 2000-2003 were again similar to the previous 5 years in the offshore, and the inshore strata in 3K and 3L were fished once again.

Prior to 1988, set allocation was proportional to stratum area, with the provision that each stratum be allocated at least 2 sets. In 1989 and 1990 an “adaptive design” was introduced in an attempt to minimize variance. It was found that this method introduced a bias and the additional sets fished during the second phase of these surveys have been excluded from analyses. In 1991-1994, additional sets were allocated in advance to certain strata based on past observed stratum variance (Gagnon 1991). In 1995-2003, set allocation was based once again on stratum area alone (with the provision that there be at least 2 sets in each stratum).

<u>Autumn bottom-trawl surveys</u>

Autumn abundance and biomass

Abundance and biomass have been estimated by areal expansion of the stratified arithmetic mean catch per tow (Smith and Somerton 1981). To account for incomplete coverage of some strata in some years, estimates of biomass and abundance for non-sampled strata were obtained using a multiplicative model.

Estimates of abundance and biomass from the autumn surveys in 1978-1994 (Divisions 2J and 3K) and 1981-1994 (Division 3L) may be found in Tables 12-19 of Shelton *et al*. (1996). The data from 1983 to 1994 have been converted to Campelen equivalents and are presented in this paper along with the actual Campelen data from 1995-2003. Data for Division 2J are in Tables 4-7 and data for Division 3K are in Tables 8-11. Note that data for 1993-2003 are presented separately from earlier years for Divisions 2J and 3K because of the change in stratification scheme introduced in 1993 (Bishop 1994). Estimates for surveys in Division 3L in 1983-1998 are in Tables 16-18 of Lilly *et al*. (1999). Estimates for strata <= 200 fathoms in Division 3L in 1992-2003 are in Tables 12-13 of the present paper. Estimates for strata > 200 fathoms in Division 3L in 1992-2003 are in Table 14.

Because there have been changes over time in the depths fished, annual variability in the abundance and biomass of cod has been monitored for those strata that have been fished most consistently since the start of the surveys. These "index" strata are those in the depth range 100-500 m in Divisions 2J and 3K and 55-366 m (30-200 fathoms) in Division 3L. The inshore strata fished in 1996-1998 and 2000-2002 are not included in the index. Because an index has also been calculated for the inshore strata, the former "index" will now be referred to in this paper as the "offshore index".

Changes in abundance and biomass in the offshore index strata are shown by Division for the years 1983-2003 in Fig. 8. The patterns in abundance and biomass differ in detail, reflecting changes in the relative abundance of small and large fish. Of note are the strong positive anomaly in 2J and 3K in 1986, the very large increase in 3K in 1989 and the rapid decline during the early 1990s. Abundance and biomass have remained at extremely low levels in all Divisions since 1993.

Abundance in offshore index strata declined from 1995 to 1997, increased from 1998 to 1999, remained rather stable to 2002, and declined in 2003. Biomass in offshore index strata increased from 1995 to 1997-1998, nearly doubled in 1999, remained relatively constant in 2000-2001, and declined in both 2002 and 2003. The biomass in offshore index strata in 2003 was about 13,000 t, which is about 1% of the average biomass of 1,200,000 t (in Campelen equivalents) in the period 1983-1988 (excluding the high value in 1986).

It is not known if the continuation of the surveys into January has created a bias in estimation of abundance and biomass. However, the continuation of the surveys into January does have an effect on the perceived depth distribution of fish. The number and biomass of cod taken in depths greater than 500 m were higher in 1995, 2002 and 2003, the three years in which the survey was extended into the following January (Fig. 9).

Autumn distribution

The distribution of cod at the time of the autumn surveys has been illustrated in numbers per standard tow (Shelton *et al*. 1996; Murphy *et al*. 1997) and in weight (kg) per standard tow (Lilly 1994, 1995). The catch from each tow in the period 1983-1994 has been recalculated to Campelen equivalents, and plots of these recalculated catches for 1985-1994 are illustrated in Lilly *et al*. (1999). Actual catches in 1995-2003 are presented in Fig. 10.

For the period 1981-1988, catches were widespread over the survey area (Lilly 1994). The first indication of the big changes to come occurred in 1988, when almost no fish were caught in the area of Harrison Bank in northwestern Division 2J (Lilly *et al*. 1999). Commencing in 1989 the fish in Divisions 2J and 3K became increasingly concentrated toward the edge of the bank. By 1991, concentrations on Hamilton Bank and the plateau of Grand Bank disappeared, leaving fish in inner Hawke Saddle and in the saddles between Belle Isle Bank and Funk Island Bank and between Funk Island Bank and Grand Bank. In 1992, only the concentration between Funk Island Bank and Grand Bank remained. This concentration was smaller in 1993 and disappeared in 1994.

Catches from 1995 onward tended to be very small (Fig. 10). On the southern Labrador Shelf and the Northeast Newfoundland Shelf (Div. 2J,3K) the larger catches were broadly spread, with a tendency toward occurrence off the banks. In Division 3L, catches tended to be small in 1995-1998, but somewhat larger and more broadly distributed in 1999 and 2000. In 2001, as in the previous 2 years, there was an area of aggregation on the outer shelf near the 3K/3L boundary. The pattern was similar in 2002, except that there was an aggregation a little further to the north and a little closer to the shelf break. In 2003, the distribution of catches in the area to the southeast of Funk Island Bank was similar to that in 2002, except that the catches tended to be smaller than in 2002.

As noted above, much of the 2002 survey was actually conducted during January 2003. When catches during calendar 2002 are displayed separately from those during January 2003 (Fig. 11a), it can be seen that the larger catches to the east of Funk Island Bank, near 50º N, were taken in January. These catches may have come from the same group of fish that were seen a little further to the south during 1999-2001. For the 2003 survey, most of Div. 3K and some of Div. 3L were surveyed during early 2004 (Fig. 11b). As in 2002-03, the appearance of relatively large catches to the east of Funk Island Bank may be related to the lateness of the surveying in this area. To investigate this possibility further, catches before and after January 1 during the 1995 survey are displayed in Fig. 11c, where it may be seen that the larger catches to the east of Funk Island Bank were taken after January 1. In addition, the relatively large catches along the outer flank of Hamilton Bank were taken after January 1. In summary, the degree of aggregation on the outer flanks of the banks may appear higher in years when these areas are surveyed after the end of the calendar year. This is not surprising in an historic context. Prior to the collapse of the stock, there were large winter (January-April) fisheries on overwintering aggregations along the shelf break. The extent to which the surveying after January 1 may create a bias in the population estimates remains unknown at this time.

Spring 3L bottom-trawl surveys

Spring 3L abundance and biomass

Abundance and biomass of cod in Division 3L in the spring have been estimated by areal expansion of the stratified arithmetic mean catch per tow. Estimates for the surveys from 1978 to 1995 may be found in Tables 20-21 of Shelton *et al*. (1996). The data from 1985 to 1995 have been converted to Campelen equivalents and are presented along with the actual Campelen data from 1996-1998 in Lilly *et al*. (2000). The data from 1992 to 2003 for the index strata (depths <= 366 m or 200 fathoms) are provided in Tables 15-16 of the present document. The indices declined very rapidly from 1990 to 1994 and have remained very low in subsequent surveys (Fig. 12). The biomass index in each of the most recent 3 years (2001-2003) was less than 1% of the average in the period 1986-1989.

Fishing in waters deeper than 200 fathoms started on a regular basis in 1991 (Table 17). In some years, most notably 1992, a substantial biomass was estimated to lie in these deeper strata. There may have been a large biomass in the deeper water in 1991 as well, because several sources of information indicate that cod were unusually deep in the early 1990s, and stratum 735 (201-300 fath), which was estimated to contain 50,000 t in 1992, was not fished in 1991 because of ice cover. The percentage of the total estimated biomass found in depths greater than 200 f has been as high as 92% in 1994 and as low as 2% in 1999. The values in 2001 - 2003 were 43% , 49% and 65%, respectively.

Spring 3L distribution

The distribution of cod during spring surveys in Division 3L is shown together with distribution in Divisions 3NO for the years 1984-2000 in Figs. 18-20 of Lilly *et al*. (2001). During the second half of the 1980s the spring distribution in Division 3L was similar to that observed during the autumn, in that the highest densities were generally on the plateau of the bank and along the northern and northeastern slopes of the bank. However, in some years there were also moderately large catches in the area between the northern slope and the plateau, a situation much less evident in the autumn. The spring of 1990 was unusual, in that few cod were taken on the plateau but very large catches were taken along the full length of the northeastern slope. Much of the northeastern slope could not be surveyed in 1991 because of ice cover, but catches seemed to be smaller. Catches continued to decline until 1995 when very few cod were caught.

Catch rates increased with the introduction of the Campelen trawl in 1996 (Fig. 13), but have remained far below the levels of the 1980s. Starting in 1996 the cod in 3NO appeared to be further onto the bank at the time of the surveys than they were in the early 1990s. In 1999 there was a hint, for the first time in many years, of a continuous distribution of cod from the southwestern part of 3O across the 3L/3NO boundary into the area of the Virgin Rocks. In 2000 cod were caught around the periphery of the bank, from the southernmost part of the Northeast Newfoundland Shelf in northern 3L, along the northeastern slope of Grand Bank to the Nose of the Bank, and southward to the 3L/3NO boundary. Small catches were also taken on the plateau of the bank and in the Avalon Channel. In 2001, 2002 and 2003, the distribution was similar to that in 2000, except that there appeared to be even fewer cod on the plateau of Grand Bank and in the Avalon Channel (Fig. 13b).

Sentinel Surveys

Sentinel surveys for cod were conducted by fishing enterprises operating from many communities in Divisions 2J, 3K and 3L at various times during summer and autumn 1995-2003. In 2003, there were 44 sentinel sites. This is a substantial reduction from the 64 sites that were operational in 2002. Sampling was conducted for a minimum of 10 weeks at each site.

The primary goal of these surveys when they were initiated was to obtain information on catch rates on traditional inshore fishing grounds during the moratorium. The surveys continued during the period of index/commercial fishing (1998-2002) and during 2003. The surveys have been conducted primarily with gillnets. Linetrawls have been used extensively in only a few areas, and indeed the use of linetrawls has declined over time. Handlines and cod traps have been used much less, and not at all in 2003.

Geographic variability in sentinel survey catch rates

Maddock Parsons *et al*. (2000) provided weekly average catch rates by sentinel survey site, gear and year (1995-1999). There is considerable among-site variability in the timing of fishing effort and in the seasonal and annual patterns in fishing success. Catch rates have been relatively low in 2J and in 3K north of White Bay since the start of the surveys in 1995. However, catch rates have been moderate to high in some times and places from White Bay to the southern boundary of the stock.

Maddock Parsons and Stead (2003) presented weekly average catch rates and annual relative length frequencies (number of fish at length divided by amount of gear) by NAFO division, gear and year (1995-2002).

The catch rate data were updated to 2003 by NAFO division, sentinel site, gear and year. These figures were reviewed visually but are not reproduced in the present document. In 2003, the highest catch rates generally occurred in southern Bonavista Bay and Trinity Bay in northern 3L, and in St. Mary’s Bay in southern 3L adjacent to 3Ps.

The sentinel surveys have deployed small mesh (3¼ inch) gillnets at many sites since 1996. For sites in 2J3KL combined, the catch rates of small fish (roughly 34-44 cm) were highest in 1996 and 1997, declined to a low in 1999 or 2000, and then increased to a level in 2003 that was approximately equal to that in 1996-1997.

Standardized (modelled) sentinel survey catch rates

As noted above, aging data were not employed in the current stock status update. An age-aggregated index of standardized relative abundance for cod in the inshore of 2J3KL was calculated from data gathered from sentinel fishing with gillnets and linetrawls. The catch from 2J3KL was divided into cells defined by gear type (gillnet 5½ inch and linetrawl), NAFO Division (2J, 3K, 3L), statistical unit area (e.g. 3Ki, 3Lh), year (1995-2002) and quarter.

The catch per unit effort (CPUE) data were standardised to remove site and seasonal effects. For gillnets, only sets fished during July to November with a soak time between 18 and 24 hours were included in the analysis. For linetrawl, sets fished during August to November with a soak time less than or equal to 12 hours were selected. Sets with effort and no catch were considered valid entries in the model.

A generalized linear model (McCullagh and Nelder 1989) was applied to the catch and effort data for each gear and survey method. The response distribution was specified as Poisson and the link function was chosen to be log. That is, the Poisson mean parameter μ_i is related to the linear predictor by

$$\log(\mu_i) = \mathrm{X}_i'\beta$$

where X_i is a vector of explanatory factors for catch observation *i* (i.e. month, site and year) and β is a vector of coefficients to be estimated from the data.

Thus catch is assumed to have a Poisson probability distribution with the mean μ_i related to the factors month nested within site and year by

$$\log(\mu_{jklm}) = \log(E) + \beta_{jk} + \beta_l$$

where E is an offset parameter for fishing effort and j,k,l indicate the level for each of the three factors, for example June for the factor *month*, and where

$$month_i(j) = \begin{cases} 1 \text{ if month} = j \\ 0 \text{ if month} \neq j \end{cases}.$$

Site/month combinations where no fish were landed in all years where deleted from the analysis. The model was fit using the SAS procedure GENMOD. Amount of gear is expressed as number of nets for gillnet and number of hooks for line trawl. Estimates for each year were adjusted for month nested in site effects and transformed to a linear scale to give the relative index for each year.

Additional details regarding the models (proportion of available data that was actually included, model output and residual plots) are not provided in the present paper. Such information from an earlier analysis of the 1995-1999 data are described in detail by Stansbury *et al*. (2000).

The standardized gillnet catch rates (Fig. 14) increased from 1995 to 1998, declined to 2002, and increased a little in 2003. Linetrawl catch rates showed relatively little change from 1995 to

1996, increased in 1997, and then declined to 2000. There has been variability without trend in the past few years. Recall that the linetrawl catch rates are based on relatively small sample sizes. In 2003, the point estimates of the catch rates with both gillnets and linetrawls were above the minimum levels observed during the time-series but remained at or below the levels observed when the sentinel surveys started in 1995.

It is not known if the index/commercial fishery in 1998-2002 had an influence on the sentinel catch rates. Some of the effort in the index/commercial fishery would have coincided in time with the sentinel activity at some locations and during certain time periods. In addition, much of the effort in the index/commercial fishery was prosecuted with gillnets, an important gear in the sentinel surveys. Thus, there may have been competition for fishing sites, the index/commercial fishery may have caused local depletion, and sentinel participants may have adjusted the time of their own sentinel fishing to participate in index/commercial fishing. The extent to which any of these possibilities has actually occurred has not been explored.

Hydroacoustic survey of Smith Sound

Hydroacoustic studies have been conducted in Smith Sound in western Trinity Bay at various times since the spring of 1995. The quantity of cod detected in the Sound at any specific time will depend not only on the size of the population but also the stage of the seasonal migration pattern. Fish overwinter in deep water in the Sound and some of them spawn in the Sound during the spring. Most of them move into shallow water and northward along the coast from late spring to early autumn. They then return to the Sound in late autumn or early winter.

Estimates of the biomass of cod within Smith Sound have varied considerably (Lilly *et al*. 2003). If one focuses on recent hydroacoustic surveys in January-February, the average index of biomass increased rapidly from about 15,000 t in 1999 to 26,000 t in 2001 and then declined to 23,000 t in 2002, 20,000 t in 2003 and 18,000 t in 2004 (Rose 2003; G. Rose, Memorial University of Newfoundland, St. John’s, pers. comm.). The fish sampled during the 2004 survey were of a wide size range (35-120 cm).

There are additional overwintering aggregations in inlets from western Notre Dame Bay to Trinity Bay, but there are no estimates of their size. They are thought to be much smaller than the aggregation in Smith Sound.

Outlook

The following text is taken directly from the stock status update (DFO 2004).

The outlook for the northern (2J+3KL) cod stock remains essentially unchanged from that determined during the most recent full assessment in February 2003 (DFO 2003).

The biomass of cod in the offshore remains at an extremely low level.

There are aggregations of cod in the inshore, most notably in western Trinity Bay and southern Bonavista Bay. The 2003 assessment determined that the spawner biomass of these populations increased from the mid-1990s to 1998, and then decreased as a consequence of increased fishing mortality in 1998-2002 and weaker recruitment during the mid-1990s. Recruitment improved during the late 1990’s and very early 2000s, and in February 2003 it was projected that the spawner biomass would increase during the next few years. The increased catch rates in the small-mesh sentinel surveys during 2003 and the observations of fish harvesters provide additional evidence that these year-classes are strong relative to those produced during the mid-1990s. The extent to which these year-classes survive and contribute to an increase in the inshore spawner biomass remains to be seen.

The 2003 Stock Status Report (DFO 2003) stated: “Under a precautionary approach, conservation limit reference points need to be defined to demarcate when the stock is considered to have impaired productivity and is thus in a situation in which serious harm has occurred. Northern cod productivity is impaired and serious harm has occurred.” It has not yet been possible to identify a conservation limit for the spawner stock biomass (Rivard and Rice 2003). “When the spawner biomass of the 2J3KL cod stock as a whole approaches 150,000 t, the available data will be reviewed with the objective of determining appropriate spawner biomass limit reference points in keeping with a precautionary approach. Based on historic data, it is anticipated that appropriate conservation limit reference levels will be set at levels greater than 300,000 t for the stock as a whole. Recovery of spawner biomass to this level is expected to take many years.”

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Table 1. Landings (t) of cod from NAFO Divisions 2J3KL for the period 1959-2003.

	2J				3K				3L				2J3KL			
	Offshore mobile gear		Fixed gear		Offshore mobile gear		Fixed gear		Offshore mobile gear		Fixed gear					
Year	Canada	Other	Canada	Total	Canada	Other	Canada	Total	Canada	Other	Canada	Total	Total Canada	Total Other	Total	TAC
1959	0	46372	17533	63905	0	97678	56264	153942	4515	51515	85695	141725	164007	195565	359572	
1960	1	164123	15418	179542	53	74999	47676	122728	7355	63985	94192	165532	164695	303107	467802	
1961	1	243144	17545	260690	0	64023	31159	95182	4675	73899	70659	149233	124039	381066	505105	
1962	0	226841	23424	250265	0	47015	42816	89831	4383	90276	72271	166930	142894	364132	507026	
1963	1	197868	23767	221636	0	79331	47486	126817	4446	83015	73295	160756	148995	360214	509209	
1964	13	197359	14787	212159	0	121423	40735	162158	10158	142370	75806	228334	141499	461152	602651	
1965	0	246650	25117	271767	21	50097	26467	76585	7353	130387	58943	196683	117901	427134	545035	
1966	39	226244	22645	248928	13	58907	32208	91128	8253	120206	55990	184449	119148	405357	524505	
1967	28	217255	27721	245004	114	78687	24905	103706	13478	200343	49233	263054	115479	496285	611764	
1968	4650	355108	12937	372695	1849	119778	40768	162395	15784	211808	47332	274924	123320	686694	810014	
1969	30	405231	4328	409589	56	80949	24923	105928	18255	151945	67973	238173	115565	638125	753690	
1970	0	212961	1963	214924	92	78274	21512	99878	14471	137840	53113	205424	91151	429075	520226	
1971	0	154700	3313	158013	31	61506	21111	82648	11976	148766	38115	198857	74546	364972	439518	
1972	0	149435	1725	151160	7	133369	14054	147430	4380	109052	46273	159705	66439	391856	458295	
1973	1123	52985	3619	57727	108	159653	13190	172951	1258	97734	24839	123831	44137	310372	354509	666000
1974	0	119463	1804	121267	19	149189	10747	159955	880	67918	22630	91428	36080	336570	372650	657000
1975	410	78578	3000	81988	189	112678	15518	128385	670	53770	22695	77135	42482	245026	287508	554000
1976	94	30691	3851	34636	771	79540	20879	101190	2187	40998	35209	78394	62991	151229	214220	300000
1977	525	39584	3523	43632	1051	26776	28818	56645	5362	26799	40282	72443	79561	93159	172720	160000
1978	4682	17546	6638	28866	7027	6373	29623	43023	9213	12263	45194	66670	102377	36182	138559	135000
1979	9194	6537	8445	24176	21572	16890	27025	65487	14184	12693	50359	77236	130779	36120	166899	180000
1980	13592	7437	17210	38239	21920	6830	37015	65765	15523	13963	42298	71784	147558	28230	175788	180000
1981	22125	4760	14251	41136	23112	3847	23002	49961	21754	15070	42827	79651	147071	23677	170748	200000
1982	58384	8923	14429	81736	8881	4074	42141	55096	27181	9271	56490	92942	207506	22268	229774	230000
1983	37276	4158	10748	52182	31621	2815	40683	75119	39123	10920	55001	105044	214452	17893	232345	260000
1984	9231	2782	13150	25163	48114	11059	35143	94316	47668	15973	49351	112992	202657	29814	232471	266000
1985	1466	78	10211	11755	68880	12945	30368	112193	36863	31176	39306	107345	187094	44199	231293	266000
1986	5734	7859	12916	26509	62086	5781	28384	96251	57805	53946	32202	143953	199127	67586	266713	266000
1987	39344	3999	16022	59365	39686	6160	27442	73288	44612	25916	36743	107271	203849	36075	239924	256000
1988	41468	9	17112	58589	40260	50	33820	74130	57805	26748	51405	135958	241870	26807	268677	266000
1989	33626	1003	23304	57933	37350	1179	20711	59240	40958	36621	59238	136817	215187	38803	253990	235000
1990	17883	183	14505	32571	26920	504	27516	54940	31187	25488	75266	131941	193277	26175	219452	199262

cont'd

Table 1 (cont'd)

	2J				3K				3L				2J3KL			
	Offshore mobile gear		Fixed gear		Offshore mobile gear		Fixed gear		Offshore mobile gear		Fixed gear					
Year	Canada	Other	Canada	Total	Canada	Other	Canada	Total	Canada	Other	Canada	Total	Total Canada	Total Other	Total	TAC
1991	621	82	2214	2917	30112	311	13332	43755	30264	49660 [2]	45416 [3]	125340	121959	50053	172012	190000
1992	0	0	18	18	584	273	884	1741	13627	14610 [4]	10960 [5]	39197	26073	14883	40956	0
1993	0	0	13	13	0	0	541	541	2	2425 [6]	8411 [7]	10838	8967	2425	11392	0
1994	0	0	9	9	0	0	368	368	0	1	936	937	1313	1	1314 [8]	0
1995	0	0	0	0	0	0	94	94	0	0	237	237	331	0	331 [9]	0
1996	0	0	3	3	0	0	739	739	1	1	655	656	1398	1	1398 [10]	0
1997	0	0	3	3	0	0	159	159	4	0	339	343	505	0	505	0
1998	0	0	16	16	0	0	1993	1993	1	6	2490	2497	4501	0	4507	4000
1999 [1]	0	0	36	36	0	0	3644	3644	0	1	4792	4793	8472	1	8473	9000
2000 [1]	0	0	5	5	0	0	1459	1459	13	54	3888	3955	5365	54	5419	7000
2001 [1]	0	0	21	21	0	0	1735	1736	7	82	5124	5212	6887	82	6969	5600
2002 [1]	0	0	13	13	0	0	647	647	3	50	3533	3586	4196	50	4246	5600
2003 [1]	0	0	2	2	0	0	29	29	3		937 [11]	940	971		971	0

[1] Provisional catches.
[2] Includes French catch and other foreign catch as estimated by Canadian surveillance.
[3] Figure is 4000 t less than Canadian statistics (this quantity is considered 3NO catch misreported as 3L).
[4] Derived from reported catch and Canadian surveillance estimate of foreign catch.
[5] Includes 5000 t catch from the recreational fishery after the moritorium was declared.
[6] Canadian surveillance estimate of foreign catch .
[7] Includes 5053 t estimated for the recreational fishery additional to that recorded by Canadian statistics.
[8] 1300 t is from the food fishery; the remainder is bycatch
[9] Includes 163 t caught in the sentinel survey and 168 t caught as bycatch.
[10] Comprises a sentinel survey catch of 397 t, a food fishery catch of 962 t and bycatch of 142 t. However, 103 t of sentinel catch remains to be allocated by division and gear.
[11] 780 t of this catch was the result of a mass mortality in Smith Sound

Table 2. Fixed gear landings (t) by Division and gear type in Divisions 2J, 3K and 3L in 1975-2003. Landings from statistical areas other than Newfoundland and Labrador are not included.

	2J					3K					3L					2J3KL
Year	Trap	GN	LL	HL	Total	Trap	GN	LL	HL	Total	Trap	GN	LL	HL	Total	Total
1975	642	2304	0	54	3000	4662	8645	565	1646	15518	10390	7552	1641	3112	22695	41213
1976	1022	2787	6	36	3851	7056	10666	718	2439	20879	18404	9066	2904	4835	35209	59939
1977	1285	2076	37	125	3523	11501	11611	1294	4412	28818	20988	8852	3591	6851	40282	72623
1978	2872	3376	55	335	6638	11329	11445	3647	3202	29623	23218	9023	5114	7839	45194	81455
1979	1333	5663	175	1274	8445	3532	11474	8414	3605	27025	20785	13488	7022	9064	50359	85829
1980	4679	11414	204	913	17210	12732	13549	8059	2675	37015	12871	11231	9394	8802	42298	96523
1981	3893	10105	72	181	14251	3952	10679	6360	2011	23002	10177	13579	11425	7646	42827	80080
1982	4464	9121	114	730	14429	16415	17571	6101	2054	42141	24248	20295	5704	6243	56490	113060
1983	3870	4854	842	1182	10748	10490	18305	2560	9328	40683	25690	16446	3834	9031	55001	106432
1984	5618	6116	379	1037	13150	9957	14362	2499	8325	35143	23103	14985	3824	7439	49351	97644
1985	4973	2992	252	1994	10211	13310	8082	2352	6624	30368	21594	8760	3245	5707	39306	79885
1986	4373	7804	109	630	12916	14555	7626	1555	4648	28384	15669	9865	2492	4176	32202	73502
1987	5158	9228	218	1418	16022	11278	10223	1590	4351	27442	11370	17419	3338	4616	36743	80207
1988	5907	9183	272	1750	17112	16261	11898	935	4726	33820	22148	18576	4004	6677	51405	102337
1989	6713	14846	290	1455	23304	8189	7921	700	3901	20711	23964	22231	4676	8367	59238	103253
1990	3616	9364	653	872	14505	11201	7726	3838	4751	27516	32158	28936	4545	9627	75266	117287
1991	1016	271	93	834	2214	7696	1384	1851	2401	13332	26524	11696 [2]	1247	5949	45416 [2]	60962
1992	0	0	2	16	18	27	103	9	745	884	1173	1131	16	8640 [3]	10960 [3]	11862
1993	0	0	1	12	13	3	37	9	492	541	11	93	80	8227 [3]	8411 [3]	8965
1994	0	0	0	9	9	0	8	0	359	367	6	38	22	870	936	1312
1995	<1	<1	0	0	0	13	52	28	2	95	12	176	33	16	237	332
1996	0	0	0	3	3	25	132	17	565	740	18	219	15	404	656	1500 [4]
1997	0	3	0	0	3	22	101	34	1	159	33	257	29	21	339	501
1998	0	3	5	8	16 0	24	1081	245	644	1994	31	1377	284	798	2490	4501
1999 [1]	0	21	3	12	36	4	3030	106	503	3644	4	4310	60	419	4792	8472
2000 [1]	0	4	0	1	5	15	1126	43	275	1459	63	2954	189	684	3891	5354
2001 [1]	0	3	1	17	21	28	796	90	822	1735	175	2844	110	1994	5124	6880
2002 [1]	0	7	0	6	13	2	272	30	342	647	128	2517	30	858	3533	4193
2003 [1]	0	2	0	0	2	0	25	4	0	29	0	152	4	781 [5]	937	968

[1] Provisional catches.

[2] Catch is 4000 (t) less than Canadian statistics as this quantity is considered 3NO gillnet catch misreported in 3L.

[3] Estimate for recreational fishery has been reported as 3L Handline.

[4] Comprised of sentinel survey catch of 294 t, a food fishery catch of 1155 t and by-catch 142 t.
An amount of 103 t must still be allocated by gear type and division from the sentinel catches.

[5] 780t of this catch was the result of a mass mortality in Smith Sound. (Actual gear used was gaff or dip net).

Table 3. Estimated average weight (kg), length (cm) and number (plus standard error and coefficient of variation) of the 2003 catch at age, for all gears combined and for individual gears. The landings from the Smith Sound mass mortality are shown separately.

AGE	WEIGHT (kg.)	LENGTH (cm.)	NUMBER (000'S)	STD ERR.	CV
All gears combined					
1			0.0		
2	0.31	33.15	0.2	0.03	
3	0.50	38.62	9.4	0.17	
4	0.82	45.09	11.1	1.18	0.11
5	1.41	53.91	18.8	2.14	0.11
6	2.03	60.99	53.4	4.94	0.09
7	2.54	65.27	44.1	5.46	0.12
8	3.03	69.44	27.7	4.58	0.17
9	3.64	73.01	22.3	4.99	0.22
10	4.36	77.66	9.5	3.22	0.34
11	4.91	81.10	32.3	5.44	0.17
12	5.72	85.05	20.3	4.39	0.22
13	5.92	85.98	26.8	4.88	0.18
14	6.07	85.99	6.7	2.74	0.41
15	5.38	83.92	3.0	1.71	0.58
16			0.0		
17	6.90	91.00	0.0		
18			0.0		
Total			285.4		
Smith Sound mass mortality (gaff and dipnet)					
1			0.0		
2			0.0		
3			0.0		
4	0.91	47.02	2.5	1.15	0.47
5	1.18	51.11	7.3	2.07	0.28
6	1.96	60.33	25.2	4.86	0.19
7	2.59	65.58	27.0	5.40	0.20
8	3.05	69.70	21.7	4.55	0.21
9	3.64	73.06	19.6	4.97	0.25
10	4.37	77.77	8.3	3.21	0.39
11	4.88	80.95	30.5	5.42	0.18
12	5.70	84.94	19.0	4.38	0.23
13	5.92	85.99	25.7	4.87	0.19
14	6.07	85.94	6.4	2.73	0.43
15	5.36	83.83	2.9	1.71	0.58
16			0.0		
17			0.0		
18			0.0		
Total			196.1		

(cont'd)

Table 3 (cont'd) Estimated average weight (kg), length (cm) and number (plus standard error and coefficient of variation) of the 2003 catch at age, for all gears combined and for individual gears. The landings from the Smith Sound mass mortality are shown separately.

	WEIGHT	LENGTH	NUMBER		
AGE	(kg.)	(cm.)	(000'S)	STD ERR.	CV
Gillnet					
1			0.0		
2	0.32	33.43	0.2		
3	0.48	38.32	8.1	0.16	
4	0.76	43.67	5.7	0.19	0.03
5	1.60	56.22	9.5	0.51	0.05
6	2.10	61.63	27.4	0.79	0.03
7	2.47	64.86	16.5	0.69	0.04
8	2.97	68.54	5.8	0.39	0.07
9	3.63	72.69	2.5	0.24	0.10
10	4.29	76.99	1.1	0.12	0.10
11	5.52	83.73	1.7	0.15	0.09
12	6.08	86.68	1.2	0.13	0.11
13	5.83	85.73	1.1	0.10	0.09
14	6.13	87.34	0.2	0.07	
15	6.97	90.95	0.0	0.01	0.35
16			0.0		
17	6.90	91.00	0.0		
18			0.0		
Total			80.8		
Gillnet (small mesh - sentinel)					
1			0.0		
2	0.32	33.63	0.1		
3	0.48	38.31	7.3	0.15	0.00
4	0.63	41.36	4.0	0.14	0.04
5	1.08	49.18	1.3	0.06	0.04
6	1.58	55.89	0.6	0.03	0.04
7	1.95	59.91	0.2	0.01	0.07
8	2.33	62.74	0.0	0.00	0.12
9	2.83	66.78	0.0	0.00	0.23
10	4.15	76.83	0.0	0.00	0.25
11	3.91	73.75	0.0	0.00	0.24
12	4.75	80.22	0.0	0.00	0.33
13	5.17	82.53	0.0	0.00	0.33
14	5.38	83.80	0.0	0.00	
15			0.0		
16			0.0		
17	6.90	91.00	0.0		
18			0.0		
Total			13.5		

Table 4. Estimates of cod abundance (thousands) from surveys in Division 2J in 1983-1992, in Campelen equivalent units.

Stratum depth (meters)	Stratum number	Area sq. nautical miles	Gadus 86-88 1983	Gadus 101-102 1984	Gadus 116-118 1985	Gadus 131-132 1986	Gadus 145-146 1987	Gadus 159-160 1988	Gadus 174-176 1989	Gadus 190-191 1990	Gadus 208-209 1991	Gadus 224-226 1992
	Mean survey date		5-Nov-83	5-Nov-84	30-Oct-85	11-Nov-86	6-Nov-87	14-Nov-88	10-Nov-89	12-Nov-90	14-Nov-91	5-Nov-92
101-200	201	1427	87811	52543	82806	99720	25126	319	0	0	0	0
	205	1823	122517	182501	48964	44029	34532	38745	502	1223	0	0
	206	2582	55637	142654	68017	134937	17607	83620	48332	2874	3197	3339
	207	2246	145830	101693	171902	37826	38648	45550	9825	15492	0	1545
201-300	202	440	5387	8111	4086	31746	7838	1025	0	0	0	0
	209	1608	108766	14599	39668	142610	48249	47602	140710	8590	9006	2522
	210	774	389901	16929	772	97706	479	10221	43414	34603	24230	2783
	213	1725	62645	33648	67470	102247	36569	43632	183006	89430	25390	1948
	214	1171	18102	112678	78314	157299	128223	115524	70582	18267	2942	897
	215	1270	25616	42569	26380	293011	27603	90521	1689	9434	2271	2114
	228	1428	22525	8643	2582	61157	4153	6679	14364	15813	154727	1964
	234	508	50198	16841	11926	22187	6825	2690	0	0	0	256
301-400	203	480	990	1552	638	5745	3962	5910	0	0	66	110
	208	448	5947	760	4622	9768	12572	1849	53462	8012	986	2465
	211	330	4698	908	2361	4880	4835	6945	35386	23197	67475	8058
	216	384	18	740	396	317	9720	1347	2562	872	687	106
	222	441	0	20	698	61	849	182	33214	4853	1597	364
	229	567	6357	208	3536	1872	338	1222	6214	5577	11518	1508
401-500	204	354	1704	5235	0	1802	1242	5405	268	146	0	162
	217	268	0	38	0	0	184	0	0	0	74	0
	227	686	47	0	0	157	236	252	3350	18150	6810	582
	235	420	9620	404	144	0	780	462	664	3178	12537	212
total strata fished <= 500 meters			1124316	743236	615282	1249077	410570	508714	647594	260268	323637	30960
1 STD strata fished <= 500 meters			320612	112688	88262	261581	66519	74633	112157	45978	165231	5287
501-750	212	664	0	91	23	761	365	548	206	3562	41423	274
	218	420	0	**nf**	0	0	0	0	0	0	0	0
	224	270	0	0	0	0	0	0	0	0	130	0
	230	237	0	0	0	0	0	98	0	978	0	0
501-750		1591	0	91 [1]	23	761	365	646	206	4540	41553	274
751-1000	219	213	0	**nf**	0	0	0	0	0	0	0	0
	231	182	0	0	0	0	0	0	**nf** [1]	0	0	325
	236	122	0	0	0	34	0	0	**nf** [1]	0	0	0
751-1000		517	0	0	0	34	0	0	0 [1]	0	0	325
total strata fished > 500 meters			0	91	23	795	365	646	206	4540	41553	599
total all strata fished			1,124,317	743,328	615,304	1,249,871	410,936	509,360	647,797	264,807	365,191	31,560
1 STD all strata fished			320612	112687	88263	261582	66519	74635	112159	46014	170124	5304
mean number per tow			345.328	237.344	188.987	383.891	126.217	159.411	201.556	81.334	112.166	9.693

[1] Not all strata in the depth range have been fished. Strata not fished in the <= 500 meter depth range have been filled using a multiplicative model using data to 1992. Std are for strata fished in the depth range.

Table 5. Estimates of cod biomass (t) from surveys in Division 2J in 1983-1992, in Campelen equivalent units.

Stratum depth (meters)	Stratum number	Area sq. nautical miles	Gadus 86-88 1983	Gadus 101-102 1984	Gadus 116-118 1985	Gadus 131-132 1986	Gadus 145-146 1987	Gadus 159-160 1988	Gadus 174-176 1989	Gadus 190-191 1990	Gadus 208-209 1991	Gadus 224-226 1992
Mean survey date			5-Nov-83	5-Nov-84	30-Oct-85	11-Nov-86	6-Nov-87	14-Nov-88	10-Nov-89	12-Nov-90	14-Nov-91	5-Nov-92
101-200	201	1427	61842	41743	58556	88676	27395	208	0	0	0	0
	205	1823	53701	95026	30679	38754	31421	61555	691	182	0	0
	206	2582	33286	121643	49111	123683	16999	92563	38555	661	1333	1489
	207	2246	46134	55054	107180	25989	36773	18803	2352	6370	0	649
201-300	202	440	8365	7647	3064	32711	11398	1874	0	0	0	0
	209	1608	127333	17017	35398	119210	56901	28242	52339	1670	3966	990
	210	774	241006	21752	1521	87332	737	10667	36642	12536	13406	1116
	213	1725	50086	27703	55229	98497	41997	53146	120476	34360	11859	587
	214	1171	19316	104048	77051	189715	170212	137161	56924	13766	1018	399
	215	1270	30986	31690	30602	379256	36553	146322	315	8508	1073	760
	228	1428	8049	7695	1244	52833	4800	10296	12552	8973	65772	672
	234	508	16910	11930	9173	22705	7342	5157	0	0	0	68
301-400	203	480	2250	3445	582	7875	6300	9640	0	0	45	77
	208	448	7465	1115	4301	8575	16641	3653	22845	3699	455	1091
	211	330	6334	1570	3287	4661	7667	7283	56896	10465	35048	3629
	216	384	52	1592	429	435	13557	2201	3178	255	287	25
	222	441	0	32	784	59	1192	247	9028	2559	579	175
	229	567	2354	263	3823	2399	340	1889	6166	4265	4906	595
401-500	204	354	2458	5863	0	2174	1732	8318	36	37	0	48
	217	268	0	60		0	211	0	0	0	45	0
	223	180	0	0	0	0	0	57	23	212	107	13
	227	686	217	0	0	224	341	353	5407	17904	4643	311
	235	420	4348	332	133	0	1090	717	962	1930	5594	101
total strata fished <= 500 meters			722492	557160	472147	1285763	491599	598478	425387	128352	150136	12795
1 STD strata fished <= 500 meters			177183	83218	65293	325107	31381	97959	218324	25701	72612	2315
501-750	212	664	0	**nf**	0	0	0	0	0	2196	20693	159
	218	420	0	0	0	0	0	0	0	0	62	0
	224	270	0	0	0	0	0	193	0	0	0	0
	230	237	0	0	0	0	0	0	0	1395	0	0
501-750		1591	0	0 [1]	0	0	0	193	0	3591	20755	159
751-1000	219	213	0	nf	0	0	0	0	0	0	0	0
	231	182	0	0	0	0	0	0	**nf**	0	0	144
	236	122	0	0	0	62	0	0	**nf**	0	0	0
751-1000		517	0	0	0	62	0	0	0 [1]	0	0	144
total strata fished > 500 meters			0	0	0	62	0	193	0	3591	20755	303
total all strata fished			722491	557302	472214	1287042	492144	599436	425874	131943	170892	13096
1 STD all strata fished			177183	83218	65293	325108	84935	97963	85921	25746	74135	2326

[1] Not all strata in the depth range have been fished. Strata not fished in the <= 500 meter depth range have been filled using a multiplicative model using data to 1992. Std are for strata fished in the depth range.

Table 6. Estimates of cod abundance (thousands) from surveys in Division 2J in 1993-2003, in Campelen equivalent units for 1993 and 1994 and actual Campelen units for 1995-2003.

Stratum depth (meters)	Stratum number	Area sq. nautical miles	GADUS 236-238 1993	GADUS 250-252 1994	TELEOST 20-23 1995-6	TELEOST 39 1996	TELEOST 54-54 1997	TELEOST 72-73 1998	TELEOST 86-88 1999	TELEOST 340-343 2000	TEL 361 AN 399-400 2001	TEL 415,454, TEL457 2002-3	Teleost 509-510 2003-4
Mean survey date			7-Nov-93	17-Nov-94	28-Dec-95	30-Oct-96	27-Oct-97	27-Oct-98	13-Nov-99	7-Nov-00	28-Nov-01	24-Dec-02	8-Dec-03
101-200	201	633	0	0	nf	0	0	44	44	0	0	0	44
	205	1594	63	219	nf	110	110	32	37	37	37	0	0
	206	1870	547	0	0	184	257	294	110	115	171	37	110
	207	2246	2128	2699	350	588	138	751	666	1280	447	1032	1122
	237	733	151	0	273	134	0	34	0	101	25	307	2041
	238	778	nf	0	nf	107	36	0	0	0	36	0	306
201-300	202	621	0	0	49	0	0	0	0	0	0	0	0
	209	680	374	514	327	249	62	243	374	187	28	218	258
	210	1035	5731	854	1424	320	214	178	854	676	261	269	473
	213	1583	871	0	2504	835	1085	871	290	1161	416	954	1327
	214	1341	1771	338	323	959	406	451	221	517	823	833	148
	215	1302	1719	358	90	2917	1381	498	788	609	191	466	1197
	228	2196	436	0	949	2068	1347	2001	868	944	1847	1729	874
	234	530	0	0	nf	73	142	36	32	36	36	146	0
301-400	203	487	0	301	0	335	234	67	100	0	0	33	0
	208	588	0	162	809	566	0	40	40	335	144	0	352
	211	251	414	322	708	483	0	192	383	533	78	72	104
	216	360	0	173	927	715	99	74	275	198	303	297	57
	222	450	279	846	495	543	1021	272	371	495	954	836	340
	229	536	590	295	627	946	205	74	442	184	1180	885	442
401-500	204	288	0	0	16	20	0	0	14	0	0	20	0
	217	241	66	55	561	63	0	166	33	33	15	715	38
	223	158	0	0	880	91	54	19	0	**nf**	0	73	54
	227	598	795	0	370	1207	41	247	0	55	0	329	0
	235	414	1044	1006	541	101	85	85	0	0	0	159	28
	240	133	9	0	123	9	18	0	128	18	42	125	0
total strata fished <= 500 meters			16989	8145	12346	13625	6936	6669	6074	7516	7033	9534	9315
upper			28803	16368	16367	17716	9046	8575	8163	10007	9222	12588	13125
t-value			2.571	3.182	2.228	2.179	2.11	2.07	2.18	2.2	2.14	2.09	2365
1STD strata fished <= 500 meters			4595	2584	1805	1877	1000	921	958	1132	1023	1461	2
501-750	212	557	77	128	69	136	77	0	0	38	0	72	82
	218	362	0	50	1660	75	0	0	0	0	0	100	0
	224	228	0	0	596	0	0	0	42	0	0	233	47
	230	185	0	34	13	0	0	0	13	13	0	480	0
	239	120	17	17	0	8	7	0	0	0	7	8	0
751-1000	219	283	0	0	0	0	0	0	0	0	0	0	0
	231	186	0	0	0	0	0	0	0	0	0	0	0
	236	193	0	0	12	0	0	0	0	0	0	0	0
1001-1250	220	330	**nf**	**nf**	**nf**	0	0		**nf**		0	0	0
	225	195	**nf**	**nf**	**nf**	0	0		0		0	0	0
	232	228	**nf**	**nf**	**nf**	0	0		0		0	0	0
1001-1250[1]		753	**nf**	**nf**	**nf**	0	0	0	0	0	0	0	0
1251-1500	221	330	**nf**	**nf**	**nf**	0	0		0	0	0	0	0
	226	201	**nf**	**nf**	**nf**	0	0		0	0	0	0	0
	233	237	**nf**	**nf**	**nf**	0	0		0	0	0	0	0
1251-1500[1]		768	**nf**	**nf**	**nf**	0		0	0		0		
total strata fished > 500 meters			94	229	2350	219	84	0	55	51	7	893	129
total all strata fished			17082	8373	14654	13844	7020	6636	6129	7567	7040	10427	9445
upper			28898	16608	19098	17946	9136	8538	8220	10060	9230	13495	13254
t-value			2.571	3.182	2.16	2.179	2.11	2.07	2.18	2.2	2.14	2.09	2.365
1 STD all strata fished			4596	2588	2057	1883	1003	919	959	1133	1023	1468	1611

[1] Not all strata in the depth range have been fished . Because of the short time series with the revised stratification scheme and a switch in 1995 to a different vessel and gear no attempt has been made to use a multiplicative model to fill strata which were not fished.

Table 7. Estimates of cod biomass (t) from surveys in Division 2J in 1993-2003, in Campelen equivalent units for 1993 and 1994 and actual Campelen units for 1995-2003.

Stratum depth (meters)	Stratum number	Area sq. nautical miles	GADUS 236-238 1993	GADUS 250-252 1994	TELEOST 20-23 1995-6	TELEOST 39 1996	TELOST 54-55 1997	TELOST 72-73 1998	TELOST 86-88 1999	TELEOST 340-343 2000	TEL 361 AN 399-400 2001	TEL 415,454, TEL457 2002-3	Teleost 509-510 2003-4
Mean survey date			7-Nov-93	17-Nov-94	28-Dec-95	30-Oct-96	27-Oct-97	27-Oct-98	13-Nov-99	7-Nov-00	28-Nov-01	24-Dec-02	8-Dec-03
101-200	201	633	0	0	nf	0	0	30	6	0	0	0	44
	205	1594	63	151	nf	16	42	5	4	42	41	0	0
	206	1870	155	0	0	62	125	186	24	47	90	20	7
	207	2246	452	507	44	57	110	406	156	220	107	26	204
	237	733	83	0	13	8	0	2	0	3	8	2	23
	238	778	nf	0	nf	21	27	0	0	0	11	0	2
201-300	202	621	0	0	9	0	0	0	0	0	0	0	0
	209	680	100	67	52	20	44	162	86	60	7	56	82
	210	1035	1158	139	108	26	112	98	168	271	77	72	121
	213	1583	346	0	336	214	586	639	180	398	208	389	715
	214	1341	700	174	39	273	186	289	127	303	355	460	122
	215	1302	443	210	21	959	586	404	625	436	88	371	646
	228	2196	294	0	263	665	747	1258	280	433	514	613	329
	234	530	0	0	nf	22	83	3	1	3	17	31	0
301-400	203	487	0	220	0	136	157	67	107	0	0	23	0
	208	588	0	41	123	200	0	4	12	268	63	0	149
	211	251	241	110	141	81	0	139	71	208	36	17	27
	216	360	0	96	234	194	54	73	82	95	148	134	33
	222	450	146	276	124	290	495	194	200	193	363	374	257
	229	536	109	124	184	305	138	54	172	63	469	339	216
401-500	204	288	0	0	1	8	0	0	19	0	0	25	0
	217	241	67	19	135	26	0	177	14	7	10	401	37
	223	158	0	0	135	32	35	25	0	**nf**	0	47	43
	227	598	441	0	109	748	33	197	0	23	0	146	0
	235	414	318	559	175	84	30	71	0	0	0	58	8
	240	133	13	0	68	2	19	0	192	10	32	77	0
total strata fished <= 500 meters			5129	2693	2312	4261	3609	4483	2527	3082	2646	3680	3065
upper			7096	3824	2905	6472	4574	5924	4023	4171	3345	4790	4226
t-value			2.228	2.201	2.179	2.776	2.086	2.08	2.45	2.23	2.09	2.13	2.262
1STD strata fished <= 500 meters			883	514	272	796	463	693	611	488	334	521	513
501-750	212	557	93	89	15	22	49	0	0	10	0	45	115
	218	362	0	51	519	12	0	0	0	0	0	77	0
	224	228	0	0	205	0	0	0	45	0	0	152	68
	230	185	0	32	14	0	0	0	18	6	0	307	0
	239	120	17	11	0	2	3	0	0	0	1	7	0
751-1000	219	283	0	0	0	0	0	0	0	0	0	0	0
	231	186	0	0	0	0	0	0	0	0	0	0	0
	236	193	0	0	2	0	0	0	0	0	0	0	0
1001-1250	220	330	**nf**	**nf**	**nf**	0	0	0	**nf**	0	0	0	0
	225	195	**nf**	**nf**	**nf**	0	0	0	0	0	0	0	0
	232	228	**nf**	**nf**	**nf**	0	0	0	0	0	0	0	0
1001-1250[1]		753	**nf**	**nf**	**nf**	0	0	0	0	0	0		
1251-1500	221	330	**nf**	**nf**	**nf**	0	0	0	0	0	0	0	0
	226	201	**nf**	**nf**	**nf**	0	0	0	0	0	0	0	0
	233	237	**nf**	**nf**	**nf**	0	0	0	0	0	0	0	0
1251-1500[1]		768	**nf**	**nf**	**nf**	0	0	0	0	0	0		
total strata fished > 500 meters			110	183	755	36	52	0	63	16	1	588	183
total all strata fished			5238	3448	3067	4484	3662	4483	2590	3098	2647	4270	3248
upper			7217	4019	3927	6621	4629	5924	4091	4187	3346	5387	4411
t-value			2.228	2.179	2.262	2.776	2.08	2.08	2.45	2.23	2.09	2.12	2.262
1 STD all strata fished			888	262	380	770	465	693	613	488	334	527	514

[1] Not all strata in the depth range have been fished . Because of the short time series with the revised stratification scheme and a switch in 1995 to a different vessel and gear no attempt has been made to use a multiplicative model to fill strata which were not fished.

Table 8. Estimates of cod abundance (thousands) from surveys in Division 3K in 1983-1992, in Campelen equivalent units.

Stratum depth (meters)	Stratum number	Area sq. nautical miles	GADUS 87-88 1983	GADUS 101-103 1984	GADUS 117-118 1985	GADUS 131-132 1986	GADUS 146-147 1987	GADUS 160-161 1988	GADUS 175-176 1989	GADUS 191-192 1990	GADUS 209-210 1991	GADUS 224-226 1992
Mean survey date			26-Nov-83	23-Nov-84	18-Nov-85	1-Dec-86	27-Nov-87	5-Dec-88	5-Dec-89	4-Dec-90	4-Dec-91	26-Nov-92
101-200	618	1455	**17028**	24569	26453	64689	14954	57577	14811	13210	721	1268
	619	1588	**3835**	9955	1155	17476	6826	19598	63705	2578	0	218
201-300	620	2709	126888	110535	4685	135397	32793	100337	253826	11304	3780	2236
	621	2859	33593	32109	8338	27811	16059	32525	44025	14230	2517	131
	624	668	10016	9786	2550	2573	1746	3982	4901	24948	7076	735
	632	447	30765	**9851**	4591	4735	7410	51959	4888	22044	10336	1438
	634	1618	61564	31160	29182	323578	60702	21441	269092	4610	99321	694
	635	1274	7711	29442	4682	14225	3593	9534	5934	3505	1490	701
	636	1455	8807	17788	3828	21566	6777	12743	13850	715	1134	133
	637	1132	31704	73889	15928	46132	15805	24915	13766	6634	5320	156
301-400	623	1027	29291	51057	3697	4026	11782	23649	102872	50690	3155	5557
	625	850	4677	1988	7156	3196	11400	5554	21251	11693	1676	546
	626	919	6953	3266	2705	62324	5815	5006	12566	9260	1264	632
	628	1085	7935	4670	6617	2687	1582	18448	12575	5522	9303	4179
	629	495	2357	2557	1647	5720	938	7276	3135	6521	978	1853
	630	544	1497	2170	262	262	524	524	7009	1085	499	150
	633	2179	15312	21312	38293	96780	49404	15737	220703	243039	185926	7410
	638	2059	53867	17476	37259	36467	24472	23650	137139	360185	200000	7511
	639	1463	12449	5283	8780	15127	5980	12176	19270	52757	91771	2262
401-500	622	632	304	1434	283	1652	174	3188	21561	12476	1449	1594
	627	1194	1032	1038	372	4658	2633	1173	10505	85313	4506	3692
	631	1202	1025	33	472	207	3059	6063	42471	28964	15157	992
	640	198	194	0	9	14	0	109	2982	150	1970	17459
	645	204	0	0	9	**90**	112	28	4686	379	0	75
total strata fished <=500 meters			447748	451517	208952	891302	284541	457191	1307523	971810	649350	61622
1 STD strata fished <=500 meters			61132	68574	27228	321032	44267	73335	270219	184614	159892	17726
501-750[1]		917	0	0	0	**nf**	107	**nf**	**nf**	92	122	263
751-1000[1]		1340	**nf**	**nf**	0	**nf**	**nf**	**nf**	**nf**	128	56	0
total strata fished > 500 meters			0	0	0	0	107	0	0	220	178	263
total all strata fished			447748	451517	208952	891302	284648	457191	1307523	972029	649529	61886
1 STD all strata fished			61132	68574	27228	321032	44267	73335	270219	184614	159892	17726

[1] Not all strata in the depth range have been fished. Strata not fished in the <= 500 meter depth range have been filled using a multiplicative model using data to 1992. Std are for strata fished in the depth range.

Table 9. Estimates of cod biomass (t) from surveys in Division 3K in 1983-1992, in Campelen equivalent units.

Stratum depth (meters)	Stratum number	Area sq. nautical miles	GADUS 87-88 1983	GADUS 101-103 1984	GADUS 117-118 1985	GADUS 131-132 1986	GADUS 146-147 1987	GADUS 160-161 1988	GADUS 175-176 1989	GADUS 191-192 1990	GADUS 209-210 1991	GADUS 224-226 1992
Mean survey date			26-Nov-83	23-Nov-84	18-Nov-85	1-Dec-86	27-Nov-87	5-Dec-88	5-Dec-89	4-Dec-90	4-Dec-91	26-Nov-92
101-200	618	1455	**7987**	18702	24894	53641	10200	2443	1575	1514	261	450
	619	1588	**1491**	4801	1113	3157	2538	1212	3363	154	0	119
201-300	620	2709	67557	87523	8223	131461	27088	13232	24447	1636	1158	847
	621	2859	18041	25813	6216	19356	3294	11590	7313	1021	359	194
	624	668	3920	3082	2340	2798	802	3087	1660	8649	3809	331
	632	447	33968	**10779**	4106	4540	7824	51549	2030	8677	5581	663
	634	1618	56301	24843	28663	436500	80357	19008	322401	1976	77639	450
	635	1274	4940	11970	3551	16754	3329	3843	2609	998	617	319
	636	1455	11657	13899	3977	13264	5871	9229	3577	431	334	138
	637	1132	36769	75369	15341	50718	15913	29982	13010	2665	2332	85
301-400	623	1027	23690	46679	5155	4602	17254	3662	22849	12857	1130	1960
	625	850	5410	2474	7062	3405	11136	5766	12105	4049	861	291
	626	919	5565	3377	4274	41267	4852	1188	5858	718	345	218
	628	1085	8807	4909	7807	2564	1484	7998	7102	2184	4028	1345
	629	495	2506	1739	955	5557	907	1391	1550	2003	95	535
	630	544	1452	1564	435	292	743	863	9065	644	267	85
	633	2179	15440	23201	39817	115810	66782	15297	148660	169097	132091	4366
	638	2059	56662	12773	35965	37822	31829	18946	184194	353107	150413	3564
	639	1463	17739	5242	8657	14185	6332	7526	7803	24244	74514	941
401-500	622	632	541	1487	215	1307	163	847	8794	2974	498	564
	627	1194	970	772	360	5307	1150	1208	4805	13523	1248	765
	631	1202	2700	138	493	273	3049	6448	31211	11300	8691	732
	640	198	**385**	0	16	22	0	299	2436	204	1231	16334
	645	204	0	0	50	**255**	139	122	1628	368	0	48
total strata fished <=500 meters			374634	370356	209686	964600	303038	216734	830045	624993	467505	35346
1 STD strata fished <=500 meters			51399	58138	26560	428297	61366	50225	289567	207590	128742	16146
501-750[1]		917	0	0	0	**nf**	174	**nf**	**nf**	72	133	258
751-1000	642	931	**nf**	0	0	**nf**	0	**nf**	**nf**	70	0	0
	647	409	**nf**	**nf**	0	**nf**	**nf**	**nf**	**nf**	0	39	0
751-1000[1]		1340	**nf**	**nf**	0	**nf**	**nf**	**nf**	**nf**	70	39	0
total strata fished > 500 meters			0	0	0	0	174	0	0	142	172	258
total all strata fished			374634	370356	209686	964600	303212	216734	830045	645136	649529	35604
1 STD all strata fished			51399	58138	26560	428297	61366	50225	289567	198748	159892	16146

[1] Not all strata in the depth range have been fished. Strata not fished in the <= 500 meter depth range have been filled using a multiplicative model using data to 1992. Std are for strata fished in the depth range.

Table 10. Estimates of cod abundance (thousands) from surveys in Division 3K in 1993-2003, in Campelen equivalent units for 1993 and 1994 and actual Campelen units for 1995-2003.

Depth range meters	Stratum number	Stratum area sq. mi.	GADUS 236-238 1993	GADUS 250-252 1994	WT 176-81 TELEOST 20-23 1995-6	WT 196-199 TELEOST 40-42 1996	WT 217 TELOEST 55-57 1997	TELEOST 73-75 1998	TELEOST 86-88 1999	TELEOST 340-343 2000	WT 376, 398 TEL 362 397 AN 399 2001	TEL 415,457 WT431,455 WT 456 2002-3	TEL 509,510 513,514 WT 511, 515 2003-4
Mean survey date			23-Nov-93	7-Dec-94	26-Dec-95	14-Nov-96	18-Nov-97	14-Nov-98	30-Nov-99	23-Nov-00	8-Dec-01	20-Dec-02	15-Jan-04
101-200	618	1347	2409	159	1170	1887	1174	1065	865	2038	812	388	1346
	619	1753	965	0	655	218	448	2411	281	2097	1021	512	1131
201-300	620	2545	3268	350	1465	915	764	1814	2514	3383	3172	1246	3214
	621	2736	0	251	2580	303	444	494	1301	1700	1196	988	979
	624	1105	391	152	813	2432	395	973	472	456	1277	924	213
	634	1555	468	642	214	1246	31	672	397	616	1497	937	299
	635	1274	467	0	88	386	243	491	245	361	70	257	70
	636	1455	734	200	286	133	267	367	300	291	392	371	272
	637	1132	4983	389	242	810	125	529	1093	**nf**	352	775	436
301-400	617	593	1876	184	693	109	1006	160	547	1332	2882	236	109
	623	494	1138	0	578	510	136	217	34	136	1446	755	442
	625	888	285	0	342	131	305	329	1160	275	912	1000	92
	626	1113	714	204	2709	1415	31	1868	4651	1217	3253	2927	1654
	628	1085	1443	299	1556	826	358	1151	2507	2478	1791	2047	1944
	629	495	908	375	545	68	69	102	272	393	230	847	306
	630	332	0	0	41	0	69	23	69	95	15	0	0
	633	2067	1153	2218	851	1381	885	695	1788	853	876	2428	903
	638	2059	8780	1187	1252	2155	472	661	5413	7308	5119	13407	3191
	639	1463	1489	1711	712	1025	537	503	1540	786	690	7864	973
401-500	622	691	1141	57	542	230	63	507	405	665	602	383	289
	627	1255	2992	604	4924	1918	514	414	2463	9091	699	1746	886
	631	1321	0	182	501	273	84	0	784	54	99	199	346
	640	69	228	16	218	25	43	47	66	47	19	71	100
	645	216	79	119	134	30	15	43	59	104	66	45	178
	650	134	995	65	276	92	350	74	78	**nf**	46	1501	535
total strata fished <= 500 meters			36906	9364	23387	18518	8828	15610	29304	35776	28534	41854	19908
upper			49711	14727	27099	22878	10868	19783	35059	59488	35927	64414	23813
t-value			2.201	2.228	2.086	2.06	2.16	2.12	2.04	2.78	2.13	2.2	2.017
1 STD strata fished <= 500 meters			5818	2407	1779	2117	944	1968	2821	8529	3471	10255	1936
501-750	641	230	11	21	63	47	0	16	0	**nf**	16	662	158
	646	325	75	0	0	0	22	0	89	0	0	45	224
	651	359	16	123	691	25	0	198	0	**nf**	28	85	1580
751-1000	642	418	115	0	0	0	0	0	0	0	0	0	0
	647	360	0	0	0	0	0	0	0	0	0	0	0
	652	516	142	106	0	0	0	71	35	0	0	0	0
1001-1250	643	733	**nf**	**nf**	0	0		0	0		0	0	0
	648								0		16	0	0
	653	531	0	**nf**	0	0		0	0		0	0	0
1001-1250[3]		1264	**nf**	**nf**	0	0	0	0	0	0	16	0	0
1251-1500	644	474	**nf**	**nf**	0	0		0	0	0	0	0	0
	649	212						0	0	0	0	0	0
	654	479	**nf**	**nf**	0	0		0	0	0	0	0	0
1251-1500[3]		1165	**nf**	**nf**	0	0	0	0	0	0	0	0	0
total strata fished > 500 meters			359	250	754	72	22	285	124	0	60	792	1962
total all strata fished			37265	9612	24142	18590	8850	15896	29433	39110	28595	42644	21868
upper			50073	14985	27956	22950	10891	20071	35187	61174	35987	65206	25860
t-value			2.201	2.228	2.08	2.06	2.16	2.12	2.04	2.57	2.13	2.2	2.014
1 STD all strata fished			5819	2412	1834	2117	945	1969	2821	8585	3470	10255	1982

[1] Not all strata in the depth range have been fished. Because of the short time series with the revised stratification scheme and a switch in 1995 to a different vessel and gear no attempt has been made to use a multiplicative model to fill strata which were not fished.

Table 11. Estimates of cod biomass (t) from surveys in Division 3K in 1993-2003, in Campelen equivalent units for 1993 and 1994 and actual Campelen units for 1995-2003.

Depth range meters	Stratum number	Stratum area sq. mi.	GADUS 236-238 1993	GADUS 250-252 1994	WT 176-181 TELEOST 20-23 1995-6	WT 196-199 TELEOST 40-42 1996	WT 217 TELOEST 55-57 1997	TELEOST 73-75 1998	TELEOST 86-88 1999	TELEOST 340-343 2000	WT 376/ 398 TEL 362 397 AN 399 2001	TEL 415,457 WT431,455 WT 456 2002-3	TEL 509,51 513,514 T 511, 515 2003-4
Mean survey date			23-Nov-93	7-Dec-94	26-Dec-95	14-Nov-96	18-Nov-97	14-Nov-98	30-Nov-99	23-Nov-00	8-Dec-01	20-Dec-02	15-Jan-04
101-200	618	1347	721	40	87	221	291	170	56	252	99	72	85
	619	1753	708	0	32	42	36	158	20	154	97	101	38
201-300	620	2545	614	118	238	230	203	471	245	415	649	164	595
	621	2736	0	267	302	77	202	207	296	397	169	186	44
	624	1105	177	85	251	714	207	752	263	225	492	364	64
	634	1555	189	417	97	391	7	300	178	152	637	424	219
	635	1274	189	0	10	94	208	322	76	104	17	82	6
	636	1455	334	141	92	39	234	303	171	260	96	93	49
	637	1132	2039	74	74	358	38	321	575	**nf**	168	235	109
301-400	617	593	383	74	97	14	359	95	212	237	748	97	53
	623	494	213	0	32	144	37	70	10	41	309	153	107
	625	888	229	0	99	66	139	166	573	173	296	342	75
	626	1113	468	89	289	340	6	1034	1217	259	716	543	156
	628	1085	736	80	353	409	274	647	837	524	953	588	171
	629	495	343	20	70	12	45	54	116	192	97	176	69
	630	332	0	0	11	0	53	14	30	38	8	0	0
	633	2067	502	1067	420	535	516	624	1138	615	543	1105	534
	638	2059	3913	401	635	720	232	593	3372	3974	2863	3385	1080
	639	1463	622	761	290	415	260	494	1124	780	418	2542	422
401-500	622	691	299	32	68	55	19	143	178	138	214	70	218
	627	1255	891	226	702	466	211	150	825	2917	135	438	194
	631	1321	0	208	99	45	90	0	481	27	59	36	218
	640	69	131	11	90	13	30	71	96	37	13	35	58
	645	216	84	87	48	14	11	44	62	84	63	48	111
	650	134	441	43	112	40	292	76	78	**nf**	30	613	236
total strata fished <= 500 meters			14227	4241	4600	5455	3998	7280	12230	11994	9890	11889	4912
upper			18515	6644	5485	6692	5034	9559	14902	19284	12834	18138	6118
t-value			2.228	2.262	2.056	2.037	2.145	2.23	2.07	2.45	2.14	2.18	2.023
1 STD strata fished <= 500 meters			1925	1062	430	607	483	1022	1291	2976	1376	2867	596
501-750	641	230	16	18	83	101	0	13	0	**nf**	14	438	175
	646	325	51	0	0	0	42	0	200	0	0	41	208
	651	359	25	116	317	30	0	133	0	**nf**	35	78	1274
751-1000	642	418	72	0	0	0	0	0	0	0	0	0	0
	647	360	0	0	0	0	0	0	0	0	0	0	0
	652	516	208	62	0	0	0	96	89	0	0	0	0
1001-1250	643	733	**nf**	**nf**	0	0	0	0	0	0	0	0	0
	648							0	0	0	7	0	0
	653	531	0	**nf**	0	0	0	0	0	0	0	0	0
1001-1250[3]		1264	**nf**	**nf**	0	0	0	0	0	0	7	0	0
1251-1500	644	474	**nf**	**nf**	0	0	0	0	0	0	0	0	0
	649	212						0	0	0	0	0	0
	654	479	**nf**	**nf**	0	0	0	0	0	0	0	0	0
1251-1500[3]		1165	**nf**	**nf**	0	0	0	0	0	0	0	0	0
total strata fished > 500 meters			372	196	400	131	42	242	289	0	56	557	1657
total all strata fished			14598	4437	5000	5586	4040	7522	12519	12585	9946	12446	6569
upper			18892	6848	6010	6825	5081	9812	15222	19889	12892	18696	8435
t-value			2.228	2.262	2.11	2.037	2.145	2.23	2.06	2.45	2.14	2.18	2.365
1 STD all strata fished			1927	1066	479	608	485	1027	1312	2981	1377	2867	789

[1] Not all strata in the depth range have been fished. Because of the short time series with the revised stratification scheme and a switch in 1995 to a different vessel and gear no attempt has been made to use a multiplicative model to fill strata which were not fished.

Table 12. Estimates of cod abundance (thousands) from autumn surveys in Division 3L in 1992-2003 in depths <= 200 fathoms. The 1992-1994 data are in Campelen equivalent units and the 1995-2003 data are in actual Campelen units.

Stratum depth (fath)	Stratum number	Area sq. nautical miles	WT 129-130 1992	WT 145-146 1993	WT 160-162 1994	WT 176-181 1995	Tel 41 WT 196-198 1996	Tel 55-57 WT 213-217 1997	WT 230-233 1998	WT 245-247 1999	WT 321-323 Tel 342-343 2000	AN 399 WT 373-376 TEL 357-358 361 2001	Tel 412 ,413 Tel 415 WT 428-431 2002-3	Tel 513 WT 487-489 WT 511 2003
Mean survey date			16-Nov-92	23-Nov-93	22-Nov-94	27-Nov-95	2-Nov-96	27-Nov-97	15-Nov-98	29-Nov-99	28-Nov-00	15-Nov-01	12-Nov-02	5-Dec-03
31-50	350	2071	1140	1804	122	1045	285	570	773	1587	936	1420	512	692
	363	1780	13036	408	367	365	82	1306	481	367	184	245	408	245
	371	1121	1079	103	0	31	0	0	0	39	0	0	77	77
	372	2460	2919	299	0	353	414	42	1114	1269	1523	926	550	296
	384	1120	146	154	0	0	0	0	0	385	77	0	39	0
51-100	328	1519	1114	488	139	0	334	376	334	1226	209	5391	775	3636
	341	1574	217	1516	0	36	289	54	223	1256	476	1261	558	693
	342	585	54	0	80	40	121	40	80	724	201	188	40	201
	343	525	722	72	96	36	0	68	0	361	397	36	36	144
	348	2120	3208	**nf**	219	250	393	167	194	767	292	1333	287	329
	349	2114	58	1939	208	122	166	344	162	955	614	706	291	706
	364	2817	388	1421	323	43	116	525	0	775	1163	388	172	400
	365	1041	286	95	95	215	207	191	0	0	**nf**	95	239	0
	370	1320	484	666	0	73	0	91	0	0	257	45	40	52
	385	2356	648	0	0	0	36	0	41	41	0	162	0	0
	390	1481	136	0	0	34	0	0	0	204	0	0	0	41
101-150	344	1494	5446	2363	771	530	2950	914	715	1548	2023	968	1219	2089
	347	983	676	439	34	199	391	541	406	316	371	496	225	406
	366	1394	44544	2972	115	230	236	652	443	345	671	5420	3209	920
	369	961	1884	227	0	78	0	220	39	1332	0	176	44	176
	386	983	766	135	0	0	45	0	0	45	0	45	45	0
	389	821	0	0	0	38	0	38	0	151	113	38	0	0
	391	282	129	116	0	0	0	19	0	97	19	0	17	19
151-200	345	1432	985	1510	542	2780	433	302	653	2863	4436	3467	1055	1435
	346	865	33292	1417	136	754	379	1269	297	881	45577	3570	806	535
	368	334	30338	15627	88	299	128	459	368	980	9396	694	184	436
	387	718	2864	2601	779	66	44	1514	132	527	494	329	88	99
	388	361	579	414	177	99	0	135	0	5313	472	221	50	0
	392	145	20	27	0	19	18	20	0	928	130	104	18	9
total strata fished <= 200 fathoms			147159	36813	4292	7732	7066	9859	6454	25281	29010	27724	10984	13638
ADJUSTED			147158	36813	4291	7735	7067	9859	6454	25281	29010	27724	10984	13638
upper			215462	65605	6233	12328	12052	15027	8524	95232	52913	42861	15550	18275
t-value			2.012	2.306	2.042	2.306	2.571	2.776	2.05	12.71	4.3	2.23	2.36	2.365
1 STD strata fished <= 200 fathon			33948	12486	951	1993	1939	1862	1010	5504	5559	6788	1935	1961

[1] Not all strata in the depth range have been fished. Strata not fished in the <= 200 fathom depth range have been filled using a multiplicative model using data to 1992. Std are for strata fished in the depth range.

Table 13. Estimates of cod biomass (t) from autumn surveys in Division 3L in 1992-2003 in depths <= 200 fathoms. The 1992-1994 data are in Campelen equivalent units and the 1995-2003 data are in actual Campelen units.

Stratum depth (fath)	Stratum number	Area sq. nautical miles	WT 129-130 1992	WT 145-146 1993	WT 160-162 1994	WT 176-181 1995	Teleost 41 WT 196-199 1996	Tel 55-57 WT 213-217 1997	WT 230-233 1998	WT 246-248 1999	WT 321-323 Tel 342-343 2000	AN 399 WT 373-376 TEL 357-358 361 2001	Tel 412 ,413 Tel 415 WT 428-431 2002-3	Tel 513 WT 487-489 WT 511 2003
Mean survey date			16-Nov-92	23-Nov-93	22-Nov-94	27-Nov-95	2-Nov-96	27-Nov-97	15-Nov-98	29-Nov-99	28-Nov-00	15-Nov-01	12-Nov-02	5-Dec-03
31-50	350	2071	1877	1522	179	1276	362	1355	997	1342	842	2442	367	1181
	363	1780	7504	344	211	506	224	2895	152	80	28	588	1230	232
	371	1121	893	91	0	10	0	0	0	26	0	0	73	51
	372	2460	1896	287	0	54	557	29	431	608	66	1303	1074	49
	384	1120	127	67	0	0	0	0	0	212	4	0	0	0
51-100	328	1519	1748	166	248	0	537	1014	144	195	41	3995	145	407
	341	1574	253	289	0	2	248	16	290	1043	120	475	272	304
	342	585	123	0	36	22	184	66	5	164	135	79	13	74
	343	525	459	79	34	18	0	45	0	69	130	5	6	44
	348	2120	1504	**nf**	322	181	326	144	191	144	55	583	174	122
	349	2114	66	1755	54	88	117	327	357	531	228	658	114	88
	364	2817	526	873	302	1	95	353	0	331	403	59	82	97
	365	1041	347	54	114	129	147	72	0	0	**nf**	72	72	0
	370	1320	673	171	0	72	0	41	0	0	107	17	22	2
	385	2356	735	0	0	0	11	0	57	13	0	77	0	0
	390	1481	81	0	0	13	0	0	0	81	0	0	0	8
101-150	344	1494	3003	988	382	233	2214	221	409	802	908	274	601	765
	347	983	181	351	20	99	324	259	407	81	87	224	175	109
	366	1394	40824	2426	116	121	87	264	223	58	321	2527	1572	292
	369	961	937	180	0	174	0	170	4	1048	0	64	15	71
	386	983	366	194	0	0	20	0	0	26	0	18	10	0
	389	821	0	0	0	12	0	35	0	58	54	9	0	0
	391	282	18	53	0	0	0	21	0	178	1	0	31	6
151-200	345	1432	736	957	245	1441	370	76	512	1301	1299	2178	709	658
	346	865	29383	702	91	459	243	466	287	414	1359	2350	394	77
	368	334	29646	10776	80	129	48	181	240	954	8268	290	169	201
	387	718	2018	1984	321	25	19	851	99	284	227	180	30	2
	388	361	390	268	119	35	0	78	0	3080	335	140	97	0
	392	145	9	19	0	15	7	10	0	489	51	97	10	7
total strata fished <= 200 fathoms			126323	24594	2873	5114	6140	8991	4804	13611	15070	18706	7460	4849
ADJUSTED			126323	24596	2874	5115	6140	8991	4804	13611		18706	7460	4849
upper			193308	44710	3895	7661	9799	13920	6901	56006	83892	27204	10528	7539
t-value			2.014	2.306	2.035	2.145	2.306	2.228	2.04	12.71	12.71	2.12	2.13	2.228
1 STD strata fished <= 200 fathoms			33260	8723	502	1187	1587	2212	1028	3336	5415	4008	1440	1207

[1] Not all strata in the depth range have been fished. Strata not fished in the <= 200 fathom depth range have been filled using a multiplicative model using data to 1992. Std are for strata fished in the depth range.

Table 14. Estimates of cod abundance (thousands) and biomass (t) from autumn surveys in Division 3L in 1992-2003 in depths > 200 fathoms. The 1992-1994 data are in Campelen equivalent units and the 1995-2003 data are in actual Campelen units.

Stratum depth (fathoms)	Stratum number	Area sq. nautical miles	WT 129-130 1992	WT 145-146 1993	WT 160-162 1994	WT 176-181 1995	Teleost 41 WT 196-198 1996	Tel 55-57 WT 213-217 1997	WT 230-233 1998	WT 246-249 1999	WT 321-323 Tel 342-343 2000	AN 399 WT 373-376 TEL 357-358 361 2001	Tel 412 ,413 Tel 415 WT 428-431 2002-3	Tel 513 WT 487-489 WT 511 2003
Mean survey date			16-Nov-92	23-Nov-93	22-Nov-94	27-Nov-95	2-Nov-96	27-Nov-97	18-Nov-98	29-Nov-99	28-Nov-00	15-Nov-01	12-Nov-02	5-Dec-03
			ABUNDANCE											
201-300	729	186	13	213	0	0	0	13	0	38	0	38	0	13
	731	216	168	277	21	13	**nf**	178	0	40	208	106	0	0
	733	468	494	1223	107	32	0	193	61	64	101	444	29	322
	735	272	886	9155	180	187	0	449	112	67	3528	692	83	337
301-400	730	170	0	0	8	0	0	0	0	0	0	0	0	0
	732	231	0	0	0	0	0	0	0	0	0	0	0	0
	734	228	0	31	42	0	0	167	0	0	0	0	0	0
	736	175	0	96	28	32	0	144	0	24	0	12	0	139
401-500	737	227	**nf**	**nf**	**nf**	16	0	0	0	0	0	0	0	0
	741	223	**nf**	**nf**	**nf**	**nf**	0	0	0	0	0	0	0	0
	745	348	**nf**	**nf**	**nf**	**nf**	0	0	0	0	0	0	0	0
	748	159	**nf**	**nf**	**nf**	**nf**	0	0	0	0	0	0	0	0
401-500		957	**nf**	**nf**	**nf**	16	0	0	0		0	0		0
501-600	738	221	**nf**	**nf**	**nf**	0	0	0	0	0	0	0	0	0
	742	206	**nf**	**nf**	**nf**	**nf**	0	0	0	0	0	0	0	0
	746	392	**nf**	**nf**	**nf**	**nf**	0	0	0	0	0	0	0	0
	749	126	**nf**	**nf**	**nf**	**nf**	0	0	0	**nf**	0	0	0	0
501-600		945	**nf**	**nf**	**nf**	0	0	0	0	0	0	0		0
601-700	739	254	**nf**	**nf**	**nf**	**nf**	0	0	0	0	0	0	0	0
	743	211	**nf**	**nf**	**nf**	**nf**	0	0	0	0	0	0	0	0
	747	724	**nf**	**nf**	**nf**	**nf**	0	0	0	0	0	0	0	0
	750	556	**nf**	**nf**	**nf**	**nf**	0	0	0	0	0	0	0	0
601-700		1745	**nf**	**nf**	**nf**	**nf**	0	0	0	0		0		
701-800	740	264	**nf**	**nf**	**nf**	**nf**	0	0	0	0	0	0	0	0
	744	280	**nf**	**nf**	**nf**	**nf**	0	0	0	**nf**	0	0	0	0
	751	229	**nf**	**nf**	**nf**	**nf**	0	0	0	**nf**	0	0	0	0
701-800		773	**nf**	**nf**	**nf**	**nf**	0	0	0	0	0	0	0	0
total strata fished > 200 fathioms			1561	10995	386	280	0	1144	173	233	3837	1292	112	811
total all strata fished offshore			148719	47809	4678	8013	7066	11004	6628	25514	32846	29017	11096	14448
upper			217045	77554	6627	12630	12052	16240	8699	95478	58562	44210	15667	19068
t-value			2.012	2.228	2.042	2.306	2.571	2.779	2.05	12.71	4.3	2.23	2.36	2.306
1 STD all strata fished offshore			33959	13351	954	2002	1939	1884	1010	5505	5980	6813	1937	2003
			BIOMASS											
201-300	729	186	45	208	0	0	0	19	0	67	0	45	0	42
	731	216	131	177	23	5	**nf**	178	0	20	165	108	0	0
	733	468	316	837	85	14	0	161	68	66	110	261	36	156
	735	272	1233	4809	91	109	0	369	167	104	3973	697	155	226
301-400	730	170	0	0	8	0	0	0	0	0	0	0	0	0
	732	231	0	0	0	0	0	0	0	0	0	0	0	0
	734	228	0	18	42	0	0	313	0	0	0	0	0	0
	736	175	0	51	28	15	0	169	0	37	0	7	0	164
												0		
401-500	737	227	**nf**	**nf**	**nf**	17	0	0	0	0	0	0	0	0
	741	223	**nf**	**nf**	**nf**	**nf**	0	0	0	0	0	0	0	0
	745	348	**nf**	**nf**	**nf**	**nf**	0	0	0	0	0	0	0	0
	748	159	**nf**	**nf**	**nf**	**nf**	0	0	0	0	0	0	0	0
401-500		957	**nf**	**nf**	**nf**	17	0	0	0		0	0		0
501-600	738	221	**nf**	**nf**	**nf**	0	0	0	0	0		0	0	0
	742	206	**nf**	**nf**	**nf**	**nf**	0	0	0	0		0	0	0
	746	392	**nf**	**nf**	**nf**	**nf**	0	0	0	0		0	0	0
	749	126	**nf**	**nf**	**nf**	**nf**	0	0	0	**nf**		0	0	0
501-600		945	**nf**	**nf**	**nf**	0	0	0	0	0	0	0		0
601-700	739	254	**nf**	**nf**	**nf**	**nf**	0	0	0	0		0	0	0
	743	211	**nf**	**nf**	**nf**	**nf**	0	0	0	0		0	0	0
	747	724	**nf**	**nf**	**nf**	**nf**	0	0	0	0		0	0	0
	750	556	**nf**	**nf**	**nf**	**nf**	0	0	0	0		0	0	0
601-700		1745	**nf**	**nf**	**nf**	**nf**	0	0	0	0	0	0		0
701-800	740	264	**nf**	**nf**	**nf**	**nf**	0	0	0	0		0	0	0
	744	280	**nf**	**nf**	**nf**	**nf**	0	0	0	**nf**		**0**	0	0
	751	229	**nf**	**nf**	**nf**	**nf**	0	0	0	**nf**		**0**	0	0
701-800		773	**nf**	**nf**	**nf**	**nf**	0	0	0	0	0	0	0	0
total strata fished > 200 fathoms			1725	6100	277	160	0	1209	235	294	4248	1118	191	588
total all strata fished offshore			128048	30694	3149	5275	6140	10200	5039	13904	19318	19824	7652	5438
upper			195072	51127	4178	7834	9799	15194	7148	56319	91159	28382	10722	8157
t-value			2.014	2.262	2.032	2.145	2.306	2.28	2.07	12.71	12.71	2.12	2.12	2.201
1 STD all strata fished offshore			33279	9033	506	1193	1587	2190	1019	3337	5652	4037	1448	1235

Table 15. Estimates of cod abundance (thousands) from spring surveys in Division 3L in 1992-2003 in depths <= 200 fathoms. The 1992-1995 data are in Campelen equivalent units and the 1996-2003 data are in actual Campelen units.

Depth range (fath)	Stratum number	Stratum area sq mi.	WT 119-122 1992	WT 137-138 1993	WT 152-154 1994	WT 168-170 1995	WT 189-191 1996	WT 207-208 1997	WT 223-224 1998	WT 240-241 1999	WT 317-318 2000	WT 365-370 2001	WT 422-424 2002	WT 479-482 2003
Mean Date			24-May-92	31-May-93	1-Jun-94	6-Jun-95	14-Jun-96	15-Jun-97	19-Jun-98	22-Jun-99	17-Jun-00	11-Jun-01	10-Jun-02	15-Jun-03
31-50	350	2071	414	32	0	0	412	122	47	1268	71	297	81	163
	363	1780	789	306	0	0	111	0	0	281	420	82	0	41
	371	1121	123	93	0	0	0	0	0	0	0	39	39	0
	372	2460	34	62	0	0	217	0	42	602	1203	42	0	42
	384	1120	0	31	0	0	102	0	0	0	77	0	0	39
51-100	328	1519	0	453	0	0	90	35	125	376	1254	139	84	507
	341	1574	0	0	736	0	340	1728	172	577	476	909	43	173
	342	585	1314	322	188	0	0	121	80	121	322	241	40	80
	343	525	1565	614	361	361	36	0	217	108	72	36	0	0
	348	2120	227	109	365	510	151	65	328	231	109	0	167	333
	349	2114	711	905	0	0	424	145	73	646	332	249	166	249
	364	2817	0	97	0	0	234	49	106	201	155	254	129	0
	365	1041	36	0	0	0	58	0	0	95	0	48	48	0
	370	1320	0	91	0	0	61	0	0	0	36	0	0	0
	385	2356	97	383	0	0	30	0	0	46	81	46	41	0
	390	1481	34	102	0	0	59	0	0	150	0	122	0	0
101-150	344	1494	1165	514	0	822	565	300	355	509	260	392	485	870
	347	983	34	304	0	0	0	34	203	336	135	676	45	180
	366	1394	415	384	0	0	245	447	141	133	1630	230	3545	652
	369	961	198	0	0	0	30	33	66	39	132	196	206	264
	386	983	68	54	0	0	0	30	34	265	406	260	45	0
	389	821	75	0	0	56	0	33	33	113	1412	1016	75	0
	391	282	0	0	0	0	0	0	0	19	0	78	19	39
151-200	345	1432	492	525	2167	197	773	972	460	1121	2151	2053	2403	906
	346	865	1577	833	278	476	487	579	71	670	948	996	2248	1282
	368	334	10866	1355	184	23	402	158	46	92	863	1330	578	347
	387	718	23145	6288	0	560	142	1037	1635	684	3556	307	285	198
	388	361	4618	2235	0	174	84	0	72	372	564	695	290	770
	392	145	40	479	0	110	111	0	80	41	195	150	748	140
total strata fished <= 200 fath			48038	16569	4278	3289	5166	5888	4386	9096	16860	10884	11810	7277
ADJUSTED			48037	16571	4279	3289	5164	5888	4386	9096	16860	10884	11810	7277
upper			105950	29261	7094	5694	6223	10529	10169	11449	52643	14422	16092	9317
t-value			4.303	3.182	2.201	2.306	2.023	2.447	4.30	2.05	12.71	2.31	2.33	2.12
1 STD strata fished <= 200 fath			13459	3989	1279	1043	522	1897	1345	1148	2815	1532	1838	962

[1] Not all strata in the depth range have been fished. Strata not fished in the <= 200 fathom depth range have been filled using a multiplicative model using data to 1992. Std are for strata fished in the depth range.

Table 16. Estimates of cod biomass (t) from spring surveys in Division 3L in 1992-2003 in depths <= 200 fathoms. The 1992-1995 data are in Campelen equivalent units and the 1996-2003 data are in actual Campelen units.

Depth range (fath) Mean Date	Stratum number	Stratum area sq mi.	WT 119-122 1992 24-May	WT 137-138 1993 31-May	WT 152-154 1994 1-Jun	WT 168-170 1995 6-Jun	WT 189-191 1996 14-Jun	WT 207-208 1997 15-Jun	WT 223-224 1998 19-Jun-98	WT 240-241 1999 22-Jun	WT 317-318 2000 17-Jun	WT 365-370 2001 11-Jun	WT 422-424 2002 10-Jun	WT 479-482 2003 15-Jun
31-50	350	2071	315	35	0	0	359	135	6	3708	17	621	28	11
	363	1780	526	111	0	0	61	0	0	693	193	1	0	3
	371	1121	36	37	0	0	0	0	0	0	0	25	1	0
	372	2460	112	96	0	0	83	0	0	598	392	4	0	355
	384	1120	0	71	0	0	65	0	0	0	20	0	0	1
51-100	328	1519	0	243	0	0	6	5	115	739	89	37	3	129
	341	1574	0	0	65	0	127	4497	9	1238	96	549	3	16
	342	585	66	64	33	0	0	346	8	209	23	9	2	9
	343	525	70	52	46	42	9	0	36	254	27	0.361	0	0
	348	2120	37	43	47	87	53	13	536	395	10	0	14	16
	349	2114	125	158	0	0	303	419	101	1903	615	26	5	113
	364	2817	0	124	0	0	20	11	225	683	43	15	3	0
	365	1041	81	0	0	0	5	0	0	178	0	17	1	0
	370	1320	0	74	0	0	6	0	0	0	1	0	0	0
	385	2356	95	256	0	0	4	0	0	227	2	4	42	0
	390	1481	58	83	0	0	31	0	0	6	0	5	0	0
101-150	344	1494	167	83	0	95	111	115	124	496	152	126	71	307
	347	983	35	83	0	0	0	8	150	52	9	182	3	32
	366	1394	111	121	0	0	104	173	61	83	210	25	292	130
	369	961	78	0	0	0	16	3	20	11	218	159	10	60
	386	983	154	66	0	0	0	16	183	94	311	131	10	0
	389	821	114	0	0	36	0	9	25	16	587	440	83	0
	391	282	0	0	0	0	0	0	0	4	0	41	2	3
151-200	345	1432	332	120	437	108	149	294	159	359	956	725	605	327
	346	865	613	302	86	91	178	238	32	407	582	260	558	644
	368	334	4684	590	120	22	148	96	8	63	499	417	100	91
	387	718	18465	2329	0	227	84	303	1199	578	2057	191	112	34
	388	361	1078	1431	0	60	12	0	27	167	251	176	147	497
	392	145	22	63	0	37	18	0	23	30	19	74	332	13
total strata fished <= 200 fathoms			27374	6633	834	805	1951	6667	3048	12962	7378	4262	2428	2794
ADJUSTED			27374	6635	834	805	1952	6667	3048	12962	7378	4262	2428	2794
upper			71593	14791	1310	1234	2468	17631	6102	18566	30307	6164	3040	4093
t-value			4.303	4.303	2.365	2.179	2.017	2.571	3.18	2.16	12.71	2.14	2.18	28
1 STD strata fished <= 200 fathoms			10276	1896	201	197	256	4264	960	2594	1804	889	281	46

[1] Not all strata in the depth range have been fished. Strata not fished in the <= 200 fathom depth range have been filled using a multiplicative model using data to 1992. Std are for strata fished in the depth range.

Table 17. Estimates of cod abundance (thousands) and biomass (t) from spring surveys in Division 3L in 1992-2003 in depths > 200 fathoms. The 1992-1995 data are in Campelen equivalent units and the 1996-2003 data are in actual Campelen units.

Depth range (fath)	Stratum number	Stratum area nautical miles	WT 119-122 1992	WT 137-138 1993	WT 152-154 1994	WT 168-170 1995	WT 189-191 1996	WT 207-208 1997	WT 223-224 1998	WT 240-241 1999	WT 317-318 2000	WT 365-370 2001	WT 422-424 2002	WT 479-482 2003
Mean Date			24-May	31-May	1-Jun	6-Jun	14-Jun	15-Jun	19-Jun	22-Jun	17-Jun	11-Jun	10-Jun	15-Jun
			abundance											
201-300	729	186	3876	192	77	0	13	0	13	0	2240	171	50	280
	731	216	267	416	9701	0	152	0	13	104	155	409	272	1398
	733	468	2672	880	1513	483	41	89	0	258	315	626	1094	5565
	735	272	92905	0	6080	673	5512	524	3480	35	580	3792	3138	3530
301-400	730	170	0	0	0	0	0	0	0	0	0	0	0	0
	732	231	0	0	0	0	0	0	0	0	0	0	0	0
	734	228	0	0	0	0	0	0	0	0	0	0	0	14
	736	175	60	0	0	0	0	0	0	0	0	0	0	0
401-500	737	227	**nf**	**nf**	0	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**
	741	223	**nf**	**nf**	0	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**
	745	348	**nf**	**nf**	0	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**
	748	159	**nf**	**nf**	0	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**
Total >200 fathoms			99780	1488	17371	1156	5718	613	3506	397	3290	4998	4554	10787
Total all strata fished			147819	18056	21649	4445	10884	6501	7892	9493	20150	15881	16364	18064
upper			1331862	29180	148586	7460	21527	11073	54843	11907	58359	67976	60855	41584
t-value			12.706	2.776	12.706	2.365	4.303	2.365	12.71	2.04	12.706	12.706	12.71	4.303
1 STD all strata fished			93188	4007	9990	1275	2473	1933	3694	1183	3007	4100	3500	5466
			biomass											
201-300	729	186	1683	78	29	0	2	0	31	0	858	78	15	108
	731	216	389	248	5913	0	69	0	15	57	51	321	117	1588
	733	468	1959	345	556	219	28	74	0	111	172	290	351	2071
	735	272	50199	0	3238	386	3823	352	2646	24	270	2557	1877	1486
301-400	730	170	0	0	0	0	0	0	0	0	0	0	0	0
	732	231	0	0	0	0	0	0	0	0	0	0	0	0
	734	228	0	0	0	0	0	0	0	0	0	0	0	50
	736	175	69	0	0	0	0	0	0	0	0	0	0	0
401-500	737	227	**nf**	**nf**	0	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**
	741	223	**nf**	**nf**	0	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**
	745	348	**nf**	**nf**	0	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**
	748	159	**nf**	**nf**	0	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**	**nf**
Total >200 fathoms			54299	671	9736	605	3922	426	2692	192	1351	3246	2360	5303
Total all strata fished			81673	7304	10570	1410	5874	7093	5740	13154	8728	7507	4788	8097
upper			729549	15476	86302	7004	32789	18073	41373	18765	32059	41939	27442	16216
t-value			12.706	4.303	12.706	12.706	4.303	2.571	12.71	2.16	12.706	12.706	12.71	3.182
1 STD all strata fished			50990	1899	5960	440	6255	4271	2804	2598	1836	2710	1782	2552

nf Not all strata in the depth range were fished. Strata not fished in the greater than 200 fathom depth range have not been filled using a multiplicative model.

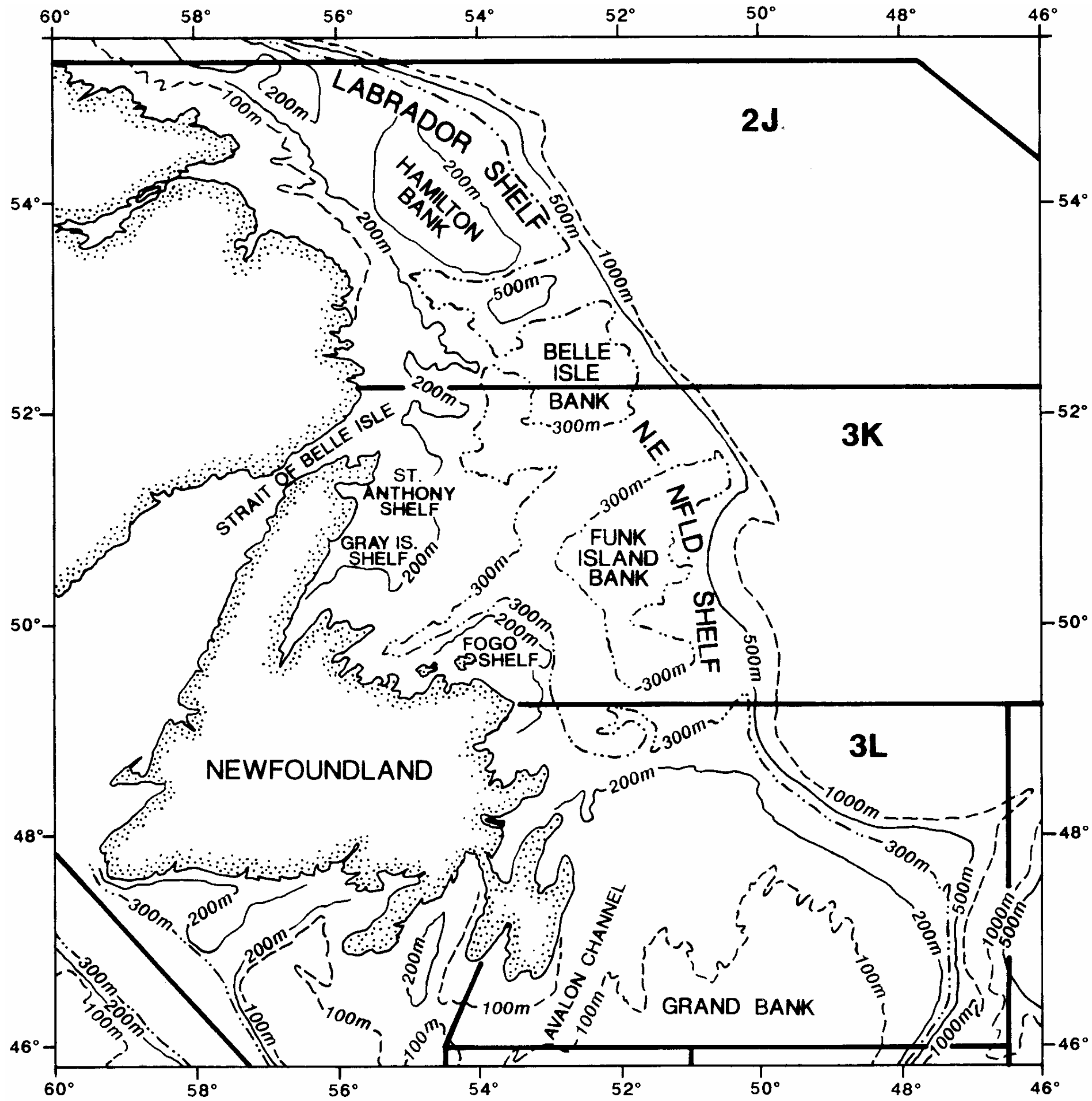


Fig. 1. Map of the stock area, showing physiographic features and NAFO Divisions.

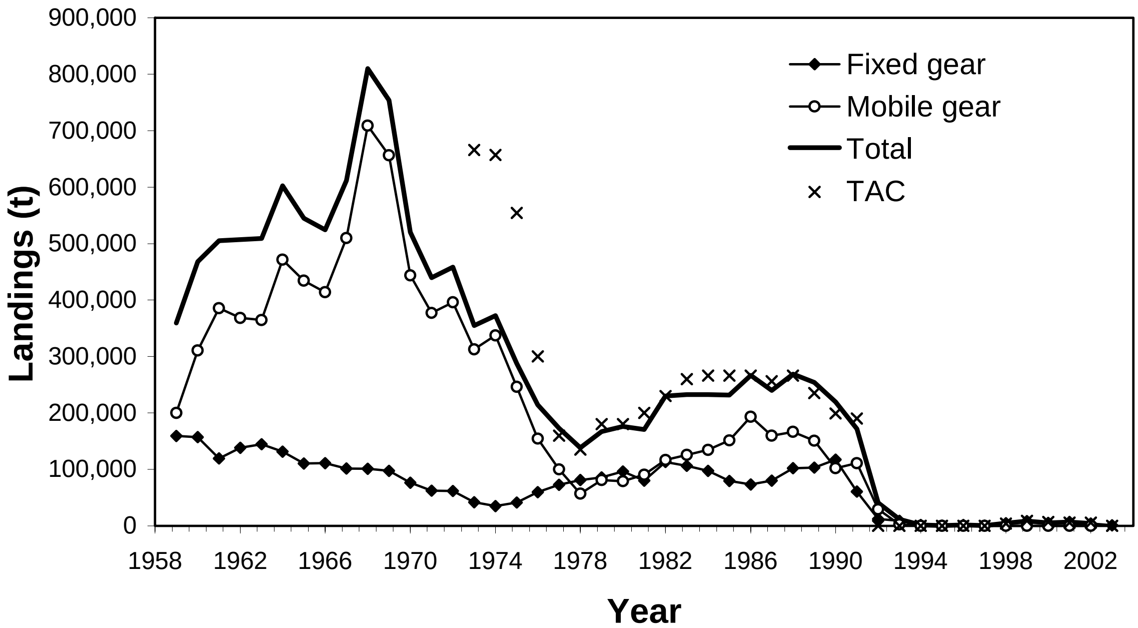


Fig. 2. TACs and landings by fixed and mobile gear, 1959-2003.

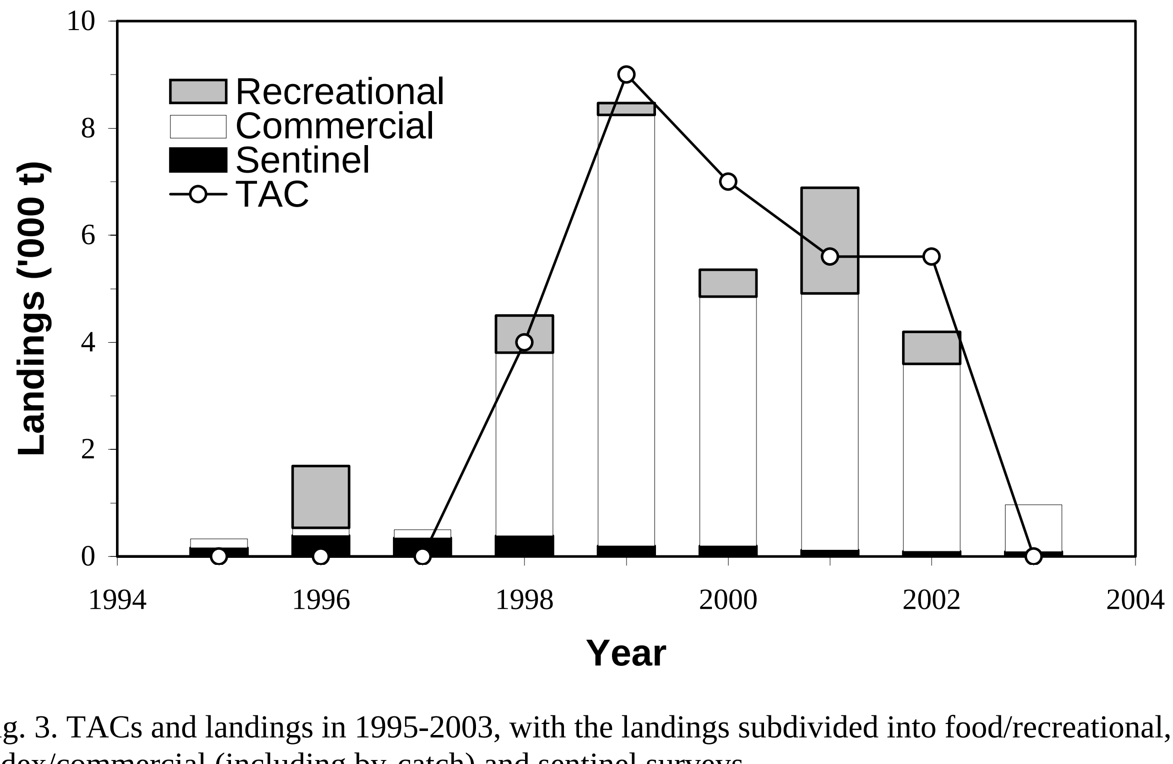


Fig. 3. TACs and landings in 1995-2003, with the landings subdivided into food/recreational, index/commercial (including by-catch) and sentinel surveys.

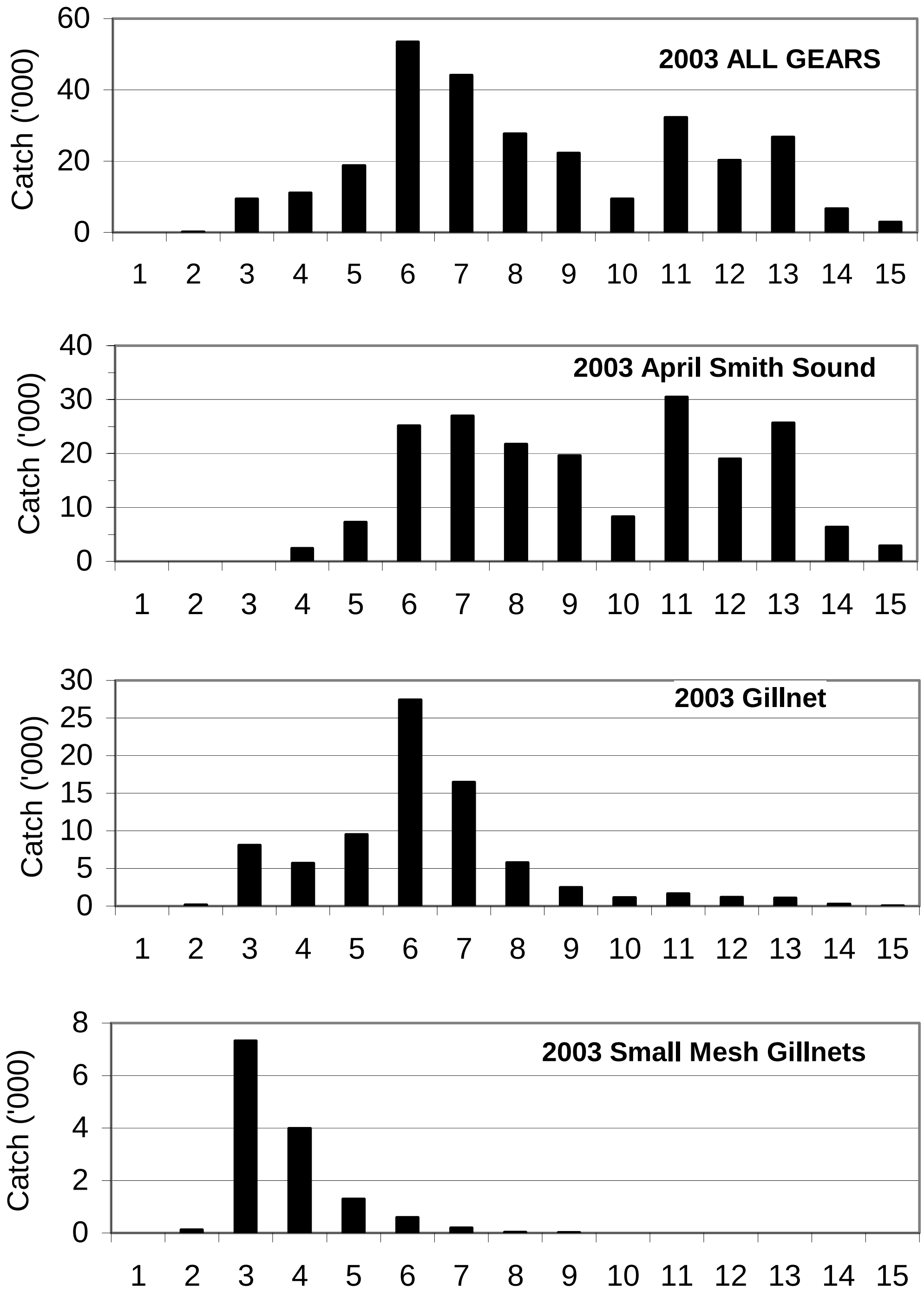


Fig. 4. The estimated landings at age for all gears combined and for individual gears in 2J3KL in 2003. The landings from Smith Sound in April 2003 came from a mass mortality. The fish were collected with gaff or dipnet. The gillnet landings include commercial by-catch and sentinel. The small mesh gillnets were deployed by the sentinel surveys.

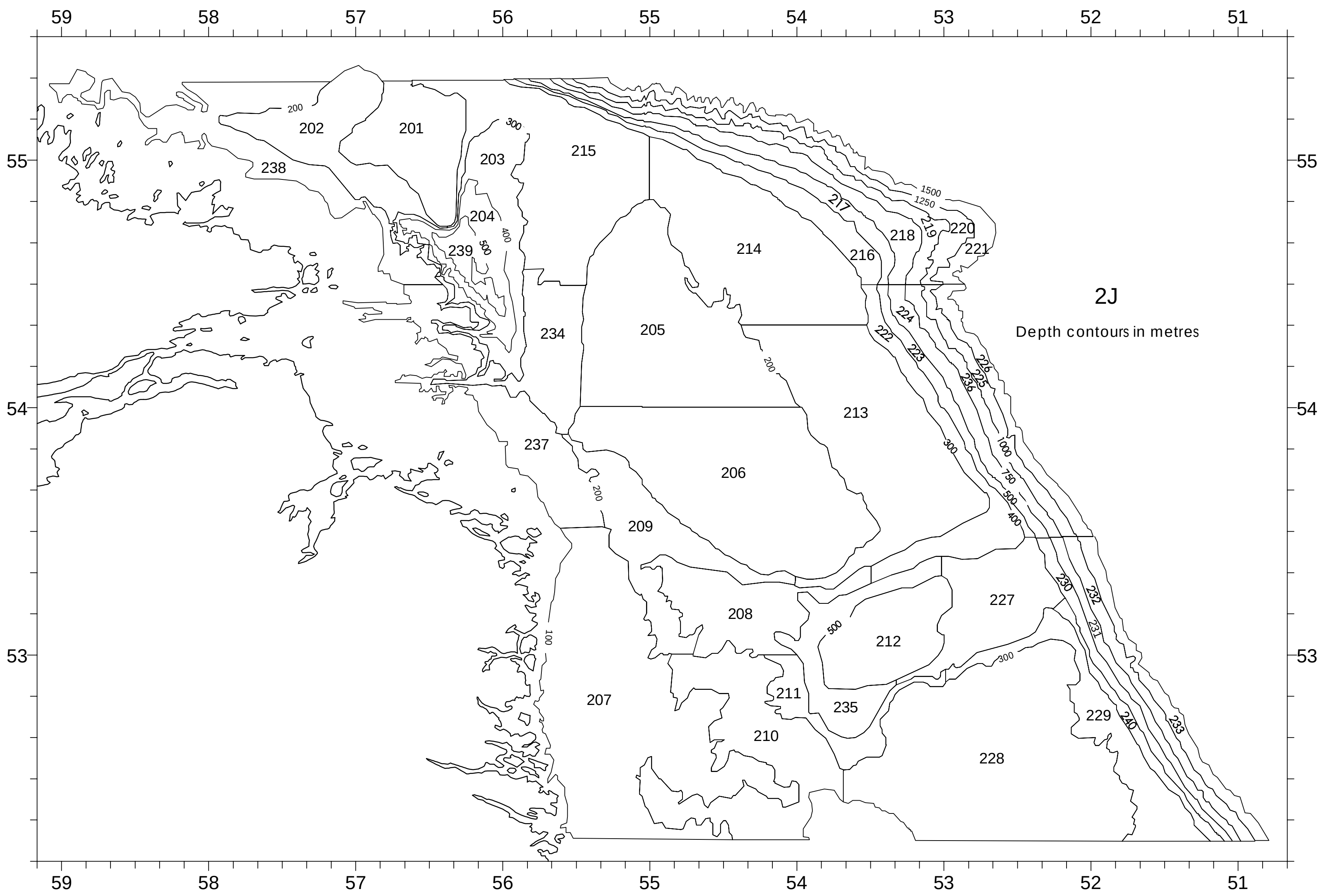


Fig. 5. Strata used for research bottom-trawl surveys in Division 2J.

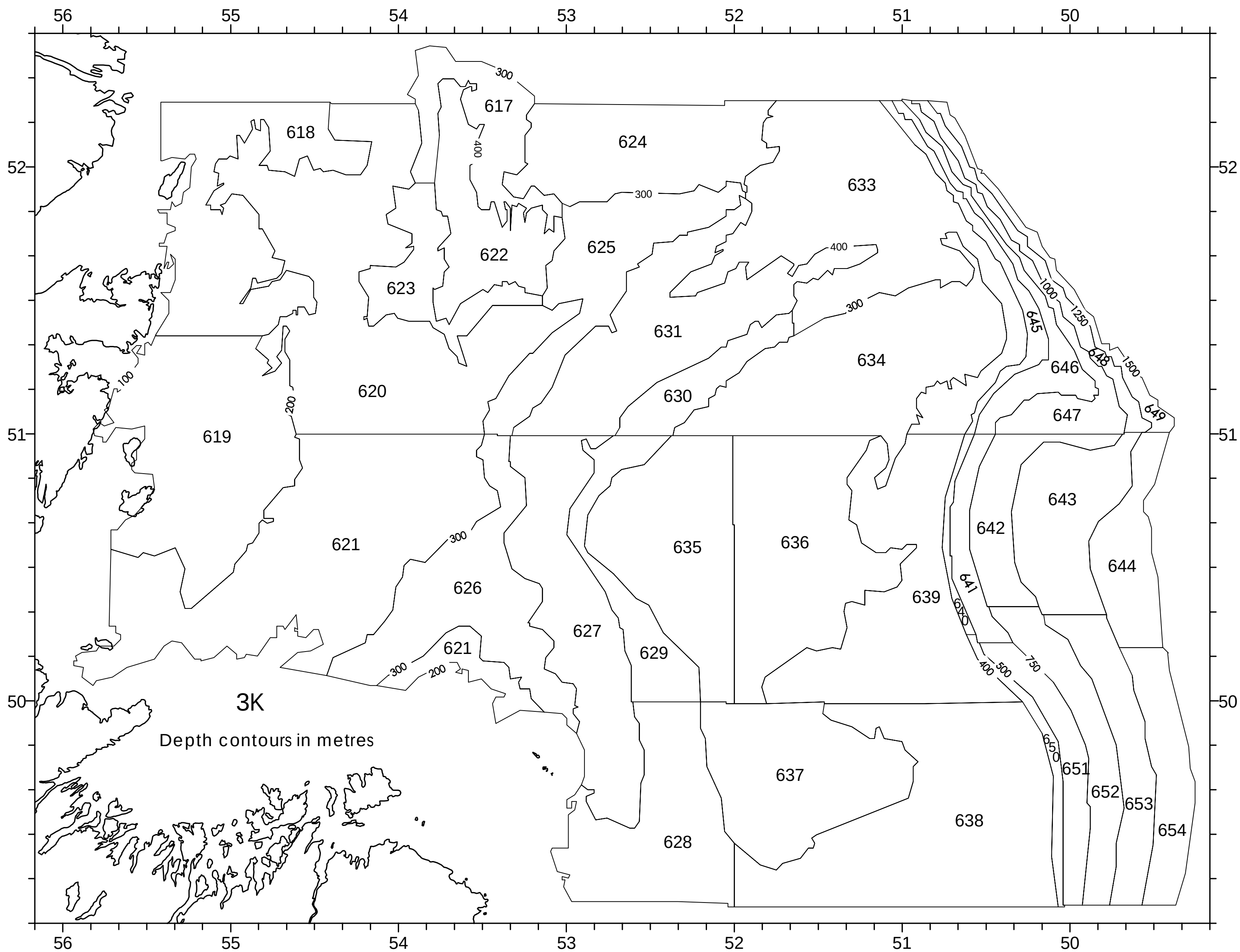


Fig. 6. Strata used for research bottom-trawl surveys in Division 3K.

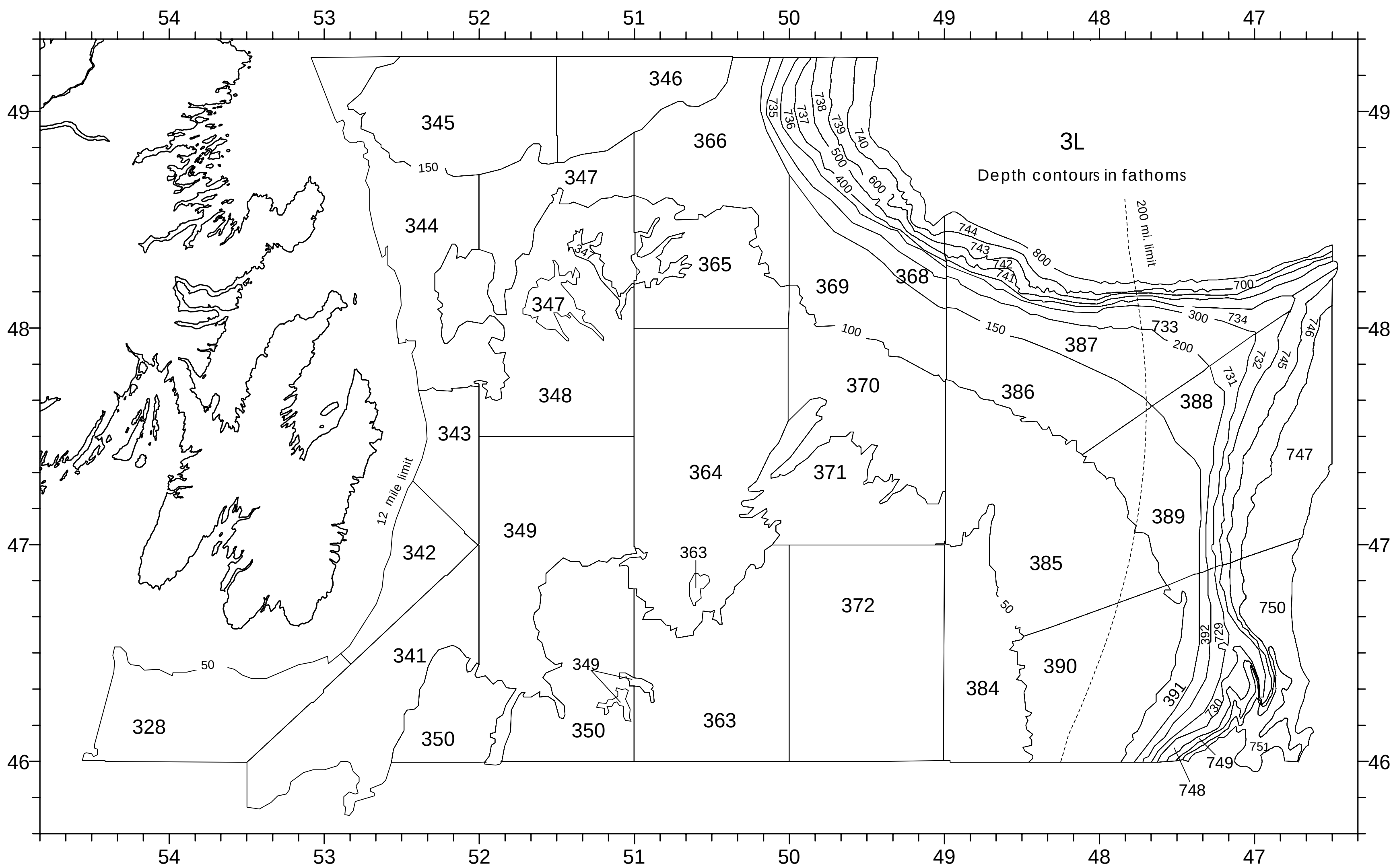


Fig. 7. Strata used for research bottom-trawl surveys in Division 3L.

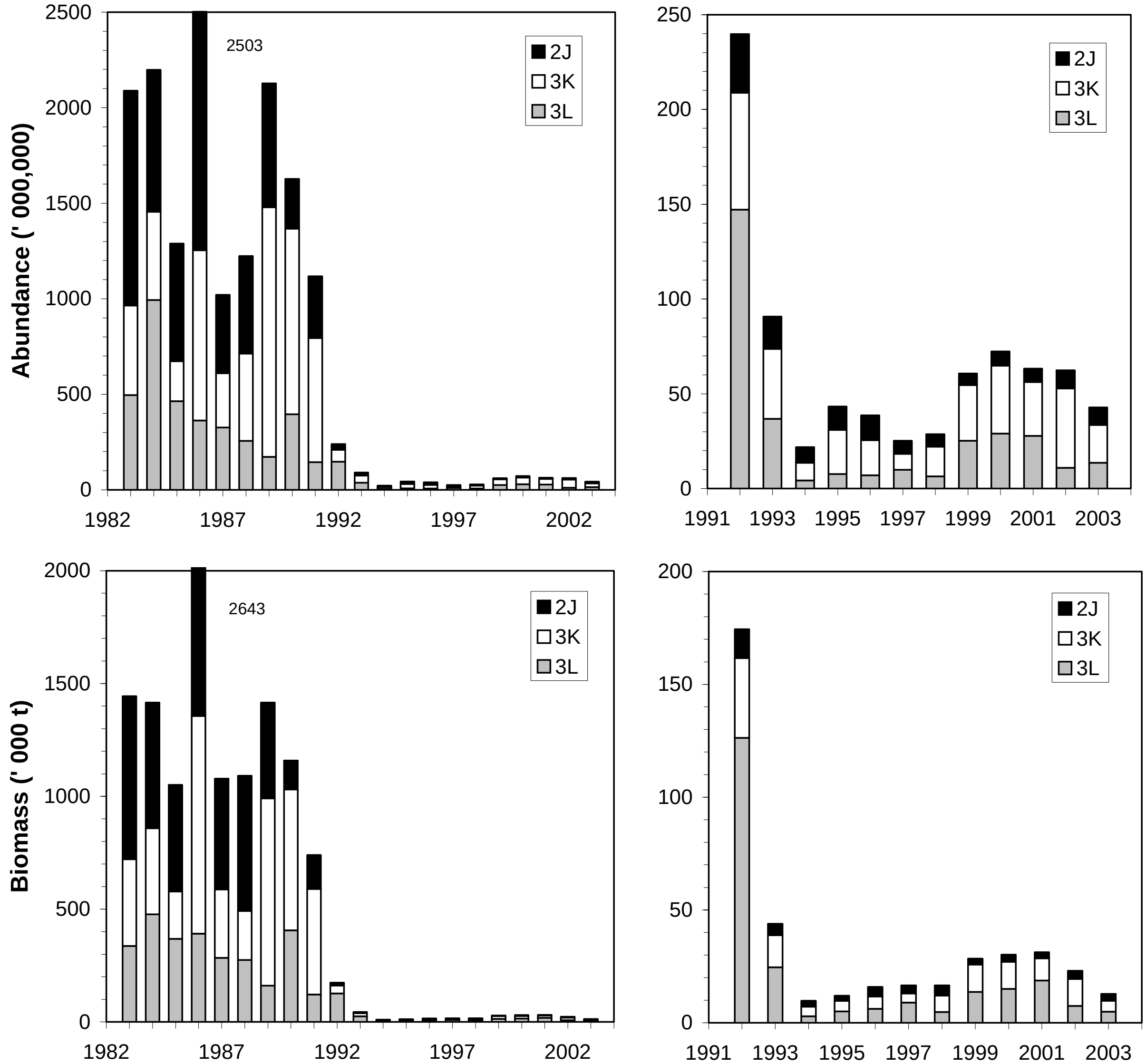
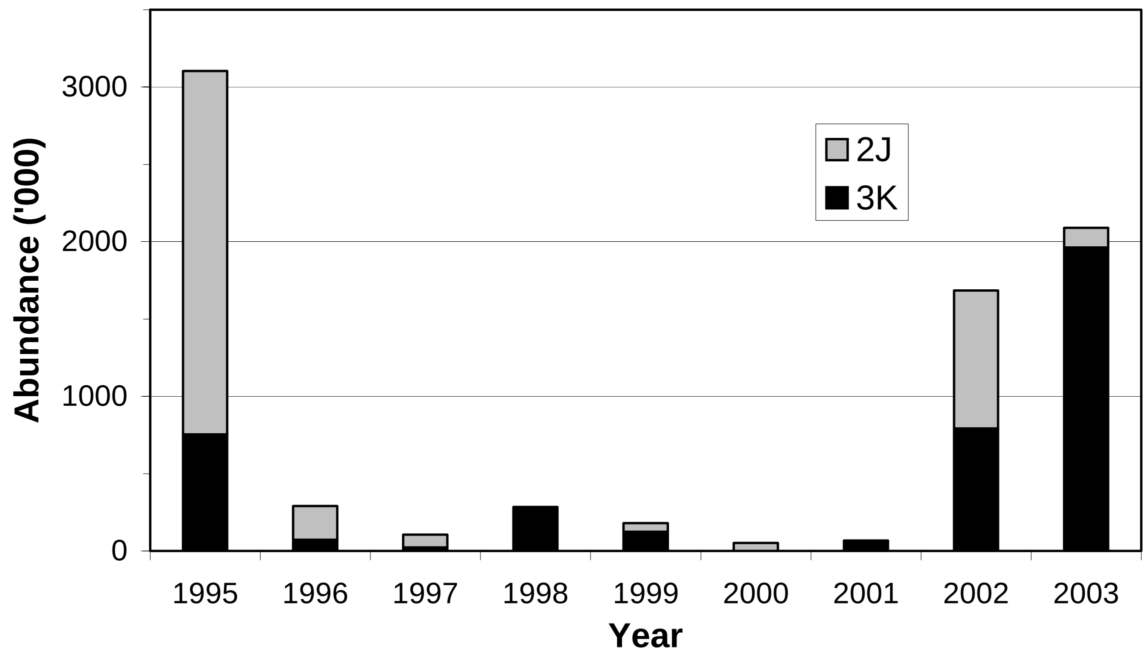


Fig. 8. Indices of abundance (above) and biomass (below) of cod from autumn bottom-trawl surveys in the offshore index strata of divisions 2J3KL in 1983-2003. The estimates for 1983-1994 are adjusted to Campelen equivalents. The right panels display data from 1992-2003 at an expanded scale so that changes may be more readily discerned.



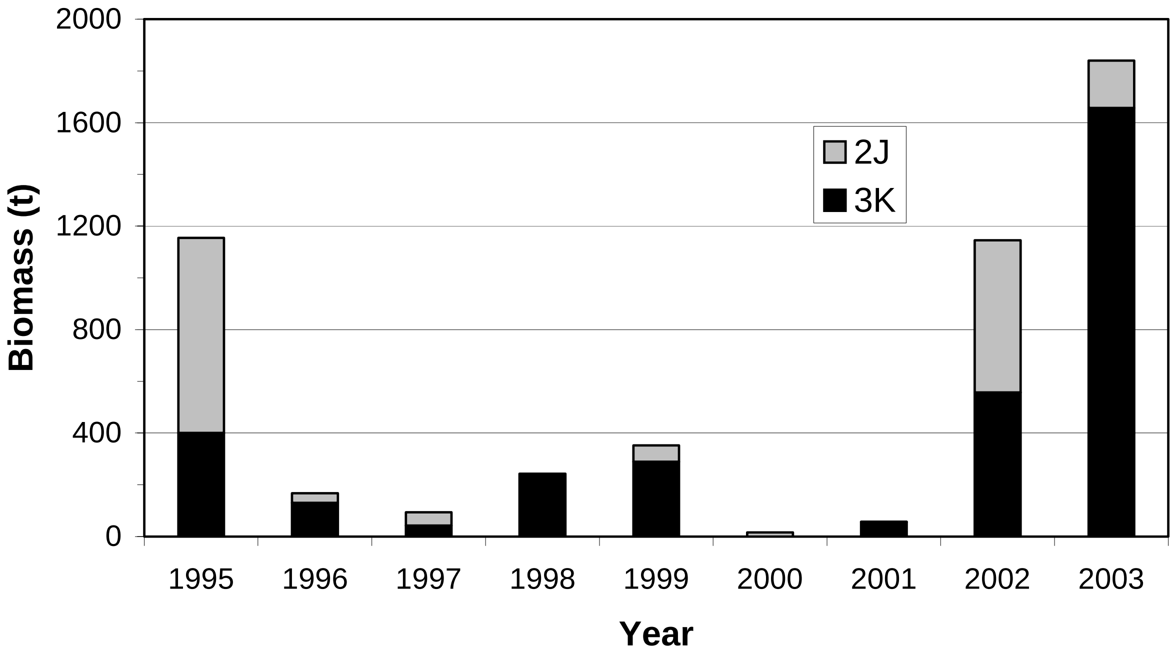
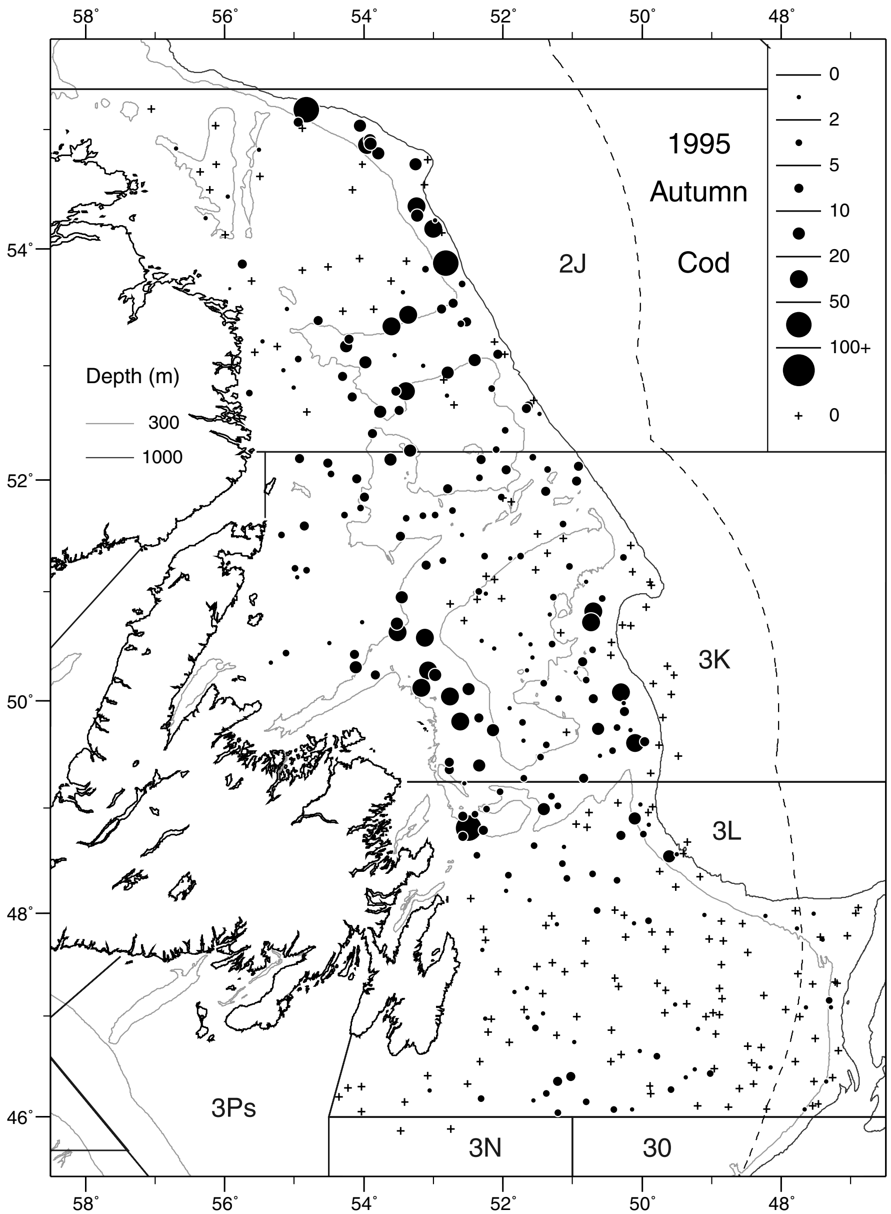


Fig. 9. Indices of abundance and biomass of cod from autumn bottom-trawl surveys in strata deeper than the standard offshore index strata in divisions 2J and 3K. Only years since the introduction of the Campelen 1800 shrimp trawl are illustrated.



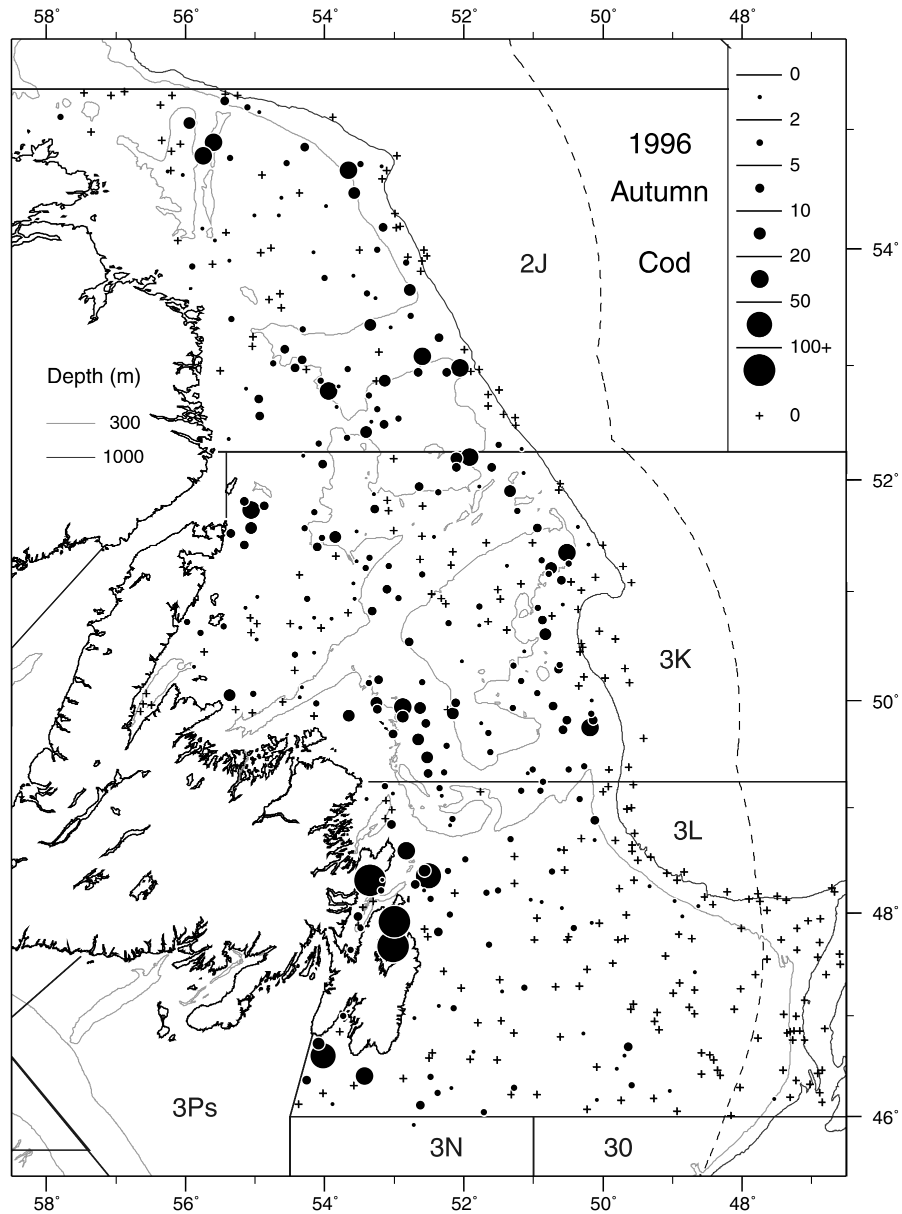


Fig. 10a. Cod distribution (number per standard tow) during the autumn surveys in divisions 2J3KL in 1995 and 1996.

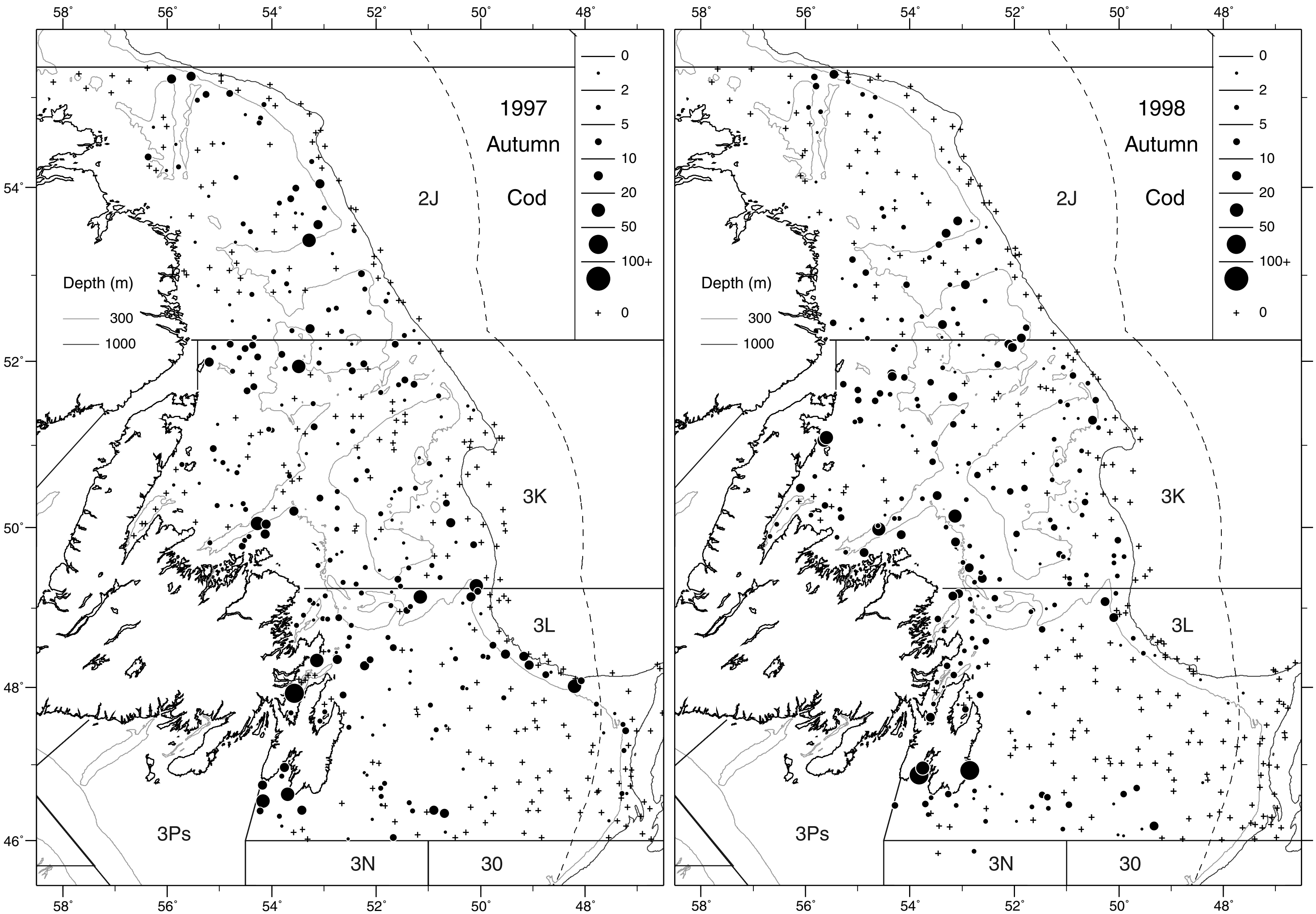


Fig. 10b. Cod distribution (number per standard tow) during the autumn surveys in divisions 2J3KL in 1997 and 1998.

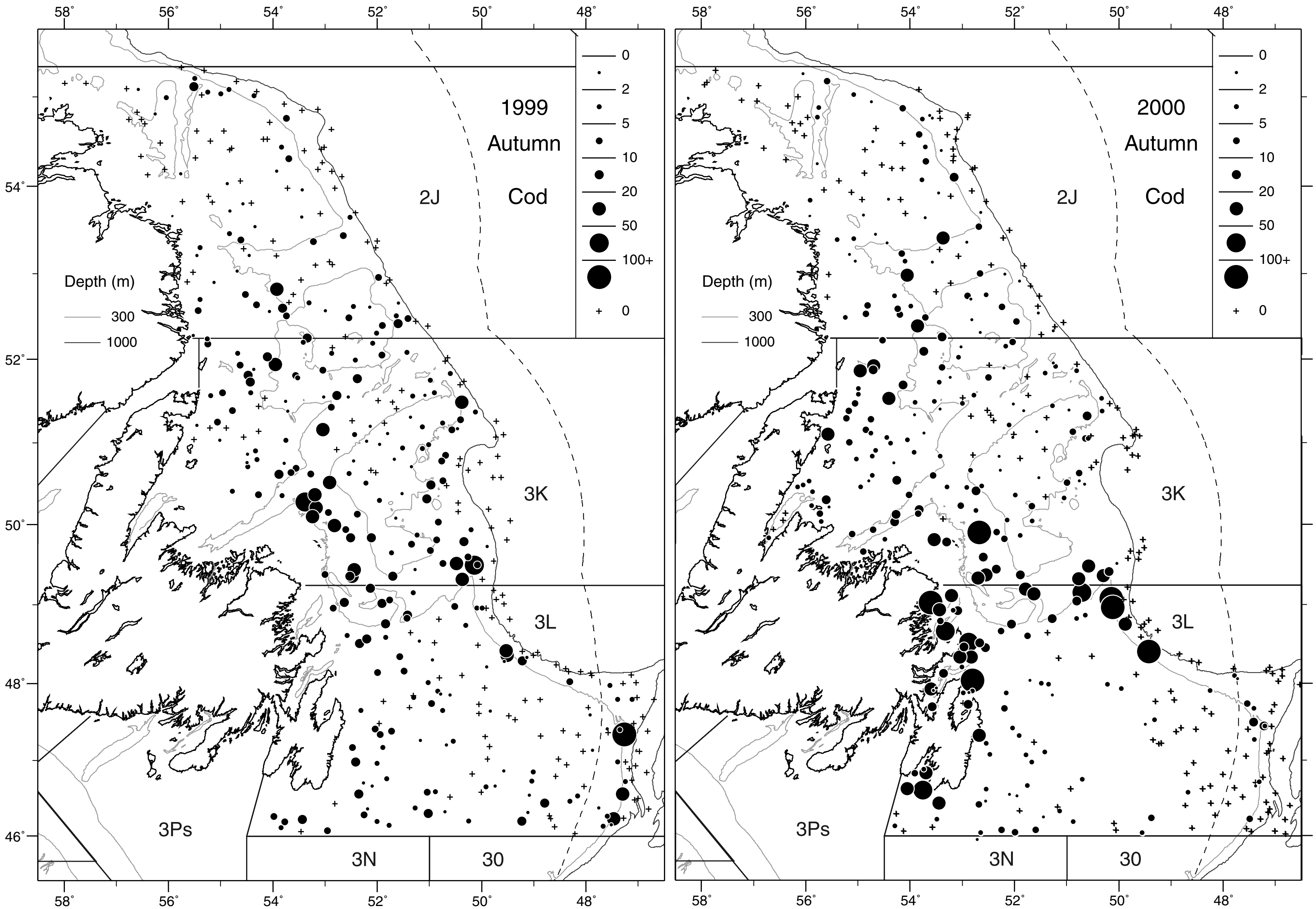


Fig. 10c. Cod distribution (number per standard tow) during the autumn surveys in divisions 2J3KL in 1999 and 2000.

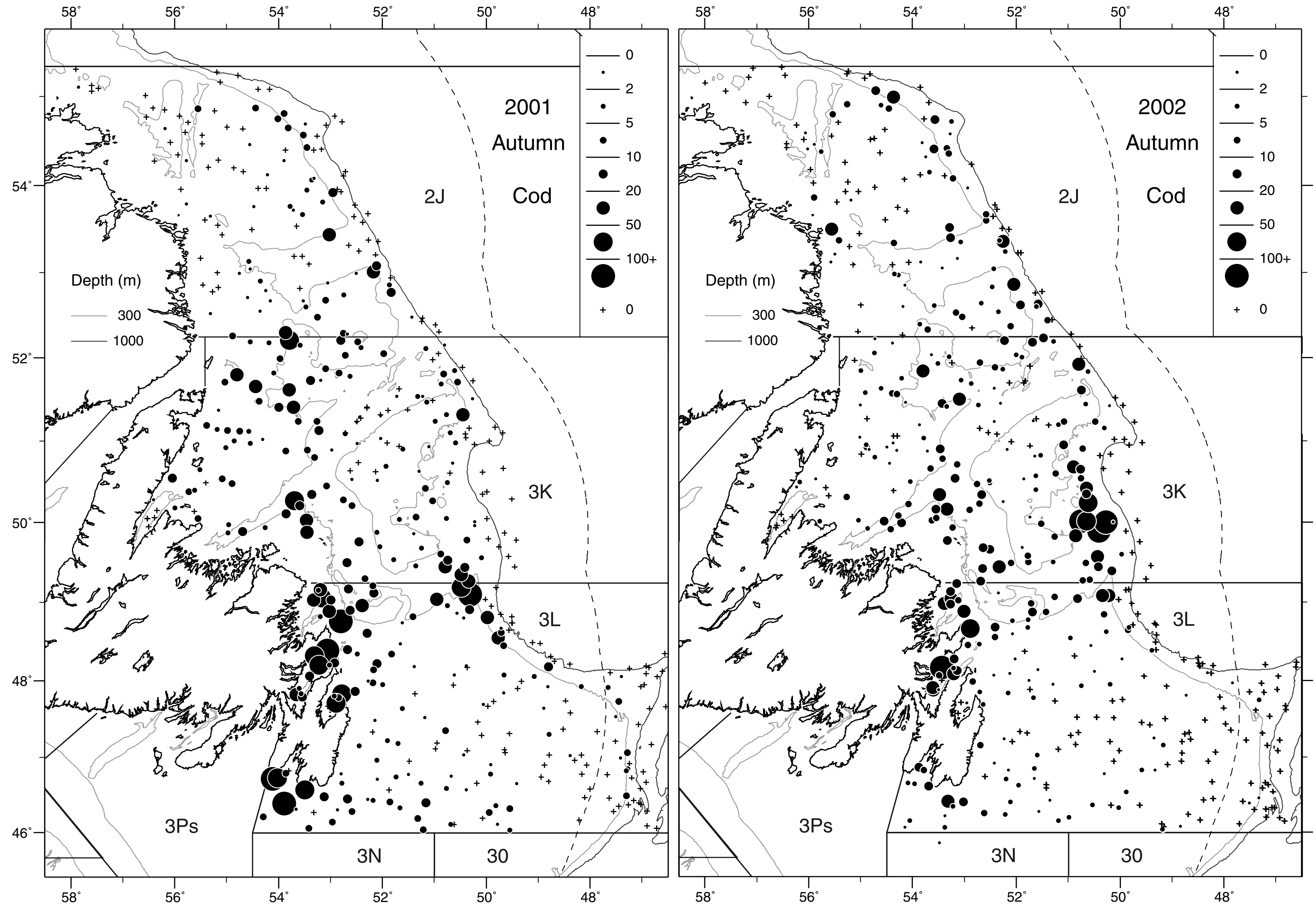


Fig. 10d. Cod distribution (number per standard tow) during the autumn surveys in divisions 2J3KL in 2001 and 2002.

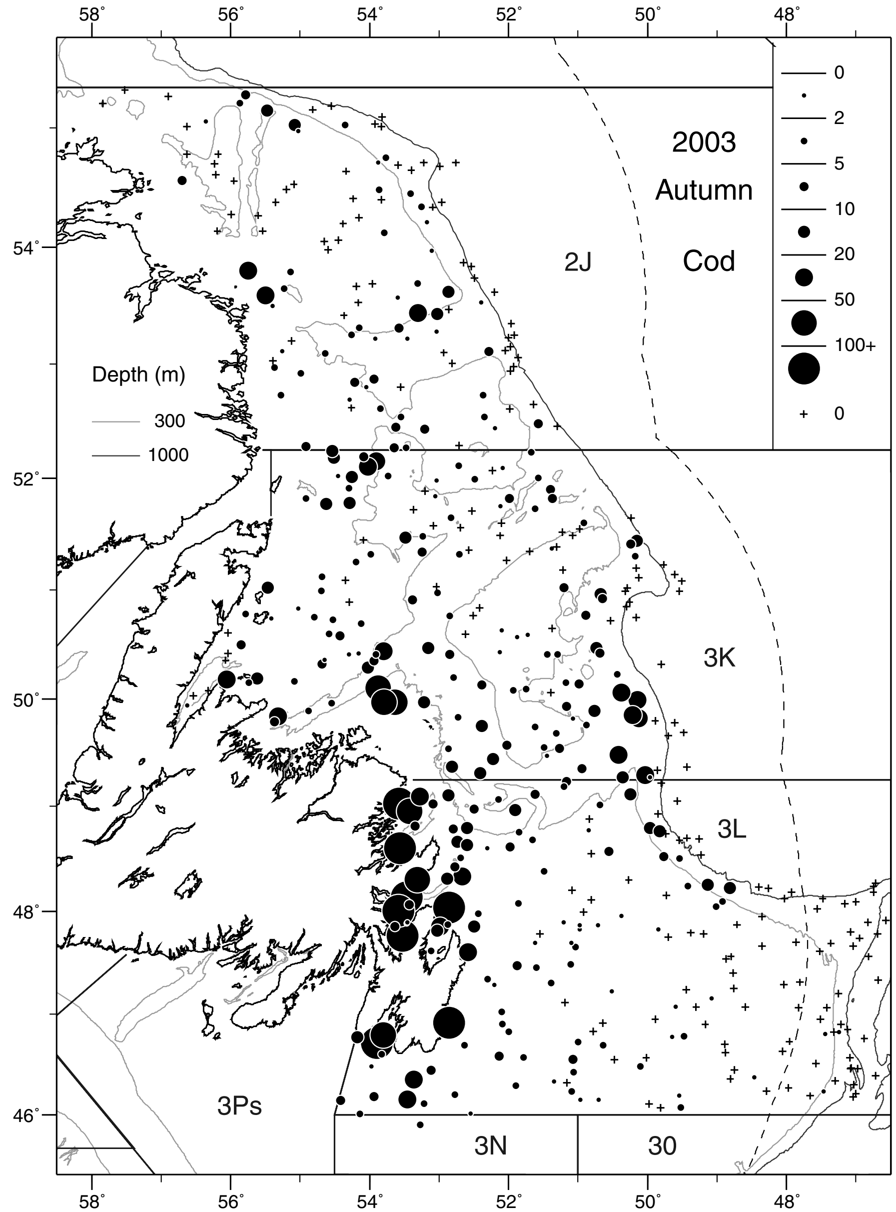


Fig. 10e. Cod distribution (number per standard tow) during the autumn survey in divisions 2J3KL in 2003.

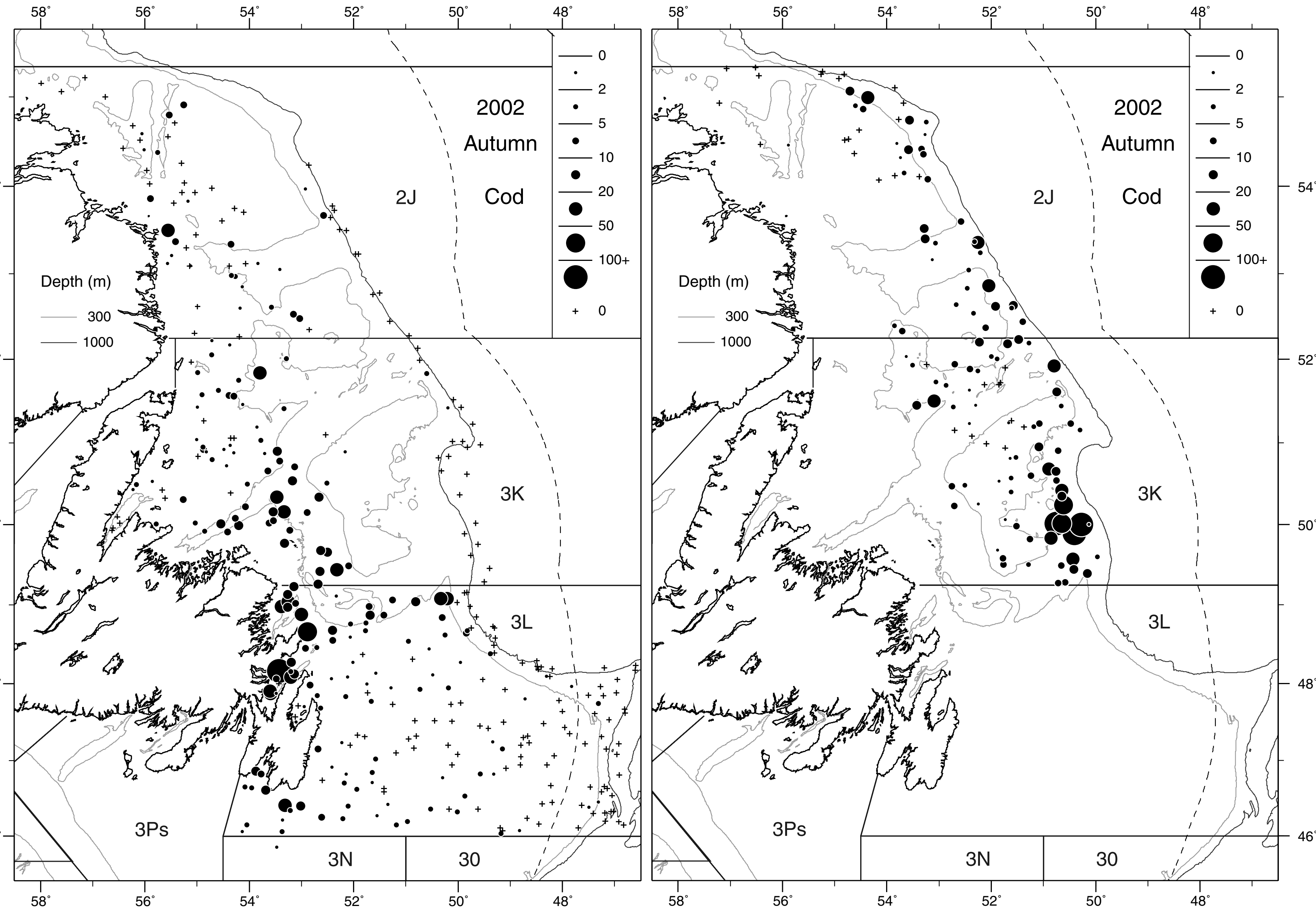


Fig. 11a. Cod distribution (number per standard tow) during the autumn surveys in divisions 2J3KL in 2002, showing those stations occupied during 2002 (left panel) and those occupied during 2003 (right panel).

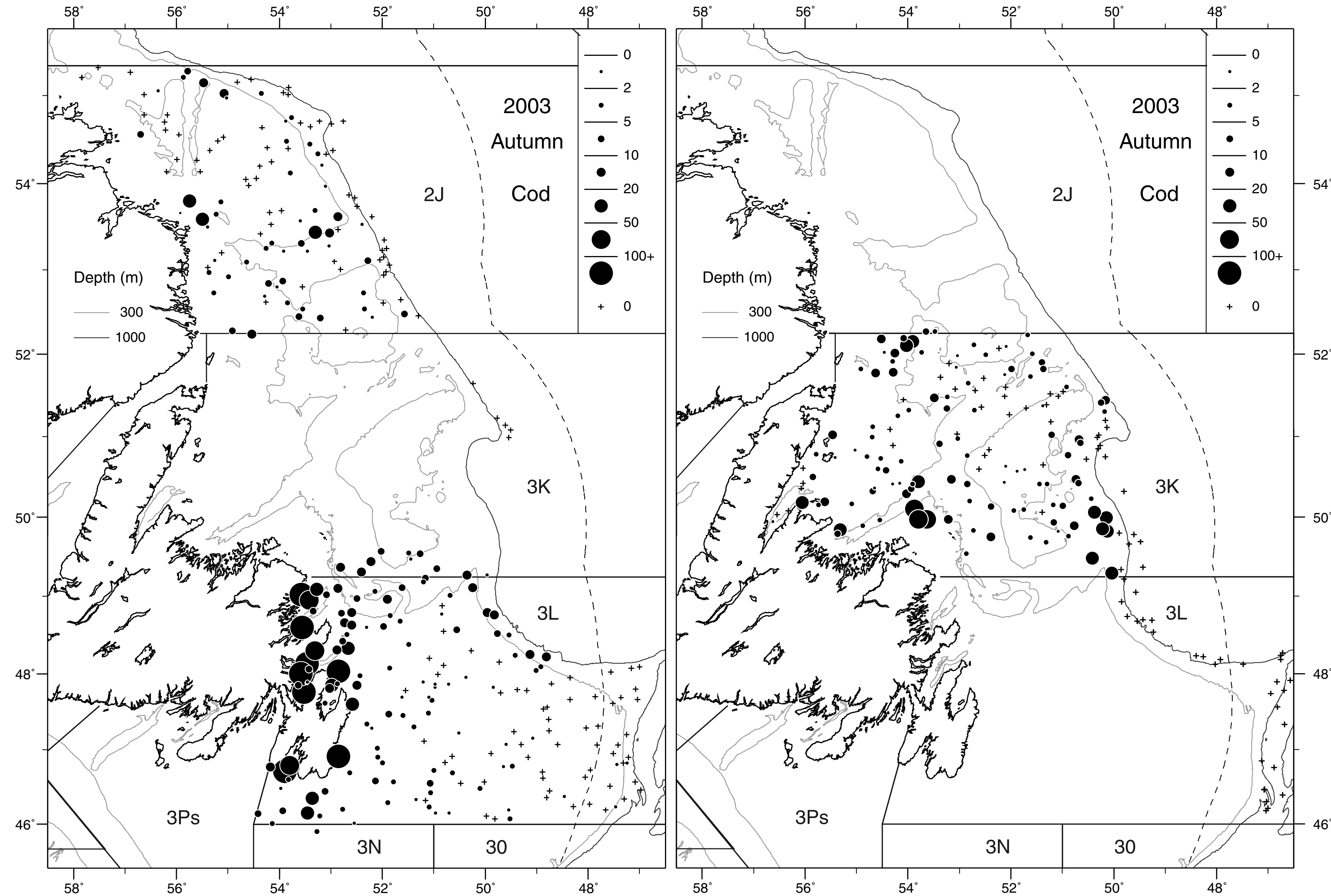


Fig. 11b. Cod distribution (number per standard tow) during the autumn surveys in divisions 2J3KL in 2003, showing those stations occupied during 2003 (left panel) and those occupied during 2004 (right panel).

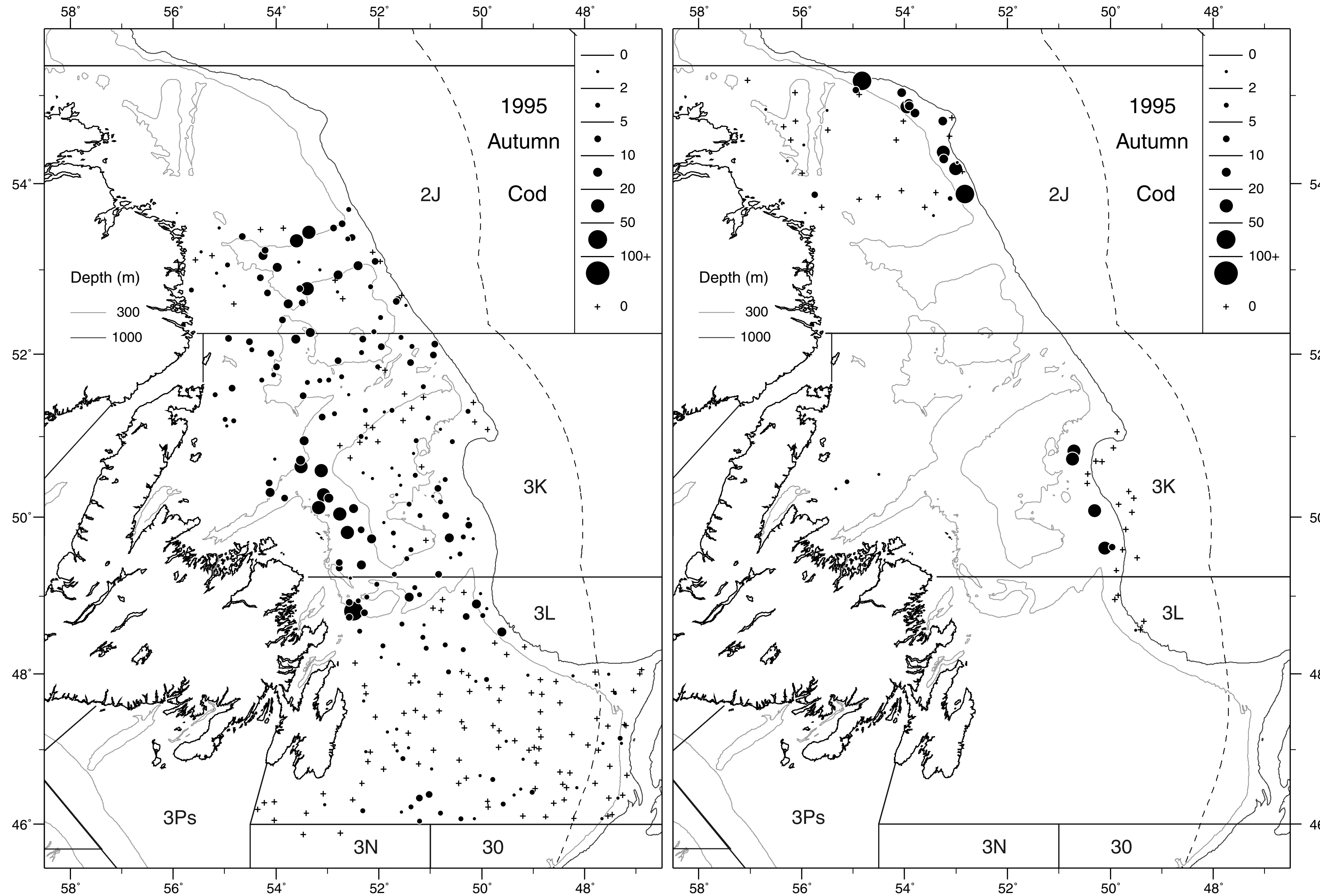


Fig. 11c. Cod distribution (number per standard tow) during the autumn surveys in divisions 2J3KL in 1995, showing those stations occupied during 1995 (left panel) and those occupied during 1996 (right panel).

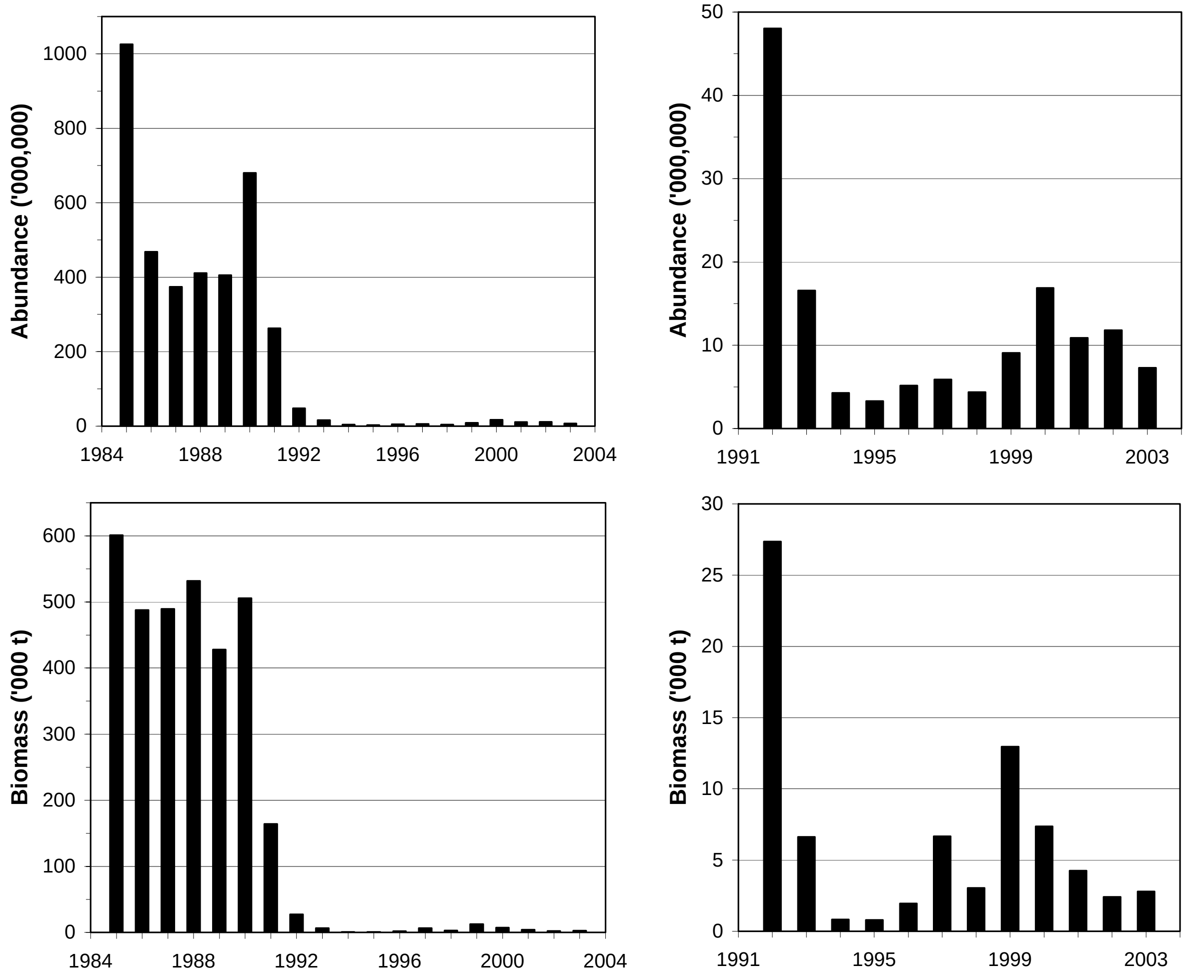


Fig. 12. Indices of abundance (above) and biomass (below) of cod from spring bottom-trawl surveys in the offshore index strata of division 3L in 1985-2003. The estimates for 1985-1995 are adjusted to Campelen equivalents. The right panels display data from 1992-2003 at an expanded scale so that changes may be more readily discerned.

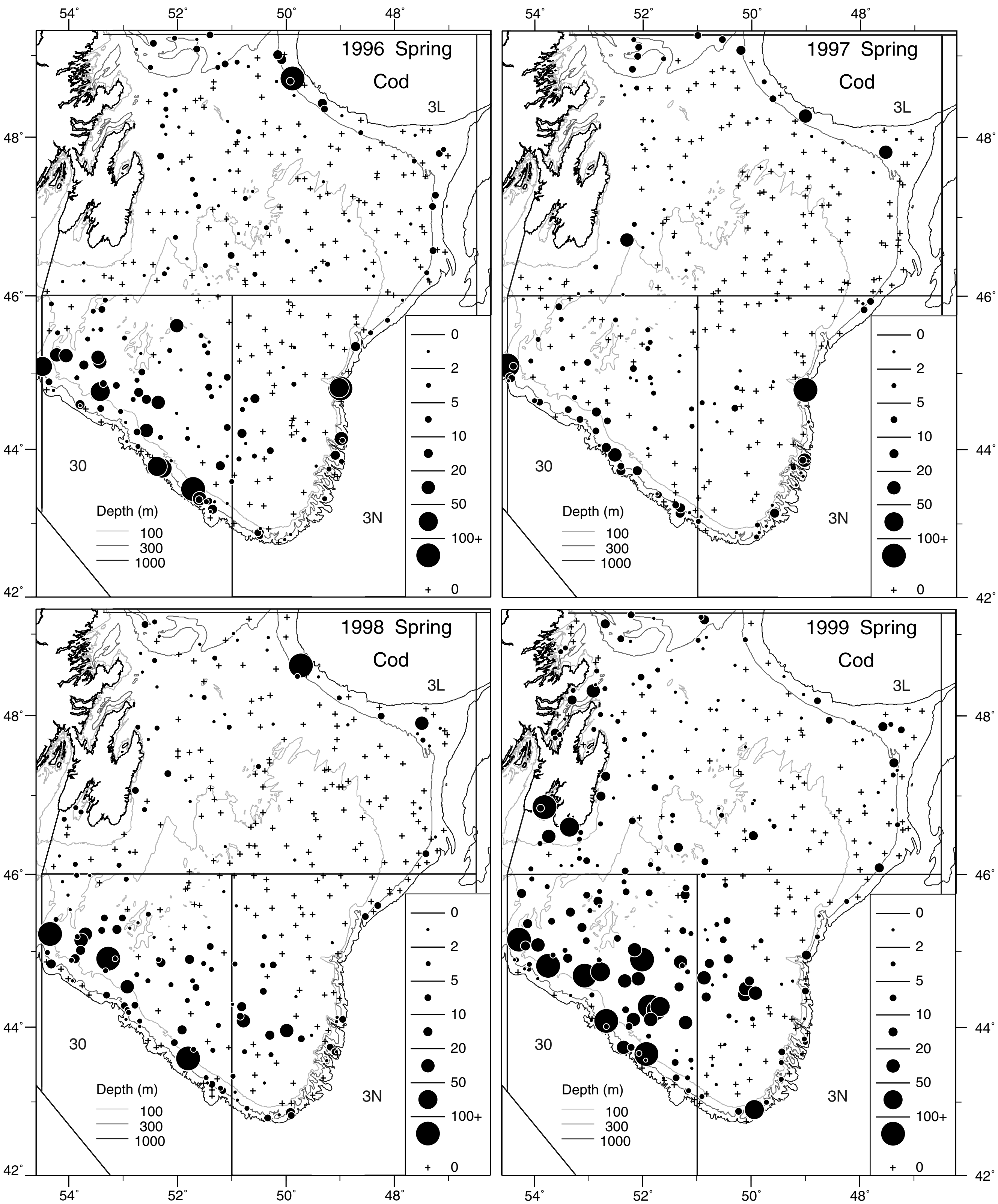


Fig. 13a. Geographic distribution (number per standard tow) during the spring surveys in divisions 3LNO in 1996-1999.

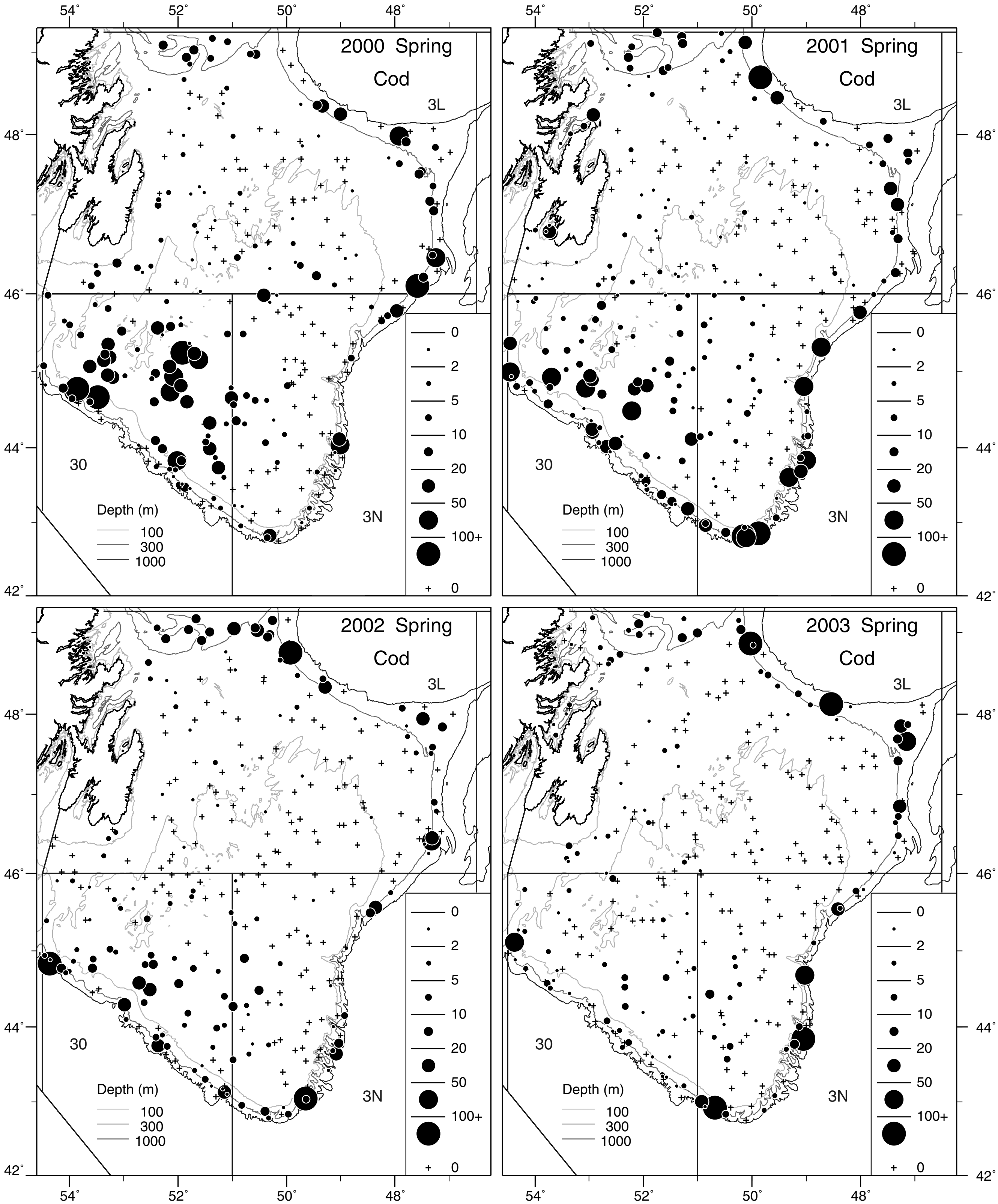


Fig. 13b. Geographic distribution (number per standard tow) during the spring surveys in divisions 3LNO in 2000-2003.

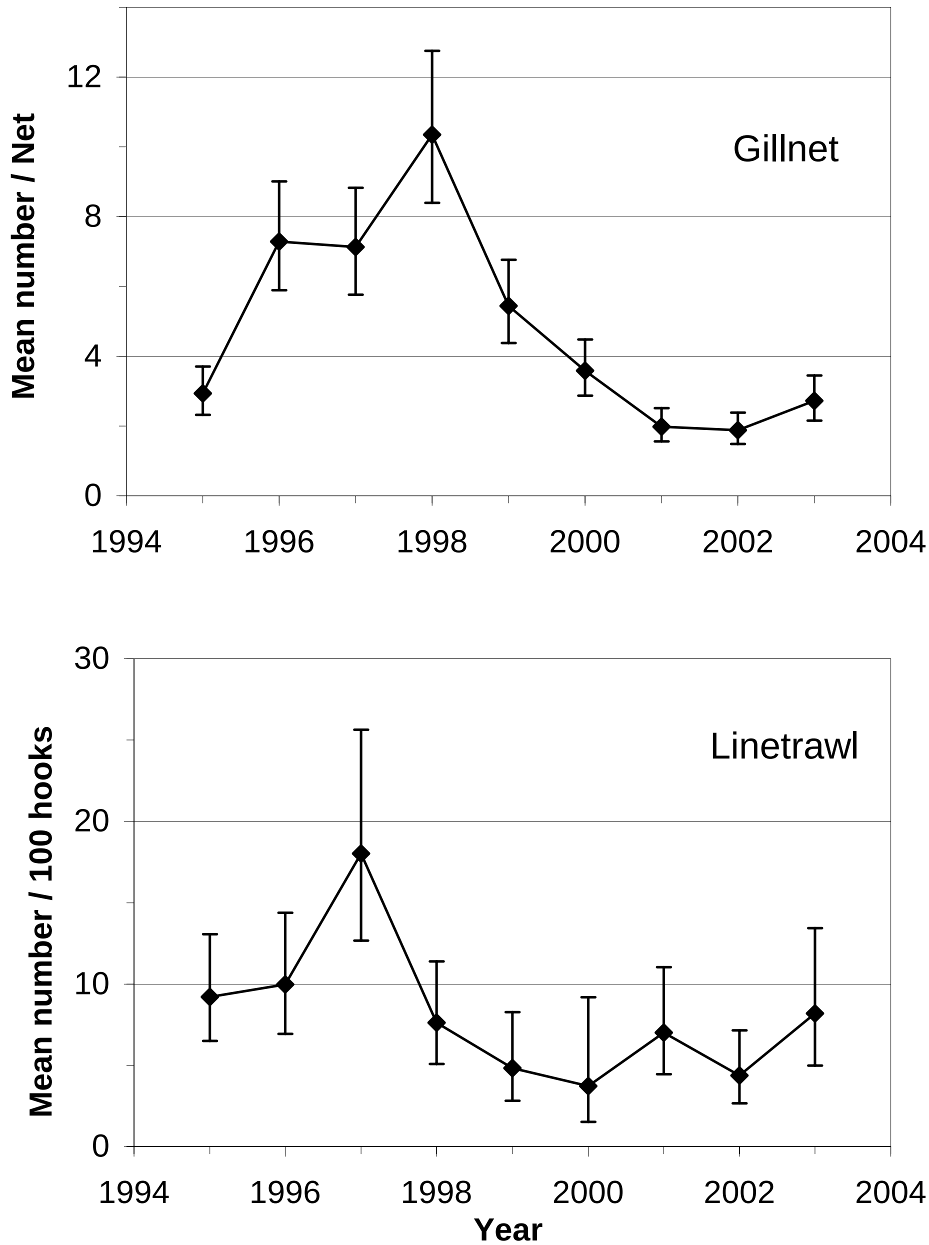


Fig. 14. Standardized catch rates from sentinel surveys in 3KL combined.