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Reference Document 2013/03

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Assessment of Eastern Georges Bank Haddock for 2013

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ABSTRACT

The total catch of eastern Georges Bank (EGB) haddock in 2012 was 5,631 mt of the 16,000 mt combined Canada/United States of America (USA) quota. The 2012 Canadian catch decreased from 11,247 in 2011 to 5,062 mt, a 55% decrease, while the USA catch in 2012 was 569 mt, a 60% decrease compared to the 2011 catch of 1,409 mt. Haddock discards from the Canadian scallop fishery and the USA groundfish fishery were estimated at 28 and 126 mt, respectively. Under restrictive management measures, combined Canada/USA catches declined from over 6,500 mt in 1991 to a low of 2,150 mt in 1995, averaged about 3,600 mt during 1996-1999 and have generally increased since then. Catches reached a peak in 2009 and have declined since then as the outstanding 2003 year class moved through the fishery.

Adult population biomass (ages 3+) has increased from near an historical low of 10,300 mt in 1993 to 83,900 mt in 2003. It decreased to about 59,900 mt at the beginning of 2005 but subsequently tripled to a record-high 159,900 mt in 2009, higher than the 1931-1955 maximum of about 90,000 mt. Adult biomass subsequently decreased to 62,700 in 2012. The exceptional 2003 and 2010 year classes, estimated at 307 million and 474 million age-1 fish, respectively, are the largest observed in the assessment time series (1931-1955 and 1969-2012). The preliminary estimate for the 2012 year class is 15 million fish at age 1. Except for the strong 2000 and 2011 year classes and the exceptional 2003 and 2010 year classes, recruitment has fluctuated between 2.1 and 28.8 million since 1990. Fully recruited fishing mortality fluctuated between 0.26 and 0.47 during the 1980s, and increased in 1993 to a high of 0.54, the highest observed. Fully recruited fishing mortality was below $F_{ref} = 0.26$ during 1995 to 2003, above or near F_{ref} in 2004 to 2006, but has subsequently been below F_{ref} and was 0.16 in 2012.

Positive signs of productivity include expanded age structure, broad spatial distribution, large biomass and two exceptional year classes and two strong year classes since 2000. On the negative side, condition has decreased substantially and size at age has declined.

Assuming a 2013 catch equal to the 10,400 mt total quota, a combined Canada/USA catch of 31,500 mt in 2014 results in a neutral risk (50%) that the 2014 fishing mortality rate would exceed $F_{ref} = 0.26$. A catch of 27,000 mt in 2014 results in a low risk (25%) that the 2014 fishing mortality rate will exceed F_{ref} . The 2010 year class at age 4 is expected to contribute 83% of the catch biomass and the 9+ group, of which the 2003 year class is the major component, is expected to contribute the next highest percentage at 9% of the 2014 catch biomass. The probability that the 2015 biomass will decrease is greater than 75% at the F_{ref} catch level and there is almost no chance that it will increase by 10% at any of the catch scenarios considered. But, adult biomass is projected to be very high, 240,000 mt, at the beginning of 2015 at the F_{ref} catch level.

RÉSUMÉ

Les captures totales d'aiglefin de l'est du banc Georges s'élevaient à 5 631 tm en 2012, sur un quota combiné de 16 000 tm pour le Canada et les États-Unis. Les captures canadiennes sont passées de 11 247 tm en 2011 à 5 062 tm en 2012, en diminution de 55 %, tandis que celles des États-Unis ont diminué de 60 %, passant de 1 409 tm en 2011 à 569 tm en 2012. On estime les rejets d'aiglefins dans la pêche canadienne du pétoncle et dans la pêche du poisson de fond aux États-Unis à 28 tm et 126 tm respectivement. En raison des mesures de gestion rigoureuses qui ont été mises en place, les captures combinées du Canada et des États-Unis sont passées de plus de 6 500 tm en 1991 à un creux d'environ 2 150 tm en 1995. Elles ont atteint en moyenne 3 600 tm entre 1996 et 1999, et elles ont généralement augmenté depuis. Les captures ont atteint un sommet en 2009 et elles ont diminué depuis, tandis que l'exceptionnelle classe d'âge 2003 est exploitée par la pêche.

La biomasse de la population adulte (âges 3+) a augmenté, passant d'un creux quasi historique de 10 300 tm en 1993 à 83 900 tm en 2003. Elle est tombée à 59 900 t en 2005, mais elle a triplé par la suite pour atteindre un record de 159 900 t en 2009, soit un niveau supérieur à la biomasse maximale de la période 1931-1955 qui était d'environ 90 000 t. La biomasse des adultes a ensuite diminué à 62 700 tm en 2012. Les classes d'âge exceptionnelles 2003 et 2010, dont on estime l'effectif des poissons d'âge 1 à 307 millions et 474 millions d'individus, respectivement, sont les plus importantes jamais observées dans les séries chronologiques d'évaluation (1931-1955 et 1969-2012). L'estimation préliminaire pour la classe d'âge 2012 est de 15 millions de poissons d'âge 1. Sauf pour les fortes classes d'âge 2000 et 2011 ainsi que pour les exceptionnelles classes d'âge 2003 et 2010, le recrutement a fluctué entre 2,1 et 28,8 millions d'individus depuis 1990. La mortalité par pêche des individus pleinement recrutés a fluctué entre 0,26 et 0,47 dans les années 1980. Elle a connu une augmentation en 1993 pour atteindre 0,54, soit la plus haute valeur jamais observée. La mortalité par pêche des individus pleinement recrutés était inférieure à la mortalité par pêche de référence $F_{\text{réf}} = 0,26$ de 1995 à 2003. Elle se situait au-dessus ou autour de $F_{\text{réf}}$ de 2004 à 2006, mais par la suite, elle est restée inférieure à $F_{\text{réf}}$ et était de 0,16 en 2012.

Parmi les signes encourageants de productivité, on peut citer l'élargissement de la structure par âge, la vaste répartition spatiale, la biomasse élevée, deux classes d'âge exceptionnelles et deux fortes classes d'âge depuis 2000. Parmi les signes négatifs, on note une détérioration importante de la condition et une diminution de la taille selon l'âge.

Si l'on suppose que les captures de 2013 sont égales au quota total de 10 400 tm, les captures combinées du Canada et des États-Unis de 31 500 t en 2014 se traduisent alors par un risque neutre (50 %) que le taux de mortalité par pêche en 2014 dépasse le taux de mortalité par pêche de référence $F_{\text{réf}} = 0,26$. Des captures totalisant 27 000 t en 2014 se traduiraient par un faible risque (25 %) que le taux de mortalité par pêche dépasse le taux de mortalité par pêche de référence $F_{\text{réf}}$ durant cette même année. La classe d'âge 2010, à l'âge 4, devrait constituer 83 % de la biomasse des captures en 2014. Au deuxième rang, avec 9 % de la biomasse des prises, on devrait trouver le groupe d'âge 9+, dont la classe d'âge 2003 est la principale composante. À $F_{\text{réf}}$, la probabilité que la biomasse de 2015 diminue est supérieure à 75 % et il n'y a pratiquement aucune chance qu'elle augmente de 10 % à l'un ou l'autre des scénarios de pêche envisagés. Toutefois, on prévoit qu'au début de 2015, à $F_{\text{réf}}$, la biomasse des adultes sera très élevée, à 240 000 tm.

INTRODUCTION

For the purpose of developing a sharing proposal and consistent management by Canada and the United States of America (USA), an agreement was reached that the transboundary management unit for haddock would be limited to the eastern portion of Georges Bank (EGB; DFO statistical unit areas j and m in NAFO sub-division 5Ze; USA statistical areas 551, 552, 561 and 562 in NAFO sub-division 5Ze; Figure 1; DFO 2002). This assessment applies the approach used by Van Eeckhaute et al. (2012) to Canadian and USA fisheries information updated to 2012. Results from the Fisheries and Oceans Canada (DFO) survey, updated to 2013, the USA National Marine Fisheries Service (NMFS) spring survey, updated to 2013 and the NMFS autumn survey, updated to 2012, were incorporated. The NMFS surveys since 2009, which use a new vessel, the *Henry B. Bigelow*, and a new net and protocols, were made equivalent to surveys undertaken by the *Albatross IV* with length based conversion factors.

FISHERY

COMMERCIAL CATCHES

Haddock on Georges Bank have supported a commercial fishery since the early 1920s (Clark et al. 1982). Catches from EGB during the 1930s to 1950s ranged between 15,000 mt and 40,000 mt (Figure 2), averaging about 25,000 mt (Schuck 1951, R. Brown pers. com.). Records of catches by unit area for 1956 to 1968 have not been located; however, based on records for NAFO Subdivision 5Ze, catches from EGB probably attained record high levels of about 60,000 mt during the early 1960s. Catches in the late 1970s and early 1980s (Table 1) reached a maximum of 23,344 mt and were associated with good recruitment. Substantial quantities of small fish were discarded in those years (Overholtz et al. 1983). Catches subsequently declined and fluctuated around 5,000 mt during the mid to late 1980s. Under restrictive management measures (Table 2), combined Canada/USA catches declined from 6,504 mt in 1991 to a low of 2,150 mt in 1995, varied between about 3,000 mt and 4,000 mt until 1999, and increased to 15,256 mt in 2005 (Figure 3). Combined catches decreased to 12,508 mt in 2007, increased to 19,856 mt in 2009, the highest catch since 1980, then decreased again to 5,631 mt in 2012. In 2012, the total catch represented 35% of the combined 16,000 mt quota. Canada caught 56% of its 9,120 mt allocation while the USA caught 8% of its 6,880 mt allocation. The total catch is well below the quota due to reduced availability of haddock and bycatch restrictions on the Canadian and USA fisheries.

Canadian

Some elements of the management measures used on EGB are described in Table 2. Quotas are the principal means used to regulate the Canadian groundfish fisheries on Georges Bank. Quota regulation requires effective monitoring of fishery catch. Weights of all Canadian landings since 1992 have been monitored at dockside. Canadian catches since 1995 have usually been below the quota due to closure of some fleet sectors when the cod quotas were reached. At-sea observer coverage increased from 2011 levels for all gears and represented 32% of otter trawl, 24% of longline and 16% of gillnet landings which amounted to an overall observed level of 31% of the haddock landings in 2012.

Between 1994 and 2004, the Canadian fishery for groundfish on EGB was prohibited from 1 January to 30 May. In 2005, increasing haddock abundance led to permission to conduct an exploratory Canadian groundfish fishery in January and February that has continued since that time. Observer coverage for this fishery has been higher than at other times of the year. So as not to adversely affect the rebuilding of cod on EGB, the winter fishery was closed February 6th

in 2012, based on when it was determined that cod were actively spawning in the previous year, i.e. when 30% of cod were in the spawning or post-spawning stages from spawning data collected by observers.

Canadian Landings

Canadian landings in 2012 decreased to 5,034 mt from 11,232 mt in 2011. The 2012 catch was the lowest since 2000. In recent years, the Canadian fishery has been conducted primarily by vessels using otter trawls and longlines with some handlines and gillnets. In 2012, almost all of the catch was taken by tonnage class 1 to 3 (less than 150 tons) vessels, corresponding roughly to vessels less than 65 ft in overall length. Otter trawl gear accounted for 83% and longline gear accounted for 17% of the haddock landings, and there were minimal landings from gillnet and handline gear (Table 3). The highest catch occurred in August, followed by July, January and February, in that order (Table 4, Figure 4). The January/February winter fishery landed 1,326 mt of haddock, accounting for 26% of the total Canadian landings, somewhat higher than the previous year. Quarter 3 had the highest percentage of total Canadian landings at 50%.

Prior to 1985, Canadian landings include haddock landings reported by the scallop fishery. Landings of haddock by the scallop fleet were low (Table 3) with a maximum of 38 mt reported in 1987.

Canadian Discards

Since 1996, the scallop fishery has been prohibited from landing haddock and this species is therefore discarded. Discards from this fleet ranged between 29 and 186 mt since 1969 (Table 1; Van Eeckhaute et al. 2005, 2006, 2010 and 2011, Gavaris et al. 2007, 2008 and 2009). In 2012 there were 20 observed scallop trips (Table 5). The monthly discard rates are calculated using a 3-month moving window average. Since 2011, the 3-month moving window used to calculate the discard rate includes December of the previous year for the January discard rate and January of the following year for the December rate (Van Eeckhaute et al. 2011). Discards in 2012 were estimated at 28 mt (Table 6).

Compliance with mandatory retention is thought to be high since at least 1992, so discards in the groundfish fishery are considered to be negligible.

USA

Management measures for the USA fishery have been primarily effort based since 1994; however, in 2004, quota management was introduced to regulate the USA groundfish fishery for EGB haddock (Table 2). From 2008 to 2010, the USA portion of the EGB management area was closed to vessels fishing with trawl gear from May 1st to July 31st. From 2011 onwards, the regulation only applies to the common pool which is a miniscule fraction of USA boats that fish on EGB (the common pool received 0.62% and 0.28% of the EGB quota in 2011 and 2012, respectively).

The minimum size for landed haddock had been reduced to 18 inches (45.7 cm) in October 2007 but reverted back to 19 inches (48.2 cm) in August, 2008. On May 1, 2009, the minimum size was again reduced to 18 inches through a NMFS interim action. This minimum size limit was retained in Amendment 16, which went into effect on May 1, 2010. On September 15th, 2008 the Ruhle trawl (previously called the Eliminator Trawl) was authorized for use in the USA portion of EGB management area. The Ruhle trawl is intended to reduce by-catch of cod. Also, beginning on May 1, 2010, many participants in the multispecies groundfish fishery organized into sectors, with each unique sector receiving a portion of the overall quota known as an Annual Catch Entitlement (ACE). Those vessels not joining a sector remained in the common pool, which received a portion of the overall quota. A discard provision went into effect on May 1, 2010, requiring that all legal sized fish be retained by vessels in a sector. On May 11,

2011, the Closed Area II Special Access Permit (SAP) was modified to allow targeting of haddock from August 1 to January 31. Also, on September 14, 2011, the haddock catch cap regulation for the herring midwater trawl fishery increased to 1% of the Georges Bank Annual Biological Catch (ABC).

USA Landings

USA landings of EGB haddock in 2012 were derived from mandatory fishing vessel trip reports (VTRs) and dealer reports. Statistical methodology was applied to allocate unknown landings to statistical area from 1994 to 2012 (Wigley et al. 2008a and Palmer 2008). Some of the landings for trawl gear that were reported in 2008 to 2010, during the months when EGB was closed to trawl gear, come from the allocation algorithm which assigns a statistical area when area is missing or there are inconsistencies in reported areas on logbooks. Trawl landings that were allocated to EGB during May to July for 2008-2010 comprised 3% to 5% of total annual US landings.

USA calendar year landings (Table 1) of EGB haddock decreased from 1,322 mt in 2011 to 443 mt in 2012. The 2012 USA landings peaked in quarter 2 (62%), primarily due to landings in April and May, which represent 25% and 26% of total annual landings. Landings from August through December were quite low, comprising only 14% of the total annual landings (Table 7). As in other years, the otter trawl gear accounted for the majority of the USA landings (438 mt; Table 8). The contribution by other gear, 5 mt, was 1%.

For USA fishing year May 1, 2012, to April 30, 2013, the USA catch quota for sectors was 6,861 mt of which only 4.2% was realized in landings (5.4% of quota, including discards). The catch quota for the common pool was 19 mt, none of which was caught. In recent years, landings have been constrained in part by the low cod quota, the closed area, as well as the delayed opening of the EGB area to trawlers until August 1, in effect from 2008 to 2010 for all USA trawl gear and, since 2011, for the common pool only. The use of the Ruhle and Separator trawls may have reduced interactions with the cod quota.

USA Discards

Discards were estimated from the ratio of discarded haddock to kept of all species, a new methodology that was first applied for the 2009 Eastern Georges Bank haddock assessment. This ratio is calculated by year-quarter (or other suitable time step)-gear-mesh and prorated to the total landings of all species in the same time-gear category to obtain total discards (mt) (Wigley et al. 2008b). Where time steps within the year are sparse, imputation is carried out.

Total discards in 2012 were 126 mt, an increase from 87 mt in 2011 (Tables 1 and 9). Discards were mostly from the second half of the year. USA discards from the large mesh otter trawl fishery increased from 31 mt in 2011 to 87 mt in 2012. Discards from this fleet accounted for 15.3% (by weight) of the USA haddock catch in 2012. Small mesh discards were 38 mt in 2012, a decrease from 50 mt in 2011. Gillnet and the scallop fisheries contributed very small amounts of discards in 2012.

SIZE AND AGE COMPOSITION

Ageing Precision and Accuracy

D. Knox provided ages for the 2012 Canadian fishery and 2013 DFO survey and S.J. Sutherland provided ages for the 2012 US fishery and the NMFS 2012 autumn and 2013 spring surveys. Age testing was conducted between the DFO reader and the NMFS reader and intra-reader testing was conducted at both labs. The NMFS reader also completed two tests against their haddock reference collection which resulted in 93% and 96% agreement. Inter-lab agreement ranged from 68% to 90%. No bias was detected for the exchange except for one

sample where Knox's ages tended to be younger by 1 year than Sutherland's. However, in this sample, the results for the strong year classes (2003, 2010 and 2011), which represented most of the catch, were not biased and agreement was high. Intra-reader agreement for the NMFS reader ranged between 91% and 98% and for the DFO reader between 84% and 95%. Age determinations at both labs were considered to be reliable for characterizing catch at age (Table 10; <http://www.nefsc.noaa.gov/fbp/QA-QC/hd-results.html>).

Canadian

The size and age composition of haddock in the 2012 Canadian groundfish fishery was characterized using port and at-sea samples from all principal gears (Table 11). Landings were applied to length samples combined by gear-month, then combined to calendar quarters before applying quarterly age length keys. Canadian fishery weights were derived from fishery lengths using a length-weight relationship which was derived from commercial fishery samples (*round weight* (kg) = 0.0000158 *length* (cm)^{2.91612}; Waiwood and Neilson 1985). Gillnet landings were low and the few available lengths were for quarter 3 only. Therefore, quarter 2 and 4 gillnet landings were added in at the quarter level. For trips that were sampled by both at-sea observers and port samples, the length frequencies from the two sources were combined with appropriate weighting from each source before using to ensure that samples were used in a consistent manner. The size composition of haddock discards in the 2012 Canadian scallop fishery was characterized by quarter using length samples obtained from 20 observed scallop trips which comprised 15% of the total trips and 16% of the total effort hours. The 2012 DFO survey ages, augmented with port and observer samples, were applied to the first quarter landings and discard length compositions. Fishery age samples for quarters 2, 3 and 4 were applied to the corresponding length compositions for both the groundfish fishery and discards.

The modal length of haddock in the 2012 Canadian fishery was the same as in 2011: 50.5 cm for otter trawlers and 50.5 to 52.5 cm for longliners (Figure 5). Haddock discarded by the scallop fleet had a peak at 32.5 cm and a peak at 50.5 cm.

The 9+ age group, comprised almost exclusively of the 2003 year-class, dominated all quarters of the Canadian landings and accounted for 55% in numbers of the Canadian landings. The contribution from the 9+ age group decreased throughout the year and dropped from 68% in quarter 1 to 37% by quarter 4. The 2005 and 2007 year classes (age 7 and 5, respectively) were the next highest contributors at about 10% each, while the 2010 year class at age 2 contributed 9% overall but by quarter 4 was making up 29% of the landings (Table 12 and Figure 6). Age 2 (2010 year class) made the highest contribution to the Canadian discards (78% by number) followed by the 2003 year class.

USA

USA landings of EGB haddock are sorted into "large" and "scrod" market categories at sea and are sampled in port for lengths and ages. Landings of large haddock totaled about 66 mt and scrod haddock totaled 377 mt in 2012 (Table 9). Length sampling for USA EGB landings in 2012 was very limited, with no samples in quarters 1 and 2 for both market categories, and also no samples for large haddock in quarter 3. Length and age samples were pooled to estimate catch at age by half-year rather than by quarter, and were augmented with length and age samples from US statistical area 522 and 525. After augmenting samples, there was a total of 2,216 lengths of EGB commercial landings and a total of 1,393 ages. USA fishery weights were derived from fishery lengths using a length-weight relationship for each half year. For quarters 1 and 2, that equation is (*round weight* (kg) = 6.07E-06**length* (cm)^{3.10782}); for quarters 3 and 4, that equation is (*round weight* (kg) = 7.12E-06**length* (cm)^{3.08054}).

USA fishermen are required to discard haddock under the legal size limit (18 inches/45.7 cm). A new regulation for the 2010 fishing year required vessels participating in a sector to retain all

legal sized haddock. USA discards at age of EGB haddock for calendar year 2012 were estimated by half-year from at-sea observer data. In fishing year 2012, the number of observed trips from the at-sea monitoring program was 148, a decrease from the previous year when there were 202. There were 552 trips to EGB for groundfish gear types, however the fraction of trips sampled varied by gear: 53% of otter trawl trips, 40% of gillnet trips, 14% of scallop trips, and 0% long line trips (out of 16 total long line trips).

As 99% of the discarding was due to the otter trawl fleet, there were few length samples from remaining gears (hook, gillnet, scallop dredge, and 'other'). Therefore, length samples were combined across gears. The resulting combined length frequencies by half-year were converted to discarded number at age by applying the age length keys from the NMFS spring bottom trawl survey (821 ages) to quarters 1 and 2 and from the autumn bottom trawl survey (579 ages) to quarters 3 and 4.

The length composition of USA landings in 2012 peaked between 51 and 55 cm (Figure 7). The 2003 year-class dominated the landings but the discards were dominated by age 2 (2010 year class; Table 12 and Figure 8). Discards from the 2010 year class were about equal in the first and second half of 2012 (Table 12). In numbers, discards represented 57% of the US catch.

Combined Canada/USA Catch at Age

The 2012 Canadian and USA landings and discards at age estimates (Table 12) were summed to obtain the combined annual catch at age and appended to the 1969 to 2011 catch at age data (Van Eeckhaute et al. 2012; Table 13; Figure 9). The average fishery weights at age are presented in Table 14 and Figure 10 and the average lengths at age in Table 15. The catch at age tracks year classes well. The contribution from older ages in recent years has increased when compared to the 1990s. The age composition of the catch projections made in 2011 and 2012 for 2012 agree reasonably well with the observed age composition (Figure 11). When compared to the projection that the quota was based on (i.e. 2011), the observed biomass is a better match than the numbers and the 2010 year class contributed almost 4 times the predicted percentage. The observed contribution from the 9+ age group was lower than expected. The 2003 year-class (age 9) dominated the fishery in 2012, accounting for 63% by weight and 50% by number.

Age 2 had contributed a large proportion of the catch during 1969 to 1994 but its contribution decreased dramatically in subsequent years (Figure 12). The increase in the dominant age in the catch is attributable primarily to a change in mesh type by the Canadian fishery, from diamond to square, and an increase in mesh size (Table 2). The combined 2005 to 2012 catch was dominated by ages 5, 6 and 7, a reflection of the domination of the 2000 and 2003 year classes, especially the 2003 year class, which continued to contribute substantially at older ages. The age composition during the 1969 to 1974 period was also atypical since it was dominated by the outstanding 1962 and 1963 year classes which continued to contribute substantially at ages 6 and older.

ABUNDANCE INDICES

RESEARCH SURVEYS

Surveys of Georges Bank have been conducted by DFO each year (February/March) since 1986 and by NMFS each autumn (October/November) since 1963 and each spring (April) since 1968. All surveys use a stratified random design (Figure 13 and 14). The *CCGS Alfred Needler* is the standard vessel used for the DFO Georges Bank survey, but, due to unavailability of the *Needler*, the *CCGS Wilfred Templeman*, a sister ship to the *Needler*, was used in 1993, 2004, 2007 and 2008. No conversion factors are available for the *Templeman*; however, this vessel is

considered to be similar in fishing strength to the *Needler*. For the NMFS surveys, two vessels have been employed from 1963 to 2008 and there was a change in the trawl door type in 1985. Vessel and door type conversion factors (Table 16), derived experimentally from comparative fishing, have been applied to the survey results to make the series consistent (Forrester et al. 1997). Additionally, two different trawl nets have been used on the NMFS spring survey, a modified Yankee 41 during 1973-81 and a Yankee 36 in other years, but no conversion factors are available for haddock.

Since spring 2009, the NMFS surveys have been conducted with the NOAA *FSV Henry B. Bigelow*, a new net (4 seam, 3 bridle) and revised protocols. Length based conversion factors have been calculated (Table 17 and Figure 15) and were applied by dividing *Bigelow* catches at length by the length specific conversion value to make the *Bigelow* survey catches equivalent to the *FRV Albatross IV* catches (Brooks et al. 2010).

The spatial distributions of catches by age group (1, 2, and 3+ for spring and 0, 1 and 2+ for autumn) for the 2012 NMFS fall survey, the 2013 DFO survey, and the 2013 NMFS spring survey are shown in comparison to the average distribution over the previous 10-year period (Figure 16-18). During the fall, age 0 is spread throughout the 5Zjm area, and age 1 haddock are also spread out over the bank but are more concentrated on the Canadian side than age 0. Older haddock migrate to deeper water along the northern edge and peak and to a lesser extent along the southern edge and so are mainly found on the Canadian side at this time of year. In February/March, the DFO survey finds ages 1 and 2 similarly distributed near the bank edges and mostly in the eastern part of the management unit. Ages 3 and older are concentrated on the bank near the northeast peak and edge and also in 5Zm near the Canada/US boundary and spreading north-eastward from there just north of 41°30'. In March/April the NMFS survey finds age 1 concentrated along the southern flank, age 2 is spread throughout the 5Zjm area, similar to the adults, which are now more widely dispersed than they were earlier in the year as observed from the DFO survey.

The 2012 NMFS fall survey had several very large catches of age 1 haddock (2011 year class). The 2013 DFO survey also had several good catches of this year class on the Canadian side and the 2013 NMFS spring survey had some good catches of the same year class but further to the west than the DFO survey. All three surveys had very large catches of the 3+ (2+ for fall) age group and they were distributed similarly to past distributions. Catches of the 2012 year class (age 1 in spring surveys and 0 in fall survey) were moderate for all three surveys (Figure 16-18).

Age-specific, swept area abundance indices show that the three surveys are consistent and track year-class strengths well (Table 18, 19 and 20; Figure 19). Some year effects are evident. For example, low spring catches occurred in 1997 in both the DFO and NMFS surveys. The most recent surveys were dominated by the 2010 and 2011 year classes. The abundance of older ages in the 2000s has increased in comparison to the 1980s and 1990s. Adult biomass indices (ages 2-7 in autumn; 3-8 in spring) peaked during the early 1960s (Figure 20). After declining to a record low in the early 1970s, they peaked again in the late 1970s, although at a lower level, and again during the early 1980s at about half the level of the 1970s peak. Adult biomass generally increased during the late 1990s and was high throughout the 2000s. The NMFS fall survey adult biomass declined in 2010 and again in 2011 but increased substantially in 2012 with the addition of the 2010 year class to the 2-8 age group. The NMFS spring and DFO surveys showed similar decreases in adult biomass from 2010 to 2012 but increased in 2013. The indices for the 2010 year class at age 3 are the highest for the DFO and NMFS spring surveys and second highest for the NMFS fall survey at age 2 (Tables 18, 19 and 20).

The recruitment indices for the 2011 year class are similar to the strong 2000 year class and the 2012 year class is comparable to the 2007 year class (Figure 21).

Georges Bank groundfish fishermen continued to corroborate the findings of the surveys with regard to the high abundance of the 2010 year class and reported that they were catching a relatively large number of small haddock in their catches.

GROWTH

Canadian and USA fishery weight at age trends show similar patterns (Figure 10). Low sampling for small year classes at older ages results in increased variability. Except for ages 3, 4 and 6, combined fishery weights at age in 2012 decreased (Table 14). A declining trend is visible starting around 2000. DFO survey weights and lengths at age in 2013 (Table 21 and 22; Figure 22) showed some decreases (ages 3, 6 and 8) and some increases (ages 2, 4, 5 and 7) but the size at age remains low compared to the pre-2000 period. Little improvement is evident for ages 6 to 8, which display a downward trend since the late 1990s. Average size at age for older haddock has declined substantially so that haddock age 4 and older are now at, or smaller, than the size that the next younger age group was in previous years before the declines occurred. Ages 5 to 8 are similar in weight and length indicating that the maximum size at age has decreased substantially as they are now generally less than the size that age 4 was before 2000. The 2010 year class length and weight at age 1 are the second lowest in the DFO time series.

Weights at age from the DFO survey are used as beginning of year population weights and are calculated using the method described in Gavaris and Van Eeckhaute (1998) in which weights observed from the survey are weighted by population numbers at length and age. Canadian fishery weights are derived from fishery lengths using a length-weight relationship (Waiwood and Neilson 1985).

HARVEST STRATEGY

The Transboundary Management Guidance Committee (TMGC) has adopted a strategy to maintain a low to neutral risk of exceeding the fishing mortality limit reference, $F_{ref} = 0.26$ (TMGC 2003). When stock conditions are poor, fishing mortality rates should be further reduced to promote rebuilding. The TMGC agreed to a common F strategy at its December 2002 TMGC meeting. The F references used by both countries for “healthy” or “rebuilt” stocks were virtually identical, i.e., 0.25 for Canada and 0.26 for the USA (TMGC Meeting Summary, October 2, 2003).

ESTIMATION OF STOCK PARAMETERS

CALIBRATION OF VIRTUAL POPULATION ANALYSIS (VPA)

Calibrated Virtual Population Analysis (VPA) was used to estimate stock parameters. The adaptive framework, ADAPT, (Gavaris 1988) was used to calibrate the VPA with the research survey data. Details of the model formulations and model assumptions can be found in the 1998 benchmark assessment (Gavaris and Van Eeckhaute 1998). Minor changes that were made since 1998 are summarized in Table 23.

The VPA was based on an annual catch at age, $C_{a,t}$ for ages $a = 0, 1, 2...8, 9+$, and time $t = 1969, 1970...2012$ where t represents the beginning of the time interval during which the catch was taken. Catch discards were included in the catch at age. The population was calculated to the beginning of 2013. The VPA was calibrated to bottom trawl survey abundance indices, $I_{s,a,t}$ for

$s = \text{DFO}$, ages $a = 1, 2, 3 \dots 8$, time $t = 1986.17, 1987.17 \dots 2011.17, 2012.17, 2013.00$

$s = \text{NMFS spring (Yankee 36)}$, ages $a = 1, 2, 3 \dots 8$, time $t = 1969.28 \dots 1972.28$ and $1982.28 \dots 2012.28, 2013.00$

$s = \text{NMFS spring (Yankee 41)}$, ages $a = 1, 2, 3 \dots 8$, time $t = 1973.28, 1974.28 \dots 1981.28$

$s = \text{NMFS autumn}$, ages $a = 0, 1, 2 \dots 5$, time $t = 1969.79, 1970.79 \dots 2012.79$.

Since the population is calculated to beginning year 2013, the NMFS and DFO spring surveys in 2013 were designated as occurring at time 2013.00.

Statistical properties of estimators were determined using conditional non-parametric bootstrapping of model residuals (Efron and Tibshirani 1993, Gavaris and Van Eeckhaute 1998). Population abundance estimates at age 1 and 2 exhibit a large relative error of 57% and 37%, respectively, and a large relative bias at age 1 of 12%. The relative error for other ages is between 23% and 29% with a relative bias for ages 2 and older between 1% and 6% (Table 24). While trends in the three surveys are generally consistent, the survey indices exhibit high variability and the average magnitude of residuals is large relative to other assessments. Although several large residuals were apparent, these do not appear to have a substantial impact on estimates of current abundance (Figure 23 to 27). Some patterns in the residuals (by cohort and by year) suggest year class and/or year effects. Negative residuals are prevalent in the most recent surveys (2012/2013).

Retrospective Analysis

Retrospective analyses were used to detect any trends to consistently overestimate or underestimate biomass, fishing mortality and recruitment relative to the terminal year estimates (Figure 28 and 29). Some bias in the estimates of ages 3+ biomass were evident but relative differences were low. Recruitment estimates may sometimes change substantially when more data becomes available, e.g., the 2008 year class, and there has been a tendency to overestimate initial year class size, but subsequent estimates exhibit only minor deviation from terminal year estimates.

A historical retrospective analysis which incorporates all data and model formulation changes by plotting the results from previous assessments back to the last benchmark in 1998 instead of peeling back years from the current assessment is illustrated in Figure 30. This analysis shows that the perception of the stock has remained fairly stable through the data and model changes.

STATE OF RESOURCE

Evaluation of the state of the resource was based on results from the VPA for the years 1969 to 2013. For each cohort, the terminal population abundance estimates from ADAPT were adjusted for bias estimated from the bootstrap, and used to construct the history of stock status (Table 25, 26 and 27). This approach for bias adjustment was considered preferable to using potentially biased point estimates of stock parameters (O'Boyle 1998). The weights at age from the DFO survey (Table 21) were used to estimate beginning of year population biomass (Table 27). A weight of 2.4 kg, which was midway between the age 6 and 8 weight for that cohort, was used for age 7 in 1995 as no data were available for that age group. The 1986-95 average weight at each age was used for 1969-85.

The adult (ages 3+) population biomass trend reflects the survey adult biomass trends (scaled with catchabilities; Figure 31). Adult biomass increased during the late 1970s and early 1980s to 38,000 mt in 1981. The increase was due to recruitment of the strong 1975 and 1978 year-classes which were both estimated to be above 50 million age-1 fish (Figure 32). However, adult biomass declined rapidly in the early 1980s as these two cohorts were fished intensely at

ages 2 and 3 and subsequent recruitment was poor. Improved recruitment in the 1990s and the strong 2000 year class (84 million at age 1), lower exploitation, and reduced capture of small fish in the fisheries allowed the biomass to increase from near a historical low of 10,300 mt in 1993 to 83,900 mt in 2003. Adult biomass decreased to 59,900 mt in 2005 but subsequently increased to 159,900 mt in 2009, higher than the 1931-1955 maximum adult biomass of about 90,000 mt. The near tripling of the biomass from 2005 to 2009 was due to the exceptional 2003 year-class, estimated at 307 million age-1 fish. The biomass decreased after the 2009 high and in 2012 the adult biomass was 62,700 mt but increased in 2013, when the 2010 year class joined the 3+ group, to 183,600 mt (80% confidence interval: 146,700 mt – 249,300 mt, Figure 33). Except for the strong 2000 and 2011 year classes and the exceptional 2003 and 2010 year classes, recruitment has fluctuated between 2.1 and 28.8 million age 1 fish since 1990. The 2001, 2002, 2004, 2006, 2007, 2008 and 2009 year classes, at less than 8 million fish, are below the median of 9.1 million age 1 fish for 1994 to 2013. The preliminary estimate of the 2012 year class at 15 million fish is similar to the 2005 estimate. The estimate for the 2010 year class is outstanding at 474 million age-1 fish, slightly lower than the estimates from the previous two assessments, making it the largest in the assessment time series: 1931-1955 and 1969-2013.

Since 2003, the age at full recruitment to the fishery has been age 5 (rather than age 4 as in previous years) due to a decline in size at age. Comparison of age 4 and 5 fishing mortality (Table 26) and average weights at age from the fishery and survey (Figure 34) indicate that full recruitment to the fishery since 2003 occurs around age 5. Fishery weights are approaching survey (population) weights at age 5, and, when beginning of year to mid-year growth is accounted for, indicate that age 5 fish are fully selected by the fishery. Fully recruited fishing mortality (population weighted average of fully recruited ages) is presented, therefore, for ages 4-8 for pre-2003 and ages 5-8 for 2003 onwards. Fully recruited fishing mortality fluctuated between 0.26 and 0.47 during the 1980s (Figure 35). After reaching a high of 0.54 in 1993, it decreased to well below $F_{ref} = 0.26$ after 1994, stayed below F_{ref} until 2003, fluctuated around F_{ref} during 2004 to 2006, then declined and was 0.16 in 2012 (80% confidence interval: 0.14 – 0.20, Figure 33).

Consistent with the increase in age at full recruitment into the fishery, the partial recruitment at age for EGB haddock is normalized to ages 4-8 population weighted F for 1969 to 2002 and to ages 5-8 population weighted F from 2003 onwards (Table 28; Figure 36). Average partial recruitment estimates are less variable when weighted by population numbers and is considered more appropriate than the unweighted average.

Gains in fishable biomass may be partitioned into those associated with somatic growth of haddock which have previously recruited to the fishery, and those associated with new recruitment to the fishery (Rivard 1980). We used age 2 as the age of first recruitment to the fishery. This choice facilitated comparisons with historic stock productivity but may be less representative of the current fishery selectivity. Since 1993, surplus production (biomass gains from growth and from recruitment, decremented by losses due to natural deaths) often exceeded fishery harvest yields, resulting in net population biomass increases (Figure 37). In 2009 to 2011, surplus production decreased substantially as growth of the 2003 year class slowed and gains from recruitment remained low but increased again, well above yield, in 2012 due to the recruitment of the outstanding 2010 year class. Growth of fish is the dominant component of the biomass gain but recruitment accounts for significant portions when stronger year classes enter the population, e.g. the 2000 year class in 2002 and the 2003 year class in 2005 (Figure 38). The biomass contributed by the 2003 and 2010 year classes, both when they recruited at age 2 and through growth during that year was greater than that of any other cohorts since 1969.

PRODUCTIVITY

Recruitment, as well as age structure, spatial distribution and fish growth reflect changes in the productive potential. Data to approximate the age composition of the catch from unit areas 5Zj and 5Zm during 1931 to 1955 were used to reconstruct a population analysis of EGB that was suitable for comparison of productivity to recent years (Gavaris and Van Eeckhaute 1997, Figure 32).

The catch and survey age structure displays a broad representation of age groups, reflecting improving recruitment and lower exploitation since 1995 (Figure 9 and 19).

Recruitment, while highly variable, has generally been higher when adult biomass has been above 40,000 mt (Figure 39). Since 1969, only the 1975, 1978, 2000, 2003, 2010 and 2011 year classes have been above the average abundance of 40.5 million age one fish of year classes observed during the period 1931-55. The recruits-per-adult biomass ratio has been highly variable since 1969. It was generally low during the 1980s but higher during the 1990s, comparable to the 1931-1955 period (Figure 40) when the 3+ biomass was above 40,000 mt. Since 2001, with the exception of 2003, 2010 and 2011, recruits per spawner have again been low. The very high 3+ biomass (greater than about 100,000 mt) observed since 2006 has produced one exceptional year class but has also produced four below average year classes (Figure 39).

The spatial distribution patterns observed during the most recent bottom trawl surveys were similar to the average patterns over the previous ten years for the spring surveys. Consistent with the pattern observed for previous exceptional year-classes, the 2010 year-class, the main component of the 3+ age group, was widely distributed throughout the survey area, especially during the NMFS spring survey (Figures 17 and 18).

Fish condition as measured by Fulton's K for ages 1 to 9, combined, derived from the DFO survey exhibits a declining trend since about 2001 and declined to its lowest value in 2011 (Figure 41). Except in 2009, the condition factor of haddock has been below the series average since 2003, similar to the trends in condition observed in Eastern Georges Bank cod and Georges Bank yellowtail flounder. Fish condition derived from the NMFS fall survey shows a similar decline (note that weights are available only since 1992 from this survey). The strong 2003 and 2010 year classes sometimes show much lower condition than the ages 1-9 average from the DFO survey. The increase in condition in fall 2008 and spring 2009 coincides with reports from the fishery of high sandlance abundance during this period (Pers. comm. Alain d'Entremont).

Both fishery and survey average lengths and weights at age have declined (Figure 10, 22 and 34) and the 2003 year class appears to have reached its maximum growth potential at a smaller size than previous year classes (Table 22 and Figure 42). Decreased growth rates at age, i.e., the 2007 year class at age 3, 4 and 5 and the 2005 year class at age 5 and 6, were observed from DFO survey data. The 2010 year class lengths at age 1 and 2 are less than the 2003 year class but slightly higher at age 3 (Figure 42).

Changes in growth in response to changes in stock abundance and episodes of very strong recruitment have been observed throughout this stock's history. Clark et al. (1982), reporting on Georges Bank haddock, observed "*a decline in mean weight for all age-groups following every period of very strong recruitment*" and a rapid increase in growth following the late 1960's and early 1970's reduction in stock size. As postulated by Clark et al. (1982), increased or decreased availability of food is probably the greatest determining factor for growth increases and decreases, respectively.

In summary, positive signs of productivity include expanded age structure, broad spatial distribution and large biomass and this stock has produced two exceptional and two strong year

classes in the last 12 years. On the negative side, condition has decreased, growth has declined and recruitment from the very large biomass has been extremely variable.

PARTIAL RECRUITMENT ON OLDER AGES

Figure 43 illustrates the results of a calculation of total mortality (Z) for ages 3 to 8 and the 9+ group from the DFO survey. Positive values indicate that there has been a decrease in survey abundance and negative values indicate an increase in survey abundance for age 'a' to 'a+1' while zero values indicate no change in abundance. The results for age 8 show that there has been a large increase in Z for about the last 9 years, however, fishing mortality for age 8 has decreased in the last few years. These results support the use of a low PR on the 9+ age group for the catch projection for the 2014 fishing year.

Another indication that a low PR on the 9+ age group should be used for projections is the comparison of predicted versus observed landings for 2012 (Figure 11). Even though a low PR of 0.3 was used, the contribution from the 9+ group was about 20% lower than the 2011 projection. However, with the reduced importance of the 2003 year class to future catches, specification of the 9+ PR for projected catch is less critical.

OUTLOOK

This outlook is provided in terms of consequences with respect to the harvest reference point for alternative catch quotas in 2014. Uncertainty about standing stock generates uncertainty in forecast results which is expressed here as the risk of exceeding $F_{ref}=0.26$. The risk calculations assist in evaluating the consequences of alternative catch quotas by providing a general measure of the uncertainties. However, they are dependent on the data and model assumptions and do not include uncertainty due to variations in weight at age, partial recruitment to the fishery, natural mortality, systematic errors in data reporting or the possibility that the model may not reflect stock dynamics closely enough.

The 2013 DFO survey weights at age were used for the projection inputs for the 2013 population weights at age. The 2003 year class survey weights at ages 4 and 5 were used for the 2010 year class population weights for the same ages. Other year classes for 2014 and 2015 were given the 2011 to 2013 average weights at age (weighted by population) from the DFO survey. The 9+ age group population weights were based on the 9+ DFO survey weight which was very similar to the 2003 year class weight. No growth was assumed for the 9+ age group.

Weights used for catch weights at age were the 2010 to 2012 Canada/USA landings average weights at age except for the 2010 year class where the 2003 year class fishery weights were used for the respective ages and the 9+ age group which was given the 2003 year class Canada/USA landings weight at age 9 (similar to the 9+ population weighted average) as no growth was assumed (Table 29).

Except for the 2010 year class and age 9+ group, partial recruitment inputs were derived from the 2003 to 2012 population weighted values. This is a deviation from the protocol (i.e., using the average of the last 3 years) but it was observed that not including the 2003 year class values resulted in PRs that were significantly higher than what was observed for the 2003 year class (Table 28). Some of the PRs were suspected to have high error as they came from very small year classes. The 2010 year class was given the 2003 year class PR values at the same ages (3 and 4). The 9+ group was given a PR of 0.3 to be consistent with the assessment model results. The 9+ group was not considered to be less catchable by the fishery, but lower availability was observed (Table 28) which was thought to be aliasing unknown processes. Ages 5 to 8 were considered fully recruited to the fishery.

EGB haddock are considered 100% mature at ages 3 and older.

Incorporating the patterns in growth and partial recruitment detailed in Table 29, a deterministic projection and risk assessment was conducted to beginning year 2015 (Table 30) Stock size estimates at the beginning of 2013 were used to start the forecasts. Abundance of the 2013 and 2014 year classes were assumed to be 6.7 million at age 1, the 2003 to 2012 median from the 2012 assessment results. Natural mortality was assumed to be 0.2. Assuming a 2013 catch equal to the 10,400 mt total quota, a combined Canada/USA catch of 31,500 mt in 2014 results in a neutral risk (50%) that the 2014 fishing mortality rate would exceed $F_{ref} = 0.26$ (Figure 44). A catch of 27,000 mt in 2014 results in a low risk (25%) that the 2014 fishing mortality rate will exceed F_{ref} . A catch of 37,500 mt in 2014 results in a high risk (75%) that the 2014 fishing mortality rate will exceed F_{ref} . The 2010 year class at age 4 is expected to contribute 83% of the catch biomass and the 9+ group, of which the 2003 year class is the major component, is expected to contribute the next highest percentage at 9% of the 2014 catch biomass. The probability that the 2015 biomass will decrease is greater than 75% at the F_{ref} catch level and there is almost no chance that it will increase by 10% at any of the catch scenarios considered. But, adult biomass is projected to be very high, 240,000 mt, at the beginning of 2015 at the F_{ref} catch level.

SPECIAL CONSIDERATIONS

Catch projections for this stock can be highly influenced by outstanding and influential year classes. There is no direct evidence to indicate that age 9 and older haddock should be less available to the fishery than age 8 haddock, however, the domed partial recruitment at age 9 and older that the assessment model produces may be aliasing increased natural mortality, emigration outside of the management area or to areas inaccessible to the fishery, or some other unknown process. Several corroborating factors influenced the decision to use the lower PR produced by the model, e.g. the percent predicted versus percent observed age 9+ in the 2011 (Van Eeckhaute et al. 2012) and, especially, the 2012 catch at age (Figure 11). These factors support the use of the lower PR as does the analysis of total mortality from the DFO survey (Figure 43). The highest contribution to the 2012 catch was age 9+ which was dominated by the 2003 year class and it should give a good indication as to whether the 9+ PR of 0.3 from the model should be used for catch projections. The 9+ age group was expected to contribute 69% by numbers in the 2011 projection which used a 9+ PR of 1.0 (Van Eeckhaute and Brooks 2011). The percent contribution for that age group was well below what was predicted indicating that the PR produced by the model is more appropriate.

In 2014, a large proportion of the 2010 year class will be below the current minimum size regulation used by the US, which could lead to significant discarding. This is not expected to be an issue in the Canadian fishery due to the different gear types and management measures.

Cod and haddock are often caught together in groundfish fisheries, although their catchabilities to the fisheries differ and they are not necessarily caught in proportion to their relative abundance. With current fishing practices and catch ratios, the achievement of rebuilding objectives for cod may constrain the harvesting of haddock. Modifications to fishing gear and practices, with enhanced monitoring, may mitigate these concerns.

The table in Appendix A summarizes the performance of the management system. It reports the TRAC advice, expected beginning of year 3+ biomass in the year following the catch year, the TMGC quota decision, actual catch, and realized stock conditions for this stock. Fishing mortality and trajectory of age 3+ biomass from the assessment following the catch year are compared to results from this assessment. These comparisons were kindly provided in 2011 by Tom Nies (staff member of the New England Fishery Management Council, NEFMC) and updated for this assessment. The largest differences in expected and actual results occurred

when projection inputs for partial recruitment and weights at age for large dominant year classes (i.e., 2000 and 2003) were higher than the realized values. When year class specific input values were used, expected and actual results were similar. These results indicate that stock biomass is being adequately estimated by the model for management purposes, but, misspecification of partial recruitment and weights at age, especially of very large and influential year classes, can result in higher than expected fishing mortality due to catch advice being set too high.

ACKNOWLEDGEMENTS

G. Donaldson and D. Frotten of DFO and at sea observers from Javitech Ltd. provided samples from the Canadian fishery. D. Knox and S. Sutherland provided ageing information for the DFO and NMFS surveys and Canadian and USA fisheries. We thank members of the fishing industry who spent time to discuss their experiences in the fishery. We also thank NMFS reviewers for their suggestions to improve the document.

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Eastern Georges Bank Haddock for 2013

Table 1. Nominal catches (mt) of haddock from eastern Georges Bank (EGB) during 1969-2012. For "Other" it was assumed that 40% of the total 5Z catch was in EGB. USA landings and 1989 to 2007 USA discards were revised (Van Eeckhaute et al. 2009). Canadian discards are from the scallop fishery and USA discards are from the groundfish fishery.

| Year | Landings | | | Discards | | Totals | | | Quotas | |
|------|-------------------|-------------------|-------|----------|------------------|--------|-------|-------|----------|------------------|
| | Canada | USA | Other | Canada | USA | Canada | USA | Catch | Canadian | USA ² |
| 1969 | 3941 | 6624 | 695 | 123 | | 4064 | 6624 | 11382 | | |
| 1970 | 1970 | 3154 | 357 | 116 | | 2086 | 3154 | 5597 | | |
| 1971 | 1610 | 3533 | 770 | 111 | | 1721 | 3533 | 6024 | | |
| 1972 | 609 | 1551 | 502 | 133 | | 742 | 1551 | 2795 | | |
| 1973 | 1565 | 1397 | 396 | 98 | | 1663 | 1397 | 3455 | | |
| 1974 | 462 | 955 | 573 | 160 | 757 | 622 | 1712 | 2907 | | |
| 1975 | 1353 | 1705 | 29 | 186 | | 1539 | 1705 | 3273 | | |
| 1976 | 1355 | 974 | 24 | 160 | | 1515 | 974 | 2513 | | |
| 1977 | 2871 | 2428 | | 151 | 2966 | 3022 | 5394 | 8416 | | |
| 1978 | 9968 | 4725 | | 177 | 1556 | 10145 | 6281 | 16426 | | |
| 1979 | 5080 | 5213 | | 186 | | 5266 | 5213 | 10479 | | |
| 1980 | 10017 | 5615 | | 151 | 7561 | 10168 | 13176 | 23344 | | |
| 1981 | 5658 | 9081 | | 177 | | 5835 | 9081 | 14916 | | |
| 1982 | 4872 | 6286 | | 130 | | 5002 | 6286 | 11287 | | |
| 1983 | 3208 | 4453 | | 119 | | 3327 | 4453 | 7780 | | |
| 1984 | 1463 | 5121 | | 124 | | 1587 | 5121 | 6708 | | |
| 1985 | 3484 | 1684 | | 186 | | 3670 | 1684 | 5354 | | |
| 1986 | 3415 | 2201 | | 92 | | 3507 | 2201 | 5708 | | |
| 1987 | 4703 | 1418 | | 138 | | 4841 | 1418 | 6259 | | |
| 1988 | 4046 ¹ | 1694 | | 151 | | 4197 | 1694 | 5891 | | |
| 1989 | 3060 | 785 | | 138 | 137 | 3198 | 922 | 4121 | | |
| 1990 | 3340 | 1189 | | 128 | 76 | 3468 | 1265 | 4732 | | |
| 1991 | 5456 | 931 | | 117 | 0 | 5573 | 931 | 6504 | | |
| 1992 | 4058 | 1629 | | 130 | 9 | 4188 | 1638 | 5826 | 5000 | |
| 1993 | 3727 | 424 | | 114 | 106 | 3841 | 530 | 4371 | 5000 | |
| 1994 | 2411 | 24 | | 114 | 1279 | 2525 | 1302 | 3827 | 3000 | |
| 1995 | 2065 | 15 | | 69 | 0 | 2134 | 16 | 2150 | 2500 | |
| 1996 | 3663 | 26 | | 52 | 5 | 3715 | 31 | 3746 | 4500 | |
| 1997 | 2749 | 55 | | 60 | 1 | 2809 | 56 | 2865 | 3200 | |
| 1998 | 3371 | 271 | | 102 | 0 | 3473 | 271 | 3744 | 3900 | |
| 1999 | 3681 | 359 | | 49 | 5 | 3729 | 364 | 4093 | 3900 | |
| 2000 | 5402 | 340 | | 29 | 3 | 5431 | 343 | 5774 | 5400 | |
| 2001 | 6774 | 762 | | 39 | 22 | 6813 | 784 | 7597 | 6989 | |
| 2002 | 6488 | 1090 | | 29 | 16 | 6517 | 1106 | 7623 | 6740 | |
| 2003 | 6775 | 1677 | | 98 | 96 | 6874 | 1772 | 8646 | 6933 | |
| 2004 | 9745 | 1847 | | 93 | 235 | 9838 | 2081 | 11919 | 9900 | 5100 |
| 2005 | 14484 | 649 | | 48 | 76 | 14532 | 724 | 15256 | 15410 | 7590 |
| 2006 | 11984 | 313 | | 62 | 275 | 12047 | 588 | 12634 | 14520 | 7480 |
| 2007 | 11890 | 256 ³ | | 56 | 306 ³ | 11946 | 562 | 12508 | 12730 | 6270 |
| 2008 | 14781 | 1138 ³ | | 33 | 52 ³ | 14814 | 1190 | 16004 | 14950 | 8050 |
| 2009 | 17595 | 2152 ³ | | 54 | 55 ³ | 17648 | 2208 | 19856 | 18900 | 11100 |
| 2010 | 16578 | 2167 | | 14 | 34 | 16592 | 2201 | 18794 | 17612 | 11988 |
| 2011 | 11232 | 1322 | | 15 | 87 | 11247 | 1409 | 12655 | 12540 | 9460 |
| 2012 | 5034 | 443 | | 28 | 126 | 5062 | 569 | 5631 | 9120 | 6880 |

¹ 1895 mt excluded because of suspected area misreporting.

² The USA quota pertains to the USA fishing year of May 1 to Apr. 30 while the USA catches reported in this table pertain to the calendar year.

³ USA landings and discards revised in 2011.

Eastern Georges Bank Haddock for 2013

Table 2. Regulatory measures implemented for the 5Z and eastern Georges Bank (EGB) fishery management units by the United States (USA) and Canada, respectively, from 1977, when jurisdiction was extended to 200 miles for coastal states, to the present.

| Year | USA | Canada |
|----------|---|---|
| 1977-82 | Mesh size of 5 1/8" (140 mm), seasonal spawning closures, quotas and trip limits. | |
| 1982-85 | All catch controls eliminated, retained closed area and mesh size regulations, implemented minimum landings size (43 cm). | First 5Ze assessment in 1983. |
| Oct.1984 | Implementation of the 'Hague' line, the boundary between Canada and the USA. | |
| 1985 | 5 1/2" mesh size, Areas 1 and 2 closed February-May. | |
| 1989 | | Combined cod-haddock-pollock quota for 4X-5Zc |
| 1990 | | EGB adopted as management unit. For mobile gear (MG) < 65 ft. – trip limits with a 30% by-catch of haddock to a maximum of 8 trips of 35,000 lbs per trip between June 1 st and October 31 st and minimum square mesh size 130 mm. Fixed gear required to use large hooks until June |
| 1991 | Established overfishing definitions for haddock. | MG < 65 ft similar to 1990 but diamond mesh size increased to minimum 145 mm. |
| 1992 | | Introduction of Individual Transferable Quotas (ITQ) and dockside monitoring. Total allowable catch (TAC) = 5000 mt. |
| 1993 | Area 2 closure in effect from January 1 st – June 30 th . | Otter trawl (OT) fishery permitted to operate in January and February. Increase in use of square mesh, minimum 130 mm). TAC = 5000 mt. |
| 1994 | January: Expanded Area 2 closure to include June and increased extent of area. Area 1 closure not in effect. 500 lb trip limit. Catch data obtained from mandatory log books combined with dealer reports (replaces interview system). May: 6" mesh restriction. December: Area 1,2 closed year-round. | Spawning closure extended to January 1 st to May 31 st . Fixed gear vessels must choose between 5Z or 4X for the period of June to September. Small fish protocol. Increased at sea monitoring. OT > 65 could not begin fishing until July 1 st . Predominantly square mesh, minimum 130 mm by end of year. TAC = 3000 mt. |
| 1995 | | All OT vessels using square mesh, minimum 130 mm. Fixed gear vessels with a history since 1990 of 25t or more for 3 years of cod, haddock, pollock, hake or cusk combined can participate in 5Z fishery. ITQ vessels require at least 2t of cod and 8t of haddock quota to fish Georges. TAC = 2500 mt. Restrictions on catching of cod and haddock under 43 cm (small fish protocol). |
| 1996 | July: Additional Days-at-Sea restrictions, trip limit raised to 1000 lbs. | Fixed gear history requirement dropped. TAC = 4500 mt. |
| 1997 | May: Additional scheduled Days-at-sea | All OT vessels using square mesh, minimum |

Eastern Georges Bank Haddock for 2013

| Year | USA | Canada |
|--|---|--|
| | restrictions. September: Trip limit raised to 1000 lbs/day, maximum of 10,000 lbs/trip. | 130 mm. Vessels over 65 ft operated on enterprise allocations, otter trawlers under 65 ft on individual quotas, fixed gear vessels 45-65 ft on self-administered individual quotas and fixed gear vessels under 45 ft on community quotas administered by local boards. TAC = 3,200 mt. |
| 1998 | September 1 st : Trip limit raised to 3000 lbs/day, maximum of 30,000 lbs/trip. | All OT vessels using square mesh, minimum 130 mm. Fixed gear vessels 45-65 ft operated on individual quotas. TAC = 3,900 mt. |
| 1999 | May 1 st : Trip limit 2,000 lbs/day, max. 20,000 lbs/trip. Square mesh size increased to 6.5" (diamond is 6"). June 15 th : Scallop exemption fishery in Closed Area II. November 5 th : Trip limit 5,000 lbs/day, max. 50,000 lbs/trip. | All OT vessels using square mesh, minimum 130 mm. TAC = 3,900 mt.; mandatory cod separator panel when no observer on board. |
| 2000 | October: Daily trip limit suspended to April 2001 but retained max. trip limit of 50,000 lbs/trip. | All OT vessels using square mesh, minimum 130 mm. TAC = 5,400 mt. |
| 2001-2002 | Day and trip limit adjustments. Daily trip limit suspended July 5, 2002. | All OT vessels using square mesh, minimum 130 mm. TAC = 6,989 and 6,740 mt for 2001 and 2002 respectively. |
| 2002-2003 | 30,000 – 50,000 lb/trip limit. Trip limit suspended in October 2003. | All OT vessels using square mesh, minimum 130 mm. TAC = 6,933 mt for 2003. |
| <i>Canada – USA Resource Sharing Agreement on Georges Bank</i> | | |
| 2004 | May 1 st , day and trip limits removed. Quota management introduced. TAC ¹ = 5,100 mt. October 1 st : unit areas 561 and 562 closed to groundfish vessels. Nov. 19: Special Access Program (SAP) for haddock opened. December 31 st : Haddock SAP closed. | All OT vessels using square mesh, minimum 130 mm. TAC = 9,900 mt. |
| 2005 | TAC ¹ = 7,590 mt. January 14 th : separator trawl required. Fishery was closed in August when cod by-catch quota reached. | All OT vessels using square mesh, minimum 130 mm. TAC = 15,410 mt; exploratory winter fishery January to February 18, 2005. |
| 2006 | TAC ¹ = 7,480 mt; EGB area closed to USA fishery in first half of year when USA cod quota nearly reached. | All OT vessels using square mesh, minimum 130 mm. TAC = 14,520 mt; exploratory winter fishery January to February 6 th , 2006. |
| 2007 | TAC ¹ = 6,270 mt. June 20 th : EGB area closed to USA fishery due to USA cod catch nearing quota. August 9 th : Minimum haddock size reduced to 18 inches; October 20 th : EGB area opened to USA fishery. | All OT vessels using square mesh, minimum 130 mm. TAC = 12,730 mt; exploratory winter fishery January to February 15, 2007 |
| 2008 | TAC ¹ = 8,050 mt. Minimum size reverts back to 19 in. in August. Prohibitions on yellowtail flounder fishing January 24 th to April 30 th . Trawl fishery opening delayed until August 1 st . Ruhle trawl (type of separator trawl) approved for use beginning | All OT vessels using square mesh, minimum 130 mm. TAC = 14,950 mt; winter fishery January 1 st , to February 8, 2008. |

Eastern Georges Bank Haddock for 2013

| Year | USA | Canada |
|------|--|--|
| | September 15 th . Restrictions on cod catches. | |
| 2009 | TAC ¹ =11,100 mt. May 1 st : Interim action by NMFS set the minimum size at 18 inches. | All OT vessels using square mesh, minimum 130 mm. TAC = 18,900 mt; winter fishery January 1 st to February 7, 2009. Industry test fishery/survey in deep water in February to assess spawning condition of haddock in deep water. Test fishery terminated after 2 trips. |
| 2010 | TAC ¹ =11,988 mt May 1, 2010: Sector Management with Annual Catch Entitlements (ACEs) and accountability measures implemented (Amendment 16). Minimum haddock size limit set to 18 inches. All legal size fish must be retained by sector vessels. | All OT vessels using square mesh, minimum 130 mm. TAC = 17,612 mt; winter fishery January 1 st to February 7, 2010 |
| 2011 | TAC ¹ =9,460 mt | All OT vessels using square mesh, minimum 130 mm. TAC = 12,540 mt; winter fishery January 1 st to February 6, 2011 |
| 2012 | TAC ¹ =6,880 mt | All OT vessels using square mesh, minimum 130 mm. TAC = 9,120 mt; winter fishery January 1 st to February 4, 2012 |

¹For fishing year from May 1st to April 30th

Eastern Georges Bank Haddock for 2013

Table 3. Canadian landings (mt) of haddock from eastern Georges Bank during 1969-2012 by gear category and tonnage class for principal gears.

| Year | Otter Trawl | | | | | | Longline | | | Scallop Fishery | Other | Total |
|-------------------|-------------|-------|------|-----|--------------------|-------|----------|--------------------|------|-----------------|-------|-------|
| | Side | Stern | | | Total ¹ | 2 | 3 | Total ¹ | | | | |
| | | 2 | 3 | 4 | | | | | 5 | | | |
| 1969 | 777 | 0 | 1 | 225 | 2902 | 3127 | 2 | 21 | 23 | 15 | 0 | 3941 |
| 1970 | 575 | 2 | 0 | 133 | 1179 | 1314 | 6 | 72 | 78 | 2 | 1 | 1970 |
| 1971 | 501 | 0 | 0 | 16 | 939 | 955 | 18 | 129 | 151 | 3 | 0 | 1610 |
| 1972 | 148 | 0 | 0 | 2 | 260 | 263 | 23 | 169 | 195 | 1 | 2 | 609 |
| 1973 | 633 | 0 | 0 | 60 | 766 | 826 | 23 | 80 | 105 | 0 | 1 | 1565 |
| 1974 | 27 | 0 | 6 | 8 | 332 | 346 | 29 | 59 | 88 | 1 | 0 | 462 |
| 1975 | 222 | 0 | 1 | 60 | 963 | 1024 | 25 | 81 | 107 | 0 | 0 | 1353 |
| 1976 | 217 | 0 | 2 | 59 | 905 | 967 | 48 | 108 | 156 | 0 | 15 | 1355 |
| 1977 | 370 | 92 | 243 | 18 | 2025 | 2378 | 43 | 51 | 94 | 1 | 28 | 2871 |
| 1978 | 2456 | 237 | 812 | 351 | 5639 | 7039 | 121 | 47 | 169 | 17 | 287 | 9968 |
| 1979 | 1622 | 136 | 858 | 627 | 1564 | 3185 | 190 | 80 | 271 | 2 | 0 | 5080 |
| 1980 | 1444 | 354 | 359 | 950 | 6254 | 7917 | 129 | 51 | 587 | 4 | 65 | 10017 |
| 1981 | 478 | 448 | 629 | 737 | 2344 | 4159 | 331 | 99 | 1019 | 1 | 1 | 5658 |
| 1982 | 115 | 189 | 318 | 187 | 3341 | 4045 | 497 | 187 | 712 | 0 | 0 | 4872 |
| 1983 | 106 | 615 | 431 | 107 | 1130 | 2283 | 593 | 195 | 815 | 1 | 3 | 3208 |
| 1984 | 5 | 180 | 269 | 21 | 149 | 620 | 614 | 192 | 835 | 2 | 1 | 1463 |
| 1985 | 72 | 840 | 1401 | 155 | 348 | 2745 | 562 | 33 | 626 | 2 | 39 | 3484 |
| 1986 | 51 | 829 | 1378 | 95 | 432 | 2734 | 475 | 98 | 594 | 4 | 32 | 3415 |
| 1987 | 48 | 782 | 1448 | 49 | 1241 | 3521 | 854 | 113 | 1046 | 38 | 50 | 4703 |
| 1988 ² | 72 | 1091 | 1456 | 186 | 398 | 3183 | 428 | 200 | 695 | 16 | 80 | 4046 |
| 1989 | 0 | 489 | 573 | 376 | 536 | 1976 | 713 | 175 | 977 | 12 | 95 | 3060 |
| 1990 | 0 | 928 | 890 | 116 | 471 | 2411 | 623 | 173 | 853 | 7 | 69 | 3340 |
| 1991 | 0 | 1610 | 1647 | 81 | 689 | 4028 | 900 | 271 | 1309 | 8 | 111 | 5456 |
| 1992 | 0 | 797 | 1084 | 56 | 645 | 2583 | 984 | 245 | 1384 | 4 | 87 | 4058 |
| 1993 | 0 | 535 | 1179 | 67 | 699 | 2489 | 794 | 156 | 1143 | 2 | 93 | 3727 |
| 1994 | 0 | 495 | 911 | 79 | 112 | 1597 | 498 | 47 | 714 | 9 | 91 | 2411 |
| 1995 | 0 | 523 | 896 | 14 | 214 | 1647 | 256 | 75 | 390 | 7 | 21 | 2065 |
| 1996 | 1 | 836 | 1405 | 166 | 270 | 2689 | 561 | 107 | 947 | 0 | 26 | 3663 |
| 1997 | 0 | 680 | 1123 | 91 | 96 | 1991 | 501 | 116 | 722 | 0 | 36 | 2749 |
| 1998 | 0 | 863 | 1340 | 98 | 71 | 2422 | 570 | 252 | 921 | 0 | 28 | 3371 |
| 1999 | 0 | 954 | 1471 | 174 | 145 | 2761 | 486 | 241 | 887 | 0 | 32 | 3680 |
| 2000 | 0 | 1313 | 2269 | 230 | 246 | 4146 | 619 | 258 | 1186 | 0 | 70 | 5402 |
| 2001 | 0 | 1564 | 2555 | 0 | 757 | 5112 | 754 | 302 | 1633 | 0 | 29 | 6774 |
| 2002 | 0 | 1217 | 2720 | 0 | 657 | 4954 | 794 | 151 | 1521 | 0 | 12 | 6488 |
| 2003 | 0 | 1186 | 3246 | 0 | 0 | 4985 | 806 | 249 | 1776 | 0 | 14 | 6775 |
| 2004 | 0 | 2152 | 4651 | 0 | 67 | 7744 | 716 | 223 | 2000 | 0 | 1 | 9745 |
| 2005 | 0 | 2929 | 7393 | 326 | 0 | 12115 | 646 | 78 | 2368 | 0 | 1 | 14484 |
| 2006 | 0 | 1805 | 6076 | 601 | 0 | 10088 | 491 | 84 | 1896 | 0 | 1 | 11984 |
| 2007 | 0 | 1982 | 6112 | 159 | 0 | 10034 | 363 | 28 | 1854 | 0 | 1 | 11890 |
| 2008 | 0 | 2413 | 7894 | 0 | 0 | 12615 | 532 | 0 | 2164 | 0 | 2 | 14781 |
| 2009 | 0 | 3112 | 9884 | 27 | 0 | 15407 | 585 | 0 | 2185 | 0 | 3 | 17595 |
| 2010 | 0 | 2645 | 8921 | 661 | 0 | 14100 | 544 | 0 | 2476 | 0 | 2 | 16578 |
| 2011 | 0 | 1606 | 6432 | 113 | 0 | 9664 | 413 | 0 | 1566 | 0 | 1 | 11232 |
| 2012 | 0 | 744 | 2819 | 29 | 0 | 4201 | 180 | 0 | 832 | 0 | 0 | 5034 |

¹ Total includes catches for tonnage classes which are not listed.

² Catches in 1988 of 26t, 776t, 1091t and 2t for side otter trawlers and stern otter trawlers tonnage classes 2, 3 and 5, respectively, were excluded because of suspected area misreporting.

Eastern Georges Bank Haddock for 2013

Table 4. Monthly landings (mt) of haddock by Canada from eastern Georges Bank during 1969-2012.

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|-------------------|------|------|-----|-----|-----|------|------|------|------|------|------|-----|-------|
| 1969 | 105 | 74 | 6 | 291 | 588 | 691 | 559 | 580 | 551 | 360 | 102 | 34 | 3941 |
| 1970 | 2 | 105 | 0 | 1 | 574 | 345 | 103 | 456 | 242 | 103 | 26 | 12 | 1970 |
| 1971 | 0 | 9 | 1 | 0 | 400 | 132 | 283 | 278 | 97 | 246 | 141 | 21 | 1610 |
| 1972 | 0 | 119 | 2 | 0 | 2 | 111 | 84 | 116 | 98 | 68 | 7 | 2 | 609 |
| 1973 | 4 | 10 | 0 | 0 | 0 | 184 | 198 | 572 | 339 | 232 | 22 | 4 | 1565 |
| 1974 | 19 | 0 | 1 | 0 | 0 | 58 | 63 | 53 | 96 | 61 | 92 | 19 | 462 |
| 1975 | 4 | 14 | 0 | 0 | 0 | 166 | 256 | 482 | 100 | 166 | 118 | 45 | 1353 |
| 1976 | 0 | 7 | 62 | 68 | 60 | 587 | 152 | 190 | 186 | 26 | 9 | 7 | 1355 |
| 1977 | 102 | 177 | 7 | 0 | 23 | 519 | 1059 | 835 | 13 | 59 | 56 | 22 | 2871 |
| 1978 | 104 | 932 | 44 | 22 | 21 | 319 | 405 | 85 | 642 | 5433 | 1962 | 0 | 9968 |
| 1979 | 123 | 898 | 400 | 175 | 69 | 1393 | 885 | 396 | 406 | 261 | 53 | 22 | 5080 |
| 1980 | 38 | 134 | 14 | 29 | 223 | 2956 | 2300 | 965 | 1411 | 1668 | 104 | 176 | 10017 |
| 1981 | 38 | 481 | 568 | 4 | 254 | 1357 | 1241 | 726 | 292 | 82 | 378 | 239 | 5658 |
| 1982 | 129 | 309 | 1 | 11 | 46 | 1060 | 769 | 682 | 585 | 837 | 398 | 44 | 4872 |
| 1983 | 32 | 67 | 29 | 47 | 60 | 1288 | 387 | 483 | 526 | 195 | 88 | 6 | 3208 |
| 1984 | 3 | 5 | 81 | 88 | 73 | 433 | 219 | 254 | 211 | 71 | 25 | 0 | 1463 |
| 1985 | 1 | 11 | 33 | 99 | 26 | 354 | 392 | 1103 | 718 | 594 | 61 | 93 | 3484 |
| 1986 | 11 | 28 | 79 | 99 | 40 | 1339 | 1059 | 369 | 233 | 139 | 12 | 8 | 3415 |
| 1987 | 24 | 26 | 138 | 70 | 12 | 1762 | 1383 | 665 | 405 | 107 | 97 | 14 | 4703 |
| 1988 ¹ | 39 | 123 | 67 | 79 | 15 | 1816 | 1360 | 315 | 130 | 65 | 13 | 24 | 4046 |
| 1989 | 33 | 94 | 48 | 7 | 20 | 1398 | 356 | 566 | 141 | 272 | 108 | 18 | 3060 |
| 1990 | 35 | 14 | 50 | 0 | 7 | 1178 | 668 | 678 | 469 | 199 | 18 | 22 | 3340 |
| 1991 | 144 | 166 | 49 | 26 | 21 | 1938 | 1004 | 705 | 566 | 576 | 123 | 137 | 5456 |
| 1992 | 118 | 205 | 97 | 152 | 36 | 1381 | 619 | 414 | 398 | 401 | 209 | 28 | 4058 |
| 1993 | 468 | 690 | 96 | 78 | 25 | 723 | 505 | 329 | 202 | 198 | 230 | 183 | 3727 |
| 1994 | 3 | 3 | 1 | 2 | 0 | 398 | 693 | 373 | 375 | 220 | 211 | 133 | 2411 |
| 1995 | 5 | 1 | 1 | 1 | 0 | 762 | 327 | 290 | 281 | 109 | 197 | 93 | 2065 |
| 1996 | 0 | 0 | 0 | 0 | 0 | 1067 | 672 | 706 | 359 | 278 | 191 | 391 | 3663 |
| 1997 | 0 | 0 | 0 | 0 | 0 | 328 | 751 | 772 | 426 | 190 | 116 | 166 | 2749 |
| 1998 | 0 | 0 | 0 | 0 | 0 | 687 | 420 | 580 | 707 | 542 | 164 | 271 | 3371 |
| 1999 | 37 | 0 | 0 | 0 | 0 | 898 | 975 | 562 | 573 | 295 | 269 | 70 | 3681 |
| 2000 | 1 | 0 | 0 | 0 | 0 | 1368 | 1175 | 1026 | 848 | 658 | 175 | 150 | 5402 |
| 2001 | 0 | 0 | 0 | 0 | 0 | 971 | 1335 | 930 | 1267 | 1075 | 647 | 548 | 6774 |
| 2002 | 0 | 0 | 0 | 0 | 0 | 572 | 1703 | 983 | 1364 | 820 | 593 | 452 | 6488 |
| 2003 | 0 | 0 | 0 | 0 | 0 | 840 | 1767 | 1290 | 930 | 952 | 676 | 320 | 6775 |
| 2004 | 0 | 0 | 0 | 0 | 0 | 1547 | 2268 | 2109 | 1753 | 1275 | 556 | 236 | 9745 |
| 2005 | 1025 | 1182 | 0 | 0 | 13 | 1423 | 3004 | 3820 | 2199 | 1198 | 357 | 266 | 14484 |
| 2006 | 1176 | 381 | 0 | 0 | 0 | 1093 | 2433 | 2668 | 2211 | 1149 | 558 | 316 | 11984 |
| 2007 | 1100 | 454 | 0 | 0 | 0 | 1432 | 3034 | 2510 | 1916 | 991 | 231 | 222 | 11890 |
| 2008 | 1867 | 1604 | 0 | 0 | 0 | 1640 | 2539 | 2446 | 2382 | 1314 | 645 | 343 | 14781 |
| 2009 | 2977 | 947 | 0 | 0 | 0 | 2217 | 1996 | 2889 | 2479 | 2191 | 1239 | 659 | 17595 |
| 2010 | 2391 | 574 | 0 | 0 | 0 | 1861 | 2893 | 3809 | 2257 | 1572 | 692 | 530 | 16578 |
| 2011 | 1954 | 466 | 0 | 0 | 0 | 941 | 2074 | 2554 | 1751 | 931 | 299 | 262 | 11232 |
| 2012 | 692 | 634 | 0 | 0 | 0 | 583 | 949 | 1077 | 490 | 419 | 61 | 128 | 5034 |

¹ Catches in 1988 of 3t, 1846t and 46t for January, February, and March, respectively, for other trawlers were excluded because of suspected area misreporting

Eastern Georges Bank Haddock for 2013

Table 5. Prorated discards (kg) and fishing effort (hr) for eastern Georges Bank haddock from the observed trips of the Canadian scallop fishery in December 2011 to January 2013. Note that there were no observed trips in January 2013. Effort hours are standardized to freezer trawler hour equivalents.

| Trip ID | Board Date | Land Date | Proration | | | Discards (kg) | | Effort (hrs) |
|----------|------------|------------|-----------|-------|-------|---------------|----------|--------------|
| | | | Dredges | | | Observed | Prorated | |
| | | | Obs. | Total | Prop. | | | |
| T2011-21 | 2011-12-05 | 2011-12-20 | 588 | 1188 | 0.49 | 106 | 214 | 217 |
| T2011-22 | 2011-12-07 | 2011-12-22 | 641 | 1277 | 0.50 | 148 | 295 | 235 |
| T2012-01 | 2012-01-28 | 2012-02-14 | 626 | 1221 | 0.51 | 4 | 8 | 238 |
| T2012-02 | 2012-02-14 | 2012-03-07 | 684 | 1367 | 0.50 | 259 | 518 | 285 |
| T2012-03 | 2012-03-07 | 2012-03-28 | 609 | 1240 | 0.49 | 325 | 662 | 245 |
| T2012-04 | 2012-03-16 | 2012-03-25 | 196 | 366 | 0.54 | 118 | 220 | 98 |
| T2012-05 | 2012-04-10 | 2012-04-19 | 143 | 234 | 0.61 | 9 | 15 | 17 |
| T2012-06 | 2012-04-12 | 2012-04-26 | 315 | 635 | 0.50 | 117 | 236 | 90 |
| T2012-07 | 2012-05-01 | 2012-05-10 | 188 | 294 | 0.64 | 3 | 5 | 41 |
| T2012-08 | 2012-05-11 | 2012-05-26 | 401 | 811 | 0.49 | 77 | 156 | 117 |
| T2012-09 | 2012-05-28 | 2012-06-07 | 226 | 390 | 0.58 | 14 | 24 | 77 |
| T2012-10 | 2012-06-09 | 2012-06-24 | 559 | 1143 | 0.49 | 120 | 245 | 175 |
| T2012-11 | 2012-07-09 | 2012-07-25 | 576 | 1140 | 0.51 | 131 | 259 | 181 |
| T2012-12 | 2012-07-17 | 2012-07-27 | 326 | 648 | 0.50 | 5 | 10 | 127 |
| T2012-13 | 2012-08-13 | 2012-08-23 | 196 | 382 | 0.51 | 8 | 16 | 119 |
| T2012-14 | 2012-08-21 | 2012-09-05 | 699 | 1337 | 0.52 | 272 | 520 | 196 |
| T2012-15 | 2012-09-19 | 2012-09-26 | 277 | 573 | 0.48 | 147 | 304 | 90 |
| T2012-16 | 2012-09-20 | 2012-10-05 | 775 | 1513 | 0.51 | 246 | 480 | 202 |
| T2012-17 | 2012-10-05 | 2012-10-20 | 618 | 1275 | 0.48 | 137 | 283 | 211 |
| T2012-18 | 2012-10-17 | 2012-10-26 | 296 | 498 | 0.59 | 14 | 24 | 100 |
| T2012-19 | 2012-11-07 | 2012-11-19 | 415 | 809 | 0.51 | 99 | 193 | 148 |
| T2012-20 | 2012-11-11 | 2012-11-26 | 655 | 1195 | 0.55 | 178 | 325 | 217 |

Eastern Georges Bank Haddock for 2013

Table 6. Haddock discards from the Canadian scallop fishery on Georges Bank for 2012 calculated using a 3-month moving window to estimate discard rates. The discard rates for January and December are calculated by including observed trips from December 2011 and January 2013, respectively. Note that there were no observed trips in January 2013. Effort hours are standardized to freezer trawler hour equivalents.

| Year | Month | Prorated Discards | Observed Effort (hrs) | Discard Rate (kg/hr) | Fleet Effort (hrs) | Discards (mt) | Cumulative Annual Discards (mt) |
|------|------------------|-------------------|-----------------------|----------------------|--------------------|---------------|---------------------------------|
| 2011 | Dec | 509 | 452 | | | | |
| 2012 | Jan ¹ | 0 | 0 | 1.061 | 30 | 0.032 | 0.032 |
| | Feb | 525 | 523 | 1.626 | 538 | 0.875 | 0.907 |
| | Mar | 882 | 343 | 1.706 | 938 | 1.600 | 2.507 |
| | Apr | 251 | 107 | 2.130 | 2400 | 5.112 | 7.618 |
| | May | 160 | 158 | 1.318 | 3457 | 4.557 | 12.175 |
| | Jun | 270 | 252 | 0.975 | 2579 | 2.514 | 14.689 |
| | Jul | 269 | 308 | 1.229 | 3104 | 3.814 | 18.503 |
| | Aug | 536 | 315 | 1.737 | 2751 | 4.779 | 23.282 |
| | Sep | 784 | 292 | 1.771 | 1085 | 1.923 | 25.205 |
| | Oct | 306 | 311 | 1.661 | 1115 | 1.853 | 27.057 |
| | Nov | 518 | 365 | 1.219 | 723 | 0.881 | 27.939 |
| | Dec | 0 | 0 | 1.418 | 312 | 0.443 | 28.381 |
| 2013 | Jan ² | | | | | | |

¹No observed trips in January 2012.

²No observed trips in January 2013.

Table 7. Monthly landings (mt) of haddock by the United States from eastern Georges Bank during 1969-2012. An allocation algorithm was applied to landings from 1994 to 2010 to determine area fished (Wigley et al. 2008a).

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|-------------------|-----|------|-----|------|-----|------|------|-----|-----|-----|-----|-----|-------|
| 1969 | 525 | 559 | 976 | 1826 | 670 | 810 | 204 | 219 | 249 | 226 | 203 | 157 | 6624 |
| 1970 | 169 | 219 | 242 | 375 | 608 | 374 | 324 | 333 | 179 | 219 | 61 | 50 | 3154 |
| 1971 | 155 | 361 | 436 | 483 | 668 | 503 | 338 | 152 | 147 | 165 | 58 | 68 | 3533 |
| 1972 | 150 | 196 | 91 | 90 | 239 | 261 | 97 | 164 | 84 | 63 | 52 | 64 | 1551 |
| 1973 | 90 | 111 | 77 | 85 | 139 | 365 | 217 | 196 | 37 | 3 | 22 | 55 | 1397 |
| 1974 | 135 | 70 | 47 | 70 | 122 | 160 | 165 | 43 | 27 | 6 | 19 | 91 | 955 |
| 1975 | 152 | 123 | 32 | 116 | 388 | 489 | 138 | 95 | 57 | 24 | 52 | 39 | 1705 |
| 1976 | 116 | 147 | 84 | 106 | 323 | 162 | 7 | 6 | 5 | 2 | 3 | 13 | 974 |
| 1977 | 75 | 211 | 121 | 154 | 374 | 372 | 434 | 191 | 73 | 52 | 146 | 226 | 2428 |
| 1978 | 336 | 437 | 263 | 584 | 752 | 750 | 467 | 221 | 245 | 426 | 194 | 49 | 4725 |
| 1979 | 274 | 329 | 352 | 548 | 766 | 816 | 588 | 659 | 224 | 202 | 282 | 172 | 5213 |
| 1980 | 632 | 1063 | 742 | 784 | 711 | 461 | 324 | 254 | 221 | 91 | 110 | 222 | 5615 |
| 1981 | 551 | 1852 | 634 | 628 | 882 | 1327 | 1233 | 873 | 321 | 284 | 242 | 255 | 9081 |
| 1982 | 425 | 755 | 502 | 348 | 719 | 1805 | 757 | 145 | 201 | 216 | 276 | 138 | 6286 |
| 1983 | 492 | 931 | 272 | 181 | 310 | 1145 | 231 | 178 | 187 | 110 | 227 | 190 | 4453 |
| 1984 | 540 | 961 | 366 | 281 | 627 | 1047 | 370 | 303 | 250 | 196 | 92 | 89 | 5121 |
| 1985 | 165 | 190 | 254 | 300 | 352 | 206 | 60 | 47 | 1 | 24 | 41 | 43 | 1683 |
| 1986 | 184 | 396 | 334 | 479 | 496 | 221 | 31 | 6 | 12 | 6 | 6 | 29 | 2201 |
| 1987 | 225 | 52 | 43 | 307 | 233 | 342 | 67 | 30 | 24 | 4 | 23 | 68 | 1418 |
| 1988 | 196 | 152 | 207 | 245 | 366 | 316 | 30 | 19 | 6 | 1 | 45 | 110 | 1694 |
| 1989 | 114 | 56 | 47 | 164 | 161 | 145 | 15 | 8 | 1 | 5 | 25 | 46 | 785 |
| 1990 | 148 | 21 | 155 | 274 | 214 | 306 | 23 | 3 | 5 | 5 | 16 | 19 | 1189 |
| 1991 | 105 | 28 | 76 | 133 | 89 | 434 | 1 | 20 | 6 | 0 | 19 | 19 | 931 |
| 1992 | 253 | 81 | 51 | 149 | 353 | 669 | 20 | 20 | 17 | 3 | 2 | 12 | 1629 |
| 1993 | 15 | 12 | 16 | 55 | 88 | 209 | 6 | 3 | 3 | 7 | 2 | 8 | 424 |
| 1994 | 0 | 1 | 1 | 3 | 1 | 1 | 12 | 1 | 0 | 1 | 1 | 2 | 24 |
| 1995 | 1 | 1 | 3 | 4 | 2 | 3 | 1 | 0 | 0 | 0 | 1 | 0 | 15 |
| 1996 | 2 | 1 | 2 | 3 | 7 | 3 | 3 | 2 | 1 | 1 | 1 | 1 | 26 |
| 1997 | 5 | 4 | 3 | 4 | 11 | 6 | 2 | 1 | 9 | 4 | 2 | 6 | 55 |
| 1998 | 5 | 19 | 23 | 29 | 31 | 50 | 21 | 17 | 39 | 22 | 1 | 15 | 271 |
| 1999 | 35 | 15 | 30 | 52 | 71 | 62 | 23 | 18 | 28 | 0 | 0 | 22 | 359 |
| 2000 | 6 | 13 | 89 | 48 | 42 | 22 | 21 | 15 | 24 | 2 | 17 | 42 | 340 |
| 2001 | 42 | 9 | 228 | 146 | 81 | 97 | 51 | 12 | 8 | 38 | 21 | 31 | 762 |
| 2002 | 92 | 105 | 91 | 150 | 272 | 175 | 66 | 46 | 17 | 42 | 11 | 24 | 1090 |
| 2003 | 94 | 24 | 86 | 506 | 310 | 319 | 57 | 17 | 4 | 51 | 40 | 169 | 1677 |
| 2004 | 97 | 21 | 174 | 725 | 101 | 349 | 256 | 26 | 57 | 5 | 5 | 31 | 1847 |
| 2005 ¹ | 2 | 0 | 45 | 34 | 210 | 158 | 103 | 93 | 0 | 0 | 1 | 2 | 649 |
| 2006 ¹ | 1 | 0 | 0 | 23 | 192 | 87 | 0 | 7 | 0 | 0 | 1 | 3 | 313 |
| 2007 ¹ | 1 | 0 | 5 | 71 | 43 | 60 | 3 | 0 | 0 | 25 | 47 | 0 | 256 |
| 2008 ¹ | 0 | 0 | 6 | 26 | 31 | 80 | 47 | 92 | 65 | 153 | 98 | 539 | 1138 |
| 2009 | 13 | 4 | 41 | 677 | 30 | 109 | 38 | 458 | 140 | 31 | 195 | 418 | 2152 |
| 2010 | 130 | 13 | 281 | 503 | 100 | 76 | 16 | 367 | 193 | 118 | 224 | 147 | 2167 |
| 2011 | 75 | 70 | 110 | 341 | 165 | 150 | 76 | 123 | 40 | 34 | 43 | 93 | 1322 |
| 2012 | 50 | 10 | 30 | 112 | 113 | 48 | 17 | 4 | 20 | 18 | 5 | 17 | 443 |

¹Restrictions placed on USA fishery in eastern Georges Bank due to bycatch limitations.

Table 8. United States landings (mt) of haddock from eastern Georges Bank during 1969-2012 by gear category and tonnage class. An allocation algorithm was applied to landings from 1994 to 2010 to determine area fished (Wigley et al. 2008a).

| Year | Otter Trawl | | Other | Total |
|------|-------------|------|-------|-------|
| | 3 | 4 | | |
| 1969 | 3013 | 3610 | 0 | 6624 |
| 1970 | 1602 | 1551 | 0 | 3154 |
| 1971 | 1760 | 1768 | 0 | 3533 |
| 1972 | 861 | 690 | 0 | 1551 |
| 1973 | 638 | 759 | 0 | 1397 |
| 1974 | 443 | 512 | 0 | 955 |
| 1975 | 1025 | 679 | 0 | 1705 |
| 1976 | 671 | 303 | 0 | 974 |
| 1977 | 1724 | 703 | 0 | 2428 |
| 1978 | 3140 | 1582 | 3 | 4725 |
| 1979 | 3285 | 1927 | 1 | 5213 |
| 1980 | 2654 | 2955 | 4 | 5615 |
| 1981 | 3601 | 5433 | 15 | 9081 |
| 1982 | 2589 | 3660 | 37 | 6286 |
| 1983 | 1162 | 3276 | 15 | 4453 |
| 1984 | 1855 | 3261 | 5 | 5121 |
| 1985 | 857 | 823 | 4 | 1683 |
| 1986 | 993 | 1207 | 1 | 2201 |
| 1987 | 766 | 651 | 1 | 1418 |
| 1988 | 920 | 768 | 6 | 1694 |
| 1989 | 359 | 419 | 6 | 785 |
| 1990 | 488 | 697 | 4 | 1189 |
| 1991 | 404 | 527 | 0 | 931 |
| 1992 | 650 | 979 | 0 | 1629 |
| 1993 | 153 | 272 | 0 | 424 |
| 1994 | 13 | 11 | 0 | 24 |
| 1995 | 4 | 11 | 0 | 15 |
| 1996 | 12 | 14 | 0 | 26 |
| 1997 | 39 | 15 | 1 | 55 |
| 1998 | 123 | 147 | 1 | 271 |
| 1999 | 126 | 229 | 4 | 359 |
| 2000 | 107 | 233 | 0 | 340 |
| 2001 | 248 | 513 | 1 | 762 |
| 2002 | 462 | 626 | 2 | 1090 |
| 2003 | 798 | 879 | 0 | 1677 |
| 2004 | 676 | 1169 | 2 | 1847 |
| 2005 | 255 | 359 | 35 | 649 |
| 2006 | 159 | 110 | 44 | 313 |
| 2007 | 139 | 101 | 16 | 256 |
| 2008 | 284 | 745 | 108 | 1138 |
| 2009 | 632 | 1395 | 125 | 2152 |
| 2010 | 472 | 1532 | 162 | 2167 |
| 2011 | 314 | 954 | 53 | 1322 |
| 2012 | 88 | 350 | 5 | 443 |

Table 9. United States landings and discards of haddock in 2012 by quarter and market category from eastern Georges Bank and National Marine Fisheries Service sampling intensity for lengths and ages. Note that summaries by market category are not possible for discards as the fish are discarded at sea and are not given a market category. Numbers in parentheses refer to sample sizes after augmenting samples from US commercial statistical areas 522 and 525.

| Market Category | Large | Scrod | Unclassified | Total |
|----------------------|-------------------|-------------------|--------------|-------------------|
| Landings (mt) | | | | |
| Quarter 1 | 23 | 66 | 0 | 90 |
| Quarter 2 | 25 | 248 | 0 | 273 |
| Quarter 3 | 7 | 33 | 0 | 40 |
| Quarter 4 | 11 | 29 | 0 | 40 |
| Total | 66 | 377 | 0 | 443 |
| Number measured | | | | |
| Quarter 1 | 0 (326) | 0 (152) | 0 | 0 (478) |
| Quarter 2 | 0 (176) | 0 (304) | 0 | 0 (480) |
| Quarter 3 | 0 (252) | 74 (277) | 0 | 74 (529) |
| Quarter 4 | 111 (411) | 182 (318) | 0 | 293 (729) |
| Total | 111 (1165) | 256 (1051) | 0 | 367 (2216) |
| Number aged | | | | |
| Quarter 1 | 0 (226) | 0 (85) | 0 | 0 (311) |
| Quarter 2 | 0 (123) | 0 (163) | 0 | 0 (286) |
| Quarter 3 | 0 (242) | 49 (134) | 0 | 49 (376) |
| Quarter 4 | 61 (235) | 100 (185) | 0 | 161 (420) |
| Total | 61 (826) | 149 (567) | 0 | 210 (1393) |
| Discards (mt) | | | | |
| Quarter 1 | N/A | N/A | N/A | |
| Quarter 2 | N/A | N/A | N/A | 33 |
| Quarter 3 | N/A | N/A | N/A | |
| Quarter 4 | N/A | N/A | N/A | 93 |
| Total | N/A | N/A | N/A | 126 |

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Table 10. Inter- and intra-reader testing for Georges Bank haddock ageing. (SJS=S. Sutherland (National Marine Fisheries Service, (NMFS)) and DK=D. Knox (Canadian Department of Fisheries and Oceans, DFO), CV=coefficient of variation).

| Sample Source | Test Type | Date Completed | Age Reader | Sample Size | CV (%) | Agreement (%) | Bowker's test |
|---------------------------------|-----------|----------------|------------|-------------|--------|---------------|---------------|
| DFO/NMFS Exchange: | | | | | | | |
| 2012 US Commercial (Q1&2) | Exchange | Spring 2013 | SJS vs DK | 50 | 3.94 | 68.0 | n/s |
| 2012 Can. Commercial (Q2,3,4) | Exchange | Spring 2013 | SJS vs DK | 150 | 1.50 | 90.0 | |
| 2013 DFO Survey | Exchange | Spring 2013 | SJS vs DK | 50 | 1.48 | 88.0 | n/s |
| 2012 NMFS Autumn Survey | Exchange | Spring 2013 | SJS vs DK | 50 | 3.09 | 78.0 | n/s |
| Combined | Exchange | Spring 2013 | SJS vs DK | 300 | 2.17 | 84.0 | ** (1) |
| NMFS testing: | | | | | | | |
| 2012 NMFS Autumn Survey | Precision | Feb 2013 | SJS | 62 | 0.21 | 98.4 | |
| 2012 US Commercial (Q4) | Precision | Apr 2013 | SJS | 91 | 0.29 | 96.7 | |
| 2012 US Commercial (Q3) | Precision | Feb 2013 | SJS | 97 | 1.40 | 90.7 | |
| 2012 US Commercial (Q2) | Precision | Nov 2012 | SJS | 97 | 0.49 | 96.9 | |
| 2012 US Commercial (Q1) | Precision | Oct 2012 | SJS | 99 | 0.53 | 94.9 | |
| 2012 NMFS Spring Survey | Precision | August 2012 | SJS | 105 | 0.57 | 98.0 | |
| Haddock Reference Collection | Accuracy | Apr 2013 | SJS | 57 | 2.36 | 93.0 | |
| Haddock Reference Collection | Accuracy | May 2012 | SJS | 55 | 2.86 | 96.4 | |
| DFO testing: | | | | | | | |
| 2013 DFO survey | Precision | May 2013 | DK | 80 | 1.28 | 91.3 | |
| 2012 Canadian Commercial (Q4) | Precision | | DK | 97 | 0.52 | 94.8 | |
| 2012 Canadian Commercial (Q3) | Precision | 2012 | DK | 113 | 1.59 | 89.4 | n/s |
| 2012 Canadian Commercial (Q2) | Precision | 2012 | DK | 87 | 1.63 | 88.5 | n/s |
| 2012 Canadian Commercial (Q1) | Precision | 2012 | DK | 64 | 1.56 | 84.4 | n/s |
| DFO combined results: | | | | | | | |
| 2012 Canadian Commercial (Q1-4) | Precision | 2012/2013 | DK | 361 | 1.31 | 89.8 | n/s |

(1) Tendency for DK's ages to be younger by 1 year than SJS'. However, the results for the strong year classes, (2003, 2010 and 2011) which represent most of the catch, were not biased and agreement was high.

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Table 11. Haddock age and length samples for landings from the Canadian groundfish fishery and for discards from the scallop dredge fishery in 2012 from eastern Georges Bank. (OTB=Otter Trawl Bottom, LL=Long Line, GN=Gill Net, DR=Scallop Dredge)

| Qtr. | Gear | Month | Landings (kg) | Length Frequency Samples | | | | Ages ³ |
|------|-----------------|-------|------------------|--------------------------|----------|---------|----------|---|
| | | | | At Sea | | Port | | |
| | | | | Trips | Measured | Samples | Measured | |
| 1 | OTB | Jan | 691,761 | 12 | 10,820 | 8 | 1,895 | DFO Survey = 543 Port = 63 At Sea = 0 Total =606 |
| | | Feb | 634,413 | 7 | 7,092 | 7 | 1,690 | |
| | DR ¹ | 2,507 | 5 | 707 | | | | |
| 2 | OTB | June | 583,059 | 23 | 23,151 | 11 | 2,575 | Port = 255 At Sea = 142 Total = 397 ⁴ |
| | GN ² | June | 22 | | | | | |
| | DR ¹ | | 12,183 | 6 | 273 | | | |
| 3 | OTB | July | 681,189 | 53 | 72,050 | 8 | 1,865 | Port = 477 At Sea = 16 Total = 493 ⁵ |
| | | Aug | 754,892 | 20 | 30,002 | 3 | 635 | |
| | | Sept | 378,388 | 7 | 8,890 | 5 | 1,238 | |
| | LL | July | 268,083 | 10 | 10,476 | 5 | 1,168 | |
| | | Aug | 322,139 | 11 | 12,509 | 4 | 971 | |
| | GN ² | Sept | 111,641 | 4 | 3,195 | 3 | 774 | |
| | | July | 114 | 1 | 6 | | | |
| | | Aug | 317 | 1 | 15 | | | |
| | DR ¹ | Sept | 97 | | | | | |
| 4 | OTB | Oct | 294,358 | 14 | 10,653 | 4 | 1,229 | Port = 342 At Sea = 79 Total = 421 ⁶ |
| | | Nov | 55,124 | 11 | 11,852 | 5 | 1,401 | |
| | | Dec | 127,552 | 17 | 25,249 | 3 | 710 | |
| | LL | Oct | 124,684 | 5 | 3,134 | 3 | 715 | |
| | | Nov | 5,815 | 3 | 1,640 | 1 | 230 | |
| | GN ² | Oct | 80 | | | | | |
| | | Nov | 33 | | | | | |
| | DR ¹ | | 3,177 | 5 | 627 | | | |
| | Totals | | | 5,062,142 | 219 | 232,817 | 70 | |

¹Scallop fishery samples were combined by quarter.

²Gillnet quarter 2 and 4 landings included at the quarter level. Quarter 3 samples combined at quarter level and landings applied to quarter 3 combination.

³When otoliths were not available for a length grouping, ages were estimated.

⁴Ages for 8 length groupings were estimated and are not included in total.

⁵Ages for 8 length groupings were estimated and are not included in total.

⁶Ages for 10 length groupings were estimated and are not included in total.

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Table 12. Components of the 2012 catch at age in numbers of haddock from eastern Georges Bank by quarter or half year.

| | Age Group | | | | | | | | | | Total |
|---|-----------|-------|--------|--------|--------|--------|--------|--------|--------|---------|---------|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9+ | |
| Canadian Landings | | | | | | | | | | | |
| 2012 Q1 | 0 | 0 | 975 | 16107 | 16513 | 78024 | 38875 | 66718 | 45650 | 558951 | 821814 |
| 2012 Q2 | 0 | 0 | 5244 | 19880 | 28113 | 33142 | 32868 | 41402 | 14873 | 217684 | 393205 |
| 2012 Q3 | 0 | 171 | 149807 | 83353 | 61010 | 170713 | 66521 | 206607 | 56865 | 885656 | 1680704 |
| 2012 Q4 | 0 | 483 | 139353 | 37515 | 11288 | 50441 | 18651 | 33202 | 13780 | 183419 | 488132 |
| Year total | 0 | 654 | 295379 | 156855 | 116923 | 332321 | 156915 | 347929 | 131168 | 1845710 | 3383855 |
| United States Landings¹ | | | | | | | | | | | |
| 2012 H1 | 0 | 0 | 1789 | 8298 | 6015 | 14812 | 13243 | 24745 | 5266 | 163417 | 237586 |
| 2012 H2 | 0 | 0 | 2354 | 3660 | 1441 | 1397 | 2747 | 3908 | 1175 | 33330 | 50013 |
| Year total | 0 | 0 | 4143 | 11957 | 7457 | 16209 | 15990 | 28653 | 6442 | 196747 | 287598 |
| Canadian Discards | | | | | | | | | | | |
| 2012 Q1 | 0 | 67 | 1751 | 200 | 46 | 191 | 82 | 128 | 83 | 795 | 3343 |
| 2012 Q2 | 69 | 206 | 12072 | 1997 | 632 | 439 | 374 | 477 | 153 | 2124 | 18542 |
| 2012 Q3 | 405 | 990 | 21637 | 224 | 56 | 59 | 32 | 48 | 26 | 404 | 23882 |
| 2012 Q4 | 399 | 402 | 5115 | 78 | 10 | 48 | 18 | 33 | 15 | 201 | 6319 |
| Year total | 872 | 1665 | 40575 | 2499 | 745 | 737 | 506 | 687 | 277 | 3524 | 52087 |
| United States Discards | | | | | | | | | | | |
| 2012 H1 | 0 | 19776 | 150309 | 346 | 148 | 207 | 105 | 281 | 23 | 1397 | 172592 |
| 2012 H2 | 1947 | 52798 | 145235 | 1843 | 692 | 1199 | 223 | 989 | 223 | 7080 | 212230 |
| Year total | 1947 | 72574 | 295544 | 2190 | 840 | 1406 | 328 | 1270 | 246 | 8476 | 384822 |
| Total Catch | | | | | | | | | | | |
| 2012 | 2819 | 74893 | 635642 | 173502 | 125965 | 350673 | 173739 | 378539 | 138133 | 2054458 | 4108361 |

¹United States landings at age were calculated by half year; however, landings occurred in other quarters.

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Table 13. Total annual commercial catch at age numbers (000's) of haddock from eastern Georges Bank during 1969-2012. Estimates of discards are included.

| Year | Age Group | | | | | | | | | | |
|------|-----------|------|-------|------|------|------|-------|------|------|------|-------|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9+ | 0+ |
| 1969 | 6 | 0 | 18 | 1451 | 262 | 334 | 2909 | 831 | 91 | 283 | 6184 |
| 1970 | 0 | 66 | 84 | 7 | 351 | 151 | 130 | 1153 | 372 | 193 | 2508 |
| 1971 | 43 | 0 | 1201 | 251 | 31 | 252 | 159 | 161 | 774 | 412 | 3284 |
| 1972 | 118 | 346 | 1 | 390 | 72 | 21 | 94 | 39 | 16 | 451 | 1547 |
| 1973 | 7 | 1119 | 1758 | 6 | 364 | 38 | 10 | 39 | 8 | 169 | 3517 |
| 1974 | 9 | 37 | 2257 | 276 | 0 | 32 | 3 | 0 | 29 | 63 | 2706 |
| 1975 | 553 | 18 | 279 | 1504 | 216 | 5 | 36 | 2 | 2 | 31 | 2645 |
| 1976 | 1 | 402 | 157 | 173 | 834 | 135 | 0 | 19 | 0 | 18 | 1739 |
| 1977 | 0 | 1 | 8028 | 66 | 182 | 307 | 164 | 0 | 15 | 15 | 8778 |
| 1978 | 110 | 6 | 291 | 9956 | 164 | 173 | 306 | 80 | 10 | 9 | 11105 |
| 1979 | 12 | 212 | 17 | 208 | 4307 | 364 | 201 | 217 | 43 | 14 | 5597 |
| 1980 | 31 | 32 | 17701 | 343 | 302 | 2425 | 193 | 130 | 52 | 12 | 21220 |
| 1981 | 6 | 55 | 693 | 6773 | 400 | 497 | 1243 | 119 | 33 | 7 | 9826 |
| 1982 | 1 | 2 | 731 | 1057 | 2848 | 205 | 379 | 730 | 62 | 65 | 6080 |
| 1983 | 75 | 11 | 149 | 663 | 554 | 1653 | 208 | 104 | 409 | 35 | 3860 |
| 1984 | 1 | 72 | 100 | 259 | 350 | 270 | 1131 | 186 | 166 | 318 | 2854 |
| 1985 | 353 | 9 | 2147 | 386 | 182 | 199 | 128 | 381 | 53 | 117 | 3954 |
| 1986 | 0 | 89 | 39 | 2586 | 175 | 143 | 124 | 119 | 174 | 42 | 3492 |
| 1987 | 19 | 0 | 2081 | 131 | 1536 | 100 | 58 | 83 | 70 | 111 | 4190 |
| 1988 | 1 | 53 | 53 | 2199 | 124 | 894 | 111 | 39 | 46 | 100 | 3619 |
| 1989 | 8 | 2 | 1274 | 86 | 776 | 143 | 347 | 34 | 23 | 47 | 2740 |
| 1990 | 18 | 31 | 8 | 1346 | 133 | 770 | 73 | 168 | 43 | 43 | 2633 |
| 1991 | 35 | 22 | 466 | 91 | 2076 | 89 | 391 | 72 | 146 | 61 | 3450 |
| 1992 | 151 | 49 | 249 | 324 | 129 | 1466 | 90 | 320 | 26 | 91 | 2895 |
| 1993 | 4 | 80 | 283 | 357 | 291 | 91 | 667 | 41 | 157 | 76 | 2049 |
| 1994 | 13 | 36 | 423 | 870 | 186 | 73 | 101 | 190 | 89 | 48 | 2028 |
| 1995 | 4 | 8 | 79 | 534 | 414 | 53 | 25 | 3 | 52 | 16 | 1188 |
| 1996 | 6 | 4 | 32 | 489 | 864 | 419 | 60 | 18 | 3 | 72 | 1967 |
| 1997 | 1 | 29 | 94 | 73 | 535 | 484 | 195 | 13 | 8 | 34 | 1466 |
| 1998 | 19 | 18 | 195 | 292 | 260 | 541 | 448 | 114 | 12 | 35 | 1932 |
| 1999 | 2 | 27 | 44 | 752 | 319 | 249 | 347 | 256 | 99 | 25 | 2119 |
| 2000 | 1 | 6 | 320 | 449 | 1268 | 264 | 213 | 217 | 186 | 67 | 2991 |
| 2001 | 0 | 22 | 65 | 1733 | 533 | 847 | 263 | 204 | 232 | 204 | 4105 |
| 2002 | 0 | 1 | 333 | 218 | 1891 | 379 | 671 | 115 | 110 | 289 | 4008 |
| 2003 | 486 | 7 | 10 | 1831 | 288 | 1487 | 426 | 479 | 110 | 234 | 5358 |
| 2004 | 4 | 332 | 26 | 75 | 3646 | 605 | 1498 | 519 | 421 | 263 | 7388 |
| 2005 | 0 | 14 | 241 | 29 | 224 | 6890 | 526 | 823 | 128 | 157 | 9033 |
| 2006 | 1 | 20 | 16 | 2519 | 44 | 289 | 4544 | 234 | 551 | 154 | 8372 |
| 2007 | 0 | 2 | 39 | 181 | 7344 | 148 | 168 | 1431 | 136 | 187 | 9635 |
| 2008 | 0 | 4 | 30 | 273 | 268 | 9721 | 102 | 85 | 708 | 95 | 11288 |
| 2009 | 3 | 17 | 125 | 192 | 741 | 261 | 11223 | 73 | 58 | 379 | 13075 |
| 2010 | 15 | 31 | 56 | 391 | 314 | 844 | 382 | 9849 | 50 | 210 | 12141 |
| 2011 | 1 | 243 | 107 | 181 | 515 | 228 | 676 | 108 | 6233 | 75 | 8365 |
| 2012 | 3 | 75 | 636 | 174 | 126 | 351 | 174 | 379 | 138 | 2054 | 4108 |

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Table 14. Average weight at age (kg) of haddock from the combined Canadian and USA commercial groundfish fishery landings on eastern Georges Bank during 1969-2012. From 1969 to 1973 only USA fishery sampling for lengths and ages was available. Between 1974 and 1984 a mix of USA and Canadian samples were used. No USA fishery weights were available for 1997, 1998. For age 1 missing weights (**bold**), an average of 0.600 kg was used. Missing weights for older haddock were extrapolated within year class.

| Year | Age Group | | | | | | | | |
|-------------|--------------------|--------------|-------|--------------|-------|--------------|--------------|--------------|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9+ |
| 1969 | 0.600 | 0.763 | 1.282 | 1.531 | 1.649 | 1.836 | 2.298 | 2.879 | 3.354 |
| 1970 | 0.721 | 1.067 | 0.812 | 1.653 | 1.886 | 2.124 | 2.199 | 2.841 | 3.150 |
| 1971 | 0.600 | 0.928 | 1.059 | 1.272 | 2.011 | 2.255 | 2.262 | 2.613 | 3.047 |
| 1972 | 0.759 | 0.983 | 1.562 | 1.750 | 2.147 | 2.505 | 2.411 | 2.514 | 2.989 |
| 1973 | 0.683 | 1.002 | 1.367 | 1.804 | 2.202 | 1.631 | 2.885 | 3.295 | 3.192 |
| 1974 | 0.600 | 1.052 | 1.491 | 1.683 | 2.017 | 3.760 | 2.583 | 3.145 | 3.735 |
| 1975 | 0.600 | 0.877 | 1.557 | 2.085 | 1.999 | 2.429 | 4.107 | 3.534 | 3.429 |
| 1976 | 0.610 | 0.984 | 1.292 | 1.853 | 2.417 | 2.247 | 2.774 | 4.484 | 3.807 |
| 1977 | 0.600 | 0.970 | 1.442 | 1.810 | 2.336 | 2.807 | 2.494 | 3.094 | 4.150 |
| 1978 | 0.619 | 1.158 | 1.432 | 2.067 | 2.602 | 2.926 | 2.971 | 2.741 | 4.334 |
| 1979 | 0.600 | 0.966 | 1.288 | 1.823 | 2.214 | 2.791 | 3.214 | 3.206 | 4.041 |
| 1980 | 0.405 | 0.889 | 1.035 | 1.703 | 2.094 | 2.606 | 3.535 | 3.584 | 3.109 |
| 1981 | 0.600 | 0.888 | 1.270 | 1.650 | 2.310 | 2.627 | 3.545 | 4.086 | 4.455 |
| 1982 | 0.600 | 0.964 | 1.370 | 1.787 | 2.332 | 2.550 | 2.957 | 3.528 | 3.426 |
| 1983 | 0.600 | 1.028 | 1.327 | 1.755 | 2.132 | 2.475 | 2.895 | 3.125 | 4.010 |
| 1984 | 0.600 | 0.872 | 1.338 | 1.798 | 2.151 | 2.577 | 2.842 | 3.119 | 3.411 |
| 1985 | 0.600 | 0.950 | 1.230 | 1.915 | 2.227 | 2.702 | 2.872 | 3.180 | 3.696 |
| 1986 | 0.452 | 0.981 | 1.352 | 1.866 | 2.367 | 2.712 | 2.969 | 3.570 | 3.908 |
| 1987 | 0.600 | 0.833 | 1.431 | 1.984 | 2.148 | 2.594 | 2.953 | 3.646 | 3.880 |
| 1988 | 0.421 | 0.974 | 1.305 | 1.708 | 2.042 | 2.350 | 3.011 | 3.305 | 3.693 |
| 1989 | 0.600 | 0.868 | 1.450 | 1.777 | 2.183 | 2.522 | 3.012 | 3.411 | 3.751 |
| 1990 | 0.639 | 0.999 | 1.419 | 1.787 | 2.141 | 2.509 | 2.807 | 3.002 | 3.668 |
| 1991 | 0.581 | 1.197 | 1.241 | 1.802 | 2.086 | 2.597 | 2.913 | 3.010 | 3.362 |
| 1992 | 0.538 | 1.163 | 1.622 | 1.654 | 2.171 | 2.491 | 2.988 | 3.388 | 3.524 |
| 1993 | 0.659 | 1.160 | 1.724 | 2.181 | 2.047 | 2.623 | 2.386 | 3.112 | 3.486 |
| 1994 | 0.405 | 1.141 | 1.669 | 2.244 | 2.662 | 2.454 | 2.837 | 3.253 | 3.449 |
| 1995 | 0.797 | 1.055 | 1.511 | 2.032 | 2.549 | 2.762 | 2.978 | 3.012 | 3.535 |
| 1996 | 0.576 | 1.026 | 1.441 | 1.796 | 2.296 | 2.490 | 3.331 | 2.220 | 3.620 |
| 1997 | 0.685 | 1.216 | 1.336 | 1.747 | 2.121 | 2.476 | 3.034 | 3.367 | 3.927 |
| 1998 | 0.568 | 1.131 | 1.573 | 1.697 | 1.983 | 2.312 | 2.864 | 3.395 | 3.657 |
| 1999 | 0.678 | 1.094 | 1.568 | 1.907 | 1.893 | 2.216 | 2.577 | 2.816 | 3.743 |
| 2000 | 0.664 | 1.104 | 1.470 | 1.917 | 2.242 | 2.132 | 2.518 | 2.829 | 3.170 |
| 2001 | 0.394 | 1.102 | 1.461 | 1.742 | 2.100 | 2.364 | 2.187 | 2.554 | 3.114 |
| 2002 | 0.405 | 1.010 | 1.400 | 1.739 | 1.905 | 2.352 | 2.742 | 2.550 | 2.895 |
| 2003 | 0.475 | 0.758 | 1.377 | 1.577 | 1.845 | 1.913 | 2.389 | 2.859 | 2.909 |
| 2004 | 0.482 | 0.589 | 1.100 | 1.502 | 1.610 | 1.872 | 1.993 | 2.307 | 2.558 |
| 2005 | 0.056 ¹ | 0.697 | 0.988 | 1.429 | 1.678 | 1.842 | 2.005 | 2.055 | 2.419 |
| 2006 | 0.335 | 0.514 | 0.977 | 0.977 | 1.598 | 1.776 | 1.861 | 2.021 | 2.216 |
| 2007 | 0.464 | 0.584 | 0.990 | 1.187 | 1.385 | 1.658 | 1.833 | 1.671 | 2.122 |
| 2008 | 0.458 | 0.791 | 1.003 | 1.230 | 1.390 | 1.610 | 1.572 | 1.912 | 2.434 |
| 2009 | 0.551 | 0.864 | 0.987 | 1.255 | 1.422 | 1.531 | 1.740 | 2.245 | 2.248 |
| 2010 | 0.436 | 0.739 | 1.063 | 1.231 | 1.338 | 1.503 | 1.594 | 1.728 | 2.220 |
| 2011 | 0.346 | 1.027 | 1.024 | 1.217 | 1.319 | 1.360 | 1.556 | 1.630 | 2.125 |
| 2012 | 0.256 | 0.646 | 1.027 | 1.222 | 1.310 | 1.437 | 1.477 | 1.559 | 1.705 |
| Low | 0.2562 | 0.514 | 0.812 | 0.977 | 1.310 | 1.360 | 1.477 | 1.559 | 1.705 |
| High | 0.797 | 1.216 | 1.724 | 2.244 | 2.662 | 3.760 | 4.107 | 4.086 | 4.455 |
| Median | 0.5452 | 0.974 | 1.345 | 1.750 | 2.097 | 2.454 | 2.822 | 3.010 | 3.427 |
| Average | 0.5352 | 0.945 | 1.311 | 1.690 | 2.013 | 2.304 | 2.617 | 2.858 | 3.288 |
| 2010-12 Avg | 0.346 | 0.804 | 1.038 | 1.224 | 1.322 | 1.433 | 1.542 | 1.639 | 2.017 |

¹One haddock measured. ²Excludes 2005 value.

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Table 15. Average lengths at age (cm) of haddock from the combined Canadian and USA commercial groundfish fishery landings on eastern Georges Bank during 1969-2012.

| Year | Age Group | | | | | | | | |
|--------------|-------------------|------|------|------|------|------|------|------|------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9+ |
| 1969 | | 42.5 | 50.2 | 53.4 | 54.9 | 56.6 | 61.2 | 66.7 | 70.6 |
| 1970 | 40.1 | 47.0 | 43.4 | 54.9 | 57.4 | 60.0 | 60.4 | 66.4 | 68.6 |
| 1971 | | 44.7 | 46.6 | 50.0 | 58.4 | 61.3 | 61.9 | 64.2 | 68.1 |
| 1972 | 40.6 | | 53.3 | 55.4 | 59.4 | 63.3 | 63.5 | 62.0 | 67.3 |
| 1973 | 39.2 | 45.2 | 52.5 | 55.4 | 60.3 | 54.7 | 65.8 | 69.2 | 69.0 |
| 1974 | | 45.6 | 52.1 | | 59.6 | 72.5 | | 69.2 | 73.3 |
| 1975 | | 42.5 | 52.8 | 59.7 | 59.8 | 63.7 | 75.8 | 72.7 | 71.7 |
| 1976 | 37.4 | 44.6 | 49.5 | 57.1 | 62.3 | | 65.8 | | 72.6 |
| 1977 | | 44.1 | 51.2 | 55.9 | 61.1 | 65.4 | | 68.8 | 76.7 |
| 1978 | 37.6 | 46.4 | 50.5 | 57.3 | 63.5 | 65.8 | 65.9 | 66.1 | 76.1 |
| 1979 | | 44.3 | 49.0 | 55.3 | 59.3 | 64.7 | 68.4 | 67.8 | 74.0 |
| 1980 | 32.5 | 42.5 | 44.9 | 54.3 | 58.6 | 63.1 | 71.6 | 71.0 | 67.0 |
| 1981 | | 42.9 | 48.8 | 53.2 | 60.4 | 63.4 | 70.7 | 75.5 | 76.3 |
| 1982 | | 44.4 | 50.1 | 55.1 | 60.6 | 63.1 | 66.3 | 71.5 | 70.9 |
| 1983 | | 45.0 | 49.2 | 54.4 | 58.8 | 62.0 | 65.4 | 67.6 | 73.4 |
| 1984 | | 44.1 | 50.5 | 55.8 | 59.8 | 63.6 | 66.5 | 68.2 | 70.3 |
| 1985 | | 43.3 | 47.5 | 55.8 | 59.2 | 63.6 | 65.9 | 67.9 | 70.8 |
| 1986 | 33.7 | 43.8 | 49.6 | 55.1 | 60.1 | 63.7 | 66.3 | 70.8 | 72.0 |
| 1987 | | 41.4 | 50.3 | 56.5 | 58.0 | 62.2 | 66.3 | 71.3 | 71.9 |
| 1988 | 32.8 | 43.7 | 48.6 | 53.7 | 58.0 | 60.6 | 67.1 | 68.5 | 69.3 |
| 1989 | | 41.9 | 50.0 | 54.1 | 59.2 | 61.9 | 66.6 | 70.3 | 70.0 |
| 1990 | 37.9 | 44.2 | 50.0 | 55.4 | 58.2 | 63.4 | 63.7 | 64.9 | 69.4 |
| 1991 | 36.2 | 47.0 | 48.3 | 54.2 | 58.3 | 62.2 | 66.7 | 64.9 | 66.6 |
| 1992 | 35.7 | 46.4 | 52.7 | 53.9 | 58.2 | 63.2 | 65.5 | 71.6 | 67.8 |
| 1993 | 38.3 | 46.4 | 53.3 | 58.0 | 57.0 | 61.7 | 62.4 | 65.2 | 67.9 |
| 1994 | 32.5 | 46.1 | 52.6 | 58.1 | 61.6 | 59.7 | 62.9 | 65.6 | 67.4 |
| 1995 | 40.2 | 45.0 | 50.9 | 56.3 | 60.8 | 62.5 | 64.1 | 64.2 | 67.9 |
| 1996 | 36.4 | 44.6 | 50.0 | 53.9 | 58.6 | 60.1 | 66.7 | 58.1 | 68.4 |
| 1997 | 38.7 | 47.2 | 48.8 | 53.4 | 57.0 | 60.2 | 64.4 | 66.9 | 70.5 |
| 1998 | 36.5 | 46.1 | 51.6 | 52.8 | 55.7 | 58.7 | 63.3 | 67.2 | 68.8 |
| 1999 | 38.7 | 45.6 | 51.5 | 55.1 | 54.9 | 57.9 | 61.0 | 63.0 | 69.3 |
| 2000 | 38.5 | 45.7 | 50.4 | 55.2 | 58.3 | 57.1 | 60.4 | 62.9 | 65.3 |
| 2001 | 32.1 | 45.5 | 50.4 | 53.5 | 56.9 | 59.2 | 57.6 | 60.3 | 64.5 |
| 2002 | 32.5 | 44.3 | 49.6 | 53.5 | 55.2 | 59.2 | 62.6 | 60.7 | 63.5 |
| 2003 | 34.2 | 40.2 | 49.3 | 51.8 | 54.7 | 55.3 | 59.7 | 63.8 | 64.0 |
| 2004 | 34.5 | 36.9 | 45.6 | 50.8 | 52.3 | 54.7 | 55.9 | 58.3 | 60.1 |
| 2005 | 16.5 ¹ | 38.8 | 44.1 | 49.9 | 52.8 | 54.5 | 56.1 | 56.5 | 59.2 |
| 2006 | 30.4 | 35.2 | 43.7 | 43.9 | 51.9 | 53.8 | 54.7 | 56.1 | 57.8 |
| 2007 | 34.0 | 36.7 | 43.9 | 46.8 | 49.3 | 52.5 | 54.3 | 52.3 | 57.1 |
| 2008 | 33.3 | 40.7 | 44.3 | 47.6 | 49.6 | 52.0 | 51.3 | 55.0 | 59.6 |
| 2009 | 36.0 | 42.0 | 44.4 | 47.9 | 49.7 | 51.4 | 52.9 | 57.7 | 57.8 |
| 2010 | 33.1 | 39.9 | 45.1 | 47.6 | 49.1 | 50.9 | 52.1 | 53.3 | 58.4 |
| 2011 | 30.7 | 44.0 | 44.7 | 47.4 | 48.9 | 49.5 | 51.8 | 52.5 | 57.8 |
| 2012 | 27.7 | 37.9 | 44.8 | 47.4 | 48.6 | 50.2 | 50.7 | 51.5 | 53.2 |
| Low | 27.7 ² | 35.2 | 43.4 | 43.9 | 48.6 | 49.5 | 50.7 | 51.5 | 53.2 |
| High | 40.6 ² | 47.2 | 53.3 | 59.7 | 63.5 | 72.5 | 75.8 | 75.5 | 76.7 |
| Median | 35.8 ² | 44.2 | 49.6 | 54.2 | 58.2 | 60.6 | 63.6 | 65.6 | 68.5 |
| Average | 35.4 ² | 43.4 | 48.9 | 53.4 | 57.0 | 59.7 | 62.4 | 64.4 | 67.3 |
| Avg. 2010-12 | 30.5 | 40.6 | 44.8 | 47.5 | 48.9 | 50.2 | 51.5 | 52.4 | 56.5 |

¹One haddock measured. ²Excludes 16.5 cm value in 2005.

Table 16. Conversion factors used to adjust for changes in door type and survey vessel in the National Marine Fisheries Service surveys during 1968-2013.

| Year | Door | Spring | | Fall | |
|-------------|------------------|-----------------|--------------|-----------------|--------------|
| | | Vessel | Conversion | Vessel | Conversion |
| 1968 | BMV | Albatross IV | 1.49 | Albatross IV | 1.49 |
| 1969 | BMV | Albatross IV | 1.49 | Albatross IV | 1.49 |
| 1970 | BMV | Albatross IV | 1.49 | Albatross IV | 1.49 |
| 1971 | BMV | Albatross IV | 1.49 | Albatross IV | 1.49 |
| 1972 | BMV | Albatross IV | 1.49 | Albatross IV | 1.49 |
| 1973 | BMV | Albatross IV | 1.49 | Albatross IV | 1.49 |
| 1974 | BMV | Albatross IV | 1.49 | Albatross IV | 1.49 |
| 1975 | BMV | Albatross IV | 1.49 | Albatross IV | 1.49 |
| 1976 | BMV | Albatross IV | 1.49 | Albatross IV | 1.49 |
| 1977 | BMV | Albatross IV | 1.49 | Delaware II | 1.2218 |
| 1978 | BMV | Albatross IV | 1.49 | Delaware II | 1.2218 |
| 1979 | BMV | Albatross IV | 1.49 | Delaware II | 1.2218 |
| 1980 | BMV | Albatross IV | 1.49 | Delaware II | 1.2218 |
| 1981 | BMV | Delaware II | 1.2218 | Delaware II | 1.2218 |
| 1982 | BMV | Delaware II | 1.2218 | Albatross IV | 1.49 |
| 1983 | BMV | Albatross IV | 1.49 | Albatross IV | 1.49 |
| 1984 | BMV | Albatross IV | 1.49 | Albatross IV | 1.49 |
| 1985 | Polyvalent | Albatross IV | 1 | Albatross IV | 1 |
| 1986 | Polyvalent | Albatross IV | 1 | Albatross IV | 1 |
| 1987 | Polyvalent | Albatross IV | 1 | Albatross IV | 1 |
| 1988 | Polyvalent | Albatross IV | 1 | Albatross IV | 1 |
| 1989 | Polyvalent | Delaware II | 0.82 | Delaware II | 0.82 |
| 1990 | Polyvalent | Delaware II | 0.82 | Delaware II | 0.82 |
| 1991 | Polyvalent | Delaware II | 0.82 | Delaware II | 0.82 |
| 1992 | Polyvalent | Albatross IV | 1 | Albatross IV | 1 |
| 1993 | Polyvalent | Albatross IV | 1 | Delaware II | 0.82 |
| 1994 | Polyvalent | Delaware II | 0.82 | Albatross IV | 1 |
| 1995 | Polyvalent | Albatross IV | 1 | Albatross IV | 1 |
| 1996 | Polyvalent | Albatross IV | 1 | Albatross IV | 1 |
| 1997 | Polyvalent | Albatross IV | 1 | Albatross IV | 1 |
| 1998 | Polyvalent | Albatross IV | 1 | Albatross IV | 1 |
| 1999 | Polyvalent | Albatross IV | 1 | Albatross IV | 1 |
| 2000 | Polyvalent | Albatross IV | 1 | Albatross IV | 1 |
| 2001 | Polyvalent | Albatross IV | 1 | Albatross IV | 1 |
| 2002 | Polyvalent | Albatross IV | 1 | Albatross IV | 1 |
| 2003 | Polyvalent | Delaware II | 0.82 | Delaware II | 0.82 |
| 2004 | Polyvalent | Albatross IV | 1 | Albatross IV | 1 |
| 2005 | Polyvalent | Albatross IV | 1 | Albatross IV | 1 |
| 2006 | Polyvalent | Albatross IV | 1 | Albatross IV | 1 |
| 2007 | Polyvalent | Albatross IV | 1 | Albatross IV | 1 |
| 2008 | Polyvalent | Albatross IV | 1 | Albatross IV | 1 |
| 2009 - 2013 | 3 bridle, 4 seam | Henry B Bigelow | See Table 17 | Henry B Bigelow | See Table 17 |

Table 17. Conversion factors for Georges Bank haddock used to adjust for changes in net, doors, survey vessel and protocols for the National Marine Fisheries Service surveys during 2009 to 2013 when the Henry B. Bigelow was the research vessel used. Bigelow catches are divided by the conversion factor to equate to Albatross IV catches.

| Length (cm) | Conversion factor |
|----------------|-------------------|
| 1 – 18 | 2.626169 |
| 19 | 2.580551 |
| 20 | 2.534933 |
| 21 | 2.489315 |
| 22 | 2.443697 |
| 23 | 2.398079 |
| 24 | 2.352462 |
| 25 | 2.306844 |
| 26 | 2.261226 |
| 27 | 2.215608 |
| 28 | 2.169990 |
| 29 | 2.124372 |
| 30 | 2.078754 |
| 31 | 2.033136 |
| 32 | 1.987518 |
| 33 | 1.941900 |
| 34 | 1.896283 |
| 35 | 1.850665 |
| 36 | 1.805047 |
| 37 | 1.759429 |
| 38 | 1.713811 |
| 39 | 1.668193 |
| 40 | 1.622575 |
| 41 | 1.576957 |
| 42 | 1.531339 |
| 43 | 1.485721 |
| 44 | 1.440104 |
| 45 | 1.394486 |
| 46 | 1.348868 |
| 47 | 1.303250 |
| 48 | 1.257632 |
| 49 | 1.212014 |
| 50 | 1.166396 |
| 51 and greater | 1.163990 |

Eastern Georges Bank Haddock for 2013

Table 18. Total swept area estimates of abundance at age (numbers in 000's) of eastern Georges Bank haddock from the Canadian Department of Fisheries and Oceans (DFO) surveys during 1986-2013.

| Year | Age Group | | | | | | | | | Total |
|------|-----------|--------|--------|-------|--------|-------|-------|-------|------|--------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9+ | |
| 1986 | 5057 | 306 | 8176 | 997 | 189 | 348 | 305 | 425 | 401 | 16205 |
| 1987 | 46 | 4286 | 929 | 3450 | 653 | 81 | 387 | 135 | 1132 | 11099 |
| 1988 | 971 | 49 | 12714 | 257 | 4345 | 274 | 244 | 130 | 686 | 19670 |
| 1989 | 48 | 6664 | 991 | 2910 | 245 | 526 | 40 | 34 | 265 | 11724 |
| 1990 | 726 | 108 | 12300 | 168 | 4466 | 299 | 1370 | 144 | 389 | 19968 |
| 1991 | 383 | 2163 | 134 | 10819 | 114 | 1909 | 117 | 505 | 225 | 16368 |
| 1992 | 1914 | 3879 | 1423 | 221 | 4810 | 18 | 1277 | 52 | 656 | 14249 |
| 1993 | 3448 | 1759 | 545 | 431 | 34 | 1186 | 19 | 281 | 147 | 7849 |
| 1994 | 4197 | 15163 | 5332 | 549 | 314 | 20 | 915 | 18 | 356 | 26864 |
| 1995 | 1231 | 3224 | 6236 | 3034 | 720 | 398 | 0 | 729 | 849 | 16422 |
| 1996 | 1455 | 2290 | 4784 | 5305 | 3113 | 303 | 274 | 38 | 684 | 18247 |
| 1997 | 1033 | 1550 | 1222 | 2742 | 2559 | 1397 | 150 | 65 | 372 | 11090 |
| 1998 | 2379 | 10626 | 5348 | 3190 | 5312 | 5028 | 2248 | 348 | 601 | 35080 |
| 1999 | 24593 | 4787 | 10067 | 3104 | 1963 | 1880 | 1764 | 448 | 174 | 48780 |
| 2000 | 3177 | 15865 | 7679 | 12108 | 2900 | 2074 | 2726 | 1591 | 813 | 48932 |
| 2001 | 23026 | 3519 | 14633 | 4255 | 5608 | 1808 | 1426 | 1963 | 2299 | 58536 |
| 2002 | 732 | 28174 | 5977 | 12660 | 2981 | 2646 | 648 | 529 | 2423 | 56769 |
| 2003 | 1682 | 1503 | 82161 | 5533 | 15105 | 3675 | 2355 | 1106 | 1986 | 115107 |
| 2004 | 91843 | 539 | 2682 | 54882 | 5001 | 9695 | 1654 | 954 | 634 | 167883 |
| 2005 | 1669 | 20958 | 531 | 1557 | 25559 | 3403 | 4815 | 1087 | 548 | 60125 |
| 2006 | 9130 | 5817 | 178604 | 2521 | 2251 | 15695 | 764 | 1633 | 261 | 216675 |
| 2007 | 3051 | 9541 | 3289 | 67311 | 984 | 154 | 3584 | 251 | 652 | 88816 |
| 2008 | 3832 | 1219 | 4647 | 5025 | 103874 | 1006 | 191 | 8553 | 724 | 129071 |
| 2009 | 2001 | 3977 | 2668 | 5989 | 652 | 43838 | 637 | 125 | 1568 | 61456 |
| 2010 | 868 | 606 | 3005 | 2335 | 4855 | 1433 | 42302 | 314 | 1071 | 56788 |
| 2011 | 209508 | 1892 | 1649 | 3079 | 1329 | 2974 | 741 | 29157 | 535 | 250864 |
| 2012 | 20047 | 353084 | 4108 | 746 | 1061 | 410 | 684 | 401 | 4454 | 384995 |
| 2013 | 2988 | 33059 | 320949 | 5319 | 786 | 1390 | 588 | 969 | 5442 | 371491 |

Eastern Georges Bank Haddock for 2013

Table 19. Total swept area estimated abundance at age (numbers in 000's) of eastern Georges Bank haddock from the National Marine Fisheries Service spring surveys during 1968-2013. From 1973-81, a 41 Yankee trawl was used while a 36 Yankee trawl was used in other years up to and including 2008. Since 2009 a new net, vessel and protocols were used and conversion factors to equate to Albatross IV catches were applied.

| Year | Age Group | | | | | | | | | Total |
|------|-----------|--------|-------|-------|-------|-------|-------|------|------|--------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9+ | |
| 1968 | 0 | 3254 | 68 | 679 | 4853 | 2045 | 240 | 123 | 234 | 11496 |
| 1969 | 17 | 35 | 614 | 235 | 523 | 3232 | 1220 | 358 | 489 | 6724 |
| 1970 | 478 | 190 | 0 | 560 | 998 | 441 | 3165 | 2491 | 769 | 9092 |
| 1971 | 0 | 655 | 261 | 0 | 144 | 102 | 58 | 1159 | 271 | 2650 |
| 1972 | 2594 | 0 | 771 | 132 | 25 | 47 | 211 | 27 | 1214 | 5020 |
| 1973 | 2455 | 5639 | 0 | 1032 | 154 | 0 | 276 | 0 | 1208 | 10763 |
| 1974 | 1323 | 20596 | 4084 | 0 | 354 | 0 | 43 | 72 | 322 | 26795 |
| 1975 | 528 | 567 | 6016 | 1063 | 0 | 218 | 127 | 45 | 208 | 8773 |
| 1976 | 8228 | 402 | 424 | 1127 | 532 | 0 | 0 | 0 | 22 | 10735 |
| 1977 | 126 | 26003 | 262 | 912 | 732 | 568 | 0 | 22 | 102 | 28727 |
| 1978 | 0 | 743 | 20859 | 641 | 880 | 1163 | 89 | 23 | 116 | 24516 |
| 1979 | 10496 | 441 | 1313 | 9764 | 475 | 72 | 445 | 42 | 9 | 23056 |
| 1980 | 4355 | 66450 | 1108 | 1086 | 5761 | 613 | 371 | 693 | 360 | 80797 |
| 1981 | 3281 | 2823 | 27085 | 2906 | 751 | 2455 | 347 | 56 | 21 | 39725 |
| 1982 | 584 | 3703 | 1658 | 7802 | 767 | 455 | 697 | 0 | 0 | 15666 |
| 1983 | 238 | 770 | 686 | 359 | 2591 | 30 | 0 | 798 | 58 | 5529 |
| 1984 | 1366 | 1414 | 1046 | 910 | 847 | 1189 | 133 | 73 | 490 | 7469 |
| 1985 | 40 | 8911 | 1396 | 674 | 1496 | 588 | 1995 | 127 | 483 | 15709 |
| 1986 | 3334 | 280 | 3597 | 246 | 210 | 333 | 235 | 560 | 159 | 8953 |
| 1987 | 122 | 5480 | 144 | 1394 | 157 | 231 | 116 | 370 | 0 | 8013 |
| 1988 | 305 | 61 | 1868 | 235 | 611 | 203 | 218 | 178 | 0 | 3678 |
| 1989 | 84 | 6665 | 619 | 1343 | 267 | 791 | 58 | 92 | 47 | 9966 |
| 1990 | 1654 | 70 | 10338 | 598 | 1042 | 110 | 182 | 0 | 0 | 13995 |
| 1991 | 740 | 2071 | 432 | 3381 | 192 | 203 | 66 | 87 | 25 | 7198 |
| 1992 | 529 | 287 | 205 | 158 | 602 | 32 | 46 | 46 | 0 | 1905 |
| 1993 | 1870 | 1116 | 197 | 232 | 195 | 717 | 77 | 35 | 43 | 4480 |
| 1994 | 1025 | 4272 | 1487 | 269 | 184 | 118 | 278 | 28 | 84 | 7745 |
| 1995 | 921 | 2312 | 4184 | 1727 | 265 | 152 | 51 | 272 | 214 | 10099 |
| 1996 | 912 | 1365 | 3789 | 3190 | 1905 | 237 | 36 | 0 | 496 | 11931 |
| 1997 | 1635 | 1226 | 380 | 595 | 470 | 343 | 24 | 44 | 20 | 4736 |
| 1998 | 549 | 6046 | 2005 | 1281 | 1184 | 303 | 58 | 15 | 122 | 11562 |
| 1999 | 6286 | 1914 | 3655 | 661 | 1128 | 1062 | 468 | 476 | 46 | 15696 |
| 2000 | 2675 | 2131 | 3399 | 1624 | 636 | 564 | 438 | 305 | 165 | 11938 |
| 2001 | 10503 | 1186 | 3304 | 1232 | 374 | 294 | 113 | 20 | 20 | 17047 |
| 2002 | 231 | 40432 | 10938 | 4044 | 1492 | 473 | 287 | 229 | 236 | 58362 |
| 2003 | 125 | 1105 | 16915 | 2245 | 3773 | 476 | 200 | 82 | 286 | 25206 |
| 2004 | 195013 | 4724 | 2644 | 45872 | 3544 | 5261 | 960 | 1245 | 842 | 260104 |
| 2005 | 540 | 32911 | 257 | 614 | 5818 | 671 | 1196 | 240 | 67 | 42313 |
| 2006 | 2961 | 1247 | 48882 | 213 | 949 | 6650 | 325 | 574 | 187 | 61988 |
| 2007 | 1468 | 11383 | 2055 | 95882 | 180 | 441 | 2168 | 222 | 312 | 114110 |
| 2008 | 3402 | 1671 | 4332 | 240 | 38569 | 836 | 371 | 1739 | 480 | 51639 |
| 2009 | 2896 | 2758 | 1589 | 5126 | 801 | 23985 | 563 | 483 | 1259 | 39462 |
| 2010 | 481 | 644 | 3326 | 1461 | 3785 | 517 | 20735 | 0 | 600 | 31548 |
| 2011 | 16812 | 1319 | 834 | 707 | 551 | 1052 | 303 | 6751 | 155 | 28484 |
| 2012 | 15004 | 101276 | 394 | 0 | 518 | 629 | 1020 | 0 | 2556 | 121420 |
| 2013 | 2583 | 9575 | 60096 | 1197 | 506 | 411 | 349 | 292 | 1101 | 76111 |

Eastern Georges Bank Haddock for 2013

Table 20. Total swept area estimated abundance at age (numbers in 000's) of eastern Georges Bank haddock from National Marine Fisheries Service fall surveys during 1963-2012. Since 2009 a new net, vessel and protocols were used and conversion factors to equate to Albatross IV catches were applied.

| Year | Age Group | | | | | | | | | Total |
|-------------------|-----------|--------|-------|-------|-------|-------|-------|------|------|--------|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8+ | |
| 1963 | 105993 | 40995 | 10314 | 3378 | 5040 | 4136 | 1477 | 451 | 276 | 172061 |
| 1964 | 1178 | 123976 | 46705 | 4358 | 807 | 1865 | 477 | 211 | 167 | 179742 |
| 1965 | 259 | 1503 | 51338 | 8538 | 479 | 302 | 142 | 148 | 208 | 62918 |
| 1966 | 9325 | 751 | 1742 | 20323 | 3631 | 671 | 138 | 133 | 84 | 36798 |
| 1967 | 0 | 3998 | 73 | 327 | 1844 | 675 | 141 | 88 | 88 | 7233 |
| 1968 | 55 | 113 | 800 | 28 | 37 | 2223 | 547 | 177 | 313 | 4293 |
| 1969 | 356 | 0 | 0 | 509 | 62 | 30 | 739 | 453 | 108 | 2257 |
| 1970 | 0 | 6400 | 336 | 16 | 415 | 337 | 500 | 902 | 578 | 9483 |
| 1971 | 2626 | 0 | 788 | 97 | 0 | 265 | 27 | 73 | 594 | 4471 |
| 1972 | 4747 | 2396 | 0 | 232 | 0 | 0 | 53 | 0 | 275 | 7702 |
| 1973 | 1223 | 16797 | 1598 | 0 | 168 | 0 | 0 | 8 | 16 | 19809 |
| 1974 | 151 | 234 | 961 | 169 | 0 | 6 | 0 | 0 | 70 | 1589 |
| 1975 | 30365 | 664 | 192 | 1042 | 239 | 0 | 0 | 0 | 28 | 32530 |
| 1976 | 738 | 121717 | 431 | 25 | 484 | 71 | 0 | 17 | 37 | 123521 |
| 1977 | 47 | 238 | 26323 | 445 | 125 | 211 | 84 | 4 | 4 | 27480 |
| 1978 | 14642 | 547 | 530 | 7706 | 56 | 42 | 94 | 0 | 0 | 23617 |
| 1979 | 1598 | 21605 | 14 | 335 | 1489 | 45 | 12 | 0 | 0 | 25098 |
| 1980 | 3556 | 2788 | 5829 | 0 | 101 | 1081 | 108 | 25 | 4 | 13492 |
| 1981 | 596 | 4617 | 2585 | 2748 | 89 | 136 | 318 | 0 | 15 | 11103 |
| 1982 | 62 | 0 | 673 | 465 | 2508 | 153 | 97 | 528 | 42 | 4527 |
| 1983 | 3609 | 444 | 236 | 501 | 289 | 402 | 17 | 12 | 86 | 5598 |
| 1984 | 45 | 3775 | 856 | 233 | 194 | 45 | 262 | 0 | 41 | 5451 |
| 1985 | 12148 | 381 | 1646 | 199 | 70 | 68 | 46 | 30 | 21 | 14611 |
| 1986 | 30 | 7471 | 109 | 961 | 52 | 50 | 72 | 24 | 23 | 8793 |
| 1987 | 508 | 0 | 843 | 28 | 152 | 38 | 22 | 0 | 0 | 1592 |
| 1988 | 122 | 3983 | 184 | 2348 | 155 | 400 | 142 | 140 | 38 | 7513 |
| 1989 | 167 | 83 | 2645 | 112 | 509 | 68 | 73 | 0 | 0 | 3656 |
| 1990 | 1217 | 1041 | 36 | 1456 | 65 | 196 | 24 | 5 | 0 | 4040 |
| 1991 | 705 | 331 | 267 | 52 | 289 | 25 | 10 | 0 | 0 | 1679 |
| 1992 | 3484 | 1052 | 172 | 110 | 0 | 95 | 0 | 18 | 18 | 4948 |
| 1993 | 687 | 6656 | 3601 | 585 | 0 | 87 | 96 | 30 | 0 | 11742 |
| 1994 | 625 | 782 | 927 | 419 | 96 | 32 | 0 | 24 | 0 | 2905 |
| 1995 | 892 | 1436 | 5993 | 3683 | 550 | 30 | 0 | 0 | 53 | 12637 |
| 1996 | 1742 | 453 | 570 | 2302 | 963 | 167 | 0 | 0 | 0 | 6196 |
| 1997 | 217 | 5738 | 3368 | 592 | 690 | 385 | 0 | 0 | 13 | 11004 |
| 1998 | 2566 | 2966 | 4214 | 1085 | 705 | 526 | 722 | 0 | 0 | 12784 |
| 1999 | 3268 | 1236 | 5364 | 5060 | 837 | 2825 | 148 | 1150 | 991 | 20879 |
| 2000 | 1368 | 5284 | 6226 | 3712 | 622 | 229 | 0 | 146 | 97 | 17684 |
| 2001 | 659 | 16626 | 1382 | 6939 | 3000 | 1586 | 306 | 127 | 58 | 30684 |
| 2002 | 172 | 1864 | 44602 | 6040 | 5120 | 1660 | 863 | 457 | 354 | 61131 |
| 2003 | 196182 | 60 | 285 | 3415 | 655 | 739 | 20 | 99 | 158 | 201613 |
| 2004 | 2864 | 116289 | 322 | 775 | 17200 | 1034 | 2410 | 416 | 528 | 141837 |
| 2005 | 4981 | 3114 | 95159 | 340 | 532 | 3631 | 347 | 242 | 155 | 108502 |
| 2006 | 930 | 8752 | 1040 | 65817 | 1083 | 82 | 796 | 0 | 16 | 78517 |
| 2007 | 1264 | 1922 | 11764 | 965 | 52456 | 955 | 562 | 244 | 0 | 70132 |
| 2008 | 1902 | 1865 | 1162 | 2564 | 477 | 21289 | 0 | 74 | 484 | 29818 |
| 2009 | 2010 | 862 | 1352 | 1082 | 2504 | 388 | 20906 | 88 | 237 | 29430 |
| 2010 ¹ | 172390 | 1154 | 585 | 1069 | 393 | 1166 | 589 | 9909 | 172 | 187428 |
| 2011 | 28394 | 164625 | 515 | 293 | 337 | 367 | 704 | 232 | 3850 | 199316 |
| 2012 | 3493 | 10311 | 72573 | 237 | 151 | 83 | 102 | 80 | 754 | 87784 |

¹The 2011 and 2012 assessments incorrectly reported the 2010 index at twice the actual values.

Eastern Georges Bank Haddock for 2013

Table 21. Average weight at age (kg) of eastern Georges Bank haddock from the Canadian Department of Fisheries and Oceans surveys during 1986-2013. These weights are used to represent beginning of year population weights. 9+ weights are population weighted averages.

| Year | Age Group | | | | | | | | |
|----------------|-----------|-------|-------|-------|-------|-------|------------------|-------|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9+ |
| 1986 | 0.135 | 0.451 | 0.974 | 1.445 | 3.044 | 2.848 | 3.598 | 3.376 | 3.918 |
| 1987 | 0.150 | 0.500 | 0.716 | 1.672 | 2.012 | 2.550 | 3.148 | 3.151 | 3.629 |
| 1988 | 0.097 | 0.465 | 0.931 | 1.795 | 1.816 | 1.918 | 2.724 | 3.264 | 3.871 |
| 1989 | 0.062 | 0.474 | 0.650 | 1.392 | 1.995 | 2.527 | 2.158 | 2.859 | 3.141 |
| 1990 | 0.149 | 0.525 | 0.924 | 1.181 | 1.862 | 2.073 | 2.507 | 2.815 | 3.472 |
| 1991 | 0.120 | 0.685 | 0.800 | 1.512 | 1.695 | 2.434 | 2.105 | 3.122 | 3.432 |
| 1992 | 0.122 | 0.602 | 1.118 | 1.061 | 2.078 | 2.165 | 2.709 | 2.284 | 3.440 |
| 1993 | 0.122 | 0.481 | 1.227 | 1.803 | 1.274 | 2.332 | 2.343 | 2.739 | 3.280 |
| 1994 | 0.107 | 0.469 | 1.047 | 1.621 | 1.927 | 2.154 | 3.154 | 2.688 | 3.084 |
| 1995 | 0.086 | 0.493 | 0.963 | 1.556 | 2.222 | 2.445 | 2.4 ¹ | 2.991 | 3.184 |
| 1996 | 0.139 | 0.495 | 0.919 | 1.320 | 1.932 | 2.555 | 2.902 | 2.611 | 3.588 |
| 1997 | 0.132 | 0.506 | 0.782 | 1.205 | 1.664 | 2.176 | 2.454 | 2.577 | 3.158 |
| 1998 | 0.107 | 0.535 | 1.035 | 1.161 | 1.570 | 1.954 | 2.609 | 3.559 | 3.462 |
| 1999 | 0.130 | 0.474 | 0.911 | 1.290 | 1.259 | 1.869 | 2.131 | 2.722 | 2.992 |
| 2000 | 0.116 | 0.543 | 0.949 | 1.478 | 1.871 | 1.789 | 2.298 | 2.508 | 2.901 |
| 2001 | 0.093 | 0.524 | 1.005 | 1.371 | 1.798 | 2.165 | 2.250 | 2.593 | 2.928 |
| 2002 | 0.096 | 0.332 | 0.778 | 1.138 | 1.494 | 1.965 | 2.177 | 2.206 | 2.708 |
| 2003 | 0.080 | 0.369 | 0.846 | 1.063 | 1.477 | 1.645 | 2.208 | 2.229 | 2.487 |
| 2004 | 0.064 | 0.310 | 0.781 | 1.151 | 1.306 | 1.558 | 1.622 | 1.956 | 2.216 |
| 2005 | 0.028 | 0.218 | 0.493 | 0.696 | 1.226 | 1.321 | 1.531 | 1.600 | 2.444 |
| 2006 | 0.059 | 0.171 | 0.389 | 0.657 | 0.870 | 1.366 | 1.591 | 1.742 | 2.355 |
| 2007 | 0.077 | 0.246 | 0.405 | 0.709 | 0.992 | 1.745 | 1.559 | 1.671 | 1.862 |
| 2008 | 0.107 | 0.329 | 0.573 | 0.795 | 0.927 | 1.254 | 1.729 | 1.476 | 1.897 |
| 2009 | 0.114 | 0.387 | 0.775 | 0.999 | 0.987 | 1.258 | 1.482 | 2.680 | 2.228 |
| 2010 | 0.072 | 0.385 | 0.749 | 0.960 | 1.120 | 1.207 | 1.333 | 1.772 | 2.066 |
| 2011 | 0.038 | 0.322 | 0.612 | 0.900 | 0.953 | 1.018 | 1.120 | 1.371 | 1.721 |
| 2012 | 0.070 | 0.186 | 0.457 | 0.506 | 0.997 | 1.104 | 1.084 | 1.190 | 1.346 |
| 2013 | 0.070 | 0.261 | 0.412 | 0.789 | 1.092 | 0.972 | 1.100 | 1.142 | 1.457 |
| Low | 0.028 | 0.171 | 0.389 | 0.506 | 0.870 | 0.972 | 1.084 | 1.142 | 1.346 |
| High | 0.150 | 0.685 | 1.227 | 1.803 | 3.044 | 2.848 | 3.598 | 3.559 | 3.918 |
| Median | 0.102 | 0.467 | 0.791 | 1.171 | 1.532 | 1.936 | 2.177 | 2.585 | 2.960 |
| Average | 0.098 | 0.434 | 0.821 | 1.228 | 1.591 | 1.934 | 2.218 | 2.483 | 2.902 |
| Avg. 1991-2000 | 0.118 | 0.528 | 0.975 | 1.401 | 1.749 | 2.187 | 2.523 | 2.780 | 3.252 |
| Avg. 2011-2013 | 0.060 | 0.256 | 0.494 | 0.732 | 1.014 | 1.031 | 1.101 | 1.234 | 1.508 |

¹The weight midway between the age 6 and 8 weight for that cohort was used as data were not available for this age group.

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Table 22. Average lengths at age (cm) of eastern Georges Bank haddock from the Canadian Department of Fisheries and Oceans surveys during 1986-2013.

| Year | Age Group | | | | | | | | |
|---------|-----------|------|------|------|------|------|------|------|------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9+ |
| 1986 | 22.9 | 36.2 | 45.4 | 51.0 | 63.7 | 61.9 | 67.8 | 66.0 | 70.7 |
| 1987 | 24.2 | 36.3 | 39.7 | 53.4 | 57.1 | 61.1 | 65.1 | 65.8 | 69.6 |
| 1988 | 22.3 | 36.4 | 45.1 | 55.7 | 55.9 | 58.0 | 62.4 | 65.8 | 71.5 |
| 1989 | 19.5 | 35.9 | 39.1 | 50.4 | 56.8 | 61.3 | 58.0 | 64.6 | 66.3 |
| 1990 | 24.7 | 35.8 | 44.4 | 48.0 | 55.9 | 58.7 | 61.6 | 63.1 | 67.5 |
| 1991 | 23.1 | 40.7 | 42.7 | 51.7 | 52.9 | 60.2 | 58.3 | 65.1 | 67.8 |
| 1992 | 23.2 | 39.2 | 47.7 | 46.8 | 57.7 | 62.5 | 63.9 | 60.3 | 68.1 |
| 1993 | 23.6 | 36.6 | 49.7 | 55.5 | 50.0 | 60.4 | 59.3 | 63.7 | 67.3 |
| 1994 | 22.3 | 35.8 | 45.8 | 53.8 | 57.6 | 58.5 | 65.9 | 66.5 | 65.4 |
| 1995 | 20.2 | 36.3 | 45.1 | 52.7 | 59.0 | 62.5 | | 65.0 | 66.0 |
| 1996 | 24.2 | 36.2 | 44.4 | 50.1 | 56.9 | 62.7 | 66.2 | 61.8 | 68.4 |
| 1997 | 23.6 | 37.1 | 42.1 | 48.9 | 54.2 | 59.5 | 62.4 | 63.5 | 66.8 |
| 1998 | 21.8 | 37.6 | 46.4 | 47.3 | 52.9 | 57.2 | 62.5 | 69.3 | 68.7 |
| 1999 | 23.7 | 35.9 | 44.8 | 49.8 | 48.9 | 56.1 | 58.9 | 63.6 | 66.6 |
| 2000 | 22.7 | 37.6 | 44.3 | 52.1 | 56.4 | 54.7 | 59.6 | 61.7 | 64.7 |
| 2001 | 21.7 | 37.5 | 46.1 | 51.1 | 56.2 | 60.0 | 59.0 | 62.5 | 65.5 |
| 2002 | 21.5 | 31.8 | 42.1 | 47.5 | 52.0 | 58.1 | 60.3 | 59.2 | 64.4 |
| 2003 | 20.2 | 34.0 | 43.3 | 46.8 | 52.0 | 53.8 | 61.2 | 61.3 | 63.3 |
| 2004 | 19.1 | 31.8 | 42.0 | 47.9 | 50.6 | 53.3 | 55.3 | 59.1 | 60.2 |
| 2005 | 15.1 | 29.1 | 37.2 | 41.1 | 49.7 | 51.6 | 53.8 | 54.3 | 62.7 |
| 2006 | 18.7 | 27.0 | 34.0 | 40.2 | 42.6 | 51.8 | 52.8 | 55.7 | 62.2 |
| 2007 | 20.6 | 29.6 | 34.2 | 41.0 | 46.7 | 55.0 | 53.5 | 54.1 | 55.4 |
| 2008 | 23.1 | 33.1 | 39.4 | 43.0 | 45.7 | 50.5 | 56.3 | 52.9 | 57.9 |
| 2009 | 23.2 | 34.7 | 42.6 | 45.8 | 44.9 | 49.3 | 51.9 | 61.7 | 59.4 |
| 2010 | 20.3 | 34.8 | 43.0 | 46.3 | 48.3 | 50.5 | 51.4 | 55.7 | 59.8 |
| 2011 | 16.6 | 32.5 | 40.1 | 45.8 | 47.5 | 47.6 | 49.3 | 52.3 | 56.9 |
| 2012 | 19.9 | 26.7 | 36.2 | 37.1 | 47.0 | 48.7 | 48.6 | 50.1 | 52.0 |
| 2013 | 19.8 | 30.0 | 35.0 | 43.9 | 48.3 | 48.2 | 49.4 | 50.4 | 53.5 |
| Low | 15.1 | 26.7 | 34.0 | 37.1 | 42.6 | 47.6 | 48.6 | 50.1 | 52.0 |
| High | 24.7 | 40.7 | 49.7 | 55.7 | 63.7 | 62.7 | 67.8 | 69.3 | 71.5 |
| Median | 22.0 | 35.8 | 42.9 | 48.0 | 52.4 | 57.6 | 59.0 | 61.8 | 65.5 |
| Average | 21.5 | 34.5 | 42.2 | 48.0 | 52.4 | 56.2 | 58.3 | 60.5 | 64.3 |

Table 23. Data and model changes to the eastern Georges Bank haddock assessment framework from 1998 to 2013.

| Assessment Year | Change |
|-----------------|---|
| 1998 | <p>Framework: Random error in catch at age negligible. Errors in abundance indices assumed independent and identically distributed after taking the natural logarithms. Annual natural mortality rate (M) = 0.2. Fishing mortality (F) on age 8 = weighted F on ages 4 to 7. 9+ age group calculated but not calibrated to indices. In Q1 of first year, 9+ based on assumption that F9+ = popn weighted F4-8. In Q1 of subsequent years, 9+ abundance calculated as sum of age 8 and 9+ at end of last quarter of previous year. Quarterly catch at age: 0,1,2...8,9+; 1969.0, 1969.25, 1969.75, 1970.0...1996.75. DFO survey: ages 1,2,3...8; 1986.16, 1987.16...1998.0. NMFS spring (Yankee 36): age 1,2,3...8; 1969.29, 1970.29...1997.29. NMFS spring (Yankee 41): age 1,2,3...8; 1973.29, 1974.29...1981.29. NMFS fall: 0,1,2...5, 1969.69, 1970.69...1997.69. Zero survey observations treated as missing data.</p> |
| 1999 | <p>Minor differences in the handling of zero terminal catches for a year class were implemented as a refinement to the software to afford more flexibility.</p> |
| 2003 | <p>NMFS spring (Yankee 36): age 1,2,3...8; 1969.29, 1970.29...2003.25. (In previous years, the last survey available was the same year as the last catch at age year.) Catch of 0 was assumed for the 1st quarter of 2003 and the population calculated to beginning of 2003.25.</p> |
| 2005 | <p>Discards ages 1 and older from Canadian scallop fishery included in catch at age but age 0 set to zero. Population calculated to beginning year 2005. NMFS and DFO spring surveys in 2005 set to time=2005.00.</p> |
| 2007 | <p>Discards at age 0 included in catch at age.</p> |
| 2008 | <p>1) an annual catch at age instead of a quarterly catch at age. 2) revised survey timing: DFO spring from 0.16 to 0.17, NMFS spring from 0.29 to 0.28 and the NMFS fall survey from 0.69 to 0.79. 3) a change from ages 4 to 7 to 5 to 7 (weighted by population numbers) used to estimate oldest age F from 2003 to present.</p> |
| 2009 | <p>USA 2007 catch corrected from previous year (calculation error). The landings at age for 2006 to 2007 were recalculated. USA landings for 1994 to 2007 revised using new methodology. (Effect was negligible.) USA landings at age from 1991 to 2005 were revised to reflect the recalculated landings using a scalar adjustment. USA discards recalculated using ratio of discarded haddock to kept of all species for 1989 to 2007. Discards at age were not revised for 1989 to 2000 as amounts were low, except for 1994 (old=258 vs new=1,021 mt). No adjustment to the 1994 discards at age was made due to the uncertainty of this estimate. Discard at age estimates for 2001 to 2007 were revised by a scalar. 2009 NMFS spring survey not used (no conversion factors).</p> |
| 2010 | <p>9+ group in catch at age expanded to 9 to 16+; ages 15 and 16 dropped; 9+ group reconstructed from ages 9 to 14. Revisions made to USA landings, Canadian scallop discards and USA groundfish fishery discards at age. Largest change for 1994 discards from 258 mt to 1279 mt.</p> |
| 2011 - 2013 | <p>No additional changes. Note that the 2010 fall survey was used at twice its actual value in the 2011 and 2012 assessments. The effect on the 2012 assessment results are as follows:</p> |

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| Assessment Year | Change |
|-----------------|---|
| | <p>2010 yc declined from 589 M to 532 M</p> <ul style="list-style-type: none">• 1+ population declined from 644,586 K to 597,434 K• 3+ population declined from 57,745 to 55,964 K• 3+ biomass declined from 70,679 mt to 68,521 mt• risk analysis for 2013 F_{ref} catch declined by 700 mt from 10,400 mt to 9,700 mt |

Table 24. Statistical properties of estimates of population abundance (numbers in 000's) at beginning of year 2013 and survey calibration constants (unitless, survey:population) for eastern Georges Bank haddock obtained from a bootstrap with 1000 replications.

| Age | Estimate | Standard Error | Relative Error | Bias | Relative Bias |
|---|----------|----------------|----------------|-------|---------------|
| <u>Population Abundance (000's)</u> | | | | | |
| 1 | 17333 | 9797 | 0.565 | 2069 | 0.119 |
| 2 | 64300 | 23994 | 0.373 | 3877 | 0.060 |
| 3 | 330738 | 96290 | 0.291 | 13528 | 0.041 |
| 4 | 2352 | 653 | 0.278 | 52 | 0.022 |
| 5 | 1328 | 370 | 0.279 | 34 | 0.025 |
| 6 | 1394 | 373 | 0.268 | 22 | 0.016 |
| 7 | 1034 | 273 | 0.264 | 27 | 0.026 |
| 8 | 2159 | 494 | 0.229 | 11 | 0.005 |
| <u>Survey Calibration Constants</u> | | | | | |
| <i>Canadian Department of Fisheries and Oceans Survey</i> | | | | | |
| 1 | 0.249 | 0.042 | 0.169 | 0.003 | 1.402 |
| 2 | 0.439 | 0.071 | 0.162 | 0.006 | 0.015 |
| 3 | 0.835 | 0.137 | 0.164 | 0.012 | 0.014 |
| 4 | 0.867 | 0.144 | 0.166 | 0.016 | 0.018 |
| 5 | 0.856 | 0.145 | 0.170 | 0.016 | 0.018 |
| 6 | 0.735 | 0.128 | 0.174 | 0.012 | 0.016 |
| 7 | 0.790 | 0.134 | 0.170 | 0.010 | 0.013 |
| 8 | 0.755 | 0.131 | 0.174 | 0.006 | 0.008 |
| <i>National Marine Fisheries Service (NMFS) Spring Survey – Yankee 36 – 1969-72/1982-2011</i> | | | | | |
| 1 | 0.137 | 0.021 | 0.150 | 0.001 | 0.007 |
| 2 | 0.327 | 0.046 | 0.139 | 0.003 | 0.008 |
| 3 | 0.411 | 0.064 | 0.155 | 0.005 | 0.012 |
| 4 | 0.403 | 0.061 | 0.151 | 0.004 | 0.011 |
| 5 | 0.443 | 0.066 | 0.149 | 0.005 | 0.011 |
| 6 | 0.387 | 0.056 | 0.144 | 0.004 | 0.010 |
| 7 | 0.379 | 0.055 | 0.145 | 0.005 | 0.012 |
| 8 | 0.392 | 0.064 | 0.162 | 0.006 | 0.016 |
| <i>NMFS Spring Survey – Yankee 41 – 1973-81</i> | | | | | |
| 1 | 0.228 | 0.071 | 0.313 | 0.008 | 0.035 |
| 2 | 0.534 | 0.158 | 0.296 | 0.020 | 0.038 |
| 3 | 0.652 | 0.202 | 0.310 | 0.025 | 0.038 |
| 4 | 0.806 | 0.263 | 0.327 | 0.036 | 0.045 |
| 5 | 0.895 | 0.286 | 0.320 | 0.058 | 0.065 |
| 6 | 0.811 | 0.284 | 0.351 | 0.041 | 0.051 |
| 7 | 1.488 | 0.538 | 0.362 | 0.088 | 0.059 |
| 8 | 0.724 | 0.244 | 0.337 | 0.051 | 0.071 |
| <i>NMFS Fall Survey</i> | | | | | |
| 0 | 0.145 | 0.020 | 0.136 | 0.001 | 0.005 |
| 1 | 0.304 | 0.043 | 0.141 | 0.003 | 0.011 |
| 2 | 0.244 | 0.033 | 0.133 | 0.001 | 0.005 |
| 3 | 0.234 | 0.032 | 0.136 | 0.003 | 0.014 |
| 4 | 0.194 | 0.027 | 0.138 | 0.001 | 0.003 |
| 5 | 0.161 | 0.022 | 0.134 | 0.000 | 0.001 |

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Table 25. Beginning of year population abundance (numbers in 000's) for eastern Georges Bank haddock during 1969-2013 from a virtual population analysis using the bootstrap bias adjusted population abundance at the beginning of 2013. Highlighted cells follow two recent large year classes, the 2000 and 2003.

| Year | Age Group | | | | | | | | | | | |
|------|-----------|--------|--------|--------|--------|-------|-------|-------|-------|--------|--------|--------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9+ | 1+ | 2+ | 3+ |
| 1969 | 804 | 193 | 3639 | 872 | 911 | 7650 | 2497 | 250 | 776 | 17592 | 16789 | 16596 |
| 1970 | 3593 | 658 | 141 | 1681 | 479 | 447 | 3659 | 1299 | 506 | 12463 | 8870 | 8212 |
| 1971 | 235 | 2881 | 463 | 109 | 1061 | 256 | 249 | 1961 | 971 | 8187 | 7952 | 5071 |
| 1972 | 5303 | 192 | 1285 | 155 | 62 | 642 | 69 | 61 | 1340 | 9109 | 3806 | 3614 |
| 1973 | 11637 | 4029 | 157 | 702 | 63 | 32 | 441 | 21 | 728 | 17811 | 6174 | 2144 |
| 1974 | 3082 | 8519 | 1728 | 123 | 251 | 18 | 17 | 327 | 454 | 14518 | 11436 | 2917 |
| 1975 | 3448 | 2490 | 4948 | 1166 | 100 | 176 | 12 | 14 | 557 | 12910 | 9462 | 6973 |
| 1976 | 54076 | 2807 | 1787 | 2701 | 761 | 78 | 112 | 8 | 437 | 62767 | 8691 | 5884 |
| 1977 | 6039 | 43911 | 2157 | 1307 | 1463 | 501 | 64 | 74 | 348 | 55864 | 49825 | 5914 |
| 1978 | 4058 | 4943 | 28726 | 1706 | 906 | 922 | 263 | 52 | 319 | 41895 | 37838 | 32895 |
| 1979 | 52347 | 3317 | 3784 | 14596 | 1249 | 587 | 480 | 144 | 287 | 76790 | 24443 | 21126 |
| 1980 | 6239 | 42666 | 2700 | 2911 | 8084 | 696 | 300 | 199 | 301 | 64095 | 57856 | 15190 |
| 1981 | 4617 | 5079 | 19101 | 1901 | 2111 | 4443 | 396 | 130 | 352 | 38129 | 33512 | 28434 |
| 1982 | 2097 | 3730 | 3534 | 9570 | 1197 | 1281 | 2522 | 217 | 358 | 24506 | 22409 | 18679 |
| 1983 | 2556 | 1715 | 2397 | 1944 | 5280 | 796 | 709 | 1409 | 356 | 17161 | 14605 | 12890 |
| 1984 | 16105 | 2083 | 1269 | 1367 | 1094 | 2839 | 465 | 487 | 1047 | 26756 | 10651 | 8568 |
| 1985 | 1640 | 13121 | 1615 | 806 | 805 | 653 | 1312 | 214 | 822 | 20988 | 19347 | 6227 |
| 1986 | 13919 | 1335 | 8810 | 975 | 497 | 480 | 420 | 732 | 695 | 27863 | 13944 | 12608 |
| 1987 | 2201 | 11316 | 1058 | 4892 | 641 | 278 | 282 | 237 | 974 | 21878 | 19677 | 8361 |
| 1988 | 16074 | 1802 | 7392 | 748 | 2627 | 435 | 176 | 156 | 829 | 30238 | 14164 | 12362 |
| 1989 | 1023 | 13113 | 1428 | 4078 | 501 | 1350 | 256 | 109 | 674 | 22532 | 21509 | 8396 |
| 1990 | 2389 | 835 | 9588 | 1091 | 2640 | 281 | 793 | 179 | 579 | 18376 | 15987 | 15152 |
| 1991 | 2077 | 1928 | 677 | 6637 | 774 | 1471 | 165 | 498 | 543 | 14770 | 12693 | 10765 |
| 1992 | 8236 | 1681 | 1160 | 472 | 3572 | 553 | 853 | 71 | 667 | 17263 | 9028 | 7347 |
| 1993 | 12387 | 6698 | 1152 | 659 | 271 | 1613 | 372 | 412 | 498 | 24061 | 11674 | 4976 |
| 1994 | 11735 | 10069 | 5228 | 623 | 279 | 140 | 724 | 267 | 535 | 29601 | 17866 | 7797 |
| 1995 | 5914 | 9575 | 7862 | 3498 | 343 | 163 | 26 | 422 | 534 | 28338 | 22423 | 12848 |
| 1996 | 5835 | 4835 | 7768 | 5955 | 2491 | 233 | 111 | 19 | 721 | 27969 | 22133 | 17298 |
| 1997 | 17508 | 4774 | 3930 | 5918 | 4098 | 1662 | 137 | 74 | 538 | 38640 | 21132 | 16358 |
| 1998 | 8478 | 14308 | 3824 | 3151 | 4363 | 2919 | 1185 | 101 | 464 | 38793 | 30314 | 16006 |
| 1999 | 28828 | 6925 | 11539 | 2868 | 2346 | 3085 | 1986 | 867 | 420 | 58864 | 30036 | 23111 |
| 2000 | 9681 | 23578 | 5630 | 8769 | 2060 | 1696 | 2213 | 1396 | 942 | 55965 | 46285 | 22707 |
| 2001 | 84261 | 7921 | 19015 | 4204 | 6037 | 1449 | 1197 | 1617 | 1686 | 127386 | 43125 | 35205 |
| 2002 | 4147 | 68967 | 6426 | 14005 | 2962 | 4179 | 950 | 796 | 2311 | 104743 | 100596 | 31629 |
| 2003 | 2537 | 3394 | 56165 | 5064 | 9763 | 2083 | 2818 | 675 | 2184 | 84682 | 82145 | 78751 |
| 2004 | 306729 | 2071 | 2770 | 44331 | 3887 | 6654 | 1322 | 1876 | 2030 | 371669 | 64940 | 62869 |
| 2005 | 7091 | 250829 | 1673 | 2200 | 33007 | 2637 | 4101 | 618 | 2582 | 304738 | 297647 | 46818 |
| 2006 | 16177 | 5793 | 205143 | 1343 | 1599 | 20826 | 1686 | 2618 | 2363 | 257548 | 241371 | 235578 |
| 2007 | 5408 | 13226 | 4729 | 165682 | 1060 | 1049 | 12965 | 1170 | 3443 | 208731 | 203323 | 190097 |
| 2008 | 6432 | 4426 | 10794 | 3708 | 129032 | 735 | 708 | 9327 | 3486 | 168649 | 162217 | 157791 |
| 2009 | 3525 | 5263 | 3596 | 8592 | 2794 | 96880 | 509 | 503 | 9766 | 131429 | 127904 | 122641 |
| 2010 | 4654 | 2871 | 4196 | 2772 | 6371 | 2053 | 69287 | 352 | 8019 | 100575 | 95920 | 93049 |
| 2011 | 474345 | 3782 | 2300 | 3083 | 1986 | 4456 | 1338 | 47855 | 6618 | 545764 | 71419 | 67637 |
| 2012 | 73883 | 388142 | 3000 | 1720 | 2061 | 1421 | 3040 | 998 | 38915 | 513180 | 439297 | 51155 |
| 2013 | 15264 | 60423 | 317209 | 2300 | 1295 | 1372 | 1007 | 2147 | 30700 | 431716 | 416452 | 356029 |

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Table 26. Fishing mortality rates for eastern Georges Bank haddock during 1969-2012 from a virtual population analysis using the bootstrap bias adjusted population abundance at the beginning of 2013. The aggregated rates are weighted by population numbers. The rates for ages 4 to 8 and 5 to 8 are also shown as exploitation rate (%). Highlighted cells follow two recent large year classes, the 2000 and 2003.

| Year | Age Group | | | | | | | | | | | 4-8 | 4-8(%) | 5-8 | 5-8(%) |
|------|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|--------|------|--------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9+ | | | | | | |
| 1969 | 0.000 | 0.111 | 0.572 | 0.399 | 0.512 | 0.538 | 0.453 | 0.508 | 0.508 | 0.508 | 0.508 | 36.4 | 0.516 | 36.9 | |
| 1970 | 0.021 | 0.152 | 0.057 | 0.261 | 0.425 | 0.383 | 0.424 | 0.377 | 0.538 | 0.377 | 0.377 | 28.7 | 0.410 | 30.7 | |
| 1971 | 0.000 | 0.608 | 0.892 | 0.369 | 0.302 | 1.114 | 1.202 | 0.564 | 0.623 | 0.564 | 0.564 | 39.5 | 0.570 | 39.8 | |
| 1972 | 0.075 | 0.005 | 0.404 | 0.705 | 0.468 | 0.175 | 0.973 | 0.342 | 0.460 | 0.342 | 0.342 | 26.4 | 0.275 | 21.9 | |
| 1973 | 0.112 | 0.647 | 0.045 | 0.830 | 1.056 | 0.410 | 0.101 | 0.571 | 0.294 | 0.571 | 0.571 | 39.8 | 0.245 | 19.7 | |
| 1974 | 0.013 | 0.343 | 0.193 | 0.000 | 0.154 | 0.181 | 0.015 | 0.103 | 0.164 | 0.103 | 0.103 | 8.9 | 0.124 | 10.6 | |
| 1975 | 0.006 | 0.132 | 0.405 | 0.227 | 0.051 | 0.255 | 0.218 | 0.218 | 0.063 | 0.218 | 0.218 | 17.8 | 0.184 | 15.3 | |
| 1976 | 0.008 | 0.064 | 0.113 | 0.413 | 0.217 | 0.000 | 0.208 | 0.000 | 0.046 | 0.357 | 0.357 | 27.3 | 0.197 | 16.2 | |
| 1977 | 0.000 | 0.224 | 0.035 | 0.166 | 0.262 | 0.444 | 0.000 | 0.247 | 0.048 | 0.247 | 0.247 | 19.9 | 0.297 | 23.4 | |
| 1978 | 0.002 | 0.067 | 0.477 | 0.112 | 0.235 | 0.452 | 0.405 | 0.244 | 0.033 | 0.244 | 0.244 | 19.7 | 0.349 | 26.9 | |
| 1979 | 0.004 | 0.006 | 0.062 | 0.391 | 0.385 | 0.470 | 0.679 | 0.401 | 0.056 | 0.401 | 0.401 | 30.2 | 0.464 | 33.9 | |
| 1980 | 0.006 | 0.604 | 0.151 | 0.121 | 0.399 | 0.363 | 0.639 | 0.335 | 0.046 | 0.335 | 0.335 | 26.0 | 0.402 | 30.2 | |
| 1981 | 0.013 | 0.163 | 0.491 | 0.263 | 0.299 | 0.366 | 0.401 | 0.330 | 0.024 | 0.330 | 0.330 | 25.6 | 0.348 | 26.8 | |
| 1982 | 0.001 | 0.242 | 0.398 | 0.395 | 0.208 | 0.392 | 0.382 | 0.377 | 0.224 | 0.377 | 0.377 | 28.6 | 0.344 | 26.6 | |
| 1983 | 0.005 | 0.101 | 0.361 | 0.375 | 0.420 | 0.338 | 0.176 | 0.383 | 0.114 | 0.383 | 0.383 | 29.0 | 0.385 | 29.1 | |
| 1984 | 0.005 | 0.054 | 0.254 | 0.330 | 0.317 | 0.572 | 0.577 | 0.466 | 0.405 | 0.466 | 0.466 | 34.0 | 0.505 | 36.2 | |
| 1985 | 0.006 | 0.198 | 0.304 | 0.284 | 0.316 | 0.242 | 0.384 | 0.320 | 0.170 | 0.320 | 0.320 | 25.0 | 0.330 | 25.6 | |
| 1986 | 0.007 | 0.033 | 0.388 | 0.220 | 0.379 | 0.333 | 0.371 | 0.303 | 0.068 | 0.303 | 0.303 | 23.8 | 0.341 | 26.3 | |
| 1987 | 0.000 | 0.226 | 0.147 | 0.422 | 0.188 | 0.259 | 0.391 | 0.388 | 0.134 | 0.388 | 0.388 | 29.3 | 0.275 | 21.9 | |
| 1988 | 0.004 | 0.033 | 0.395 | 0.201 | 0.466 | 0.330 | 0.277 | 0.393 | 0.143 | 0.393 | 0.393 | 29.7 | 0.436 | 32.2 | |
| 1989 | 0.002 | 0.113 | 0.069 | 0.235 | 0.377 | 0.331 | 0.158 | 0.264 | 0.079 | 0.264 | 0.264 | 21.1 | 0.318 | 24.8 | |
| 1990 | 0.014 | 0.010 | 0.168 | 0.144 | 0.385 | 0.334 | 0.265 | 0.308 | 0.085 | 0.308 | 0.308 | 24.1 | 0.354 | 27.2 | |
| 1991 | 0.012 | 0.308 | 0.161 | 0.420 | 0.136 | 0.345 | 0.644 | 0.387 | 0.132 | 0.387 | 0.387 | 29.3 | 0.314 | 24.5 | |
| 1992 | 0.007 | 0.178 | 0.365 | 0.355 | 0.595 | 0.196 | 0.528 | 0.523 | 0.164 | 0.523 | 0.523 | 37.3 | 0.539 | 38.1 | |
| 1993 | 0.007 | 0.048 | 0.415 | 0.658 | 0.460 | 0.601 | 0.130 | 0.541 | 0.184 | 0.541 | 0.541 | 38.2 | 0.511 | 36.6 | |
| 1994 | 0.003 | 0.047 | 0.202 | 0.395 | 0.339 | 1.493 | 0.340 | 0.451 | 0.104 | 0.451 | 0.451 | 33.1 | 0.475 | 34.5 | |
| 1995 | 0.001 | 0.009 | 0.078 | 0.140 | 0.187 | 0.187 | 0.117 | 0.145 | 0.034 | 0.145 | 0.145 | 12.3 | 0.167 | 13.9 | |
| 1996 | 0.001 | 0.007 | 0.072 | 0.174 | 0.204 | 0.333 | 0.196 | 0.187 | 0.117 | 0.187 | 0.187 | 15.5 | 0.214 | 17.6 | |
| 1997 | 0.002 | 0.022 | 0.021 | 0.105 | 0.139 | 0.138 | 0.108 | 0.122 | 0.072 | 0.122 | 0.122 | 10.4 | 0.138 | 11.7 | |
| 1998 | 0.002 | 0.015 | 0.088 | 0.095 | 0.147 | 0.185 | 0.112 | 0.139 | 0.086 | 0.139 | 0.139 | 11.8 | 0.155 | 13.0 | |
| 1999 | 0.001 | 0.007 | 0.075 | 0.131 | 0.124 | 0.132 | 0.153 | 0.134 | 0.069 | 0.134 | 0.134 | 11.4 | 0.135 | 11.5 | |
| 2000 | 0.001 | 0.015 | 0.092 | 0.173 | 0.152 | 0.148 | 0.114 | 0.158 | 0.082 | 0.158 | 0.158 | 13.3 | 0.141 | 11.9 | |
| 2001 | 0.000 | 0.009 | 0.106 | 0.150 | 0.168 | 0.222 | 0.208 | 0.172 | 0.143 | 0.172 | 0.172 | 14.3 | 0.181 | 15.0 | |
| 2002 | 0.000 | 0.005 | 0.038 | 0.161 | 0.152 | 0.194 | 0.142 | 0.165 | 0.148 | 0.165 | 0.165 | 13.8 | 0.172 | 14.4 | |
| 2003 | 0.003 | 0.003 | 0.037 | 0.065 | 0.183 | 0.255 | 0.207 | 0.198 | 0.126 | 0.165 | 0.165 | 13.8 | 0.198 | 16.3 | |
| 2004 | 0.001 | 0.014 | 0.030 | 0.095 | 0.187 | 0.283 | 0.559 | 0.283 | 0.154 | 0.139 | 0.139 | 11.8 | 0.283 | 22.4 | |
| 2005 | 0.002 | 0.001 | 0.019 | 0.119 | 0.260 | 0.247 | 0.248 | 0.258 | 0.069 | 0.251 | 0.251 | 20.2 | 0.258 | 20.7 | |
| 2006 | 0.001 | 0.003 | 0.014 | 0.037 | 0.220 | 0.273 | 0.165 | 0.262 | 0.075 | 0.251 | 0.251 | 20.2 | 0.262 | 21.0 | |
| 2007 | 0.000 | 0.003 | 0.043 | 0.050 | 0.165 | 0.192 | 0.128 | 0.135 | 0.061 | 0.057 | 0.057 | 5.1 | 0.136 | 11.5 | |
| 2008 | 0.001 | 0.007 | 0.028 | 0.083 | 0.086 | 0.165 | 0.141 | 0.087 | 0.030 | 0.087 | 0.087 | 7.5 | 0.087 | 7.5 | |
| 2009 | 0.005 | 0.026 | 0.059 | 0.097 | 0.107 | 0.134 | 0.169 | 0.133 | 0.043 | 0.131 | 0.131 | 11.1 | 0.133 | 11.3 | |
| 2010 | 0.007 | 0.021 | 0.105 | 0.129 | 0.154 | 0.226 | 0.168 | 0.168 | 0.029 | 0.167 | 0.167 | 14.0 | 0.168 | 14.1 | |
| 2011 | 0.001 | 0.030 | 0.085 | 0.195 | 0.129 | 0.176 | 0.091 | 0.152 | 0.013 | 0.154 | 0.154 | 13.0 | 0.152 | 12.8 | |
| 2012 | 0.001 | 0.002 | 0.061 | 0.078 | 0.195 | 0.136 | 0.140 | 0.162 | 0.059 | 0.143 | 0.143 | 12.1 | 0.157 | 13.2 | |

Eastern Georges Bank Haddock for 2013

Table 27. Beginning of year biomass (mt) for eastern Georges Bank haddock during 1969-2013. Weights at age from the DFO survey were applied to the virtual population analysis bootstrap bias adjusted population numbers at age at the beginning of 2013 to determine biomass. Highlighted cells follow two recent large year classes, the 2000 and 2003.

| Year | Age Group | | | | | | | | | | | |
|------|-----------|-------|--------|--------|--------|--------|-------|-------|-------|--------|--------|--------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9+ | 1+ | 2+ | 3+ |
| 1969 | 92 | 99 | 3403 | 1311 | 1816 | 17938 | 6702 | 733 | 2674 | 34768 | 34676 | 34577 |
| 1970 | 413 | 339 | 132 | 2528 | 954 | 1048 | 9823 | 3805 | 1743 | 20784 | 20371 | 20033 |
| 1971 | 27 | 1483 | 433 | 164 | 2113 | 600 | 670 | 5745 | 3346 | 14580 | 14553 | 13071 |
| 1972 | 610 | 99 | 1201 | 234 | 123 | 1506 | 185 | 180 | 4616 | 8752 | 8143 | 8044 |
| 1973 | 1338 | 2073 | 146 | 1056 | 125 | 74 | 1185 | 62 | 2509 | 8569 | 7231 | 5158 |
| 1974 | 354 | 4383 | 1615 | 184 | 499 | 42 | 46 | 956 | 1565 | 9646 | 9292 | 4909 |
| 1975 | 396 | 1281 | 4626 | 1754 | 200 | 412 | 33 | 41 | 1918 | 10661 | 10264 | 8983 |
| 1976 | 6216 | 1444 | 1671 | 4062 | 1516 | 183 | 299 | 24 | 1507 | 16922 | 10706 | 9261 |
| 1977 | 694 | 22593 | 2017 | 1965 | 2915 | 1175 | 171 | 217 | 1200 | 32948 | 32254 | 9661 |
| 1978 | 466 | 2543 | 26857 | 2565 | 1805 | 2162 | 706 | 153 | 1100 | 38359 | 37893 | 35350 |
| 1979 | 6017 | 1707 | 3538 | 21950 | 2489 | 1375 | 1289 | 421 | 987 | 39774 | 33756 | 32050 |
| 1980 | 717 | 21953 | 2524 | 4377 | 16108 | 1631 | 805 | 584 | 1036 | 49735 | 49018 | 27065 |
| 1981 | 531 | 2613 | 17858 | 2859 | 4206 | 10418 | 1063 | 380 | 1212 | 41140 | 40609 | 37996 |
| 1982 | 241 | 1919 | 3304 | 14392 | 2385 | 3005 | 6769 | 636 | 1232 | 33884 | 33643 | 31724 |
| 1983 | 294 | 882 | 2241 | 2924 | 10520 | 1866 | 1902 | 4128 | 1226 | 25983 | 25689 | 24806 |
| 1984 | 1851 | 1072 | 1187 | 2056 | 2180 | 6658 | 1248 | 1425 | 3607 | 21283 | 19432 | 18360 |
| 1985 | 189 | 6751 | 1510 | 1212 | 1603 | 1531 | 3523 | 626 | 2831 | 19776 | 19587 | 12836 |
| 1986 | 1874 | 603 | 8583 | 1409 | 1512 | 1368 | 1510 | 2471 | 2721 | 22051 | 20177 | 19575 |
| 1987 | 331 | 5653 | 757 | 8181 | 1289 | 710 | 887 | 747 | 3533 | 22088 | 21757 | 16105 |
| 1988 | 1563 | 837 | 6878 | 1342 | 4772 | 834 | 479 | 509 | 3207 | 20422 | 18859 | 18022 |
| 1989 | 63 | 6217 | 928 | 5679 | 999 | 3410 | 552 | 312 | 2119 | 20279 | 20216 | 13998 |
| 1990 | 356 | 438 | 8861 | 1289 | 4917 | 583 | 1989 | 504 | 2009 | 20946 | 20590 | 20152 |
| 1991 | 248 | 1320 | 542 | 10032 | 1311 | 3580 | 347 | 1556 | 1864 | 20800 | 20551 | 19231 |
| 1992 | 1007 | 1012 | 1296 | 501 | 7424 | 1197 | 2310 | 162 | 2293 | 17202 | 16195 | 15182 |
| 1993 | 1511 | 3223 | 1413 | 1188 | 345 | 3762 | 872 | 1127 | 1633 | 15074 | 13563 | 10340 |
| 1994 | 1252 | 4724 | 5473 | 1010 | 538 | 302 | 2284 | 719 | 1651 | 17952 | 16700 | 11976 |
| 1995 | 510 | 4724 | 7572 | 5443 | 763 | 398 | 62 | 1263 | 1701 | 22436 | 21927 | 17202 |
| 1996 | 808 | 2393 | 7139 | 7862 | 4811 | 596 | 321 | 49 | 2589 | 26568 | 25759 | 23366 |
| 1997 | 2314 | 2418 | 3072 | 7134 | 6819 | 3617 | 336 | 192 | 1700 | 27601 | 25287 | 22869 |
| 1998 | 910 | 7660 | 3959 | 3660 | 6848 | 5704 | 3092 | 358 | 1607 | 33797 | 32887 | 25227 |
| 1999 | 3738 | 3280 | 10510 | 3698 | 2952 | 5765 | 4232 | 2361 | 1257 | 37793 | 34056 | 30776 |
| 2000 | 1120 | 12811 | 5341 | 12964 | 3854 | 3035 | 5086 | 3500 | 2734 | 50446 | 49326 | 36515 |
| 2001 | 7866 | 4147 | 19116 | 5764 | 10853 | 3137 | 2694 | 4192 | 4936 | 62706 | 54839 | 50692 |
| 2002 | 397 | 22868 | 4999 | 15934 | 4425 | 8212 | 2068 | 1757 | 6257 | 66915 | 66519 | 43651 |
| 2003 | 204 | 1254 | 47519 | 5383 | 14420 | 3427 | 6222 | 1504 | 5431 | 85364 | 85160 | 83906 |
| 2004 | 19599 | 642 | 2165 | 51034 | 5076 | 10368 | 2145 | 3669 | 4497 | 99196 | 79597 | 78955 |
| 2005 | 197 | 54619 | 824 | 1532 | 40469 | 3484 | 6279 | 990 | 6311 | 114705 | 114507 | 59889 |
| 2006 | 949 | 992 | 79773 | 883 | 1391 | 28449 | 2681 | 4560 | 5566 | 125242 | 124294 | 123302 |
| 2007 | 414 | 3247 | 1915 | 117476 | 1051 | 1831 | 20217 | 1954 | 6410 | 154514 | 154100 | 150853 |
| 2008 | 688 | 1456 | 6188 | 2947 | 119650 | 922 | 1224 | 13763 | 6613 | 153451 | 152763 | 151307 |
| 2009 | 402 | 2036 | 2787 | 8582 | 2758 | 121886 | 755 | 1348 | 21758 | 162313 | 161911 | 159875 |
| 2010 | 337 | 1105 | 3143 | 2660 | 7137 | 2479 | 92337 | 623 | 16570 | 126392 | 126055 | 124950 |
| 2011 | 18234 | 1217 | 1408 | 2773 | 1893 | 4536 | 1498 | 65600 | 11390 | 108551 | 90317 | 89100 |
| 2012 | 5196 | 72131 | 1372 | 870 | 2055 | 1569 | 3295 | 1188 | 52363 | 140040 | 134844 | 62712 |
| 2013 | 1069 | 15779 | 130792 | 1815 | 1413 | 1333 | 1108 | 2452 | 44734 | 200494 | 199425 | 183647 |

Eastern Georges Bank Haddock for 2013

Table 28. Partial recruitment of haddock normalized to ages 4 to 8 for 1969 to 2002 and to ages 5 to 8 for 2003 to 2012 from the eastern Georges Bank Canadian commercial fishery. Average F 's used to normalize the partial recruitment were weighted by population numbers. ¹Weighted by population.

| Year | Age Group | | | | | | | | |
|--------------------------|-----------|-------|------|------|------|------|------|------|------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9+ |
| 1969 | 0.00 | 0.22 | 1.13 | 0.79 | 1.01 | 1.06 | 0.89 | 1.00 | 1.00 |
| 1970 | 0.05 | 0.40 | 0.15 | 0.69 | 1.13 | 1.02 | 1.12 | 1.00 | 1.43 |
| 1971 | | 1.08 | 1.58 | 0.65 | 0.53 | 1.97 | 2.13 | 1.00 | 1.10 |
| 1972 | 0.22 | 0.01 | 1.18 | 2.06 | 1.37 | 0.51 | 2.84 | 1.00 | 1.34 |
| 1973 | 0.20 | 1.13 | 0.08 | 1.45 | 1.85 | 0.72 | 0.18 | 1.00 | 0.51 |
| 1974 | 0.11 | 2.78 | 1.56 | | 1.24 | 1.46 | 0.12 | 0.83 | 1.33 |
| 1975 | 0.03 | 0.60 | 1.85 | 1.04 | 0.24 | 1.17 | 1.00 | 1.00 | 0.29 |
| 1976 | 0.02 | 0.17 | 0.31 | 1.13 | 0.59 | | 0.57 | | 0.13 |
| 1977 | 0.00 | 0.91 | 0.14 | 0.67 | 1.06 | 1.80 | 0.00 | 1.00 | 0.19 |
| 1978 | 0.01 | 0.28 | 1.95 | 0.46 | 0.96 | 1.85 | 1.66 | 1.00 | 0.14 |
| 1979 | 0.01 | 0.01 | 0.16 | 0.97 | 0.96 | 1.17 | 1.69 | 1.00 | 0.14 |
| 1980 | 0.02 | 1.80 | 0.45 | 0.36 | 1.19 | 1.08 | 1.91 | 1.00 | 0.14 |
| 1981 | 0.04 | 0.49 | 1.49 | 0.80 | 0.91 | 1.11 | 1.22 | 1.00 | 0.07 |
| 1982 | 0.00 | 0.64 | 1.05 | 1.05 | 0.55 | 1.04 | 1.01 | 1.00 | 0.60 |
| 1983 | 0.01 | 0.26 | 0.94 | 0.98 | 1.10 | 0.88 | 0.46 | 1.00 | 0.30 |
| 1984 | 0.01 | 0.12 | 0.54 | 0.71 | 0.68 | 1.23 | 1.24 | 1.00 | 0.87 |
| 1985 | 0.02 | 0.62 | 0.95 | 0.89 | 0.99 | 0.76 | 1.20 | 1.00 | 0.53 |
| 1986 | 0.02 | 0.11 | 1.28 | 0.73 | 1.25 | 1.10 | 1.23 | 1.00 | 0.23 |
| 1987 | 0.00 | 0.58 | 0.38 | 1.09 | 0.48 | 0.67 | 1.01 | 1.00 | 0.35 |
| 1988 | 0.01 | 0.08 | 1.00 | 0.51 | 1.19 | 0.84 | 0.70 | 1.00 | 0.36 |
| 1989 | 0.01 | 0.43 | 0.26 | 0.89 | 1.43 | 1.25 | 0.60 | 1.00 | 0.30 |
| 1990 | 0.05 | 0.03 | 0.55 | 0.47 | 1.25 | 1.09 | 0.86 | 1.00 | 0.28 |
| 1991 | 0.03 | 0.80 | 0.42 | 1.08 | 0.35 | 0.89 | 1.66 | 1.00 | 0.34 |
| 1992 | 0.01 | 0.34 | 0.70 | 0.68 | 1.14 | 0.38 | 1.01 | 1.00 | 0.31 |
| 1993 | 0.01 | 0.09 | 0.77 | 1.22 | 0.85 | 1.11 | 0.24 | 1.00 | 0.34 |
| 1994 | 0.01 | 0.11 | 0.45 | 0.88 | 0.75 | 3.31 | 0.75 | 1.00 | 0.23 |
| 1995 | 0.01 | 0.06 | 0.53 | 0.96 | 1.29 | 1.29 | 0.80 | 1.00 | 0.24 |
| 1996 | 0.00 | 0.04 | 0.38 | 0.93 | 1.09 | 1.78 | 1.05 | 1.00 | 0.63 |
| 1997 | 0.01 | 0.18 | 0.17 | 0.86 | 1.15 | 1.14 | 0.89 | 1.00 | 0.59 |
| 1998 | 0.02 | 0.11 | 0.63 | 0.69 | 1.06 | 1.33 | 0.81 | 1.00 | 0.62 |
| 1999 | 0.01 | 0.05 | 0.56 | 0.98 | 0.93 | 0.99 | 1.14 | 1.00 | 0.52 |
| 2000 | 0.00 | 0.10 | 0.58 | 1.09 | 0.96 | 0.94 | 0.72 | 1.00 | 0.52 |
| 2001 | 0.00 | 0.05 | 0.62 | 0.87 | 0.98 | 1.29 | 1.21 | 1.00 | 0.83 |
| 2002 | 0.00 | 0.03 | 0.23 | 0.97 | 0.92 | 1.18 | 0.86 | 1.00 | 0.90 |
| 2003 | 0.015 | 0.02 | 0.18 | 0.33 | 0.93 | 1.29 | 1.04 | 1.00 | 0.64 |
| 2004 | 0.004 | 0.05 | 0.11 | 0.34 | 0.66 | 1.00 | 1.98 | 1.00 | 0.54 |
| 2005 | 0.008 | 0.004 | 0.07 | 0.46 | 1.01 | 0.96 | 0.96 | 1.00 | 0.27 |
| 2006 | 0.005 | 0.01 | 0.05 | 0.14 | 0.84 | 1.04 | 0.63 | 1.00 | 0.28 |
| 2007 | 0.003 | 0.02 | 0.32 | 0.37 | 1.22 | 1.42 | 0.95 | 1.00 | 0.45 |
| 2008 | 0.008 | 0.08 | 0.32 | 0.95 | 0.99 | 1.91 | 1.63 | 1.00 | 0.35 |
| 2009 | 0.037 | 0.19 | 0.44 | 0.73 | 0.80 | 1.00 | 1.27 | 1.00 | 0.32 |
| 2010 | 0.042 | 0.12 | 0.63 | 0.76 | 0.91 | 1.34 | 1.00 | 1.00 | 0.17 |
| 2011 | 0.003 | 0.20 | 0.56 | 1.29 | 0.85 | 1.16 | 0.60 | 1.00 | 0.08 |
| 2012 | 0.006 | 0.01 | 0.39 | 0.50 | 1.24 | 0.87 | 0.89 | 1.03 | 0.37 |
| Avg 1998-02 ¹ | 0.004 | 0.06 | 0.53 | 0.97 | 0.94 | 1.11 | 0.94 | 1.01 | 0.75 |
| Avg 2008-12 ¹ | 0.004 | 0.02 | 0.42 | 0.84 | 0.99 | 1.02 | 0.99 | 1.00 | 0.31 |
| Avg 2010-12 ¹ | 0.004 | 0.01 | 0.54 | 0.92 | 0.97 | 1.16 | 0.99 | 1.00 | 0.31 |
| Avg 2003-12 ¹ | 0.004 | 0.01 | 0.11 | 0.40 | 0.98 | 1.03 | 1.00 | 1.00 | 0.33 |

Eastern Georges Bank Haddock for 2013

Table 29. Input for projections and risk analyses of eastern Georges Bank haddock for the 2014 fishery. A catch of 10,400 mt in 2013 and natural mortality = 0.2 were assumed for the forecasts. The 9+ age group is dominated by the 2003 year class and the 2010 year class is shaded with blue.

| Year | Age Group | | | | | | | | |
|--|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------------|-------------------|-------------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9+ |
| <i>Population Numbers (000s)</i> | | | | | | | | | |
| 2013 | 15264 | 60423 | 317209 | 2300 | 1295 | 1372 | 1007 | 2147 | 30700 |
| <i>Partial Recruitment to the Fishery¹</i> | | | | | | | | | |
| 2013 | 0 | 0.01 | 0.05 ² | 0.4 | 1 | 1 | 1 | 1 | 0.3 |
| 2014 | 0 | 0.01 | 0.11 | 0.37 ² | 1 | 1 | 1 | 1 | 0.3 |
| <i>Weight at beginning of year for population (kg)³</i> | | | | | | | | | |
| 2013 | 0.07 ⁴ | 0.26 ⁴ | 0.41 ⁴ | 0.79 ⁴ | 1.09 ⁴ | 0.97 ⁴ | 1.1 ⁴ | 1.14 ⁴ | 1.46 ⁴ |
| 2014 | 0.06 | 0.26 | 0.49 | 0.71 ⁵ | 1.01 | 1.03 | 1.1 | 1.23 | 1.46 ⁴ |
| 2015 | 0.06 | 0.26 | 0.49 | 0.73 | 0.93 ⁵ | 1.03 | 1.1 | 1.23 | 1.46 ⁴ |
| <i>Weight at age for catch (kg)⁶</i> | | | | | | | | | |
| 2013 | 0.35 | 0.8 | 0.98 ⁷ | 1.22 | 1.32 | 1.43 | 1.54 | 1.64 | 1.7 ⁸ |
| 2014 | 0.35 | 0.8 | 1.04 | 1.19 ⁷ | 1.32 | 1.43 | 1.54 | 1.64 | 1.7 ⁸ |
| <i>Maturity</i> | | | | | | | | | |
| 2013 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2014 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

¹Based on 2003 to 2012 weighted average except where indicated and ages 5 to 8 assumed fully recruited.

²Based on observed values from 2003 year class.

³2011-2013 average weights (weighted by population) from the DFO survey unless indicated otherwise.

⁴2013 Canadian Department of Fisheries and Oceans (DFO) survey average weights at age. Age 9+ weight similar to 2003 year class weight at age 10.

⁵2003 year class weights used for 2010 year class.

⁶2010-2012 Canadian/USA landings average weights at age except where indicated.

⁷2003 year class Canadian/USA landings weights used for 2010 year class.

⁸2003 year class Canadian/USA 2012 landings weight at age 9 (similar to 9+ weighted average). Assumes no growth.

Table 30. Bias adjusted deterministic projection results for eastern Georges Bank haddock for the 2014 fishery using 6.7 million age 1 recruits (2003 to 2012 median from 2012 assessment results) for the 2013 and 2014 year classes, the input values detailed in Table 29 and assuming that the 2013 quota of 10,400 mt is caught. Natural mortality was assumed to be 0.2. Shaded values indicate the 2010 year class (blue) and the 9+ age group (yellow) which is dominated by the 2003 year class.

| Year | Age Group | | | | | | | | | | | |
|---------------------------------------|-----------|-------|--------|--------|--------|------|------|------|-------|--------|--------|--------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9+ | 1+ | 2+ | 3+ |
| <i>Population Numbers (000s)</i> | | | | | | | | | | | | |
| 2013 | 15264 | 60423 | 317209 | 2300 | 1295 | 1372 | 1007 | 2147 | 30700 | 431717 | 416453 | 356030 |
| 2014 | 6700 | 12482 | 49327 | 255974 | 1677 | 793 | 841 | 617 | 24359 | 352770 | 346070 | 333588 |
| 2015 | 6700 | 5480 | 10193 | 39247 | 190352 | 1059 | 501 | 531 | 18836 | 272899 | 266199 | 260719 |
| <i>Population Biomass (mt)</i> | | | | | | | | | | | | |
| 2013 | 1068 | 15770 | 130690 | 1815 | 1414 | 1333 | 1107 | 2452 | 44730 | 200380 | 199312 | 183541 |
| 2014 | 402 | 3195 | 24368 | 181486 | 1700 | 818 | 925 | 761 | 35490 | 249146 | 248744 | 245549 |
| 2015 | 402 | 1403 | 5035 | 28729 | 176457 | 1091 | 551 | 655 | 27444 | 241768 | 241366 | 239963 |
| <i>Fishing mortality</i> | | | | | | | | | | | | |
| 2013 | 0.001 | 0.003 | 0.014 | 0.116 | 0.29 | 0.29 | 0.29 | 0.29 | 0.087 | | | |
| 2014 | 0.001 | 0.003 | 0.029 | 0.096 | 0.26 | 0.26 | 0.26 | 0.26 | 0.078 | | | |
| <i>Projected Catch Numbers (000s)</i> | | | | | | | | | | | | |
| 2013 | 16 | 158 | 4135 | 229 | 297 | 314 | 231 | 492 | 2319 | 8191 | 8175 | 8017 |
| 2014 | 6 | 29 | 1261 | 21313 | 349 | 165 | 175 | 129 | 1659 | 25086 | 25080 | 25051 |
| <i>Catch Biomass (mt)</i> | | | | | | | | | | | | |
| 2013 | 6 | 127 | 4040 | 280 | 392 | 450 | 356 | 806 | 3943 | 10400 | 10394 | 10267 |
| 2014 | 2 | 24 | 1309 | 25298 | 462 | 237 | 270 | 211 | 2820 | 30633 | 30631 | 30607 |

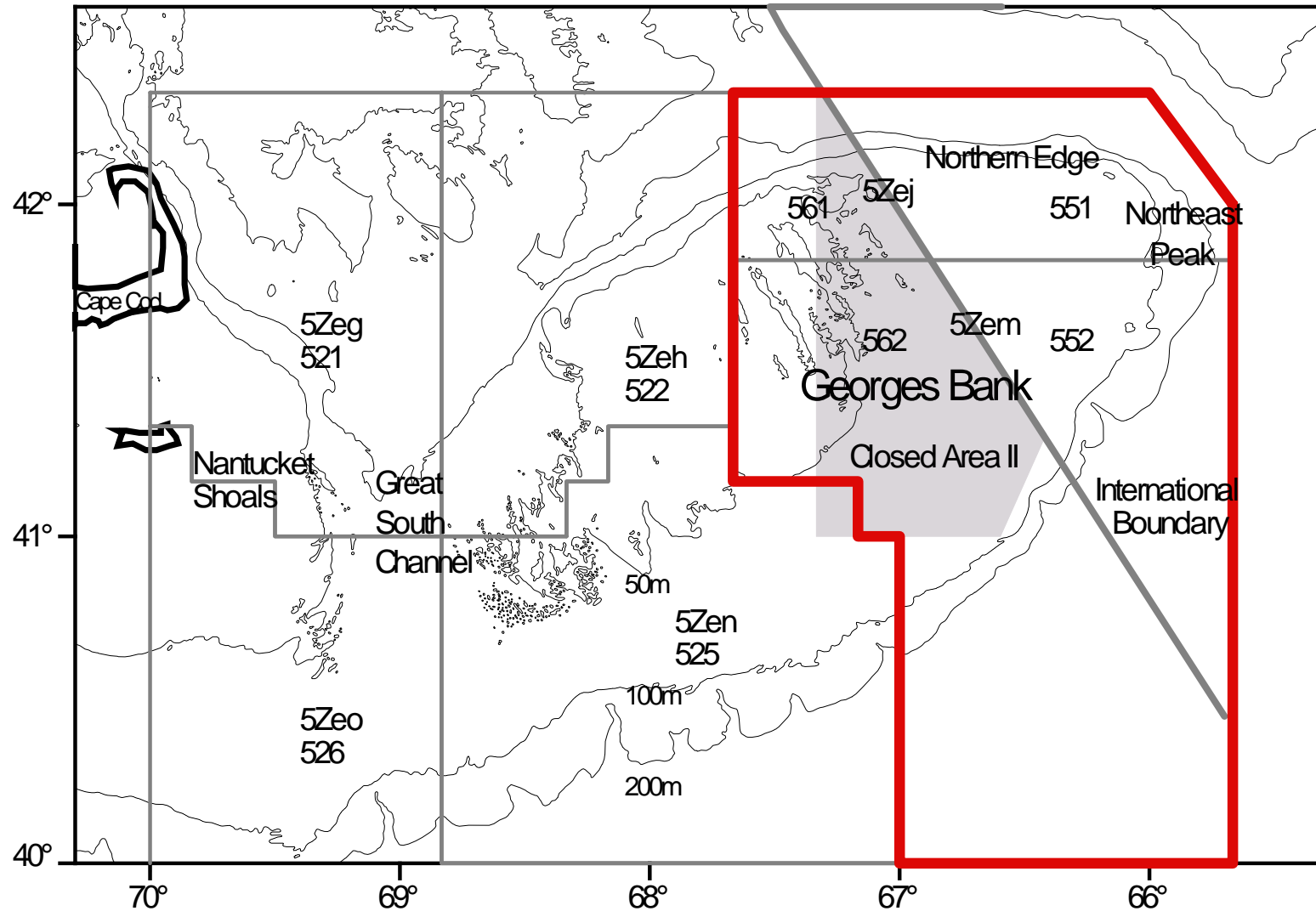


Figure 1. Fisheries statistical unit areas in North Atlantic Fisheries Organization Subdivision 5Ze. Alpha-numeric codes, e.g. 5Zej, are the Canadian Department of Fisheries and Oceans designations and numeric codes, e.g. 561, are National Marine Fisheries Service designations. The eastern Georges Bank management unit is outlined by a heavy red line.

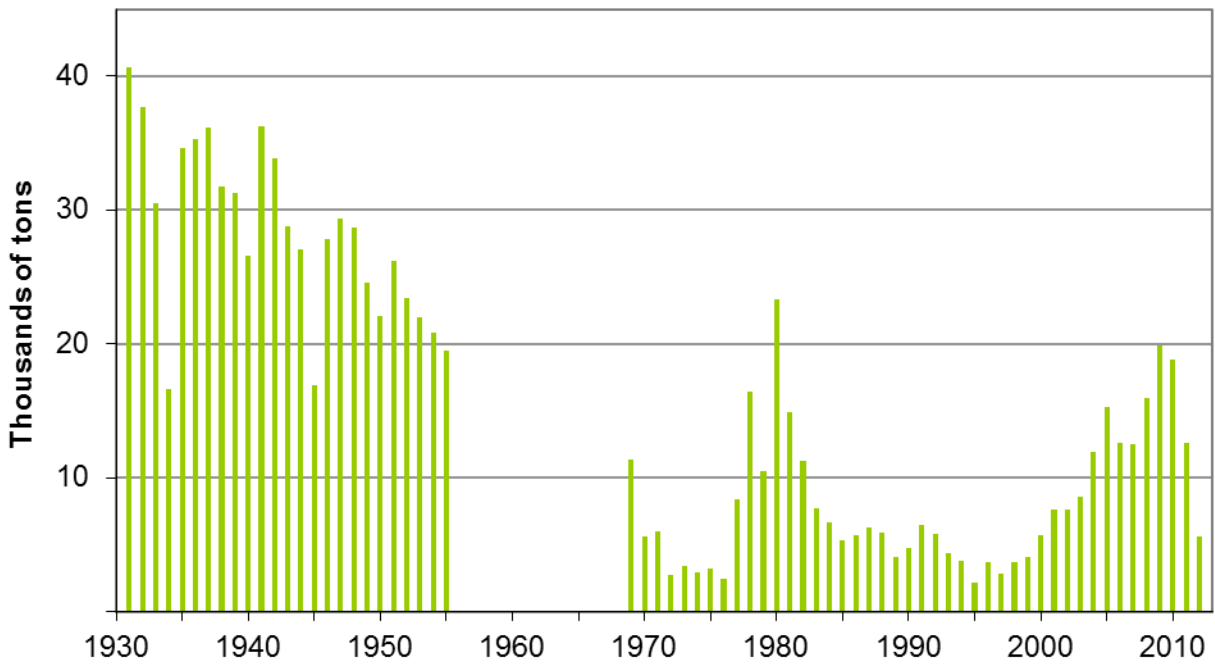


Figure 2. Historical catch of eastern Georges Bank haddock during 1931-1955 (Gavaris and Van Eeckhaute 1997) compared to recent catches during 1969-2012. Catch data for 1956 to 1968 were not available by unit area.

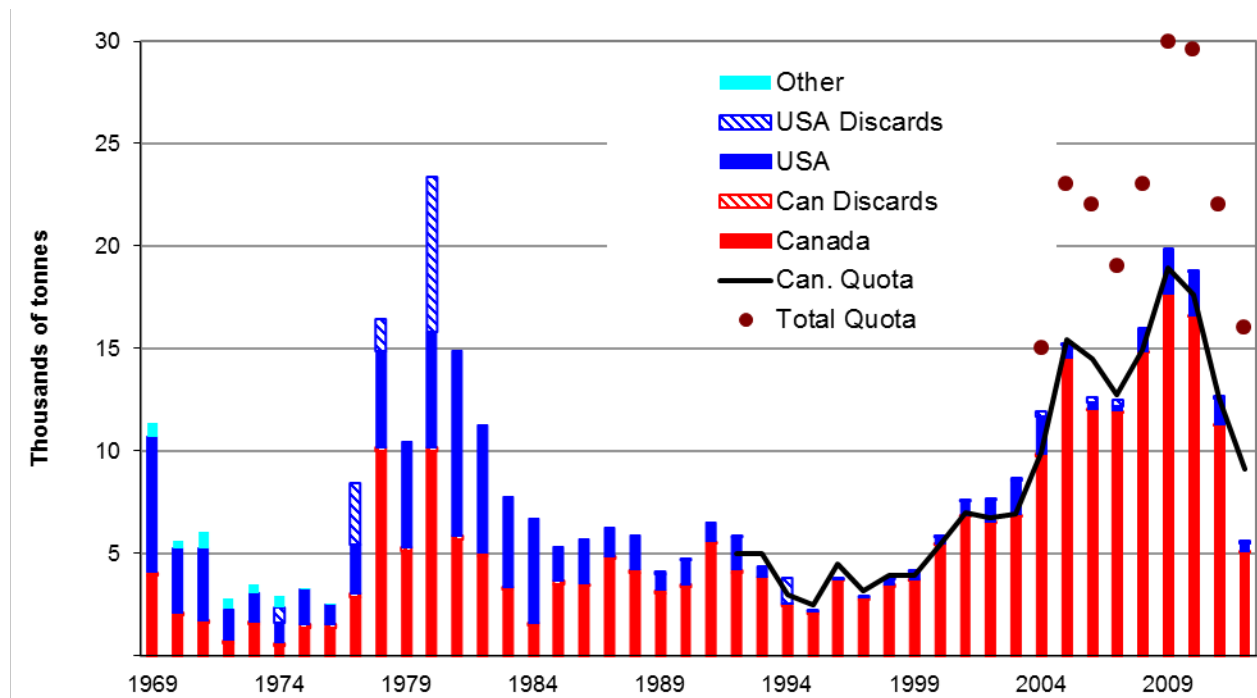


Figure 3. Nominal catches of eastern Georges Bank haddock during 1969-2012.

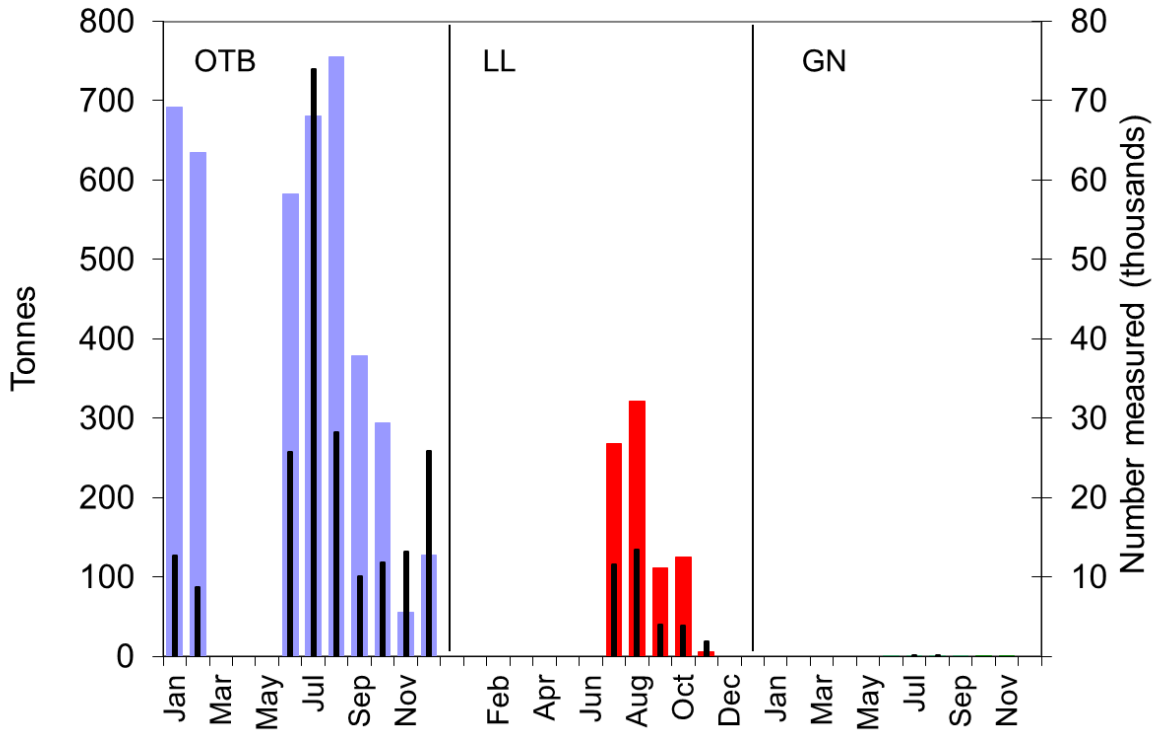


Figure 4. Haddock landings in eastern Georges Bank by month and gear for the Canadian commercial groundfish fishery in 2012 (wide bars) with sampling levels (narrow bars). Landings and sampling from the gillnet fishery were very low.

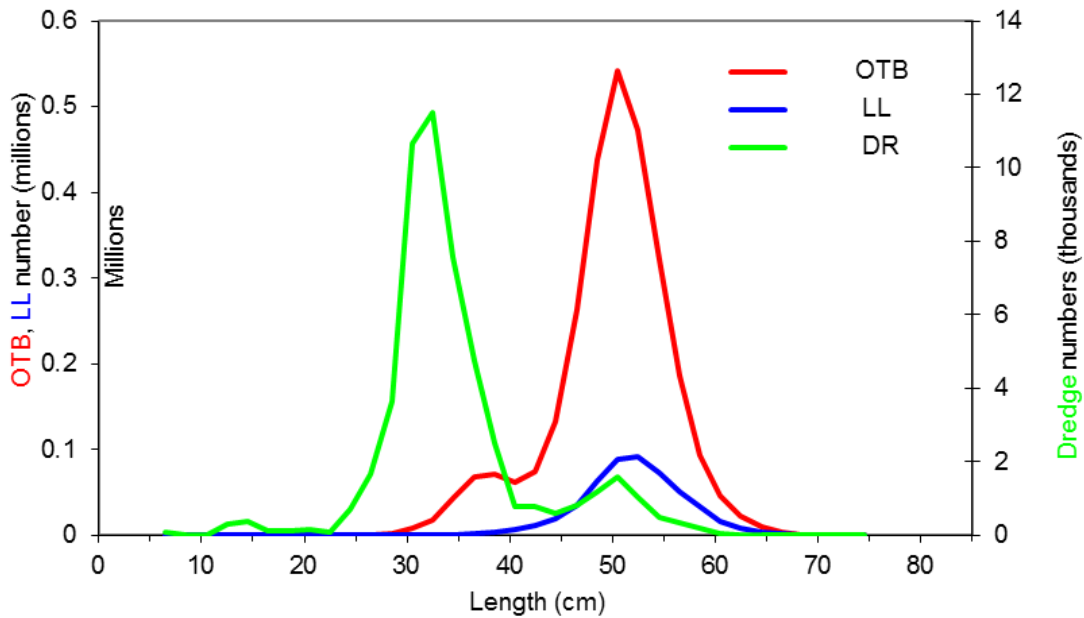


Figure 5. Haddock numbers at length landed by components of the Canadian commercial groundfish fisheries and haddock discards at length from the Canadian scallop fishery on eastern Georges Bank in 2012. The scallop dredge length frequencies are expanded according to the axis on the right. OTB=otter trawl bottom, LL=longline, DR=scallop dredge. Landings and sampling from the gillnet fishery were very low.

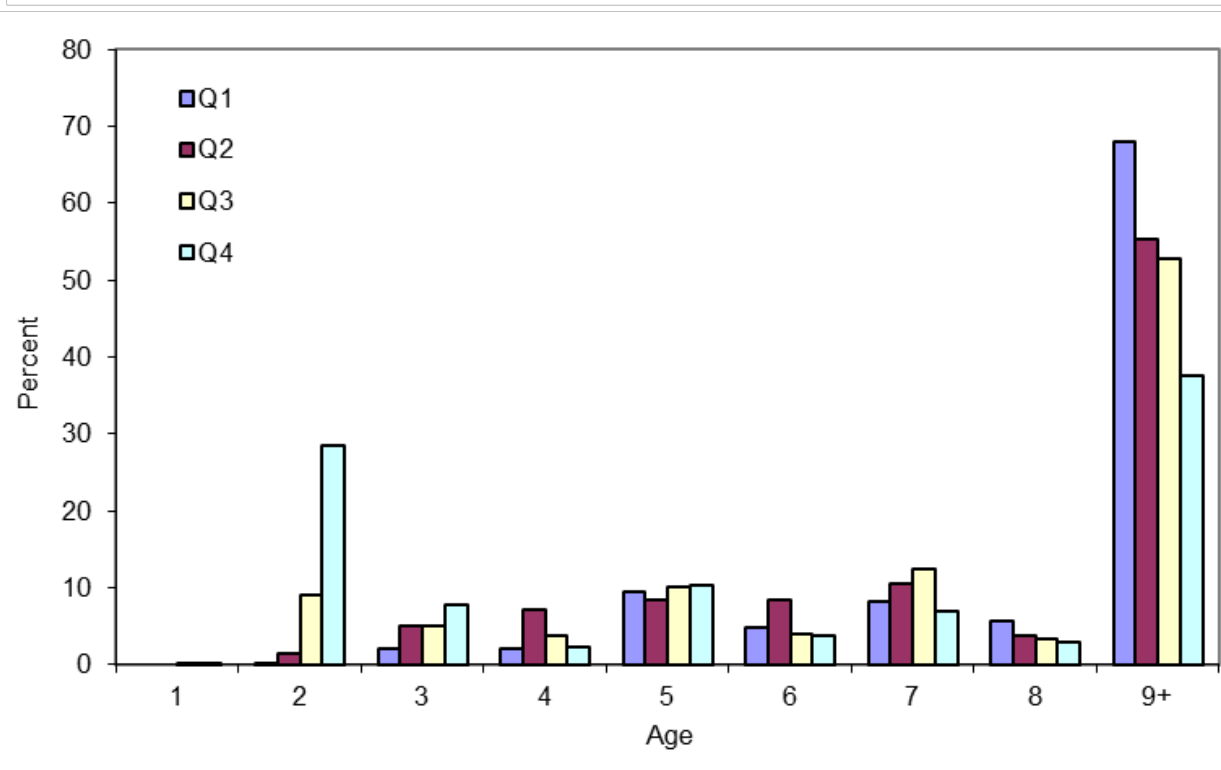
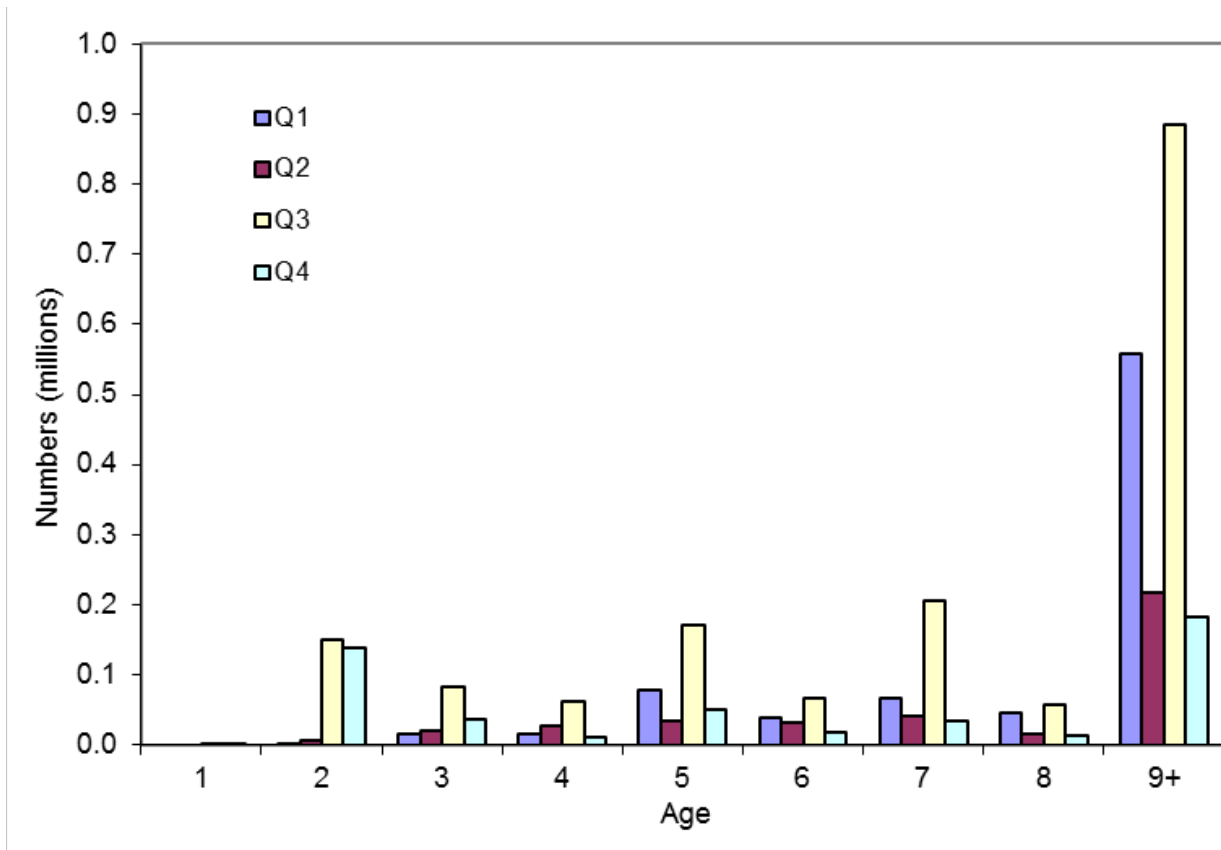


Figure 6. Numbers (top panel) and percent (bottom panel) of haddock landings at age by quarter by the Canadian groundfish fishery on eastern Georges Bank in 2012.

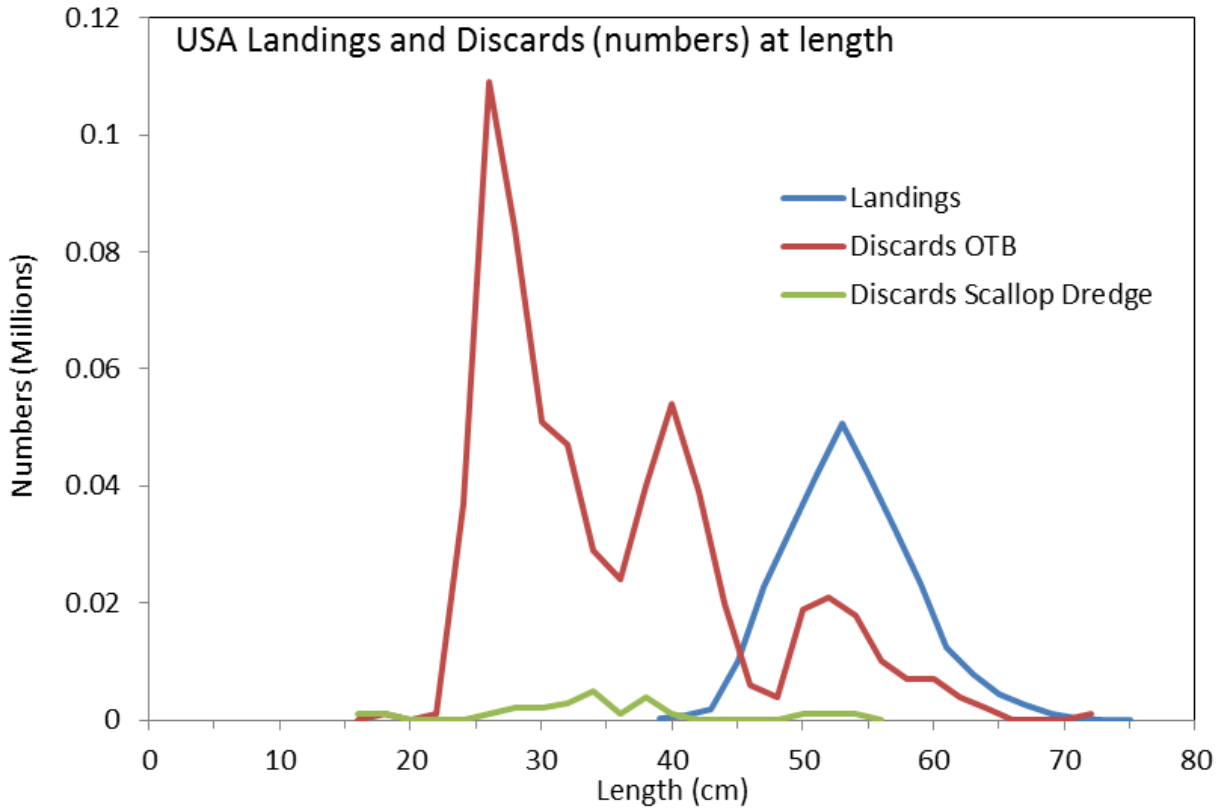


Figure 7. Length composition of haddock landed by the United States eastern Georges Bank groundfish fisheries in 2012.

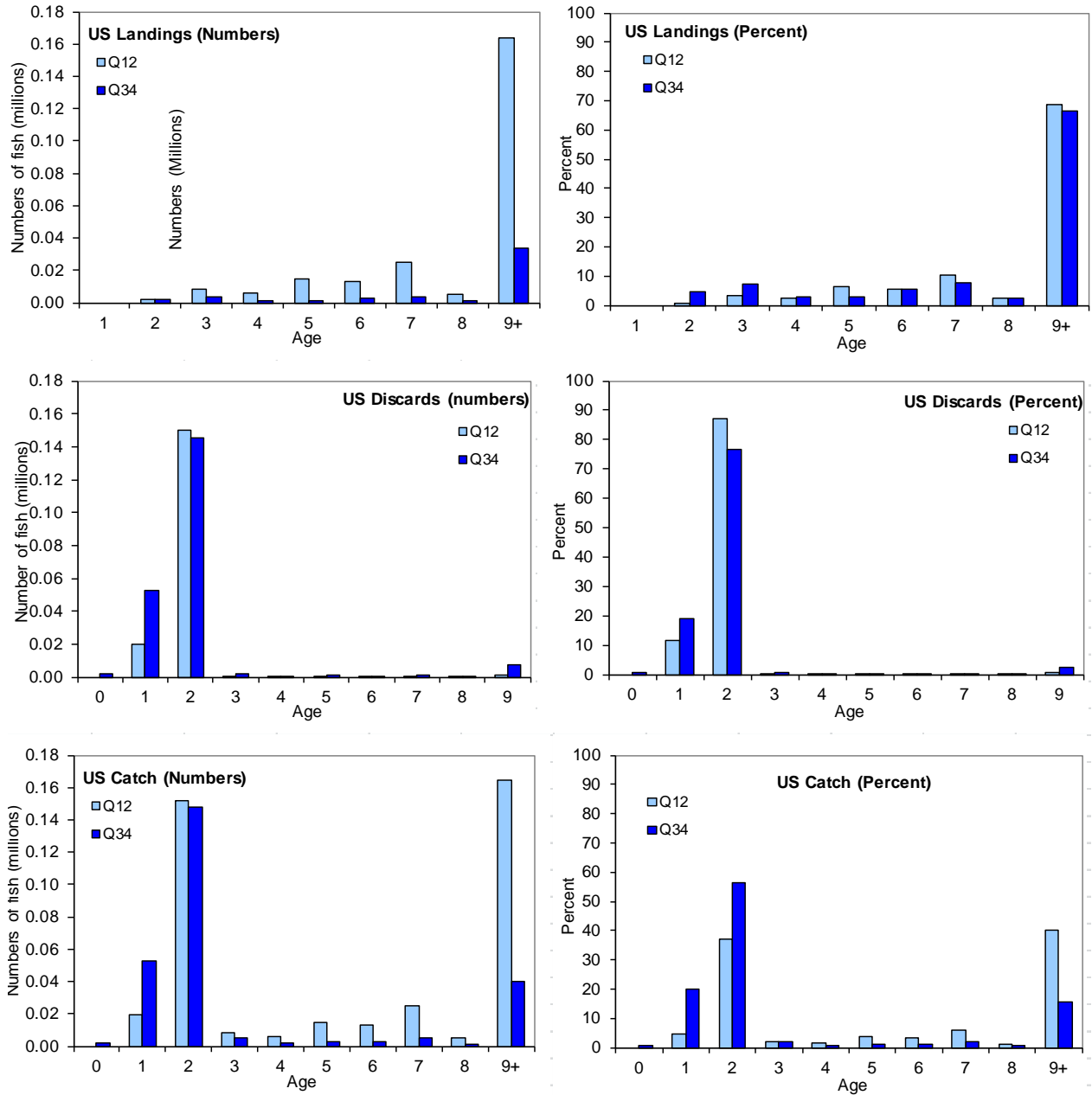


Figure 8. Haddock landings and discards at age in numbers and percent by half year from the USA eastern Georges Bank groundfish fisheries in 2012.

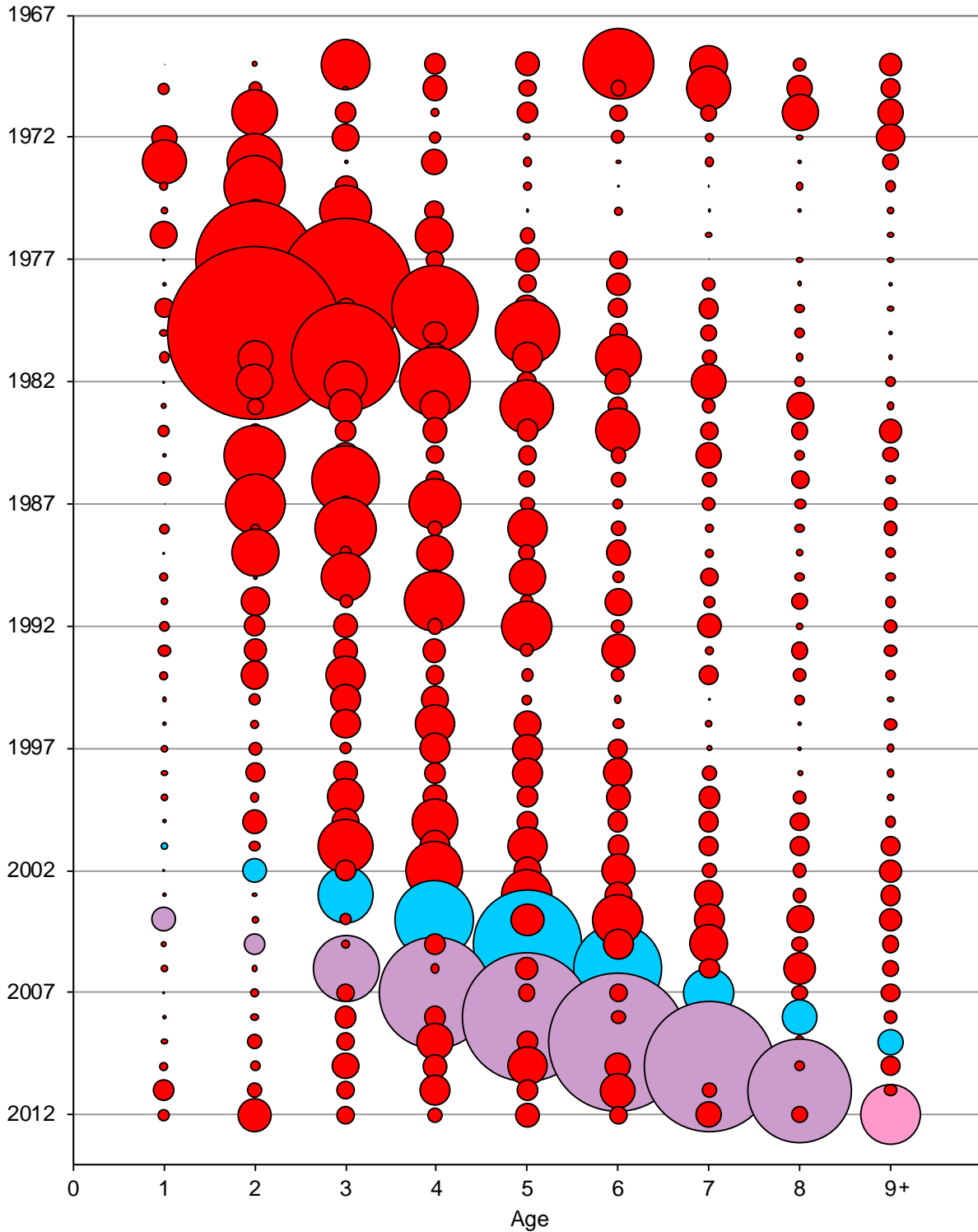


Figure 9. Total commercial catch at age (numbers) of eastern Georges Bank haddock during 1969-2012. The 2000 and 2003 year classes are indicated in blue and purple, respectively. The bubble area is proportional to catch magnitude.

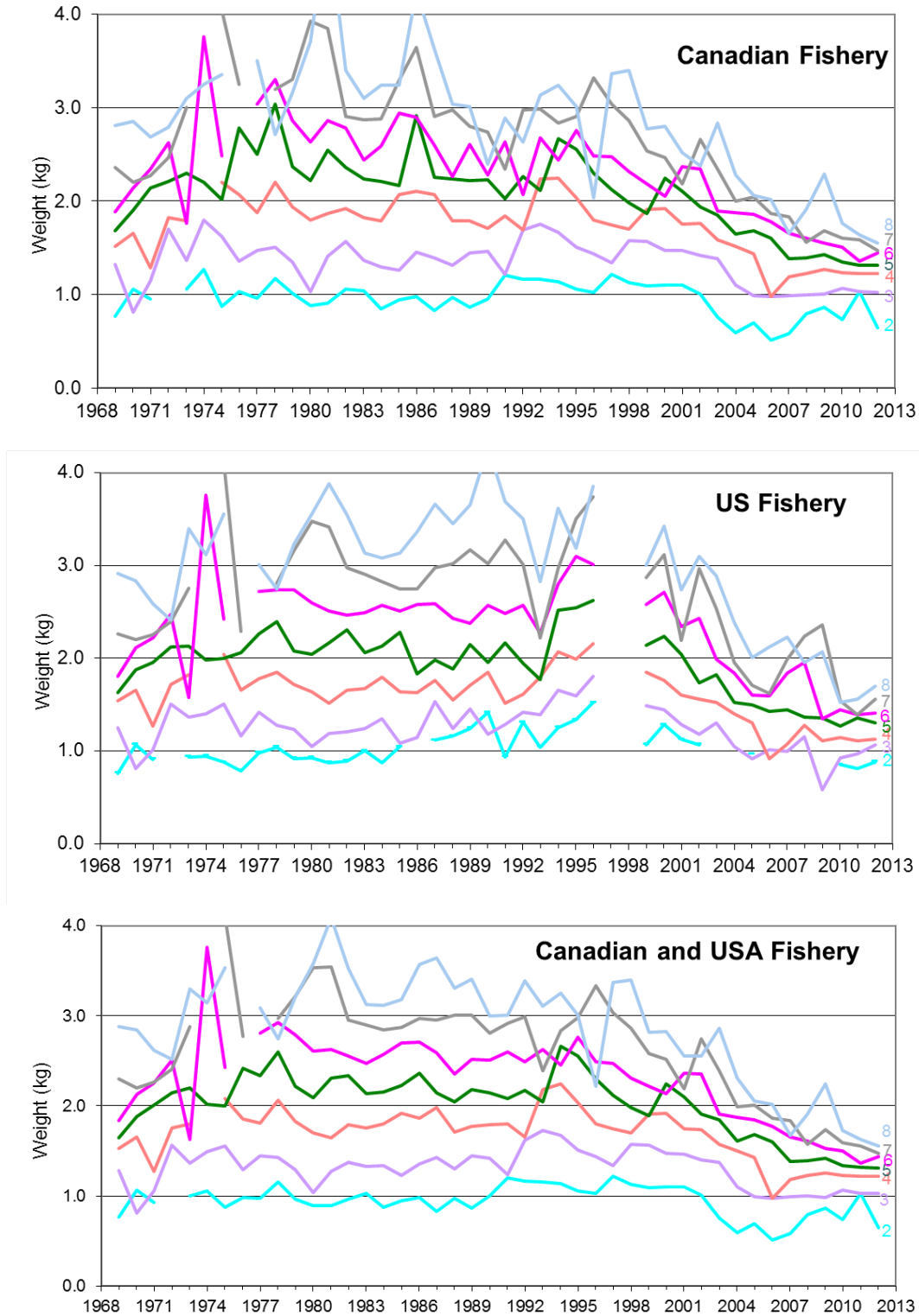


Figure 10. Average weights at age for eastern Georges Bank haddock from the Canadian, USA and combined commercial groundfish fishery during 1969-2012. From 1969 to 1973 only USA fishery sampling for lengths and ages was available. Between 1974 and 1984 a mix of USA and Canadian samples was used (Gavaris and Van Eeckhaute 1990).

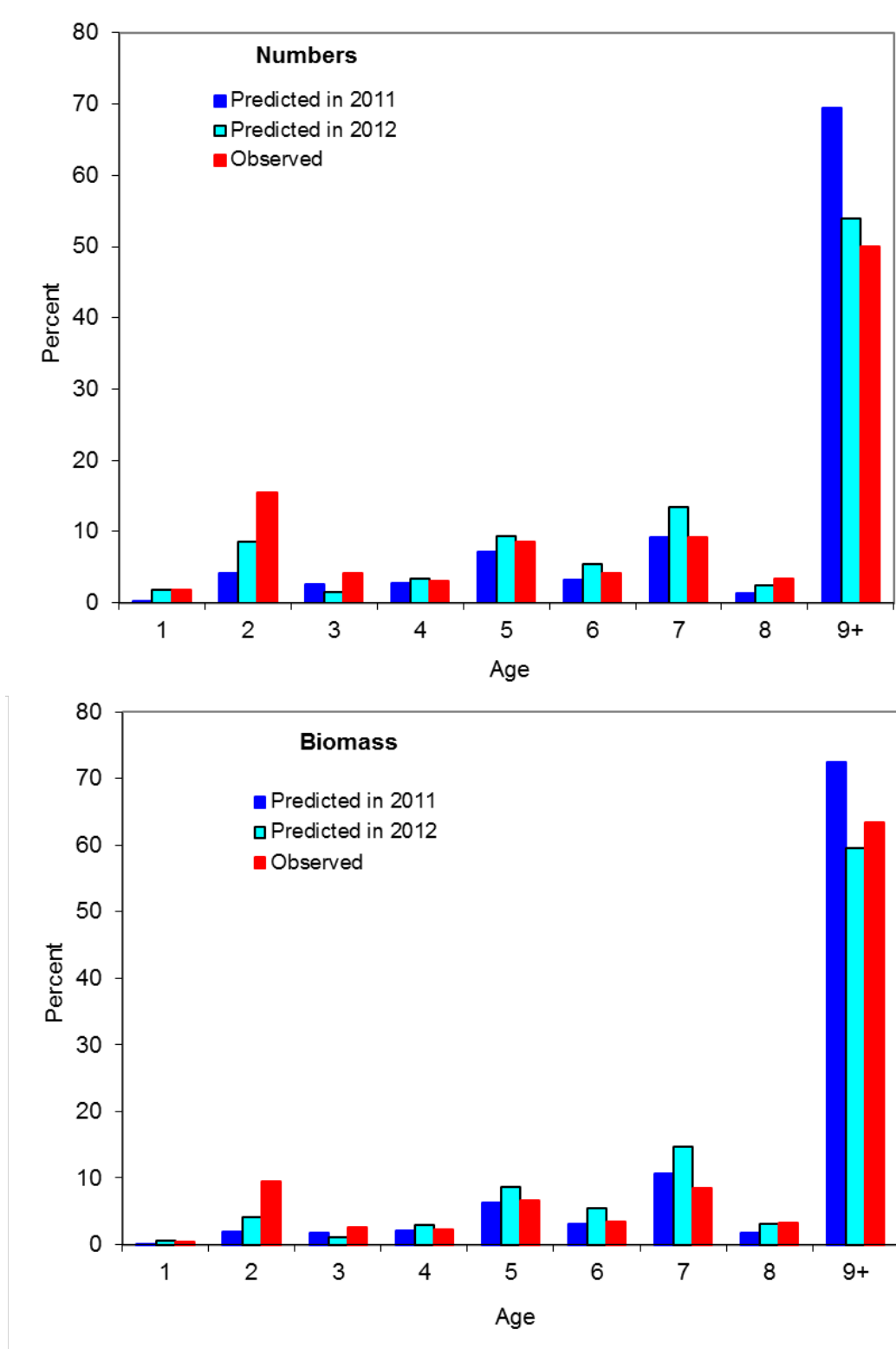


Figure 11. Percent composition in numbers and biomass of 2012 observed eastern Georges Bank haddock landings projected in 2011, upon which the quota was based, and 2012. The partial recruitment for the 9+ age group used in the 2011 projection was 1.0 while in the 2012 projection a value of 0.3 was used.

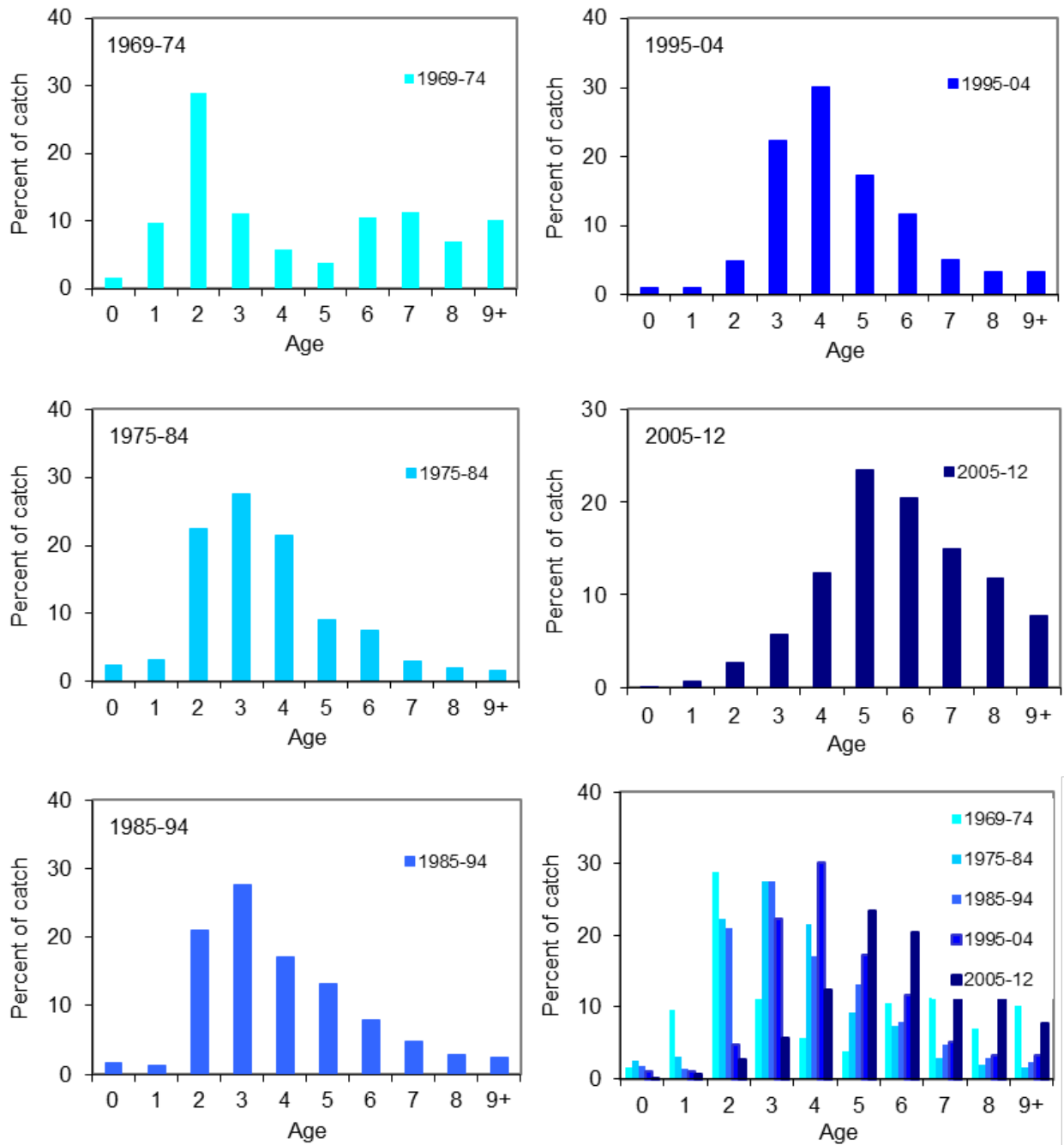


Figure 12. Age composition of the haddock catch for the eastern Georges Bank commercial fishery during 1969-1974, 1975-1984, 1985-1994, 1995-2004, and 2005-2012.

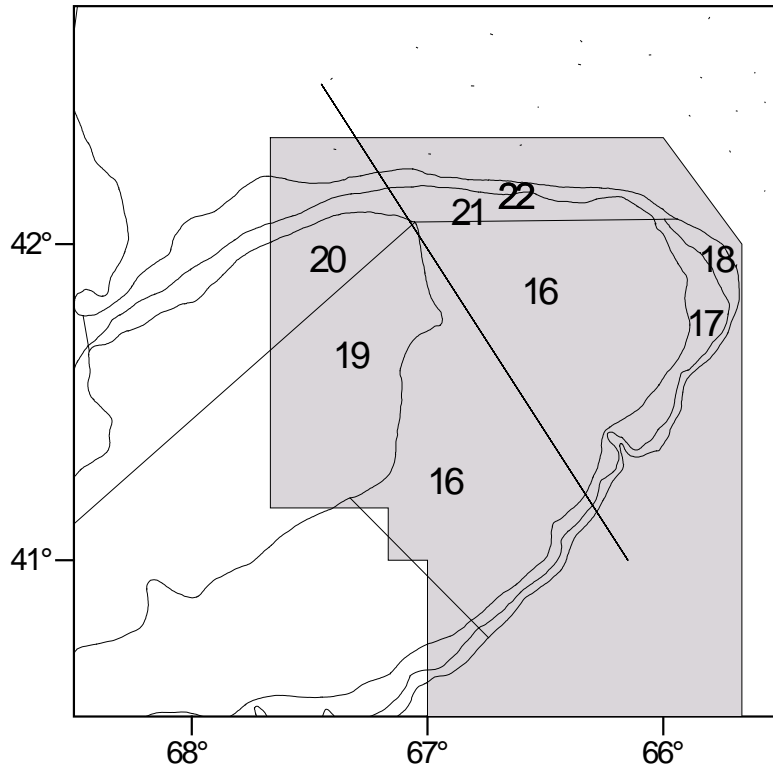


Figure 13. Stratification scheme used for National Marine Fisheries Service surveys. The eastern Georges Bank management area is indicated by shading.

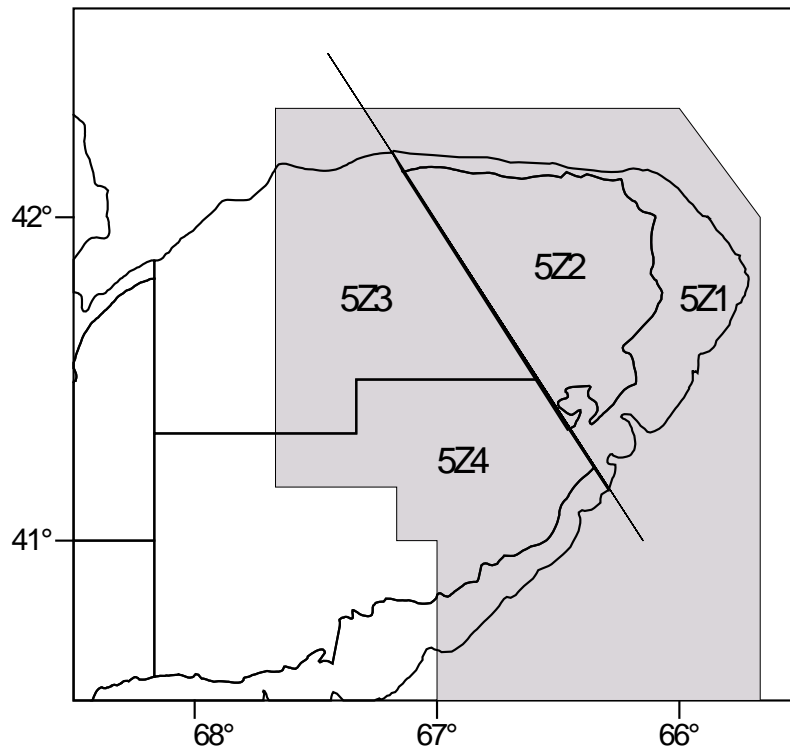


Figure 14. Stratification scheme used for the Canadian Department of Fisheries and Oceans survey. The eastern Georges Bank management area is indicated by shading.

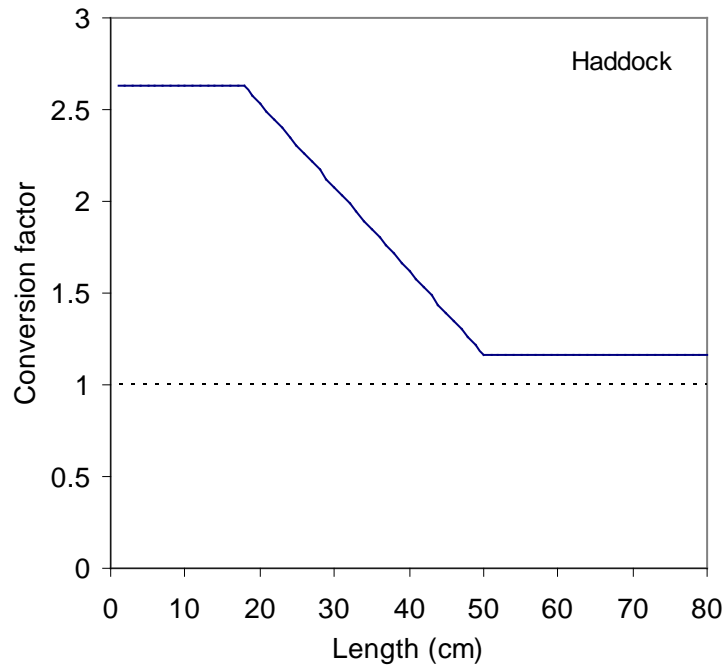


Figure 15. Conversion factors for NMFS surveys conducted by the Henry B. Bigelow since 2009. Factors are applied by dividing the Bigelow catch at length by the length specific conversion factor to make them equivalent to Albatross IV catches.

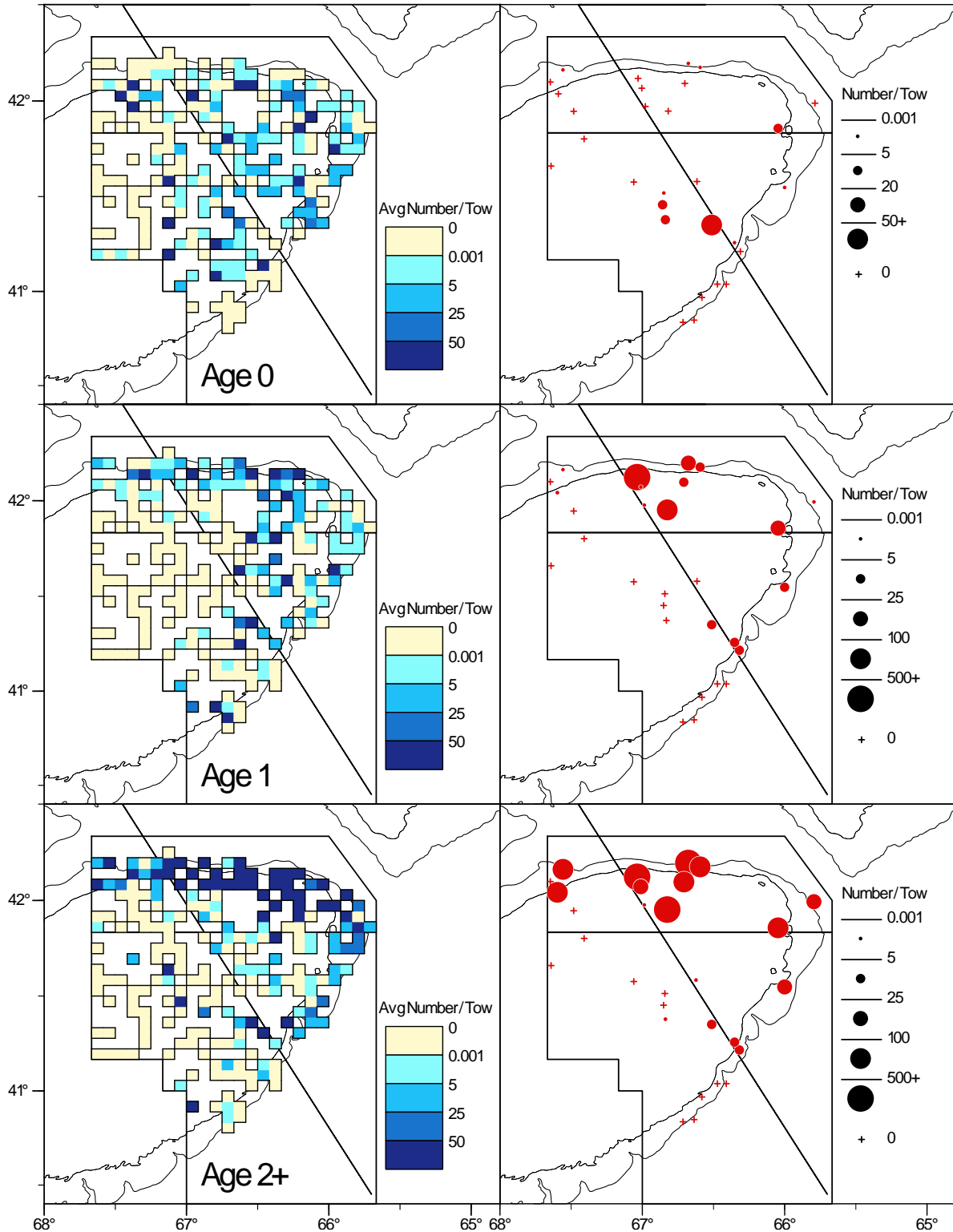


Figure 16. Distribution of eastern Georges Bank haddock abundance (number/tow) as observed from the National Marine Fisheries Service **fall** survey. The squares (left panels) are shaded relative to the average survey catch for 2002 to 2011. The expanding symbols (right panels) represent the **2012** survey catches. Length based conversion coefficients have been applied since the 2009 survey to make them comparable to surveys undertaken by the Albatross IV.

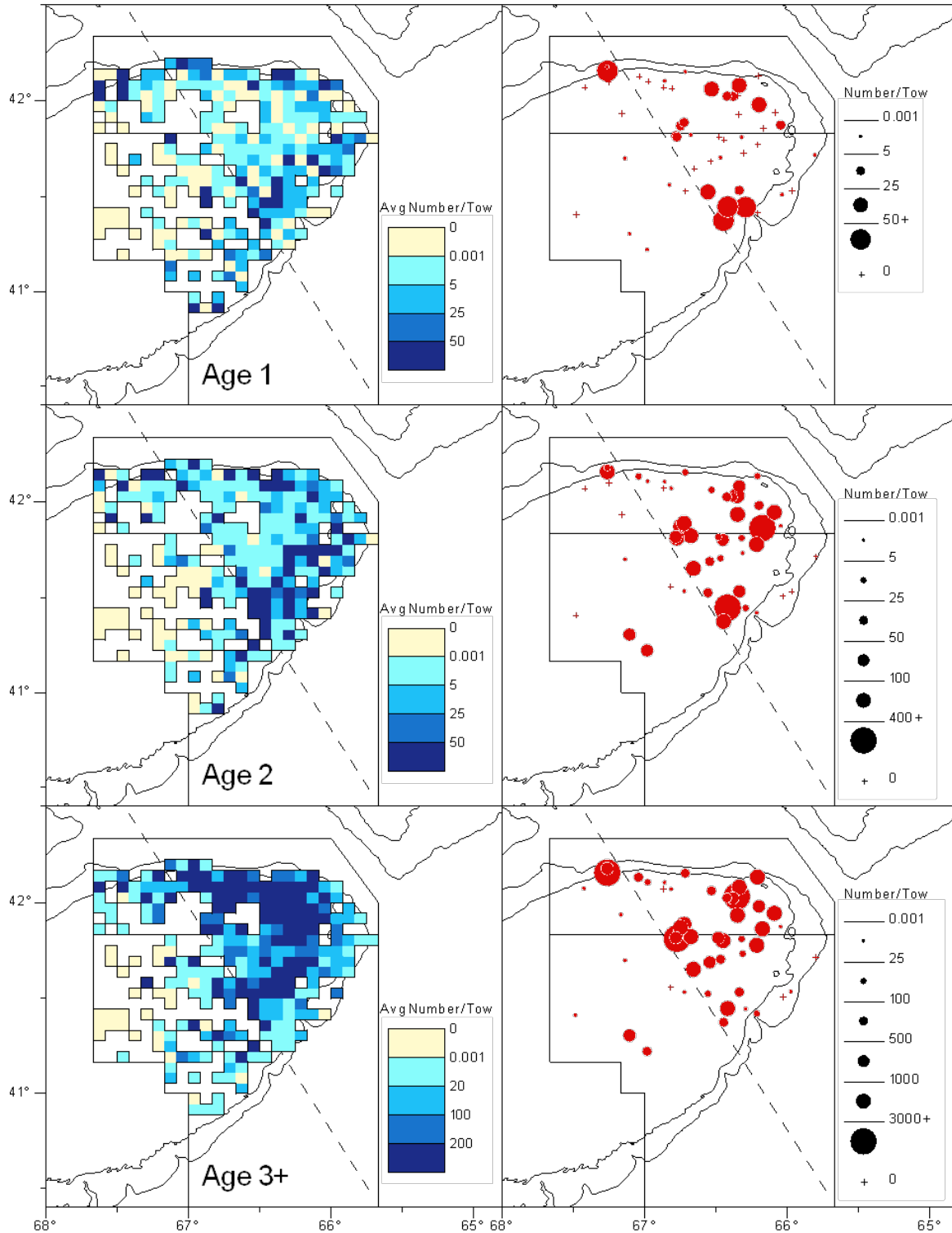


Figure 17. Distribution of eastern Georges Bank haddock abundance (number/tow) as observed from the Canadian Department of Fisheries and Oceans survey. The squares (left panels) are shaded relative to the average survey catch for 2003 to 2012. The expanding symbols (right panels) represent the 2013 survey catches.

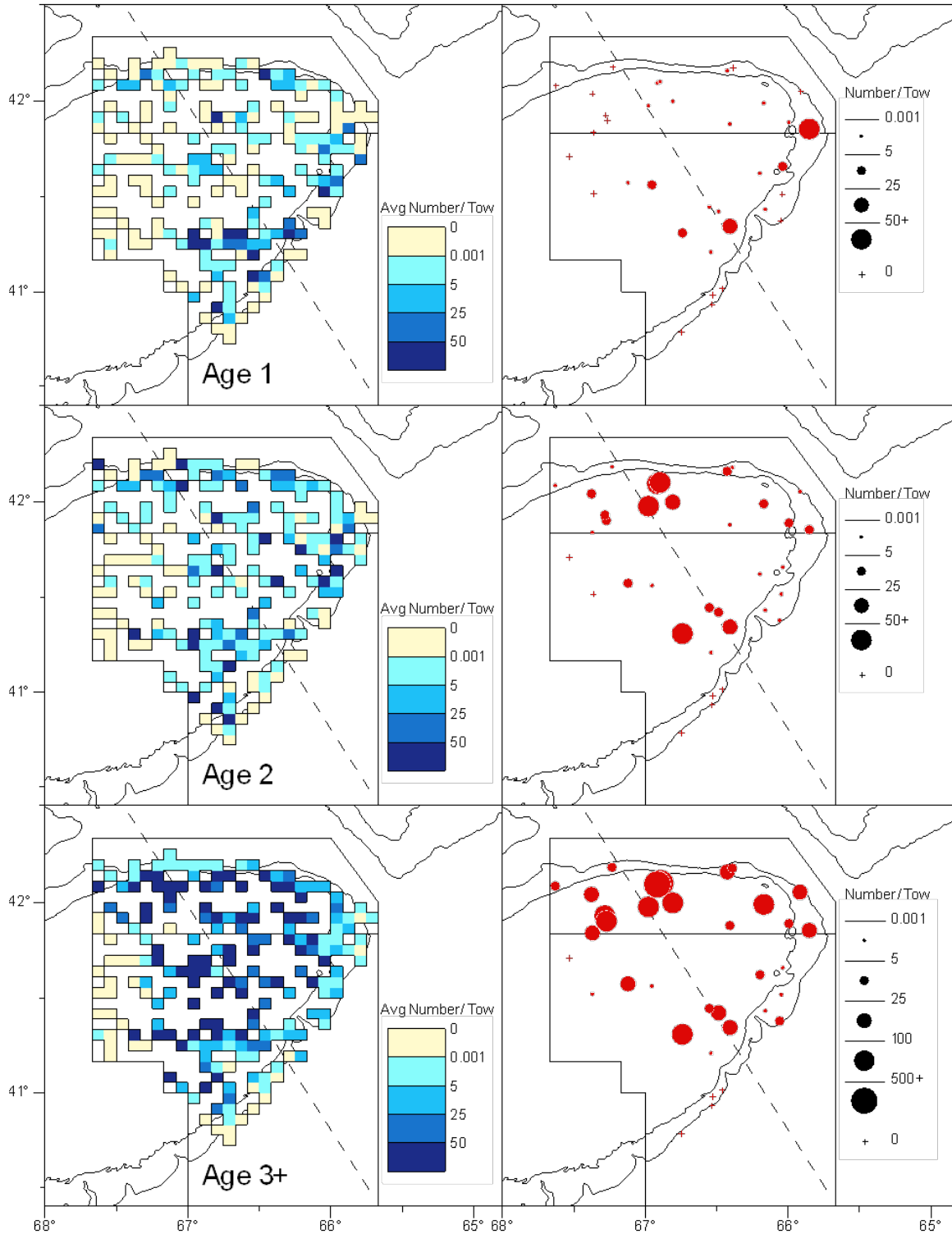


Figure 18. Distribution of eastern Georges Bank haddock abundance (number/tow) as observed from the National Marine Fisheries Service **spring** survey. The squares (left panels) are shaded relative to the average survey catch for 2003 to 2012. The expanding symbols (right panels) represent the **2013** survey catches. Length based conversion coefficients have been applied since the 2009 survey to make them comparable to surveys undertaken by the Albatross IV.

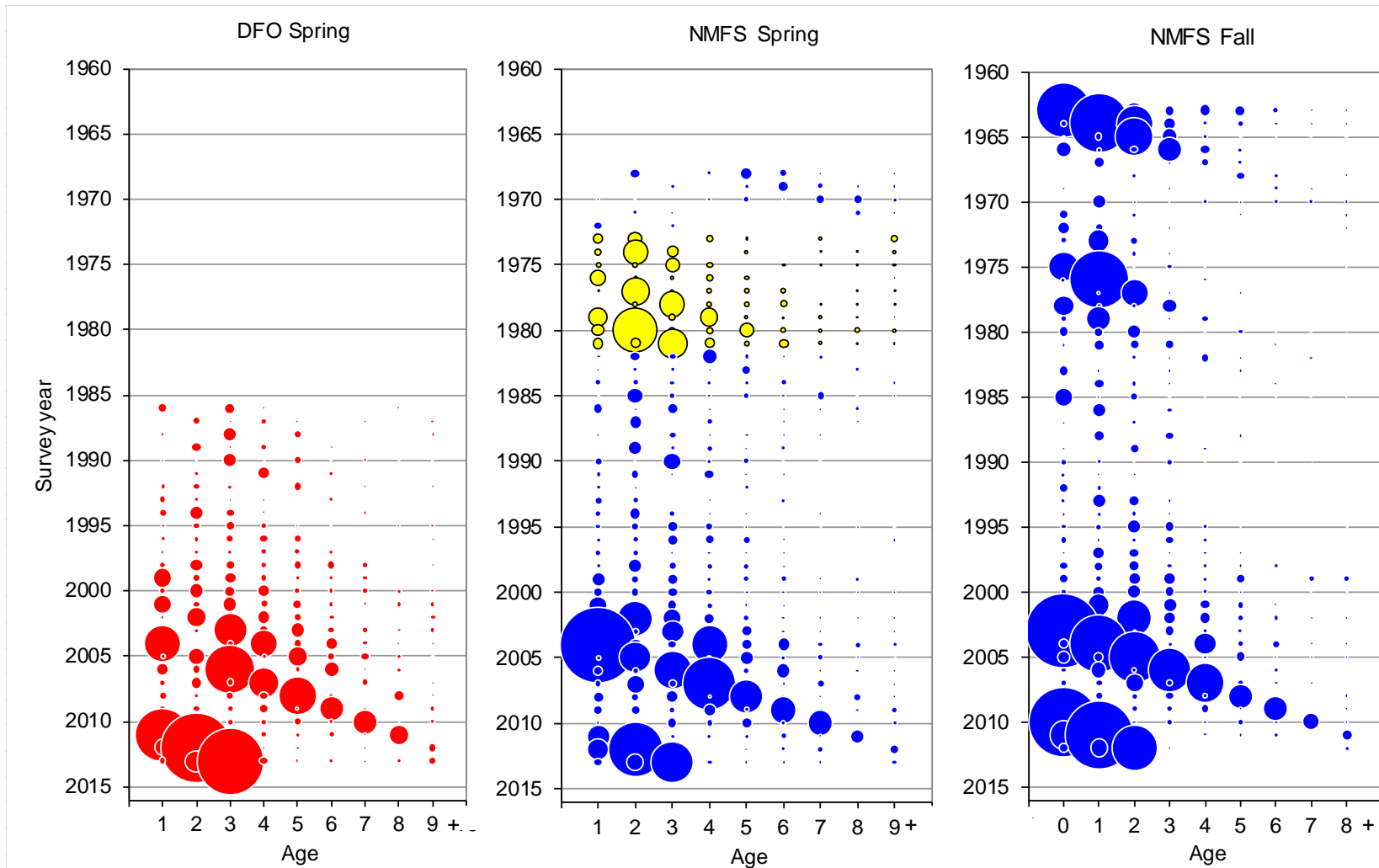


Figure 19. Estimated abundance at age (numbers in 000's) of eastern Georges Bank haddock for the Canadian Department of Fisheries and Oceans (DFO) for 1986 to 2013, the National Marine Fisheries Service (NMFS) spring survey for 1968 to 2013 and the NMFS fall survey for 1963 to 2012. Bubble area is proportional to magnitude (see Tables 18-20). Conversion factors to adjust for changes in door type and survey vessel were applied to the NMFS surveys. From 1973-81 (yellow circles), a 41 Yankee trawl was used for the NMFS spring survey while a 36 Yankee was used in the other years. Length based conversion coefficients have been applied to the NMFS surveys since the 2009 survey to make them comparable to surveys undertaken by the Albatross IV. Symbol size has not been adjusted between surveys for the catchability of the survey.

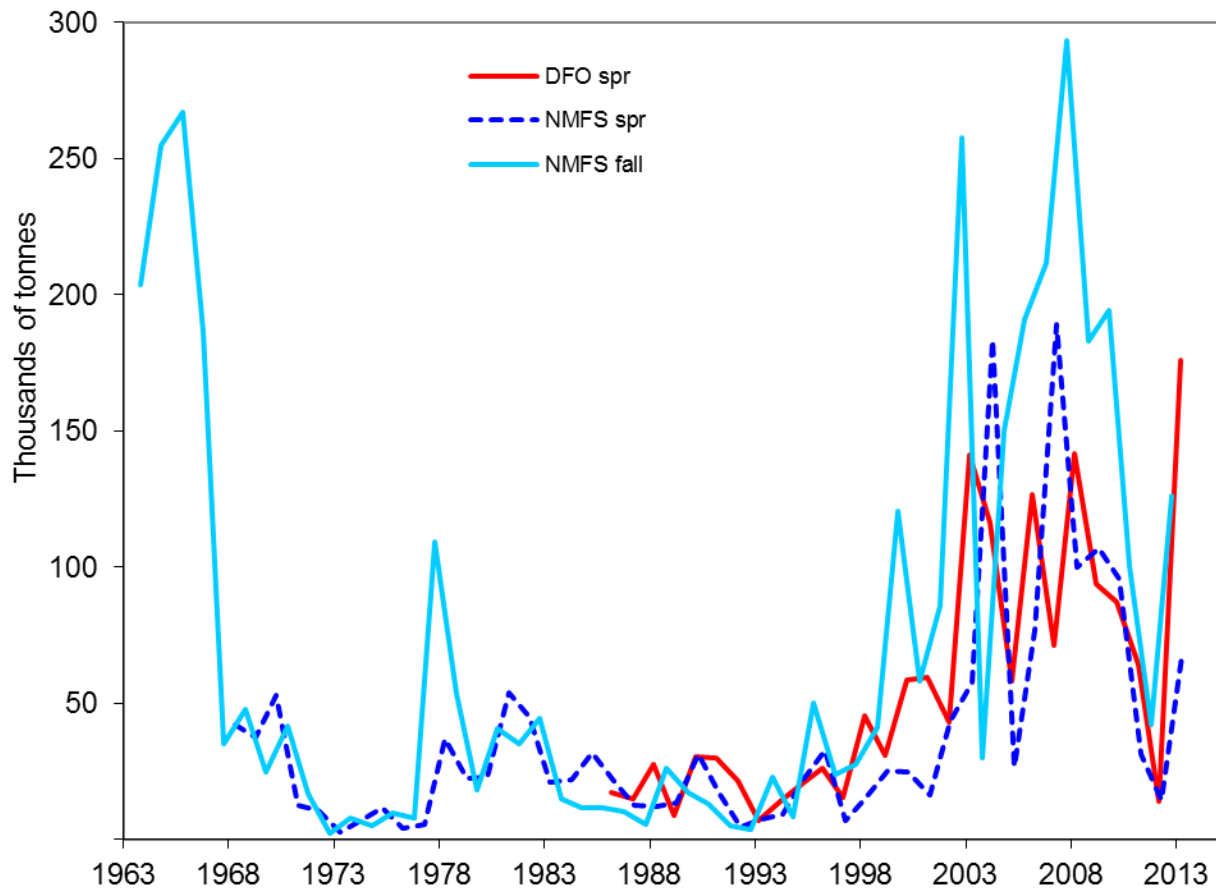


Figure 20. Biomass from National Marine Fisheries Service (NMFS) fall (ages 2-8), NMFS spring (ages 3-8) and Canadian Department of Fisheries and Oceans (DFO) (ages 3-8) research surveys for eastern Georges Bank haddock during 1963-2012, 1968-2013, 1986-2013, respectively (scaled by calibration constants). Conversion factors to adjust for changes in door type and survey vessel were applied to the NMFS surveys. From 1973-81 a 41 Yankee trawl was used for the NMFS spring survey while a 36 Yankee was used in the other years. Length based conversion coefficients have been applied to the NMFS surveys since the 2009 survey to make them comparable to surveys undertaken by the Albatross IV.

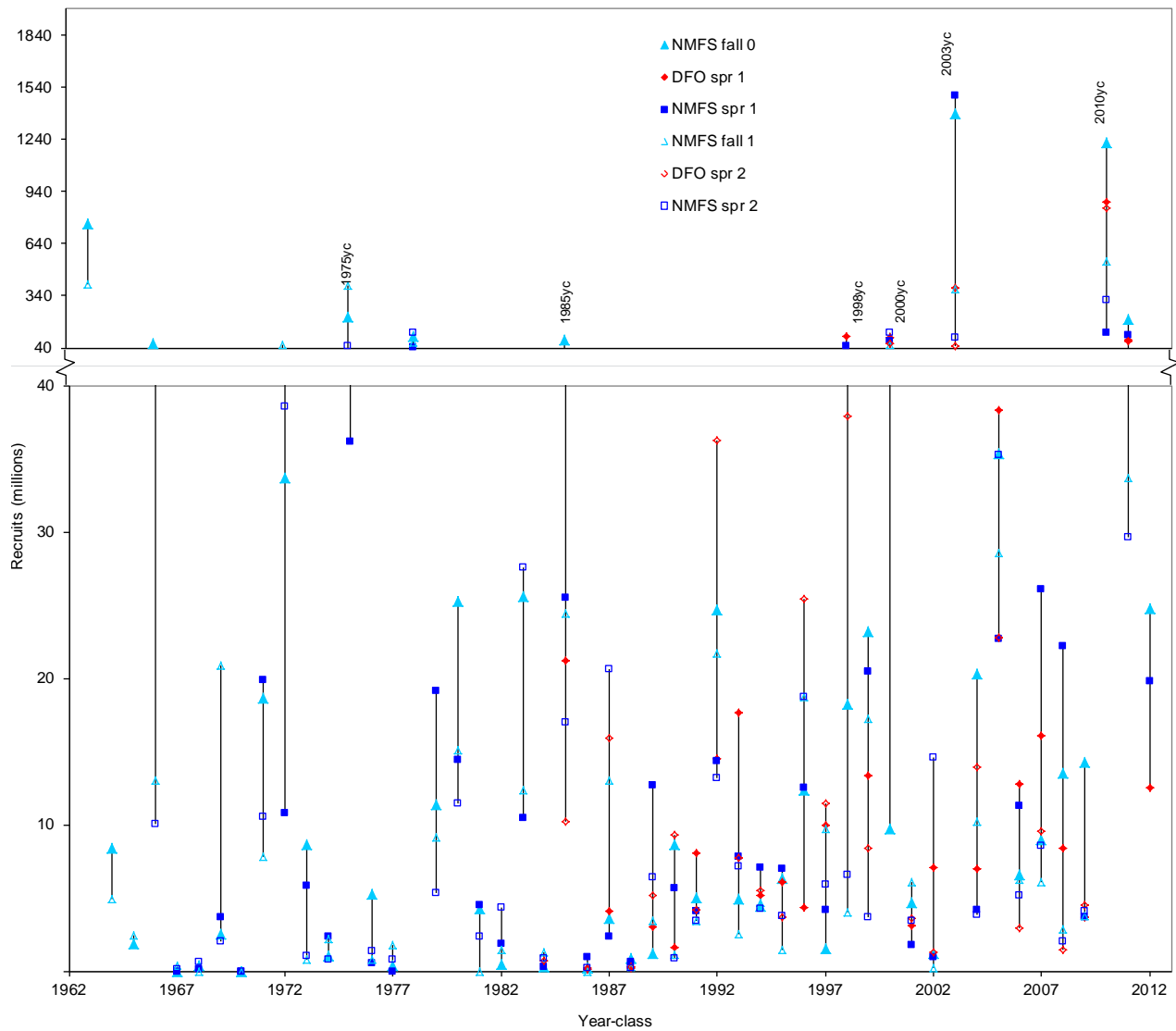


Figure 21. Year-class abundance for ages 0 and 1 from the National Marine Fisheries Service (NMFS) fall survey for 1963-2012 and ages 1 and 2 from the NMFS spring survey for 1968-2013 and the Canadian Department of Fisheries and Oceans (DFO) research survey for 1986-2013 (scaled by calibration constants) for eastern Georges Bank haddock. Conversion factors to adjust for changes in door type and survey vessel were applied to the NMFS surveys. From 1973-81 a 41 Yankee trawl was used for the NMFS spring survey while a 36 Yankee was used in the other years. Length based conversion coefficients have been applied to the NMFS surveys since the 2009 survey to make them comparable to surveys undertaken by the Albatross IV.

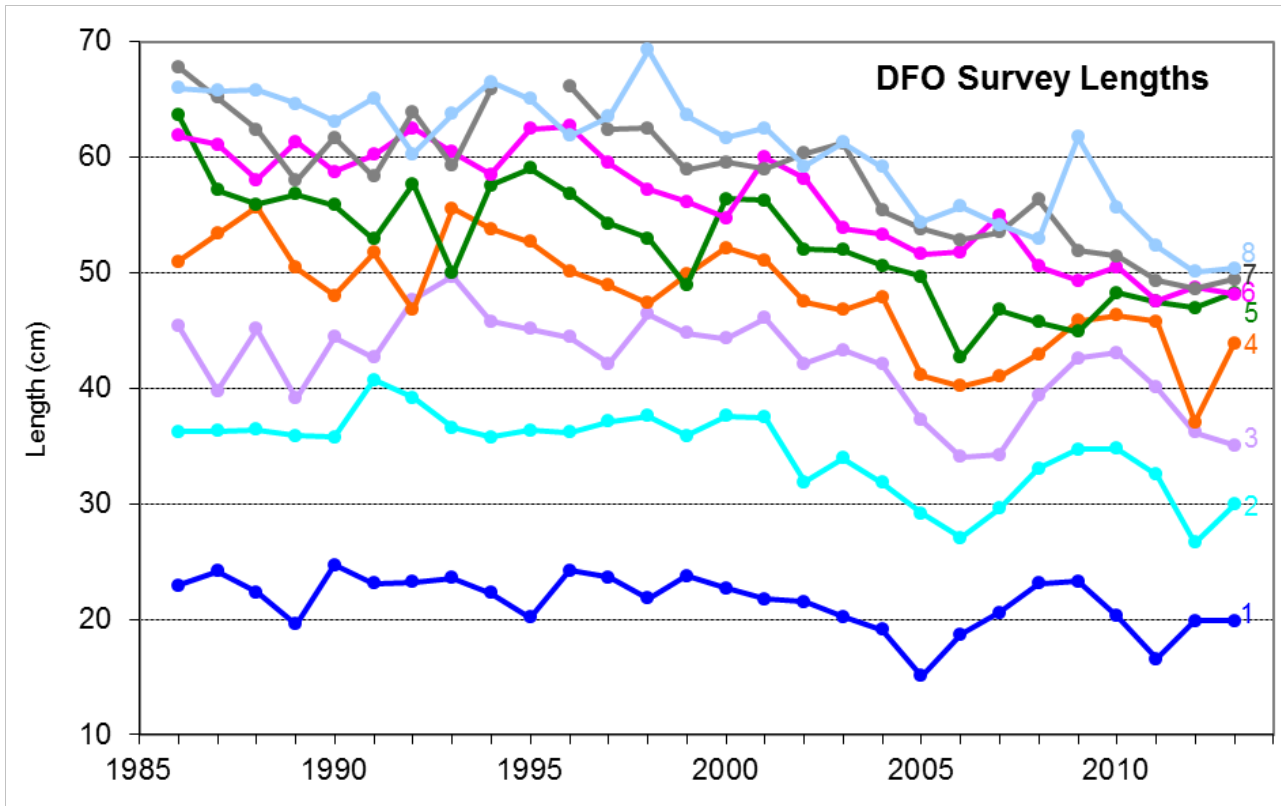
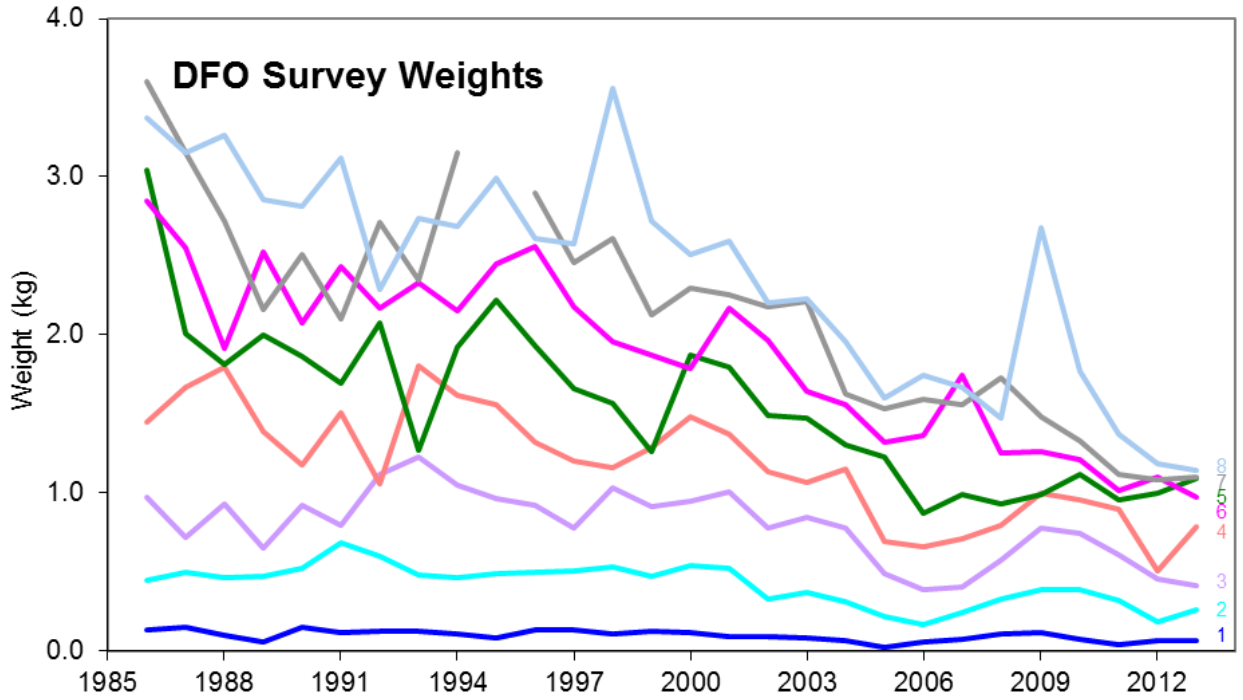


Figure 22. Average weights (upper panel) and lengths (lower panel) at age for eastern Georges Bank haddock derived from Canadian Department of Fisheries and Oceans surveys during 1986-2013.

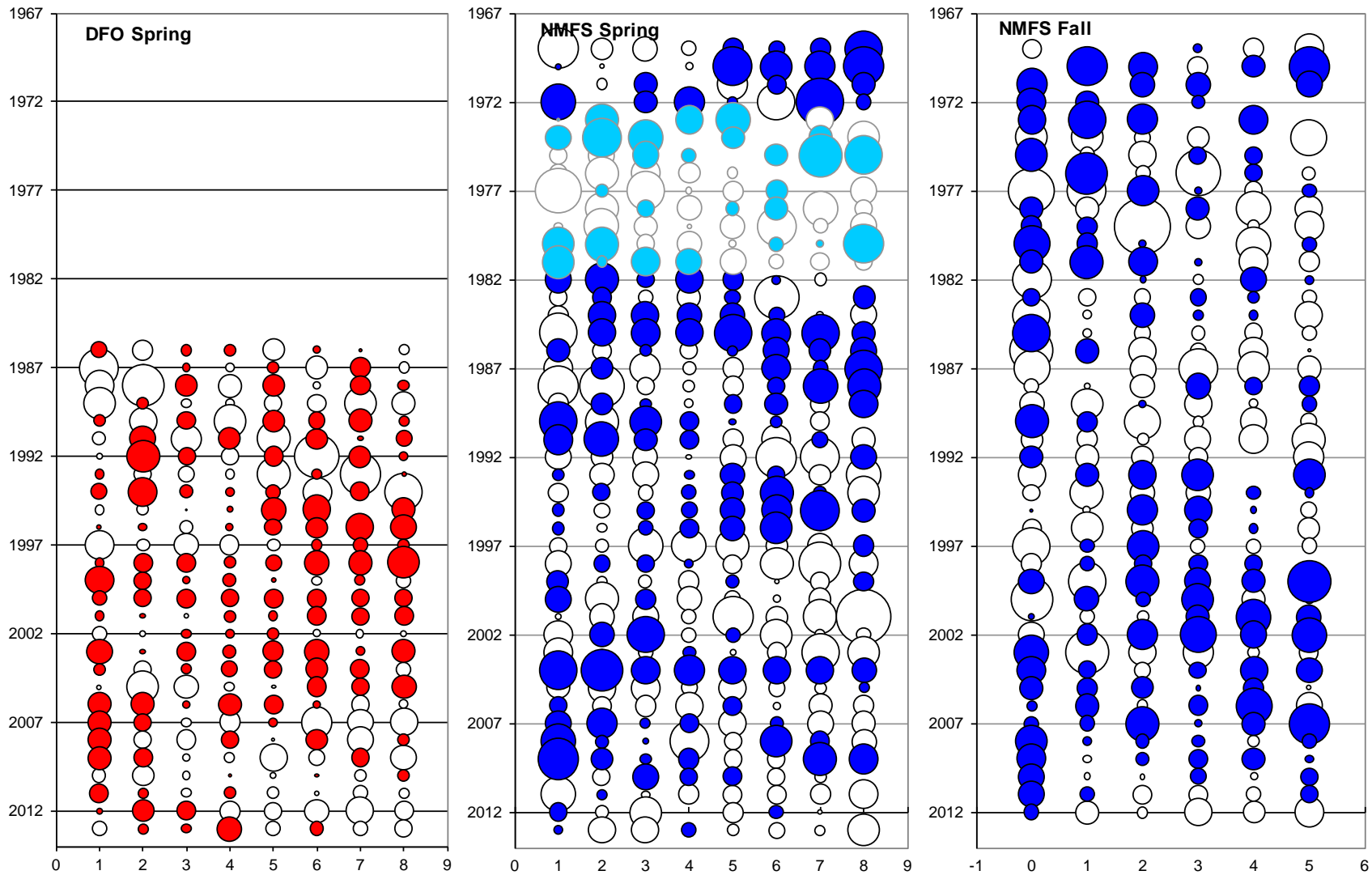


Figure 23. Residuals of survey abundance indices, by year and age group, from the Canadian Department of Fisheries and Oceans (DFO) research survey 1986 to 2013 and the National Marine Fisheries Service (NMFS) spring and autumn surveys during 1969 to 2013 and 1969 to 2012, respectively, for eastern Georges Bank haddock. Solid symbols indicate positive values, open symbols indicate negative values. Bubble area is proportional to magnitude. From 1973-81 (light blue circles), a Yankee 41 trawl was used for the NMFS spring survey while a Yankee 36 trawl was used in the other years.

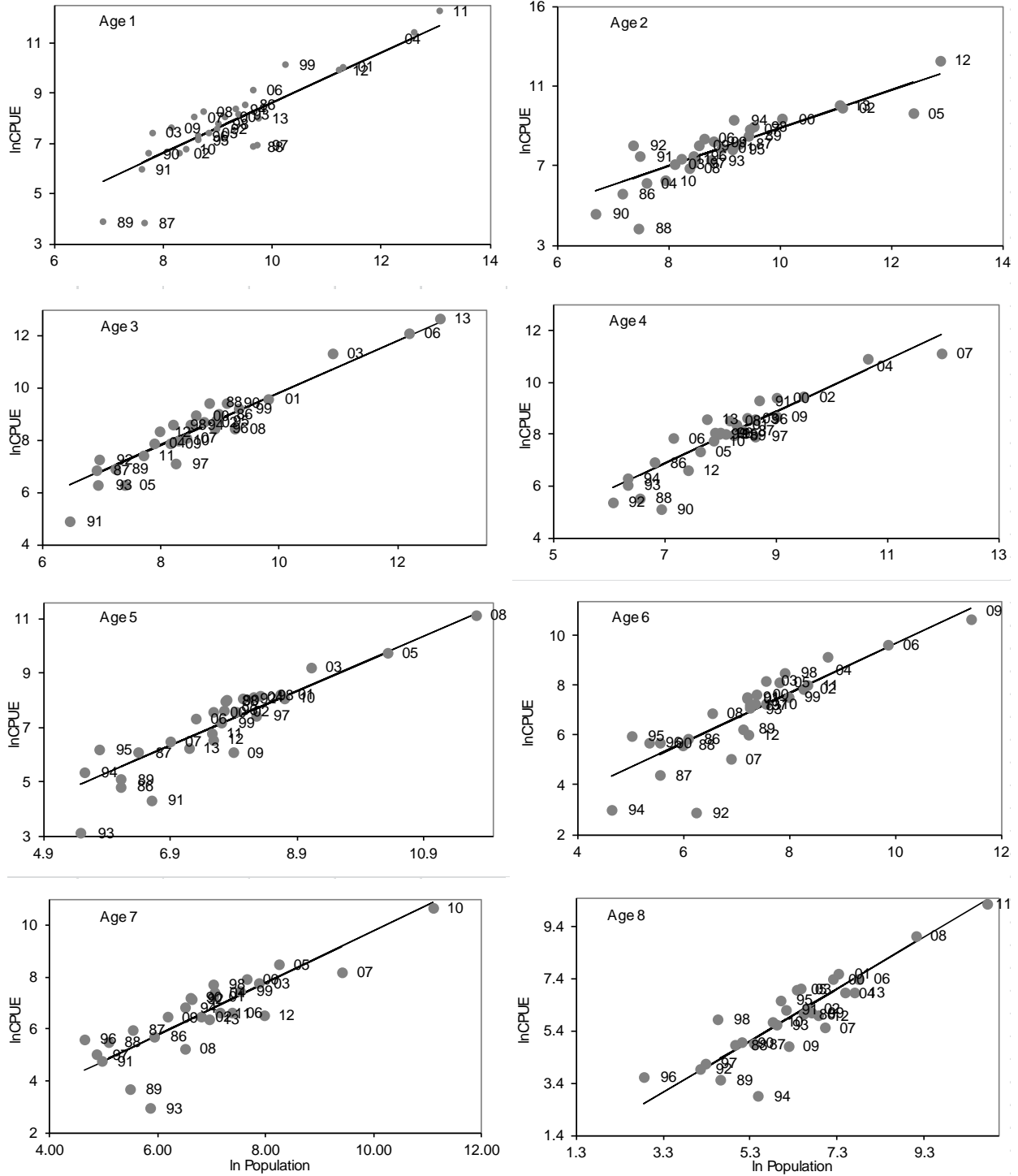


Figure 24. Age by age plots of the observed and predicted \ln abundance index versus \ln population numbers for eastern Georges Bank haddock from the Department of Fisheries and Oceans survey during 1986-2013.

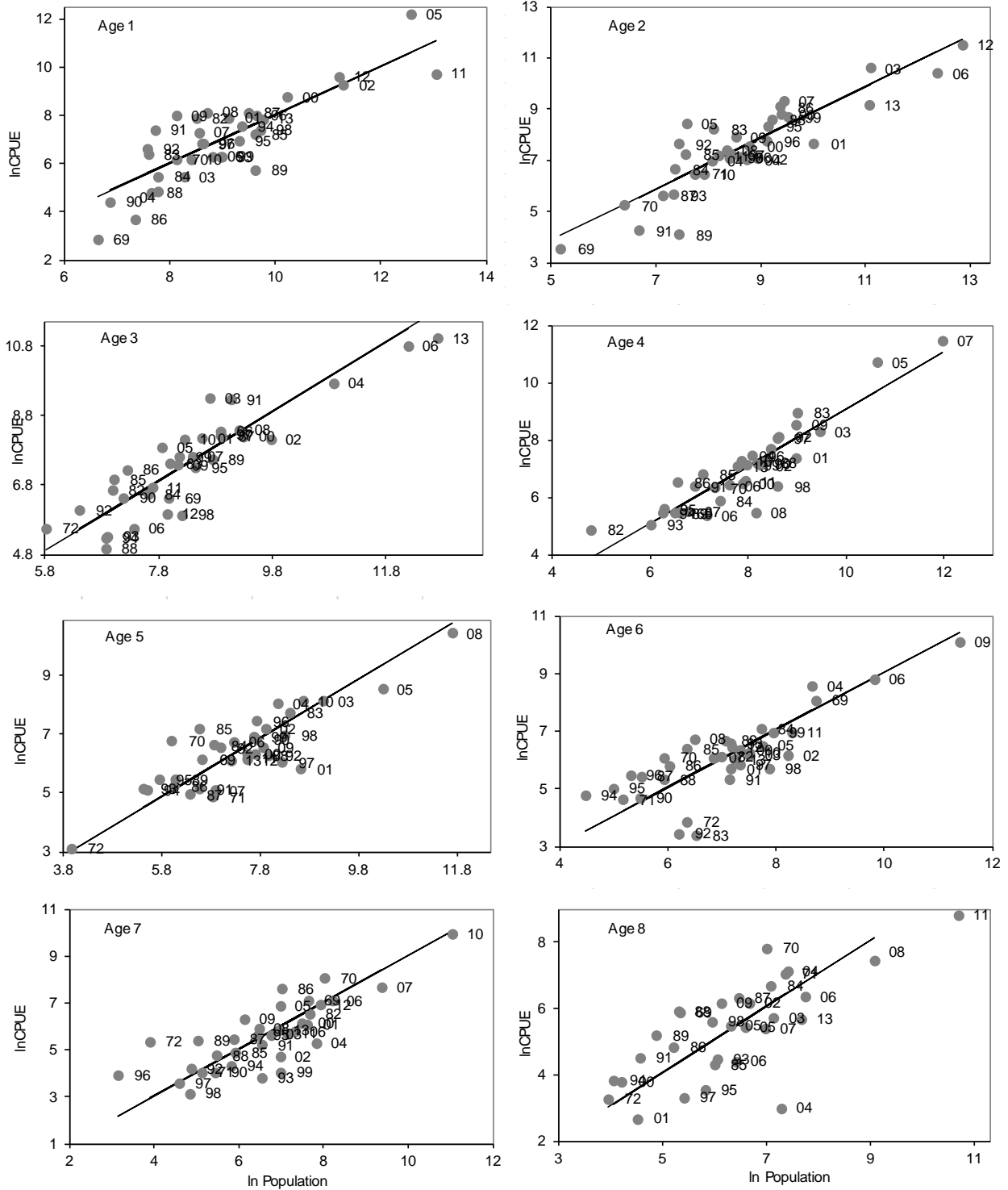


Figure 25. Age by age plots of the observed and predicted *ln* abundance index versus *ln* population numbers for eastern Georges Bank haddock from the National Marine Fisheries Service **spring** survey with a Yankee 36 net during 1969-1972 and 1982-2013.

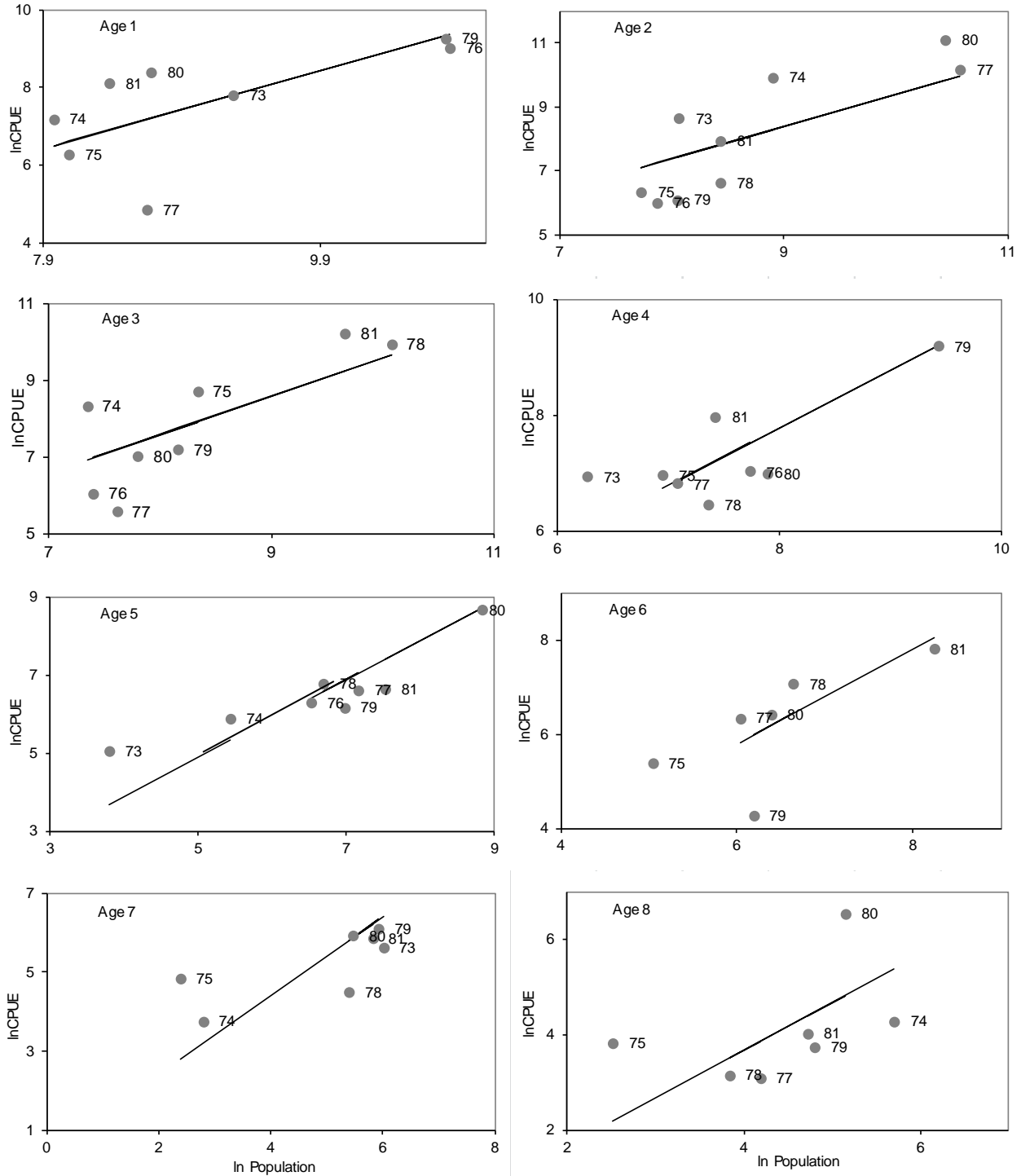


Figure 26. Age by age plots of the observed and predicted \ln abundance index versus \ln population numbers for eastern Georges Bank haddock from the National Marine Fisheries Service **spring** survey with a Yankee 41 net during 1973-1981.

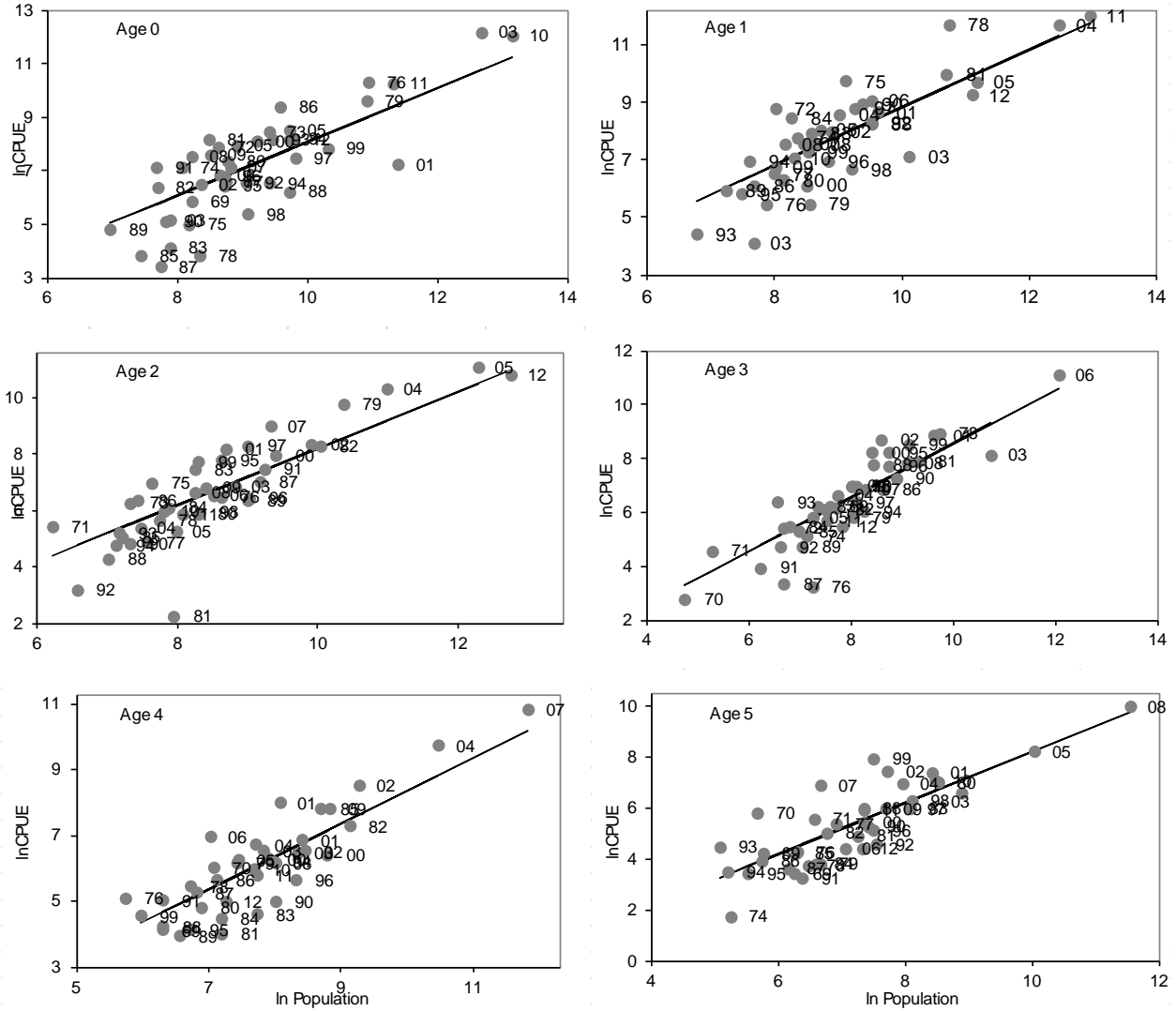


Figure 27. Age by age plots of the observed and predicted \ln abundance index versus \ln population numbers for eastern Georges Bank haddock from the National Marine Fisheries Service fall survey 1969-2012.

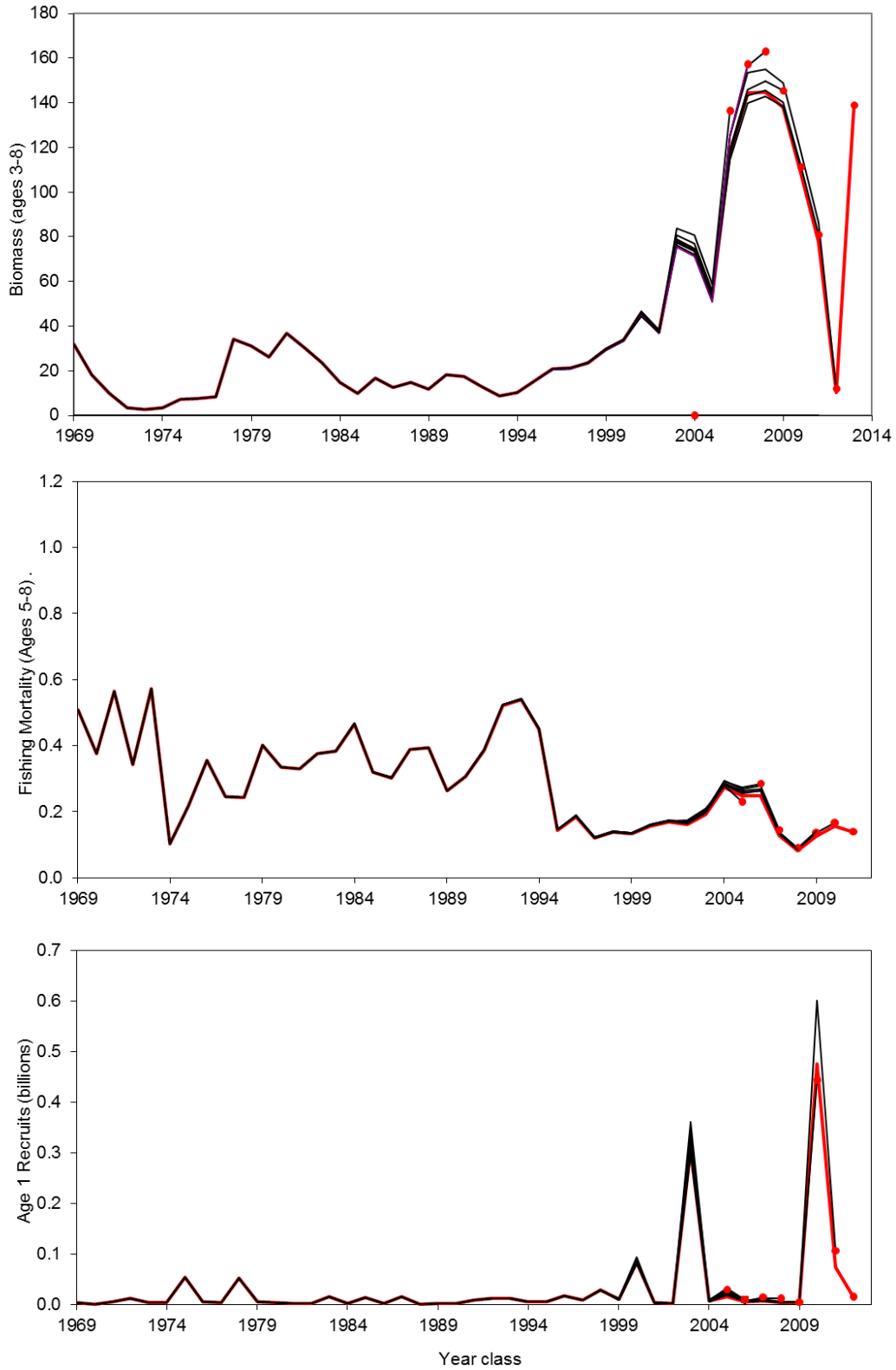


Figure 28. Retrospective results from virtual population analysis of eastern Georges Bank haddock for biomass (ages 3-8), fishing mortality (ages 5-8) and recruits (age 1) as successive years of data are excluded in the assessment. The present assessment (2013) is indicated in red.

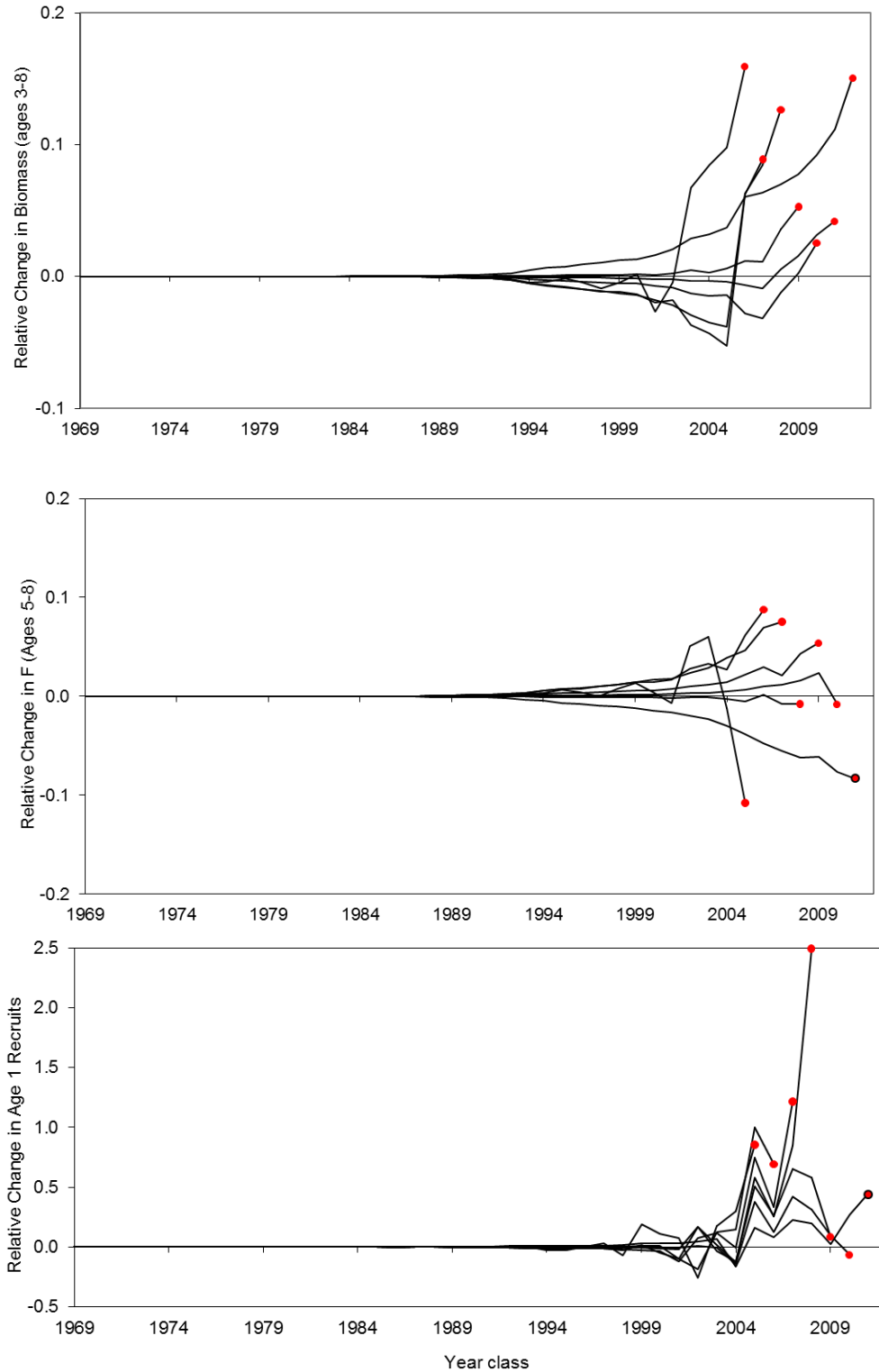


Figure 29. Relative retrospective results from virtual population analysis of eastern Georges Bank haddock for biomass (ages 3-8), fishing mortality (ages 5-8) and recruits (age 1) as successive years of data are excluded in the assessment. Changes are relative to the 2013 assessment.

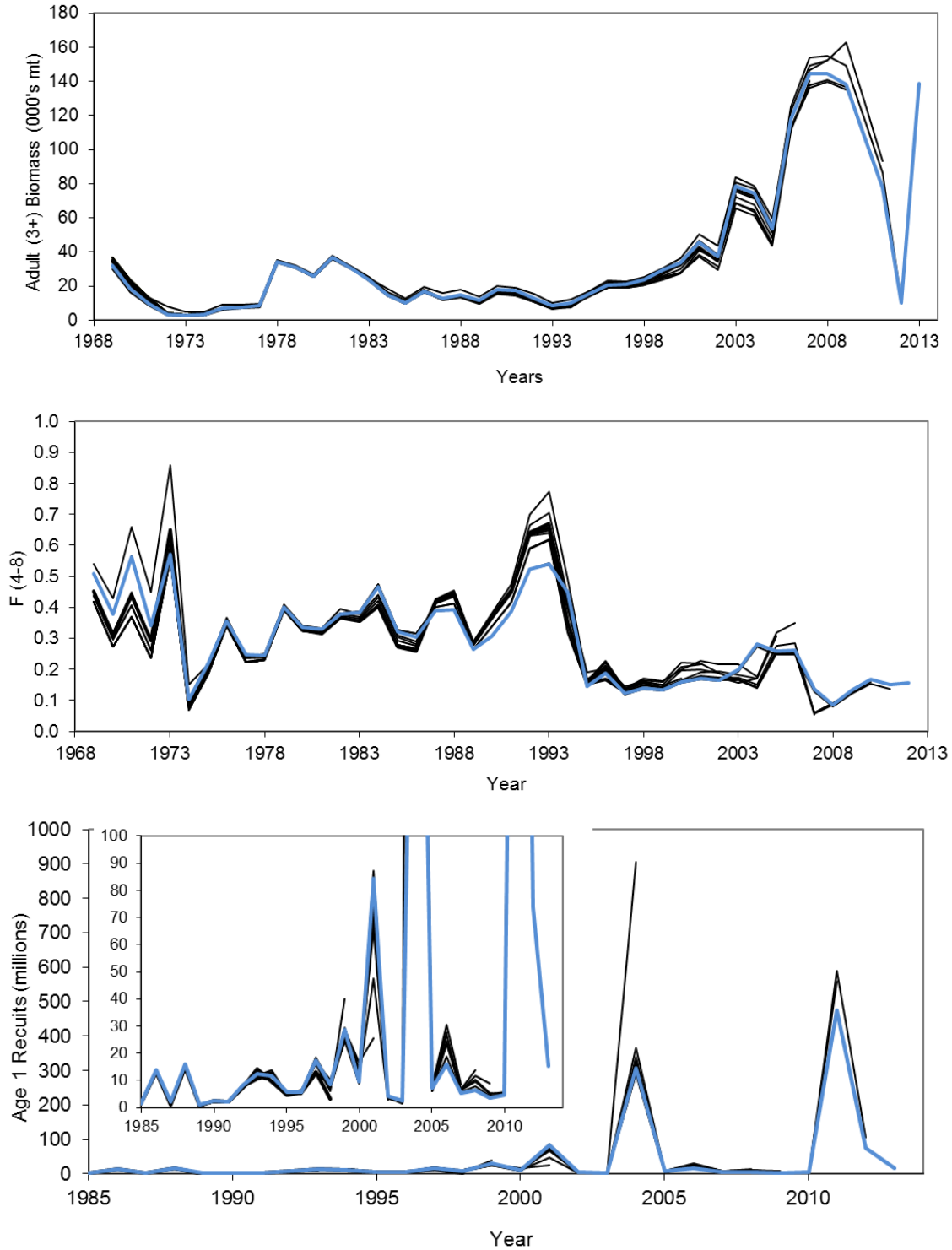


Figure 30. Historical retrospective analysis of 1969 to 2013 3+ biomass (top panel), age 4-8 population weighted fishing mortality (middle panel) and 1984 to 2012 recruitment (lower panel) from the 1998 to 2013 eastern Georges Bank haddock assessments. The insert in the lower panel is an expansion of the 0 to 100 million recruitment axis. The 1998 assessment is the last benchmark. The 2013 assessment is indicated in blue.

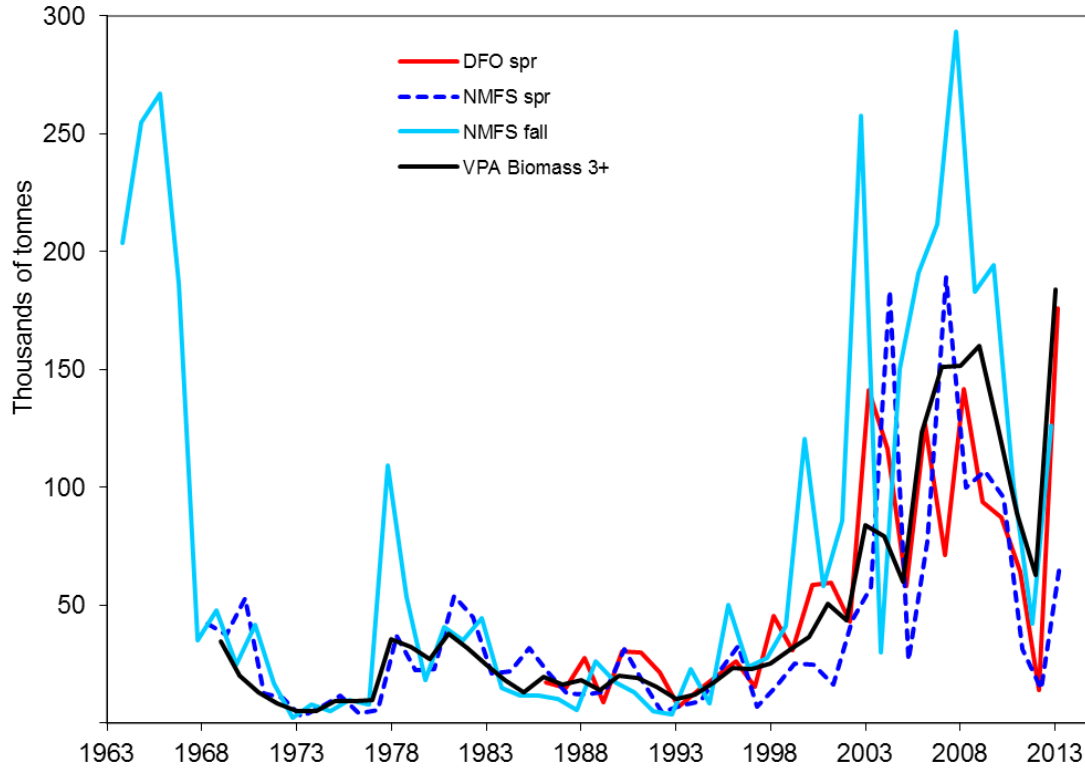


Figure 31. The 1969 to 2013 eastern Georges Bank adult haddock (ages 3+) biomass trend from virtual population analysis compared with the survey adult biomass (scaled with catchabilities) trends.

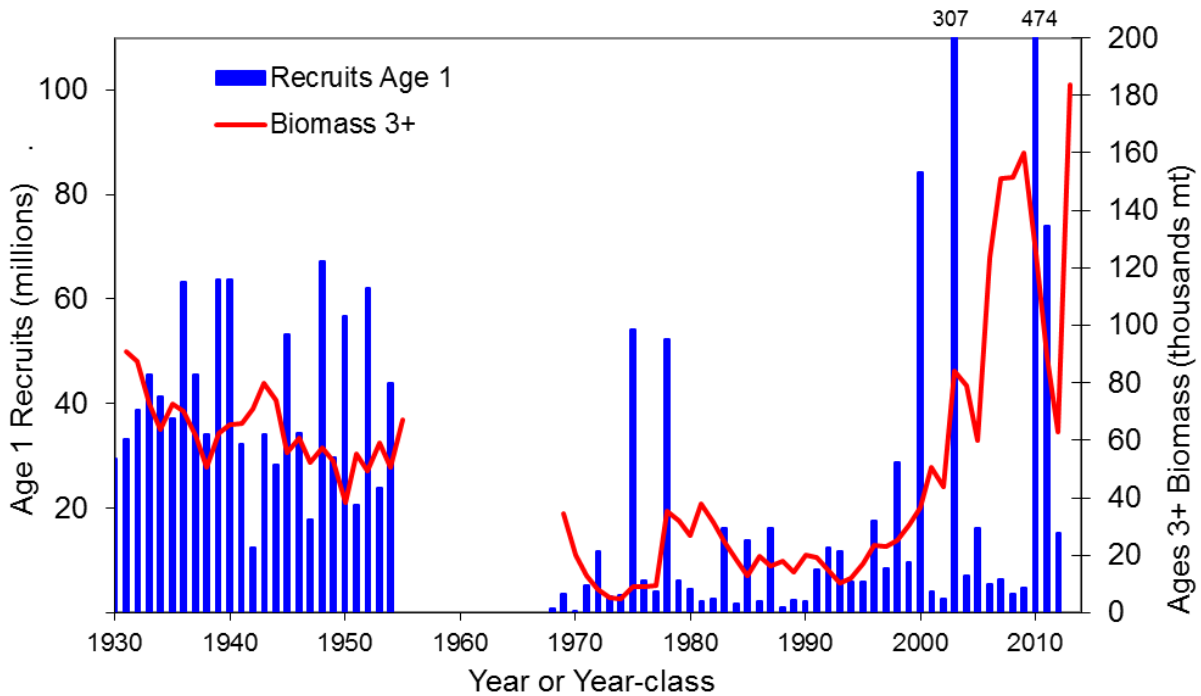


Figure 32. Beginning of year adult (3+) biomass and number of age 1 recruits for eastern Georges Bank haddock during 1931-1955 and 1969-2013.

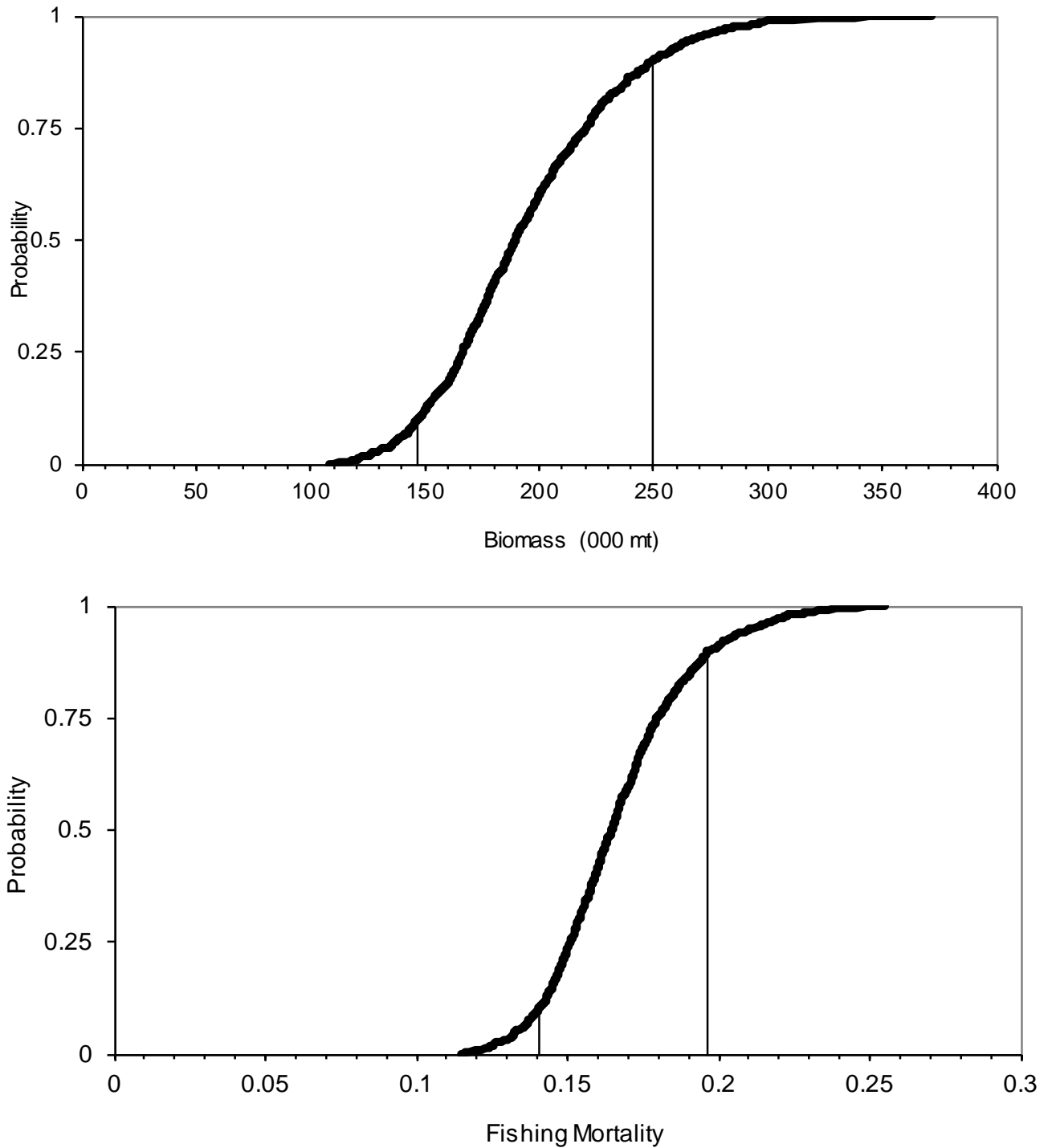


Figure 33. Cumulative probability distribution with 80% confidence intervals for 2013 age 3+ biomass (000 mt) and 2012 age 5-8 fishing mortality for eastern Georges Bank haddock.

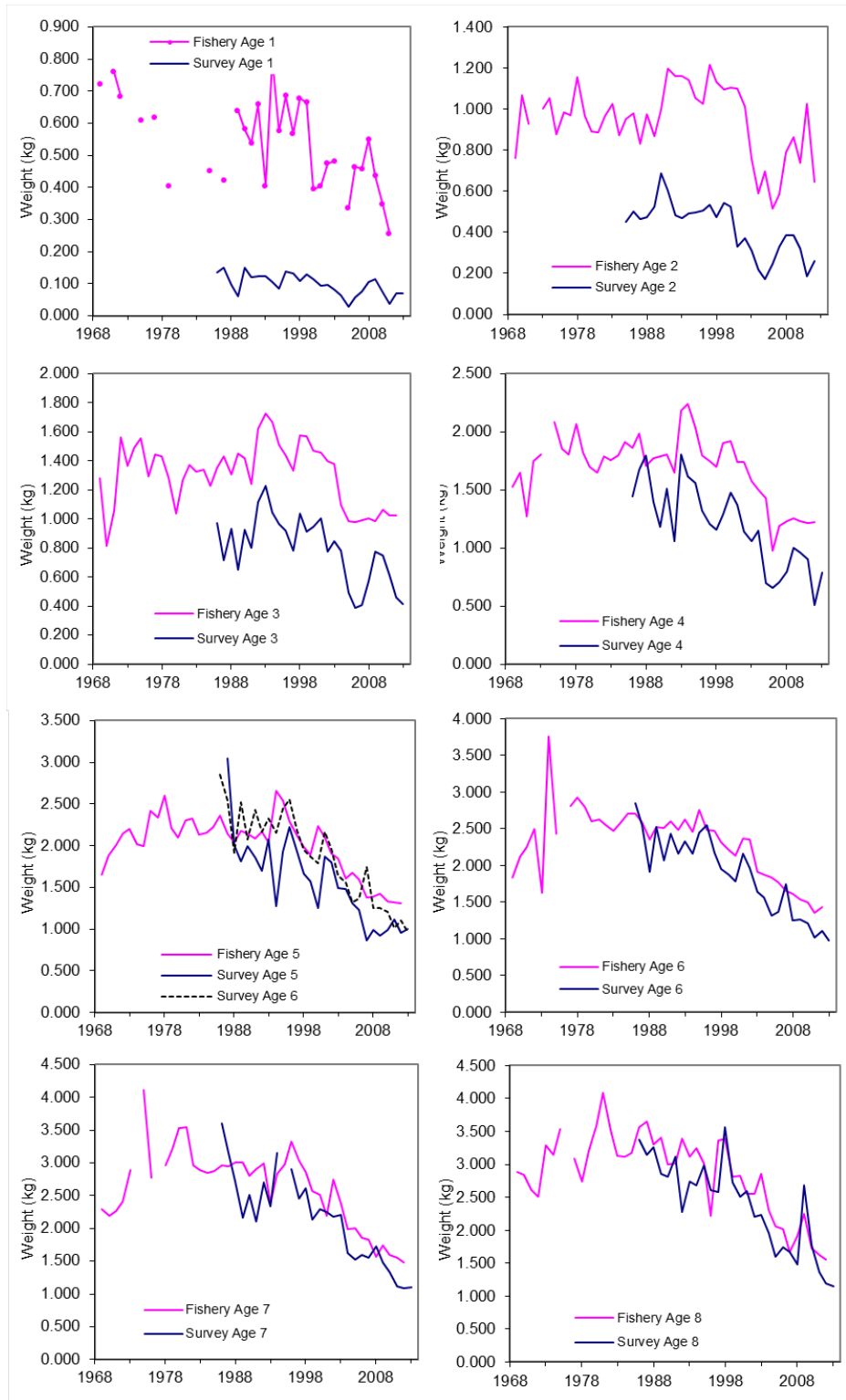


Figure 34. Average weights at age for eastern Georges Bank haddock from the Canada/USA commercial groundfish fishery during 1969-2012 and from the Canadian Department of Fisheries and Oceans survey during 1986-2013.

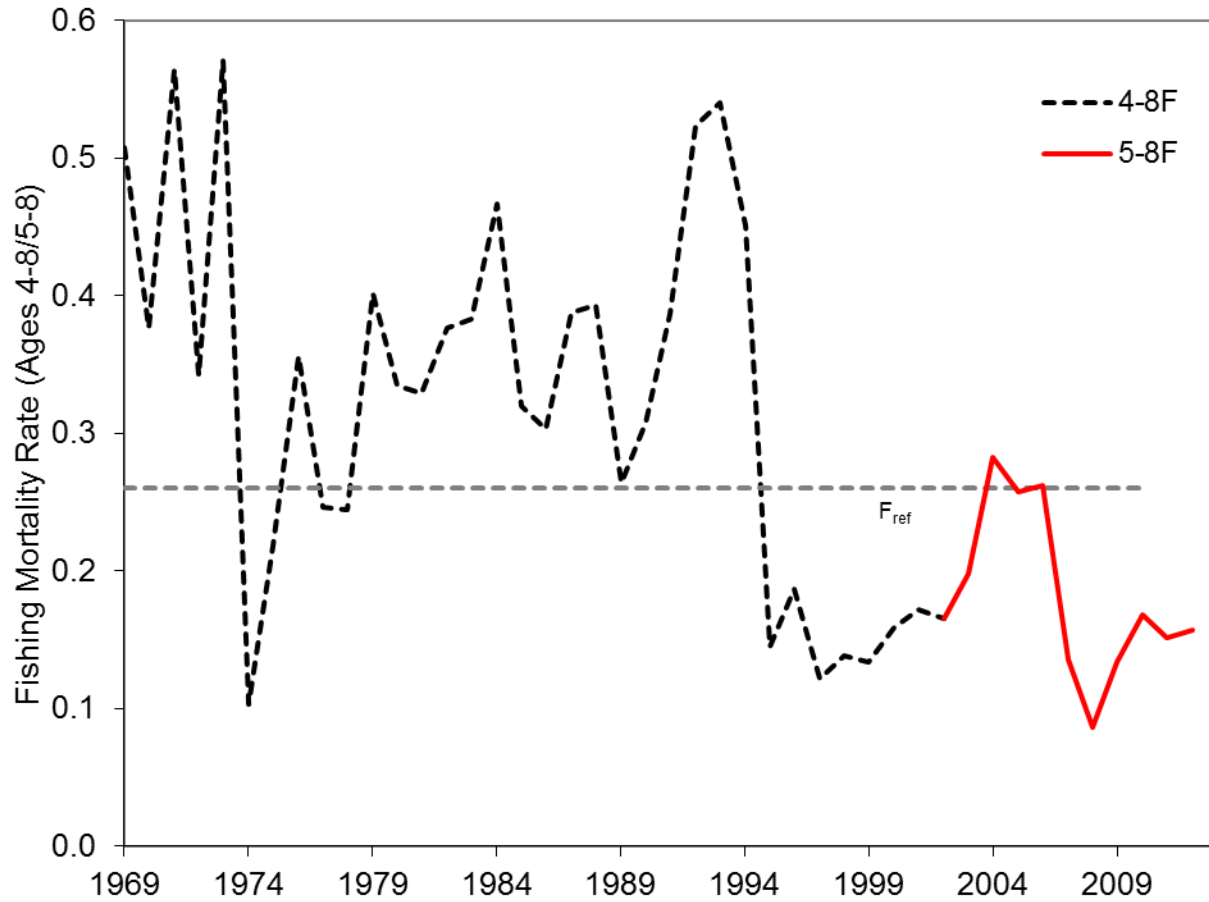


Figure 35. Fishing mortality rate (weighted by population) for eastern Georges Bank haddock ages 4+ and 5+ during 1969-2012 and the fishing mortality threshold reference established at $F_{ref} = 0.26$.

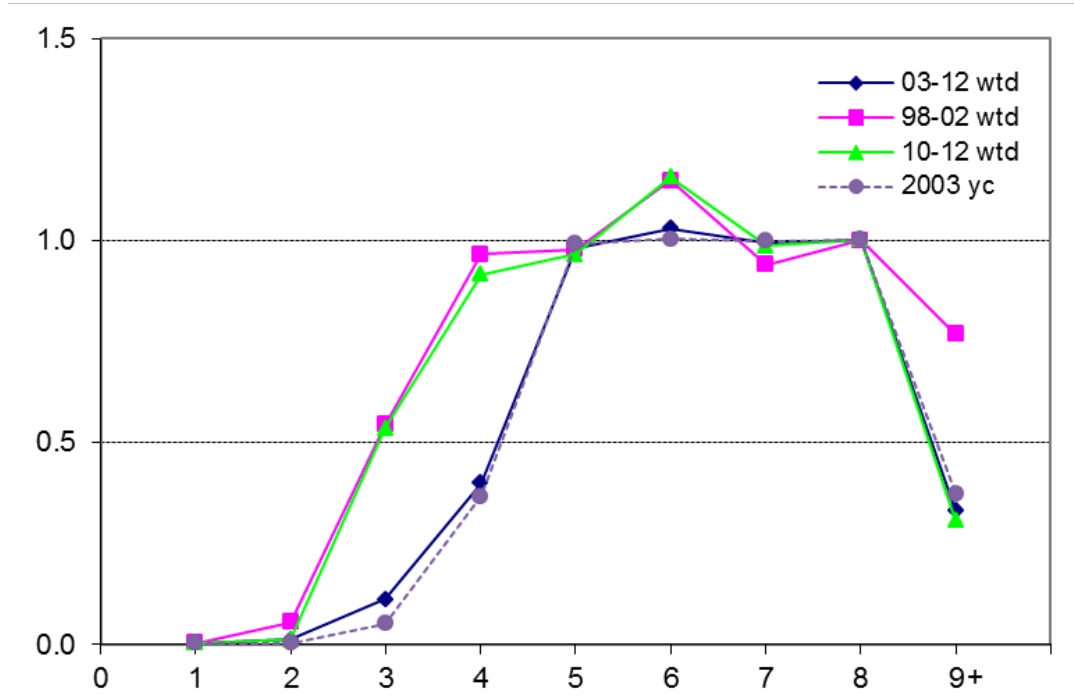


Figure 36. Partial recruitment of eastern Georges Bank haddock for the population weighted average of 1998 to 2002, 2003 to 2012 and 2010 to 2012 and for the 2003 year class. The partial recruitment is normalized to ages 4-8 for years before 2003 and to ages 5-8 for years after 2002.

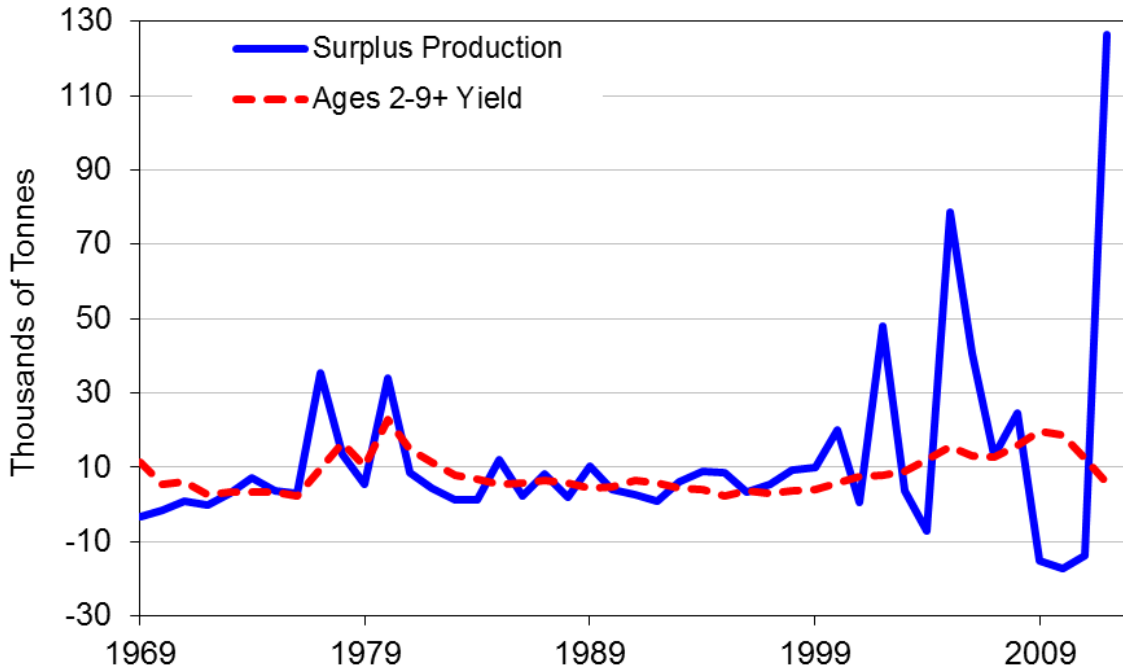


Figure 37. Surplus production of eastern Georges Bank haddock available to the commercial fishery compared to the harvested yield during 1969-2012.

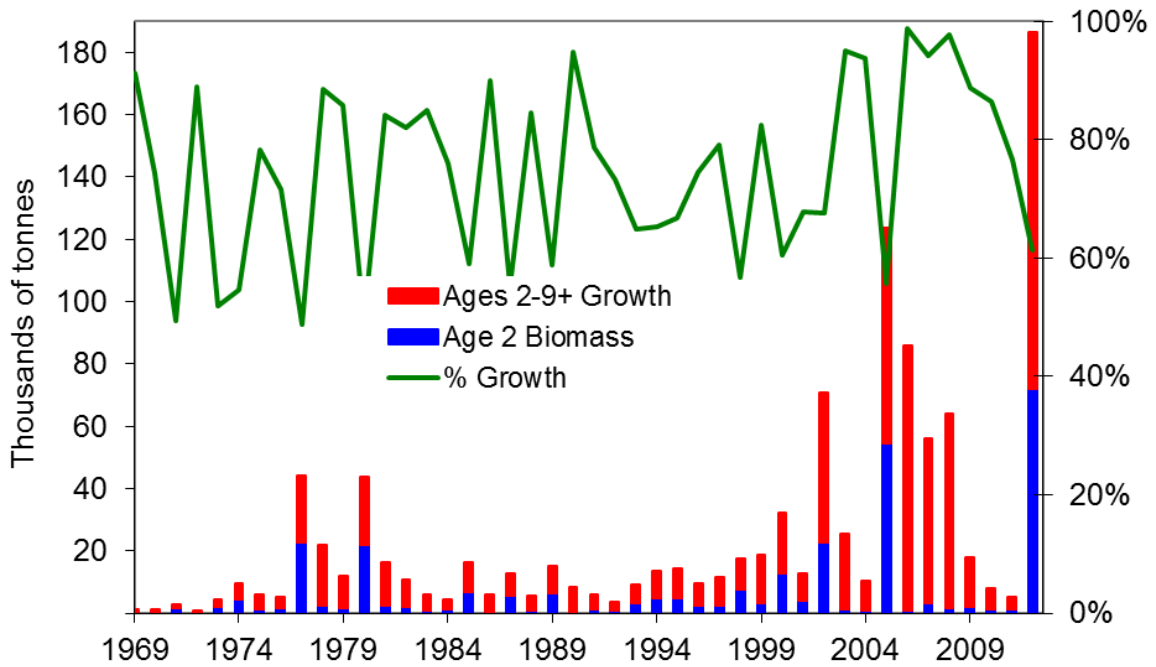


Figure 38. Amount of productivity attributable to growth (ages 2 to 9+) of eastern Georges Bank haddock and the amount contributed by recruitment (age 2) during 1969-2012.

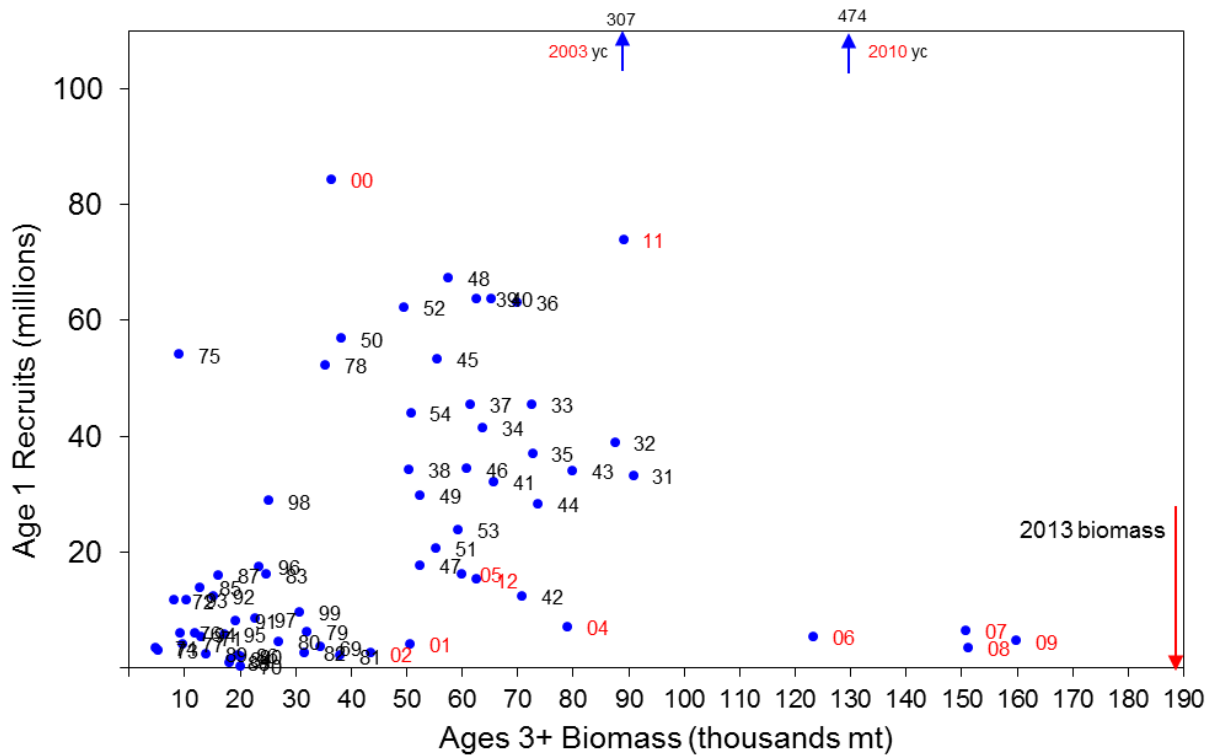


Figure 39. Relationship between eastern Georges Bank adult (ages 3+) haddock biomass during 1931-1955 and 1969-2012 and recruits at age 1. The year classes since the 2000 are labeled in red font.

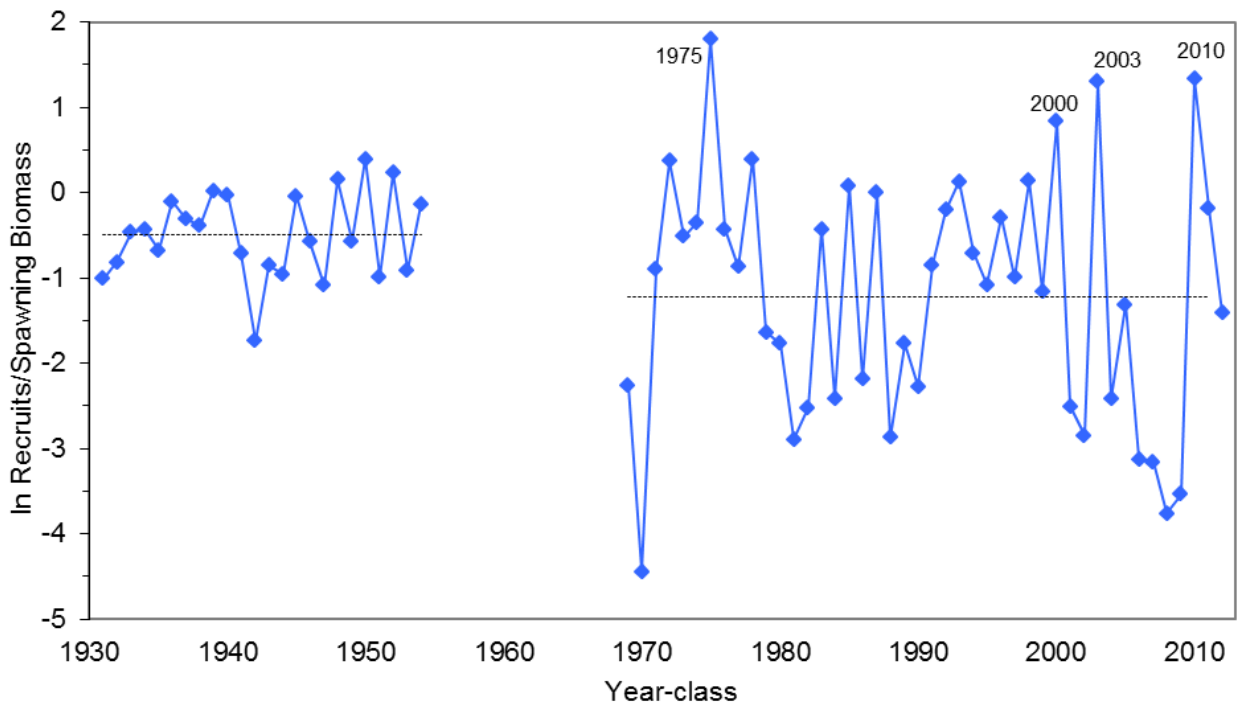
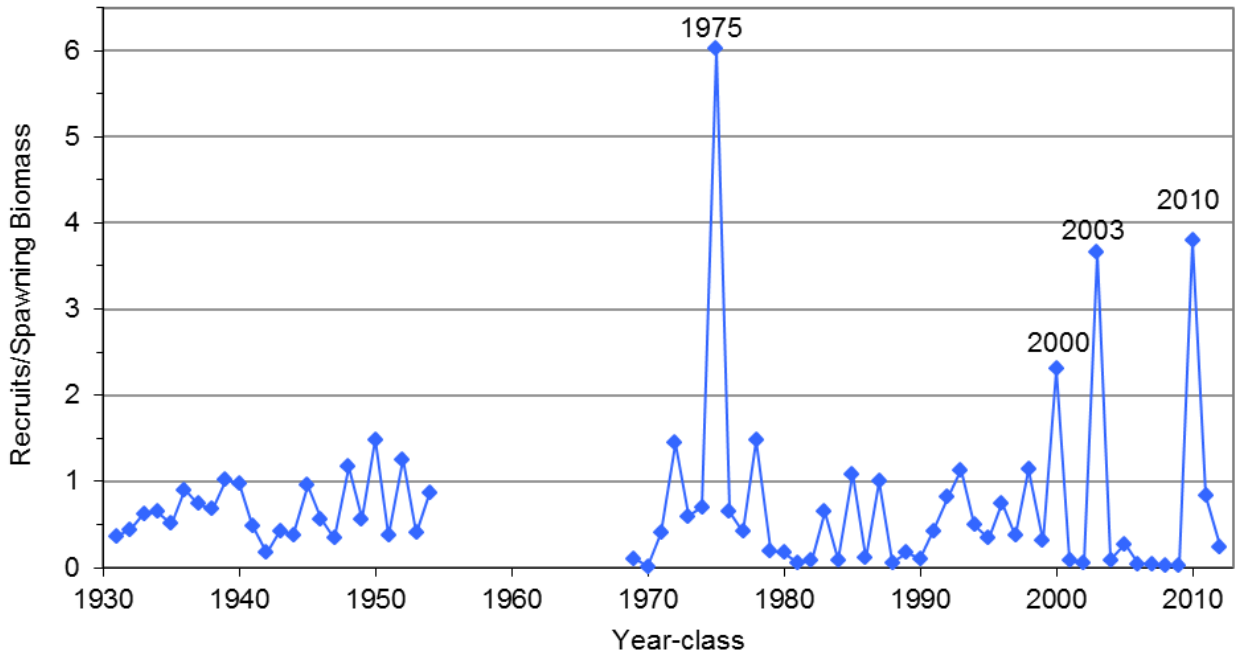


Figure 40. Ratio of recruits (numbers at age 1) to spawning biomass (kg) for eastern Georges Bank haddock during 1931-1955 and during 1969-2012. Upper graph is in absolute numbers, lower graph is on a ln scale. Dotted lines in lower graph indicate averages over the two periods.

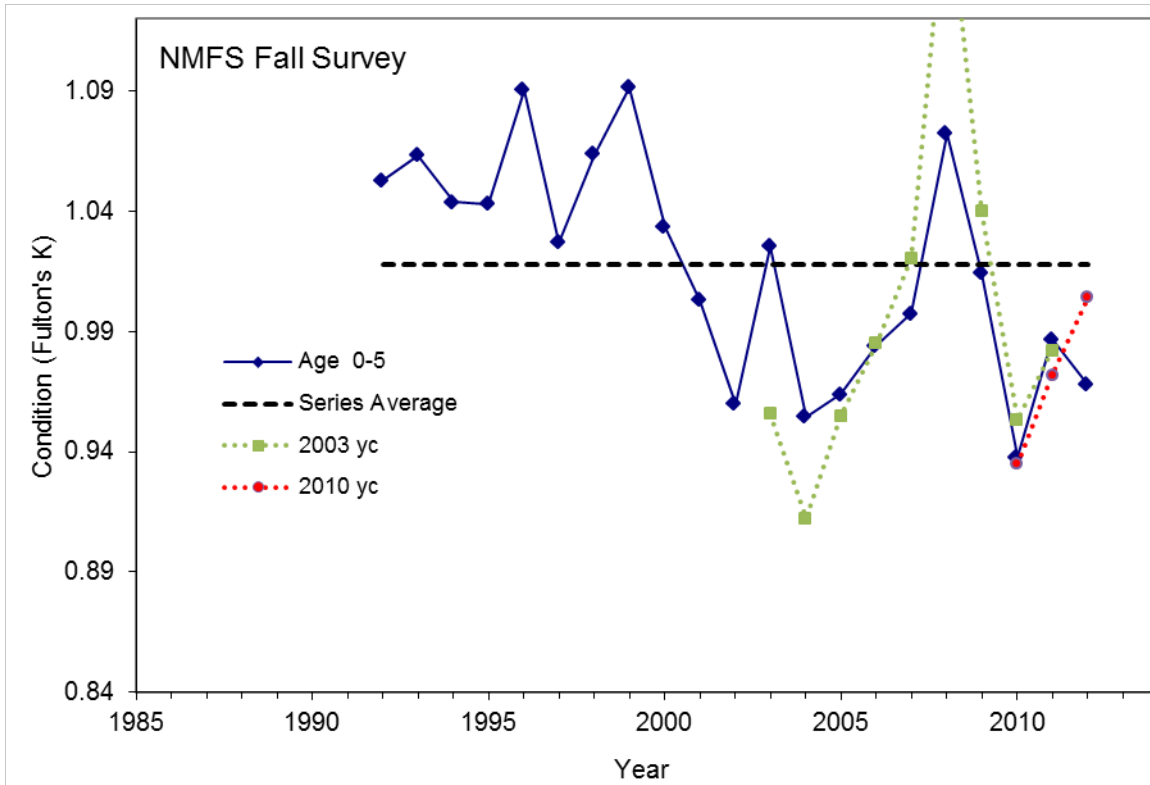
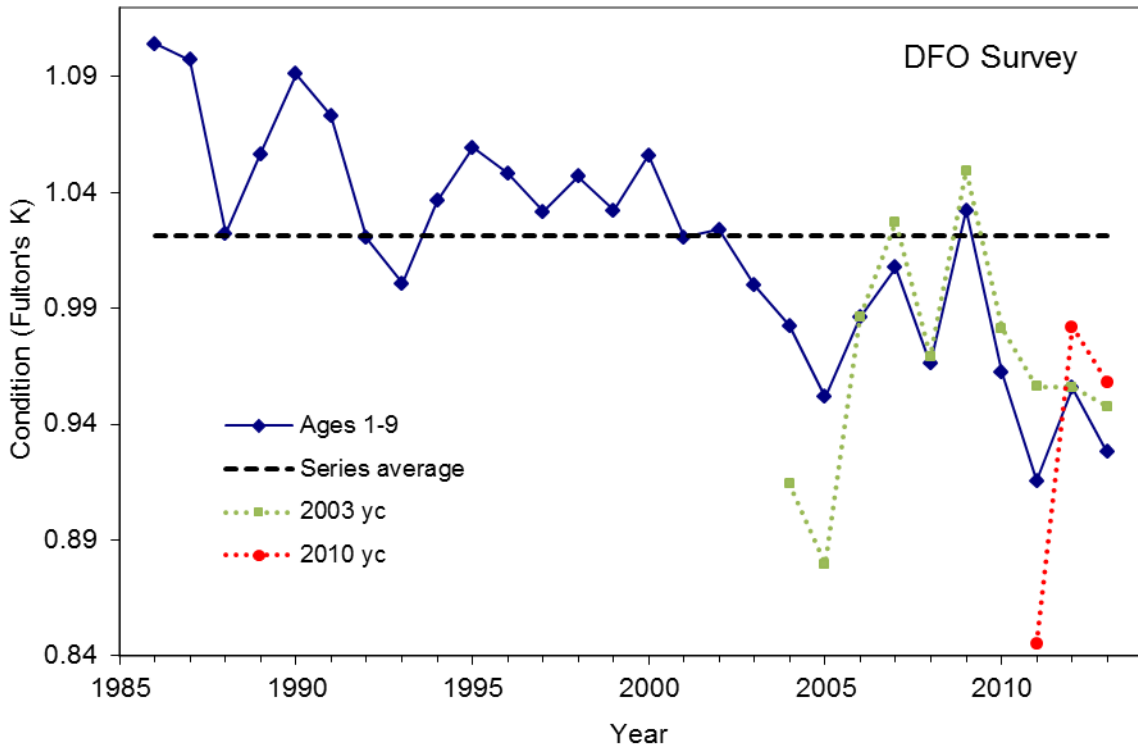


Figure 41. Condition as indicated by Fulton's K for eastern Georges Bank haddock from the Canadian Department of Fisheries and Oceans survey for age group 1-9 during 1986-2013 (upper panel) and from the NMFS fall survey for ages 0-5 (lower panel) compared to the average for each time series. The 2003 and 2010 year classes are also shown.

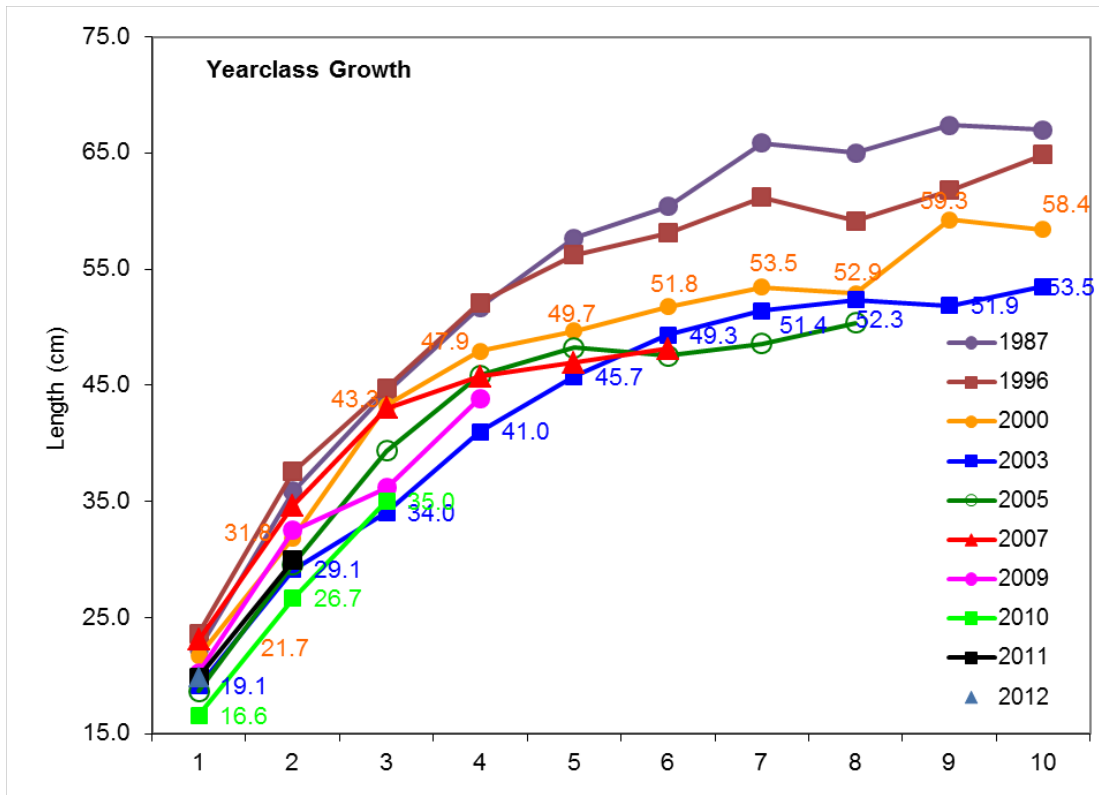


Figure 42. Length at age of eastern Georges Bank haddock year classes from the DFO survey.

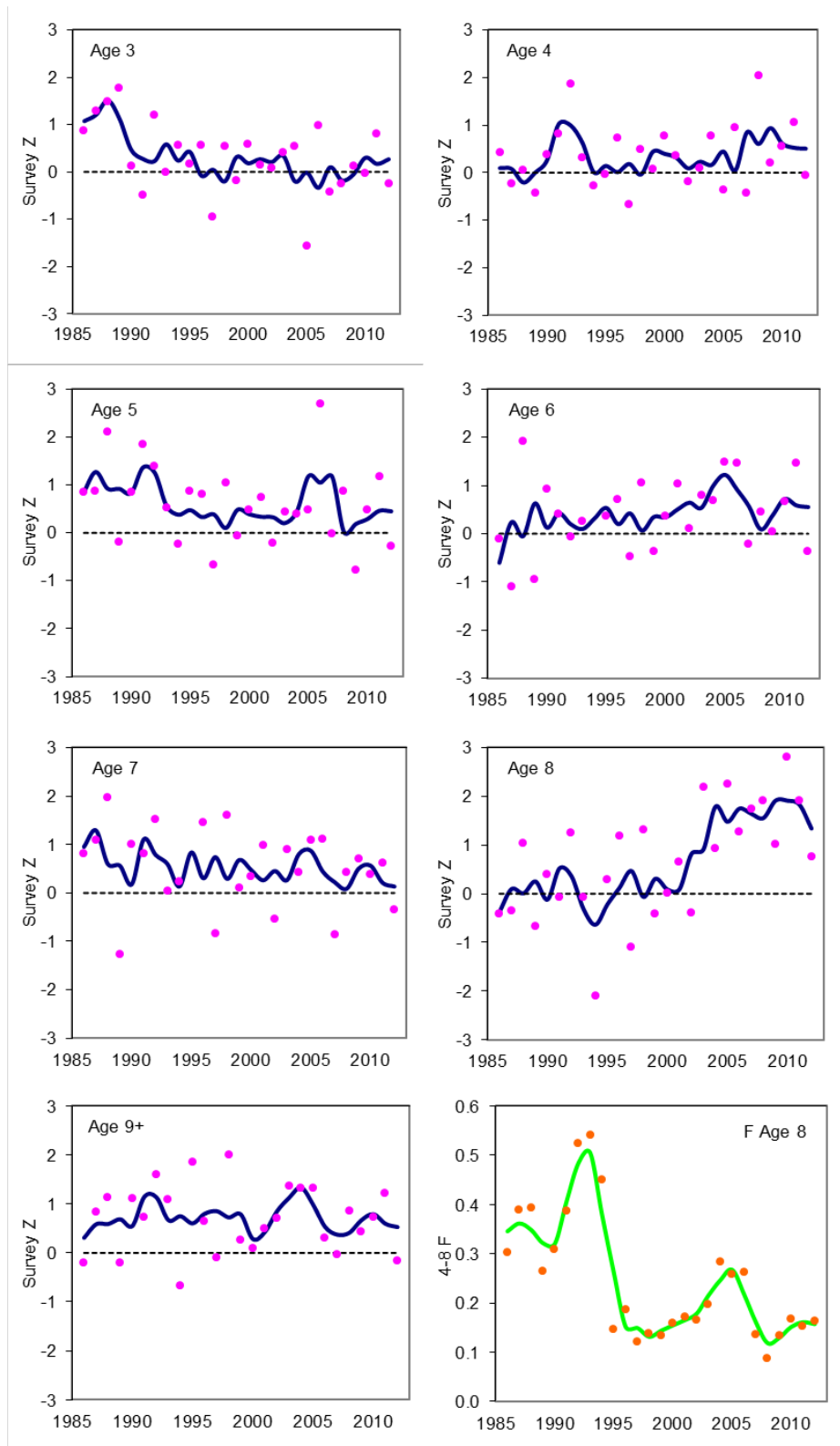


Figure 43. Eastern Georges Bank haddock total mortality (Z's) for ages 3 to 9+ for 1986 to 2012 from the Canadian Department of Fisheries and Oceans survey and the age 8 fishing mortality from VPA (bottom right).

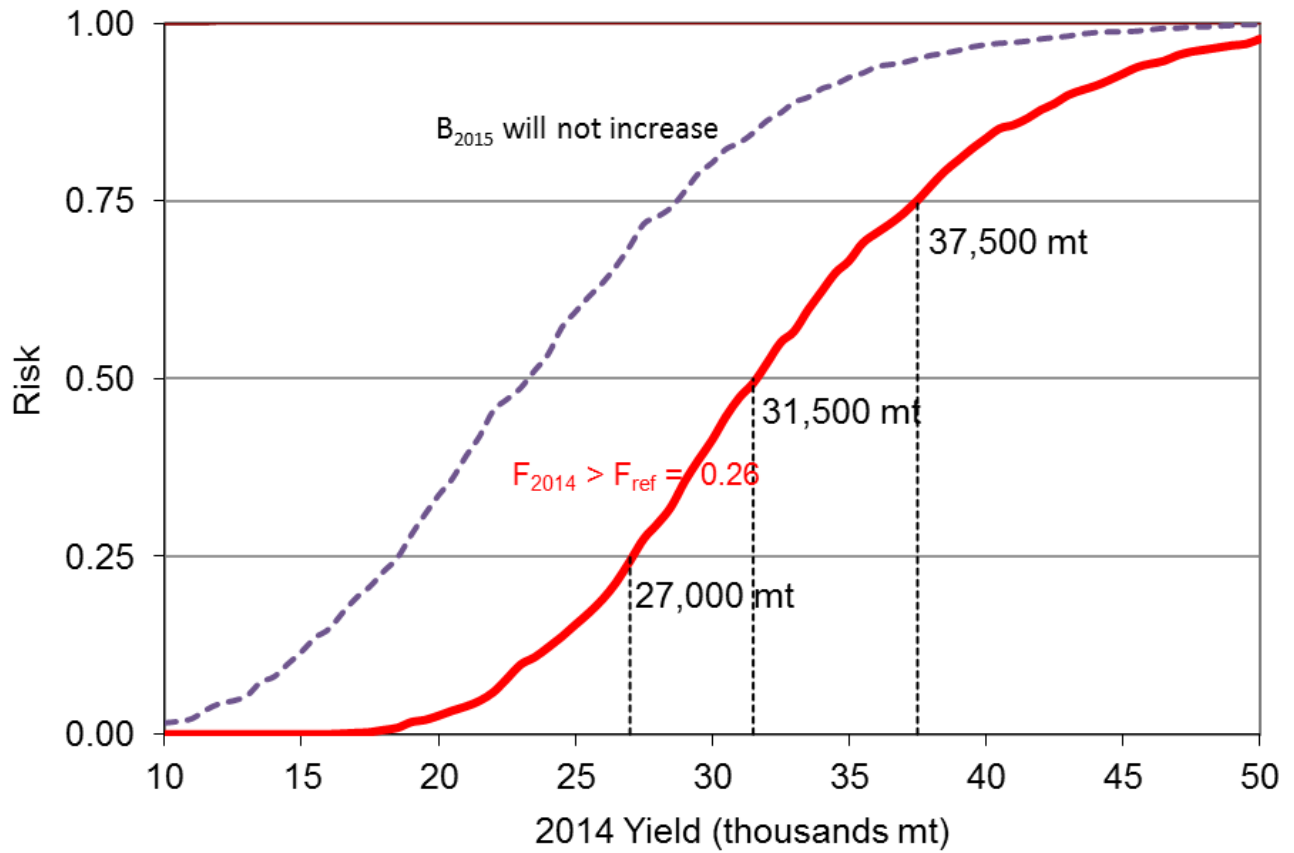


Figure 44. Risk of 2014 fishing mortality exceeding $F_{ref} = 0.26$ for eastern Georges Bank haddock for increasing catch quotas.

APPENDIX A

Comparison of EGB haddock TRAC catch advice, TMGC quota decision, actual catch, resulting fishing mortality and biomass changes. All catches are calendar year catches. In the "Results" column, values in italics are assessment results in the year immediately following the catch year; values in normal font are results from the 2013 assessment. This table was kindly provided by Tom Nies (New England Fisheries Management Council) in 2011 and updated to the 2013 assessment.

| TRAC | Catch Year | TRAC Analysis/Recommendation | | TMGC Decision | | Actual Catch/ Compared to Risk Analysis | Results | Comments ² |
|--|------------|-------------------------------|---|---------------|---|---|---|---|
| | | Amount | Rationale/Biomass | Amount | Rationale | | | |
| 1999 ¹ | 1999 | 6,300 mt | F _{0.1} | NA | NA | 4,000 mt | <i>Below F_{0.1}</i> | |
| 2000 ¹ | 2000 | 8,800 mt | F _{0.1} | NA | NA | 5,600 mt | <i>Below F_{0.1}</i> | |
| 2001 ¹ | 2001 | 9,700 mt | F _{0.1} | NA | NA | 7,300 mt | <i>Below F_{0.1}</i> | |
| 2002 ¹ | 2002 | 10,700 mt | F _{0.1} | NA | NA | 7,500 mt | <i>Below F_{ref} = 0.26</i> | |
| <i>Transition to TMGC process in following year; note catch year differs from TRAC year in following lines F's below are based on Age 5+</i> | | | | | | | | |
| 2003 | 2004 | (1) 20,000 mt (2) 8,000 mt | (1) Low risk of exceeding F _{ref} (2) Neutral risk of biomass decline | 15,000 mt | Low risk of exceeding F _{ref} and reduction in biomass > 10% | 11,800 mt Low risk of exceeding F _{ref} | <i>F = 0.17 Age 3+ biomass decrease of 27% 2004 to 2005</i> F = 0.283 Age 3+ biomass decreased 24% 2004 to 2005 | In projection, PR on age 4 (2000 year class) was set to 1. Realized was 0.3. Fully recruited ages now 5 – 8. |
| 2004 | 2005 | 26,000 mt | Neutral risk of exceeding F _{ref} Adult biomass will increase substantially 3+ B ₂₀₀₆ =513,700 mt | 23,000 mt | Low risk of exceeding F _{ref} Adult biomass will increase substantially | 15,100 mt Low risk of exceeding F _{ref} | <i>F = 0.29 Age 3+ biomass increase of 142% 2005 to 2006</i> F = 0.258 Age 3+ biomass increased 106% 2005 to 2006 3+ B ₂₀₀₆ =123,300 mt | Higher F due to lower realized PR and weights at age for 2003 year class and lower weights for 2000 year class. Large biomass increase due to 2003 year class. |
| 2005 | 2006 | 22,000 mt/18,000 mt | Neutral/low risk of exceeding F _{ref} 3+ B ₂₀₀₇ =157,400 mt | 22,000 mt | Neutral risk of exceeding F _{ref} | 12,642 mt Low risk of exceeding F _{ref} | <i>F = 0.36 Age 3+ biomass increase of 26% 2006 to 2007</i> F = 0.262 Age 3+ biomass increased 22% 2006 – 2007 3+ B ₂₀₀₇ =150,900 mt | Higher F due to lower realized PR and weights at age for 2003 year class and lower weights for 2000 year class. |

Eastern Georges Bank Haddock for 2013

| TRAC | Catch Year | TRAC Analysis/Recommendation | | TMGC Decision | | Actual Catch/ Compared to Risk Analysis | Results | Comments ² |
|------|------------|------------------------------|---|---------------|--|---|---|--|
| | | Amount | Rationale/Biomass | Amount | Rationale | | | |
| 2006 | 2007 | 19,000 mt/16,000 mt | Neutral/low risk of exceeding F_{ref} $3+ B_{2008}=161,900$ mt | 19,000 mt | Neutral risk of exceeding F_{ref} | 12,680 mt Low risk of exceeding F_{ref} | $F = 0.14$ Age 3+ biomass increase of 4% 2007 – 2008 $F = 0.136$ Age 3+ biomass increased <1% 2007 to 2008 $3+ B_{2008}=151,300$ mt | 2003 year class specific values for projection inputs. |
| 2007 | 2008 | 26,700 mt/ 23,000 mt | Neutral/low risk of exceeding F_{ref} $3+ B_{2009}=145,700$ mt | 23,000 mt | Low risk of exceeding F_{ref} | 15,995 mt Low risk of exceeding F_{ref} | $F = 0.09$ Age 3+ biomass increase of 7% 2008 to 2009 $F = 0.087$ Age 3+ biomass increased 6% 2008 to 2009 $3+ B_{2009}=159,900$ mt | 2003 year class specific values for projection inputs. |
| 2008 | 2009 | 33,000 mt /28,000 mt | Neutral/low risk of exceeding F_{ref} $3+ B_{2010}=125,500$ mt | 30,000 mt | Low to neutral risk of exceeding F_{ref} | 19,707 mt Low risk of exceeding F_{ref} | $F = 0.13$ Age 3+ biomass decrease of 21% 2009 to 2010 $F = 0.133$ Age 3+ biomass decreased 22% 2009 to 2010 $3+ B_{2010}=125,000$ mt | 2003 year class specific values for projection inputs. |
| 2009 | 2010 | 29,600 mt/ 25,900 mt | Neutral/low risk of exceeding F_{ref} $3+ B_{2011}=94,700$ mt | 29,600 mt | Low to neutral risk of exceeding F_{ref} | 18,794 mt Low risk of exceeding F_{ref} | $F = 0.148$ Age 3+ biomass decrease of 28% 2010 to 2011 $F = 0.168$ Age 3+ biomass decreased 29% 2010 to 2011 $3+ B_{2011}=89,100$ mt | 2003 and 2005 year class specific values for projection inputs. |
| 2010 | 2011 | 22,000 mt/ 19,000 mt | Neutral/low risk of exceeding F_{ref} $3+ B_{2012}=67,800$ mt | 22,000 mt | Neutral risk of exceeding F_{ref} | 12,655 mt Low risk of exceeding F_{ref} | $F = 0.135$ Age 3+ biomass decrease of 29% 2011 to 2012 $F = 0.152$ Age 3+ biomass decreased 30% 2011 to 2012 $3+ B_{2012}=62,700$ mt | 2003 and 2005 year class specific values for projection inputs. |
| 2011 | 2012 | 16,000 mt/ 13,900 mt | Neutral/low risk of exceeding F_{ref} Adult biomass will increase substantially from 2012 to 2013 (2010 year class) $3+ B_{2013}=188,700$ mt | 16,000mt | Neutral risk of exceeding F_{ref} | 5,631 mt Low risk of exceeding F_{ref} | $F = 0.157$ Age 3+ biomass increased 193% 2012 to 2013 $3+ B_{2013}=183,600$ mt | 2003, 2005 and 2010 year class specific values for projection inputs. PR ₉₊ for projection higher than model |

Eastern Georges Bank Haddock for 2013

| TRAC | Catch Year | TRAC Analysis/Recommendation | | TMGC Decision | | Actual Catch/ Compared to Risk Analysis | Results | Comments ² |
|------|------------|------------------------------|--|---------------|-------------------------------------|---|---------|--|
| | | Amount | Rationale/Biomass | Amount | Rationale | | | |
| | | | | | | | | estimate. |
| 2012 | 2013 | 10,400 mt/ 9,300 mt | Neutral/low risk of exceeding F_{ref} . Adult biomass will increase substantially from 2012 to 2013 (growth of 2010 year class) $3+B_{2014}=306,000\text{mt}$ | 10,400 mt | Neutral risk of exceeding F_{ref} | N/A | N/A | 2003 year class values for 2010 year class inputs. Model estimate for PR_{9+} used for projection. |
| 2013 | 2014 | 31,500 mt/ 27,000 mt | Neutral/low risk of exceeding F_{ref} . Adult biomass will decrease slightly from series maximum projected for 2014. $3+B_{2015}=240,000\text{ mt}$ | N/A | N/A | N/A | N/A | 2003 year class values for 2010 year class inputs. Model estimate for PR_{9+} used for projection. |

¹ Prior to implementation of US/CA Understanding

² Comments by L. Van Eeckhaute