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An Assessment of the Status of Redfish in NAFO Division 3O

by

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Abstract

There are two species of redfish, the deep sea redfish (*Sebastes mentella)* and the Acadian redfish (*Sebastes fasciatus*) that have been commercially fished and reported collectively in fishery statistics in Div. 3O. Nominal catches have ranged between 3 000 t and 35 000 t since 1960. Up to 1986 catches averaged 13 000 tons and subsequently increased to a maximum value of 35 000 tons in 1988, exceeding the TAC by 21,000 tons. Following 1988 catches generally declined to a low of 3,000 tons in 1995, partly due to reductions in foreign allocations within the Canadian fishery zone since 1993. There was an overall increasing trend in catch over the next five years to a high value of 20 000 tons in 2001. Then, catch declined to 4000 t in 2008 and has remained below 8500 t since that time with a mean of approximately 7900 t taken annually during 2013-2015. Assessment of this stock has been based primarily on research survey data due to variable commercial indices and fleets prosecuting different areas of the stock. It is difficult to reconcile year to year changes in the indices, but generally, the Canadian spring survey biomass index suggests the stock may have increased between the early and mid 1990s, fluctuated over 100,000 tons from 1994 to 1999 and declined to 20,000 t in 2002. Then, the index increased to 280,000 t in 2008, which approximates the time series high, but it has been variable at lower levels since then. The index mean was 130,000 t for 2013-2015. The Canadian autumn survey, while more stable in the early 1990s, generally supports the pattern of the spring survey index indicating a gradual increase from 18,000 t in 2003 to 150 000 t in 2010. Then, index values were stable until 2012, but decreased in 2013 and was lower again in 2015 at 43,000 t. Canadian RV surveys do not adequately sample fish greater than 25 cm, which in some years comprise a large portion of the fishery, making interpretation of survey estimates difficult. The fishery since 1998 appeared to target the relatively strong 1988 year class, and more recently a strong year class born in the early 2000s. There is concern that there has been little sign in recent surveys of size groups smaller than 17 cm despite using a shrimp trawl, which is very effective at catching small fish.

Introduction

Two species of redfish have been commercially fished in Div. 3O, the deep sea redfish (*Sebastes mentella)* and the Acadian redfish (*Sebastes fasciatus*). The two species are difficult to distinguish based on external characteristics, and as a consequence are reported collectively as “redfish” in the commercial fishery statistics. A recent study (Valentin *et al.* 2015) showed that some juvenile *S. fasciatus* sampled in the Gulf of St. Lawrence had the genetic signature of adult redfish from Divs. 3LNO and southern 3Ps. These findings suggest that stock structure is not well understood for not only Div. 3O but also neighbouring redfish stocks.

Most of the habitable redfish area in Div. 3O lies within Canada's 200 mile exclusive fishery zone and has been subject to management regulation since 1974. Approximately 8% of the habitable redfish area within Div. 3O lies within the NAFO Regulatory Area (NRA) and was brought under TAC regulation starting in 2005.

Nominal Catches and TACs

Nominal catches have ranged between 3 000 tons and 35 000 tons since 1960 (Table 1, Fig. 1). Catches averaged 13 000 t up to 1986 and then increased to 27 000 t in 1987 and 35 000 t in 1988 (exceeding TACs by 7 000 t and 21 000 t, respectively). Catches declined to 16 000 t by 1993 then to about 3 000 t in 1995, partly due to reductions in foreign allocations within the Canadian fishery zone since 1993. Catches increased to 20 000 t by 2001 and subsequently declined to 4000 t in 2008 and have been in the 6000 to 8400 t range since 2009.

The large redfish catches in 1987 and 1988 were due mainly to increased activity in the NRA by South Korea and non-Contracting parties (NCPs), primarily Panama. There has been no activity by NCPs in the NRA since 1994. Estimates of under-reported catch which have occurred primarily before 1995, have ranged from 200 tons to 23 500 tons. There have also been estimates of over-reported catch in the recent period since 2000, with a maximum value of 4 300 t in 2003.

A TAC of 16 000 tons was first implemented by Canada within its 200-mile limit in 1974. The TAC was increased in 1978 to 20 000 tons and generally remained at that level through to 1987. The TAC for 1988 was reduced to 14 000 tons and remained unchanged until 1994 when it was reduced to 10 000 tons as a precautionary measure and maintained at that level to 2003. In September 2004, the NAFO Fisheries Commission adopted TAC regulation for redfish in 3O, implementing a level of 20 000 tons for the entire division in 2005 and remaining in effect up to 2015.

Description of the Fishery

Russia predominated in the 3O redfish fishery up until 1993 (Table 2) and generally caught about 50% of the total non-Canadian allocation, which accounted for about 2/3 of the Canadian TAC. Russia and Cuba, impacted by the reduction and eventual elimination of foreign allocations by Canada, ceased directed fishing in 1994. Russia resumed directed fishing in 2000, rapidly increasing their catch from 2 200 tons to about 11 000 tons from 2001-2003 before a large reduction in catch to only 240 t in 2004. Generally, catches increased from 50 t in 2007 to about 1100 tons in 2015. Portugal began fishing redfish in Div. 3O in 1992 and averaged about 1 800 tons between 1992 and 1998. Their catches escalated to 5 500 tons in 1999 and have ranged between 3 200 – 6 400 tons thereafter with 4700 tons taken in 2015. Spain, which had taken less than 50 tons before 1996, increased catches from 1 200 tons in 1997 to a peak of 4 500 tons in 1999 with a subsequent decline to 300 tons in 2004. Since then, Spanish catch ranged between 600 – 1 700 with about 1500 tons taken in 2015.

Canada has had limited interest in a fishery in Div. 3O because of small sizes of redfish encountered in areas suitable for trawling. Canadian landings were less than 200 tons annually from 1983-1991. In 1994, Canada took 1 600 tons due to improved markets related to lobster bait, but reduced catch to less than 200 tons in 1995. Between 1996 and 1999 Canadian catches alternated between levels of about 8 000 tons and 2 500 tons based on market acceptance for redfish near the 22 cm size limit regulated within Canada. From 2000-2006 Canada averaged about 3 600 tons, followed by a decrease to 1000 tons in 2007. Canadian landings decreased further in 2008 and have been below 400 tons since then with only 283 tons reported for 2015.

Although the redfish fishery in Div. 3O has generally occurred throughout the year in the most recent decade, the majority of catch has been taken during the last three quarters of the year (Table 3a). The vast majority (>90%) of catch has been taken via bottom trawling by Canadian, Portuguese, Russian and Spanish fleets (Table 3b). Catches via mid-water trawl prior to 2005 were taken predominantly by Russia.

Commercial Fishery Data

Commercial fishery sampling

Sampling of the redfish fisheries was conducted by Spain (González-Costas *et al*., MS 2016), Portugal (Vargas *et al*., MS 2016), Estonia (Torra *et al*., MS 2016) and Russia (Fomin and Pochtar MS 2016) from the 2015 trawl fishery (Fig. 2). The Portuguese fleet fished between 150 and 567 m while the Russian fleet fished from 115-610 m. Sampling details for the Canadian fleets over time are given in Table 4. Canadian redfish landings have not been sampled since 2010. Lengths between 16-22 cm (range 6-36 cm) dominated the Portuguese catch in 2015. The Spanish catch was dominated by 19-25 cm fish (range 10-34 cm) while the Estonian catch had a modal length of 22-23 cm (range15-33 cm).

A compilation of catch at length from various fleets from 1995 to 2004 suggested that the size composition has changed over the time period with fleets catching a larger portion of fish >25 cm prior to 1998 (Power, MS 2005). These size compositions were converted to catch at length for 2001 to 2015 and compared to Canadian RV survey numbers at length in Figure 2. Dominant modes in length frequency plots from the Canadian autumn survey and commercial catches were similar during 2011 to 2013, but EU-Portugal catch modes were broader, composed of smaller fish than the rv survey and other commercial catches for 2014 and 2015.

Research Survey Data

Abundance Indices

Stratified random groundfish surveys have been conducted by Canada in the spring and autumn in Div. 3O since 1991, with regular coverage of depths to 730 m (and sporadic coverage of deeper strata in the autumn). In addition, a summer survey was conducted in 1993. Surveys utilized an Engel 145 otter trawl (1.75 n. mi. standard tow) from 1991 to spring 1995 and a Campelen 1800 shrimp trawl (0.75 n. mi. standard tow) from autumn 1995 to the present. The Engel 145 data were converted into Campelen 1800 trawl equivalent data based on comparative fishing trials (see Power and Atkinson MS 1998a). Vessel problems during the 2006 spring survey resulted in the completion of only a single tow in redfish depths. There was no fall survey in 2014.

Abundance (Tables 5 and 7) and biomass (Tables 6 and 8) estimates based on spring and autumn data from the Canadian surveys demonstrate large fluctuations between seasons and years for some strata. This is usually accounted for by the influence of one or two large sets on the survey. It is difficult to reconcile year to year changes in the indices, but generally, the spring survey biomass index (Fig. 3) suggests the stock may have increased between the early and mid-1990s, and subsequently declined to 2002 (21 000 t, 24 kg per tow). The low 1997 value is considered a sampling anomaly. The biomass index increased in 2003 and again in 2004 (103 kg per tow) but in 2004 was influenced by one large set in a stratum that represented 40% of the biomass index of 85 000 t. The biomass index has alternated between 60 000 t and 90 000 t between 2005 and 2009 (no data for 2006) and increased steadily to an estimate of 232 000 t (280 kg per tow) in 2012. Lower and variable index values were observed during 2013 to 2015, with 77,000 t (92.7 kg per tow) observed in 2015. Biomass estimates from the autumn surveys, while more stable in the early 1990s, generally support the pattern of the spring survey index with a gradual increase in the biomass index from 2003 (18 600 t: 22.5 kg per tow) to 2012 (154 000 t: 187 kg per tow) and lower values for 2013 (81,000 t; 98.1 kg per tow) and 2015 (43,000 t; 51.2 kg per tow). It should be noted that the 1996 autumn estimate does not include important strata that were not sampled due to problems on the survey. Also, there was no autumn survey in 2014.

Density estimates per stratum were generally lower in the NAFO Regulatory Area (denoted in Tables 5 - 8 as strata 354, 355, 356, 721, 722) compared to strata inside the Canadian 200 mile exclusive fishery zone, although it should be pointed out that part of these NRA strata overlap the Canadian zone. Estimates of the proportion of survey biomass within the NRA have ranged from 3% to 53% (average 15.7%) for the spring survey and 4% to 36% (average 19.6%) for the autumn survey.

Data were available from EU-Spain spring surveys conducted in the NAFO regulatory area (NRA) of Div. 3O from 1997 to 2015. These surveys use the same stratification scheme as the Canadian surveys and the area of redfish habitat covered in Div. 3O is less than 8% compared to the Canadian surveys for strata <732m. The surveys covered depths to 1500m (800 fathoms). Until 2001, these surveys were conducted with a Pedreira type bottom trawl and thereafter with a Campelen trawl similar to that used in Canadian surveys. The data prior to 2001 were converted into Campelen equivalent units.

The biomass indices for Div. 3O from the EU-Spain survey peaked at 773 kg per tow in 2010, and have been considerably lower since then. The 2015 index value was 341 kg per tow (Fig. 4). Six of the most recent seven biomass index values from the EU-Spain survey in Div. 3O were above the series mean.

Recruitment

Size distributions from the Canadian spring (Fig. 5) and autumn surveys (Fig. 6) in terms of mean number per tow at length indicates a bimodal distribution in 1991 corresponding to a 1988 and 1984 year-class respectively. The 1984 year-class progressed at about one cm per year up to 1994 and cannot be traced any further. The 1988 year-class remained dominant but progressed slowly between 22-25 cm based on the 2001-2007 surveys, then decreased substantially. Recruitment pulses detected in both surveys in 1999 were greatly diminished by 2002. There was a new relatively large pulse at 17cm in the 2007 surveys corresponding to a year class born in the early 2000s that has remained the dominant mode to 2015. Although their presence was detected at smaller sizes in previous surveys, the sudden increase in density at 17cm in 2007 is unusual. At a modal length of 22-23 cm in 2015, this pulse is now recruiting fully to the fishery. No strong recruitment pulses are apparent at smaller sizes in the Canadian or EU-Spain surveys.

The size distributions of the survey catches indicate only a narrow range of sizes caught each year in Div. 3O. Generally fish smaller than about 10 cm and larger than about 25 cm are absent in survey catches from 1991-2000 which cover strata down to 732 m (400 fathoms). It is well documented that the Engel survey gear (e.g. Power MS 1995) and the Campelen survey gear (e.g. Power and Atkinson, MS 1998b) can catch both smaller (than 10 cm) and larger (than 25 cm) redfish. A recent study (Valentin *et al*. 2015) showed that juvenile S. *fasciatus* sampled from strong year-classes that disappeared from the Gulf of St. Lawrence at ages five to six, had the genetic signature of adult redfish from Divisions 3LNO and southern 3Ps. The dynamics of local versus distant recruitment of redfish in Div. 3O is not understood, but may be linked to the sudden appearance of fish around 17 cm in Div. 3O. Length sampling from the commercial fisheries in the mid-1990s reveals a higher proportion of fish greater than 25 cm compared to the survey catches (see Power, MS 2005). Therefore, it appears that fish sizes outside this range, especially fish greater than 25 cm, are generally unavailable to the gear in this area. The reasons for this are unknown but may be related to distribution relative to trawlable bottom.

Catch/Biomass ratio

A fishing mortality proxy was derived by simple catch to survey biomass ratios. In deriving a fishing mortality proxy, and because most of the catch is taken in the last three quarters of the year, the catch in year "n" was divided by the average of the Canadian Spring (year = n) and Autumn (year = n-1) survey biomass estimates to better represent the relative biomass at the time of the year before the catch was taken. Survey catchability (q) for redfish is not known but assumed to be less than one. All fish sizes were included in the survey biomass estimate. The results (Fig. 7) suggest that relative fishing mortality increased from 1998 to the highest estimate in the series in 2002. This relatively high value was maintained in 2003 but declined substantially in 2004. In 2005, relative fishing mortality increased once more and was around the series average. The 2006 estimate of fishing mortality was calculated using only the autumn survey biomass. In 2007-2008 the estimate of fishing mortality dropped to some of the lowest levels since the mid 1990s and has remained at similar levels up to 2015. It should be noted that the 2014 value is based only on the spring survey data.

Size at maturity

No new maturity at length data were analysed for this assessment. However, based on previous analyses of size at maturity for this stock estimated L50 is about 28 cm for females and 21 cm for males (Power and

Atkinson MS 1998). Based on current catches dominated by lengths between 18 cm-24 cm, it is clear that the fishery is based predominantly on immature fish.

State of the Stock

It is still not possible to determine absolute size of the stock. RV survey estimates suggest that stock size has decreased considerably from near time series highs in the late 2000s. Using the ratio of catch:biomass as a proxy for fishing mortality suggests a value less than 0.15 for 2007-2015, among the lowest levels observed since the mid 1990s. The appearance of a relatively strong year class (born in the early 2000s) in the 2007 and subsequent surveys constitutes the only sign of strong recruitment to the population since the relatively strong 1988 year-class. The bulk of the catches in recent years are comprised of fish less than 25 cm, suggesting that these fisheries continue to be comprised of predominantly immature fish (Power and Atkinson 1998 MS).

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Table 1. Estimated catches (t) and TACs of redfish in Div. 3O.

Year	Canada	Others	Catch [a]	TAC	Year	Canada	Others	Catch [a]	TAC
1960	100	4900	5000		1988	181	11111	34792	14000
1961	1000	10000	11000		1989	27	11029	13256	14000
1962	1046	6511	7557		1990	155	8887	14242	14000
1963	2155	7025	9180		1991	28	7533	8461	14000
1964	1320	14724	16044		1992	1219	12149	15268	14000
1965	203	19588	19791		1993	698	12522	15720	14000
1966	107	15198	15305		1994	1624	3004	5428	10000
1967	645	18392	19037		1995	177	2637	3214	10000
1968	52	6393	6445		1996	7255	2390	9845	10000
1969	186	15692	15878		1997	2554	2558	5112	10000
1970	288	12904	13192		1998	8972	4380	14052	10000
1971	165	19627	19792		1999	2344	10249	12593	10200
1972	508	15609	16117		2000	2206	10584	10003	10000
1973	133	8664	8797		2001	4893	17681	20274	10000
1974	91	13033	13124	16000	2002	3000	16453	17234	10000
1975	103	15007	15110	16000	2003	3125	18466	17246 [b]	10000
1976	3664	11684	15348	16000	2004	2616	3848	3753	10000
1977	2972	7878	10850	16000	2005	5501	6409	11305	20000 [c]
1978	1841	5019	6860	16000	2006	3580	7455	12610	20000
1979	6404	11333	17737	20000	2007	1053	6472	5179	20000
1980	1541	15765	17306	21900	2008	203	4816	4020	20000
1981	2577	10027	12604	20000	2009	255	6233	6431	20000
1982	491	10869	11360	20000	2010	260	6285	5234	20000
1983	7	7133	7340	20000	2011	97	5875	5972	20000
1984	167	9861	16978	20000	2012	0	6967	6967	20000
1985	104	8106	12860	20000	2013	75	7720	7795	20000
1986	141	10314	11055	20000	2014	374	7150	7524	20000
1987	183	12837	27170	20000	2015	283	8073	8356 d	20000

[a] Totals from 1983 to 2010 may include adjustments for estimated catches from various sources

[b] Midpoint of estimates ranging between 16100-18400

[c] Prior to 2005 TACs were set by Canada within its fisheries jurisdiction

d Based on daily catch reports from the NRA and Statlant 21A data for Canada

Table 2. Reported and estimated catches (t) of redfish in Div. 3O by country and year since 1992.

Year	Canada (M)	Canada (N)	France (SPM)	Japan	Portugal	Spain	Russia	Cuba	Ukraine	Estonia	Lithuania	Korea (S)	Faroe Islands	Latvia	Total	TAC	a
1992	27	1192	-	125	1468	-	5845	2776	-	-	-	1935	-	-	15268	14000	
1993	21	677	-	159	4794	-	6887	665	-	-	-	17	-	-	15720	14000	
1994	779	845	-	-	2918	26	60	-	-	-	-	-	-	-	5428	10000	
1995	4	173	-	264	1935	22	416	-	-	-	-	-	-	-	3214	10000	
1996	2124	5131	-	417	1635	338	-	-	-	-	-	-	-	-	9845	10000	
1997	693	1861	134	285	894	1245	-	-	-	-	-	-	-	-	5112	10000	
1998	2851	6121	266	355	1875	1884	-	-	-	-	-	-	-	-	14052	10000	
1999	317	2027	-	-	5469	4549	231	-	-	-	-	-	-	-	12593	10200	
2000	1326	880	-	-	4555	3747	2233	-	-	49	-	-	-	-	10003	10000	
2001	336	4557	-	-	3537	2792	11343	-	-	9	-	-	-	-	20274	10000	
2002	12	2988	-	-	4610	660	11182	-	-	-	1	-	-	-	17234	10000	
2003	32	3093	-	-	6382	1289	10794	-	1	-	-	-	-	-	17246	10000	
2004	276	2340	-	2	3279	320	242	-	3	2	-	-	-	-	3753	10000	
2005	137	5364	-	1	4555	1683	170	-	-	-	-	-	-	-	11305	20000	
2006	-	3580	-	0	5184	1294	977	-	-	-	-	-	-	-	12610	20000	
2007	-	1053	-	61	4755	1502	54	-	-	100	-	-	-	-	5179	20000	
2008	0	203	-	-	3850	603	82	-	-	42	139	-	100	-	4020	20000	
2009	-	255	-	-	4273	1691	169	-	-	100	-	-	-	-	6431	20000	
2010	218	42	-	-	3853	1692	474	-	-	103	-	-	163	-	6545	20000	
2011	-	97	-	-	4006	1661	570	-	-	121	5	-	-	82	6542	20000	
2012	-	0	-	-	4142	1572	971	-	-	181	-	-	101	-	6967	20000	
2013	75	0	-	-	4820	1135	1438	-	-	269	-	-	58	-	7795	20000	
2014	340	34	-	-	4720	932	1271	-	-	227	-	-	-	-	7524	20000	
2015	252	31	-	-	4659	1510	1086	-	-	817	-	-	-	-	8355	20000	

[a] Prior to 2005 TACs were set by Canada within it's fisheries jurisdiction

Table 3a. Nominal reported catches (t) of redfish in Div. 3O by month and year since 1992.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Unk	Total
1992	0	57	14	10	635	3262	2520	1808	896	1261	797	2108		13368
1993	226	14	754	817	2089	1601	1887	2068	1809	829	630	496		13220
1994	60	93	742	1609	236	83	-	68	1000	540	19	178		4628
1995	7	125	145	2	45	28	56	765	645	879	107	10		2814
1996	0	0	89	119	166	46	773	882	1685	2864	1539	1482		9645
1997	4	0	10	34	86	417	1298	909	622	1274	409	49		5112
1998	40	193	216	279	1329	2723	1924	953	1280	1964	2275	176		13352
1999	100	139	262	463	527	942	1644	2513	2298	2056	1434	215		12593
2000	80	92	943	739	1077	1844	1088	1254	1545	2068	1814	246		12790
2001	31	193	1228	1909	1958	2750	1257	1421	2020	4048	3472	2287		22574
2002	1850	1269	2356	1904	1490	1423	300	2085	2000	2309	1402	1064		19452
2003	453	1212	910	1392	2361	3232	2826	961	2294	2212	2484	1149		21486
2004	323	343	597	794	318	180	336	400	651	1393	859	270		6464
2005	100	12	241	169	436	371	2114	2115	1100	1288	1933	2029		11908
2006	743	485	49	1044	617	654	885	1436	1303	1786	1566	467		11035
2007	225	132	214	475	858	657	950	1298	966	859	358	479		7471
2008	124	328	56	289	187	72	97	433	350	689	1247	966		4838
2009	223	660	136	307	525	901	310	1118	778	368	754	234		6314
2010	242	298	303	211	435	1148	1246	201	1205	879	189	186		6543
2011	331	574	466	734	764	275	405	768	528	380	373	374		5972
2012	242	60	253	130	50	135	170	163	91	202	117	240		1853
2013	185	483	538	316	593	748	76	831	1112	923	990	923		7718

Table 3b. Nominal reported catches (t) of redfish in Div. 3O by gear since 1992.

	Otter Trawls				
Year	Bottom	Midwater	Gillnets	Misc.	Total
1992	10046	3292	1	29	13368
1993	11997	1214	-	9	13220
1994	3085	1498	26	19	4628
1995	2221	525	26	42	2814
1996	9303	335	7	-	9645
1997	5091	10	2	9	5112
1998	13352				13352
1999	11623	970			12593
2000	12750	39		1	12790
2001	21945	629			22574
2002	16586	2866			19452
2003	19226	2260			21486
2004	6308	156	0	0	6464
2005	11908	0	0	0	11908
2006	10058	0	0	977	11035
2007	7525	0	0	0	7525
2008	4880	0	0	0	4880
2009	6314				6314
2010	6545		0		6545
2011	5890	82			5972
2012	1853		0		1853
2013	7718				7718

Table 4. Commercial sampling of redfish catches from CAN (N) in 2007-2015.

Year	Observer samples					Port samples			
	Month	Samples	n	depth min	depth max	Samples	n	depth min	depth max
2007	APR	2	489	411	457	-	-	-	-
	MAY	5	1325	278	508	2	602	365	457
2008	APR	-	-	-	-	2	622	487	487
	MAY	2	488	361	450	-	-	-	-
2009	NOV	6	572	357	505	-	-	-	-
2010	OCT	5	1190	362	477	-	-	-	-
2011	-	-	-	-	-	-	-	-	-
2012	-	-	-	-	-	-	-	-	-
2013	-	-	-	-	-	-	-	-	-
2014	-	-	-	-	-	-	-	-	-
2015	-	-	-	-	-	-	-	-	-

Table 5. Mean number per standard tow from Canadian SPRING surveys in Div. 3O covering strata from 93 to 731 m (400ftm.). Dashes (---) represent unsampled strata. Number of successful sets in brackets. Data from 1991-1995 are Campelen trawl equivalent units (see text). Data from 1996 to present are actual Campelen data. G=Gadus Atlantica, W=Wilfred Templeman, A=Alfred Needler.

Stratum	Depth Range (M)	Area sq mi	% Area within NRA	May3-11 1991-Q2 W105	May2-13 1992-Q2 W119-20	May5-18 1993-Q2 W136-7	May14-22 1994-Q2 W153	May13-27 1995-Q2 W168-69	May22-30 1996-Q2 W188	May-Jun 1997-Q2 W204	May-Jun 1998-Q2 W221-2	May-Jun 1999-Q2 W238	May-Jun 2000-Q2 W315-16	May-Jun 2001-Q2 W365,367	May 2002-Q2 W419,421	May 2003-Q2 W479-480
329	093-183	1721	0.00	13.3 (9)	0.0 (8)	0.0 (6)	169.6 (5)	19.6 (5)	0.0 (6)	33.5 (6)	0.0 (7)	0.3 (6)	0.0 (5)	0.0 (5)	0.0 (5)	80.0 (5)
332	093-183	1047	0.00	35.5 (6)	1.4 (5)	0.0 (4)	0.0 (4)	1177.8 (4)	181.8 (4)	7.3 (3)	348.0 (4)	899.0 (4)	43.5 (4)	44.0 (3)	23.7 (3)	79.7 (3)
337	093-183	948	0.00	607.2 (5)	6.5 (4)	3.0 (2)	0.0 (3)	3462.8 (4)	5.0 (3)	2.0 (3)	703.5 (4)	339.0 (3)	207.5 (4)	48.7 (3)	2.7 (3)	429.7 (3)
339	093-183	585	0.00	0.0 (3)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.5 (2)	0.0 (2)
354	093-183	474	0.52	0.0 (3)	0.0 (2)	2537.0 (2)	0.0 (2)	0.0 (3)	2.5 (2)	0.0 (2)	422.9 (2)	1006.5 (2)	4.5 (2)	81.1 (2)	0.0 (2)	3.0 (2)
333	185-274	151(147)	0.00	1089.0 (2)	3240.0 (2)	8184.5 (2)	50275.0 (2)	979.5 (2)	870.1 (2)	231.9 (2)	4321.3 (2)	5502.4 (2)	1355.9 (2)	1525.5 (2)	941.5 (2)	534.3 (2)
336	185-274	121	0.00	187.5 (2)	688.5 (2)	4496.5 (2)	9955.5 (2)	83150.0 (2)	1360.6 (2)	139.1 (2)	34839.0 (2)	1682.7 (2)	1714.3 (2)	1742.0 (2)	1048.0 (2)	1456.5 (2)
355	185-274	103	0.72	119.5 (2)	111.0 (2)	7307.0 (2)	5829.0 (2)	1928.0 (2)	36488.9 (2)	306.2 (2)	5152.0 (2)	2191.6 (2)	4161.1 (2)	407.5 (2)	515.2 (2)	1191.0 (2)
334	275-366	92(96)	0.00	733.0 (2)	223.0 (2)	837.0 (2)	1179.0 (2)	159.0 (2)	1206.8 (2)	286.2 (2)	733.5 (2)	2515.2 (2)	3960.3 (2)	730.9 (2)	916.5 (2)	3154.1 (2)
335	275-366	58	0.00	39.7 (3)	265.3 (3)	582.5 (2)	6992.0 (2)	2267.0 (2)	15196.4 (2)	531.6 (2)	5796.0 (2)	8671.3 (2)	957.6 (2)	4730.6 (2)	4291.9 (2)	1155.1 (2)
356	275-366	61	0.77	444.0 (2)	805.5 (2)	2552.5 (2)	883.0 (2)	3980.0 (2)	4347.0 (2)	133.6 (2)	3990.2 (2)	9384.4 (2)	24603.5 (2)	503.2 (2)	2020.9 (2)	521.3 (2)
717	367-549	93(166)	0.00	1461.5 (2)	324.0 (2)	279.0 (2)	1269.0 (2)	312.5 (2)	597.0 (2)	3398.6 (2)	483.6 (2)	3239.6 (2)	740.9 (2)	139.5 (2)	242.0 (2)	584.0 (2)
719	367-549	76	0.00	277.0 (2)	88.5 (2)	497.5 (2)	1985.0 (2)	331.0 (2)	440.5 (2)	374.3 (2)	1098.0 (2)	1487.6 (2)	1685.1 (2)	1755.4 (2)	208.8 (2)	602.5 (2)
721	367-549	76	0.76	176.0 (2)	4369.0 (2)	449.0 (2)	108.0 (2)	7596.5 (2)	575.5 (2)	262.6 (2)	543.0 (2)	3263.2 (2)	687.8 (2)	541.1 (2)	94.7 (2)	304.4 (2)
718	550-731	111(134)	0.00	56.5 (2)	17.5 (2)	174.0 (2)	349.0 (2)	15.5 (2)	47.8 (2)	60.8 (2)	79.3 (3)	35.4 (3)	369.0 (3)	22.5 (2)	79.0 (2)	0.0 (2)
720	550-731	105	0.00	35.5 (2)	113.0 (2)	24.0 (2)	34.5 (2)	40.0 (2)	284.6 (2)	63.2 (2)	35.6 (2)	221.3 (2)	53.6 (2)	52.1 (2)	93.1 (2)	31.5 (2)
722	550-731	93	0.76	186.5 (2)	79.0 (2)	76.0 (2)	327.5 (2)	17.0 (2)	80.0 (2)	91.8 (2)	334.0 (2)	47.5 (2)	640.2 (2)	447.9 (2)	86.7 (2)	71.9 (2)
	Total:	6011	8.25													
Upper (95% CI)				455.926	493.28	1780.36	3066.841	4290.28	8553.1	1169.7	8670.1	1340.4	862.0	285.9	224.9	483.9
Weighted mean (by area)				190.987	180.3	698.4	1681.547	2662.6	953.2	141.7	1250.0	869.5	571.3	204.7	149.3	263.6
Lower (95% CI)				-74.0	-132.6	-383.5	296.3	1035.0	-6646.7	-886.2	-6170.2	398.6	280.6	123.6	73.8	43.4
SURVEY ABUNDANCE(x10^6)				155.4	146.7	568.3	1445.8	2201.7	788.2	117.2	1033.6	719.0	472.4	169.3	123.5	218.0
ABUNDANCE within NRA				7.3	42.0	181.1	69.1	106.1	405.0	7.0	100.2	143.6	213.3	18.8	19.9	18.7
% within NRA				4.7	28.6	31.9	4.8	4.8	51.4	6.0	9.7	20.0	45.2	11.1	16.1	8.6

Table 5 continued.

Stratum	Depth Range (M)	Area sq mi	% Area within NRA	May 2004-Q2 W546-547	May 2005-Q2 W618-621	May 2006-Q2 W693,A729	May 2007-Q2 W759-761	May 2008-Q2 W827	May 2009-Q2 A904-05	May 2010-Q2 A932-33	May 2011-Q2 A403-04	May 2012-Q2 A417-19	Apr-May 2013-Q2 A432-33	May-Jun 2014-Q2 T139	May 2015-Q2 A452-53
329	093-183	1721	0.00	0.0 (5)	0.2 (5)	---	25.0 (5)	399.8 (5)	0.0 (5)	3.2 (5)	1271.1 (5)	3.4 (5)	147.8 (5)	0.0 (3)	188.0 (5)
332	093-183	1047	0.00	94.8 (3)	69.3 (3)	---	83.7 (3)	0.7 (3)	8.5 (3)	78.8 (3)	798.2 (3)	3020.2 (3)	245.0 (3)	1969.0 (2)	243.0 (3)
337	093-183	948	0.00	1048.8 (3)	18.5 (3)	---	2886.0 (3)	29.0 (3)	13.0 (3)	3314.6 (3)	78.8 (3)	1037.0 (3)	3.3 (3)	202.0 (2)	716.3 (3)
339	093-183	585	0.00	0.0 (2)	0.5 (2)	0.4 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.5 (2)	0.5 (2)	0.0 (2)	0.0 (2)
354	093-183	474	0.52	1.0 (2)	433.3 (2)	---	27.5 (2)	0.0 (2)	0.0 (2)	3465.0 (2)	3050.8 (2)	3745.5 (2)	5.5 (2)	6759.1 (2)	1638.0 (2)
333	185-274	151(147)	0.00	2759.2 (2)	5329.0 (2)	---	1683.1 (2)	4605.1 (2)	614.0 (2)	8921.3 (2)	8974.2 (2)	4727.6 (2)	4168.5 (2)	985.5 (2)	2305.5 (2)
336	185-274	121	0.00	12646.5 (2)	4701.9 (2)	---	694.2 (2)	8781.5 (2)	726.9 (2)	10791.5 (2)	7300.4 (2)	20363.5 (2)	1792.9 (2)	2148.5 (2)	1333.5 (2)
355	185-274	103	0.72	1321.6 (2)	643.6 (2)	---	540.0 (2)	3929.5 (2)	9261.3 (2)	2168.0 (2)	7279.1 (2)	4179.7 (2)	4640.3 (2)	1862.0 (2)	1551.5 (2)
334	275-366	92(96)	0.00	1387.1 (2)	2364.5 (2)	---	617.4 (2)	9238.5 (2)	16761.3 (2)	1790.8 (2)	4545.8 (2)	5887.9 (2)	2254.2 (2)	8832.5 (2)	3098.1 (2)
335	275-366	58	0.00	1037.1 (2)	2563.6 (2)	---	3760.2 (2)	2560.9 (2)	13134.5 (2)	10498.7 (2)	28306.9 (2)	7583.5 (2)	3716.0 (2)	4680.5 (2)	3701.5 (2)
356	275-366	61	0.77	658.0 (2)	3515.6 (2)	---	924.8 (2)	1489.8 (2)	3027.2 (2)	1580.3 (2)	5820.2 (2)	10444.5 (2)	658.2 (2)	1704.5 (2)	810.5 (2)
717	367-549	93(166)	0.00	1349.7 (2)	1211.4 (2)	---	2633.9 (2)	2404.6 (2)	2612.7 (2)	1325.7 (2)	4881.9 (2)	3101.3 (2)	687.1 (2)	2742.8 (2)	1320.1 (2)
719	367-549	76	0.00	326.5 (2)	1346.0 (2)	---	2653.8 (2)	1508.8 (2)	3134.0 (2)	4963.6 (2)	375.2 (2)	8938.9 (2)	12735.0 (2)	1510.0 (2)	629.4 (2)
721	367-549	76	0.76	116.5 (2)	566.2 (2)	---	470.0 (2)	253.6 (2)	1688.0 (2)	1122.4 (2)	501.0 (2)	2148.0 (2)	1493.7 (2)	987.0 (2)	1787.5 (2)
718	550-731	111(134)	0.00	30.2 (2)	55.1 (2)	---	20.5 (2)	18.0 (2)	58.7 (2)	0.0 (2)	39.9 (2)	70.7 (2)	2.0 (2)	5.7 (2)	30.0 (2)
720	550-731	105	0.00	42.0 (2)	23.1 (2)	---	112.4 (2)	32.6 (2)	270.5 (2)	191.3 (2)	---	239.0 (2)	23.1 (2)	113.0 (2)	18.7 (2)
722	550-731	93	0.76	69.5 (2)	60.9 (2)	---	21.8 (2)	2.0 (2)	52.0 (2)	3.7 -3	15.2 (2)	202.4 (2)	3.4 (2)	5.1 (2)	12.5 (2)
	Total:	6011	8.25												
Upper (95% CI)				1757.7	1477.8		2641.3	1273.8	998.9	3466.3	3142.5	3932.4	922.9	4403.8	899.6
Weighted mean (by area)				610.9	443.6		714.0	752.9	757.0	1546.1	1830.9	2091.0	581.5	1320.1	609.7
Lower (95% CI)				-535.9	-590.6		-1213.4	232.1	515.1	-374.2	519.4	249.7	240.0	-1763.6	319.9
SURVEY ABUNDANCE(x10^6)				505.1	366.8		590.4	622.6	625.9	12784.4	1487.5	1729.0	480.8	1091.5	504.2
ABUNDANCE within NRA				19.4	49.1		16.4	51.7	127.8	158.5	219.1	256.0	63.6	266.6	90.9
% within NRA				3.8	13.4		2.8	8.3	20.4	1.2	14.7	14.8	13.2	24.4 ###	18.0

Table 6. Mean weight (kg) per standard tow from Canadian SPRING surveys in Div. 3O covering strata from 93 to 731 m (400ftm.). Dashes (---) represent unsampled strata. Number of successful sets in brackets. Data from 1991-1995 are Campelen trawl equivalent units (see text). Data from 1996 to present are actual Campelen data. G=Gadus Atlantica, W=Wilfred Templeman, A=Alfred Needler.

Stratum	Depth Range (M)	Area sq mi	% Area within NRA	May3-11 1991-Q2 W105	May2-13 1992-Q2 W119-20	May5-18 1993-Q2 W136-7	May14-22 1994-Q2 W153	May13-27 1995-Q2 W168-69	May22-30 1996-Q2 W188	May-Jun 1997-Q2 W204	May-Jun 1998-Q2 W221-2	May-Jun 1999-Q2 W238	May-Jun 2000-Q2 W315-16	May-Jun 2001-Q2 W365,367	May 2002-Q2 W419,421	May 2003-Q2 W479-480
329	093-183	1721	0.00	0.3 (9)	0.0 (8)	0.0 (6)	11.2 (5)	0.5 (5)	0.0 (6)	1.0 (6)	0.0 (7)	0.0 (6)	0.0 (5)	0.0 (5)	0.0 (5)	3.0 (5)
332	093-183	1047	0.00	0.7 (6)	0.2 (5)	0.0 (4)	0.0 (4)	148.5 (4)	11.9 (4)	0.3 (3)	49.1 (4)	238.5 (4)	1.7 (4)	2.3 (3)	3.1 (3)	10.3 (3)
337	093-183	948	0.00	16.0 (5)	1.5 (4)	0.9 (2)	0.0 (3)	335.0 (4)	0.1 (3)	0.1 (3)	75.9 (4)	29.5 (3)	14.5 (4)	4.7 (3)	0.0 (3)	58.3 (3)
339	093-183	585	0.00	0.0 (3)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)
354	093-183	474	0.52	0.0 (3)	0.0 (2)	284.6 (2)	0.0 (2)	0.0 (3)	0.0 (2)	0.0 (2)	109.4 (2)	28.7 (2)	0.1 (2)	8.4 (2)	0.0 (2)	0.7 (2)
333	185-274	151(147)	0.00	120.8 (2)	404.0 (2)	1339.7 (2)	5428.5 (2)	113.5 (2)	120.4 (2)	20.2 (2)	696.3 (2)	797.6 (2)	236.2 (2)	225.7 (2)	154.9 (2)	71.3 (2)
336	185-274	121	0.00	11.6 (2)	81.2 (2)	630.9 (2)	1032.9 (2)	8543.1 (2)	161.8 (2)	7.7 (2)	5068.7 (2)	198.9 (2)	226.1 (2)	222.9 (2)	133.7 (2)	202.3 (2)
355	185-274	103	0.72	2.7 (2)	2.8 (2)	972.9 (2)	608.3 (2)	178.4 (2)	4916.3 (2)	7.5 (2)	741.6 (2)	314.7 (2)	502.8 (2)	44.2 (2)	78.3 (2)	154.9 (2)
334	275-366	92(96)	0.00	103.3 (2)	36.5 (2)	202.9 (2)	171.1 (2)	29.4 (2)	220.0 (2)	33.9 (2)	140.3 (2)	478.9 (2)	733.0 (2)	146.4 (2)	142.3 (2)	447.8 (2)
335	275-366	58	0.00	4.3 (3)	54.3 (3)	118.3 (2)	1210.4 (2)	263.7 (2)	2445.8 (2)	58.7 (2)	1053.9 (2)	1460.3 (2)	138.7 (2)	741.6 (2)	740.4 (2)	164.1 (2)
356	275-366	61	0.77	26.6 (2)	113.0 (2)	462.4 (2)	135.8 (2)	468.0 (2)	515.8 (2)	7.5 (2)	651.6 (2)	1600.5 (2)	4317.8 (2)	73.3 (2)	302.7 (2)	66.3 (2)
717	367-549	93(166)	0.00	452.4 (2)	74.3 (2)	83.2 (2)	395.3 (2)	91.4 (2)	191.2 (2)	534.7 (2)	143.1 (2)	670.0 (2)	310.6 (2)	30.2 (2)	45.3 (2)	135.8 (2)
719	367-549	76	0.00	33.7 (2)	12.3 (2)	150.0 (2)	669.7 (2)	71.8 (2)	79.5 (2)	59.6 (2)	291.6 (2)	289.0 (2)	326.3 (2)	366.5 (2)	52.4 (2)	113.0 (2)
721	367-549	76	0.76	24.7 (2)	183.6 (2)	110.5 (2)	22.0 (2)	1220.5 (2)	68.2 (2)	20.9 (2)	153.0 (2)	651.6 (2)	129.6 (2)	90.7 (2)	17.2 (2)	43.0 (2)
718	550-731	111(134)	0.00	42.2 (2)	7.5 (2)	87.7 (2)	156.0 (2)	7.3 (2)	27.2 (2)	15.0 (2)	35.5 (3)	16.7 (3)	174.5 (3)	7.4 (2)	18.1 (2)	0.0 (2)
720	550-731	105	0.00	11.7 (2)	57.7 (2)	9.7 (2)	15.9 (2)	14.6 (2)	129.1 (2)	21.0 (2)	14.5 (2)	103.6 (2)	17.7 (2)	18.2 (2)	30.9 (2)	5.8 (2)
722	550-731	93	0.76	118.4 (2)	12.6 (2)	33.2 (2)	126.1 (2)	6.3 (2)	25.4 (2)	12.2 (2)	137.0 (2)	19.7 (2)	261.0 (2)	114.2 (2)	26.6 (2)	16.3 (2)
	Total:	6011	8.25													
Upper (95% CI)				55.0	69.9	263.0	467.0	440.6	1023.1	187.2	1293.7	268.1	144.2	44.9	36.1	67.8
Weighted mean (by area)				18.8	19.6	103.1	200.4	283.8	124.2	19.0	192.7	148.2	101.0	31.7	24.3	35.8
Lower (95% CI)				-17.4	-30.7	-56.8	-66.2	127.0	-774.7	-149.2	-908.3	28.3	57.8	18.5	12.6	3.9
SURVEY BIOMASS(tons)				15278	15961	83874	172264	234648	102695	15699	159313	122550	83508	26183	20126	29642
BIOMASS within NRA				1553	2347	23733	8478	14641	54177	410	18024	19914	36624	3048	3151	2529
% within NRA				10.2	14.7	28.3	4.9	6.2	52.8	2.6	11.3	16.2	43.9	11.6	15.7	8.5

Table 6 continued.

Stratum	Depth Range (M)	Area sq mi	% Area within NRA	May 2004-Q2 W546-547	May 2005-Q2 W618-621	May 2006-Q2 W693,A729	May 2007-Q2 W759-761	May 2008-Q2 W827	May 2009-Q2 A904-05	May 2010-Q2 A932-33	May 2011-Q2 A403-04	May 2012-Q2 A417-19	Apr-May 2013-Q2 A432-33	May-Jun 2014-Q2 T139	May 2015-Q2 A452-53
329	093-183	1721	0.00	0.0 (5)	0.0 (5)	---	0.1 (5)	15.3 (5)	0.0 (5)	0.1 (5)	109.0 (5)	0.1 (5)	19.2 (5)	0.0 (3)	22.0 (5)
332	093-183	1047	0.00	5.5 (3)	3.6 (3)	---	0.7 (3)	0.0 (3)	0.1 (3)	7.9 (3)	193.5 (3)	456.6 (3)	31.0 (3)	294.1 (2)	30.3 (3)
337	093-183	948	0.00	152.1 (3)	2.4 (3)	---	405.0 (3)	0.3 (3)	0.2 (3)	332.3 (3)	9.1 (3)	121.6 (3)	0.0 (3)	24.0 (2)	84.2 (3)
339	093-183	585	0.00	0.0 (2)	0.2 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)
354	093-183	474	0.52	0.2 (2)	43.2 (2)	---	7.5 (2)	0.0 (2)	0.0 (2)	341.6 (2)	446.1 (2)	463.3 (2)	1.0 (2)	1138.7 (2)	301.1 (2)
333	185-274	151(147)	0.00	426.0 (2)	705.6 (2)	---	276.7 (2)	301.8 (2)	47.3 (2)	1025.7 (2)	1055.4 (2)	568.3 (2)	598.0 (2)	140.5 (2)	311.7 (2)
336	185-274	121	0.00	2033.3 (2)	698.5 (2)	---	82.1 (2)	739.2 (2)	63.0 (2)	1012.6 (2)	901.0 (2)	2527.7 (2)	240.3 (2)	271.0 (2)	177.8 (2)
355	185-274	103	0.72	232.5 (2)	80.3 (2)	---	41.0 (2)	496.2 (2)	849.2 (2)	217.4 (2)	883.4 (2)	429.3 (2)	727.3 (2)	258.8 (2)	221.5 (2)
334	275-366	92(96)	0.00	284.9 (2)	418.2 (2)	---	102.5 (2)	957.5 (2)	2325.4 (2)	200.6 (2)	659.9 (2)	795.1 (2)	307.5 (2)	1330.2 (2)	492.0 (2)
335	275-366	58	0.00	192.7 (2)	496.1 (2)	---	605.2 (2)	381.6 (2)	1351.7 (2)	1144.9 (2)	3452.4 (2)	1014.5 (2)	456.0 (2)	616.6 (2)	526.6 (2)
356	275-366	61	0.77	133.5 (2)	713.4 (2)	---	127.9 (2)	255.6 (2)	360.0 (2)	241.6 (2)	837.3 (2)	1330.5 (2)	88.0 (2)	253.2 (2)	122.3 (2)
717	367-549	93(166)	0.00	452.0 (2)	352.7 (2)	---	658.3 (2)	720.5 (2)	746.4 (2)	235.5 (2)	1007.3 (2)	528.4 (2)	160.0 (2)	516.2 (2)	256.4 (2)
719	367-549	76	0.00	99.1 (2)	312.1 (2)	---	618.7 (2)	396.5 (2)	634.3 (2)	875.5 (2)	115.7 (2)	1342.0 (2)	2153.3 (2)	297.0 (2)	138.5 (2)
721	367-549	76	0.76	30.0 (2)	154.0 (2)	---	147.0 (2)	64.0 (2)	289.9 (2)	330.9 (2)	90.4 (2)	298.7 (2)	231.6 (2)	178.1 (2)	454.2 (2)
718	550-731	111(134)	0.00	9.3 (2)	33.3 (2)	---	7.1 (2)	7.9 (2)	34.9 (2)	0.0 (2)	9.3 (2)	18.8 (2)	0.5 (2)	1.7 (2)	8.7 (2)
720	550-731	105	0.00	15.0 (2)	6.9 (2)	---	47.5 (2)	11.0 (2)	84.5 (2)	48.3 (2)	---	64.5 (2)	7.2 (2)	28.8 (2)	4.0 (2)
722	550-731	93	0.76	23.2 (2)	25.4 (2)	---	8.7 (2)	1.2 (2)	15.5 (2)	2.2 (2)	4.1 (2)	43.2 (2)	1.3 (2)	1.6 (2)	2.1 (2)
	Total:	6011	8.25												
Upper (95% CI)				294.7	184.6		382.8	123.9	174.5	358.2	418.1	562.1	146.2	762.1	134.6
Weighted mean (by area)				103.0	72.7		111.5	82.9	105.7	169.3	248.0	280.9	87.8	208.7	92.7
Lower (95% CI)				-88.7	-39.2		-159.8	41.8	36.8	-19.7	77.9	-0.2	29.4	-344.7	50.7
SURVEY BIOMASS(tons)				85170	60138		92202	68519	87362	139960	201458	232298	72634	172583	76615
BIOMASS within NRA				3702	8369		2754	7226	13437	17997	30263	31456	9867	44244	16879
% within NRA				4.3	13.9		3.0	10.5	15.4	12.9	15.0	13.5	13.6	25.6	22.0

Table 7. Mean number per standard tow from Canadian AUTUMN surveys in Div. 3O covering strata from 93 to 731 m (400ftm.). Dashes (---) represent unsampled strata. Number of successful sets in brackets. Data from 1991-1995 are Campelen trawl equivalent units (see text). Data from 1996 to present are actual Campelen data. G=Gadus Atlantica, W=Wilfred Templeman, A=Alfred Needler.

Stratum	Depth Range (M)	Area sq mi	% Area within NRA	Oct27-Nov10 1991-Q4 W113-4	Oct26-Nov5 1992-Q4 W128-9	Nov1-12 1993-Q4 W144-5	Oct29-Dec13 1994-Q4 W160-61	Sep28-Oct26 1995-Q4 W176-77	Nov25-Dec13 1996-Q4 W200 A253, T42	Oct-Dec 1997-Q4 W212-13	Sep-Oct 1998-Q4 W229-230	Sep-Oct 1999-Q4 W246-247	Sep-Oct 2000-Q4 W319-320 T338	Sep-Oct 2001-Q4 W372 T357	Sep-Oct 2002-Q4 W427 T411	Sep-Oct 2003-Q4 W485-6 T469
329	093-183	1721	0.00	1.1 (7)	0.0 (3)	0.0 (5)	0.0 (6)	47.8 (5)	0.2 (5)	421.4 (5)	0.8 (5)	0.0 (5)	0.0 (5)	746.8 (5)	405.8 (5)	0.4 (5)
332	093-183	1047	0.00	0.0 (4)	88.3 (3)	49.7 (3)	118.0 (3)	403.0 (3)	11.5 (2)	89.0 (3)	45.3 (3)	32.0 (3)	65.5 (3)	8.7 (3)	12.8 (3)	37.4 (3)
337	093-183	948	0.00	175.5 (4)	667.5 (2)	35.3 (3)	41.5 (2)	515.0 (2)	0.0 (2)	149.3 (3)	273.8 (3)	28.7 (3)	50.6 (3)	37.3 (3)	61.9 (3)	55.3 (3)
339	093-183	585	0.00	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.0 (3)	0.0 (2)	0.0 (2)		1.0 (2)	1.0 (2)	0.5 (2)	0.0 (2)
354	093-183	474	0.52	0.0 (2)	628.0 (2)	0.0 (2)	0.0 (2)	8100.0 (3)	427.3 (2)	6357.5 (2)	226.5 (2)	695.5 (2)	0.0 (2)	272.5 (2)	150.9 (2)	0.0 (2)
333	185-274	151(147)	0.00	314.5 (2)	1365.0 (2)	479.0 (2)	2073.0 (2)	923.5 (2)	---	217.0 (2)	155.2 (2)	230.5 (2)	488.8 (2)	320.7 (2)	31.6 (2)	96.5 (2)
336	185-274	121	0.00	364.5 (2)	2760.0 (2)	3298.5 (2)	3807.0 (2)	450.0 (2)	161.5 (2)	918.0 (2)	691.7 (2)	3481.0 (2)	802.0 (2)	131.0 (2)	87.5 (2)	85.5 (2)
355	185-274	103	0.72	9957.0 (2)	6381.0 (2)	1317.5 (2)	2310.5 (2)	2317.3 (2)	391.4 (2)	215.0 (2)	124.5 (2)	2333.5 (2)	1020.5 (2)	879.1 (2)	614.5 (2)	61.5 (2)
334	275-366	92(96)	0.00	8774.0 (2)	3290.0 (2)	2603.7 (3)	975.0 (2)	3474.0 (2)	---	1670.0 (2)	1110.5 (2)	178.1 (2)	378.7 (2)	1441.2 (2)	106.2 (2)	872.5 (2)
335	275-366	58	0.00	3853.0 (2)	5346.0 (2)	2541.5 (2)	5648.0 (2)	1667.0 (2)	2895.5 (2)	8352.5 (2)	2459.5 (2)	2748.0 (2)	2403.4 (2)	740.5 (2)	781.7 (2)	1051.0 (2)
356	275-366	61	0.77	678.5 (2)	3828.0 (2)	568.5 (2)	2671.0 (2)	3637.1 (2)	868.4 (2)	735.5 (2)	5602.0 (2)	3452.9 (2)	5888.0 (2)	2481.2 (2)	692.0 (2)	828.0 (2)
717	367-549	93(166)	0.00	---	---	6079.5 (2)	1172.5 (2)	2247.5 (2)	---	13031.5 (2)	8428.5 (2)	603.2 (2)	5420.1 (2)	1401.5 (2)	488.9 (2)	675.7 (2)
719	367-549	76	0.00	813.5 (2)	---	4854.0 (2)	2715.5 (2)	2892.6 (2)	5015.5 (2)	5311.5 (2)	1953.0 (2)	3604.0 (2)	8204.0 (3)	2407.5 (2)	6420.9 (2)	1265.0 (2)
721	367-549	76	0.76	315.5 (2)	---	543.5 (2)	82.5 (2)	9946.8 (2)	575.5 (2)	3882.0 (2)	1872.5 (2)	905.6 (2)	1502.7 (2)	1970.5 (2)	4210.8 (2)	3567.9 (2)
718	550-731	111(134)	0.00	---	---	520.0 (2)	1051.5 (2)	863.8 (2)	---	95.0 (2)	12.5 (2)	169.5 (2)	102.0 (2)	289.5 (2)	545.3 (2)	16.0 (2)
720	550-731	105	0.00	---	---	147.0 (2)	306.0 (2)	43.2 (2)	1560.6 (2)	---	471.0 (2)	103.5 (2)	160.0 (2)	88.4 (2)	12.7 (2)	236.4 (2)
722	550-731	93	0.76	11.5 (2)	---	371.5 (2)	56.5 (2)	365.5 (2)	324.0 (2)	13.8 (2)	278.0 (2)	15.0 (2)	156.4 (2)	282.3 (2)	336.4 (2)	112.4 (2)
764	732-914	105	1.00	---	---	---	---	---	---	---	5.0 (2)	---	4.5 (2)	0.0 (2)	0.5 (2)	---
768	732-914	99	0.00	---	---	---	---	---	---	---	0.5 (2)	---	0.0 (2)	0.0 (2)	0.0 (2)	---
772	732-914	135	0.00	---	---	---	---	---	---	---	0.0 (2)	---	6.3 (2)	---	0.6 (2)	1.3 (2)
	Total:	6350	9.46													
Upper (95% CI)				1330.0	1096.5	578.8	667.1	8664.7	443.7	3681.0	2561.0	673.4	515.5	985.0	611.9	258.6
Weighted mean (by area)				436.0	572.0	371.5	388.6	1233.7	203.8	1304.5	455.7	359.5	411.0	416.0	317.1	135.9
Lower (95% CI)				-458.0	47.5	164.3	110.1	-6197.3	-36.0	-1072.0	-1649.7	45.6	306.5	-153.1	22.3	13.3
SURVEY ABUNDANCE(x10^6)				336.3	421.8	302.3	321.3	1020.1	153.3	1059.8	398.0	268.3	359.0	355.6	277.0	114.9
ABUNDANCE within NRA				108.4	111.0	25.1	42.0	404.2	31.8	253.2	62.9	77.0	62.0	52.7	52.7	35.5
% within NRA				32.2	26.3	8.3	13.1	39.6	20.8	23.9	15.8	28.7	17.3	14.8	19.0	30.9

Table 7 continued.

Stratum	Depth Range (M)	Area sq mi	% Area within NRA	Nov 2004-Q4 W557	Oct 2005-Q4 W627-628 T608	Oct 2006-Q4 W704	Oct 2007-Q4 W770-771 T750	Oct 2008-Q4 W835-836	Oct 2009-Q4 A913-15 TI894-95	Sep-Oct 2010-Q4 A942-43	Sep-Oct 2011-Q4 A409-10	Sep-Oct 2012-Q4 A424	Sep 2013-Q4 A438	2014-Q4	Sep-Oct 2015-Q4 A458-60
329	093-183	1721	0.00	0.0 (5)	14.2 (5)	74.2 (5)	0.0 (5)	3.0 (3)	91.8 (5)	0.0 (5)	86.2 (5)	634.8 (5)	0.4 (5)		0.0 (5)
332	093-183	1047	0.00	29.7 (3)	41.2 (3)	0.3 (3)	27.3 (3)	0.7 (3)	261.9 (3)	107.9 (3)	84.9 (3)	36.7 (3)	102.0 (3)	no	121.0 (3)
337	093-183	948	0.00	54.9 (3)	90.3 (3)	38.3 (3)	402.0 (3)	0.0 (2)	383.5 (3)	1564.2 (3)	56.0 (3)	125.6 (3)	314.9 (3)	survey	208.0 (3)
339	093-183	585	0.00	0.6 (2)	3.0 (2)	0.0 (2)	1.5 (2)	0.0 (2)	0.0 (2)	0.5 (2)	0.0 (2)	0.0 (2)	0.0 (2)	in	0.0 (2)
354	093-183	474	0.52	171.6 (2)	69.5 (2)	6.0 (2)	1124.9 (2)	363.6 (2)	1172.9 (2)	263.6 (2)	776.0 (2)	42.5 (2)	4.0 (2)	redfish	513.0 (2)
333	185-274	151(147)	0.00	77.5 (2)	674.0 (2)	103.8 (2)	159.6 (2)	963.1 (2)	389.3 (2)	1362.7 (2)	148.9 (2)	796.2 (2)	562.2 (2)	strata	296.5 (2)
336	185-274	121	0.00	273.5 (2)	255.0 (2)	744.0 (2)	722.2 (2)	7145.3 (2)	---	149.3 (2)	342.5 (2)	630.9 (2)	394.7 (2)		456.0 (2)
355	185-274	103	0.72	527.0 (2)	643.4 (2)	963.8 (2)	2225.3 (2)	11598.4 (2)	1738.7 (2)	1148.0 (2)	970.0 (2)	2039.1 (2)	364.0 (2)		531.7 (2)
334	275-366	92(96)	0.00	256.3 (2)	816.5 (2)	569.8 (2)	1474.5 (2)	754.2 (2)	9905.8 (2)	1576.9 (2)	1971.6 (2)	3259.8 (2)	6271.1 (2)		1000.5 (2)
335	275-366	58	0.00	2291.6 (2)	626.7 (2)	898.0 (2)	7626.0 (2)	8416.0 (2)	4935.4 (2)	2917.0 (2)	6197.7 (2)	6804.8 (2)	7026.2 (2)		1728.9 (2)
356	275-366	61	0.77	603.4 (2)	2484.4 (2)	5727.5 (2)	1123.1 (2)	8649.7 (2)	3298.4 (2)	65720.0 (2)	497.4 (2)	732.0 (2)	3405.5 (2)		179.9 (2)
717	367-549	93(166)	0.00	2530.3 (2)	1382.2 (2)	1756.3 (2)	2576.0 (2)	2205.3 (2)	8353.8 (2)	8394.6 (2)	20038.4 (2)	8641.1 (2)	4169.0 (2)		1751.8 (2)
719	367-549	76	0.00	1844.2 (2)	3854.5 (2)	14161.4 (2)	7449.1 (2)	5984.2 (2)	15486.3 (2)	11698.5 (2)	12566.3 (2)	55983.3 (2)	10118.3 (2)		1616.5 (2)
721	367-549	76	0.76	927.6 (2)	648.0 (2)	410.2 (2)	2007.9 (2)	1472.6 (2)	8545.8 (2)	4935.2 (2)	4239.3 (2)	2881.4 (2)	4973.4 (2)		4672.6 (2)
718	550-731	111(134)	0.00	120.5 (2)	45.2 (2)	---	928.7 (2)	64.7 (2)	725.3 (2)	207.1 (2)	25.0 (2)	751.9 (2)	961.7 (2)		146.0 (2)
720	550-731	105	0.00	478.9 (2)	4489.7 (2)	1761.3 (2)	786.6 (2)	1005.3 (2)	424.5 (2)	669.2 (2)	2606.9 (2)	1048.0 (2)	1336.6 (2)		588.9 (2)
722	550-731	93	0.76	106.9 (2)	35.1 (2)	9.0 (2)	35.6 (2)	7.5 (2)	9.6 (2)	9.5 (2)	391.5 (2)	443.5 (2)	1021.0 (2)		1089.7 (2)
764	732-914	105	1.00	---	0.0 (2)	---	0.0 (2)	---	73.7 (2)	---	---	---	---		---
768	732-914	99	0.00	---	0.0 (2)	---	0.0 (2)	---	2.5 (2)	---	---	---	---		---
772	732-914	135	0.00	---	0.0 (2)	---	0.0 (2)	---	0.0 (2)	---	---	---	---		---
	Total:	6350	9.46												
Upper (95% CI)				527.3	362.8	1607.1	884.8	1512.4	1413.1	6021.7	6602.4	6989.0	926.9		525.2
Weighted mean (by area)				193.8	268.1	410.5	518.6	751.1	1025.9	1521.2	1051.0	1428.4	664.8		312.7
Lower (95% CI)				-139.7	173.5	-786.1	152.3	-10.2	638.7	-2979.4	-4500.4	-4132.3	402.8		100.1
SURVEY ABUNDANCE(x10^6)				160.2	234.2	331.9	453.0	621.1	878.0	1257.0	869.1	1181.1	549.7		258.5
ABUNDANCE within NRA				23.5	30.5	50.4	84.4	198.1	147.0	485.0	77.0	54.3	75.5		71.9
% within NRA				14.7	13.0	15.2	18.6	31.9	16.7	38.6	8.9	4.6	13.7		27.8

Table 8. Mean weight (kg) per standard tow from Canadian AUTUMN surveys in Div. 3O covering strata from 93 to 731 m (400ftm.). Dashes (---) represent unsampled strata. Number of successful sets in brackets. Data from 1991-1995 are Campelen trawl equivalent units (see text). Data from 1996 to present are actual Campelen data. G=Gadus Atlantica, W=Wilfred Templeman, A=Alfred Needler.

Stratum	Depth Range (M)	Area sq mi	% Area within NRA	Oct27-Nov10 1991-Q4 W113-4	Oct26-Nov5 1992-Q4 W128-9	Nov1-12 1993-Q4 W144-5	Oct29-Dec13 1994-Q4 W160-61	Sep28-Oct26 1995-Q4 W176-77	Nov25-Dec13 1996-Q4 W200 A253, T42	Oct-Dec 1997-Q4 W212-13	Sep-Oct 1998-Q4 W229-230	Sep-Oct 1999-Q4 W246-247	Sep-Oct 2000-Q4 W319-320 T338	Sep-Oct 2001-Q4 W372 T357	Sep-Oct 2002-Q4 W427 T411	Sep-Oct 2003-Q4 W485-6 T469
329	093-183	1721	0.00	0.0 (7)	0.0 (3)	0.0 (5)	0.00 (6)	1.0 (5)	0.0 (5)	22.6 (5)	0.0 (5)	0.0 (5)	0.0 (5)	42.1 (5)	32.2 (5)	0.0 (5)
332	093-183	1047	0.00	0.0 (4)	13.3 (3)	2.7 (3)	15.59 (3)	31.5 (3)	0.2 (2)	7.7 (3)	2.7 (3)	0.8 (3)	0.8 (3)	0.1 (3)	1.7 (3)	2.9 (3)
337	093-183	948	0.00	30.8 (4)	64.7 (2)	7.0 (3)	5.04 (2)	55.5 (2)	0.0 (2)	17.9 (3)	34.6 (3)	1.9 (3)	12.7 (3)	2.9 (3)	3.9 (3)	3.8 (3)
339	093-183	585	0.00	0.0 (2)	0.0 (2)	0.0 (2)	0.00 (2)	0.0 (2)	0.0 (3)	0.0 (2)	0.0 (2)		0.2 (2)	0.2 (2)	0.1 (2)	0.0 (2)
354	093-183	474	0.52	0.0 (2)	171.5 (2)	0.0 (2)	0.00 (2)	785.3 (3)	15.6 (2)	915.0 (2)	31.5 (2)	69.0 (2)	0.0 (2)	35.2 (2)	10.9 (2)	0.0 (2)
333	185-274	151(147)	0.00	27.1 (2)	168.0 (2)	46.5 (2)	257.7 (2)	107.0 (2)	---	26.5 (2)	20.0 (2)	18.0 (2)	24.4 (2)	31.0 (2)	3.9 (2)	11.3 (2)
336	185-274	121	0.00	18.5 (2)	374.3 (2)	378.8 (2)	357.8 (2)	49.7 (2)	9.1 (2)	117.4 (2)	103.8 (2)	548.7 (2)	98.9 (2)	13.5 (2)	9.0 (2)	10.0 (2)
355	185-274	103	0.72	352.2 (2)	450.7 (2)	77.9 (2)	264.2 (2)	237.0 (2)	37.9 (2)	25.9 (2)	11.9 (2)	387.8 (2)	127.8 (2)	119.0 (2)	64.2 (2)	6.3 (2)
334	275-366	92(96)	0.00	1317.9 (2)	480.7 (2)	380.5 (3)	171.1 (2)	506.8 (2)	---	289.5 (2)	188.3 (2)	22.6 (2)	54.6 (2)	188.8 (2)	13.7 (2)	146.6 (2)
335	275-366	58	0.00	512.6 (2)	850.9 (2)	351.8 (2)	877.1 (2)	187.7 (2)	332.2 (2)	1114.4 (2)	362.1 (2)	443.2 (2)	355.4 (2)	89.0 (2)	82.5 (2)	136.1 (2)
356	275-366	61	0.77	59.4 (2)	684.6 (2)	60.1 (2)	303.8 (2)	387.6 (2)	145.5 (2)	106.1 (2)	914.5 (2)	592.9 (2)	801.6 (2)	370.6 (2)	96.4 (2)	91.3 (2)
717	367-549	93(166)	0.00	---	---	1391.3 (2)	340.4 (2)	588.8 (2)	---	2281.8 (2)	1834.0 (2)	135.7 (2)	1143.7 (2)	229.2 (2)	75.9 (2)	115.4 (2)
719	367-549	76	0.00	268.9 (2)	---	930.5 (2)	536.2 (2)	414.0 (2)	656.4 (2)	880.2 (2)	321.3 (2)	691.0 (2)	1313.7 (3)	373.6 (2)	889.9 (2)	194.9 (2)
721	367-549	76	0.76	53.7 (2)	---	100.4 (2)	16.57 (2)	1666.7 (2)	87.3 (2)	732.5 (2)	410.5 (2)	177.5 (2)	230.2 (2)	319.2 (2)	762.0 (2)	718.8 (2)
718	550-731	111(134)	0.00	---	---	169.3 (2)	442.1 (2)	409.4 (2)	---	37.1 (2)	4.4 (2)	48.0 (2)	24.8 (2)	79.5 (2)	118.0 (2)	3.9 (2)
720	550-731	105	0.00	---	---	50.0 (2)	118.7 (2)	16.5 (2)	572.6 (2)	---	162.6 (2)	21.3 (2)	52.3 (2)	16.1 (2)	2.9 (2)	49.3 (2)
722	550-731	93	0.76	7.7 (2)	---	164.0 (2)	22.71 (2)	125.8 (2)	103.9 (2)	4.0 (2)	108.6 (2)	5.3 (2)	34.9 (2)	125.2 (2)	68.1 (2)	33.8 (2)
764	732-914	105	1.00	---	---	---	---	---	---	---	1.6	---	2.6 (2)	0.0 (2)	0.4 (2)	---
768	732-914	99	0.00	---	---	---	---	---	---	---	0.3	---	0.0 (2)	0.0 (2)	0.0 (2)	---
772	732-914	135	0.00	---	---	---	---	---	---	---	0.0	---	2.2 (2)	---	0.1 (2)	0.2 (2)
	Total:	6350	9.46													
Upper (95% CI)				167.6	142.4	104.3	107.9	731.9	84.4	632.5	599.5	103.2	83.0	75.5	67.0	54.3
Weighted mean (by area)				44.9	76.3	63.6	64.5	151.9	30.5	190.3	86.6	56.4	68.7	43.6	38.9	22.0
Lower (95% CI)				-77.8	10.2	23.0	21.1	-428.1	-23.3	-251.9	-426.3	9.6	54.4	11.7	10.8	-10.3
SURVEY BIOMASS(tons)				34618	56247	51782	53324	125578	22974	154622	75676	42100	60004	37286	33976	18604
BIOMASS within NRA				4473	14818	3584	5008	46022	3565	37798	11459	11585	8700	8567	8396	6720
% within NRA				12.9	26.3	6.9	9.4	36.6	15.5	24.4	15.1	27.5	14.5	23.0	24.7	36.1

Table 8 continued.

Stratum	Depth Range (M)	Area sq mi	% Area within NRA	Nov 2004-Q4 W557	Oct 2005-Q4 W627-628 T608	Oct 2006-Q4 W704	Oct 2007-Q4 W770-771 T750	Oct 2008-Q4 W835-836	Oct 2009-Q4 A913-15 TI894-95	Sep-Oct 2010-Q4 A942-43	Sep-Oct 2011-Q4 A409-10	Sep-Oct 2012-Q4 A424	Sep 2013-Q4 A438	2014-Q4	Sep-Oct 2015-Q4 A458-60
329	093-183	1721	0.00	0.0 (5)	0.2 (5)	4.5 (5)	0.0 (5)	0.0 (3)	3.3 (5)	0.0 (5)	4.0 (5)	61.1 (5)	0.0 (5)		0.0 (5)
332	093-183	1047	0.00	0.1 (3)	0.7 (3)	0.0 (3)	0.8 (3)	0.0 (3)	32.2 (3)	7.1 (3)	3.7 (3)	1.5 (3)	7.9 (3)	no	17.2 (3)
337	093-183	948	0.00	0.3 (3)	1.7 (3)	1.1 (3)	49.9 (3)	0.0 (2)	16.2 (3)	140.7 (3)	6.3 (3)	10.1 (3)	56.9 (3)	survey	31.0 (3)
339	093-183	585	0.00	0.0 (2)	0.1 (2)	0.0 (2)	0.1 (2)	0.0 (2)	0.0 (2)	0.1 (2)	0.0 (2)	0.0 (2)	0.0 (2)	in	0.0 (2)
354	093-183	474	0.52	7.2 (2)	3.6 (2)	0.6 (2)	131.2 (2)	26.9 (2)	102.3 (2)	18.2 (2)	108.2 (2)	2.8 (2)	0.6 (2)	redfish	85.1 (2)
333	185-274	151(147)	0.00	3.0 (2)	53.4 (2)	8.0 (2)	12.5 (2)	81.7 (2)	37.0 (2)	150.2 (2)	15.9 (2)	128.2 (2)	74.2 (2)	strata	13.6 (2)
336	185-274	121	0.00	31.9 (2)	25.0 (2)	51.0 (2)	47.3 (2)	613.8 (2)	---	15.7 (2)	37.9 (2)	76.9 (2)	44.3 (2)		29.7 (2)
355	185-274	103	0.72	67.2 (2)	59.3 (2)	117.1 (2)	161.8 (2)	853.7 (2)	146.1 (2)	119.5 (2)	116.0 (2)	231.6 (2)	48.1 (2)		65.5 (2)
334	275-366	92(96)	0.00	54.9 (2)	162.7 (2)	105.4 (2)	256.1 (2)	122.2 (2)	1044.9 (2)	156.2 (2)	244.6 (2)	424.3 (2)	785.7 (2)		172.0 (2)
335	275-366	58	0.00	334.0 (2)	92.2 (2)	126.4 (2)	669.5 (2)	1250.5 (2)	549.1 (2)	311.6 (2)	700.7 (2)	816.7 (2)	858.8 (2)		243.6 (2)
356	275-366	61	0.77	82.3 (2)	437.8 (2)	1176.1 (2)	157.0 (2)	1903.0 (2)	328.0 (2)	7178.6 (2)	58.6 (2)	98.3 (2)	450.7 (2)		26.8 (2)
717	367-549	93(166)	0.00	540.9 (2)	253.7 (2)	355.2 (2)	497.1 (2)	235.5 (2)	1424.6 (2)	1230.5 (2)	3007.8 (2)	1205.6 (2)	625.2 (2)		321.0 (2)
719	367-549	76	0.00	385.7 (2)	627.9 (2)	2137.5 (2)	1297.0 (2)	1034.3 (2)	1679.4 (2)	1689.1 (2)	1592.6 (2)	7348.1 (2)	1442.2 (2)		249.0 (2)
721	367-549	76	0.76	184.1 (2)	119.8 (2)	73.8 (2)	381.7 (2)	339.8 (2)	892.8 (2)	924.5 (2)	593.1 (2)	384.3 (2)	666.5 (2)		838.5 (2)
718	550-731	111(134)	0.00	34.8 (2)	12.0 (2)	---	320.0 (2)	24.3 (2)	277.0 (2)	75.8 (2)	9.2 (2)	212.3 (2)	284.0 (2)		38.5 (2)
720	550-731	105	0.00	134.1 (2)	1013.5 (2)	403.9 (2)	217.1 (2)	279.2 (2)	103.4 (2)	180.5 (2)	710.2 (2)	290.3 (2)	287.2 (2)		153.7 (2)
722	550-731	93	0.76	46.7 (2)	11.2 (2)	3.5 (2)	13.8 (2)	3.5 (2)	2.9 (2)	3.4 (2)	103.3 (2)	116.7 (2)	225.9 (2)		257.1 (2)
764	732-914	105	1.00	---	0.0 (2)	(2)	0.0 (2)	---	---	---	---	---	---		---
768	732-914	99	0.00	---	0.0 (2)	(2)	0.0 (2)	---	---	---	---	---	---		---
772	732-914	135	0.00	---	0.0 (2)	(2)	0.0 (2)	---	---	---	---	---	---		---
	Total:	6350	9.46												
Upper (95% CI)				117.5	64.0	194.1	130.3	140.5	194.7	693.5	986.4	927.2	130.4		91.2
Weighted mean (by area)				33.4	43.6	65.9	76.3	93.8	121.5	181.2	150.6	186.8	98.1		52.1
Lower (95% CI)				-50.7	23.2	-62.3	22.3	47.1	48.4	-331.1	-685.1	-554.2	65.8		13.0
SURVEY BIOMASS(tons)				27631	38125	53291	66682	77562	104013	149819	124539	154234	81123		43118
BIOMASS within NRA				3385	4619	9439	10285	24651	14222	55658	10964	7294	10949		12921
% within NRA				12.3	12.1	17.7	15.4	31.8	13.7	37.2	8.8	4.7	13.5		30.0

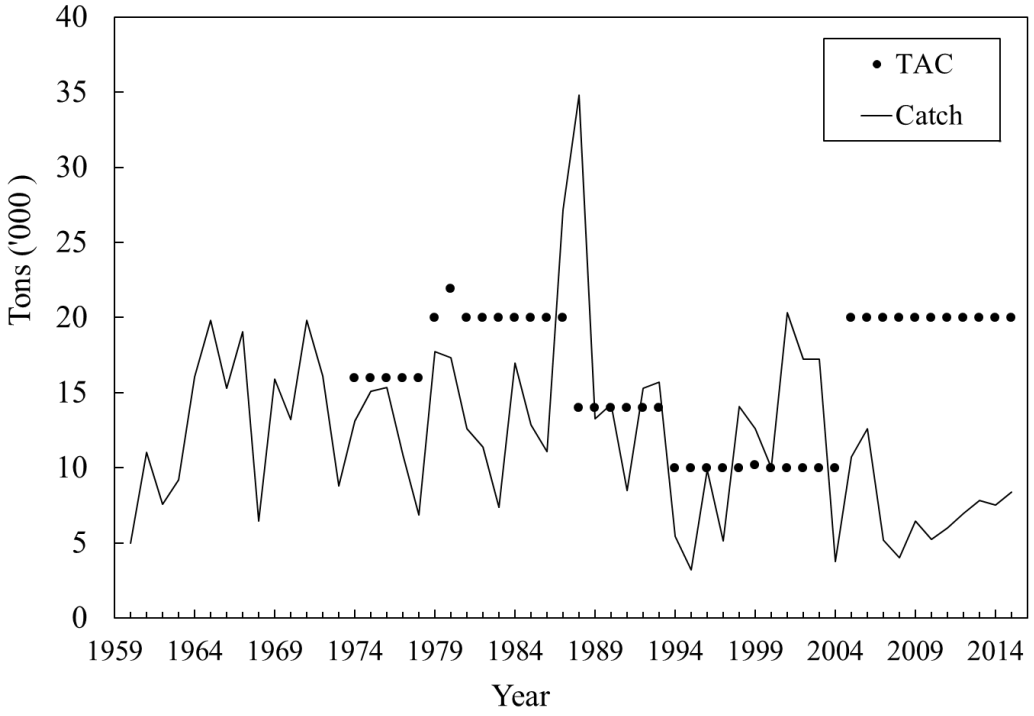

Fig. 1. Nominal catches and TACS of Redfish in Div. 3O. TAC to 2004 was only for Canadian fishery zone.

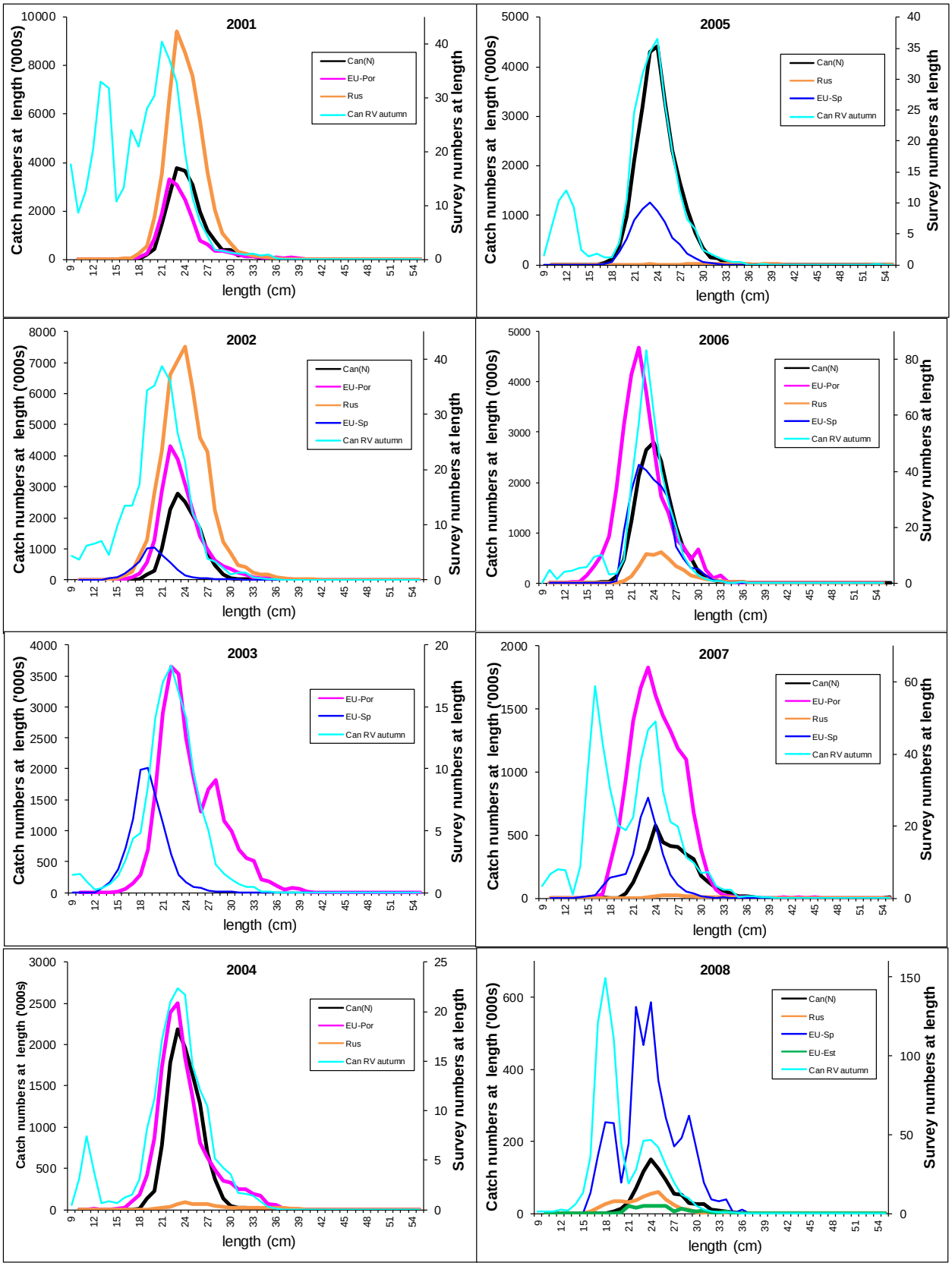

Fig. 2. Catch numbers at length ('000s) and Canadian RV survey numbers at length.

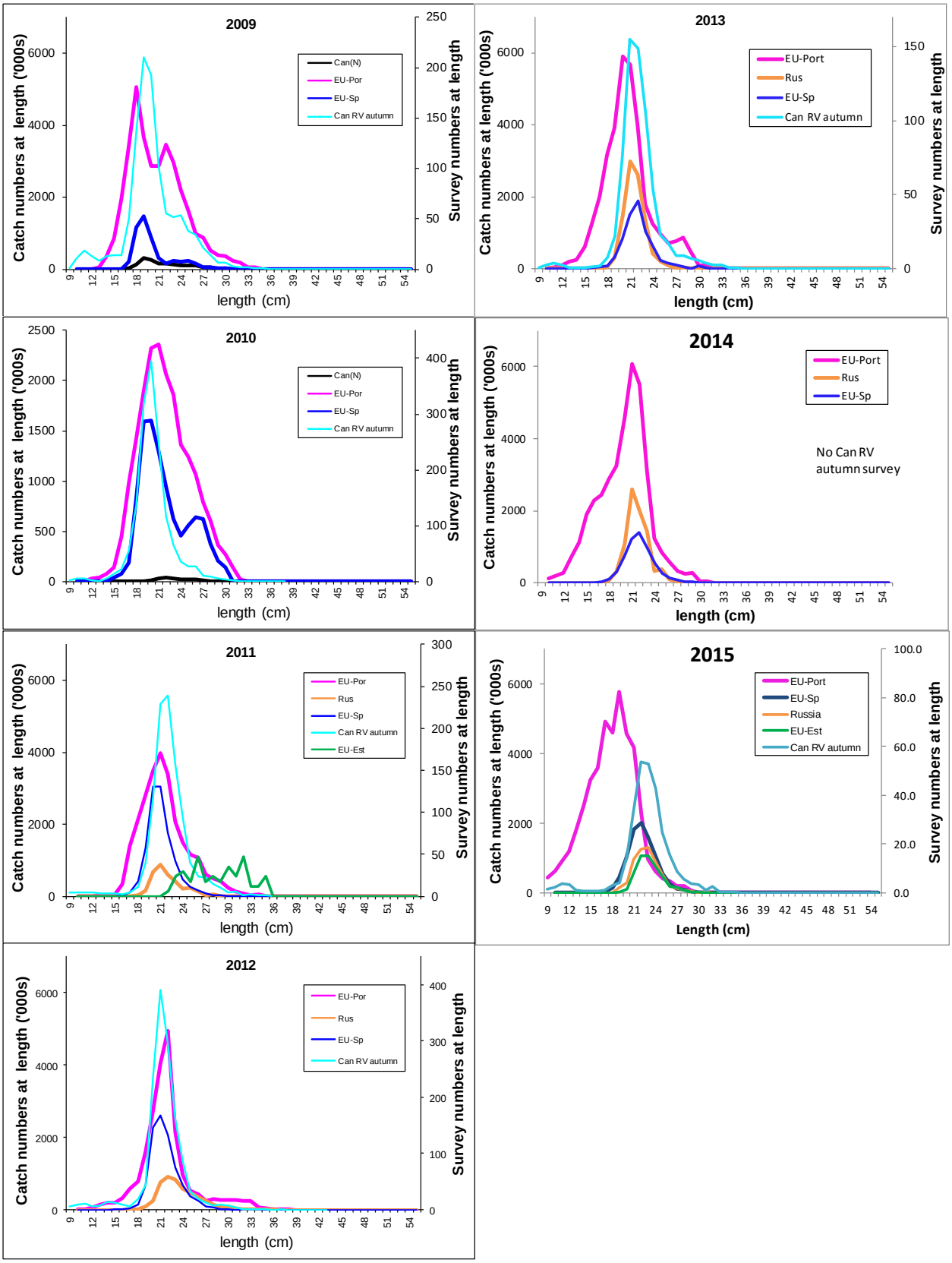

Fig. 2. Continued

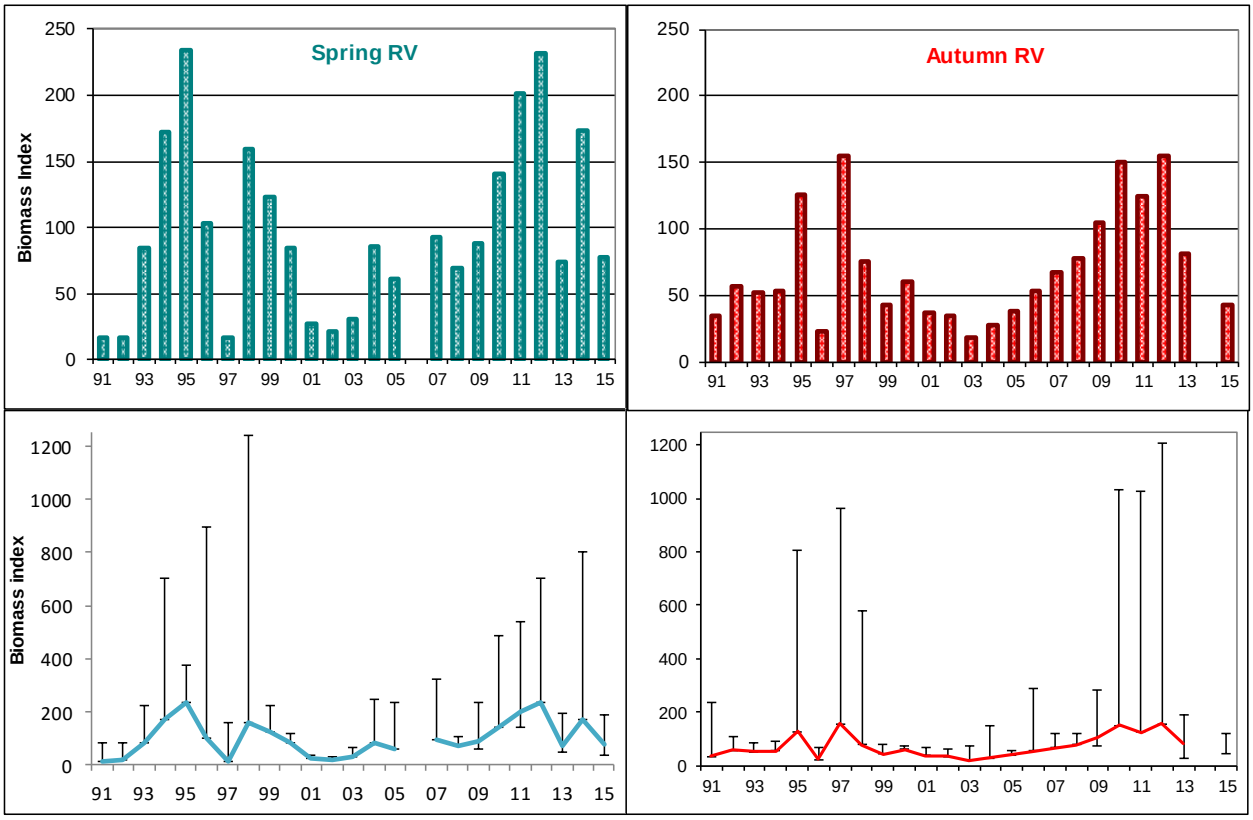

Fig 3. Survey biomass index for redfish in Div. 3O for spring and autumn surveys from 1991-2015 (upper panel) with 95% CI (lower panels). Surveys prior to autumn 1995 utilized an Engel trawl. Estimates were converted into Campelen equivalents based on comparative fishing trials.

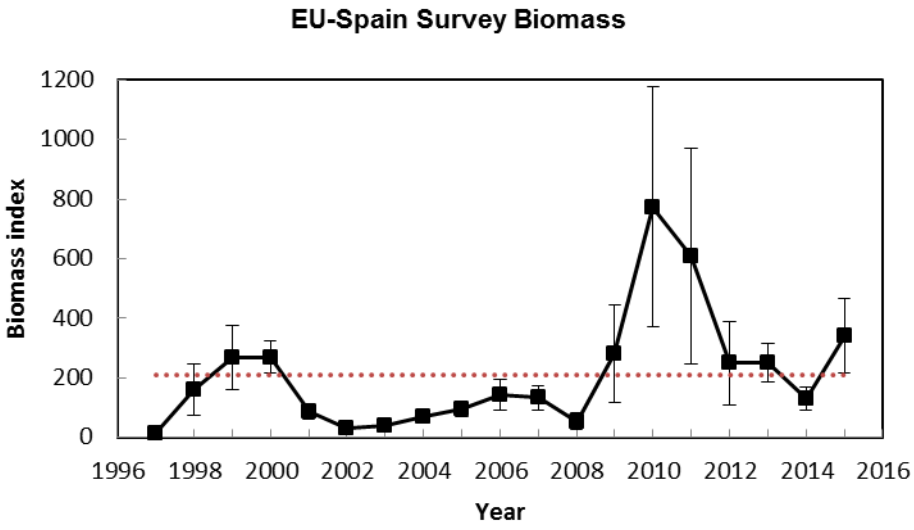

Fig. 4. EU-Spain survey biomass index for redfish in Div. 3O for spring 1997 to 2015 with error bars (one standard deviation). Surveys prior to 2001 used a Pedreira trawl. The horizontal dashed line is the series mean. Data prior to 2001 were converted to Campelen equivalent units.

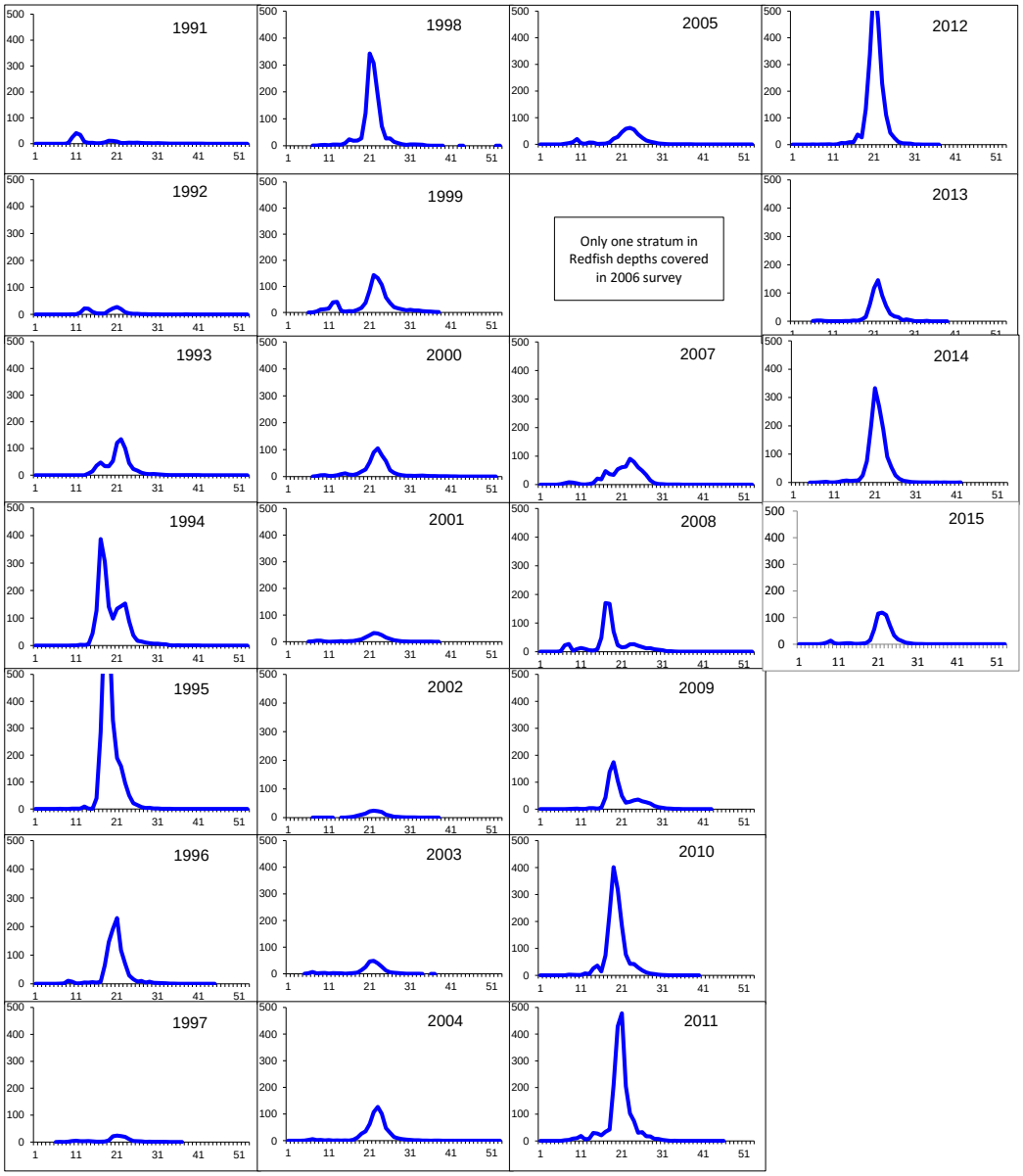

Fig. 5. Length distributions from Canadian RV surveys in Div. 3O during SPRING from 1991-2015. Plotted are mean per standard tow. The 1991-1994 data are conversions into Campelen equivalents based on comparative fishing experiments.

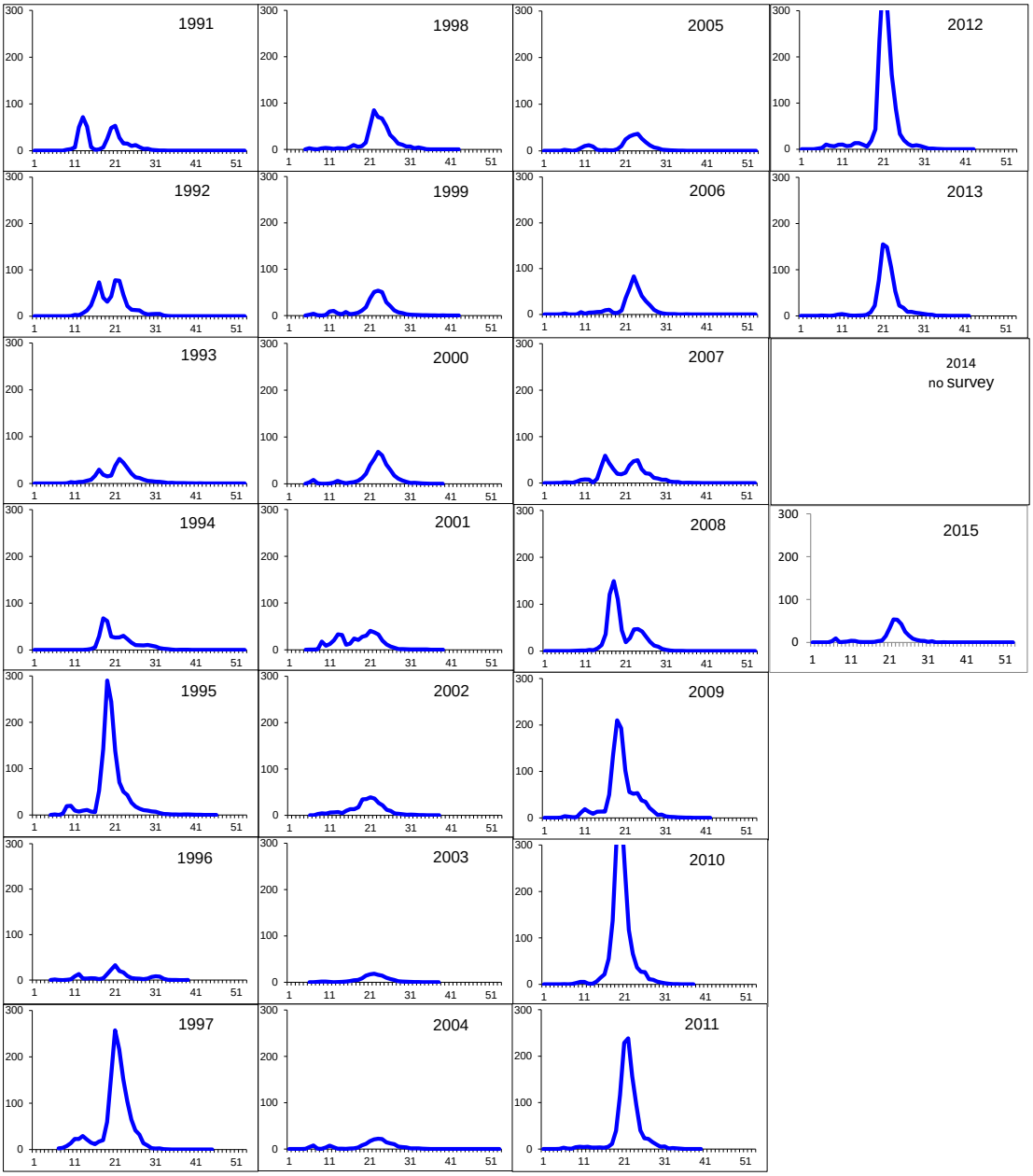

Fig. 6. Length distributions from Canadian RV surveys in Div. 3O during AUTUMN from 1991-2015. Plotted are mean per standard tow. The 1991-1994 data are conversions into Campelen equivalents based on comparative fishing experiments.

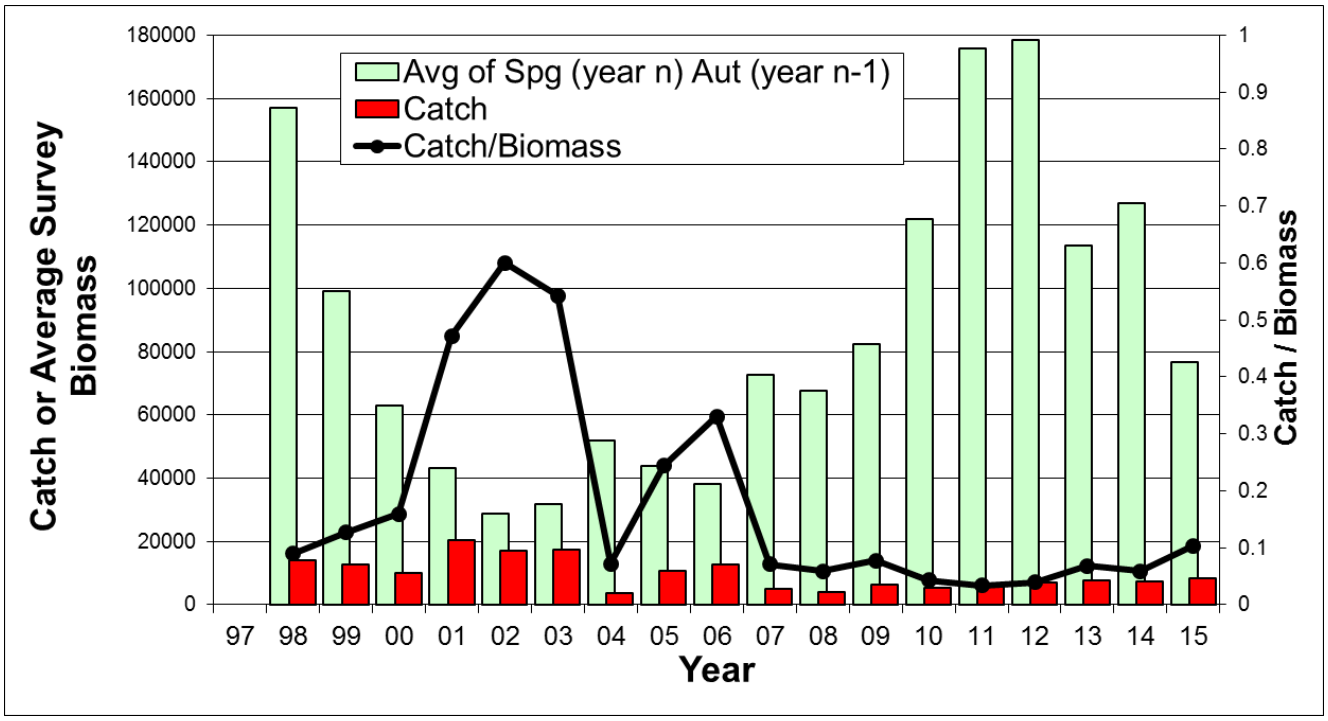

Fig. 7. Catch/Biomass ratios for Div. 3O based on Canadian RV surveys. Plotted are average survey biomass between spring (n) and autumn (n-1) for year (n) in which catch was taken. The 2006 and 2014 values of biomass come only from the autumn and spring surveys respectively.