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An assessment of Redfish in Division 3LN

by

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Introduction

Nominal Catches

The average reported catch from Div. 3LN from 1959 to 1985 was about 22,000 t ranging between 10,000 t and 45,000 t (Table 1, Fig. 1). Catches increased sharply from about 21,000 t in 1985, peaked at a historical high of 79,000 t in 1987 and declined to about 27,000 t in 1992. Catches in 1993 and 1994 at about 23,000 t and 6,000 t respectively could not be estimated precisely because of discrepancies in the available sources of information, however, the likely amount is between 20,000 t and 26,000 t for 1993 and 3,700 t to 7,500 t for 1994. The 1995 catch, estimated at 2,000 t, is the lowest historically for this fishery.

Description of the Fishery

In the early 1980's the former USSR, Cuba and Canada were the primary fleets directing for redfish (Table 2a,b). The rapid expansion of the fishery in 1986 was due primarily to the entry of EU-Portugal, taking about 21,000 t. In 1987 various non-Contracting parties, most notably South Korea, Panama and Caymen Islands began to fish in the regulatory area accounting for a catch of about 24,000 t. From 1987 to 1994 non-Contracting parties had taken between 1,000 t and 13,000 t annually, however, in 1995 they did not fish in Div. 3LN.

Information from surveillance sources indicate that during the 1980s most of the Div. 3LN catch was taken in the vicinity of the Div. 3N and Div. 3O border in addition to the slopes of the Grand Bank in Div. 3L. Since the 1990s a considerable amount of activity has occurred in the 'Beothuk knoll' area which is southwest of the Flemish Cap at the Div. 3M, Div. 3L and Div. 3N border. However, in 1993 and 1994 activity increased in the southwest portion of Div. 3N. In 1994 fleets from the Baltic countries returned home early in the year because of a poor fishery in this area. These countries did not direct for redfish in 1995 and in addition Cuba has not fished since 1993 and EU/Portugal has directed to other species or fisheries in the NAFO Regulatory Area.

From 1980 to 1990 the TAC each year for this stock has been 25,000 t. The TAC was reduced to 14,000 for 1991 and was maintained at that level to 1995. The estimated catches for 1994-1995 represents first time since 1985 that the TAC was not exceeded. In some years catches have been double (1988) and even triple (1987) the agreed TAC.

The monthly pattern of the catches in recent years (Table 3a,b) reveals the fishery is conducted during the first half of the year in Div. 3L but mostly in the second half of the year in Div. 3N. Catches for each division by gear since 1981 (Table 4) shows the bottom trawl is the predominant gear in the fishery.

Commercial Fishery Data

Catch and Effort

Catch and effort data from the 1959 to 1992 ICNAF/NAFO Statistical Bulletins were obtained and combined with provisional 1993-1994 NAFO data. Only those data where redfish comprised more than 50% of the total catch were selected for further analysis as these were considered to be redfish directed.

The catch/effort data were analyzed with a multiplicative model (Gavaris 1980) to derive a standardized catch rate series in tons per hour and additional series utilizing effort in days fished. Effects included in the model were a combination country-gear-tonnage class category type (CGT), NAFO division, month, and a category type representing the amount of bycatch associated with each observation, consistent with previous years assessment (eg. see Power MS 1995).

In the usual practise, catch or effort data of less than 10 units were eliminated prior to analysis. Category types where there was less than five samples in the database, except the year category type, were also eliminated. However, for the analysis utilizing the effort in terms of days fished catch less than 10 tons or effort less than an arbitrarily chosen 5 days were eliminated prior to analysis. For all analyses an unweighted regression was run because of unknown percentages of prorating prior to 1984. Standardized catch rate indexes were derived separately for Div. 3L and Div. 3N.

The regression for Div. 3L using effort in hours is significant ($p < .05$), accounting for 56% of the total variation in catch rates (Table 5). All category types were significant. Although the year category type is significant, only the estimated coefficient for 1991 is statistically different from 1959 (within 2 s.e.). The standardized catch rate series (Table 9; Fig. 2a) shows much interannual variability especially prior to 1974. There is a slight trend of increase from

1974 to 1986 followed by a decline to 1991 except for an intermittent increase in 1989. The catch rate increased sharply in 1992 and the 1993 data suggest a further marginal increase although these mean values are associated with high variability.

The regression for Div. 3N using effort in hours fished is significant ($p < .05$), accounting for 55% of the total variability in the CPUE data (Table 6). All category types were significant, except the month category. For the year category type only eight of the estimated coefficients are different from 1959 (within 2 s.e.), five of these are in the recent period 1990-1994. The standardized catch rate series (Table 10, Fig. 2b) shows much within year variability over time, especially for the period prior to 1976. There is a general trend of increase from 1976 to one of the highest rates in the series in 1980 followed by a decline to 1986. Catch rate increased sharply in 1987 and has since declined to one of the lowest rates in the series in 1994.

Analyses incorporating effort measured in days fished were conducted on the premise that such a unit of effort may reflect time searching for concentrations of redfish.

The regression for Div. 3L using effort in days fished was significant ($p < .05$), accounting for 60% of the total variation in the CPUE data (Table 7). All category types were significant, except month. For the year category type only five of the estimated coefficients are different from 1959 (within 2 s.e.). The standardized catch rate series (Table 11, Fig. 3a) shows much interannual variability throughout the series especially prior to 1976. There is a trend of successive increases from 1978 to 1982 followed by a decrease to 1985. Catch rate increased again in 1986 to about the level of the 1982 rate and except for an intermittent increase in 1989 decreased systematically to one of the lowest rates on record in 1991. Since 1991 the rate has increased substantially and the preliminary 1993 data suggest the catch rate is at the level of that experienced in the mid 1980s.

The regression utilizing effort as days fished for Div. 3N was significant ($p < .05$), accounting for 69% of the total variability in CPUE (Table 8). Only the month category type was not significant. The catch rate series has much interannual variability associated with the mean (Table 12, Fig. 3b) particularly prior to 1980 but there is an indication of stability. From 1980 to 1985 there is a trend of decline followed by successive increases to 1987 and a subsequent declined to one of the lowest rates in the series in 1993. Preliminary 1994 data suggest an marginal increase but there is high variability associated with the estimate.

A standardized catch rate series utilizing effort in hours fished for the Portuguese fleet based on logbook information (Godinho et al., MS 1996) suggests stability in Div. 3L from 1988 to 1993. There was directed effort in Div. 3L in 1994 or 1995. The data for Div. 3NO combined shows a trend of increase from 1991 to 1994 and stability between 1994-1995. It is uncertain whether these are representative of trends in the population or simply reflect the experience of the Portuguese fleet.

Commercial fishery sampling

Limited sampling as bycatch from a 1995 Portuguese fishery in Div. 3L (Godinho et al., MS 1996) suggested males 22cm - 30cm and females 23cm - 30cm dominated the catch based on a sample obtained in February. The mean lengths of the samples were 27.5 cm for males and 28.8 cm for females. Sampling of the 1995 Div. 3N Portuguese trawl fishery from February to August suggested males 26cm - 32cm and females 26cm - 35cm dominated the catch. The mean lengths of these samples were 32.1 for males and 32.7 for females. The mean length and mean weight in the catch increased by 4-5 cm and 150 grams respectively, compared to 1994. Given the relatively slow growth rate of redfish it is possible that the fishery was conducted on a different body of fish than in 1994.

Research Survey Data

Stratified-random surveys have been conducted by Canada in Div. 3L in various years and seasons from 1978 to 1995 in which strata up to a maximum of 732 m (400 fathoms) were sampled. Although these surveys were conducted at various times of the year throughout the period, they provide an indication of relative abundance and dynamics of the population. The design of the surveys was based on a stratification scheme down to 400 fathoms for Div. 3LN (Fig. 4). Up until the autumn of 1995 these surveys were conducted with an Engels 145 high lift otter trawl with a small mesh liner (29mm) in the codend and tows planned for 30 minute duration. Starting with the autumn 1995 survey in Div. 3LN, a Campelen 1800 survey gear was adopted with a 12mm liner in the codend and 15 minute tows utilizing SCANMAR. Data from comparative fishing trials between the Engels trawl and protocol, and, the Campelen trawl and protocol were not available prior to this assessment to convert the pre-autumn 1995 data of the Engels into Campelen equivalents. Data from similar trials (Warren MS 1996) suggest that the Campelen trawl catches larger numbers of smaller sized fish (<20 cm) than the Engels.

Mean number and mean weight (kg) per standard tow show large fluctuations between some adjacent years (Table 13-14 and 17, Fig. 5). There are also rather large changes in stratum by stratum density estimates in adjacent years where seasons can be compared. Although it is difficult to interpret year to year changes in the estimates, in general, the data suggest that the survey biomass index from 1991 up to spring 1995 is at its lowest level (average 4,500 t) relative to the time period prior to 1986 (average 103,000 t). The fall 1995 index at 50,000 t is currently not directly comparable, however, 90% of this estimate is due to a large catch in one stratum. Regardless of this caveat, the 1995 estimate is still lower than the unconverted estimates prior to the mid-1980s.

Stratified-random surveys have also been conducted in spring and autumn by Canada in Div 3N from 1991-1996 that also cover to the extent of the stratification (732 m or 400 fathoms). The Campelen trawl and protocol were also utilized on these surveys beginning in the autumn of 1995. Mean number and weight per tow (Table 15-17, Fig. 6) are considerably higher than in Div 3L but there relatively greater variability in these estimates as well. The source of this variability is unclear but is likely due to availability to the trawl gear rather than real changes in population abundance and therefore the interpretation of these data in terms of year to year trends is difficult. The average survey biomass index for the 1991 to spring 1995 period is about 14,000 t. Surveys in the fall 1995 and spring 1996 resulted in a biomass index of 41,000 t and 6,000 t respectively. About 28,000 t of the fall 1995 estimate occurred in a single stratum due to a large catch. Again these are within the range of the unconverted estimates of the surveys prior to the Campelen surveys.

A comparison of the Canadian and Russian bottom trawl surveys in Div. 3L (Fig. 7) indicate a similar trend of decline in density estimates from 1984 to 1990 and both indexes have remained at this relatively low level to 1994.

The Canadian index continued to be relatively low to the spring of 1995. The situation is unclear for Div. 3N (Fig. 8). The Russian surveys indicate relatively low mean weight per tow from 1989-1991 with a dramatic rise in 1993. This large increase in 1993 relative to 1991 was highly influenced by the trawling conducted in one stratum (see Vaskov (1994), Table 2) which accounted for 70% of the biomass but only represents about 9% of the area surveyed. There have been no Russian surveys conducted in Div. 3N since 1993.

Recruitment

Length distributions in terms of mean number per tow at length and corresponding age distributions in number per thousand from the regular spring and autumn Canadian surveys in Div. 3L indicate there has been relatively poor recruitment over the time period covered by the surveys (Fig. 9). These also indicate the seasonal variability in years where seasons have been covered sufficiently. The 1994 autumn and 1995 spring surveys show similar length distributions. The bulk of the lengths were within a range from 26cm - 29 cm which corresponds to fish born about 1984. The length distribution sampled by the Campelen trawl in autumn 1995 shows a much broader range but samples mostly consisted of fish in the range of 25 cm to 33 cm. There is no sign of any good recruitment in the recent surveys.

Length distributions and age distributions from spring and autumn Canadian surveys in in Div. 3N from 1991-1995 (Fig. 10) show different compositions compared with Div. 3L for each corresponding seasonal survey, generally being composed of size groups that are much smaller. There was a relatively good pulse of recruitment picked up in the 1991 autumn survey in the range of 12-14 cm (1986-1987 year classes) that could be tracked through to the 1995 spring survey at about 19 cm. This mode is also reflected in the 1995 autumn survey which has a peak at 20 cm. Given the variability in the survey estimates the magnitude of this recruitment cannot be determined. However, there is no sign of any good year classes subsequent to this in the surveys.

State of the Stock

It is not possible to provide an estimate of the absolute size of the stock in Div. 3LN. The results from Canadian spring and autumn surveys suggest the survey biomass index has been low in Div. 3L since 1991 relative to the late 1970's to mid 1980's period. A direct comparison cannot be made at this time with the recent survey utilizing the Campelen trawl. However, the estimates from the autumn 1995 survey in Div. 3L are within the lower range of the unconverted Engel survey prior to 1987. The situation in Div. 3N based on the Canadian surveys is unclear because of large seasonal fluctuations, however, the survey biomass index has averaged 14,000 t from 1991 to the spring of 1995, which is about three times the average biomass index based on Canadian surveys in Div. 3L since 1992 (4,500 t). Surveys using the Campelen trawl since the autumn of 1995 cannot be compared directly at this time but are within the range of Engels estimates since 1991. Russian bottom trawl surveys have also indicated a decline in relative abundance to historically low values in recent years for Div. 3L and indicate a decline for Div. 3N from 1984 to 1991.

The catch rate indices derived for Div. 3L and Div. 3N show much variability. Although some of the changes in mean catch rate between some years are too dramatic to be solely the result of changes in population abundance, there are indications of decline from the mid 1980s to 1990 in all the derived indices. This corresponds to a period when some of the largest catches historically were taken and have likely generated high fishing mortalities.

In summary, Div. 3L continues to be very low with no sign of good recruitment. Div. 3N has declined from 1984 to 1991 but the status since then is uncertain. The Div. 3N portion contains a recruiting component of unknown abundance that is already recruiting to some fleet sectors. Despite this there is no sign in the research surveys of any good year classes to follow.

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Table 1. Summary of nominal catches (t) of redfish in Divisions 3LN (provisional for 1993-1995).

Year	3L	3N	Total	TAC
1959	34,107	10,478	44,585	
1960	10,015	16,547	26,562	
1961	8,349	14,826	23,175	
1962	3,425	18,009	21,439[a]	
1963	8,191	12,906	27,362[a]	
1964	3,898	4,206	10,261[a]	
1965	18,772	4,694	23,466	
1966	6,927	10,047	16,974	
1967	7,684	19,504	27,188	
1968	2,378	15,265	17,660[a]	
1969	2,344	22,356	24,750[a]	
1970	1,029	13,359	14,419[a]	
1971	10,043	24,310	34,370[a]	
1972	3,095	25,838	28,933	
1973	4,709	28,588	33,297	
1974	11,419	10,867	22,286	28,000
1975	3,838	14,033	17,871	20,000
1976	15,971	4,541	20,513	20,000
1977	13,452	3,064	16,516	16,000
1978	6,318	5,725	12,043	16,000
1979	5,584	8,483	14,067	18,000
1980	4,367	11,663	16,030	25,000
1981	9,407	14,873	24,280	25,000
1982	7,870	13,677	21,547	25,000
1983	8,657	11,090	19,747	25,000
1984	2,696	12,065	14,761	25,000
1985	3,677	16,880	20,557	25,000
1986	27,833	14,972	42,805	25,000
1987	30,342	40,949	79,031[b]	25,000
1988	22,317	23,049	53,266[b]	25,000
1989	18,947	12,902	33,649[b]	25,000
1990	15,538	9,217	29,105[b]	25,000
1991	8,892	12,723	25,815[b]	14,000
1992	4,630	10,153	27,283[b]	14,000
1993	10,013	7,129	20,367-26,246[b,c]	14,000
1994	379	2274	3,828-7,654[b,c]	14,000
1995	51	1,497	1,979[b]	14,000
1996				11,000

[a]Includes catch that could not be identified by division.

[b]Includes estimates of unreported catch.

[c]Catch could not be precisely estimated due to discrepancies in figures from available sources.

Table 2a. Nominal reported catches (t) of redfish in Div. 3L by country and year since 1982.

Country	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993[b]	1994[b]	1995[b]
Canada (M)	1,003	2,663	52	342	2,597	2,352	5,042	1,095	73	37	86	-	-	3
Canada (N)	5,910	3,800	1,229	1,716	2,235	2,159	1,444	489	947	362	656	5	-	1
EEC/Germany	12	586	938	981	540	696	694	742	646	1151	1,455	-	-	-
Japan	159	-	105	129	135	114	152	114	151	84	67	37	82	47
EEC/Portugal	125	91	48	4	13,469	19,858	9,867	5,408	4,820	5,099	769	1	4	-
EEC/Spain	25	347	91	192	199	335	94	109	837	681	625	29	128	-
Russia	607	1,168	232	309	8,658	4,459	5,004	10,037	7,003	1,032	571	2,407	22	-
Lithuania	-	-	-	-	-	-	-	-	-	-	-	676	-	-
Latvia	-	-	-	-	-	-	-	-	-	-	-	2,156	55	-
Estonia	-	-	-	-	-	-	-	-	-	-	-	4,115	88	-
Kor-S	29	-	-	-	-	364	20	952	1,061	420	370	586	-	-
Others[a]	-	2	1	4	-	5	-	1	-	26	31	-	-	-
TOTAL	7,870	8,657	2,696	3,677	27,833	30,342	22,317	18,947	15,538	8,892	4,630	10,012	379	51

[a]Others include France (M), France (SP), Poland, EEC-UK.
[b]Provisional.

Table 2b. Nominal reported catches (t) of redfish in Div. 3N by country and year since 1982.

Country	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993[b]	1994[b]	1995[b]
Canada (M)	-	-	13	311	-	-	1	22	-	-	-	-	110	-
Canada (N)	337	1	2	82	17	21	4	4	11	-	1	40	-	-
EEC/Portugal	1	-	365	890	8,273	7,854	2,147	600	1,235	3,275	1,149	252	60	78
Japan	-	-	81	-	12	51	-	39	4	4	1	19	-	-
EEC/Spain	278	875	239	2,881	1,393	132	581	224	416	956	119	7	106	-
Russia	10,414	7,844	9,045	10,576	2,227	14,397	6,735	941	359	4,821	3,009	3,212	1,998	1,419
Lithuania	-	-	-	-	-	-	-	-	-	-	-	1,116	-	-
Latvia	-	-	-	-	-	-	-	-	-	-	-	1,247	-	-
Estonia	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cuba	2,621	2,370	2,320	2,055	2,429	2,433	2,483	2,869	2,456	1,378	1,308	1,152	-	-
Kor-S	26	-	-	-	617	16,053	11,098	8,203	4,640	2,276	4,560	122	-	-
Others[a]	-	-	-	85	4	8	-	-	96	13	6	-	-	-
TOTAL	13,677	11,090	12,065	16,880	14,972	40,949	23,049	12,902	9,217	12,723	10,153	7,148	2,273	1,497

[a]Others include France (M), USA, EEC-Germany, Denmark (Greenland).
[b]Provisional.

Table 3a. Nominal reported catches (t) of redfish in Division 3L by month and year since 1982.

Year	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Total
1982	1,126	672	1,232	1,225	295	289	459	37	643	1,367	173	352	7,870
1983	1,304	496	672	1,080	934	708	274	642	562	1,070	799	116	8,657
1984	243	135	168	360	76	161	49	57	1,002	318	46	81	2,696
1985	481	120	177	331	215	165	41	78	354	866	441	408	3,677
1986	423	845	3,470	7,266	3,662	503	975	2,196	544	3,964	2,166	1,819	27,833
1987	2,439	1,631	5,306	1,423	1,765	75	1,233	3,877	3,285	4,215	3,712	1,381	30,342
1988	2,856	1,623	865	1,466	471	1,213	2,776	4,800	1,628	1,869	682	2,068	22,317
1989	786	4,497	4,301	1,140	1,628	501	1,730	1,311	832	1,151	1,002	68	18,947
1990	269	331	297	831	578	1,717	3,061	3,683	1,911	1,611	1,056	193	15,538
1991	328	901	642	821	685	503	613	296	229	692	2,123	1,059	8,892
1992	417	203	137	1,479	1,487	246	15	9	26	30	480	101	4,630
1993	6	9	676	1,606	1,187	2	1	0	1	0	1	1	3,490[a]
1994	0	0	0	143	4	3	1	2	0	19	27	98	297[b]

[a]Provisional, 6523 t not available by month
[b]Provisional, 82 t not available by month

Table 3b. Nominal reported catches (t) of redfish in Division 3N by month and year since 1982.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1982	3,042	1,970	2,919	1,141	243	100	581	3,156	485	21	12	7	13,677
1983	869	609	2,029	2,186	1,226	675	1,121	1,266	303	376	208	222	11,090
1984	4,562	1,763	1,821	676	67	74	1,694	1,014	156	93	131	14	12,065
1985	1,110	2,169	2,181	4,213	1,668	420	1,665	676	784	541	230	1,223	16,880
1986	392	665	406	534	454	915	4,392	81	1,196	110	4,131	1,696	14,972
1987	3,787	3,118	1,885	2,203	2,698	2,383	4,339	6,280	7,287	2,431	1,004	3,534	40,949
1988	662	648	815	841	952	1,295	2,327	4,505	3,390	1,419	3,453	2,742	23,049
1989	576	151	274	380	278	1,183	928	4,109	2,085	1,515	1,164	259	12,902
1990	220	366	537	9	1,003	1,679	1,236	1,716	619	754	858	220	9,217
1991	387	91	15	122	312	670	3,241	2,229	1698	2,013	1,085	860	12,723
1992	274	638	87	65	104	2,285	2,352	1,626	432	702	926	662	10,153
1993	110	9	191	1,739	2,426	1,072	164	52	5	12	1	84	5,865[a]
1994	151	53	5	68	595	723	302	0	1	28	310	38	2,274[b]

[a]Provisional, 1264 t not available by month
[b]Provisional

Table 4. Nominal reported catches by gear type for redfish in Divisions 3L and 3N since 1981.

	3L					3N				
Year	Bottom trawl	MW trawl	Gillnets	Misc.	Total	Bottom trawl	MW trawl	Gillnets	Misc.	Total
1982	7,234	466	145	25	7,870	7,400	6,001	1	275	13,677
1983	7,760	308	238	351	8,657	7,050	3,165	-	875	11,090
1984	2,151	237	218	90	2,696	3,287	8,767	-	11	12,065
1985	3,092	307	128	150	3,677	10,232	6,453	-	195	16,880
1986	18,964	8,624	122	123	27,833	10,423	3,405	-	1,144	14,972
1987	25,294	4,441	276	331	30,342	32,391	8,527	-	31	40,949
1988	15,435	6,722	105	55	22,317	16,740	6,269	17	23	23,049
1989	7,542	10,922	449	34	18,947	9,131	3,746	-	25	12,902
1990	7,851	7,537	136	14	15,538	6,511	2,675	10	21	9,217
1991	7,322	1,422	71	77	8,892	11,028	1,628	-	67	12,723
1992	3,538	949	67	76	4,630	8,553	1,518	6	76	10,153
1993	652	2,838	-	-	3,490[a]	320	5,441	-	104	5,865[b]
1994	279	18	-	-	297[c]	274	1,198	-	-	2,274[d]

[a]Provisional, 6523 t not available by gear
[b]Provisional, 1264 t not available by gear
[c]Provisional, 82 t not available by gear
[d]Provisional

Table 5. ANOVA results and regression coefficients from a multiplicative model utilized to derive a standardized catch rate series for Redfish in Div. 3L. Effort is measured in hours fished (1993 based on preliminary data).

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R..... 0.747

MULTIPLE R SQUARED..... 0.559

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DF	SUMS OF SQUARES	MEAN SQUARES	F-VALUE
INTERCEPT	1	2.974E1	2.974E1	
REGRESSION	79	1.506E2	1.906E0	7.899
Country¦Gear¦TC	30	6.675E1	2.225E0	9.220
Month	11	1.146E1	1.041E0	4.316
Bycatch PCT	4	1.596E1	3.991E0	16.537
Year	34	2.636E1	7.752E-1	3.212
RESIDUALS	493	1.190E2	2.413E-1	
TOTAL	573	2.993E2		

REGRESSION COEFFICIENTS

CATEGORY	CODE	VARIABLE	COEFFICIENT	STD. ERROR	NO. OBS.
Country¦Gear¦TC	3125	INTERCEPT	0.295	0.179	573
Month	7				
Bycatch PCT	95				
Year	59				
(1)	2114	1	-0.709	0.208	9
	2125	2	-0.126	0.198	8
	2155	3	-0.079	0.224	6
	3114	4	-0.517	0.185	15
	3124	5	-0.008	0.178	9
	3154	6	-0.516	0.243	5
	3155	7	0.222	0.123	27
	10127	8	-0.629	0.241	5
	11115	9	-0.517	0.217	10
	11116	10	-0.423	0.224	8
	11125	11	0.037	0.121	22
	11126	12	-0.090	0.211	11
	11127	13	-0.080	0.140	20
	11155	14	-0.465	0.234	5
	14126	15	-0.366	0.191	8
	14127	16	0.369	0.194	14
	16127	17	-0.121	0.183	27
	17116	18	-0.944	0.249	5
	17126	19	-0.743	0.223	6
	17127	20	0.195	0.183	9
	20114	21	-1.357	0.201	11
	20116	22	-0.295	0.223	11
	20127	23	0.236	0.092	66
	20145	24	1.192	0.352	12
	20157	25	0.464	0.089	55
	25126	26	-0.253	0.168	13
	25127	27	0.684	0.165	13
	27125	28	0.096	0.097	37
	27126	29	0.379	0.216	6
	27157	30	1.063	0.209	7
(2)	1	31	-0.028	0.112	40
	2	32	0.017	0.109	41
	3	33	0.253	0.099	53
	4	34	0.348	0.099	54
	5	35	0.150	0.104	43
	6	36	-0.120	0.094	59
	8	37	-0.145	0.098	54
	9	38	-0.013	0.103	45
	10	39	-0.158	0.100	51
	11	40	-0.046	0.103	46
	12	41	0.035	0.123	26
(3)	55	42	-0.572	0.112	28
	65	43	-0.599	0.088	46
	75	44	-0.294	0.077	87
	85	45	-0.084	0.064	102
(4)	60	46	0.159	0.208	13
	61	47	0.449	0.266	7
	62	48	0.118	0.243	10
	63	49	0.330	0.253	9
	64	50	0.594	0.345	3
	65	51	0.449	0.294	5
	66	52	0.006	0.227	13
	67	53	0.305	0.223	19
	68	54	0.106	0.269	7
	69	55	0.153	0.244	7
	70	56	0.330	0.250	8
	71	57	0.259	0.241	12
	72	58	0.106	0.259	6
	73	59	0.444	0.329	3
	74	60	-0.405	0.343	15
	75	61	0.061	0.265	8
	76	62	-0.068	0.174	32
	77	63	-0.158	0.181	33
	78	64	-0.352	0.184	27
	79	65	0.055	0.197	24
	80	66	0.014	0.200	18
	81	67	0.040	0.198	18
	82	68	0.083	0.188	25
	83	69	0.150	0.190	21
	84	70	-0.002	0.206	15
	85	71	0.152	0.199	19
	86	72	0.195	0.185	31
	87	73	0.018	0.196	21
	88	74	-0.116	0.181	36
	89	75	0.218	0.197	23
	90	76	-0.355	0.183	29
	91	77	-0.742	0.187	22
	92	78	0.252	0.238	10
	93	79	0.408	0.401	2

Table 6. ANOVA results and regression coefficients from a multiplicative model utilized to derive a standardized catch rate series for Redfish in Div. 3N. Effort is measured in hours fished (1993-1994 based on preliminary data).

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R..... 0.742

MULTIPLE R SQUARED..... 0.550

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DF	SUMS OF SQUARES	MEAN SQUARES	F-VALUE
INTERCEPT	1	4.182E1	4.182E1	
REGRESSION	68	9.989E1	1.469E0	6.627
Country¦Gear¦TC	18	2.678E1	1.488E0	6.713
Month	11	2.159E0	1.963E-1	0.886 (NS)
Bycatch PCT	4	1.408E1	3.521E0	15.885
Year	35	2.924E1	8.355E-1	3.769
RESIDUALS	368	8.157E1	2.216E-1	
TOTAL	437	2.233E2		

REGRESSION COEFFICIENTS

CATEGORY	CODE	VARIABLE	COEFFICIENT	STD. ERROR	NO. OBS.
Country¦Gear¦TC	3125	INTERCEPT	0.112	0.164	437
Month	7				
Bycatch PCT	95				
Year	59				
(1)	2114	1	-0.320	0.172	17
	3114	2	-0.065	0.141	59
	3124	3	0.050	0.225	6
	4127	4	0.431	0.164	18
	4157	5	0.671	0.151	32
	11115	6	-0.484	0.278	5
	14127	7	0.514	0.264	5
	16127	8	-0.178	0.246	5
	17126	9	0.050	0.267	5
	20114	10	-0.907	0.225	8
	20116	11	-0.060	0.220	8
	20127	12	0.558	0.121	90
	20156	13	0.083	0.233	6
	20157	14	0.747	0.131	65
	25126	15	0.454	0.184	17
	25127	16	0.893	0.150	46
	27125	17	0.352	0.224	7
	34157	18	1.097	0.334	9
(2)	1	19	-0.099	0.109	35
	2	20	-0.009	0.117	30
	3	21	-0.089	0.113	32
	4	22	0.057	0.128	24
	5	23	-0.051	0.118	26
	6	24	0.086	0.105	36
	8	25	0.019	0.093	54
	9	26	-0.040	0.093	56
	10	27	-0.157	0.108	33
	11	28	-0.068	0.113	30
	12	29	-0.232	0.124	23
(3)	55	30	-0.585	0.104	35
	65	31	-0.561	0.087	48
	75	32	-0.390	0.082	55
	85	33	-0.179	0.074	64
(4)	60	34	0.241	0.253	5
	61	35	0.191	0.199	11
	62	36	0.283	0.179	16
	63	37	0.173	0.220	8
	64	38	0.154	0.231	8
	65	39	0.422	0.238	7
	66	40	0.515	0.177	17
	67	41	0.429	0.275	6
	68	42	-0.330	0.285	4
	69	43	0.077	0.216	8
	70	44	0.098	0.215	8
	71	45	0.011	0.305	3
	72	46	0.112	0.198	10
	73	47	0.242	0.231	8
	74	48	0.499	0.233	7
	75	49	0.331	0.241	6
	76	50	-0.176	0.206	9
	77	51	-0.069	0.241	6
	78	52	-0.021	0.216	8
	79	53	0.119	0.174	17
	80	54	0.415	0.174	16
	81	55	0.258	0.182	17
	82	56	0.319	0.172	17
	83	57	0.168	0.180	15
	84	58	-0.195	0.188	14
	85	59	-0.204	0.187	15
	86	60	-0.213	0.198	12
	87	61	0.222	0.156	39
	88	62	-0.110	0.171	24
	89	63	-0.268	0.177	24
	90	64	-0.670	0.184	13
	91	65	-0.625	0.186	14
	92	66	-0.577	0.228	9
	93	67	-0.862	0.282	4
	94	68	-0.739	0.353	8

Table 7. ANOVA results and regression coefficients from a multiplicative model utilized to derive a standardized catch rate series for Redfish in Div. 3L. Effort is measured in days fished (1993 based on preliminary data).

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R..... 0.777

MULTIPLE R SQUARED..... 0.603

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DF	SUMS OF SQUARES	MEAN SQUARES	F-VALUE
INTERCEPT	1	2.811E3	2.811E3	
REGRESSION	74	1.022E2	1.381E0	7.104
Country¦Gear¦TC	25	5.089E1	2.036E0	10.474
Month	11	3.321E0	3.019E-1	1.553
Bycatch PCT	4	7.344E0	1.836E0	9.447
Year	34	2.045E1	6.015E-1	3.095
RESIDUALS	346	6.725E1	1.944E-1	
TOTAL	421	2.980E3		

REGRESSION COEFFICIENTS

CATEGORY	CODE	VARIABLE	COEFFICIENT	STD. ERROR	NO. OBS.
Country¦Gear¦TC	3125	INTERCEPT	2.989	0.177	421
Month	7				
Bycatch PCT	95				
Year	59				
(1)	2114	1	-0.682	0.216	7
	2125	2	-0.260	0.198	7
	2155	3	-0.282	0.226	5
	3114	4	-0.621	0.198	11
	3124	5	0.331	0.182	7
	3155	6	0.294	0.129	24
	10125	7	0.082	0.209	8
	10126	8	0.042	0.184	14
	11115	9	-0.548	0.220	9
	11125	10	-0.179	0.123	18
	11126	11	-0.180	0.250	10
	11127	12	-0.356	0.149	15
	11155	13	-0.898	0.217	5
	14126	14	-0.481	0.189	7
	16127	15	-0.210	0.172	24
	17126	16	-0.224	0.129	20
	17127	17	0.544	0.223	5
	20114	18	-1.612	0.223	8
	20116	19	-0.853	0.224	8
	20127	20	0.255	0.113	44
	20145	21	0.869	0.520	12
	20157	22	0.617	0.103	36
	25127	23	0.665	0.223	6
	27125	24	0.138	0.104	27
	27157	25	0.478	0.226	5
(2)	1	26	-0.320	0.118	29
	2	27	-0.320	0.122	23
	3	28	-0.016	0.106	39
(3)	55	37	-0.472	0.113	25
	65	38	-0.470	0.095	39
	75	39	-0.325	0.078	63
	85	40	-0.092	0.069	82
(4)	60	41	0.048	0.189	13
	61	42	0.094	0.195	15
	62	43	0.045	0.215	10
	63	44	0.309	0.249	6
	64	45	0.478	0.311	3
	65	46	-0.060	0.286	4
	66	47	-0.190	0.214	12
	67	48	0.141	0.240	12
	68	49	-0.095	0.257	6
	69	50	-0.113	0.248	5
	70	51	-0.647	0.311	3
	71	52	0.078	0.373	3
	72	53	-0.609	0.267	4
	73	54	0.047	0.340	2
	74	55	-0.811	0.503	13
	75	56	-0.376	0.304	3
	76	57	-0.110	0.162	25
	77	58	-0.148	0.169	27
	78	59	-0.560	0.174	19
	79	60	-0.238	0.204	12
	80	61	-0.122	0.209	11
	81	62	-0.038	0.201	13
	82	63	0.101	0.196	15
	83	64	0.091	0.195	13
	84	65	-0.180	0.228	8
	85	66	-0.274	0.205	12
	86	67	0.023	0.181	27
	87	68	-0.090	0.184	24
	88	69	-0.229	0.180	28
	89	70	-0.048	0.208	12
	90	71	-0.489	0.196	18
	91	72	-0.936	0.182	14
	92	73	-0.141	0.257	5
	93	74	0.093	0.517	1

Table 8. ANOVA results and regression coefficients from a multiplicative model utilized to derive a standardized catch rate series for Redfish in Div. 3N. Effort is measured in days fished (1993-1994 based on preliminary data).

REGRESSION OF MULTIPLICATIVE MODEL

MULTIPLE R..... 0.829

MULTIPLE R SQUARED..... 0.687

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DF	SUMS OF SQUARES	MEAN SQUARES	F-VALUE
INTERCEPT	1	2.922E3	2.922E3	
REGRESSION	61	1.256E2	2.059E0	11.583
Country¦Gear¦TC	12	7.174E1	5.978E0	33.625
Month	11	1.435E0	1.305E-1	0.734 (NS)
Bycatch PCT	4	4.346E0	1.086E0	6.111
Year	34	2.490E1	7.323E-1	4.119
RESIDUALS	322	5.725E1	1.778E-1	
TOTAL	384	3.105E3		

REGRESSION COEFFICIENTS

CATEGORY	CODE	VARIABLE	COEFFICIENT	STD. ERROR	NO. OBS.
Country¦Gear¦TC	3125	INTERCEPT	2.296	0.215	384
Month	7				
Bycatch PCT	95				
Year	59				
(1)	2114	1	-0.193	0.212	13
	3114	2	0.005	0.186	46
	4127	3	0.082	0.214	15
	4157	4	0.600	0.210	28
	17126	5	-0.332	0.215	25
	20114	6	-1.412	0.276	6
	20127	7	0.518	0.183	75
	20157	8	0.772	0.194	50
	22114	9	1.259	0.199	50
	25126	10	0.155	0.228	17
	25127	11	0.684	0.208	41
	34157	12	0.586	0.499	8
(2)	1	13	-0.206	0.107	34
	2	14	-0.120	0.108	32
	3	15	-0.157	0.110	30
	4	16	-0.089	0.116	25
	5	17	-0.249	0.115	24
	6	18	-0.059	0.106	29
	8	19	-0.093	0.093	45
	9	20	-0.068	0.096	41
	10	21	-0.040	0.109	28
	11	22	-0.027	0.109	27
	12	23	-0.150	0.113	25
(3)	55	24	-0.378	0.094	35
	65	25	-0.337	0.089	37
	75	26	-0.120	0.080	47
	85	27	-0.051	0.079	44
(4)	60	28	0.832	0.161	12
(4)	61	29	0.151	0.139	22
	62	30	0.236	0.178	12
	63	31	-0.011	0.143	19
	64	32	0.039	0.164	12
	65	33	0.161	0.228	5
	66	34	0.383	0.216	6
	68	35	0.208	0.302	3
	69	36	0.406	0.227	7
	70	37	0.486	0.227	7
	71	38	0.336	0.282	3
	72	39	0.435	0.202	9
	73	40	0.270	0.343	2
	74	41	-1.441	0.459	1
	75	42	0.588	0.250	5
	76	43	-0.065	0.206	7
	77	44	0.392	0.275	4
	78	45	0.079	0.253	5
	79	46	0.490	0.204	9
	80	47	0.597	0.202	10
	81	48	0.360	0.206	11
	82	49	0.342	0.190	15
	83	50	0.335	0.197	13
	84	51	0.072	0.215	9
	85	52	-0.304	0.188	18
	86	53	0.082	0.213	10
	87	54	0.445	0.176	44
	88	55	0.159	0.184	29
	89	56	0.134	0.196	20
	90	57	-0.397	0.222	8
	91	58	-0.103	0.205	11
	92	59	-0.242	0.239	8
	93	60	-0.424	0.305	3
	94	61	0.080	0.515	7

Table 9. Standardized catch rate series for Div. 3L redfish from a multiplicative model utilizing hours fished as a measure of effort.

PREDICTED CATCH RATE

YEAR	LN TRANSFORM MEAN	LN TRANSFORM S.E.	RETRANSFORMED MEAN	RETRANSFORMED S.E.	CATCH	EFFORT
1959	0.2949	0.0321	1.491	0.265	34107	22869
1960	0.4544	0.0360	1.746	0.329	10015	5736
1961	0.7435	0.0649	2.298	0.577	8349	3634
1962	0.4134	0.0524	1.662	0.376	3425	2061
1963	0.6245	0.0576	2.047	0.485	8191	4001
1964	0.8890	0.1119	2.596	0.845	3898	1502
1965	0.7444	0.0812	2.281	0.638	18772	8230
1966	0.3006	0.0385	1.495	0.291	6927	4633
1967	0.5999	0.0360	2.019	0.380	7684	3805
1968	0.4010	0.0541	1.640	0.377	2378	1450
1969	0.4478	0.0504	1.722	0.382	2344	1361
1970	0.6251	0.0552	2.051	0.476	1029	502
1971	0.5539	0.0463	1.919	0.409	10043	5234
1972	0.4012	0.0561	1.639	0.383	3095	1888
1973	0.7389	0.0998	2.247	0.693	4709	2095
1974	-0.1099	0.1007	0.961	0.298	11419	11879
1975	0.3556	0.0517	1.569	0.353	3838	2446
1976	0.2268	0.0174	1.404	0.184	15971	11379
1977	0.1367	0.0172	1.283	0.168	13452	10487
1978	-0.0573	0.0167	1.057	0.136	6318	5978
1979	0.3497	0.0217	1.584	0.232	5584	3526
1980	0.3093	0.0209	1.522	0.219	4367	2870
1981	0.3344	0.0204	1.561	0.222	9407	6028
1982	0.3779	0.0159	1.634	0.205	7870	4817
1983	0.4446	0.0185	1.744	0.236	8657	4964
1984	0.2929	0.0235	1.495	0.228	2696	1803
1985	0.4468	0.0197	1.747	0.244	3677	2105
1986	0.4900	0.0148	1.828	0.222	27833	15222
1987	0.3126	0.0185	1.528	0.207	34212	22385
1988	0.1786	0.0148	1.339	0.162	26267	19614
1989	0.5108	0.0202	1.862	0.263	19847	10660
1990	-0.0604	0.0158	1.054	0.132	17713	16805
1991	-0.4473	0.0194	0.715	0.099	8892	12444
1992	0.5471	0.0393	1.912	0.376	4630	2421
1993	0.7031	0.1446	2.120	0.779	10013	4722

AVERAGE C.V. FOR THE RETRANSFORMED MEAN: 0.193

Table 10. Standardized catch rate series for Div. 3N redfish from a multiplicative model utilizing hours fished as a measure of effort.

PREDICTED CATCH RATE

YEAR	LN TRANSFORM MEAN	LN TRANSFORM S.E.	RETRANSFORMED MEAN	RETRANSFORMED S.E.	CATCH	EFFORT
1959	0.1115	0.0269	1.233	0.201	10478	8500
1960	0.3526	0.0683	1.536	0.395	16547	10770
1961	0.3026	0.0432	1.480	0.305	14826	10018
1962	0.3941	0.0347	1.629	0.301	18009	11056
1963	0.2842	0.0513	1.447	0.324	12906	8918
1964	0.2655	0.0559	1.417	0.331	4206	2968
1965	0.5338	0.0604	1.849	0.448	4694	2539
1966	0.6261	0.0250	2.064	0.325	10047	4867
1967	0.5404	0.0700	1.852	0.482	19504	10530
1968	-0.2181	0.0696	0.868	0.225	15265	17592
1969	0.1884	0.0459	1.318	0.280	22356	16956
1970	0.2094	0.0459	1.347	0.286	13359	9921
1971	0.1222	0.0933	1.205	0.360	24310	20174
1972	0.2237	0.0393	1.370	0.269	25838	18854
1973	0.3534	0.0461	1.555	0.330	28588	18385
1974	0.6106	0.0531	2.004	0.456	10867	5423
1975	0.4423	0.0562	1.691	0.396	14033	8299
1976	-0.0641	0.0430	1.026	0.211	4541	4427
1977	0.0426	0.0566	1.134	0.266	3064	2703
1978	0.0903	0.0479	1.194	0.259	5725	4794
1979	0.2309	0.0249	1.390	0.218	8483	6101
1980	0.5262	0.0295	1.864	0.318	11663	6258
1981	0.3693	0.0292	1.593	0.271	14873	9336
1982	0.4310	0.0266	1.697	0.275	13677	8060
1983	0.2796	0.0313	1.455	0.256	11090	7622
1984	-0.0833	0.0348	1.010	0.187	12065	11940
1985	-0.0928	0.0325	1.002	0.179	16880	16846
1986	-0.1015	0.0378	0.991	0.191	14972	15113
1987	0.3337	0.0233	1.542	0.235	44819	29065
1988	0.0014	0.0282	1.103	0.184	26999	24470
1989	-0.1566	0.0305	0.941	0.163	13802	14668
1990	-0.5585	0.0322	0.629	0.112	11392	18109
1991	-0.5131	0.0343	0.658	0.121	12723	19349
1992	-0.4655	0.0504	0.684	0.152	10153	14842
1993	-0.7509	0.0784	0.507	0.139	7129	14059
1994	-0.6277	0.1213	0.561	0.190	2274	4051

AVERAGE C.V. FOR THE RETRANSFORMED MEAN: 0.209

Table 11. Standardized catch rate series for Div. 3L redfish from a multiplicative model utilizing days fished as a measure of effort.

PREDICTED CATCH RATE

YEAR	LN TRANSFORM MEAN	LN TRANSFORM S.E.	RETRANSFORMED MEAN	RETRANSFORMED S.E.	CATCH	EFFORT
1959	2.9891	0.0313	21.560	3.792	34107	1582
1960	3.0369	0.0376	22.544	4.339	10015	444
1961	3.0832	0.0406	23.579	4.710	8349	354
1962	3.0338	0.0478	22.360	4.838	3425	153
1963	3.2977	0.0625	28.900	7.124	8191	283
1964	3.4666	0.0958	33.650	10.184	3898	116
1965	2.9287	0.0840	19.768	5.618	18772	950
1966	2.7987	0.0396	17.749	3.503	6927	390
1967	3.1297	0.0510	24.572	5.486	7684	313
1968	2.8942	0.0525	19.402	4.392	2378	123
1969	2.8765	0.0573	19.015	4.493	2344	123
1970	2.3421	0.1014	10.900	3.389	1029	94
1971	3.0673	0.1360	22.121	7.899	10043	454
1972	2.3805	0.0700	11.506	2.995	3095	269
1973	3.0359	0.1202	21.609	7.283	4709	218
1974	2.1784	0.2565	8.561	4.077	11419	1334
1975	2.6129	0.0805	14.440	4.021	3838	266
1975	2.6129	0.0805	14.440	4.021	3838	266
1976	2.8789	0.0201	19.419	2.741	15971	822
1977	2.8410	0.0197	18.702	2.617	13452	719
1978	2.4292	0.0205	12.384	1.765	6318	510
1979	2.7509	0.0282	17.016	2.844	5584	328
1980	2.8674	0.0274	19.128	3.148	4367	228
1981	2.9506	0.0242	20.821	3.221	9407	452
1982	3.0898	0.0191	23.991	3.305	7870	328
1983	3.0805	0.0219	23.735	3.502	8657	365
1984	2.8088	0.0335	17.983	3.270	2696	150
1985	2.7147	0.0239	16.447	2.532	3677	224
1986	3.0120	0.0154	22.236	2.754	27833	1252
1987	2.8988	0.0180	19.831	2.652	34212	1725
1988	2.7600	0.0172	17.268	2.256	26267	1521
1989	2.9410	0.0266	20.598	3.340	19847	964
1990	2.5005	0.0221	13.289	1.968	17713	1333
1991	2.0534	0.0233	8.492	1.291	8892	1047
1992	2.8481	0.0590	18.468	4.426	4630	251
1993	3.0822	0.2542	21.161	10.039	10013	473

AVERAGE C.V. FOR THE RETRANSFORMED MEAN: 0.218

Table 12. Standardized catch rate series for Div. 3N redfish from a multiplicative model utilizing days fished as a measure of effort.

PREDICTED CATCH RATE

YEAR	LN TRANSFORM MEAN	LN TRANSFORM S.E.	RETRANSFORMED MEAN	RETRANSFORMED S.E.	CATCH	EFFORT
1959	2.2957	0.0464	10.608	2.263	10478	988
1960	3.1277	0.0548	24.274	5.613	16547	682
1961	2.4470	0.0468	12.339	2.643	14826	1202
1962	2.5313	0.0535	13.378	3.058	18009	1346
1963	2.2847	0.0488	10.479	2.291	12906	1232
1964	2.3343	0.0559	10.973	2.563	4206	383
1965	2.4565	0.0809	12.245	3.418	4694	383
1966	2.6786	0.0496	15.532	3.420	10047	647
1968	2.5039	0.0759	12.871	3.484	15265	1186
1969	2.7015	0.0683	15.744	4.052	22356	1420
1970	2.7818	0.0698	17.048	4.432	13359	784
1971	2.6316	0.0972	14.470	4.411	24310	1680
1972	2.7305	0.0521	16.339	3.689	25838	1581
1973	2.5661	0.1327	13.313	4.700	28588	2147
1974	0.8548	0.2228	2.298	1.029	10867	4728
1975	2.8842	0.0799	18.789	5.213	14033	747
1976	2.2307	0.0568	9.889	2.328	4541	459
1977	2.6874	0.0883	15.368	4.475	3064	199
1978	2.3745	0.0786	11.293	3.109	5725	507
1979	2.7856	0.0389	17.379	3.400	8483	488
1980	2.8931	0.0532	19.213	4.378	11663	607
1981	2.6562	0.0556	15.142	3.526	14873	982
1982	2.6381	0.0463	14.940	3.184	13677	915
1983	2.6306	0.0503	14.799	3.281	11090	749
1984	2.3681	0.0594	11.330	2.726	12065	1065
1985	1.9919	0.0500	7.815	1.729	16880	2160
1986	2.3780	0.0598	11.441	2.759	14972	1309
1987	2.7409	0.0443	16.574	3.456	44819	2704
1988	2.4551	0.0477	12.432	2.688	26999	2172
1989	2.4294	0.0523	12.090	2.732	13802	1142
1990	1.8983	0.0626	7.072	1.744	11392	1611
1991	2.1930	0.0552	9.530	2.213	12723	1335
1992	2.0534	0.0713	8.222	2.160	10153	1235
1993	1.8719	0.1054	6.741	2.135	7129	1058
1994	2.3761	0.2851	10.199	5.087	2274	223

AVERAGE C.V. FOR THE RETRANSFORMED MEAN: 0.258

Table 13. Mean number per standard tow from various Canadian surveys in Div. 3L where strata greater than 366 m (200 fath.) were sampled. Dashes (-) represent unsampled strata. Number of successful sets in brackets. The gear utilized was an Engels 145 otter trawl with a small mesh liner in the codend. G.A. = Gadus Atlantica, W.T. = Wilfred Templeman, A.N. = Alfred Needler.

Stratum	Depth Range (M)	Area (sq. n.) mi	Aug 16-Aug 29 1978 (G.A. 12)	Sep 4-Sep 10 1979 (G.A. 25)	May 8-May 13 1980 (G.A. 36)	Sep 18-Sep 26 1981 (G.A. 55)	Jul 26-Sep 3 1984 (W.T. 16-18)	Jan 10-Feb 11 1985-Q1 (W.T. 22-24)	Apr 17-May 26 1985-Q2 (W.T. 28-30)	Jul 27-Aug 25 1985-Q3 (W.T. 32-34)	Oct 9-Nov 18 1985-Q4 (W.T. 37-39)
347	184-274	983	131.67 (3)	0.00 (2)	0.00 (4)	3.96 (4)	0.00 (6)	0.00 (5)	0.40 (5)	0.00 (3)	0.00 (5)
366	184-274	1394	197.00 (3)	13.50 (2)	9.83 (6)	47.67 (6)	13.91 (11)	0.00 (5)	1.33 (6)	17.40 (5)	17.22 (9)
369	184-274	961	0.00 (3)	1.00 (2)	0.25 (4)	13.75 (4)	0.43 (7)	0.00 (5)	0.20 (5)	0.17 (6)	0.00 (6)
386	184-274	983	115.67 (3)	11.50 (2)	2.00 (4)	11.00 (4)	23.13 (8)	0.00 (5)	0.40 (5)	19.60 (5)	0.60 (5)
389	184-274	821	0.33 (3)	0.00 (1)	29.50 (2)	4.00 (3)	21.67 (6)	4.00 (4)	0.20 (5)	1.75 (4)	7.40 (5)
391	184-274	282	0.00 (2)	19.00 (2)	4.00 (2)	1.50 (2)	0.50 (2)	0.00 (2)	0.00 (2)	0.00 (2)	12.50 (2)
345	275-366	1432	68.50 (2)	96.75 (4)	12.00 (4)	46.60 (5)	37.80 (7)	3.33 (3)	3.20 (5)	62.29 (7)	5.11 (9)
346	275-366	865	206.00 (2)	126.75 (4)	27.00 (2)	70.33 (3)	263.33 (6)	10.00 (4)	20.00 (2)	91.33 (3)	84.40 (5)
368	275-366	334	2,709.00 (2)	140.00 (3)	24.00 (2)	526.50 (2)	4,379.50 (2)	405.00 (2)	14.50 (2)	320.50 (2)	351.50 (2)
387	275-366	718	532.00 (2)	595.40 (5)	23.67 (3)	1,748.67 (3)	4,678.00 (3)	102.00 (4)	11.33 (6)	1,807.33 (3)	628.00 (4)
388	275-366	361	1,240.50 (2)	2,326.33 (3)	4.50 (2)	464.50 (2)	195.00 (2)	16.00 (3)	20.00 (2)	397.00 (2)	78.00 (2)
392	275-366	145	-	818.00 (3)	27.33 (3)	536.50 (2)	2,811.00 (2)	4.00 (2)	10.00 (2)	131.50 (2)	1,398.50 (2)
729	367-549	186	-	488.00 (3)	77.00 (1)	1,050.00 (2)	448.00 (2)	3,406.00 (2)	24.50 (2)	1,231.00 (2)	2,720.50 (2)
731	367-549	216	486.00 (2)	457.00 (3)	325.50 (2)	176.00 (2)	257.00 (2)	80.67 (3)	63.00 (2)	257.00 (2)	502.00 (2)
733	367-549	468	817.00 (2)	1,300.67 (3)	43.67 (3)	1,420.50 (2)	480.00 (4)	1,921.67 (3)	1,147.53 (3)	1,699.50 (2)	727.00 (3)
735	367-549	272	810.50 (2)	452.67 (3)	39.00 (2)	768.00 (2)	723.33 (3)	10.50 (2)	52.50 (2)	282.00 (2)	232.00 (2)
730	550-731	170	1,135.00 (2)	399.33 (3)	295.00 (2)	496.50 (2)	100.50 (2)	816.00 (2)	8,926.00 (2)	347.00 (2)	37.50 (2)
732	550-731	231	85.50 (2)	54.00 (2)	104.00 (2)	53.00 (2)	90.00 (2)	416.00 (2)	141.50 (2)	48.00 (2)	39.00 (2)
734	550-731	228	1,435.50 (2)	535.67 (3)	1,756.00 (2)	760.50 (2)	557.00 (3)	195.50 (2)	366.00 (2)	912.00 (2)	540.00 (2)
736	550-731	175	163.50 (2)	270.33 (3)	119.00 (1)	84.00 (2)	17.00 (1)	-	532.50 (2)	26.50 (2)	222.00 (2)
737	732-914	227	-	-	-	-	-	-	-	-	-
741	732-914	223	-	-	-	-	-	-	-	-	-
745	732-914	348	-	-	-	-	-	-	-	-	-
748	732-914	159	-	-	-	-	-	-	-	-	-
Upper (95% CI)a			653.40	544.20	266.40	680.10	1,078.50	302.20	1,909.10	465.20	290.30
Weighted mean (by area) (incl. strata with 1 set)			349.30	257.30	64.50	293.50	567.50	174.70	208.70	286.80	187.90
Lower (95% CI)a			45.20	11.03	-139.6	-93.2	73.94	47.20	-1491.7	108.50	85.50
Abundance of surveyed area (millions)			285.60	216.80	54.30	247.30	478.20	144.90	175.90	241.70	158.30

a - Confidence interval of mean for those strata with at least two sets.

Table 13. Mean number , Div. 3L (continued)

Stratum	Depth Range (M)	Area (sq. n.) mi	Jan 22-Feb 27 1986-Q1 (W.T.42-44)	Nov13-Nov 30 1986-Q4 (A.N. 72)	Jan 17-Jan 25 1990-Q1 (W.T. 90)	Aug 7-Aug 19 1990-Q3 (W.T. 98)	Oct 18-Nov 18 1990-Q4 (W.T. 101)	May 11- May 29 1991-Q2 (W.T. 106-7)	Aug 4- Aug 11 1991-Q3 (W.T. 109)	Nov 10- Dec 2 1991-Q4 (W.T. 114-5)	May 13-June 7 1992-Q2 (W.T 120-2)
									0.3		
347	184-274	983	1.50 (4)	0.00 (4)	0.50 (4)	1.93 (4)	0.00 (2)	0.25 (2)	0.00 (3)	0.00 (4)	0.00 (4)
366	184-274	1394	1.50 (2)	5.50 (4)	1.00 (5)	9.00 (4)	0.00 (6)	-	0.33 (3)	0.19 (21)	0.33 (6)
369	184-274	961	0.00 (3)	4.24 (3)	0.00 (4)	2.50 (4)	0.00 (4)	0.00 (2)	6.50 (4)	0.56 (9)	0.00 (4)
386	184-274	983	0.86 (7)	4.10 (4)	5.50 (4)	1.29 (7)	2.00 (4)	0.67 (3)	1.00 (3)	0.00 (3)	0.00 (4)
389	184-274	821	1.50 (4)	2.25 (4)	0.00 (3)	5.33 (3)	1.00 (3)	1.67 (3)	0.33 (3)	0.00 (3)	0.00 (3)
391	184-274	282	0.00 (3)	18.00 (2)	0.50 (5)	1.00 (5)	0.00 (2)	0.00 (3)	5.67 (3)	0.00 (3)	2.50 (2)
345	275-366	1432	1.33 (3)	6.68 (4)	0.40 (5)	16.33 (6)	1.00 (5)	0.67 (3)	4.50 (4)	0.25 (4)	0.00 (6)
346	275-366	865	4.25 (4)	22.13 (3)	14.67 (3)	247.66 (7)	67.00 (3)	-	30.00 (4)	6.80 (15)	1.75 (4)
368	275-366	334	7.00 (1)	24.90 (2)	21.00 (2)	1,728.57 (7)	57.50 (2)	-	409.75 (4)	31.17 (6)	12.00 (2)
387	275-366	718	12.00 (4)	6.00 (2)	135.00 (3)	297.70 (10)	89.67 (3)	45.00 (3)	189.40 (5)	13.00 (5)	8.00 (3)
388	275-366	361	15.67 (3)	-	13.00 (2)	183.86 (7)	16.00 (2)	13.53 (3)	50.33 (3)	12.33 (3)	2.00 (2)
392	275-366	145	9.67 (3)	359.50 (2)	4.00 (2)	146.56 (9)	9.00 (2)	2.50 (2)	350.67 (3)	4.67 (3)	3.50 (2)
729	367-549	186	2,690.00 (2)	1,491.22 (2)	206.50 (2)	328.43 (7)	206.50 (2)	19.00 (2)	190.00 (2)	142.00 (3)	59.50 (2)
731	367-549	216	153.00 (1)	220.80 (1)	68.00 (2)	166.83 (6)	275.50 (2)	27.50 (2)	244.00 (3)	41.00 (3)	26.00 (2)
733	367-549	468	452.07 (2)	-	72.00 (2)	490.87 (9)	216.00 (2)	16.00 (2)	611.00 (4)	340.00 (3)	53.00 (2)
735	367-549	272	-	153.50 (2)	223.00 (2)	603.51 (6)	195.00 (1)	-	106.82 (3)	125.67 (3)	76.50 (2)
730	550-731	170	1,822.50 (1)	-	109.50 (2)	183.52 (4)	42.00 (1)	178.00 (2)	222.33 (3)	348.50 (2)	113.50 (2)
732	550-731	231	1,694.00 (1)	-	68.00 (2)	59.44 (9)	193.00 (2)	300.00 (2)	96.67 (3)	39.00 (2)	214.50 (2)
734	550-731	228	451.00 (2)	-	142.93 (2)	271.60 (5)	42.00 (2)	231.60 (2)	59.67 (3)	16.00 (2)	140.00 (2)
736	550-731	175	-	24.74 (2)	208.50 (2)	93.50 (6)	281.00 (2)	-	12.67 (3)	51.00 (2)	60.50 (2)
737	732-914	227	-	-	-	-	-	-	-	-	-
741	732-914	223	-	-	-	-	-	-	-	-	-
745	732-914	348	-	-	-	-	-	-	-	-	-
748	732-914	159	-	-	-	-	-	-	-	-	-
Upper (95% CI)a			466.00	66.30	62.50	263.80	63.10	123.20	94.90	58.30	38.60
Weighted mean (by area) (incl. strata with 1 set)			146.40	49.90	33.90	156.20	45.90	25.70	76.90	30.40	16.70
Lower (95% CI)a			-294.7	25.80	5.30	48.60	21.30	-71.9	58.80	2.50	-5.2
Abundance of surveyed area (millions)			118.50	36.60	28.60	131.60	38.70	15.80	64.80	25.60	14.10

a - Confidence interval of mean for those strata with at least two sets.

Table 13. Mean number , Div. 3L (continued)

Stratum	Depth Range (M)	Area (sq. n.) mi	Nov 5-Nov 29 1992-Q4 (W.T 129-30)	May 18-Jun 10 1993-Q2 (W.T 137-8)	Aug 5-Aug 15 1993-Q3 (G.A. 223)	Nov 12- Dec 4 1993-Q4 (W.T. 145-6)	May 22-Jun 10 1994-Q2 (W.T. 153-54)	Nov 8-Dec 7 1994-Q4 (W.T. 161-62)	May 27-Jun 14 1995-Q2 (W.T. 169-70)
347	184-274	983	0.00 (2)	0.00 (4)	0.00 (3)	0.00 (4)	0.00 (4)	0.00 (8)	0.00 (4)
366	184-274	1394	1.00 (24)	0.00 (7)	2.50 (2)	0.21 (14)	0.20 (5)	0.10 (10)	0.00 (5)
369	184-274	961	0.00 (8)	0.00 (5)	0.00 (3)	0.14 (7)	0.33 (3)	0.00 (3)	0.00 (3)
386	184-274	983	0.00 (3)	0.20 (5)	0.00 (3)	0.00 (3)	0.00 (4)	0.00 (3)	0.00 (4)
389	184-274	821	0.67 (3)	0.00 (4)	1.00 (3)	0.00 (3)	0.00 (3)	0.00 (3)	2.25 (4)
391	184-274	282	0.00 (3)	0.00 (2)	0.33 (3)	1.00 (3)	0.00 (2)	1.67 (3)	2.00 (2)
345	275-366	1432	0.25 (4)	0.00 (2)	1.67 (3)	0.00 (3)	0.60 (5)	0.00 (8)	0.00 (5)
346	275-366	865	2.64 (14)	2.25 (6)	5.33 (3)	5.09 (11)	1.83 (3)	0.29 (7)	0.67 (3)
368	275-366	334	18.20 (10)	9.50 (4)	25.00 (3)	5.63 (8)	3.50 (2)	0.50 (12)	2.00 (2)
387	275-366	718	10.00 (3)	6.07 (2)	51.33 (3)	2.33 (3)	1.00 (3)	3.22 (9)	7.33 (3)
388	275-366	361	20.00 (3)	1.50 (3)	11.00 (3)	6.67 (3)	0.00 (2)	2.86 (7)	5.00 (2)
392	275-366	145	3.33 (3)	1.50 (2)	21.00 (3)	4.67 (3)	0.00 (2)	4.67 (3)	27.50 (2)
729	367-549	186	296.50 (3)	31.50 (2)	210.33 (3)	172.67 (3)	18.50 (2)	800.67 (9)	48.00 (2)
731	367-549	216	205.00 (3)	26.00 (3)	170.00 (3)	21.67 (3)	41.00 (2)	35.50 (7)	24.50 (2)
733	367-549	468	210.00 (3)	20.67 (2)	215.67 (3)	18.67 (3)	20.50 (2)	40.89 (9)	7.50 (2)
735	367-549	272	222.33 (3)	14.50 (2)	35.00 (3)	31.00 (3)	34.00 (2)	11.20 (11)	22.00 (2)
730	550-731	170	69.50 (2)	249.00 (2)	50.33 (3)	332.00 (3)	35.00 (2)	114.33 (3)	72.00 (2)
732	550-731	231	198.00 (2)	401.00 (2)	93.67 (3)	18.00 (2)	53.00 (2)	98.67 (3)	54.50 (2)
734	550-731	228	108.00 (2)	19.06 (2)	20.67 (3)	70.50 (2)	43.38 (2)	44.87 (3)	106.50 (2)
736	550-731	175	45.50 (2)	40.50 (2)	11.67 (3)	24.67 (3)	23.00 (2)	25.43 (7)	41.50 (2)
737	732-914	227	-	-	-	-	5.50 (2)	-	-
741	732-914	223	-	-	-	-	1.50 (2)	-	-
745	732-914	348	-	-	-	-	0.50 (2)	-	-
748	732-914	159	-	-	-	-	1.00 (2)	-	-
Upper (95% CI)a			49.80	117.90	41.60	24.65	8.80	39.30	10.54
Weighted mean (by area) (incl. strata with 1 set)			33.30	16.20	25.60	13.10	5.90	21.50	8.45
Lower (95% CI)a			16.80	-85.5	9.50	1.50	2.80	3.60	6.36
Abundance of surveyed area (millions)			28.10	13.70	21.50	11.00	5.30	18.10	7.10

a - Confidence interval of mean for those strata with at least two sets.

Table 14. Mean weight (kg) per standard tow from various Canadian surveys in Div. 3L where strata greater than 366 m (200 fath.) were sampled. Dashes (-) represent unsampled strata. Number of successful sets in brackets. The gear utilized was an Engels 145 otter trawl with a small mesh liner in the codend. G.A. = Gadus Atlantica, W.T. = Wilfred Templeman, A.N. = Alfred Needler.

Stratum	Depth Range (M)	Area (sq. n.) mi	Aug 16-Aug 29 1,978.00 (G.A. 12)	Sep 4-Sep 10 1,979.00 (G.A. 25)	May 8-May 13 1,980.00 (G.A. 36)	Sep 18-Sep 26 1,981.00 (G.A. 55)	Jul 26-Sep 3 1,984.00 (W.T. 16-18)	Jan 10-Feb 11 1985-Q1 (W.T. 22-24)	Apr 17-May 26 1985-Q2 (W.T. 28-30)	Jul 27-Aug 25 1985-Q3 (W.T. 32-34)	Oct 9-Nov 18 1985-Q4 (W.T. 37-39)
347	184-274	983	42.52 (3)	0.00 (2)	0.00 (4)	1.32 (4)	0.00 (6)	0.00 (5)	0.00 (5)	0.00 (3)	0.00 (5)
366	184-274	1394	35.42 (3)	1.82 (2)	2.00 (6)	25.01 (6)	1.14 (11)	0.00 (5)	0.05 (6)	4.00 (5)	5.33 (9)
369	184-274	961	0.00 (3)	0.80 (2)	0.25 (4)	2.40 (4)	0.00 (7)	0.00 (5)	0.20 (5)	0.17 (6)	0.00 (6)
386	184-274	983	62.99 (3)	11.32 (2)	1.25 (4)	8.50 (4)	14.18 (8)	0.00 (5)	0.21 (5)	15.30 (5)	0.44 (5)
389	184-274	821	0.03 (3)	0.00 (1)	9.25 (2)	2.33 (3)	8.83 (6)	0.50 (4)	0.01 (5)	0.63 (4)	1.46 (5)
391	184-274	282	0.00 (2)	6.39 (2)	0.75 (2)	0.08 (2)	0.03 (2)	0.00 (2)	0.00 (2)	0.00 (2)	4.00 (2)
345	275-366	1432	51.08 (2)	78.92 (4)	8.50 (4)	35.80 (5)	31.10 (7)	0.83 (3)	3.14 (5)	44.41 (7)	3.32 (9)
346	275-366	865	151.18 (2)	80.88 (4)	14.75 (2)	64.83 (3)	163.33 (6)	5.80 (4)	18.25 (2)	67.50 (3)	61.50 (5)
368	275-366	334	1,154.53 (2)	61.72 (3)	7.25 (2)	176.75 (2)	1,915.75 (2)	2.00 (2)	5.35 (2)	181.75 (2)	151.50 (2)
387	275-366	718	203.16 (2)	286.77 (5)	6.83 (3)	572.00 (3)	1,972.33 (3)	71.50 (4)	4.68 (6)	633.03 (3)	279.17 (4)
388	275-366	361	262.18 (2)	562.10 (3)	1.10 (2)	145.50 (2)	63.00 (2)	14.17. (3)	7.65 (2)	130.50 (2)	30.75 (2)
392	275-366	145	-	304.24 (3)	7.50 (3)	146.75 (2)	1,118.44 (2)	1.40 (2)	1.50 (2)	45.75 (2)	451.50 (2)
729	367-549	186	-	199.53 (3)	24.00 (1)	413.50 (2)	203.43 (2)	1,249.00 (2)	7.25 (2)	560.00 (2)	1,213.50 (2)
731	367-549	216	289.42 (2)	255.57 (3)	112.25 (2)	69.00 (2)	120.00 (2)	29.17 (3)	16.00 (2)	121.50 (2)	275.50 (2)
733	367-549	468	460.96 (2)	647.34 (3)	18.83 (3)	754.00 (2)	280.63 (4)	895.28 (3)	623.43 (3)	1,023.50 (2)	353.76 (3)
735	367-549	272	603.98 (2)	252.05 (3)	14.50 (2)	348.00 (2)	442.00 (3)	4.50 (2)	20.50 (2)	186.00 (2)	127.75 (2)
730	550-731	170	509.74 (2)	238.85 (3)	96.75 (2)	263.25 (2)	57.25 (2)	408.00 (2)	4,710.00 (2)	195.50 (2)	19.75 (2)
732	550-731	231	47.44 (2)	29.94 (2)	30.25 (2)	30.50 (2)	49.25 (2)	217.50 (2)	56.00 (2)	33.00 (2)	22.00 (2)
734	550-731	228	1,084.93 (2)	357.43 (3)	1,187.45 (2)	430.64 (2)	350.00 (3)	119.75 (2)	146.75 (2)	598.50 (2)	387.13 (2)
736	550-731	175	61.59 (2)	116.73 (3)	28.00 (1)	42.25 (2)	11.00 (1)	-	152.00 (2)	17.25 (2)	107.75 (2)
737	732-914	227	-	-	-	-	-	-	-	-	-
741	732-914	223	-	-	-	-	-	-	-	-	-
745	732-914	348	-	-	-	-	-	-	-	-	-
748	732-914	159	-	-	-	-	-	-	-	-	-
Upper (95% CI)a			252.90	164.50	185.30	246.60	536.80	111.30	1,008.10	264.90	278.70
Weighted mean (by area) (incl. strata with 1 set)			163.50	114.60	34.40	124.40	255.50	78.70	107.30	138.30	88.80
Lower (95% CI)a			74.13	82.80	-115.9	3.20	-18.1	46.10	-793.4	11.70	-101.1
Survey biomass index (tons)			133724	96536	29001	104817	215259	65282	90432	116543	74828

a - Confidence interval of mean for those strata with at least two sets.

Table 14. Mean weight , Div. 3L (continued)

Stratum	Depth Range (M)	Area (sq. n.) mi	Jan 22-Feb 27 1986-Q1 (W.T.42-44)	Nov13-Nov 30 1986-Q4 (A.N. 72)	Jan 17-Jan 25 1990-Q1 (W.T. 90)	Aug 7-Aug 19 1990-Q3 (W.T. 98)	Oct 18-Nov 18 1990-Q4 (W.T. 101)	May 11- May 29 1991-Q2 (W.T. 106-7)	Aug 4- Aug 11 1991-Q3 (W.T. 109)	Nov 10- Dec 2 1991-Q4 (W.T. 114-5)	May 13-June 7 1992-Q2 (W.T 120-2)
									0.3		
347	184-274	983	0.08 (4)	0.00 (4)	0.06 (4)	0.63 (4)	0.00 (2)	0.00 (2)	0.00 (3)	0.00 (4)	0.00 (4)
366	184-274	1394	0.01 (2)	2.13 (4)	0.04 (5)	2.56 (4)	0.00 (6)	-	0.10 (3)	0.03 (21)	0.08 (6)
369	184-274	961	0.00 (3)	0.71 (3)	0.00 (4)	0.79 (4)	0.00 (4)	0.00 (2)	3.27 (4)	0.12 (9)	0.00 (4)
386	184-274	983	0.45 (7)	0.34 (4)	3.21 (4)	0.09 (7)	0.05 (4)	0.02 (3)	0.20 (3)	0.00 (3)	0.00 (4)
389	184-274	821	0.15 (4)	0.84 (4)	0.00 (3)	0.85 (3)	0.54 (3)	0.07 (3)	0.22 (3)	0.00 (3)	0.00 (3)
391	184-274	282	0.00 (3)	3.50 (2)	0.01 (5)	0.26 (5)	0.00 (2)	0.00 (3)	1.40 (3)	0.00 (3)	0.40 (2)
345	275-366	1432	0.04 (3)	5.21 (4)	0.02 (5)	8.66 (6)	0.53 (5)	0.07 (3)	2.13 (4)	0.12 (4)	0.00 (6)
346	275-366	865	1.08 (4)	16.80 (3)	3.22 (3)	172.19 (7)	38.98 (3)	-	11.46 (4)	2.59 (15)	0.50 (4)
368	275-366	334	1.70 (1)	7.25 (2)	5.10 (2)	737.95 (7)	14.25 (2)	-	153.78 (4)	6.80 (6)	4.70 (2)
387	275-366	718	8.00 (4)	3.10 (2)	75.92 (3)	115.68 (10)	35.05 (3)	12.73 (3)	61.37 (5)	6.08 (5)	2.47 (3)
388	275-366	361	5.33 (3)	-	2.85 (2)	47.46 (7)	3.30 (2)	1.56 (3)	8.13 (3)	1.67 (3)	0.30 (2)
392	275-366	145	4.10 (3)	113.25 (2)	2.08 (2)	35.49 (9)	2.32 (2)	0.48 (2)	133.63 (3)	0.56 (3)	1.63 (2)
729	367-549	186	1,118.30 (2)	480.88 (2)	121.20 (2)	175.09 (7)	94.00 (2)	4.45 (2)	86.38 (2)	40.88 (3)	13.70 (2)
731	367-549	216	69.00 (1)	105.60 (1)	18.38 (2)	66.18 (6)	116.86 (2)	5.47 (2)	78.32 (3)	9.65 (3)	6.75 (2)
733	367-549	468	238.22 (2)	-	30.00 (2)	314.42 (9)	59.60 (2)	5.83 (2)	282.51 (4)	100.25 (3)	16.83 (2)
735	367-549	272	-	63.50 (2)	51.22 (2)	417.61 (6)	70.45 (1)	-	47.01 (3)	30.17 (3)	20.88 (2)
730	550-731	170	767.81 (1)	-	59.68 (2)	107.15 (4)	25.90 (1)	45.30 (2)	120.32 (3)	247.68 (2)	41.40 (2)
732	550-731	231	850.50 (1)	-	37.75 (2)	31.32 (9)	118.85 (2)	56.35 (2)	44.95 (3)	19.08 (2)	71.70 (2)
734	550-731	228	296.90 (2)	-	80.68 (2)	164.97 (5)	23.00 (2)	43.29 (2)	37.08 (3)	11.00 (2)	51.63 (2)
736	550-731	175	-	14.38 (2)	65.63 (2)	51.32 (6)	156.25 (2)	-	6.43 (3)	22.02 (2)	17.38 (2)
737	732-914	227	-	-	-	-	-	-	-	-	-
741	732-914	223	-	-	-	-	-	-	-	-	-
745	732-914	348	-	-	-	-	-	-	-	-	-
748	732-914	159	-	-	-	-	-	-	-	-	-
Upper (95% CI)a			202.70	24.80	31.90	130.00	29.90	11.70	40.80	19.80	12.50
Weighted mean (by area) (incl. strata with 1 set)			68.60	18.50	14.90	80.10	19.70	5.53	31.50	11.40	5.40
Lower (95% CI)a			-121.9	8.30	-2.1	30.10	6.60	-0.6	22.10	2.90	-1.7
Survey biomass index (tons)			55514	13568	12525	67453	16563	3399	26510	9576	4528

a - Confidence interval of mean for those strata with at least two sets.

Table 14. Mean weight , Div. 3L (continued)

Stratum	Depth Range (M)	Area (sq. n.) mi	Nov 5-Nov 29 1992-Q4 (W.T 129-30)	May 18-Jun 10 1993-Q2 (W.T 137-8)	Aug 5-Aug 15 1993-Q3 (G.A. 223)	Nov 12- Dec 4 1993-Q4 (W.T. 145-6)	May 22-Jun 10 1994-Q2 (W.T. 153-54)	Nov 8-Dec 7 1994-Q4 (W.T. 161-62)	May 27-Jun 14 1995-Q2 (W.T. 169-70)
347	184-274	983	0.00 (2)	0.00 (4)	0.00 (3)	0.00 (4)	0.00 (4)	0.00 (8)	0.00 (4)
366	184-274	1394	0.28 (24)	0.00 (7)	0.70 (2)	0.06 (14)	0.08 (5)	0.04 (10)	0.00 (5)
369	184-274	961	0.00 (8)	0.00 (5)	0.00 (3)	0.03 (7)	0.06 (3)	0.00 (3)	0.00 (3)
386	184-274	983	0.00 (3)	0.09 (5)	0.00 (3)	0.00 (3)	0.00 (4)	0.00 (3)	0.00 (4)
389	184-274	821	0.03 (3)	0.00 (4)	0.14 (3)	0.00 (3)	0.00 (3)	0.00 (3)	0.59 (4)
391	184-274	282	0.00 (3)	0.00 (2)	0.22 (3)	0.53 (3)	0.00 (2)	0.78 (3)	0.17 (2)
345	275-366	1432	0.19 (4)	0.00 (2)	0.48 (3)	0.00 (3)	0.23 (5)	0.00 (8)	0.00 (5)
346	275-366	865	0.83 (14)	0.52 (6)	1.43 (3)	1.94 (11)	0.56 (3)	0.09 (7)	0.30 (3)
368	275-366	334	4.60 (10)	3.25 (4)	6.77 (3)	1.04 (8)	0.63 (2)	0.10 (12)	0.16 (2)
387	275-366	718	2.43 (3)	2.36 (2)	14.45 (3)	0.68 (3)	0.17 (3)	0.78 (9)	1.22 (3)
388	275-366	361	3.27 (3)	0.49 (3)	3.28 (3)	2.33 (3)	0.00 (2)	0.81 (7)	0.50 (2)
392	275-366	145	0.55 (3)	0.36 (2)	3.45 (3)	1.56 (3)	0.00 (2)	2.11 (3)	2.40 (2)
729	367-549	186	89.72 (3)	6.75 (2)	60.22 (3)	55.12 (3)	3.82 (2)	235.73 (9)	8.10 (2)
731	367-549	216	46.25 (3)	7.25 (3)	59.72 (3)	5.08 (3)	9.53 (2)	6.88 (7)	4.68 (2)
733	367-549	468	68.35 (3)	6.68 (2)	68.48 (3)	4.92 (3)	5.30 (2)	10.54 (9)	1.23 (2)
735	367-549	272	79.35 (3)	3.90 (2)	7.60 (3)	5.32 (3)	5.95 (2)	2.43 (11)	3.65 (2)
730	550-731	170	36.53 (2)	43.95 (2)	23.32 (3)	168.46 (3)	10.15 (2)	45.77 (3)	23.13 (2)
732	550-731	231	67.80 (2)	90.90 (2)	45.27 (3)	4.57 (2)	13.15 (2)	31.68 (3)	16.55 (2)
734	550-731	228	43.58 (2)	7.93 (2)	11.35 (3)	21.03 (2)	12.29 (2)	16.53 (3)	31.52 (2)
736	550-731	175	13.60 (2)	13.60 (2)	6.43 (3)	6.35 (3)	5.40 (2)	8.25 (7)	12.10 (2)
737	732-914	227	-	-	-	-	1.98 (2)	-	-
741	732-914	223	-	-	-	-	0.65 (2)	-	-
745	732-914	348	-	-	-	-	0.43 (2)	-	-
748	732-914	159	-	-	-	-	0.32 (2)	-	-
Upper (95% CI)a			16.20	24.90	14.80	10.70	2.10	12.00	2.58
Weighted mean (by area) (incl. strata with 1 set)			10.70	3.90	8.40	4.90	1.40	6.50	2.08
Lower (95% CI)a			5.30	-17.2	1.90	-1.0	0.70	1.00	1.58
Survey biomass index (tons)			9037	3243	7037	4095	1313	5463	1756

a - Confidence interval of mean for those strata with at least two sets.

Table 15. Mean number per standard tow from various Canadian surveys in Div. 3N where strata greater than 366 m (200 fath.) were sampled. Dashes (-) represent unsampled strata. Number of successful sets in brackets. The gear utilized was an Engels 145 otter trawl with a small mesh liner in the codend. G.A. = Gadus Atlantica, W.T. = Wilfred Templeman, A.N. = Alfred Needler.

Stratum	Depth Range (M)	Area (sq. n.) mi	May 3-11 1991-Q2 (W.T. 106)	Aug 11-18 1991-Q3 (W.T.109)	Oct 27-Nov 10 1991-Q4 (W.T. 113-4)	May 2-13 1992-Q2 (W.T.119-20)	Oct 26-Nov 5 1992-Q4 (W.T. 128-9)	May 5-18 1993-Q2 (W.T.136-7)	Aug 15-20 1993-Q3 (G.A.233)	Nov 1-12 1993-Q4 (W.T.144-5)	May 14-22 1994-Q2 (W.T.153)	Oct 29-Dec 13 1994-Q4 (W.T.160-61)	May 13-27 1995-Q2 (W.T.168-69)
382	093-183	647	0.50 (2)	0.00 (3)	0.00 (3)	0.00 (3)	0.00 (2)	0.00 (2)	0.00 (3)	0.00 (2)	0.00 (2)	0.00 (2)	0.00 (2)
377	093-183	100	0.00 (2)	0.00 (2)	0.00 (1)	0.00 (2)	0.00 (2)	0.00 (2)	2.00 (3)	0.50 (2)	0.00 (2)	0.50 (2)	0.00 (2)
359	093-183	421	0.50 (2)	26.25 (4)	0.00 (2)	0.00 (2)	0.00 (2)	0.00 (2)	0.33 (3)	0.00 (2)	0.00 (2)	1.50 (2)	0.00 (2)
381	185-274	182	0.50 (2)	5.00 (3)	1.00 (2)	1.00 (2)	-	0.00 (2)	2.00 (4)	3.00 (2)	0.00 (2)	0.00 (2)	0.00 (2)
378	185-274	139	5.33 (3)	13.00 (3)	177.00 (2)	7.50 (2)	1.50 (2)	1.00 (2)	4.33 (3)	3.00 (2)	0.50 (2)	1.50 (2)	1.69 (2)
358	185-274	225	9.00 (2)	677.00 (3)	1,867.50 (2)	6.00 (2)	18,258.00 (2)	526.00 (2)	6,700.75 (4)	4.50 (2)	12.50 (2)	143.00 (2)	1.50 (2)
380	275-366	116	1.00 (2)	3,856.00 (2)	197.00 (2)	0.00 (2)	-	4.00 (2)	318.00 (2)	2.50 (2)	2.00 (2)	0.00 (2)	11.50 (2)
379	275-366	106	30.00 (2)	6,305.20 (2)	57.00 (1)	6.50 (2)	94.50 (2)	10.00 (2)	982.00 (3)	156.50 (2)	25.50 (2)	50.00 (2)	22.50 (2)
357	275-366	164	101.50 (2)	2,649.00 (2)	2,380.00 (2)	105.00 (2)	4,188.00 (2)	176.00 (2)	545.33 (3)	113.50 (2)	94.50 (2)	2,253.00 (2)	96.50 (2)
727	367-549	160	15.50 (2)	121.44 (4)	-	9.00 (2)	-	32.00 (2)	1,551.05 (3)	195.50 (2)	36.50 (2)	128.00 (2)	73.50 (2)
725	367-549	105	148.00 (2)	502.67 (3)	378.33 (1)	219.00 (1)	2,083.70 (2)	72.00 (2)	746.00 (3)	296.50 (2)	28.50 (2)	418.00 (2)	30.00 (2)
723	367-549	155	158.00 (2)	328.00 (1)	170.00 (2)	236.50 (2)	-	266.50 (2)	1,517.57 (4)	1,509.00 (2)	78.50 (2)	1,268.00 (2)	72.00 (2)
728	550-731	156	72.50 (2)	66.50 (4)	-	85.00 (2)	-	1,203.73 (2)	100.67 (3)	31.00 (1)	38.00 (3)	9.29 (2)	123.00 (2)
726	550-731	72	402.00 (2)	91.00 (2)	74.00 (1)	89.50 (2)	-	93.25 (2)	362.50 (2)	79.50 (2)	34.85 (2)	262.50 (2)	103.50 (2)
724	550-731	124	446.85 (2)	61.00 (1)	34.76 (2)	80.50 (2)	-	194.50 (2)	783.75 (4)	676.00 (2)	66.00 (2)	1,305.00 (2)	141.50 (2)
760	732-914	154	-	-	-	-	-	-	-	-	3.69 (2)	-	-
756	732-914	106	-	-	-	-	-	-	-	-	5.50 (2)	-	-
752	732-914	134	-	-	-	-	-	-	-	-	1.50 (2)	-	-
Upper (95% CI.)a			134.6	2,964.8	850.2	55.1	23,024.8	1,090.0	1,969.9	767.7	28.1	1,703.1	55.1
Weighted mean (by area) (incl. strata with 1 set)			56.2	648.9	367.7	38.5	2,634.5	146.8	849.6	149.1	18.5	284.6	31.5
Lower (95% CI)a			-22.2	-1572.3	-32.2	8.70	-17755.9	-796.5	-270.7	-456	8.9	-133.8	7.88
Abundance of surveyed area (millions)			12.1	139.9	70.6	6.6	377.1	31.6	182.2	31.8	4.5	61.4	6.8

a - Confidence interval of mean for those strata with at least two sets.

Table 16. Mean weight (kg) per standard tow from various Canadian surveys in Div. 3N where strata greater than 366 m (200 fath.) were sampled. Dashes (-) represent unsampled strata. Number of successful sets in brackets. The gear utilized was an Engels 145 otter trawl with a small mesh liner in the codend. G.A. = Gadus Atlantica, W.T. = Wilfred Templeman, A.N. = Alfred Needler.

Stratum	Depth Range (M)	Area (sq. n.) mi	May 3-11 1991-Q2 (W.T. 106)	Aug 11-18 1991-Q3 (W.T.109)	Oct 27-Nov 10 1991-Q4 (W.T. 113-4)	May 2-13 1992-Q2 (W.T.119-20)	Oct 26-Nov 5 1992-Q4 (W.T. 128-9)	May 5-18 1993-Q2 (W.T.136-7)	Aug 15-20 1993-Q3 (G.A.233)	Nov 1-12 1993-Q4 (W.T.144-5)	May 14-22 1994-Q2 (W.T.153)	Oct 29-Dec 13 1994-Q4 (W.T.160-61)	May 13-27 1995-Q2 (W.T.168-69)
382	093-183	647	0.16 (2)	0.00 (3)	0.00 (3)	0.00 (3)	0.00 (2)	0.00 (2)	0.00 (3)	0.00 (2)	0.00 (2)	0.00 (2)	0.00 (3)
377	093-183	100	0.00 (2)	0.00 (2)	0.00 (1)	0.00 (2)	0.00 (2)	0.00 (2)	0.37 (3)	0.25 (2)	0.00 (2)	0.13 (2)	0.00 (2)
359	093-183	421	0.00 (2)	0.60 (4)	0.00 (2)	0.00 (2)	0.00 (2)	0.00 (2)	0.06 (3)	0.00 (2)	0.00 (2)	1.20 (2)	0.00 (2)
381	185-274	182	0.13 (2)	0.97 (3)	0.09 (2)	0.17 (2)	-	0.00 (2)	0.58 (4)	1.00 (2)	0.00 (2)	0.00 (2)	0.00 (2)
378	185-274	139	0.88 (3)	3.68 (3)	57.39 (2)	1.10 (2)	0.38 (2)	0.30 (2)	1.41 (3)	0.80 (2)	0.07 (2)	0.10 (2)	0.20 (2)
358	185-274	225	0.18 (2)	106.19 (3)	132.02 (2)	0.30 (2)	2,176.10 (2)	54.13 (2)	547.29 (4)	0.90 (2)	0.72 (2)	12.23 (2)	0.12 (2)
380	275-366	116	0.03 (2)	1,041.38 (2)	53.54 (2)	0.00 (2)	-	0.68 (2)	62.67 (2)	0.18 (2)	0.12 (2)	0.00 (2)	1.50 (2)
379	275-366	106	3.14 (2)	949.58 (2)	7.25 (1)	0.73 (2)	13.28 (2)	1.30 (2)	212.93 (3)	23.95 (2)	2.67 (2)	7.58 (2)	2.55 (2)
357	275-366	164	11.13 (2)	576.92 (2)	324.18 (2)	5.95 (2)	674.36 (2)	23.48 (2)	95.47 (3)	14.05 (2)	9.60 (2)	301.35 (2)	10.88 (2)
727	367-549	160	2.85 (2)	40.73 (4)	-	1.20 (2)	-	4.54 (2)	558.06 (3)	43.95 (2)	6.97 (2)	32.20 (2)	13.43 (2)
725	367-549	105	18.78 (2)	177.22 (3)	127.50 (1)	27.05 (1)	589.09 (2)	14.52 (2)	246.24 (3)	79.54 (2)	5.22 (2)	112.40 (2)	4.33 (2)
723	367-549	155	19.05 (2)	188.85 (1)	46.42 (2)	31.20 (2)	-	74.20 (2)	605.24 (4)	291.95 (2)	13.45 (2)	375.87 (2)	11.25 (2)
728	550-731	156	22.20 (2)	30.75 (4)	-	23.95 (2)	-	513.79 (2)	40.93 (3)	11.25 (1)	10.37 (3)	3.65 (2)	34.80 (2)
726	550-731	.72	97.75 (2)	41.17 (2)	40.05 (1)	26.80 (2)	-	20.99 (2)	180.50 (2)	30.17 (2)	9.24 (2)	116.92 (2)	16.76 (2)
724	550-731	124	76.18 (2)	36.10 (1)	26.17 (2)	18.33 (2)	-	82.08 (2)	314.30 (4)	281.02 (2)	23.30 (2)	383.55 (2)	27.75 (2)
760	732-914	154	-	-	-	-	-	-	-	-	1.52 (2)	-	-
756	732-914	106	-	-	-	-	-	-	-	-	2.38 (2)	-	-
752	732-914	134	-	-	-	-	-	-	-	-	0.50 (2)	-	-
Upper (95% CI)a			24.4	729.9	160.7	10.3	2,769.5	392.8	250.4	72.1	4.4	136.0	9.2
Weighted mean (by area) incl. strata with 1 set)			9.7	141.7	48.7	6.0	348.0	42.4	151.9	36.5	3.5	64.5	5.8
Lower (95% CI)a			-5.1	-442.0	-61.7	0.0	-2073.6	-308	53.5	3.8	2.6	-7.0	2.4
Survey biomass index (tons)			2085	30552	9350	1071	49807	9148	32752	7735	864	13907	1254

a - Confidence interval of mean for those strata with at least two sets.

Table 17. Mean number and weight (kg) per standard tow from Canadian stratified random surveys in Div. 3L and 3N. Dashes (-) represent unsampled strata. Number of successful sets in brackets. The gear utilized was a Campelen 1800 survey trawl trawl with a small mesh liner in the codend. W.T. = Wilfred Templen

Stratum	Depth Range (M)	Area (sq. n. mi)	Oct 3-Nov23 1995-Q4 (W.T. 176,178-79) Div 3L NUM/tow		KG/tow	Stratum	Depth Range (M)	Area (sq. n. mi)	Sep 28-Oct26 1995-Q4 (W.T. 176-77) Div 3N NUM/tow		KG/tow	May 22-30 1996-Q2 (W.T. 188) Div 3N NUM/tow		KG/tow
347	184-274	983	0.00	(4)	0.00	382	093-183	647	1.00	(2)	0.14	0.00	(2)	0.00
366	184-274	1394	0.60	(5)	0.09	377	093-183	100	2.00	(2)	0.28	0.50	(2)	0.09
369	184-274	961	14.52	(3)	1.82	359	093-183	421	0.00	(2)	0.00	0.00	(2)	0.00
386	184-274	983	4.25	(4)	0.65	381	185-274	182	0.50	(2)	0.00	9.50	(2)	0.19
389	184-274	821	3.33	(3)	0.57	378	185-274	139	1.00	(2)	0.47	62.00	(2)	8.57
391	184-274	282	3.67	(2)	1.32	358	185-274	225	425.78	(2)	39.93	152.00	(2)	7.45
345	275-366	1432	0.71	(7)	0.06	380	275-366	116	733.78	(2)	117.53	47.50	(2)	4.63
346	275-366	865	1.00	(3)	0.17	379	275-366	106	548.89	(2)	59.05	569.00	(2)	65.43
368	275-366	334	38.00	(2)	5.33	357	275-366	164	10,297.78	(2)	1,230.70	222.00	(2)	34.38
387	275-366	718	12.67	(3)	1.75	727	367-549	160	329.80	(2)	35.86	170.00	(2)	19.80
388	275-366	361	8.00	(2)	1.29	725	367-549	105	293.80	(2)	46.88	505.00	(2)	86.50
392	275-366	145	38.61	(2)	3.06	723	367-549	155	791.00	(2)	197.07	307.00	(2)	39.38
729	367-549	186	145.00	(2)	24.97	728	550-731	156	243.07	(2)	60.99	64.00	(2)	13.08
731	367-549	216	123.22	(2)	17.53	726	550-731	72	322.00	(2)	113.38	215.50	(2)	73.93
733	367-549	468	1,625.50	(2)	702.57	724	550-731	124	120.86	(2)	46.19	130.00	(2)	40.33
735	367-549	272	28.50	(2)	4.45	760	732-914	154	-		-	-		-
730	550-731	170	72.11	(2)	24.21	756	732-914	106	-		-	-		-
732	550-731	231	67.72	(2)	15.11	752	732-914	134	-		-	-		-
734	550-731	228	58.40	(2)	19.99									
736	550-731	175	73.33	(2)	16.76									
737	732-914	227	41.50	(2)	13.07									
741	732-914	223	-		-									
745	732-914	348	-		-									
748	732-914	159	-		-									
Upper (95% CI)a			892.7		388.2				7503.4		910.5	182.0		29.5
Weighted mean (by area) (incl. strata with 1 set)			82.1		31.8				770.0		102.9	110.1		16.3
Lower (95% CI)a			-728.5		-324.6				-5963.4		-704.7	38.2		3.1
Survey biomass index (tons)					50078						40650			6429
Abundance of surveyed area (millions)			129.4						304.2			43.5		

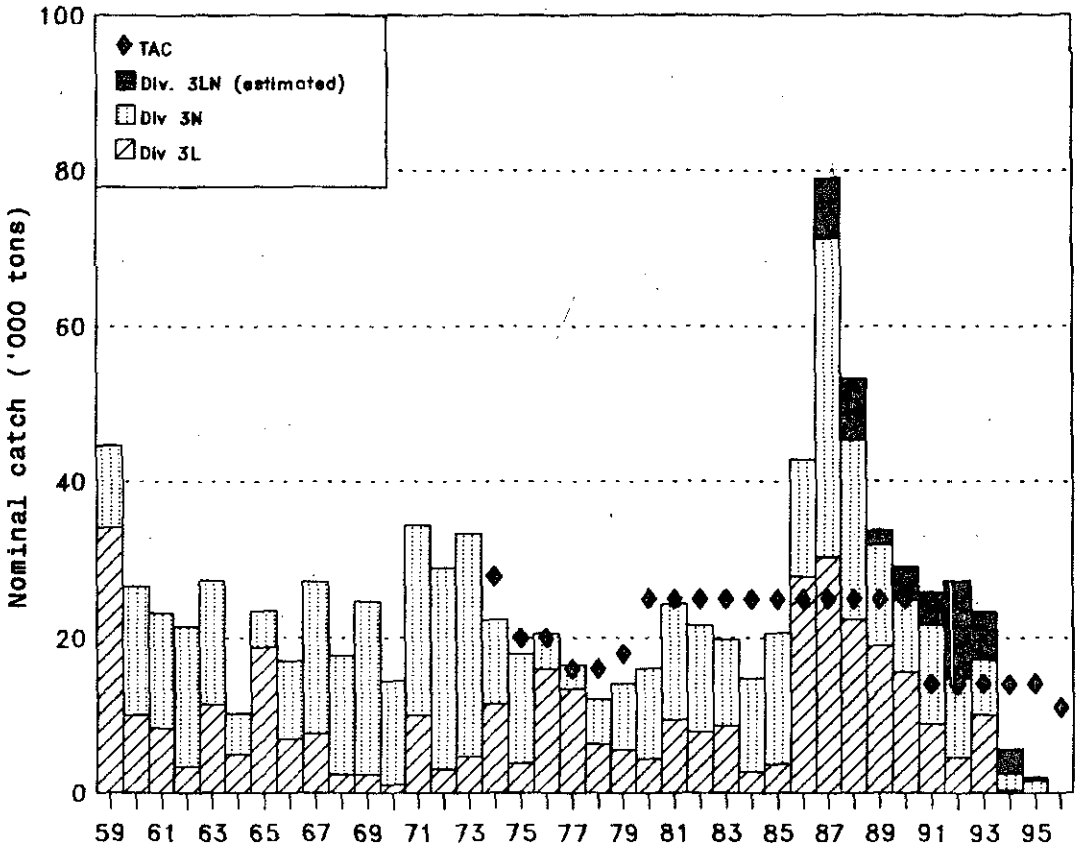


Fig. 1. Nominal catches and TACs of redfish in Div. 3LN (1993-95 are provisional)

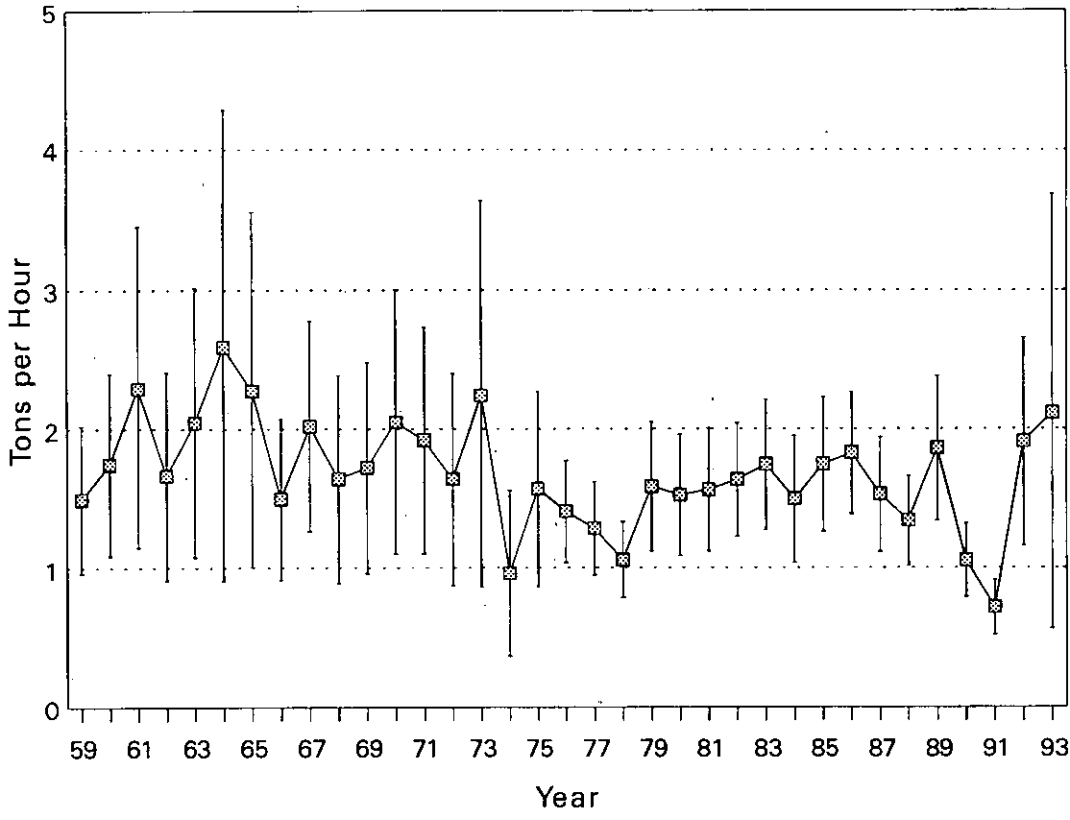


Fig. 2a. Standardized CPUE and approximate 95% confidence interval for Div. 3L redfish based on effort in hours fished for 1959-1993.

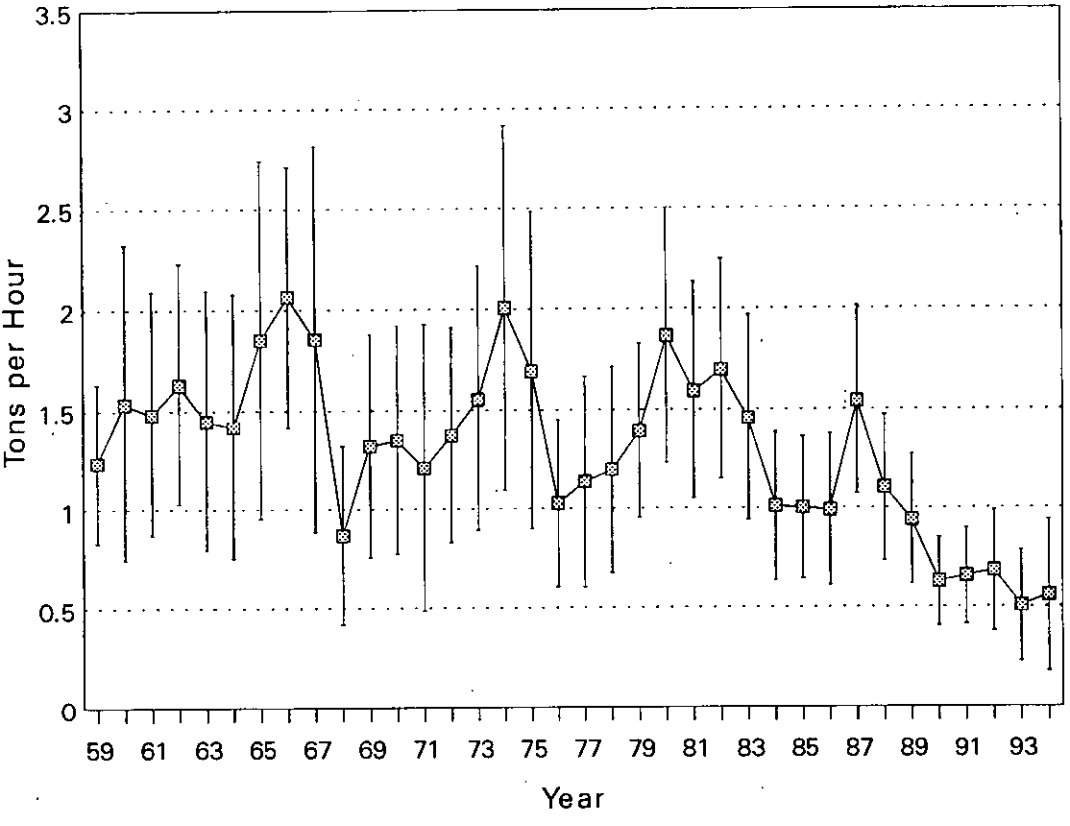


Fig. 2b. Standardized CPUE and approximate 95% confidence interval for Div. 3N redfish based on effort in hours fished for 1959-1994.

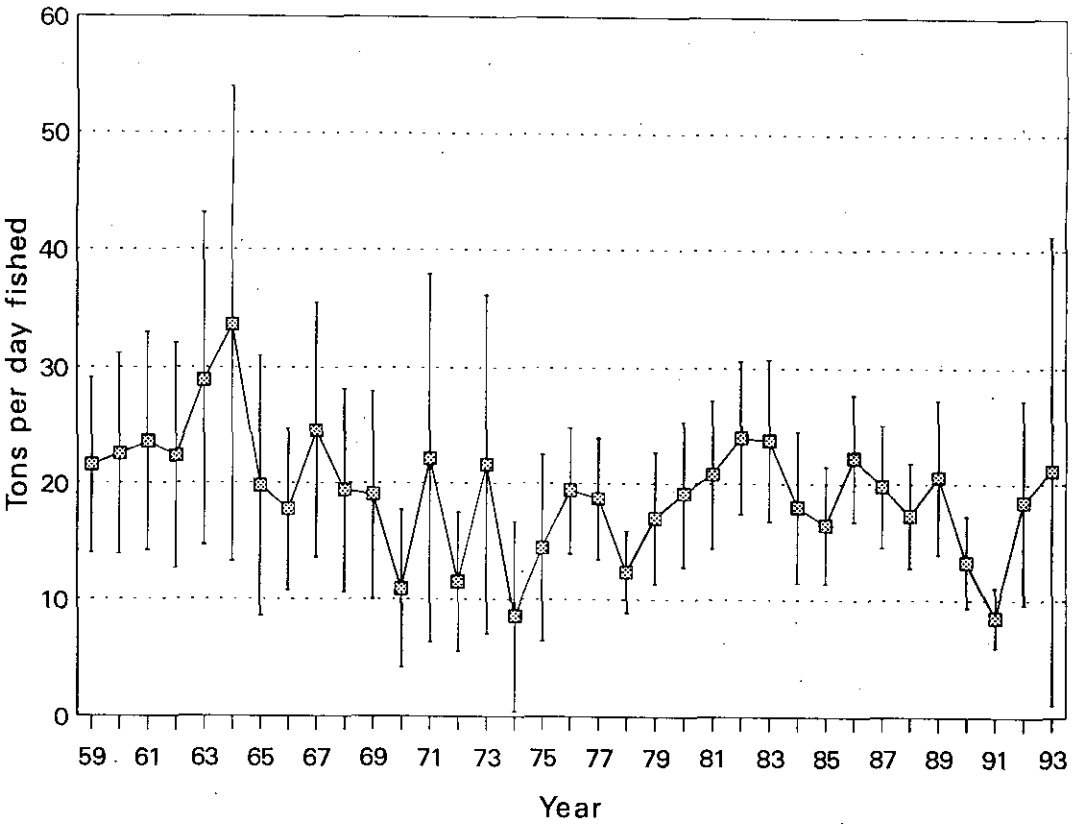


Fig. 3a. Standardized CPUE and approximate 95% confidence interval for Div. 3L redfish based on effort in days fished for 1959-1993.

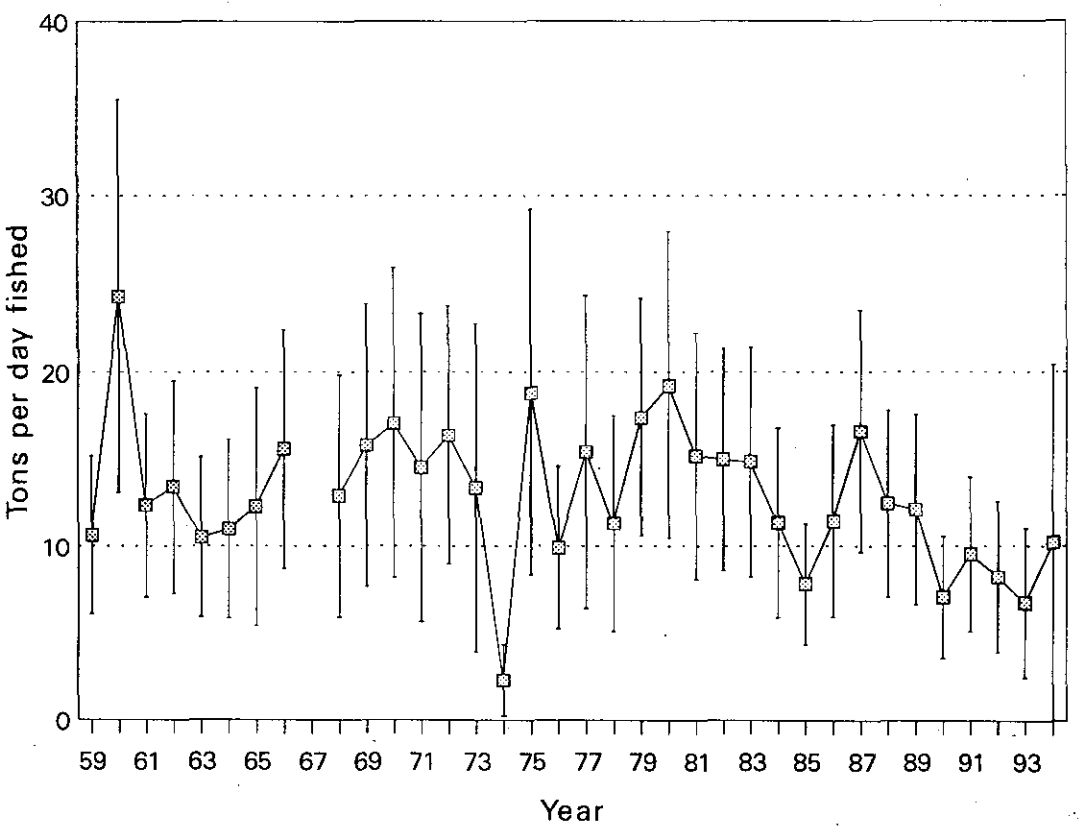


Fig. 3b. Standardized CPUE and approximate 95% confidence interval for Div. 3N redfish based on effort in days fished for 1959-1994.

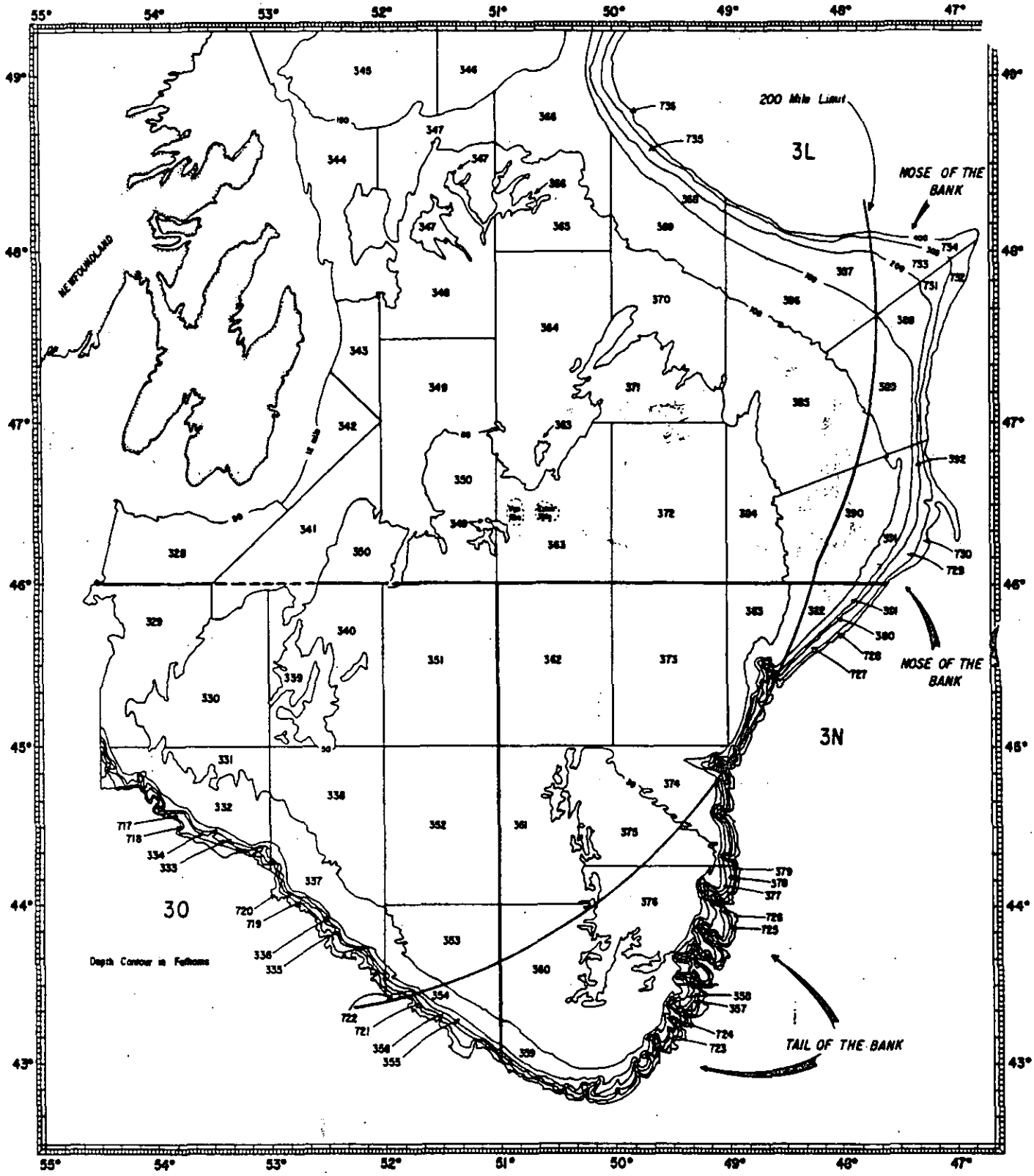


Fig. 4. Stratification scheme for NAFO Divisions 3LNO showing the boundary line between the Canadian economic zone and the NAFO Regulatory area.

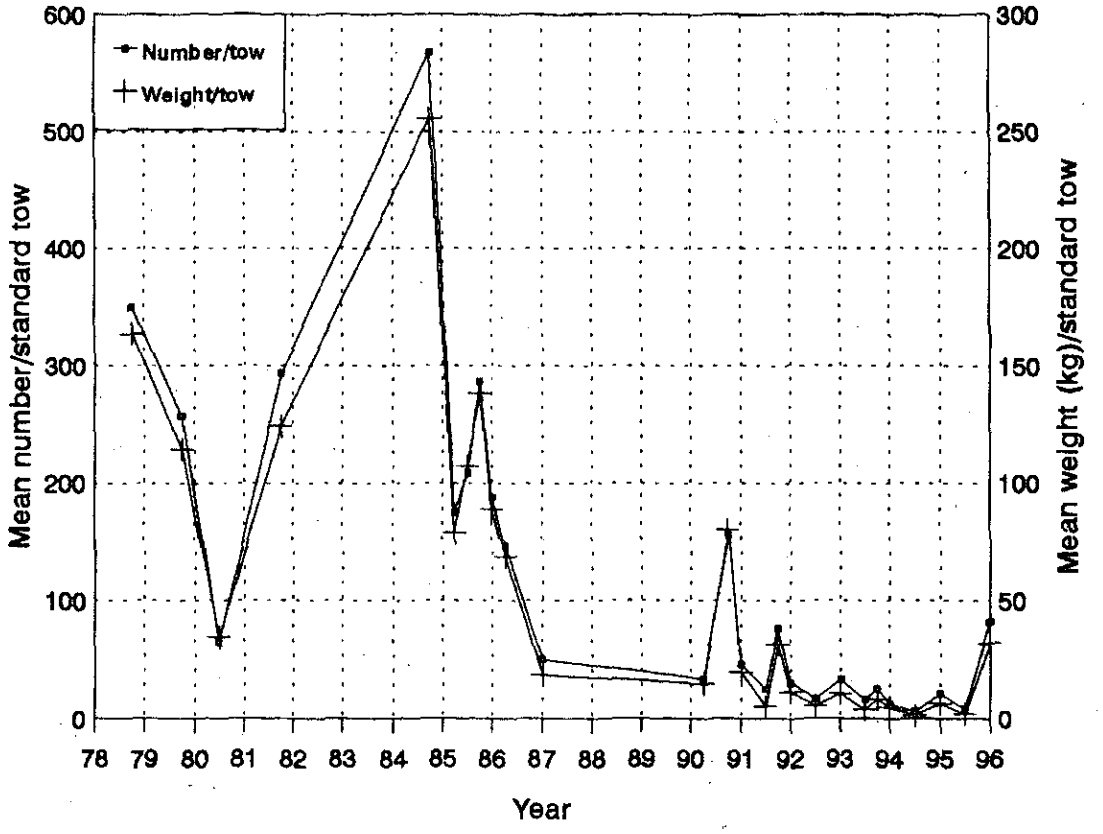


Fig 5. Stratified mean number and weight (kg) per tow in Div. 3L from various Canadian surveys Surveys up to spring 1995 were Engels, from autumn onwards were Campelen gear.

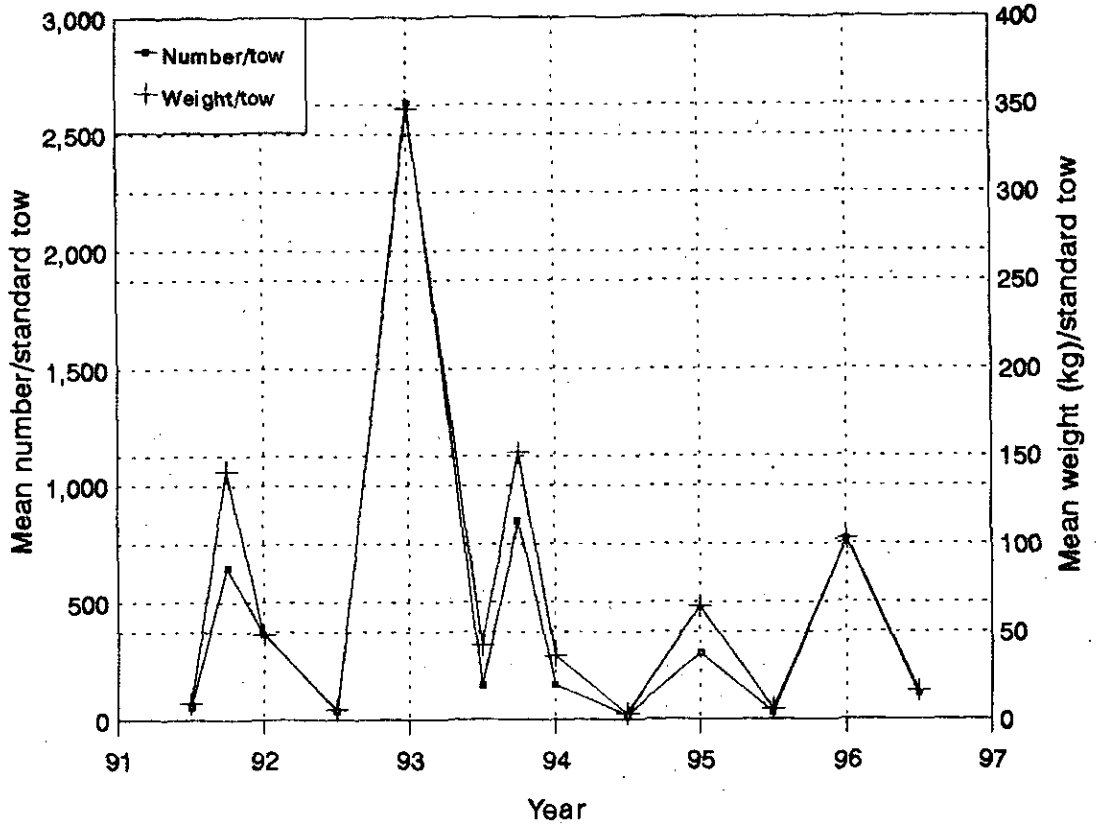


Fig 6. Stratified mean number and weight (kg) per tow from Canadian surveys in Div 3N for 1991-1996. Surveys up to spring 1995 were Engels, from autumn 1995 onward were Campelen gear.

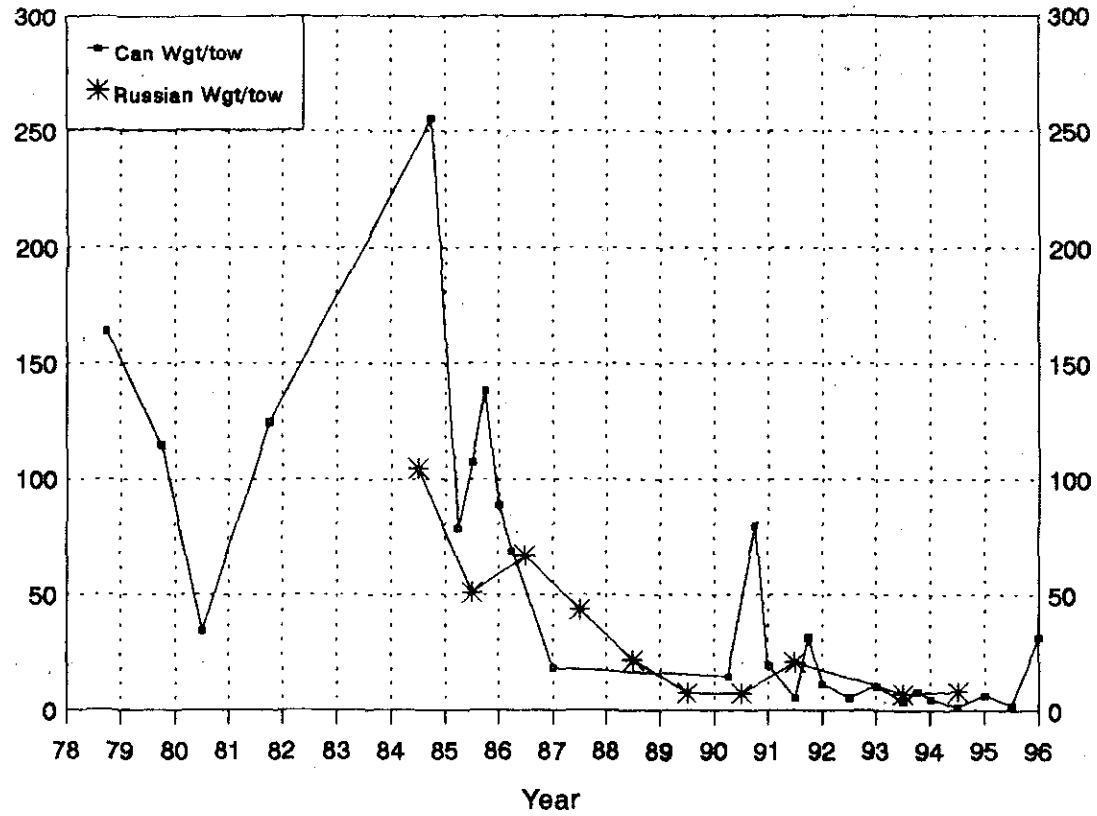


Fig 7. Stratified mean weight (kg) per In Div. 3L from Canadian and Russian surveys since 1978.

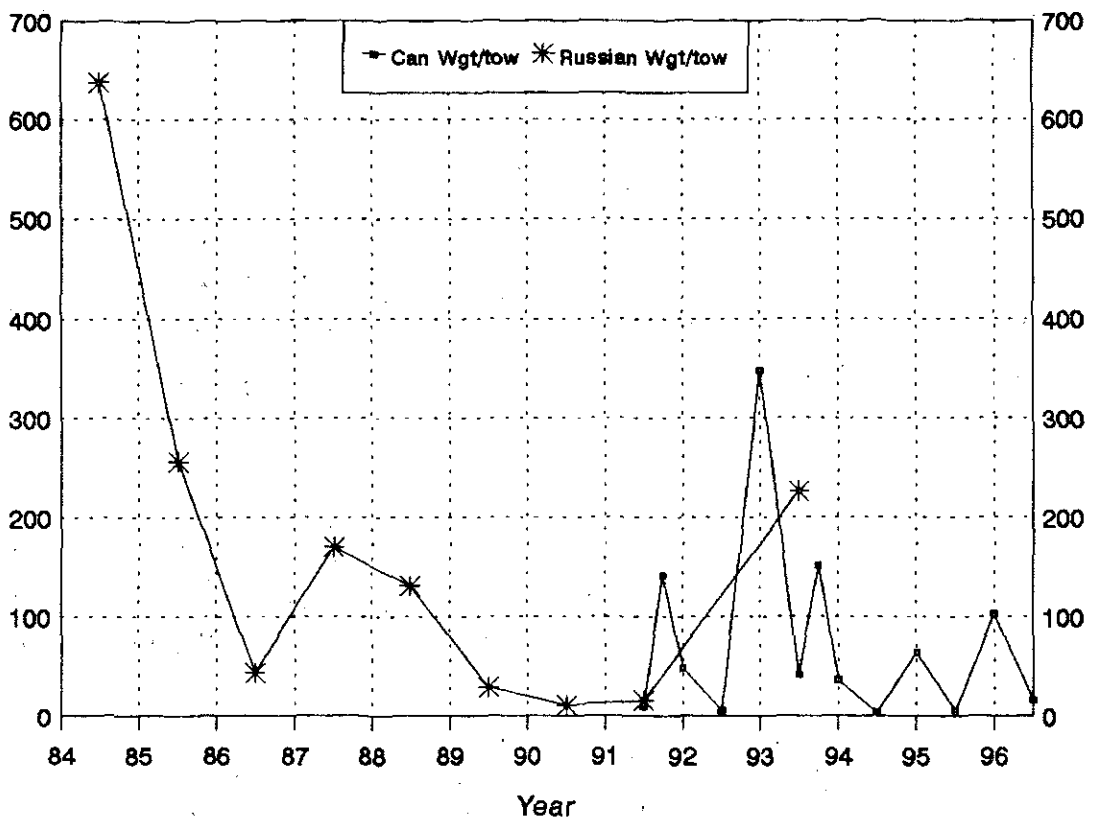


Fig 8. Stratified mean weight (kg) per tow in Div. 3N from Canadian and Russian surveys since 1984.

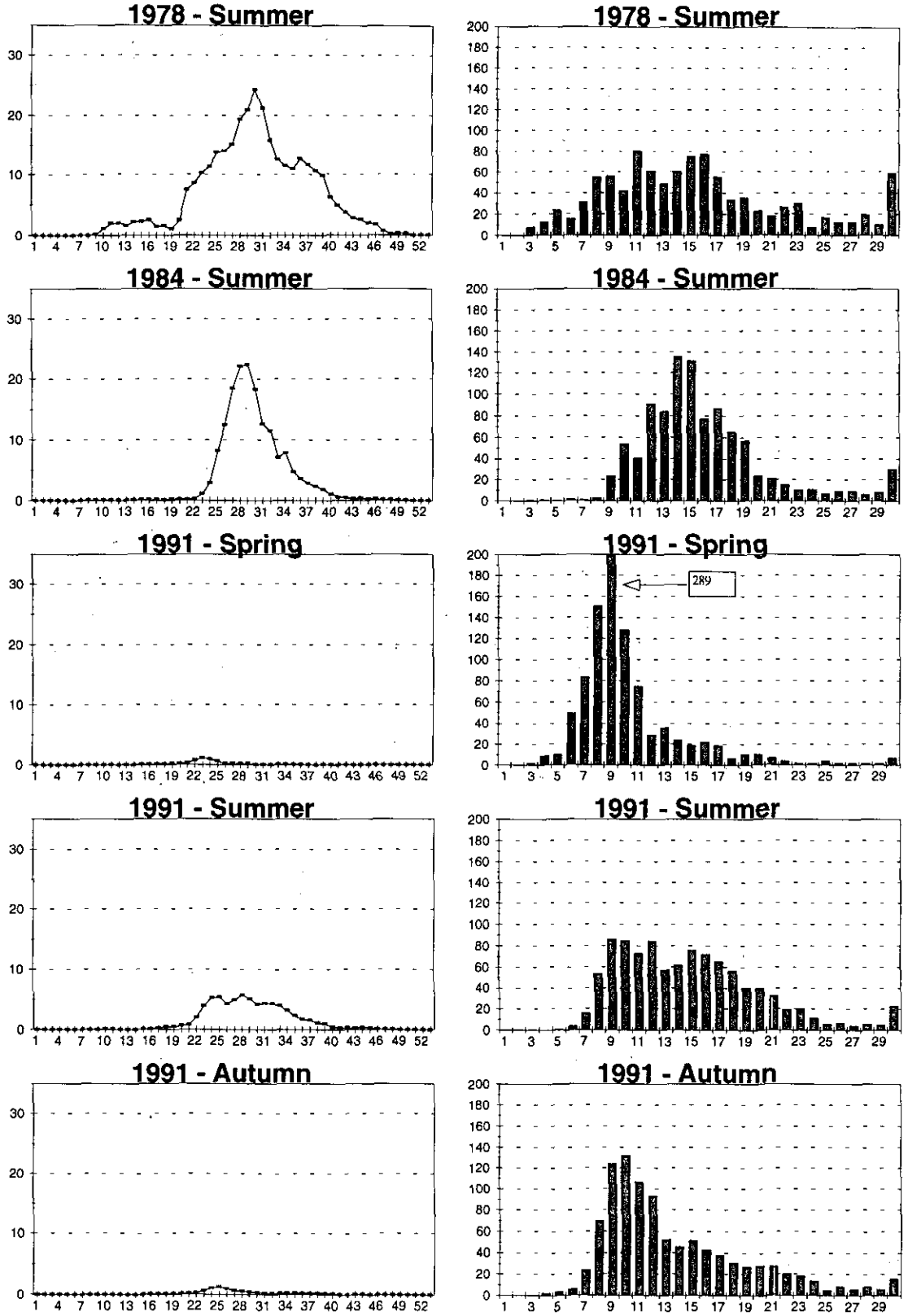


Fig. 9 . Length frequencies and corresponding age distribution from stratified-random research surveys to Div. 3L from 1978-1995. Plotted above are mean number per standard tow (left) and corresponding number per thousand age distribution (right). X-axis is forklength in centimetres for left plot, and age in years for right plot.

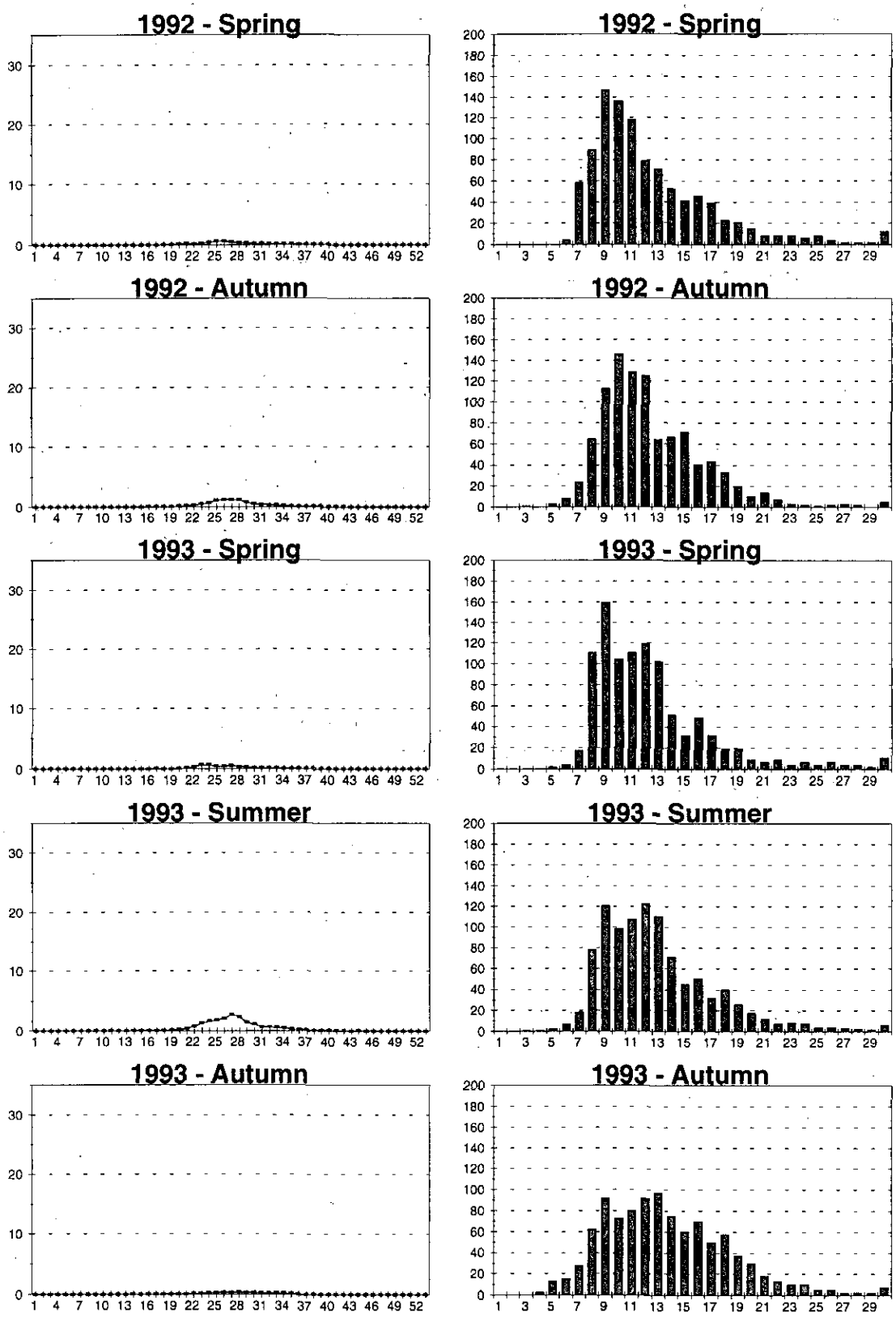


Fig. 9. Div 3L (continued)

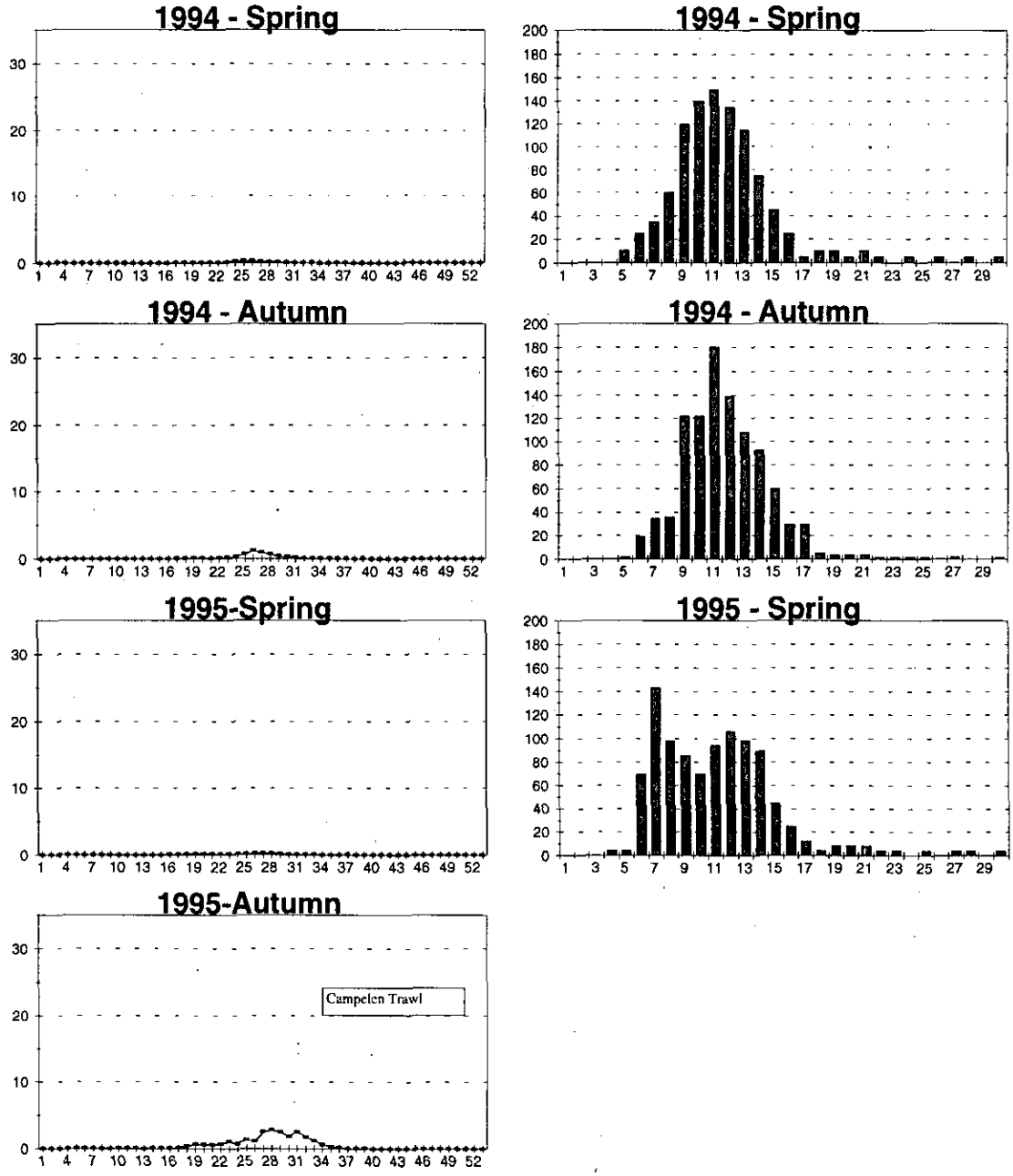


Fig. 9. Div 3L (continued)

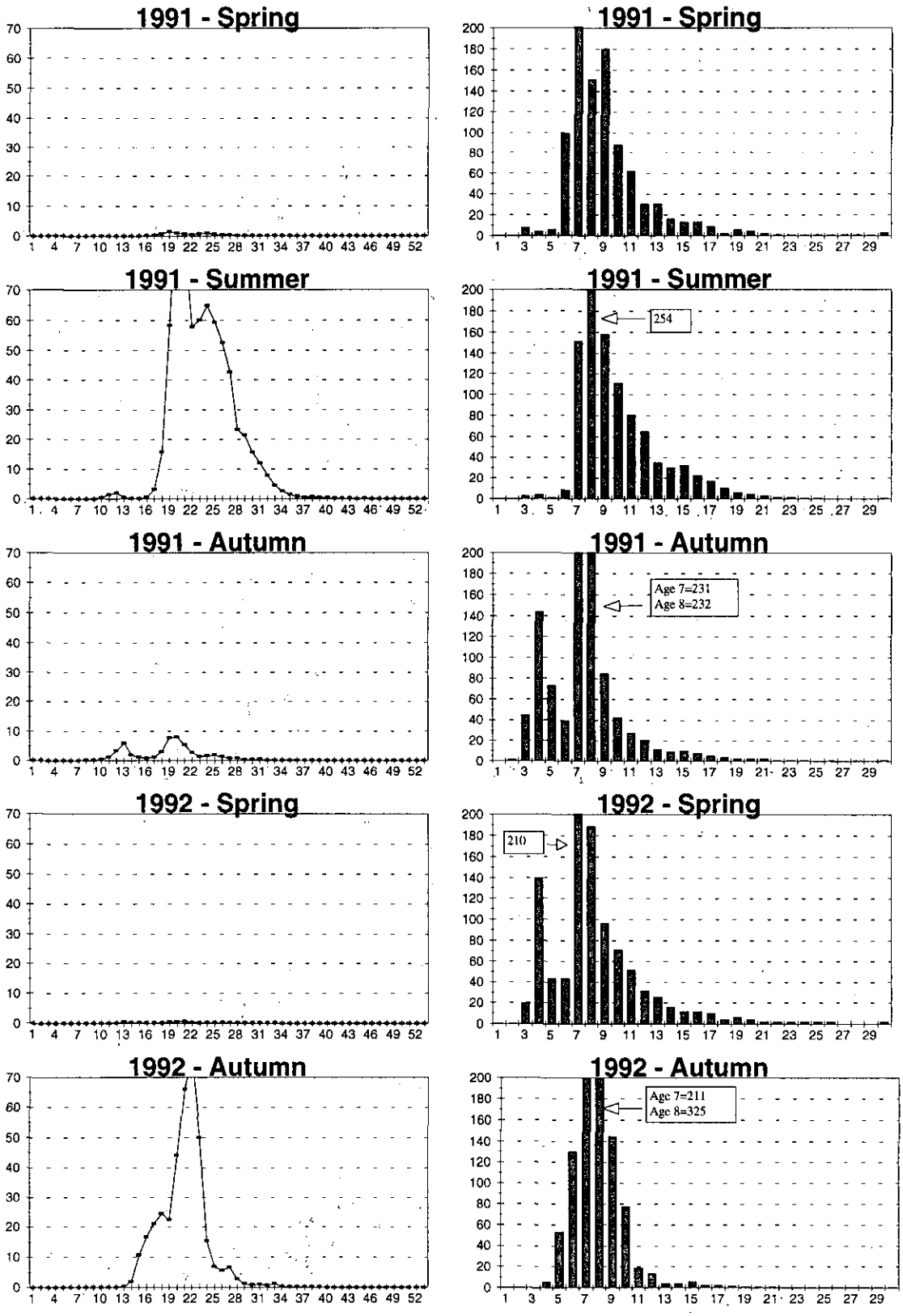


Fig. 10. Length frequencies and corresponding age distribution from stratified-random research surveys to Div. 3N from 1991-1994. Plotted above are mean number per standard tow (left) and corresponding number per thousand age distribution (right). X-axis is forklength in centimetres for left plot, and age in years for right plot.

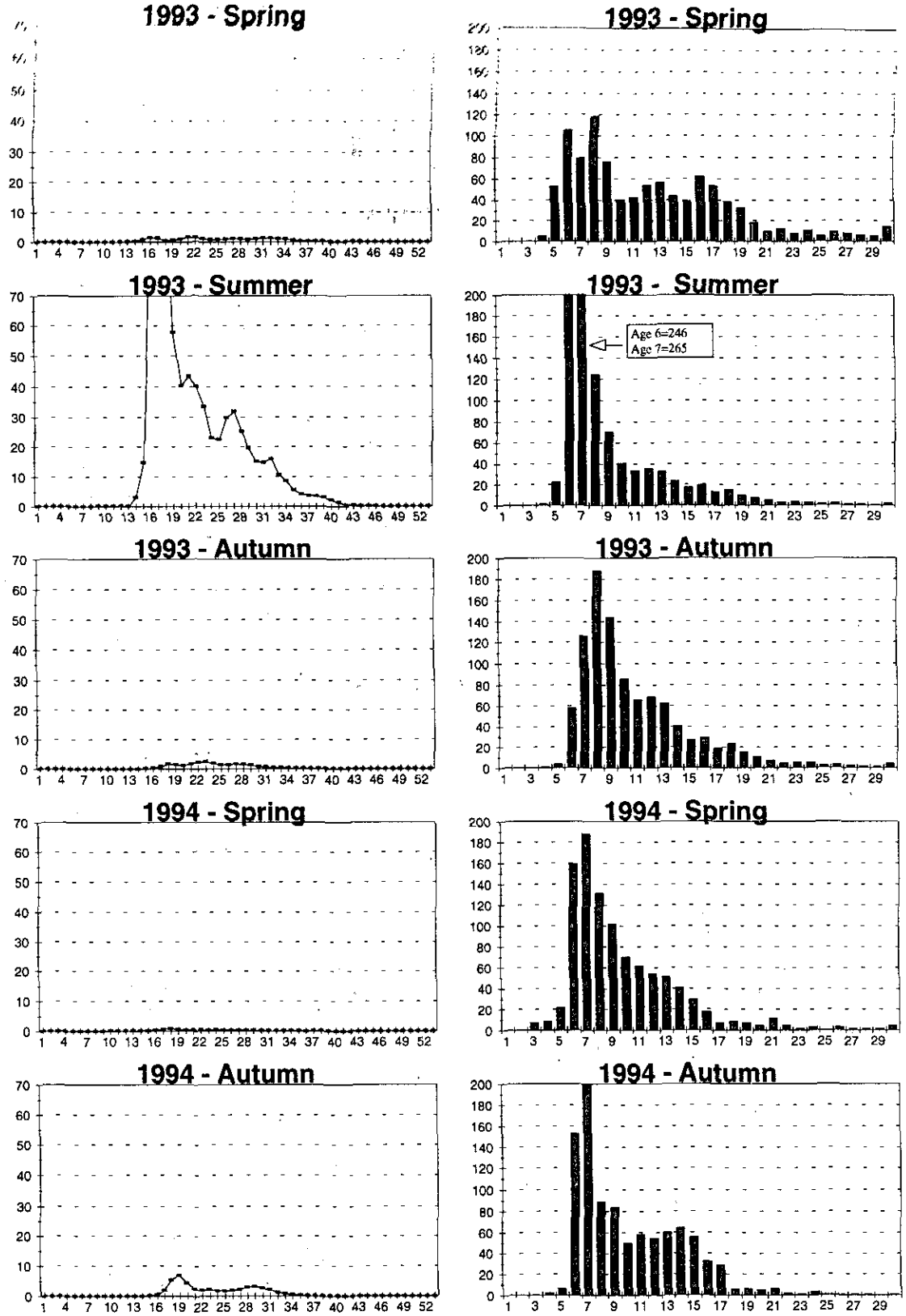
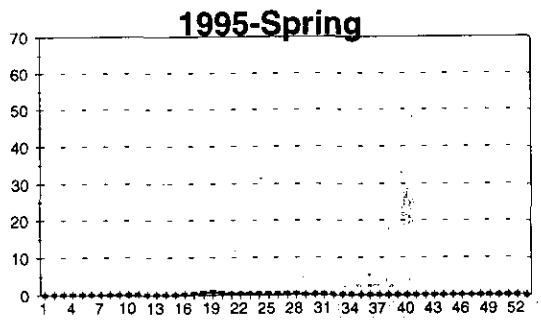
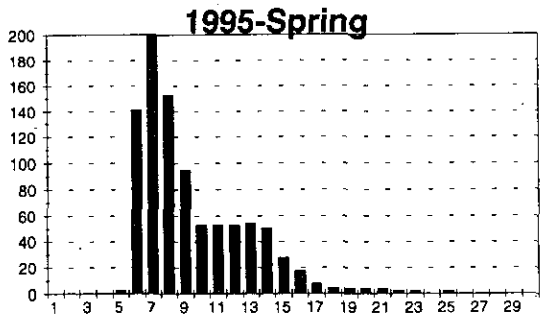


Fig. 10. Div. 3N (continued)





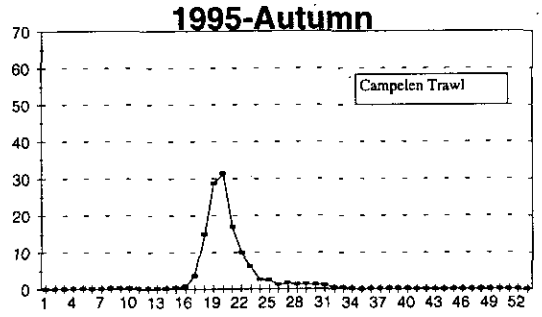


Fig. 10. Div. 3N (continued)