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Witch Flounder in NAFO Divisions 2J, 3K and 3L

by

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Abstract

Canadian autumn surveys since the late 1970's indicated that witch flounder were widely distributed throughout the shelf area in deeper channels around the fishing banks primarily in Div. 3K. By the mid 1980's they were rapidly disappearing and by the early 1990's had virtually disappeared from the area entirely except for some very small catches along the slope in Division 3L. In several years from 1991-2003, more of the survey stock was found in Div. 3L. In recent surveys, Div. 3K estimates were higher once again than those in Div. 3L. For the three divisions combined, the biomass index declined from about 65,000 tons in 1984 to 1100 tons in 1995, by far the lowest in the time series. Mean weight per tow decreased from a maximum of near 6 kg/tow in 1984 to a low of 0.23 kg/tow in 1995. The small increase in biomass index and mean weight per tow observed between 1995 and 1996 was almost exclusively a result of inclusion of the deeper strata surveyed in Division 3L. Although estimates of biomass and abundance have increased steadily in recent years, the stock size remains extremely low.

Fisheries and management

The fishery for witch flounder in NAFO Divs. 2J3KL began in the early 1960's and increased steadily from about 1,000 t in 1963 to a peak of over 24,000 t in 1973 (Table 1; Fig. 1). Catches declined rapidly to 2,800 t by 1980 and subsequently fluctuated between 3,000 and 4,500 t to 1991. The catch in 1992 declined to about 2,700 t, the lowest since 1964, and further declined to around 400 t by 1993 (Table 1). Until the late 1980's, the fishery was conducted primarily by Poland, USSR and Canada (Table 1) mainly in Div. 3K (Fig. 1). The regulated fishery (beginning in 1974) was conducted mainly by Canada, although EU (Portugal and Spain) took increased catches in the NAFO Regulatory area of Div. 3L from the mid-1980's. Although only 12 t were reported for 1994, a catch of 491 t was indicated for Spain in the Spanish Research Report (SCS Doc. 95/15) for the Regulatory Area of Div. 3L. In 1995 and 1996 total catches (as by-catch) were estimated to be about 780 and 1370 tons, respectively. However, it is believed that these catches could be overestimated by 15-20% because of misreported Greenland halibut. The catches in 1997 and 1998 were estimated to be about 850 and 1100 tons, respectively most of which was reported from the NAFO Regulatory Area of Div. 3L. From 1999 to 2005 catches ranged from 160 to 830 t and in 2007 was the lowest in the time series at 53 t. Catches have remained low (about 200 t) in recent years, with 217 t reported in 2015.

During 1988-92, the Canadian fishery was particularly successful by fishing on pre-spawning concentrations in the deep slopes of Div. 3K, especially in depths beyond 700 m. Between 1988 and 1993, however, the area fished had become increasingly smaller and substantially deeper as the resource became

depleted. The fishery during the winter of 1993 was very poor with the best catch rates occurring in depths greater than 1400 m.

The stock has been regulated by TAC since 1974 (first introduced by ICNAF) and managed by Canada within its zone since the introduction of the 200 mile national limit and has been under moratorium from 1995 to the present (Fig. 1). Because of the poor state of the stock, the NAFO Fisheries Commission agreed to extend the moratorium to the NAFO Regulatory Area in 1998 and it has continued to 2016.

Canadian Research Vessel Surveys

Distribution

Changes in spatial distribution patterns of witch flounder over the 20 year history of the surveys from 1978-2010 were presented in previous assessments as graphical distribution maps (Bowring 1998, Maddock Parsons 2011) and were updated for 1998-2015 in Rideout (2016). Survey distribution data from the late 1970's and early 1980's indicated that witch flounder were widely distributed throughout the shelf area in deeper channels around the fishing banks primarily in Div. 3K. By the mid 1980's, however, they were rapidly disappearing and by the early 1990's had virtually disappeared from the area entirely except for some very small catches along the slope and more to the southern area. Since 1998, surveys caught witch flounder mostly along the deep continental slope area, both inside and outside the Canadian 200-mile fishery zone. From 1991-2003, several years had survey estimates of biomass that were higher in Div. 3L than in Div. 3K (where historically, most of the stock was located) (Fig. 2). As the biomass estimates have increased in the last several years, however, more of the stock is once again found in Div. 3K. The distribution of witch flounder in the 2012 to 2015 autumn surveys is shown in Figures 3-6 and 7-8, respectively. These figures show that witch flounder now appear to be located along the deep continental slope area, both inside and outside the Canadian 200-mile fishery zone and in some deeper channels offshore.

Biomass and Abundance Indices

Stratified-random research vessel surveys have been conducted in the autumn in Div. 2J, 3K and 3L since 1977, 1978 and 1981 respectively. Until 1994, the surveys were conducted using an *Engel* 145' high-rise groundfish trawl whereas the 1995-2009 surveys were carried out with a much more efficient *Campelen 1800* shrimp trawl. All data presented here are now in *Campelen 1800* trawl catch equivalents for 1977-94 with the actual data for 1995-2015.

For Div. 2J, biomass estimates ranged from as high as 5 900 t in 1986 to a low of less than 200 t in 2003 and increased every year to nearly 2 000 t in 2008. From 2008-2012 biomass estimates showed a slight declining trend although confidence limits are wide as the majority of the biomass estimate in some years results from one or few stratum (Tables 2, 3 and 14; Fig. 9). Between 2012 and 2015, biomass estimates increased sharply with a value of 3700 t observed in 2015. Mean weight per tow peaked at 1.8 kg in 1986 and declined to 0.1 kg in 2003 (Table 15; Fig. 10). Since then values have been higher, and mean weight per tow increased to 1.1 kg/tow in 2015.

In Div. 3K, during 1979-85, there was a period of relative stability where most annual biomass estimates were near 50 000 t (Tables 4, 5 and 14; Fig. 9). Estimates declined considerably to around 400 t in 1995, the lowest in the time series. Estimates increased slightly after 1995 ranging from 500-1400 tons from 1996-2003. Estimates of biomass increased to 2600t in 2004 and continued to increase to 5600 t in 2009. In 2014 and 2015, estimates were 7300 t and 7600 t respectively. In several of the recent surveys the majority of the estimate has been the result of high catches in one or a few strata (Table 5). Corresponding to the period of higher biomass estimates (1979-85), the mean weights per tow in Division 3K ranged from 8 to 13 kg (Table 15; Fig. 10) and declined to a low of less than 1 kg/tow in 1995. Mean weights per tow have remained low since then although, there has been a general increasing trend over the last 13 years with values increasing to 1.6 kg/tow in 2015.

For Div. 3L, biomass estimates varied generally between 7 000 and 13 000 t from 1984 to 1990 but then declined rapidly to a low of around 400 t in 1995 (Tables 6, 7 and 14; Fig. 9). In 1996, the Canadian

autumn survey expanded to included deeper water strata (depths of 732-1097). Surveys prior to 1996 covered only a part of the stock area and biomass estimates from the early part of the survey series are most likely underestimated. Using the strata surveyed in 1984 as index strata (the first year of the combined Div. 2J, 3K and 3L series and also the highest estimate in the series), it was estimated that survey estimates prior to 1996, may have been underestimated by about 48% (Maddock Parsons, 2010). In 2004, difficulties with the Canadian autumn survey resulted in incomplete coverage, particularly in the deeper strata of Div. 3L (SCR Doc. 05/34) and the biomass estimate was the lowest in the time series at 451 t. Coverage in strata greater than 731m was very limited in the 2005 survey as well, but the biomass estimate increased to 1,000 t. Biomass estimates in Div. 3L increased from 1 000 t in 2005 to 5000 t in 2013, then decreased to 2300 t in 2015. Mean weight per tow in Division 3L (Table 15; Fig 10) ranged from 2 to 2.5 kg/tow in the early part of the survey series (1984-1990). A rapid decline in mean weight per tow then resulted in the lowest observed at 0.1 kg in 1995. The inclusion of deep water strata in 1996 explains the over three-fold increase in mean weight per tow to 0.3 kg. During the period 1996 to 2007, mean weight per was variable below 0.4 kg/tow then, it generally increased to 0.9 kg/tow in 2013, but declined to 2007 levels in 2015 (0.4 kg/tow). During 2011 to 2013 and in 2015, deep water strata were not surveyed due to logistical problems. Mean weight per tow has shown the same general trend as the biomass index in the survey.

The abundance indices for Divisions 2J, 3K and 3L followed similar trends as the biomass indices, as illustrated in Fig. 9 by Division and in Fig. 11 and Table 16 for the divisions combined. The mean numbers per tow by Division are given in Tables 8-13 and Table 17, and are shown in Fig. 10. In general, abundance indices have increased in trend since 2003, but in 2006 and 2008, the increase in biomass in the survey was not seen in the abundance estimates. In these years, there were fewer small fish in the survey than in the other recent surveys (Fig. 12).

For the three divisions combined, there was a very steady and rather systematic decline in the biomass index from about 65,000 tons (nearly 6 kg/tow) in 1984 to 1100 tons (0.23 kg/tow) in 1995, the lowest in the time series (Fig. 11; Table 14). There has been a very slight increasing trend in recent years, however current stock size remains below B_{lim} .

Length frequencies

Population numbers at length from the 1996-2015 Canadian autumn surveys are given in Figure 12. The proportion of small fish (<23cm) was higher than the time series average (1996-2015) in five of the most recent seven surveys (Fig. 13).

Assessment Results

Precautionary limit reference points

In a previous assessment for this stock, a proxy for B_{lim} was calculated as 15% of the highest observed survey biomass estimate because no analytical assessment was available ($B_{lim} = 9\ 800$ t; Maddock Parsons, 2007). Since the highest observed biomass estimate is in the early part of the time series when the survey did not cover the entire stock area, B_{lim} was likely underestimated using this method. An analysis of the amount of biomass in index strata (those strata covered in 1984, the highest biomass estimate in the series) concluded that the survey biomass estimates in the early part of the time series may have been underestimated by about 48% -the average of the biomass outside of the index strata in 1996-2009. The proxy for B_{lim} , adjusted for less extensive coverage in the survey, was calculated to be 14 500 t ($B_{lim} = 15\%$ of $B_{1984} * 1.48$; Maddock Parsons, 2011). The survey biomass estimates have been below this reference point since 1991 (Figures 15 and 16).

Mortality

A fishing mortality proxy was calculated from the ratio of catch to survey biomass. The values from 2006 to 2015 were among the lowest in the time-series (Fig. 14).

Current Status

The stock remains below B_{lim} with current indices of stock size based on survey trends at most 5% of the average of the early 1980's when the stock was considered at a reasonably healthy level.

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Table 1: Catch statistics by country of witch flounder in Divisions 2J, 3K, and 3L during 1963-2015.**In 1998-2001, and 2005 small portions of the “Others” catch are from Division 3.**

Year	Canada	Fed. Rep Germany	German Dem. Rep.	Poland	USSR/Russia	UK	Others	Total	TAC
1963	17	3	0	259	89	7	570	945	
1964	103	0	0	752	164	24	1	1044	
1965	41	29	0	1876	2056	58	0	4060	
1966	187	9	1045	559	1868	29	0	3697	
1967	901	0	332	926	1933	9	0	4101	
1968	446	0	358	1990	7834	33	5	10666	
1969	1355	0	546	957	9726	1	0	12585	
1970	4020	0	508	3566	9934	0	2	18030	
1971	8030	75	508	5404	2018	9	9	16053	
1972	5520	6	648	4013	7016	225	0	17428	
1973	3761	1348	2327	11802	2834	258	1291	23621	
1974	1868	1082	272	5302	6917	29	493	15963	22000
1975	1352	446	374	4583	4763	0	687	12205	17000
1976	2081	606	110	3828	3022	3	975	10625	17000
1977	4371	300	203	3052	392	0	0	8318	17000
1978	1979	23	58	3490	1345	1	8	6904	17000
1979	1392	0	22	1855	150	22	656	4097	17000
1980	1459	0	16	1235	45	0	68	2823	17000
1981	2661	0	32	1385	85	0	31	4194	8000
1982	1206	0	4	1151	552	0	68	2981	8000
1983	1483	0	50	1005	516	0	34	3088	8000
1984	2082	0	27	1617	1000	2	85	4813	8000
1985	1305	26	33	565	1006	-	68	3003	8000
1986	1199	2	7	3	21	-	2684	3916	8000
1987	854	-	56	765	1057	-	1743	4475	6000
1988	3270	-	10	760	4	-	110	4154	5000
1989	4059	-	4	691	5	-	147	4906	5000
1990	3272	-	-	-	-	-	695	3967	4000
1991	2805	-	-	-	-	1	1209	4015	4000
1992	1736	5	-	-	-	2	959	2702	4000
1993	343	-	-	-	-	-	59	402	3500
1994	11	-	-	-	-	-	126	137	1000
1995	10	-	-	-	-	-	769	779	0
1996	5	-	-	-	-	-	1366	1371	0
1997	8	-	-	-	-	-	846	854	0
1998	0	-	-	-	37	-	397	434	0
1999	1	-	-	-	20	-	338	359	0
2000	90	-	-	-	14	-	372	476	0
2001	159	-	-	-	31	-	443	633	0
2002	167	-	-	-	15	-	343	525	0
2003	110	-	-	-	6	-	374	490	0
2004	26	-	-	-	12	-	252	290	0
2005	40	-	-	-	2	-	161	203	0
2006	53	-	-	-	3	-	21	77	0
2007	23	-	-	-	2	-	43	68	0
2008	7	-	-	-	9	-	68	84	0
2009	42	-	-	-	-	-	58	100	0
2010	158	-	-	-	2	-	76	236	0
2011	140	-	-	-	2	-	78	220	0
2012	92	-	-	-	19	-	81	192	0
2013	182	-	-	-	10	-	25	217	0
2014	178	-	-	-	8	-	34	220	0
2015	187	-	-	-	13	-	16	216	0

Table 2. Mean Weight (kg) per Tow of Witch Flounder (M+F) in each stratum in Div. 2J during fall 1977-1994

Stratum	Stratum Area	Depth Range (m)																			
			77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	
201	633	101 - 200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	1594		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	1870		0.3	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	2264		0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	733																		0.0	0.0	
	778																			0.0	
202	621	201 - 300	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	680		0.5	0.1	0.2	0.6	0.0	0.4	0.6	0.1	0.7	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	
	1035		1.2	0.4	1.1	3.2	0.2	1.2	0.0	2.7	0.0	0.0	0.4	0.0	0.2	0.0	0.0	0.0	0.0	0.0	
	1583		1.1	1.1	0.7	1.3	1.2	1.6	0.8	0.5	0.4	0.5	0.4	0.1	0.2	0.0	0.0	0.0	0.0	0.0	
	1341		1.2	0.3	0.0	0.4	0.4	0.8	0.5	0.1	0.7	0.4	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	
	1302		1.1	0.2	0.1	0.0	0.5	0.4	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
228	2196	301 - 400	2.6	0.7	1.5	2.8	0.9	3.4	1.3	2.4	0.4	3.7	0.5	0.6	0.8	0.4	0.0	0.2	0.1	0.0	
	530		0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	487		0.0	0.0	0.0	0.0	0.0	0.8	1.7	0.0	0.0	0.3	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	
	588		2.9	0.6	1.2	6.0	1.5	10.4	1.3	1.5	9.9	1.5	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	
	251		9.8	4.4	2.2	6.4	1.5	5.3	0.3	2.2	1.6	0.6	0.8	0.0	0.7	0.0	0.0	0.0	0.0	0.0	
	360		0.0	0.0	0.5	0.8	1.1	1.2	1.6	0.0	0.0	1.0	0.3	0.2	0.3	0.0	0.0	0.0	0.0	0.0	
229	450	401 - 500	3.3	1.6	0.5	1.7	2.6	4.7	1.1	0.4	0.8	0.0	0.0	2.8	0.8	0.0	0.2	0.0	0.0	0.0	
	536		2.4	2.3	1.5	2.8	1.6	1.8	2.0	1.3	0.7	11.0	0.9	1.9	7.6	0.4	0.4	0.4	0.2	0.2	
	288		1.2	0.0	0.8		1.7	2.6	0.3	1.9	0.0	1.5	0.3	0.9	1.2	0.3	0.0	0.0	0.0	0.0	
	241		0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	1.5	1.7	1.2	2.0	0.2	0.0	0.0	0.0	0.4	
	158		0.5	0.0	0.0	0.0	1.5	0.0	0.0	1.3	0.0	5.6	4.7	2.4	2.6	0.7	0.7	0.3	0.4	0.6	
	598		1.7	1.3	0.5	5.1	1.9	3.8	2.2	0.9	1.6	3.5	4.4	2.2	2.4	19.5	2.2	1.3	1.6	0.0	
240	414	501 - 750	14.1	0.0	7.9	7.4	8.7	6.4	15.7	9.0	6.9	2.1	2.9	0.0	1.1	2.6	0.6	0.4	0.0	0.7	
	133																	2.0	1.0		
	557		17.1	1.2	7.0	2.1	6.9	12.2	15.2	9.0	13.7	34.4	9.1	4.3	6.4	7.0	1.2	3.0	0.6	0.7	
	362		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.8	2.0	1.4	1.0	0.2	0.0	0.2	0.0	0.4	
	228		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	1.3	3.2	3.4	0.4	1.3	0.9	0.0	0.7	
	185		0.0	0.0	0.5	0.0	0.0	0.0	0.5	0.0	1.7	0.5	3.1	12.1	23.7	52.5	10.6	3.3	4.1	0.0	
219	120	751 - 1000																		0.0	
	283																			0.0	
	186		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.2	7.0	7.7	4.6	
	193																1.4	1.5	3.1	1.9	1.4
	303																				
	195																				
220	228	1001 - 1250																			
	330																				
	201																				
	237																				
	221																				
	226																				
233	237	1251 - 1500																			
	237																				
All strata			1.6	0.4	0.7	1.1	0.8	1.5	1.1	0.9	0.9	1.8	0.6	0.5	0.8	1.1	0.8	0.3	0.2	0.1	

Table 3. Mean Weights (kg) per Tow of Witch Flounder (M+F) in each stratum in Div. 2J during fall 1995-2015

Stratum	Stratum Area	Depth Range (m)	Mean Weight (kg) per Tow																			
			95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	
201	633	101 - 200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
205	1594		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
206	1870		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	
207	2264		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
237	733		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	
238	778		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
202	621	201 - 300	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
209	680		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
210	1035		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
213	1583		0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0
214	1341		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
215	1302		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
228	2196		0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.2	0.0	1.1	1.2	0.5	0.4	0.4	0.4
234	530		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
203	487	301 - 400	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
208	588		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	2.0	0.0	2.5	4.4	4.4	4.4
211	251		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	6.8	0.0	0.0
216	360		0.0	0.5	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.5	0.5	0.0	0.0	0.5	3.6	1.2	1.2	1.2	1.2
222	450		0.0	0.9	0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.6	0.5	1.0	0.5	0.2	0.2
229	536		0.0	0.0	0.0	0.0	0.0	0.5	0.4	0.0	0.5	0.5	2.0	1.5	2.5	0.0	4.0	0.7	2.5	5.5	2.4	2.4
204	288	401 - 500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	1.0	0.0	0.0	0.0
217	241		0.0	1.0	2.0	0.9	0.0	0.0	0.0	0.0	0.6	2.0	1.5	0.5	0.0	0.0	0.5	0.0	2.0	0.0	0.2	0.2
223	158		0.0	3.4	2.0	0.9	0.0	2.0	0.6	1.0	0.0	1.6	2.5	2.5	1.9	0.5	0.6	0.0	0.0	0.2	0.2	0.2
227	598		0.0	0.0	2.5	4.0	6.5	0.0	2.5	0.6	0.0	1.6	2.0	4.0	4.0	2.7	3.0	5.0	1.5	3.0	1.1	1.1
235	414		0.0	0.9	0.5	1.5	0.0	0.0	1.1	0.0	6.0	2.0	1.0	1.5	5.3	0.5	16.5	28.9	8.0	7.0	7.0	7.0
240	133		0.0	8.0	3.0	2.5	7.5	2.0	4.2	0.0	1.0	2.5	4.5	6.5	5.8	2.7	17.1	6.3	1.5	2.5	2.6	2.6
212	557	501 - 750	4.0	2.8	3.5	9.0	7.0	6.0	0.9	1.5	1.5	7.5	13.0	18.2	29.6	43.3	22.5	14.6	2.0	2.0	2.5	2.5
218	362		0.3	4.0	1.5	1.0	0.9	1.0	0.0	0.0	0.4	3.0	1.0	1.0	0.5	0.5	3.4	0.0	0.0	0.0	0.0	0.0
224	228		1.0	2.5	4.5	2.7	0.5	3.0	2.3	0.5	0.0	0.0	0.5	3.5	1.0	2.6	1.0	0.0	0.0	0.0	0.0	0.0
230	185		32.5	22.9	34.0	4.0	26.5	6.5	5.1	1.1	8.5	6.0	16.0	15.5	6.0	7.5	20.0	1.1	0.0	1.8	0.5	0.5
239	120		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	2.5	0.5	2.0	0.7
219	283		1.0	1.5	1.0	2.0	0.0	0.4	0.4	1.6	1.8	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
231	186	751 - 1000	22.0	1.0	3.5	32.5	18.0	39.5	8.0	37.2	1.7	9.1	6.0	0.0	1.0	1.0	0.0	0.0	2.0	0.0	0.0	0.0
236	193		0.9	5.0	0.5	1.4	2.5	3.0	6.5	3.0	5.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
220	303		1.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
225	195	1001 - 1250	0.0	0.0	0.0	0.5	0.5	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
232	228		0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
221	330	1251 - 1500	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
226	201		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
233	237		0.0	0.0	0.0	0.7	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All strata			0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.3	0.4	0.6	0.4	0.4	0.3	0.3	0.4	0.7	1.1

Table 4. Mean Weight (kg) per Tow of Witch Flounder (M+F) in each stratum in Div. 3K during fall 1978-1994

Stratum	Stratum Area	Depth Range (m)	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94
608	798																		
612	445																		
616	250																		
618	1347																		
619	1753	101 - 200																	
609	342																		
611	573																		
615	251																		
620	2545		1.6	3.8	1.4	0.4	0.6	0.4	0.3	0.2	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
621	2537		2.7	9.5	1.3	1.1	0.6	2.0	0.8	1.1	0.1	0.2	0.0	0.2	0.0	0.0	0.0	0.0	
624	1105	201 - 300	3.9	1.6	1.1	4.1	4.9	1.3	4.0	1.0	0.7	0.2	0.0	0.0	0.1	0.0	0.0	0.1	
632	.		6.4	9.6	3.7	8.5	6.6	7.3		3.4	1.5	0.5	0.6	1.3	0.0	0.1	0.1	0.0	
634	1555		3.5	3.5	4.8	2.4	4.4	0.8	3.9	1.7	1.1	0.9	1.7	0.6	0.0	0.0	0.1	0.0	
635	1274		9.3	10.8	8.2	8.5	4.8	3.1	12.6	4.4	0.1	0.8	1.9	0.9	0.1	0.0	0.2	0.0	
636	1455		7.4	8.4	9.2	5.8	4.4	3.6	14.5	4.2	1.6	2.6	4.1	1.8	0.3	0.0	0.0	0.0	
637	1132		7.2	14.4	9.2	12.0	12.2	23.6	17.5	16.0	4.5	5.4	1.4	1.0	0.0	0.0	0.4	0.1	
610	256																		
614	263																		
617	593																		
623	494		3.5	4.5	4.1	3.9	2.9	4.3	2.4	4.6	1.2	1.4	0.2	0.1	0.0	0.0	0.0	0.0	
625	888		7.4	19.1	8.4	13.5	4.2	13.6	12.1	9.4	0.4	1.4	0.9	0.1	0.0	0.0	0.0	0.0	
626	1113	301 - 400	28.4	45.4	47.1	9.1	32.7	27.5	9.9	8.8	0.4	1.4	0.3	0.4	0.0	0.0	0.2	0.0	
628	1085		16.4	40.7	23.5	9.2	16.3	32.7	13.9	15.6	6.4	3.5	0.3	1.4	0.0	0.0	0.1	0.0	
629	495		25.1	23.6	36.7	25.4	14.0	32.8	14.8	14.5	3.3	7.4	2.9	0.9	1.0	0.0	0.1	0.0	
630	332		14.0	9.8	11.4	13.1		9.7	7.3	4.9	2.2	2.4	2.1	0.4	0.0	0.0	0.2	0.4	
633	2067		7.3	9.6	12.4	4.7	8.0	8.9	10.3	6.9	5.3	3.7	6.4	4.0	1.2	0.5	0.4	0.3	
638	2059		11.7	30.8	16.6	20.6	12.1	15.5	30.4	24.8	29.2	19.4	25.8	12.0	1.2	1.2	0.3	0.0	
639	1463		7.0	5.4	10.3	8.5	5.6	18.1	20.2	10.5	8.7	3.9	13.1	2.7	2.4	0.4	0.1	0.0	
613	30																		
622	691		6.9	14.1	22.3	11.6	6.9	10.9	7.4	13.2	3.0	7.5	0.2	0.2	0.4	0.1	0.3	0.1	
627	1255	401 - 500	17.7	25.4	49.6	71.4	53.0	64.8	48.2	27.9	9.8	8.5	8.2	4.5	1.5	0.0	0.3	0.4	
631	1321		13.8	13.7	15.3	46.8	6.1	35.6	39.0	27.6	17.7	9.4	3.6	2.2	0.4	2.0	1.9	0.3	
640	69		1.9	6.5	2.3	15.1		16.0	39.4	61.3	83.7	49.5	42.1	6.5	6.8	0.7	0.0	0.0	
645	216		0.4	0.0	0.4	12.2	10.0	54.1	8.5		109.7	20.4	9.0	35.3	3.5	0.5	0.5	0.3	
650	134																1.1	0.2	
641	230	501 - 750	0.0	0.0	0.5	1.0	0.9	2.1	0.0	10.1		20.6			137.8	11.7	0.0	0.4	
646	325		0.0	0.0	1.5	0.3	0.5	13.4	2.1	2.4		2.2			6.0	3.8	1.1	0.8	
651	359																0.5	0.5	
642	418	751 - 1000	0.0		0.6	0.0	0.3		1.0	0.7		0.6			19.5	9.5	6.2	1.4	
647	360		0.0	0.0	0.0	0.0	0.0			0.5					6.9	12.9	3.5	2.2	
652	516																3.7	2.2	
643	733	1001 - 1250	0.0	0.0														5.9	
644	474	1251 - 1500	0.0	0.0															
649	212		0.0	0.0															
654	479		0.0	0.0															
All strata			7.1	12.3	11.5	11.1	8.4	13.3	11.6	8.2	5.3	5.1	4.5	2.2	3.9	1.0	0.4	0.3	0.2

Table 5. Mean Weight (kg) per Tow of Witch Flounder (M+F) in each stratum in Div. 3K during fall 1995-2015

Stratum	Stratum Area	Depth Range (m)	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	
608	798	101 - 200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
612	445		0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
616	250		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
618	1347		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
619	1753		0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
609	342	201 - 300	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6						
611	573		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5				0.0						
615	251		0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	1.0					0.0				0.0	0.0	0.0
620	2545		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.1	0.1	0.1	
621	2537		0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.1	0.1	0.1	0.1	
624	1105		0.0	0.0	0.2	0.0	0.4	0.2	0.2	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.7	0.7	0.7	
632	.																							
634	1555		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.2	0.2	0.0	0.6	0.1	0.1	0.1	
635	1274		0.2	0.0	0.4	0.6	0.0	0.5	0.0	0.0	0.0	0.0	0.3		0.0	0.0	0.0	0.0	1.0	0.2	0.3	0.3	0.3	
636	1455		0.1	0.2	0.3	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.5	0.0	0.2	0.3	1.1	1.0	1.0	1.0	
637	1132		0.0	0.0	0.2	0.4	0.9		0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.9	0.3	0.4	0.2	0.0	0.6	0.6	0.6	
610	256	301 - 400	2.9	0.5	1.5	1.0	1.6	3.0	0.4	0.0	1.5	1.8					0.5							
614	263		1.0	0.5	0.0	4.5	1.0	0.0	0.0	0.0	0.0	0.0					0.0		0.1	0.1	0.1			
617	593		0.5	0.0	0.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.4	0.0	1.7	0.3	0.3	0.3	
623	494		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	5.0	0.5	0.5	0.5	
625	888		0.3	0.2	0.0	0.3	0.3	0.0	0.3	0.0	0.3	0.3	0.0	0.4	0.0	0.0	0.0	4.3	0.3	0.5	0.5	0.5	0.5	
626	1113		0.0	0.0	0.8	0.0	3.8	2.4	2.0	0.0	0.0	0.3	0.4	1.1	13.0	3.5	6.5	2.5	4.6	2.8	3.7	3.7	3.7	
628	1085		0.2	0.0	0.2	0.0	1.2	1.8	0.8	0.0	0.2	0.0	0.6	0.0	1.4	0.3		1.2	3.6	3.2	5.4	5.4	5.4	
629	495		4.5	0.5	0.5	1.0	5.5	4.1	0.7	0.0	0.0	0.5	0.5	7.5	0.9	4.3	0.5	0.0	2.1	2.0	0.8	0.8	0.8	
630	332		0.0	1.0	1.0	0.5	2.5	2.2	0.3	0.4	0.0	0.0	0.5	0.9	1.0	4.1	2.0	1.7	0.5	0.5	1.1	1.1	1.1	
633	2067		0.2	0.8	1.0	1.2	0.2	0.7	0.5	0.3	0.1	0.2	1.0	0.3	1.2	0.4	1.1	2.4	1.3	1.1	1.7	1.7	1.7	
638	2059		0.3	0.5	0.6	2.3	2.1	3.6	2.2	0.9	1.2	2.4	2.0	2.0	8.8	7.4	2.6	5.7	2.3	6.0	4.1	4.1	4.1	
639	1463		0.6	0.2	0.5	0.8	0.0	0.0	0.5	0.0	0.0	0.8	0.0	1.7	0.3	0.7	0.7	1.8	0.7	1.2	1.2	1.2	1.2	
613	30	401 - 500	0.6	1.0	3.5	53.2	3.4	2.3	1.4	0.6	2.4	2.4					2.0		0.8	0.8	0.8			
622	691		0.3	0.2	0.3	1.0	0.0	0.7	1.7	0.0	0.0	0.7	0.6	0.0	0.3	0.0	0.4	0.0	1.5	2.0	0.3	0.3	0.3	
627	1255		4.6	0.7	7.8	13.0	3.8	11.7	4.5	2.1	0.8	2.8	2.2	6.4	15.5	8.3	11.0	18.1	10.3	8.2	5.3	5.3	5.3	
631	1321		3.0	1.0	3.1	2.7	0.5	3.5	1.7	1.2	0.7	2.8	3.8	0.9	3.2	3.0	3.6	3.2	1.1	4.8	0.9	0.9	0.9	
640	69		0.0	4.1	2.0	6.5	0.5	5.0	14.5	1.0	0.5	16.9	1.5	16.5	8.5	20.4	17.5	47.5	9.5	14.0	8.1	8.1	8.1	
645	216		0.0	5.0	1.5	0.4	3.5	2.5	3.7	2.5	0.0	0.0	9.8	8.5	7.5	1.8	28.7	16.2	6.7	15.5	8.5	8.5	8.5	
650	134		2.0	1.5	8.0	17.0	9.7		9.0	5.4	9.0	23.0	3.1	31.0	30.7	51.6	18.4	40.5	30.0	25.5	14.5	14.5	14.5	
641	230	501 - 750	2.5	8.0	6.0	16.0	11.9		25.0	4.9	9.5	61.5	7.3	37.0	35.7	34.3	89.5	48.9	33.8	59.9	7.0	7.0	7.0	
646	325		0.5	49.4	3.5	3.5	3.5	17.8	12.0	17.6	2.0	7.0	6.5	0.5	31.4	5.6	12.0	9.5	19.1	6.5	1.1	1.1	1.1	
651	359		5.0	9.0	15.6	9.0	11.6		31.4	25.1	4.5	98.5	56.6	99.0	84.2	64.5	135.2		136.6	30.5	28.6	5.2	5.2	5.2
642	418	751 - 1000	1.5	0.5	0.0	0.5	3.0	10.4	0.6	1.0	5.5	0.5	22.5	1.5	5.0	0.5	4.0	0.0	0.0	0.0	0.0	0.0	0.0	
647	360		1.0	3.5	4.0	5.5	15.0	0.0	17.5	0.5	7.0	13.6	14.5	0.5	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	
652	516		5.5	10.5	17.0	21.5	2.5	12.5	3.4	2.5	18.0	1.0	25.5	0.0	9.5	1.0	20.6	1.5	0.0	1.1	0.0	0.0	0.0	
643	733	1001 - 1250	2.3	0.0	0.0	0.0	0.3	0.4	0.0	0.0	1.2	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
648	228		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
653	531		3.5	0.0	0.0	0.0	0.5	0.0	0.5	0.0	2.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
644	474	1251 - 1500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
649	212		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	
654	479		0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	
All strata			0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.1	0.1	0.5	0.6	0.6	0.6	1.0	0.8	1.2	1.1	0.8	0.9	1.3	1.6	1.6

Table 6. Mean Weight (kg) per Tow of Witch Flounder (M+F) in each stratum in Div. 3L during fall 1984-1998

Stratum		Stratum Area	Depth Range (m)	Mean Weight (kg) per Tow of Witch Flounder (M+F) in each stratum in Div. 3L during fall 1984-1998														
				84	85	86	87	88	89	90	91	92	93	94	95	96	97	98
784		268	30 - 56													0.0	0.0	0.0
350		2071		0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
363		1780		0.3	0.0	0.2	0.0	0.0	0.0	1.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0
371		1121	57 - 92	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
372		2460		0.4	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
384		1120		0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
785		465														0.0	0.0	0.0
328		1519		0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
341		1574		1.1	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
342		585		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
343		525		1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
348		2120		1.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
349		2114		1.1	0.0	0.5	0.0	0.1	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
364		2817		0.5	0.0	0.4	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
365		1041		0.7	0.0	0.5	0.2	0.1	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
370		1320		1.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
385		2356		1.0	0.0	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
390		1481		0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
786		84													0.1	0.0	0.0	
787		613													0.0	0.0	0.0	
788		261													0.0	0.0	0.0	
790		89													0.0	0.0	0.1	
793		72													0.0	0.0	0.0	
794		216													0.0	0.0	0.0	
797		98													0.0	0.0	0.0	
799		72													0.0	0.0	0.0	
344		1582		0.8	0.2	0.1	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
347		983		3.5	0.0	0.3	0.0	1.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
366		1394		1.0	1.9	1.6	0.9	0.6	1.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
369		961	184 - 274	2.8	4.3	5.3	2.4	8.0	3.2	3.6	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
386		983		1.2	3.8	8.0	11.2	12.9	3.3	1.6	2.3	6.5	0.0	0.0	0.0	0.0	0.0	0.0
389		821		1.7	1.2	6.7	2.2	1.2	0.2	0.7	0.0	0.2	0.0	0.0	0.3	0.0	0.0	0.0
391		282		0.0	0.8	0.0	0.2	0.0	0.0	0.0	1.8	0.6	0.0	0.0	0.9	0.0	0.7	0.0
795		164													0.0	0.0	0.0	
789		72	184 - 366												0.0	0.0	0.0	
791		227													0.1	0.0	0.0	
798		100													0.0	0.1	1.6	
345		1432		22.8	6.2	3.1	18.7	10.7	12.0	3.8	0.0	0.3	0.4	0.0	0.0	0.0	0.0	0.2
346		865		12.0	18.8	27.9	10.1	15.3	10.8	15.7	1.7	0.3	0.1	0.0	0.0	0.1	0.0	0.0
368		334		1.0	0.6	8.4	0.5	1.4	3.1	2.3	0.8	0.3	0.0	0.0	0.5	0.0	0.0	0.0
387		718	275 - 366	1.7	4.1	2.8	5.8	18.0	15.7	37.1	1.6	0.5	0.3	0.1	0.6	0.1	0.0	0.0
388		361		24.7	1.0		11.9	1.8	2.5	0.0	2.5	3.5	0.0	0.3	0.0	0.0	0.0	0.3
392		145		2.7	0.6	1.0	2.5	0.6	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.1
796		175													0.0	0.0	0.0	0.1
800		81													0.0	0.0	0.2	
729		186		5.7	5.0	10.9			1.9	10.7	9.6	1.6	5.1	0.1	5.9	0.9	0.0	
731		216		16.8	8.3				15.7	6.0	12.0	1.3	2.7	0.6	0.0	0.3		
733		468		5.1	18.1				25.1	32.8	9.5	2.8	0.9	0.4	0.2	0.0	0.6	
735		272		9.8	0.9	45.8				5.9	5.8	1.1	0.3	0.1	0.5	0.6	0.5	
792		50													8.1	5.4	1.7	
730		170		4.4	0.7				5.5	0.3	6.0	3.8	3.5	0.0	0.9	0.5		
732		231	550 - 731	8.9	7.4				0.9	6.5	8.9	1.3	6.1	0.5	4.6	3.8	13.9	
734		228		1.0	5.9				5.4	3.2	0.4	3.4	1.6	1.2	4.0	0.5	4.8	
736		175		11.2	29.4				14.7	37.9	3.7	2.9	0.8	0.4	10.9	1.7	5.6	
737		227	732 - 914												0.6	4.2	3.3	14.0
741		223													3.8	5.4	10.2	
745		348													3.2	4.4	2.6	
748		159													4.0	0.0	0.0	
738		221												0.3	10.9	4.2	0.8	
742		206	915 - 1097												1.1	0.1	0.3	
746		392													2.2	2.3	0.0	
749		126													1.9	1.7	0.0	
739		254													0.0	0.0	0.0	
743		211	1098 - 1280												0.0	0.0	0.0	
747		724													0.0	0.0	1.1	
750		556													0.0	0.0	0.0	
740		264	1281 - 1463												0.0	0.0	0.0	
744		280													0.0	0.0	0.0	
751		229													0.0	0.0	0.0	
	All strata			2.5	1.5	2.1	1.7	1.8	1.3	2.0	1.0	0.6	0.2	0.1	0.1	0.3	0.2	0.3

Table 7. Mean Weight (kg) per Tow of Witch Flounder (M+F) in each stratum in Div. 3L during fall 1999-2015

Stratum	Stratum Area	Depth Range (m)																		
			99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	
784	268	30 - 56		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
350	2071		0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
363	1780		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	
371	1121		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	
372	2460		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	
384	1120		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
785	465		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
328	1519		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	
341	1574		0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.8	0.0	0.2	0.0	0.4	0.3	0.0	6.5	0.0	0.2	
342	585		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
343	525		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
348	2120		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	
349	2114		0.0	0.0	0.0	0.0	0.1	0.0	0.4	0.0	0.0	0.3	0.0	0.1	0.1	0.0	1.1	0.0	0.0	
364	2817		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	
365	1041		0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
370	1320		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
385	2356		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
390	1481		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
786	84		0.0	0.1	0.0	0.1	0.0	0.1												
787	613		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0										
788	261		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0										
790	89		0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0										
793	72		0.0	0.0	0.2	0.0	0.0	0.3												
794	216		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0										
797	98		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0										
799	72		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0										
344	1582		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
347	983		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	1.8	0.2	0.0	0.0	
366	1394		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.2	0.8	0.2	0.0	
369	961		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.4	0.6	0.0	0.0	
386	983		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.5	0.0	0.0	
389	821		0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	
391	282		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	
795	164		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
789	72		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0										
791	227		0.0	0.0	0.0	0.1	0.0	0.1												
798	100		0.2	1.7	0.0	0.0	0.2	0.1												
345	1432		0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.1	1.3	0.2	0.8	0.4	3.8	2.5	0.1	0.1		
346	865		0.2	0.1	0.1	0.0	0.0	0.6	0.8	0.6	5.1	0.3	0.1	3.7	4.4	5.2	2.4	2.1		
368	334		0.0	0.1	0.0	0.0	0.0	0.1	0.3	0.0	0.6	0.0	0.0	0.0	1.0	2.2	0.0	0.0		
387	718		0.0	0.4	0.0	0.1	0.0	0.0	0.2	0.4	1.3	0.0	1.0	0.8	0.5	0.1	0.0	2.2		
388	361		0.0	0.1	0.3	0.1	0.1	0.0	0.1	0.7	0.2	0.3	0.4	0.1	0.1	0.2	2.8	0.1	1.7	
392	145		0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	2.4	
796	175		0.0	0.2	0.0	0.0	0.0	0.4	0.1								1.8	0.0	0.0	
800	81		0.6	2.2	2.0	0.1	0.3	0.7					0.9	0.5						
729	186		0.0	0.0	0.5	1.3	0.5	0.0	0.1	1.3	1.1	2.9	0.4	7.6	3.1	0.7	2.1	0.9	4.2	
731	216		0.6	0.6	0.1	0.1	0.5	0.7	0.8	1.6	0.4	1.4	2.8	3.1	0.8	4.8	3.2	4.2		
733	468		0.8	1.0	0.8	1.6	0.1	3.9	3.6	2.6	5.8	0.4	3.2	3.5	6.8	6.2	6.0	1.5	1.6	
735	272		0.3	0.1	0.1	0.3	0.0	1.6	1.2	5.0	8.9	13.6	8.0	14.4	20.2	6.2	22.0	6.6		
792	50		4.2	7.8	7.1	6.6	7.2	11.5							3.6					
730	170		0.4	2.5	11.7	4.9	0.0	0.6	0.0	2.1	0.6	0.2	1.7	2.9	2.0	2.5	3.0	0.1	0.0	
732	231		7.9	7.2	6.5	3.6	3.4	3.3	1.1	5.8	3.8	4.7	7.9	10.6	4.4	2.3	2.9	6.9	6.7	
734	228		3.0	1.5	0.5	2.5	0.1	0.0	2.7	1.4	0.6	14.9	7.0	20.8	1.6	2.1	2.2	0.0		
736	175		3.9	17.2	7.7	49.7	4.3	8.1	31.5	32.3	34.6	38.7	39.7	22.7	16.1	13.2	34.9	35.3		
737	227		4.8	0.4	4.0	16.1	2.2	1.6	0.4	0.0	0.0	2.6					17.0			
741	223		0.2	0.0	0.1	5.2	0.5	0.3	0.0	0.0	0.5	0.0					7.1			
745	348		1.4	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.5	0.0				0.3			
748	159		1.8	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0	0.2	0.0				0.0			
738	221		0.0	0.0	0.2	0.2	13.9			0.0	0.0	0.0	0.0	0.0				0.0		
742	206		0.0	0.0	0.0	0.0	4.1			0.0	0.0	0.0	0.0	0.0				0.0		
746	392		0.0	0.0	0.0	0.0	0.1			0.0	0.0	0.0	0.0	0.0				0.0		
749	126		0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0				0.0		
739	254		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0				0.0		
743	211		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0				0.0		
747	724		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0				0.0		
750	556		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0				0.0		
740	264		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0				0.0		
744	280		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0				0.0		
751	229		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0				0.0		
All strata			0.1	0.2	0.2	0.4	0.2	0.1	0.2	0.3	0.3	0.5	0.4	0.5	0.5	0.6	0.7	0.9	0.6	0.4

Table 8. Mean Numbers per Tow of Witch Flounder (M+F) in each stratum from surveys in Div. 2J during fall of 1977-1994

Stratum	Stratum Area	Depth Range (m)	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94
201	633		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
205	1594		0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
206	1870	101 - 200	0.4	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
207	2264		0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
237	733																		0.0	
238	778																		0.0	
202	621		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
209	680		0.7	0.2	0.1	0.7	0.0	0.4	0.7	0.1	0.7	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	
210	1035		1.3	0.4	1.0	3.8	0.3	1.2	0.0	3.5	0.0	0.0	0.5	0.0	0.5	0.0	0.0	0.0	0.0	
213	1583	201 - 300	1.6	1.1	0.9	1.4	1.8	2.0	1.3	0.8	0.8	0.8	0.7	0.1	0.2	0.0	0.0	0.0	0.0	
214	1341		1.7	0.4	0.0	0.6	0.4	0.9	0.6	0.3	0.8	0.5	0.0	0.2	0.3	0.2	0.0	0.0	0.0	
215	1302		1.3	0.1	0.2	0.0	0.2	0.4	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
228	2196		2.9	1.3	2.0	3.8	1.0	4.2	1.5	2.1	0.3	5.5	0.6	1.0	2.0	1.2	0.0	0.4	0.3	
234	530		0.0	0.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
203	487		0.0	0.0	0.0	0.0	0.0	1.0	2.3	0.0	0.0	0.5	0.0	0.0	0.3	0.0	0.0	0.0	0.0	
208	588		5.5	1.0	2.3	8.3	2.5	15.0	2.0	2.3	15.7	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	
211	251	301 - 400	12.0	6.8	3.3	8.6	2.0	7.5	0.5	3.0	2.3	0.5	1.0	0.0	1.5	0.0	0.0	0.0	0.0	
216	360		0.0	0.0	0.8	0.8	2.0	2.0	2.3	0.0	0.0	1.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0	
222	450		5.0	3.0	0.8	2.5	3.5	7.7	1.7	0.7	1.0	0.0	0.0	6.5	1.0	0.0	0.3	0.0	0.0	
229	536		4.0	3.8	2.3	4.3	1.5	2.5	2.8	1.7	0.7	23.7	3.3	4.7	21.3	1.0	0.3	1.7	3.0	
204	288		1.5	0.0	1.5	2.0	2.7	0.3	2.5	0.0	2.0	0.5	1.5	2.0	0.5	0.0	0.0	0.0	0.0	
217	241		0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	2.0	2.5	2.0	2.5	0.5	0.0	0.0	4.7	
223	158	401 - 500	0.5	0.0	0.0	0.0	1.5	0.0	0.0	2.0	0.0	10.0	6.5	5.0	4.5	1.5	2.7	1.3	3.5	
227	598		1.8	2.0	0.5	6.0	2.0	4.2	3.0	1.3	2.3	4.3	7.3	2.3	3.8	46.7	7.0	3.5	4.0	
235	414		23.3	0.0	11.5	9.5	11.5	10.0	23.5	13.3	9.0	6.5	5.0	0.0	3.5	3.0	1.7	0.3	0.0	
240	133																	19.0	7.7	
212	557		23.5	2.0	9.5	2.5	8.0	16.0	18.7	12.3	17.8	51.0	14.3	7.5	9.8	13.3	4.5	4.0	1.0	
218	362		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	1.0	3.0	2.5	1.5	0.5	0.0	2.0	4.0	
224	228	501 - 750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	1.5	5.5	5.0	0.5	3.0	2.0	0.0	
230	185		0.0	0.0	0.5	0.0	0.0	0.0	0.5	0.0	2.0	0.5	4.5	24.0	52.0	139.5	27.0	18.5	15.0	
239	120																	0.0	0.0	
219	283	751 - 1000																	4.0	
231	186		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	
236	193		0.0						1.5	0.0	0.0	0.0	0.0	0.5	3.5	2.0	9.0	7.5	6.0	
220	303	1001 - 1250																		
225	195		0.0																	
232	228		0.0																	
221	330	1251 - 1500																		
226	201																			
233	237																			
All strata			2.2	0.6	1.0	1.4	1.0	2.0	1.5	1.2	1.3	2.9	1.0	0.9	1.7	2.5	2.1	0.8	0.8	0.7

Table 9. Mean Numbers per Tow of Witch Flounder (M+F) in each stratum from surveys in Div. 2J during fall of 1995-2015

Stratum	Stratum Area	Depth Range (m)	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
201	633		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
205	1594		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
206	1870		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.0	
207	2264		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
237	733		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	
238	778		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
202	621		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
209	680		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
210	1035		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
213	1583		0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.4	0.1	
214	1341		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.2	
215	1302		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
228	2196		0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.2	0.0	1.1	1.2	0.5	0.6	1.4	1.8	
234	530		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
203	487		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
208	588		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	2.5	8.0	14.0	1.0	
211	251		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	6.8	0.0	7.7	16.5	
216	360		0.0	0.5	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.5	3.6	2.8	3.0	2.5		
222	450		0.0	0.9	0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.6	0.5	1.0	0.5	0.5	0.0	1.1	
229	536		0.0	0.0	0.0	0.0	0.0	0.5	0.4	0.0	0.5	0.5	2.0	1.5	2.5	0.0	4.0	0.7	2.5	5.5	6.7	3.5	
204	288		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	1.0	0.0	0.0	0.0	
217	241		0.0	1.0	2.0	0.9	0.0	0.0	0.0	0.6	2.0	1.5	0.5	0.0	0.0	0.5	0.0	2.0	0.0	0.5	0.7	1.6	
223	158		0.0	3.4	2.0	0.9	0.0	2.0	0.6	1.0	0.0	1.6	2.5	2.5	1.9	0.5	0.6	0.0	0.5	4.0	6.0		
227	598		0.0	0.0	2.5	4.0	6.5	0.0	2.5	0.6	0.0	1.6	2.0	4.0	4.0	2.7	3.0	5.0	1.5	3.0	2.0	0.7	
235	414		0.0	0.9	0.5	1.5	0.0	0.0	0.1	1.0	0.0	6.0	2.0	1.0	1.5	5.3	0.5	16.5	28.9	8.0	14.5	22.5	
240	133		0.0	8.0	3.0	2.5	7.5	2.0	4.2	0.0	1.0	2.5	4.5	6.5	5.8	2.7	17.1	6.3	1.5	2.5	4.0	5.8	
212	557		4.0	2.8	3.5	9.0	7.0	6.0	0.9	1.5	1.5	7.5	13.0	18.2	29.6	43.3	22.5	14.6	2.0	2.0	6.0	9.0	
218	362		0.3	4.0	1.5	1.0	0.9	1.0	0.0	0.0	0.4	3.0	1.0	1.0	0.5	0.5	3.4	0.0	0.0	0.0	0.0	0.0	
224	228		1.0	2.5	4.5	2.7	0.5	3.0	2.3	0.5	0.0	0.0	0.5	3.5	1.0	2.6	1.0	0.0	0.0	0.0	0.0	0.0	
230	185		32.5	22.9	34.0	4.0	26.5	6.5	5.1	1.1	8.5	6.0	16.0	15.5	6.0	7.5	20.0	1.1	0.0	1.8	0.7	1.7	
239	120		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	2.5	0.5	2.0	2.0	0.0	
219	283		1.0	1.5	1.0	2.0	0.0	0.4	0.4	1.6	1.8	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
231	186		22.0	1.0	3.5	32.5	18.0	39.5	8.0	37.2	1.7	9.1	6.0	0.0	1.0	1.0	0.0	0.0	2.0	0.0	0.0	0.5	
236	193		0.9	5.0	0.5	1.4	2.5	3.0	6.5	3.0	5.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
220	303		1.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
225	195		0.0	0.0	0.0	0.5	0.5	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
232	228		0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
221	330		0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
226	201		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
233	237		0.0	0.0	0.7	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
All strata			0.6	0.5	0.5	0.7	0.7	0.6	0.3	0.4	0.2	0.5	0.6	0.8	0.9	1.3	1.0	1.0	0.9	0.6	0.9	1.3	1.8

Table 10. Mean Numbers per Tow of Witch Flounder (M+F) in each stratum from surveys in Div. 3K during fall of 1978-1994

Stratum	Stratum Area	Depth Range (m)																	
			78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94
608	798																		
612	445																		
616	250	101 - 200																	
618	1347																		
619	1753																		
609	342																		
611	573																		
615	251																		
620	2545		2.6	5.3	1.7	0.4	0.4	0.3	0.3	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
621	2537	201 - 300	5.1	13.1	1.8	0.7	0.4	1.8	0.6	1.0	0.1	0.2	0.0	1.2	0.0	0.0	0.0	0.0	0.0
624	1105		5.7	2.5	1.8	6.5	5.0	2.0	4.0	1.8	1.0	0.3	0.0	0.0	0.3	0.0	0.0	0.1	0.0
632	.		9.0	12.5	4.3	10.5	8.3	8.0		3.7	1.5	0.5	0.5	1.0	0.0	0.1	0.9		
634	1555		3.8	3.8	5.7	3.0	4.1	1.0	4.0	2.4	1.2	1.3	2.2	1.1	0.0	0.0	1.1	0.1	0.0
635	1274		9.7	10.9	10.2	9.0	5.0	3.3	13.9	6.4	0.2	0.8	2.6	1.0	0.2	0.0	0.3	0.0	0.0
636	1455		8.6	8.6	9.4	5.8	4.8	3.2	14.6	4.9	2.0	2.4	3.8	1.2	0.1	0.0	0.0	0.0	0.0
637	1132		10.3	21.1	12.7	15.2	15.3	30.6	22.7	21.3	4.8	6.2	1.3	1.0	0.0	0.0	0.3	0.3	0.0
610	256																		
614	263																		
617	593																		
623	494	301 - 400	6.2	7.0	6.2	5.3	3.4	6.2	4.0	6.5	2.0	3.8	2.2	0.3	0.0	0.0	0.0	0.0	0.0
625	888		13.5	34.0	12.5	22.0	5.0	19.0	17.8	14.4	0.7	2.8	2.5	0.8	0.0	0.0	0.0	0.0	0.0
626	1113	401 - 500	70.0	89.0	84.2	12.6	54.8	38.5	22.7	12.8	0.5	4.6	1.0	2.6	0.0	0.0	0.3	0.0	0.0
628	1085		24.1	56.0	35.2	12.3	23.0	44.0	18.1	28.3	11.3	6.0	1.8	4.3	0.0	0.0	1.0	0.0	0.0
629	495		44.2	53.5	71.6	40.7	21.5	53.0	20.0	30.5	7.7	10.7	11.0	6.0	1.5	0.0	0.7	2.7	2.0
630	332		37.0	18.0	15.0	17.5		12.0	10.7	12.3	4.0	3.7	3.3	1.7	0.0	0.0	0.3	0.7	0.0
633	2067		9.9	13.0	15.1	7.0	9.9	10.2	12.1	9.5	11.9	6.2	11.6	12.3	3.5	1.2	1.8	2.1	0.2
638	2059		24.1	53.7	34.3	33.8	20.9	24.2	50.9	43.7	40.0	26.6	40.3	17.8	1.9	2.2	1.1	1.3	0.0
639	1463		10.0	5.8	13.2	10.0	7.1	20.0	27.1	13.9	11.8	6.1	16.5	2.5	2.4	0.3	0.1	0.0	1.1
613	30	501 - 750																	
622	691		30.5	22.3	38.5	18.5	13.0	26.0	11.3	22.3	8.0	17.0	2.3	3.3	1.5	0.7	3.0	2.5	0.0
627	1255	751 - 1000	37.0	71.3	79.5	140.8	113.9	136.5	114.8	106.3	47.6	23.8	44.2	38.5	12.0	2.7	1.7	21.0	2.1
631	1321		51.5	34.3	38.3	80.2	11.0	53.6	76.6	69.1	48.5	20.7	15.5	11.0	1.7	15.5	13.7	4.0	13.5
640	69		4.0		8.5	3.0	17.0		21.0	63.0	90.5	147.5	83.5	60.5	9.0	9.0	3.3	0.0	0.0
645	216		0.5		0.0	0.5	14.7	10.5	72.0	14.0		208.0	39.5	16.5	84.0	7.0	1.7	6.3	4.0
650	134																1.3	0.3	
641	230	1001 - 1250	0.0	0.0	1.0	2.0	0.8	3.0	0.0	12.5		30.3			212.0	17.0	0.0	1.7	2.3
646	325		0.0	0.0	1.0	0.5	1.0	15.5	2.0	2.7		2.5			11.5	8.0	6.3	4.7	10.3
651	359																	1.0	2.3
642	418	1251 - 1500	0.0		0.5	0.0	0.3		1.0	1.0		1.0			31.3	17.0	8.5	6.7	3.0
647	360		0.0	0.0	0.0	0.0	0.0					0.7			9.5	28.3	9.0	5.7	5.3
652	516																12.7	5.0	
643	733		0.0																
648	228		0.0																
653	531																		
644	474		0.0																
649	212		0.0																
654	479		0.0																
All strata			13.9	21.0	18.6	17.9	13.6	20.3	18.9	16.2	10.2	8.7	8.8	5.7	6.8	2.3	1.5	2.0	1.1

Table 11. Mean Numbers per Tow of Witch Flounder (M+F) in each stratum from surveys in Div. 3K during fall of 1995-2015

Stratum	Stratum Area	Depth Range (m)																						
			95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13			
608	798	101-200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
612	445		0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
616	250		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
618	1347		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
619	1753		0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0			
609	342	201-300	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6						
611	573		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5											
615	251		0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	1.0												
620	2545		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.2	0.0	0.2		
621	2537		0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.1	0.2	0.5	1.3		
624	1105		0.0	0.0	0.2	0.0	0.4	0.2	0.2	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.2	0.4	0.2		
632	.		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.6	0.3	0.4		
634	1555		0.2	0.0	0.4	0.6	0.0	0.5	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.2	0.8	1.0	0.0	
635	1274		0.1	0.2	0.3	0.0	0.0	0.4	0.0	0.0	0.0	0.2	0.0	0.0	0.5	0.0	0.2	0.3	1.1	1.5	0.2	0.0		
637	1132		0.0	0.0	0.2	0.4	0.9	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.9	0.3	0.4	0.2	0.0	1.3	2.9	0.0		
610	256	301-400	2.9	0.5	1.5	1.0	1.6	3.0	0.4	0.0	1.5	1.8						0.5						
614	263		1.0	0.5	0.0	4.5	1.0	0.0	0.0	0.0	0.0	0.0						0.0	8.7	0.0	0.0			
617	593		0.5	0.0	0.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.4	0.0	1.7	1.3	1.3	0.3	
623	494		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	5.0	1.1	0.0	0.0	
625	888		0.3	0.2	0.0	0.3	0.3	0.0	0.3	0.0	0.3	0.3	0.0	0.4	0.0	0.0	0.0	4.3	0.3	0.8	0.8	1.5		
626	1113		0.0	0.0	0.8	0.0	3.8	2.4	2.0	0.0	0.0	0.3	0.4	1.1	13.0	3.5	6.5	2.5	4.6	2.8	10.4	5.6	4.7	
628	1085		0.2	0.0	0.2	0.0	1.2	1.8	0.8	0.0	0.2	0.2	0.0	0.6	0.0	1.4	0.3	1.2	3.6	3.2	11.3	4.0	2.1	
629	495		4.5	0.5	0.5	1.0	5.5	4.1	0.7	0.0	0.0	0.5	0.5	7.5	0.9	4.3	0.5	0.0	2.1	2.0	5.3	10.8	10.0	
630	332		0.0	1.0	1.0	0.5	2.5	2.2	0.3	0.4	0.0	0.0	0.5	0.9	1.0	4.1	2.0	1.7	0.5	0.5	5.5	10.0	4.0	
633	2067		0.2	0.8	1.0	1.2	0.2	0.7	0.5	0.3	0.1	0.2	1.0	0.3	1.2	0.4	1.1	2.4	1.3	1.1	3.0	1.3	1.3	
638	2059		0.3	0.5	0.6	2.3	2.1	3.6	2.2	0.9	1.2	2.4	2.0	2.0	8.8	7.4	2.6	5.7	2.3	6.0	9.7	16.7	7.2	
639	1463		0.6	0.2	0.5	0.8	0.0	0.0	0.5	0.0	0.0	0.8	0.0	1.7	0.3	0.7	0.7	1.8	0.7	2.3	4.2	4.2		
613	30	401-500	0.6	1.0	3.5	53.2	3.4	2.3	1.4	0.6	2.4	2.4					2.0		49.8	0.0	0.0			
622	691		0.3	0.2	0.3	1.0	0.0	0.7	1.7	0.0	0.0	0.7	0.6	0.0	0.3	0.0	0.4	0.0	1.5	2.0	1.1	4.8	16.0	
627	1255		4.6	0.7	7.8	13.0	3.8	11.7	4.5	2.1	0.8	2.8	2.2	6.4	15.5	8.3	11.0	18.1	10.3	8.2	25.8	55.4	33.8	
631	1321		3.0	1.0	3.1	2.7	0.5	3.5	1.7	1.2	0.7	2.8	3.8	0.9	3.2	3.0	3.6	3.2	1.1	4.8	3.0	14.8	15.6	
640	69		0.0	4.1	2.0	6.5	0.5	5.0	14.5	1.0	0.5	16.9	1.5	16.5	8.5	20.4	17.5	47.5	9.5	14.0	20.0	37.0	56.0	
645	216	501-750	0.0	5.0	1.5	0.4	3.5	2.5	3.7	2.5	0.0	0.0	9.8	8.5	7.5	1.8	28.7	16.2	6.7	15.5	15.5	6.5	10.7	
650	134		2.0	1.5	8.0	17.0	9.7	9.0	5.4	9.0	23.0	3.1	31.0	30.7	51.6	18.4	40.5	30.0	25.5	38.2	14.0	105.3		
641	230	751-1000	2.5	8.0	6.0	16.0	11.9	25.0	4.9	9.5	61.5	7.3	37.0	35.7	34.3	89.5	48.9	33.8	59.9	16.5	26.0	54.5		
646	325		0.5	49.4	3.5	3.5	3.5	17.8	12.0	17.6	2.0	7.0	6.5	0.5	31.4	5.6	12.0	9.5	19.1	6.5	2.3	1.5	2.7	
651	359		5.0	9.0	15.6	9.0	11.6	31.4	25.1	4.5	98.5	56.6	99.0	84.2	64.5	135.2	136.6	30.5	28.6	12.0	25.0	44.1		
642	418	1001-1250	1.5	0.5	0.0	0.5	3.0	10.4	0.6	1.0	5.5	0.5	22.5	1.5	5.0	0.5	4.0	0.0	0.0	0.0	0.0	0.0		
647	360		1.0	3.5	4.0	5.5	15.0	0.0	17.5	0.5	7.0	13.6	14.5	0.5	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0		
652	516		5.5	10.5	17.0	21.5	2.5	12.5	3.4	2.5	18.0	1.0	25.5	0.0	9.5	1.0	20.6	1.5	0.0	1.1	0.0	0.0		
643	733	1251-1500	2.3	0.0	0.0	0.0	0.3	0.4	0.0	0.0	1.2	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
648	228		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
653	531		3.5	0.0	0.0	0.0	0.5	0.0	0.5	0.0	2.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
644	474	1500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
649	212		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
654	479		0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0		
All strata			0.8	1.0	1.1	1.6	1.2	1.6	1.4	0.7	0.7	2.0	2.0	2.0	2.0	3.7	2.7	3.9	3.5	2.3	2.5	3.6	5.5	4.9

Table 12. Mean Numbers per Tow of Witch Flounder (M+F) in each stratum from surveys in Div. 3L during fall of 1984-1998

Stratum	New Stratum Area	Depth Range (m)																
			84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	
784	268	30 - 56													0.0	0.0	0.0	
350	2071		0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
363	1780		0.4	0.0	0.1	0.0	0.0	0.0	1.3	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	
371	1121		0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	
372	2460		0.5	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	
384	1120		0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
785	465														0.0	0.0	0.0	
328	1519		0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
341	1574		1.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	
342	585		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
343	525		1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
348	2120		1.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	
349	2114		1.0	0.0	0.6	0.0	0.1	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	
364	2817		0.7	0.0	0.4	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	
365	1041		1.0	0.0	0.4	0.3	0.2	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
370	1320		1.3	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
385	2356		1.0	0.0	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
390	1481		0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
786	84														7.8	3.1	2.0	
787	613														0.0	0.0	0.0	
788	261														0.0	0.0	0.5	
790	89														0.5	1.5	4.5	
793	72														0.0	0.0	0.0	
794	216														0.0	0.0	0.0	
797	98														0.5	0.0	0.0	
799	72														0.0	0.0	0.0	
344	1582		1.0	0.2	0.6	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
347	983		4.3	0.0	0.3	0.0	1.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
366	1394		0.8	1.9	2.3	1.1	0.6	0.9	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	
369	961		2.7	3.8	5.0	2.5	10.2	4.0	3.5	1.2	0.0	0.0	0.0	0.3	0.0	0.0	0.0	
386	983		1.4	4.2	8.0	13.3	14.6	2.6	1.8	2.0	9.3	0.0	0.0	0.0	0.0	0.0	0.0	
389	821		1.5	1.4	7.8	2.0	1.5	0.3	0.7	0.0	0.3	0.0	0.0	0.3	0.0	0.0	0.0	
391	282		0.0	1.0	0.0	0.5	0.0	0.0	0.0	2.3	0.7	0.0	0.0	0.9	0.0	0.5	0.0	
795	164														0.0	0.0	0.0	
789	72														0.0	0.5	0.5	
791	227														1.0	2.0	0.0	
798	100														0.5	0.5	12.5	
345	1432		35.0	7.6	3.8	23.0	13.1	16.1	10.6	0.0	1.8	2.0	0.0	0.6	0.4	1.1	2.2	
346	865		20.0	29.4	33.0	12.5	20.4	13.5	19.7	3.3	1.4	0.6	0.0	0.0	0.3	2.7	1.5	
368	334		1.0	1.0	10.0	0.5	1.5	4.5	2.5	1.5	0.3	0.0	0.0	0.5	0.0	0.5	0.0	
387	718		1.7	4.5	2.5	7.0	20.5	17.0	50.3	2.0	0.7	0.3	0.8	1.0	0.5	0.4	0.0	
388	361		29.0	1.0		16.5	3.0	3.0	0.0	2.3	4.0	0.0	0.3	0.0	0.0	0.0	3.0	
392	145		4.0	1.0	1.0	3.5	1.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	
796	175														0.0	4.4	1.0	
800	81														14.0	16.0		
729	186		8.5	7.5	16.0				2.5	13.3	16.5	2.0	11.3	1.3	14.7	4.5	0.0	
731	216		29.5	12.5					17.5	8.3	20.3	3.3	6.7	1.5		0.0	2.5	
733	468		5.3	25.0					34.5	46.3	10.3	4.0	2.1	0.5	0.3	0.0	1.8	
735	272		17.7	1.0	62.0				9.3	6.7	1.0	0.4	2.0	1.5	2.0	4.5		
792	50														131.0	61.5	40.5	
730	170		4.5	1.0					5.0	0.5	8.3	7.3	4.6	0.0	2.0	0.8		
732	231		11.5	9.5					1.0	8.5	12.5	1.5	10.7	2.4	8.8	13.0	30.5	
734	228		0.7	8.5					8.0	3.5	0.5	4.5	4.7	1.4	14.9	2.2	12.1	
736	175		15.5	41.0					21.0	67.0	9.0	10.0	1.4	3.1	32.5	11.5	43.1	
737	227														2.5	15.0	9.5	35.5
741	223														9.5	15.0	29.1	
745	348														6.5	10.0	3.5	
748	159														8.5	0.0	0.0	
738	221														2.0	17.5	11.4	1.8
742	206														1.5	0.5	0.5	
746	392														4.0	3.1	0.0	
749	126														3.5	2.5	0.0	
739	254														0.0	0.0	0.0	
743	211		1098 -												0.0	0.0	0.0	
747	724		1280												0.0	0.0	1.0	
750	556														0.0	0.0	0.0	
740	264														0.0	0.0	0.0	
744	280		1281 -												0.0	0.0	0.0	
751	229		1463												0.0	0.4	0.0	
All strata			3.4	2.0	2.5	2.1	2.2	1.6	2.7	1.4	0.9	0.3	0.3	0.2	0.8	0.7	1.1	

Table 13. Mean Numbers per Tow of Witch Flounder (M+F) in each stratum from surveys in Div. 3L during fall of 1999-2015

Stratum	Stratum Area	Depth Range (m)																		
			99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	
784	268	30 - 56		2.0	0.0	0.0	0.0	0.0	0.0											
350	2071		0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0	
363	1780		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	
371	1121	57 - 92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	
372	2460		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	
384	1120		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
785	465		0.0	0.5	0.0	0.0	0.0	0.0	0.6											
328	1519		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.0	0.0	0.0	
341	1574		0.0	0.0	0.0	0.0	0.0	0.0	0.2	2.8	0.0	0.5	0.2	0.8	0.6	0.6	6.5	0.0	0.2	
342	585		0.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
343	525		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
348	2120		0.0	0.3	0.0	0.0	0.0	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.0	0.0	
349	2114		0.0	0.1	0.0	0.0	0.4	0.1	0.5	0.0	0.1	0.3	0.1	0.1	0.3	0.0	1.1	0.0	0.0	
364	2817		0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.4	1.1	0.0	0.0	0.0	
365	1041		0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
370	1320		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	
385	2356	93 - 183	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	
390	1481		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
786	84		3.5	14.2	2.5	5.5	3.4	17.6												
787	613		0.0	0.0	0.0	0.0	0.0	0.0	0.0											
788	261		0.5	0.0	0.0	0.0	0.0	0.0	0.0					1.1						
790	89		0.0	3.0	0.5	0.0	0.0	0.0	0.0				0.0							
793	72		0.0	0.0	5.0	0.0	0.7	0.6					0.8							
794	216		0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.0							
797	98		0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.0							
799	72		0.0	0.0	0.6	0.0	0.0	0.0	0.0				0.0							
344	1582		0.0	0.3	0.0	0.4	0.6	0.2	0.0	0.2	1.8	0.8	0.3	0.0	1.0	0.0	0.0	0.0	0.0	
347	983		0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.6	0.7	3.7	0.2	0.0	0.0	0.0	
366	1394		0.2	0.0	0.0	0.0	0.4		0.2	0.0	0.2	0.0	0.0	0.2	0.3	0.4	0.8	0.2	0.0	
369	961	184 - 274	0.0	0.0	0.0	0.0	0.0		0.2	0.3	0.0	0.3	0.0	0.0	1.0	1.3	0.6	0.0	0.0	
386	983		0.0	0.0	0.0	0.6	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.7	0.5	0.0	0.0	
389	821		0.0	2.7	0.0	0.0	0.0	0.3	0.0	1.3	0.0	0.0	0.0	0.0	0.0	1.0	0.1	0.0	0.0	
391	282		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.2	0.0	
795	164		2.5	0.0	0.0	0.0	0.0	0.4					0.0							
789	72	184 - 366		2.2	0.5	2.4	0.5	2.0	1.2	2.5										
791	227		0.0	0.9	0.3	0.5	0.0	1.4					0.0							
798	100		9.8	38.5	1.5	0.0	8.9	3.0					0.7							
345	1432		0.8	0.6	0.4	2.4	0.9	0.5	2.9	1.1	1.0	4.7	3.2	9.1	2.0	7.7	2.5	0.1	0.1	
346	865		2.4	1.0	2.3	2.7	0.5	0.3	3.0	2.7	4.0	12.6	2.4	2.5	8.3	5.2	2.4	2.1		
368	334		0.4	0.5	0.0	0.0	0.5		3.0	0.4	0.0	3.6	0.0	0.0	0.5	3.3	2.2	0.0	0.0	
387	718	275 - 366	0.4	6.0	0.4	0.9	0.0		0.6	1.8	4.0	5.9	0.0	3.0	7.0	6.5	0.1	0.0	2.2	
388	361		0.0	2.5	6.2	0.9	1.9	0.0	3.5	1.0	5.3	2.7	2.2	0.4	4.1	1.0	2.8	0.1	1.7	
392	145		0.0	0.0	0.8	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	1.5	0.0	0.4	0.6	0.0	2.4	
796	175		0.9	26.5	4.0	0.0	0.0	16.0	5.0				3.5			1.8	0.0	0.0		
800	81		12.2	85.5	51.6	2.5	14.9	17.5				97.7	33.7							
729	186		0.0	1.3	0.5	3.1	1.0	0.0	0.9	4.0	7.1	9.3	2.4	20.9	10.0	4.0	2.1	0.9	4.2	
731	216	367 - 549	1.9	2.0	0.5	1.3	3.9	6.3	3.2	6.0	1.3	8.0	14.5	10.8		3.0	4.8	3.2	4.2	
733	468		2.0	2.6	1.7	6.7	0.9	23.4	13.5	8.2	22.8	0.9	11.9	14.2	25.5	20.9	6.0	1.5	1.6	
735	272		1.3	0.4	0.5	0.4	0.0		4.0	3.6	10.7	23.3	39.5	23.3	34.5	52.2	6.2	22.0	6.6	
792	50		133.1	265.9	419.7	334.1	193.5	344.3				150.0								
730	170		0.9	2.5	21.8	9.5	0.4	1.8	0.0	3.4	0.9	0.4	3.5	4.9	3.4	6.3	3.0	0.1	0.0	
732	231	550 - 731	16.0	16.5	17.8	7.3	7.2	7.8	2.8	12.0	7.0	8.0	13.4	21.4	9.9	5.7	2.9	6.9	6.7	
734	228		5.5	4.0	0.9	8.4	0.8		0.0	6.4	2.9	1.0	27.9	15.0	53.9	3.4	2.1	2.2	0.0	
736	175		18.0	59.5	28.3	136.9	26.2		25.5	68.0	66.5	84.5	84.0	86.3	53.0	38.3	13.2	34.9	35.3	
737	227		12.5	0.5	9.0	32.9	12.5		4.0	0.5	0.0		0.0	6.5				17.0		
741	223	732 - 914	0.4	0.0	1.0	9.5	2.3			0.5	0.0		1.0	0.0				7.1		
745	348		4.2	0.5	0.5	0.0	1.0			0.0	0.0		0.0	1.0				0.3		
748	159		2.3	0.0	0.0	0.0	2.5			0.0	0.0		0.0	0.5				0.0		
738	221		0.0	0.0	0.4	1.0	34.5			0.0	0.0		0.0	0.0				0.0		
742	206	915 - 1097	0.4	0.0	0.0	0.0	9.3			0.0	0.0		0.0	0.0				0.0		
746	392		0.0	0.5	0.0	0.0	0.3			0.0	0.0		0.0	0.0				0.0		
749	126		0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	0.0				0.0		
739	254		0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0					0.0		
743	211	1098 - 1280	0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	0.0				0.0		
747	724		0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	0.0				0.0		
750	556		0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	0.0				0.0		
740	264	1281 - 1463	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0					0.0		
744	280		0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	0.0				0.0		
751	229		0.0	0.0	0.0	0.0	0.0			0.0	0.0		0.0	0.0				0.0		
All strata			0.5	0.9	1.1	1.7	1.0	0.8	1.2	0.8	1.0	1.4	1.4	1.4	1.8	1.9	1.9	2.9	1.3	1.0

Table 14. Estimates of biomass (tons) of witch flounder from Canadian fall surveys in Div. 2J, 3K and 3L during 1977-2015

	2J	3K	3L	2J3KL
1977	5123			
1978	1302	30353	0	31655
1979	2218	49789	0	52008
1980	3494	44962	0	48456
1981	2581	43406	0	37338
1982	4909	32429	0	37338
1983	3693	49251	9082	62026
1984	2903	49038	13210	65151
1985	3030	35694	7881	46605
1986	5920	21359	10743	38022
1987	2063	21746	8679	32488
1988	1571	18110	9294	28975
1989	2653	8976	6606	18234
1990	3672	17088	10341	31101
1991	2669	4272	5274	12215
1992	1102	1863	3131	6095
1993	627	1327	778	2733
1994	462	846	663	1971
1995	263	435	418	1117
1996	370	855	1806	3031
1997	465	1116	1095	2676
1998	649	1255	1906	3810
1999	752	881	826	2460
2000	498	1200	968	2667
2001	209	1427	1042	2678
2002	404	471	2428	3303
2003	178	651	1010	1839
2004	476	2641	451	3568
2005	684	2842	1003	4529
2006	962	2889	1987	5838
2007	1369	4671	1723	7762
2008	1947	3374	2759	8080
2009	1351	5639	2625	9616
2010	1242	5417	2986	9645
2011	1151	3806	3339	8297
2012	1028	4384	3562	8975
2013	1494	6295	4968	12757
2014	2469	7293	3291	13053
2015	3719	7639	2312	13671

Table 15. Mean weights (kg) of witch flounder per tow from Canadian fall surveys in Div. 2J, 3K and 3L during 1977-2015.

	2J	3K	3L	2J3KL
1977	1.56			
1978	0.39		7.077	0.00
1979	0.72		12.332	0.00
1980	1.11		11.483	0.00
1981	0.80		11.086	0.00
1982	1.52		8.443	0.00
1983	1.13		13.297	2.05
1984	0.93		11.630	2.49
1985	0.93		8.235	1.48
1986	1.82		5.346	2.11
1987	0.63		5.083	1.72
1988	0.49		4.501	1.84
1989	0.83		2.231	1.31
1990	1.13		3.943	1.96
1991	0.82		0.986	0.99
1992	0.34		0.430	0.59
1993	0.20		0.302	0.15
1994	0.14		0.196	0.12
1995	0.09		0.094	0.08
1996	0.11		0.168	0.28
1997	0.13		0.219	0.17
1998	0.19		0.246	0.30
1999	0.22		0.189	0.14
2000	0.14		0.248	0.16
2001	0.06		0.280	0.16
2002	0.12		0.092	0.38
2003	0.05		0.128	0.16
2004	0.14		0.518	0.10
2005	0.20		0.561	0.17
2006	0.28		0.587	0.33
2007	0.39		1.003	0.29
2008	0.59		0.782	0.52
2009	0.39		1.20	0.44
2010	0.36		1.07	0.48
2011	0.34		0.82	0.63
2012	0.30		0.94	0.67
2013	0.43		1.31	0.93
2014	0.71		1.57	0.55
2015	1.07		1.64	0.43
				1.01

Table 16. Estimates of abundance (000s) of witch flounder from Canadian fall surveys in Div. 2J, 3K and 3L during 1977-2015

	2J	3K	3L	Total
1977	7106			
1978	1962	59729	0	61691
1979	3016	84955	0	87971
1980	4503	72872	0	77374
1981	3190	70058	0	58631
1982	6486	52146	0	58631
1983	4963	75267	12033	92262
1984	3840	79553	17914	101307
1985	4089	70384	10401	84874
1986	9432	40917	12839	63188
1987	3337	37279	10500	51117
1988	2746	35486	11269	49501
1989	5377	22734	8002	36114
1990	8110	29338	14453	51901
1991	6941	10045	7428	24414
1992	2463	6377	4748	13588
1993	2588	8918	1572	13078
1994	2369	4815	1428	8612
1995	1808	3546	1004	6358
1996	1724	5081	5297	12102
1997	1890	5716	4383	11989
1998	2505	7955	6755	17214
1999	2548	5441	2655	10644
2000	1964	7952	5361	15276
2001	1096	7220	7316	15631
2002	1497	3752	10776	16025
2003	715	3659	6090	10464
2004	1870	10424	3990	16284
2005	2254	10129	7023	19406
2006	2719	10065	5091	17875
2007	3290	17080	5865	26235
2008	4313	11589	7538	23441
2009	3398	18194	8410	30001
2010	3344	17547	10991	31882
2011	2879	10541	9994	23414
2012	2222	11482	9954	23658
2013	3100	17485	15731	36317
2014	4665	25404	7716	37784
2015	6294	23028	5339	34661

Table 17. Mean numbers of witch flounder per tow from Canadian fall surveys in Div. 2J, 3K and 3L during 1977-2015.

	2J	3K	3L	2J3KL
1977	2.16			
1978	0.59	13.93	0.00	8.12
1979	0.97	21.04	0.00	12.33
1980	1.42	18.61	0.00	10.93
1981	0.99	17.89	0.00	8.30
1982	2.01	13.58	0.00	8.30
1983	1.52	20.32	2.72	8.10
1984	1.23	18.87	3.38	8.01
1985	1.26	16.24	1.95	6.57
1986	2.90	10.24	2.52	5.12
1987	1.03	8.71	2.08	4.06
1988	0.86	8.82	2.23	4.03
1989	1.67	5.65	1.58	2.94
1990	2.49	6.77	2.74	4.04
1991	2.13	2.32	1.39	1.89
1992	0.76	1.47	0.89	1.05
1993	0.82	2.03	0.31	1.04
1994	0.72	1.12	0.27	0.67
1995	0.65	0.77	0.19	0.50
1996	0.50	1.00	0.83	0.81
1997	0.54	1.12	0.69	0.80
1998	0.72	1.56	1.06	1.15
1999	0.74	1.17	0.45	0.76
2000	0.57	1.64	0.86	1.05
2001	0.32	1.42	1.15	1.05
2002	0.43	0.74	1.69	1.07
2003	0.21	0.72	0.96	0.70
2004	0.54	2.05	0.84	1.22
2005	0.65	2.00	1.20	1.35
2006	0.78	2.05	0.84	1.24
2007	0.95	3.67	0.99	1.86
2008	1.31	2.69	1.41	1.81
2009	0.98	3.87	1.41	2.12
2010	0.96	3.47	1.78	2.17
2011	0.85	2.26	1.88	1.76
2012	0.64	2.47	1.86	1.76
2013	0.89	3.65	2.93	2.66
2014	1.34	5.46	1.30	2.68
2015	1.81	4.95	1.00	2.57

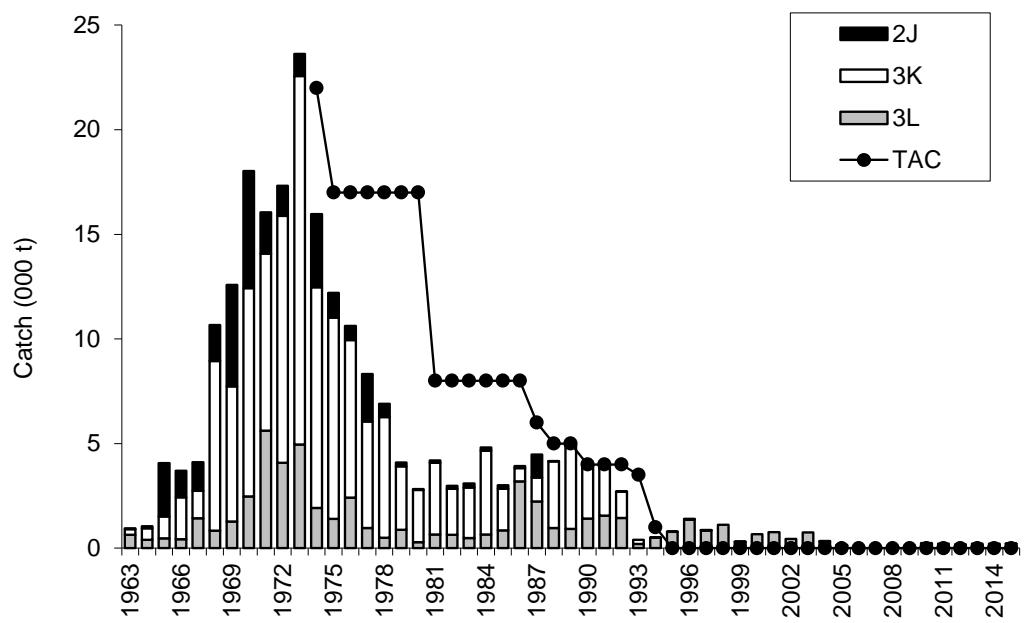


Fig. 1. Commercial catches and TACs of witch flounder in Divisions 2J, 3K and 3L during 1963-2015. Catches in Div. 3M are included for 1998-2000. Although not included, the estimated catches in Div 3M from 2001-2004 averaged 360 tons.

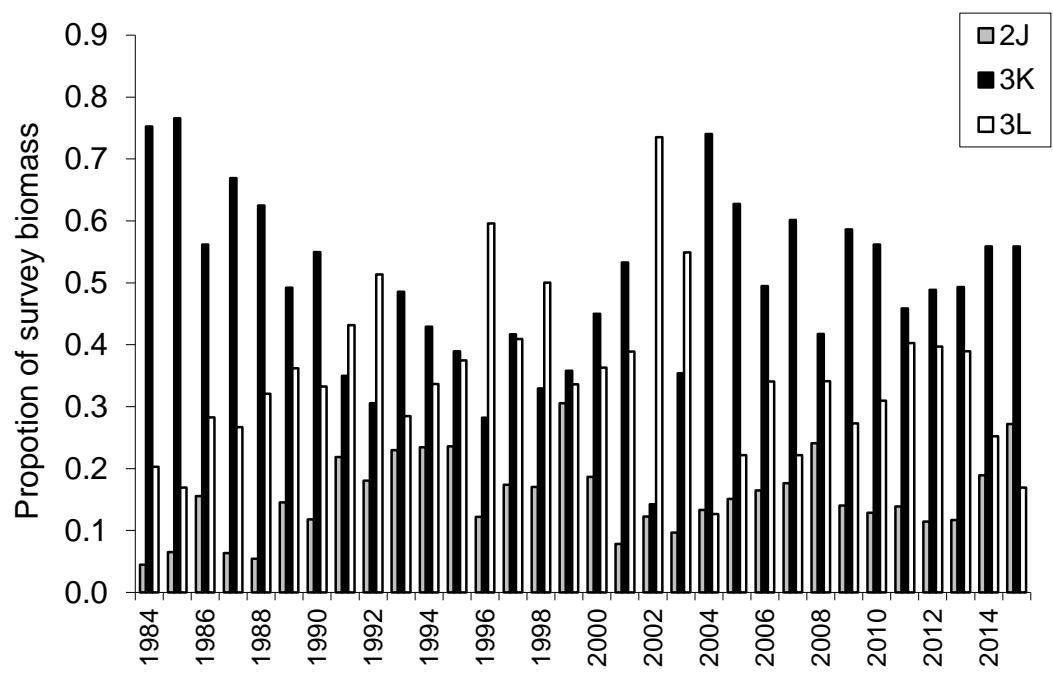


Figure 2. Proportion of witch flounder in Div, 2J, 3K and 3L from Canadian autumn surveys 1984-2015.

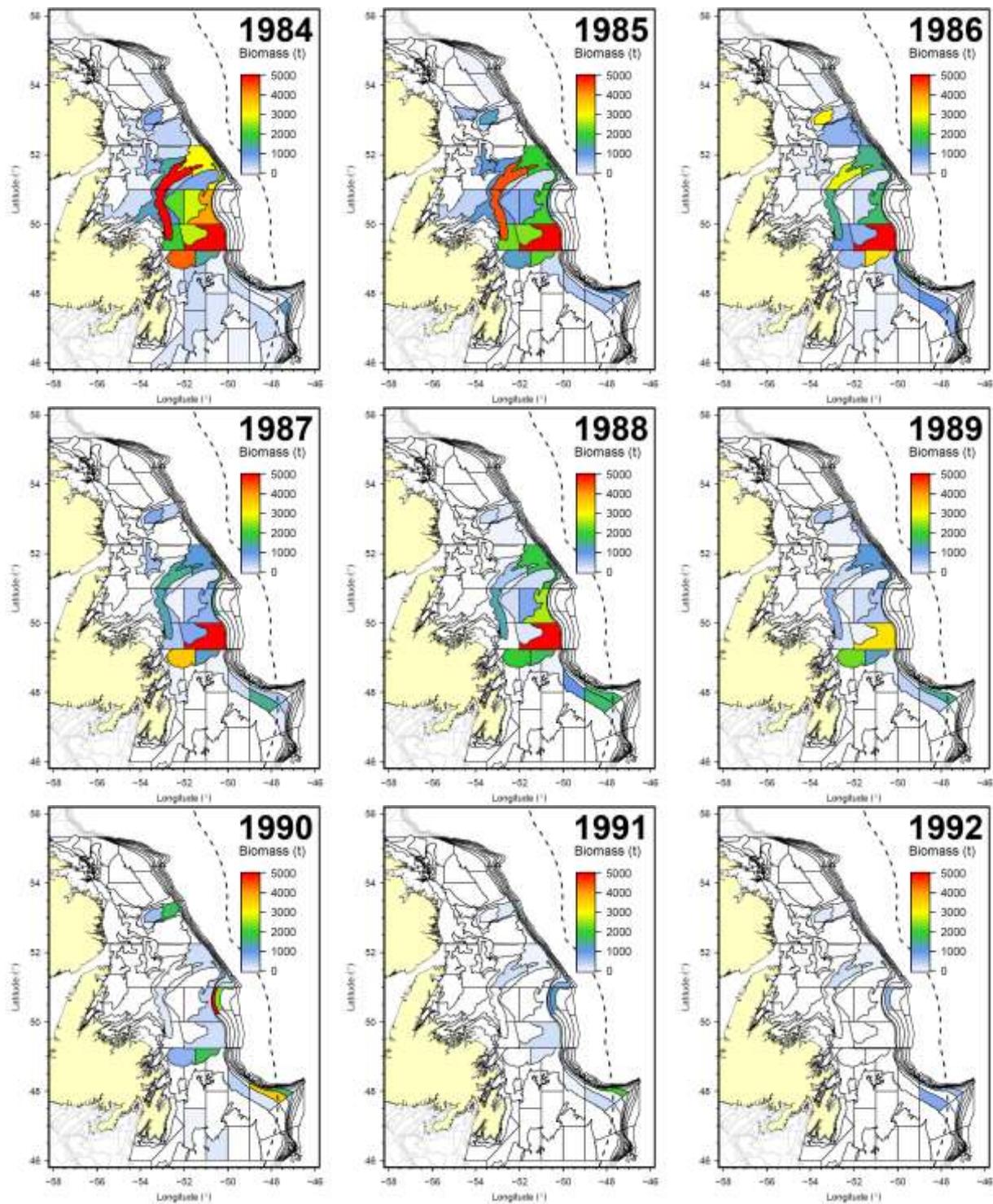


Fig. 3. Biomass estimates (t) shown by strata from Canadian autumn surveys 1984-1992.

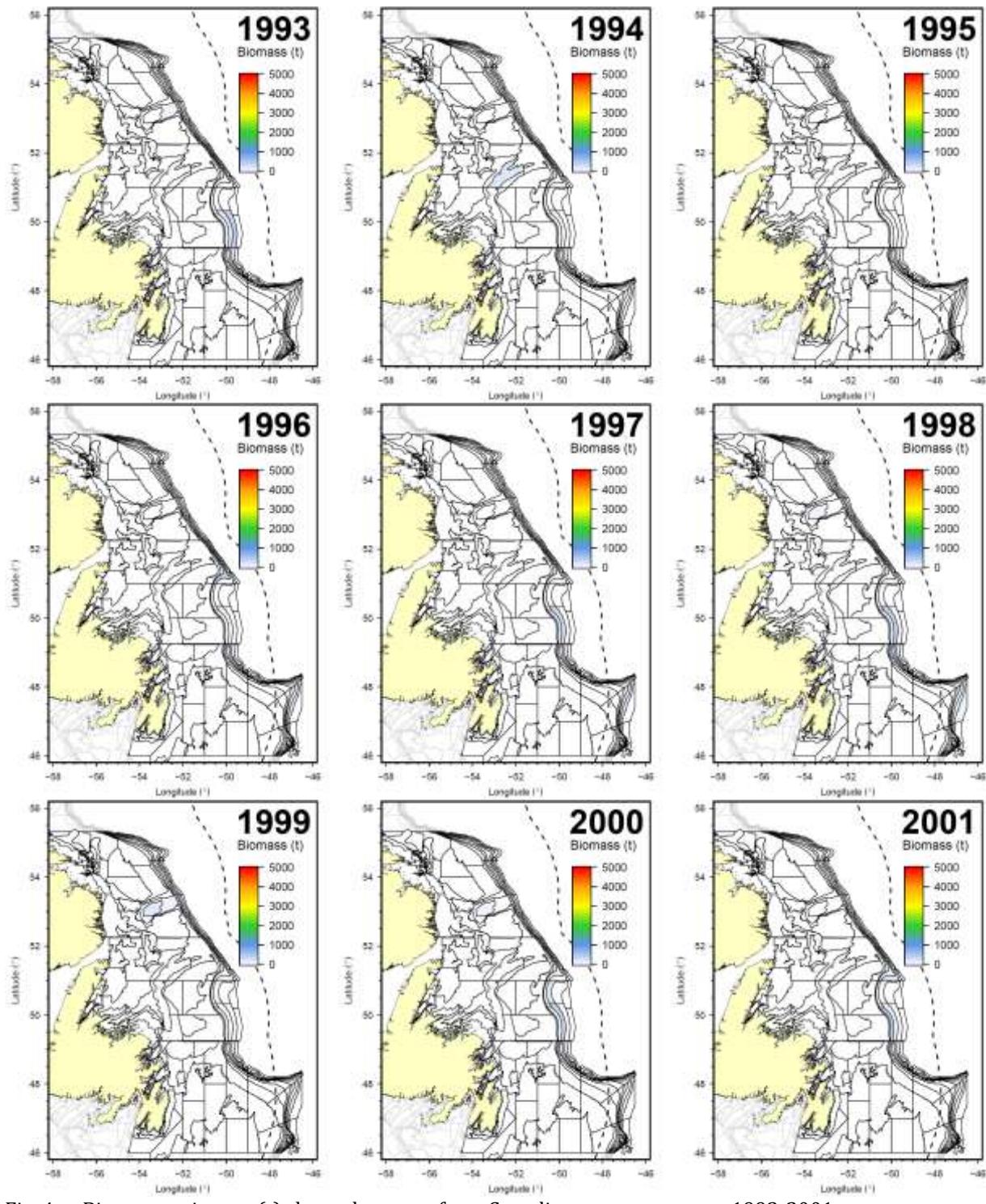


Fig. 4. Biomass estimates (t) shown by strata from Canadian autumn surveys 1993-2001.

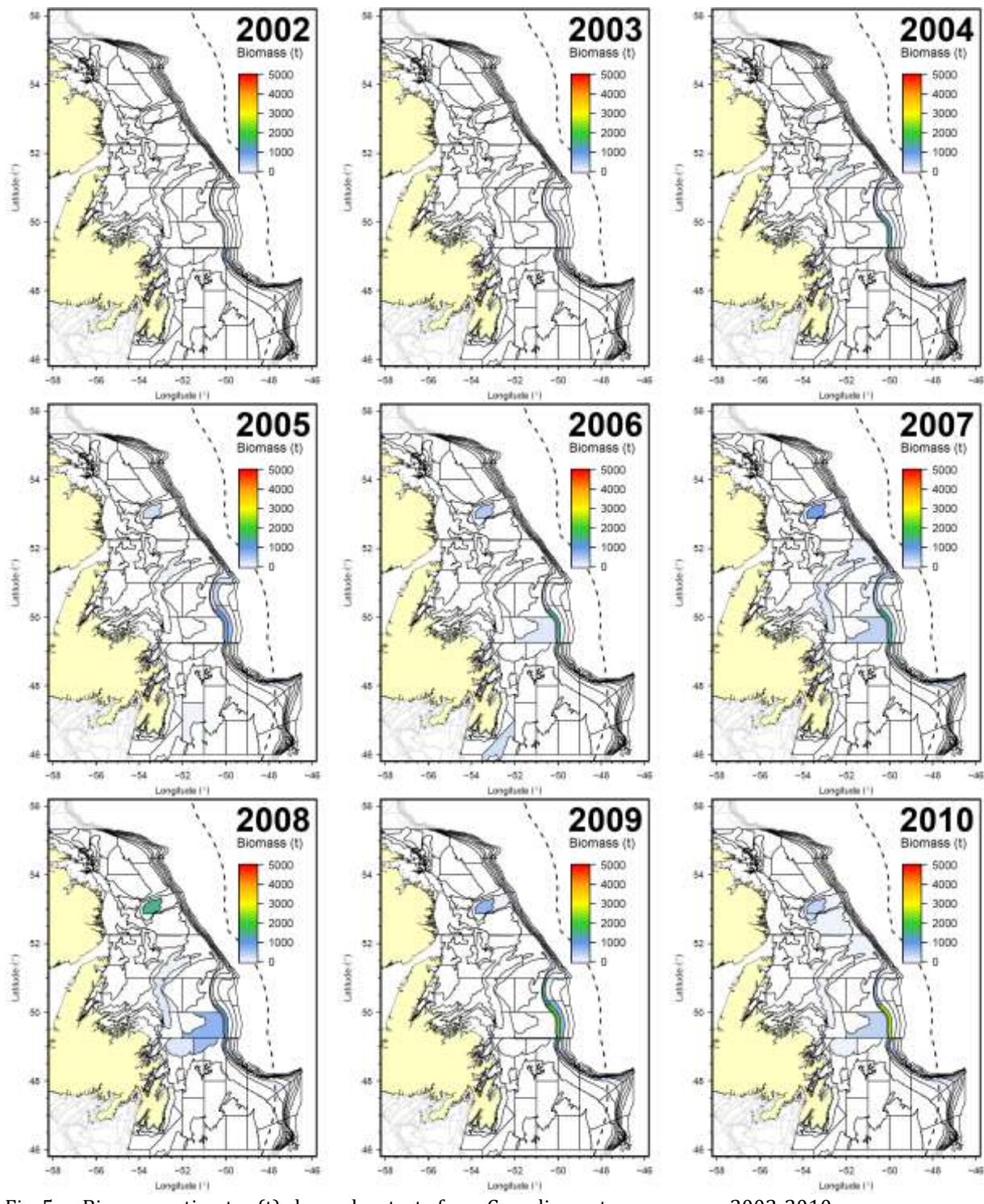


Fig. 5. Biomass estimates (t) shown by strata from Canadian autumn surveys 2002-2010.

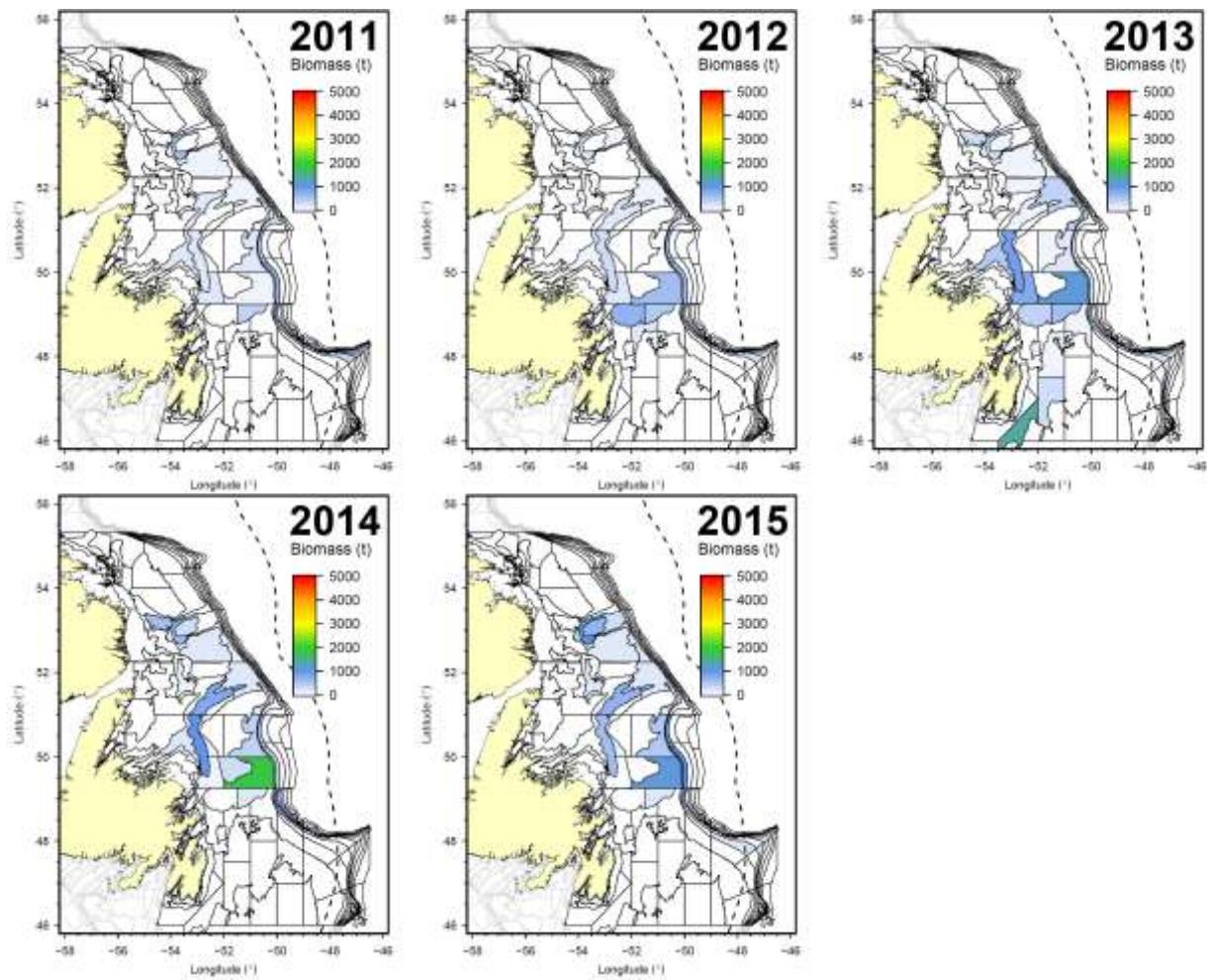


Fig. 6. Biomass estimates (t) shown by strata from Canadian autumn surveys 2011-2015.

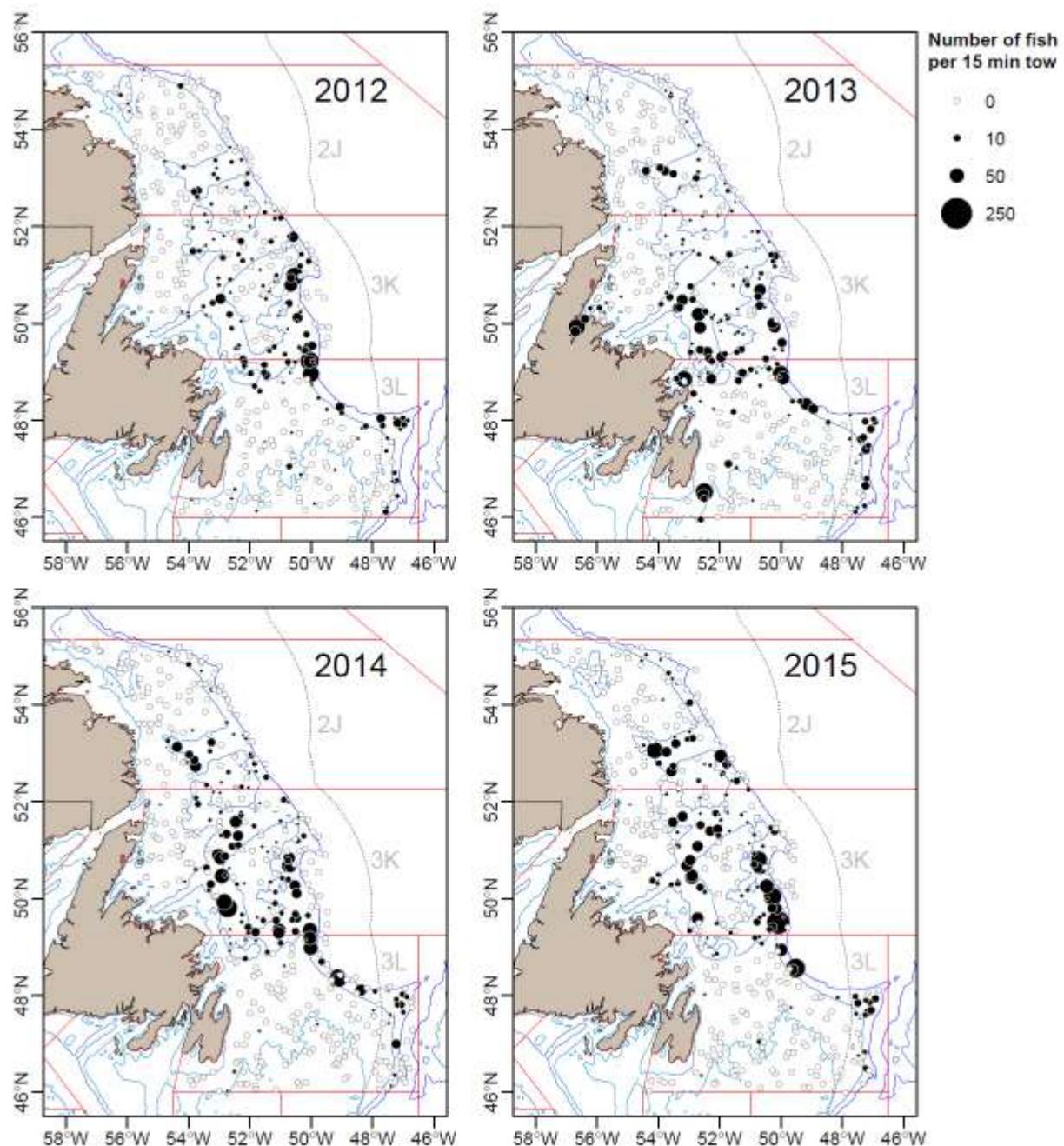


Fig. 7. Number of witch flounder per tow from Canadian autumn surveys in NAFO Divisions 2J3KL 2012-2015.

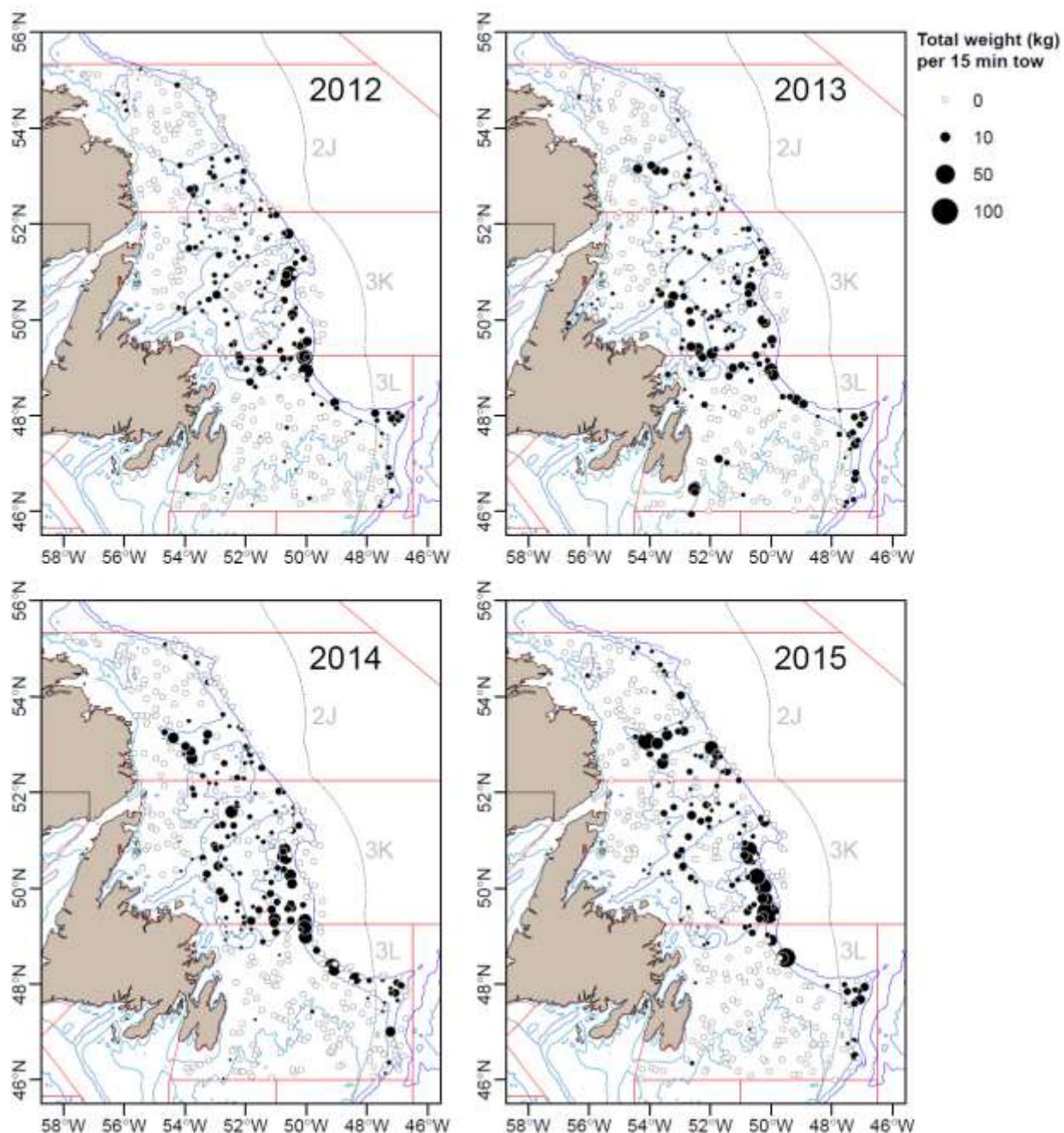


Fig. 8. Weight (kg) per tow of witch flounder per tow from Canadian autumn surveys in NAFO Divisions 2J3KL 2012-2015.

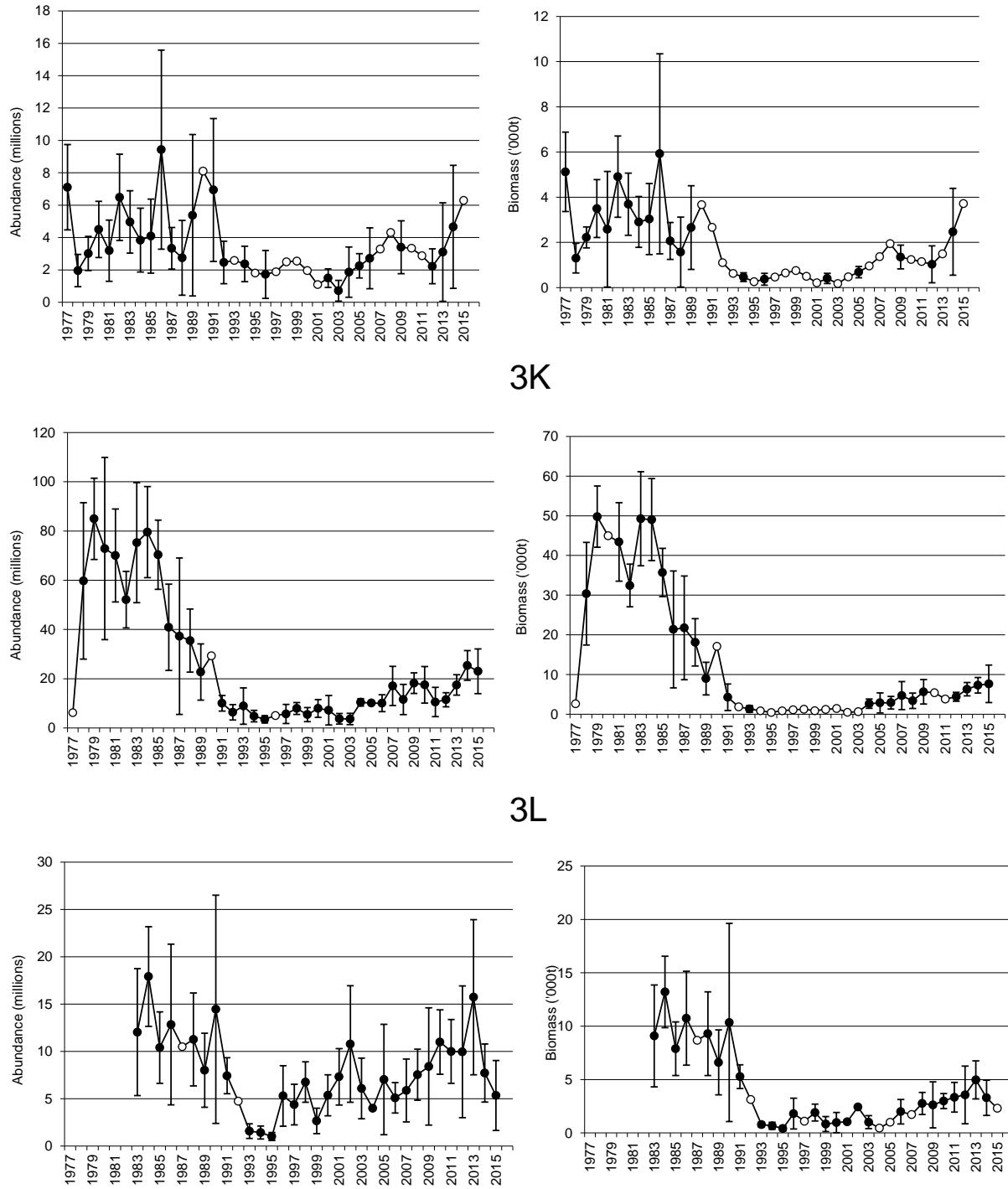
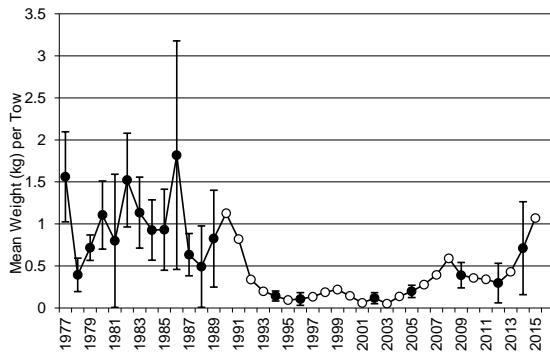
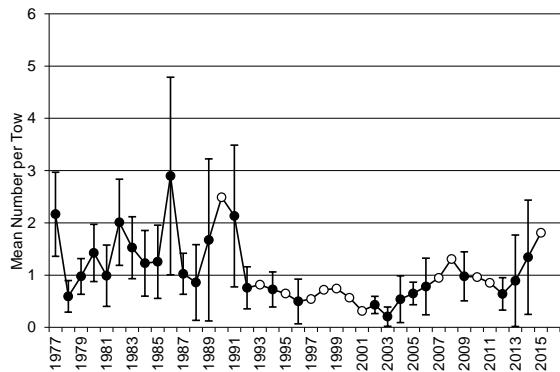
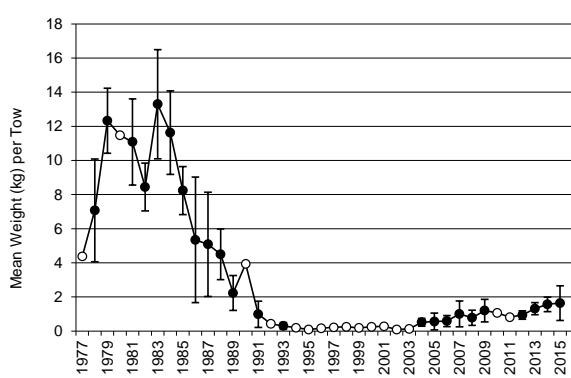
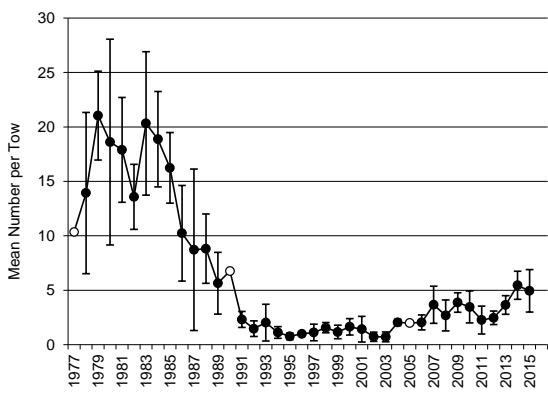


Fig. 9. Abundance (millions) and biomass (000 t) for Div. 2J, 3K, and 3L Canadian autumn surveys. Where lower confidence limits were negative, error bars were omitted (hollow symbols).

2J



3K



3L

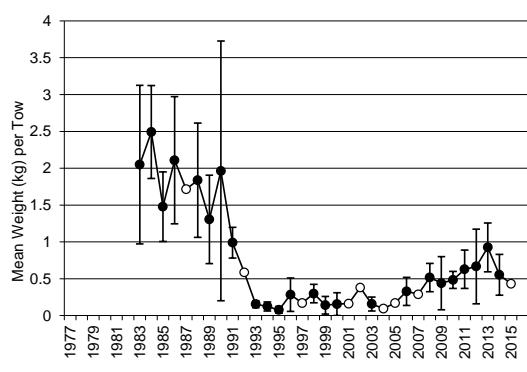
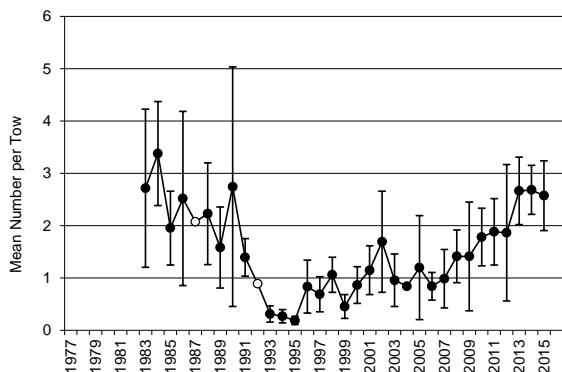


Fig. 10. Mean number and weight (kg) per tow for Div. 2J, 3K and 3L Canadian autumn surveys. Where lower confidence limits were negative, error bars were omitted (hollow symbols).

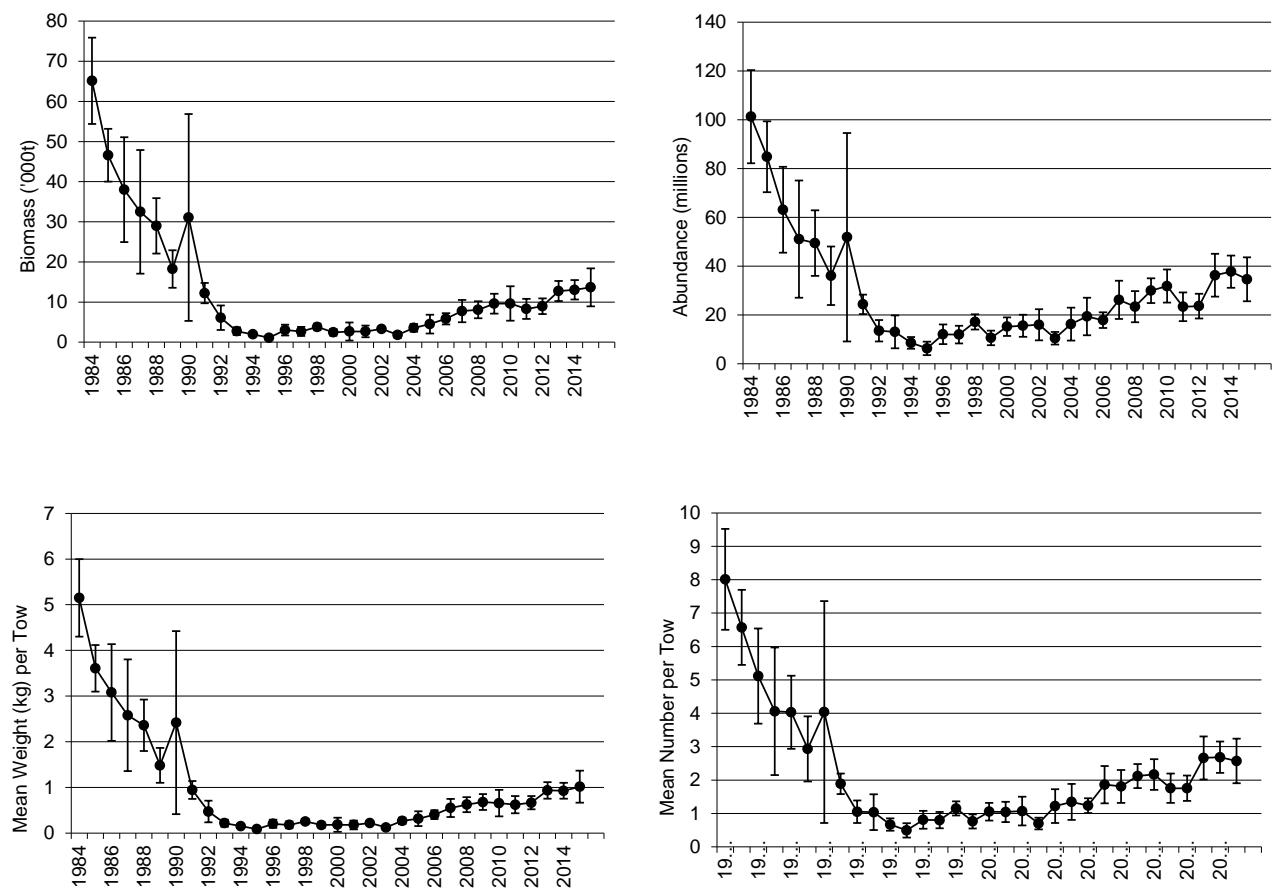


Fig. 11. Biomass (000 t) and abundance (millions) estimates, mean number and weight (kg) per tow, of witch flounder from Canadian autumn surveys in Div. 2J, 3K and 3L combined. Where lower confidence limits were negative, error bars were omitted (hollow symbols).

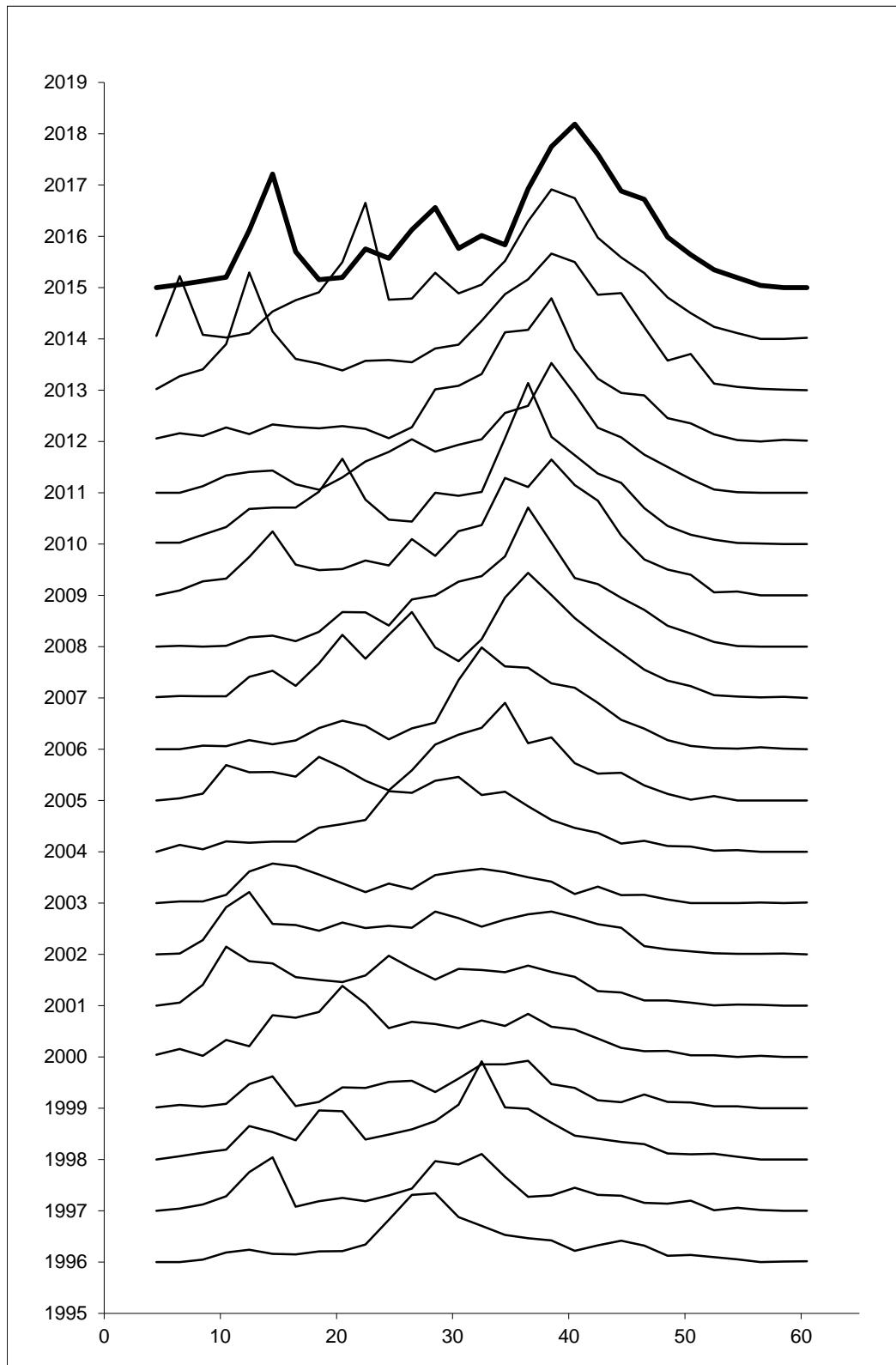


Fig. 12. Witch flounder in 2J3KL: population numbers at length from Canadian autumn surveys (1996-2015).

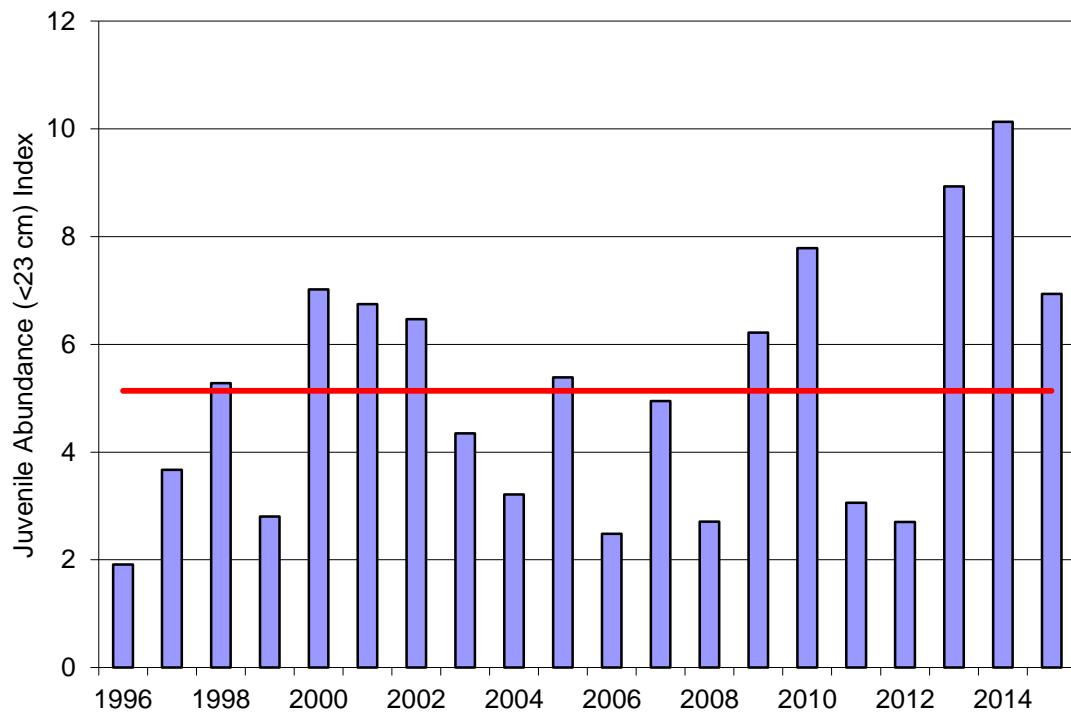


Fig. 13. Abundance of yellowtail flounder less than 23 cm from autumn surveys 1996-2015. Horizontal line is series mean.

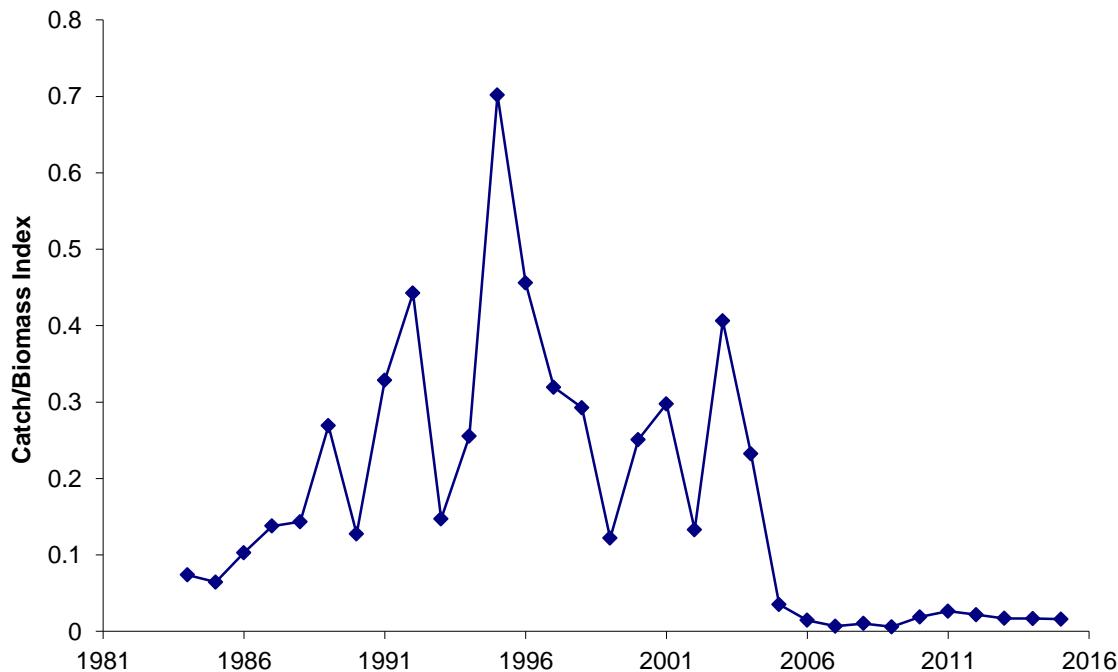


Fig.14. Catch to survey biomass ratio for witch flounder in NAFO Divs. 2J, 3K, and 3L.

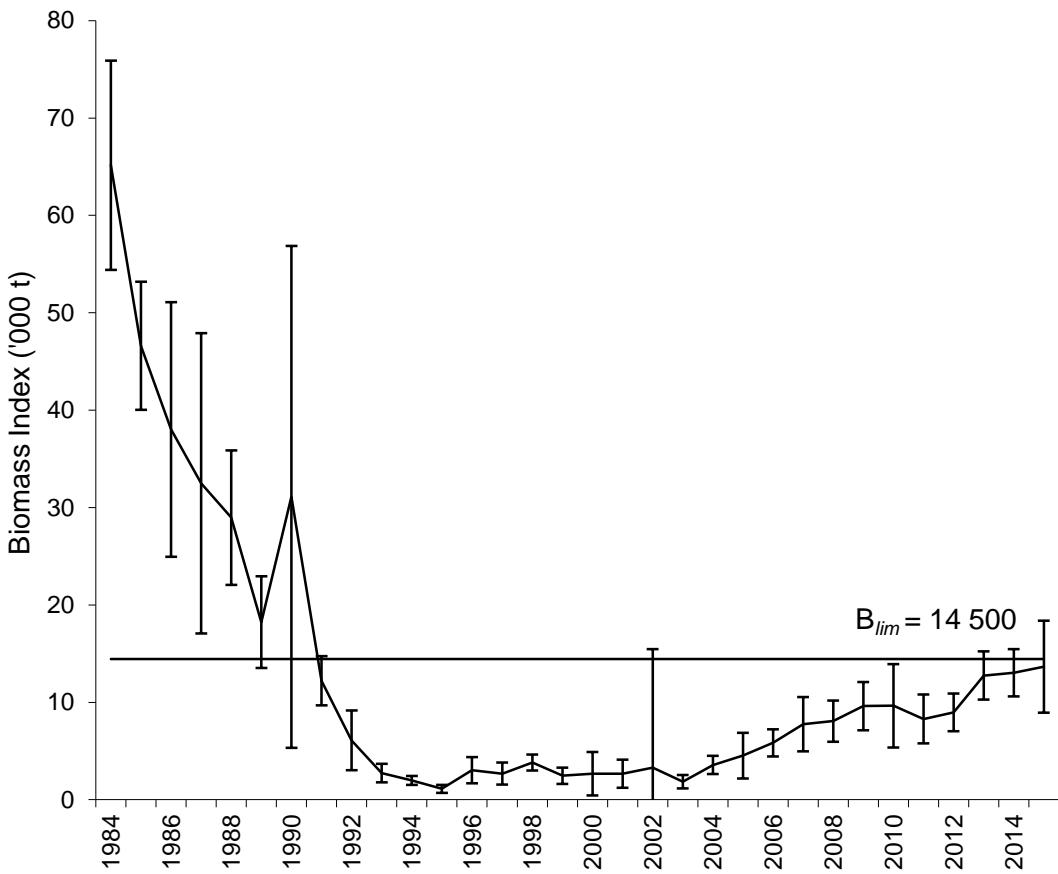


Fig. 15. Biomass estimates of witch flounder in Div. 2J, 3K, and 3L from the Canadian autumn survey. Surveys prior to 1996 covered fewer strata and biomass estimates likely represent less of the total stock. $B_{lim}=14\ 500$ t is 15% of B_{1984} adjusted for less extensive survey coverage (x 1.48).

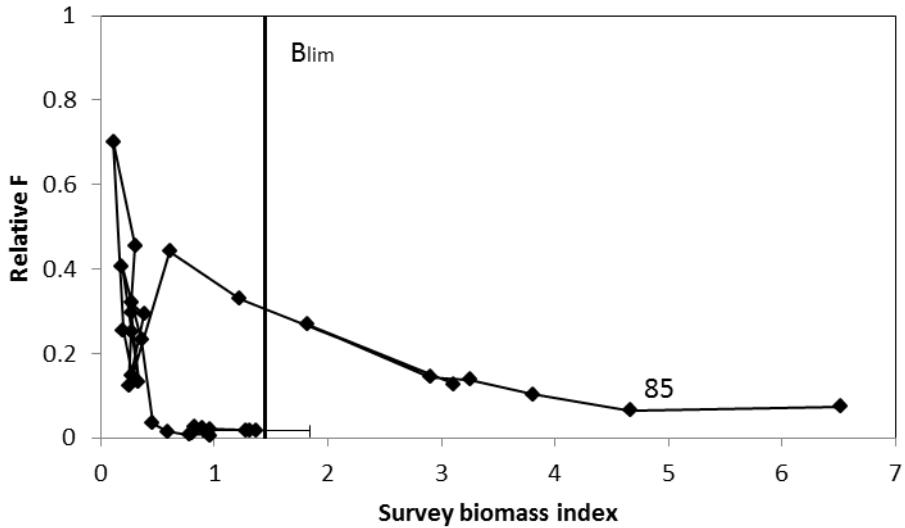


Fig. 16. Witch flounder stock trajectory within the NAFO PA framework. Blim is shown as 15% of the highest observed biomass level (adjusted for less survey coverage in 1984).