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An Update of Witch Flounder Population Trends in NAFO Divisions 2J, 3K and 3L

by

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Abstract

Canadian fall surveys since the late-1970s 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-1980s they were rapidly disappearing and by the early-1990s had virtually disappeared from the area entirely except for some very small catches along the slope in Div. 3L. The fall 1998-2003 surveys indicate no change in this distribution pattern. For the three divisions combined, the biomass index declined from about 65,000 tons in 1984 to 1,100 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 Div. 3L. The estimates have remained the same since then. The stock size remains extremely low.

Fisheries and management

The fishery for witch in this area began in the early-1960s and increased steadily from about 1,000 tons in 1963 to a peak of over 24,000 tons in 1973 (Table 1; Fig. 1). Catches declined rapidly to 2,800 tons by 1980 and subsequently fluctuated between 3,000 and 4,500 tons to 1991. The catch in 1992 declined to about 2,700 tons, the lowest since 1964, and further declined to around 400 tons by 1993 (Table 1). Until the late-1980's, the fishery was conducted by Poland, USSR and Canada (Table 1) mainly in Div. 3K (Fig. 1). More recently, the regulated fishery has been mainly Canadian although EU (Portugal and Spain) has taken increased catches in the NAFO Regulatory area of Div. 3L since the mid-1980s. Although only 12 tons were reported for 1994, a catch of 491 tons 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 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. The 1999 and 2000 catches were estimated to be about 300 and 700 tons, respectively. The catch in 2001 was nearly 800 tons of which more than 300 tons was from Div. 3M. In 2002, an estimated 440 tons of witch were caught primarily in Division 3L. The catch in 2003 was estimated to be about 750 tons.

During 1988-92, the Canadian fishery was particularly successful by fishing on prespawning 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 1,400 m. No directed fishing by Canada has been permitted since 1994 due to the poor state of the stock.

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 has continued to 2003.

Canadian Research Vessel Surveys

Distribution

Changes in spatial distribution patterns of witch flounder over the 20 year history of the surveys from 1978-97 were presented in a previous assessment as graphical distribution maps (SCR Doc. 98/64). Survey distribution data from the late-1970s and early-1980s 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-1980s, however, they were rapidly disappearing and by the early-1990s had virtually disappeared from the area entirely except for some very small catches along the slope and more to the southern area. They now appear to be located only along the deep continental slope area, especially in Division 3L both inside and outside the Canadian 200-mile fishery zone. The results from the fall surveys over the past several years (see Bowering 1998; 1999; 2000; 2001; 2002) confirm this distribution pattern remains as indicated by the 2002 and 2003 survey results in Fig. 2.

Biomass and Abundance Indices

Stratified-random research vessel surveys have been conducted in the fall in Div. 2J, 3K and 3L since 1977, 1978 and 1981, respectively. As indicated above, up until 1994, the surveys were conducted using an *Engel 145'* high-rise groundfish trawl whereas the 1995-2001 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 1995-2003.

For Div. 2J, biomass estimates ranged from as high as 5,900 tons in 1986 to a low of less than 300 tons in 1995 with only marginal changes since (Tables 2 and 14; Fig. 3a). The 2003 estimate of less than 200 tons is the lowest observed. Mean weight per tow peaked at 1.82 kg/tow in 1986 and declined to 0.09 kg/tow in 1995 (Tables 11 and 15; Fig. 3b). Since then values have remained at low levels, reaching an all time low of 0.05 kg/tow in 2003.

In Div. 3K, during 1979-85, there was a period of relative stability where most annual biomass estimates were near 50,000 tons (Tables 3 and 14; Fig. 3a). Since that time estimates have declined considerably to around 400 tons in 1995, the lowest in the time series. Estimates increased slightly after 1995 ranging from 500-1400 tons between 1996-2002 and in 2003 is around 650 tons (Table 3; Fig. 3a). Corresponding to the period of higher biomass estimates (1979-85), the mean weights per tow in Div. 3K ranged from 8 to 13 kg/tow (Tables 12 and 15; Fig. 3b) and declined to a low of 0.09 kg/tow in 1995. Mean weights per tow have remained low since then and in 2002 were again at an all time low of 0.09 kg/tow. In 2003 mean weight per tow increased slightly to 0.13 kg/tow.

For Div. 3L, biomass estimates varied generally between 7,000 and 13,000 tons from 1984 to 1990 but declined rapidly since then to a low of around 400 tons in 1995 (Tables 4 and 14; Fig. 3a). The 1996 estimate increased to 1,800 tons, however, more than half this estimate was based on the inclusion of deep water strata (at depths of 732-1,097 m) that weren't surveyed previously (Table 4). The 1997 estimate then declined to 1,100 tons although there was equal coverage to that of 1996 with 70% of the estimate attributed to the deeper strata. The 1998 estimate was similar to 1996 with more than half being attributed also to the inclusion of the new deeper strata. The 1999 estimate of about 800 tons is the lowest since the extension of the survey coverage to deeper water in 1996 with about 30% of the estimate accounted for by the new deep strata (Table 4; Fig. 3a). Little change occurred in the 2000 and 2001 surveys, however, the biomass and abundance in the deeper strata appear to have been declining since 1996 and contributed little to the survey estimates of the past 2 years (Table 4). In 2002, the increase in the estimate from 2001 (from 1,000 tons to 2,400 tons) is due almost entirely to the biomass estimate in one stratum and for 2003 is estimated to be again around 1,000 tons (Table 4). Mean weights per tow in Div. 3L (Tables 13 and 15; Fig 3b) 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 0.08 kg/tow in 1995. The inclusion of deep water strata (previously not surveyed) in 1996 explains the over three-fold increase in mean weight per tow to 0.28 kg/tow. Since then mean weights per tow have ranged from 0.14 to 0.38 kg/ tow in 2002, and for 2003 was 0.16 kg/tow.

The abundance indices followed similar trends as the biomass indices and are shown in Tables 5-7 and Table 16 for Div. 2J, 3K and 3L, respectively and illustrated in Fig. 3a by Division and Fig. 4; Table 16 for the divisions combined. The mean numbers per tow by Division are given in Tables 8-10 and Table 17, and are shown in Fig. 3b. The exception is in the estimate of abundance and mean number per tow for Div. 3L, which both show an increase from 1999-2002 (Fig. 3b). The trend in these indices is questionable when the confidence limits are considered, however, and in 2003 declined once more.

For the three Divisions combined, there has been a very steady and rather systematic decline in the biomass index from about 65,000 tons (nearly 6 kg/tow) in 1984 to 1,100 tons (0.23 kg/tow) in 1995, by far the lowest in the time series (Fig. 4; Table 14). Although there was a small increase between 1995 and 1996 there has been little change since then. The current level of stock size is extremely low.

Current Status

The stock remains at an extremely low level with current indices of stock size based on survey trends at about 5% of the average of the early-1980s when the stock was considered at a reasonably healthy level.

References

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- Bowering, W.R. 1999. Distribution and Abundance of Witch Flounder in Divisions 2J, 3K and 3L. NAFO SCR Doc. 99/35, Ser. No. N4093: 14p.
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Table 1. Catch statistics by country of witch flounder in Divisions 2J, 3K and 3L during 1963-2003.
In 1998-2003, small portions of the "Others" catch are from Division 3M.

Year	Canada	Fed. Rep. Germany	German Dem. Rep.	Poland	USSR/ Russia	UK	Others	Total
1963	17	3	0	259	89	7	570	945
1964	103	0	0	752	164	24	1	1044
1965	128	29	0	1876	2056	58	0	4147
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	2031	24361
1974	1868	1082	272	5302	6917	29	493	15963
1975	1352	446	374	4583	4763	0	687	12205
1976	2081	606	110	3828	3022	3	975	10625
1977	4371	300	203	3052	392	0	0	8318
1978	1979	23	58	3490	1345	1	8	6904
1979	1392	0	22	1855	150	22	656	4097
1980	1459	0	16	1235	45	0	68	2823
1981	2661	0	32	1385	85	0	31	4194
1982	1206	0	4	1151	552	0	68	2981
1983	1483	0	50	1005	516	0	34	3088
1984	2077	0	27	1617	1000	2	85	4808
1985	1305	26	33	565	1006	-	68	3003
1986	1199	2	7	3	21	-	2684 ^a	3916
1987	854	-	56	765	1057	-	1743	4475
1988	3270	-	10	760	4	-	110	4154
1989	4059	-	4	691	5	-	147	4906
1990	3271	-	-	-	-	-	696	3967
1991	2805	-	-	-	-	1	1208	4014
1992	1736	5	-	-	-	2	954	2697
1993	343	-	-	-	-	-	59	402
1994	12	-	-	-	-	-	491 ^b	503
1995	7	-	-	-	-	-	777	784
1996	11	-	-	-	-	-	1371	1382
1997	8	-	-	-	-	-	847	855
1998	-	-	-	-	2	-	1113	1115
1999	2	-	-	-	20	-	278	300
2000	85	-	-	-	6	-	578	669
2001	161	-	-	-	31	-	605	797
2002	166	-	-	-	15	-	258	439
2003	110	-	-	-	7	-	630	747

^aSince 1985 the "Others" category is mainly comprised of EU catches

^bSpain (SCS Doc. 95/15)

Table 5. Abundance (000s) per stratum of Witch Flounder (M+F) from surveys in Div. 2J during fall of 1977-2003. Engel 145 data converted to Campelen Units for 1977-94.

Depth Range (m)	Old Stratum Area		New Stratum Area		Year																														
	Area	Stratum	Area	Stratum	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03				
101 - 200	1427	633	201	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		
	1823	1594	205	205	129	0	0	0	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	2582	1870	206	206	0	0	0	0	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	2246	2264	207	207	0	0	0	0	21	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	237	237																															
		778	238	238																															
201 - 300	440	621	202	202	158	37	32	147	0	80	158	32	147	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	1608	680	209	209	142	46	106	405	35	124	0	373	0	53	0	53	0	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	774	1035	210	210	386	271	203	326	435	475	308	190	185	158	30	53	0	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	1725	1583	213	213	268	69	0	97	64	141	101	40	134	81	0	27	54	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	1171	1341	214	214	218	22	29	0	35	78	0	58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	1270	1302	215	215	565	262	393	746	196	825	295	421	56	1080	112	196	393	229	0	79	101	0	0	0	0	0	0	0	0	0	0	0	0	38	
	1428	2196	228	228	508	42	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	530	530	234	234	0	0	0	0	0	66	154	0	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
301 - 400	480	487	203	203	339	62	139	508	154	924	123	144	965	123	0	0	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	448	588	208	208	545	306	148	390	21	340	23	136	106	23	45	0	68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	330	251	211	211	0	0	40	40	106	106	123	0	79	26	26	26	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	384	360	216	216	303	182	45	152	212	465	101	40	61	0	0	394	61	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	
	441	450	222	222	312	292	175	331	117	195	214	130	52	1846	260	364	1664	78	26	130	221	25	0	0	0	0	0	0	0	0	0	0	0	0	
	567	536	229	229	73	0	73	0	73	130	16	122	0	97	24	73	97	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
401 - 500	354	288	204	204	0	0	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	268	241	217	217	12	0	0	0	37	0	0	50	0	248	161	124	111	37	66	33	76	145	0	75	43	19	0	0	0	0	0	0	0	19	
	180	158	223	223	165	189	47	566	189	396	283	126	212	409	684	220	354	4404	661	330	329	0	0	0	206	329	535	0	206	47	0	0	0	0	
	686	598	227	227	1343	0	664	549	664	578	1358	770	520	376	289	0	202	173	96	19	0	304	0	51	28	85	0	0	0	0	0	0	0	65	
	420	414	235	235	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	133	133	240	240	2147	183	868	228	731	1461	1705	1127	1621	4658	1302	685	891	1218	411	365	77	281	306	217	268	690	536	460	68	115	115	0	18		
501 - 750	664	557	212	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	
	420	362	218	218	0	0	0	0	0	0	0	0	29	0	58	173	144	87	29	0	100	199	17	199	75	50	47	50	0	0	0	0	0	22	
	270	228	224	224	0	0	0	0	0	0	0	0	0	56	56	204	186	19	111	74	0	146	31	78	141	84	16	94	72	16	0	0	0	0	
	237	185	230	230	0	0	0	16	0	0	0	16	0	65	16	147	782	1695	4548	880	471	382	827	582	865	102	674	165	130	29	216	0	0	0	
	237	120	239	239	0	0	0	0	0	0	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 - 1000	213	283	219	219	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	182	186	231	231	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	122	193	236	236	0	0	0	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1001 - 1250	324	303	220	220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	177	195	225	225	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	236	228	232	232	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1251 - 1500	286	330	221	221	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	180	201	226	226	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	180	237	233	233	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	7106	1962	3016	4503	3190	6486	4963	3840	4089	9432	3337	2746	5377	8110	6941	2463	2588	2369	1808	1724	1890	2505	2548	1964	1096	1497	715	0	0	0	0	0	0		

Table 7. Abundance (000s) per stratum of Witch Flounder (M+F) from surveys in Div. 3L during fall of 1983-2003. (Engel 145 data converted to Campelen Units for 1983-94).

Depth Range (m)	Old Stratum Area	New Stratum Area	Stratum	Year																			
				84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03
30 - 56	.	268	784															74	0	0	0		
57 - 92	2071	2071	350	166	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	1780	1780	363	92	0	35	0	0	0	306	43	39	0	0	0	0	0	0	0	0	0		
	1121	1121	371	44	0	0	0	0	0	0	0	0	0	0	0	44	0	0	0	0	0		
	2460	2460	372	182	0	0	0	26	0	34	13	0	0	0	34	0	0	0	0	0	0		
	1120	1120	384	128	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	.	465	785																0	32	0	0	
93 - 183	1519	1519	328	52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	1574	1574	341	217	0	0	24	27	0	0	0	0	0	0	0	0	43	0	0	0	0		
	585	585	342	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	40		
	525	525	343	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	2120	2120	348	292	0	0	0	58	0	0	0	0	0	0	0	0	49	0	73	0	0		
	2114	2114	349	291	0	162	0	32	0	166	0	0	0	0	0	42	0	0	42	0	125		
	2817	2817	364	271	0	155	0	55	0	32	0	0	0	0	0	0	43	43	0	43	0		
	1041	1041	365	143	0	57	48	29	0	0	48	0	0	0	0	0	0	0	0	0	0		
	1320	1320	370	233	0	0	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	2356	2356	385	324	0	122	36	25	0	0	0	0	0	0	0	0	0	0	0	0	0		
	1481	1481	390	136	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	.	84	786														90	36	23	40	164	29	
	.	613	787														0	0	0	0	0	0	
	.	261	788														0	0	18	18	0	0	
	.	89	790														6	18	55	0	37	6	
	.	72	793														0	0	0	0	0	50	
.	216	794														0	0	0	0	0	0		
.	98	797														7	0	0	0	0	0		
.	72	799														0	0	0	0	0	6		
184 - 274	1494	1582	344	206	46	117	154	0	0	0	0	0	0	0	0	0	0	0	64	0	87		
	983	983	347	586	0	34	0	135	108	0	0	0	0	0	0	0	0	0	0	45	0		
	1394	1394	366	157	362	431	219	110	164	32	0	8	0	0	0	38	0	38	0	0	77		
	961	961	369	359	507	661	330	1348	529	463	162	0	0	0	39	0	0	0	0	0	0		
	983	983	386	186	568	1082	1792	1974	352	237	270	1262	0	0	0	0	0	0	0	0	80		
	821	821	389	169	158	875	226	169	28	75	0	38	0	0	33	0	0	0	301	0	0		
	282	282	391	0	39	0	19	0	0	0	91	26	0	0	34	0	19	0	0	0	0		
	.	164	795														0	0	0	56	0	0	
184 - 366	.	72	789													0	5	5	22	5	24		
	.	227	791													42	62	0	0	28	10		
	.	100	798													7	7	172	135	530	21		
275 - 366	1432	1432	345	6895	1488	739	4531	2589	3180	2088	0	345	394	0	113	70	223	439	149	117	79		
	865	865	346	2380	3498	3927	1487	2427	1606	2340	389	170	76	0	0	35	317	178	282	119	278		
	334	334	368	46	46	459	23	69	207	115	69	14	0	0	23	0	23	0	20	23	0		
	718	718	387	165	444	247	691	2025	1679	4971	198	66	33	77	99	49	44	0	44	593	44		
	361	361	388	1440	50		819	149	149	0	116	199	0	14	0	0	0	149	0	124	309		
	145	145	392	80	20	20	70	20	0	0	0	0	0	7	0	0	0	0	0	16	0		
	.	175	796														0	107	24	21	638	96	
	.	81	800															156	178	136	953	574	
367 - 549	186	186	729	217	192	409				64	341	422	51	290	34	375	115	0	0	34	13		
	216	216	731	877	371					520	248	604	99	200	45		0	74	56	59	15		
	468	468	733	338	1609					2221	2983	665	258	136	32	19	0	114	129	170	109		
	272	272	735	661	37	2320					349	249	37	14	75	58	75	168	50	17	19		
	.	50	792													901	423	279	915	1829	2887	2298	
550 - 731	170	170	730	105	23						117	12	195	171	108	0	47	19	21	58	509		
	231	231	732	365	302					32	270	397	48	339	78	280	413	969	508	524	565		
	228	228	734	21	267					251	110	16	141	146	44	467	70	380	173	125	28		
	175	175	736		373	987				506	1613	217	241	34	75	782	277	1037	433	1432	681		
732 - 914	.	227	737												78	468	297	1109	390	16	281		
	.	223	741													291	460	892	14	0	31		
	.	348	745													311	479	168	202	24	24		
	.	159	748													186	0	0	50	0	0		
915 - 1097	.	221	738												61	532	347	56	0	0	14		
	.	206	742													43	14	14	13	0	0		
	.	392	746													216	168	0	0	27	0		
1098 - 1280	.	126	749													61	43	0	0	0	0		
	.	254	739													0	0	0	0	0	0		
	.	211	743													0	0	0	0	0	0		
	.	724	747													0	0	100	0	0	0		
1281 - 1463	.	556	750													0	0	0	0	0	0		
	.	264	740													0	0	0	0	0	0		
	.	280	744													0	0	0	0	0	0		
Grand Total	.	229	751	17914	10401	12839	10500	11269	8002	14453	7428	4748	1572	1428	1004	5297	4383	6755	2655	5361	7316	10776	6090

Table 10. Mean Numbers per Tow of Witch Flounder (M+F) in each stratum from surveys in Div. 3L during fall of 1983-2003. (Enqel 145 data converted to Campelen Units for 1983-94).

Depth Range (m)	Old Stratum Area	New Stratum Area	Stratum	Year																			
				84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03
30 - 56	2071	268	784	0.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
57 - 92	1780	1780	363	0.38	0.00	0.14	0.00	0.00	0.00	1.25	0.18	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	1121	1121	371	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.00	
	2460	2460	372	0.54	0.00	0.00	0.00	0.08	0.00	0.10	0.04	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	1120	1120	384	0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	465	465	785	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	
93 - 183	1519	1519	328	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	1574	1574	341	1.00	0.00	0.00	0.11	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	
	585	585	342	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.50	
	525	525	343	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	2120	2120	348	1.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.25	0.00	0.00	0.00	
	2114	2114	349	1.00	0.00	0.56	0.00	0.11	0.00	0.57	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.14	0.00	0.00	0.43	
	2817	2817	364	0.70	0.00	0.40	0.00	0.14	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.11	0.00	0.11	0.00	0.00	
	1041	1041	365	1.00	0.00	0.40	0.33	0.20	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	1320	1320	370	1.29	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	2356	2356	385	1.00	0.00	0.38	0.11	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	1481	1481	390	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	.	.	84	786												7.79	3.14	2.00		3.50	14.22	2.50	5.50
	.	.	613	787												0.00	0.00	0.00		0.00	0.00	0.00	0.00
	.	.	261	788												0.00	0.00	0.50		0.50	0.00	0.00	0.00
	.	.	89	790												0.50	1.50	4.50		0.00	3.00	0.50	0.00
.	.	72	793												0.00	0.00	0.00		0.00	0.00	5.00	0.00	
.	.	216	794												0.00	0.00	0.00			0.00	0.00	0.00	
.	.	98	797												0.50	0.00	0.00		0.00	0.00	0.00	0.00	
.	.	72	799												0.00	0.00	0.00		0.00	0.00	0.57	0.00	
184 - 274	1494	1582	344	1.00	0.22	0.57	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.40	0.60	
	983	983	347	4.33	0.00	0.25	0.00	1.00	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	
	1394	1394	366	0.82	1.89	2.25	1.14	0.57	0.86	0.17	0.00	0.04	0.00	0.00	0.00	0.20	0.00	0.20	0.00	0.00	0.00	0.40	
	961	961	369	2.71	3.83	5.00	2.50	10.20	4.00	3.50	1.22	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	983	983	386	1.38	4.20	8.00	13.25	14.60	2.60	1.75	2.00	9.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.59	
	821	821	389	1.50	1.40	7.75	2.00	1.50	0.25	0.67	0.00	0.33	0.00	0.00	0.30	0.00	0.00	0.00	0.00	2.67	0.00	0.00	
	282	282	391	0.00	1.00	0.00	0.50	0.00	0.00	0.00	2.33	0.67	0.00	0.00	0.89	0.00	0.50	0.00	0.00	0.00	0.00	0.00	
	164	164	795	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	0.00	0.00	0.00	
184 - 366	.	72	789												0.00	0.50	0.50		2.22	0.50	2.44	0.50	
	.	227	791												1.00	2.00	0.00		0.00	0.89	0.33	0.50	
	100	798													0.50	0.50	12.50		9.78	38.50	1.50	0.00	
275 - 366	1432	1432	345	35.00	7.56	3.75	23.00	13.14	16.14	10.60	0.00	1.75	2.00	0.00	0.57	0.36	1.13	2.23	0.76	0.59	0.40	2.38	0.93
	865	865	346	20.00	29.40	33.00	12.50	20.40	13.50	19.67	3.27	1.43	0.64	0.00	0.00	0.30	2.67	1.50	2.37	1.00	2.33	2.74	0.50
	334	334	368	1.00	1.00	10.00	0.50	1.50	4.50	2.50	1.50	0.30	0.00	0.00	0.50	0.00	0.50	0.00	0.44	0.50	0.00	0.00	0.50
	718	718	387	1.67	4.50	2.50	7.00	20.50	17.00	50.33	2.00	0.67	0.33	0.78	1.00	0.50	0.44	0.00	0.44	6.00	0.44	0.94	0.00
	361	361	388	29.00	1.00		16.50	3.00	3.00	0.00	2.33	4.00	0.00	0.29	0.00	0.00	0.00	3.00	0.00	2.50	6.22	0.89	1.89
	145	145	392	4.00	1.00	1.00	3.50	1.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.80	0.00	0.00
	.	175	796												0.00	4.44	1.00		0.89	26.50	4.00	0.00	
	81	800														14.00	16.00		12.22	85.50	51.56	2.50	
367 - 549	186	186	729	8.50	7.50	16.00				2.50	13.33	16.50	2.00	11.33	1.33	14.67	4.50	0.00	0.00	1.33	0.50	3.11	1.00
	216	216	731	29.50	12.50					17.50	8.33	20.33	3.33	6.71	1.50		0.00	2.50	1.89	2.00	0.50	1.33	3.91
	468	468	733	5.25	25.00					34.50	46.33	10.33	4.00	2.11	0.50	0.30	0.00	1.78	2.00	2.64	1.70	6.72	0.94
	272	272	735	17.67	1.00	62.00				9.33	6.67	1.00	0.36	2.00		1.54	2.00	4.50	1.33	0.44	0.50	0.44	0.00
	50	792														131.00	61.50	40.50		133.06	265.86	419.68	334.10
550 - 731	170	170	730	4.50	1.00					5.00	0.50	8.33	7.33	4.61	0.00	2.00	0.80	0.89	2.50	21.78	9.50	0.44	
	231	231	732	11.50	9.50					1.00	8.50	12.50	1.50	10.67	2.44	8.80	13.00	30.50	16.00	16.50	17.78	7.33	7.20
	228	228	734	0.67	8.50					8.00	3.50	0.50	4.50	4.67	1.40	14.90	2.22	12.11	5.50	4.00	0.89	8.44	0.80
	175	175	736		15.50	41.00				21.00	67.00	9.00	10.00	1.43	3.11	32.50	11.50	43.07	18.00	59.50	28.28	136.89	26.22
732 - 914	.	227	737												2.50	15.00	9.50	35.50	12.50	0.50	9.00	32.93	12.50
	.	223	741													9.50	15.00	29.07	0.44	0.00	1.00	9.50	2.29
	.	348	745													6.50	10.00	3.50	4.22	0.50	0.50	0.00	1.00
915 - 1097	.	159	748													8.50	0.00	0.00	2.28	0.00	0.00	0.00	2.50
	.	221	73																				

Table 13. Mean Weight (kg) per Tow of Witch Flounder (M+F) in each stratum from surveys in Div. 3L during fall of 1983-2003.
(Engel 145 data converted to Campelen Units for 1983-94)

Depth Range (m)	Old Stratum Area	New Stratum Area	Stratum	Year																						
				84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03			
30 - 56	.	268	784															0.00	0.00	0.00		0.02	0.00	0.00	0.00	
57 - 92	2071	2071	350	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	1780	1780	363	0.35	0.00	0.20	0.00	0.00	0.00	1.08	0.13	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	1121	1121	371	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	2460	2460	372	0.43	0.00	0.00	0.00	0.05	0.00	0.11	0.02	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	1120	1120	384	0.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	.	465	785															0.00	0.00	0.00		0.00	0.01	0.00	0.00	
93 - 183	1519	1519	328	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	1574	1574	341	1.06	0.00	0.00	0.16	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	
	585	585	342	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	
	525	525	343	1.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	2120	2120	348	1.14	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	2114	2114	349	1.05	0.00	0.53	0.00	0.12	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.06	
	2817	2817	364	0.52	0.00	0.37	0.00	0.10	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	1041	1041	365	0.70	0.00	0.47	0.21	0.13	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	1320	1320	370	1.05	0.00	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	2356	2356	385	1.05	0.00	0.24	0.18	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	1481	1481	390	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	.	.	84	786															0.05	0.02	0.03		0.03	0.11	0.01	0.05
	.	.	613	787															0.00	0.00	0.00		0.00	0.00	0.00	0.00
	.	.	261	788															0.00	0.00	0.01		0.01	0.00	0.00	0.00
	.	.	89	790															0.02	0.01	0.11		0.00	0.10	0.01	0.00
	.	.	72	793															0.00	0.00	0.00		0.00	0.00	0.20	0.00
.	.	216	794															0.00	0.00	0.00		0.00	0.00	0.00	0.00	
.	.	98	797															0.01	0.00	0.00		0.00	0.00	0.00	0.00	
.	.	72	799															0.00	0.00	0.00		0.00	0.00	0.01	0.00	
184 - 274	1494	1582	344	0.77	0.18	0.14	0.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.01	
	983	983	347	3.45	0.00	0.31	0.00	1.14	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	
	1394	1394	366	0.97	1.85	1.60	0.89	0.57	0.97	0.14	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	
	961	961	369	2.83	4.31	5.34	2.42	8.02	3.25	3.58	1.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	983	983	386	1.24	3.84	8.00	11.23	12.94	3.27	1.61	2.27	6.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	821	821	389	1.74	1.17	6.73	2.22	1.22	0.19	0.70	0.00	0.24	0.00	0.00	0.34	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.00	
	282	282	391	0.00	0.83	0.00	0.23	0.00	0.00	0.00	1.80	0.56	0.00	0.00	0.93	0.00	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	.	.	164	795															0.00	0.00	0.00		0.02	0.00	0.00	0.00
184 - 366	.	72	789															0.00	0.01	0.01		0.02	0.01	0.04	0.01	
	.	227	791															0.14	0.02	0.00		0.00	0.01	0.02	0.10	
	.	100	798															0.01	0.14	1.56		0.24	1.65	0.02	0.00	
275 - 366	1432	1432	345	22.76	6.23	3.13	18.75	10.66	11.97	3.81	0.00	0.31	0.37	0.00	0.05	0.02	0.02	0.18	0.01	0.02	0.00	0.00	0.04	0.03	0.01	
	865	865	346	11.96	18.82	27.91	10.09	15.32	10.81	15.66	1.70	0.34	0.12	0.00	0.00	0.10	0.03	0.01	0.17	0.14	0.06	0.03	0.00	0.01	0.01	
	334	334	368	1.03	0.64	8.40	0.49	1.40	3.13	2.31	0.84	0.31	0.00	0.00	0.48	0.00	0.01	0.00	0.00	0.13	0.00	0.00	0.00	0.01	0.01	
	718	718	387	1.71	4.09	2.79	5.79	17.97	15.65	37.14	1.61	0.53	0.32	0.12	0.63	0.08	0.02	0.00	0.05	0.38	0.04	0.06	0.00	0.00	0.00	
	361	361	388	24.75	0.97		11.87	1.85	2.54	0.00	2.51	3.48	0.00	0.28	0.00	0.00	0.00	0.25	0.00	0.11	0.34	0.13	0.07	0.00	0.00	
	145	145	392	2.74	0.64	0.99	2.50	0.63	0.00	0.00	0.00	0.00	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.72	0.00	0.00	0.00	0.00	
	.	.	175	796															0.00	0.04	0.08		0.01	0.18	0.05	0.00
	.	.	81	800															0.71	0.24			0.56	2.18	2.00	0.06
367 - 549	186	186	729	5.71	4.95	10.94				1.88	10.69	9.63	1.62	5.11	0.09	5.92	0.93	0.00	0.00	0.04	0.53	1.29	0.45	0.01	0.01	
	216	216	731	16.75	8.34					15.66	5.98	11.98	1.28	2.67	0.63		0.00	0.25	0.62	0.55	0.13	0.09	0.45	0.01	0.01	
	468	468	733	5.10	18.07					25.13	32.78	9.48	2.85	0.93	0.37	0.19	0.00	0.64	0.84	0.96	0.78	1.65	0.13	0.00	0.00	
	272	272	735	9.82	0.92	45.82				5.93	5.76	1.06	0.32	0.09		0.54	0.63	0.48	0.31	0.08	0.08	0.33	0.00	0.00	0.00	
	.	50	792															8.05	5.35	1.65		4.19	7.80	7.07	6.59	
550 - 731	170	170	730	4.43	0.67					5.54	0.27	5.99	3.77	3.54	0.00	0.90	0.46	0.44	2.53	11.71	4.85	0.01	0.01	0.01	0.01	
	231	231	732	8.88	7.40					0.92	6.50	8.90	1.30	6.12	0.51	4.64	3.80	13.85	7.93	7.23	6.50	3.63	3.38	0.01	0.01	
	228	228	734	0.96	5.86					5.36	3.20	0.37	3.37	1.57	1.17	4.04	0.47	4.76	3.03	1.48	0.53	2.51	0.14	0.01	0.01	
	175	175	736		11.15	29.44				14.73	37.94	3.74	2.92	0.82	0.43	10.86	1.72	5.60	3.88	17.22	7.70	49.70	4.34	0.01	0.01	
732 - 914	.	227	737												0.62	4.15	3.33	14.03	4.83	0.36	3.98	16.08	2.18	0.01	0.01	
	.	223	741													3.75	5.35	10.20	0.22	0.00	0.10	5.18	0.49	0.01	0.01	
	.	348	745													3.23	4.43	2.58	1.36	0.01	0.01	0.00	0.15	0.01	0.01	
	.	159	748													4.00	0.00	0.00	1.83	0.00						

Table 14. Estimates of biomass (tons) of witch flounder from Canadian fall surveys in Div. 2J, 3K and 3L during 1977-2003.

year	div			Total
	2J	3K	3L	
1977	5123			
1978	1302	30353		
1979	2218	49789		
1980	3494	44962		
1981	2581	43406		
1982	4909	32429		
1983	3693	49251		
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

Table 15. Mean weights (kg) of witch flounder per tow from Canadian fall surveys in Div. 2J, 3K and 3L during 1977-2003.

year	div		
	2J	3K	3L
1977	1.56	4.38	
1978	0.39	7.08	
1979	0.72	12.33	
1980	1.11	11.48	
1981	0.80	11.09	
1982	1.52	8.44	
1983	1.13	13.30	2.05
1984	0.93	11.63	2.49
1985	0.93	8.24	1.48
1986	1.82	5.35	2.11
1987	0.63	5.08	1.72
1988	0.49	4.50	1.84
1989	0.83	2.23	1.31
1990	1.13	3.94	1.96
1991	0.82	0.99	0.99
1992	0.34	0.43	0.59
1993	0.20	0.30	0.15
1994	0.14	0.20	0.12
1995	0.09	0.09	0.08
1996	0.11	0.17	0.28
1997	0.13	0.22	0.17
1998	0.19	0.25	0.30
1999	0.22	0.19	0.14
2000	0.14	0.25	0.16
2001	0.06	0.28	0.16
2002	0.12	0.09	0.38
2003	0.05	0.13	0.16

Table 16. Estimates of abundance (000s) of witch flounder from Canadian fall surveys in Div. 2J, 3K and 3L during 1977-2003.

year	div			Total
	2J	3K	3L	
1977	7106	6221		
1978	1962	59729		
1979	3016	84955		
1980	4503	72872		
1981	3190	70058		
1982	6486	52146		
1983	4963	75267	12033	
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

Table 17. Mean numbers of witch flounder per tow from Canadian fall surveys in Div. 2J, 3K and 3L during 1977-2003.

year	div		
	2J	3K	3L
1977	2.16	10.35	
1978	0.59	13.93	
1979	0.97	21.04	
1980	1.42	18.61	
1981	0.99	17.89	
1982	2.01	13.58	
1983	1.52	20.32	2.72
1984	1.23	18.87	3.38
1985	1.26	16.24	1.95
1986	2.90	10.24	2.52
1987	1.03	8.71	2.08
1988	0.86	8.82	2.23
1989	1.67	5.65	1.58
1990	2.49	6.77	2.74
1991	2.13	2.32	1.39
1992	0.76	1.47	0.89
1993	0.82	2.03	0.31
1994	0.72	1.12	0.27
1995	0.65	0.77	0.19
1996	0.50	1.00	0.83
1997	0.54	1.12	0.69
1998	0.72	1.56	1.06
1999	0.74	1.17	0.45
2000	0.57	1.64	0.86
2001	0.32	1.42	1.15
2002	0.43	0.74	1.69
2003	0.21	0.72	0.96

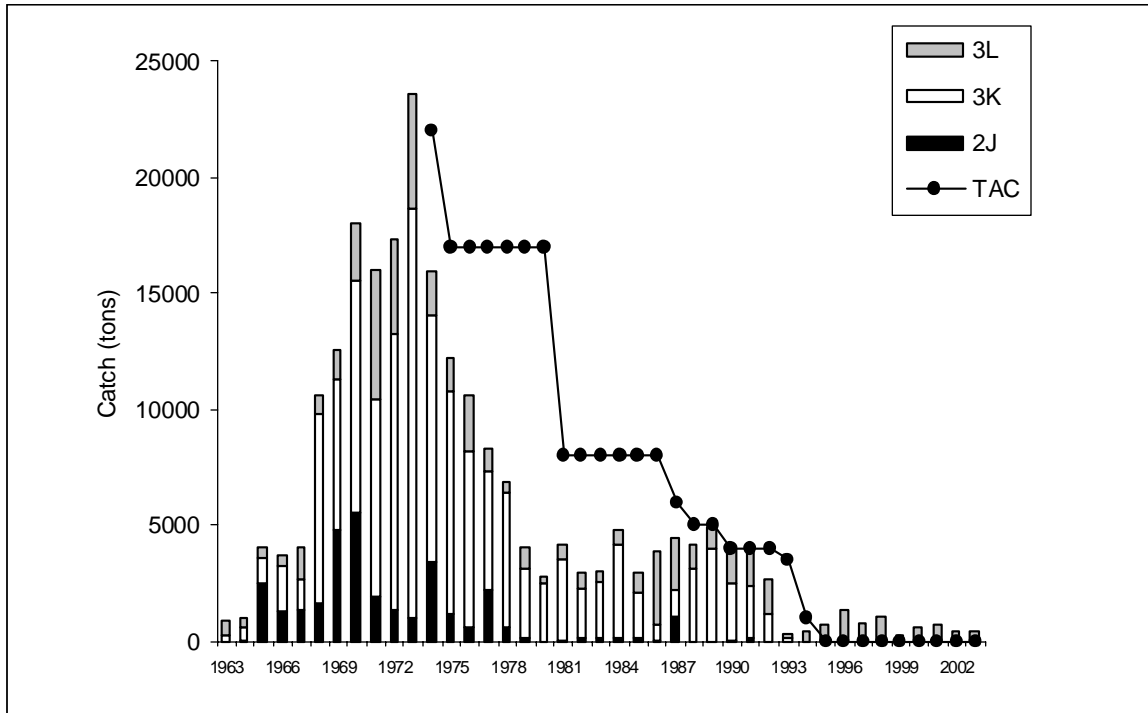


Fig. 1. Commercial catches and TACs of witch flounder in Divisions 2J, 3K and 3L during 1963-2003. Catches in Div. 3M are included for 1998-2000. Although not included, the estimated catches in Div 3M from 2001-2003 were 324, 302 and 342 tons respectively.

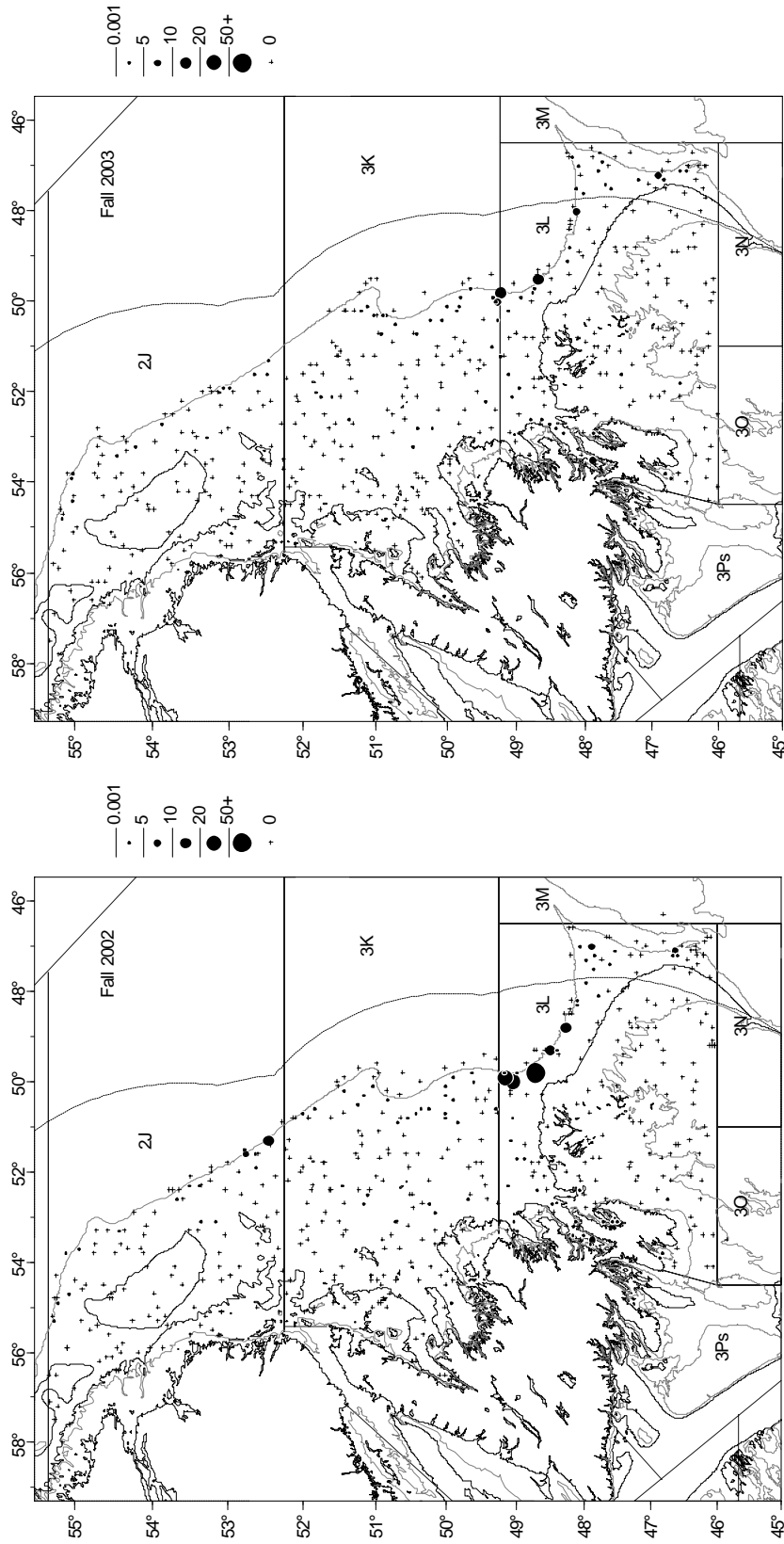
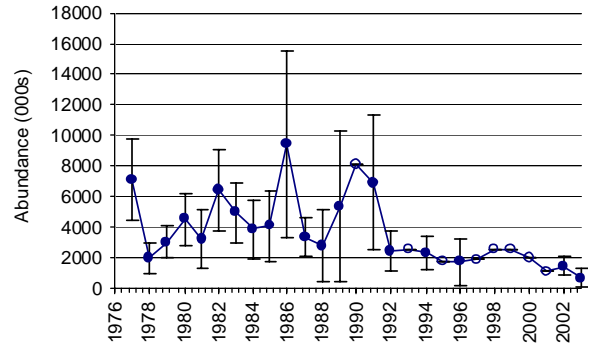
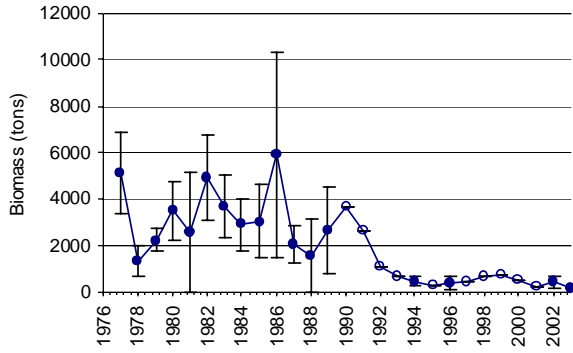
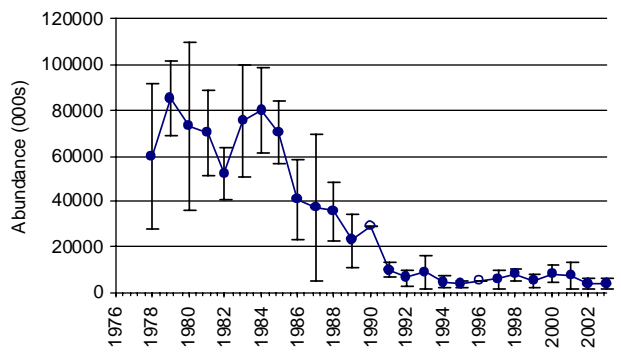
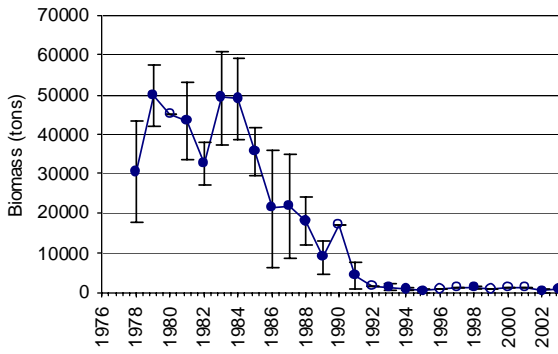


Fig. 2. Weight (kg) per set of witch flounder from Canadian surveys in NAFO divisions 2J, 3K, and 3L during autumn 2002 and 2003.

2J



3K



3L

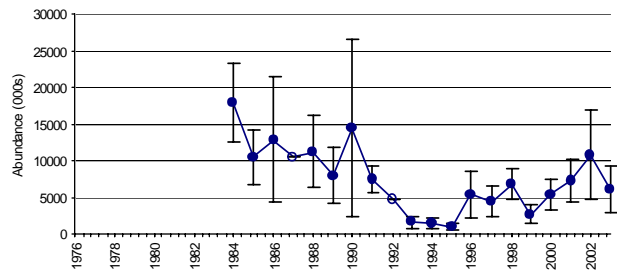
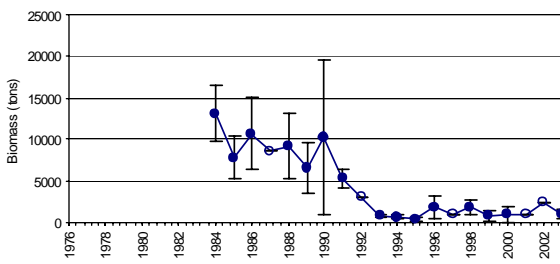
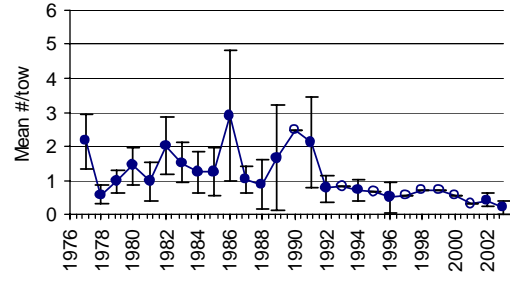
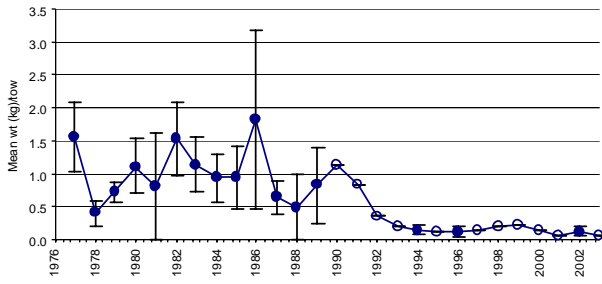
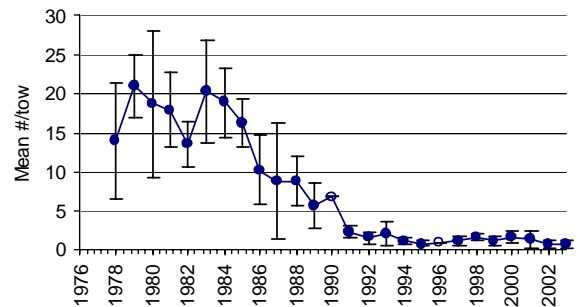
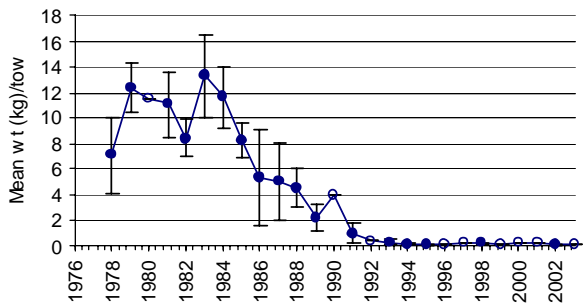


Figure 3a. Biomass (tons) and Abundance (000's) for 2J, 3K and 3L fall surveys. Where lower confidence limit was negative, error bars were omitted (hollow symbol).

2J



3K



3L

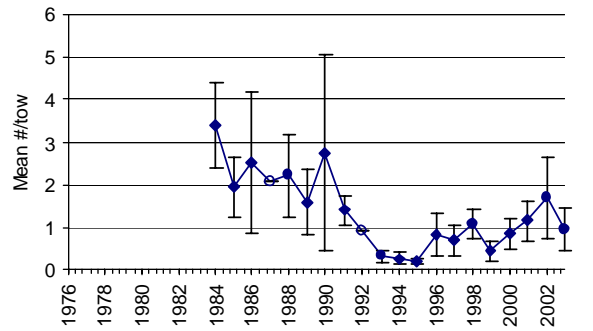
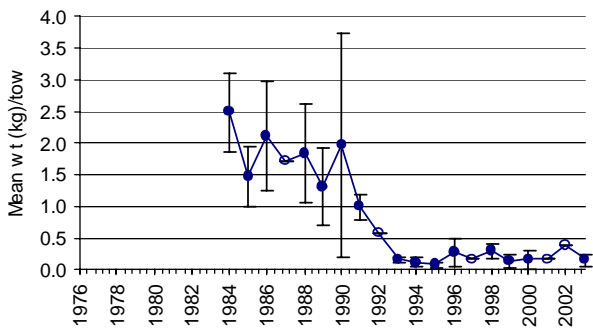


Figure 3b. Mean numbers and weights (kg) per tow for 2J, 3K and 3L fall surveys. Where lower confidence limit was negative, error bars were omitted (hollow symbol).

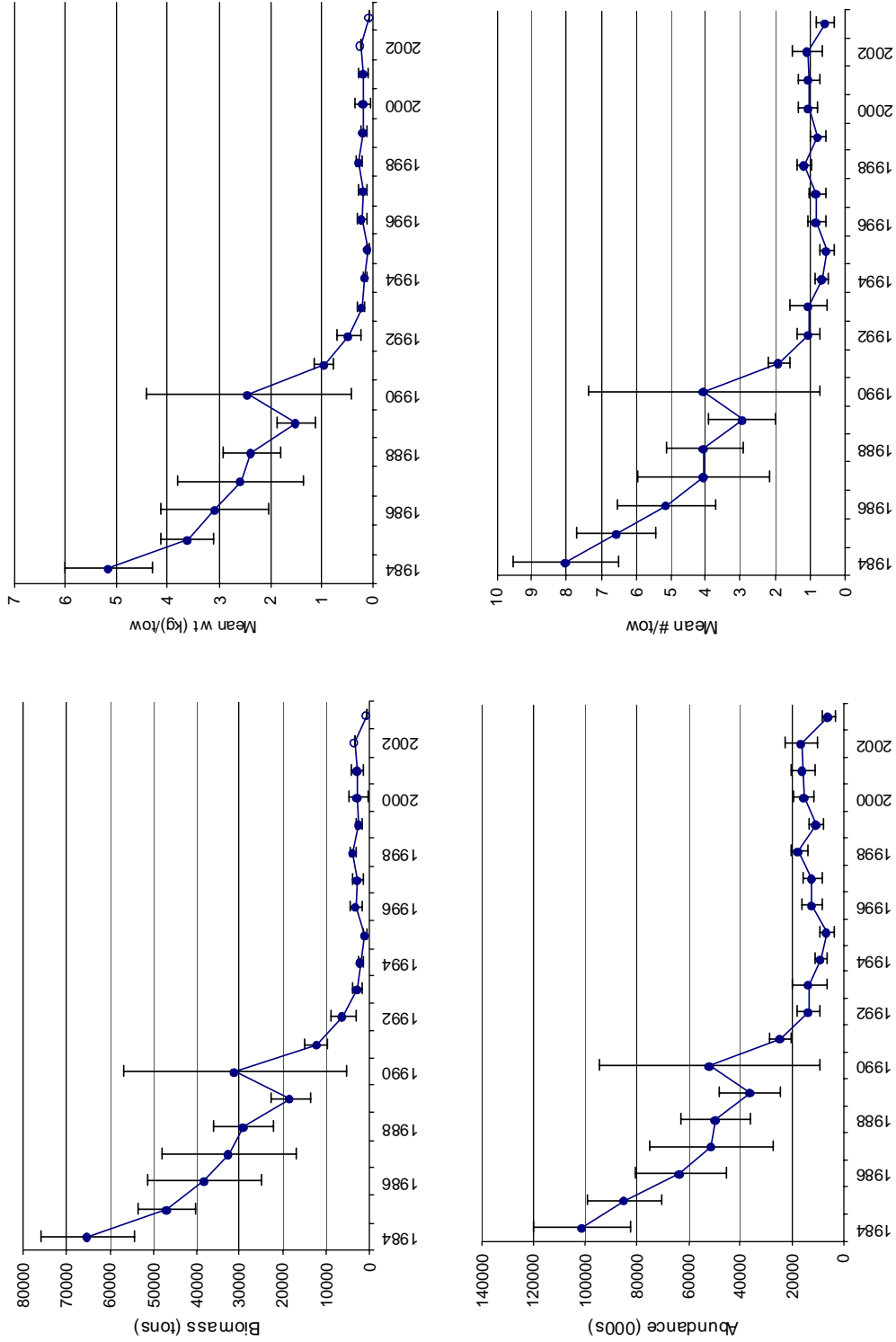


Fig. 4. Biomass (t) and abundance (000s) estimates, mean numbers and weights (kg) per tow, of witch flounder from Canadian fall surveys in 2J3KL based on Campelen trawl catch equivalents during 1984-2003.