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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 1998-2002 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-1960's 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-1980s, 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 t 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 1 370 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 1 100 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.

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 Div. 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 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 1995-2002.

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 estimate of 210 tons in 2001 is the lowest observed and the 2002 estimate was 400 tons. 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 0.06 kg/tow in 2001 and in 2002 was 0.12 kg/tow.

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 around 400 tons in 1995, the lowest in the time series. Estimates increased slightly after 1995 ranging from 900-1 400 tons between 1996-2001 (Table 3; Fig. 3a). Corresponding to the period of higher biomass estimates (1979-85), the mean weights per tow in Division 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 are again at an all time low of 0.09 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 (Table 4). Mean weights per tow in Division 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.

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.

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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Table 1. Catch statistics by country of witch flounder in Divisions 2J, 3K and 3L during 1963-2002.
In 1998-2002, 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

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

^bSpain (SCS Doc. 95/15)

Table 2. Estimated Biomass (tons) of Witch Flounder (M+F) in each stratum from surveys in Div. 2J during fall of 1977-2002.
(Engel 145 data converted to Campelen Units for 1977-94).

Depth Range (m)	Old Stratum Area	New Stratum Area	Stratum	Year																												
				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			
101 - 200	1427	633	201	0	0	0	0	0	0	0	61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	1823	1594	205	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	2582	1870	206	114	0	0	0	0	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	2246	2264	207	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	.	733	237	207	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
		778	238	208	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
201 - 300	440	621	202	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
	1608	680	209	103	14	48	122	0	83	123	19	152	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0					
	774	1035	210	133	45	121	338	24	129	0	286	0	0	38	0	22	0	0	0	0	0	0	0	0	0	0	0					
	1725	1583	213	265	249	160	298	280	371	197	118	102	130	98	21	56	0	0	0	0	0	0	0	8	0	0	0					
	1171	1341	214	193	54	0	58	65	122	74	21	106	71	0	16	14	19	0	0	0	0	0	0	0	0	0	0					
	1270	1302	215	193	33	11	0	82	67	0	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
	1428	2196	228	508	134	301	543	183	678	264	467	79	728	93	123	151	76	0	44	35	0	0	0	0	0	0	3					
	508	530	234	0	35	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
	480	487	203	0	0	0	0	0	54	112	0	0	19	0	0	20	0	0	0	0	0	0	0	0	0	0	0					
	448	588	208	178	36	75	367	91	638	80	95	608	91	0	0	27	0	0	0	0	0	0	0	0	0	0	0					
330	251	211	447	198	100	289	70	242	12	99	72	27	38	0	34	0	0	0	0	0	0	0	0	0	0	0						
384	360	216	0	0	27	42	56	63	85	0	0	54	13	10	16	0	0	0	0	0	0	2	0	0	0	3						
441	450	222	197	99	29	103	155	285	69	26	45	0	0	173	46	0	10	0	0	0	0	6	0	17	10	0						
567	536	229	183	177	118	215	127	139	155	103	52	857	70	145	596	32	31	28	15	13	0	0	0	0	6	4						
401 - 500	354	288	204	57	0	37	85	125	13	91	0	71	14	42	58	14	0	0	0	0	0	0	0	0	0	0	0					
	268	241	217	0	0	15	0	0	0	0	0	54	64	44	72	6	0	0	13	0	7	8	6	0	0	0						
	180	158	223	13	0	0	0	37	0	0	31	0	139	116	59	64	18	18	8	8	14	0	7	5	5	4						
	686	598	227	161	123	44	482	180	358	211	85	147	329	411	203	228	1837	207	125	132	0	0	86	84	125	0						
	420	414	235	813	0	456	430	502	371	908	517	399	121	168	0	62	149	37	20	0	41	0	16	3	22	0						
	133	133	240	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36	19	0	17	16	11	24	11						
501 - 750	664	557	212	1564	105	640	193	630	1116	1390	822	1253	3139	834	392	588	639	111	272	44	52	71	96	90	184	261						
	420	362	218	0	0	0	0	0	0	0	0	15	0	44	114	79	58	13	0	8	19	1	17	10	12	9						
	270	228	224	0	0	0	0	0	0	0	0	0	32	48	120	125	17	49	32	0	23	1	18	23	16	1						
	237	185	230	0	0	0	15	0	0	0	17	0	57	15	101	396	771	1711	346	85	105	69	126	176	26	161						
	120	120	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					
751 -1000	213	283	219	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	8	3	13	9	14	0	3						
	182	186	231	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	457	176	197	118	115	6	36	228						
	122	193	236	0	0	0	14	0	0	0	0	0	0	0	9	23	25	51	51	37	3	28	3	11	16	13						
1001 -1250	324	303	220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0						
	177	195	225	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1						
	236	228	232	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23						
1251 -1500	286	330	221	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	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0						
Grand Total				5123	1302	2218	3494	2581	4909	3693	2903	3030	5920	2063	1571	2653	3672	2669	1102	627	462	263	370	465	649	752	498	209	404			

Table 3. Estimated Biomass (tons) of Witch Flounder (M+F) in each stratum from surveys in Div. 3K during fall of 1978-2002.
(Engel 145 data converted to Campelen Units for 1978-94).

Depth Range (m)	Old Stratum Area	New Stratum Area	Stratum	Year																									
				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	
101 - 200	.	798	608																	0	0	0		0	0	0			
		445	612																		0	0	0		0	0	0		
		250	616																		0	0	0		0	0	0		
		1455	618							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
		1588	619							0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0		
201 - 300	.	342	609																	0	0	0		0	0	0			
		573	611																		0	0	0		0	0	0		
		251	615																		0	0	0		1	0	0		
		2709	620	612	1410	509	152	227	133	126	64	198	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
		2859	621	1051	3719	498	424	250	788	329	445	26	62	0	63	0	0	0	0	0	0	0	0	0	1	0	0		
		668	624	356	145	105	378	446	121	367	90	66	19	0	0	7	0	0	12	0	0	0	9	0	6	5	24		
		1618	634	788	772	1075	536	981	177	860	388	256	209	373	131	0	0	25	4	0	0	0	0	0	0	0	0		
		1274	635	1635	1887	1443	1481	833	538	2211	775	15	136	338	166	21	0	31	0	0	1	0	46	17	0	6	0		
		1455	636	1482	1680	1845	1166	876	711	2898	848	314	520	824	355	63	0	0	0	0	2	2	37	0	0	0	5		
		1132	637	1116	2242	1430	1864	1905	3668	2724	2490	702	841	215	158	0	0	57	17	0	0	0	3	2	32		1		
		447	632	395	591	230	524	408	447			210	89	34	38	82	0	3	8										
		301 - 400	.	256	610																	1	0	3		1	1	3	
				263	614																		0	0	0		1	1	0
				593	617																		0	0	4	13	0	0	0
1027	623			500	633	584	551	410	601	343	650	164	199	30	10	0	0	0	0	0	0	0	0	0	0	0	0		
850	625			864	2238	988	1580	491	1588	1416	1101	50	165	104	12	0	0	0	0	0	3	4	0	7	2	0	2		
919	626			3586	5737	5960	1149	4128	3477	1248	1110	57	174	32	56	0	0	22	0	0	0	0	1	0	9	8	5		
1085	628			2454	6077	3512	1379	2431	4882	2070	2324	954	523	39	214	0	0	20	0	0	0	0	0	5	12	3	0		
499	629			1722	1617	2520	1745	958	2253	1016	998	225	510	196	63	66	0	10	2	6	4	2	2	8	18	14	1		
544	630			1048	730	850	981		727	549	363	168	182	155	28	0	11	18	0	0	0	7	1	0	3	5	8	0	
2179	633			2190	2876	3722	1402	2399	2661	3092	2072	1599	1105	1931	1186	365	162	117	94	47	3	33	39	74	21	26	13	11	
2059	638			3316	8711	4695	5840	3430	4381	8608	7033	8275	5506	7317	3393	327	340	91	81	4	4	5	17	79	60	79	75	14	
1463	639			1415	1092	2077	1716	1127	3637	4062	2121	1744	779	2637	544	487	83	13	0	36	40	14	4	41	0	0	0	3	
401 - 500	.			30	613																	0	0	0		3	0	0	
				632	622	598	1228	1938	1010	600	946	640	1152	263	653	21	20	37	10	28	14	0	5	1	6	18	0	48	42
		1184	627	2887	4140	8083	11621	8635	10560	7849	4541	1598	1378	1341	738	243	6	47	69	23	32	8	48	81	42	98	40		
		1202	631	2274	2264	2534	7736	1009	5887	6448	4570	2929	1553	598	358	73	338	313	63	280	77	7	85	80	16	66	18		
		198	640	51		177	62	411		436	1074	1669	2280	1347	1145	176	184	18	0	0	0	8	3	10	0	12	14		
		204	645	12		0	12	341	281	1519	238		3079	571	252	991	99	15	15	8	0	18	15	3	23	7	9		
501 - 750	.	584	641	0	0	39	82	72	171	0	813		1657		11071	937	0	12	8	9	45	36	108	114		162	25		
		333	646	0	0	68	14	25	615	94	108			102		275	173	49	36	79	3	431	42	40	36	173	118		
			651																25	23	19	52	202	127	179		447	134	
			642	0		79	0	36		131	89		83			2496	1213	790	81	65	17	7	0	6	35	208	11	14	
			647	0	0	0	0	0		26						390	724	198	67	108	30	50	118	103	193	0	280	9	
			652														266	154	52	149	382	408	39	412	112	59			
1001 -1250	.	1266	643	0	0															66	0	0	0	12	18	0	0		
		232	648	0																	0	0	0	0	0	0	0	0	
			653																		429		66	0	0	0	12	0	18
1251 -1500	.	954	644	0	0																0	0	0	0	0	0	0	0	
		263	649	0																	0	0	0	0	0	0	0	0	
			654																		0	0	0	0	4	0	0	0	
Grand Total			30353	49789	44962	43406	32429	49251	49038	35694	21359	21746	18110	8976	17088	4272	1863	1327	846	435	855	1116	1255	881	1200	1427	471		

Table 4. Estimated Biomass (tons) of Witch Flounder (M+F) in each stratum from surveys in Div. 3L during fall of 1983-2002. (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
30 - 56		268	784																			
57 - 92	2071	2071	350	136	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	1780	1780	363	85	0	50	0	0	0	264	33	41	0	0	0	0	0	0	0	0		
	1121	1121	371	46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	2460	2460	372	144	0	0	0	16	0	38	8	0	0	0	27	0	0	0	0	0		
	1120	1120	384	98	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	.	465	785																			
93 - 183	1519	1519	328	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	1574	1574	341	230	0	0	34	34	0	0	0	0	0	0	0	0	0	1	0	0		
	585	585	342	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1		
	525	525	343	84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	2120	2120	348	334	0	0	0	44	0	0	0	0	0	0	0	0	0	0	1	0		
	2114	2114	349	306	0	155	0	36	0	145	0	0	0	0	0	0	0	0	2	0		
	2817	2817	364	202	0	143	0	39	0	27	0	0	0	0	0	0	0	0	0	0		
	1041	1041	365	100	0	68	29	18	0	0	36	0	0	0	0	0	0	0	0	0		
	1320	1320	370	190	0	0	34	0	0	0	0	0	0	0	0	0	0	0	0	0		
	2356	2356	385	340	0	79	58	27	0	0	0	0	0	0	0	0	0	0	0	0		
	1481	1481	390	159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	.	84	786																			
	.	613	787																			
	.	261	788																			
	.	89	790																			
	.	72	793																			
	.	216	794																			
	.	98	797																			
	.	72	799																			
184 - 274	1494	1582	344	159	37	29	127	0	0	0	0	0	0	0	0	0	0	0	1	0		
	983	983	347	467	0	42	0	154	66	0	0	0	0	0	0	0	0	0	0	4		
	1394	1394	366	186	355	307	171	110	187	27	0	7	0	0	0	0	0	0	0	0		
	961	961	369	374	570	706	320	1061	429	473	162	0	0	0	0	0	0	0	0	0		
	983	983	386	168	519	1082	1518	1750	442	218	307	875	0	0	0	0	0	0	0	0		
	821	821	389	196	133	760	250	138	21	79	0	27	0	0	38	0	0	0	11	0		
	282	282	391	0	32	0	9	0	0	0	70	22	0	0	36	0	25	0	0	0		
	.	164	795																			
184 - 366	.	72	789																			
	.	227	791																			
	.	100	798																			
275 - 366	1432	1432	345	4484	1227	617	3693	2099	2358	750	0	61	73	0	10	3	5	35	3	5		
	865	865	346	1423	2240	3321	1201	1823	1287	1863	203	40	14	0	0	12	3	1	20	16		
	334	334	368	47	29	386	23	64	144	106	39	14	0	0	22	0	0	0	0	6		
	718	718	387	169	404	276	572	1775	1546	3668	159	52	32	12	63	8	2	0	5	38		
	361	361	388	1229	48		589	92	126	0	125	173	0	14	0	0	0	12	0	5		
	145	145	392	55	13	20	50	13	0	0	0	0	0	4	0	0	0	0	0	14		
	.	175	796																			
	.	81	800																			
367 - 549	186	186	729	146	127	280				48	274	246	42	131	2	151	24	0	0	1		
	216	216	731	498	248					465	178	356	38	79	19		0	7	19	16		
	468	468	733	328	1164					1618	2110	610	183	60	23	12	0	41	54	62		
	272	272	735	367	34	1714				222	216	40	12	3	20	23	18	12	3	3		
	.	50	792																			
550 - 731	170	170	730	104	16					130	6	140	88	83	0	21	11	10	59	274		
	231	231	732	282	235					29	207	283	41	194	16	147	121	440	252	230		
	228	228	734	30	184					168	100	11	106	49	37	127	15	149	95	47		
	175	175	736	268	708					355	913	90	70	20	10	261	41	135	93	415		
	.	227	737																			
	.	223	741																			
	.	348	745																			
	.	159	748																			
915 - 1097	.	221	738																			
	.	206	742																			
	.	392	746																			
	.	126	749																			
1098 - 1280	.	254	739																			
	.	211	743																			
	.	724	747																			
	.	556	750																			
1281 - 1463	.	264	740																			
	.	280	744																			
	.	229	751																			
Grand Total				13210	7881	10743	8679	9294	6606	10341	5274	3131	778	663	418	1806	1095	1906	826	968		

Table 5. Abundance (000s) per stratum of Witch Flounder (M+F) from surveys in Div. 2J during fall of 1977-2002.
(Engel 145 data converted to Campelen Units for 1977-94).

Depth Range (m)	Old Stratum Srea	New Stratum Area	Stratum	Year																									
				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
101 - 200	1427	633	201	0	0	0	0	0	0	0	65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	1823	1594	205	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	2582	1870	206	129	0	0	0	0	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	2246	2264	207	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	.	733	237	237																									
		778	238																										
201 - 300	440	621	202	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	1608	680	209	158	37	32	147	0	80	158	32	147	0	0	0	0	37	0	0	0	0	0	0	0	0	0	0		
	774	1035	210	142	46	106	405	35	124	0	373	0	0	53	0	53	0	0	0	0	0	0	0	0	0	0	0		
	1725	1583	213	386	271	203	326	435	475	308	190	185	185	158	30	53	0	0	0	0	0	0	0	0	36	0	0		
	1171	1341	214	268	69	0	97	64	141	101	40	134	81	0	27	54	32	0	0	0	0	0	0	0	0	0	0		
	1270	1302	215	218	22	29	0	35	78	0	58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	1428	2196	228	565	262	393	746	196	825	295	421	56	1080	112	196	393	229	0	79	101	0	0	0	0	0	0	38		
	508	530	234	0	42	35	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	0	0	0	0	0	66	154	0	33	0	0	22	0	0	0	0	0	0	0	0	0	0	0	0	
448		588	208	339	62	139	508	154	924	123	144	965	123	0	123	0	0	0	0	0	0	0	0	0	0	0	0		
330		251	211	545	306	148	390	91	340	23	136	106	23	45	0	68	0	0	0	0	0	0	0	0	0	0	0		
384		360	216	0	0	40	40	106	106	123	0	0	79	26	26	26	0	0	0	0	25	0	0	0	0	0	25		
441		450	222	303	182	45	152	212	465	101	40	61	0	0	394	61	0	20	0	0	0	58	0	62	62	0	0		
567		536	229	312	292	175	331	117	195	214	130	52	1846	260	364	1664	78	26	130	221	25	0	0	0	0	37	33		
354		288	204	73	0	73		97	130	16	122	0	97	24	73	97	24	0	0	0	0	0	0	0	0	0	0		
401 - 500	268	241	217	0	0	18	0	0	0	0	0	74	92	74	92	18	0	0	155	0	33	66	31	0	0	0			
	180	158	223	12	0	0	0	37	0	50	0	248	161	124	111	37	66	33	76	145	0	75	43	19	0	43			
	686	598	227	165	189	47	566	189	396	283	126	212	409	684	220	354	4404	661	330	329	0	0	0	206	329	535			
	420	414	235	1343	0	664	549	664	578	1358	770	520	376	289	0	202	173	96	19	0	304	0	51	28	85	0			
		133	240																										
501 - 750	664	557	212	2147	183	868	228	731	1461	1705	1127	1621	4658	1302	685	891	1218	411	365	77	281	306	217	268	690	536			
	420	362	218	0	0	0	0	0	0	0	29	0	58	173	144	87	29	0	100	199	17	199	75	50	47	50	0		
	270	228	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		
	237	185	230	0	0	16	0	0	0	16	0	65	16	147	782	1695	4548	880	471	382	827	582	865	102	674	165	130		
	120	239																											
751 -1000	213	283	219					0		0		0	0	0	0	0	0	0	156	58	39	58	39	78	0	17	16		
	182	186	231	0	0		0	0	0	0	0	0	0	0	0	0	0	0	939	401	512	375	563	26	90	832	461		
	122	193	236	0			25	0	0	0	0	0	0	0	8		59	34	151	199	159	25	133	13	38	66	80		
1001 -1250	324	303	220		0																								
	177	195	225	0																									
	236	228	232	0	0																								
1251 -1500	286	330	221																										
	180	201	226	0																									
	180	237	233																										
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

Table 7. Abundance (000s) per stratum of Witch Flounder (M+F) from surveys in Div. 3L during fall of 1983-2002. (Engel 145 data converted to Campelen Units for 1983-94).

Depth Range (m)	Old Stratum Area	New Stratum	Stratum	Year																			
				84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	
30 - 56		268	784																	74	0	0	
57 - 92	2071 1780 1121 2460 1120	2071 1780 1121 2460 1120	350 363 371 372 384	166 92 44 182 128	0 0 0 0 0	0 35 0 0 0	0 0 0 0 0	0 0 0 26 0	0 0 0 0 0	0 0 0 34 0	0 306 0 13 0	0 43 0 0 0	0 39 0 0 0	0 0 0 34 0	0 0 0 0 0	0 0 44 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	74 0 0 0 0	0 0 0 0 0	
93 - 183	1519 1574 585 525 2120 2114 2817 1041 1320 2356 1481	1519 1574 585 525 2120 2114 2817 1041 1320 2356 1481	328 341 342 343 348 349 364 365 370 385 390	52 217 0 90 292 291 271 143 233 324 136	0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 162 155 57 0 122 0	0 24 0 0 0 0 0 48 30 36 0	0 27 0 0 58 32 55 29 0 25 0	0 0 0 0 0 0 32 0 0 0 0	0 0 0 0 0 166 0 48 0 0 0	0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 42 0 0 0 0 0	0 0 0 0 0 0 43 0 0 0 0	0 0 0 0 0 0 43 0 0 0 0	0 0 0 0 0 0 43 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0
184 - 274	1494 983 1394 961 983 821 282	1582 983 1394 961 983 821 282	344 347 366 369 386 389 391	206 586 157 359 186 169 0	46 0 362 507 568 158 39	117 34 431 661 1082 875 0	154 0 219 330 1792 226 19	0 135 110 1348 1974 169 0	0 108 164 529 352 28 0	0 0 32 463 237 75 0	0 0 8 162 270 0 26	0 0 0 0 1262 0 0	0 0 0 0 0 38 0	0 0 0 39 0 0 34	0 0 0 0 0 0 0	0 0 0 0 0 0 33	0 0 0 0 0 0 0	0 0 0 0 0 0 0	0 0 0 0 0 0 0	0 0 0 0 0 0 0	64 0 38 0 0 301 0	0 45 0 0 0 0 0	87 0 0 0 80 0 0
184 - 366		72	789																		56	0	
275 - 366	1432 865 334 718 361 145 175 81	1432 865 334 718 361 145 175 81	345 346 368 387 388 392 796 800	6895 2380 46 165 1440 80	1488 3498 46 444 50 20	739 3927 459 247 819 20	4531 1487 23 691 819 70	2589 2427 69 2025 149 20	3180 1606 207 1679 149 0	2088 2340 115 4971 0 0	0 389 170 198 0 0	345 170 69 66 116 0	394 76 14 33 0 0	0 0 23 77 0 7	113 0 0 99 14 0	70 35 0 49 0 0	223 317 178 44 149 107	439 178 282 0 0 24	149 219 117 44 0 0	117 119 593 124 0 21	79 278 44 309 16 638	468 326 0 93 44 96	
367 - 549	186 216 468 272	186 216 468 272	729 731 733 735	217 877 338 661	192 371 1609 37	409 2320																	
550 - 731	170 231 228 175	170 231 228 175	730 732 734 736	105 365 21 373	23 302 267 987																		
732 - 914		227 223 348 159	737 741 745 748																				
915 - 1097		221 206 392 126	738 742 746 749																				
1098 - 1280		254 211 724 556	739 743 747 750																				
1281 - 1463		284 280 229	740 744 751																				
Grand Total				17914	10401	12839	10500	11269	8002	14453	7428	4748	1572	1428	1004	5297	4383	6755	2655	5361	7316	10776	

Table 8. Mean Numbers per Tow of Witch Flounder (M+F) in each stratum from surveys in Div. 2J during fall of 1977-2002.
(Engel 145 data converted to Campelen Units for 1977-94).

Depth Range (m)	Old Stratum Area	New Stratum Area	Stratum	Year																									
				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
101 - 200	1427	633	201	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
	1823	1594	205	0.00	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
	2582	1870	206	0.36	0.00	0.00	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	0.00	0.00	0.00		
	2246	2264	207	0.00	0.00	0.00	0.00	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	0.00	0.00	0.00		
	.	733	237																	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	.	778	238																0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
201 - 300	440	621	202	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	0.00	0.00	0.00		
	1608	680	209	0.71	0.17	0.14	0.67	0.00	0.36	0.71	0.14	0.67	0.00	0.00	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		
	774	1035	210	1.33	0.43	1.00	3.80	0.33	1.17	0.00	3.50	0.00	0.00	0.50	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
	1725	1583	213	1.63	1.14	0.86	1.38	1.83	2.00	1.30	0.80	0.78	0.78	0.67	0.13	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00		
	1171	1341	214	1.67	0.43	0.00	0.60	0.40	0.88	0.63	0.25	0.83	0.50	0.00	0.17	0.33	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
	1270	1302	215	1.25	0.13	0.17	0.00	0.20	0.44	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	0.00	0.00	0.00	0.00	0.00		
	1428	2196	228	2.88	1.33	2.00	3.80	1.00	4.20	1.50	2.14	0.29	5.50	0.57	1.00	2.00	1.17	0.00	0.40	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.13		
	508	530	234	0.00	0.60	0.50	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		
	480	487	203	0.00	0.00	0.00	0.00	0.00	1.00	2.33	0.00	0.00	0.50	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		
	448	588	208	5.50	1.00	2.25	8.25	2.50	15.00	2.00	2.33	15.67	2.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
330	251	211	12.00	6.75	3.25	8.60	2.00	7.50	0.50	3.00	2.33	0.50	1.00	0.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
384	360	216	0.00	0.00	0.75	0.75	2.00	2.00	2.33	0.00	0.00	1.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.50			
441	450	222	5.00	3.00	0.75	2.50	3.50	7.67	1.67	0.67	1.00	0.00	0.00	6.50	1.00	0.00	0.33	0.00	0.00	0.00	0.94	0.00	1.00	1.00	0.00	0.00			
567	536	229	4.00	3.75	2.25	4.25	1.50	2.50	2.75	1.67	0.67	23.67	3.33	4.67	21.33	1.00	0.33	1.67	3.00	0.33	0.00	0.00	0.00	0.50	0.00	0.44			
401 - 500	354	288	204	1.50	0.00	1.50		2.00	2.67	0.33	2.50	0.00	2.00	0.50	1.50	2.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
	268	241	217	0.00	0.00	0.50	0.00	0.00	0.00	0.00		0.00	2.00	2.50	2.00	2.50	0.50	0.00	0.00	0.00	4.67	0.00	1.00	2.00	0.94	0.00			
	180	158	223	0.50	0.00	0.00	0.00	1.50	0.00	0.00	2.00	0.00	10.00	6.50	5.00	4.50	1.50	2.67	1.33	3.50	6.67	0.00	3.44	2.00	0.89	0.00			
	686	598	227	1.75	2.00	0.50	6.00	2.00	4.20	3.00	1.33	2.25	4.33	7.25	2.33	3.75	46.67	7.00	3.50	4.00	0.00	0.00	2.50	4.00	6.50	0.00			
	420	414	235	23.25	0.00	11.50	9.50	11.50	10.00	23.50	13.33	9.00	6.50	5.00	0.00	3.50	3.00	1.67	0.33	0.00	5.33	0.00	0.89	0.50	1.50	0.00			
	.	133	240																	19.00	7.67	0.00	8.00	3.00	2.46	7.50	2.00		
		.	.																								4.17		
501 - 750	664	557	212	23.50	2.00	9.50	2.50	8.00	16.00	18.67	12.33	17.75	51.00	14.25	7.50	9.75	13.33	4.50	4.00	1.00	3.67	4.00	2.83	3.50	9.00	7.00			
	420	362	218	0.00	0.00		0.00	0.00	0.00	0.00		0.50	0.00	1.00	3.00	2.50	1.50	0.50	0.00	2.00	4.00	0.33	4.00	1.50	1.00	0.94			
	270	228	224	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	1.50	5.50	5.00	0.50	3.00	2.00	0.00	4.67	1.00	2.50	4.50	2.67	0.50			
	237	185	230	0.00	0.00		0.50	0.00	0.00	0.00	0.50	0.00	2.00	0.50	4.50	24.00	52.00	139.50	27.00	18.50	15.00	32.50	22.89	34.00	4.00	26.50			
	.	120	239																		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
751 - 1000	213	283	219					0.00		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	1.50	1.00	1.50	1.00	2.00	0.44			
	182	186	231	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	37.50	16.00	20.00	14.67	22.00	1.00	3.50	32.53			
	122	193	236	0.00			1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50		3.50	2.00	9.00	7.50	6.00	0.94	5.00	0.50	1.44	2.50			
1001 - 1250	324	303	220		0.00																					0.00	0.44		
	177	195	225	0.00																					0.00	0.50	0.44		
	236	228	232	0.00	0.00																				0.00	2.00	0.00		
1251 - 1500	286	330	221																							0.00	0.50		
	180	201	226		0.00																					0.00	0.00		
	180	237	233																							0.00	0.50		
Grand Total				2.16	0.59	0.97	1.42	0.99	2.01	1.52	1.23	1.26	2.90	1.03	0.86	1.67	2.49	2.13	0.76	0.82	0.72	0.65	0.50	0.54	0.72	0.74	0.57	0.32	0.43

Table 9. Mean Numbers per Tow of Witch Flounder (M+F) in each stratum from surveys in Div. 3K during fall of 1978-2002
(Engel 145 data converted to Campelen Units for 1978-94).

Depth Range (m)	Old Stratum Area	New Stratum Area	Stratum	Year																								
				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
101 - 200	.	798	608																									
	.	445	612																		0.00	0.00	0.00		0.00	0.00	0.00	
	.	250	616																		0.00	0.00	0.00		0.50	0.00	0.00	
	1455	1347	618								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	
	1588	1753	619								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	
201 - 300	.	342	609																									
	.	573	611																									
	.	251	615																									
	2709	2545	620	2.58	5.30	1.67	0.40	0.44	0.30	0.31	0.21	0.33	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	
	2859	2537	621	5.08	13.09	1.77	0.73	0.43	1.75	0.64	1.00	0.07	0.17	0.00	1.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.54	0.00	0.00	0.00	
	668	1105	624	5.71	2.50	1.75	6.50	5.00	2.00	4.00	1.75	1.00	0.33	0.00	0.00	0.25	0.00	0.00	0.14	0.00	0.00	0.00	0.20	0.00	0.38	0.20	0.20	
	1618	1555	634	3.78	3.75	5.71	3.00	4.09	1.00	4.00	2.44	1.20	1.27	2.17	1.14	0.00	0.00	1.08	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	1274	1274	635	9.67	10.88	10.17	9.00	5.00	3.33	13.88	6.43	0.17	0.83	2.60	1.00	0.17	0.00	0.33	0.00	0.00	0.17	0.00	0.40	0.60	0.00	0.46	0.00	
	1455	1455	636	8.57	8.57	9.43	5.83	4.80	3.17	14.63	4.88	2.00	2.43	3.83	1.20	0.14	0.00	0.00	0.00	0.00	0.14	0.17	0.33	0.00	0.00	0.00	0.36	
	1132	1132	637	10.33	21.14	12.67	15.17	15.29	30.60	22.67	21.29	4.75	6.17	1.25	1.00	0.00	0.00	0.33	0.33	0.00	0.00	0.00	0.20	0.40	0.93		0.20	
	447	.	632	9.00	12.50	4.25	10.50	8.33	8.00		3.67	1.50	0.50	0.50	1.00	0.00	0.10	0.92										
	301 - 400	.	256	610																								
		.	263	614																								
		.	593	617																								
1027		494	623	6.17	7.00	6.17	5.25	3.40	6.17	4.00	6.50	2.00	3.80	2.20	0.33	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.33	0.63	0.00	0.00	0.00	
850		888	625	13.50	34.00	12.50	22.00	5.00	19.00	17.80	14.40	0.67	2.75	2.50	0.75	0.00	0.00	0.00	0.00	0.00	0.33	0.20	0.00	0.25	0.25	0.00	0.29	
919		1113	626	70.00	89.00	84.20	12.60	54.80	38.50	22.67	12.80	0.50	4.60	1.00	2.60	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.80	0.00	3.76	2.38	2.00	
1085		1085	628	24.14	56.00	35.17	12.33	23.00	44.00	18.14	28.33	11.33	6.00	1.80	4.25	0.00	0.00	1.00	0.00	0.00	0.18	0.00	0.20	0.00	1.20	1.80	0.76	
499		495	629	44.17	53.50	71.60	40.67	21.50	53.00	20.00	30.50	7.67	10.67	11.00	6.00	1.50	0.00	0.67	2.67	2.00	4.50	0.50	1.00	5.50	4.11	0.67	0.00	
544		332	630	37.00	18.00	15.00	17.50		12.00	10.67	12.25	4.00	3.67	3.33	1.67	0.00	0.00	0.33	0.67	0.00	1.00	1.00	0.50	2.50	2.21	0.33	0.44	
2179		2067	633	9.89	13.00	15.10	7.00	9.86	10.17	12.10	9.50	11.88	6.18	11.63	12.30	3.55	1.20	1.84	2.11	0.20	0.24	0.78	1.00	1.22	0.22	0.67	0.48	
2059		2059	638	24.13	53.67	34.33	33.75	20.87	24.18	50.90	43.73	40.00	26.60	40.25	17.82	1.89	2.16	1.12	1.30	0.05	0.28	0.53	0.56	2.33	2.13	3.60	2.18	
1463		1463	639	10.00	5.75	13.17	10.00	7.10	20.00	27.13	13.88	11.83	6.14	16.50	2.50	2.43	0.33	0.12	0.00	1.13	0.57	0.17	0.50	0.83	0.00	0.00	0.00	
401 - 500		.	30	613																								
		632	691	622	30.50	22.33	38.50	18.50	13.00	26.00	11.25	22.25	8.00	17.00	2.33	3.33	1.50	0.67	3.00	2.50	0.00	0.30	0.24	0.33	1.00	0.00	0.67	1.67
	1184	1255	627	37.00	71.33	79.50	140.83	113.86	136.50	114.75	106.29	47.60	23.83	44.20	38.50	12.00	2.67	1.67	21.00	2.13	4.59	0.73	7.78	13.00	3.82	11.66	4.48	
	1202	1321	631	51.50	34.33	38.33	80.20	11.00	53.60	76.60	69.14	48.50	20.67	15.50	11.00	1.67	15.50	13.67	4.00	13.50	2.96	0.98	3.13	2.67	0.46	3.46	1.73	
	198	69	640	4.00		8.50	3.00	17.00		21.00	63.00	90.50	147.50	83.50	60.50	9.00	9.00	3.33	0.00	0.00	0.00	4.06	2.00	6.50	0.50	5.00	14.50	
	204	216	645	0.50		0.00	0.50	14.67	10.50	72.00	14.00		208.00	39.50	16.50	84.00	7.00	1.67	6.33	4.00	0.00	5.00	1.50	0.44	3.50	2.50	3.71	
501 - 750	584	230	641	0.00	0.00	1.00	2.00	0.75	3.00	0.00	12.50		30.33															
	333	325	646	0.00	0.00	1.00	0.50	1.00	15.50	2.00	2.67		2.50															
	.	359	651																									
751 -1000	931	418	642	0.00		0.50	0.00	0.33		1.00	1.00		1.00															
	409	360	647	0.00	0.00	0.00	0.00	0.00																				
	.	516	652																									
1001 -1250	1266	733	643	0.00	0.00																							
	232	228	648	0.00																								
	.	531	653																									
1251 -1500	954	474	644	0.00	0.00																							
	263	212	649	0.00																								
	.	479	654																									
Grand Total				13.93	21.04	18.61	17.89	13.58	20.32	18.87	16.24	10.24	8.71	8.82	5.65	6.77	2.32	1.47	2.03	1.12	0.77	1.00	1.12	1.56	1.17	1.64	1.42	0.74

Table 11. Mean Weight (kg) per Tow of Witch Flounder (M+F) in each stratum from surveys in Div. 2J during fall of 1977-2002.
(Engel 145 data converted to Campelen Units for 1977-94).

Depth Range (m)	Old Stratum Area	New Stratum Area	Stratum	Year																											
				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		
101 - 200	1427	633	201	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31	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			
	1823	1594	205	0.00	0.00	0.00	0.00	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
	2582	1870	206	0.32	0.00	0.00	0.00	0.00	0.10	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			
	2246	2264	207	0.00	0.00	0.00	0.00	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	0.00	0.00	0.00	0.00			
	.	733	237																		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
	.	778	238																		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
201 - 300	440	621	202	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	0.00	0.00	0.00	0.00			
	1608	680	209	0.47	0.06	0.22	0.55	0.00	0.38	0.55	0.08	0.69	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
	774	1035	210	1.25	0.42	1.14	3.18	0.23	1.22	0.00	2.69	0.00	0.00	0.35	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
	1725	1583	213	1.12	1.05	0.67	1.25	1.18	1.56	0.83	0.50	0.43	0.55	0.41	0.09	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00			
	1171	1341	214	1.20	0.33	0.00	0.36	0.41	0.76	0.46	0.13	0.66	0.44	0.00	0.10	0.09	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
	1270	1302	215	1.10	0.19	0.06	0.00	0.47	0.38	0.00	0.26	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			
	1428	2196	228	2.59	0.68	1.53	2.77	0.93	3.45	1.34	2.38	0.40	3.71	0.47	0.63	0.77	0.39	0.00	0.22	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01			
	508	530	234	0.00	0.50	0.51	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	0.00			
	301 - 400	480	487	203	0.00	0.00	0.00	0.00	0.00	0.82	1.70	0.00	0.00	0.30	0.00	0.00	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
448		588	208	2.89	0.58	1.22	5.95	1.47	10.36	1.31	1.54	9.86	1.48	0.00	0.00	0.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
330		251	211	9.84	4.36	2.20	6.37	1.54	5.32	0.26	2.18	1.58	0.61	0.84	0.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
384		360	216	0.00	0.00	0.52	0.80	1.07	1.20	1.61	0.00	0.00	1.02	0.26	0.19	0.30	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.06			
441		450	222	3.26	1.64	0.47	1.70	2.56	4.70	1.13	0.43	0.75	0.00	0.00	2.85	0.76	0.00	0.17	0.00	0.00	0.00	0.00	0.10	0.00	0.28	0.16	0.00	0.00			
567		536	229	2.35	2.27	1.52	2.76	1.63	1.79	1.99	1.32	0.66	10.99	0.90	1.86	7.64	0.41	0.40	0.35	0.20	0.18	0.00	0.00	0.00	0.00	0.00	0.09	0.05	0.00		
401 - 500	354	288	204	1.17	0.00	0.77	1.74	2.56	0.27	1.86	0.00	1.45	0.30	0.87	1.19	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			
	268	241	217	0.00	0.00	0.41	0.00	0.00	0.00	0.00	0.00	1.47	1.73	1.20	1.97	0.16	0.00	0.00	0.00	0.39	0.00	0.23	0.24	0.17	0.00	0.00	0.00	0.00			
	180	158	223	0.53	0.00	0.00	0.00	1.48	0.00	0.00	1.25	0.00	5.62	4.67	2.37	2.58	0.73	0.73	0.32	0.38	0.63	0.00	0.31	0.24	0.24	0.00	0.21	0.07			
	686	598	227	1.71	1.31	0.47	5.11	1.91	3.79	2.24	0.90	1.56	3.48	4.36	2.15	2.42	19.47	2.19	1.32	1.60	0.00	0.00	1.05	1.03	1.52	0.00	0.31	0.05			
	420	414	235	14.08	0.00	7.90	7.44	8.69	6.43	15.71	8.95	6.90	2.10	2.92	0.00	1.07	2.58	0.63	0.35	0.00	0.73	0.00	0.29	0.06	0.39	0.00	0.00	0.80			
	.	133	240																		1.98	1.03	0.00	0.93	0.85	0.62	1.33	0.60	0.50	0.00	
501 - 750	664	557	212	17.13	1.16	7.01	2.11	6.90	12.21	15.22	9.00	13.72	34.37	9.13	4.29	6.44	6.99	1.21	2.98	0.58	0.68	0.93	1.26	1.18	2.40	3.40	1.63	0.10	0.50		
	420	362	218	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.76	1.98	1.36	1.01	0.23	0.00	0.17	0.39	0.02	0.34	0.20	0.23	0.19	0.09	0.00	0.00			
	270	228	224	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.87	1.30	3.24	3.38	0.45	1.33	0.88	0.00	0.75	0.05	0.58	0.73	0.51	0.05	0.47	0.40	0.05		
	237	185	230	0.00	0.00	0.47	0.00	0.00	0.00	0.00	0.53	0.00	1.75	0.47	3.09	12.14	23.66	52.49	10.62	3.33	4.14	2.71	4.94	6.93	1.04	6.33	1.43	0.84	0.09		
	.	120	239																		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
751 -1000	213	283	219				0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.21	0.07	0.33	0.23	0.35	0.00	0.09	0.11	0.15			
	182	186	231	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	18.25	7.01	7.72	4.59	4.50	0.25	1.40	8.89	5.58	11.05	2.30	10.04
	122	193	236	0.00			0.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.53		1.36	1.50	3.06	1.93	1.38	0.13	1.05	0.12	0.40	0.60	0.50	1.43	1.00		
1001 -1250	324	303	220		0.00																										
	177	195	225	0.00																				0.25	0.00	0.00		0.00	0.00	0.16	
	236	228	232	0.00	0.00																		0.00	0.00	0.00	0.09	0.05	0.04	0.00		
1251 -1500	286	330	221																												
	180	201	226		0.00																			0.00	0.00	0.00	0.00	0.00	0.00	0.06	
	180	237	233																				0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.20	
Grand Total				1.56	0.39	0.72	1.11	0.80	1.52	1.13	0.93	0.93	1.82	0.63	0.49	0.83	1.13	0.82	0.34	0.20	0.14	0.09	0.11	0.13	0.19	0.22	0.14	0.06	0.12		

Table 12. Mean Weight (kg) per Tow of Witch Flounder (M+F) in each stratum from surveys in Div. 3K during fall of 1978-2002 (Engel 145 data converted to Campelen Units for 1978-94).

				Year																								
Depth Range (m)	Old Stratum Area	New Stratum Area	Stratum	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
101 - 200	.	798	608																			0.00	0.00	0.00		0.00	0.00	0.00
	.	445	612																			0.00	0.00	0.00		0.01	0.00	0.00
	.	250	616																			0.00	0.00	0.00		0.00	0.00	0.00
	1455	1347	618							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
	1588	1753	619							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
201 - 300	.	342	609																			0.00	0.00	0.00		0.00	0.00	0.00
	.	573	611																			0.00	0.00	0.00		0.00	0.00	0.00
	.	251	615																			0.00	0.00	0.00		0.02	0.00	0.00
	2709	2545	620		1.64	3.78	1.37	0.41	0.61	0.36	0.34	0.17	0.53	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
	2859	2537	621		2.67	9.46	1.27	1.08	0.64	2.00	0.84	1.13	0.07	0.16	0.00	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	668	1105	624		3.88	1.58	1.14	4.11	4.85	1.32	4.00	0.98	0.72	0.20	0.00	0.00	0.08	0.00	0.00	0.08	0.00	0.00	0.00	0.06	0.00	0.04	0.03	0.16
	1618	1555	634		3.54	3.47	4.83	2.41	4.41	0.79	3.86	1.74	1.15	0.94	1.68	0.59	0.00	0.00	0.11	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1274	1274	635		9.33	10.77	8.24	8.45	4.75	3.07	12.62	4.42	0.09	0.78	1.93	0.95	0.12	0.00	0.18	0.00	0.00	0.01	0.00	0.26	0.10	0.00	0.03	0.00
	1455	1455	636		7.40	8.39	9.22	5.82	4.38	3.55	14.48	4.24	1.57	2.60	4.12	1.78	0.32	0.00	0.00	0.00	0.00	0.01	0.01	0.19	0.00	0.00	0.00	0.02
	1132	1132	637		7.16	14.40	9.18	11.97	12.24	23.55	17.49	15.99	4.51	5.40	1.38	1.02	0.00	0.00	0.36	0.11	0.00	0.00	0.00	0.02	0.01	0.21		0.00
	447	.	632		6.43	9.61	3.74	8.53	6.64	7.27		3.41	1.46	0.55	0.62	1.34	0.00	0.05	0.13									
	301 - 400	.	256	610																			0.03	0.01	0.09		0.02	0.03
.		263	614																			0.01	0.01	0.00		0.04	0.03	0.00
.		593	617																	0.00	0.00	0.01	0.00	0.05	0.16	0.00	0.00	0.00
1027		494	623		3.54	4.48	4.13	3.90	2.90	4.25	2.43	4.60	1.16	1.41	0.21	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
850		888	625		7.39	19.14	8.45	13.52	4.20	13.58	12.11	9.41	0.43	1.41	0.89	0.10	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.00	0.06	0.02	0.00	0.02
919		1113	626		28.36	45.38	47.15	9.09	32.65	27.51	9.88	8.78	0.45	1.38	0.25	0.45	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.01	0.00	0.06	0.05	0.04
1085		1085	628		16.44	40.72	23.53	9.24	16.29	32.71	13.87	15.57	6.39	3.50	0.26	1.43	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.08	0.02
499		495	629		25.09	23.55	36.72	25.42	13.96	32.82	14.81	14.54	3.28	7.42	2.85	0.92	0.96	0.00	0.14	0.04	0.09	0.06	0.03	0.03	0.12	0.27	0.21	0.01
544		332	630		14.01	9.76	11.35	13.12		9.72	7.34	4.85	2.24	2.43	2.07	0.38	0.00	0.00	0.15	0.40	0.00	0.00	0.15	0.03	0.01	0.07	0.10	0.17
2179		2067	633		7.31	9.60	12.42	4.68	8.00	8.88	10.32	6.91	5.34	3.69	6.44	3.96	1.22	0.54	0.39	0.33	0.17	0.01	0.12	0.14	0.26	0.07	0.09	0.05
2059		2059	638		11.71	30.76	16.58	20.62	12.11	15.47	30.39	24.83	29.22	19.44	25.84	11.98	1.16	1.20	0.32	0.29	0.02	0.02	0.02	0.06	0.28	0.21	0.28	0.27
1463		1463	639		7.03	5.43	10.32	8.53	5.60	18.07	20.19	10.54	8.67	3.87	13.10	2.70	2.42	0.41	0.06	0.00	0.18	0.20	0.07	0.02	0.21	0.00	0.00	0.00
401 - 500	.	30	613																			0.02	0.01	0.04		0.79	0.07	0.03
	632	691	622		6.88	14.13	22.30	11.62	6.91	10.88	7.37	13.25	3.02	7.51	0.25	0.23	0.42	0.11	0.32	0.15	0.00	0.05	0.01	0.06	0.19	0.00	0.50	
	1184	1255	627		17.73	25.42	49.63	71.35	53.01	64.84	48.19	27.88	9.81	8.46	8.24	4.53	1.49	0.04	0.29	0.40	0.14	0.19	0.05	0.28	0.47	0.24	0.57	
	1202	1321	631		13.75	13.69	15.33	46.79	6.11	35.60	39.00	27.64	17.71	9.39	3.62	2.17	0.44	2.04	1.89	0.35	1.54	0.42	0.04	0.47	0.44	0.09	0.36	
	198	69	640		1.89	6.49	2.27	15.08		16.00	39.42	61.26	83.72	49.47	42.05	6.47	6.77	0.65	0.00	0.00	0.00	0.88	0.29	1.11	0.05	1.30	1.45	
	204	216	645		0.42	0.00	0.42	12.15	10.01	54.12	8.49		109.71	20.35	8.98	35.33	3.52	0.53	0.50	0.26	0.00	0.60	0.50	0.09	0.76	0.25	0.31	
501 - 750	.	134	650																	1.15	0.21	0.09	0.52	0.90	1.08	1.37	0.84	
	584	230	641		0.00	0.00	0.49	1.03	0.90	2.13	0.00	10.13		20.62					0.38	0.25	0.29	1.43	1.13	3.40	3.60		5.13	
	333	325	646		0.00	0.00	1.50	0.31	0.54	13.42	2.05	2.36		2.23					6.00	3.77	1.07	0.80	1.77	0.07	9.63	0.95	0.90	
751 -1000	.	359	651																	0.50	0.47	0.38	1.05	4.09	2.58	3.62		9.06
	931	418	642		0.00		0.62	0.00	0.28		1.02	0.70		0.65					19.49	9.47	6.17	1.42	1.14	0.30	1.12	0.00	0.11	
1001 -1250	409	360	647		0.00	0.00	0.00	0.00	0.00										6.93	12.87	3.53	1.36	2.17	0.60	1.00	2.38	2.08	
	.	516	652																			3.74	2.17	0.73	2.10	5.38	5.75	5.80
	1266	733	643		0.00	0.00																	0.66	0.00	0.00	0.00	0.12	0.18
1251 -1500	232	228	648		0.00																	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	.	531	653																	5.88		0.91	0.00	0.00	0.00	0.17	0.00	0.25
	954	474	644		0.00	0.00																0.00	0.00	0.00	0.00	0.00	0.00	0.00
	263	212	649		0.00																	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grand Total	.	479	654		7.08	12.33	11.48	11.09	8.44	13.30	11.63	8.24	5.35	5.08	4.50	2.23	3.94	0.99	0.43	0.30	0.20	0.09	0.17	0.22	0.25	0.19	0.25	

Table 14. Estimates of biomass (tons) of witch flounder from Canadian fall surveys in Div. 2J, 3K and 3L during 1977-2002.

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

Table 15. Mean weights (kg) of witch flounder per tow from Canadian fall surveys in Div. 2J, 3K and 3L during 1977-2002.

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

Table 16. Estimates of abundance (000s) of witch flounder from Canadian fall surveys in Div. 2J, 3K and 3L during 1977-2002.

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

Table 17. Mean numbers of witch flounder per tow from Canadian fall surveys in Div. 2J, 3K and 3L during 1977-2002.

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

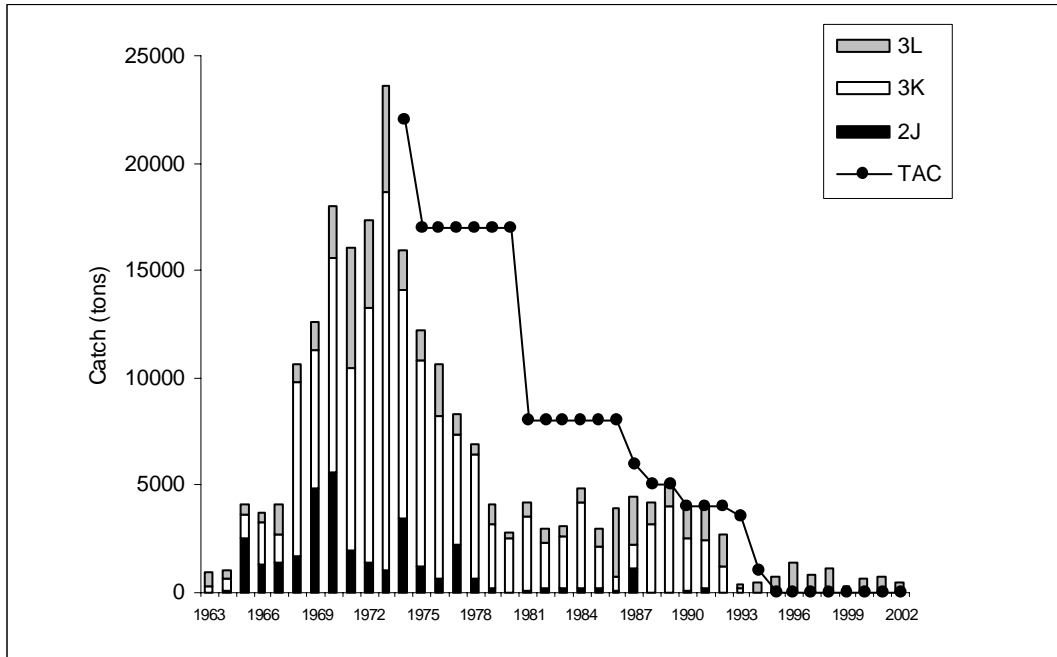


Fig. 1. Commercial catches and TACs of witch flounder in Divisions 2J, 3K and 3L during 1963-2002. Catches in Div. 3M are included for 1998-2000. Although not included, the estimated catch in Div 3M for 2001 was 324 tons.

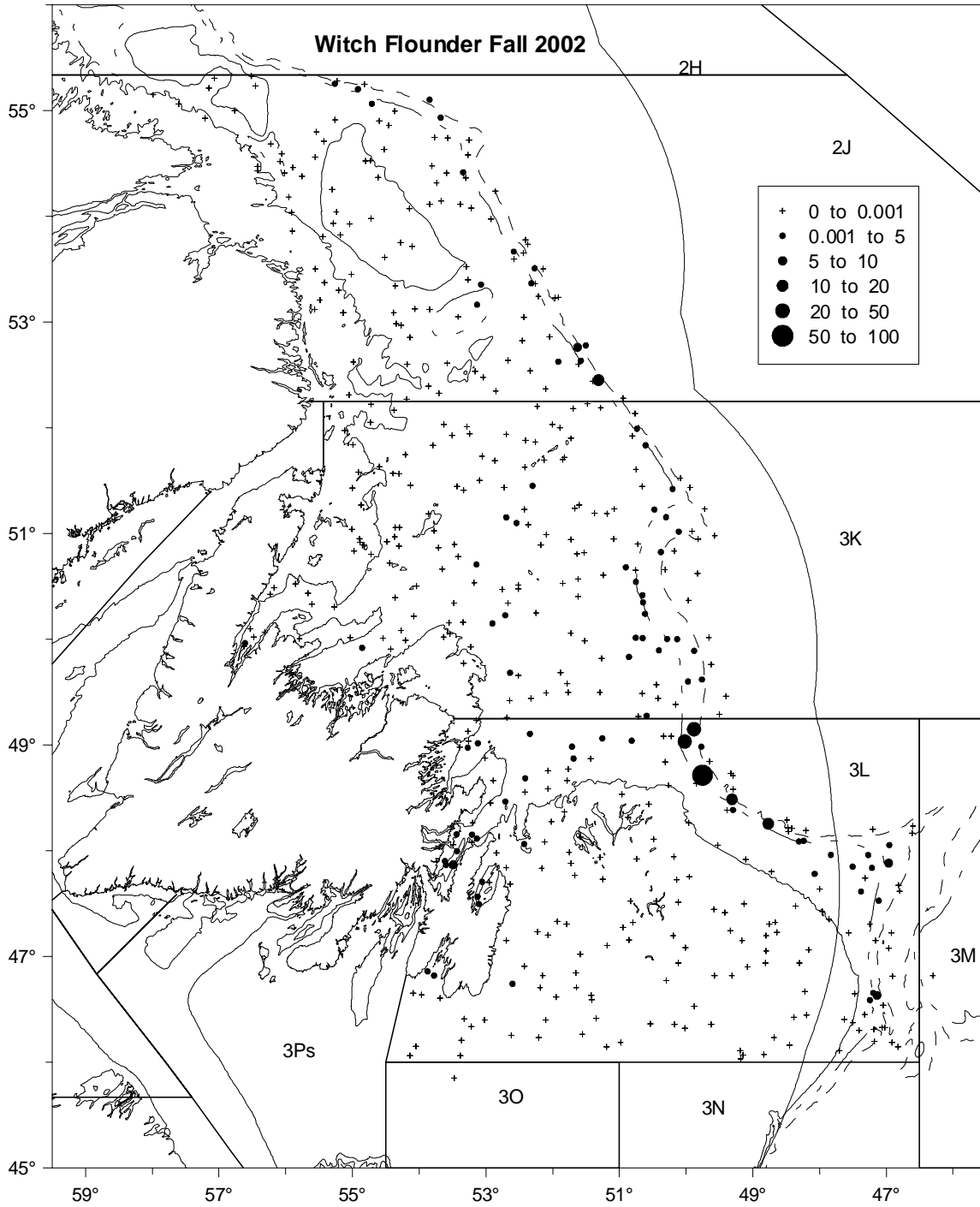
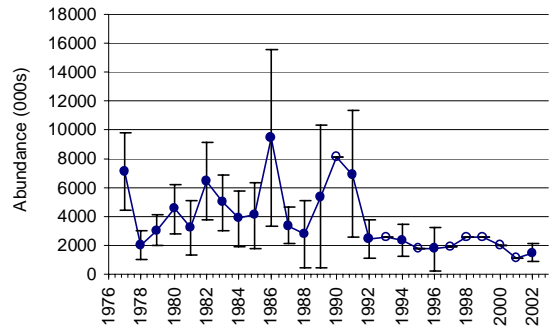
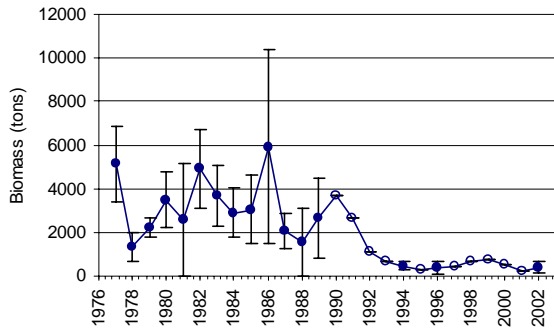
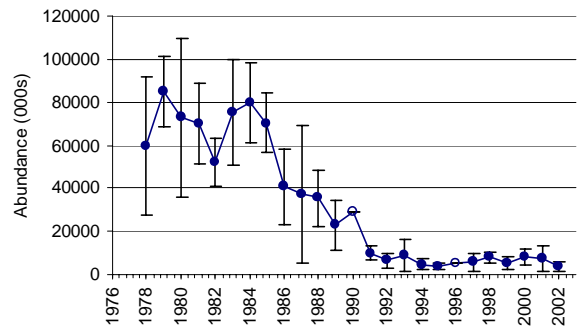
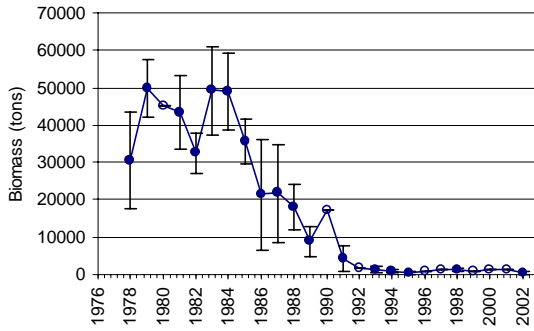


Fig. 2 Weight (kg) per set of Witch flounder from Canadian surveys in NAFO Divisions 2J, 3K and 3L during fall 2002 .

2J



3K



3L

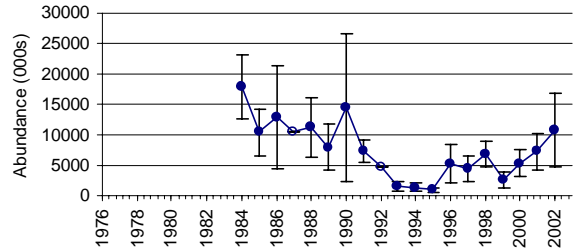
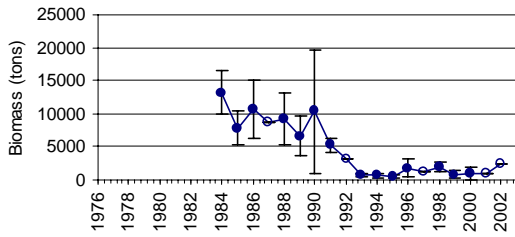
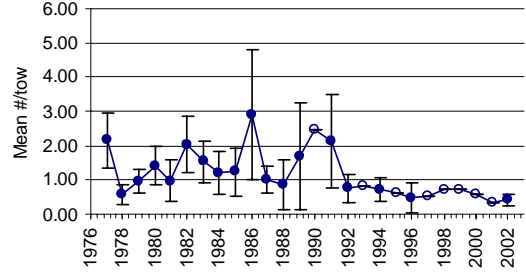
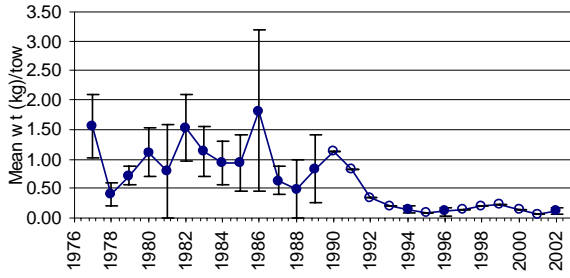
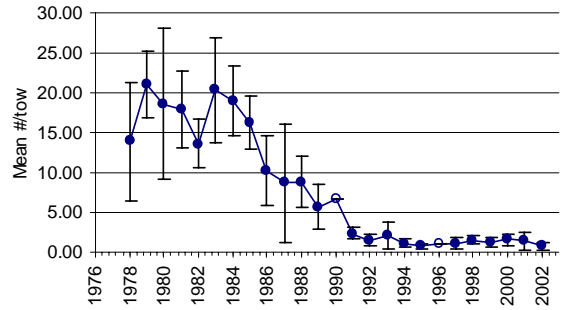
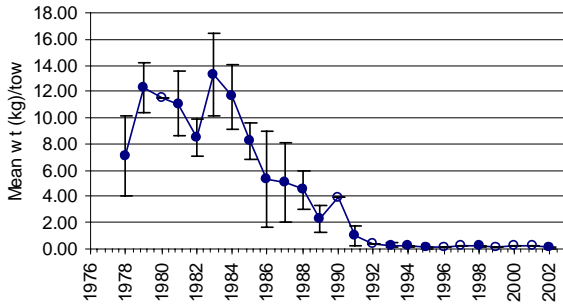


Figure 3a. Biomass (tons) and Abundance (000's) for 2J, 3K and 3L fall surveys. Where lower confidence limit was negative, error bars were omitted (hollow symbol).

2J



3K



3L

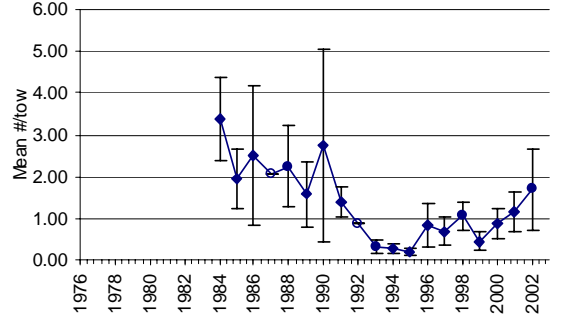
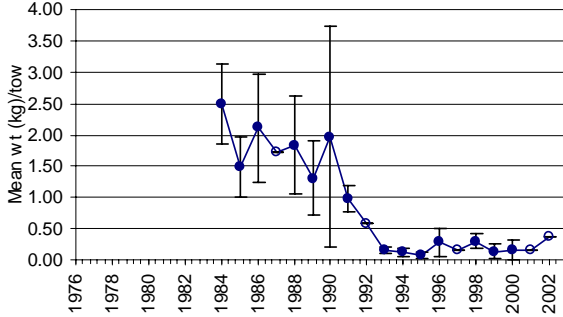


Figure 3b. Mean numbers and weights(kg) per tow for 2J, 3K and 3L fall surveys. Where lower confidence limit was negative, error bars were omitted (hollow symbol).

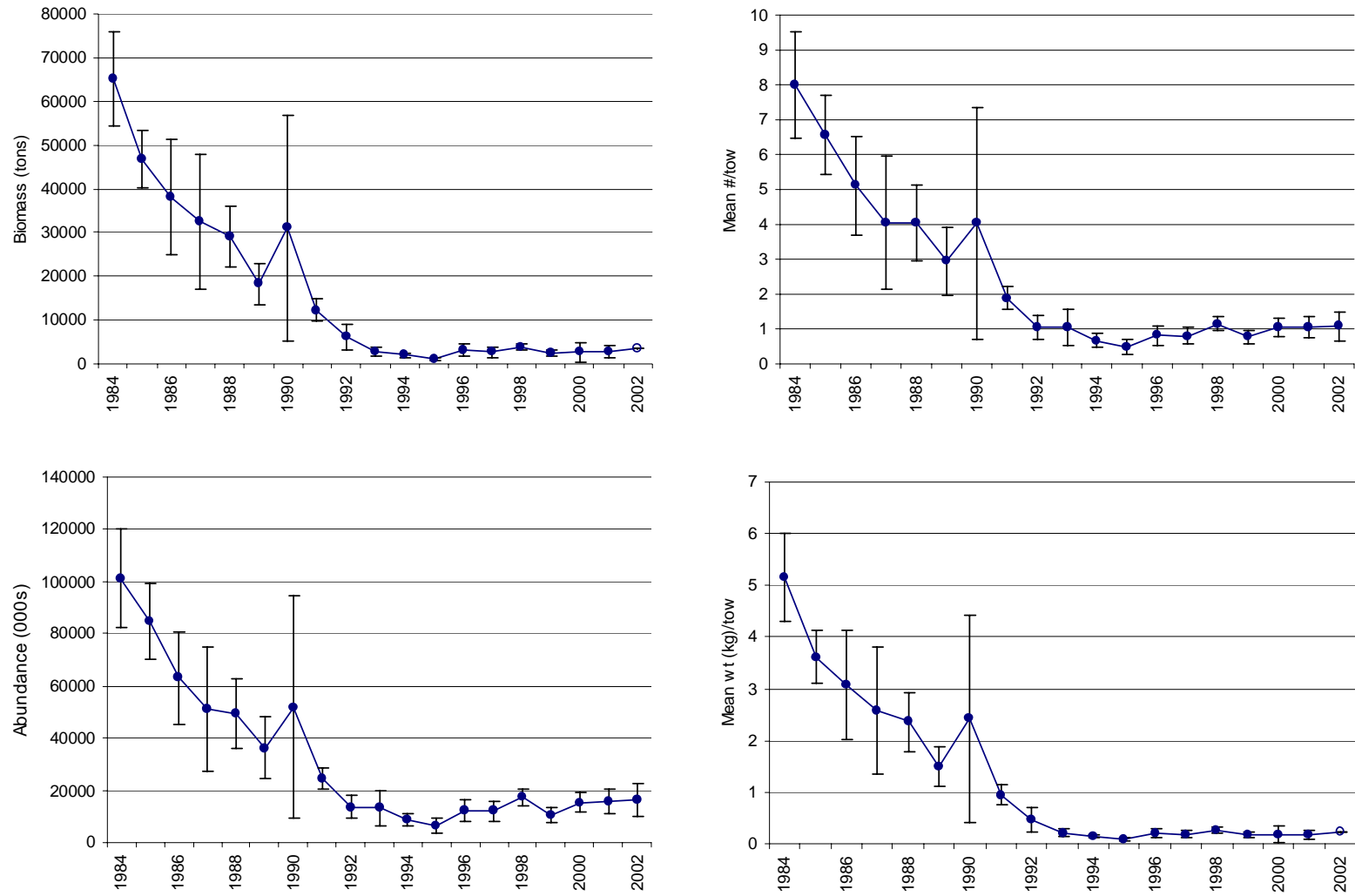


Fig. 4. Biomass (t) and abundance (000s) estimates, mean numbers and weights (kg) per tow, of witch flounder from Canadian fall surveys based on Campelen trawl catch equivalents during 1984-2002.