Northwest Atlantic Fisheries Organization

Serial No. N4664 **NAFO SCR Doc. 02/52**

SCIENTIFIC COUNCIL MEETING – JUNE 2002

Witch Flounder in Divisions 2J, 3K and 3L: a Stock Status Update

by

W. R. Bowering

Dept. of Fisheries and Oceans, Science, Oceans & Environment Branch
P.O. Box 5667 St. John's, NF, Canada A1C 5X1

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 Division 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 1998-2001 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 less than 1 000 tons in 1995, by far the lowest in the time series. A small increase was observed between 1995 and 1996 and 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-1980s, the fishery was conducted by Poland, USSR and Canada (Table 1) mainly in Div. 3K (Table 1; 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.

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 the 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) confirm this distribution pattern remains as indicated by the 2001 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 1995-2001.

For Div. 2J, biomass estimates ranged from as high as 5,900 t in 1986 to a low of less than 300 tons in 1995 with only marginal increases since then with the 2000 estimate still only 500 tons (Table 2; Fig. 3). The estimate of 210 tons in 2001 is the lowest observed.

In Div. 3K, during 1979-85, there was a period of relative stability where most annual biomass estimates were near 50 000 tons (Table 3; Fig. 3). Since that time estimates have declined considerably to less than 200 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. 3).

For Div. 3L, biomass estimates varied generally between 7 000 and 10 000 tons from 1983 to 1990 but declined rapidly since then to a low of less than 400 tons in 1995 (Table 4; Fig. 3). The 1996 estimate increased to nearly 1 800 tons, however, more than half this estimate was based on the inclusion of deepwater 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. 3). 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).

The abundance indices followed similar trends as biomass and are shown in Tables 5-7 for Div. 2J, 3K and 3L, respectively and illustrated in Fig. 3 by Division and Fig. 4; Table 9 for the divisions combined.

For the three Divisions combined, there has been a very steady and rather systematic decline in the biomass index from about 65 000 tons in 1984 to less than 1 000 tons in 1995, by far the lowest in the time series (Fig. 4; Table 8). 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

Bowering, W.R. 1998. Changes in Distribution and Trends in Stock Size of the Witch Flounder Resource in Divisions 2J, 3K and 3L. NAFO SCR Doc. 98/64, Ser. No. N3056: 16p.

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.

Bowering, W.R. 2000. Stock status update of witch flounder in Divisions 2J, 3K and 3L. NAFO SCR Doc. 00/13.

Bowering, W.R. 2001. An update of the Distribution and Population Trends of witch flounder in Divisions 2J, 3K and 3L. NAFO SCR Doc. 01/64, Ser. No. N4442: 14p.

Table 1. Catch statistics by country of witch flounder in Div. 2K, 3K and 3L during 1963-2001. In 1998-2001, some portions of the "Others" catch are from Div.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	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[c]	503
1995[b]	7	-	-	-	-	-	777	784
1996[b]	11	-	-	-	-	-	1371	1382
1997[b]	8	-	-	-	-	-	847	855
1998[b]	-	-	-	-	2	-	1113	1115
1999[b]	2	-	-	-	20	-	278	300
2000[b]	85	-	-	-	6	-	578	669
2001[b]	161	-	-	-	31	-	605	797

[a] Provisional

[b] Estimated. In 2001, 324 tons are estimated for Division 3M.

[c] Spain (SCS Doc. 95/15)

[d] Since 1985 the "Others" category is mainly comprised of EU catches

Table 2. Estimated biomass (tons) of Witch Flounder (M+F) in each stratum from surveys in Div. 2J during fall of 1977-2001. (Engel 145 data converted to Campelen Units for 1977-94).

Year				1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Depth Range	Old Stratum Area (sq. n. mi.)	New Stratum Area (sq. n. mi.)	Stratum																								
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
	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
	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
	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	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	.	0	0	0	0	0	0
	.	778	238	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	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
	1608	680	209	103	14	48	122	0	83	123	19	152	0	0	0	14	0	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	0	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	0	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	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
	1428	2196	228	508	134	301	543	183	678	264	467	79	728	93	123	76	0	44	35	0	0	0	0	0	0	0	0
	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
301 - 400	480	487	203	0	0	0	0	0	54	112	0	0	19	0	0	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	0	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	0	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	0	0	0	0	0	.	2	0	0	0	0	0
	441	450	222	197	99	29	103	155	285	69	26	46	0	0	173	0	10	0	0	0	0	6	0	17	10	0	0
	567	536	229	183	177	118	215	127	139	155	103	52	857	70	145	32	31	28	15	13	0	0	0	0	0	6	4
401 - 500	354	288	204	57	0	38	.	85	125	13	91	0	71	14	42	14	0	0	0	0	.	0	0	0	0	0	0
	268	241	217	0	0	15	0	0	0	0	.	0	54	64	44	6	0	0	0	13	.	7	8	6	0	0	0
	180	158	223	13	0	0	0	37	0	0	31	0	139	116	59	18	18	8	8	14	.	7	5	5	0	.	4
	686	598	227	161	123	44	482	180	358	211	85	147	329	411	203	1837	207	125	132	0	0	0	86	84	125	0	26
	420	414	235	813	0	456	430	502	371	908	517	399	121	168	0	149	37	20	0	41	0	16	3	22	0	0	0
	.	133	240	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	36	19	0	17	16	11	24	11	9
501 - 750	664	557	212	1564	106	640	193	630	1116	1390	822	1253	3139	834	392	639	111	272	44	52	71	96	90	184	261	125	8
	420	362	218	0	0	.	0	0	0	0	.	15	0	44	114	58	13	0	8	19	.	17	10	12	9	4	0
	270	228	224	0	0	0	0	0	0	0	0	0	32	48	120	17	49	33	0	23	.	18	23	16	1	15	13
	237	185	230	0	0	.	15	0	0	0	17	0	57	15	101	771	1711	346	85	105	69	126	176	26	161	36	21
	.	120	239	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	.	0	0	0	0	0	0
751 -1000	213	283	219	.	.	.	.	0	.	0	.	0	0	0	0	0	0	0	15	8	.	13	9	14	0	3	4
	182	186	231	0	0	.	0	.	0	0	0	0	0	0	0	0	457	176	197	118	115	6	36	228	143	283	59
	122	193	236	0	.	.	.	14	0	0	0	0	0	0	9	23	25	51	51	37	.	28	3	11	16	13	38
1001 -1250	324	303	220	.	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10	0	0	.	0	0
	177	195	225	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	2	1	1
	236	228	232	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	23
1251 -1500	286	330	221	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0
	180	201	226	.	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0
	180	237	233	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	6	0	0	0
Biomass (t)				5123	1302	2218	3494	2582	4909	3693	2903	3030	5920	2063	1571	3672	2669	1102	627	462	255	370	465	649	752	497	209

Table 3 Estimated biomass (tons) of Witch Flounder (M+F) in each stratum from surveys in Div. 3K during fall of 1978-2001. (Engel 145 data converted to Campelen Units for 1977-94).

Year Depth Range	Old Stratum Area (sq. n. mi.)	New Stratum Area (sq. n. mi.)	Stratum	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
101 - 200	.	798	608	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	0	0
	.	445	612	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	0	0
	.	250	616	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	0	0
	1455	1347	618	.	.	.	.	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1588	1753	619	.	.	.	.	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201 - 300	.	342	609	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	0	0
	.	573	611	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	0	0
	.	251	615	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	1	0
	2709	2545	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	2537	621	1051	3719	498	424	250	788	329	445	26	62	0	63	0	0	0	0	0	0	0	0	1	0	0	0
	668	1105	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
	447	.	632	395	591	230	524	408	447	.	210	89	34	38	82	0	3	8	.	.	.	.	.	.	.	.	.
	1618	1555	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	1274	635	1636	1887	1443	1481	833	538	2211	775	15	136	338	166	21	0	31	0	0	1	0	46	17	0	6	0
	1455	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	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
301 - 400	.	256	610	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	0	3	.	1	1
	.	263	614	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	1	1
	.	593	617	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	4	13	0	0	0
	1027	494	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	888	625	864	2238	988	1580	491	1588	1417	1101	50	165	104	12	0	0	0	0	0	3	4	0	7	2	0	2
	919	1113	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	1085	628	2454	6077	3512	1379	2431	4882	2070	2324	954	523	39	214	0	0	20	0	0	0	0	0	0	5	12	3
	499	495	629	1722	1617	2520	1745	958	2253	1016	998	225	510	196	63	66	0	10	3	6	4	2	2	8	18	14	1
	544	332	630	1048	730	850	981	.	727	549	363	168	182	155	28	0	0	11	18	0	0	7	1	0	3	5	8
	2179	2067	633	2190	2876	3722	1402	2399	2661	3093	2073	1599	1105	1932	1186	365	162	117	94	47	3	33	39	74	21	26	13
	2059	2059	638	3316	8711	4695	5840	3430	4381	8608	7033	8275	5506	7318	3393	327	340	91	81	4	4	5	17	79	60	79	75
	1463	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
401 - 500	.	30	613	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	3	0
	632	691	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	1255	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	1321	631	2274	2264	2534	7736	1010	5887	6448	4570	2929	1553	598	358	73	338	313	63	280	77	7	85	80	16	66	18
	198	69	640	51	.	177	62	411	.	436	1074	1669	2280	1347	1145	176	184	18	0	0	.	8	3	10	0	12	14
	204	216	645	12	.	0	12	341	281	1519	238	.	3079	571	252	991	99	15	15	8	0	18	15	3	23	7	9
		134	650	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	21	4	.	9	17	20	25	.	15
501 - 750	584	230	641	0	0	39	82	72	171	0	813	.	1657	.	.	11071	937	0	12	8	9	45	36	108	114	.	162
	333	325	646	0	0	68	14	25	615	94	108	.	102	.	.	275	173	49	36	79	3	431	42	40	36	173	118
		359	651	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	25	23	.	52	202	127	179	.	447
751 -1000	931	418	642	0	.	79	0	36	.	131	89	.	83	.	.	2497	1213	790	81	65	.	7	0	6	35	208	11
	409	360	647	0	0	0	0	0	.	.	26	.	.	.	.	390	724	198	67	108	.	50	118	103	193	0	280
	.	516	652	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	266	154	.	149	382	408	39	412	112
1001 -1250	1266	733	643	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	12	18	0
	232	228	648	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0
	.	531	653	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	429	.	.	0	0	0	12	0	18
1251 -1500	954	474	644	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0
	263	212	649	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0
	.	479	654	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	4	0	0	0
Total biomass (t)				30353	49789	44962	43405	32429	49250	49038	35694	21359	21746	18110	8976	17088	4272	1863	1327	846	184	855	1116	1255	881	1200	1427

Table 4. Estimated biomass (tons) of Witch Flounder (M+F) per stratum from surveys in Div. 3L during fall of 1983-2001 (Engel 145 data converted to Campelen Units for 1983-94).

Year				1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Depth Range	Old Stratum Area (sq. n. mi.)	New Stratum Area (sq. n. mi.)	Stratum																			
274-366	.	81	800	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	24
30 - 56	.	268	784	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	1	0
57 - 92	2071	2071	350	0	136	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1780	1780	363	0	85	0	50	0	0	0	264	33	41	0	0	0	0	0	0	0	0	0
	1121	1121	371	0	46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2460	2460	372	0	144	0	0	0	16	0	38	8	0	0	0	27	0	0	0	0	0	0
	1120	1120	384	120	98	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	465	785	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	0	0
93 - 183	1519	1519	328	.	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1574	1574	341	0	230	0	0	34	34	0	0	0	0	0	0	0	0	0	1	0	0	0
	585	585	342	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	525	525	343	0	84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2120	2120	348	26	334	0	0	0	44	0	0	0	0	.	0	0	0	0	0	0	1	0
	2114	2114	349	0	306	0	155	0	36	0	145	0	0	0	0	0	0	0	0	0	2	0
	2817	2817	364	50	202	0	143	0	39	0	27	0	0	0	0	0	0	0	0	0	0	0
	1041	1041	365	0	100	0	68	29	18	0	0	36	0	0	0	0	0	0	0	0	.	0
	1320	1320	370	0	190	0	0	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2356	2356	385	0	340	0	79	58	27	0	0	0	0	0	0	0	0	0	0	0	0	0
	1481	1481	390	0	159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	84	786	.	.	.	.	.	.	.	.	.	.	.	.	.	1	0	0	.	0	1
	.	613	787	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	0	0
	.	261	788	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	0	0
	.	89	790	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	1	.	0	1
	.	72	793	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	0	0
	.	216	794	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	.	0
	.	98	797	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	0	0
	.	72	799	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	0	0
184 - 274	1494	1582	344	159	159	37	29	127	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	983	983	347	41	467	0	42	0	154	66	0	0	0	0	0	0	0	0	0	0	0	4
	1394	1394	366	0	186	355	307	171	110	187	27	0	7	0	0	0	0	0	0	0	0	0
	961	961	369	181	374	570	706	320	1061	429	473	162	0	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	0
	821	821	389	.	196	133	760	250	138	21	79	0	27	0	0	38	0	0	0	0	11	0
	282	282	391	0	0	32	0	9	0	0	0	70	22	0	0	36	0	25	0	0	0	0
	.	164	795	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	0	0
	.	72	789	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	0	0
	.	227	791	.	.	.	.	.	.	.	.	.	.	.	.	.	6	0	0	.	0	0
	.	100	798	.	.	.	.	.	.	.	.	.	.	.	.	.	0	2	21	.	3	23
275 - 366	1432	1432	345	5808	4484	1227	617	3693	2099	2358	750	0	61	73	0	10	3	5	35	3	5	0
	865	865	346	2134	1423	2240	3321	1201	1823	1287	1863	203	40	14	0	0	12	3	1	20	16	8
	334	334	368	.	47	29	386	23	64	144	106	39	14	0	0	22	0	0	0	0	6	0
	718	718	387	.	169	404	276	572	1775	1546	3668	159	52	32	12	63	8	2	0	5	38	4
	361	361	388	.	1229	48	.	589	92	126	0	125	173	0	14	0	0	0	12	0	5	17
	145	145	392	17	55	13	20	50	13	0	0	0	0	0	4	0	0	0	0	0	0	14
	.	175	796	.	.	.	.	.	.	.	.	.	.	.	.	.	0	1	2	.	0	4
367 - 549	186	186	729	.	146	127	280	.	.	.	48	274	246	42	131	2	151	24	0	0	1	13
	216	216	731	.	498	248	.	.	.	.	465	178	356	38	79	19	.	0	7	19	16	4
	468	468	733	.	328	1164	.	.	.	.	1618	2110	610	183	60	24	12	0	41	54	62	50
	272	272	735	.	367	34	1714	.	.	.	.	222	216	40	12	3	20	23	18	12	3	3
	.	50	792	.	.	.	.	.	.	.	.	.	.	.	.	.	55	37	11	.	29	54
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	207
	228	228	734	.	30	184	.	.	.	.	168	100	11	106	49	37	127	15	149	95	47	17
	175	175	736	546	.	268	709	.	.	.	355	913	90	70	20	10	261	41	135	93	415	185
732 - 914	.	227	737	.	.	.	.	.	.	.	.	.	.	.	.	.	130	104	435	151	11	124
	.	223	741	.	.	.	.	.	.	.	.	.	.	.	.	.	115	164	313	7	0	3
	.	348	745	.	.	.	.	.	.	.	.	.	.	.	.	.	154	212	123	65	0	0
	.	159	748	.	.	.	.	.	.	.	.	.	.	.	.	.	87	0	0	40	0	0
915 -1097	.	221	738	.	.	.	.	.	.	.	.	.	.	.	.	.	331	127	24	0	0	7
	.	206	742	.	.	.	.	.	.	.	.	.	.	.	.	.	31	3	9	0	0	0
	.	392	746	.	.	.	.	.	.	.	.	.	.	.	.	.	120	126	0	0	0	0
	.	126	749	.	.	.	.	.	.	.	.	.	.	.	.	.	33	29	0	.	0	0
1098 -1280	.	254	739	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0
	.	211	743	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0
	.	724	747	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	107	0	0	0
	.	556	750	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0
1281 -1463	.	264	740	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0
	.	280	744	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	0	0
	.	229	751	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	0	0
Biomass >731 m																	1002	765	1011	262	1	7
Percent >731 m																	55.4	70.3	53.1	31.8	0.1	0.7
Biomass (tons)				9082	13210	7881	10743	8679	9294	6606	10341	5274	3131	778	663	390	1806	1087	1903	826	968	1042

Table 5. Abundance (000s) per stratum of Witch flounder (M+F) from research vessel surveys in Div. 2J during fall 1977-2001 (Engel data converted to Campelen Units for 1977-94).

Year Depth Range (meters)	Old Stratum Area (sq. n. mi.)	New Stratum Area (sq. n. mi.)	Stratum	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
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	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	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	.	0	0	0	0	0	0
	.	778	238	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	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
	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	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	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	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	0	0
	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	0	33	0	0	22	0	0	0	0	0	.	0	0	0	0	0	0
	448	588	208	339	62	139	508	154	924	123	144	966	123	0	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	0
	384	360	216	0	0	40	40	106	106	123	0	0	79	26	26	26	0	0	0	0	0	.	25	0	0	0	0	0
	441	450	222	303	182	46	152	212	465	101	40	61	0	0	394	61	0	20	0	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	0	37	33
401 - 500	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
	268	241	217	0	0	18	0	0	0	0	.	0	74	92	74	92	18	0	0	0	155	.	33	66	31	0	0	0
	180	158	223	12	0	0	0	37	0	0	50	0	248	161	124	111	37	66	33	76	145	.	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	0	206
	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	0	0
	.	133	240	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	348	140	0	146	55	45	137	37	76
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	460	68
	420	362	218	0	0	.	0	0	0	0	.	29	0	58	173	144	87	29	0	100	199	.	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	.	78	141	84	16	94	72
	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	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	.	0	0	0	0	0	0
751 -1000	213	283	219	.	.	.	.	0	.	0	.	0	0	0	0	0	0	0	0	156	58	.	58	39	78	0	17	16
	182	186	231	0	0	.	0	.	0	0	0	0	0	0	0	.	0	939	401	512	375	563	26	90	832	461	1011	205
	122	193	236	0	.	.	.	25	0	0	0	0	0	0	8	.	59	34	151	199	159	.	133	13	38	66	80	173
1001 -1250	324	303	220	.	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	42	0	0	.	0	0
	177	195	225	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	13	13	12
	236	228	232	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	63
1251 -1500	286	330	221	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0
	180	201	226	.	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0
	180	237	233	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	23	0	0	0
Abundance (000's)				7106	1962	3016	4503	3190	6486	4963	3840	4089	9432	3337	2746	5377	8110	6941	2463	2588	2369	1696	1724	1890	2505	2548	1964	1096

Table 6. Abundance (000s) per stratum of Witch flounder (M+F) from research vessel surveys in Div. 3K during fall 1978-2001 (Engel data converted to Campelen Units for 1978-94)..

Year				1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Depth Range (meters)	Old Stratum Area (sq. n. mi.)	New Stratum Area (sq. n. mi.)	Stratum																								
101 - 200	.	798	608	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	0	0
	.	445	612	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	31	0
	.	250	616	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	0	0
	1455	1347	618	.	.	.	.	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1588	1753	619	.	.	.	.	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
201 - 300	.	342	609	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	0	0
	.	573	611	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	0	0
	.	251	615	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	17	0
	2709	2545	620	963	1975	621	149	166	112	115	80	124	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2859	2537	621	1999	5149	696	286	169	688	253	393	28	66	0	486	0	0	0	0	0	0	0	0	187	0	0	0
	668	1105	624	525	230	161	597	459	184	368	161	92	31	0	0	23	0	0	22	0	0	0	30	0	57	30	30
	447	.	632	553	769	261	646	512	492	.	225	92	31	31	61	0	6	57	.	.	.	.	.	.	.	.	.
	1618	1555	634	841	835	1272	668	911	223	890	544	267	283	482	254	0	0	240	13	0	0	0	0	0	0	0	0
	1274	1274	635	1694	1906	1782	1577	876	584	2432	1127	29	146	456	175	29	0	58	0	0	29	0	70	105	0	80	0
	1455	1455	636	1716	1716	1887	1168	961	634	2927	976	400	486	767	240	29	0	0	0	0	29	33	67	0	0	0	71
	1132	1132	637	1609	3292	1972	2362	2380	4765	3530	3315	740	960	195	156	0	0	52	52	0	0	0	31	62	145	.	31
301 - 400	.	256	610	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	104	18	53	.	35	55
	.	263	614	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	36	18	0	.	163	36
	.	593	617	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	41	0	27	51	0	0	0
	1027	494	623	871	989	871	742	480	871	565	918	283	537	311	47	0	0	0	0	0	0	0	0	0	0	0	0
	850	888	625	1579	3976	1462	2572	585	2222	2081	1684	78	322	292	88	0	0	0	0	0	41	24	0	31	31	0	35
	919	1113	626	8849	11251	10644	1593	6928	4867	2866	1618	63	582	126	329	0	0	42	0	0	0	0	122	0	575	364	306
	1085	1085	628	3603	8358	5249	1841	3433	6567	2708	4229	1692	896	269	634	0	0	149	0	0	27	0	30	0	179	269	114
	499	495	629	3032	3672	4915	2792	1476	3638	1373	2094	526	732	755	412	103	0	46	182	136	306	34	34	68	375	280	45
	544	332	630	2769	1347	1123	1310	.	898	798	917	299	274	249	125	0	0	25	30	0	0	46	46	23	114	101	15
	2179	2067	633	2964	3897	4526	2098	2955	3047	3627	2848	3560	1853	3485	3687	1063	360	552	600	57	67	221	284	348	63	190	135
	2059	2059	638	6833	15200	9725	9559	5910	6849	14417	12385	11330	7534	11400	5047	535	612	317	368	13	78	150	157	661	602	1020	617
	1463	1463	639	2013	1157	2650	2013	1429	4025	5459	2792	2382	1236	3321	503	489	67	24	0	226	115	34	101	168	0	0	0
401 - 500	.	30	613	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	4	14	.	220	14
	632	691	622	2652	1942	3347	1608	1130	2260	978	1934	696	1478	203	290	130	58	261	238	0	28	23	32	95	0	63	158
	1184	1255	627	6026	11618	12948	22938	18544	22232	18690	17311	7753	3882	7199	6271	1955	434	271	3625	367	792	127	1343	2244	660	2013	773
	1202	1321	631	8515	5677	6338	13261	1819	8863	12666	11433	8019	3417	2563	1819	276	2563	2260	727	2453	537	178	569	485	84	628	314
	198	69	640	109	.	232	82	463	.	572	1716	2465	4018	2274	1648	245	245	91	0	0	.	38	19	62	5	47	138
	204	216	645	14	.	0	14	412	295	2021	393	.	5837	1109	463	2357	196	47	188	119	0	149	45	13	104	74	110
	.	134	650	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	25	5	.	28	147	313	179	.	166
501 - 750	584	230	641	0	0	80	161	60	241	0	1004	.	2437	.	.	17031	1366	0	53	74	79	253	190	506	378	.	791
	333	325	646	0	0	46	23	46	710	92	122	.	115	.	.	527	366	290	209	462	22	2209	156	156	156	797	536
	.	359	651	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	49	111	.	444	771	444	571	.	1552
751 -1000	931	418	642	0	.	64	0	43	.	128	128	.	128	.	.	4013	2177	1089	383	173	.	29	0	29	173	597	33
	409	360	647	0	0	0	0	0	.	.	38	.	.	.	.	534	1594	506	281	264	.	173	198	272	743	0	867
	.	516	652	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	899	355	.	745	1207	1526	177	887	238
1001 -1250	1266	733	643	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	34	45	0
	232	228	648	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0
	.	531	653	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	974	.	.	0	0	0	37	0	37
1251 -1500	954	474	644	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0
	263	212	649	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0
	.	479	654	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	38	0	0	0
Abundance (000's)				59729	84954	72871	70058	52145	75267	79554	70384	40917	37279	35486	22734	29338	10045	6377	8918	4815	2191	5081	5716	7955	5441	7952	7220

Table 7 Abundance (000s) per stratum of Witch flounder (M+F) from research vessels in Div. 3L during the fall 1984-2001 (Engel data converted to Campelen Units for 1984-94).

Year				1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Depth Range (meters)	Old Stratum Area (sq. n. mi.)	New Stratum Area (sq. n. mi.)	Stratum																		
274-366	.	81	800	.	.	.	.	.	.	.	.	.	.	.	.	.	.	178	.	.	953
30 - 56	.	268	784	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	74	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	0	44	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	0	0	.	0	32
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	0	43	0	0	0
	585	585	342	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0
	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
	2114	2114	349	291	0	162	0	32	0	166	0	0	0	0	0	0	42	0	0	42	0
	2817	2817	364	271	0	155	0	55	0	32	0	0	0	0	0	0	0	43	43	0	43
	1041	1041	365	143	0	57	48	29	0	0	48	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
	.	613	787	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	0	0
	.	261	788	.	.	.	.	.	.	.	.	.	.	.	.	0	0	18	.	18	0
	.	89	790	.	.	.	.	.	.	.	.	.	.	.	.	6	18	55	.	0	37
	.	72	793	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	0	0
	.	216	794	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	.	0
	.	98	797	.	.	.	.	.	.	.	.	.	.	.	.	7	0	0	.	0	0
	.	72	799	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	0	0
184 - 274	1494	1582	344	206	46	117	154	0	0	0	0	0	0	0	0	0	0	0	0	64	0
	983	983	347	586	0	34	0	135	108	0	0	0	0	0	0	0	0	0	0	0	45
	1394	1394	366	157	362	431	219	110	164	32	0	8	0	0	0	0	38	0	38	0	0
	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	0
	821	821	389	169	158	875	226	169	28	75	0	38	0	0	33	0	0	0	0	301	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
	.	72	789	.	.	.	.	.	.	.	.	.	.	.	.	0	5	5	.	22	5
	.	227	791	.	.	.	.	.	.	.	.	.	.	.	.	42	62	0	.	0	28
	.	100	798	.	.	.	.	.	.	.	.	.	.	.	.	7	7	172	.	135	530
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	0	7	0	0	0	0	0	16
	.	175	796	.	.	.	.	.	.	.	.	.	.	.	.	0	107	24	.	21	638
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	1610	.	.	.	.	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
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	.	.	.	.	.	.	.	.	.	.	.	.	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	.	.	.	.	.	.	.	.	.	.	.	.	532	347	56	0	0	14
	.	206	742	.	.	.	.	.	.	.	.	.	.	.	.	43	14	14	13	0	0
	.	392	746	.	.	.	.	.	.	.	.	.	.	.	.	216	168	0	0	27	0
	.	126	749	.	.	.	.	.	.	.	.	.	.	.	.	61	43	0	.	0	0
1098 -1280	.	254	739	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0
	.	211	743	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0
	.	724	747	.	.	.	.	.	.	.	.	.	.	.	.	0	0	100	0	0	0
	.	556	750	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0
1281 -1463	.	264	740	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0
	.	280	744	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	.	0	0
	.	229	751	.	.	.	.	.	.	.	.	.	.	.	.	0	14	0	.	0	0
Abundance (000's)				17914	10401	12839	10500	11269	8002	14453	7428	4748	1572	1428	865	5297	4227	6754	2655	5361	7316

Table 8. Estimates of biomass (tons) of witch flounder from Canadian fall surveys in Div. 2J, 3K and 3L during 1977-2001.

YEAR	DIV. 2J	DIV. 3K	DIV. 3L	TOTAL
1977	5123			
1978	1302	30353		
1979	2218	49789		
1980	3494	44962		
1981	2582	43405		
1982	4909	32429		
1983	3693	49250		
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	255	184	390	828
1996	370	855	1806	3031
1997	465	1116	1087	2669
1998	649	1255	1906	3810
1999	752	881	826	2459
2000	497	1200	468	2165
2001	209	1427	1042	2678

Table 9. Estimates of abundance (000s) of witch flounder from Canadian fall surveys in Div. 2J, 3K and 3L during 1977-2001.

YEAR	DIV. 2J	DIV. 3K	DIV. 3L	TOTAL
1977	7106			
1978	1962	59729		
1979	3016	84954		
1980	4503	72871		
1981	3190	70058		
1982	6486	52145		
1983	4963	75267		
1984	3840	79554	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	36113
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	1696	2191	865	4753
1996	1724	5081	5297	12102
1997	1890	5716	4227	11833
1998	2505	7955	6755	17215
1999	2548	5441	2655	10644
2000	1964	7952	5361	15277
2001	1096	7220	7316	15632

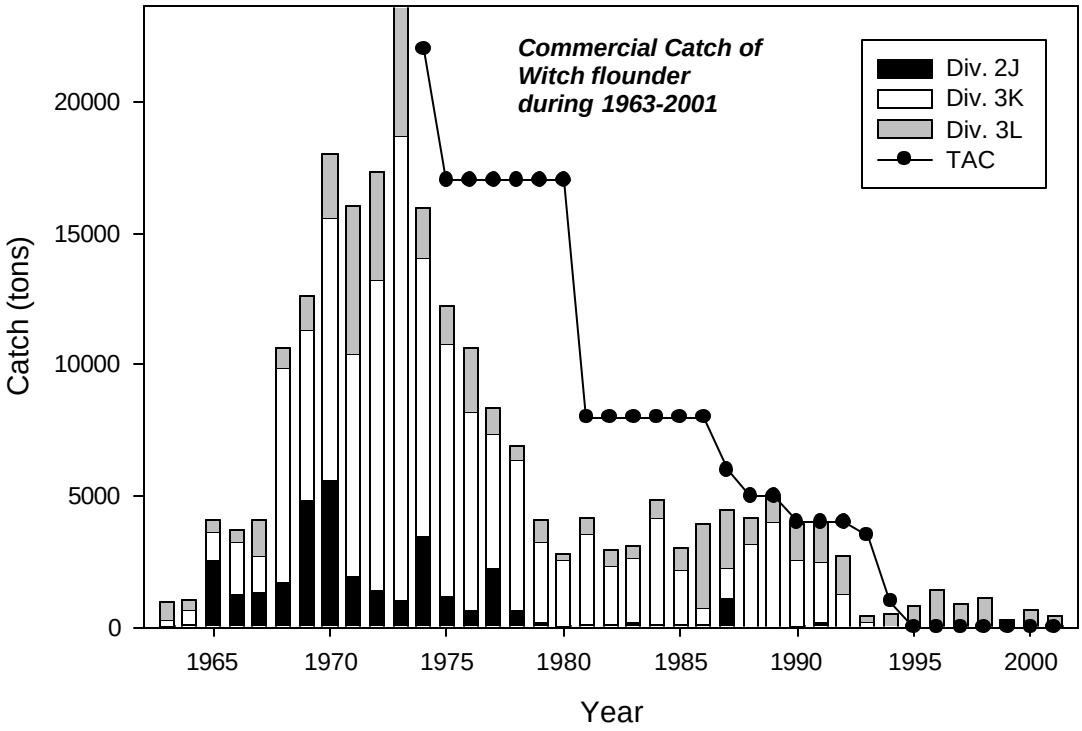

Fig. 1 Commercial catches and TAC's of witch flounder in Divisions 2J, 3K and 3L during 1963-2001. Catches in Division 3M are included for 1998-2000. Although not included, the estimated catch in Division 3M for 2001 was 324 tons.

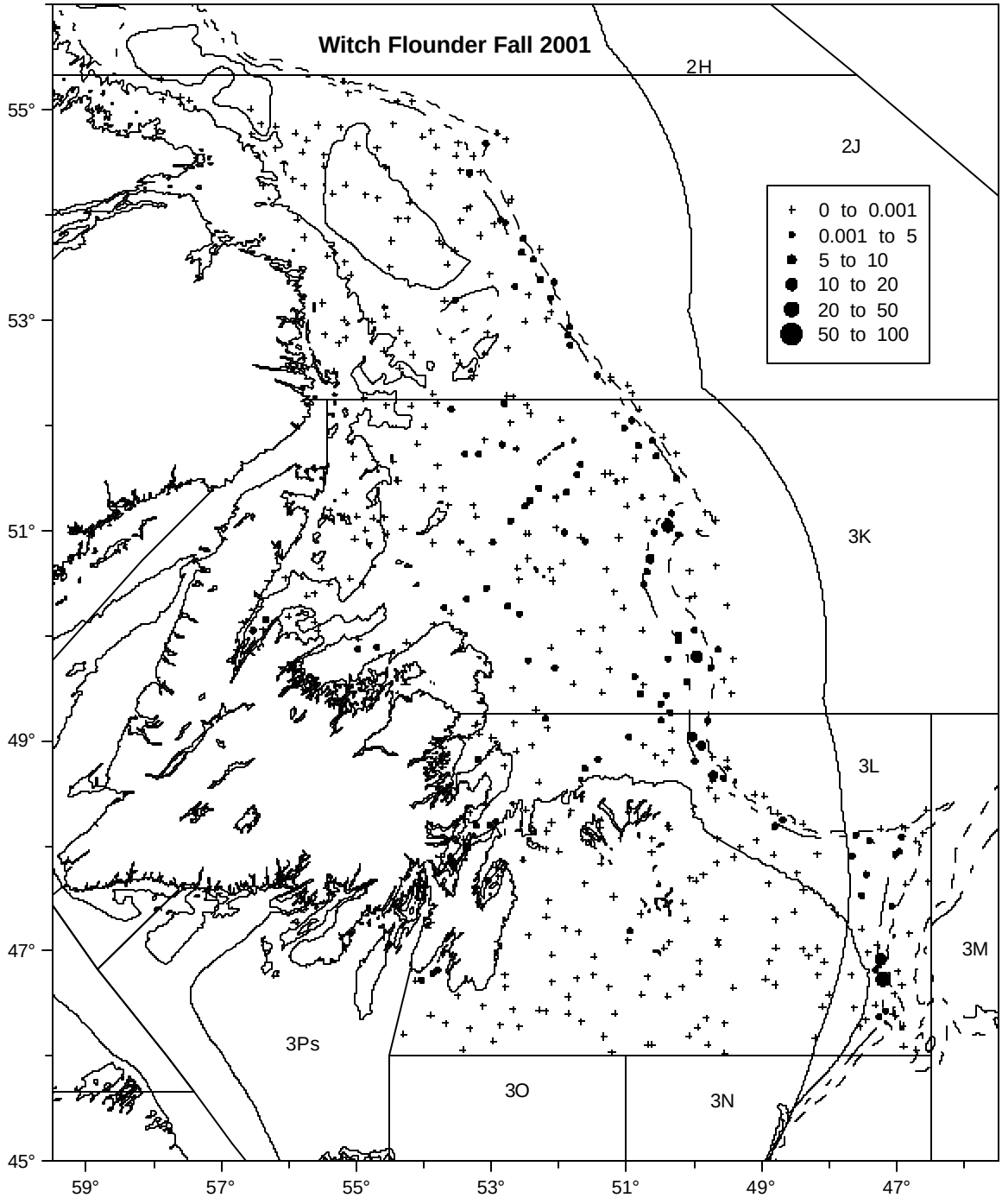

Fig. 2 Weight (kg) per set of Witch flounder from Canadian surveys in NAFO Divisions 2J, 3K and 3L during fall 2001 .

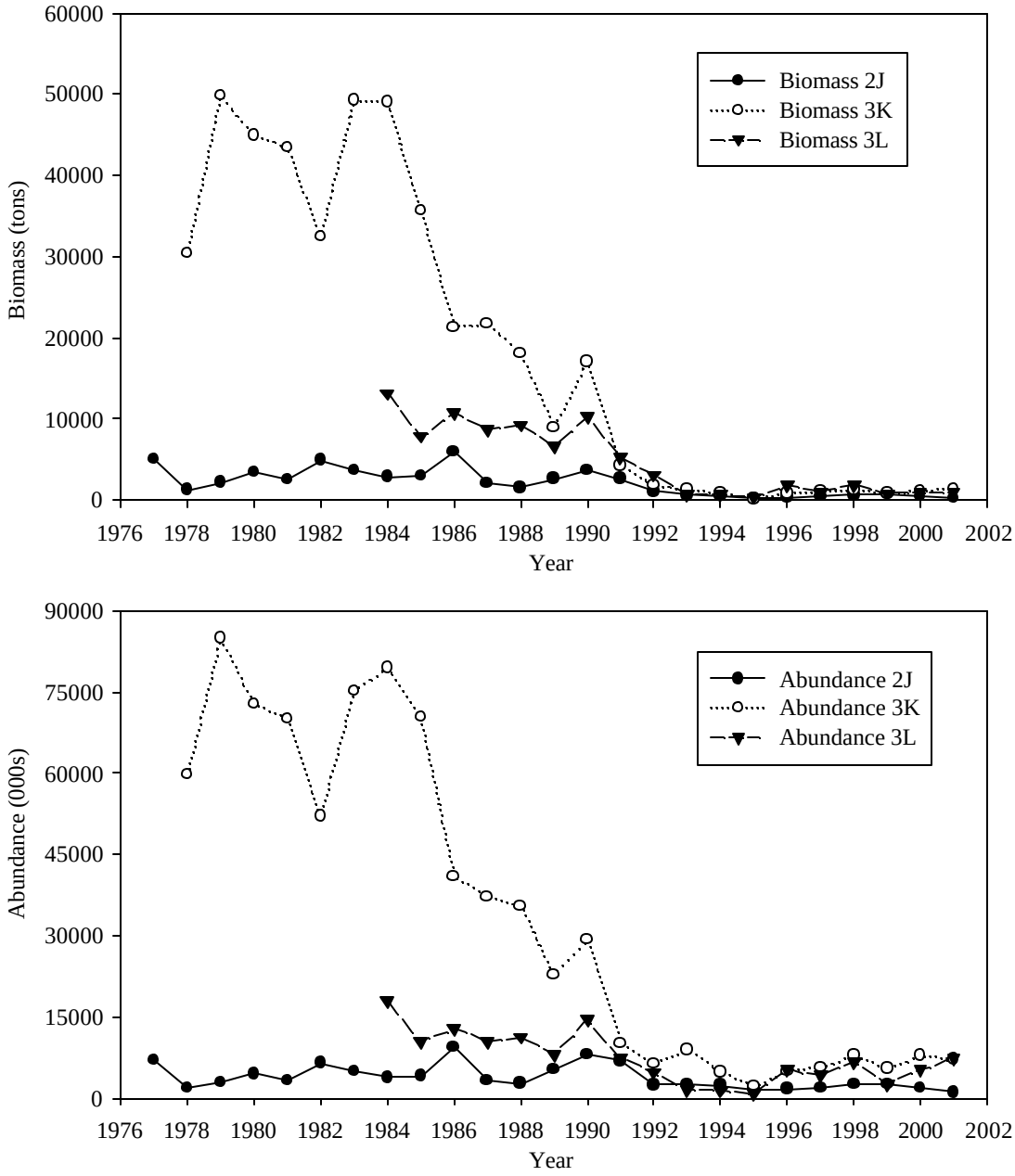

Fig. 3 Biomass (tons) and abundance (000s) of witch flounder by division from Canadian surveys in Div. 2J, 3K and 3L during 1977-2001. Data based on Campelen trawl catch equivalents.

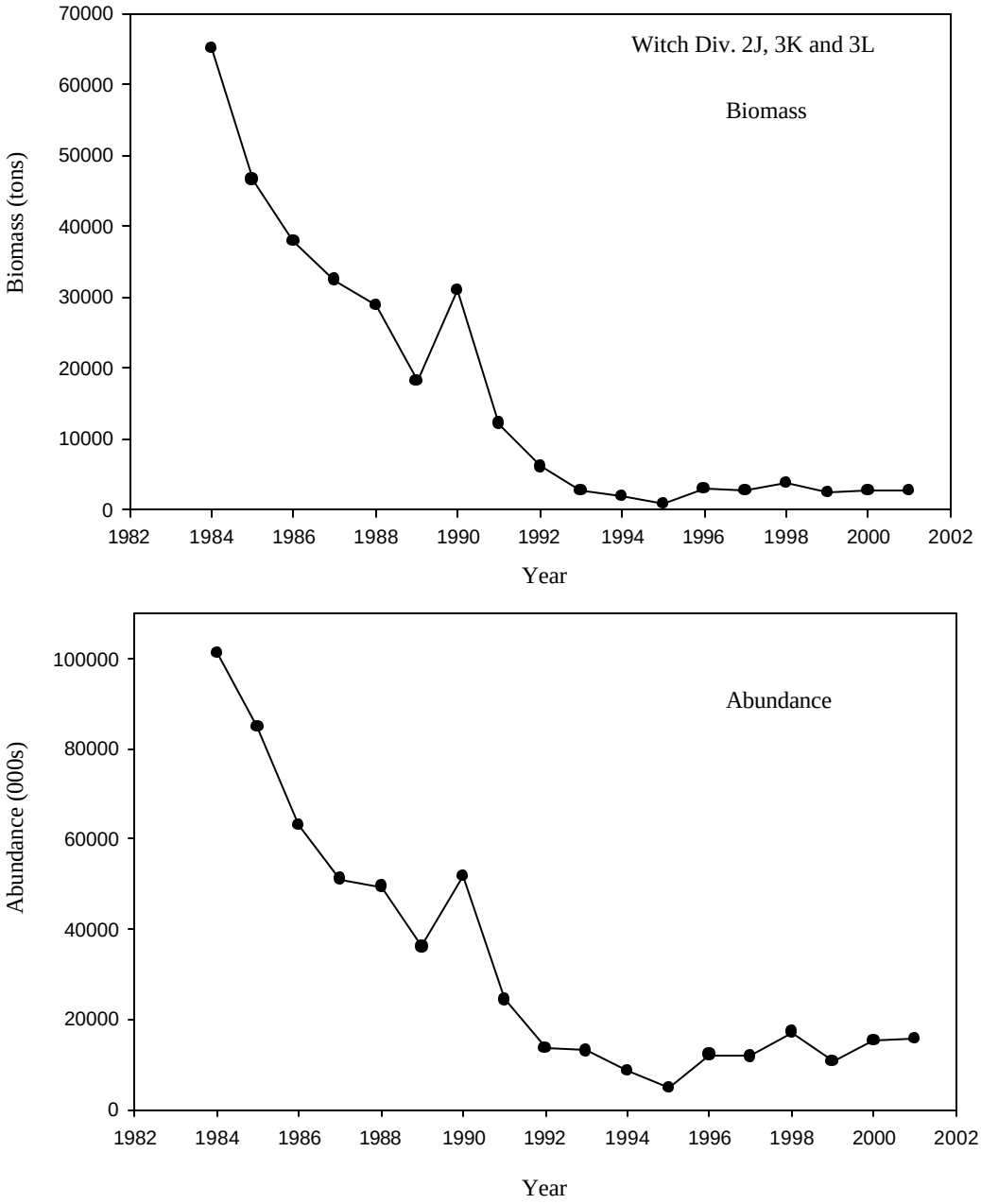

Fig. 4 Biomass (tons) and abundance (000s) of Divisions 2J, 3K and 3L combined, of witch flounder from Canadian fall surveys based on Campelen trawl catch equivalents during 1984-2001.