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# Distribution and Abundance of Witch Flounder in Divisions 2J, 3K and 3L

by

W. R. Bowering

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

## Abstract

Canadian fall survey distribution data from the late 1970's and early 1980's indicated that witch flounder were widely distributed throughout the shelf area in deeper channels around the fishing banks primarily in Div. 3K. By the mid 1980's, however, they were rapidly disappearing and by the early 1990's had virtually disappeared from the area entirely except for some very small catches along the slope and more to the southern area. 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 1998 surveys confirm that this distribution remains. 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 1000 tons in 1995, by far the lowest in the time series. A small increase observed during 1996-98 was almost exclusively a result of inclusion of the deeper strata surveyed in Division 3L. Nevertheless, the current level of stock size is still extremely low compared to the early 1980's.

## Fisheries and Management

The fishery for witch in this area began in the early 1960's and increased steadily from about 1,000 t in 1963 to a peak of over 24,000 t in 1973 (Table 1; Fig. 1). Catches declined rapidly to 2,800 t by 1980 and subsequently fluctuated between 3,000 and 4,500 t to 1991. The catch in 1992 declined to about 2,700 t, the lowest since 1964, and further declined to around 400 t by 1993 (Table 1). Until the late 1980's, the fishery was conducted 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-1980's. Although only 12 t were reported for 1994, a catch of 491 t was indicated for Spain in the Spanish Research Report (SCS Doc. 95/15) for the Regulatory Area of Div. 3L. In 1995 and 1996 total catches were estimated to be about 780 and 1370 tons, respectively. However, it is believed that these catches could be overestimated by 15-20% because of misreported Greenland halibut. The catches in 1997 and 1998 were estimated to be about 850 and 1100 tons, respectively most of which was reported from the NAFO Regulatory Area of Div. 3L.

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. The fishery during the winter of 1993 was very poor with the best catch rates occurring in depths greater than 1400 m. As the season progressed, catch rates quickly declined until they became too low for economic viability and the fishery was curtailed. Similar observations were made during the winter of 1994, only more extreme, which caused the catch in 1994 to be virtually nothing. No directed fishing by Canada has been permitted since then.

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 1999.

## 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 (ACON plots) (SCR Doc. 98/64) and won't be repeated here. Survey distribution data from the late 1970's and early 1980's indicated that witch flounder were widely distributed throughout the shelf area in deeper channels around the fishing banks primarily in Div. 3K. By the mid 1980's, however, they were rapidly disappearing and by the early 1990's had virtually disappeared from the area entirely except for some very small catches along the slope and more to the southern area. 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 latest results from the fall 1998 surveys confirm that this distribution remains (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 1995-97 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 1995-98.

For Div. 2J, biomass estimates ranged from as high as 5,900 t in 1986 to a low of less than 300 t in 1994 and remained at a very low level since then (Table 2; Fig. 3). In Div. 3K, during 1979-85, there was a period of relative stability where most annual biomass estimates were near 50,000 t (Table 3; Fig. 3). Since that time estimates have declined considerably to less than 200 t in 1995, the lowest in the time series. Estimates increased slightly since 1996 with the 1998 estimate just over 1200 tons (Table 3; Fig. 3). For Div. 3L, biomass estimates varied generally between 7,000 and 10,000 t from 1983 to 1990 but declined rapidly since then to a low of less than 400 t in 1995 (Table 4; Fig. 3). The 1996 estimate increased to nearly 1800 t, however, more than half this estimate was based on the inclusion of deep water strata (at depths of 732-1097 m) that weren't surveyed previously (Table 4). The 1997 estimate then declined to 1100 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 abundance indices followed similar trends as biomass and are shown in Tables 5-7 for Divisions 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 1000 tons in 1995, by far the lowest in the time series (Fig. 4; Table 8). The small increase during 1996-98 was almost exclusively a result of inclusion of the deeper strata in Division 3L. Nevertheless, the current level of stock size is still extremely low compared to the early 1980's.

## 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 1980's 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.

Table 1. Catch statistics by country of witch flounder in Divisions 2K, 3K and 3L during 1963-98.

| 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[a] | 12 | - | - | - | - | - | 491[c] | 503 |
| 1995[b] | 7 | - | - | - | - | - | 777 | 784 |
| 1996[b] | 11 | - | - | - | - | - | 1371 | 1382 |
| 1997[b] | 8 | - | - | - | - | - | 847 | 855 |
| 1998[b] | - | - | - | - | - | - | 1113 | 1113 |

[a]Provisional

[b]Estimated

[c]Spain (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 1977-1998.
(Engel 145 data converted to Campelen Units for 1977-94).

| Year | | | | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth Range | Old Stratum | New Stratum | Stratum | | | | | | | | | | | | | | | | | | | | | | |
| | Area (sq. n. mi.) | Area (sq. n. mi.) | | | | | | | | | | | | | | | | | | | | | | | |
| 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 |
| 101 - 200 | 1823 | 1594 | 205 | 0 | 0 | 0 | 0 | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 |
| 101 - 200 | 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 |
| 101 - 200 | 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 |
| 101 - 200 | . | 733 | 237 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | . | 0 | 0 | 0 |
| 101 - 200 | . | 778 | 238 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 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 |
| 201 - 300 | 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 |
| 201 - 300 | 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 |
| 201 - 300 | 1725 | 1583 | 213 | 265 | 249 | 160 | 298 | 280 | 371 | 197 | 118 | 102 | 130 | 98 | 21 | 56 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| 201 - 300 | 1171 | 1341 | 214 | 193 | 54 | 0 | 58 | 65 | 122 | 74 | 21 | 106 | 71 | 0 | 16 | 14 | 19 | 0 | 0 | 0 | 0 | . | 0 | 0 | 0 |
| 201 - 300 | 1270 | 1302 | 215 | 193 | 33 | 11 | 0 | 82 | 67 | 0 | 45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | . | 0 | 0 | 0 |
| 201 - 300 | 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 |
| 201 - 300 | 508 | 530 | 234 | 0 | 35 | 36 | 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 | 20 | 0 | 0 | 0 | 0 | 0 | . | 0 | 0 | 0 |
| 301 - 400 | 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 |
| 301 - 400 | 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 |
| 301 - 400 | 384 | 360 | 216 | 0 | 0 | 27 | 42 | 56 | 63 | 85 | 0 | 0 | 54 | 13 | 10 | 16 | 0 | 0 | 0 | 0 | 0 | . | 2 | 0 | 0 |
| 301 - 400 | 441 | 450 | 222 | 197 | 99 | 29 | 103 | 155 | 285 | 69 | 26 | 46 | 0 | 0 | 173 | 46 | 0 | 10 | 0 | 0 | 0 | 0 | 6 | 0 | 17 |
| 301 - 400 | 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 |
| 401 - 500 | 354 | 288 | 204 | 57 | 0 | 38 | . | 85 | 125 | 13 | 91 | 0 | 71 | 14 | 42 | 58 | 14 | 0 | 0 | 0 | 0 | . | 0 | 0 | 0 |
| 401 - 500 | 268 | 241 | 217 | 0 | 0 | 15 | 0 | 0 | 0 | 0 | . | 0 | 54 | 64 | 44 | 72 | 6 | 0 | 0 | 0 | 13 | . | 7 | 8 | 6 |
| 401 - 500 | 180 | 158 | 223 | 13 | 0 | 0 | 0 | 37 | 0 | 0 | 31 | 0 | 139 | 116 | 59 | 64 | 18 | 18 | 8 | 8 | 14 | . | 7 | 5 | 5 |
| 401 - 500 | 686 | 598 | 227 | 161 | 123 | 44 | 482 | 180 | 358 | 211 | 85 | 147 | 329 | 411 | 203 | 228 | 1837 | 207 | 125 | 132 | 0 | 0 | 0 | 86 | 84 |
| 401 - 500 | 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 |
| 401 - 500 | . | 133 | 240 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 36 | 19 | 0 | 17 | 16 | 11 |
| 501 - 750 | 664 | 557 | 212 | 1564 | 106 | 640 | 193 | 630 | 1116 | 1390 | 822 | 1253 | 3139 | 834 | 392 | 588 | 639 | 111 | 272 | 44 | 52 | 71 | 96 | 90 | 184 |
| 501 - 750 | 420 | 362 | 218 | 0 | 0 | . | 0 | 0 | 0 | 0 | . | 15 | 0 | 44 | 114 | 79 | 58 | 13 | 0 | 8 | 19 | . | 17 | 10 | 12 |
| 501 - 750 | 270 | 228 | 224 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 48 | 120 | 125 | 17 | 49 | 33 | 0 | 23 | . | 18 | 23 | 16 |
| 501 - 750 | 237 | 185 | 230 | 0 | 0 | . | 15 | 0 | 0 | 0 | 17 | 0 | 57 | 15 | 101 | 396 | 771 | 1711 | 346 | 85 | 105 | 69 | 126 | 176 | 26 |
| 501 - 750 | . | 120 | 239 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | . | 0 | 0 | 0 |
| 751 -1000 | 213 | 283 | 219 | . | . | . | . | 0 | . | 0 | . | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 8 | . | 13 | 9 | 14 |
| 751 -1000 | 182 | 186 | 231 | 0 | 0 | . | 0 | . | 0 | 0 | 0 | 0 | 0 | 0 | 0 | . | 0 | 457 | 176 | 197 | 118 | 115 | 6 | 36 | 228 |
| 751 -1000 | 122 | 193 | 236 | 0 | . | . | . | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | . | 23 | 25 | 51 | 51 | 37 | . | 28 | 3 | 11 |
| 1001 -1250 | 324 | 303 | 220 | . | 0 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 10 | 0 | 0 |
| 1001 -1250 | 177 | 195 | 225 | 0 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1001 -1250 | 236 | 228 | 232 | 0 | 0 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1251 -1500 | 286 | 330 | 221 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1251 -1500 | 180 | 201 | 226 | . | 0 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1251 -1500 | 180 | 237 | 233 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 6 |
| Biomass (t) | | | | 5123 | 1302 | 2218 | 3494 | 2582 | 4909 | 3693 | 2903 | 3030 | 5920 | 2063 | 1571 | 2653 | 3672 | 2669 | 1102 | 627 | 462 | 255 | 370 | 465 | 649 |

Table 3 Estimated biomass (tons) of Witch Flounder (M+F) in each stratum from surveys in Div. 3K during fall of 1978-1998.
(Engel 145 data converted to Campelen Units for 1977-94).

| Year | | | | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth Range | Old Stratum | New Stratum | Stratum | | | | | | | | | | | | | | | | | | | | | |
| | Area (sq. n. mi.) | Area (sq. n. mi.) | | | | | | | | | | | | | | | | | | | | | | |
| 101 - 200 | . | 798 | 608 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 101 - 200 | . | 445 | 612 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 101 - 200 | . | 250 | 616 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 101 - 200 | 1455 | 1347 | 618 | . | . | . | . | . | . | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 101 - 200 | 1588 | 1753 | 619 | . | . | . | . | . | . | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 201 - 300 | . | 342 | 609 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 201 - 300 | . | 573 | 611 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 201 - 300 | . | 251 | 615 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 201 - 300 | 2709 | 2545 | 620 | 612 | 1410 | 509 | 152 | 227 | 133 | 126 | 64 | 198 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 201 - 300 | 2859 | 2537 | 621 | 1051 | 3719 | 498 | 424 | 250 | 788 | 329 | 445 | 26 | 62 | 0 | 63 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 201 - 300 | 668 | 1105 | 624 | 356 | 145 | 105 | 378 | 446 | 121 | 367 | 90 | 66 | 19 | 0 | 0 | 7 | 0 | 0 | 12 | 0 | 0 | 0 | 9 | 0 |
| 201 - 300 | 447 | . | 632 | 395 | 591 | 230 | 524 | 408 | 447 | . | 210 | 89 | 34 | 38 | 82 | 0 | 3 | 8 | . | . | . | . | . | . |
| 201 - 300 | 1618 | 1555 | 634 | 788 | 772 | 1075 | 536 | 981 | 177 | 860 | 388 | 256 | 209 | 373 | 131 | 0 | 0 | 25 | 4 | 0 | 0 | 0 | 0 | 0 |
| 201 - 300 | 1274 | 1274 | 635 | 1636 | 1887 | 1443 | 1481 | 833 | 538 | 2211 | 775 | 15 | 136 | 338 | 166 | 21 | 0 | 31 | 0 | 0 | 1 | 0 | 46 | 17 |
| 201 - 300 | 1455 | 1455 | 636 | 1482 | 1680 | 1845 | 1166 | 876 | 711 | 2898 | 848 | 314 | 520 | 824 | 355 | 63 | 0 | 0 | 0 | 0 | 2 | 2 | 37 | 0 |
| 201 - 300 | 1132 | 1132 | 637 | 1116 | 2242 | 1430 | 1864 | 1905 | 3668 | 2724 | 2490 | 702 | 841 | 215 | 158 | 0 | 0 | 57 | 17 | 0 | 0 | 0 | 3 | 2 |
| 301 - 400 | . | 256 | 610 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | 0 | 3 |
| 301 - 400 | . | 263 | 614 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 301 - 400 | . | 593 | 617 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 | 0 | 4 | 13 |
| 301 - 400 | 1027 | 494 | 623 | 500 | 633 | 584 | 551 | 410 | 601 | 343 | 650 | 164 | 199 | 30 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 301 - 400 | 850 | 888 | 625 | 864 | 2238 | 988 | 1580 | 491 | 1588 | 1417 | 1101 | 50 | 165 | 104 | 12 | 0 | 0 | 0 | 0 | 0 | 3 | 4 | 0 | 7 |
| 301 - 400 | 919 | 1113 | 626 | 3586 | 5737 | 5960 | 1149 | 4128 | 3477 | 1248 | 1110 | 57 | 174 | 32 | 56 | 0 | 0 | 22 | 0 | 0 | 0 | 0 | 1 | 0 |
| 301 - 400 | 1085 | 1085 | 628 | 2454 | 6077 | 3512 | 1379 | 2431 | 4882 | 2070 | 2324 | 954 | 523 | 39 | 214 | 0 | 0 | 20 | 0 | 0 | 0 | 0 | 0 | 0 |
| 301 - 400 | 499 | 495 | 629 | 1722 | 1617 | 2520 | 1745 | 958 | 2253 | 1016 | 998 | 225 | 510 | 196 | 63 | 66 | 0 | 10 | 3 | 6 | 4 | 2 | 2 | 8 |
| 301 - 400 | 544 | 332 | 630 | 1048 | 730 | 850 | 981 | . | 727 | 549 | 363 | 168 | 182 | 155 | 28 | 0 | 0 | 11 | 18 | 0 | 0 | 7 | 1 | 0 |
| 301 - 400 | 2179 | 2067 | 633 | 2190 | 2876 | 3722 | 1402 | 2399 | 2661 | 3093 | 2073 | 1599 | 1105 | 1932 | 1186 | 365 | 162 | 117 | 94 | 47 | 3 | 33 | 39 | 74 |
| 301 - 400 | 2059 | 2059 | 638 | 3316 | 8711 | 4695 | 5840 | 3430 | 4381 | 8608 | 7033 | 8275 | 5506 | 7318 | 3393 | 327 | 340 | 91 | 81 | 4 | 4 | 5 | 17 | 79 |
| 301 - 400 | 1463 | 1463 | 639 | 1415 | 1092 | 2077 | 1716 | 1127 | 3637 | 4062 | 2121 | 1744 | 779 | 2637 | 544 | 487 | 83 | 13 | 0 | 36 | 40 | 14 | 4 | 41 |
| 401 - 500 | . | 30 | 613 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 401 - 500 | 632 | 691 | 622 | 598 | 1228 | 1938 | 1010 | 600 | 946 | 640 | 1152 | 263 | 653 | 21 | 20 | 37 | 10 | 28 | 14 | 0 | 5 | 1 | 6 | 18 |
| 401 - 500 | 1184 | 1255 | 627 | 2887 | 4140 | 8083 | 11621 | 8635 | 10560 | 7849 | 4541 | 1598 | 1378 | 1341 | 738 | 243 | 6 | 47 | 69 | 23 | 32 | 8 | 48 | 81 |
| 401 - 500 | 1202 | 1321 | 631 | 2274 | 2264 | 2534 | 7736 | 1010 | 5887 | 6448 | 4570 | 2929 | 1553 | 598 | 358 | 73 | 338 | 313 | 63 | 280 | 77 | 7 | 85 | 80 |
| 401 - 500 | 198 | 69 | 640 | 51 | . | 177 | 62 | 411 | . | 436 | 1074 | 1669 | 2280 | 1347 | 1145 | 176 | 184 | 18 | 0 | 0 | . | 8 | 3 | 10 |
| 401 - 500 | 204 | 216 | 645 | 12 | . | 0 | 12 | 341 | 281 | 1519 | 238 | . | 3079 | 571 | 252 | 991 | 99 | 15 | 15 | 8 | 0 | 18 | 15 | 3 |
| 401 - 500 | . | 134 | 650 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 21 | 4 | . | 9 | 17 | 20 |
| 501 - 750 | 584 | 230 | 641 | 0 | 0 | 39 | 82 | 72 | 171 | 0 | 813 | . | 1657 | . | . | 11071 | 937 | 0 | 12 | 8 | 9 | 45 | 36 | 108 |
| 501 - 750 | 333 | 325 | 646 | 0 | 0 | 68 | 14 | 25 | 615 | 94 | 108 | . | 102 | . | . | 275 | 173 | 49 | 36 | 79 | 3 | 431 | 42 | 40 |
| 501 - 750 | . | 359 | 651 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 25 | 23 | . | 52 | 202 | 127 |
| 751 -1000 | 931 | 418 | 642 | 0 | . | 79 | 0 | 36 | . | 131 | 89 | . | 83 | . | . | 2497 | 1213 | 790 | 81 | 65 | . | 7 | 0 | 6 |
| 751 -1000 | 409 | 360 | 647 | 0 | 0 | 0 | 0 | 0 | . | . | 26 | . | . | . | . | 390 | 724 | 198 | 67 | 108 | . | 50 | 118 | 103 |
| 751 -1000 | . | 516 | 652 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 266 | 154 | . | 149 | 382 | 408 |
| 1001 -1250 | 1266 | 733 | 643 | 0 | 0 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1001 -1250 | 232 | 228 | 648 | 0 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1001 -1250 | . | 531 | 653 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 429 | . | . | 0 | 0 | 0 |
| 1251 -1500 | 954 | 474 | 644 | 0 | 0 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1251 -1500 | 263 | 212 | 649 | 0 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1251 -1500 | . | 479 | 654 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 4 |
| Total biomass (t) | | | | 30353 | 49789 | 44962 | 43405 | 32429 | 49250 | 49038 | 35694 | 21359 | 21746 | 18110 | 8976 | 17088 | 4272 | 1863 | 1327 | 846 | 184 | 855 | 1116 | 1255 |

Table 4 Estimated biomass (tons) of Witch Flounder (M+F) per stratum from surveys in Div. 3L during fall of 1983 - 1998
(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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth Range | Old Stratum | New Stratum | Stratum | | | | | | | | | | | | | | | | |
| | Area (sq. n. mi.) | Area (sq. n. mi.) | | | | | | | | | | | | | | | | | |
| | | | 800 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 3 |
| 30 - 56 | . | 268 | 784 | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 57 - 92 | 2071 | 2071 | 350 | 0 | 136 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 57 - 92 | 1780 | 1780 | 363 | 0 | 85 | 0 | 50 | 0 | 0 | 0 | 264 | 33 | 41 | 0 | 0 | 0 | 0 | 0 | 0 |
| 57 - 92 | 1121 | 1121 | 371 | 0 | 46 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 57 - 92 | 2460 | 2460 | 372 | 0 | 144 | 0 | 0 | 0 | 16 | 0 | 38 | 8 | 0 | 0 | 0 | 27 | 0 | 0 | 0 |
| 57 - 92 | 1120 | 1120 | 384 | 120 | 98 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 57 - 92 | . | 465 | 785 | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 93 - 183 | 1519 | 1519 | 328 | . | 45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 93 - 183 | 1574 | 1574 | 341 | 0 | 230 | 0 | 0 | 34 | 34 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 93 - 183 | 585 | 585 | 342 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 93 - 183 | 525 | 525 | 343 | 0 | 84 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 93 - 183 | 2120 | 2120 | 348 | 26 | 334 | 0 | 0 | 0 | 44 | 0 | 0 | 0 | 0 | . | 0 | 0 | 0 | 0 | 0 |
| 93 - 183 | 2114 | 2114 | 349 | 0 | 306 | 0 | 155 | 0 | 36 | 0 | 145 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 93 - 183 | 2817 | 2817 | 364 | 50 | 202 | 0 | 143 | 0 | 39 | 0 | 27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 93 - 183 | 1041 | 1041 | 365 | 0 | 100 | 0 | 68 | 29 | 18 | 0 | 0 | 36 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 93 - 183 | 1320 | 1320 | 370 | 0 | 190 | 0 | 0 | 34 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 93 - 183 | 2356 | 2356 | 385 | 0 | 340 | 0 | 79 | 58 | 27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 93 - 183 | 1481 | 1481 | 390 | 0 | 159 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 93 - 183 | . | 84 | 786 | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | 0 | 0 |
| 93 - 183 | . | 613 | 787 | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 93 - 183 | . | 261 | 788 | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 93 - 183 | . | 89 | 790 | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 1 |
| 93 - 183 | . | 72 | 793 | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 93 - 183 | . | 216 | 794 | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 93 - 183 | . | 98 | 797 | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 93 - 183 | . | 72 | 799 | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 184 - 274 | 1494 | 1582 | 344 | 159 | 159 | 37 | 29 | 127 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 184 - 274 | 983 | 983 | 347 | 41 | 467 | 0 | 42 | 0 | 154 | 66 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 184 - 274 | 1394 | 1394 | 366 | 0 | 186 | 355 | 307 | 171 | 110 | 187 | 27 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 |
| 184 - 274 | 961 | 961 | 369 | 181 | 374 | 570 | 706 | 320 | 1061 | 429 | 473 | 162 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 184 - 274 | 983 | 983 | 386 | . | 168 | 519 | 1082 | 1518 | 1750 | 442 | 218 | 307 | 875 | 0 | 0 | 0 | 0 | 0 | 0 |
| 184 - 274 | 821 | 821 | 389 | . | 196 | 133 | 760 | 250 | 138 | 21 | 79 | 0 | 27 | 0 | 0 | 38 | 0 | 0 | 0 |
| 184 - 274 | 282 | 282 | 391 | 0 | 0 | 32 | 0 | 9 | 0 | 0 | 0 | 70 | 22 | 0 | 0 | 36 | 0 | 25 | 0 |
| 184 - 274 | . | 164 | 795 | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 184 - 366 | . | 72 | 789 | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 184 - 366 | . | 227 | 791 | . | . | . | . | . | . | . | . | . | . | . | . | . | 6 | 0 | 0 |
| 184 - 366 | . | 100 | 798 | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 2 | 21 |
| 275 - 366 | 1432 | 1432 | 345 | 5808 | 4484 | 1227 | 617 | 3693 | 2099 | 2358 | 750 | 0 | 61 | 73 | 0 | 10 | 3 | 5 | 35 |
| 275 - 366 | 865 | 865 | 346 | 2134 | 1423 | 2240 | 3321 | 1201 | 1823 | 1287 | 1863 | 203 | 40 | 14 | 0 | 0 | 12 | 3 | 1 |
| 275 - 366 | 334 | 334 | 368 | . | 47 | 29 | 386 | 23 | 64 | 144 | 106 | 39 | 14 | 0 | 0 | 22 | 0 | 0 | 0 |
| 275 - 366 | 718 | 718 | 387 | . | 169 | 404 | 276 | 572 | 1775 | 1546 | 3668 | 159 | 52 | 32 | 12 | 63 | 8 | 2 | 0 |
| 275 - 366 | 361 | 361 | 388 | . | 1229 | 48 | . | 589 | 92 | 126 | 0 | 125 | 173 | 0 | 14 | 0 | 0 | 0 | 12 |
| 275 - 366 | 145 | 145 | 392 | 17 | 55 | 13 | 20 | 50 | 13 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 |
| 275 - 366 | . | 175 | 796 | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 1 | 2 |
| 367 - 549 | 186 | 186 | 729 | . | 146 | 127 | 280 | . | . | . | 48 | 274 | 246 | 42 | 131 | 2 | 151 | 24 | 0 |
| 367 - 549 | 216 | 216 | 731 | . | 498 | 248 | . | . | . | . | 465 | 178 | 356 | 38 | 79 | 19 | . | 0 | 7 |
| 367 - 549 | 468 | 468 | 733 | . | 328 | 1164 | . | . | . | . | 1618 | 2110 | 610 | 183 | 60 | 24 | 12 | 0 | 41 |
| 367 - 549 | 272 | 272 | 735 | . | 367 | 34 | 1714 | . | . | . | . | 222 | 216 | 40 | 12 | 3 | 20 | 23 | 18 |
| 367 - 549 | . | 50 | 792 | . | . | . | . | . | . | . | . | . | . | . | . | . | 55 | 37 | 11 |
| 550 - 731 | 170 | 170 | 730 | . | 104 | 16 | . | . | . | . | . | 130 | 6 | 140 | 88 | 83 | 0 | 21 | 11 |
| 550 - 731 | 231 | 231 | 732 | . | 282 | 235 | . | . | . | . | 29 | 207 | 283 | 41 | 194 | 16 | 147 | 121 | 440 |
| 550 - 731 | 228 | 228 | 734 | . | 30 | 184 | . | . | . | . | 168 | 100 | 11 | 106 | 49 | 37 | 127 | 15 | 149 |
| 550 - 731 | 175 | 175 | 736 | 546 | . | 268 | 709 | . | . | . | 355 | 913 | 90 | 70 | 20 | 10 | 261 | 41 | 135 |
| 732 - 914 | . | 227 | 737 | . | . | . | . | . | . | . | . | . | . | . | . | . | 130 | 104 | 435 |
| 732 - 914 | . | 223 | 741 | . | . | . | . | . | . | . | . | . | . | . | . | . | 115 | 164 | 313 |
| 732 - 914 | . | 348 | 745 | . | . | . | . | . | . | . | . | . | . | . | . | . | 154 | 212 | 123 |
| 732 - 914 | . | 159 | 748 | . | . | . | . | . | . | . | . | . | . | . | . | . | 87 | 0 | 0 |
| 915 -1097 | . | 221 | 738 | . | . | . | . | . | . | . | . | . | . | . | . | . | 331 | 127 | 24 |
| 915 -1097 | . | 206 | 742 | . | . | . | . | . | . | . | . | . | . | . | . | . | 31 | 3 | 9 |
| 915 -1097 | . | 392 | 746 | . | . | . | . | . | . | . | . | . | . | . | . | . | 120 | 126 | 0 |
| 915 -1097 | . | 126 | 749 | . | . | . | . | . | . | . | . | . | . | . | . | . | 33 | 29 | 0 |
| 1098 -1280 | . | 254 | 739 | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1098 -1280 | . | 211 | 743 | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1098 -1280 | . | 724 | 747 | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 107 |
| 1098 -1280 | . | 556 | 750 | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1281 -1463 | . | 264 | 740 | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1281 -1463 | . | 280 | 744 | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1281 -1463 | . | 229 | 751 | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| Biomass >731 m | | | | | | | | | | | | | | | | | 1002 | 765 | 1011 |
| Percent >731 m | | | | | | | | | | | | | | | | | 55.4 | 70.3 | 53.1 |
| Biomass (tons) | | | | 9082 | 13210 | 7881 | 10743 | 8679 | 9294 | 6606 | 10341 | 5274 | 3131 | 778 | 663 | 390 | 1806 | 1087 | 1903 |

Table 5 Abundance (000s) per stratum of Witch flounder (M+F) from research vessel surveys in Div. 2J during fall 1977-1994 (Engel data converted to Campelen Units for 1977-94).

| Year | | | | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth Range | Old Stratum | New Stratum | Stratum | | | | | | | | | | | | | | | | | | | | | | |
| (meters) | Area (sq. n. mi.) | Area (sq. n. mi.) | | | | | | | | | | | | | | | | | | | | | | | |
| 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 |
| 101 - 200 | 1823 | 1594 | 205 | 0 | 0 | 0 | 0 | 0 | 21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | . | 0 | 0 | 0 |
| 101 - 200 | 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 |
| 101 - 200 | 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 |
| 101 - 200 | . | 733 | 237 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | . | 0 | 0 | 0 |
| 101 - 200 | . | 778 | 238 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 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 |
| 201 - 300 | 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 |
| 201 - 300 | 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 |
| 201 - 300 | 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 |
| 201 - 300 | 1171 | 1341 | 214 | 268 | 69 | 0 | 97 | 64 | 141 | 101 | 40 | 134 | 81 | 0 | 27 | 54 | 32 | 0 | 0 | 0 | 0 | . | 0 | 0 | 0 |
| 201 - 300 | 1270 | 1302 | 215 | 218 | 22 | 29 | 0 | 35 | 78 | 0 | 58 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | . | 0 | 0 | 0 |
| 201 - 300 | 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 |
| 201 - 300 | 508 | 530 | 234 | 0 | 42 | 35 | 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 |
| 301 - 400 | 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 |
| 301 - 400 | 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 |
| 301 - 400 | 384 | 360 | 216 | 0 | 0 | 40 | 40 | 106 | 106 | 123 | 0 | 0 | 79 | 26 | 26 | 26 | 0 | 0 | 0 | 0 | 0 | . | 25 | 0 | 0 |
| 301 - 400 | 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 |
| 301 - 400 | 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 |
| 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 |
| 401 - 500 | 268 | 241 | 217 | 0 | 0 | 18 | 0 | 0 | 0 | 0 | . | 0 | 74 | 92 | 74 | 92 | 18 | 0 | 0 | 0 | 155 | . | 33 | 66 | 31 |
| 401 - 500 | 180 | 158 | 223 | 12 | 0 | 0 | 0 | 37 | 0 | 0 | 50 | 0 | 248 | 161 | 124 | 111 | 37 | 66 | 33 | 76 | 145 | . | 75 | 43 | 19 |
| 401 - 500 | 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 |
| 401 - 500 | 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 |
| 401 - 500 | . | 133 | 240 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 348 | 140 | 0 | 146 | 55 | 45 |
| 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 |
| 501 - 750 | 420 | 362 | 218 | 0 | 0 | . | 0 | 0 | 0 | 0 | . | 29 | 0 | 58 | 173 | 144 | 87 | 29 | 0 | 100 | 199 | . | 199 | 75 | 50 |
| 501 - 750 | 270 | 228 | 224 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 56 | 56 | 204 | 186 | 19 | 111 | 74 | 0 | 146 | . | 78 | 141 | 84 |
| 501 - 750 | 237 | 185 | 230 | 0 | 0 | . | 16 | 0 | 0 | 0 | 16 | 0 | 65 | 16 | 147 | 782 | 1695 | 4548 | 880 | 471 | 382 | 827 | 582 | 865 | 102 |
| 501 - 750 | . | 120 | 239 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 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 |
| 751 -1000 | 182 | 186 | 231 | 0 | 0 | . | 0 | . | 0 | 0 | 0 | 0 | 0 | 0 | 0 | . | 0 | 939 | 401 | 512 | 375 | 563 | 26 | 90 | 832 |
| 751 -1000 | 122 | 193 | 236 | 0 | . | . | . | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | . | 59 | 34 | 151 | 199 | 159 | . | 133 | 13 | 38 |
| 1001 -1250 | 324 | 303 | 220 | . | 0 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 42 | 0 | 0 |
| 1001 -1250 | 177 | 195 | 225 | 0 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1001 -1250 | 236 | 228 | 232 | 0 | 0 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1251 -1500 | 286 | 330 | 221 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1251 -1500 | 180 | 201 | 226 | . | 0 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1251 -1500 | 180 | 237 | 233 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 23 |
| Abundance (000's) | | Total (000s) | | 7106 | 1962 | 3016 | 4503 | 3190 | 6486 | 4963 | 3840 | 4089 | 9432 | 3337 | 2746 | 5377 | 8110 | 6941 | 2463 | 2588 | 2369 | 1696 | 1724 | 1890 | 2505 |

Table 6 Abundance (000s) per stratum of Witch flounder (M+F) from research vessel surveys in Div. 3K during fall 1978-1998 (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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth Range | Old Stratum | New Stratum | Stratum | | | | | | | | | | | | | | | | | | | | | |
| (meters) | Area (sq. n. mi.) | Area (sq. n. mi.) | | | | | | | | | | | | | | | | | | | | | | |
| 101 - 200 | . | 798 | 608 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 101 - 200 | . | 445 | 612 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 101 - 200 | . | 250 | 616 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 101 - 200 | 1455 | 1347 | 618 | . | . | . | . | . | . | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 101 - 200 | 1588 | 1753 | 619 | . | . | . | . | . | . | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 201 - 300 | . | 342 | 609 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 201 - 300 | . | 573 | 611 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 201 - 300 | . | 251 | 615 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 201 - 300 | 2709 | 2545 | 620 | 963 | 1975 | 621 | 149 | 166 | 112 | 115 | 80 | 124 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 201 - 300 | 2859 | 2537 | 621 | 1999 | 5149 | 696 | 286 | 169 | 688 | 253 | 393 | 28 | 66 | 0 | 486 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 187 |
| 201 - 300 | 668 | 1105 | 624 | 525 | 230 | 161 | 597 | 459 | 184 | 368 | 161 | 92 | 31 | 0 | 0 | 23 | 0 | 0 | 22 | 0 | 0 | 0 | 30 | 0 |
| 201 - 300 | 447 | . | 632 | 553 | 769 | 261 | 646 | 512 | 492 | . | 225 | 92 | 31 | 31 | 61 | 0 | 6 | 57 | . | . | . | . | . | . |
| 201 - 300 | 1618 | 1555 | 634 | 841 | 835 | 1272 | 668 | 911 | 223 | 890 | 544 | 267 | 283 | 482 | 254 | 0 | 0 | 240 | 13 | 0 | 0 | 0 | 0 | 0 |
| 201 - 300 | 1274 | 1274 | 635 | 1694 | 1906 | 1782 | 1577 | 876 | 584 | 2432 | 1127 | 29 | 146 | 456 | 175 | 29 | 0 | 58 | 0 | 0 | 29 | 0 | 70 | 105 |
| 201 - 300 | 1455 | 1455 | 636 | 1716 | 1716 | 1887 | 1168 | 961 | 634 | 2927 | 976 | 400 | 486 | 767 | 240 | 29 | 0 | 0 | 0 | 0 | 29 | 33 | 67 | 0 |
| 201 - 300 | 1132 | 1132 | 637 | 1609 | 3292 | 1972 | 2362 | 2380 | 4765 | 3530 | 3315 | 740 | 960 | 195 | 156 | 0 | 0 | 52 | 52 | 0 | 0 | 0 | 31 | 62 |
| 301 - 400 | . | 256 | 610 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 104 | 18 | 53 |
| 301 - 400 | . | 263 | 614 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 36 | 18 | 0 |
| 301 - 400 | . | 593 | 617 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 41 | 0 | 27 | 51 |
| 301 - 400 | 1027 | 494 | 623 | 871 | 989 | 871 | 742 | 480 | 871 | 565 | 918 | 283 | 537 | 311 | 47 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 301 - 400 | 850 | 888 | 625 | 1579 | 3976 | 1462 | 2572 | 585 | 2222 | 2081 | 1684 | 78 | 322 | 292 | 88 | 0 | 0 | 0 | 0 | 0 | 41 | 24 | 0 | 31 |
| 301 - 400 | 919 | 1113 | 626 | 8849 | 11251 | 10644 | 1593 | 6928 | 4867 | 2866 | 1618 | 63 | 582 | 126 | 329 | 0 | 0 | 42 | 0 | 0 | 0 | 0 | 122 | 0 |
| 301 - 400 | 1085 | 1085 | 628 | 3603 | 8358 | 5249 | 1841 | 3433 | 6567 | 2708 | 4229 | 1692 | 896 | 269 | 634 | 0 | 0 | 149 | 0 | 0 | 27 | 0 | 30 | 0 |
| 301 - 400 | 499 | 495 | 629 | 3032 | 3672 | 4915 | 2792 | 1476 | 3638 | 1373 | 2094 | 526 | 732 | 755 | 412 | 103 | 0 | 46 | 182 | 136 | 306 | 34 | 34 | 68 |
| 301 - 400 | 544 | 332 | 630 | 2769 | 1347 | 1123 | 1310 | . | 898 | 798 | 917 | 299 | 274 | 249 | 125 | 0 | 0 | 25 | 30 | 0 | 0 | 46 | 46 | 23 |
| 301 - 400 | 2179 | 2067 | 633 | 2964 | 3897 | 4526 | 2098 | 2955 | 3047 | 3627 | 2848 | 3560 | 1853 | 3485 | 3687 | 1063 | 360 | 552 | 600 | 57 | 67 | 221 | 284 | 348 |
| 301 - 400 | 2059 | 2059 | 638 | 6833 | 15200 | 9725 | 9559 | 5910 | 6849 | 14417 | 12385 | 11330 | 7534 | 11400 | 5047 | 535 | 612 | 317 | 368 | 13 | 78 | 150 | 157 | 661 |
| 301 - 400 | 1463 | 1463 | 639 | 2013 | 1157 | 2650 | 2013 | 1429 | 4025 | 5459 | 2792 | 2382 | 1236 | 3321 | 503 | 489 | 67 | 24 | 0 | 226 | 115 | 34 | 101 | 168 |
| 401 - 500 | . | 30 | 613 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 2 | 4 | 14 |
| 401 - 500 | 632 | 691 | 622 | 2652 | 1942 | 3347 | 1608 | 1130 | 2260 | 978 | 1934 | 696 | 1478 | 203 | 290 | 130 | 58 | 261 | 238 | 0 | 28 | 23 | 32 | 95 |
| 401 - 500 | 1184 | 1255 | 627 | 6026 | 11618 | 12948 | 22938 | 18544 | 22232 | 18690 | 17311 | 7753 | 3882 | 7199 | 6271 | 1955 | 434 | 271 | 3625 | 367 | 792 | 127 | 1343 | 2244 |
| 401 - 500 | 1202 | 1321 | 631 | 8515 | 5677 | 6338 | 13261 | 1819 | 8863 | 12666 | 11433 | 8019 | 3417 | 2563 | 1819 | 276 | 2563 | 2260 | 727 | 2453 | 537 | 178 | 569 | 485 |
| 401 - 500 | 198 | 69 | 640 | 109 | . | 232 | 82 | 463 | . | 572 | 1716 | 2465 | 4018 | 2274 | 1648 | 245 | 245 | 91 | 0 | 0 | . | 38 | 19 | 62 |
| 401 - 500 | 204 | 216 | 645 | 14 | . | 0 | 14 | 412 | 295 | 2021 | 393 | . | 5837 | 1109 | 463 | 2357 | 196 | 47 | 188 | 119 | 0 | 149 | 45 | 13 |
| 401 - 500 | . | 134 | 650 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 25 | 5 | . | 28 | 147 | 313 |
| 501 - 750 | 584 | 230 | 641 | 0 | 0 | 80 | 161 | 60 | 241 | 0 | 1004 | . | 2437 | . | . | 17031 | 1366 | 0 | 53 | 74 | 79 | 253 | 190 | 506 |
| 501 - 750 | 333 | 325 | 646 | 0 | 0 | 46 | 23 | 46 | 710 | 92 | 122 | . | 115 | . | . | 527 | 366 | 290 | 209 | 462 | 22 | 2209 | 156 | 156 |
| 501 - 750 | . | 359 | 651 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 49 | 111 | . | 444 | 771 | 444 |
| 751 -1000 | 931 | 418 | 642 | 0 | . | 64 | 0 | 43 | . | 128 | 128 | . | 128 | . | . | 4013 | 2177 | 1089 | 383 | 173 | . | 29 | 0 | 29 |
| 751 -1000 | 409 | 360 | 647 | 0 | 0 | 0 | 0 | 0 | . | . | 38 | . | . | . | . | 534 | 1594 | 506 | 281 | 264 | . | 173 | 198 | 272 |
| 751 -1000 | . | 516 | 652 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 899 | 355 | . | 745 | 1207 | 1526 |
| 1001 -1250 | 1266 | 733 | 643 | 0 | 0 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1001 -1250 | 232 | 228 | 648 | 0 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1001 -1250 | . | 531 | 653 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 974 | . | . | 0 | 0 | 0 |
| 1251 -1500 | 954 | 474 | 644 | 0 | 0 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1251 -1500 | 263 | 212 | 649 | 0 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1251 -1500 | . | 479 | 654 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 38 |
| Estimated abundance (000's) | | | | 59729 | 84954 | 72871 | 70058 | 52145 | 75267 | 79554 | 70384 | 40917 | 37279 | 35486 | 22734 | 29338 | 10045 | 6377 | 8918 | 4815 | 2191 | 5081 | 5716 | 7955 |

Table 7 Abundance (000s) per stratum of Witch flounder (M+F) from research vessels in Div. 3L during the fall 1984-1998 (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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth Range | Old Stratum | New Stratum | Stratum | | | | | | | | | | | | | | | |
| (meters) | Area (sq. n. mi.) | Area (sq. n. mi.) | | | | | | | | | | | | | | | | |
| | | | 800 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 178 |
| 30 - 56 | . | 268 | 784 | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 57 - 92 | 2071 | 2071 | 350 | 166 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 57 - 92 | 1780 | 1780 | 363 | 92 | 0 | 35 | 0 | 0 | 0 | 306 | 43 | 39 | 0 | 0 | 0 | 0 | 0 | 0 |
| 57 - 92 | 1121 | 1121 | 371 | 44 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 44 | 0 |
| 57 - 92 | 2460 | 2460 | 372 | 182 | 0 | 0 | 0 | 26 | 0 | 34 | 13 | 0 | 0 | 0 | 34 | 0 | 0 | 0 |
| 57 - 92 | 1120 | 1120 | 384 | 128 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 57 - 92 | . | 465 | 785 | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 93 - 183 | 1519 | 1519 | 328 | 52 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 93 - 183 | 1574 | 1574 | 341 | 217 | 0 | 0 | 24 | 27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 43 |
| 93 - 183 | 585 | 585 | 342 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 93 - 183 | 525 | 525 | 343 | 90 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 93 - 183 | 2120 | 2120 | 348 | 292 | 0 | 0 | 0 | 58 | 0 | 0 | 0 | 0 | . | 0 | 0 | 0 | 0 | 49 |
| 93 - 183 | 2114 | 2114 | 349 | 291 | 0 | 162 | 0 | 32 | 0 | 166 | 0 | 0 | 0 | 0 | 0 | 0 | 42 | 0 |
| 93 - 183 | 2817 | 2817 | 364 | 271 | 0 | 155 | 0 | 55 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 43 |
| 93 - 183 | 1041 | 1041 | 365 | 143 | 0 | 57 | 48 | 29 | 0 | 0 | 48 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 93 - 183 | 1320 | 1320 | 370 | 233 | 0 | 0 | 30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 93 - 183 | 2356 | 2356 | 385 | 324 | 0 | 122 | 36 | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 93 - 183 | 1481 | 1481 | 390 | 136 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 93 - 183 | . | 84 | 786 | . | . | . | . | . | . | . | . | . | . | . | . | 90 | 36 | 23 |
| 93 - 183 | . | 613 | 787 | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 93 - 183 | . | 261 | 788 | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 18 |
| 93 - 183 | . | 89 | 790 | . | . | . | . | . | . | . | . | . | . | . | . | 6 | 18 | 55 |
| 93 - 183 | . | 72 | 793 | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 93 - 183 | . | 216 | 794 | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 93 - 183 | . | 98 | 797 | . | . | . | . | . | . | . | . | . | . | . | . | 7 | 0 | 0 |
| 93 - 183 | . | 72 | 799 | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 184 - 274 | 1494 | 1582 | 344 | 206 | 46 | 117 | 154 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 184 - 274 | 983 | 983 | 347 | 586 | 0 | 34 | 0 | 135 | 108 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 184 - 274 | 1394 | 1394 | 366 | 157 | 362 | 431 | 219 | 110 | 164 | 32 | 0 | 8 | 0 | 0 | 0 | 0 | 38 | 0 |
| 184 - 274 | 961 | 961 | 369 | 359 | 507 | 661 | 330 | 1348 | 529 | 463 | 162 | 0 | 0 | 0 | 39 | 0 | 0 | 0 |
| 184 - 274 | 983 | 983 | 386 | 186 | 568 | 1082 | 1792 | 1974 | 352 | 237 | 270 | 1262 | 0 | 0 | 0 | 0 | 0 | 0 |
| 184 - 274 | 821 | 821 | 389 | 169 | 158 | 875 | 226 | 169 | 28 | 75 | 0 | 38 | 0 | 0 | 33 | 0 | 0 | 0 |
| 184 - 274 | 282 | 282 | 391 | 0 | 39 | 0 | 19 | 0 | 0 | 0 | 91 | 26 | 0 | 0 | 34 | 0 | 19 | 0 |
| 184 - 274 | . | 164 | 795 | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 184 - 366 | . | 72 | 789 | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 5 | 5 |
| 184 - 366 | . | 227 | 791 | . | . | . | . | . | . | . | . | . | . | . | . | 42 | 62 | 0 |
| 184 - 366 | . | 100 | 798 | . | . | . | . | . | . | . | . | . | . | . | . | 7 | 7 | 172 |
| 275 - 366 | 1432 | 1432 | 345 | 6895 | 1488 | 739 | 4531 | 2589 | 3180 | 2088 | 0 | 345 | 394 | 0 | 113 | 70 | 223 | 439 |
| 275 - 366 | 865 | 865 | 346 | 2380 | 3498 | 3927 | 1487 | 2427 | 1606 | 2340 | 389 | 170 | 76 | 0 | 0 | 35 | 317 | 178 |
| 275 - 366 | 334 | 334 | 368 | 46 | 46 | 459 | 23 | 69 | 207 | 115 | 69 | 14 | 0 | 0 | 23 | 0 | 23 | 0 |
| 275 - 366 | 718 | 718 | 387 | 165 | 444 | 247 | 691 | 2025 | 1679 | 4971 | 198 | 66 | 33 | 77 | 99 | 49 | 44 | 0 |
| 275 - 366 | 361 | 361 | 388 | 1440 | 50 | . | 819 | 149 | 149 | 0 | 116 | 199 | 0 | 14 | 0 | 0 | 0 | 149 |
| 275 - 366 | 145 | 145 | 392 | 80 | 20 | 20 | 70 | 20 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 |
| 275 - 366 | . | 175 | 796 | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 107 | 24 |
| 367 - 549 | 186 | 186 | 729 | 217 | 192 | 409 | . | . | . | 64 | 341 | 422 | 51 | 290 | 34 | 375 | 115 | 0 |
| 367 - 549 | 216 | 216 | 731 | 877 | 371 | . | . | . | . | 520 | 248 | 604 | 99 | 200 | 45 | . | 0 | 74 |
| 367 - 549 | 468 | 468 | 733 | 338 | 1610 | . | . | . | . | 2221 | 2983 | 665 | 258 | 136 | 32 | 19 | 0 | 114 |
| 367 - 549 | 272 | 272 | 735 | 661 | 37 | 2320 | . | . | . | . | 349 | 249 | 37 | 14 | 75 | 58 | 75 | 168 |
| 367 - 549 | . | 50 | 792 | . | . | . | . | . | . | . | . | . | . | . | . | 901 | 423 | 279 |
| 550 - 731 | 170 | 170 | 730 | 105 | 23 | . | . | . | . | . | 117 | 12 | 195 | 171 | 108 | 0 | 47 | 19 |
| 550 - 731 | 231 | 231 | 732 | 365 | 302 | . | . | . | . | 32 | 270 | 397 | 48 | 339 | 78 | 280 | 413 | 969 |
| 550 - 731 | 228 | 228 | 734 | 21 | 267 | . | . | . | . | 251 | 110 | 16 | 141 | 146 | 44 | 467 | 70 | 380 |
| 550 - 731 | 175 | 175 | 736 | . | 373 | 987 | . | . | . | 506 | 1613 | 217 | 241 | 34 | 75 | 782 | 277 | 1037 |
| 732 - 914 | . | 227 | 737 | . | . | . | . | . | . | . | . | . | . | . | . | 468 | 297 | 1109 |
| 732 - 914 | . | 223 | 741 | . | . | . | . | . | . | . | . | . | . | . | . | 291 | 460 | 892 |
| 732 - 914 | . | 348 | 745 | . | . | . | . | . | . | . | . | . | . | . | . | 311 | 479 | 168 |
| 732 - 914 | . | 159 | 748 | . | . | . | . | . | . | . | . | . | . | . | . | 186 | 0 | 0 |
| 915 -1097 | . | 221 | 738 | . | . | . | . | . | . | . | . | . | . | . | . | 532 | 347 | 56 |
| 915 -1097 | . | 206 | 742 | . | . | . | . | . | . | . | . | . | . | . | . | 43 | 14 | 14 |
| 915 -1097 | . | 392 | 746 | . | . | . | . | . | . | . | . | . | . | . | . | 216 | 168 | 0 |
| 915 -1097 | . | 126 | 749 | . | . | . | . | . | . | . | . | . | . | . | . | 61 | 43 | 0 |
| 1098 -1280 | . | 254 | 739 | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1098 -1280 | . | 211 | 743 | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1098 -1280 | . | 724 | 747 | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 100 |
| 1098 -1280 | . | 556 | 750 | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1281 -1463 | . | 264 | 740 | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1281 -1463 | . | 280 | 744 | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 0 | 0 |
| 1281 -1463 | . | 229 | 751 | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 14 | 0 |
| Estimated abundance (000's) | | | | 17914 | 10401 | 12839 | 10500 | 11269 | 8002 | 14453 | 7428 | 4748 | 1572 | 1428 | 865 | 5297 | 4227 | 6754 |

Table 8 Estimates of biomass (tons) of witch flounder from Canadian fall surveys in Div. 2J, 3K and 3L during 1977-98.

| 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 |

Table 9 Estimates of abundance (000s) of witch flounder from Canadian fall surveys in Div. 2J, 3K and 3L during 1977-98.

| 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 |

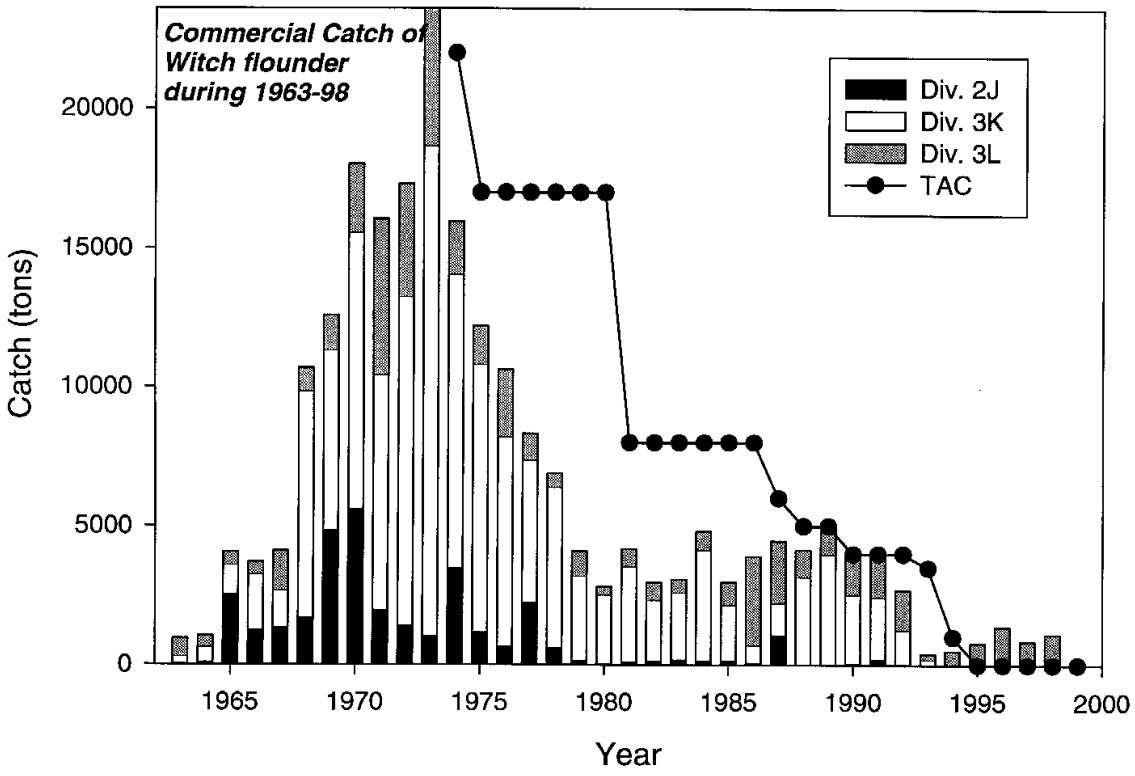



Fig. 1 Commercial catches and TAC's of witch flounder in Divisions 2J, 3K and 3L during 1963-99. Catches in Division 3M are included for 1998.

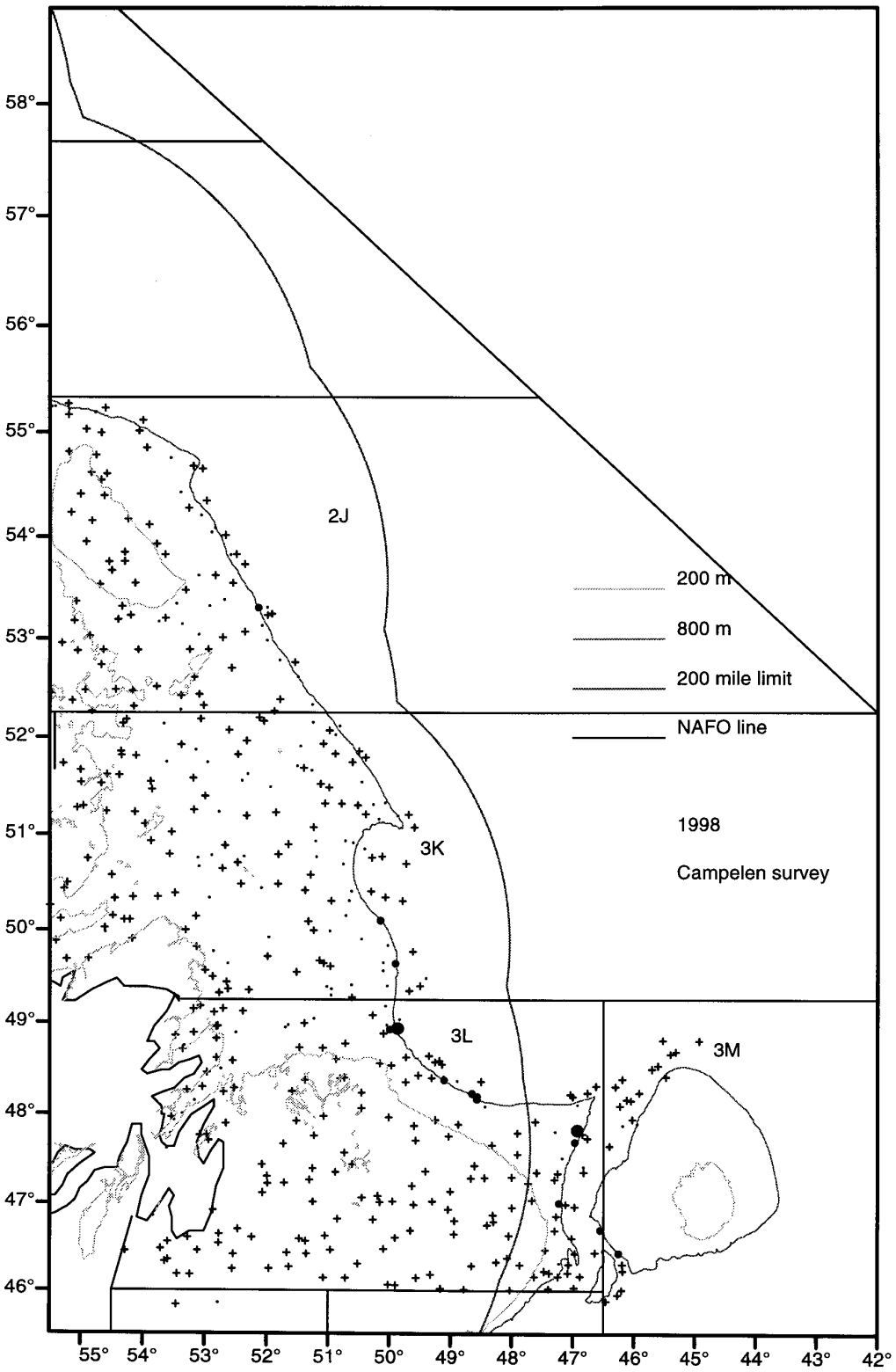



Fig. 2 Distribution of weight in Divisions 2J3KLM from Canadian fall surveys in 1998. Expressed as weight (kg) per tow using the Campelen 1800 trawl.

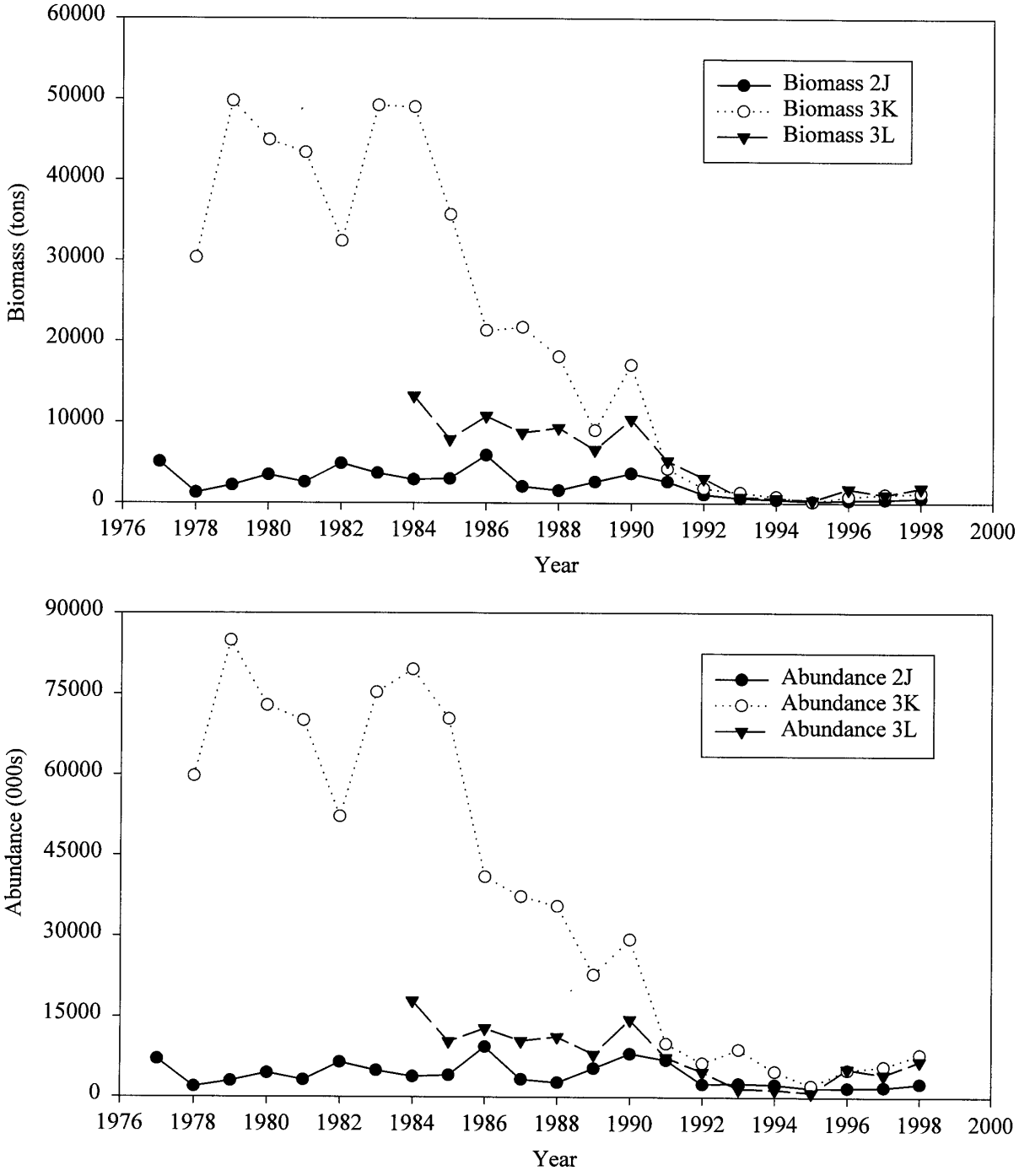
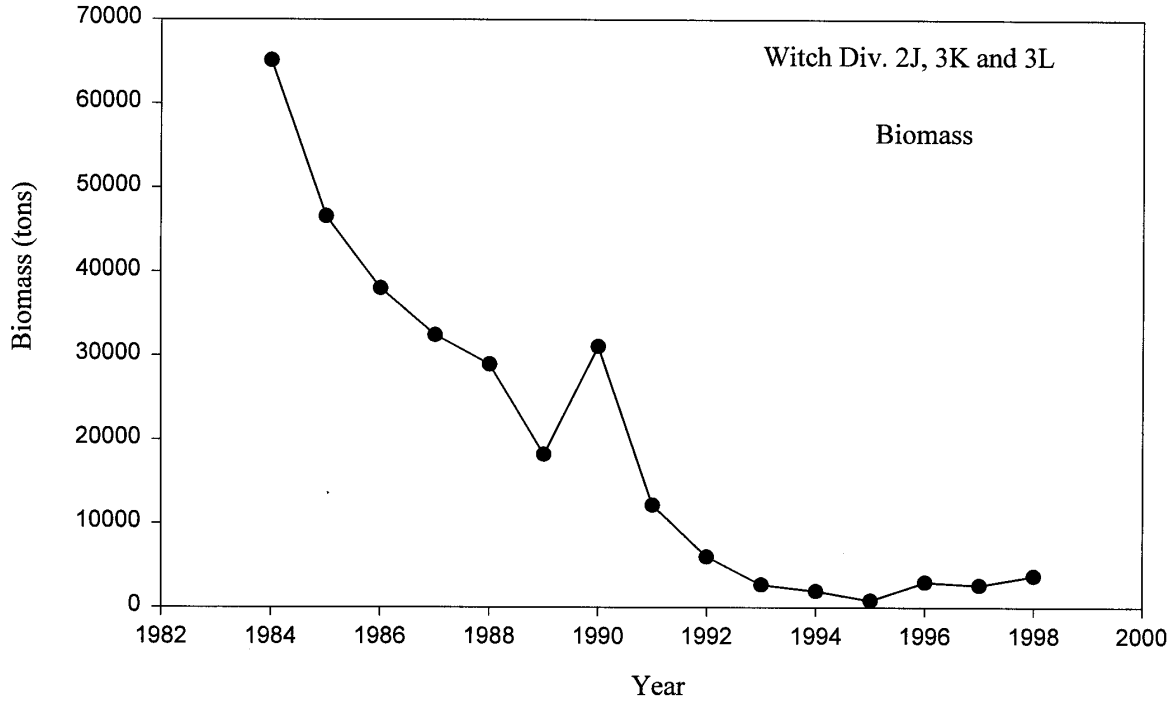



Fig. 3 Biomass (tons) and abundance (000s) of witch flounder by division from Canadian surveys in Div. 2J, 3K and 3L during 1977-98. Data based on Campelen trawl catch equivalents.



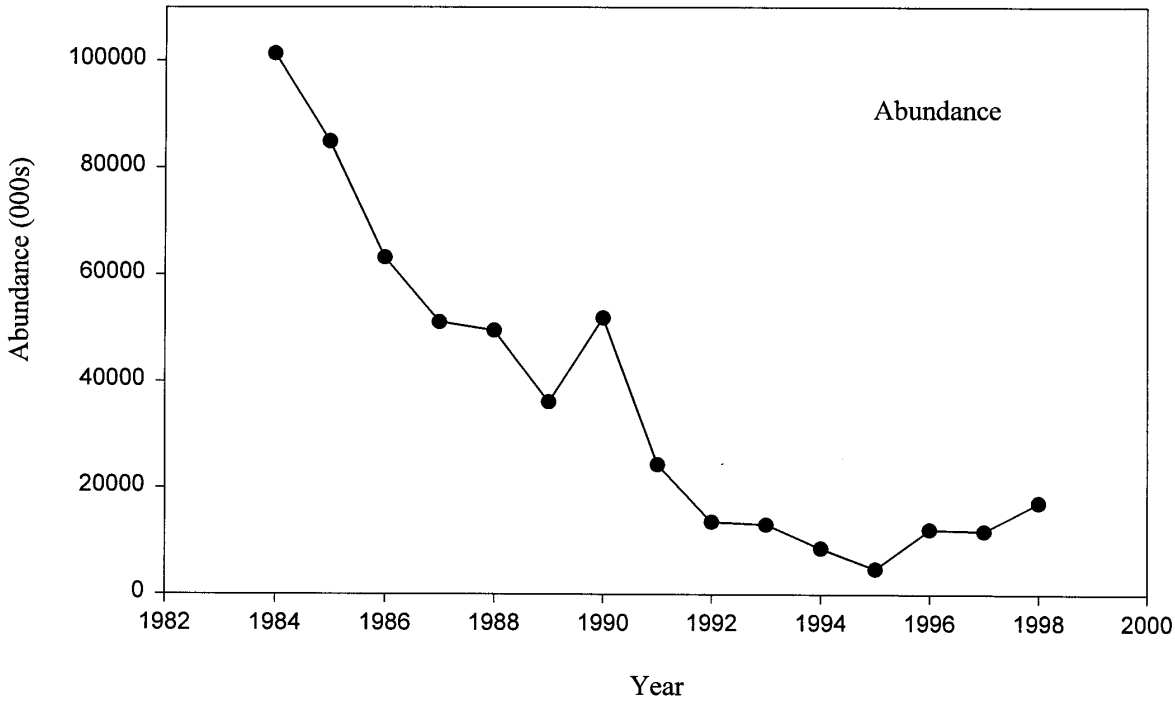




Fig. 4 Biomass (tons) and abundance (000s) of Divisions 2J, 3K and 3L combined, of witch flounder from Canadian fall surveys based on Campelen trawl catch equivalents during 1984-98.