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Contribution to the Assessment of the Cod Stock in Subdivision 3Ps

by

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Nominal catch and catch at age.

Total catches by France from Subdivision 3Ps increased from 10 770 tons in 1984 to 18 508 tons in 1985. The inshore fishery (handline and longline) took place mainly in summer and reported a total catch of 642 tons. French trawlers reported catches of 17 866 tons, the fishery was mostly conducted from January to May and in October and November.

Age compositions for the french inshore and offshore fisheries (table 1) were obtained using sampling data as shown in table 2. The 1980 year class was the most abundant in the total catch in 1985.

Survey data.

The estimates of cod abundance and biomass obtained from stratified random research surveys are shown in tables 3 and 4.

In 1986, very high biomass was observed on the Burgeo Bank (in strata 306-307 and 309) compared to previous years. It is well known (Templeman, 1979) that cod from the northeastern gulf of St. Lawrence stock (Div. 4RS-3Pn cod stock) migrates through the Cabot Strait along the south coast of Newfoundland into Subdivision 3Pn and sometimes as far as Burgeo Bank.

Length frequency distribution of cod caught in strata 306 to 309 was very similar to that observed in Division 4R during a stratified random research survey conducted from January 19th to 29th, 1986. Cod catches in those strata presented a high proportion of maturing fish. It seems then that the cod caught this year in strata 306 to 309 belonged to the northeastern gulf of St. Lawrence cod stock. The same phenomenon probably occurred in 1981 and 1983 in stratum 306 and may be in 1983 in stratum 307 with a smaller extent.

The age composition of the mean number per tow calculated without strata 306 to 309 is given in table 5. The same calculation including these strata (with corrections for the year 1985 as compared to table 5 in Maucorps et al., 1985) is provided table 6 for comparison. Significant differences can be noticed from age 4 to 8 for the years 1981 to 1983 and 1986.

If we except the year 1984, research survey data show a constant upward trend in biomass and abundance from 1978 to 1986. Year classes 1981, 1980 and 1982 were respectively the most abundant in age distribution from the 1986 survey in terms of mean number per tow (table 5 and fig. 2). The 1983 year class does not appear as strong as 1980 to 1982 year classes, on the other hand the strengths of the 1983 and 1984 year classes at age 3 and 2 in 1986 are close to the strength of the 1978 year class observed at the same ages.

References

Maucorps, A. and J.C. Poulard, 1985.- Contribution to the Assessment of the Cod Stock in Subdivision 3Ps. NAFO SCR Doc. 85/32.

Templeman, W., 1979.- Migration and Intermingling of Stocks of Atlantic Cod, Gadus morhua, of the Newfoundland and Adjacent Areas from Tagging in 1962-66. ICNAF Res.Bull., No. 14 : 5-48.

Table 1 - Cod catch at age (,000's) from the French offshore and inshore fisheries in Subdivision 3Ps during 1985.

| Age | Offshore fishery | Inshore fishery | Total |
|--------------|------------------|-----------------|--------------|
| 3 | 83 | 13 | 96 |
| 4 | 2410 | 75 | 2485 |
| 5 | 4587 | 257 | 4844 |
| 6 | 2109 | 97 | 2206 |
| 7 | 1473 | 52 | 1525 |
| 8 | 451 | 14 | 465 |
| 9 | 121 | | 121 |
| 10 | 111 | 1 | 112 |
| 11 | 121 | | 121 |
| 12 | 53 | | 53 |
| 13 | 6 | | 6 |
| 14 | 6 | | 6 |
| Total | 11531 | 509 | 12040 |

Table 2 - Commercial sampling for NAFO Subdivision 3Ps cod in 1985.

| Quarter | Gear | No. aged | No. measured |
|---------|------|----------|--------------|
| 1 | OT | 87 | 398 |
| 2 | OT | 166 | 1198 |
| | HL | 79 | 865 |
| 3 | OT | 70 | 433 |
| | HL | 109 | 897 |
| 4 | OT | 138 | 833 |

Table 3 - Cod 3Ps abundance (000's) from groundfish surveys 1978-1986. Numbers in brackets are estimates for non-sampled strata.

| Depth range (Fth) | Strata | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|--------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| 0-30 | 314 | 33 | 133 | (183) | 266 | 22 | 133 | 0 | 33 | 33 |
| | 320 | 36 | 241 | (346) | 783 | 90 | 572 | 663 | 135 | 45 |
| | Total | 69 | 374 | 529 | 1049 | 112 | 705 | 663 | 168 | 78 |
| 31-50 | 308 | 189 | 11 | 34 | 34 | 161 | 46 | 157 | 49 | 134 |
| | 312 | 605 | 99 | 27 | 676 | 456 | 99 | 6837 | 155 | 298 |
| | 315 | 368 | 56 | 169 | 269 | 113 | 84 | 3596 | 28 | 320 |
| | 321 | 20 | 895 | 325 | 502 | 386 | 190 | 146 | 16 | 54 |
| | Total | 1182 | 1061 | 555 | 1481 | 1116 | 419 | 10736 | 248 | 806 |
| 51-100 | 307 | 1947 | 1154 | 3084 | 640 | 4644 | 2957 | 2624 | 784 | 21238 |
| | 311 | 401 | 1628 | 1157 | 4356 | 3995 | 4147 | 15162 | 1954 | 18053 |
| | 317 | 0 | 118 | (828) | 723 | 4939 | 1696 | 16435 | 1308 | 1181 |
| | 319 | 1051 | 4583 | 1145 | 3262 | 3515 | 7666 | 5472 | 3358 | 2886 |
| | 322 | 939 | 617 | 5742 | 1149 | 4915 | 5719 | 2602 | 4239 | 4865 |
| | 323 | 349 | 226 | 317 | 1156 | 572 | 3670 | 3682 | 2669 | 4544 |
| | Total | 4687 | 8326 | 12273 | 11286 | 22580 | 25855 | 45977 | 14312 | 52767 |
| 101-150 | 306 | 765 | 870 | 698 | 9690 | 2841 | 6332 | 947 | 277 | 14559 |
| | 309 | 354 | 1642 | 263 | 1452 | 594 | 1500 | 1588 | 871 | 4899 |
| | 310 | 395 | 186 | 15 | 489 | 1094 | 935 | 104 | 9571 | 174 |
| | 313 | 129 | 327 | 14 | 858 | 813 | 678 | 82 | 2359 | 137 |
| | 316 | 43 | 94 | 25 | 165 | 422 | 30 | 172 | 3827 | 826 |
| | 318 | 21 | 8 | (417) | 247 | 214 | 1182 | 603 | 575 | 5810 |
| | Total | 1707 | 3127 | 1432 | 12901 | 5978 | 10657 | 3496 | 17480 | 26405 |
| 151-200 | 705 | 253 | 981 | 890 | 422 | 3285 | 672 | 908 | 69 | 227 |
| | 706 | 21 | 1597 | 81 | 671 | 3053 | 179 | 532 | 130 | 1988 |
| | 715 | 922 | 596 | 895 | 628 | 2472 | 587 | 1636 | 916 | 1131 |
| | 716 | 123 | 356 | 922 | 455 | 1772 | 1196 | 1058 | 24 | 2258 |
| | Total | 1319 | 3530 | 2788 | 2176 | 10582 | 2634 | 4134 | 1139 | 5604 |
| 0-200 | Total | 8964 | 16418 | 17577 | 28893 | 40368 | 40270 | 65006 | 33347 | 85660 |
| Total strata 306-307-308-309 | | 3255 | 3677 | 4079 | 11816 | 8240 | 10835 | 5316 | 1981 | 40830 |
| Total area excluding 306-307-308-309 | | 5709 | 12741 | 13498 | 17077 | 32128 | 29435 | 59690 | 31366 | 44830 |

Table 4 - Cod biomass (metric tons) from stratified random surveys in Subdivision 3Ps.
Numbers in brackets are estimates for non-sampled strata.

| Depth range (Fth) | Strata | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|
| 0-30 | 314 | 16 | 450 | (316) | 1389 | 111 | 30 | 0 | 6 | 13 |
| | 320 | 108 | 813 | (1202) | 3797 | 512 | 2802 | 3526 | 103 | 13 |
| | Total | 124 | 1263 | 1518 | 5186 | 623 | 2832 | 3526 | 109 | 26 |
| 31-50 | 308 | 370 | 8 | 149 | 88 | 299 | 150 | 111 | 65 | 99 |
| | 312 | 819 | 270 | 111 | 2303 | 453 | 635 | 1403 | 145 | 343 |
| | 315 | 771 | 849 | 1954 | 1076 | 821 | 325 | 16917 | 8 | 1812 |
| | 321 | 183 | 4784 | 3746 | 2198 | 3746 | 1521 | 1026 | 3 | 542 |
| | Total | 2143 | 5911 | 5960 | 5665 | 5319 | 2631 | 19457 | 221 | 2796 |
| 51-100 | 307 | 3598 | 2714 | 4427 | 1875 | 9009 | 6268 | 5383 | 2976 | 23172 |
| | 311 | 86 | 3198 | 1136 | 5797 | 8201 | 3571 | 19598 | 1275 | 20626 |
| | 317 | 0 | 259 | (1011) | 812 | 454 | 420 | 21353 | 3082 | 2561 |
| | 319 | 997 | 5809 | 1303 | 4434 | 4077 | 11348 | 8101 | 2628 | 3178 |
| | 322 | 605 | 1945 | 3380 | 1793 | 2404 | 967 | 1121 | 2388 | 5944 |
| | 323 | 90 | 572 | 858 | 822 | 54 | 793 | 803 | 512 | 2399 |
| Total | 5376 | 14497 | 12115 | 15533 | 24199 | 23367 | 56359 | 12861 | 57880 | |
| 101-150 | 306 | 3080 | 2659 | 2161 | 12196 | 3716 | 11967 | 2295 | 803 | 23131 |
| | 309 | 167 | 2743 | 804 | 2176 | 1121 | 3318 | 3852 | 1581 | 7433 |
| | 310 | 411 | 190 | 19 | 481 | 1682 | 739 | 228 | 4674 | 168 |
| | 313 | 113 | 331 | 14 | 1099 | 1279 | 840 | 169 | 1752 | 142 |
| | 316 | 73 | 120 | 20 | 281 | 544 | 36 | 332 | 37104 | 694 |
| | 318 | 42 | 25 | (1147) | 592 | 274 | 5282 | 786 | 1828 | 28348 |
| | Total | 3886 | 6068 | 4165 | 16825 | 8616 | 22182 | 7662 | 47742 | 59916 |
| 151-200 | 705 | 320 | 1115 | 1544 | 574 | 4549 | 983 | 1660 | 98 | 414 |
| | 706 | 10 | 1814 | 163 | 951 | 4010 | 374 | 1141 | 220 | 3896 |
| | 715 | 836 | 831 | 1564 | 827 | 4158 | 1261 | 3806 | 2281 | 2612 |
| | 716 | 178 | 455 | 1169 | 553 | 2104 | 1934 | 2325 | 86 | 2774 |
| | Total | 1344 | 4215 | 4440 | 2905 | 14821 | 4552 | 8932 | 2685 | 9696 |
| 0-200 | Total | 12873 | 31954 | 28198 | 46114 | 53578 | 55564 | 95936 | 63618 | 130314 |
| Total strata 306-307-308-309 | | 7215 | 8124 | 7541 | 16335 | 14145 | 21703 | 11641 | 5425 | 53835 |
| Total area excluding 306-307-308-309 | | 5658 | 23830 | 20657 | 29779 | 39433 | 33861 | 84295 | 58193 | 76479 |

Table 5 - Mean number of cod per tow from research trips in Subdivision 3Ps :
in strata 310 to 323, 705, 706, 715 and 716.

| Age | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|----------------|-------------------|-------------------|--------------|-------------------|------------------|-------------------|-------------------|------------------|------------------|
| 1 | | 0.08 | | 0.08 | 1.16 | 5.24 | 0.03 | 0.16 | 0.06 |
| 2 | 0.85 | 0.50 | 9.48 | 0.21 | 13.49 | 12.43 | 13.68 | 6.25 | 8.59 |
| 3 | 1.61 | 0.44 | 2.06 | 5.30 | 2.09 | 5.98 | 9.04 | 16.36 | 4.94 |
| 4 | 2.88 | 2.26 | 0.33 | 2.80 | 8.06 | 2.59 | 17.63 | 8.39 | 9.70 |
| 5 | 1.55 | 7.91 | 1.70 | 2.81 | 6.34 | 4.80 | 9.78 | 4.07 | 11.78 |
| 6 | 0.49 | 3.17 | 2.89 | 4.81 | 4.03 | 3.19 | 19.83 | 0.98 | 10.03 |
| 7 | 0.20 | 1.55 | 1.07 | 4.40 | 3.11 | 2.31 | 5.54 | 1.74 | 5.33 |
| 8 | 0.10 | 0.78 | 0.49 | 1.49 | 3.96 | 1.96 | 2.13 | 1.10 | 5.90 |
| 9 | 0.10 | 0.32 | 0.24 | 1.18 | 1.39 | 1.78 | 3.23 | 0.84 | 4.11 |
| 10 | 0.10 | 0.18 | 0.19 | 0.46 | 0.85 | 0.72 | 2.30 | 0.94 | 0.82 |
| 11 | 0.01 | 0.24 | 0.19 | 0.16 | 0.40 | 0.25 | 0.67 | 1.18 | 0.63 |
| 12 | 0.02 | 0.07 | 0.10 | 0.15 | 0.15 | 0.16 | 0.16 | 1.38 | 0.73 |
| 13 | 0.01 | 0.07 | 0.07 | 0.06 | 0.19 | 0.05 | 0.15 | 0.13 | 0.23 |
| 14+ | 0.03 | 0.22 | 0.19 | 0.13 | 0.07 | 0.05 | 0.11 | 0.25 | 0.37 |
| Total | 8.04 | 17.88 | 19.08 | 24.11 | 45.36 | 41.50 | 84.36 | 43.77 | 63.30 |
| Standard error | 1.47 | 6.89 | 4.21 | 5.09 | 10.68 | 11.86 | 17.71 | 7.67 | 11.96 |
| Sets | 56 | 53 | 29 | 72 | 63 | 77 | 63 | 73 | 72 |
| Surveys Dates | Feb 21- Mar 25 | Feb 21- Mar 20 | Mar 3-12 | Feb 24- Mar 31 | Mar 5 April 2 | Feb 10- Mar 19 | Feb 15- Mar 19 | Feb 9- Mar 10 | Feb 3- Mar 12 |

Table 6 - Mean number of cod per tow from research trips in Subdivision 3Ps :
in strata 306 to 323, 705, 706, 715 and 716.

| Age | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|----------------|-------------------|-------------------|--------------|-------------------|------------------|-------------------|-------------------|------------------|------------------|
| 1 | | 0.07 | | 0.07 | 1.04 | 4.92 | 0.03 | 0.14 | 0.09 |
| 2 | 0.77 | 0.45 | 8.10 | 0.20 | 12.10 | 11.46 | 12.50 | 5.70 | 8.04 |
| 3 | 1.65 | 0.41 | 1.89 | 5.57 | 1.98 | 5.73 | 8.25 | 15.05 | 4.67 |
| 4 | 3.24 | 2.40 | 0.54 | 5.61 | 8.39 | 3.16 | 16.27 | 7.75 | 16.86 |
| 5 | 2.16 | 8.89 | 2.93 | 5.84 | 8.03 | 7.65 | 9.43 | 4.08 | 29.39 |
| 6 | 1.26 | 3.91 | 4.96 | 8.46 | 6.11 | 6.49 | 20.47 | 1.10 | 24.05 |
| 7 | 0.94 | 2.06 | 1.83 | 6.40 | 4.59 | 4.83 | 6.03 | 2.02 | 10.13 |
| 8 | 0.55 | 1.06 | 0.74 | 1.82 | 5.34 | 2.94 | 2.30 | 1.18 | 7.74 |
| 9 | 0.32 | 0.42 | 0.32 | 1.35 | 1.59 | 2.21 | 3.34 | 0.81 | 4.27 |
| 10 | 0.23 | 0.23 | 0.25 | 0.53 | 0.88 | 0.80 | 2.38 | 0.90 | 0.88 |
| 11 | 0.02 | 0.31 | 0.19 | 0.17 | 0.42 | 0.27 | 0.66 | 1.13 | 0.65 |
| 12 | 0.04 | 0.09 | 0.12 | 0.16 | 0.15 | 0.20 | 0.17 | 1.37 | 0.80 |
| 13 | 0.01 | 0.10 | 0.08 | 0.07 | 0.21 | 0.08 | 0.14 | 0.13 | 0.24 |
| 14+ | 0.03 | 0.23 | 0.19 | 0.15 | 0.10 | 0.06 | 0.13 | 0.24 | 0.36 |
| Total | 11.28 | 20.74 | 22.23 | 36.49 | 51.00 | 50.88 | 82.15 | 41.60 | 108.21 |
| Standard error | 1.41 | 5.88 | 3.79 | 7.58 | 9.53 | 10.71 | 14.71 | 6.44 | 14.84 |
| Sets | 68 | 64 | 40 | 83 | 73 | 88 | 74 | 84 | 82 |
| Surveys Dates | Feb 21- Mar 25 | Feb 21- Mar 20 | Mar 3-12 | Feb 24- Mar 31 | Mar 5 April 2 | Feb 10- Mar 19 | Feb 15- Mar 19 | Feb 9- Mar 10 | Feb 3- Mar 12 |

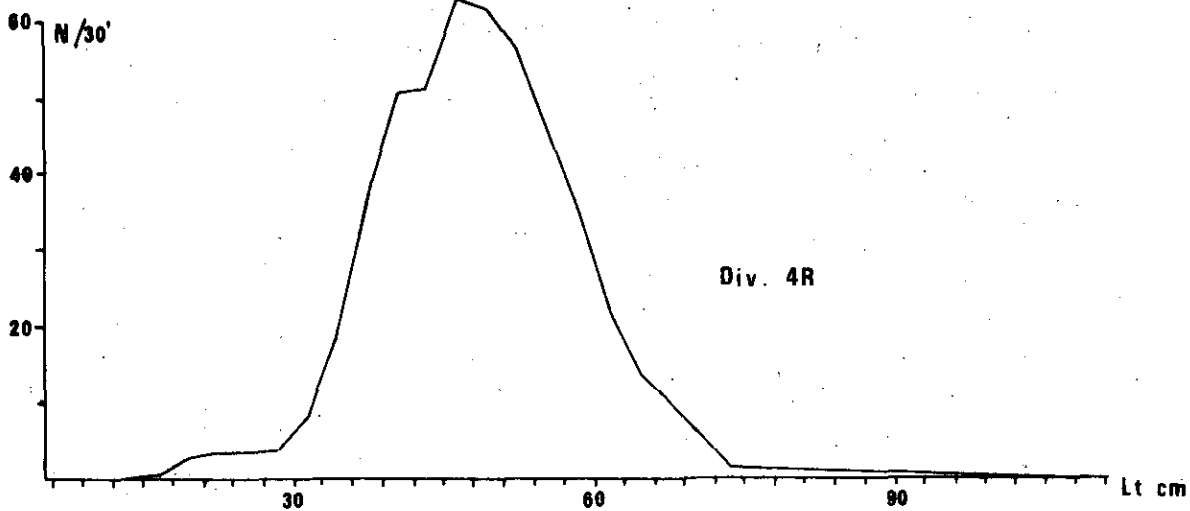
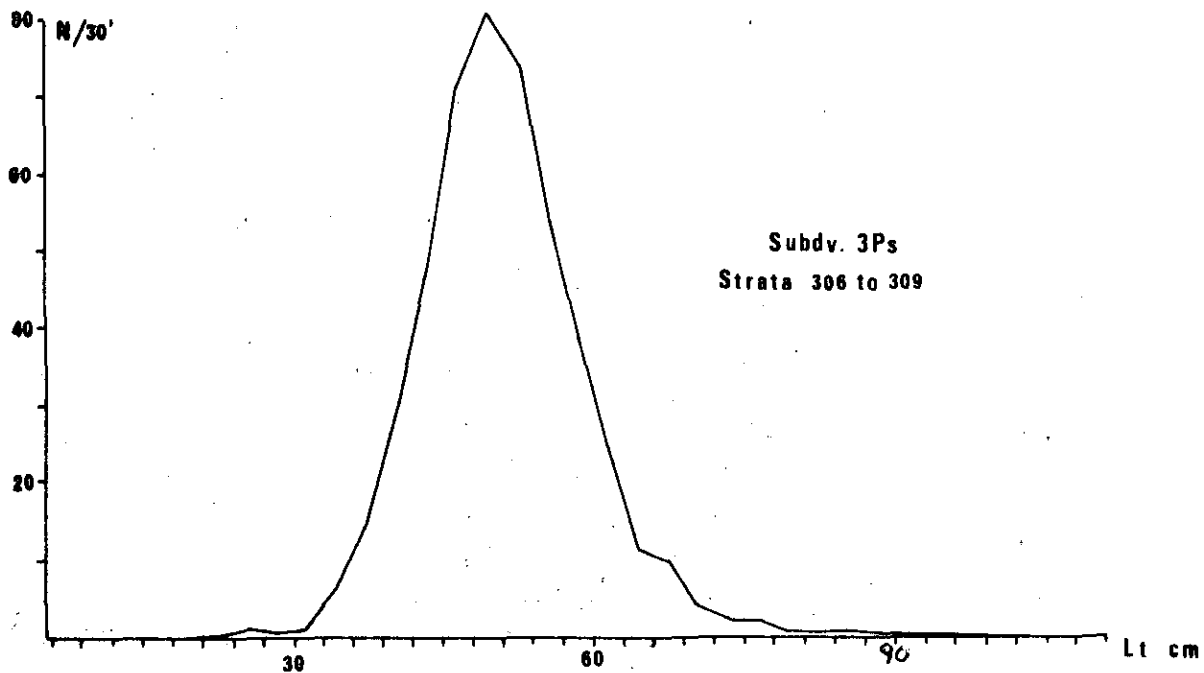


Fig. 1 - Length distribution of cod caught in strata 306 to 309 (Subdiv. 3Ps) and in Div. 4R.

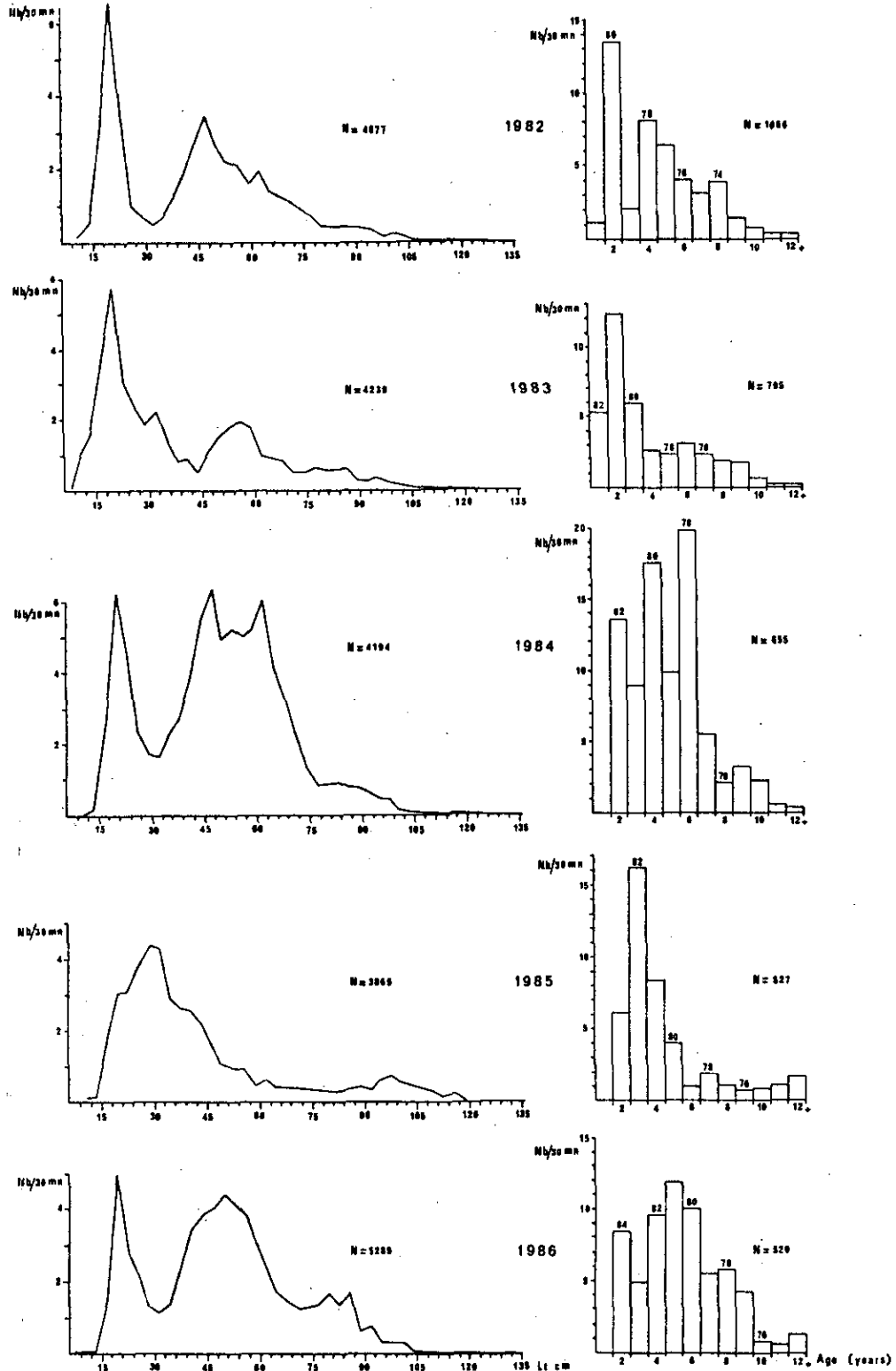


Fig. 2 - Length distribution and age composition for cod in 3Ps from the winter groundfish surveys (strata used : 310 to 323, 705, 706, 715 and 716).

