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Yield-per-recruit Analysis for the Cod Stock in NAFO Divisions 3NO

by

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For previous assessments of the cod stock in Div. 3NO, the values of $F_{0.1}$ and F_{max} reference levels were estimated to be 0.18 and 0.22 respectively. A yield per recruit analysis using data for a more recent time period is presented in this document.

Average weight-at-age and partial recruitment values for ages 3-20 were used in this analysis and are given in Table 1. Average weight-at-age values for ages 3-12 (Anon 1987, p. 30) were obtained from the commercial fishery (1984-86 average) while those for ages 13-20 were obtained from Canadian research vessel surveys, averaged over the 1981-86 period (excluding 1983 when no survey was conducted). Partial recruitment values used were obtained from averaging selectivity coefficients (Bishop and Baird 1987) for the 1981-84 period. These selectivity coefficients were available for ages 3-12 and PR values for ages 13-20 were assumed to be 1.0. Natural mortality was assumed to be 0.20.

The results of this yield per recruit analysis are given in Table 2 and Fig. 1. The $F_{0.1}$ reference level is computed as 0.1505 at a yield per recruit of 1.2449 kg while the F_{max} level is computed as 0.2497 at a yield per recruit of 1.3238 kg.

References

- Anon. 1987. Provisional Report of Scientific Council, June 1987 Meeting. NAFO SCS Doc. 87/21. Ser. No. N1363. 92 p.
- Bishop, C. A., and J. W. Baird. Assessment of the cod stock in NAFO Divisions 3NO. NAFO SCR Doc. 87/53. Ser. No. N1342. 20 p.

Table 1. Weight-at-age (kg) and partial recruitment data used in a yield per recruit analysis for cod in NAFO Division 3NO.

| AGE | WEIGHT-AT-AGE | PARTIAL RECRUITMENT |
|-----|---------------|---------------------|
| 3 | 0.550 | 0.060 |
| 4 | 1.000 | 0.240 |
| 5 | 1.510 | 0.540 |
| 6 | 2.160 | 0.750 |
| 7 | 3.260 | 1.000 |
| 8 | 4.710 | 1.000 |
| 9 | 6.780 | 1.000 |
| 10 | 8.430 | 1.000 |
| 11 | 9.330 | 1.000 |
| 12 | 11.210 | 1.000 |
| 13 | 14.830 | 1.000 |
| 14 | 13.260 | 1.000 |
| 15 | 17.240 | 1.000 |
| 16 | 16.820 | 1.000 |
| 17 | 18.570 | 1.000 |
| 18 | 18.930 | 1.000 |
| 19 | 19.700 | 1.000 |
| 20 | 17.030 | 1.000 |

Table 2. Results of a yield per recruit analysis for cod in NAFO Division 3NO.

YIELD PER RECRUIT ANALYSIS

| | FISHING MORTALITY | CATCH (NUMBER) | YIELD (KG) | AVG. WEIGHT (KG) | YIELD PER UNIT EFFORT |
|---------|-------------------|----------------|------------|------------------|-----------------------|
| | 0.1000 | 0.213 | 1.092 | 5.076 | 1.308 |
| F0.1--- | 0.1505 | 0.278 | 1.245 | 4.485 | 1.000 |
| | 0.2000 | 0.326 | 1.309 | 4.016 | 0.791 |
| FMAX--- | 0.2497 | 0.364 | 1.324 | 3.634 | 0.641 |
| | 0.3000 | 0.396 | 1.314 | 3.319 | 0.529 |
| | 0.4000 | 0.445 | 1.266 | 2.848 | 0.382 |
| | 0.5000 | 0.481 | 1.210 | 2.516 | 0.292 |
| | 0.6000 | 0.509 | 1.158 | 2.273 | 0.233 |
| | 0.7000 | 0.533 | 1.112 | 2.089 | 0.192 |
| | 0.8000 | 0.552 | 1.074 | 1.945 | 0.162 |
| | 0.9000 | 0.569 | 1.041 | 1.830 | 0.140 |
| | 1.0000 | 0.583 | 1.013 | 1.737 | 0.122 |
| | 1.1000 | 0.596 | 0.989 | 1.659 | 0.109 |
| | 1.2000 | 0.608 | 0.968 | 1.593 | 0.097 |
| | 1.3000 | 0.618 | 0.950 | 1.537 | 0.088 |
| | 1.4000 | 0.627 | 0.934 | 1.488 | 0.081 |
| | 1.5000 | 0.636 | 0.919 | 1.445 | 0.074 |

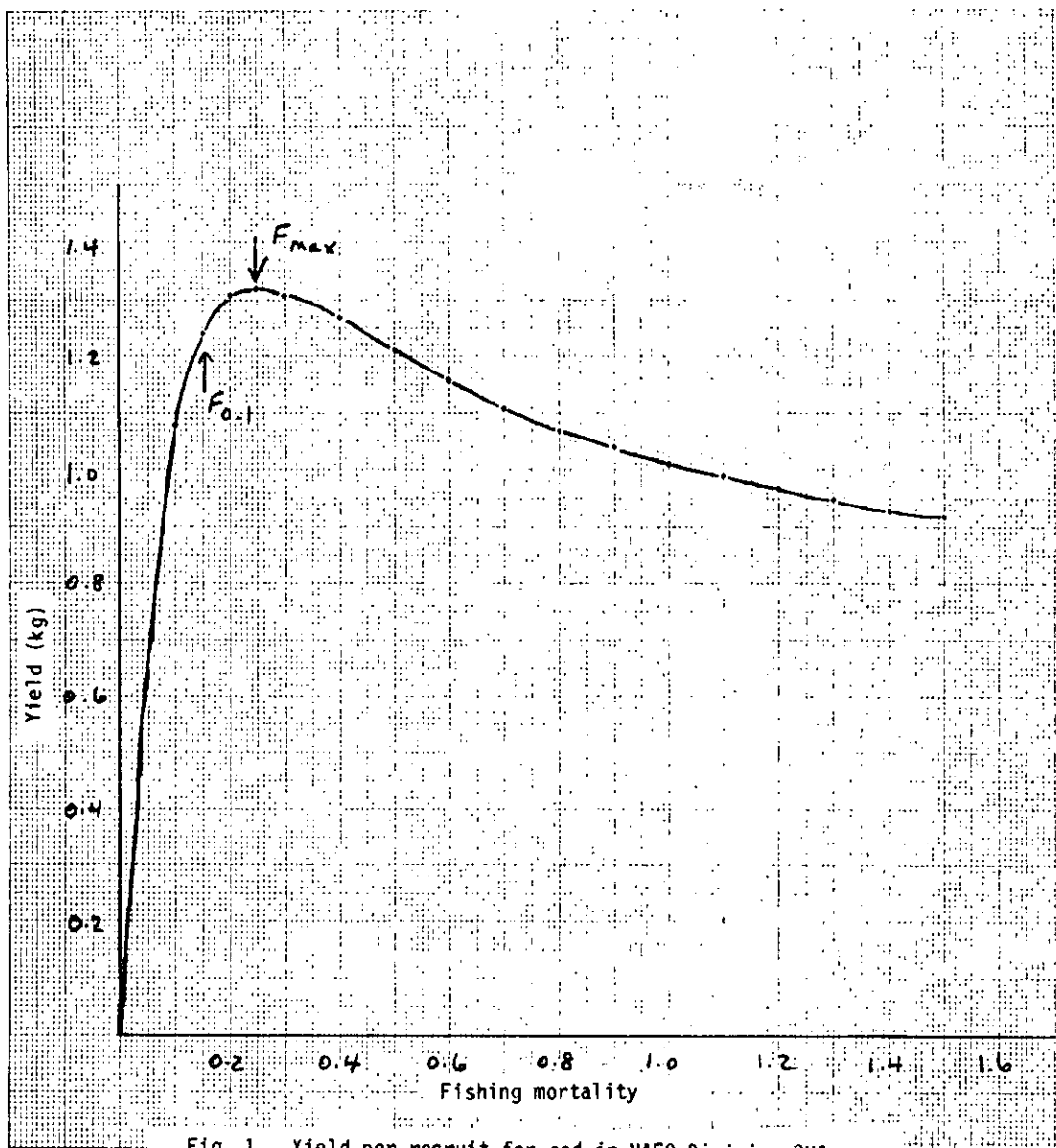


Fig. 1. Yield per recruit for cod in NAFO Division 3NO.