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Changes in Stock Abundance for Some Cod Stocks in Subareas 2 and 3

by

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ABSTRACT

Information is presented on trends in stock abundance for cod stocks that occupy the following management units: Divisions 2J3KL; Divisions 3NO; and Subdivision 3Ps. In general, stock abundance was highest in the early 1960's with subsequent declines until the middle to late 1970's. Stock abundance has increased somewhat in the 1980's, but has not reached the levels observed in the 1960's. Estimates of young cod recruiting to the various commercial fisheries for current and historical periods is also compared.

INTRODUCTION

- 1) Five stocks in Subarea 2 and 3 around the coast of Newfoundland defined by the following NAFO Divisions: (Fig. 16)
 - 2GH
 - 2J3KL
 - 3M
 - 3NO
 - 3Ps
- 2) This presentation will describe the:
 - a) Various fisheries and
 - b) Stock status including:
 - Fishing Mortality
 - Biomass
 - Recruitment
 - c) Possible causes for observed fluctuations

THE FISHERIES

- 1) 2GH (Fig. 1)
 - Landings high from 1965 to 1969 (ave 70,000t)
 - Less than 20,000 from 1970 to 1982
 - Less than 1,000 since 1982

COD SYMPOSIUM, SEPTEMBER 1991

- 2) 2J3KL (Fig. 2)
 - The largest cod stock in the area
 - Increased rapidly in late 50's and early 60's
 - Catches peaked (800,000t) in 1968
 - Subsequent decline to 1978 (170,000t)
 - Followed by an increase
 - Average catch since 1982 about 250,000t
- 3) 3M (Fig. 3)
 - Highest in mid-60's early 70's
 - Peaked in 1965 and 1972 (over 55,000t)
 - Moratorium since 1988
 - Catches in 1989 and 1990 estimated at 40 and 32,000t
- 4) 3NO (Fig. 4)
 - Highest in late-60's and early 70's
 - Peaked in 1967 at 226,000t
 - Since 1975 catches all less than 50,000t
- 5) 3Ps (Fig. 5)
 - Catches highest in 1960's and early 70's
 - About 65,000t ave during this time
 - Less than 40,000t from 1975 to 1984
 - Approached 60,000t in 1986 and 1987
 - About 40,000t in last three years
- 6) COMBO (Fig. 6)
 - Catches highest in 1960's
 - Peak of 1.2 million tons in 1968
 - Between 300,000 and 400,000t since 1982
 - 2J3KL about 70% of total

STOCK STATUS

- a) Only analytical assessments for:
 - 2J3KL
 - 3NO
 - 3Ps
- b) Adequate data not available for others
- c) Assessments conducted since mid-1970's
- d) Methodology databases improving with time
- e) Variability in assessments usually reflect variability in inputs
- f) Assessment data comes from 2 basic sources:
 - Commercial fishery data
 - Research vessel surveys
- g) Sequential Population Analysis
- h) Calibration of SPA using The Adaptive Framework

2J3KL

a) Fishing Mortality (Fig. 7)

- F on fully recruited ages 7-9
- General increase from early 60's to mid-70's
- Lowest in 1980 (about 0.3)
- Increasing slowly to about .6 in 1989
- About 0.5 in 1990

b) January 1 biomass (Fig. 8)

- Highest in late 60's and early 70's (over 2 million tons)
- Declined substantially to 1976 (.5 million)
- Generally increased thereafter
- Around 1 million tons since early 80's

c) Recruitment (Fig. 9)

- Higher than 600 million from 62 to 71 (Average about 800 million)
- Below 600 million from 1972 to 1989
- 1989 and 1990 (86 and 87 Y/C's) largest since 60's
- Two bad followed by some good

3NO

a) Fishing Mortality (Fig. 10)

- Results considered approximate
- Fully recruited ages 7 to 10
- High in 60's to mid 70's
- Less than 0.2 from 1978 to 1984
- Close to 0.4 since 1988

b) Biomass (Fig. 11)

- Peaked in 1967 (400,000t)
- Declined to about 75,000t in 1975-76
- Increased to 250,000 by 1984
- Declined again, probably as low now as mid-70's
- Recent decline caused by recruitment failure

c) Recruitment (Fig. 12)

- Several over 100 million in 1960's
- Average since 1973 about 35 million
- Recent 5 Y/C's lowest in time series
- All less than 10 million

3Ps

a) Fishing Mortality (Fig. 13)

- Fully recruited ages 7 to 9
- Increasing trend until mid-70's
- Followed by substantial decline (less than 0.4 in 1977)
- 1989 and 1990 F's amongst lowest in time series

- b) Biomass (Fig. 14)
 - Declined from late 60's to mid-70's (to about 75,000t)
 - Generally increased since that time
 - Currently at levels of the late 50's and early 60's
- c) Recruitment (Fig. 15)
 - Variable but no general trend observed
 - Recent years about the highest in time series

DISCUSSION

Possible reasons for change in stock status

- a) Declines in biomass coincident with high exploitation
- b) Recruitment generally declined during same period
- c) Instances where low SSB produced good recruitment (the reverse true as well)
- d) Poor stock recruit relationships however there is a tendency to have higher recruitment with high SSB
- e) Synchrony of yearclasses
 - Eg. 1960, 1970-71, 1976-77, 1983-84
 - Recruitment may be influenced by factors other than SSB, such as: Temperature, salinity and currents, etc.
- f) Hydrographic data not extensive in early years
- g) Need better definition of hydrographic conditions relative to spawning location

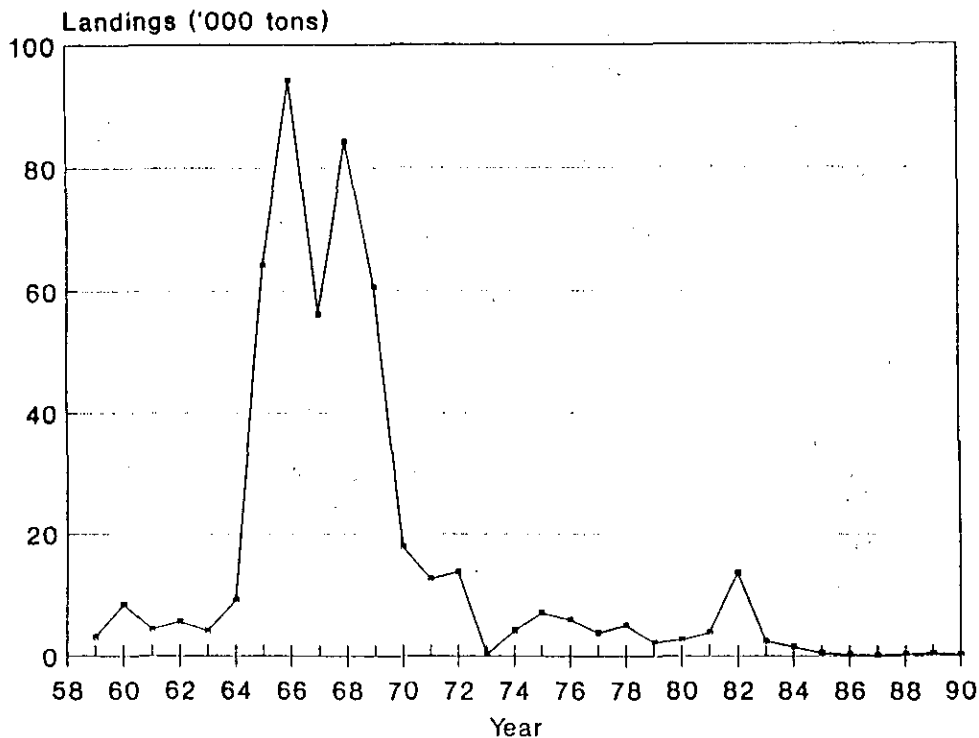


Fig. 1. Cod landings in Div. 2GH.

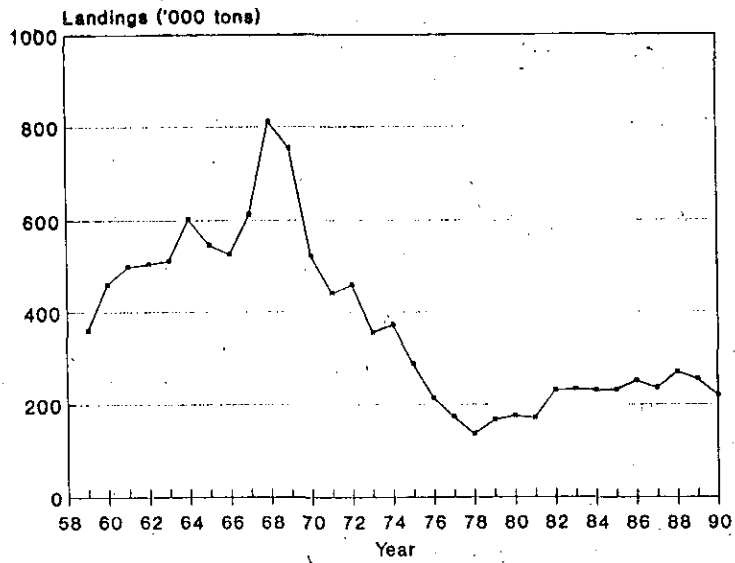


Fig. 2. Cod landings in Div. 2J3KL.

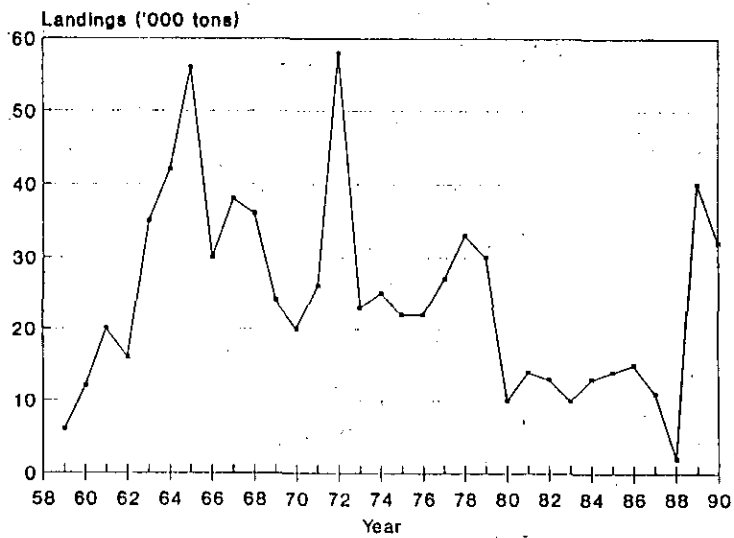


Fig. 3. Cod landings in Div. 3M.
(1989 & 1990 are estimates)

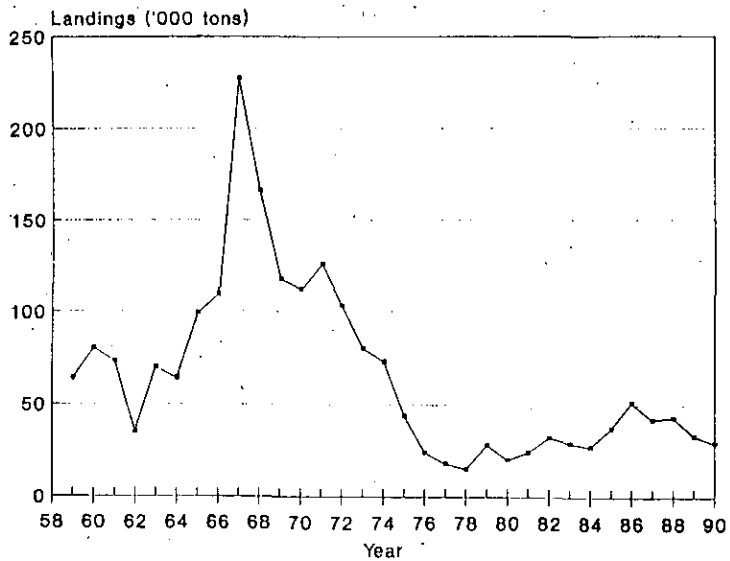


Fig. 4. Cod landings Div. 3NO.

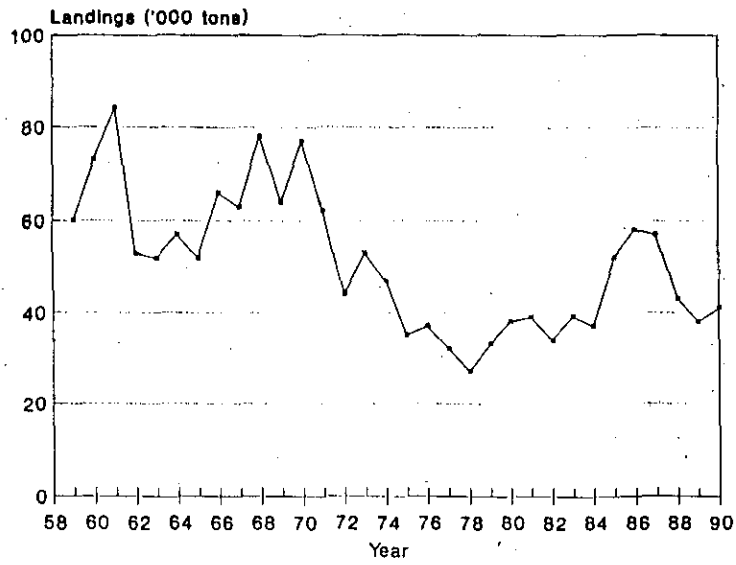


Fig. 5. Cod landings in Subdiv. 3Ps.

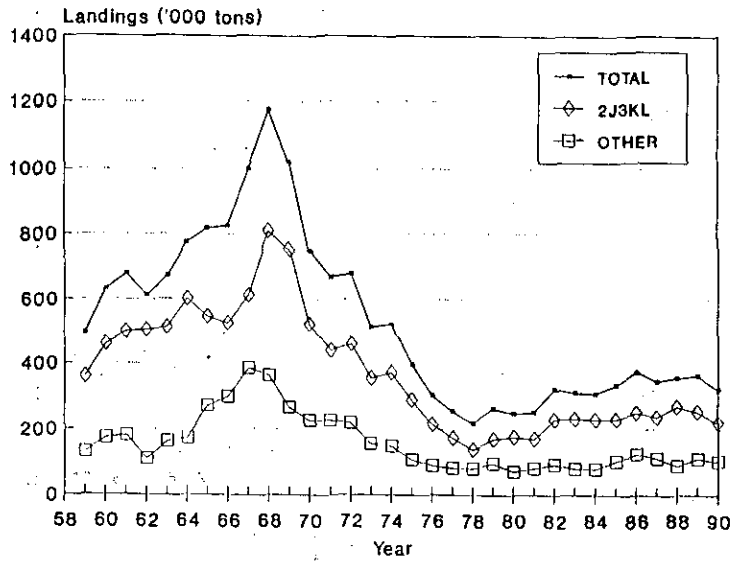


Fig. 6. Cod landings in Subareas 2+3.

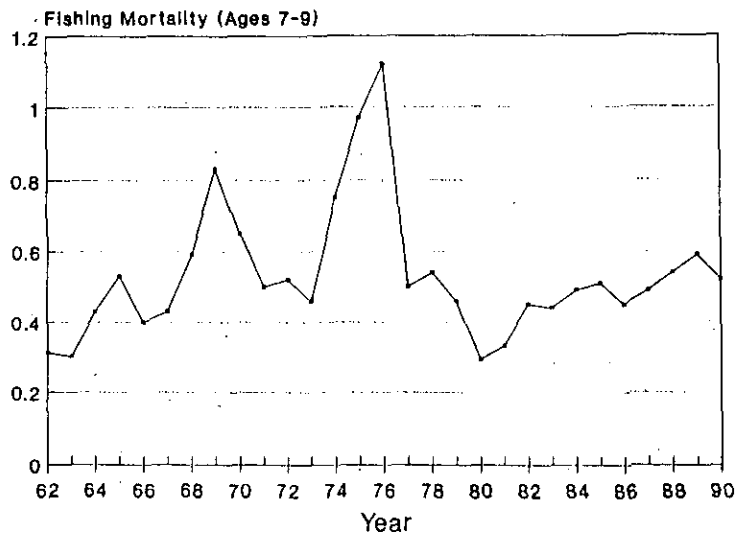


Fig 7. Fishing mortality for cod in Divisions 2J3KL.

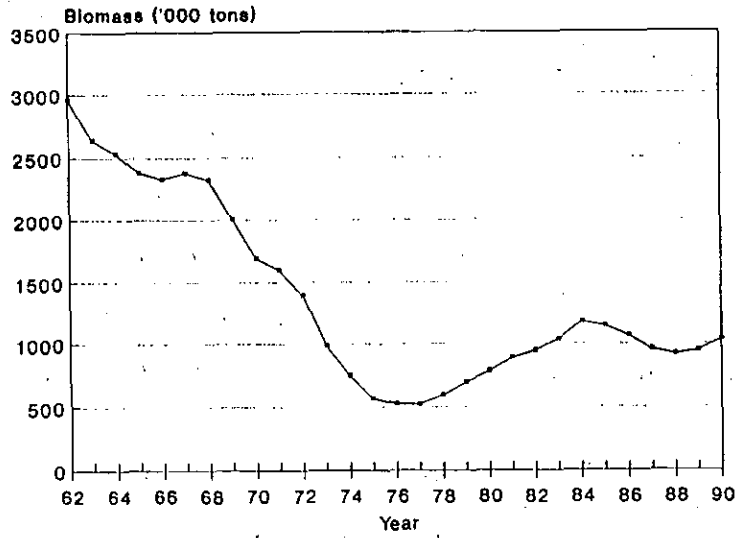


Fig. 8. January 1 age 3+ biomass for cod in Divisions 2J3KL.

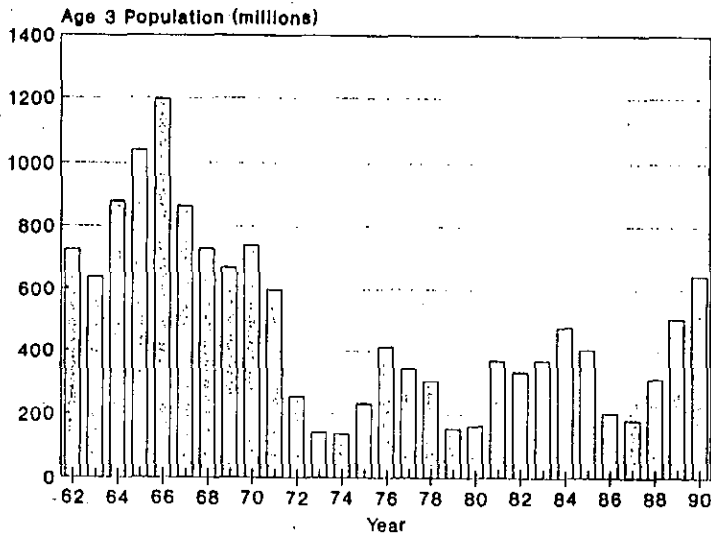


Fig. 9. Recruitment for cod in Divisions 2J3KL.

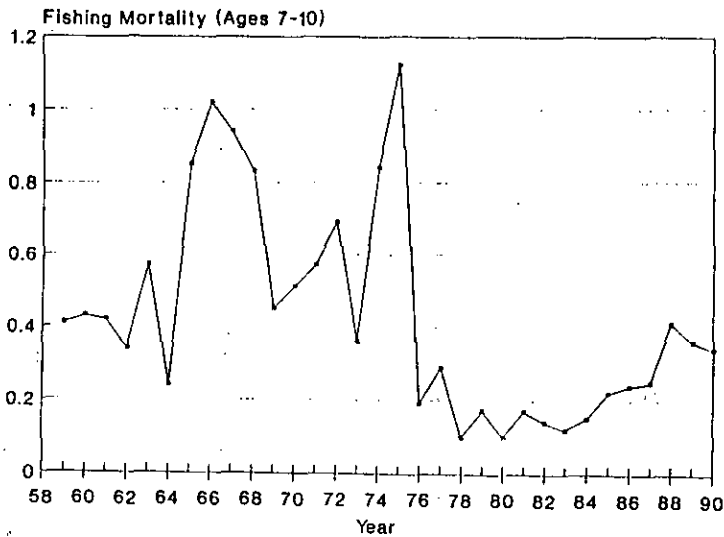


Fig 10. Fishing mortality for cod in Divisions 3NO.

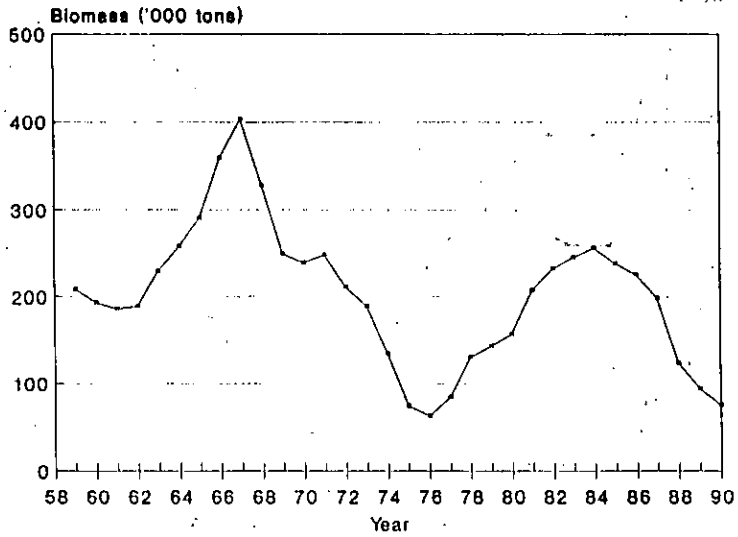


Fig. 11. January 1 age 3+ biomass for cod in Division 3NO.

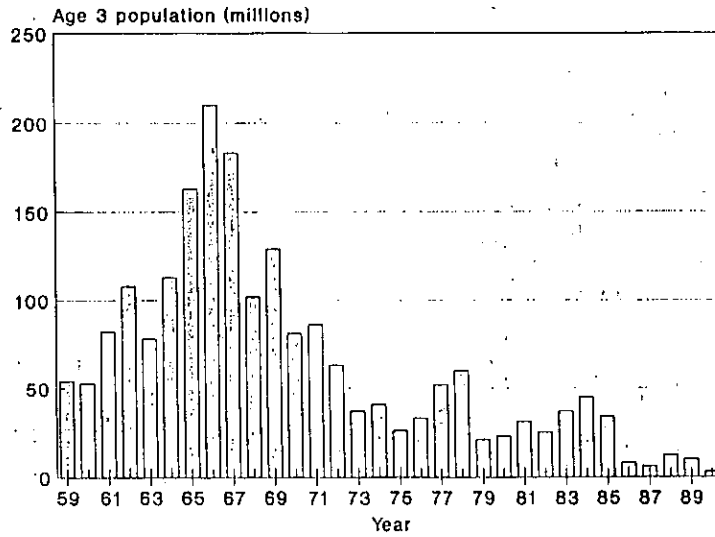


Fig. 12. Recruitment for cod in Division 3NO.

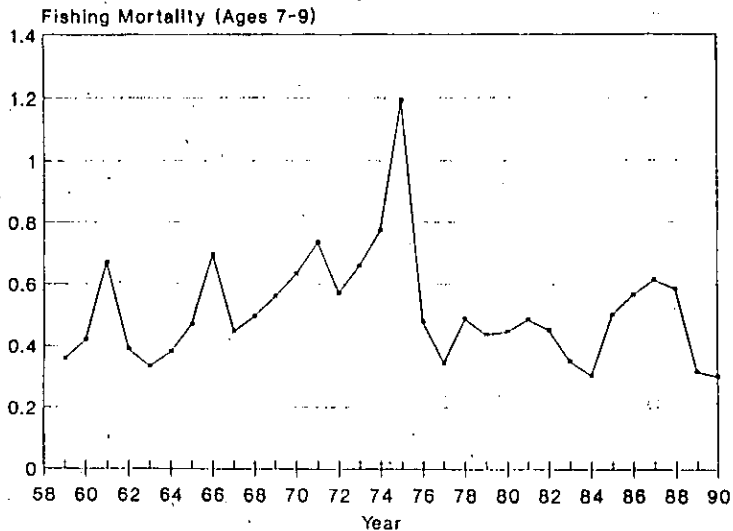


Fig. 13. Fishing mortality for cod in Subdivision 3Ps.

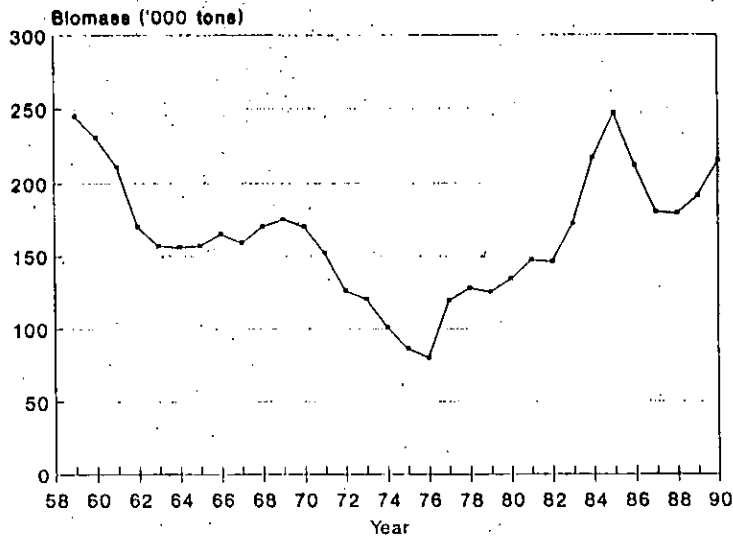


Fig. 14. January 1 age 3+ biomass for cod in Subdivision 3Ps.

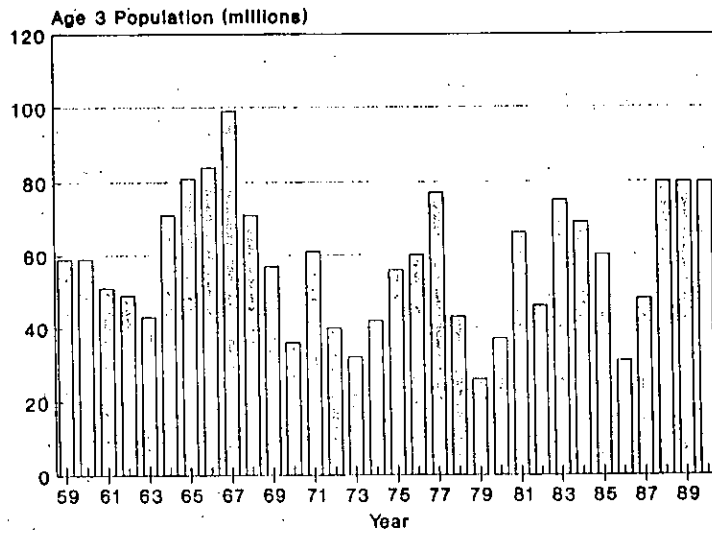


Fig. 15. Recruitment for cod in Subdivision 3Ps.

MAP ILLUSTRATING NAFO'S CONVENTION AREA AND 200-MILE FISHING ZONE BOUNDARIES

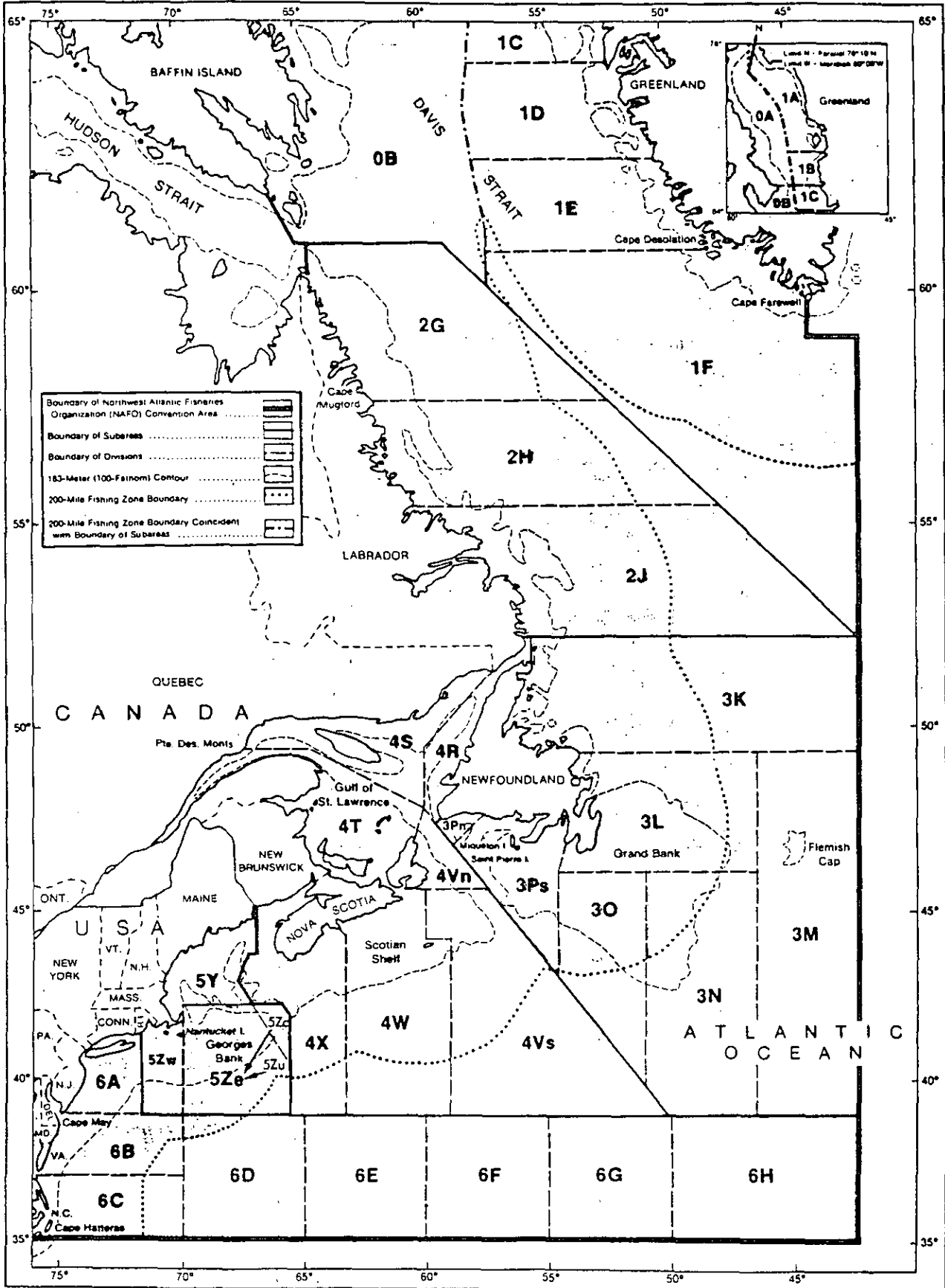


Figure 16. NAFO Areas