

Gulf of Maine Cod Total Commercial Landings

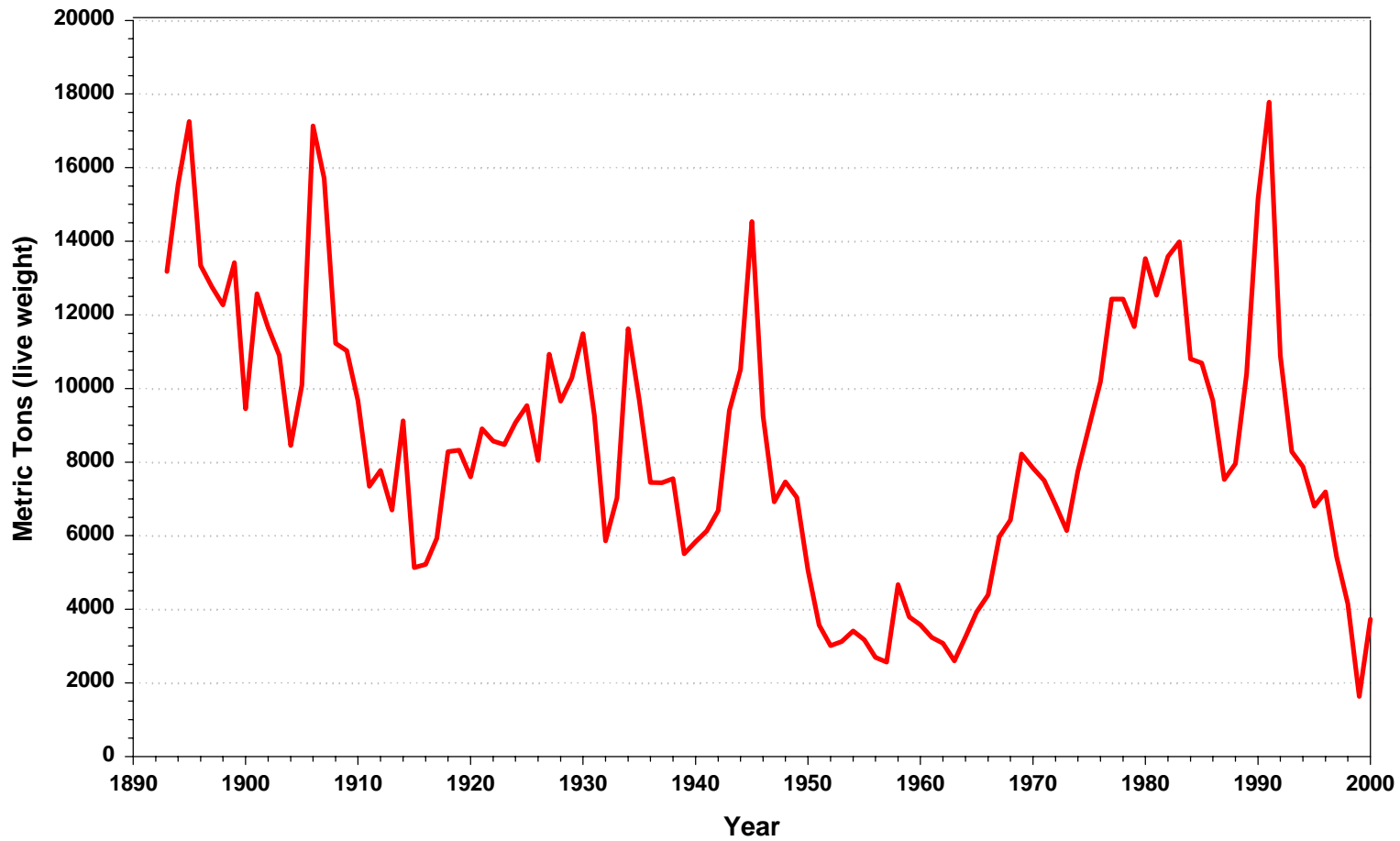
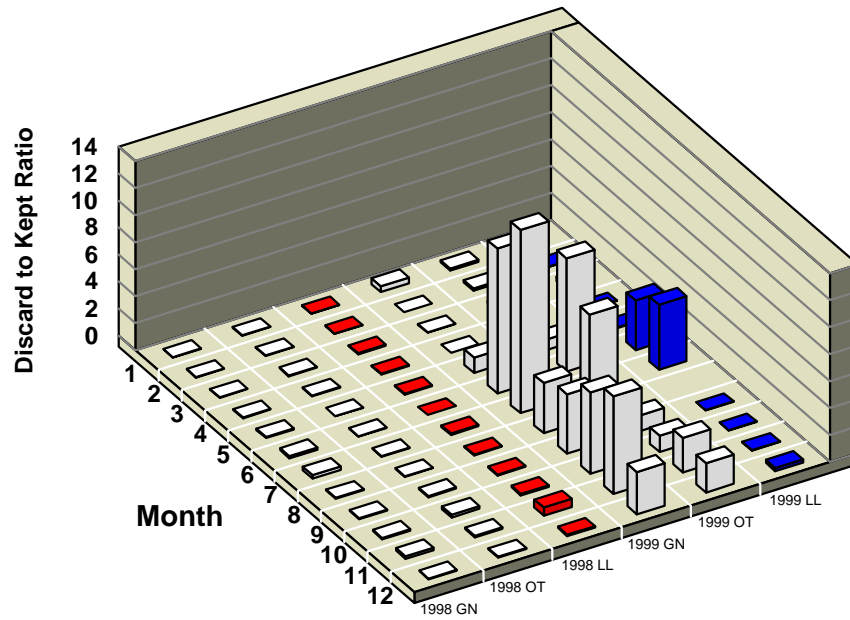


Figure A1. Total commercial landings of Gulf of Maine cod (NAFO Div. 5Y), 1893-2000.

Gulf of Maine Cod 1998 and 1999 VTR Data



Georges Bank Cod 1998 and 1999 VTR Data

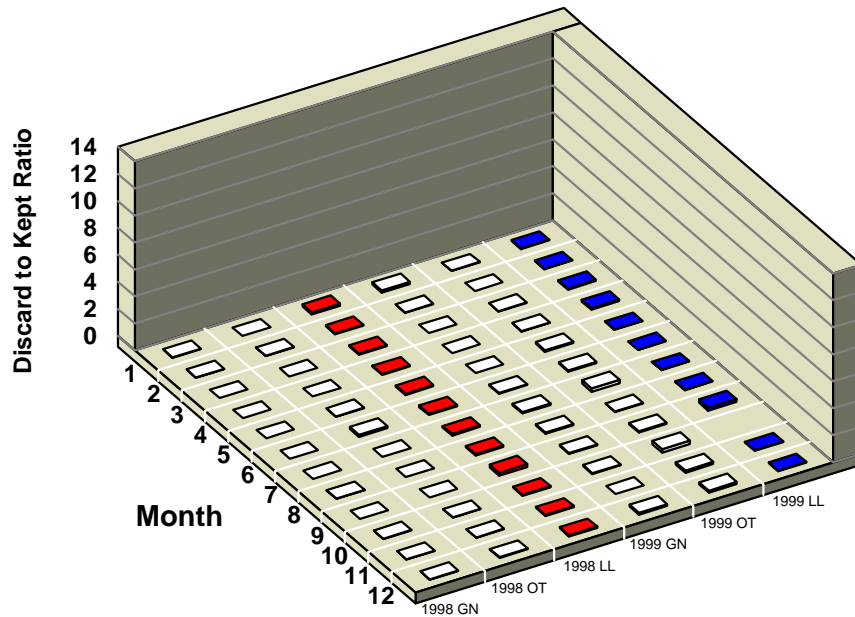
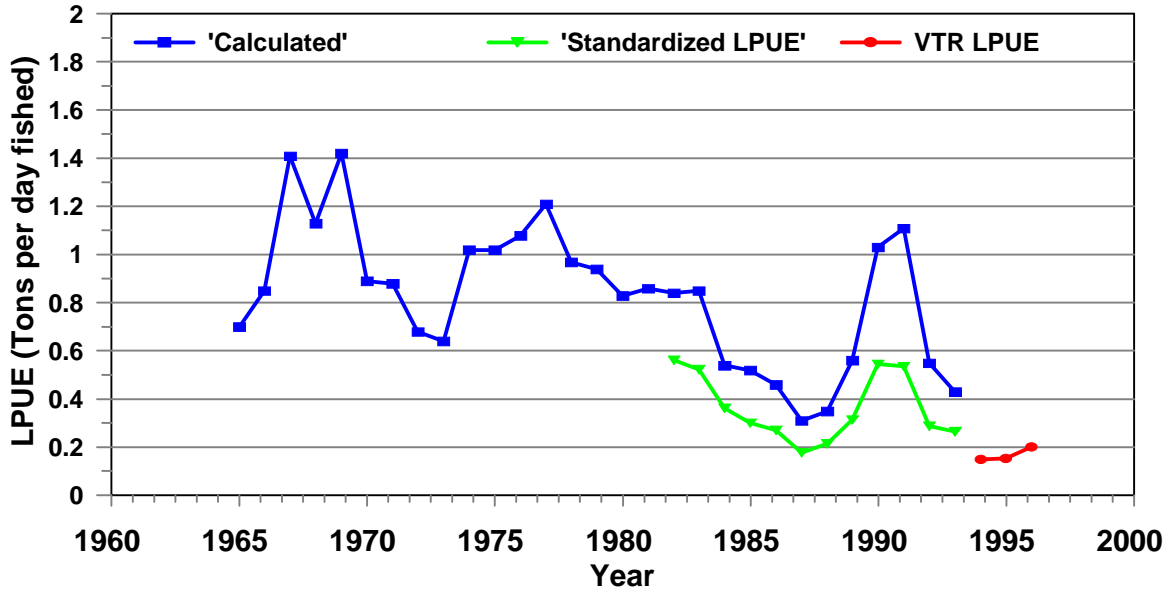


Figure A2. Discard to kept ratios based of 1998 and 1999 VTR data for Gulf of Maine and Georges Bank cod.

Gulf of Maine Cod Trends in Landings per Unit Effort



Gulf of Maine Cod Trends in Fishing Effort

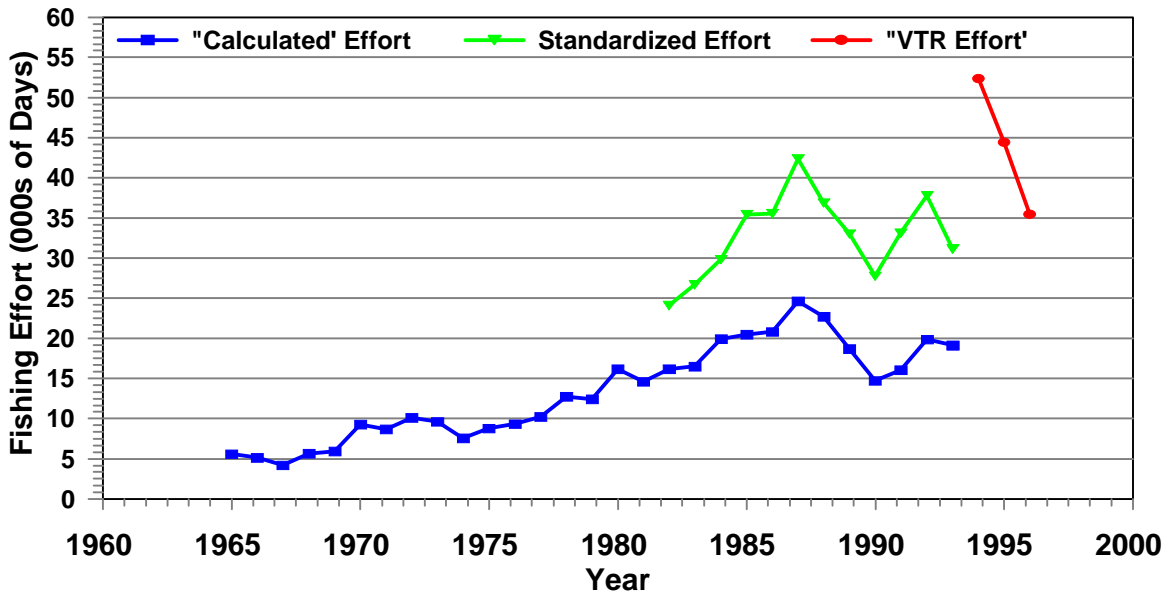


Figure A3. (a) Trends in LPUE for Gulf of Maine cod, 1964-1996.
(b) Trends in fishing effort for Gulf of Maine cod, 1964-1996.

Gulf of Maine Cod NEFSC Spring and Autumn Biomass Indices

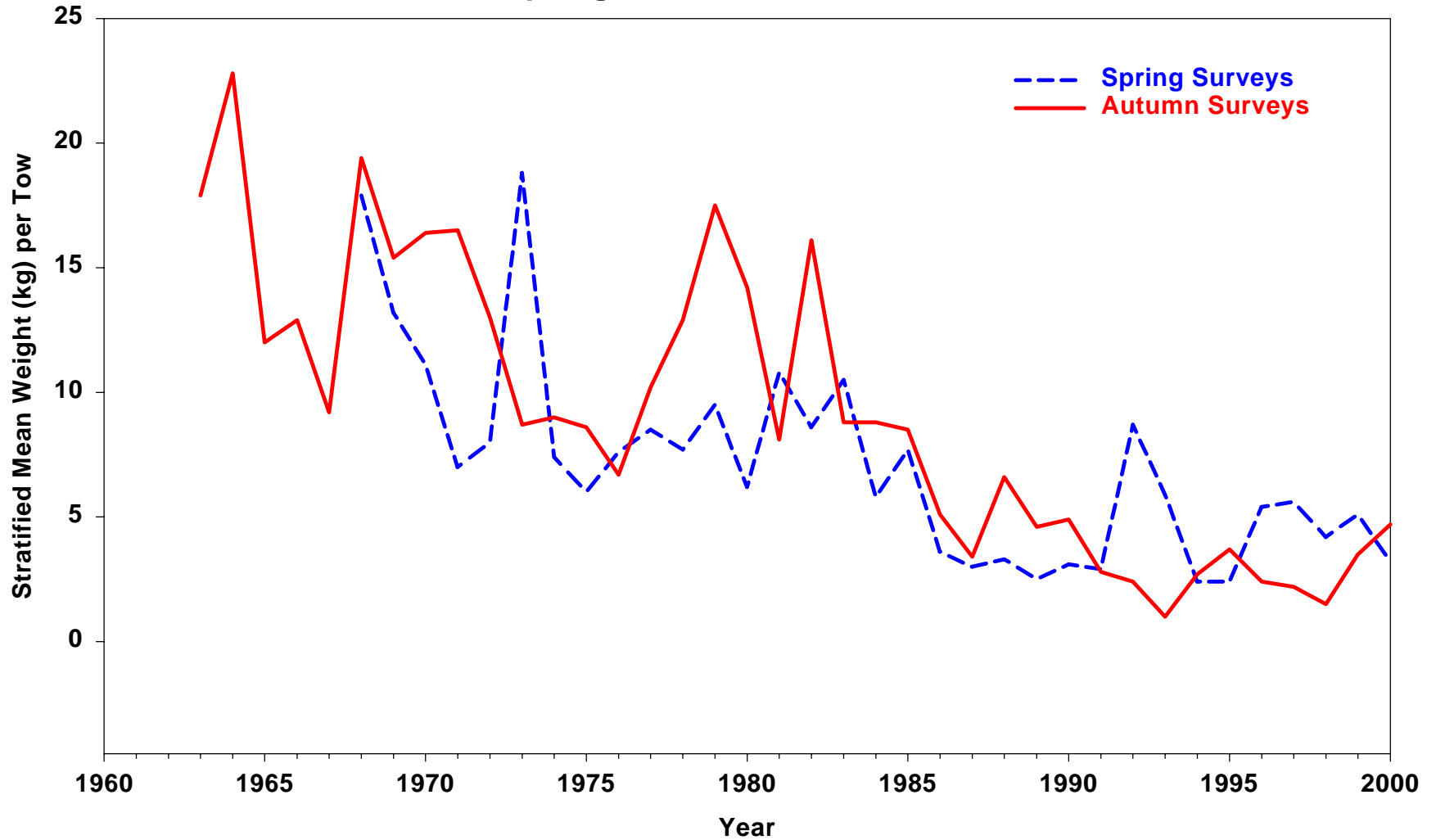
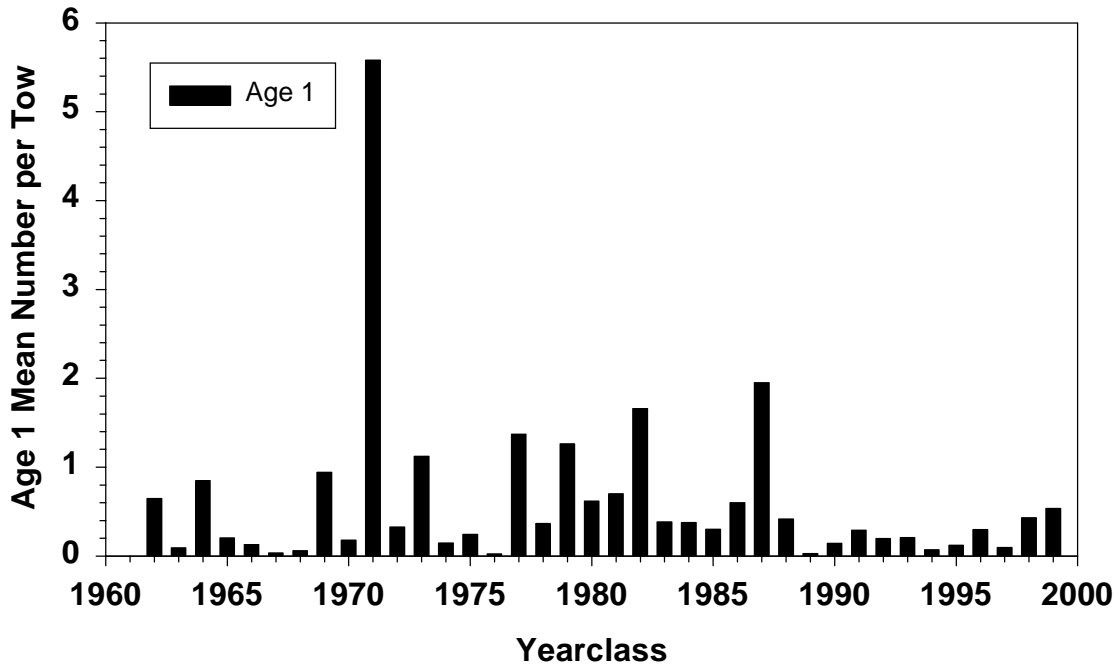


Figure A4. Biomass indices (stratified mean weight per tow) for Gulf of Maine cod from NEFSC autumn bottom trawl surveys.

NEFSC Autumn Survey: Yearclass Strength at Age 1



NEFSC Autumn Survey: Yearclass Strength at Age 2

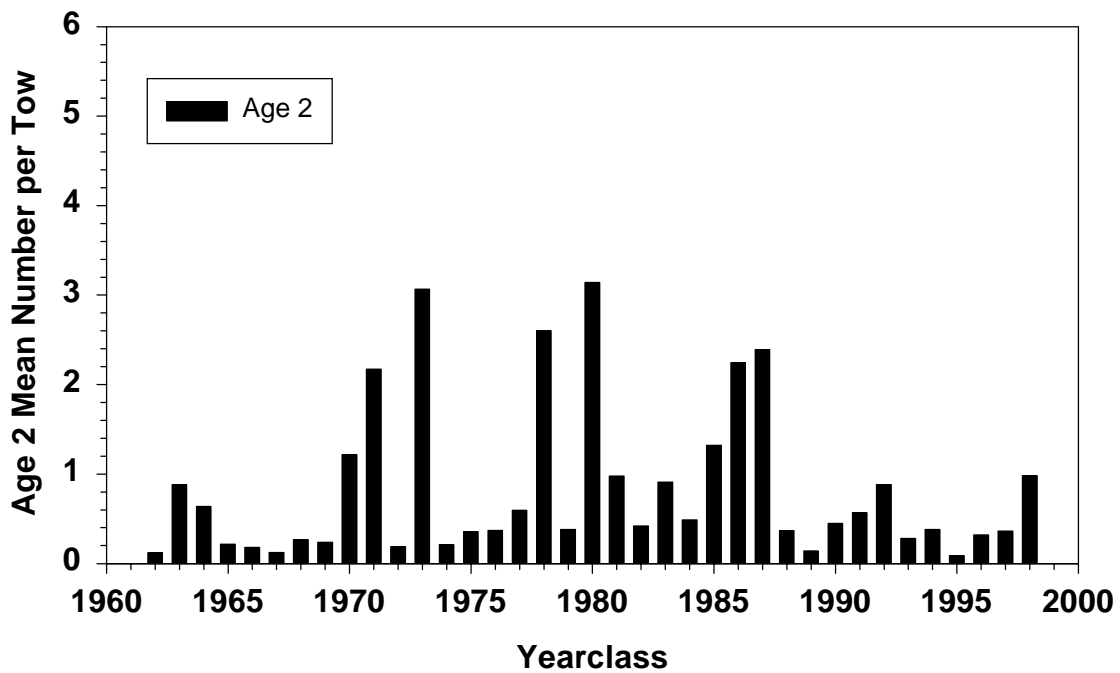
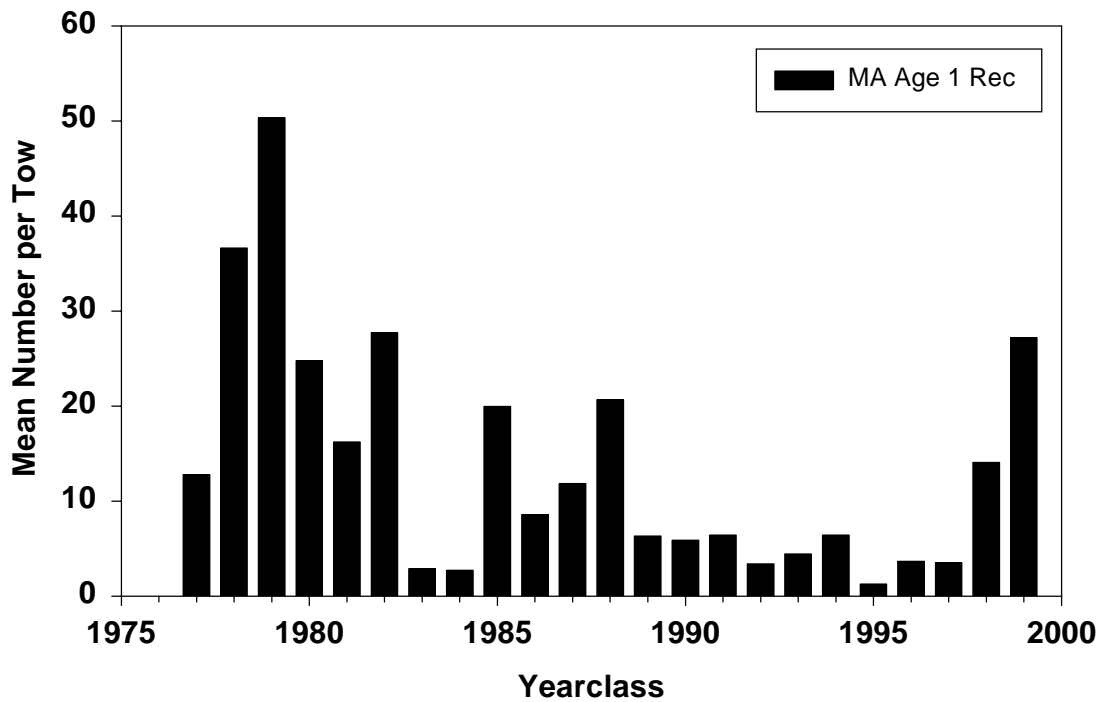


Figure A5. Recruitment indices at age 1 and 2 for Gulf of Maine cod from NEFSC autumn bottom trawl surveys.

Mass Spring Survey: Yearclass Strength at Age 1



Mass Spring Survey: Yearclass Strength at Age 2

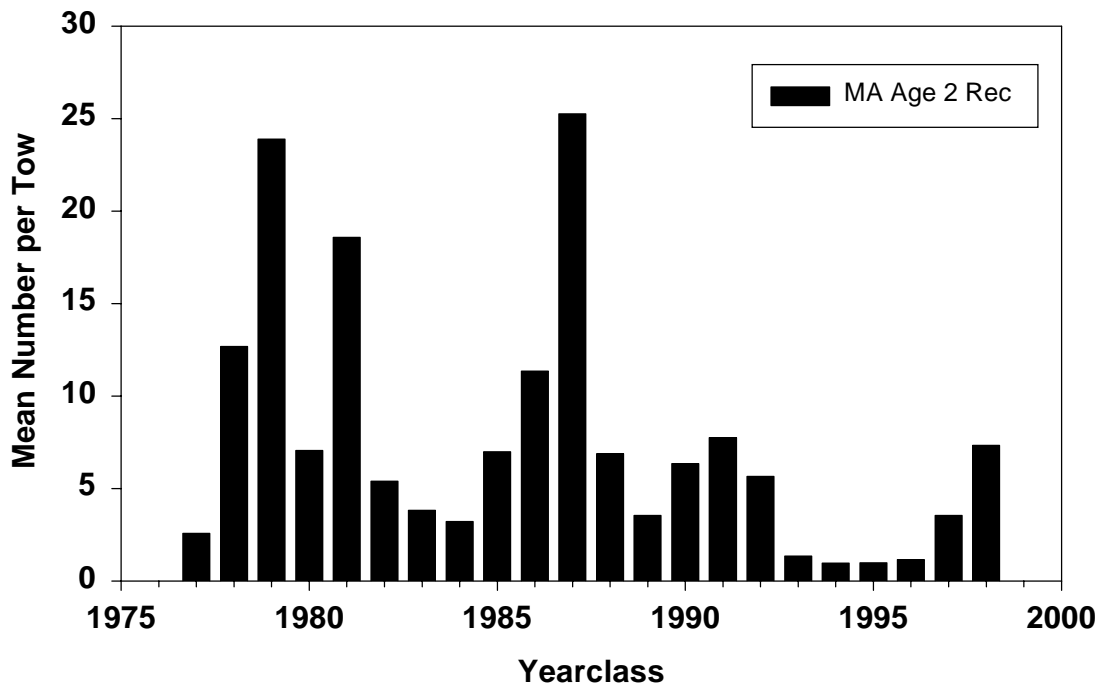


Figure A6. Recruitment indices at age 1 and 2 for Gulf of Maine cod from MA DMF autumn bottom trawl surveys.

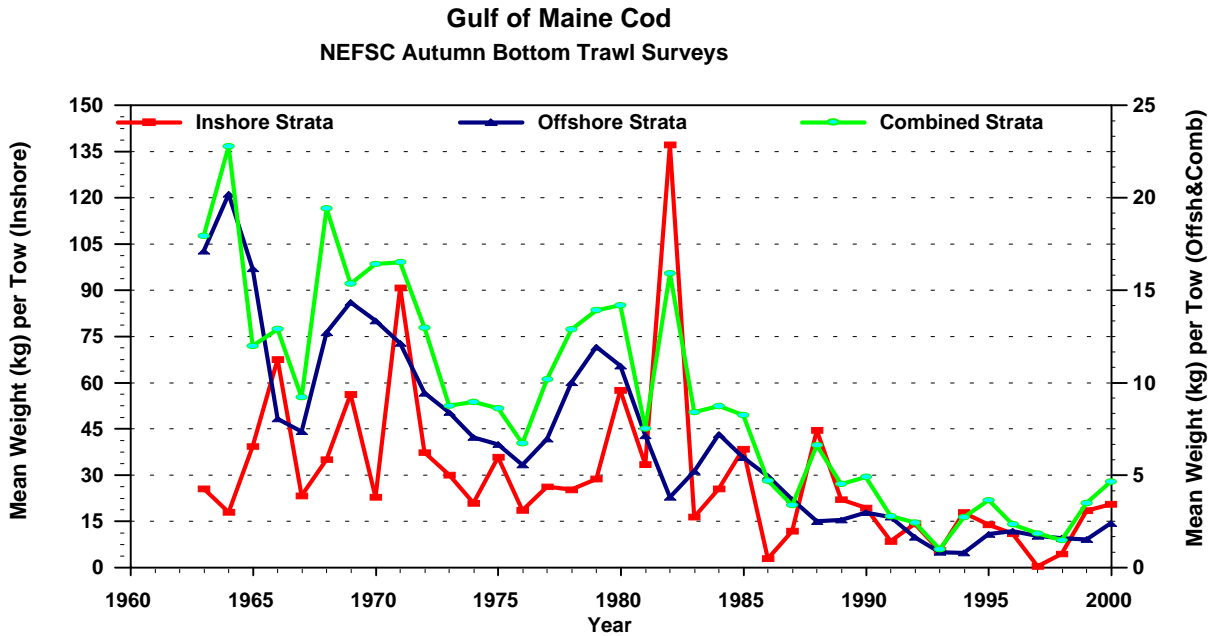


Figure A7. Biomass indices (Stratified mean weight per tow) for Gulf of Maine cod based on inshore (strata 26 and 27), offshore (strata 28-30 and 36-40), and combined regions from NEFSC autumn bottom trawl surveys.

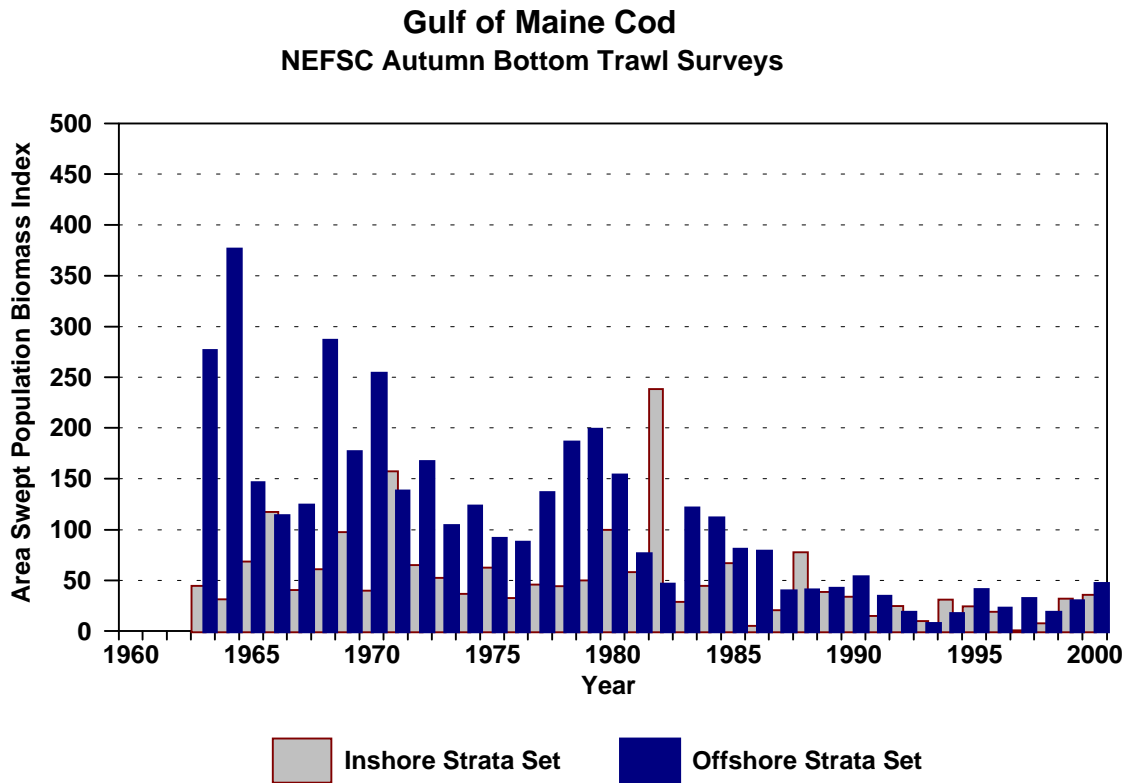


Figure A8. Swept area weighted biomass indices (Stratified mean weight per tow) for Gulf of Maine cod based on inshore (strata 26 and 27) and offshore (strata 28-30 and 36-40) regions from NEFSC autumn bottom trawl surveys.

Gulf of Maine Cod Inshore/Offshore Biomass Proportions

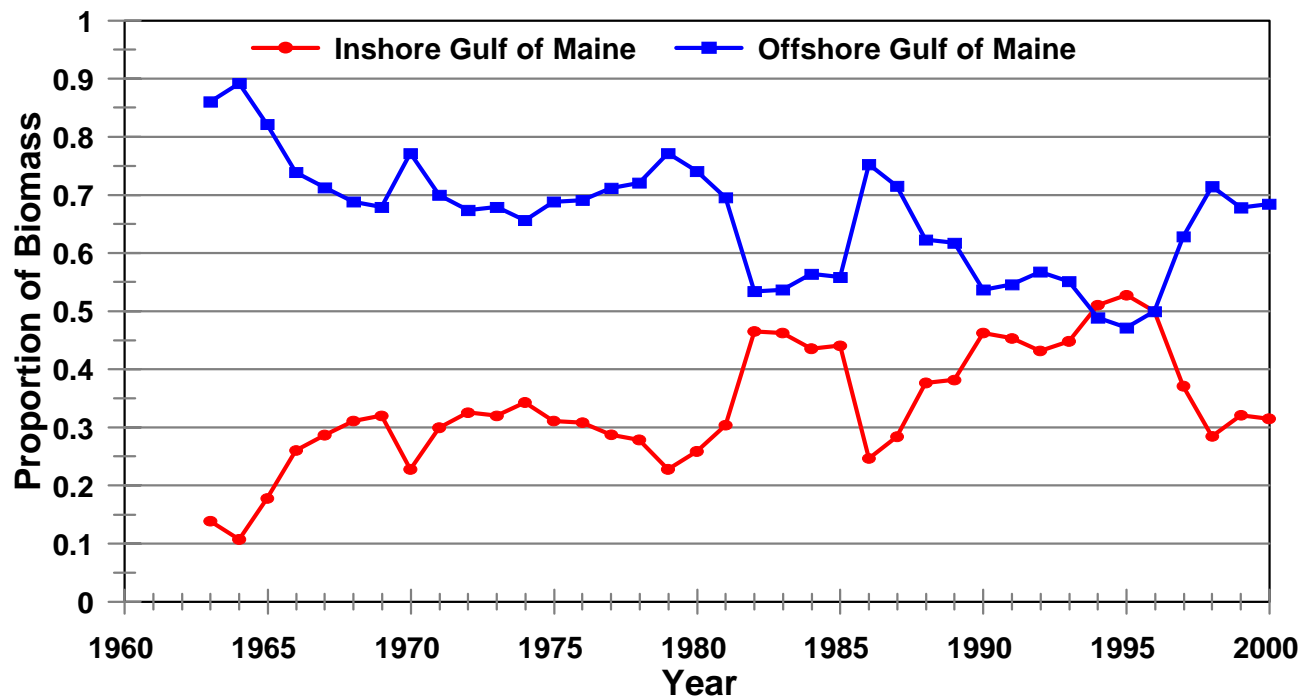
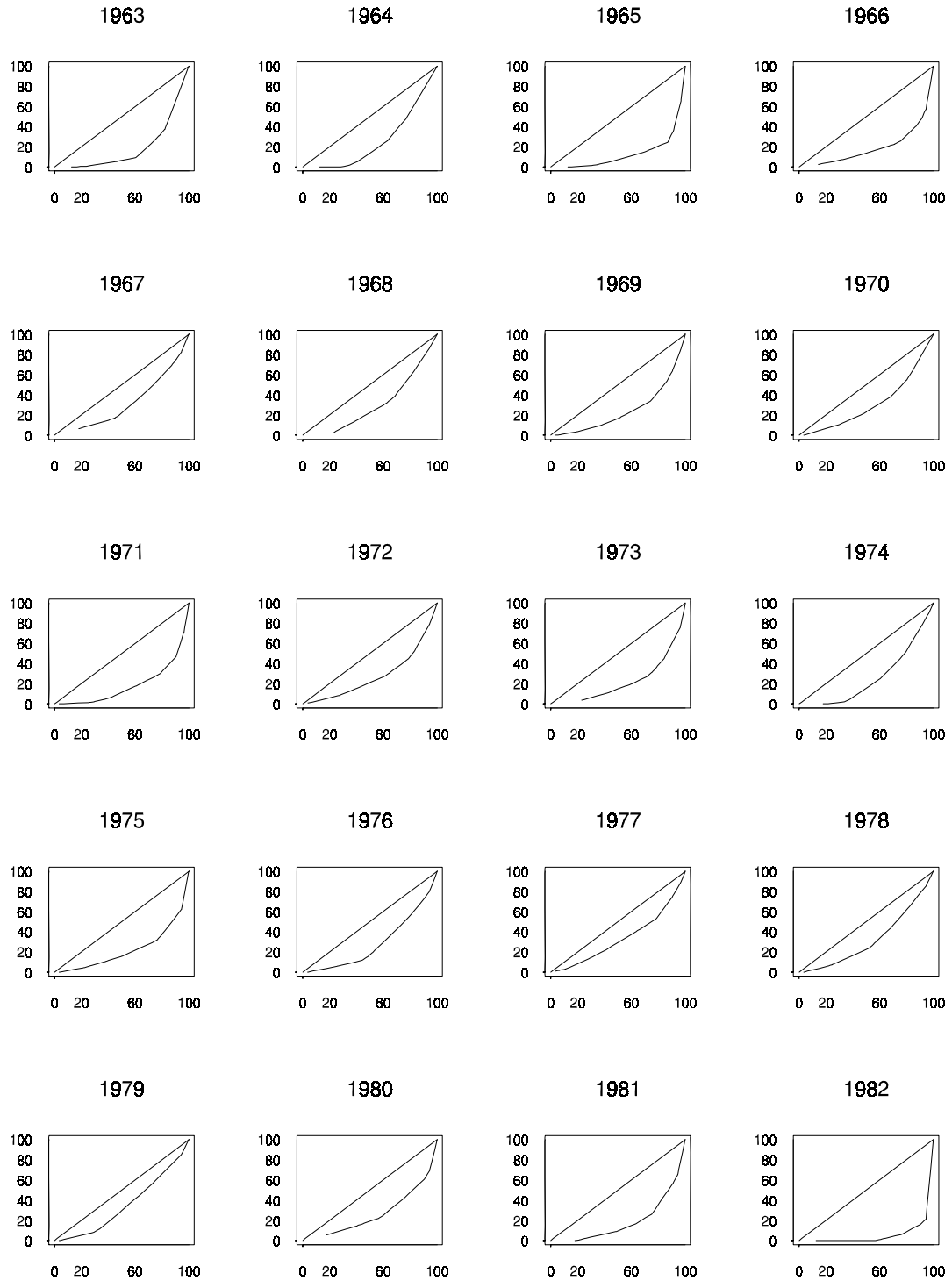


Figure A9. Proportion of biomass of Gulf of Maine cod from inshore (strata 26 and 27) and offshore (strata 28-30, 36-40) regions from NEFSC autumn bottom trawl surveys (4-year running average).

Cumulative % Biomass

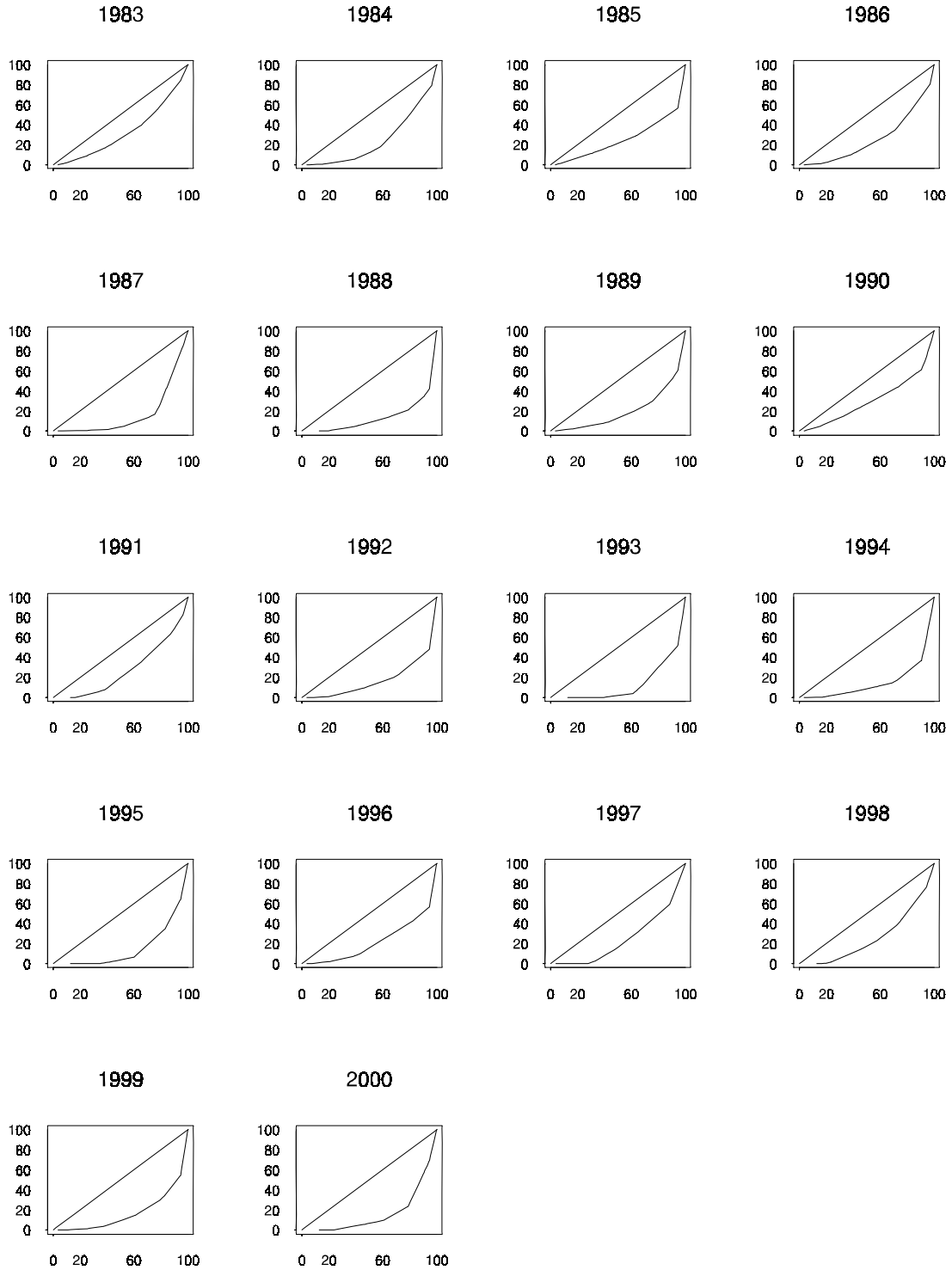


Cumulative % Area

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Figure A10. Lorenz curves for Gulf of Maine cod from NEFSC autumn bottom trawl survey biomass indices, strata 26-30 and 36-40.

Cumulative % Biomass



Cumulative % Area

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Figure A10 (Continued).

Gulf of Maine Cod Concentration Index - Autumn Survey

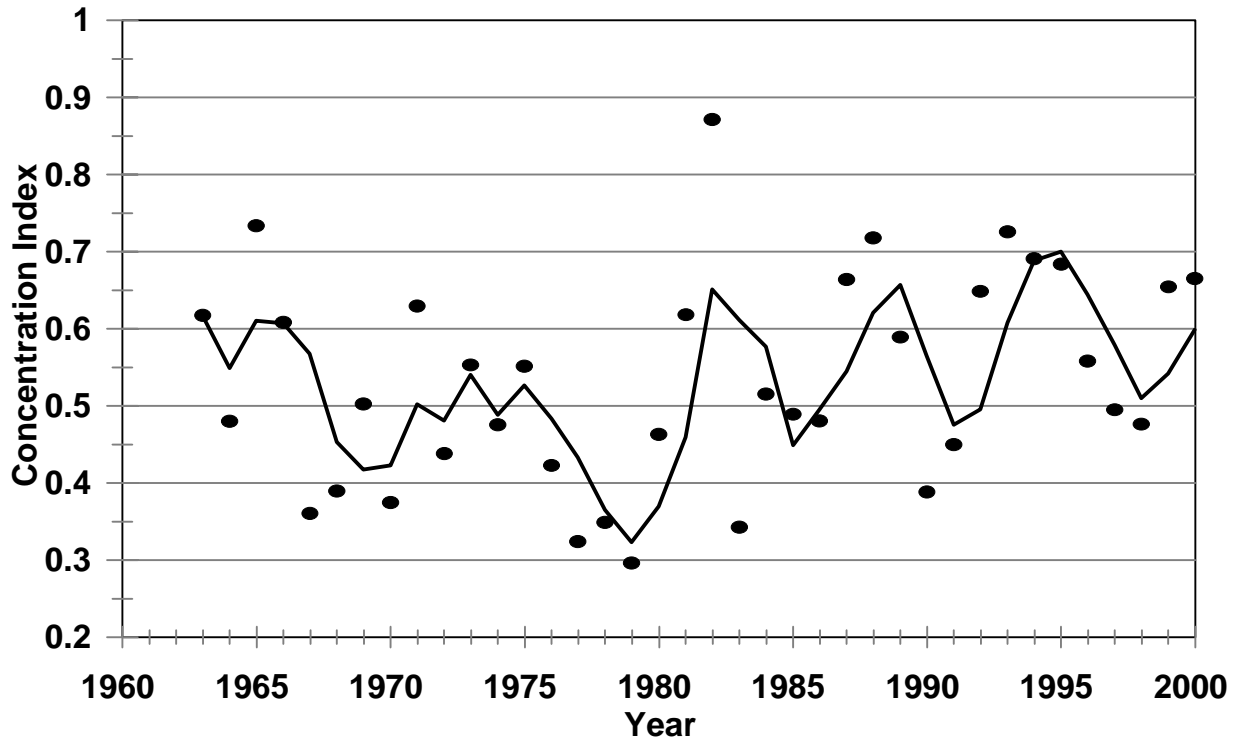
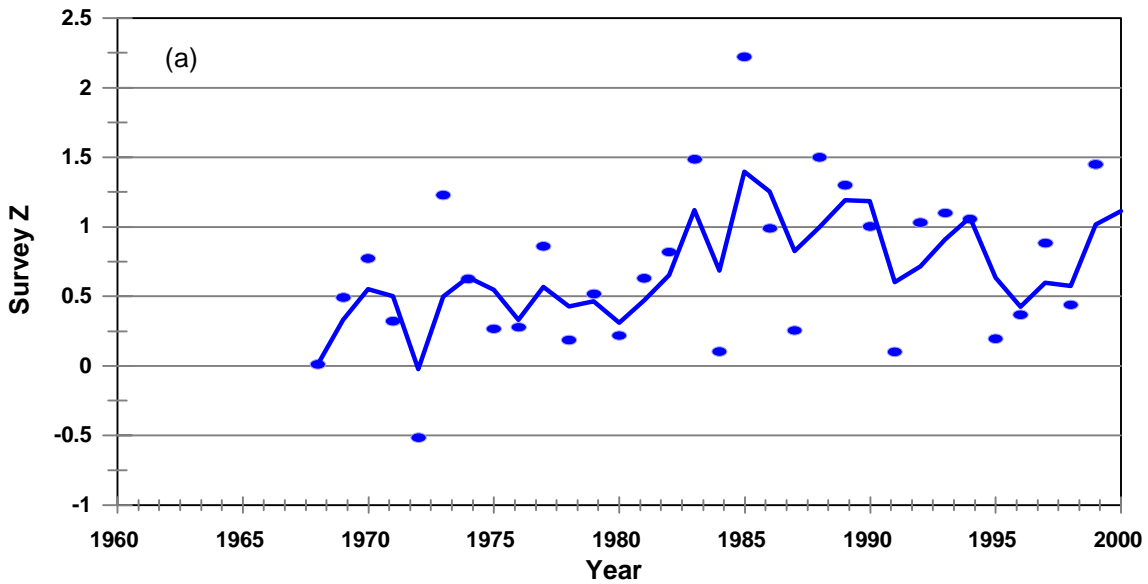


Figure A11. Concentration Index for Gulf of Maine cod derived from Lorenz curves from NEFSC autumn bottom trawl survey biomass indices, strata 26-30 and 36-40.

Gulf of Maine Cod Surveys Zs - Spring



Gulf of Maine Cod Surveys Zs - Autumn

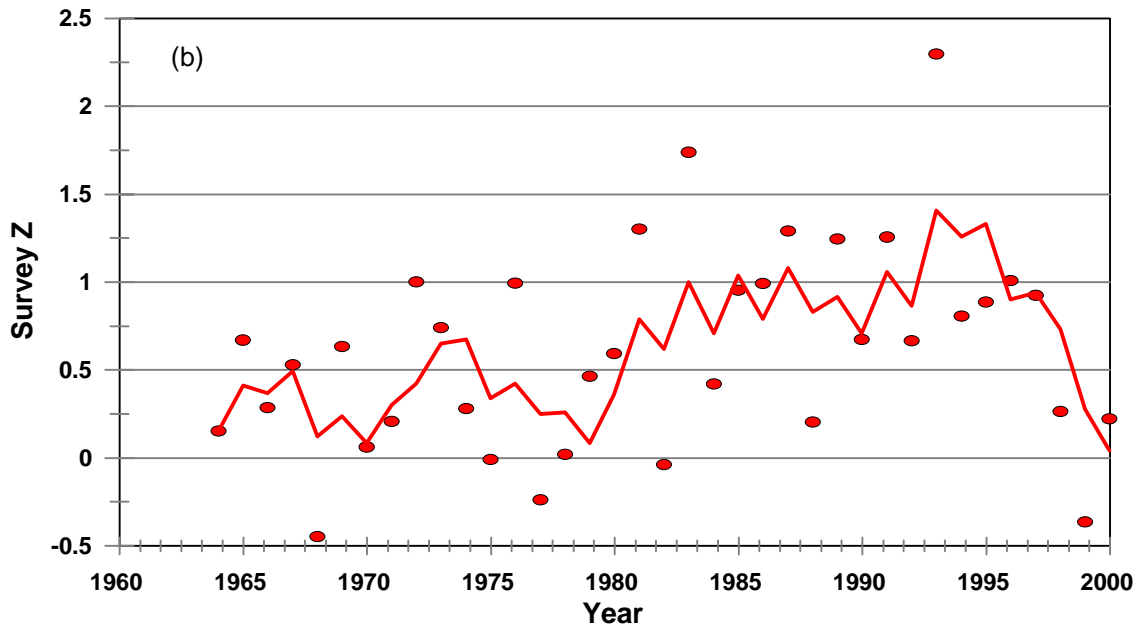
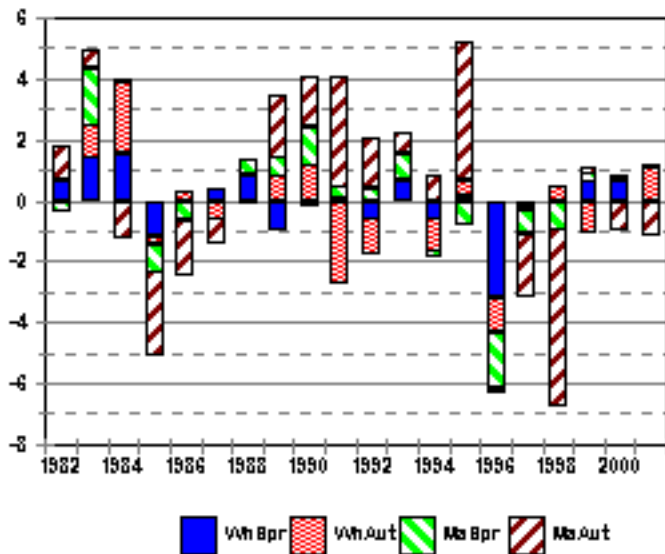
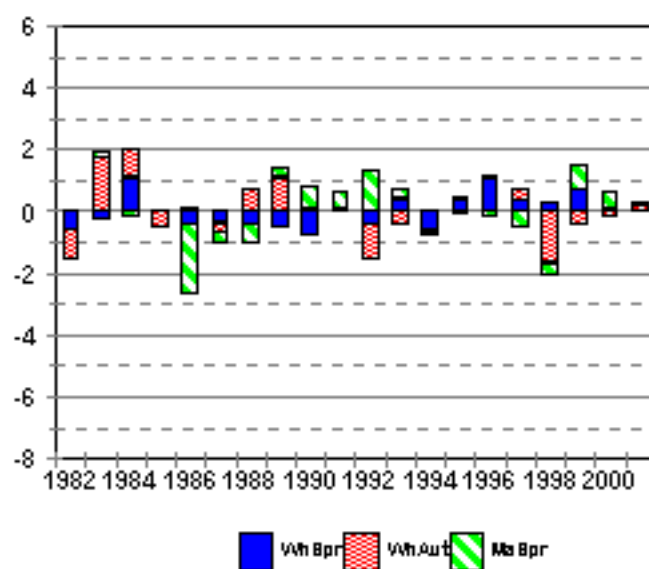


Figure A12. Annual estimates of total instantaneous mortality (Z) for Gulf of Maine cod (points) and 3-year running average (line) from (a) NEFSC spring and (b) NEFSC autumn bottom trawl surveys.

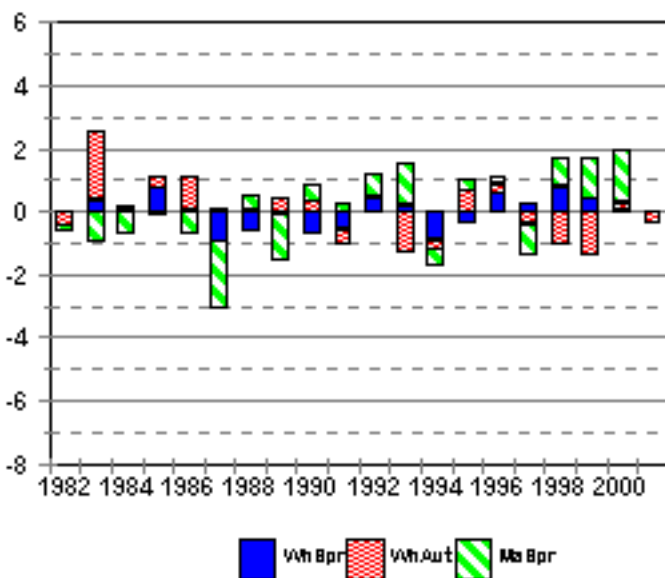
**Gulf of Maine Cod
Age 2 Residuals**



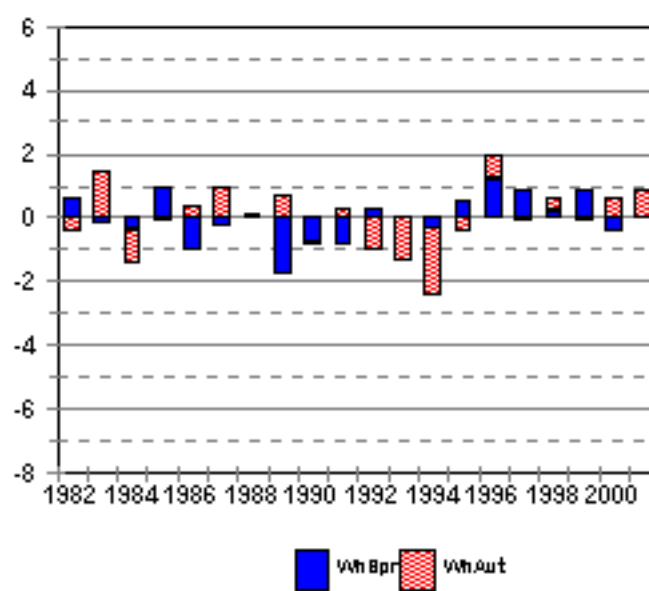
**Gulf of Maine Cod
Age 3 Residuals**



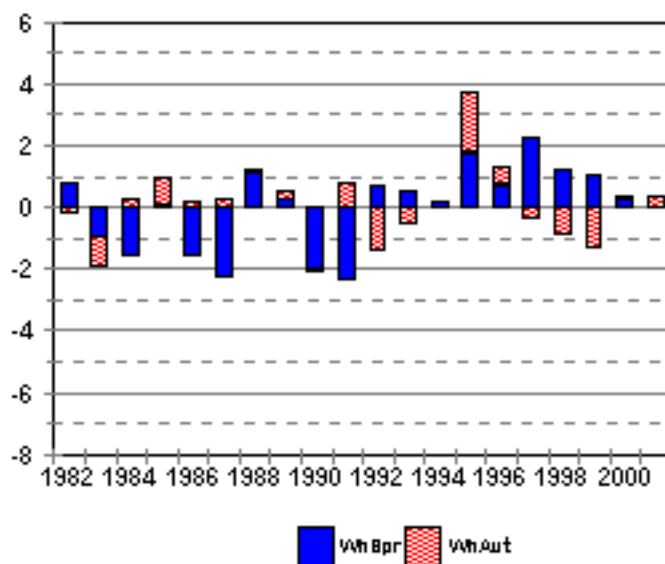
**Gulf of Maine Cod
Age 4 Residuals**



**Gulf of Maine Cod
Age 5 Residuals**



**Gulf of Maine Cod
Age 6 Residuals**



**Figure A13. Residual plots from VPA calibration
for Gulf of Maine cod.**

Gulf of Maine Cod Trends in Landings and Fishing Mortality

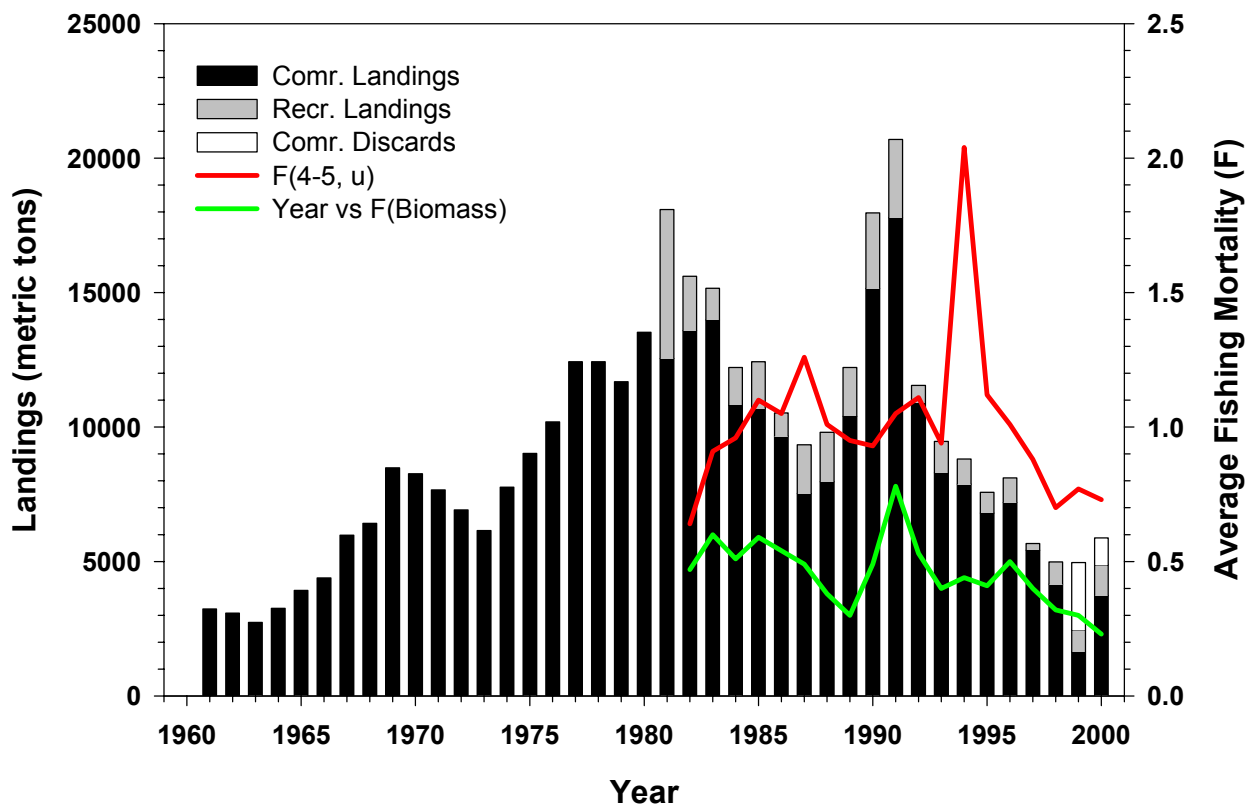


Figure A14. Trends in landings and fishing mortality for Gulf of Maine cod.

Gulf of Maine Cod Trends in Recruitment and Biomass

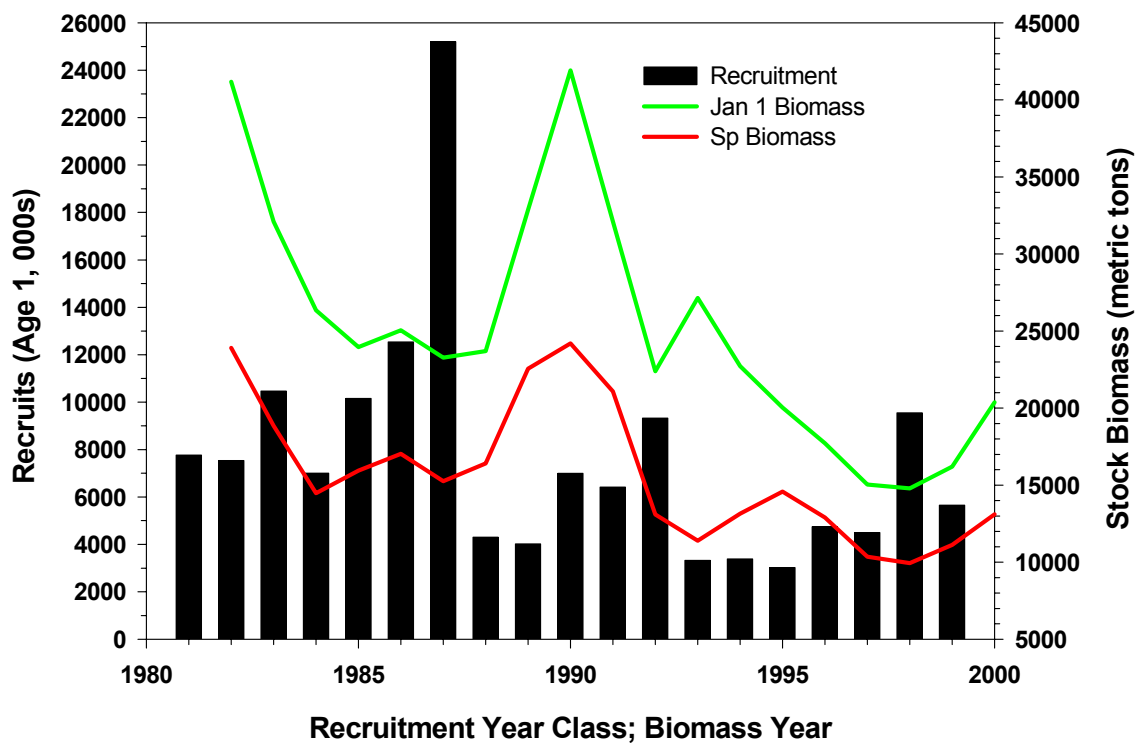


Figure A15. Trends in recruitment (age 1) and biomass for Gulf of Maine cod.

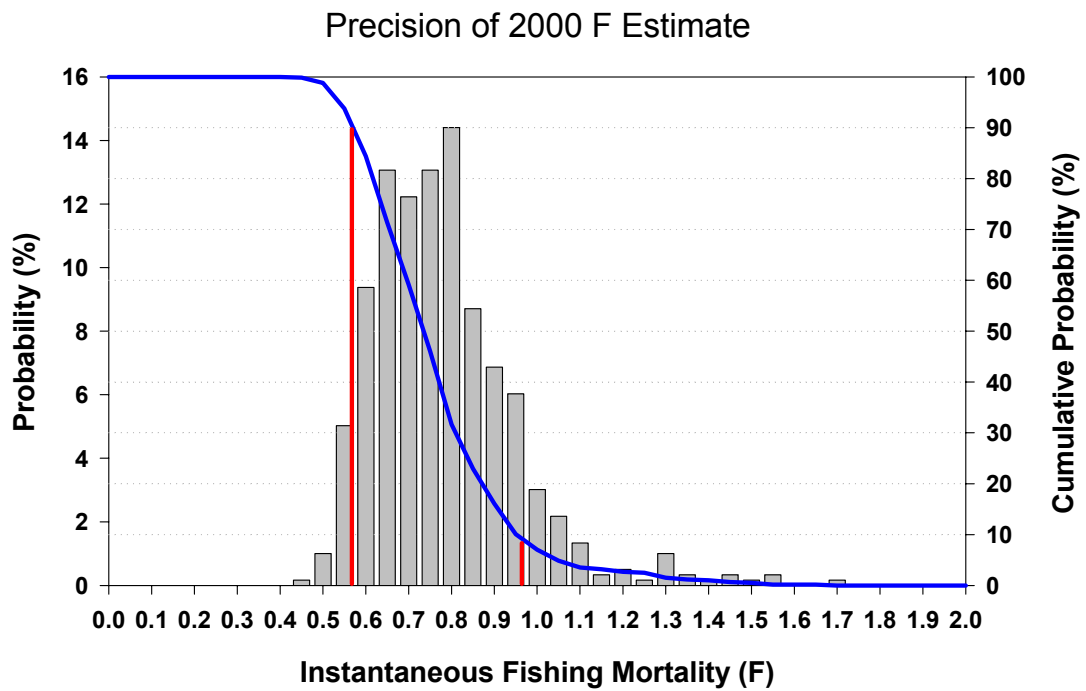


Figure A16. Precision of the estimated fully recruited fishing mortality in 2000 based on 600 bootstrap realizations of the VPA for Gulf of Maine cod.

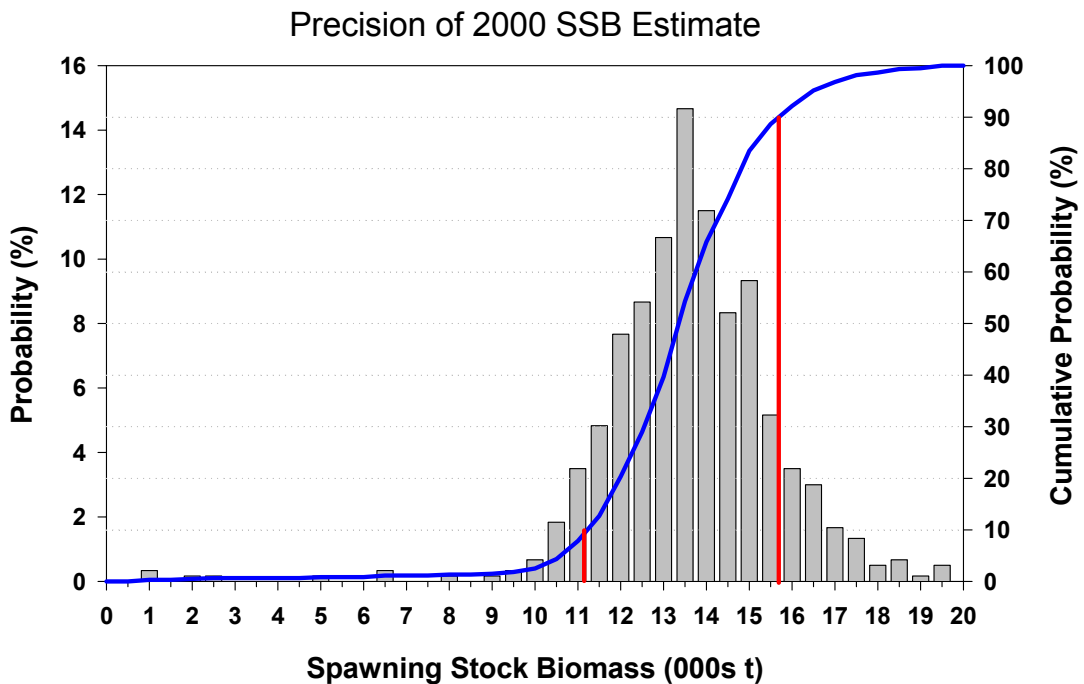
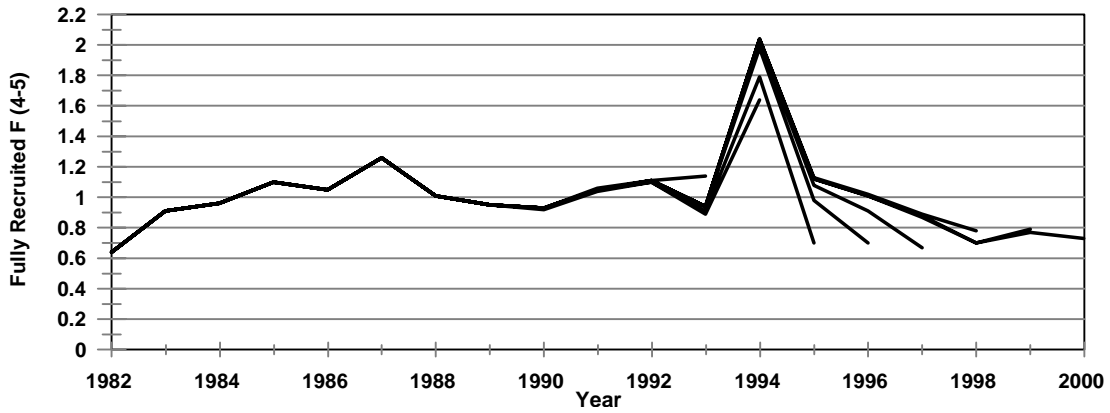
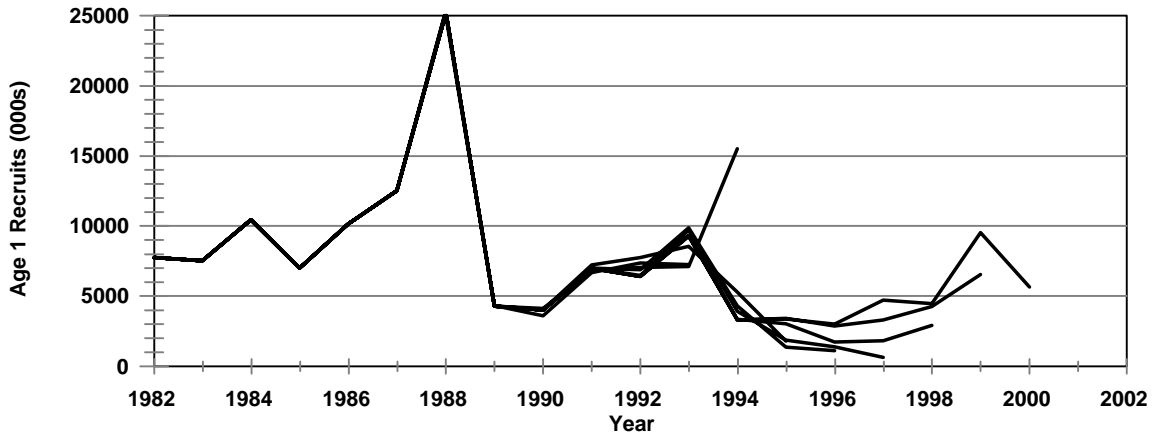


Figure A17. Precision of the estimated spawning stock biomass in 2000 based on 600 bootstrap realizations of the VPA for Gulf of Maine cod.

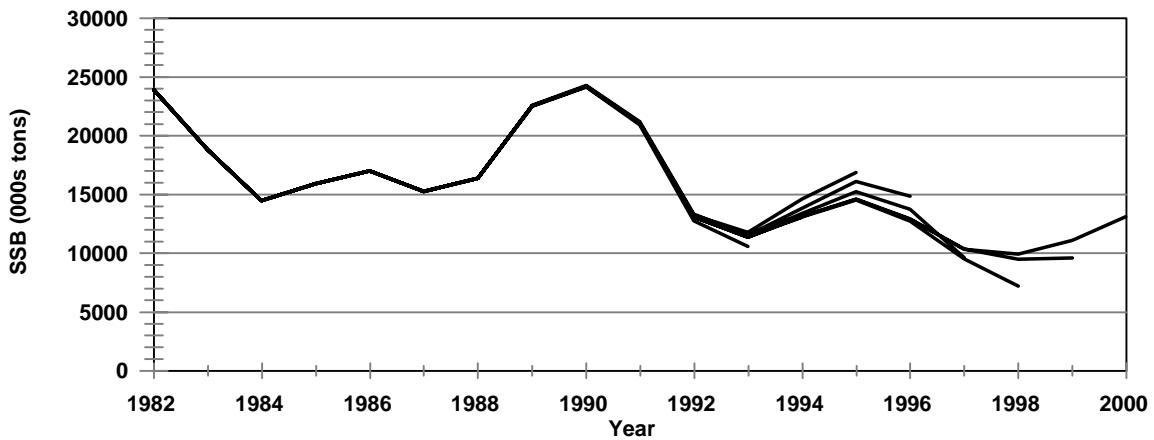
Gulf of Maine Cod
VPA Retrospective Analysis



Gulf of Maine Cod
VPA Retrospective Analysis



Gulf of Maine Cod
VPA Retrospective Analysis



— 1993 — 1994 — 1995 — 1996 — 1997 — 1998 — 1999 — 2000

Figure A18. Retrospective analysis of estimates of terminal year F, recruitment and SSB from the VPA for Gulf of Maine cod.

Gulf of Maine Cod Stock-Recruitment Plot

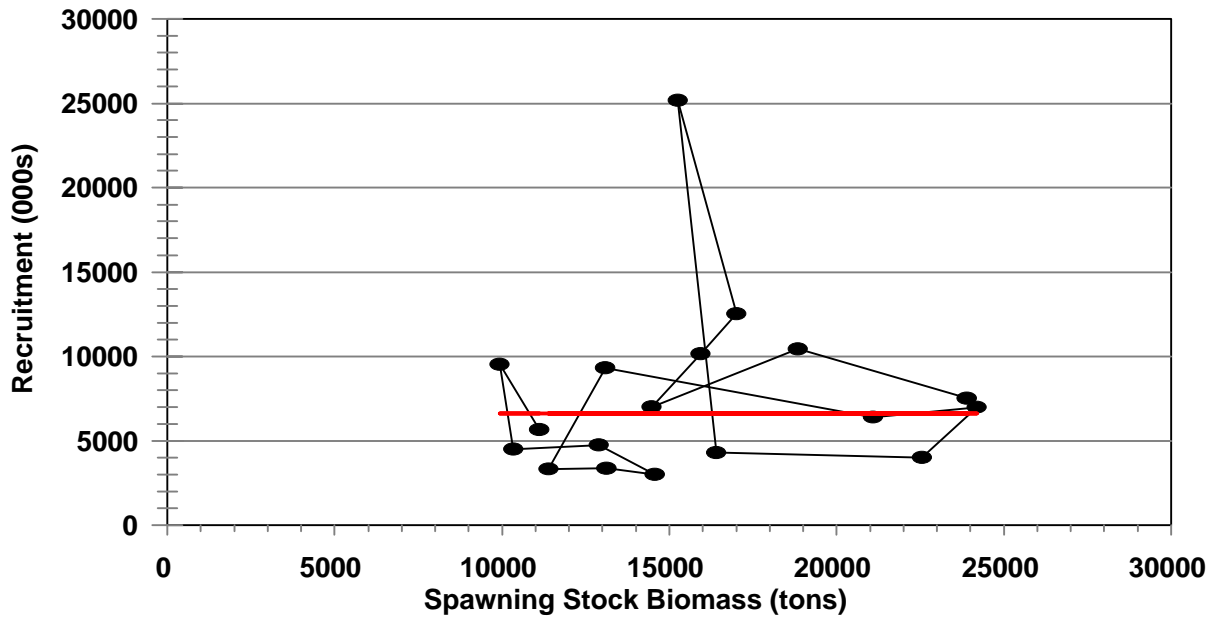


Figure A19a. Spawning stock-recruitment scatterplot for Gulf of Maine cod. The solid horizontal line represents the geometric mean.

Gulf of Maine Cod R/S Survival Ratios

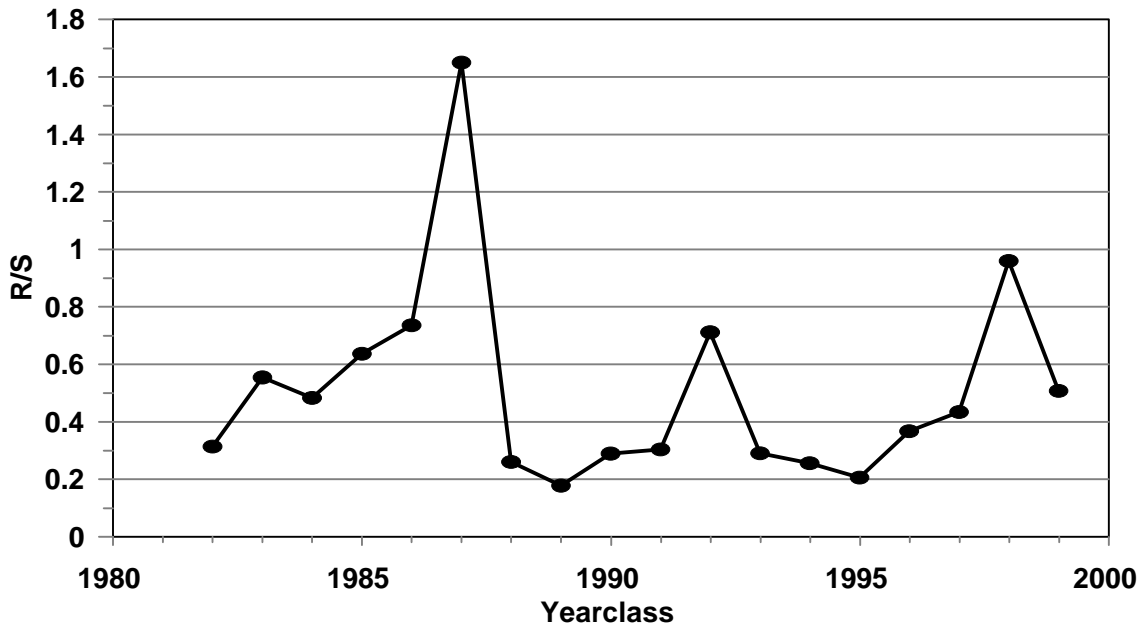
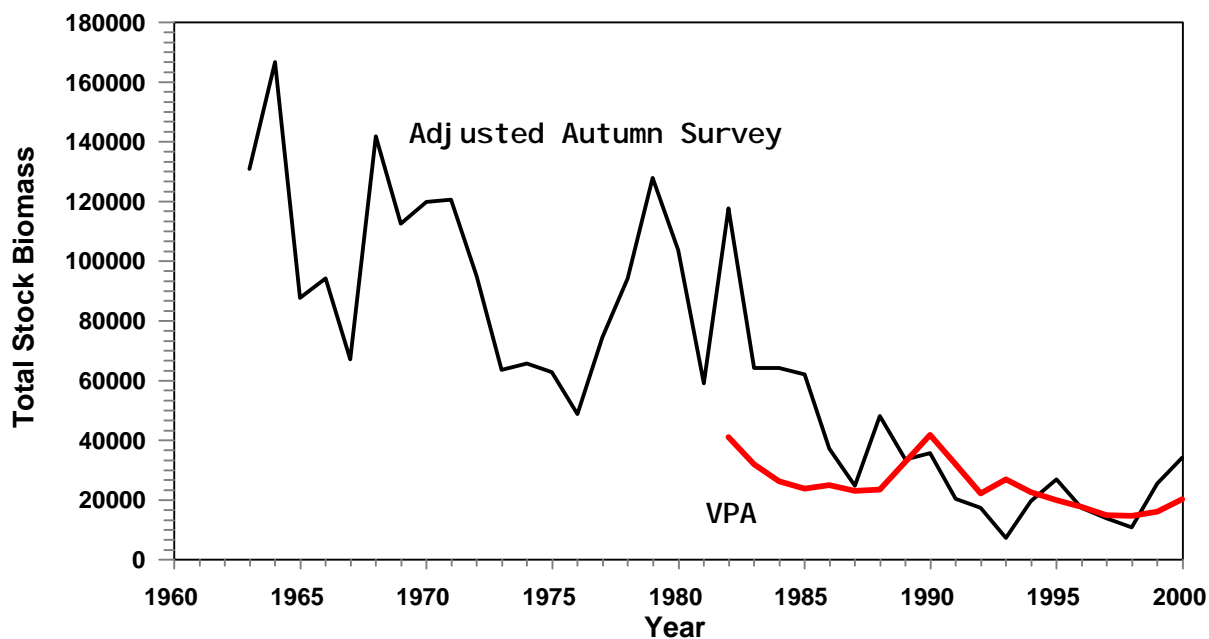


Figure A19b. Trends in survival ratios (R/SSB) for Gulf of Maine cod.

A7 **Gulf of Maine Cod**
Trends in Total Biomass



A8 **Gulf of Maine Cod**
Trends in Spawning Biomass

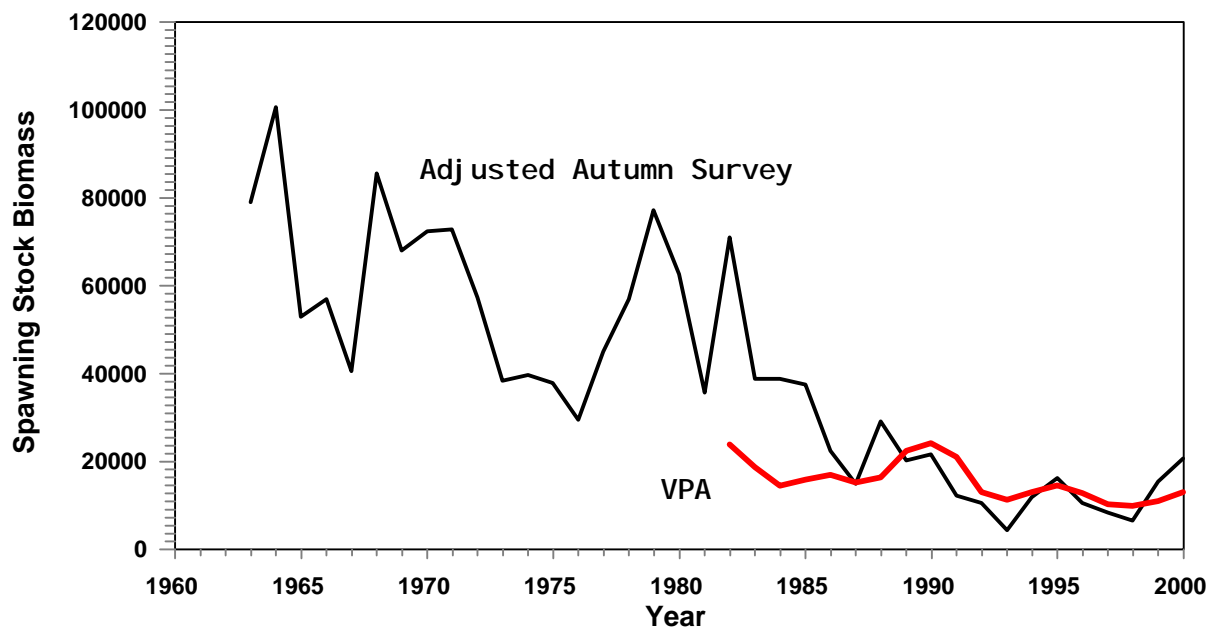


Figure A20. Hind-cast estimates of total stock biomass (upper panel) and spawning stock biomass (lower panel) for Gulf of Maine cod based on VPA-NEFSC autumn survey biomass relationships.

Gulf of Maine Cod
Yield and SSB per Recruit

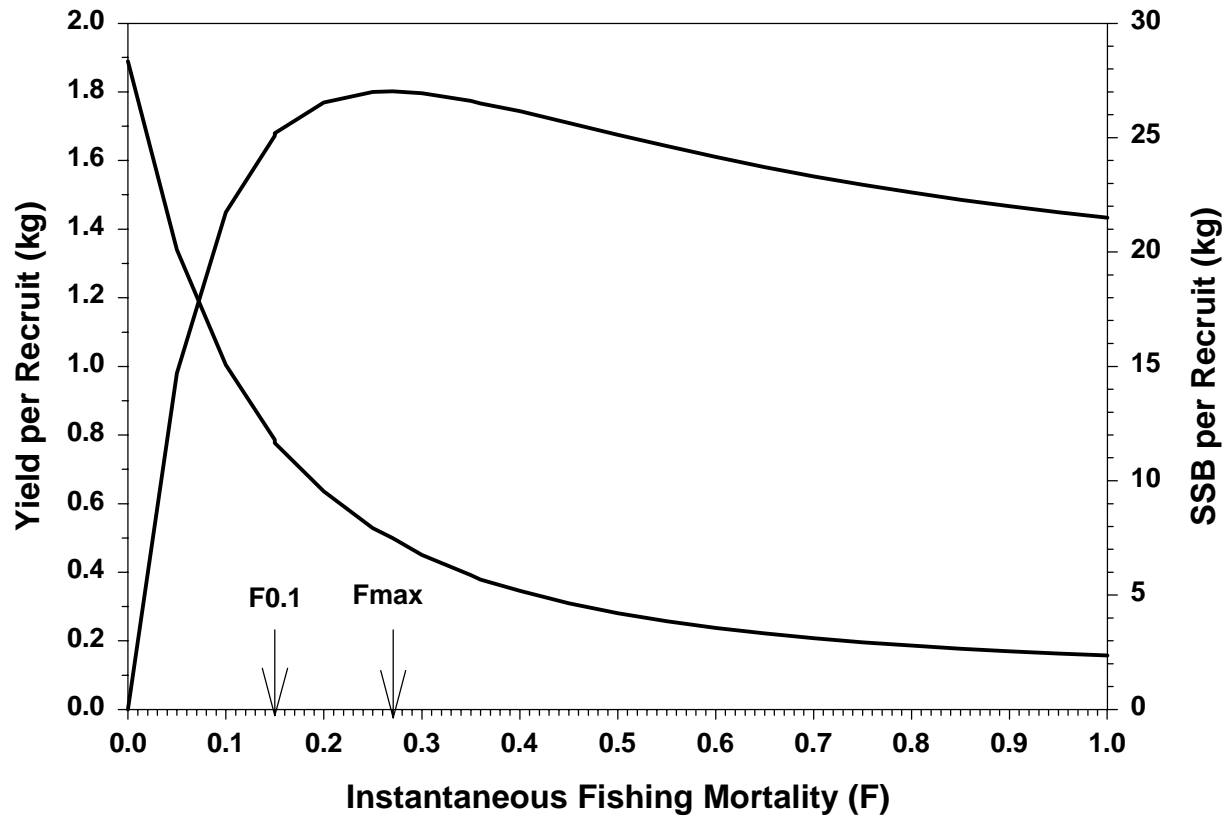


Figure A21. Yield and SSB per recruit results for Gulf of Maine cod.

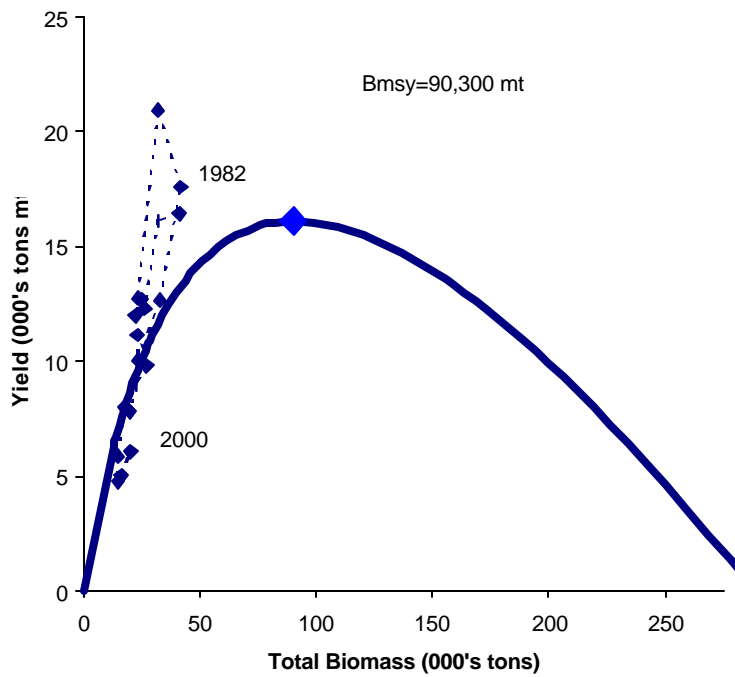
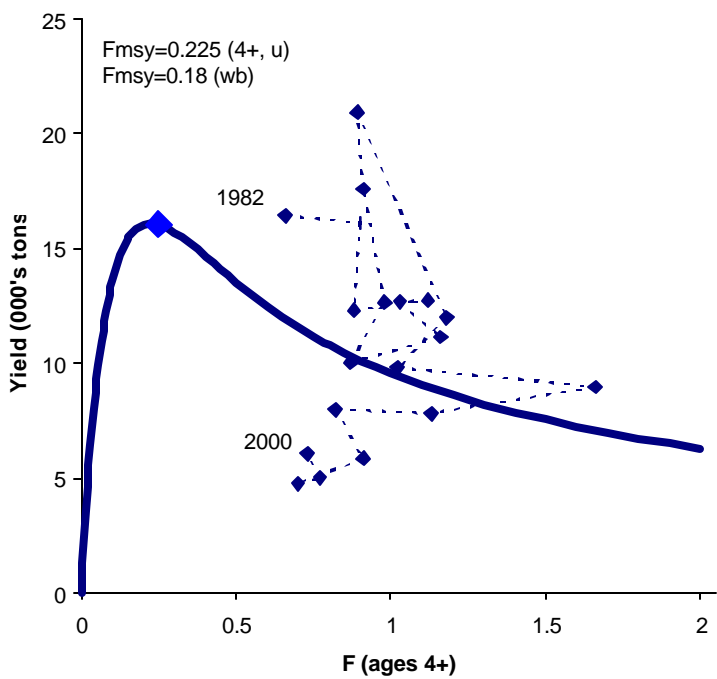
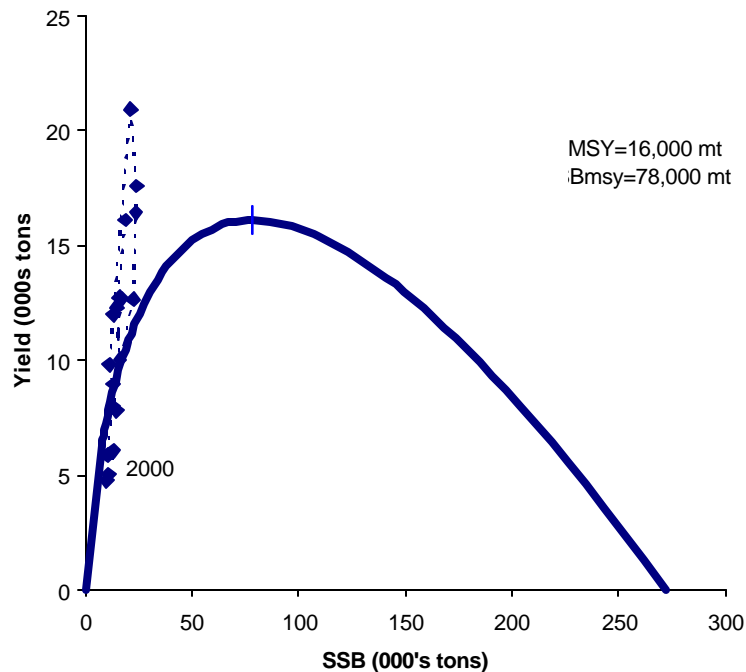
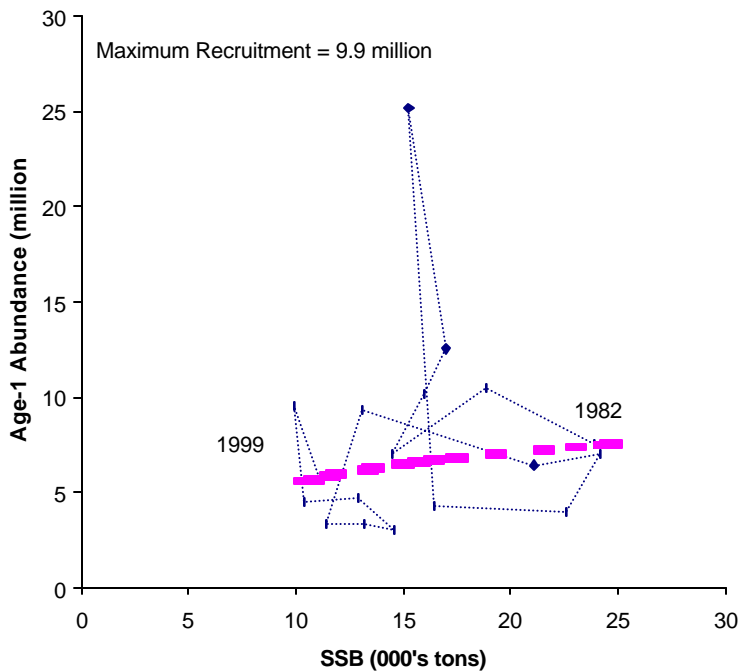


Figure A22. Age structured production model results for Gulf of Maine cod.

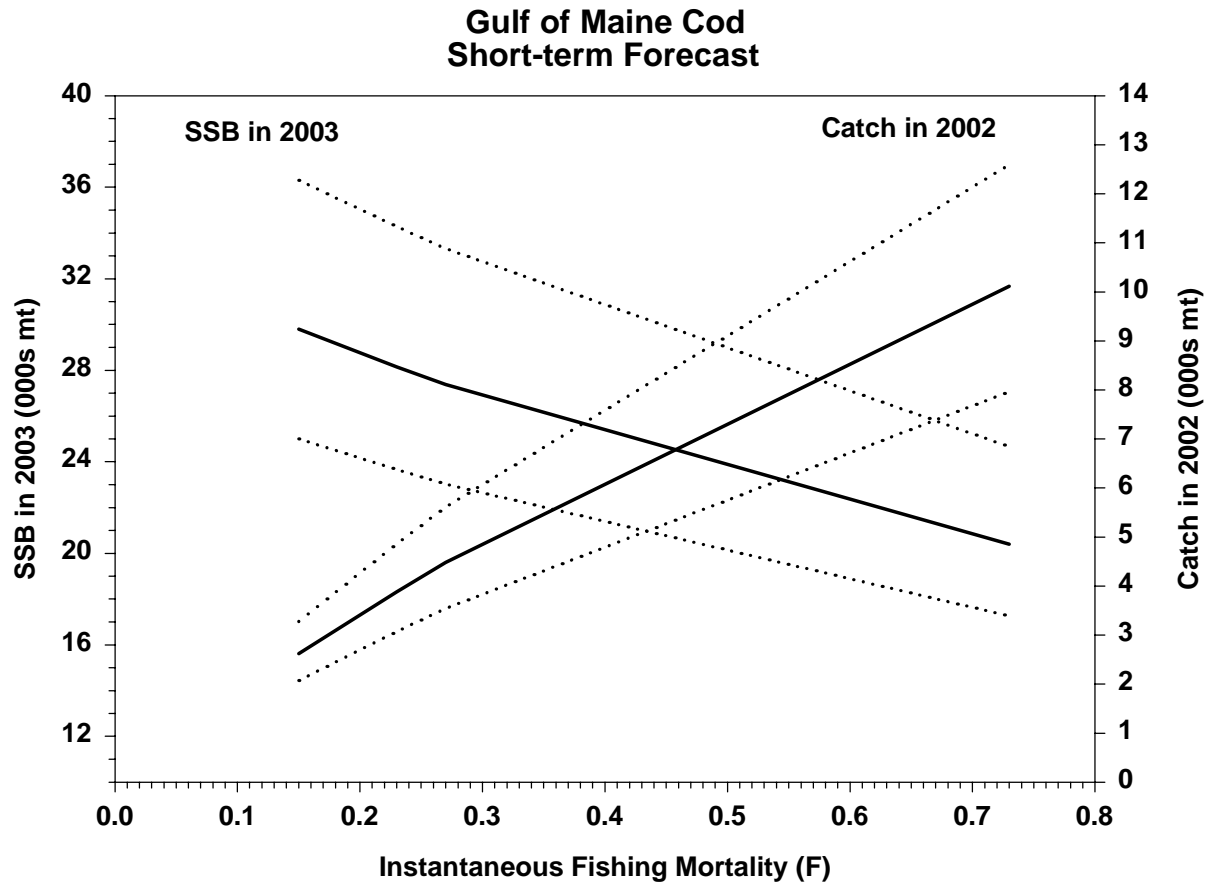


Figure A23. Short-term stochastic catch and stock biomass projection results for Gulf of Maine cod.

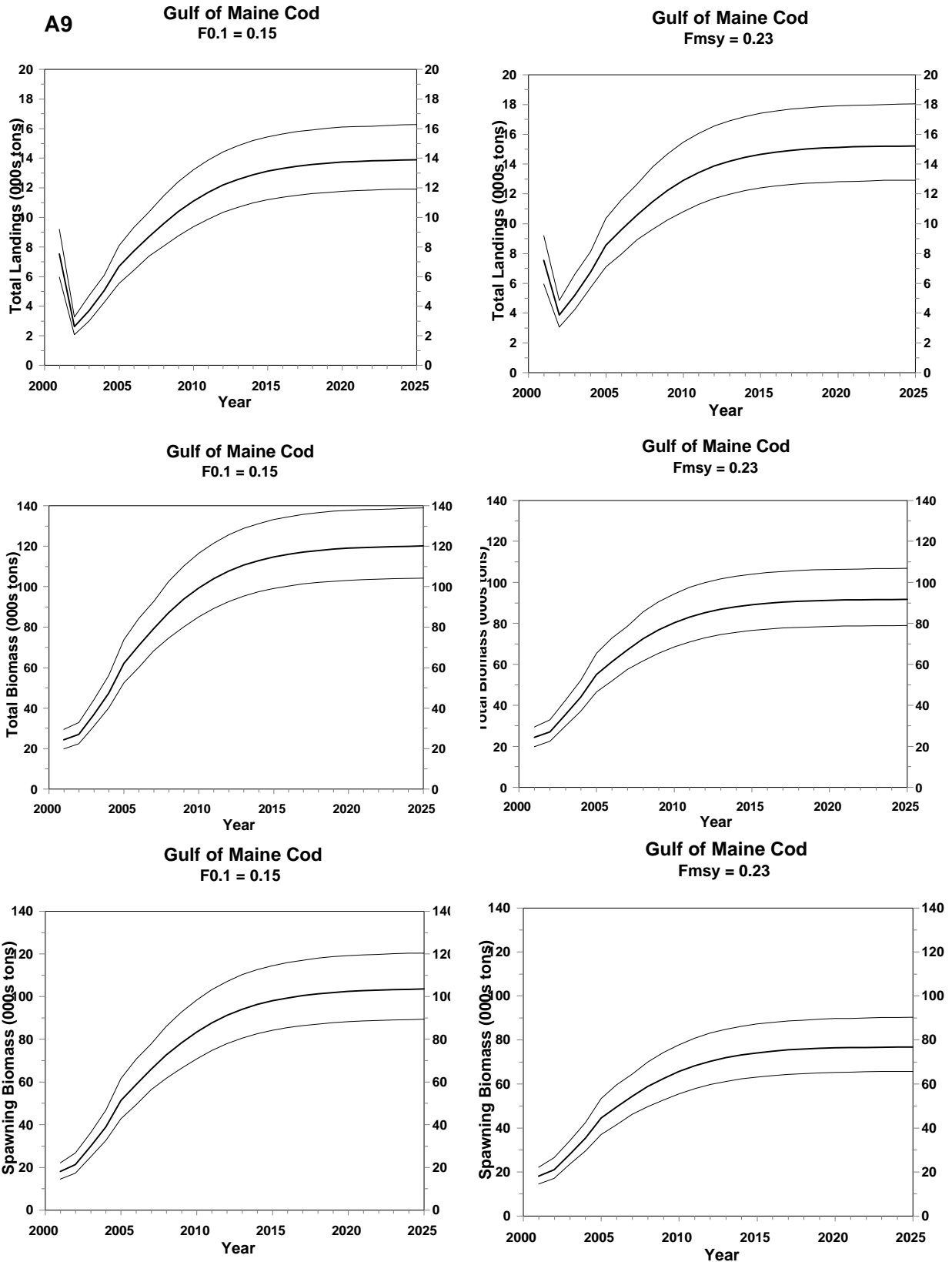


Figure A24. Long-term stochastic catch and stock biomass results for Gulf of Maine cod at $F_{0.1}$ (0.15) and F_{msy} (0.23).

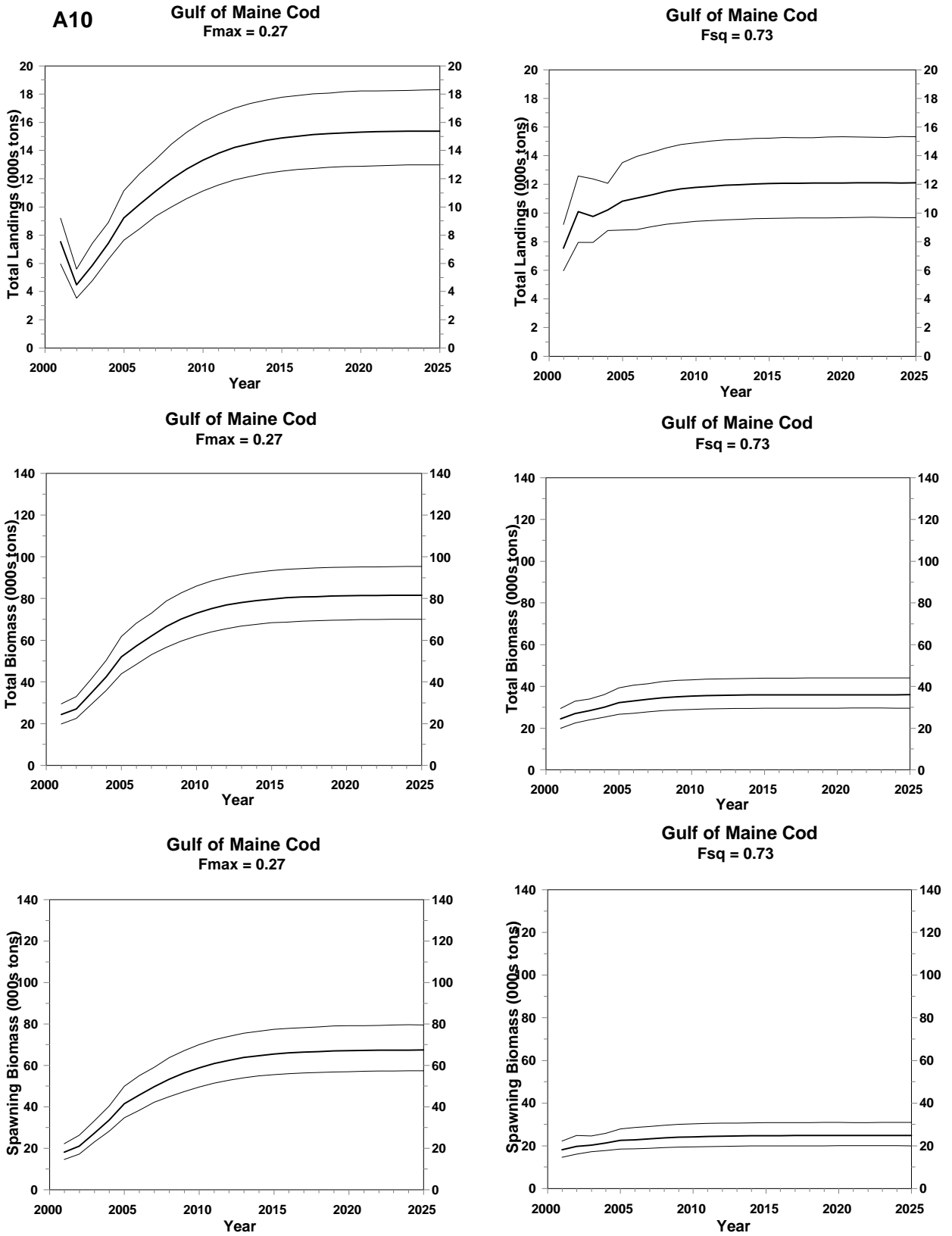


Figure A25. Long-term stochastic catch and stock biomass results for Gulf of Maine cod at Fmax (0.27) and Fsq (0.73).