

Figure C1. Gulf of Maine northern shrimp landings by fishing season.

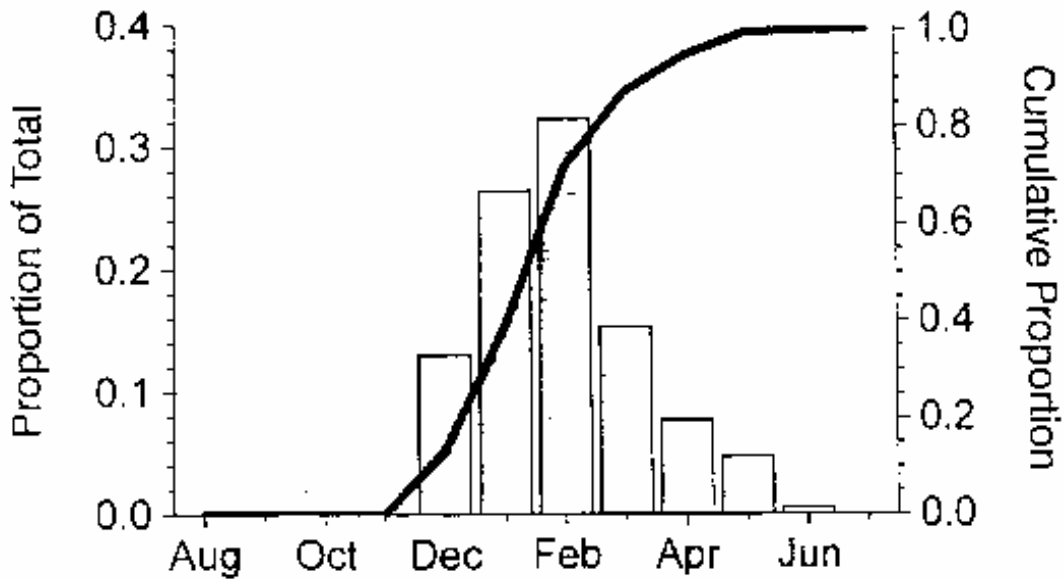


Figure C2. Distribution of monthly landings of Gulf of Maine northern shrimp, 1984 - 1996.

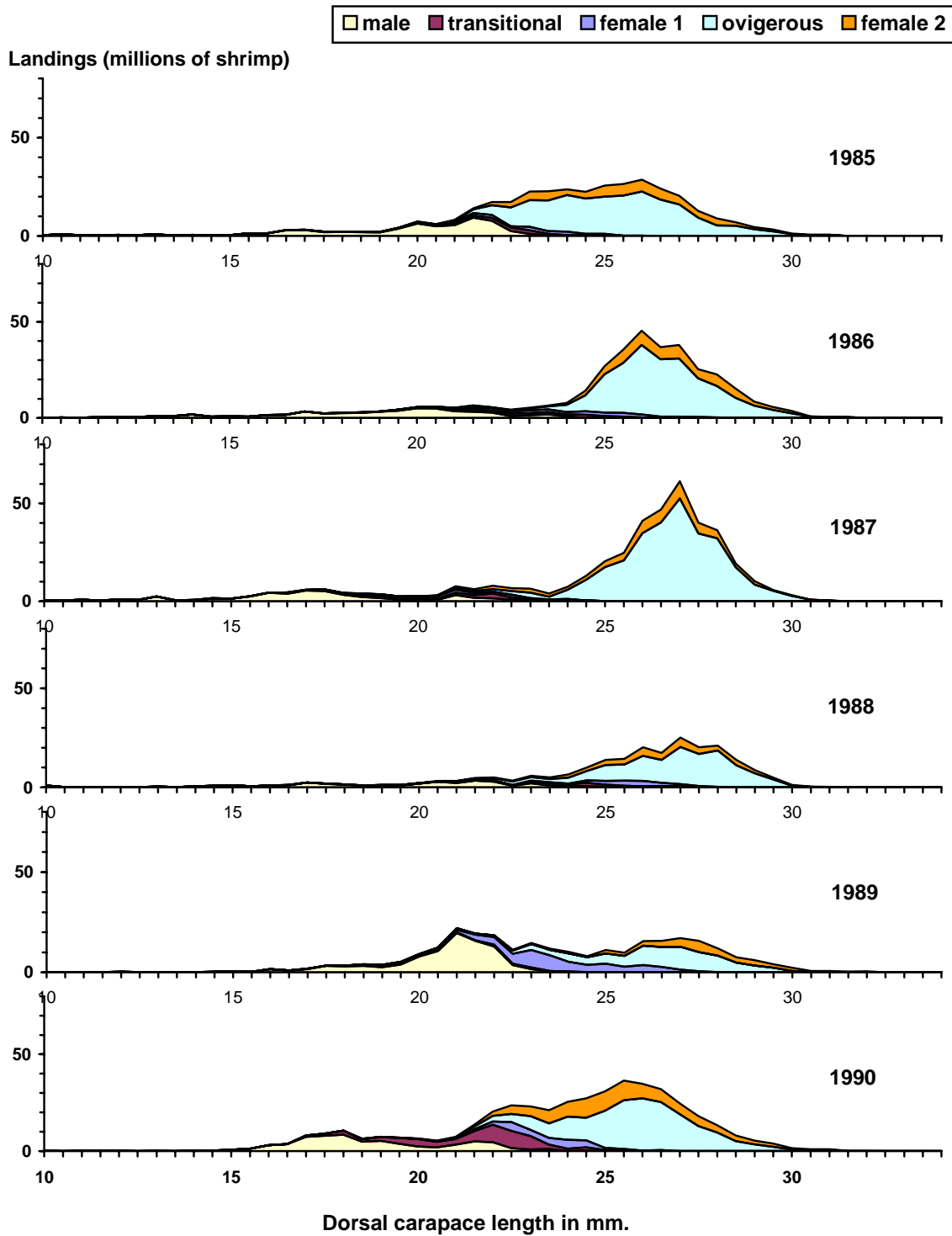


Figure C3. Gulf of Maine northern shrimp landings by length, developmental stage, and fishing season.

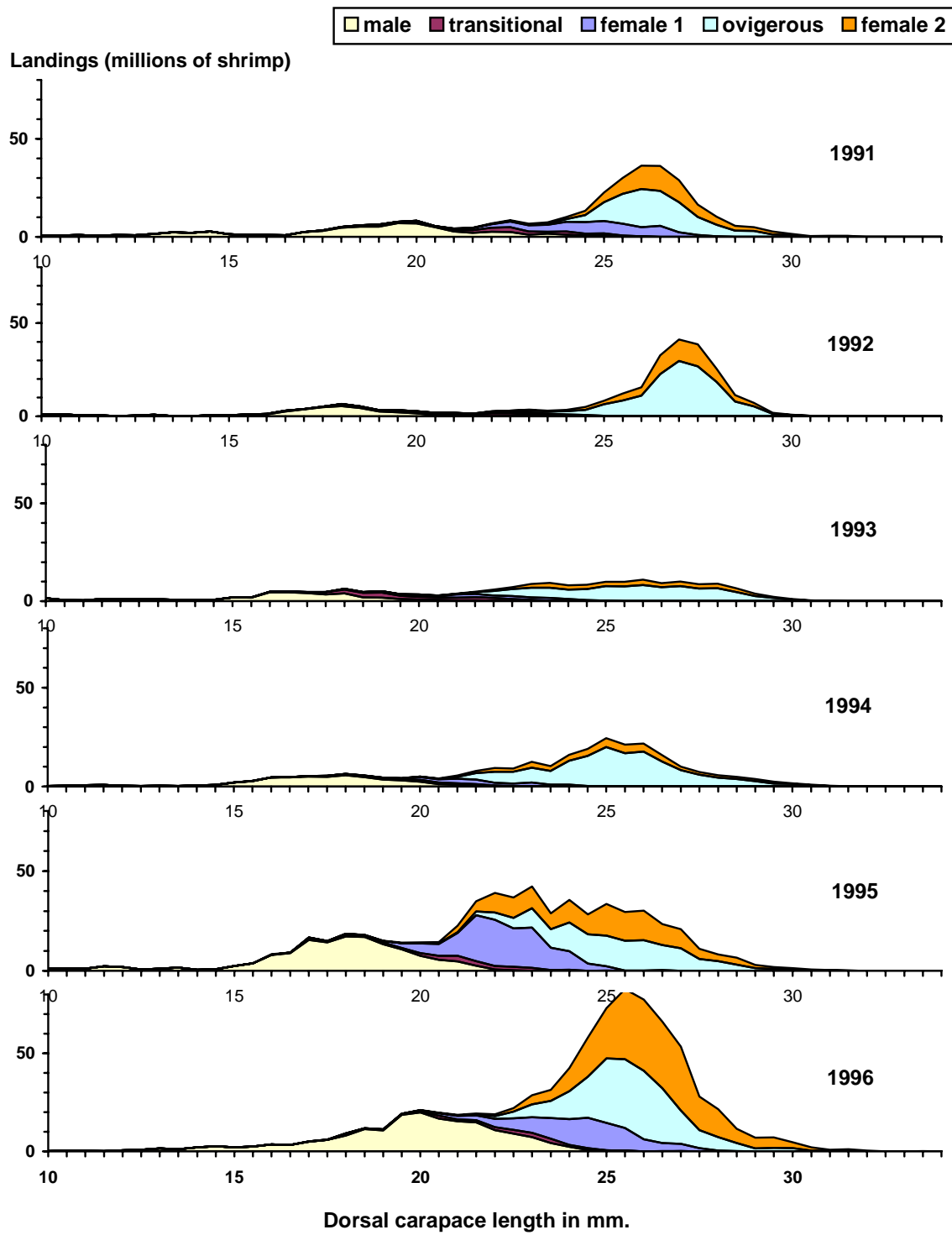


Figure C3 continued.

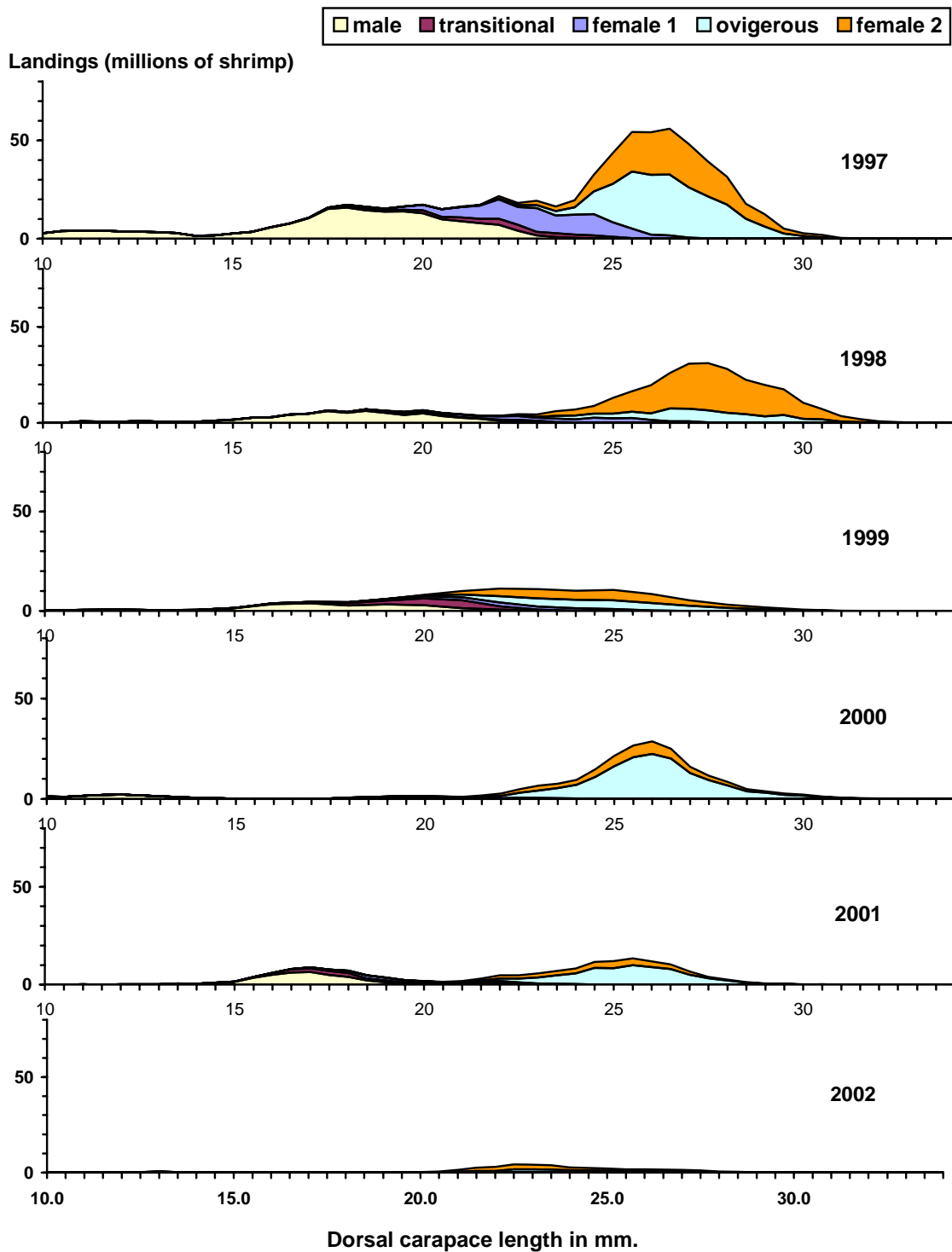
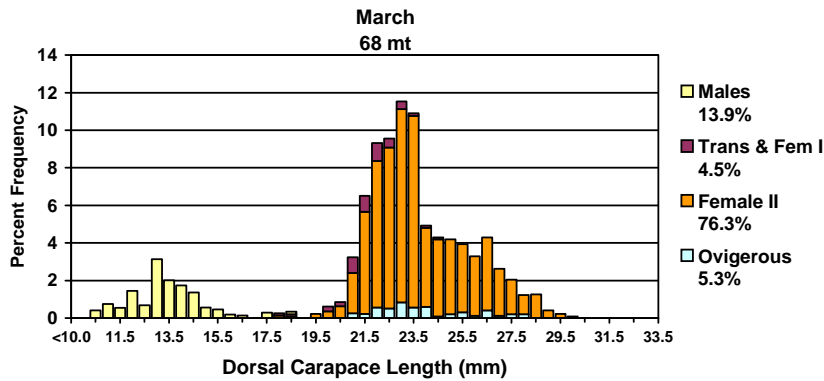
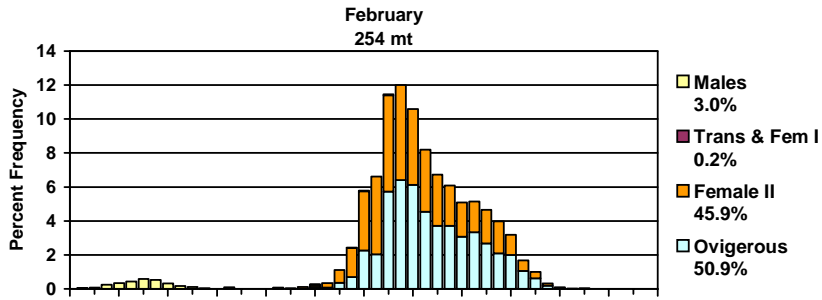


Figure C3 continued.

Maine



Massachusetts and New Hampshire

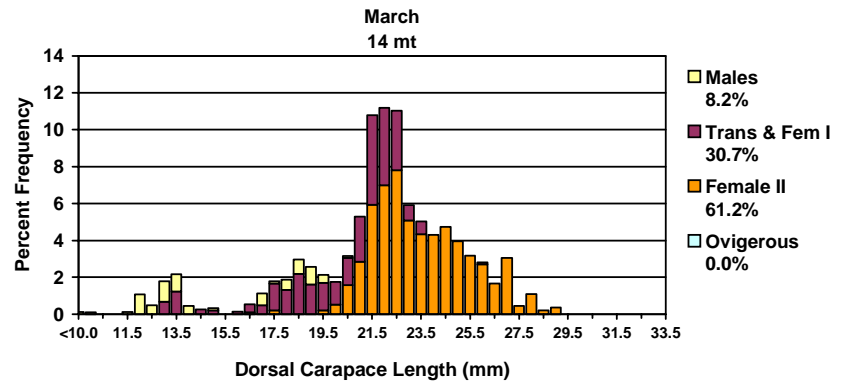
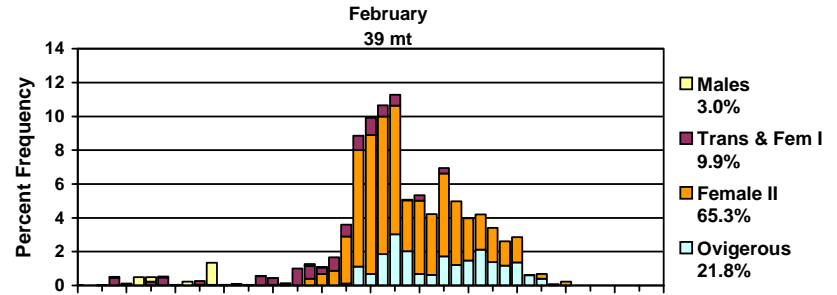


Figure C4a. Gulf of Maine northern shrimp landings by length, developmental stage, and month, 2002 fishing season.

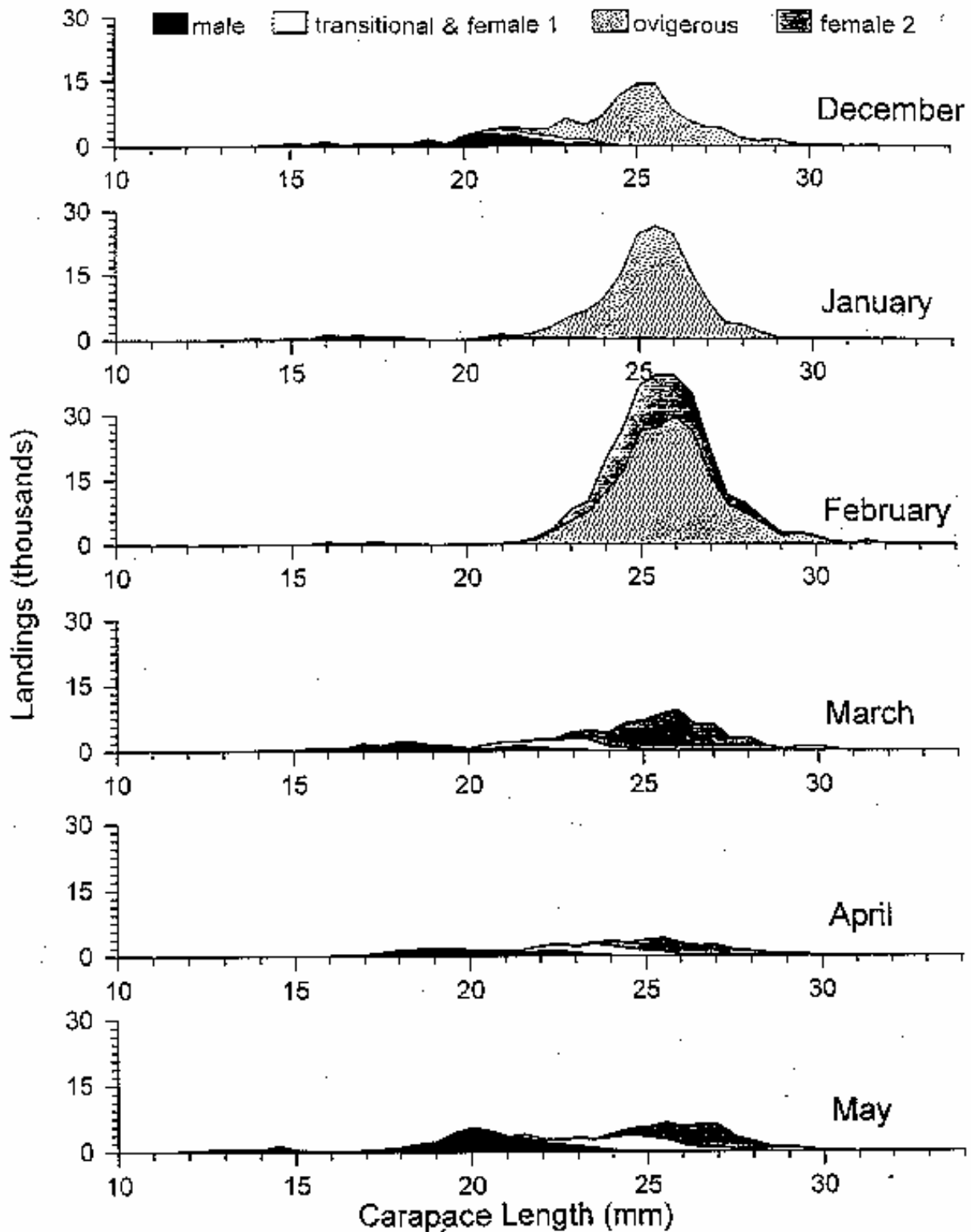


Figure C4b. Gulf of Maine northern shrimp landings by length, developmental stage, and month, 1996 fishing season.

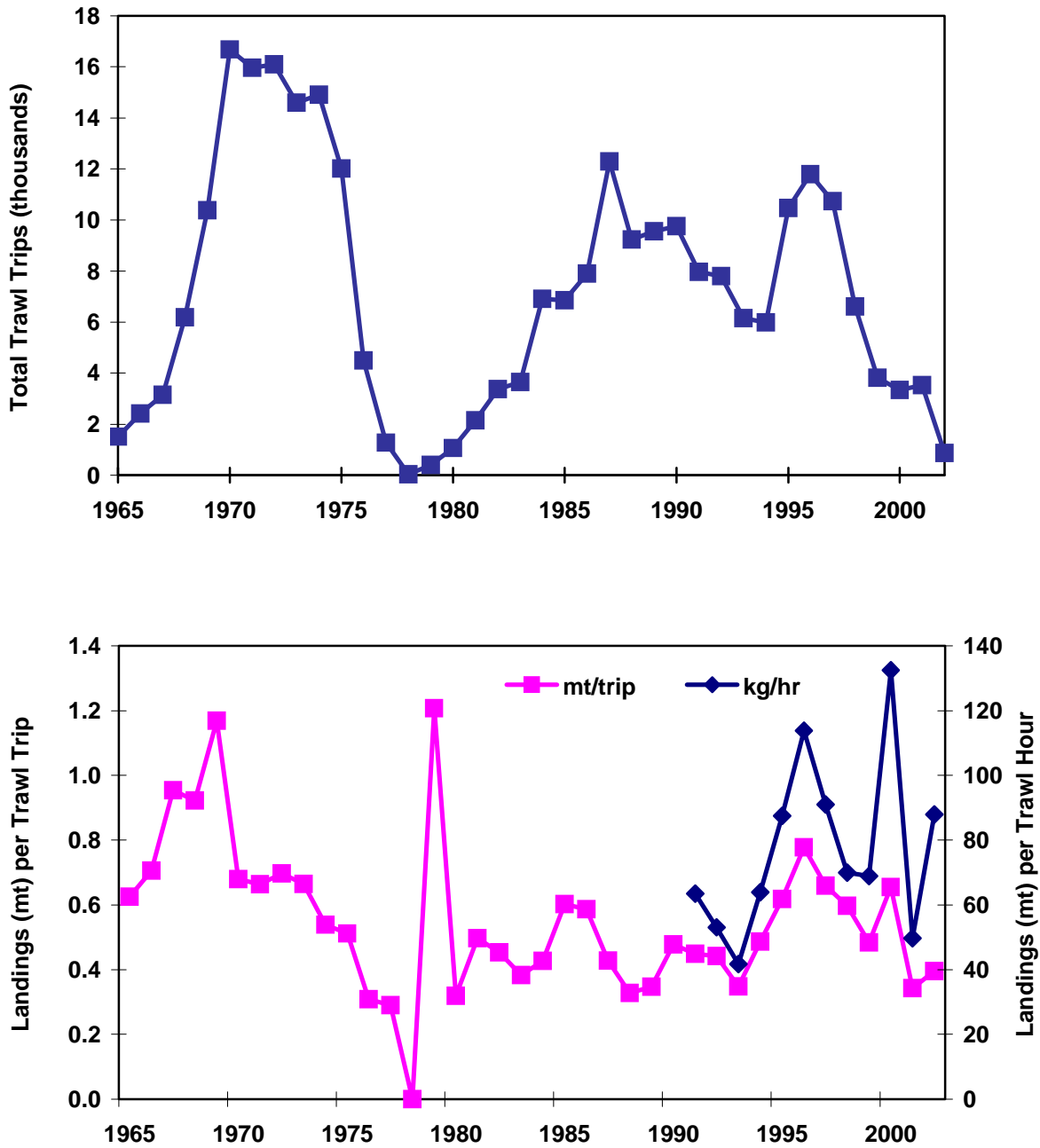


Figure C5. Nominal fishing effort, and CPUE.

Above – trips from NMFS data.

Below – Catch per unit effort in landings per trip, and per hour from state interview data.

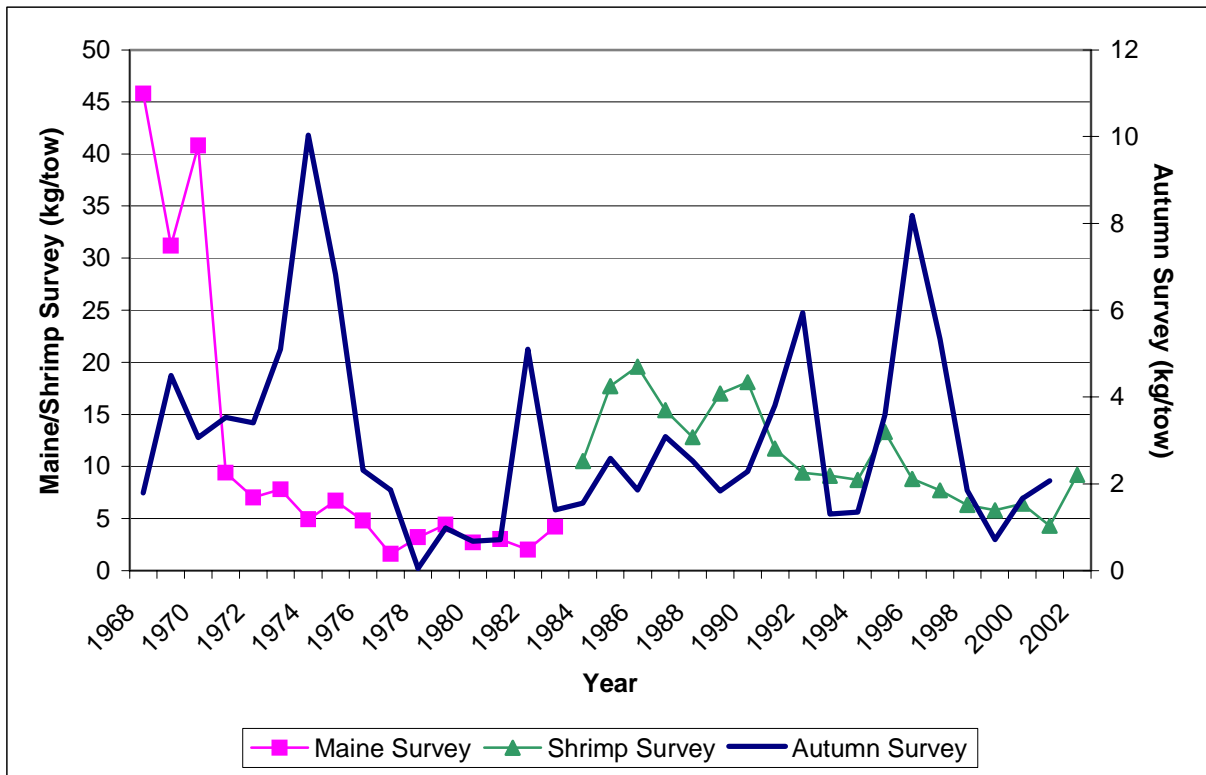


Figure C6. Research trawl survey indices of Gulf of Maine northern shrimp biomass (kg/tow).

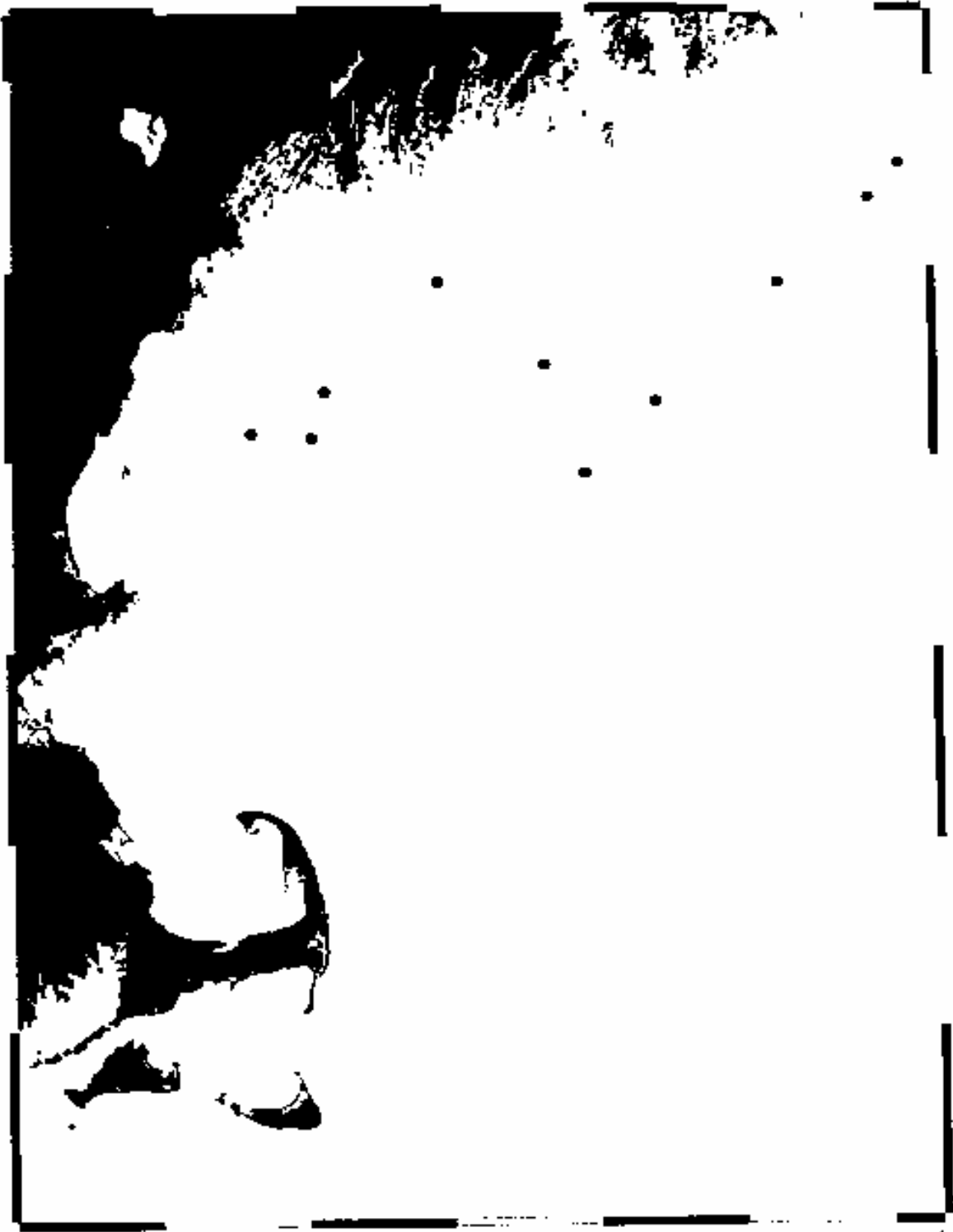


Figure C7. State of Maine summer survey fixed station locations.

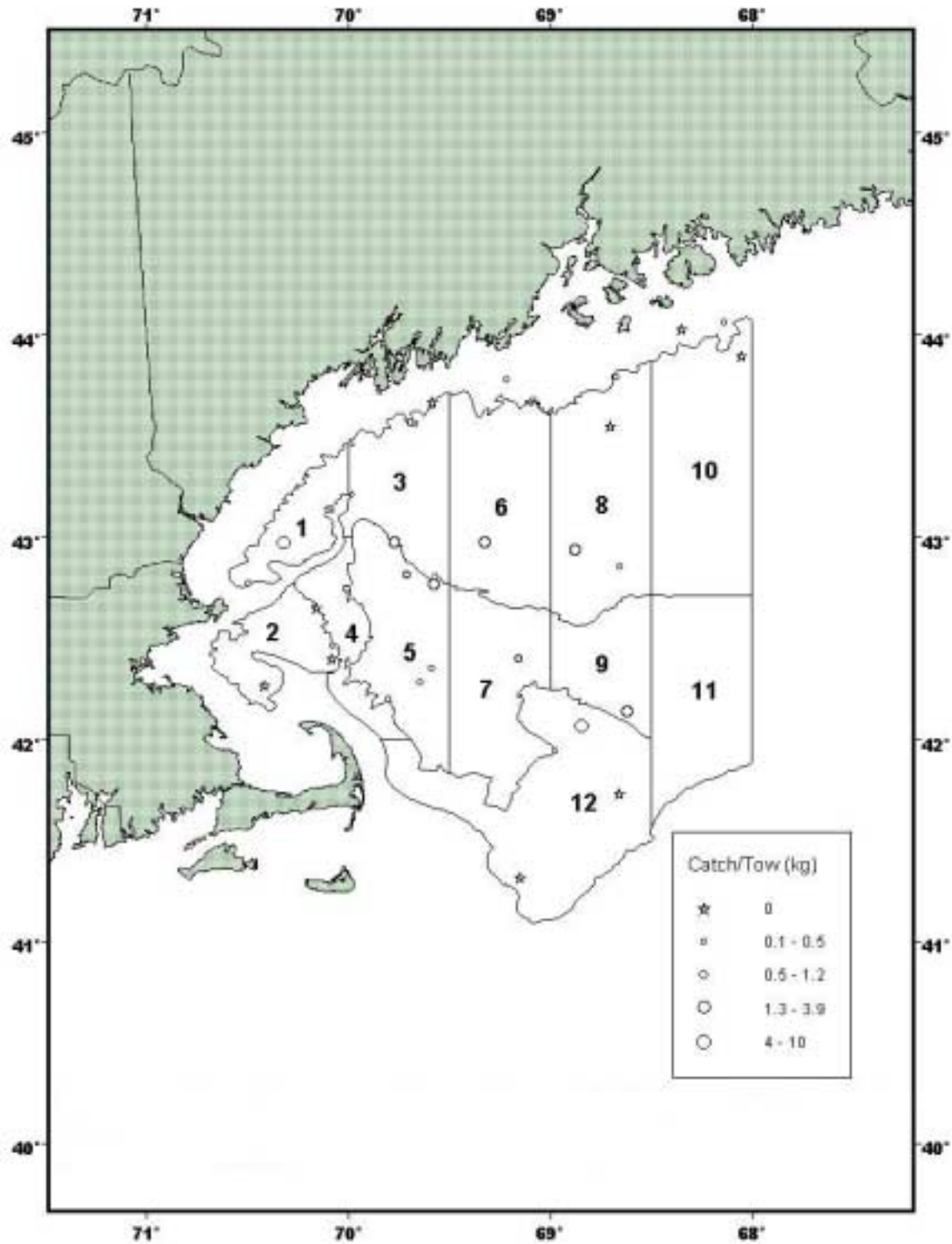


Figure C8. Northern shrimp survey strata and observed distribution of catch per tow (kg) collected during the NEFSC autumn bottom trawl survey in the western Gulf of Maine aboard the R/V Albatross IV, October 2001.

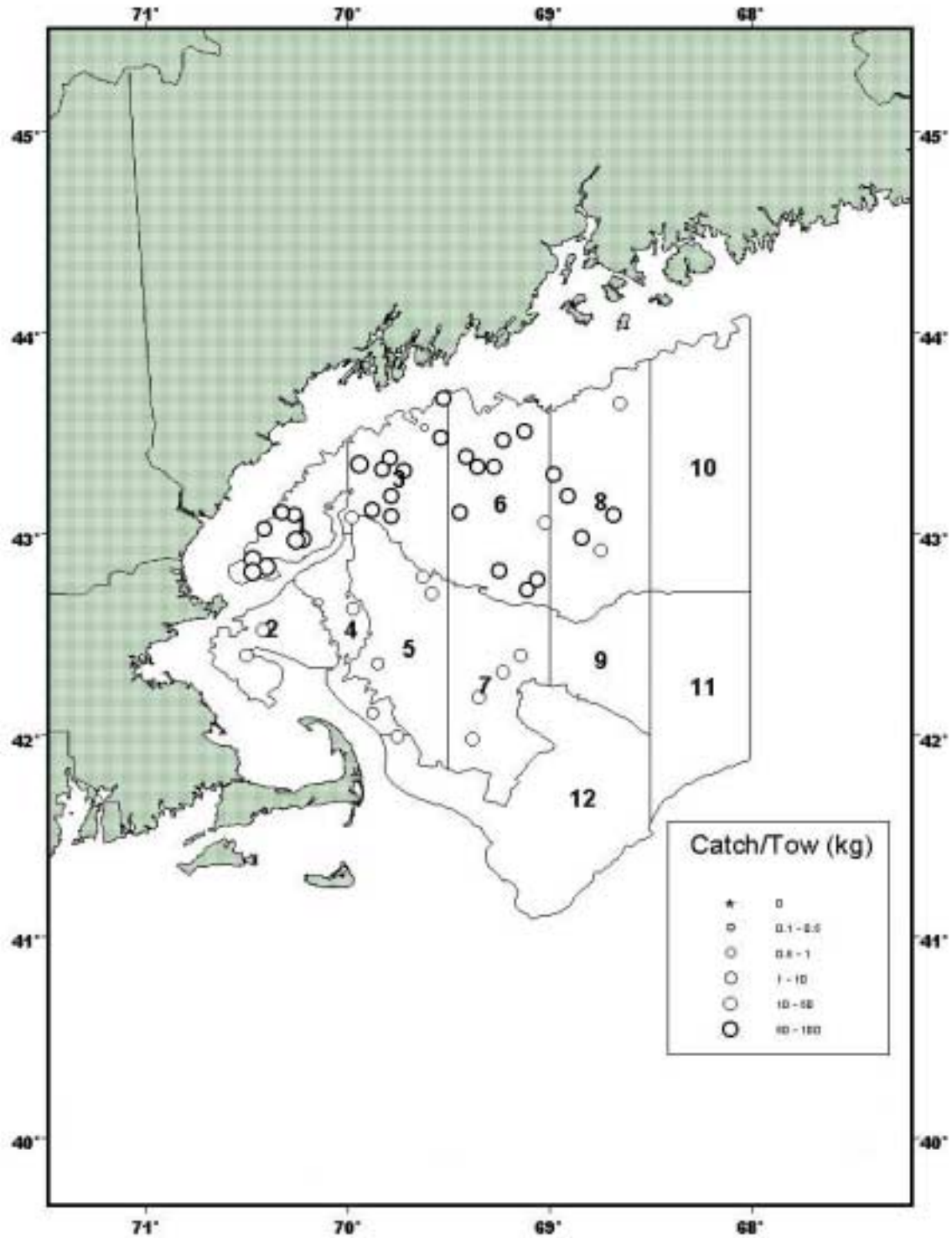


Figure C9. Gulf of Maine northern shrimp summer survey strata and observed distribution of catch per tow (kg) collected during 2002 aboard the R/V Gloria Michelle, July 22 – August 2, 2002.

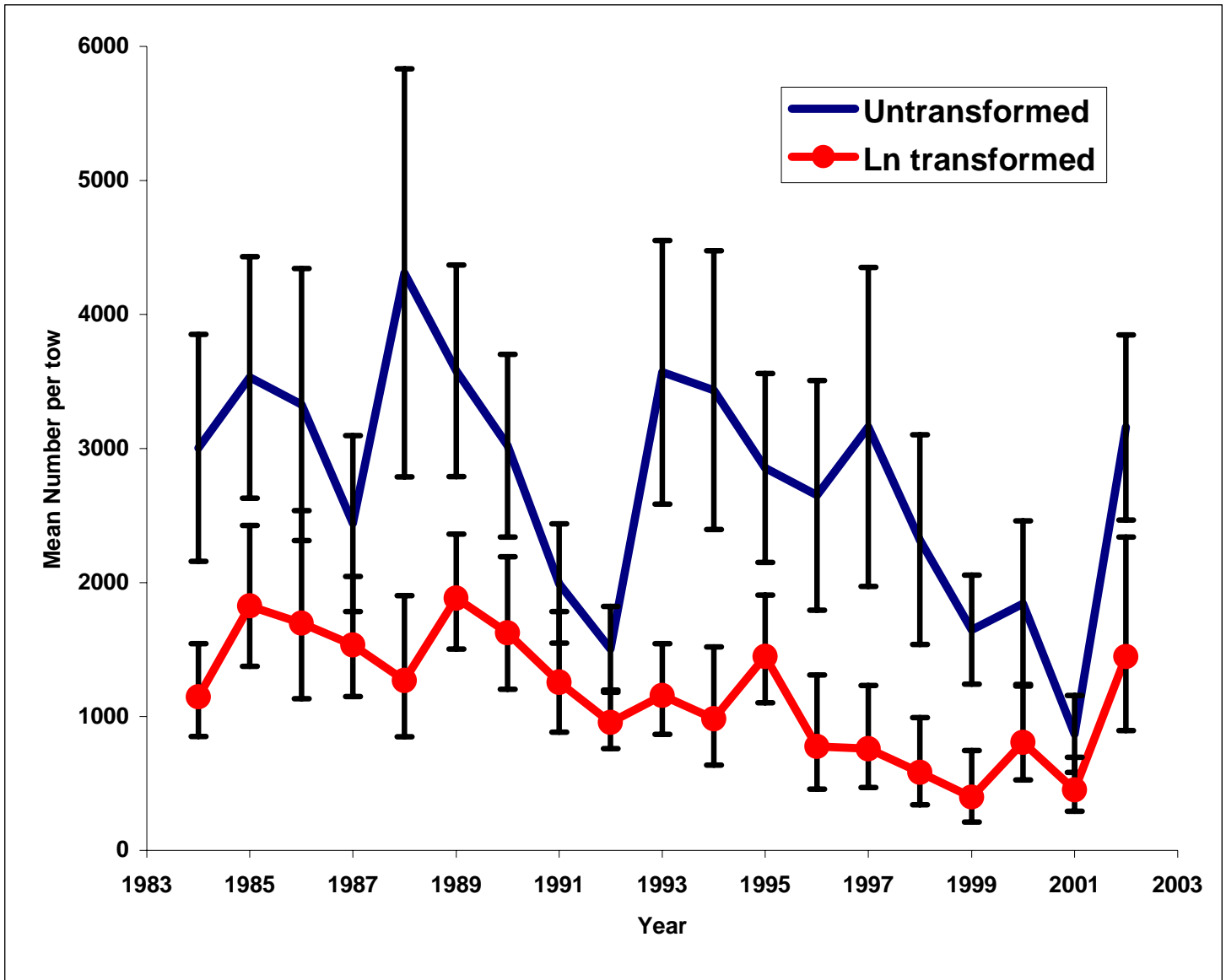


Figure C10. Gulf of Maine summer survey indices of abundance (mean number per tow +/- 2 SE).

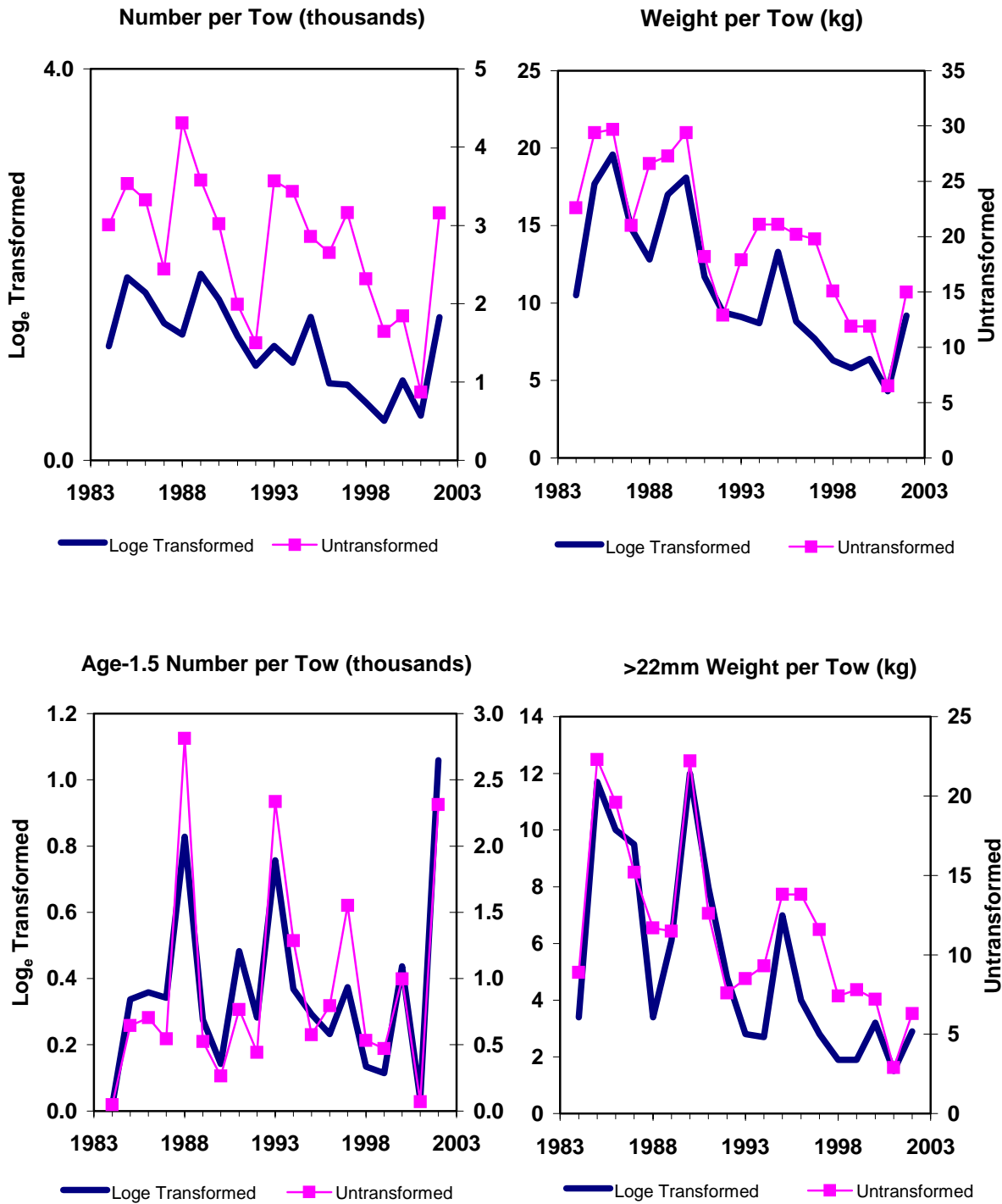


Figure C11. Gulf of Maine northern shrimp summer survey indices of abundance.

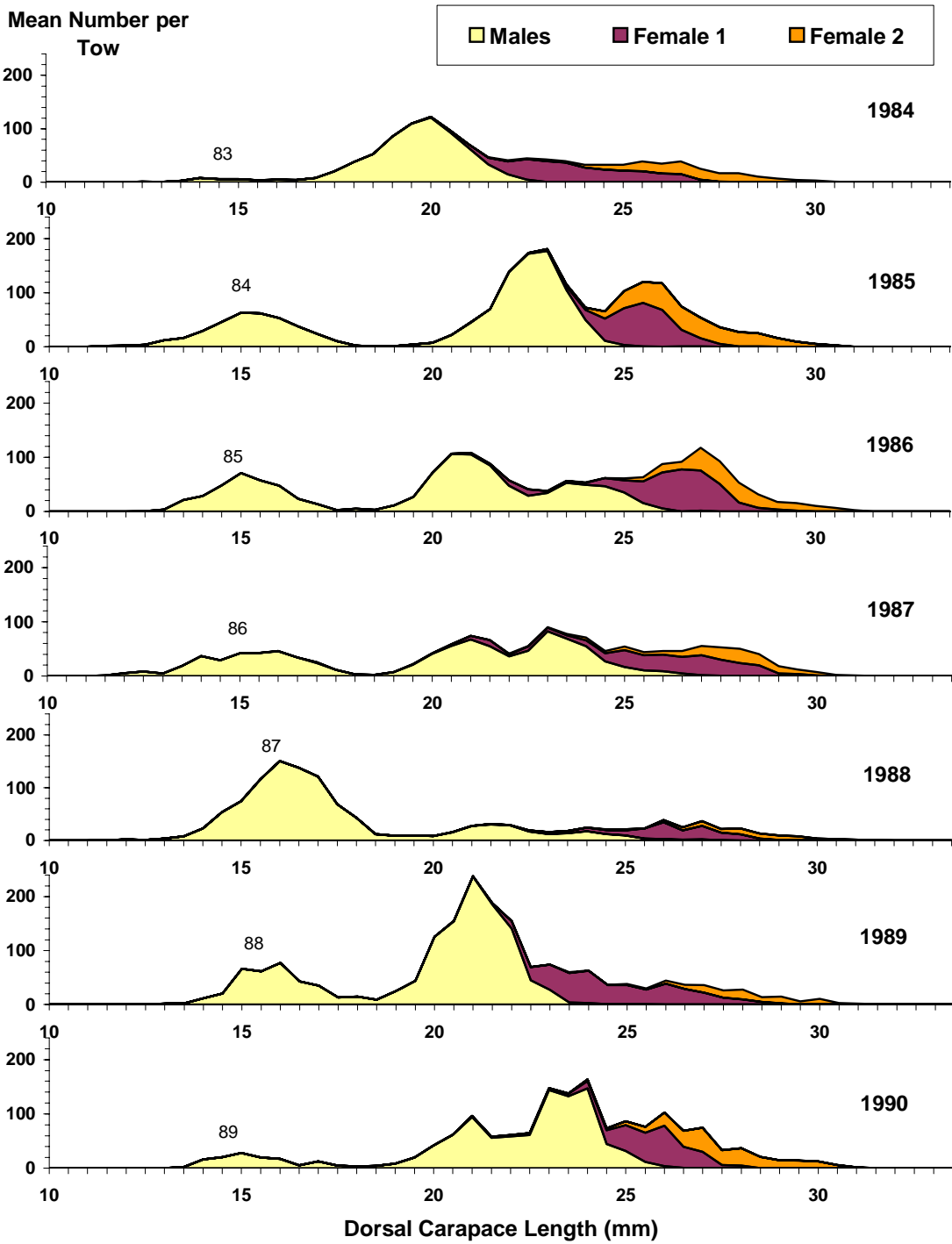


Figure C12. Gulf of Maine northern shrimp summer survey mean catch per tow by length and developmental stage, by survey year. 2-digit numbers are assumed 1.5 age year class.

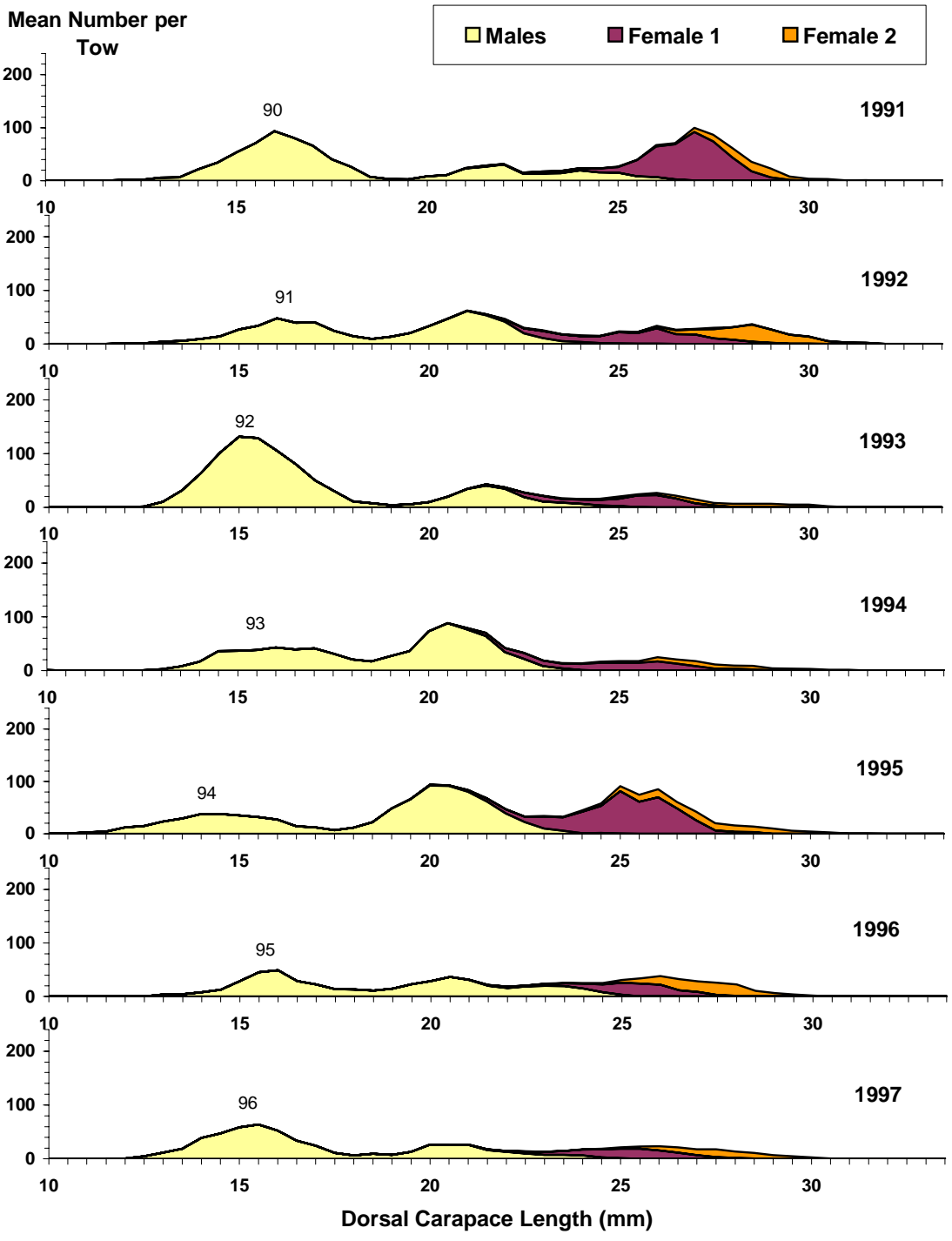


Figure C12 continued.

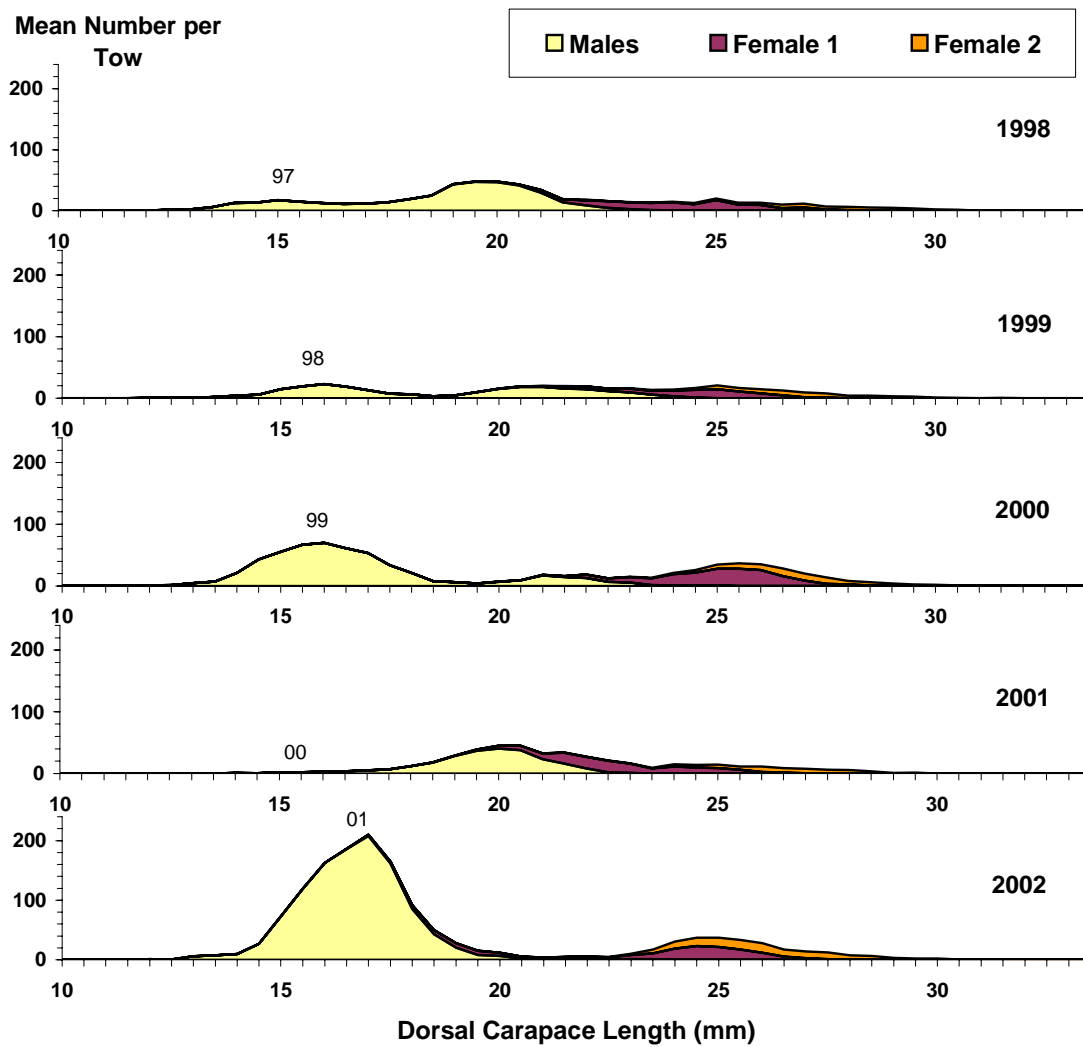


Figure C12 continued.

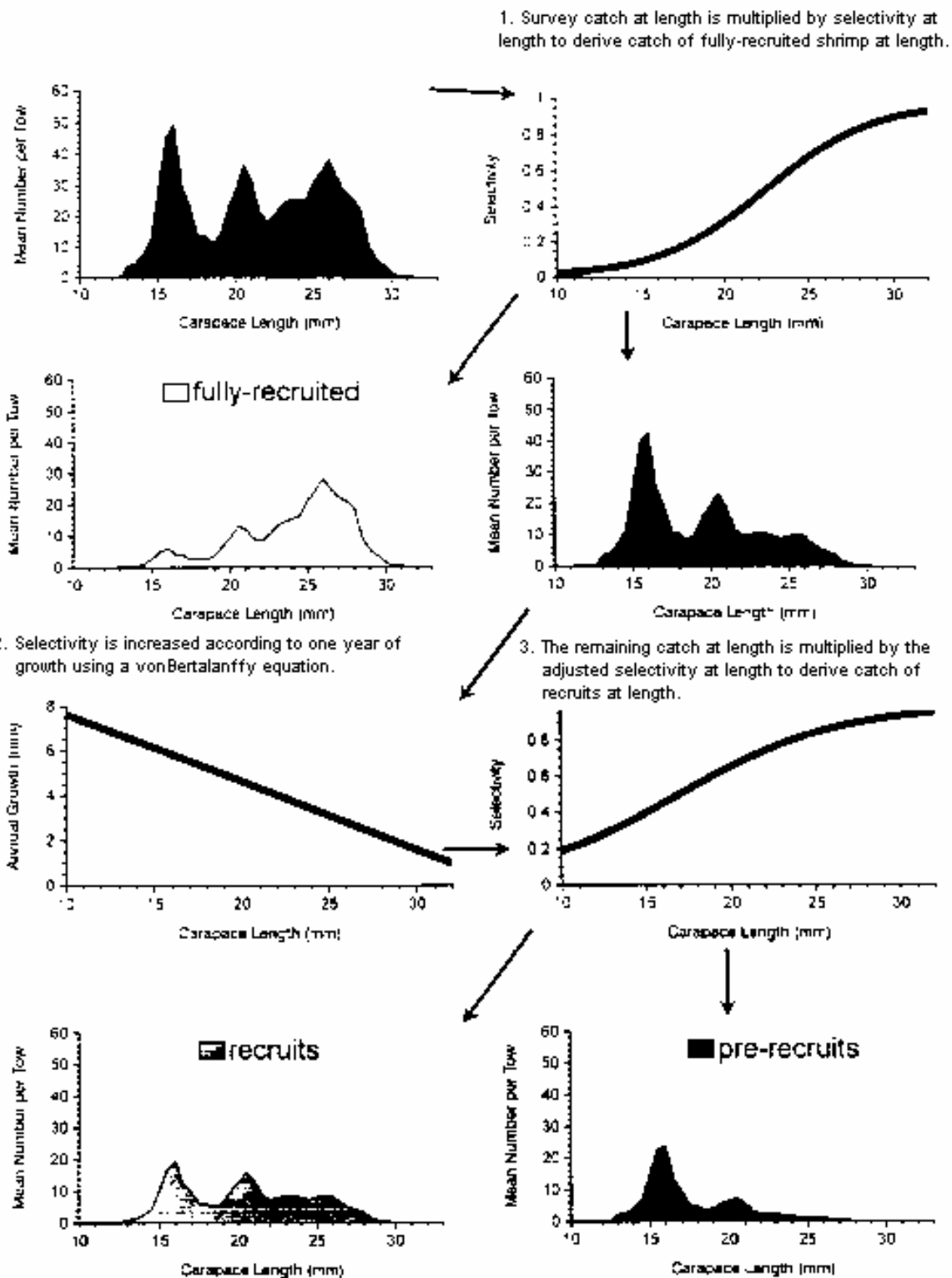


Figure C13. The “selectivity” method of deriving indices of abundance for fully-recruited and recruited Gulf of Maine northern shrimp from summer survey length frequencies. Example illustrated here is from 1996.

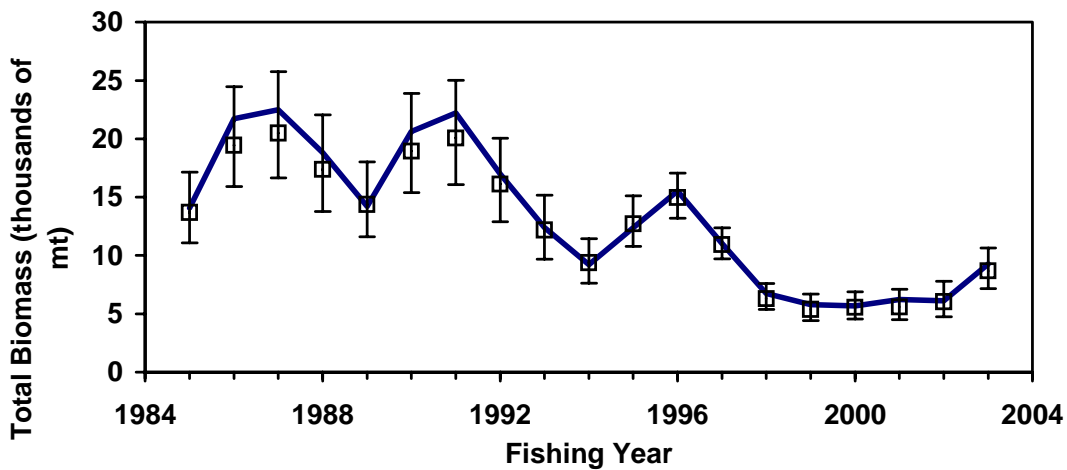
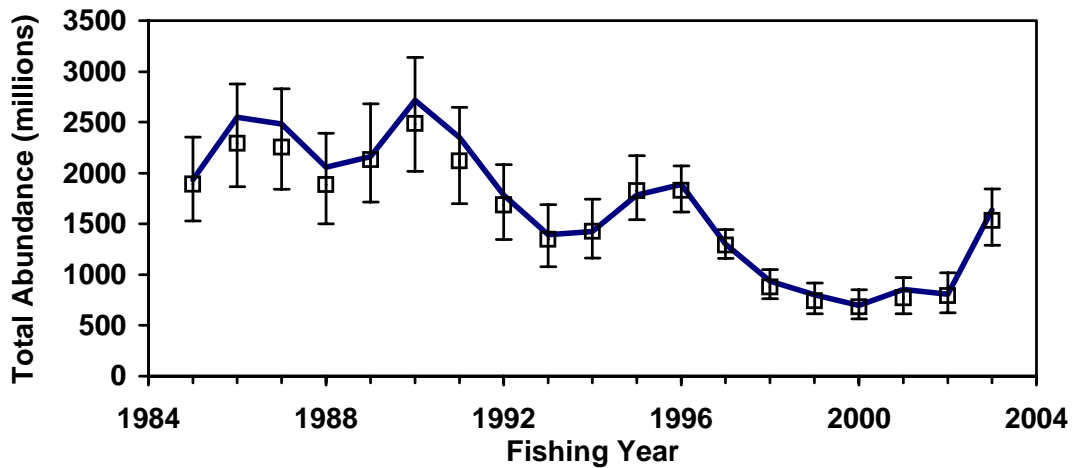
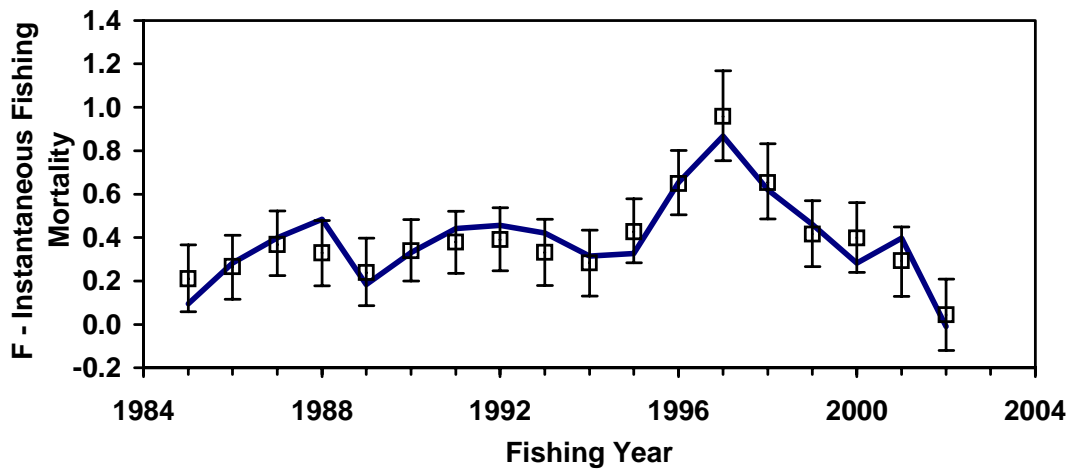


Figure C14. Summary of CSA for Gulf of Maine northern shrimp with least squares estimates, bootstrapped means, and 80% confidence intervals.

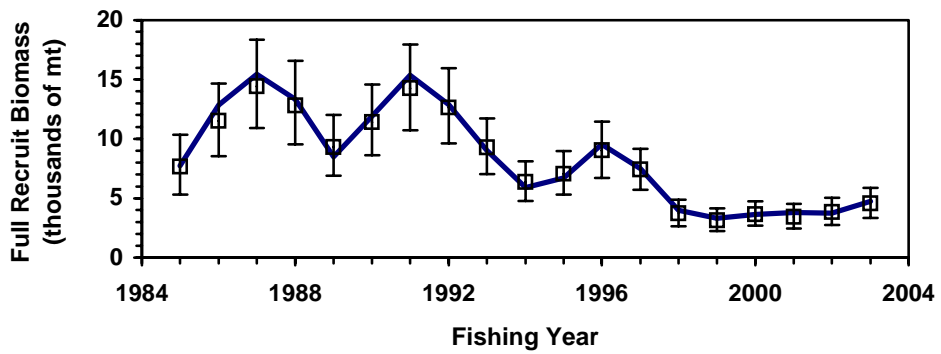
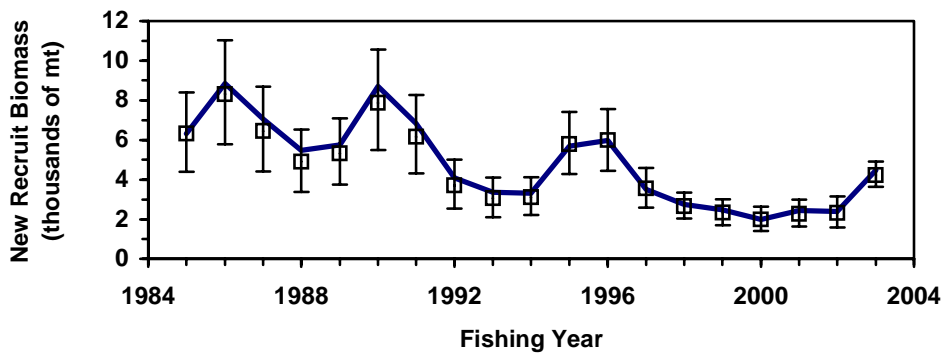
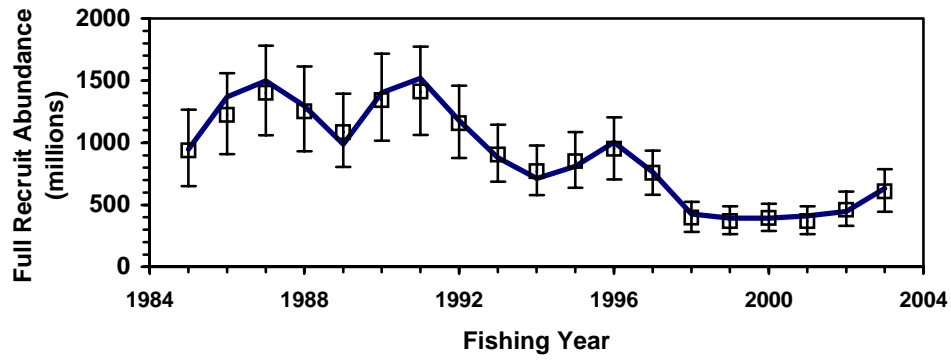
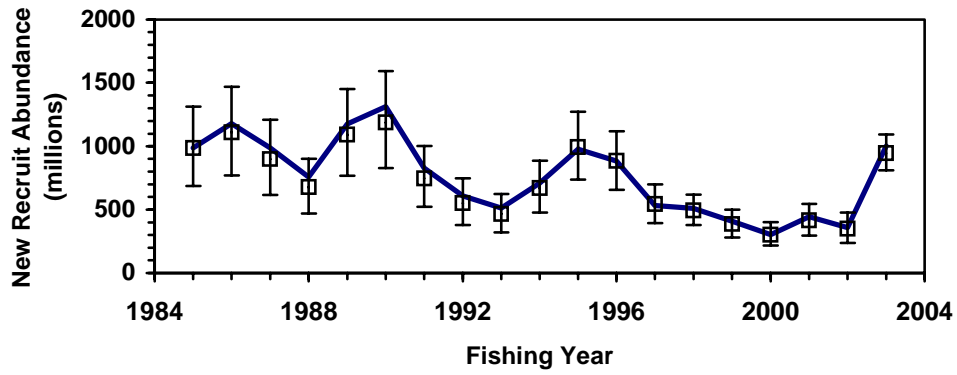


Figure C14 continued.

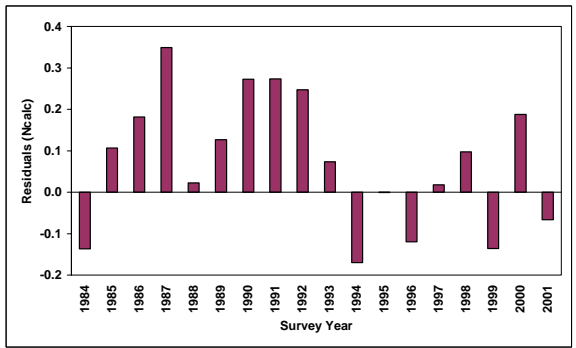
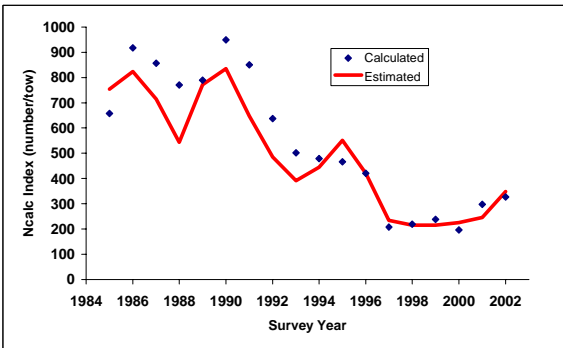
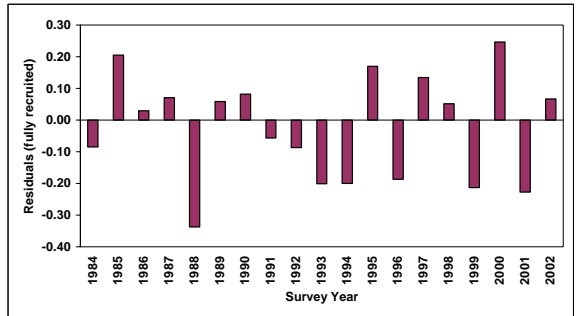
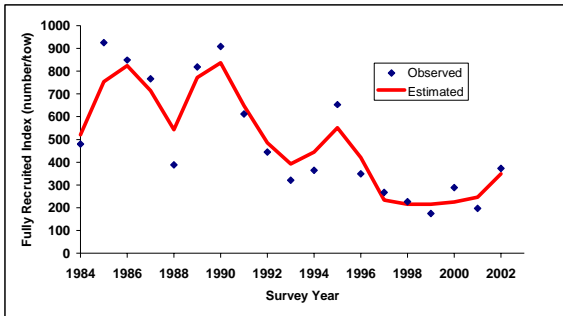
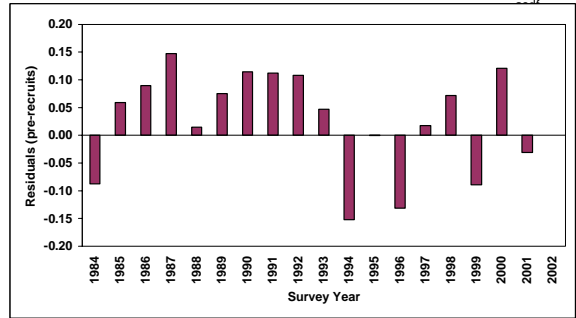
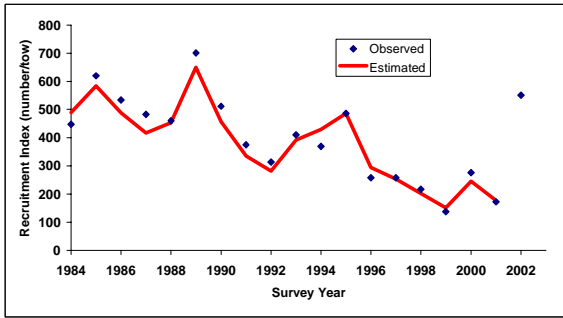


Figure C15. Summary results of CSA of Gulf of Maine northern shrimp with residuals.

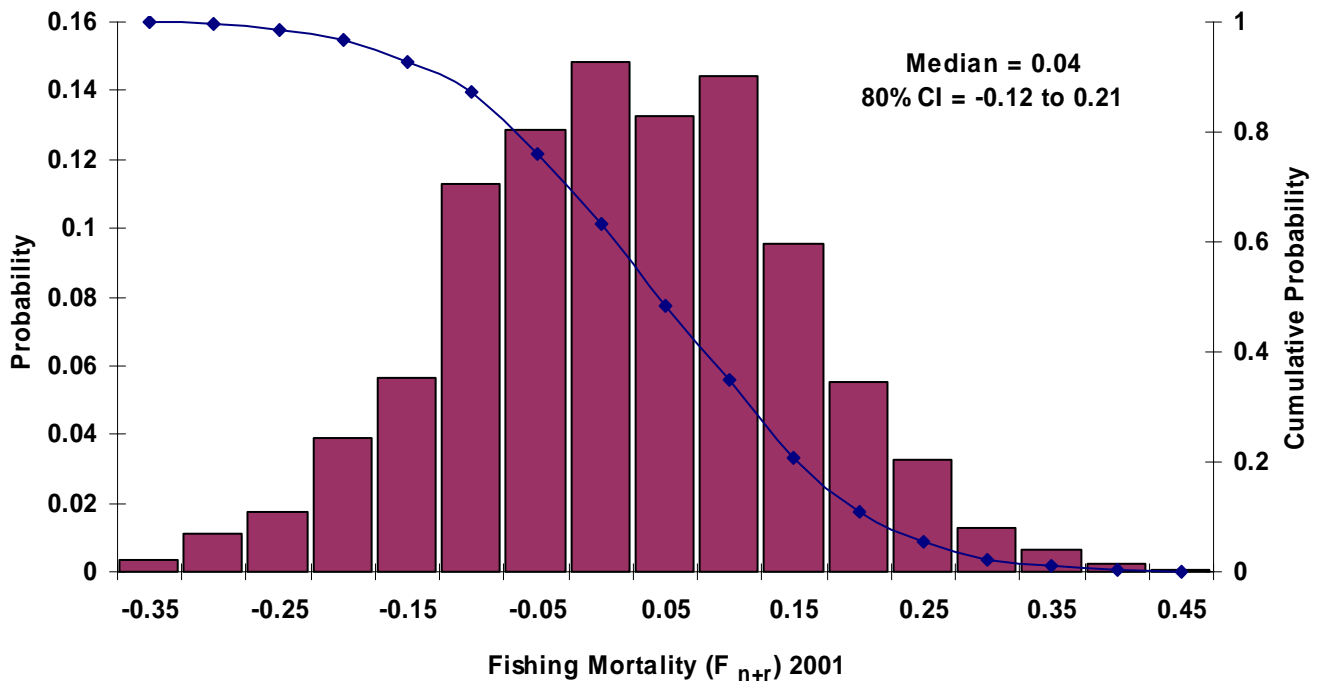


Figure C16a. Bootstrapped CSA estimates of fishing mortality for the 2002 fishing season (2001 survey year) for Gulf of Maine northern shrimp.

Distribution of F Bootstrap Estimates

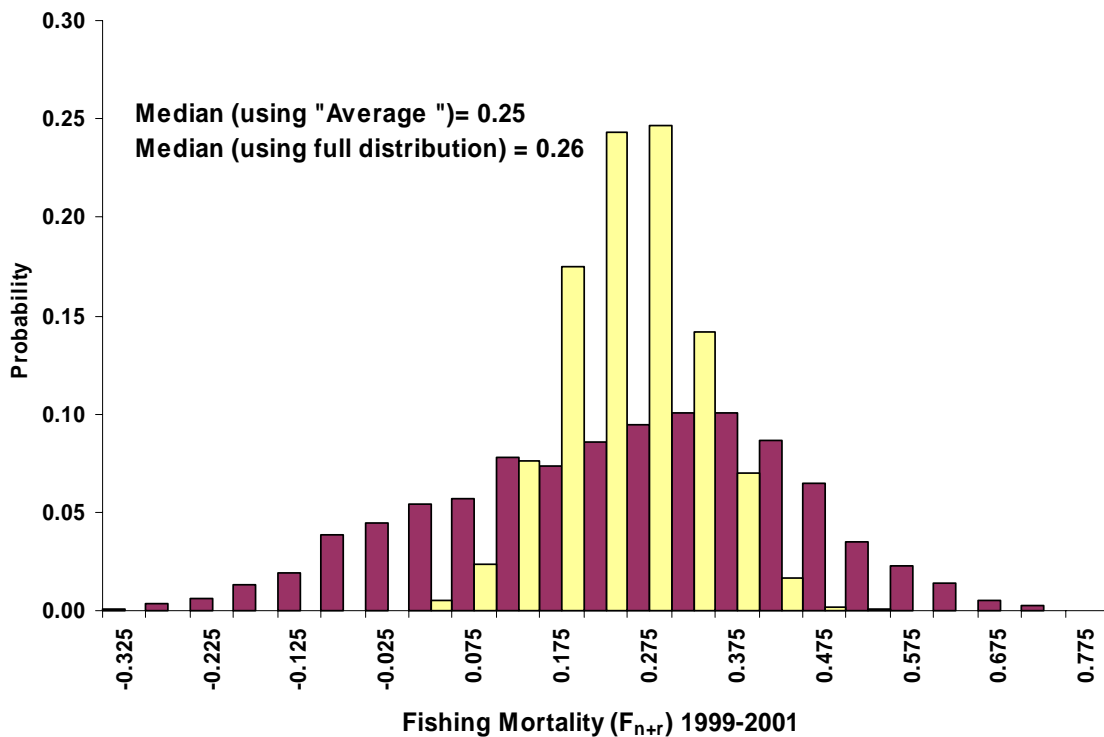


Figure C16b. Bootstrapped CSA estimates of fishing mortality for the 2000-2002 fishing seasons (1999-2001 survey years) for Gulf of Maine northern shrimp.

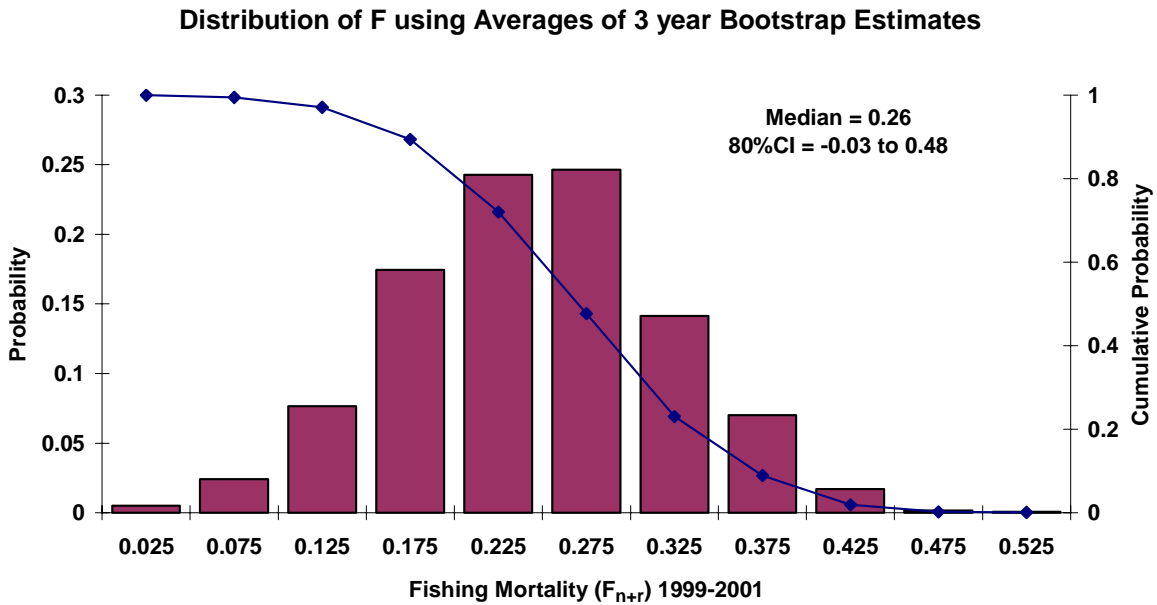
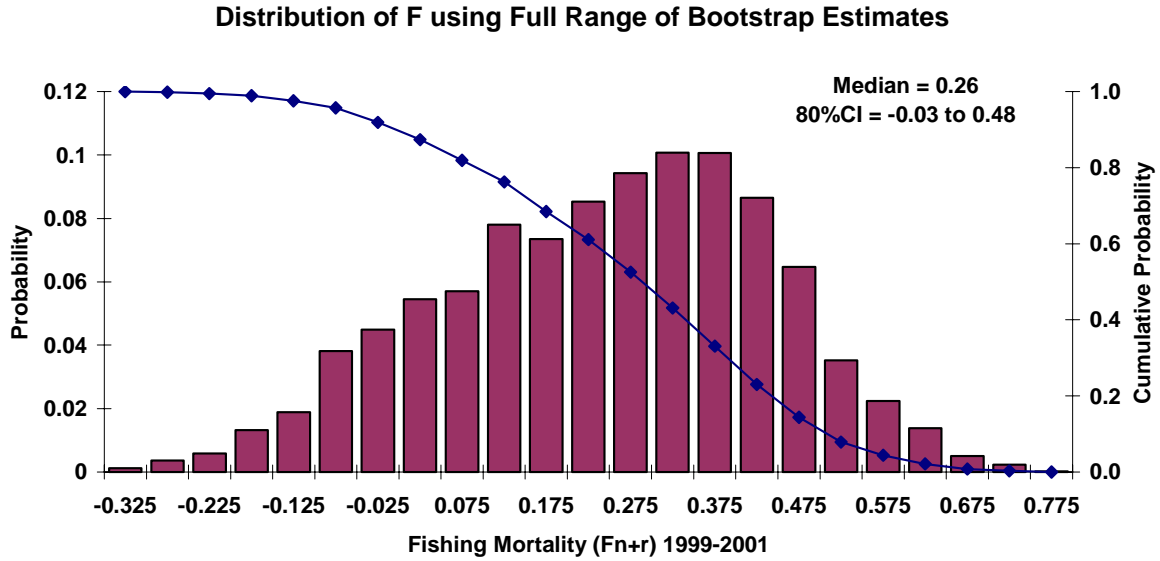


Figure C16c. Bootstrapped CSA estimates of fishing mortality for the 2000-2002 fishing seasons (1999-2001 survey year) for Gulf of Maine northern shrimp using all 6000 bootstrap iterations, and three year averages of the 2000 iterations (see text).

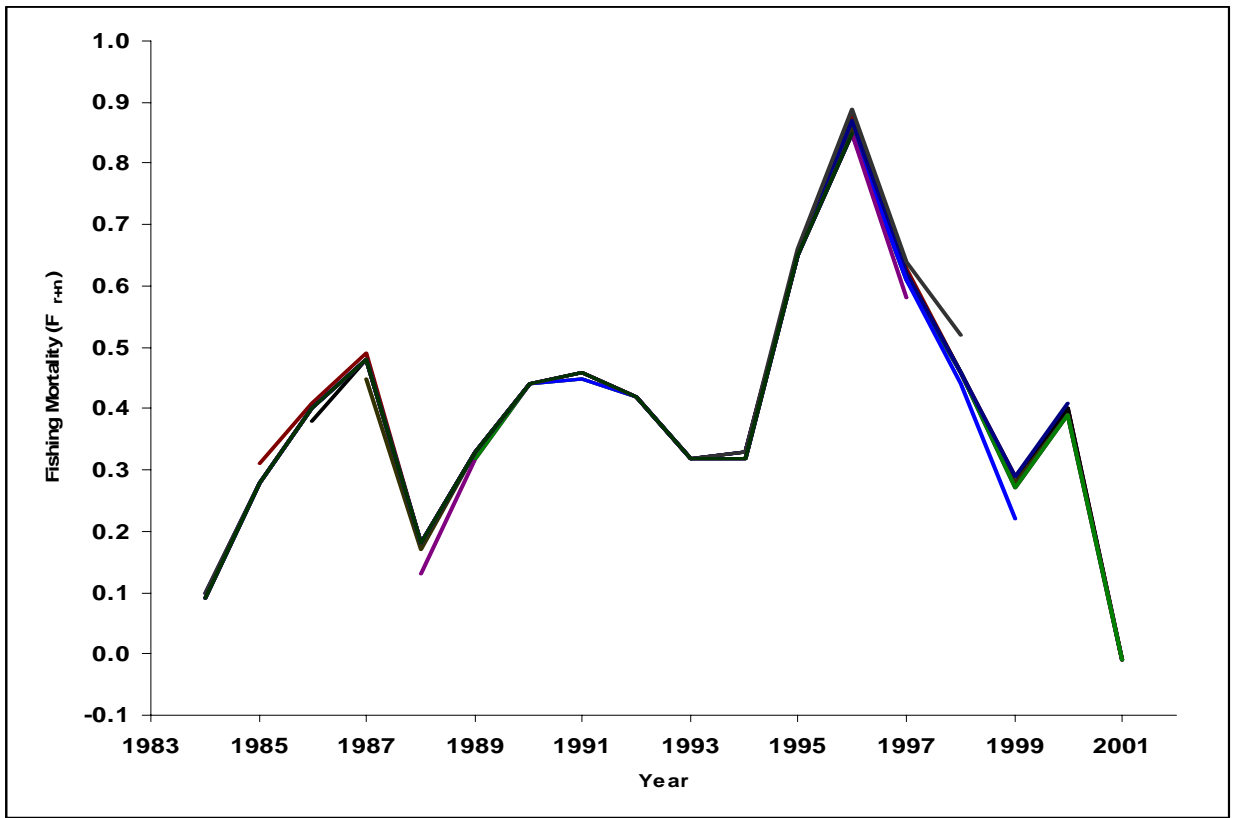


Figure C17a. Retrospective CSA estimates of fishing mortality for Gulf of Maine northern shrimp.

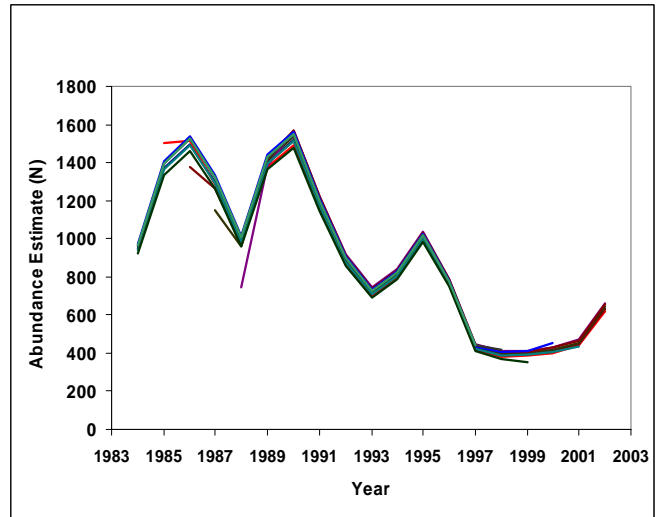
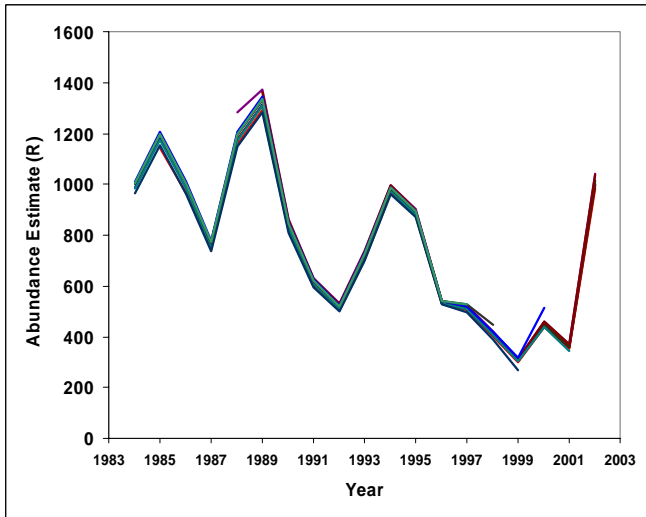


Figure C17b. Retrospective CSA estimates of abundance (recruits and fully recruited) for Gulf of Maine northern shrimp.

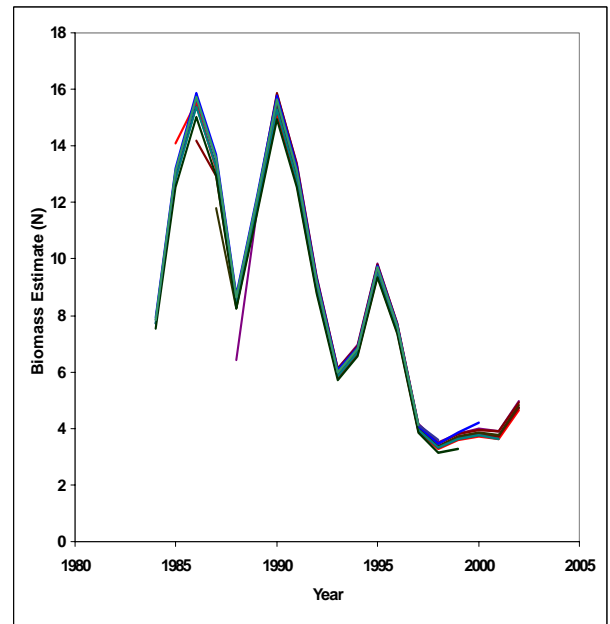
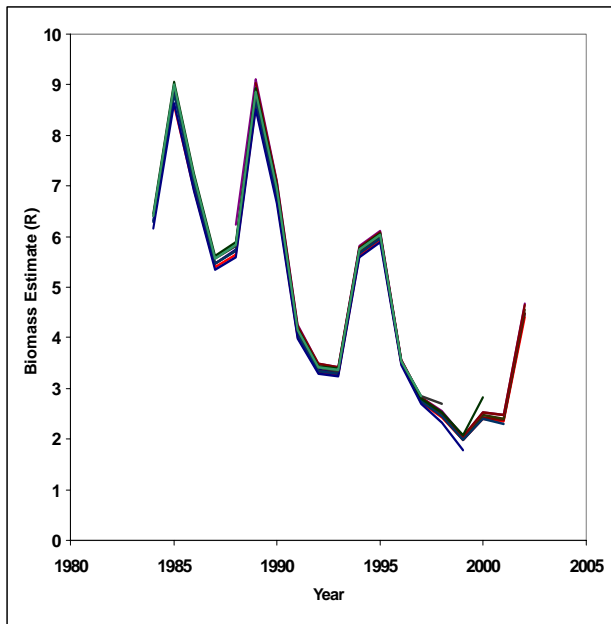


Figure C17c. Retrospective CSA estimates of biomass (recruits and fully recruited) for Gulf of Maine northern shrimp.

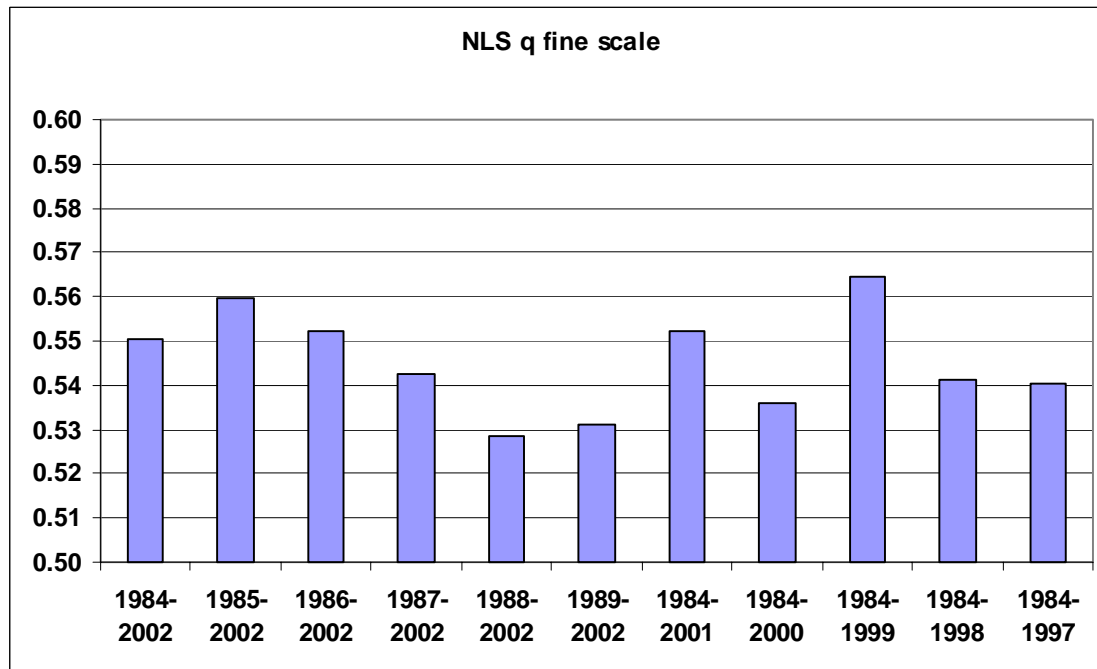
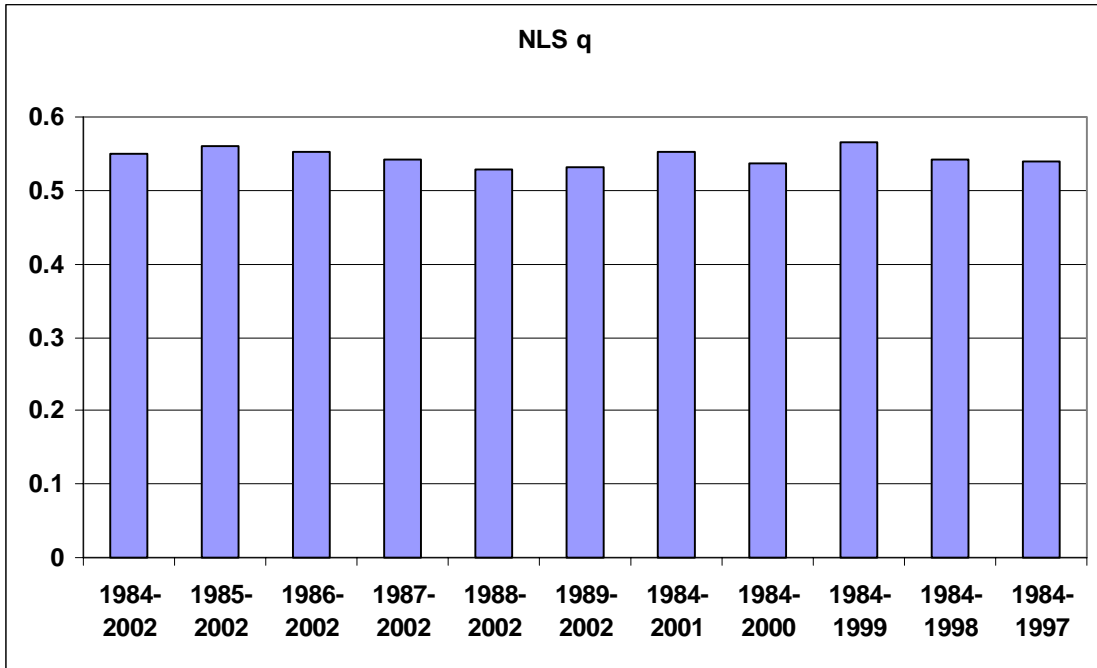


Figure C17d. Retrospective CSA estimates of q for Gulf of Maine northern shrimp.

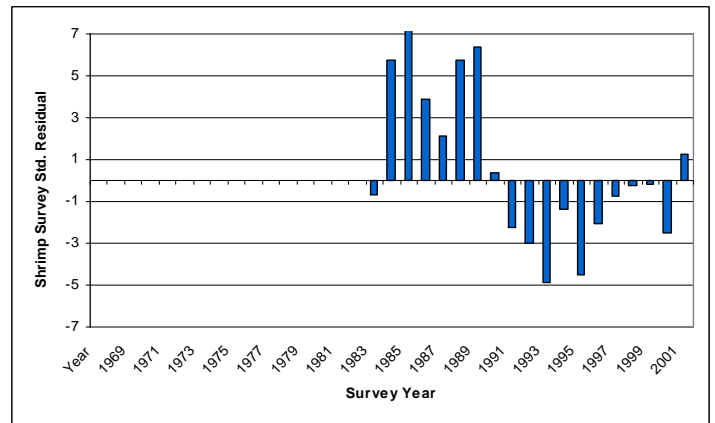
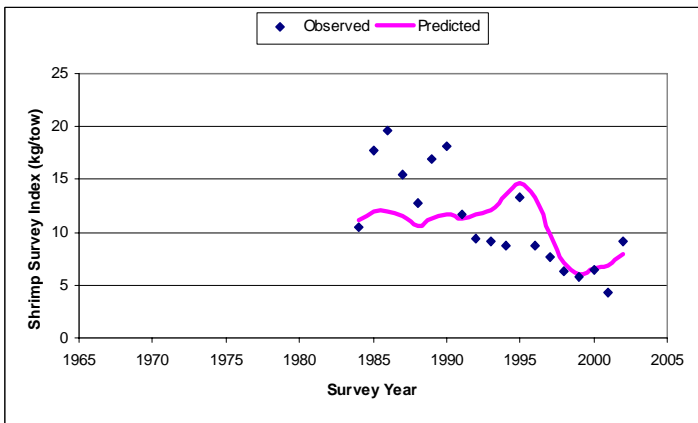
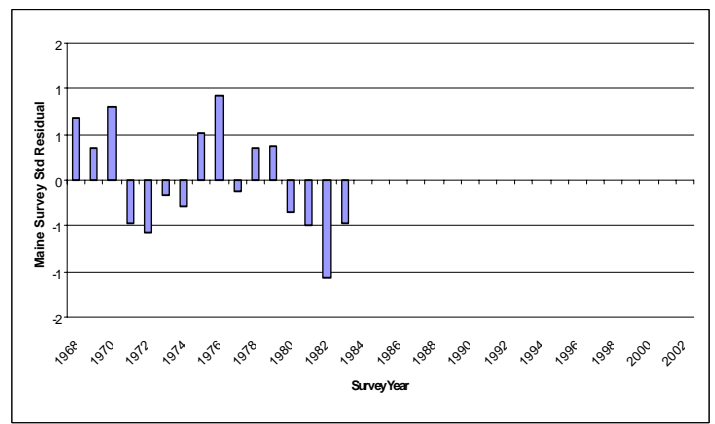
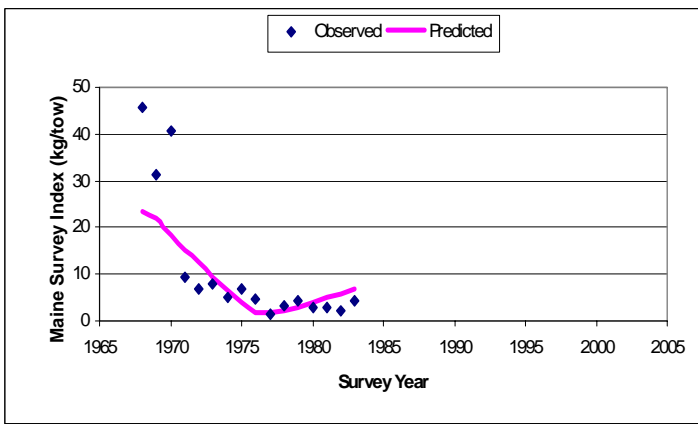
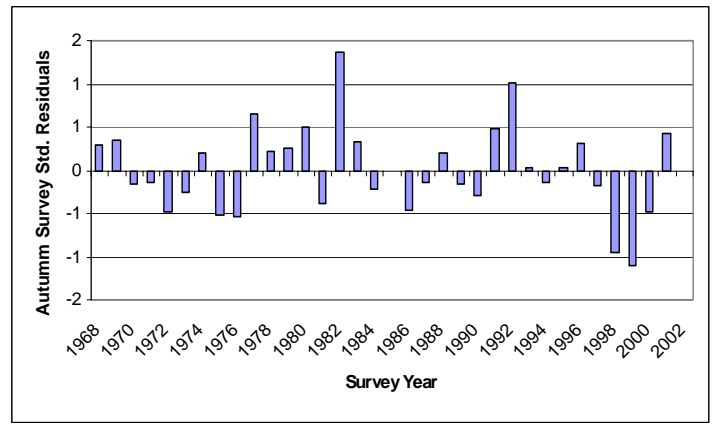
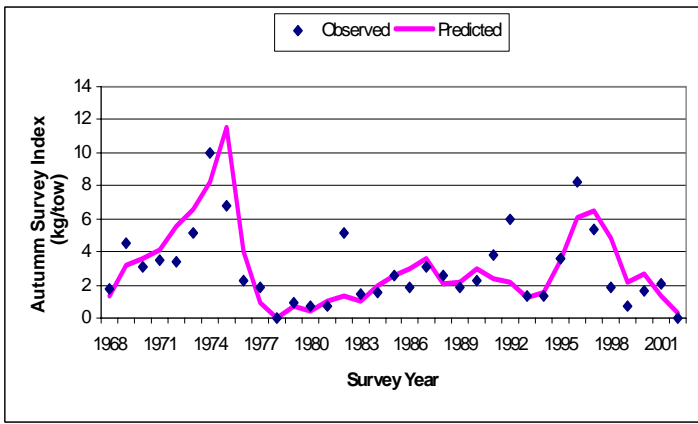
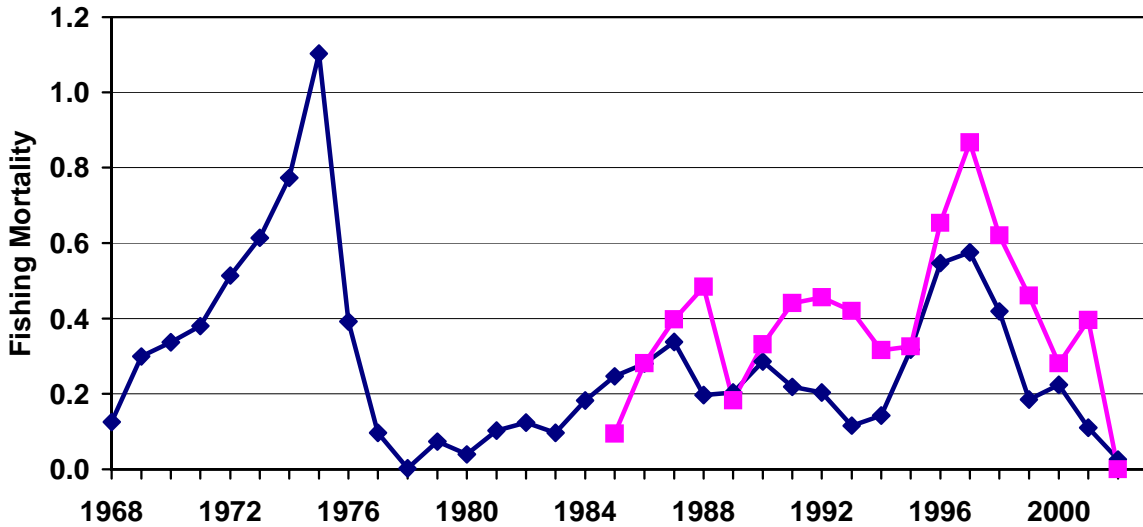


Figure C18. Summary of results from ASPIC analysis of Gulf of Maine northern shrimp biomass dynamics, with residuals.



◆ surplus production
 ■ Collie-Sissenwine analysis

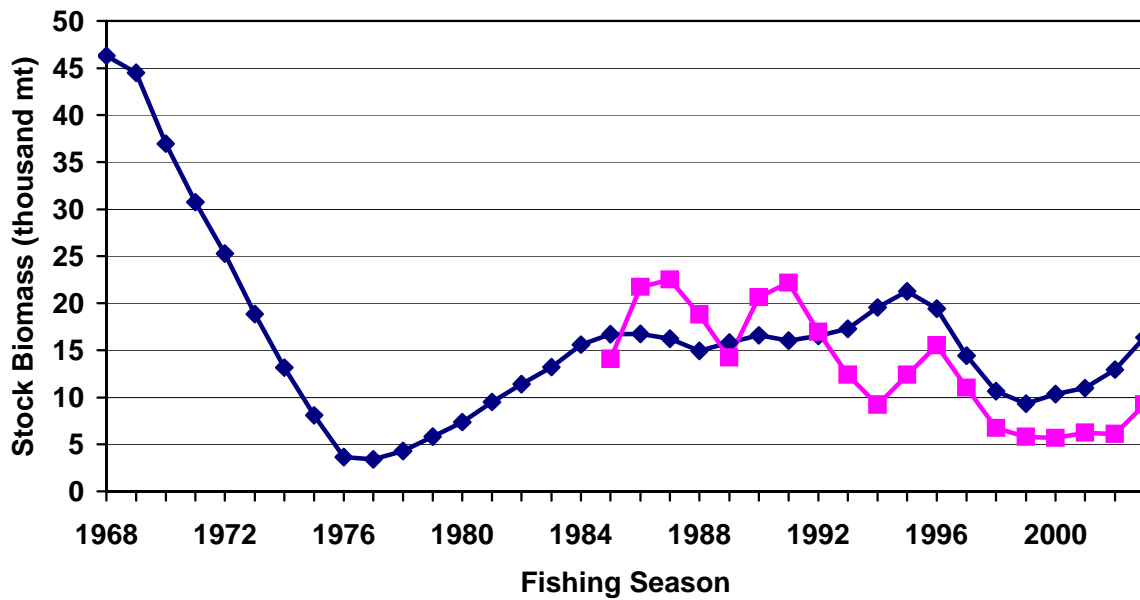


Figure C19. Estimates of fishing mortality (above) and stock biomass (below) for Gulf of Maine northern shrimp from CSA and surplus production (ASPIC) modeling.

Figure C20a. Biomass dynamics of the Gulf of Maine northern shrimp fishery, based on surplus production (ASPIC) modeling (above) and CSA (below) with possible fishing mortality and biomass reference points.

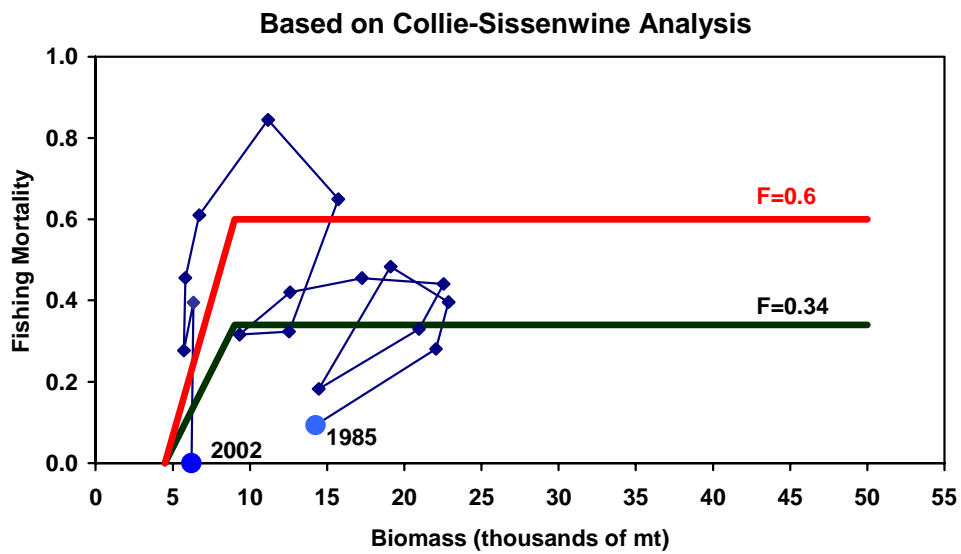
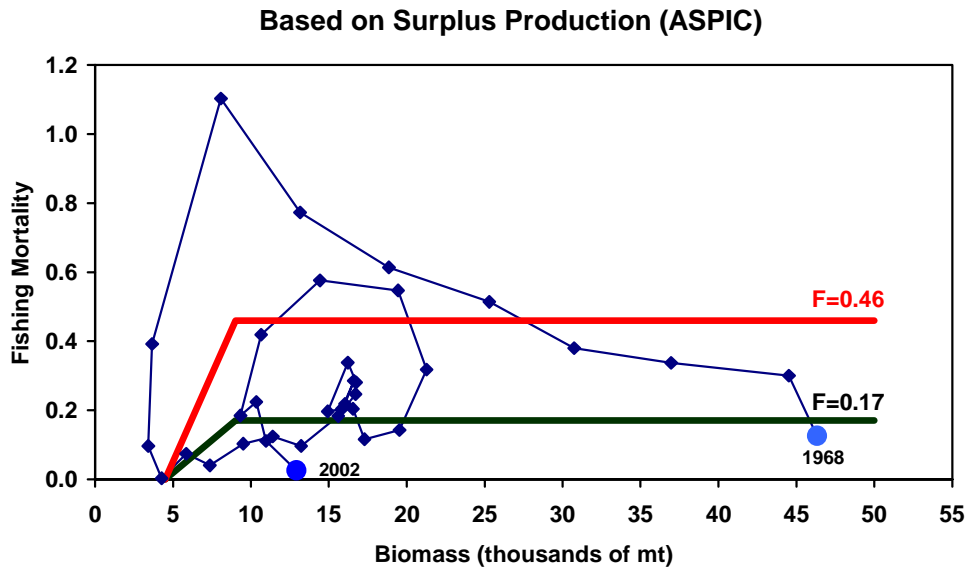
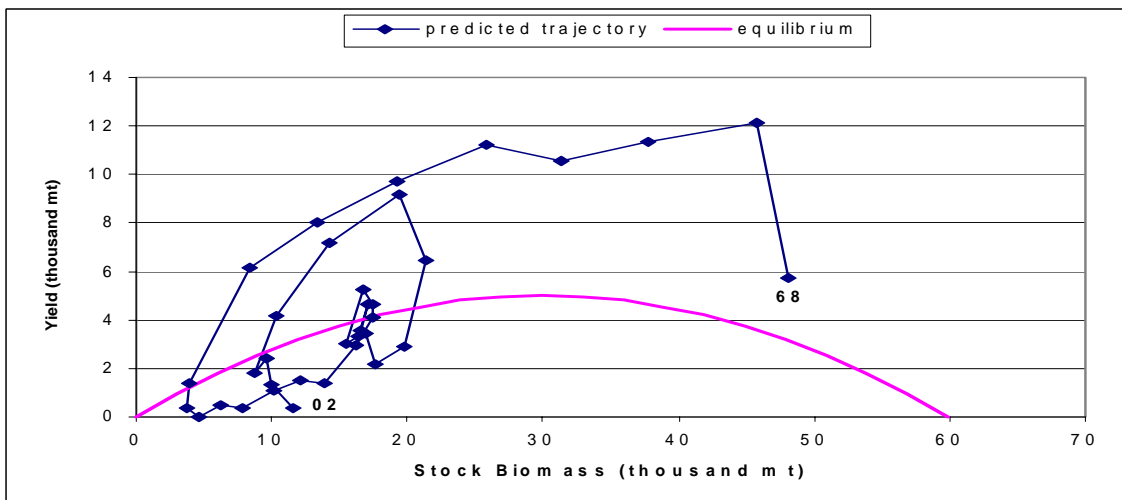
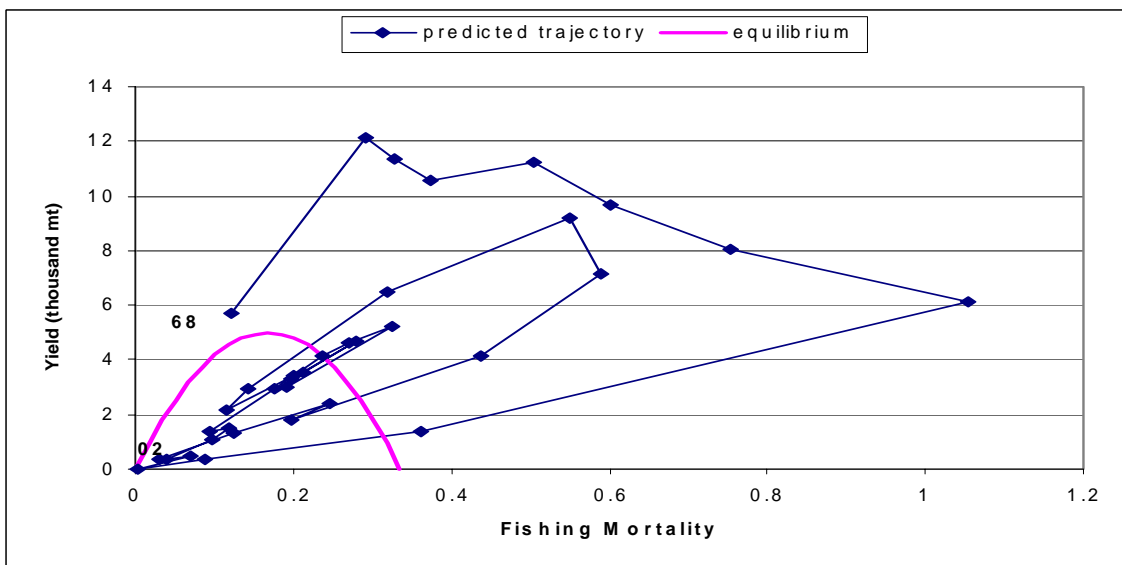
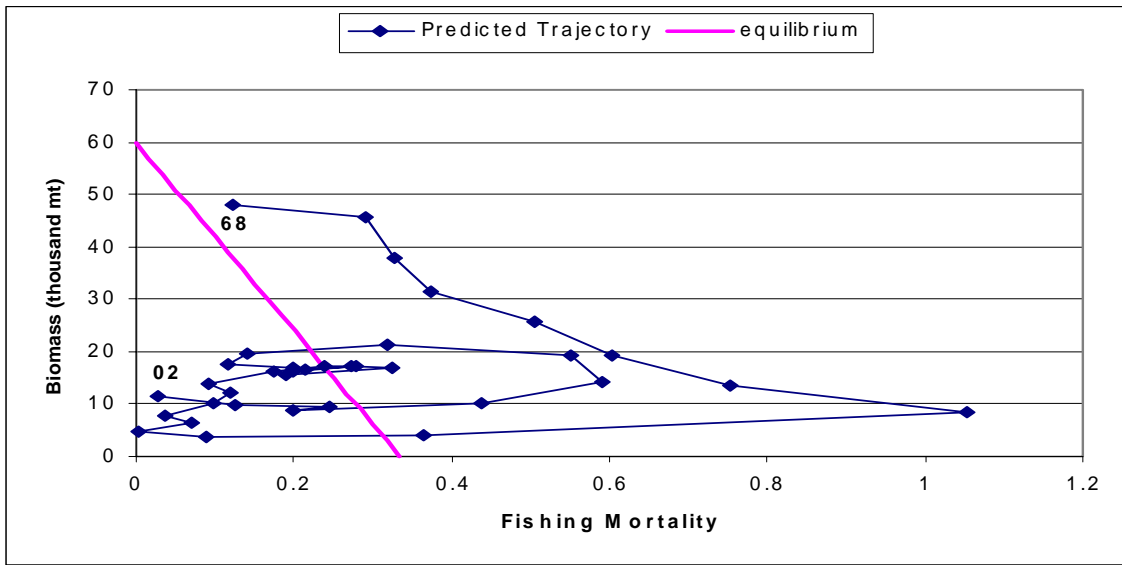


Figure C20b. Biomass dynamics of Gulf of Maine northern shrimp from ASPIC modeling.



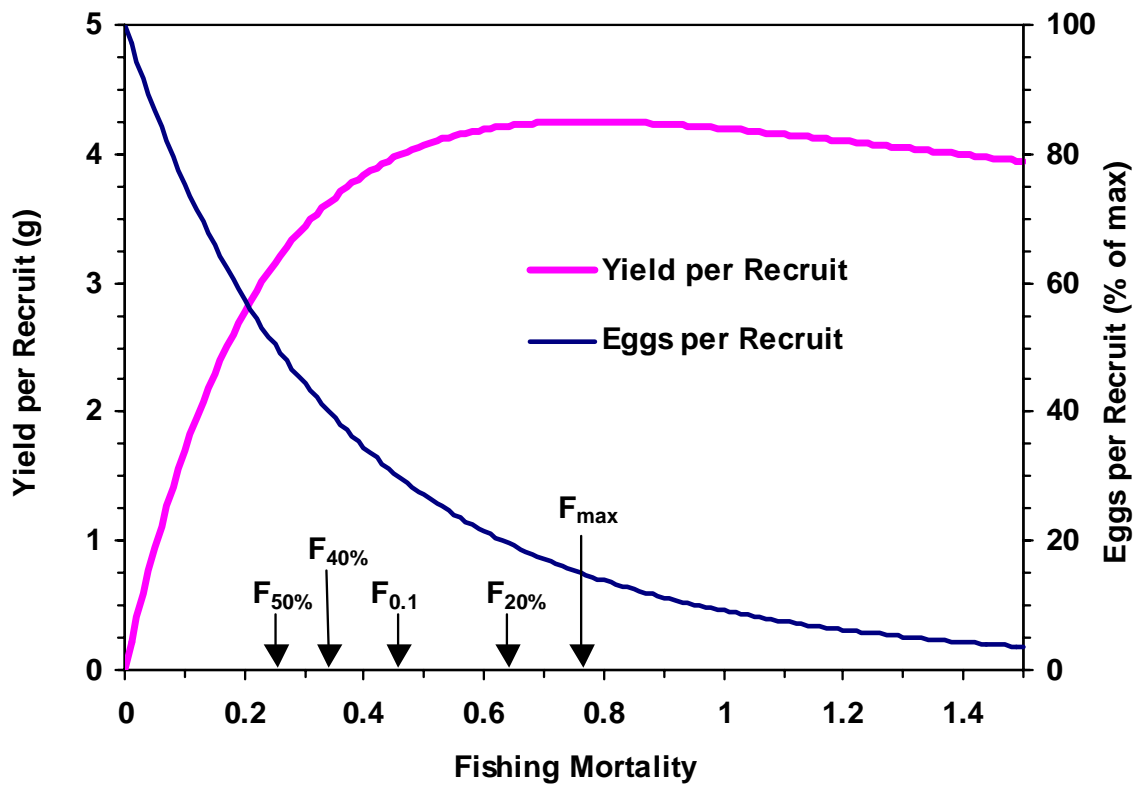


Figure C21. Yield and egg production per recruit for Gulf of Maine northern shrimp.

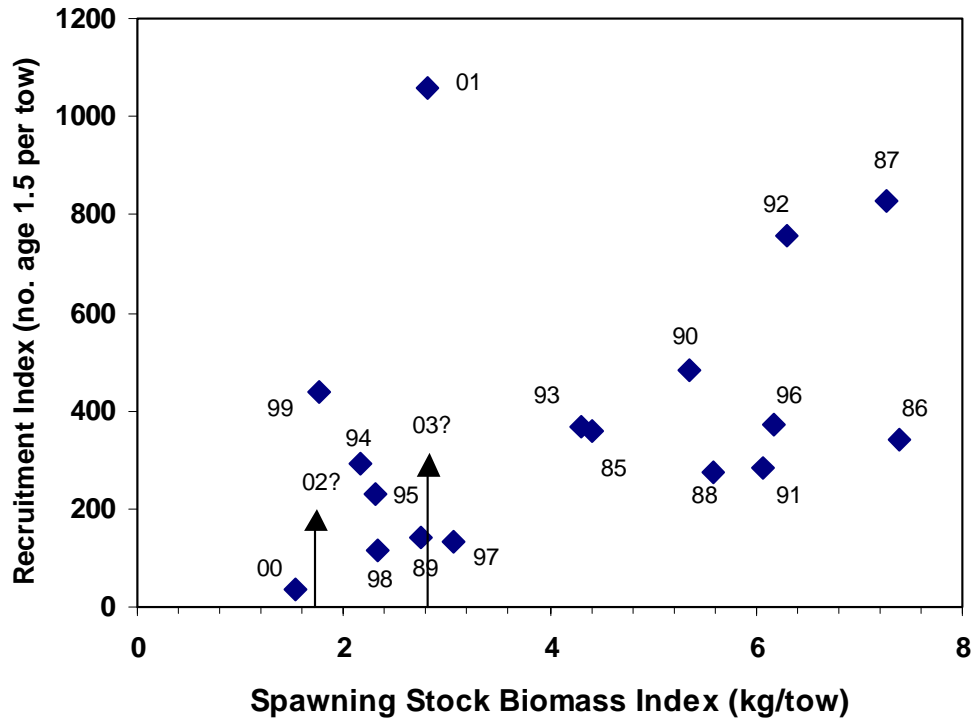


Figure C22a. Relationship between summer survey indices of Gulf of Maine northern shrimp female biomass the summer before egg hatch to age 1.5 abundance two years later. Data labels indicate year of egg hatch.

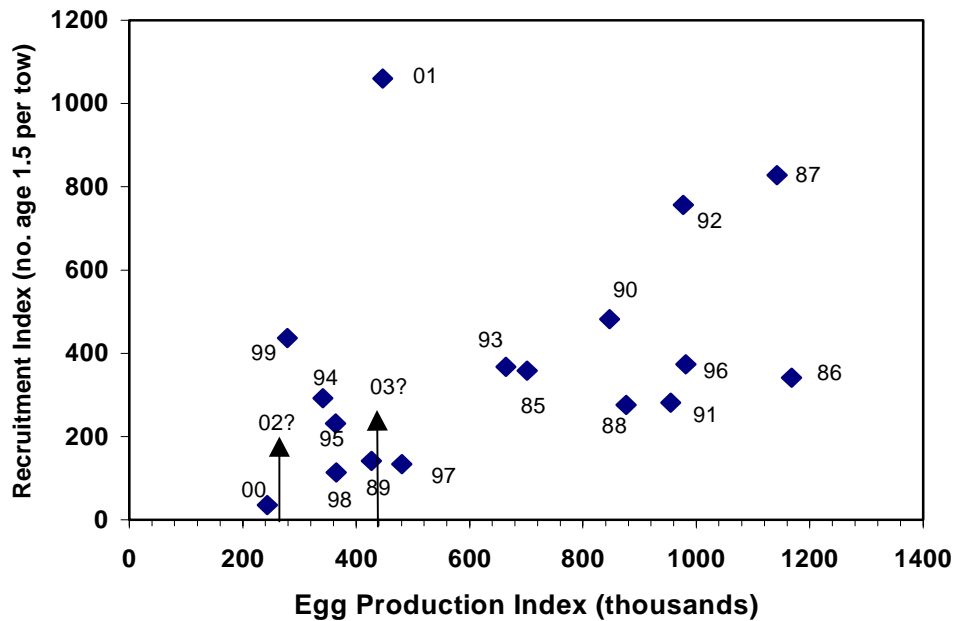


Figure C22b. Relationship between egg production index for Gulf of Maine northern shrimp the summer before egg hatch to age 1.5 abundance two years later. Data labels indicate year of egg hatch.

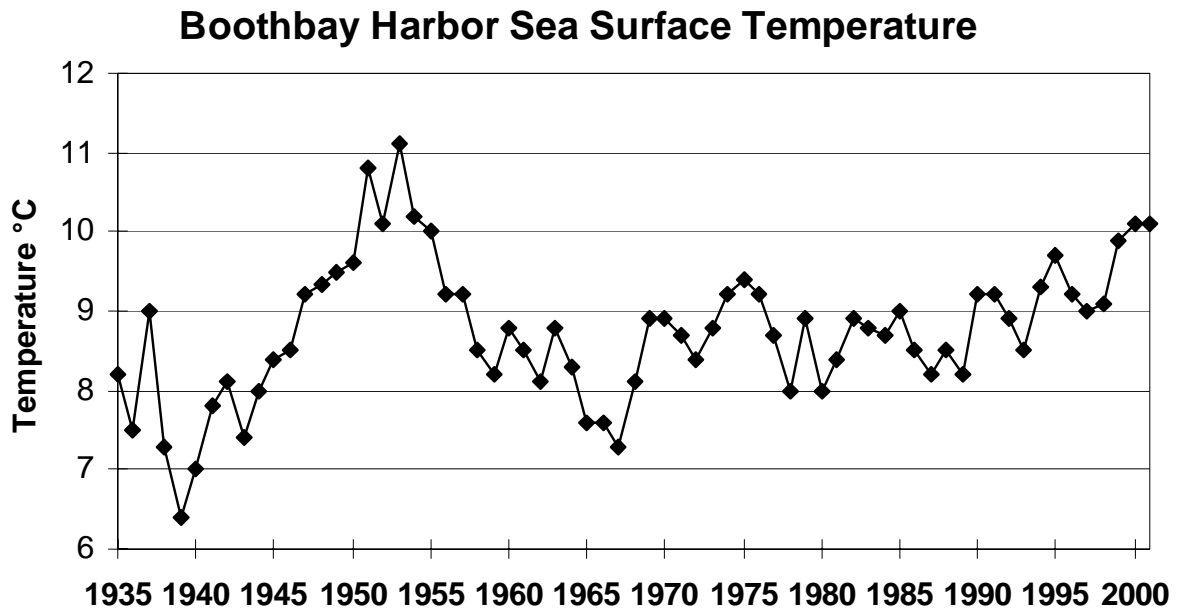


Figure C23. Average annual sea surface temperature in °C at Boothbay Harbor, Maine.