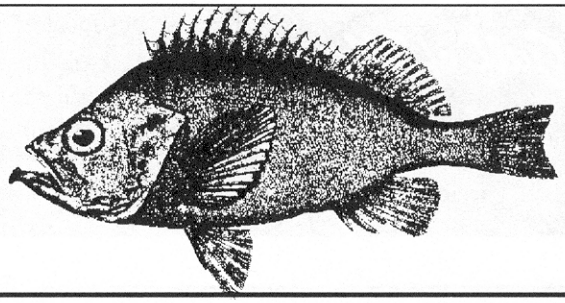
Redfish

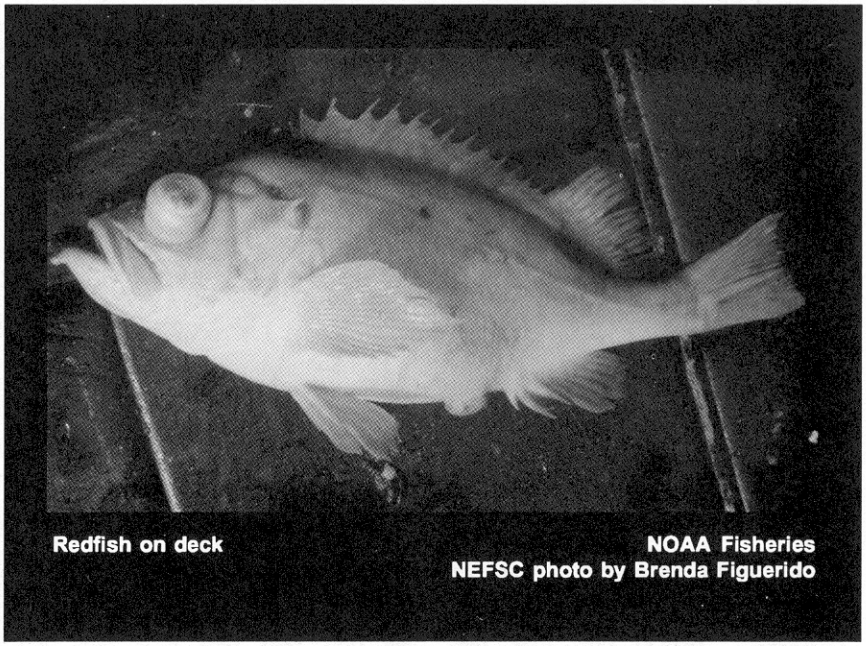


by R.K. Mayo

Redfish or ocean perch, *Sebastes* spp., are distributed throughout the North Atlantic from the coast of Norway to Georges Bank. Off New England, *Sebastes fasciatus* are most common in deep waters of the Gulf of Maine to depths of 300 m (975 ft). Redfish are slow growing, long-lived animals with an extremely low natural mortality rate. Ages in excess of 50 years and maximum sizes of 45 to 50 cm (18 to 20 in.) have been noted. In the Gulf of Maine, redfish reach maturity in about 5 to 6 years at an average length of 20 to 23 cm (8 to 9 in.). Females are viviparous, retaining eggs in the ovary after fertilization until yolk-sac absorption. Mating takes place in autumn, with subsequent larval extrusion occurring the following spring and summer.

Redfish are managed under the New England Fishery Management Council's Multispecies Fishery Management Plan (FMP). Under this FMP redfish are included in a complex of 10 groundfish species which has been managed by time/area closures, gear restrictions, minimum size limits, and, since 1994, direct effort controls including a moratorium on permits and days-at-sea restrictions under Amendments 5 and 7. The ultimate goal of the management program is to reduce fishing mortality to levels which will allow stocks within the complex to rebuild to above minimum spawning biomass thresholds.

The principal commercial fishing gear used to catch redfish is the otter trawl. Recreational catches are insignificant. During the early development phase of the Gulf of Maine fishery, U.S. nominal catches rose rapidly to a peak level of about 60,000 mt in 1942 followed by a steep decline through the early 1950s. Nominal catches declined more gradually to less than 10,000 mt during the 1960s, and then increased somewhat, peaking at 20,000 mt in 1971 and again at 14,800 mt in 1979. Landings then declined steadily throughout the 1980s, dropping to 500 mt by 1991. After a slight increase to 800 mt in 1992 and 1993, landings declined again, reaching 322 mt in 1996, the lowest recorded level since the directed fishery began in the early 1930s.



Redfish on deck

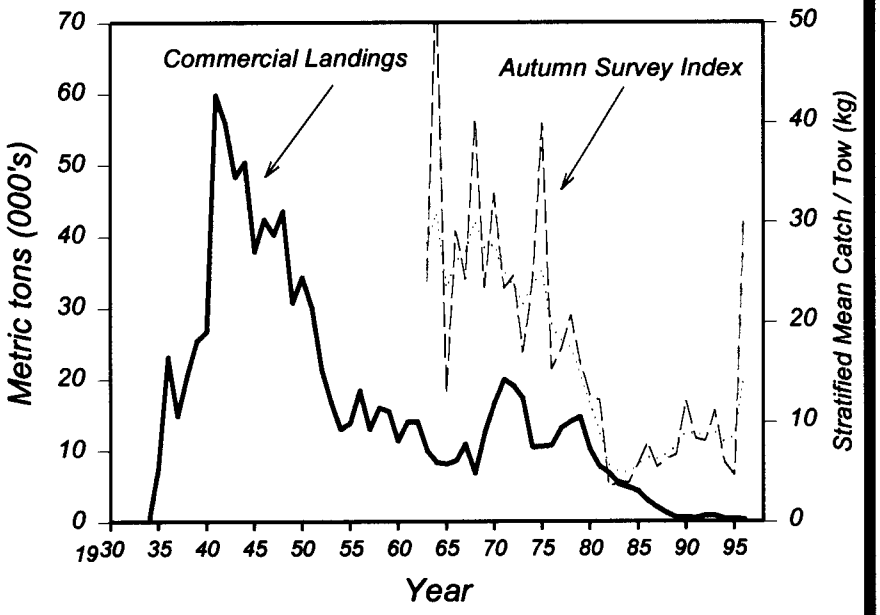
NOAA Fisheries
NEFSC photo by Brenda Figuerido

The standardized catch per unit effort (CPUE) index declined from 6.1 mt per day in 1968 to approximately 2.4 mt per day between 1975 and 1978, and to less than 1.0 mt per day since 1987. The NEFSC autumn bottom trawl survey biomass index declined from 40.4 kg per tow in 1968 to an average of 3.8 kg per tow during 1982-84, a 91% reduction. This index subsequently increased to an average of 6.5 kg per tow during 1985-1989 and increased further to an average of 10.0 kg per tow during 1990-1993. Biomass indices decreased again in 1994 and 1995 to less than 6.0 kg per tow, but increased substantially in 1996 to 30.6 kg per tow.

Increases in the survey biomass index between 1990 and 1993 are consistent with incremental annual increases in the NEFSC survey abundance index (mean number per tow) observed during the early 1990s, and reflect accumulated recruitment and growth of one or more above-average year classes produced in the mid-1980s. The large increase in the survey biomass index in 1996 was supported almost exclusively by fish in the 18-23 cm range at a corresponding age of approximately 5-6 years. Production of these redfish is likely to have occurred during 1990 and 1991, with reproduction augmented by early-maturing spawners from the mid-1980s year classes. Thus, stock biomass appears to have increased substantially through the combined effects of

Gulf of Maine and Georges Bank

Redfish



"...stock biomass appears to have increased substantially through the combined effects of growth and survival of fish from a period of relatively successful reproduction in the early 1990s."

Table 3.1 Recreational catches and commercial landings (thousand metric tons)

Category	Year										
	1977-86 Average	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
U.S. recreational	-	-	-	-	-	-	-	-	-	-	-
Commercial											
United States	8.3	1.9	1.1	0.6	0.6	0.5	0.8	0.8	0.4	0.4	0.3
Canada	0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other	<0.1	-	-	-	-	-	-	-	-	-	-
Total nominal catch	8.4	2.0	1.2	0.6	0.6	0.5	0.8	0.8	0.4	0.4	0.3

Summary Status

Long-term potential catch	=	14,000 mt
SSB for long-term potential catch	=	Unknown
Importance of recreational fishery	=	Insignificant
Management	=	Multispecies FMP
Status of exploitation	=	Fully exploited
Age at 50% maturity	=	5.5 years (both sexes)
Size at 50% maturity	=	21 cm (8.3 in.), males 22 cm (8.7 in.), females
Assessment level	=	Yield per recruit
Overfishing definition	=	20% MSP
Fishing mortality rate corresponding to overfishing definition	=	$F_{20\%} = 0.12$

M = 0.05 **$F_{0.1}$ = 0.06** **F_{max} = 0.13** **$F_{1996} \leq F_{0.1}$**

growth and survival of fish from a period of relatively successful reproduction in the early 1990s.

During the previous two decades beginning in 1970, only two strong year classes, those produced in 1971 and 1978, have been detected. However, length composition data from bottom trawl surveys suggest that one or more above-average year classes which were produced in the mid-1980s recruited to the fishery during the early 1990s. These fish were first detected in the 1991 commercial length composition and appeared in greater numbers as a distinct mode around 25 cm in 1992 and 1993, and they continue to support the fishery.

Estimates of exploitable biomass (ages 5 and older) derived by virtual population analysis or VPA declined by 76%, from 136,000 mt in 1969 to 32,000 mt in 1985. Projections are not available for recent years. Fishing mortality during the 1970s was slightly greater than F_{max} (0.13, 12% exploitation rate) and twice the $F_{0.1}$ level (0.06, 6% exploitation rate). During the late 1970s, the combination of declining stock size and increased fishing effort on the 1971 year class produced fishing mortality rates that were 50 percent greater than F_{max} and three times higher than $F_{0.1}$. Fishing mortality has declined in recent years to a level less than or equal to $F_{0.1}$, and well below

F_{max}. Equilibrium surplus production models have indicated that the long-term potential catch from the stock is about 14,000 mt. Given the low population biomass and poor recruitment during most of the 1980s, surplus production in the near future will remain considerably less than 14,000 mt.

Landings since 1989 have been extremely low (less than 900 mt/yr), reflecting low levels of stock abundance and fishing mortality. Recruitment has been poor throughout the 1970s and 1980s, except for the moderate to strong 1971 and 1978 year classes and some modest recruitment from the mid-1980s. Stock biomass has since increased steadily through the mid-1990s, substantially so based on 1996 observations. However, most of the redfish supporting the recent increase in biomass are small, immature fish produced in the early 1990s, and have yet to realize their full growth and reproductive potential. If fishing mortality on these young fish increases significantly in the near-term, stock biomass may decline to levels observed during the 1980s. To allow recovery to continue, catches must remain low. The stock is considered to be fully exploited at present.

NEFSC scientist Betsy Broughton with basket of redfish

NOAA Fisheries NEFSC photo by Brenda Figuerido

For further information

Mayo, R. K. 1980. Exploitation of redfish, Sebastes marinus (L.), in the Gulf of Maine-Georges Bank region, with particular reference to the 1971 year class. *J. Northw. Atl. Fish. Sci.* 1: 21-38.

Mayo, R. K., U. B. Dozier, and S. H. Clark. 1983. An assessment of the redfish, Sebastes fasciatus, stock in the Gulf of Maine - Georges Bank region. Woods Hole, MA: NOAA/NMFS/NEFC. *NEFC Ref. Doc.* 83-22.

Mayo, R.K. 1987. Recent exploitation patterns and future stock rebuilding strategies for Acadian redfish, *Sebastes fasciatus* Storer, in the Gulf of Maine-Georges Bank region of the Northwest Atlantic. In Proceedings of the International Rockfish Symposium, B. R. Melteff, coordinator, p. 335-353. Anchorage, Alaska, October 20-22, 1986. Fairbanks, AK: University of Alaska Sea Grant College Program. *Alaska Sea Grant Report* 87-2.

Mayo, R.K. 1993. Historic and recent trends in the population dynamics of redfish, *Sebastes fasciatus* Storer, in the Gulf of Maine-Georges Bank Region. Woods Hole, MA: NOAA/NMFS/NEFSC. *NEFSC Ref. Doc.* 93-03.

Northeast Fisheries Center. 1986. Report of the Second NEFC Stock Assessment Workshop. Woods Hole, MA: NOAA/NMFS/NEFC. *NEFC Ref. Doc.* 86-09.