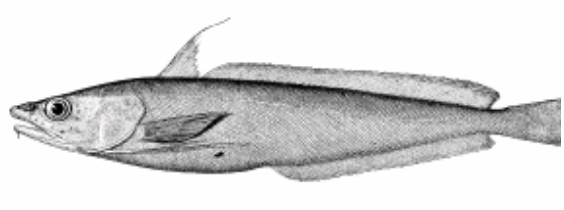

Last revised: December 2006

White Hake

by

Katherine Sosebee

Distribution, Biology and Management

The white hake, *Urophycis tenuis*, occurs from Newfoundland to Southern New England and is common on muddy bottom throughout the Gulf of Maine (Bigelow and Schroeder 1953; Klein-MacPhee 2002) (Figure 18.1). Depth distribution of white hake varies by age and season; juveniles typically occupy shallower areas than adults, but individuals of all ages tend to move inshore or shoalward in summer, dispersing to deeper areas in winter (Musick 1974; Markel et al. 1982). Most trawl catches are taken at depths of 110 m (60 fathoms) or greater, although hake are taken as shallow as 27 m (15 fathoms) by gillnetting. Small white hake are difficult to distinguish from red hake, *Urophycis chuss*, resulting in a small degree of bias in reported nominal catches (Mayo and Terceiro 2005).

Larval distributions indicate the presence of two spawning groups in the Gulf of Maine, Georges Bank and Scotian Shelf region, one which spawns in deep water on the continental slope in late winter and early spring, and a second which spawns on the Scotian Shelf in the summer (Fahay and Able 1989; Lang et al. 1994). Populations in U.S. waters appears to be supported by both spawning events, but individuals are not distinguishable in commercial landings. White hake attain a maximum length of at least 135 cm (53 in.) and weights of up to 21 kg (46 lb), with females being larger (Klein-MacPhee 2002). Ages up to 15 years have been documented (NEFSC 1999). Juveniles feed primarily upon shrimp and other crustaceans, but adults feed almost exclusively on fish, including juveniles of their own species (Bowman, 1981; Bowman et al. 1987; Bowman et al. 2000).

The principal fishing gears used to catch white hake are otter trawls and gill nets (Sosebee et al. 1998; NEFSC 1999). Recreational and distant-water fleet catches have been insignificant, and Canadian catches have generally been minor. The fishery is managed under the New England Fishery Management Council's Multispecies Fishery Management Plan (FMP). Under this FMP white hake are included in a complex of 15 groundfish species managed by time/area closures, gear restrictions, minimum size limits and, since 1994, by direct effort controls including a

moratorium on permits and days-at-sea restrictions. The goal of the management program is to reduce fishing mortality to allow stocks to rebuild above minimum biomass thresholds, and to attain and remain at or near target biomass levels. The information provided herein reflects the results of the most recent peer-reviewed assessments for the Gulf of Maine-Georges Bank white hake stock (Mayo and Terceiro 2005).

The Fishery

U.S. landings have primarily been taken in the western Gulf of Maine, both incidentally in directed fisheries for other demersal species and as an intended component in mixed-species fisheries. Since 1968, U.S. landings have accounted for approximately 90 percent of the Gulf of Maine-Georges Bank white hake catch (Table 18.1). Canadian landings averaged 600 mt from 1977-1991, increased to 1,700 mt in 1993, but have since declined to less than 100 mt.

Total landings of white hake increased from about 1,000 mt during the late 1960s to 8,300 mt in 1985 (Figure 18.2). Landings then declined to 5,100 mt in 1989, rose sharply to 9,600 mt in 1992, and have since steadily declined to levels not seen since the early 1970s. Landings of white hake subsequently increased to 4,400 mt in 2003, but declined to 3,600 mt in 2004.

Research Vessel Survey Indices

The NEFSC autumn bottom trawl survey biomass index fluctuated about a relatively high level during the 1970s and 1980s but declined during the 1990s, falling to near record low in 1999 (Figure 18.3). The biomass index increased between 2000 and 2002 because of the recruitment of a good 1998 year class (NEFSC 2001), but has since declined to a very low level. The NEFSC spring survey biomass indices are more variable than the autumn, but declined during the 1990s, increased in the early 2000s, but have since declined.

Assessment Results

Landings and discards of white hake were derived for fish >= 60 cm. Biomass of large fish was highest in the late 1970s, declined from 1980 through 1999, increased slightly through 2002, but declined again (Figure 18.4). Commercial catch of large fish increased through the 1970s and early 1980s with a decline in the late 1980s followed by a large peak in 1993. Catch declined from 1994 through 1998 and then increased through 2003. Catch and biomass of large fish were used to compute relative exploitation ratios, defined as the catch in the current year divided by the 3 year average survey biomass index for the current year and the previous 2 years. Exploitation ratios were low in the 1970s, increased in the late 1980s and remained variable but high through 2004 (Figure 18.5).

Biological Reference Points

Autumn NEFSC survey biomass indices for large fish from 1963 through 2001 were used to calculate replacement ratios, defined as the biomass index in the current year divided by the average biomass indices from the previous 5 years. When the replacement ratio falls below 1.00 the stock is not able to replace itself. This occurred for a considerable period between the early

1980s and 2000 (Figure 18.6). Replacement ratios increased to above 1.00 for a short time around 2000 but have since declined.

The relationship between replacement ratios and relative F was used by the Working Group on Re-Evaluation of Biological Reference Points for New England Groundfish (NEFSC 2002a) to derive an estimate of relative F corresponding to a replacement ratio of 1.0. On average, when the relative F is greater than 0.55 the stock is not likely to replace itself in the long-term. This relative F value is considered to be a proxy F_{msy} reference point (Table 18.2). Relative exploitation remained well above 0.55 from the early 1980s through 2005 (Figure 18.7). The exploitation ratio was used along with the estimate of MSY (4,234 mt) from the last accepted ASPIC model (NEFSC 2001) to determine a value of 7.70 kg/tow for a B_{msy} proxy (NEFSC 2002b). Comparison between trends in biomass and replacement ratios reveal that most replacement ratios below 1.0 occurred when the biomass index was less than 7.7 kg/tow (Figure 18.8).

Summary

The 2004 autumn survey biomass index of 3.01 kg/tow was below that of ½ B_{msy} (3.35 kg/tow) indicating that the stock is overfished (Figure 18.8). Likewise, the relative F value of 1.18 in 2004 was above F_{msy} indicating that overfishing is still occurring (Figure 18.7).

Table 18.1 Recreational and commercial landings of white hake (thousand metric tons).

Category	1986-95 Average	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
U. S. Recreational	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Commercial											
United States	5.7	3.3	2.2	2.4	2.6	3.0	3.5	3.3	4.4	3.5	2.7
Canada	0.8	0.5	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.1	n/a
Other	<0.1	-	-	-	-	-	-	-	-	-	-
Total Nominal Catch	6.5	3.8	2.6	2.7	2.8	3.2	3.7	3.5	4.6	3.6	2.7

Table 18.2. MSY-based reference points for Gulf of Maine/Georges Bank white hake.

MSY-based Reference Points		
MSY	=	4,234 mt
B_{MSY}	=	7.70 kg/tow
F_{MSY}	=	0.55 (Relative F)

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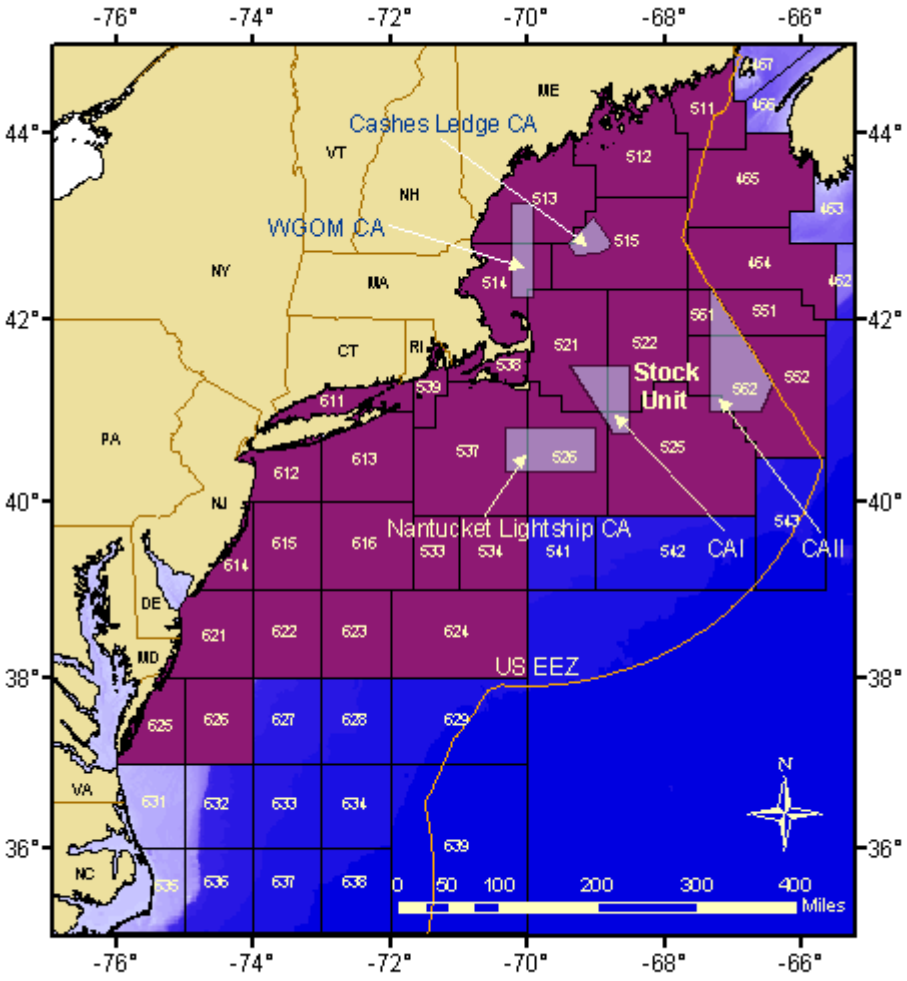

Figure 18.1. Statistical areas used to define the Georges Bank/Gulf of Maine white hake stock.

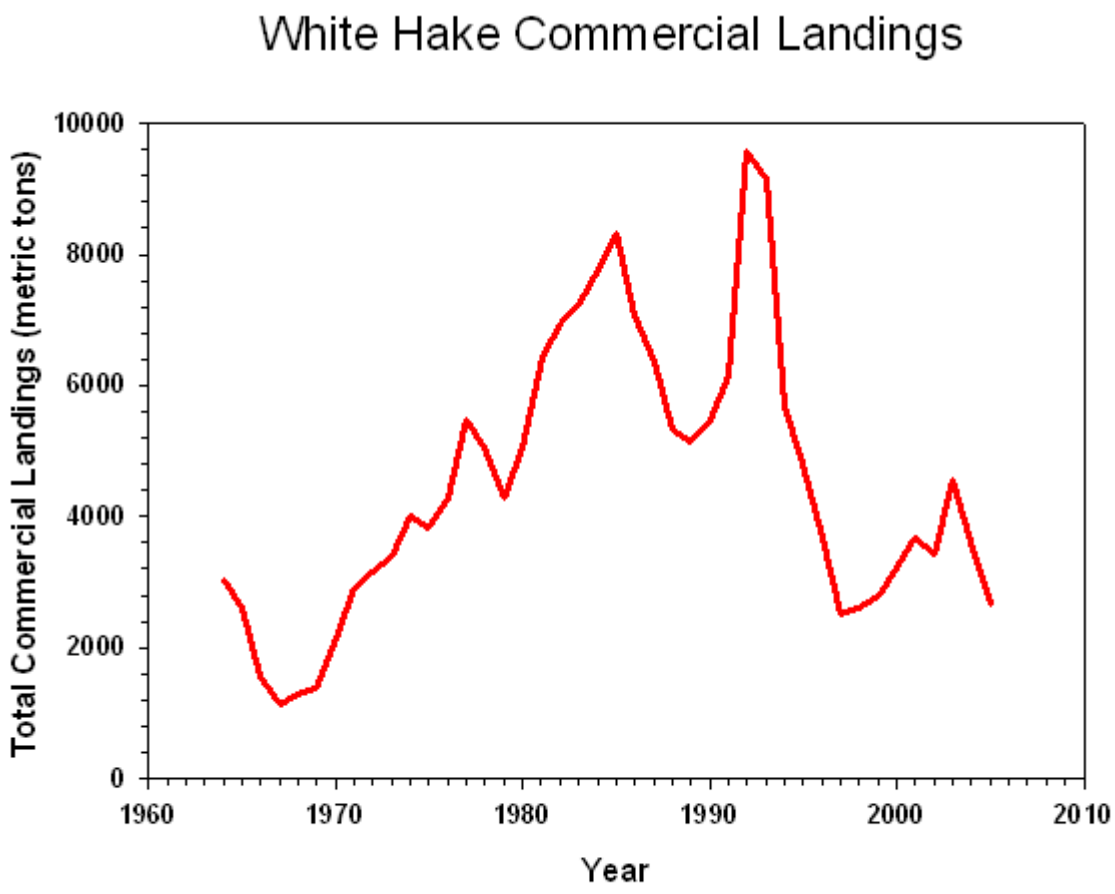

Figure 18.2. Total commercial landings (metric tons, live) of white hake from the Gulf of Maine-Georges Bank region (Subareas 5&6).

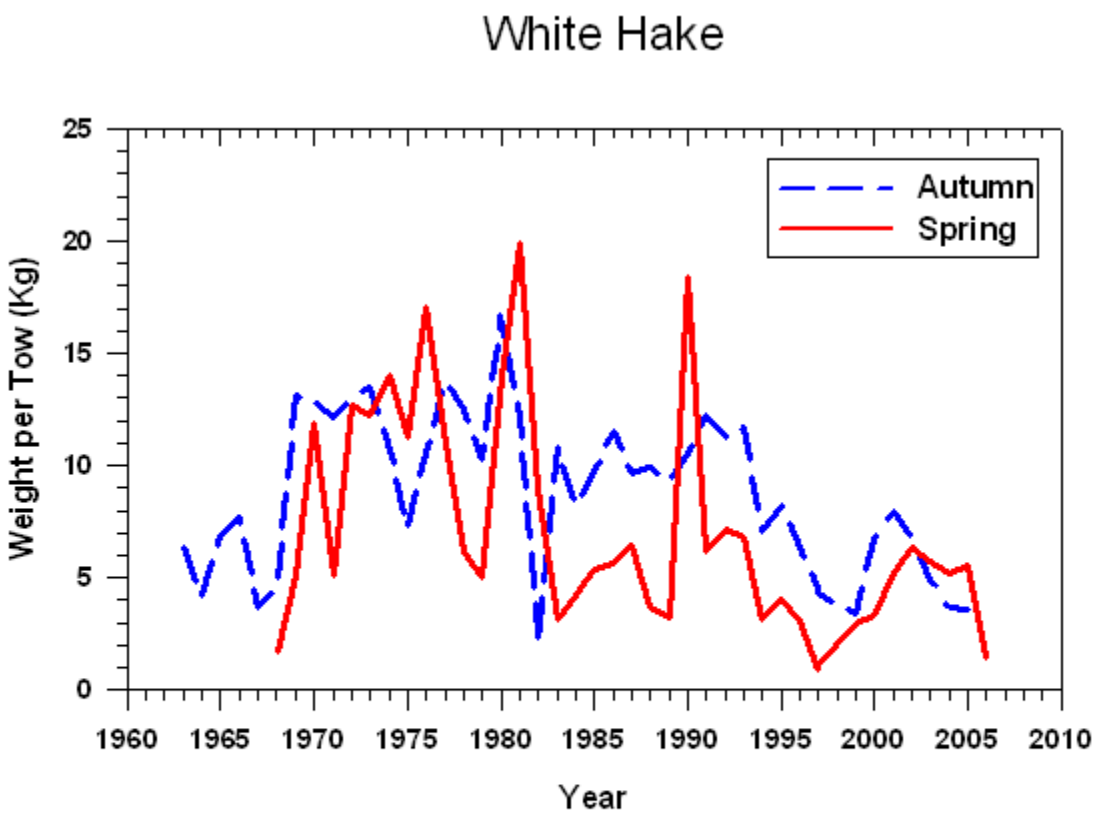

Figure 18.3. White hake indices of biomass from the NEFSC bottom trawl spring (solid line) and autumn (dashed line) surveys in the Gulf of Maine to Northern Georges Bank region (offshore strata 21-30, 33-40), 1963-2006.

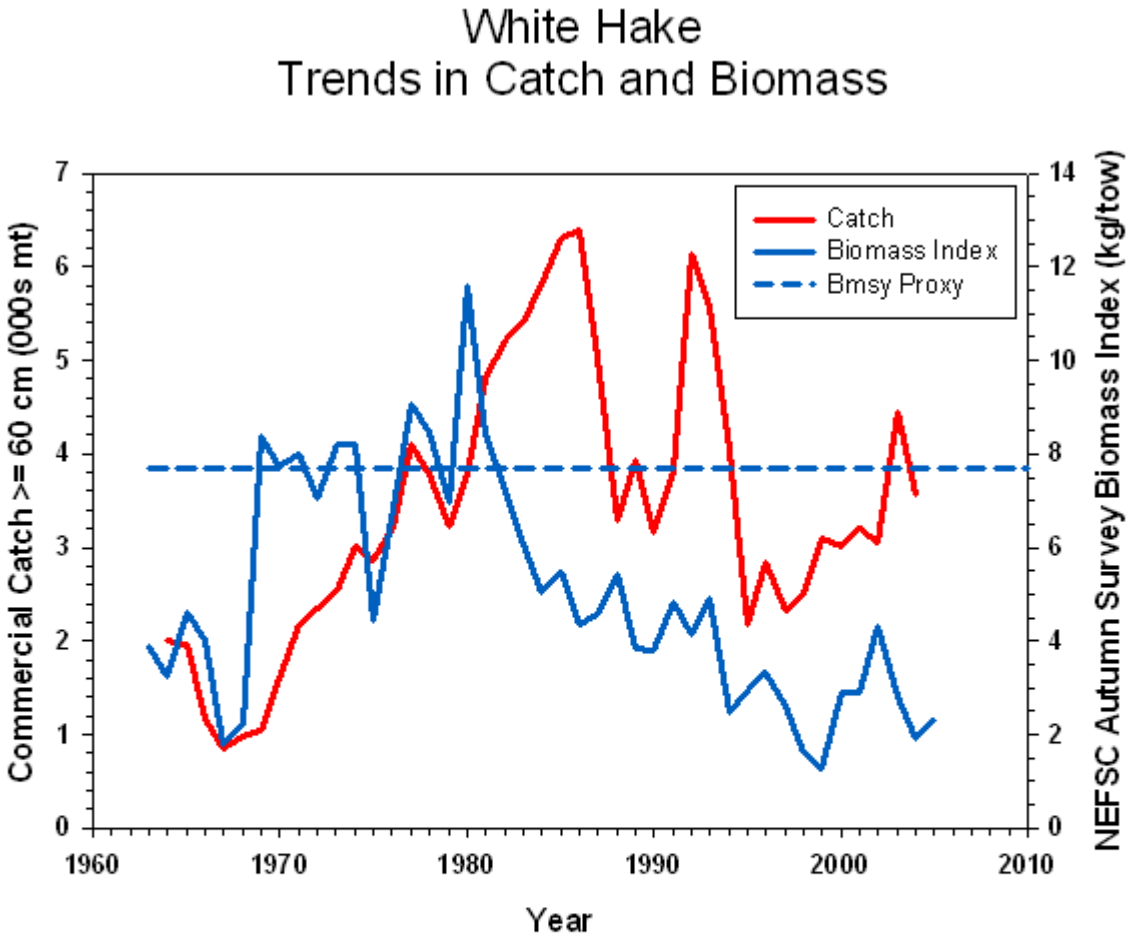

Figure 18.4. Trends in catch of fish >= 60 cm (metric tons, live) and NEFSC autumn survey biomass indices of fish >= 60 cm (kg/tow) for white hake in the Gulf of Maine-Georges Bank region. The dashed line represents the Bmsy proxy (7.70) based on historical survey biomass trends.

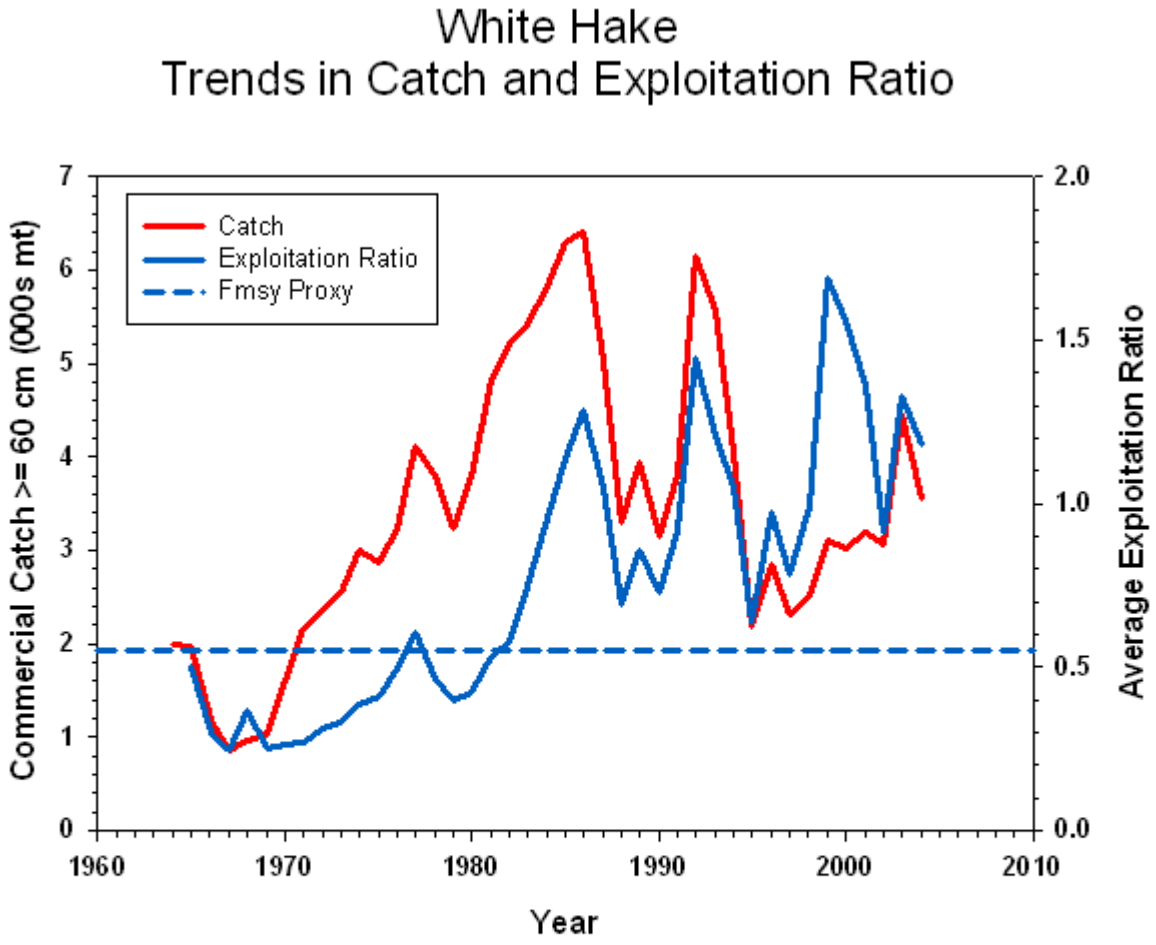

Figure 18.5. Trends in commercial catch of fish >= 60 cm (000s metric tons, live) and an average exploitation ratio (catch/3 year average survey biomass index) for white hake in the Gulf of Maine-Georges Bank region. The dashed line represents the Fmsy proxy (0.55).

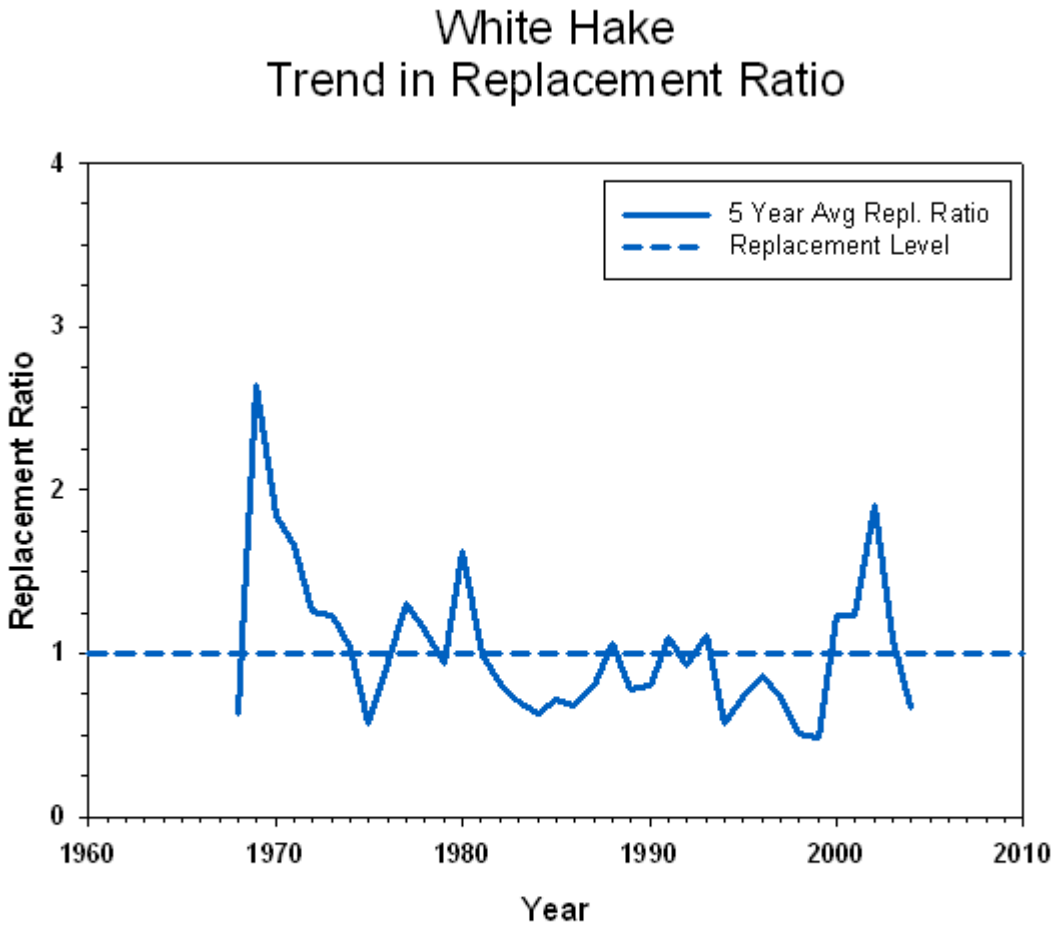

Figure 18.6. Trends in replacement ratios for white hake in the Gulf of Maine-Georges Bank region. The dashed line represents the ratio where the stock replaces itself on average (1.00).

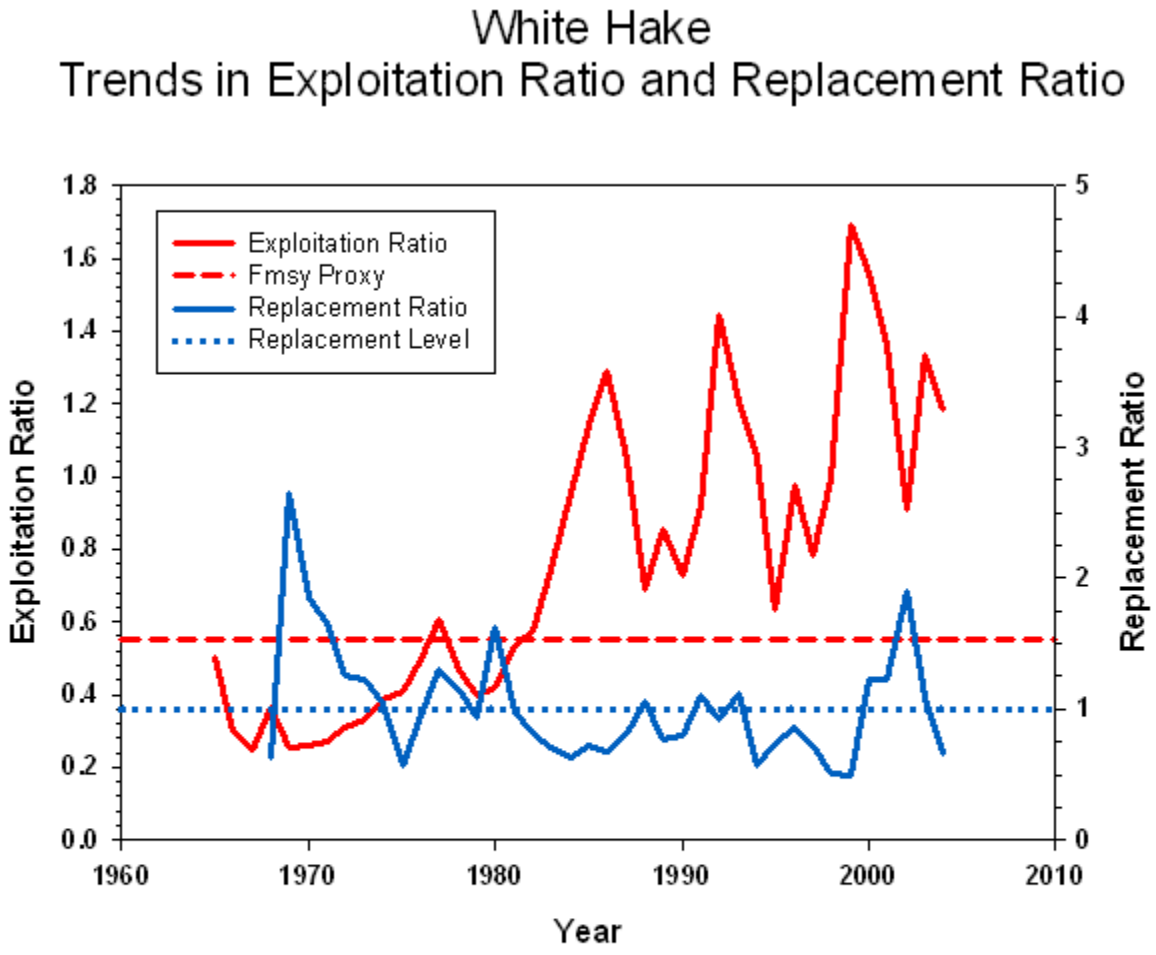

Figure 18.7. Comparison of trends in the exploitation ratio and the replacement ratio for white hake in the Gulf of Maine-Georges Bank region. The dashed lines represent the Fmsy proxy (0.55) and the ratio where the stock replaces itself on average (1.00).

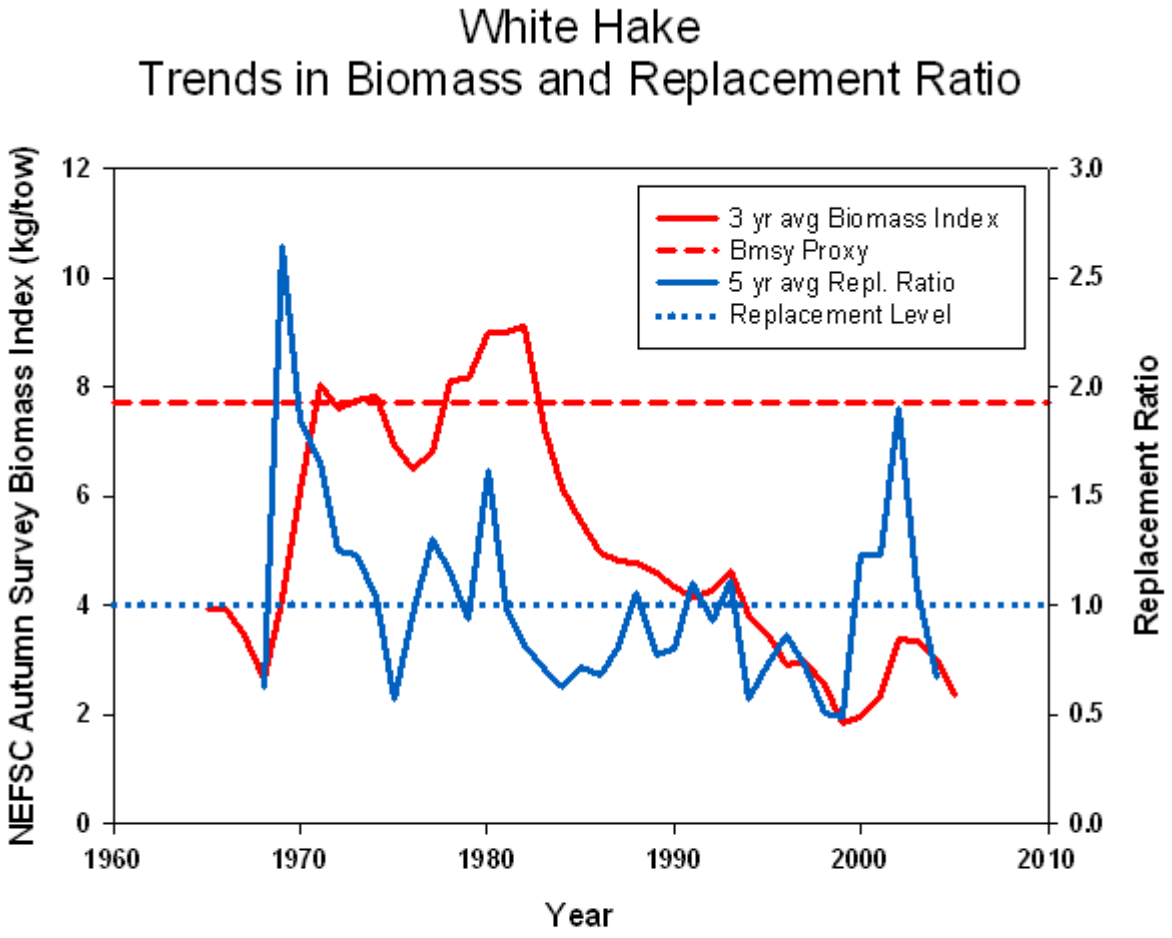

Figure 18.8. Comparison of trends in survey biomass index and the replacement ratio for white hake in the Gulf of Maine-Georges Bank region. The dashed lines represent the Bmsy proxy (7.70) and the ratio where the stock replaces itself on average (1.00).