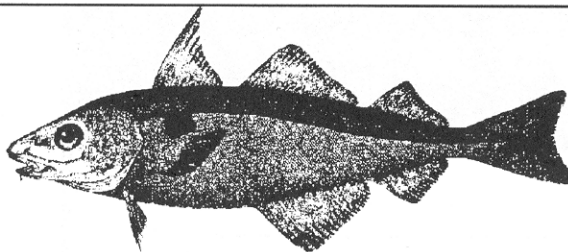


# Haddock



by R. Brown

The haddock, *Melanogrammus aeglefinus*, is a demersal gadoid species distributed on both sides of the North Atlantic. In the western North Atlantic, haddock range from Greenland to Cape Hatteras. Highest concentrations off the U.S. coast are associated with the two major stocks located on Georges Bank and in the southwestern Gulf of Maine. Haddock are most common at depths of 45 to 135 m (25 to 75 fathoms) and temperatures of 2° to 10° C (36° to 50° F). Haddock exhibit age-dependent shifts in habitat use with juveniles occupying shallower water on bank and shoal areas, and larger adults associated with deeper water. Adult haddock do not undertake long migrations, but seasonal movements occur in the western Gulf of Maine and on the northeast peak of Georges Bank. Haddock prey primarily on small invertebrates, although adult haddock will consume fish on occasion.

Growth and maturation rates of haddock have changed significantly over the past 30 to 40 years, possibly in response to changes in abundance. Before 1960, when haddock were considerably more abundant than at present, the average length of an age 4 fish was approximately 48 to 50 cm (19 to 20 in.). During the early 1960s, all females age 4 and older were fully mature, and approximately 75% of age 3 females were mature. Presently, growth is more rapid, with haddock reaching 48 to 50 cm at age 3; and nearly all age 3 and 35% of age 2 females are mature. Although early maturing fish increase spawning stock biomass, the degree to which these younger fish contribute to reproductive success of the population is uncertain.



NEFSC scientist Roger Clifford  
with haddock and cod

NOAA Fisheries  
NEFSC photo by Brenda Figuerido

Spawning occurs between January and June, with peak activity during late March and early April. An average sized (55 cm, 22-in.) female

produces approximately 850,000 eggs, and larger females are capable of producing up to 3 million eggs annually. Spawning concentrations occur on east-

# Gulf of Maine Haddock

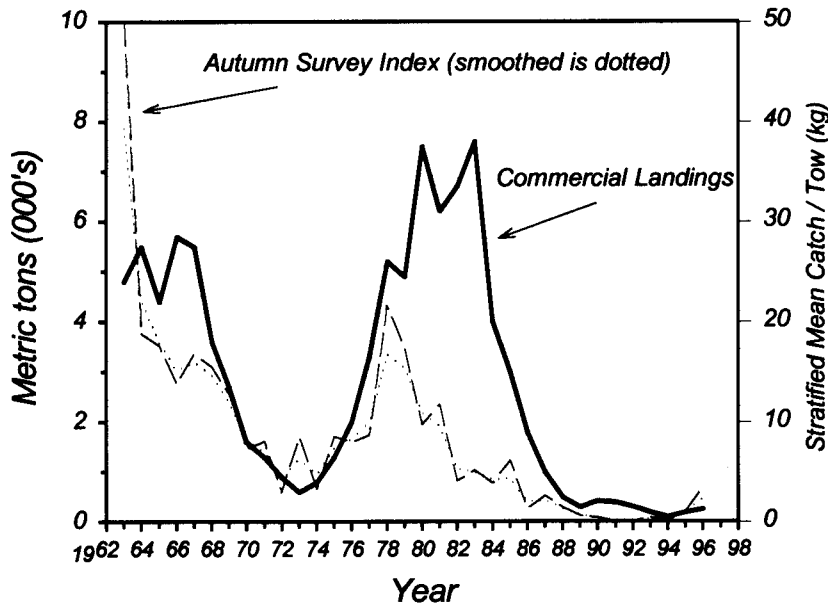


Table 2.1 Recreational catches and commercial landings (thousand metric tons)

Category	Year										
	1977-86 Average	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
U.S. recreational	<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	4.6	0.8	0.4	0.3	0.4	0.4	0.3	0.2	0.1	0.2	0.3
Canada	0.7	0.2	0.1	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-
Total nominal catch	5.3	1.0	0.5	0.3	0.4	0.4	0.3	0.2	0.1	0.2	0.3

## Summary Status

- Long-term potential catch = 5,000 mt
- Importance of recreational fishery = Insignificant
- Management = Multispecies FMP
- Status of exploitation = Overexploited
- Age at 50% maturity = 1.8 years, males  
2.2 years, females
- Size at 50% maturity = 30 cm (11.8 in.), males  
39 cm (15.4 in.), females
- Assessment level = Yield per recruit
- Overfishing definition = 20% MSP
- Fishing mortality rate corresponding to overfishing definition = N/A

$M = 0.20$      $F_{0.1} = 0.24$      $F_{20\%} = 0.40$      $F_{1996} = \text{unknown}$

**“Spawning stock biomass is below maintenance level and is likely to remain so for the foreseeable future.”**

ern Georges Bank, to the east of Nantucket Shoals and along the Maine coast. Juvenile haddock remain pelagic for several months before settling to the bottom.

The U.S. fishery for haddock is managed under the New England Fishery Management Council’s Multispecies Fishery Management Plan (FMP). Under this FMP haddock are included in a complex of 10 groundfish species which have 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. Trip limits are also in effect for haddock. 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 Canadian fishery on Georges Bank is managed under an individual quota system, and Canadian waters on Georges Bank are closed to groundfishing annually from January until mid-June.

The principal commercial fishing gear used to catch haddock is the otter trawl. Recreational catches are insignificant. Total landings (U.S. and Canada) in 1996 from the Georges Bank and Gulf of Maine haddock stocks were 4,300 mt, approximately equal to the 1993 total (4,600 mt). United States landings decreased from 900 mt in 1993 to 600 mt in 1996.

## Gulf of Maine

Commercial landings of Gulf of Maine haddock declined from about 5,000 mt annually in the mid-1960s to less than 1,000 mt in 1973. Landings

**“Significant rebuilding beyond current stock levels will require improved recruitment ...”**

subsequently increased sharply to an annual average of 7,000 mt from 1980 to 1983 but have since declined to record lows. Recreational catches have also declined and since 1981 have been insignificant. Virtually all landings from this stock are now taken in the U.S. fishery.

The NEFSC autumn bottom trawl survey biomass index declined steadily since 1978 and between 1989 and 1992 fell to a new record low every year, reaching 0.1 kg per tow in 1992. The index has since increased; and the 1996 index value (3.5 kg per tow) was the highest since 1985. However, current indices are less than 20% of the level observed prior to collapse of this stock.

The sharp decline in landings observed since 1983 (7,600 to 300 mt) and the corresponding decline in the autumn survey index reflect the severely depleted state of this stock. Spawning stock biomass is below maintenance level and is likely to remain so for the foreseeable future. Recent restrictive management actions on Georges Bank may also have resulted in additional fishing effort on this stock, further threatening stock recovery. Fishing mortality must be reduced to enhance prospects for stock rebuilding.

**Georges Bank**

From 1935-1960, Georges Bank haddock stock biomass averaged over 150,000 mt, which produced stable commercial landings of 40,000 to 60,000 mt. Total commercial landings increased to over 150,000 mt in 1965 and 121,000 mt in 1966 due to recruitment of the exceptionally strong 1962 and 1963 year classes and in-

*Georges Bank  
Haddock*

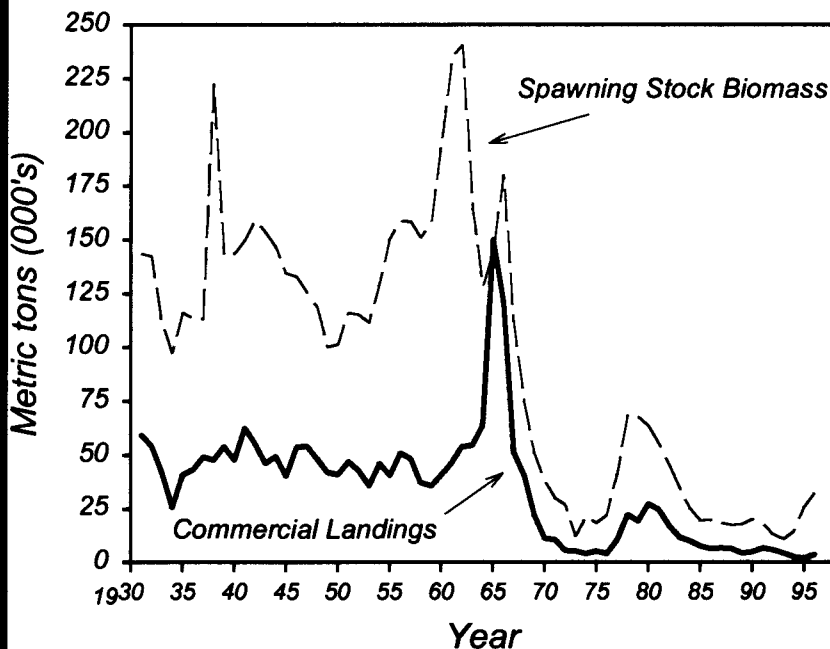


Table 2.2 Recreational catches and commercial landings (thousand metric tons)

Category	Year										
	1977-86 Average	1987	1989	1989	1990	1991	1992	1993	1994	1995	1996
U.S. recreational	0.1	-	-	-	-	-	-	-	-	-	-
Commercial											
United States	10.9	2.2	2.5	1.4	2.0	1.4	2.0	0.7	0.2	0.2	0.3
Canada	5.0	4.1	5.9 <sup>1</sup>	3.1	3.3	5.5	4.1	3.7	2.4	2.1	3.7
Total nominal catch	15.6	6.3	8.4 <sup>1</sup>	4.5	5.3	6.9	6.1	4.4	2.6	2.3	4.0

<sup>1</sup>Suspected to be roughly 2,000 mt too high due to misreporting.

*Summary Status*

- Long-term potential catch = 47,000 mt
  - Importance of recreational fishery = Insignificant
  - Management = Multispecies FMP
  - Status of exploitation = Fully exploited
  - Age at 50% maturity = 1.9 years, males  
2.2 years, females
  - Size at 50% maturity = 34 cm (13.4 in.), males  
39 cm (15.4 in.), females
  - Assessment level = Age Structured
  - Overfishing definition = 30% MSP
  - Fishing mortality rate corresponding to overfishing definition =  $F_{30\%} = 0.45$
- M = 0.20                  F<sub>0.1</sub> = 0.26                  F<sub>1997</sub> = 0.11**

tense fishing by distant-water fleets. The stock subsequently collapsed, with landings declining to less than 5,000 mt annually during the mid-1970s. Landings increased between 1977 and 1980, reaching 27,500 mt, but subsequently declined to 4,500 mt in 1989. Landings have remained below 4,000 mt since 1993, less than 10 percent of the 1935-1960 average. Of the 1997 total, U.S. landings accounted for only 23% (800 mt) of Georges Bank landings, while Canadian landings accounted for the remainder (2,700 mt).

The NEFSC autumn bottom trawl survey indicates that stock biomass declined markedly since the late 1970s. The index reached a historic low in 1991 (0.9 kg per tow), but subsequently increased owing to recruitment of the moderate 1992 year class. The 1997 index value (6.5 kg per tow) is well below levels observed in the 1960s and mid- to late 1970s. Recent analysis of survey data suggest that haddock are currently highly concentrated, resulting in increased relative vulnerability to fishing and survey gear.

Population estimates derived from virtual population analysis indicate that this stock has started to rebuild. Total stock size declined from 133 million fish in 1979 to 15 million fish in 1991, and has subsequently increased to 36 million fish at the beginning of 1995 and has stabilized at this level. Spawning stock biomass declined from 68,900 mt in 1978 to 10,900 mt by 1993, and has since increased to 40,200 mt in 1997.

Recruitment was poor during most of the 1980s and 1990s. The strongest recent year classes were those of 1983, 1985, 1987 and 1992, each contributing between 14 to 17 million fish at age 1. These year classes were less than one-third the size of the average year classes produced by this stock during the 1930s, 1940s, and 1950s. Fishing mortality on age 4 and older haddock exceeded 0.40 (30% exploitation rate) in 1992-1993, declined to 0.12 (10% exploitation rate) in 1995, and has since remained below the management target ( $F_{0.1} = 0.26$ , 21%

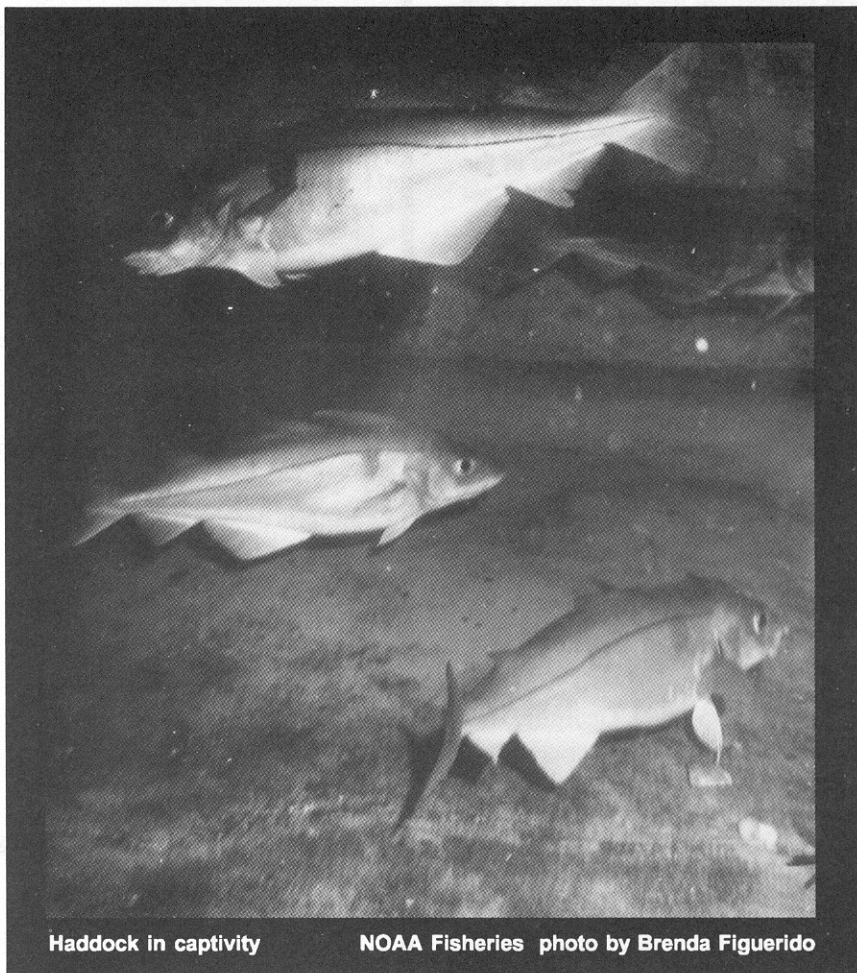
exploitation rate). Recent recruitment from the 1992 year class, coupled with restrictive management measures by the U.S. and Canada, have contributed to the initiation of stock rebuilding.

Observed increases in spawning stock biomass of Georges Bank haddock have resulted from conservation of existing year classes. This is a necessary first step in the stock rebuilding process. Significant rebuilding beyond current stock levels will require improved recruitment above levels observed in the past decade. To date, there are no indications in the survey data to suggest that incoming recruitment has increased above these levels. Until this occurs, restrictive management practices will continue to be necessary.

### For further information

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Haddock in captivity

NOAA Fisheries photo by Brenda Figuerido