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# Northeast Demersal Fisheries

## Unit 1

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Andrew J. Martinez

### INTRODUCTION

Northeast groundfish fisheries include about 35 stocks, primarily in New England waters and also off the Mid-Atlantic states. In New England, groundfish fisheries are dominated by members of the cod family (Atlantic cod, haddock, hakes, and pollock), flounders, and goosefish (also known as monkfish). Other important species in the complex include dogfish and skates. Mid-Atlantic groundfish fisheries are primarily for summer flounder, scup, goosefish, and black sea bass.

Groundfish fishermen use various fishing gears including otter trawls, gillnets, traps, and set lines. Otter trawling is the predominant fishing method employed throughout the region, although many vessels participating in groundfish fisheries switch gears seasonally. In 2006, 1,545 vessels possessed multispecies limited-access permits to participate in groundfish fisheries in the Northeast Region. Recent average yield (RAY; 2004–06; includes

United States, Canada, and recreational) of mixed groundfish was just over 160,000 metric tons (t; Table 1-1). This level is about one-half of the sustainable yield, primarily due to reductions in catch quotas while many stocks rebuild from overfishing in previous years.

Northeast groundfish resources occur in mixed-species aggregations that result in significant bycatch interactions among fisheries targeting different species or species groups. Management of the fishery is complex due to differences in mesh size, gear type, minimum landing (fish) size, quotas, and seasonal and year-round closure regulations set by the various regional management bodies: New England Fishery Management Council (NEFMC), Mid-Atlantic Fishery Management Council (MA-FMC), Atlantic States Marine Fisheries Commission (ASMFC), individual states, and Canada. The principal species of New England groundfish are managed under the Northeast Multispecies Fishery Management Plan (FMP), as well as peripherally

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Photo above:  
School of haddock.

**Table 1-1**  
Productivity in metric tons (t) and status of northeast U.S. demersal fisheries resources.

Species/stock	Recent average yield (RAY) <sup>1</sup>	Current yield (CY)	Sustainable yield (MSY)	Stock level relative to $B_{MSY}$	Harvest rate	Stock status
<b>Principal groundfish</b>						
Acadian redfish	487	1,946	8,200	Below	Not overfishing	Rebuilding
American plaice	1,627	3,666	4,900	Below	Not overfishing	Overfished
Atlantic cod <sup>2,3,4</sup>						
Gulf of Maine	5,298	5,146	16,600	Below	Overfishing	Overfished
Georges Bank	5,080	7,458	35,200	Below	Overfishing	Overfished
Atlantic halibut	24	Unknown	300	Below	Unknown	Overfished
Haddock <sup>2,3,5</sup>						
Gulf of Maine	1,430	1,279	5,100	Below	Not overfishing	Overfished
Georges Bank	18,228	49,829	52,900	Below	Not overfishing	Overfished
Ocean pout <sup>6</sup>	294	38	1,500	Below	Not overfishing	Overfished
Pollock <sup>2,3,7</sup>	7,860	12,005	17,600	Below	Not overfishing	Rebuilding
Red hake						
Gulf of Maine / N. Georges Bank	165	Unknown	2,000	Below	Unknown	Not overfished
S. Georges Bank / Mid-Atlantic	354	Unknown	Unknown	Unknown	Undefined	Not overfished
Silver hake						
Gulf of Maine / N. Georges Bank	466	Unknown	Unknown	Below	Not overfishing	Not overfished
S. Georges Bank / Mid-Atlantic	6,475	Unknown	Unknown	Below	Not overfishing	Not overfished
White hake <sup>2,8</sup>	2,625	2,056	4,200	Below	Overfishing	Overfished
Windowpane flounder <sup>6</sup>						
Gulf of Maine / Georges Bank	652	389	1,000	Near	Not overfishing	Not overfished
S. New England / Mid-Atlantic	385	173	900	Below	Not overfishing	Overfished
Winter flounder <sup>2,3,9</sup>						
Gulf of Maine	441	Unknown	1,500	Below	Not overfishing	Not overfished
Georges Bank <sup>6</sup>	2,038	1,424	3,000	Below	Overfishing	Not overfished
S. New England / Mid-Atlantic	3,035	2,481	10,600	Below	Overfishing	Overfished
Witch flounder	2,659	5,511	4,400	Near	Not overfishing	Not overfished
Yellowtail flounder <sup>2,10</sup>						
Cape Cod / Gulf of Maine	450	650	2,300	Below	Overfishing	Overfished
Georges Bank	4,330	3,000	12,900	Below	Overfishing	Overfished
S. New England / Mid-Atlantic	934	146	14,200	Below	Overfishing	Overfished
Subtotal, principal groundfish	65,337	105,122	206,595			
<b>Dogfish and skates</b>						
Skates <sup>11</sup>	41,575	Unknown	Unknown	Undefined		
Spiny dogfish <sup>2,3,12</sup>	6,451	1,800	Unknown	Undefined	Not overfishing	Rebuilding
Subtotal, dogfish and skates	48,026	43,375	43,375			

under provisions of the ASMFC's Northern Shrimp FMP, while other species are managed either directly or indirectly under other FMP's.

Groundfish fisheries in New England were traditionally managed by indirect methods such as restrictions on mesh sizes, minimum fish lengths, and some area closures. Regulatory measures currently in place for the major New England groundfish stocks include effort controls through allowable days at sea coupled with closed areas, trip limits, and target levels for total allowable catch. The Summer Flounder, Scup, and Black Sea Bass

FMP includes provisions for catch quotas aimed at rebuilding these stocks.

Extensive historical data for Northeast demersal fisheries have been derived from both fishery-dependent (i.e. catch and effort monitoring) and fishery-independent (i.e. NOAA fishery research vessel surveys since 1963) data collection programs. Beginning in 1989, an at-sea observer program has been conducted aboard a subset of commercial fishing vessels to document discard rates and collect high quality, high-resolution data on the groundfish catch. Some of the Northeast demersal

Species/stock	Recent average yield (RAY) <sup>1</sup>	Current yield (CY)	Sustainable yield (MSY)	Stock level relative to $B_{MSY}$	Harvest rate	Stock status
<b>Other finfish</b>						
Atlantic hagfish <sup>13</sup>	844	Unknown	Unknown	Unknown		
Black sea bass <sup>3</sup>	2,200	3,100	Unknown	Below	Not overfishing	Rebuilding
Cusk <sup>2,13,14</sup>	263	Unknown	Unknown	Unknown		
Goosefish (monkfish) <sup>2,15</sup>						
Northern stock	10,800	7,737	Unknown	Above	Not overfishing	Overfished
Southern stock	10,500	3,667	Unknown	Above	Not overfishing	Overfished
Scup <sup>3</sup>	6,955	8,977	Unknown	Below	Overfishing	Overfished
Spot <sup>3</sup>	1,588	Unknown	Unknown	Unknown	Unknown	Unknown
Summer flounder <sup>3</sup>	13,484	10,704	21,444	Above	Overfishing	Overfished
Tilefish	918	905	2,000	Below	Not overfishing	Rebuilding
Weakfish <sup>3</sup>	1,013	6,538	Unknown	Unknown	Unknown	Unknown
Wolffishes <sup>13</sup>	106	Unknown	Unknown	Unknown		
Subtotal, other finfish	48,671	44,429	56,264			
Total	162,034	192,926	306,234			
U.S. Subtotal	147,168	157,287	263,977			

**Table 1-1**

Continued from previous page.

<sup>1</sup>2004–06 average. Includes foreign and recreational landings.<sup>2</sup>Includes more than 100 t/year of foreign (Canadian) landings.<sup>3</sup>Includes more than 100 t/year of recreational landings.<sup>4</sup>U.S. portion of RAY is 8,852 t.<sup>5</sup>U.S. portion of RAY is 8,836 t.<sup>6</sup>CY represents landings only.<sup>7</sup>U.S. portion of RAY is 6,190 t.<sup>8</sup>U.S. portion of RAY is 2,543 t.<sup>9</sup>U.S. portion of RAY is 5,407 t.<sup>10</sup>U.S. portion of RAY is 5,250 t.<sup>11</sup>Consists of barndoor, clearnose, little, rosette, smooth, thorny, and winter skates. Collectively, the status of the species complex cannot be determined.<sup>12</sup>2004–05 average; discards not yet estimated for 2006.<sup>13</sup>Harvest rate and stock status are not available for this stock.<sup>14</sup>U.S. portion of RAY is 78 t.<sup>15</sup>U.S. portion of RAY is 21,300 t.

stocks (Atlantic cod, yellowtail flounder, haddock, American plaice, and summer flounder) are among the best understood and most thoroughly assessed fishery resources in the United States.

## SPECIES AND STATUS

### Principal Groundfish

The principal groundfish group includes important species in the cod family (Atlantic cod, haddock, silver hake, red hake, white hake, and pollock), flounders (yellowtail, winter, witch, windowpane, Atlantic halibut and American plaice), ocean pout, and Acadian redfish. Recent (2004–06) yields of these 14 species (representing 23 stocks)

have averaged about 65,000 t (78% U.S. and 22% Canadian), compared to a combined sustainable yield of about 207,000 t (Table 1-1). Current yields are lower than the sustainable yield because many of these stocks are considered overfished and currently rebuilding. Total ex-vessel revenue from the principal U.S. groundfish commercial landings has dropped in recent years and was \$83 million in 2006, compared to \$107 million in 2003. The groundfish complex also supports important recreational fisheries for summer flounder, Atlantic cod, winter flounder, and pollock, representing about 10% of the total catch of these species.

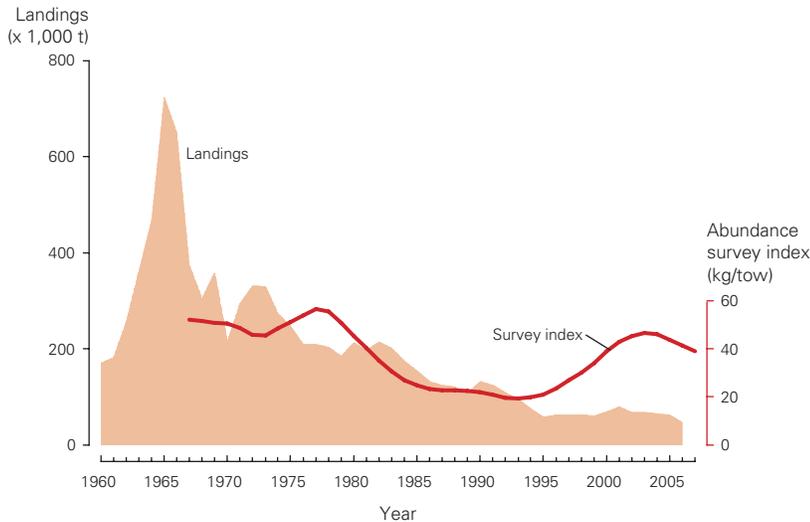
The research vessel survey abundance index<sup>1</sup> for this group of species declined rapidly during

<sup>1</sup>An aggregate index of abundance used to monitor resource trends; computed as the sum of the individual species stratified mean catch-per-tow values, smoothed to compensate for between-year variability.



B. F. Figueroa

Silver hake.



**Figure 1-1**  
Landings in metric tons (t) and abundance survey index (kg/tow) of principal groundfishes, 1960–2007.

the 1960's and early 1970's (Figure 1-1), reflecting substantial increases in exploitation associated with the arrival of distant-water fleets. Many stocks in this group declined sharply during that period, notably Georges Bank haddock, most silver and red hake stocks, and most flatfish stocks. By 1974, indices of abundance for many of these species had dropped to the lowest levels ever recorded.

Groundfish partially recovered during the mid-to-late 1970's because of reduced fishing effort associated with increasingly restrictive management under the International Commission for the Northwest Atlantic Fisheries in the early 1970's, and implementation of the Magnuson Fishery Conservation and Management Act in 1977 (Mayo et al., 1992). Cod and haddock abundance increased markedly, stock biomass of pollock increased more or less continually, and recruitment and abundance also increased for several flatfish stocks. The aggregate abundance index began to increase through the late 1970's, but then subsequently declined, reaching new lows in the late 1980's and early 1990's. The 1989 and 1990 abundance values were slightly higher than the previous two years, primarily due to recruitment of moderate 1987 year-classes of Atlantic cod, haddock, and yellowtail flounder. However, subsequent abundance indices declined, due in large part to the rapid depletion of the 1987 yellowtail flounder year-class and declining cod abundance. The overall index of abundance of the principal groundfish and flounders reached a

30-year low in 1992, but has subsequently more than doubled (Figure 1-1) owing to rebuilding efforts. The most recent changes in the aggregate abundance index are strongly influenced by substantial increases since 1996 of the biomass index for Acadian redfish in the Gulf of Maine, but also reflect increased biomass of haddock and yellowtail flounder on Georges Bank, and cod in the Gulf of Maine (NEFSC, 2001; NEFSC, 2005; Mayo and Terceiro, 2005; TRAC, 2007a,b).

Landings of most groundfish species declined substantially during the mid 1990's. For many stocks, landings continue to remain relatively low as a result of generally poor recruitment and continued restrictions on effort, low trip limits, and additional area closures in the Gulf of Maine. However, relatively strong year-classes produced in 1997 for Georges Bank yellowtail flounder, in 1998, 2000, and 2003 for Georges Bank haddock, and in 2003 for Gulf of Maine cod, combined with sharp reductions in fishing mortality, have led to improved conditions for these stocks (NEFSC, 2005).

### Dogfish and Skates

Dogfish and skates make up a significant part of the aggregate groundfish stock biomass in the Northeast. Of the two dogfish species, spiny dogfish make up a much larger proportion than smooth dogfish. Seven species of skates, including little, winter, barndoor, clearnose, thorny, rosette, and smooth occur on the Northeast shelf; of these, winter, little, and thorny skates account for most of the landed catch.

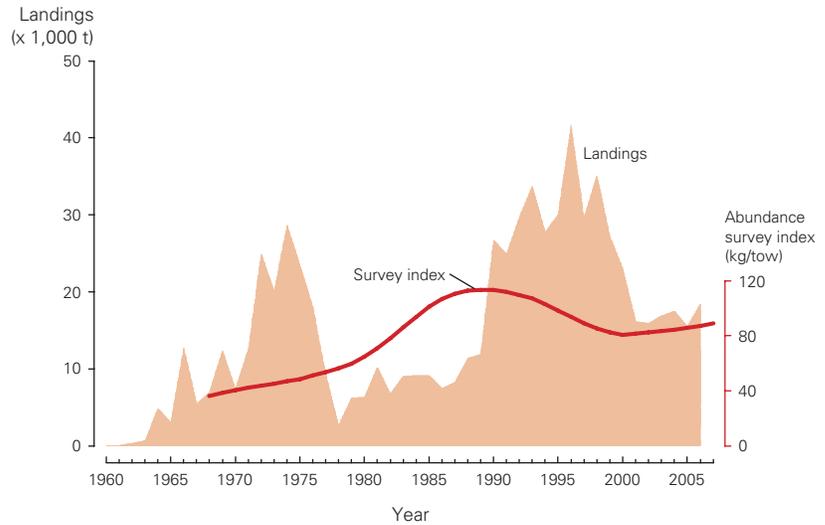
As catches of principal groundfish declined, reported landings of skates and spiny dogfish increased markedly from 2,600 t in 1978 to 29,700 t in 1992, and peaked at 41,700 t in 1996 (Figure 1-2). Annual landings declined to a low of 15,500 t in 2005 and averaged 17,200 t during 2005–06, primarily as a result of continued restrictions on spiny dogfish landings. Discards of these species in fisheries directed towards other species are at least equivalent to the amounts landed and sometimes exceed the landings. The abundance of skates and dogfish increased throughout the 1970's and 1980's, peaked in 1990, declined through 2000, and has since increased (Figure 1-2). Estimates of

spiny dogfish exploitable and spawning stock biomass in 2002 were about one-half of the maximum level observed in 1985 (NEFSC, 2006). However, the restrictions on dogfish landings have resulted in an increase in spawning stock biomass through 2007. Trends in biomass for most skate species indicate decreases or stability in the last 5 years (NEFSC, 2007).

### Other Finfish

Other groundfish species include those taken primarily as bycatch in fisheries directed at the principal groundfish species, as well as those that are targeted directly. In the Gulf of Maine, goosefish (also known as monkfish), cusk, and wolffishes are taken primarily as bycatch. In the Mid-Atlantic area, goosefish, scup, weakfish, black sea bass, spot, tilefish, and several other species are landed both in directed fisheries and as bycatch. As a group, other finfish can be characterized as generally overexploited; individually, some have landings well below their long-term mean as a result of being depleted, while for others, recent landings have exceeded their long-term mean due to overfishing. Some of these stocks are managed indirectly by other FMP's; for example, cusk and wolffishes are taken in various groundfish fisheries managed under the Northeast Multispecies FMP. Other stocks are managed directly under FMP's. Goosefish has been managed under a single-species FMP since 1999. Scup and black sea bass represent major directed fisheries as well as components of the summer flounder directed fishery, with all three species managed under a single FMP.

In recent years, goosefish has become one of the most important species in the Northeast region and is currently the top-ranked groundfish species in both landings and value. U.S. landings increased from less than 600 t annually during 1964–72 to about 8,800 t during 1980–1988, and then peaked at 28,300 t in 1997 with ex-vessel revenue of \$35 million. Landings have declined steadily since 2003 due to regulatory changes, and averaged 18,300 t during 2004–06. The value of goosefish landings peaked at \$53.4 million in 2000, but has since declined to \$33.5 million in 2006. The marked increase in goosefish landings during the 1990's resulted from a diversion of fishing effort from



**Figure 1-2**

Landings in metric tons (t) and abundance survey index (kg/tow) of dogfish and skates, 1960–2007.

principal groundfish stocks, increased market demand for the species, and resulting higher prices. The most recent assessment (Northeast Data Poor Stocks Working Group, 2007) indicated that the goosefish resource is not overfished and overfishing is not occurring. However, the assessment had significant uncertainties due to poorly understood life history parameters and application of a newly-developed model. Intensive cooperative industry vessel surveys conducted during 2001 and 2004 provided significant new information, and biological studies are underway to improve understanding of life history of goosefish.

Summer flounder, one of the most valuable groundfish species in the Mid-Atlantic area, is the focus of both commercial and recreational fisheries with about 60% of the landings commercial and 40% recreational. Prior to the implementation of management measures in 1988, stock abundance had been steadily declining due to excessively high fishing mortality rates. However, spawning stock biomass increased substantially from 1989 to 2006 (Terceiro, 2006) and fishing mortality has declined since 1997. The recent average yield was about 13,500 t during 2004–06, compared to a sustainable yield of nearly 21,500 t (Table 1-1).

Atlantic hagfish, common in U.S. waters between the Gulf of Maine and North Carolina, support a small commercial fishery (six vessels in 2005) and can be a problem in hook and gillnet fisheries where they feed on caught fish. Hagfish



Goosefish lying camouflaged on a rocky reef on Georges Bank.

landings are exported to Asia where the skin is used to make “eel skin” leather products and the meat is used for food. Landings are uncertain because reporting is not required, but appear to have increased substantially during the 1990’s. During 2004–06, reported annual landings averaged 844 t (Table 1-1), a decline from 2001–03. Ex-vessel revenues were over \$1,200,000 for landings of 1,340 t in 2004. Currently, the hagfish fishery is not managed, as there is no FMP in place. Based on a recent review (NEFSC, 2003), little is known about the condition of hagfish stocks, although the biological characteristics of the species (e.g. low fecundity, potentially delayed sexual maturity, and years with apparently no reproduction) indicate that hagfish may be vulnerable to overfishing. Collection of basic biological and fishery data for hagfish is ongoing and a stock assessment is planned for the near future.

## ISSUES

### Management Concerns

During most of the 1980’s and early 1990’s, New England groundfish harvests were regulated by indirect controls on fishing mortality such as mesh and minimum fish size restrictions and some area closures. Amendment 5 to the Northeast Multispecies FMP, implemented in March 1994, marked the

beginning of an effort reduction program to address the Magnuson-Stevens Fishery Conservation and Management Act (MSA) requirement to eliminate the overfished conditions of Atlantic cod, haddock, and yellowtail flounder. The regulatory package included a moratorium on new vessel entrants, a schedule of reduction in days at sea for trawl and gillnet vessels, increases in regulated mesh size, and expanded closed areas to protect haddock. Since December 1994, three large areas (Closed Areas I and II on Georges Bank and Nantucket Lightship Closed Area; Figure 1-3) have been closed to protect the regulated groundfish stocks. In May 1998, a large portion of the western Gulf of Maine was also closed to afford protection for several additional groundfish stocks.

Amendment 7 to the Northeast Multispecies FMP was developed and implemented in 1996 to accelerate the existing days-at-sea reduction schedule and impose other restrictions, including the creation of three year-round closed areas and a system of seasonal closures in the Gulf of Maine. Amendment 9, implemented in 1999, established overfishing definitions and rebuilding objectives to meet the requirements of the MSA. The Multispecies FMP has also been modified by a series of framework adjustments which enacted increases in codend mesh size, as well as trip limits and area closures, to achieve specific management objectives for cod in the Gulf of Maine and on Georges Bank. Trip limits were also imposed on Georges Bank haddock catches.

A groundfish vessel buyback program was initiated in 1995, first as a pilot project and later as a comprehensive fishing-capacity reduction project. The program was designed to reduce excess fishing capacity and provide economic assistance to fishermen adversely affected by the collapse of the groundfish fishery if they voluntarily chose to permanently remove their vessels from the fishery. The vessel buyback program, which concluded in 1998, successfully removed 79 fishing vessels at a cost of nearly \$25 million and resulted in an approximate 20% reduction in fishing effort in the Northeast groundfish fishery.

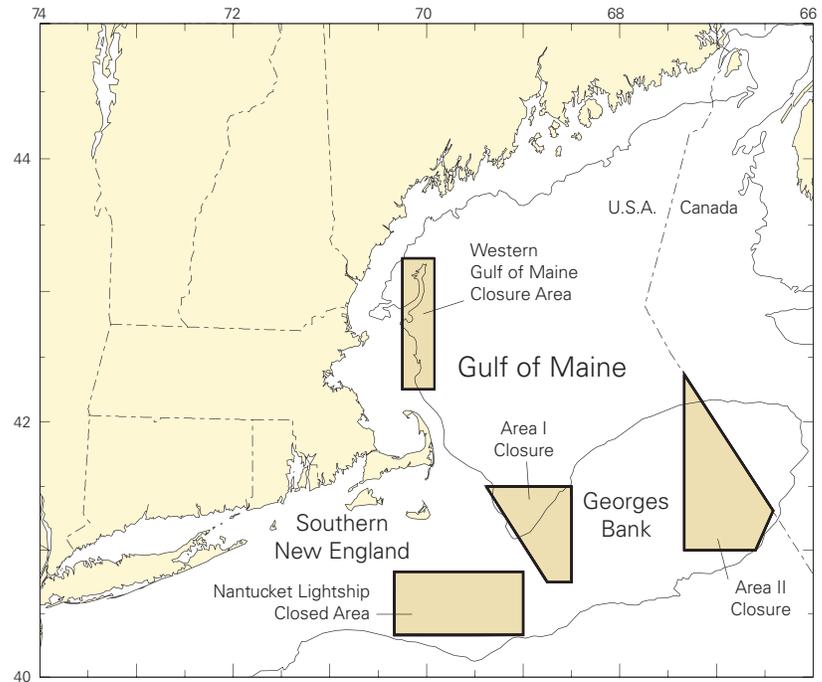
In December 2001, as a result of a lawsuit filed by the Conservation Law Foundation and several other environmental groups, a Federal district court ruled that the National Marine Fisheries Service

had failed to comply with the MSA's overfishing and rebuilding provisions, and failed to accurately account for bycatch and to minimize bycatch mortality in the groundfish fishery. To bring the Northeast Multispecies FMP into full compliance with the MSA, the NEFMC developed Amendment 13, which was implemented in May 2004. Amendment 13 established a new days-at-sea baseline for each individual operator, and allowed only 60% of those days to be directed at regulated species in fishing years 2004 and 2005, with further reductions scheduled through 2009. The remaining 40% of days can only be used in Special Access Programs that minimize the catch of overfished stocks or in directed fishing where it can be otherwise demonstrated that bycatch of overfished stocks is minimal. Amendment 13 also established a formal rebuilding plan for overfished groundfish stocks based on re-estimated biomass and fishing mortality reference points (NEFSC, 2002). Framework 42 was implemented in 2006 to adjust the rebuilding schedules following assessment results obtained at the August 2005 Groundfish Assessment Review Meeting (NEFSC, 2005). The NEFMC is currently developing Amendment 16 to the Northeast Multispecies FMP to implement further rebuilding adjustments based on revised biological reference points and status of 19 stocks through 2007.

The joint MAFMC-ASMFC Summer Flounder FMP was initially approved in 1988 but was subsequently modified by a series of amendments to include scup and black sea bass, as well as revised overfishing definitions. This FMP has a strategy to reduce fishing mortality to the level producing maximum yield per recruit for summer flounder (i.e.  $F_{max}$ , used as a proxy for  $F_{MSY}$ ). The FMP uses commercial landings quotas (allocated by state and season), recreational harvest limits, and possession/size limits to achieve this goal. Increased recruitment levels, combined with lower fishing mortality rates during 1993–2002, have resulted in significant increases in stock biomass.

### Transboundary Stocks and Jurisdiction

Significant catches are taken from transboundary stocks of Atlantic cod, haddock, yellowtail flounder, and pollock in Canadian waters on Georges Bank and in the Gulf of Maine. During 2004–06, 15%



**Figure 1-3**

Areas closed year-round to protect New England groundfishes.

of cod, 21% of pollock, 8% of yellowtail flounder, and 55% of haddock landings were taken by Canadian fishermen. Stock assessment activities between the United States and Canada have been coordinated on an informal basis for decades, but in 1998 a formal joint stock assessment and peer review process for transboundary stocks was initiated under the auspices of the Transboundary Resources Assessment Committee (TRAC). Both countries have continued to independently prepare management advice on the basis of jointly prepared and reviewed assessments.

Further coordination efforts led to the formation in 2000 of a bilateral government–industry committee, the Transboundary Management Guidance Committee (TMGC), to provide a linkage between fisheries and their respective management bodies. This committee is charged with recommending harvesting strategies and harvest levels consistent with each country's management strategies. The TMGC also developed a United States–Canada Resource Sharing Agreement for the joint management of cod and haddock on Eastern Georges Bank and yellowtail flounder on all of Georges Bank, which was formally implemented in Amendment 13 to the Northeast Multispecies



Norm Daspres

Wolf fish hiding amongst the rocks in Stellwagen Bank National Marine Sanctuary.

FMP. Under the agreement, country-specific quotas are applied annually for each of the three stocks based on an agreed total allowable catch (TAC) sharing formula.

### Stock Recovery

Fishing effort restrictions were first implemented in 1994 under Amendment 5 to the Northeast Multispecies FMP through days-at-sea allocations based on either individual vessel or fleet-level performance criteria. Since 1995, the number of vessels in these two permit categories has fluctuated due to changing stock status, new regulations, and vessel buyback programs. Total allocations of days at sea have also changed according to a prescribed schedule of reductions in Amendments 5 and 7. As a result, the total number of permitted vessels in the individual vessel category declined between 1995 and 1998. The number of permitted vessels and their allocated days remained relatively unchanged in 1998–2001. The total number of vessels in the fleet category, however, rose between 1995 and 1996 when the fixed-gear sector (gillnets and longline) was included following the adoption of Amendment 7. The vessel buyback reduced the total number of fleet vessels in 1998, but neither

effort allocation nor number of permitted vessels changed much through 2001. Measures enacted following implementation of Amendment 13 will generally result in a substantial reduction in overall effort, depending on the usage rate of fishing time in the Special Access Programs and in other fisheries that do not target the overfished stocks. At the same time, Amendment 13 allows for leasing or transfer of days at sea between comparable vessels, which could lead to further consolidation of the fleet.

After a decade of direct-effort control measures and many indirect controls on exploitation, several of the groundfish stocks regulated by the Northeast Multispecies FMP have begun to recover and are approaching biomass levels not seen for many decades (e.g. Acadian redfish and Georges Bank haddock). Thus, although total fishing effort may decline, the catch per day-at-sea may increase as stocks continue to recover and approach a level that will allow harvest rates equal to the sustainable yield. Summer flounder spawning stock biomass, regulated by fishing quotas that shut down the fishery when attained (known as a hard TAC level), has increased eight-fold over the last decade. Indications are that the biomasses of scup and black sea bass have also increased.

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