



## **NOAA Technical Memorandum NMFS-NE-111**

This series represents a secondary level of scientific publishing. It employs thorough internal scientific review and technical and copy editing, but not necessarily external scientific review.

# **Review and Evaluation of the 1994 Experimental Fishery in Closed Area II on Georges Bank**

**Patricia Gerrior<sup>1</sup>, Fredric M. Serchuk<sup>1</sup>, Kathleen C. Mays<sup>1</sup>,  
John F. Kenney<sup>2</sup>, and Peter D. Colosi<sup>2</sup>**

*<sup>1</sup>National Marine Fisheries Service, Woods Hole, MA 02543*

*<sup>2</sup>National Marine Fisheries Service, Gloucester, MA 01930*

**U. S. DEPARTMENT OF COMMERCE**  
Mickey Kantor, Secretary  
**National Oceanic and Atmospheric Administration**  
D. James Baker, Administrator  
**National Marine Fisheries Service**  
Rolland A. Schmitten, Assistant Administrator for Fisheries  
**Northeast Region**  
**Northeast Fisheries Science Center**  
**Woods Hole, Massachusetts**

**October 1996**

## NOTE ON SPECIES NAMES

The NMFS Northeast Region's policy on the use of species names in all technical communications is to follow the American Fisheries Society's (AFS) lists of scientific and common names for fishes (Robins *et al.* 1991)<sup>a</sup>, mollusks (Turgeon *et al.* 1988)<sup>b</sup>, and decapod crustaceans (Williams *et al.* 1989)<sup>c</sup>, and to follow the American Society of Mammalogists' list of scientific and common names for marine mammals (Wilson and Reeder 1993)<sup>d</sup>. This policy applies to all issues of the *NOAA Technical Memorandum NMFS-NE* series.

<sup>a</sup>Robins, C.R. (chair); Bailey, R.M.; Bond, C.E.; Brooker, J.R.; Lachner, E.A.; Lea, R.N.; Scott, W.B. 1991. *Common and scientific names of fishes from the United States and Canada*. 5th ed. Amer. Fish. Soc. Spec. Publ. 20; 183 p.

<sup>b</sup>Turgeon, D.D. (chair); Bogan, A.E.; Coan, E.V.; Emerson, W.K.; Lyons, W.G.; Pratt, W.L.; Roper, C.F.E.; Scheltema, A.; Thompson, F.G.; Williams, J.D. 1988. *Common and scientific names of aquatic invertebrates from the United States and Canada: mollusks*. Amer. Fish. Soc. Spec. Publ. 16; 277 p.

<sup>c</sup>Williams, A.B. (chair); Abele, L.G.; Felder, D.L.; Hobbs, H.H., Jr.; Manning, R.B.; McLaughlin, P.A.; Pérez Farfante, I. 1989. *Common and scientific names of aquatic invertebrates from the United States and Canada: decapod crustaceans*. Amer. Fish. Soc. Spec. Publ. 17; 77 p.

<sup>d</sup>Wilson, D.E.; Reeder, D.M. 1993. *Mammal species of the world: a taxonomic and geographic reference*. Washington, DC: Smithsonian Institution Press; 1206 p.

## Contents

Summary .....	v
Introduction .....	1
Methods .....	2
Results .....	3
Discussion .....	7
Acknowledgments .....	7
References Cited .....	7

## Tables

Table 1.	Species caught in the January-June 1994 experimental fishery .....	9
Table 2.	Vessels participating in the January-June 1994 experimental fishery and in two July 1994 sea sampling trips to Georges Bank .....	10
Table 3.	Summary statistics for the January-June 1994 experimental fishery .....	11
Table 4.	Summary of retained catches and discards taken in the January-June 1994 experimental fishery .....	12
Table 5.	Catch per unit of effort of retained catches and discards taken in the January-June 1994 experimental fishery .....	13
Table 6.	Summary trip statistics for 14 trips made during the January-June 1994 experimental fishery .....	14
Table 7.	Summary of trip catches taken inside Area II during the January-June 1994 experimental fishery .....	15
Table 8.	Summary of trip catches taken outside Area II during the January-June 1994 experimental fishery .....	16
Table 9.	Summary of monthly catches taken inside Area II during the January-June 1994 experimental fishery .....	17
Table 10.	Summary of monthly catches taken outside Area II during the January-June 1994 experimental fishery .....	18
Table 11.	Summary of monthly discarded catches taken inside Area II during the January-June 1994 experimental fishery .....	19
Table 12.	Monthly discard percentages of catches taken inside Area II during the January-June 1994 experimental fishery .....	20
Table 13.	Frequency distributions of observed tows in the January-June 1994 experimental fishery categorized by catch of haddock .....	21
Table 14.	Summary of monthly catches taken outside Area II during the January-June 1994 experimental fishery .....	22
Table 15.	Summary of monthly retained catches taken outside Area II during the January-June 1994 experimental fishery .....	23
Table 16.	Summary of monthly discarded catches taken outside Area II during the January-June 1994 experimental fishery .....	24
Table 17.	Monthly discard percentages of catches taken outside Area II during the January-June 1994 experimental fishery .....	25
Table 18.	Summary statistics for the July 1994 sea sampling trips on Georges Bank .....	26
Table 19.	Summary of retained catches and discards taken in two July 1994 sea sampling trips on Georges Bank .....	27
Table 20.	Size composition data of groundfish FMP species sampled in the January-June 1994 experimental fishery. Goosefish samples are also presented. ....	28

## Figures

Figure 1.	A) ICNAF haddock closed area established in 1970. B) U.S. haddock closed Area II. ....	29
Figure 2.	Location of all tows in the January-June 1994 experimental fishery .....	30
Figure 3.	Location of all tows by month in the January-June 1994 experimental fishery .....	31
Figure 4.	Catch per unit of effort by month for haddock, Atlantic cod, and 11 other groundfish FMP species taken inside Area II and outside Area II in the January-June 1994 experimental fishery .....	32
Figure 5.	Distribution of haddock catches by month in the January-June 1994 experimental fishery .....	33
Figure 6.	Distribution of Atlantic cod catches by month in the January-June 1994 experimental fishery .....	34
Figure 7.	Distribution of yellowtail flounder catches by month in the January-June 1994 experimental fishery .....	35
Figure 8.	Distribution of winter flounder catches by month in the January-June 1994 experimental fishery .....	36
Figure 9.	Distribution of American plaice catches by month in the January-June 1994 experimental fishery .....	37
Figure 10.	Distribution of witch flounder catches by month in the January-June 1994 experimental fishery .....	38
Figure 11.	Distribution of white hake catches by month in the January-June 1994 experimental fishery .....	39
Figure 12.	Distribution of goosefish catches by month in the January-June 1994 experimental fishery .....	40
Figure 13.	Location of all tows in the two July 1994 Georges Bank trips .....	41
Figure 14.	Distribution of yellowtail flounder catches in Area II in the two July 1994 Georges Bank trips .....	42
Figure 15.	Size-frequency distributions of haddock samples in the January-June 1994 experimental fishery .....	43
Figure 16.	Size-frequency distributions of Atlantic cod samples in the January-June 1994 experimental fishery .....	44
Figure 17.	Size-frequency distributions of yellowtail flounder samples in the January-June 1994 experimental fishery .....	45
Figure 18.	Size-frequency distributions of pollock and winter flounder samples in the January-June 1994 experimental fishery .....	46
Figure 19.	Size-frequency distributions of witch flounder samples in the January-June 1994 experimental fishery .....	47
Figure 20.	Size-frequency distributions of windowpane samples in the January-June 1994 experimental fishery .....	48
Figure 21.	Size-frequency distributions of American plaice samples in the January-June 1994 experimental fishery .....	49
Figure 22.	Size-frequency distributions of white hake samples in the January-June 1994 experimental fishery .....	50
Figure 23.	Size-frequency distributions of goosefish samples in the January-June 1994 experimental fishery .....	51
Figure 24.	Catch per unit of effort of retained catches and discards for 11 species taken in the January-June 1994 experimental fishery .....	52

## SUMMARY

During January-June 1994, an experimental fishery was conducted on Georges Bank in the expanded portion of Area II, an area closed to fishing during that period. ("Area II" refers to just the expanded portion of Area II unless noted otherwise.) Purpose of the experimental fishery was to monitor the catch and bycatch of Atlantic cod and haddock in Area II during its closure. During the fishery, 12 vessels from five New England ports made 14 trips, totaling 522 tows and 1881.9 hr fished (gear on bottom). All trips were conducted with Northeast Fisheries Science Center scientific observers on board. Observers recorded data on catches, discards, fishing effort, and gear characteristics, and collected size-frequency samples of haddock and other species.

Vessels were not restricted to fishing solely in the experimental area; all trips but one fished both inside and outside Area II. Fishing effort in Area II was twice as great as that outside the area. Within Area II, the majority of tows were made in the northwest corner of the area and along the north-south boundary separating the expanded area from the original area of Area II. Fishing effort was also high along the U.S.-Canadian maritime boundary. Effort outside Area II was dispersed with no clear concentrations.

Within Area II, catches from observed tows totaled 474,491 lb. Catches of the 13 groundfish species covered by the Northeast Multispecies Fishery Management Plan (hereafter referred to as "groundfish FMP species") constituted 70% (333,366 lb) of the Area II total. Haddock catches (60,934 lb) accounted for 13% of total catches and 18% of the catch of groundfish FMP species. Atlantic cod was the dominant species taken in Area II, accounting for 34% (161,997 lb) of total catches and 49% of groundfish FMP catches.

Outside Area II, observed catches totaled 135,250 lb, of which 66% were groundfish FMP species (88,875 lb) and 6% were haddock (8098 lb).

Catch rates, expressed as catch per unit of effort (CPUE; lb/hr fished), in Area II were considerably higher than those outside the area. Haddock CPUE was 205% greater inside Area II than outside. CPUEs within Area II were also higher for yellowtail flounder (178%), American plaice (95%), winter flounder (68%), Atlantic cod (39%), pollock (31%), ocean pout (30%), windowpane (25%), and red hake (25%). Of the 13 groundfish FMP species, only witch flounder, Acadian redfish, white hake, and silver hake CPUEs were higher outside Area II than inside.

During January-March, haddock catches in Area II were low, accounting for less than 2% of total catches in the area. During April-June, however, haddock accounted for 16% of total catches in Area II; in May and June (when haddock catches and CPUE peaked), haddock accounted for 34% of total catches in Area II and 46% of groundfish FMP catches. Had an open fishery for mixed groundfish been conducted in the expanded portion of Area II during April-June, total haddock catches would have been extremely high. The largest individual tows of haddock occurred in late June, indicating that haddock were still aggregated in early summer.

Length-frequency compositions of species were similar inside and outside Area II, with discarding consistent with prevailing minimum size regulations or market demand. For haddock, however, large mature fish (>23 inches) constituted a greater proportion of catches inside Area II than outside.

Given that Atlantic cod and haddock together accounted for nearly half (47%) of the total experimental fishery catches in the expanded portion of Area II, and that both of these stocks on Georges Bank are presently at record-low levels of abundance, maintaining the enlarged Area II seasonal closure in 1995 (and thereafter) is prudent as one component of a suite of conservation measures aimed at eliminating the overfished conditions of these stocks.

## INTRODUCTION

Since 1970, a seasonal closure of the northeast corner of Georges Bank has been implemented to protect spawning concentrations of haddock. This spawning area closure (originally designated as Area B, but subsequently referred to as Area II) was first enacted by the International Commission for the Northwest Atlantic Fisheries (ICNAF) in March and April 1970 (Figure 1A). The closure prohibited “fishing with gear capable of catching demersal species” (International Commission for the Northwest Atlantic Fisheries 1969), and was designed to reduce haddock catches and to supplement existing catch limitations by spreading catches throughout the year (Halliday 1988). Fishermen’s support for such closures has traditionally been very strong; in fact, enactment of the haddock spawning closure in 1970 by ICNAF has been attributed to the insistence of U.S. fishermen (Halliday 1988).

Both the United States and Canada retained use of the ICNAF haddock spawning area fishery closures after extension of fishery jurisdictions in 1977, with minor adjustments in gear restrictions and closure duration (Clark et al. 1982). After 1971, duration of the Area II closure was lengthened by both countries to include March-May. In October 1984, delimitation of the U.S.-Canadian maritime boundary subdivided Area II between the United States and Canada. Nonetheless, the Area II closure has since been independently maintained by both countries with little change. Since 1985, Canada has continued to close its sector of Area II to fishing during March-May. Similar closures were enacted in U.S. Area II waters in 1985 and 1986. In 1987, the United States--under provisions of the Northeast Multispecies Fishery Management Plan (hereafter referred to as the “groundfish FMP”)--lengthened the duration of the Area II closure to include February-May. This 4-mo closure was maintained annually through 1993 in the U.S. portion of Area II.

Effective 1 January 1994, a revised U.S. management program was implemented for groundfish (i.e., Amendment 5 to the groundfish FMP). As one part of a suite of conservation measures to “eliminate the overfished condition of the principal groundfish stocks” (New England Fishery Management Council 1993), the Area II seasonal closure was extended spatially and temporally. Area II was expanded by 20' longitude to the west and 15' latitude to the south (Figure 1B), and the closure implemented for 6 mo, from 1 January through 30 June. Rationale for this time/area extension was to provide additional protection to concentrations of haddock in the area, viz.

*In the case of the expansion of Area II, significant landings of haddock are reported from the area around the current [pre-1994] boundary line and when the area is opened. There are reports of illegal fishing just over the boundary during the closure. Haddock that are aggregated to spawn in this area are extremely susceptible to being targeted, particularly around the margins of the area and upon the termination of the closure. Based on historical landings,*

*nearly one quarter of the total landings of haddock are caught within the area included in the proposed expansion during the closure, and about one third of haddock landings are caught within the expanded area during January through June. Based on an analysis of the fishing effort in the area and displacing that effort to other areas in the region with the next-highest catch rates in the 1988-90 period, the haddock that would have been saved amounts to 21% of the total landings of haddock while the landings of other groundfish would have increased by 1 percent. Without calculating for displaced effort, the haddock savings would have amounted to 33 percent and other groundfish species to about one percent of the total landings (Ham et al., 1991). (New England Fishery Management Council 1993).*

The 1994 regulations prohibited any fishing in Area II during the closure period, except for vessels using pot gear to fish for American lobsters and for vessels using dredges to catch sea scallops. Retention of any haddock caught incidentally by scallop dredge vessels was not permitted.

Concurrent with enactment of the expanded Area II closure in 1994, an experimental fishery program was established. This fishery was authorized as a research exemption under the groundfish FMP, and allowed a restricted number of trawl vessels to fish in the newly-expanded, L-shaped portion of Area II during the closure period, provided that scientific observers were carried aboard the vessels. Purpose of the experimental fishery was to monitor the catch and bycatch of Atlantic cod and haddock in the expanded area during the January-June closure. Additional objectives were to: 1) assess whether a limited trawl fishery for Atlantic cod (and other groundfish) could be prosecuted in the expanded area without incurring significant bycatches of haddock; and 2) determine when concentrations of spawning and post-spawning haddock no longer resided in the expanded area.

In this report, we summarize and evaluate the performance of the 1994 experimental fishery using tow-by-tow data collected by scientific observers placed aboard each vessel in the experiment. Information is provided on total catches, total fishing effort, species composition, discarding practices, size-frequency composition of the landings and discards, and spatial and temporal trends in catch, effort, and CPUE. Attention is focused on haddock and the 12 other species covered by the groundfish FMP (i.e., Atlantic cod, pollock, yellowtail flounder, winter flounder, witch flounder, windowpane, American plaice, Acadian redfish, white hake, red hake, silver hake, and ocean pout), although data are provided on all species caught in the experimental fishery. Comparisons by species and month are made between catches taken inside and outside Area II. We also report the results of two sea sampling trips made on Georges Bank in July 1994 after Area II was reopened for fishing.

## METHODS

### DESIGN AND CONDUCT OF THE EXPERIMENTAL FISHERY

The operational plan for the experimental fishery required deployment of scientific observers aboard commercial vessels authorized to fish in the expanded portion of Area II. A limited number of trawl vessels were solicited to participate voluntarily in the experiment. Vessel and observer schedules were coordinated to ensure that all scientific data collection needs would be met.

Industry participation was initiated with inquiries to vessel owners and captains who had landed trips from the expanded area during the preceding winter-spring season. Prospective participants were briefed on the purpose, design, and administrative requirements of the experiment. All vessels licensed to fish in the groundfish fishery, however, received written notification in December 1993 that an experimental fishery would be conducted and that participating vessels would be required to take approved observers and submit logbooks. The number of participants in the experimental fishery were limited to those required to keep pace with the scheduled 2-4 trips per month.

Once a vessel was selected to participate in the experimental fishery, an "Experimental Fishing Certificate for the Expanded Portion of Closed Area II" was issued and arrangements made to provide observer coverage. The certificate was hand-delivered to the vessel captain, at which time the objectives and procedures of the experimental fishery program were discussed. Any questions or concerns on the part of the captain or crew were addressed. While fishing in the experimental area, each participating captain agreed to the following conditions:

1. The vessel could fish anywhere within the expanded closed area, but not within the inner triangle portion constituting the original Area II. Within the L-shaped expanded area, the captain was free to decide where and when to fish. No restrictions were placed on the number of tows or how fishing operations should be conducted. However, each captain was informed that broad coverage of the expanded area would be beneficial in providing a synoptic basis for analyzing the experimental fishery data.
2. Vessels could fish only with regulated mesh [i.e., 5.5 inches (13.97 cm) during January-March, 6.0 inches (15.24 cm) from April onward].
3. Catches of Atlantic cod, American plaice, pollock, Acadian redfish, winter flounder, witch flounder, and yellowtail flounder of legal size could be landed, but no haddock could be retained.
4. The vessel had to be accompanied by a National Marine Fisheries Service (NMFS)-approved observer.
5. Vessels were under no obligation to remain in the experimental area for the entire trip.
6. An experimental fishery certificate was issued and valid for a single trip. If a vessel wished to make a subsequent trip in the experimental fishery program, a new certificate had to be issued.

As word of the experimental fishery spread through the industry, vessel owners and captains contacted NMFS requesting details on the experiment and expressing interest in participation. In the few cases where the number of interested vessels exceeded the available observer coverage, vessels were selected randomly.

All scientific observers were provided by the Northeast Fisheries Science Center (NEFSC) Fisheries Observer Program. Observers were instructed to observe as many hauls as possible and, for each haul, record data on fishing location, fishing effort, catches, discards, gear characteristics, hydrographic information, and other information as specified in the "NEFSC Observer Manual." Additionally, observers were requested to obtain length-frequency samples from haddock and other groundfish FMP species.

Cooperation at sea was generally excellent between vessel operators and scientific observers. In addition to providing all required data, many captains and crew members provided additional anecdotal information on vessel operations and the status and management of the groundfish fishery.

### DATA PROCESSING AND ANALYSIS

Copies of the tow-by-tow logbooks completed by the scientific observers on each trip in the experimental fishery were forwarded to the NEFSC Woods Hole Laboratory for review and analysis. Data analyses included: 1) tow-by-tow summaries of fishing effort and catches (i.e., both retained and discarded) by species or species group; 2) trip summaries of the tow-by-tow locations (i.e., inside or outside Area II) where fishing occurred; 3) month/location summaries of catches, effort, and CPUE; and 4) location summaries of the size frequencies of landings and discard samples. Spatial and temporal patterns in fishing effort, catches, and CPUE were evaluated by month. CPUE was expressed as catch per time fished (lb/hr), discard rates as percentages, and size frequencies as mean, maximum, and minimum lengths (cm). In calculating CPUE, no adjustments were made for possible differences in fishing power among vessels.

Tows were assigned to Area II if all, or any part, of the tow was made inside Area II. Tows made outside Area II were collectively analyzed as a single group, although these hauls were made over a very wide geographical area. Comparisons of catches, species composition, and CPUE from tows made inside and outside Area II were conducted to provide initial insight on the impacts of the Area II closure in protecting haddock and other groundfish FMP species. More refined geographical-information-system-type analyses, however, are required to delineate finer-scale spatial patterns, both within Area II and between Area II and external (both adjacent and more distant) areas.

## RESULTS

### EXPERIMENT-WIDE

Table 1 lists the common and scientific names of all species caught during the January-June 1994 experimental fishery. During the fishery, 14 trips were made by 12 different vessels (Table 2). Participating vessels were from the Massachusetts ports of Boston (1), Gloucester (6), and New Bedford (2), and from the Maine ports of Portland (2) and Rockland (1). Vessels were absent from port for a total of 137 days, fished (i.e., gear on bottom) 1882 hr (78.4 days), and made 522 tows. Average trip duration was 9.8 days (with a range of 9-13 days), average fishing time per trip was 134 hr (with a range of 62-186 hr), average number of tows per trip was 37 (with a range of 20-58), and average tow duration was 3.6 hr (with a range of 2.1-4.8 hr).

All trips but one (i.e., trip 10) fished both inside and outside Area II (Table 2; Figure 2). Total catches, discards, fishing effort, number of tows, and haddock CPUE for the entire experiment are summarized by location in Tables 3-5; individual trip data are presented in Tables 6-8. Of the 522 tows made during the experiment, 445 tows (85%) were observed by scientific observers (Table 3). Sixty-nine percent (305) of the observed tows occurred inside Area II, and 31% (140) outside Area II. Observed tows accounted for 90% of total hauls in Area II, and 76% of total hauls made outside Area II. Retained catches were recorded by scientific observers for all hauls (i.e., observed and unobserved), but discards could only be tallied in observed hauls. Fishing captains do not normally maintain records of discards. Therefore, discard estimates are not available from unobserved tows. Accordingly, all results subsequently presented are based solely on observed hauls.

Experiment-wide catches totaled 609,741 lb [276.6 metric tons (mt)], of which 422,241 lb (191.5 mt) were groundfish FMP species (69%) and 69,032 lb (31.3 mt) were haddock (Table 3). Haddock accounted for 11.3% of total catches and 16.3% of groundfish FMP catches. Although total observed fishing effort inside Area II, in terms of both number of tows and hours fished, was twice as great as outside Area II, total Area II catches were 251% higher (474,491 versus 135,250 lb), groundfish FMP catches 275% higher (333,366 versus 88,875 lb), and haddock catches 652% higher (60,934 versus 8098 lb) than outside Area II (Table 4). While groundfish FMP species accounted for about the same percentage of total catches in both areas (i.e., 70% inside Area II, 66% outside Area II), haddock accounted for 18.3% of groundfish FMP catches inside Area II and 9.1% outside Area II (Table 3). For the January-June period, haddock CPUE inside Area II was 205% higher than outside Area II (53.1 versus 17.4 lb/hr; Table 5).

Nearly all (96%) caught haddock were discarded (Table 3). Within Area II, this was due to the experimental fishery requirement that any caught haddock could not be retained (although haddock were inadvertently retained on three tows inside Area II due to a misunderstanding that haddock could be retained if a tow was not completely within Area II). Outside Area II, retention of haddock was legally restricted to 500 lb (227 kg) per trip.

Discards of all species combined amounted to 206,867 lb

(93.8 mt), of which groundfish FMP species constituted 37% (75,845 lb; 34.4 mt) (Table 3). Haddock discards (66,052 lb; 30.0 mt) accounted for 32% of total discards and 87% of groundfish FMP discards. Other species heavily discarded included skates (100,736 lb; 45.7 mt) and spiny dogfish (19,422 lb; 8.8 mt) (Table 4). Together with haddock, these species accounted for 90% of the total biomass of fish discarded.

Enroute to the fishing grounds, vessel captains were asked to identify the species targeted for fishing. Atlantic cod was designated as the target in nine trips, "mixed groundfish" in four trips, and pollock in one trip (Table 6). Trip catches were consistent with these designations (Tables 6-8). Atlantic cod accounted for 34% of total catches during the experiment, and 50% of catches of groundfish FMP species (Table 6). Captains generally fished according to the "style" of their port, i.e., Gloucester vessels fished for a mix of groundfish, New Bedford vessels fished for Atlantic cod and various flounders, and Maine vessels fished for Atlantic cod, pollock, and American plaice.

Nearly 50 different species were caught during the experimental fishery (Table 1). Relative contributions (as percent by weight) of individual species to the total experiment-wide catch of 609,741 lb were as follows: Atlantic cod (34%), skates (19%), pollock (12%), haddock (11%), goosefish (5%), American plaice (3%), yellowtail flounder (3%), spiny dogfish (3%), white hake (2%), "other fishes" (1%; see Table 1 for the 23 species constituting this category), cusk (1%), witch flounder (1%), American lobster (1%), winter flounder (1%), ocean pout (1%), Atlantic wolf-fish (<1%), Acadian redfish (<1%), silver hake (<1%), red hake (<1%), "other invertebrates" (<1%; see Table 1 for the eight species constituting this category), and windowpane (<1%) (Table 4). Additionally, two Atlantic white-sided dolphin (*Lagen-orhynchus acutus*) were incidentally captured during one of the trips and returned to the sea. No other marine mammals, sea turtles, or sea birds were caught during the experiment.

### INSIDE AREA II

Within Area II, catches from the 304 observed tows (1148 fishing hr) totaled 474,491 lb (215.2 mt), of which 302,634 lb (137.3 mt) were retained (64%) and 171,857 lb (78.0 mt) were discarded (Tables 9-11). Fishing activity occurred in all 6 mo, but was not evenly distributed in time or space. Experimental fishing effort was lowest in January (15 observed tows; 72 hr fished), intermediate during February and May (32 and 37 tows; 76 and 110 hr fished), and highest in March, April, and June (61-97 tows; 230-422 hr fished) (Table 9). The majority of tows were made in the northwest corner of the expanded area (Figure 3). During March-June, fishing was concentrated along the north-south boundary separating the expanded area from the original area of Area II, and also along the U.S.-Canadian maritime boundary (i.e., Hague

Line). In the first few months of the experiment, vessels moved



throughout the expanded area to locate target species; in the last three months, some vessels towed in locations where it was felt haddock could be avoided.

Groundfish FMP catches (333,366 lb; 151.2 mt) constituted 70.3% of total catches in Area II, and 88.3% (267,120 lb; 121.2 mt) of retained catches in Area II (Tables 9 and 10). Atlantic cod was the most-caught species (161,997 lb; 73.5 mt), accounting for 34% of the Area II total catch and 49% of the Area II groundfish FMP catch. Haddock catches in Area II totaled 60,934 lb (26.7 mt), 12.8% of Area II total catches and 18.3% of Area II groundfish FMP catches. All but 2% (1071 lb) of the caught haddock were subsequently discarded (Table 12).

Prior to April, haddock catches in Area II were minor (i.e., January-March total of 1968 lb), accounting for less than 3% of Area II total catches per month and less than 4% of groundfish FMP catches per month (Table 9). Average catch per tow of haddock during January-March was only 18.2 lb (i.e., January--12.0 lb; February--0.3 lb; and March--29.2 lb); in these months, haddock CPUE averaged just 5.2 lb/hr (i.e., January--2.5 lb/hr; February--0.1 lb/hr; and March--7.7 lb/hr) (Figure 4). The largest catch of haddock taken in any one tow during these 3 mo was 407 lb (Table 6). Apart from this tow and another tow in which 102 lb of haddock were caught, none of remaining 106 observed tows during January-March in Area II caught more than 78 lb of haddock (Figure 5).

Beginning in April and continuing through May, haddock CPUE markedly increased in every trip made in Area II, rising from 50 lb/tow (10.5 lb/hr) in trip 8 to 669 lb/tow (186 lb/hr) in trip 12 (Table 7). Average haddock catch per tow was 130 lb/tow (30 lb/hr) in April and 577 lb/tow (194 lb/hr) in May (Table 9; Figure 4). During these 2 mo, catches of haddock exceeded 100 lb in 51 of the 134 observed tows (38%), and exceeded 500 lb in 17 tows. Tows with the highest haddock catches occurred in the northwest corner of the expanded area (near the 50-fathom contour) and along/near the north-south boundary of the original and expanded closed areas (Figure 5). The largest catch of haddock taken in a single tow during April and May was 4600 lb--more than twice the total haddock caught in Area II during the first 3 mo of the experimental fishery.

In June, haddock CPUE declined to 105 lb/hr (396.7 lb/tow)--lower than in May but substantially higher than any other month (Figure 4). The last trip in the experimental fishery made in June (i.e., trip 14) also fished on 1 July, the first day that all of Area II was re-opened. On this date, three observed tows were made in the inner triangle of original Area II. Two large hauls of haddock were taken (9000 and 3500 lb), indicating that high concentrations of haddock still existed in the re-opened area.

Over the entire January-June period, 87 of the 305 observed tows (28%) in Area II caught no haddock, and in 114 other tows (37%) haddock catches were 50 lb or less (Table 13). Overall, 93% of Area II hauls (284 tows) caught less than 500 lb (227 kg) of haddock.

Spatial distributions of haddock catches per tow by month are presented in Figure 5. Similar distributions of catch per tow are presented for Atlantic cod, flounders (yellowtail, winter, American plaice, and witch), white hake, and goosefish in Figures 6-12. Spatially, these relative density distributions are consistent with

those observed in recent NEFSC spring research vessel bottom trawl surveys.

After Atlantic cod (which accounted for 34% of Area II catch), the most-caught species were skates (20%), haddock (13%), pollock (12%), yellowtail flounder (4%), goosefish (4%), American plaice (4%), and spiny dogfish (3%) (Table 9). However, the relative contributions of these species to the overall retained catch were quite different, as 90% of the skates (84,159 lb; 38.2 mt) and all spiny dogfish (13,672 lb; 6.2 mt) were discarded (Tables 11 and 12). As a result, Atlantic cod accounted for 53% of retained catches, pollock for 18%, yellowtail flounder and goosefish for 6% each, and American plaice for 5% (Table 10). The groundfish FMP species accounted for 88% of retained catches in Area II.

Fish were discarded for three main reasons. Haddock caught in Area II could not be retained under provisions governing the experimental fishery. Spiny dogfish, ocean pout, skates, other fishes, and other invertebrates were heavily discarded (i.e., 90% discard rates; Table 12) due to the limited market value of these species to the vessels in the experiment. For the remaining species, discards generally reflected culling of undersized fish due to market considerations or existing legal minimum-size restrictions.

## OUTSIDE AREA II

Catches, landings, and discards taken outside Area II during the experimental fishery are summarized by species or species groups in Tables 14-16, respectively. Catches by trip are presented in Table 8. A total of 140 tows were observed, comprising 466.2 hr of fishing effort. Expectedly, the temporal distribution of fishing activity outside Area II differed from that inside Area II as the vessels in the experimental fishery differentially allocated their fishing activities between the two areas. Fishing effort outside Area II was lowest in April (5 tows; 19 hr fished) (Table 14) when fishing effort inside Area II was highest (Table 9). Highest fishing effort outside Area II occurred in March (53 tows; 167 hr) and May (36 tows; 126 hr); during these 2 mo, effort inside Area II was similar, indicating that vessels divided their fishing activities nearly equally between the two areas.

Catches in observed tows made outside Area II totaled 135,250 lb (61.3 mt), of which 66% (88,875 lb; 40.3 mt) were groundfish FMP species and 6% (8098 lb; 3.7 mt) were haddock (Tables 9 and 14). More than 75% (6189 lb; 2.8 mt) of caught haddock were discarded (Table 16). As in Area II, Atlantic cod was the predominant species caught (47,272 lb; 21.4 mt), accounting for 35% of total catch and 53% of groundfish FMP catch.

Haddock catches outside Area II did not exceed 500 lb per trip in the first 11 trips of the experiment (i.e., trips between January and mid-May; Table 8). In these first 11 trips, haddock catches accounted for about 2% (with a range of 0-9.6%) of total catches taken in trips outside Area II, and about 2.4% (with a range of 0-10.2%) of groundfish FMP catches taken in trips outside Area II (Table 8).

On a monthly basis, haddock catches accounted for less than 4% of total catches outside Area II during January-May (Table 14). Apart from April when haddock CPUE seemingly increased (i.e., to 16.5 lb/hr, although this is based on only five observed

tows), haddock CPUE prior to June was extremely low (i.e., <6.9 lb/hr; <24 lb/tow) (Table 14). In June, haddock catches and haddock CPUE outside Area II sharply increased (Table 14; Figure 4); more haddock were caught in June (5759 lb) than in the first 5 mo combined (2339 lb). This increase was due to two large hauls (3500 and 1000 lb) of haddock in June made just outside the Area II boundary.

Of the 140 observed tows made outside Area II during the experiment, 44% (61 tows) contained no haddock, and 40% (56 tows) contained haddock catches of 50 lb or less (Table 13). In only two tows did haddock catches outside Area II exceed 500 lb (i.e., the June tows mentioned above).

Species composition of catches made outside Area II was similar to that inside Area II. Atlantic cod accounted for 35% of total catches, followed by skates (15%), pollock (13%), goosefish (9%), haddock (6%), spiny dogfish (4%), white hake (4%), and American plaice (3%) (Table 14). Of retained catches, Atlantic cod accounted for 47%, pollock for 17%, goosefish for 12%, and white hake for 5% (Table 15). Since discarding practices outside Area II were nearly identical to those inside Area II, species discard percentages were also similar (Tables 12 and 17).

## POST-EXPERIMENT SEA SAMPLING TRIPS TO GEORGES BANK

On 1 July, the entirety of Area II (i.e., both the expanded area and the inner triangle) was re-opened for fishing. To assess post-opening catch rates of haddock and other groundfish FMP species, observers were placed on two vessels that intended to fish in the Area II region. Both trips sailed in mid-July and were absent from port for 10-11 days (Table 2). One of the trips (i.e., trip 15) fished completely outside Area II, targeting Atlantic cod and flounders; the other trip (i.e., trip 16) fished completely inside Area II, targeting yellowtail flounder (Figure 13).

Within Area II, 37 of the 48 post-experiment tows (77%) were observed (Table 18); haddock catches in these hauls amounted to only 22 lb, and constituted less than 1% of the total catch (24,792 lb; 11.2 mt). Haddock catches were negligible primarily because the vessel used a trawl designed for catching flatfish. As intended, yellowtail flounder was the principal species caught during the trip, accounting for 45% (11,331 lb; 5.1 mt) of total catch and 77% (10,192 lb; 4.6 mt) of retained catch (Table 19). Most yellowtail flounder catches were taken in the inner triangular section of Area II (Figure 14). Large quantities (10,178 lb; 4.6 mt) of skates were also caught, but 90% were discarded.

In the July trip that fished outside Area II, 36 of 40 tows (90%) were observed (Table 18). Groundfish FMP species accounted for 66% (12,410 lb; 5.6 mt) of total catch (18,877 lb; 8.6 mt), with Atlantic cod and American plaice each accounting for 20% of the total (Table 19). Haddock catches totaled 798 lb, or 4% of total catch and 6% of groundfish FMP catch. Approximately 25% of the total trip catch was discarded, consisting mostly of spiny dogfish and skates.

## SIZE COMPOSITION OF EXPERIMENTAL FISHERY CATCHES

During the January-June experimental fishery, 9430 length-frequency measurements were made on 13 species. Samples were taken inside and outside Area II from both retained catches and discards. Most sampling (9408 fish) focused on nine groundfish FMP species and goosefish (Table 20); sampling of three additional species was insignificant (i.e., 15 Atlantic halibut, 5 American lobster, and 2 American shad).

Sampling of haddock was the top priority. A total of 4801 haddock were measured, constituting 51% of all sampled fish. Within Area II, length frequencies were taken from 3968 haddock (3884 discards; 84 retained); outside Area II, length frequencies were taken from 833 haddock (564 discards; 269 retained) (Figure 15). Size range of haddock discarded in both areas was similar (Table 20), but large haddock (>60 cm) constituted a greater proportion of discards inside Area II than outside Area II. Since, in both areas, nearly all caught haddock had to be discarded [i.e., culling was not much affected by the minimum legal size of 19 inches (48 cm)], the larger size composition of Area II discards indicates that older, mature haddock were proportionally more dominant inside Area II than outside.

For Atlantic cod, the principal species caught in both areas, size-frequency distributions of catches inside and outside Area II were virtually identical (Table 20; Figure 16). Discarded fish ranged from 37 to 49 cm (14.6-19.3 inches), and averaged about 42 cm (16.5 inches); retained fish ranged from 47 to 117 cm (18.5-46.1 inches), and averaged about 70 cm (27.6 inches). The lack of overlap in sizes between discarded and retained fish reflects culling in accord with the legal minimum size of 48 cm (19 inches) for Atlantic cod.

Size-frequency plots for the other eight species sampled (i.e., yellowtail flounder, pollock, winter flounder, witch flounder, American plaice, windowpane, white hake, and goosefish) are presented in Figures 17-23. In general, size compositions were similar inside and outside Area II, with culling consistent with prevailing minimum-size regulations—in the cases where these exist—or marketing demands. Of course, presence of scientific observers aboard the experimental fishery vessels may have affected culling practices, particularly for species regulated by minimum-size restrictions.

## IMPACT OF AREA II CLOSURE ON HADDOCK AND OTHER GROUND FISH FMP SPECIES

Enlargement of Area II in 1994 was enacted to ensure the protection of haddock from fishing during the spawning season when they become concentrated. The closure period was also lengthened in time to include January to ensure that haddock beginning to aggregate in the area would be provided the fullest protection.

One approach to evaluate the protection afforded to haddock and other groundfish FMP species by the expanded Area II closure is to examine the experimental fishery catch rates inside the expanded portion of Area II with those outside Area II. Higher catch rates generally reflect higher densities of fish. Hence, to the extent that catch rates inside the expanded portion of Area II are higher than those outside, the absence of a fishery inside the expanded portion will generate considerable "savings" of fish.

The CPUE--retained and discard catches combined--inside Area II was higher than outside Area II for: 1) all species combined (413 versus 290 lb/hr); 2) total groundfish FMP species (290 versus 191 lb/hr); and 3) for nine of the 13 groundfish FMP species. The CPUE inside Area II was higher for haddock (205%), yellowtail flounder (178%), American plaice (95%), winter flounder (68%), Atlantic cod (39%), pollock (31%), ocean pout (30%), windowpane (25%), and red hake (25%). For the remaining four groundfish FMP species, the CPUE inside Area II was lower: witch flounder (15%), white hake (27%), silver hake (43%), and Acadian redfish (96%) (Table 5 and Figure 24).

During January-March, haddock CPUE both inside and outside Area II was very low (<8 lb/hr) (Tables 9 and 14; Figure 4). In April and May, haddock CPUE within Area II was substantially higher than outside (April--30 versus 17 lb/tow; May--194 versus

7 lb/tow). In June, haddock CPUE in both areas exceeded 100 lb/hr. As previously mentioned, the high haddock CPUE in June outside Area II was due to two large catches just outside the Area II boundary.

Within Area II, CPUEs of Atlantic cod and of all groundfish FMP species excluding haddock and Atlantic cod peaked in April, and were higher than those for haddock in each month but May and June (Figure 4). Outside Area II, Atlantic cod CPUE peaked in March and was higher than haddock CPUE in all months but June.

For species and species groups other than groundfish FMP species taken in the experimental fishery, CPUEs inside Area II were generally the same or higher than those outside Area II, except for goosefish (15.2 versus 25.8 lb/hr), spiny dogfish (11.9 versus 12.3 lb/hr), cusk (4.1 versus 4.9 lb/hr), American lobster (3.3 versus 3.4 lb/hr), Atlantic wolffish (0.4 versus 3.3 lb/hr), and other invertebrates (0.2 versus 1.2 lb/hr) (Table 5).

In total, the generally higher CPUEs inside the expanded portion of Area II compared to those outside Area II suggest that fish densities were higher inside the expanded area. Prohibiting a commercial fishery in the expanded area in 1994 therefore prevented high concentrations of fish from being exploited.

## DISCUSSION

Some commercial fishermen have taken the position that it is possible to prosecute a fishery for mixed groundfish in the expanded portion of Area II without catching significant quantities of haddock. This position was, in part, the basis for conducting the experimental fishery, the purpose of which was to monitor the catch and bycatch of Atlantic cod and haddock in the expanded portion of Area II during January-June 1994.

During January through March, haddock catches in the expanded area were low (1968 lb in total), accounting for less than 2% of total Area II catches. During this same period, 60,478 lb of other groundfish FMP species were taken in the expanded area. Clearly, fishing in these months had little negative impact on haddock.

However, during April-June, haddock constituted 16% of total catches, and 22% of groundfish FMP catches, in Area II. In May and June when haddock catches and CPUE were at their highest in Area II, haddock constituted 34% of total catches and 46% of groundfish FMP catches. Obviously, had an open fishery for mixed groundfish been conducted in the expanded area during April-June, total haddock catches would have been extremely high.

Traditionally, the period of peak haddock spawning on the northeastern part of Georges Bank is during March and April (Overholtz 1987). However, the timing and duration of spawning can vary from year to year due to influence of temperature. In 1994, high concentrations of haddock (i.e., >400 lb/tow) were not detected in the experimental fishery until mid-March, suggesting that haddock spawning occurred later in 1994 than the traditional pattern. Catches of haddock in tows made in Area II in late June

were among the highest observed in the experiment, indicating that haddock were still aggregated in early summer.

After 1 July when Area II was re-opened for fishing, large catches of haddock inside Area II were reported by commercial fishermen. Observations made from two sea sampling trips conducted in mid-July, however, did not substantiate the existence of large concentrations of haddock--although haddock may have already dispersed by this time. Also, the fishing gear used in the July sea sampling trip to Area II was not optimal for catching haddock.

Since haddock caught inside Area II could not be retained, several vessels in the experimental fishery moved to different fishing locations after haddock were caught. These movements were likely intended to avoid subsequent haddock catches and to reduce culling time. Large haddock catches taken during the last few trips in the experimental fishery prompted some vessel captains to suggest that the closure period should be extended further into the summer.

Haddock and Atlantic cod accounted for 13 and 34%, respectively, of total catches inside Area II. As a group, the 13 groundfish FMP species accounted for 70% of total catches inside Area II. Area II catches were thus dominated by species regulated under the Northeast Multispecies Fishery Management Plan. Haddock, Atlantic cod, and yellowtail flounder on Georges Bank are at record-low abundance levels; the haddock and yellowtail flounder stocks have "collapsed," and an imminent danger exists that the Georges Bank Atlantic cod stock will soon collapse (Northeast Fisheries Science Center 1994). Given that these three species constituted

a major fraction of monthly catches inside Area II during the January-June 1994 experimental fishery, maintaining the enlarged Area II seasonal closure in 1995 (and thereafter) is

prudent as one component of the suite of conservation measures aimed at eliminating the overfished conditions of these stocks.

## ACKNOWLEDGMENTS

We extend our gratitude and appreciation to all scientific observers who collected the experimental fishery data. We also

thank the captains, vessel owners, and crews who participated in the 1994 experiment.

## REFERENCES CITED

- Clark, S.H.; Overholtz, W.J.; Hennemuth, R.C. 1982. Review and assessment of the Georges Bank and Gulf of Maine haddock fishery. *J. Northwest Atl. Fish. Sci.* 3:1-27.
- Halliday, R.G. 1988. Use of seasonal spawning area closures in the management of haddock fisheries in the Northwest Atlantic. *Northwest Atl. Fish. Organ. Sci. Counc. Stud.* 12:27-36.
- Ham, D.; Mannesto, G.; Wang, S. 1991. Haddock spawning closed area analysis--a summary. A report for the Multispecies Plan Development Team of the New England [Fishery Management] Council. Gloucester, MA: NMFS Northeast Regional Operations Office.
- International Commission for the Northwest Atlantic Fisheries. 1969. Report of the 19th annual meeting, 2-7 June 1969. *Int. Comm. Northwest Atl. Fish. Annu. Proc.* 19:14-39.
- New England Fishery Management Council. 1993. Amendment #5 to the Northeast Multispecies Fishery Management Plan. Saugus, MA: New England Fishery Management Council.
- Northeast Fisheries Science Center. 1994. Report of the 18th Northeast Regional Stock Assessment Workshop (18th SAW): the plenary. *Northeast Fish. Sci. Cent. Ref. Doc.* 94-23: 71 p. Available from: National Marine Fisheries Service, 166 Water St., Woods Hole, MA 02543.
- Overholtz, W.J. 1987. Factors relating to the reproductive biology of Georges Bank haddock (*Melanogrammus aeglefinus*) in 1977-83. *J. Northwest Atl. Fish. Sci.* 7:145-154.



Table 1. Species caught in the January-June 1994 experimental fishery

Common Name	Scientific Name
<b>Principal Fishes</b>	
Acadian redfish .....	<i>Sebastes fasciatus</i>
American plaice .....	<i>Hippoglossoides platessoides</i>
Atlantic cod .....	<i>Gadus morhua</i>
Atlantic wolffish .....	<i>Anarhichas lupus</i>
Cusk .....	<i>Brosme brosme</i>
Goosefish .....	<i>Lophius americanus</i>
Haddock .....	<i>Melanogrammus aeglefinus</i>
Ocean pout .....	<i>Macrozoarces americanus</i>
Pollock .....	<i>Pollachius virens</i>
Red hake .....	<i>Urophycis chuss</i>
Silver hake .....	<i>Merluccius bilinearis</i>
Skates .....	<i>Raja</i> spp.
Spiny dogfish .....	<i>Squalus acanthias</i>
White hake .....	<i>Urophycis tenuis</i>
Windowpane .....	<i>Scophthalmus aquosus</i>
Winter flounder .....	<i>Pleuronectes americanus</i>
Witch flounder .....	<i>Glyptocephalus cynoglossus</i>
Yellowtail flounder .....	<i>Pleuronectes ferrugineus</i>
<b>Other Fishes</b>	
Alewife .....	<i>Alosa pseudoharengus</i>
American shad .....	<i>Alosa sapidissima</i>
Atlantic halibut .....	<i>Hippoglossus hippoglossus</i>
Atlantic herring .....	<i>Clupea harengus</i>
Atlantic mackerel .....	<i>Scomber scombrus</i>
Atlantic menhaden .....	<i>Brevoortia tyrannus</i>
Atlantic torpedo .....	<i>Torpedo nobiliana</i>
Bluefish .....	<i>Pomatomus saltatrix</i>
Buckler dory .....	<i>Zenopsis conchifera</i>
Butterfish .....	<i>Peprilus triacanthus</i>
Conger eel .....	<i>Conger oceanicus</i>
Cunner .....	<i>Tautoglabrus adspersus</i>
Fourspot flounder .....	<i>Paralichthys oblongus</i>
Lumpfish .....	<i>Cyclopterus lumpus</i>
Marlin-spike .....	<i>Nezumia bairdi</i>
Sculpins .....	<i>Myoxocephalus</i> spp.
Scup .....	<i>Stenotomus chrysops</i>
Sea lamprey .....	<i>Petromyzon marinus</i>
Sea raven .....	<i>Hemitripterus americanus</i>
Sharks .....	<i>Carcharhinus</i> spp.
Summer flounder .....	<i>Paralichthys dentatus</i>
Tilefish .....	<i>Lopholatilus chamaeleonticeps</i>
Wrymouth .....	<i>Cryptacanthodes maculatus</i>
<b>Principal Invertebrates</b>	
American lobster .....	<i>Homarus americanus</i>
<b>Other Invertebrates</b>	
Atlantic rock crab .....	<i>Cancer irroratus</i>
Atlantic surfclam .....	<i>Spisula solidissima</i>
Jonah crab .....	<i>Cancer borealis</i>
Longfin squid .....	<i>Loligo pealei</i> <sup>1</sup>
Northern shortfin squid .....	<i>Illex illecebrosus</i>
Red deepsea crab .....	<i>Geryon quinquegens</i>
Sea scallop .....	<i>Placopecten magellanicus</i>
Spoonarm octopus .....	<i>Bathypolypus arcticus</i>

<sup>1</sup>Changed from *L. pealeii* to *L. pealei* per communication of M. Vecchione, NMFS National Systematics Lab., Washington, DC; July 1996.

Table 2. Vessels participating in the January-June 1994 experimental fishery and in two July 1994 sea sampling trips to Georges Bank

Trip No.	Vessel Ident.	Port	Trip Dates	Total		Number of Tows		
				Days Absent	Hours Fished	Inside Area II	Outside Area II	Total
1	A	Gloucester	21-29 Jan	9	134.7	15	15	30
2	B	Gloucester	5-10 Feb	6	70.5	4	16	20
3	C	New Bedford	16-23 Feb	8	129.4	35	23	58
4	D	Boston	28 Feb - 8 Mar	9	66.9	4	23	27
5	E	New Bedford	5-10 Mar	6	62.5	11	15	26
6	A	Gloucester	14-23 Mar	10	143.1	8	28	36
7	F	Portland	15-27 Mar	13	179.4	40	3	43
8	G	Gloucester	31 Mar - 11 Apr	12	185.6	37	2	39
9	H	Gloucester	4-15 Apr	12	184.3	37	5	42
10	I	Rockland	11-19 Apr	9	105.4	29	0	29
11	D	Boston	12-20 May	9	112.7	29	12	41
12	J	Gloucester	23 May - 2 Jun	11	166.9	13	31	44
13	K	Gloucester	2-13 Jun	12	176.9	39	6	45
14	L	Portland	22 Jun - 2 Jul	11	163.9	37	5	42
Subtotal:				137	1881.9	338	184	522
15	M	Gloucester	12-21 Jul	10	162.4	0	40	40
16	N	New Bedford	15-25 Jul	11	159.7	48	0	48
Total:				158	2204.0	386	224	610

Table 3. Summary statistics for the January-June 1994 experimental fishery. (Data are presented for tows made inside and outside Area II. All catch data are based on observed tows only. Fourteen trips were conducted using 12 different vessels.)

Statistic	Inside Area II	Outside Area II	Total
Number of tows observed	305	140	445
Number of tows unobserved	33	44	77
Total tows	338	184	522
Percent observed	90	76	85
Avg. tow time (hr) <sup>1</sup>	3.8	3.3	3.6
Total effort (hr) <sup>1</sup>	1,147.7	466.2	1,613.9
<b>Observed Tows</b>			
Total catch (lb)	474,491	135,250	609,741
Haddock	60,934	8,098	69,032
FMP species <sup>2</sup>	333,366	88,875	422,241
Others	141,125	46,375	187,500
Total discards (lb)	171,857	35,010	206,867
Haddock	59,863	6,189	66,052
FMP species <sup>2</sup>	66,246	9,599	75,845
Others	105,611	25,411	131,022
Haddock catch/total catch (%)	12.8	6.0	11.3
Haddock catch/FMP species catch (%) <sup>2</sup>	18.3	9.1	16.3
Haddock discards/total discards (%)	34.8	17.7	31.9

<sup>1</sup>From observed tows.

<sup>2</sup>Thirteen species in Northeast Multispecies Fishery Management Plan: haddock, Atlantic cod, pollock, yellowtail flounder, winter flounder, witch flounder, windowpane, American plaice, Acadian redfish, white hake, red hake, silver hake, and ocean pout.



Table 4. Summary of retained catches (lb) and discards (lb) taken in the January-June 1994 experimental fishery. (Data are presented for tows made inside and outside Area II. All data are based on observed tows only.)

Species	Inside Area II			Outside Area II			Combined Total
	Retained Catches	Discards	Total	Retained Catches	Discards	Total	
Haddock <sup>1</sup>	1,071	59,863	60,934	1,909	6,189	8,098	69,032
Atlantic cod <sup>1</sup>	160,879	1,118	161,997	46,681	591	47,272	209,269
Pollock <sup>1</sup>	54,573	38	54,611	16,864	62	16,926	71,537
Yellowtail flounder <sup>1</sup>	17,096	464	17,560	2,487	70	2,557	20,117
Winter flounder <sup>1</sup>	3,614	3	3,617	836	24	860	4,477
Witch flounder <sup>1</sup>	3,765	169	3,934	1,666	170	1,836	5,770
Windowpane <sup>1</sup>	308	213	521	54	156	210	731
American plaice <sup>1</sup>	16,442	367	16,809	3,314	201	3,515	20,324
Acadian redfish <sup>1</sup>	154	3	157	889	337	1,226	1,383
White hake <sup>1</sup>	8,442	172	8,614	4,530	267	4,797	13,411
Red hake <sup>1</sup>	562	66	628	46	129	175	803
Silver hake <sup>1</sup>	109	384	493	0	319	319	812
Ocean pout <sup>1</sup>	105	3,386	3,491	0	1,084	1,084	4,575
Cusk	4,731	0	4,731	2,270	0	2,270	7,001
Atlantic wolffish	476	1	477	1,543	4	1,547	2,024
Goosefish	17,027	497	17,524	11,555	471	12,026	29,550
Skates	9,615	84,159	93,774	4,069	16,577	20,646	114,420
Spiny dogfish	0	13,672	13,672	0	5,750	5,750	19,422
Other fishes <sup>2</sup>	650	6,314	6,964	207	1,736	1,943	8,907
American lobster	3,003	774	3,777	1,300	303	1,603	5,380
Other invertebrates <sup>3</sup>	12	194	206	20	570	590	796
Total	302,634	171,857	474,491	100,240	35,010	135,250	609,741
Total FMP species <sup>1</sup>	267,120	66,246	333,366	79,276	9,599	88,875	422,241

<sup>1</sup>Thirteen species in Northeast Multispecies Fishery Management Plan: haddock, Atlantic cod, pollock, yellowtail flounder, winter flounder, witch flounder, windowpane, American plaice, Acadian redfish, white hake, red hake, silver hake, and ocean pout.

<sup>2</sup>Other fishes comprised 23 species. (See Table 1.)

<sup>3</sup>Other invertebrates comprised eight species. (See Table 1.)

Table 5. Catch per unit of effort (lb/hr fished) of retained catches and discards (lb) taken in the January-June 1994 experimental fishery. (Data are presented for tows made inside and outside Area II. All data are based on observed tows only.)

Species	Inside Area II			Outside Area II			Combined Total <sup>4</sup>
	Retained Catches	Discards	Total	Retained Catches	Discards	Total	
Haddock <sup>1</sup>	0.9	52.2	53.1	4.1	13.3	17.4	42.7
Atlantic cod <sup>1</sup>	140.2	1.0	141.2	100.1	1.3	101.4	129.7
Pollock <sup>1</sup>	47.5	0.1	47.6	36.2	0.1	36.3	44.3
Yellowtail flounder <sup>1</sup>	14.9	0.4	15.3	5.3	0.2	5.5	12.5
Winter flounder <sup>1</sup>	3.1	0.1	3.2	1.8	0.1	1.9	2.8
Witch flounder <sup>1</sup>	3.3	0.1	3.4	3.6	0.4	4.0	3.6
Windowpane <sup>1</sup>	0.3	0.2	0.5	0.1	0.3	0.4	0.5
American plaice <sup>1</sup>	14.3	0.3	14.6	7.1	0.4	7.5	12.6
Acadian redfish <sup>1</sup>	0.1	<0.1	0.1	1.9	0.7	2.6	0.9
White hake <sup>1</sup>	7.4	0.1	7.5	9.7	0.6	10.3	8.3
Red hake <sup>1</sup>	0.5	<0.1	0.5	0.1	0.3	0.4	0.5
Silver hake <sup>1</sup>	0.1	0.3	0.4	-	0.7	0.7	0.5
Ocean pout <sup>1</sup>	<0.1	3.0	3.0	-	2.3	2.3	2.8
Cusk	4.1	-	4.1	4.9	-	4.9	4.3
Atlantic wolffish	0.4	<0.1	0.4	3.3	<0.1	3.3	1.3
Goosefish	14.8	0.4	15.2	24.8	1.0	25.8	18.3
Skates	8.4	73.3	81.7	8.7	35.6	44.3	70.9
Spiny dogfish	-	11.9	11.9	-	12.3	12.3	12.0
Other fishes <sup>2</sup>	0.6	5.5	6.1	0.4	3.7	4.1	5.5
American lobster	2.6	0.7	3.3	2.8	0.6	3.4	3.3
Other invertebrates <sup>3</sup>	<0.1	0.2	0.2	<0.1	1.2	1.2	0.5
Total	263.7	149.7	413.4	215.0	75.1	290.1	377.8
Total FMP species <sup>1</sup>	232.7	57.7	290.4	170.0	20.6	190.6	261.6

<sup>1</sup>Thirteen species in Northeast Multispecies Fishery Management Plan: haddock, Atlantic cod, pollock, yellowtail flounder, winter flounder, witch flounder, windowpane, American plaice, Acadian redfish, white hake, red hake, silver hake, and ocean pout.

<sup>2</sup>Other fishes comprised 23 species. (See Table 1.)

<sup>3</sup>Other invertebrates comprised eight species. (See Table 1.)

<sup>4</sup>Total catches (retained and discards)/total fishing effort.

Table 6. Summary trip statistics for 14 trips made during the January-June 1994 experimental fishery. (Data are presented for tows made inside and outside Area II combined. All data are based on observed tows only.)

Statistic	Trip No.														Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Month	Jan	Feb	Feb	Mar	Mar	Mar	Mar	Apr	Apr	Apr	May	May	Jun	Jun <sup>2</sup>	
Target species	Cod	Cod	Cod	Mixed	Mixed	Cod	Pollock	Cod	Cod	Cod	Mixed	Mixed	Cod	Cod	
Mesh size (inches)	5.5	6.0	5.5/6.0	6.0	5.5	5.5	5.5	5.5	6.0	5.5	6.0	6.0	6.0	6.0	
Number of tows															
Total	30	20	58	27	26	36	43	39	42	29	41	44	45	42	522
Observed	24	17	41	24	20	27	43	39	34	29	34	39	38	36	445
Unobserved	6	3	17	3	6	9	0	0	8	0	7	5	7	6	77
% Observed	80	85	71	89	77	75	100	100	81	100	83	89	84	86	85
<b>Observed Tows</b>															
Effort (hr)	111.3	61.5	86.3	57.9	45.8	113.6	179.4	185.6	149.8	105.4	91.9	144.3	147.4	133.7	1614.0
Avg. tow duration (hr)	4.6	3.6	2.1	2.4	2.3	4.2	4.2	4.8	4.4	3.6	2.7	3.7	3.9	3.7	3.6
Catches (lb)															
Total all species	24,847	13,051	14,430	33,716	8,863	26,731	69,054	50,651	89,704	94,165	47,622	42,231	49,960	44,716	609,741
Haddock	362	228	9	554	28	119	1,817	2,159	3,784	7,004	12,821	9,393	11,943	18,811	69,032
Atlantic cod	7,171	1,348	8,527	6,682	2,433	23,435	16,883	16,240	31,063	56,218	5,682	7,934	21,221	4,432	209,269
FMP species <sup>1</sup>	11,735	4,441	9,224	20,892	3,446	25,199	44,837	34,594	55,311	86,123	28,820	20,936	37,598	39,085	422,241
Haddock															
Catch/tow (lb)	15.1	13.4	0.0	23.1	1.4	4.4	42.3	55.4	111.3	241.5	377.1	240.8	314.3	522.5	155.1
CPUE (lb/hr)	3.3	3.7	0.1	9.6	0.6	1.0	10.1	11.6	25.3	66.5	139.5	65.1	81.0	140.7	42.8
Largest tow (lb)	67	82	9	121	13	29	407	400	486	1,462	4,600	4,000	7,000	9,000	9,000

<sup>1</sup>Thirteen species in Northeast Multispecies Fishery Management Plan: haddock, Atlantic cod, pollock, yellowtail flounder, winter flounder, witch flounder, windowpane, American plaice, Acadian redfish, white hake, red hake, silver hake, and ocean pout.

<sup>2</sup>Six tows on this trip were made on 1 July.

Table 7. Summary of trip catches (lb; retained catches and discards combined) taken inside Area II during the January-June 1994 experimental fishery. (All data are based on observed tows only.)

Statistic/Species	Trip No.														Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
No. of observed tows	15	4	28	4	10	7	40	37	31	29	24	13	32	31	305
Fishing Effort (hr)	71.5	14.2	61.7	12.0	21.9	27.4	168.7	177.3	138.8	105.4	63.4	46.7	121.3	117.4	1147.7
Haddock <sup>1</sup>	180	6	0	80	28	0	1,674	1,859	3,765	7,004	12,643	8,700	10,705	14,290	60,934
Atlantic cod <sup>1</sup>	4,499	397	8,355	126	932	1,535	15,563	14,440	30,677	56,218	4,676	3,536	17,521	3,522	161,997
Pollock <sup>1</sup>	975	21	0	106	327	0	19,576	8,757	3,418	17,222	775	71	318	3,045	54,611
Yellowtail flounder <sup>1</sup>	93	8	134	4	113	2	595	4,774	10,340	0	236	126	1,120	15	17,560
Winter flounder <sup>1</sup>	128	2	403	0	40	55	260	90	9	0	124	367	1,919	220	3,617
Witch flounder <sup>1</sup>	219	0	0	18	25	2	973	129	345	723	463	2	0	1,035	3,934
Windowpane <sup>1</sup>	21	3	44	0	103	0	36	10	197	0	32	5	70	0	521
American plaice <sup>1</sup>	421	95	18	101	63	135	794	1,435	982	3,043	4,094	2	0	5,626	16,809
Acadian redfish <sup>1</sup>	1	0	0	0	0	0	144	0	2	9	1	0	0	0	157
White hake <sup>1</sup>	341	30	0	0	0	0	2,019	50	162	1,786	679	0	7	3,540	8,614
Red hake <sup>1</sup>	64	0	0	0	0	0	4	0	0	0	0	0	0	560	628
Silver hake <sup>1</sup>	63	0	0	4	8	0	81	18	104	90	74	0	0	51	493
Ocean pout <sup>1</sup>	135	0	0	31	0	28	205	82	2,299	28	165	103	410	5	3,491
Cusk	97	0	0	85	5	0	1,309	370	977	480	678	0	0	730	4,731
Atlantic wolffish	24	0	2	40	0	0	56	35	0	79	103	13	90	35	477
Goosefish	3,423	102	0	255	70	0	6,151	1,118	1,592	651	2,186	56	30	1,890	17,524
Skates	4,175	3,650	3,724	1,700	3,530	870	12,162	12,655	22,880	1,261	9,860	7,022	8,420	1,865	93,774
Spiny dogfish	275	0	0	500	95	0	2,358	1,285	2,357	4,807	79	1,258	573	85	13,672
Other fishes <sup>2</sup>	528	49	278	91	98	55	274	258	3,396	297	590	259	772	19	6,964
American lobster	480	22	107	21	87	0	1,317	171	454	465	340	22	4	287	3,777
Other invertebrates <sup>3</sup>	26	1	3	6	3	0	0	0	36	2	27	7	95	0	206
Total	16,168	4,386	13,068	3,168	5,527	2,682	65,551	47,536	83,992	94,165	37,825	21,549	42,054	36,820	474,491
Total FMP species <sup>1</sup>	7,140	562	8,954	470	1,639	1,757	41,924	31,644	52,300	86,123	23,962	12,912	32,070	31,909	333,366
Haddock as a % of:															
All species	1.1	0.1	0.0	2.5	0.5	0.0	2.6	3.9	4.5	7.4	33.4	40.4	25.5	38.8	12.8
FMP species <sup>1</sup>	2.5	1.1	0.0	17.0	1.7	0.0	4.0	5.9	7.2	8.1	52.8	67.4	33.4	44.8	18.3
Haddock															
Catch/tow (lb)	12.0	1.5	0.0	20.0	2.8	0.0	41.9	50.2	121.5	241.5	526.8	669.2	334.5	461.0	199.8
CPUE (lb/hr)	2.5	0.4	0.0	6.7	1.3	0.0	9.9	10.5	27.1	66.5	199.4	186.3	88.3	121.7	53.1

<sup>1</sup>Thirteen species in Northeast Multispecies Fishery Management Plan: haddock, Atlantic cod, pollock, yellowtail flounder, winter flounder, witch flounder, windowpane, American plaice, Acadian redfish, white hake, red hake, silver hake, and ocean pout.

<sup>2</sup>Other fishes comprised 23 species. (See Table 1.)

<sup>3</sup>Other invertebrates comprised eight species. (See Table 1.)

Table 8. Summary of trip catches (lb; retained catches and discards combined) taken outside Area II during the January-June 1994 experimental fishery. (All data are based on observed tows only.)

Statistic/Species	Trip No.														Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
No. of observed tows	9	13	13	20	10	20	3	2	3	0	10	26	6	5	140
Fishing effort (hr)	39.8	47.3	24.6	45.9	23.9	86.2	10.7	8.3	11.0	0	28.5	97.6	26.1	16.3	466.2
Haddock <sup>1</sup>	182	222	9	474	0	119	143	300	19	0	178	693	1,238	4,521	8,098
Atlantic cod <sup>1</sup>	2,672	951	172	6,556	1,501	21,900	1,320	1,800	386	0	1,006	4,398	3,700	910	47,272
Pollock <sup>1</sup>	456	916	0	10,989	0	290	1,225	800	10	0	1,555	255	50	380	16,926
Yellowtail flounder <sup>1</sup>	2	0	9	25	35	10	0	0	2,266	0	0	30	180	0	2,557
Winter flounder <sup>1</sup>	2	0	58	3	150	0	0	0	11	0	0	61	295	280	860
Witch flounder <sup>1</sup>	297	198	0	614	0	335	91	15	0	0	109	152	0	25	1,836
Windowpane <sup>1</sup>	0	0	17	47	110	0	0	0	0	0	0	36	0	0	210
American plaice <sup>1</sup>	382	256	5	442	11	668	37	35	8	0	864	692	0	115	3,515
Acadian redfish <sup>1</sup>	4	313	0	20	0	110	0	0	0	0	79	410	0	290	1,226
White hake <sup>1</sup>	326	982	0	805	0	0	87	0	0	0	1,052	890	0	655	4,797
Red hake <sup>1</sup>	175	0	0	0	0	0	0	0	0	0	0	0	0	0	175
Silver hake <sup>1</sup>	90	41	0	119	0	0	10	0	11	0	15	33	0	0	319
Ocean pout <sup>1</sup>	7	0	0	328	0	10	0	0	300	0	0	374	65	0	1,084
Cusk	347	268	0	626	0	5	60	40	0	0	696	163	0	65	2,270
Atlantic wolffish	8	17	0	874	0	20	0	0	0	0	200	403	20	5	1,547
Goosefish	2,930	2,320	26	2,118	0	0	408	45	45	0	2,603	1,231	50	250	12,026
Skates	163	1,030	925	5,545	1,443	265	40	20	2,180	0	720	6,370	1,765	180	20,646
Spiny dogfish	44	544	0	409	3	0	16	10	50	0	450	3,784	240	200	5,750
Other fishes <sup>2</sup>	76	46	118	291	41	230	18	25	421	0	77	447	153	0	1,943
American lobster	463	185	23	206	6	87	48	25	4	0	173	213	150	20	1,603
Other invertebrates <sup>3</sup>	53	376	0	57	36	0	0	0	1	0	20	47	0	0	590
Total	8,679	8,665	1,362	30,548	3,336	24,049	3,503	3,115	5,712	0	9,797	20,682	7,906	7,896	135,250
Total FMP species <sup>1</sup>	4,595	3,879	270	20,422	1,807	23,442	2,913	2,950	3,011	0	4,858	8,024	5,528	7,176	88,875
Haddock as a % of:															
All species	2.1	2.6	0.7	1.6	0.0	0.5	4.1	9.6	0.3	0.0	1.8	3.4	15.7	57.3	6.0
FMP species <sup>1</sup>	4.0	5.7	3.3	2.3	0.0	0.5	4.9	10.2	0.6	0.0	3.7	8.6	22.4	63.0	9.1
Haddock															
Catch/tow (lb)	20.2	17.1	0.7	23.7	0.0	6.0	47.7	150.0	6.3	0.0	17.8	26.7	206.3	904.2	57.8
CPUE (lb/hr)	4.6	4.7	0.4	10.3	0.0	1.4	13.4	36.1	1.7	0.0	6.2	7.1	47.4	25.8	17.4

<sup>1</sup>Thirteen species in Northeast Multispecies Fishery Management Plan: haddock, Atlantic cod, pollock, yellowtail flounder, winter flounder, witch flounder, windowpane, American plaice, Acadian redfish, white hake, red hake, silver hake, and ocean pout.

<sup>2</sup>Other fishes comprised 23 species. (See Table 1.)

<sup>3</sup>Other invertebrates comprised eight species. (See Table 1.)

Table 9. Summary of monthly catches (lb; retained catches and discards combined) taken inside Area II during the January-June 1994 experimental fishery. (All data are based on observed tows only.)

Statistic/Species	Month						Total
	Jan	Feb	Mar	Apr	May	Jun	
No. of observed tows	15	32	61	97	37	63	305
Fishing effort (hr)	71.5	75.9	230.0	421.5	110.1	238.7	1147.7
Haddock <sup>1</sup>	180	6	1,782	12,628	21,343	24,995	60,934
Atlantic cod <sup>1</sup>	4,499	8,752	18,156	101,335	8,212	21,043	161,997
Pollock <sup>1</sup>	975	21	20,009	29,397	846	3,363	54,611
Yellowtail flounder <sup>1</sup>	93	142	714	15,114	362	1,135	17,560
Winter flounder <sup>1</sup>	128	405	355	99	491	2,139	3,617
Witch flounder <sup>1</sup>	219	0	1,018	1,197	465	1,035	3,934
Windowpane <sup>1</sup>	21	47	139	207	37	70	521
American plaice <sup>1</sup>	421	113	1,093	5,460	4,096	5,626	16,809
Acadian redfish <sup>1</sup>	1	0	144	11	1	0	157
White hake <sup>1</sup>	341	30	2,019	1,998	679	3,547	8,614
Red hake <sup>1</sup>	64	0	4	0	0	560	628
Silver hake <sup>1</sup>	63	0	93	212	74	51	493
Ocean pout <sup>1</sup>	135	0	264	2,409	268	415	3,491
Cusk	97	0	1,399	1,827	678	730	4,731
Atlantic wolffish	24	2	96	114	116	125	477
Goosefish	3,423	102	6,476	3,361	2,242	1,920	17,524
Skates	4,175	7,374	18,262	36,796	16,882	10,285	93,774
Spiny dogfish	275	0	2,953	8,449	1,337	658	13,672
Other fishes <sup>2</sup>	528	327	518	3,951	849	791	6,964
American lobster	480	129	1,425	1,090	362	291	3,777
Other invertebrates <sup>3</sup>	26	4	9	38	34	95	206
Total	16,168	17,454	76,928	225,693	59,374	78,874	474,491
Total FMP species <sup>1</sup>	7,140	9,516	45,790	170,067	36,874	63,979	333,366
Haddock catches as a % of:							
All species	1.1	0.0	2.3	5.6	35.9	31.7	12.8
FMP species <sup>1</sup>	2.5	0.1	3.9	7.4	57.9	39.1	18.3
Haddock							
Catch/tow (lb)	12.0	0.2	29.2	130.2	576.8	396.7	199.8
CPUE (lb/hr)	2.5	0.1	7.7	30.0	193.9	104.7	53.1

<sup>1</sup>Thirteen species in Northeast Multispecies Fishery Management Plan: haddock, Atlantic cod, pollock, yellowtail flounder, winter flounder, witch flounder, windowpane, American plaice, Acadian redfish, white hake, red hake, silver hake, and ocean pout.

<sup>2</sup>Other fishes comprised 23 species. (See Table 1.)

<sup>3</sup>Other invertebrates comprised eight species. (See Table 1.)

Table 10. Summary of monthly retained catches (lb) taken inside Area II during the January-June 1994 experimental fishery. (All data are based on observed tows only.)

Statistic/Species	Month						Total
	Jan	Feb	Mar	Apr	May	Jun	
No. of observed tows	15	32	61	97	37	63	305
Fishing effort (hr)	71.5	75.9	230.0	421.5	110.1	238.7	1147.7
Haddock <sup>1</sup>	0	0	0	500	71	500	1,071
Atlantic cod <sup>1</sup>	4,460	8,749	18,097	100,697	8,081	20,795	160,879
Pollock <sup>1</sup>	968	21	20,009	29,372	843	3,360	54,573
Yellowtail flounder <sup>1</sup>	92	141	657	14,747	326	1,133	17,096
Winter flounder <sup>1</sup>	128	403	354	99	491	2,139	3,614
Witch flounder <sup>1</sup>	199	0	1,001	1,120	411	1,034	3,765
Windowpane <sup>1</sup>	0	38	81	110	9	70	308
American plaice <sup>1</sup>	390	113	1,082	5,337	3,945	5,575	16,442
Acadian redfish <sup>1</sup>	0	0	144	9	1	0	154
White hake <sup>1</sup>	341	30	2,019	1,905	602	3,545	8,442
Red hake <sup>1</sup>	0	0	2	0	0	560	562
Silver hake <sup>1</sup>	0	0	78	3	0	28	109
Ocean pout <sup>1</sup>	0	0	0	105	0	0	105
Cusk	97	0	1,399	1,827	678	730	4,731
Atlantic wolffish	24	2	95	114	116	125	476
Goosefish	3,350	102	6,415	3,144	2,096	1,920	17,027
Skates	530	768	967	1,080	2,080	4,190	9,615
Spiny dogfish	0	0	0	0	0	0	0
Other fishes <sup>2</sup>	70	0	112	361	95	12	650
American lobster	380	125	1,324	756	194	224	3,003
Other invertebrates <sup>3</sup>	0	0	0	10	2	0	12
Total	11,029	10,492	53,836	161,296	20,041	45,940	302,634
Total FMP species <sup>1</sup>	6,578	9,495	43,524	154,004	14,780	38,739	267,120
Haddock landings as a % of:							
All species	0.0	0.0	0.0	0.3	0.4	1.1	0.4
FMP species <sup>1</sup>	0.0	0.0	0.0	0.3	0.5	1.3	0.4

<sup>1</sup>Thirteen species in Northeast Multispecies Fishery Management Plan: haddock, Atlantic cod, pollock, yellowtail flounder, winter flounder, witch flounder, windowpane, American plaice, Acadian redfish, white hake, red hake, silver hake, and ocean pout.

<sup>2</sup>Other fishes comprised 23 species. (See Table 1.)

<sup>3</sup>Other invertebrates comprised eight species. (See Table 1.)

Table 11. Summary of monthly discarded catches (lb) taken inside Area II during the January-June 1994 experimental fishery. (All data are based on observed tows only.)

Statistic/Species	Month						Total
	Jan	Feb	Mar	Apr	May	Jun	
No. of observed tows	15	32	61	97	37	63	305
Fishing effort (hr)	71.5	75.9	230.0	421.5	110.1	238.7	1147.7
Haddock <sup>1</sup>	180	6	1,782	12,128	21,272	24,495	59,863
Atlantic cod <sup>1</sup>	39	3	59	638	131	248	1,118
Pollock <sup>1</sup>	7	0	0	25	3	3	38
Yellowtail flounder <sup>1</sup>	1	1	57	367	36	2	464
Winter flounder <sup>1</sup>	0	2	1	0	0	0	3
Witch flounder <sup>1</sup>	20	0	17	77	54	1	169
Windowpane <sup>1</sup>	21	9	58	97	28	0	213
American plaice <sup>1</sup>	31	0	11	123	151	51	367
Acadian redfish <sup>1</sup>	1	0	0	2	0	0	3
White hake <sup>1</sup>	0	0	0	93	77	2	172
Red hake <sup>1</sup>	64	0	2	0	0	0	66
Silver hake <sup>1</sup>	63	0	15	209	74	23	384
Ocean pout <sup>1</sup>	135	0	264	2,304	268	415	3,386
Cusk	0	0	0	0	0	0	0
Atlantic wolffish	0	0	1	0	0	0	1
Goosefish	73	0	61	217	146	0	497
Skates	3,645	6,606	17,295	35,716	14,802	6,095	84,159
Spiny dogfish	275	0	2,953	8,449	1,337	658	13,672
Other fishes <sup>2</sup>	458	327	406	3,590	754	779	6,314
American lobster	100	4	101	334	168	67	774
Other invertebrates <sup>3</sup>	26	4	9	28	32	95	194
Total	5,139	6,962	23,092	64,397	39,333	45,940	171,857
Total FMP species <sup>1</sup>	562	21	2,266	16,063	22,094	25,240	66,246
Haddock discards as a % of:							
All species	3.5	0.1	7.7	18.8	54.1	74.4	34.8
FMP species <sup>1</sup>	32.0	28.6	78.6	75.5	96.3	97.0	90.4

<sup>1</sup>Thirteen species in Northeast Multispecies Fishery Management Plan: haddock, Atlantic cod, pollock, yellowtail flounder, winter flounder, witch flounder, windowpane, American plaice, Acadian redfish, white hake, red hake, silver hake, and ocean pout.

<sup>2</sup>Other fishes comprised 23 species. (See Table 1.)

<sup>3</sup>Other invertebrates comprised eight species. (See Table 1.)



Table 12. Summary of monthly discard percentages (discard weight/total catch weight) of catches taken inside Area II during the January-June 1994 experimental fishery. (All data are based on observed tows only.)

Species	Month						Total
	Jan	Feb	Mar	Apr	May	Jun	
Haddock <sup>1</sup>	100.0	100.0	100.0	100.0	99.7	98.0	98.2
Atlantic cod <sup>1</sup>	0.9	<0.1	0.3	0.6	1.6	1.2	0.7
Pollock <sup>1</sup>	0.7	0.0	0.0	0.1	0.4	0.1	0.1
Yellowtail flounder <sup>1</sup>	1.1	0.7	8.0	2.4	9.9	0.2	2.6
Winter flounder <sup>1</sup>	0.0	0.5	0.3	0.0	0.0	0.0	0.1
Witch flounder <sup>1</sup>	9.1	-	1.7	6.4	11.6	0.1	4.3
Windowpane <sup>1</sup>	100.0	19.1	41.7	46.9	75.7	0.0	40.9
American plaice <sup>1</sup>	7.4	0.0	1.0	2.3	3.7	0.9	2.2
Acadian redfish <sup>1</sup>	100.0	-	0.0	18.2	0.0	-	1.9
White hake <sup>1</sup>	0.0	0.0	0.0	4.7	11.3	0.1	2.0
Red hake <sup>1</sup>	100.0	-	50.0	-	-	0.0	10.5
Silver hake <sup>1</sup>	100.0	-	16.1	98.6	100.0	45.1	77.9
Ocean pout <sup>1</sup>	100.0	-	100.0	95.6	100.0	100.0	97.0
Cusk	0.0	-	0.0	0.0	0.0	0.0	0.0
Atlantic wolffish	0.0	0.0	1.0	0.0	0.0	0.0	0.2
Goosefish	2.1	0.0	0.9	6.5	6.5	0.0	2.8
Skates	87.3	89.6	94.7	97.1	87.7	59.3	89.7
Spiny dogfish	100.0	-	100.0	100.0	100.0	100.0	100.0
Other fishes <sup>2</sup>	86.7	100.0	78.4	90.9	88.8	98.5	90.7
American lobster	20.8	3.1	7.1	30.6	46.4	23.0	20.5
Other invertebrates <sup>3</sup>	100.0	100.0	100.0	73.7	94.1	100.0	94.2
Total	31.8	39.9	30.0	28.5	66.2	58.2	36.2
Total FMP species <sup>1</sup>	7.9	0.2	4.9	9.4	59.9	39.5	19.9
Total FMP species <sup>1</sup> (excluding haddock)	5.5	0.2	1.1	2.5	5.3	1.9	2.3

<sup>1</sup>Thirteen species in Northeast Multispecies Fishery Management Plan: haddock, Atlantic cod, pollock, yellowtail flounder, winter flounder, witch flounder, windowpane, American plaice, Acadian redfish, white hake, red hake, silver hake, and ocean pout.

<sup>2</sup>Other fishes comprised 23 species. (See Table 1.)

<sup>3</sup>Other invertebrates comprised eight species. (See Table 1.)

<sup>4</sup>Total = total discards during January-June/total catches during January-June.

Table 13. Frequency distributions of observed tows in the January-June 1994 experimental fishery categorized by the catch (lb) of haddock. (Data are summarized separately for tows inside Area II, outside Area II, and both areas combined.)

Month	Pounds of Haddock										Pounds of Haddock				Total Tows
	0	1-50	51-100	101-150	151-200	201-250	251-500	501-1000	1001-5000	>5000	0	>0	>500	>1000	
<b>Inside Area II</b>															
Jan	6	9	0	0	0	0	0	0	0	0	6	9	0	0	15
Feb	31	1	0	0	0	0	0	0	0	0	31	1	0	0	32
Mar	20	31	8	1	0	0	0	0	0	0	20	41	0	0	61
Apr	19	34	12	9	7	2	8	4	2	0	19	78	6	2	97
May	6	7	6	2	0	1	4	6	5	0	6	31	11	5	37
Jun	5	32	12	2	1	1	6	1	1	2	5	58	4	3	63
Total	87	114	38	14	8	4	19	11	8	2	87	218	21	10	305
<b>Outside Area II</b>															
Jan	4	4	1	0	0	0	0	0	0	0	4	5	0	0	9
Feb	17	7	2	0	0	0	0	0	0	0	17	9	0	0	26
Mar	30	18	2	3	0	0	0	0	0	0	30	23	0	0	53
Apr	0	3	1	0	1	0	0	0	0	0	0	5	0	0	5
May	8	22	5	1	0	0	0	0	0	0	8	28	0	0	36
Jun	2	2	0	1	1	1	2	1	1	0	2	9	2	1	11
Total	61	56	11	5	2	1	2	1	1	0	61	79	2	1	140
<b>Inside &amp; Outside Area II Combined</b>															
Jan	10	13	1	0	0	0	0	0	0	0	10	14	0	0	24
Feb	48	8	2	0	0	0	0	0	0	0	48	10	0	0	58
Mar	50	49	10	4	0	0	1	0	0	0	50	64	0	0	114
Apr	19	37	13	9	8	2	8	4	2	0	19	83	6	2	102
May	14	29	11	3	0	1	4	6	5	0	14	59	11	5	73
Jun	7	34	12	3	2	2	8	2	2	2	7	67	6	4	74
Total	148	170	49	19	10	5	21	12	9	2	148	297	33	11	445

Table 14. Summary of monthly catches (lb; retained catches and discards combined) taken outside Area II during the January-June 1994 experimental fishery. (All data are based on observed tows only.)

Statistic/Species	Month						Total
	Jan	Feb	Mar	Apr	May	Jun	
No. of observed tows	9	26	53	5	36	11	140
Fishing effort (hr)	39.8	71.9	166.7	19.3	126.1	42.4	466.2
Haddock <sup>1</sup>	182	231	736	319	871	5,759	8,098
Atlantic cod <sup>1</sup>	2,672	1,123	31,277	2,186	5,404	4,610	47,272
Pollock <sup>1</sup>	456	916	12,504	810	1,810	430	16,926
Yellowtail flounder <sup>1</sup>	2	9	70	2,266	30	180	2,557
Winter flounder <sup>1</sup>	2	58	153	11	61	575	860
Witch flounder <sup>1</sup>	297	198	1,040	15	261	25	1,836
Windowpane <sup>1</sup>	0	17	157	0	36	0	210
American plaice <sup>1</sup>	382	261	1,158	43	1,556	115	3,515
Acadian redfish <sup>1</sup>	4	313	130	0	489	290	1,226
White hake <sup>1</sup>	326	982	892	0	1,942	655	4,797
Red hake <sup>1</sup>	175	0	0	0	0	0	175
Silver hake <sup>1</sup>	90	41	129	11	48	0	319
Ocean pout <sup>1</sup>	7	0	338	300	374	65	1,084
Cusk	347	268	691	40	859	65	2,270
Atlantic wolffish	8	17	894	0	603	25	1,547
Goosefish	2,930	2,346	2,526	90	3,834	300	12,026
Skates	163	1,955	7,293	2,200	7,090	1,945	20,646
Spiny dogfish	44	544	428	60	4,234	440	5,750
Other fishes <sup>2</sup>	76	164	580	446	524	153	1,943
American lobster	463	208	347	29	386	170	1,603
Other invertebrates <sup>3</sup>	53	376	93	1	67	0	590
Total	8,679	10,027	61,436	8,827	30,479	15,802	135,250
Total FMP species <sup>1</sup>	4,595	4,149	48,584	5,961	12,882	12,707	88,875
Haddock catches as a % of:							
All species	2.1	2.3	1.2	3.6	2.9	36.4	6.0
FMP species <sup>1</sup>	4.0	5.6	1.5	5.4	6.8	45.3	9.1
Haddock							
Catch/tow (lb)	20.2	8.9	13.9	63.8	24.2	523.5	57.8
CPUE (lb/hr)	4.6	3.2	4.4	16.5	6.9	135.8	17.4

<sup>1</sup>Thirteen species in Northeast Multispecies Fishery Management Plan: haddock, Atlantic cod, pollock, yellowtail flounder, winter flounder, witch flounder, windowpane, American plaice, Acadian redfish, white hake, red hake, silver hake, and ocean pout.

<sup>2</sup>Other fishes comprised 23 species. (See Table 1.)

<sup>3</sup>Other invertebrates comprised eight species. (See Table 1.)

Table 15. Summary of monthly retained catches (lb) taken outside Area II during the January-June 1994 experimental fishery. (All data are based on observed tows only.)

Statistic/Species	Month						Total
	Jan	Feb	Mar	Apr	May	Jun	
No. of observed tows	9	26	53	5	36	11	140
Fishing effort (hr)	39.8	71.9	166.7	19.3	126.1	42.4	466.2
Haddock <sup>1</sup>	177	171	495	0	567	500	1,909
Atlantic cod <sup>1</sup>	2,660	1,121	30,848	2,177	5,265	4,610	46,681
Pollock <sup>1</sup>	453	914	12,457	810	1,800	430	16,864
Yellowtail flounder <sup>1</sup>	2	9	52	2,218	26	180	2,487
Winter flounder <sup>1</sup>	2	56	131	11	61	575	836
Witch flounder <sup>1</sup>	263	196	929	15	238	25	1,666
Windowpane <sup>1</sup>	0	14	39	0	1	0	54
American plaice <sup>1</sup>	366	257	1,048	43	1,485	115	3,314
Acadian redfish <sup>1</sup>	4	260	17	0	318	290	889
White hake <sup>1</sup>	324	956	815	0	1,780	655	4,530
Red hake <sup>1</sup>	46	0	0	0	0	0	46
Silver hake <sup>1</sup>	0	0	0	0	0	0	0
Ocean pout <sup>1</sup>	0	0	0	0	0	0	0
Cusk	347	268	691	40	859	65	2,270
Atlantic wolffish	8	17	890	0	603	25	1,543
Goosefish	2,850	2,346	2,347	78	3,634	300	11,555
Skates	85	151	1,650	230	1,238	715	4,069
Spiny dogfish	0	0	0	0	0	0	0
Other fishes <sup>2</sup>	8	0	158	5	18	18	207
American lobster	355	202	273	23	277	170	1,300
Other invertebrates <sup>3</sup>	0	0	0	1	19	0	20
Total	7,950	6,937	52,840	5,651	18,189	8,673	100,240
Total FMP species <sup>1</sup>	4,297	3,953	46,831	5,274	11,541	7,380	79,276
Haddock landings as a % of:							
All species	2.2	2.5	0.9	0.0	3.1	5.8	1.9
FMP species <sup>1</sup>	4.1	4.3	1.1	0.0	4.9	6.8	2.4

<sup>1</sup>Thirteen species in Northeast Multispecies Fishery Management Plan: haddock, Atlantic cod, pollock, yellowtail flounder, winter flounder, witch flounder, windowpane, American plaice, Acadian redfish, white hake, red hake, silver hake, and ocean pout.

<sup>2</sup>Other fishes comprised 23 species. (See Table 1.)

<sup>3</sup>Other invertebrates comprised eight species. (See Table 1.)

Table 16. Summary of monthly discarded catches (lb) taken outside Area II during the January-June 1994 experimental fishery. (All data are based on observed tows only.)

Statistic/Species	Month						Total
	Jan	Feb	Mar	Apr	May	Jun	
No. of observed tows	9	26	53	5	36	11	140
Fishing effort (hr)	39.8	71.9	166.7	19.3	126.1	42.4	466.2
Haddock <sup>1</sup>	5	61	241	319	304	5,259	6,189
Atlantic cod <sup>1</sup>	12	2	429	9	139	0	591
Pollock <sup>1</sup>	3	2	47	0	10	0	62
Yellowtail flounder <sup>1</sup>	0	0	18	48	4	0	70
Winter flounder <sup>1</sup>	0	2	22	0	0	0	24
Witch flounder <sup>1</sup>	34	2	111	0	23	0	170
Windowpane <sup>1</sup>	0	3	118	0	35	0	156
American plaice <sup>1</sup>	16	4	110	0	71	0	201
Acadian redfish <sup>1</sup>	0	53	113	0	171	0	337
White hake <sup>1</sup>	2	26	77	0	162	0	267
Red hake <sup>1</sup>	129	0	0	0	0	0	129
Silver hake <sup>1</sup>	90	41	129	11	48	0	319
Ocean pout <sup>1</sup>	7	0	338	300	374	65	1,084
Cusk	0	0	0	0	0	0	0
Atlantic wolffish	0	0	4	0	0	0	4
Goosefish	80	0	179	12	200	0	471
Skates	78	1,804	5,643	1,970	5,852	1,230	16,577
Spiny dogfish	44	544	428	60	4,234	440	5,750
Other fishes <sup>2</sup>	68	164	422	441	506	135	1,736
American lobster	108	6	74	6	109	0	303
Other invertebrates <sup>3</sup>	53	376	93	0	48	0	570
Total	729	3,090	8,596	3,176	12,290	7,129	35,010
Total FMP species <sup>1</sup>	298	196	1,753	687	1,341	5,324	9,599
Haddock discards as a % of:							
All species	0.7	2.0	2.8	10.0	2.5	73.8	17.7
FMP species <sup>1</sup>	1.7	31.1	13.7	46.4	22.7	98.8	64.5

<sup>1</sup>Thirteen species in Northeast Multispecies Fishery Management Plan: haddock, Atlantic cod, pollock, yellowtail flounder, winter flounder, witch flounder, windowpane, American plaice, Acadian redfish, white hake, red hake, silver hake, and ocean pout.

<sup>2</sup>Other fishes comprised 23 species. (See Table 1.)

<sup>3</sup>Other invertebrates comprised eight species. (See Table 1.)

Table 17. Summary of monthly discard percentages (discard weight/total catch weight) of catches taken outside Area II during the January-June 1994 experimental fishery. (All data are based on observed tows only.)

Species	Month						Total
	Jan	Feb	Mar	Apr	May	Jun	
Haddock <sup>1</sup>	2.7	26.4	32.7	100.0	34.9	91.3	76.4
Atlantic cod <sup>1</sup>	0.4	0.2	1.4	0.4	2.6	0.0	1.3
Pollock <sup>1</sup>	0.7	0.2	0.4	0.0	0.6	0.0	0.4
Yellowtail flounder <sup>1</sup>	0.0	0.0	25.7	2.1	13.3	0.0	2.7
Winter flounder <sup>1</sup>	0.0	3.4	14.4	0.0	0.0	0.0	2.8
Witch flounder <sup>1</sup>	11.4	1.0	10.7	0.0	8.8	0.0	9.3
Windowpane <sup>1</sup>	-	17.6	75.2	-	97.2	-	74.3
American plaice <sup>1</sup>	4.2	1.5	9.5	0.0	4.6	0.0	5.7
Acadian redfish <sup>1</sup>	0.0	16.9	86.9	-	35.0	0.0	21.8
White hake <sup>1</sup>	0.6	2.6	8.6	-	8.3	0.0	5.6
Red hake <sup>1</sup>	73.7	-	-	-	-	-	73.7
Silver hake <sup>1</sup>	100.0	100.0	100.0	100.0	100.0	0.0	100.0
Ocean pout <sup>1</sup>	100.0	-	100.0	100.0	100.0	100.0	100.0
Cusk	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Atlantic wolffish	0.0	0.0	0.4	-	0.0	0.0	0.3
Goosefish	2.7	0.0	7.1	13.3	5.2	0.0	3.9
Skates	47.9	92.3	77.4	89.5	82.5	63.2	80.3
Spiny dogfish	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Other fishes <sup>2</sup>	89.5	100.0	72.8	98.9	96.6	88.2	89.3
American lobster	23.3	2.9	21.3	20.7	28.2	0.0	18.9
Other invertebrates <sup>3</sup>	100.0	100.0	100.0	0.0	71.6	-	96.6
Total	8.4	30.8	14.0	36.0	40.3	45.1	25.9
Total FMP species <sup>1</sup>	6.5	4.7	3.6	11.5	10.4	41.9	10.8
Total FMP species <sup>1</sup> (excluding haddock)	6.6	3.4	3.2	6.5	8.6	0.9	4.2

<sup>1</sup>Thirteen species in Northeast Multispecies Fishery Management Plan: haddock, Atlantic cod, pollock, yellowtail flounder, winter flounder, witch flounder, windowpane, American plaice, Acadian redfish, white hake, red hake, silver hake, and ocean pout.

<sup>2</sup>Other fishes comprised 23 species. (See Table 1.)

<sup>3</sup>Other invertebrates comprised eight species. (See Table 1.)

<sup>4</sup>Total = total discards during January-June/total catches during January-June.

Table 18. Summary statistics for the July 1994 sea sampling trips on Georges Bank. (Data are presented for tows made inside and outside Area II. All catch data are based on observed tows only. Two trips were conducted using two different vessels.)

Statistic	Inside Area II	Outside Area II	Total
Number of tows observed	37	36	73
Number of tows unobserved	11	4	15
Total tows	48	40	88
Percent observed	77	90	83
Avg. tow time (hr) <sup>1</sup>	3.2	4.0	3.6
Total effort (hr) <sup>1</sup>	118.8	145.4	264.2
<b>Observed Tows</b>			
Total catch (lb)	24,792	18,877	43,699
Haddock	22	798	820
FMP species <sup>2</sup>	12,037	12,410	24,447
Others	12,755	6,467	19,222
Total discards (lb)	12,225	4,782	17,007
Haddock	0	287	287
FMP species <sup>2</sup>	1,448	653	3,549
Others	10,077	3,842	13,919
Haddock catch/total catch (%)	0.1	4.2	1.9
Haddock catch/FMP species catch (%) <sup>2</sup>	0.2	6.4	3.4
Haddock discards/total discards (%)	0.0	6.0	1.8

<sup>1</sup>From observed tows.

<sup>2</sup>Thirteen species in Northeast Multispecies Fishery Management Plan: haddock, Atlantic cod, pollock, yellowtail flounder, winter flounder, witch flounder, windowpane, American plaice, Acadian redfish, white hake, red hake, silver hake, and ocean pout.

Table 19. Summary of retained catches (lb) and discards (lb) taken in two July 1994 sea sampling trips on Georges Bank. (Data are presented for tows made inside and outside Area II. All data are based on observed tows only.)

Species	Inside Area II			Outside Area II			Combined Total
	Retained Catches	Discards	Total	Retained Catches	Discards	Total	
Haddock <sup>1</sup>	22	0	22	511	287	798	820
Atlantic cod <sup>1</sup>	139	11	150	3,825	2	3,827	3,977
Pollock <sup>1</sup>	0	0	565	0	565	565	
Yellowtail flounder <sup>1</sup>	10,192	1,139	11,331	0	0	0	11,331
Winter flounder <sup>1</sup>	28	0	28	0	0	0	28
Witch flounder <sup>1</sup>	85	1	86	473	108	581	667
Windowpane <sup>1</sup>	26	14	40	0	0	0	40
American plaice <sup>1</sup>	36	2	38	3,431	457	3,888	3,926
Acadian redfish <sup>1</sup>	0	0	0	525	77	602	602
White hake <sup>1</sup>	54	65	119	1,660	0	1,660	1,779
Red hake <sup>1</sup>	0	0	0	480	0	480	480
Silver hake <sup>1</sup>	7	59	66	0	9	9	75
Ocean pout <sup>1</sup>	0	157	157	0	0	0	157
Cusk	0	0	0	205	0	205	205
Atlantic wolffish	0	0	0	743	0	743	743
Goosefish	1,438	54	1,492	1,257	10	1,267	2,759
Skates	920	9,258	10,178	410	1,565	1,975	12,153
Spiny dogfish	0	0	0	0	1,920	1,920	1,920
Other fishes <sup>2</sup>	13	673	686	10	192	202	888
American lobster	74	18	92	0	0	0	92
Other invertebrates <sup>3</sup>	233	74	307	0	155	155	462
Total	13,267	11,525	24,792	14,095	4,782	18,877	43,669
Total FMP species <sup>1</sup>	10,589	1,448	12,037	11,470	940	12,410	24,447

<sup>1</sup>Thirteen species in Northeast Multispecies Fishery Management Plan: haddock, Atlantic cod, pollock, yellowtail flounder, winter flounder, witch flounder, windowpane, American plaice, Acadian redfish, white hake, red hake, silver hake, and ocean pout.

<sup>2</sup>Other fishes comprised 23 species. (See Table 1.)

<sup>3</sup>Other invertebrates comprised eight species. (See Table 1.)



Table 20. Size composition data (total length; cm) of groundfish FMP species sampled (retained and discarded) in the January-June 1994 experimental fishery. Goosefish samples are also presented. (Data are presented for tows made inside and outside Area II. All data are based on observed tows only.)

Species	Retained Catches				Minimum Legal Size (cm)	Discards				Total Number Measured
	N	Total Length (cm)				N	Total Length (cm)			
		Min	Max	Mean			Min	Max	Mean	
<b>Inside Area II</b>										
Haddock	84	55	83	71.1	48	3884	32	88	62.1	3968
Atlantic cod	787	47	117	70.5	48	156	27	49	43.4	943
Pollock	29	61	105	81.4	48	3	44	52	48.3	32
Yellowtail flounder	354	32	48	36.4	33	152	24	48	33.7	506
Winter flounder	97	30	55	41.9	30	1	29	29	29.0	98
Witch flounder	187	35	58	43.0	36	17	31	37	33.2	204
Windowpane	65	28	38	31.7	-	70	24	30	28.5	135
American plaice	128	31	59	47.3	36	92	25	36	33.4	220
White hake	260	42	83	62.9	-	2	36	36	36.0	262
Goosefish	341	30	92	57.0	-	15	18	31	24.7	356
Total	2332					4392				6724
<b>Outside Area II</b>										
Haddock	269	46	84	58.8	48	564	23	80	49.4	833
Atlantic cod	823	48	111	68.9	48	254	29	49	41.0	1077
Pollock	128	52	106	78.5	48	3	39	47	41.7	131
Yellowtail flounder	55	33	44	35.2	33	2	30	31	30.5	57
Winter flounder	38	32	60	43.4	30	5	30	33	31.2	43
Witch flounder	82	35	58	43.7	36	1	34	34	34.0	83
Windowpane flounder	24	31	36	32.4	-	92	23	30	27.3	116
American plaice	140	33	59	43.3	36	26	20	34	28.8	166
White hake	57	43	76	59.7	-	21	29	51	39.8	78
Goosefish	66	31	88	54.0	-	34	15	30	24.6	100
Total	1682					1002				2684

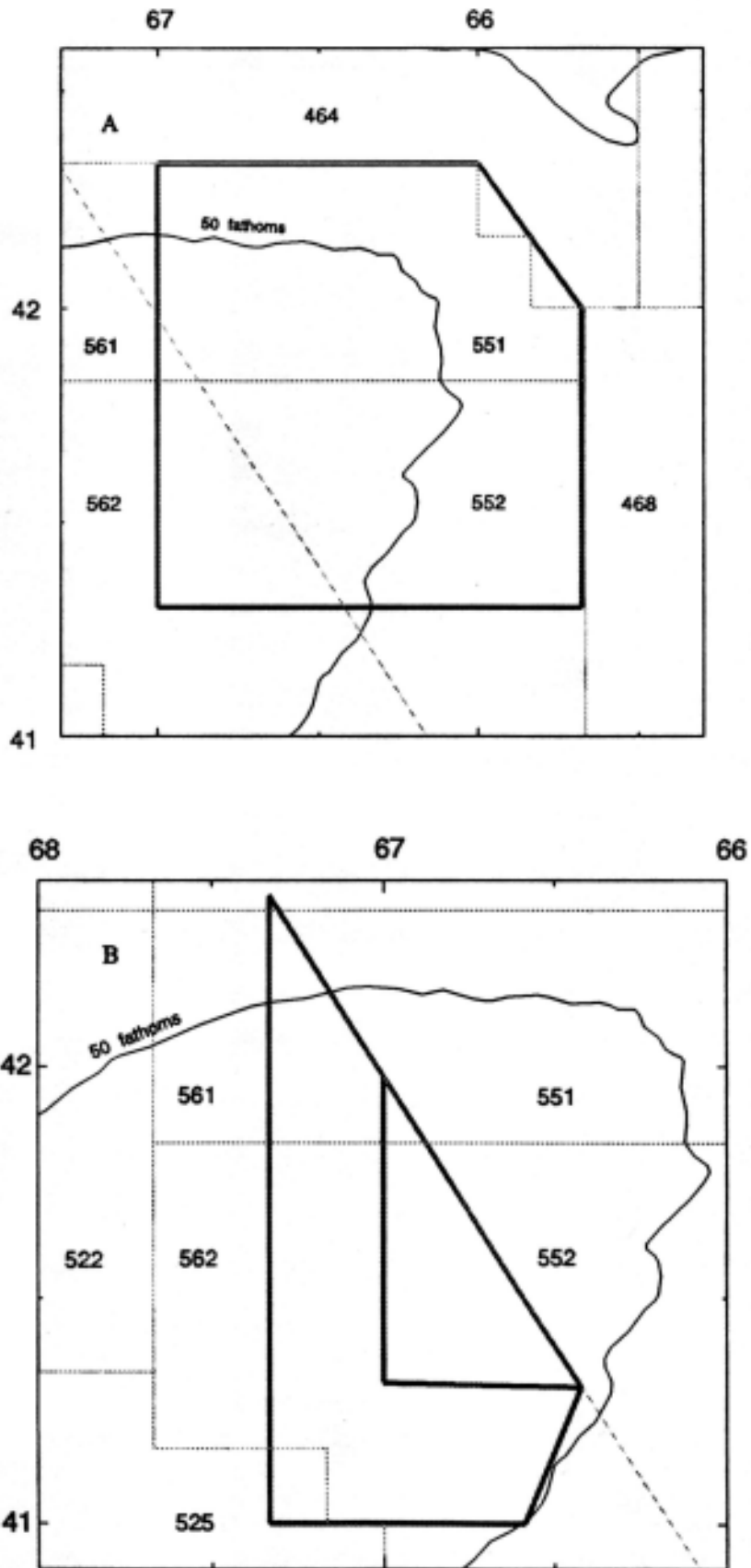


Figure 1. A) ICNAF haddock closed area established in 1970. B) U.S. haddock closed Area II. (The inner, small, triangle-shaped area is that portion of the ICNAF haddock closed area which remained in U.S. waters after the World Court divided Georges Bank between the United States and Canada in 1984. The outer, large, "L"-shaped area is the expansion which went into effect in January 1994 due to Amendment 5 to the Northeast Multispecies Fishery Management Plan.)

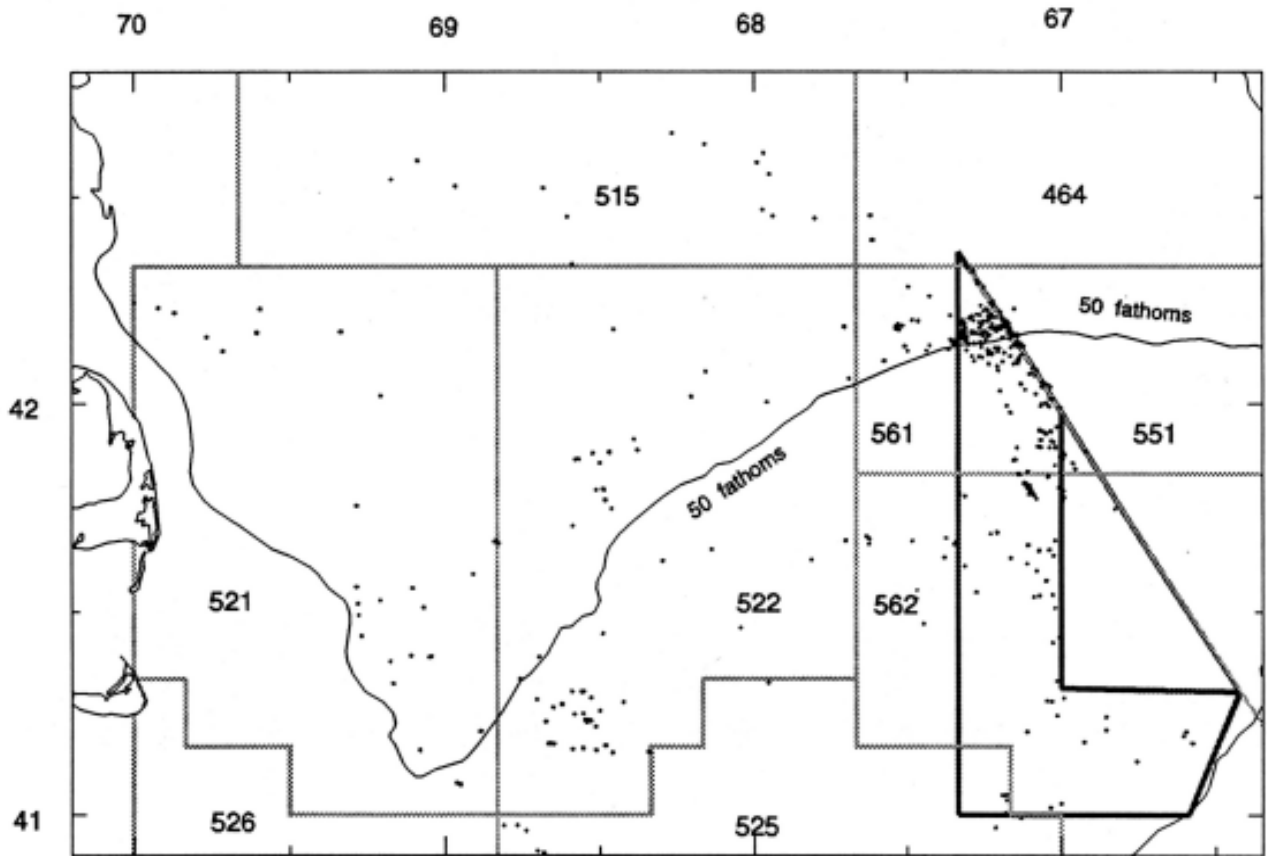


Figure 2. Location of all tows (observed and unobserved) in the January-June 1994 experimental fishery. (Three-digit numbers refer to the NEFSC statistical catch reporting areas. Tows located within the inner triangle of Area II were made on 1 July.)

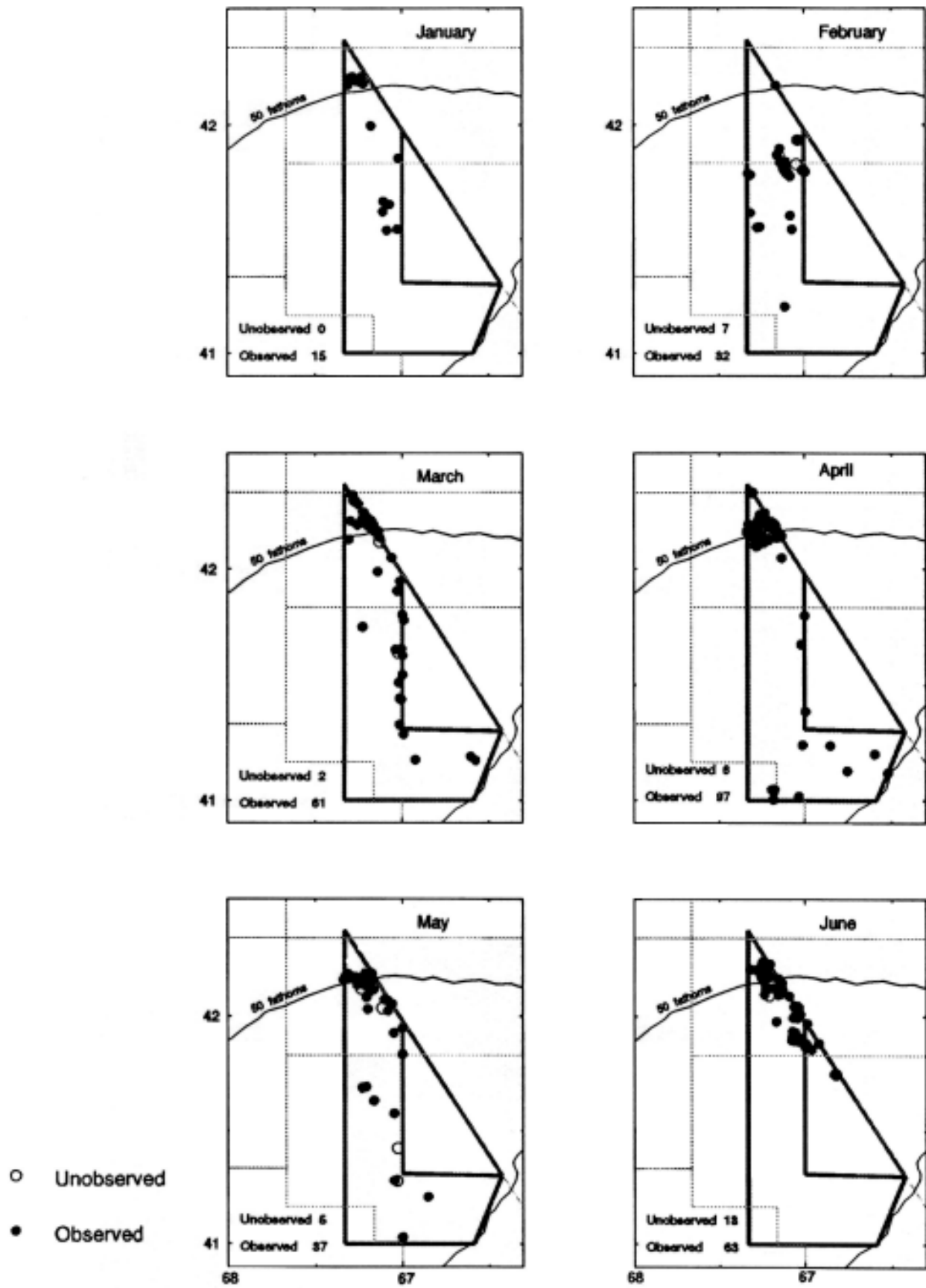


Figure 3. Location of all tows by month in the January-June 1994 experimental fishery. (Data are for observed and unobserved tows in Area II. Tows located within the inner triangle of Area II were made on 1 July.)

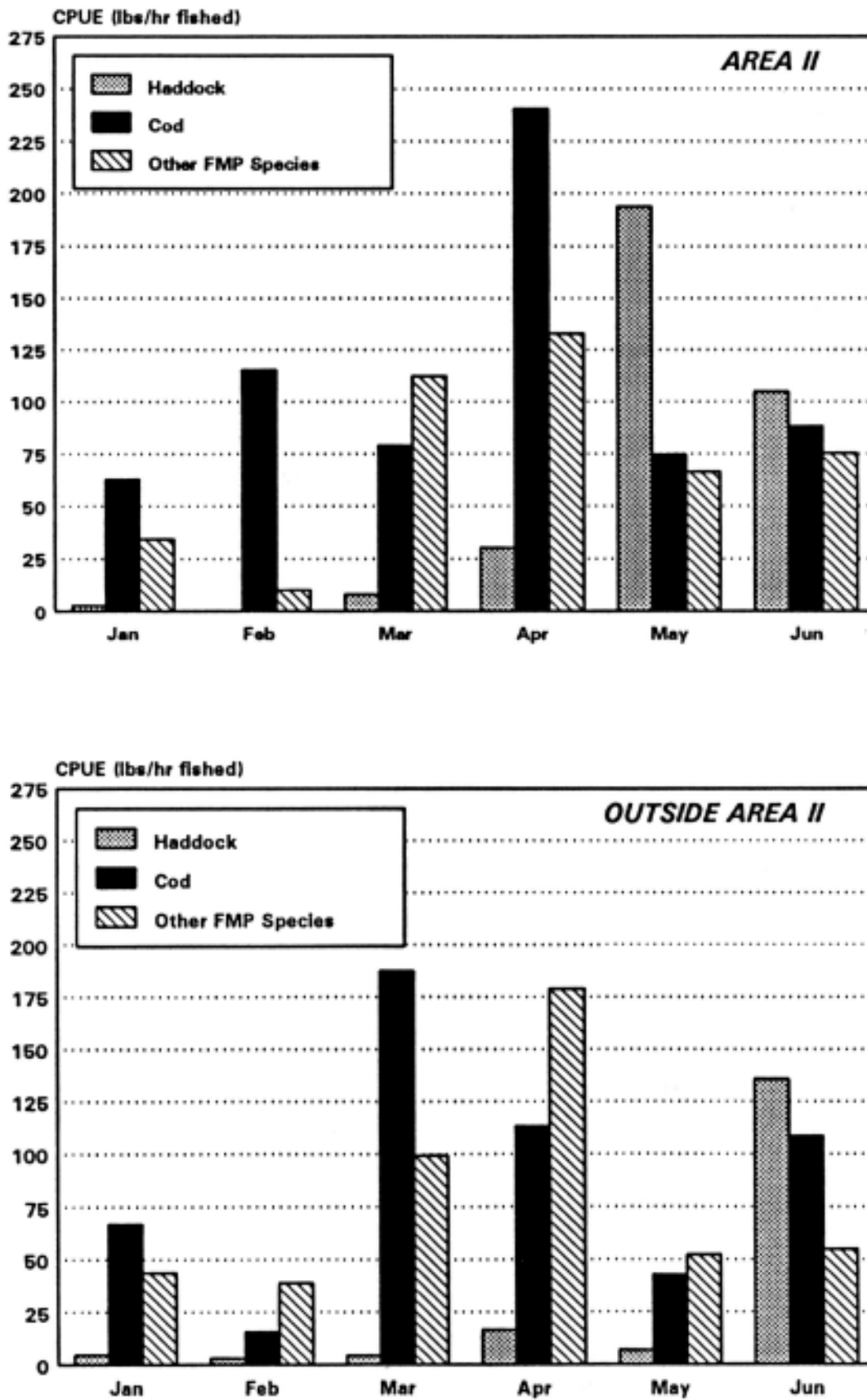


Figure 2. Catch per unit of effort (lb/hr fished) by month for haddock, Atlantic cod, and 11 other groundfish FMP species taken inside Area II (upper panel) and outside Area II (lower panel) in the January-June 1994 experimental fishery.

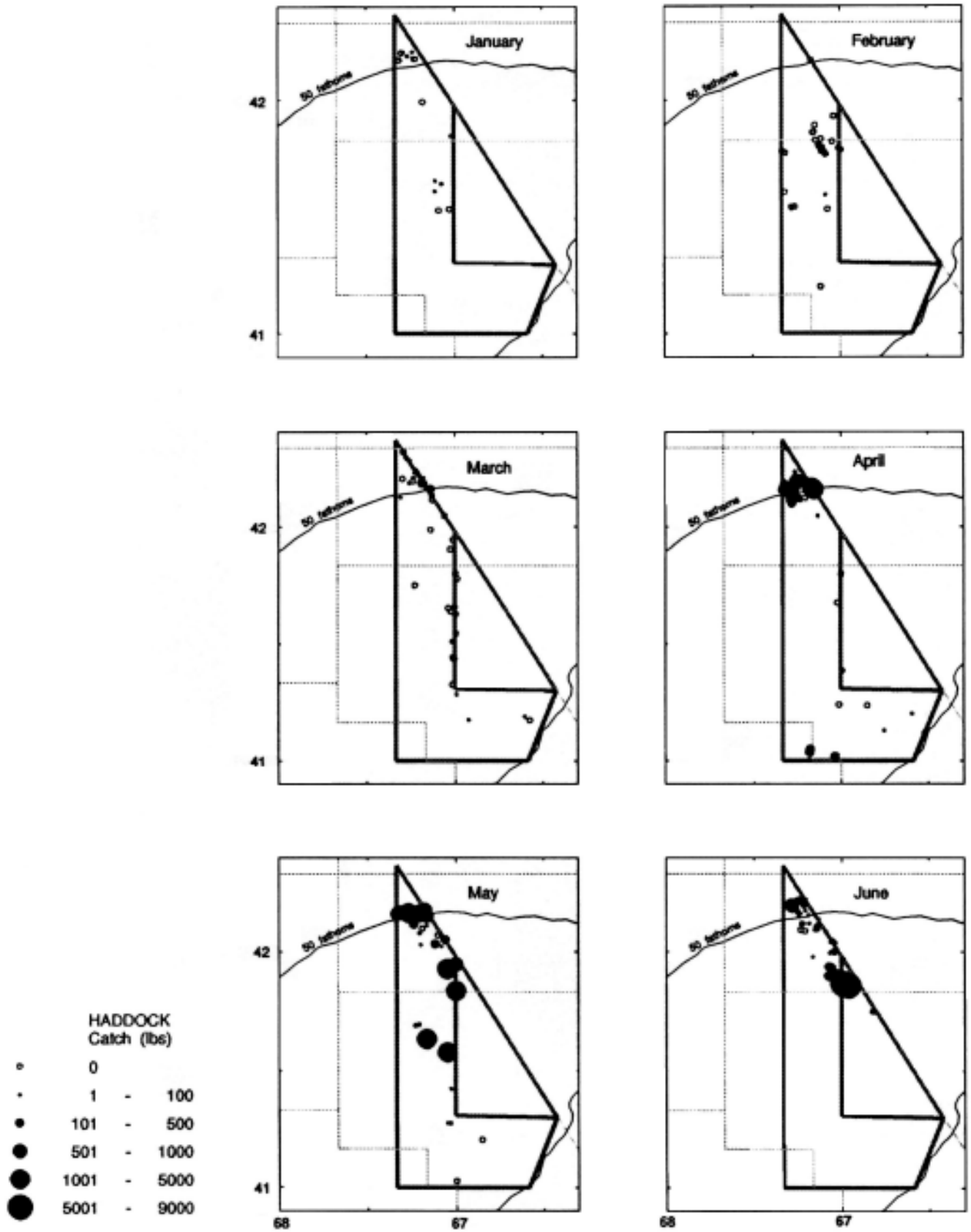


Figure 5. Distribution of haddock catches by month in the January-June 1994 experimental fishery. (Data are for observed tows in Area II.)

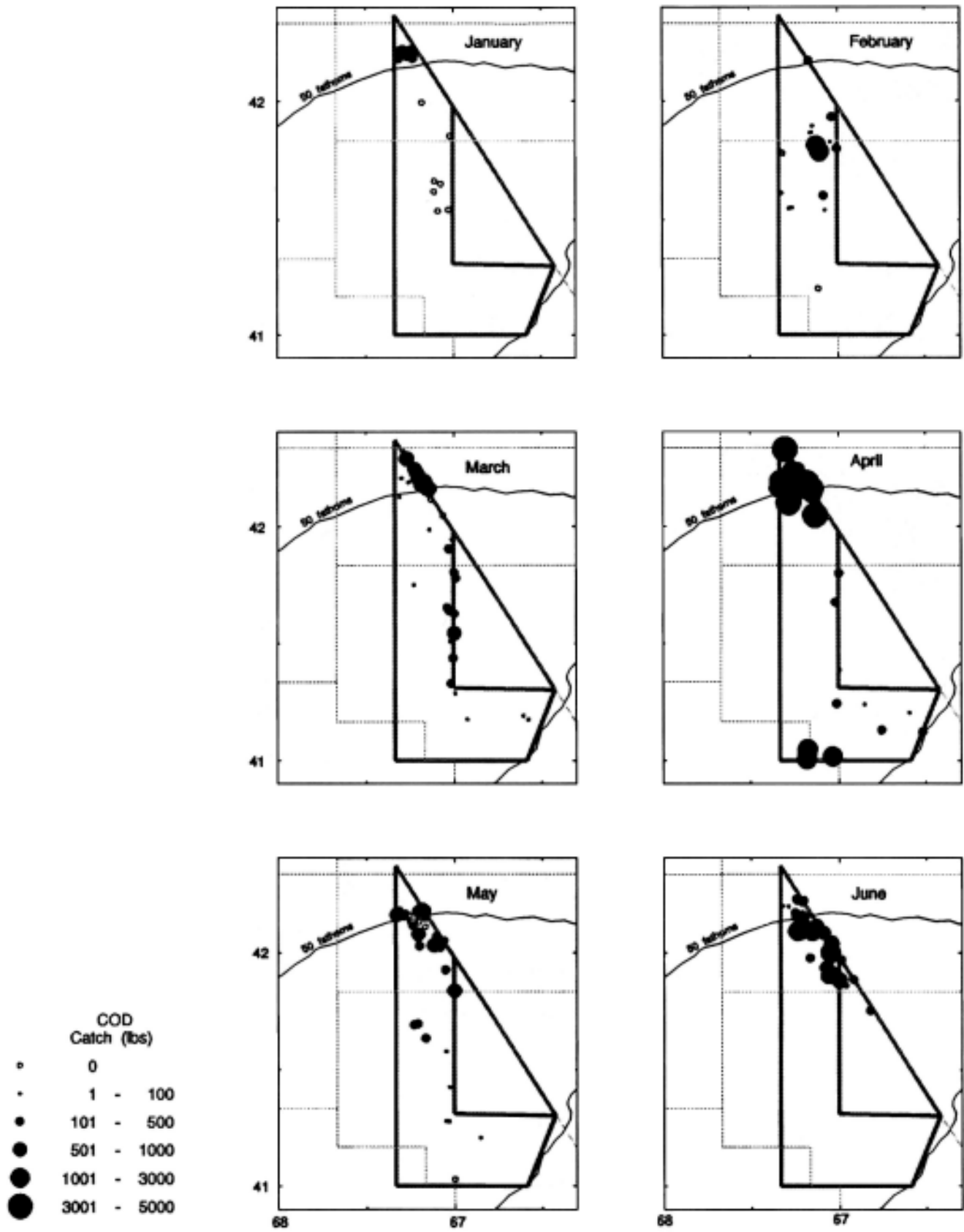


Figure 6. Distribution of Atlantic cod catches by month in the January-June 1994 experimental fishery. (Data are for observed tows in Area II.)

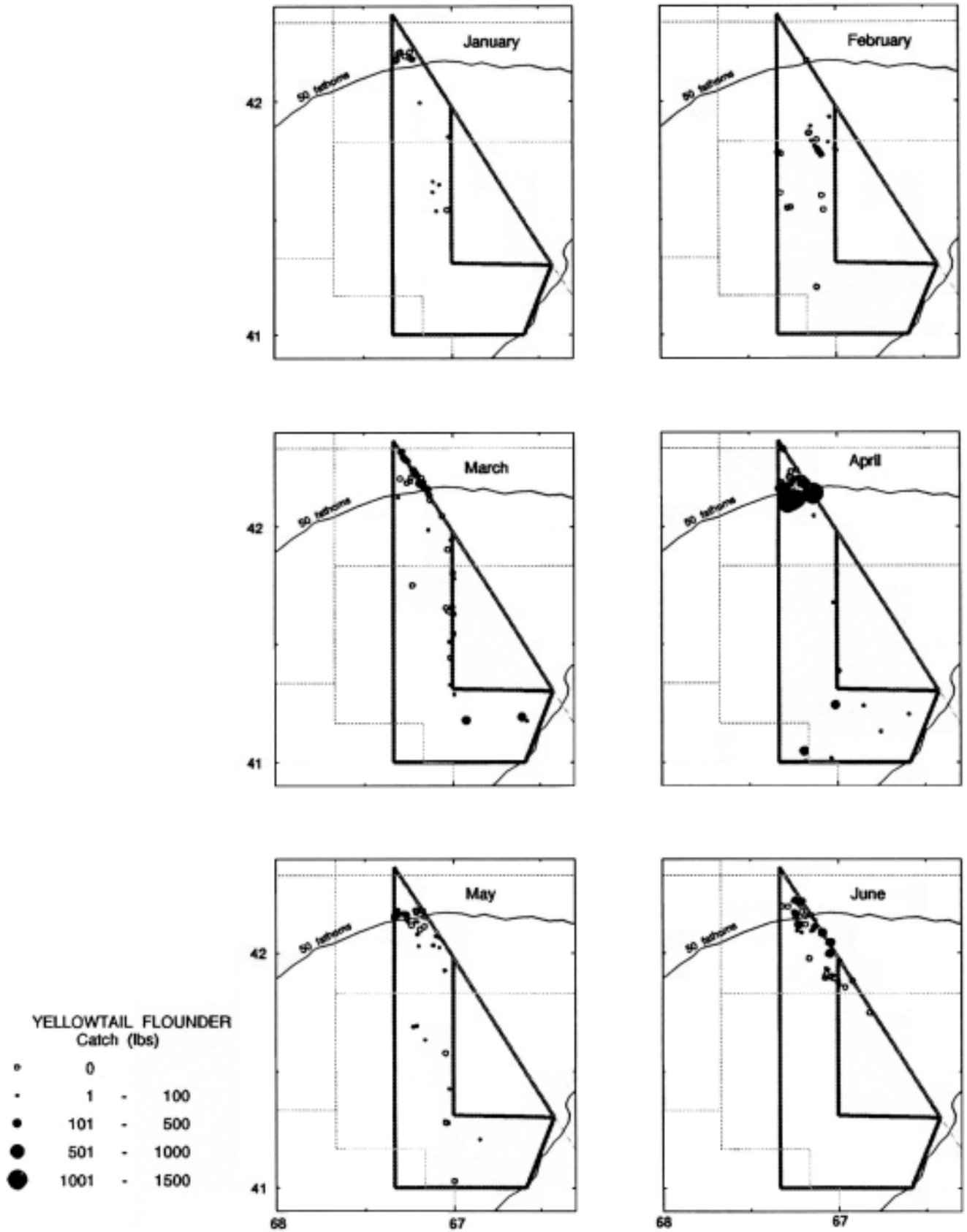


Figure 7. Distribution of yellowtail flounder catches by month in the January-June 1994 experimental fishery. (Data are for observed tows in Area II.)



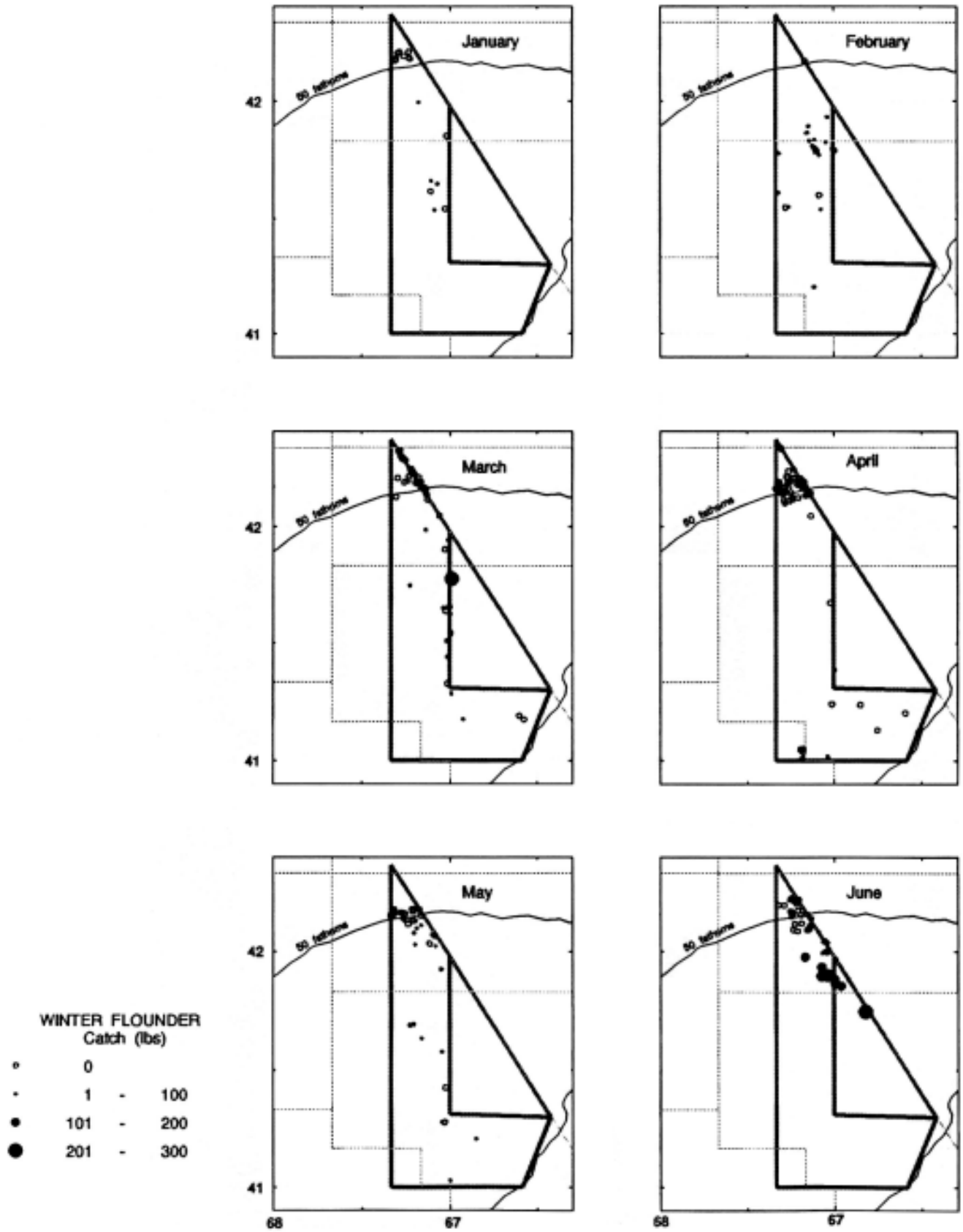


Figure 8. Distribution of winter flounder catches by month in the January-June 1994 experimental fishery. (Data are for observed tows in Area II.)

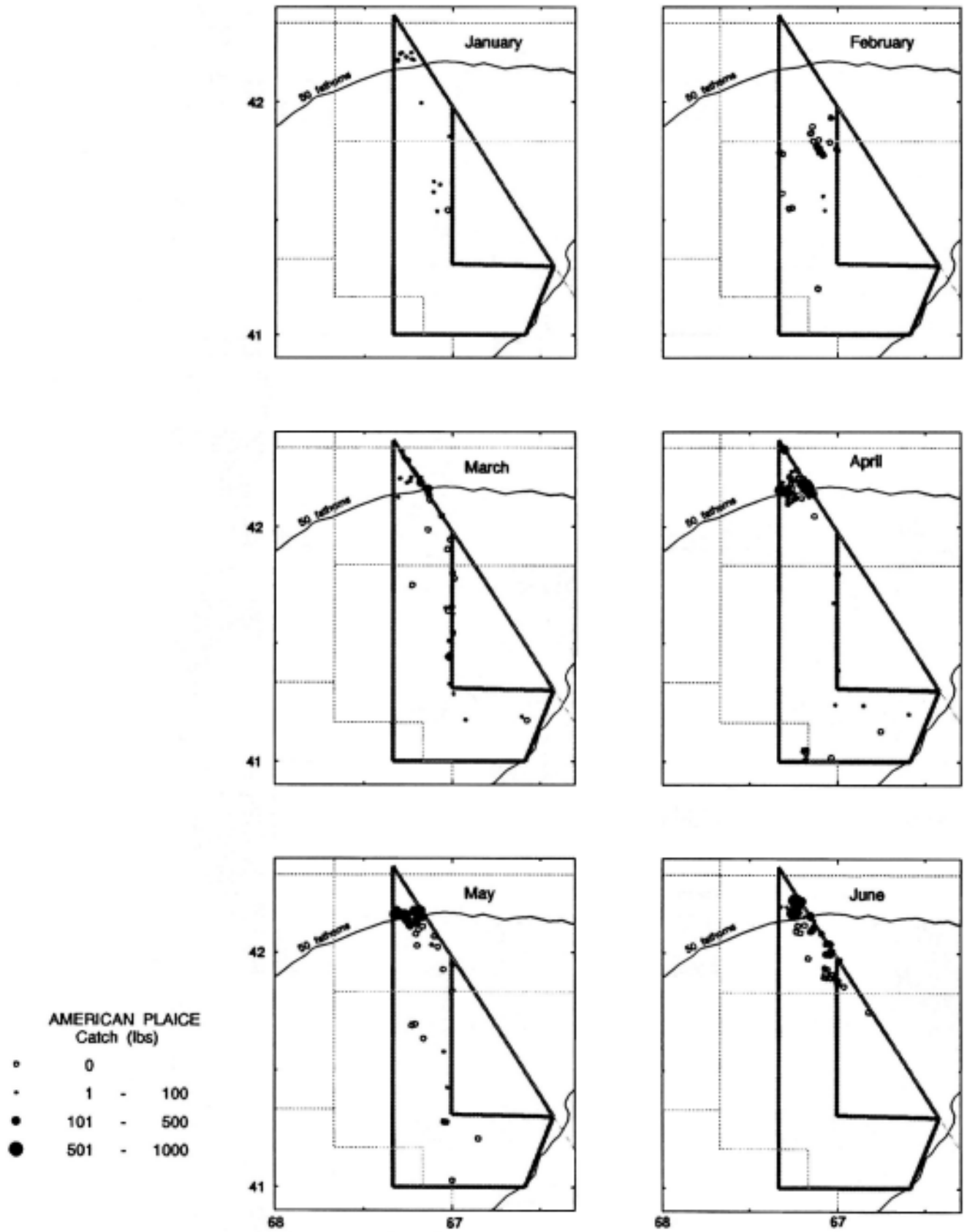


Figure 9. Distribution of American plaice catches by month in the January-June 1994 experimental fishery. (Data are for observed tows in Area II.)

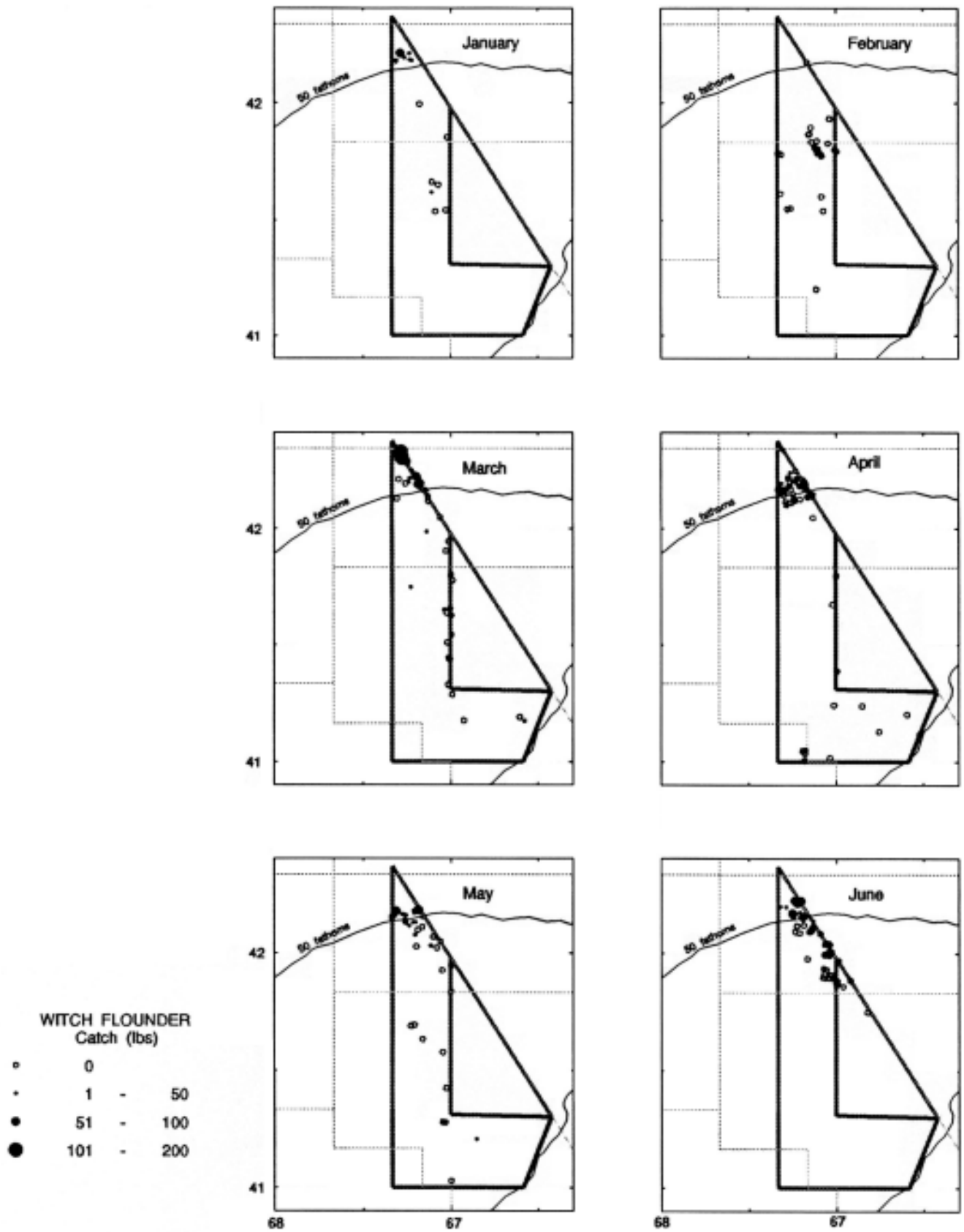


Figure 10. Distribution of witch flounder catches by month in the January-June 1994 experimental fishery. (Data are for observed tows in Area II.)

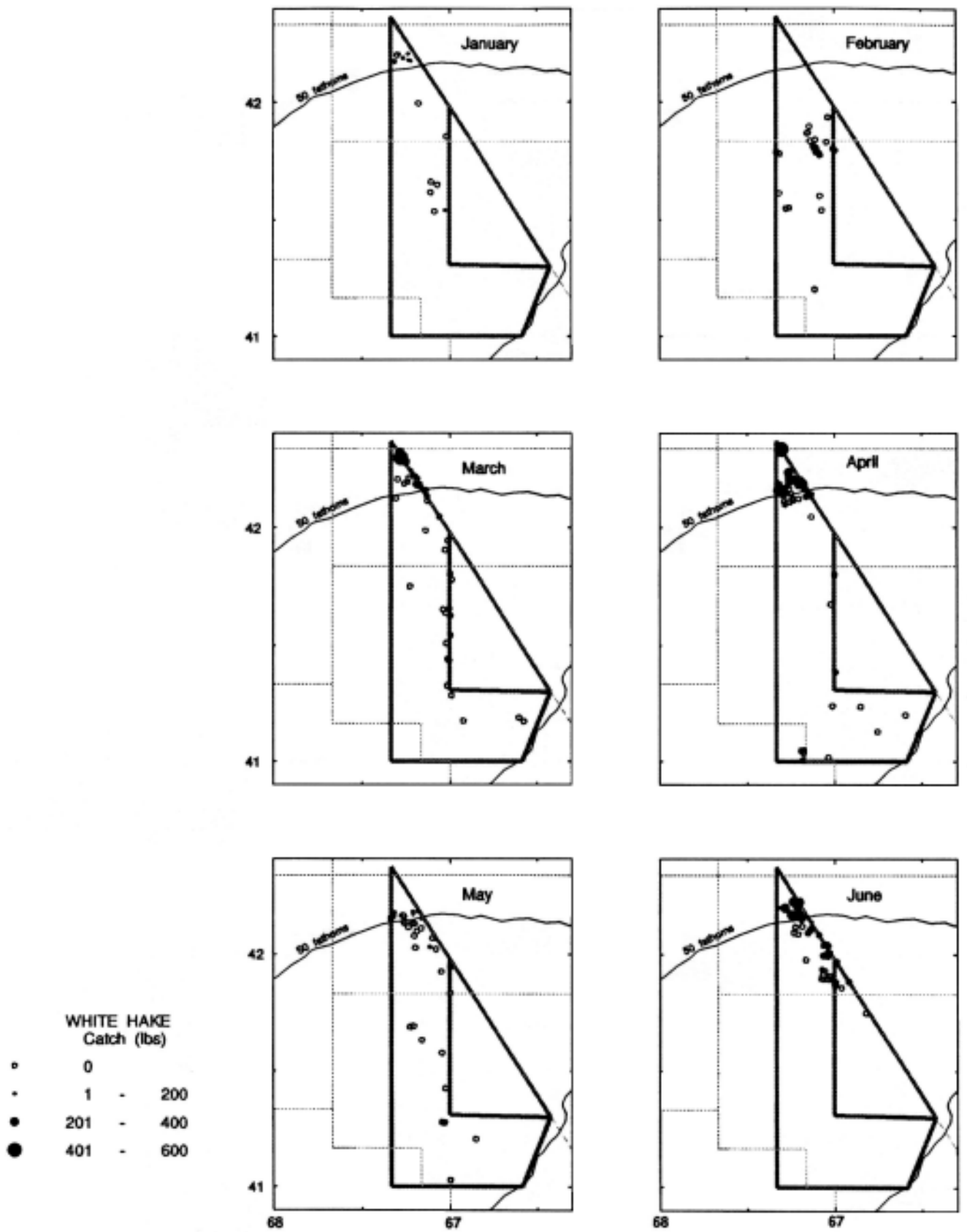


Figure 11. Distribution of white hake catches by month in the January-June 1994 experimental fishery. (Data are for observed tows in Area II.)

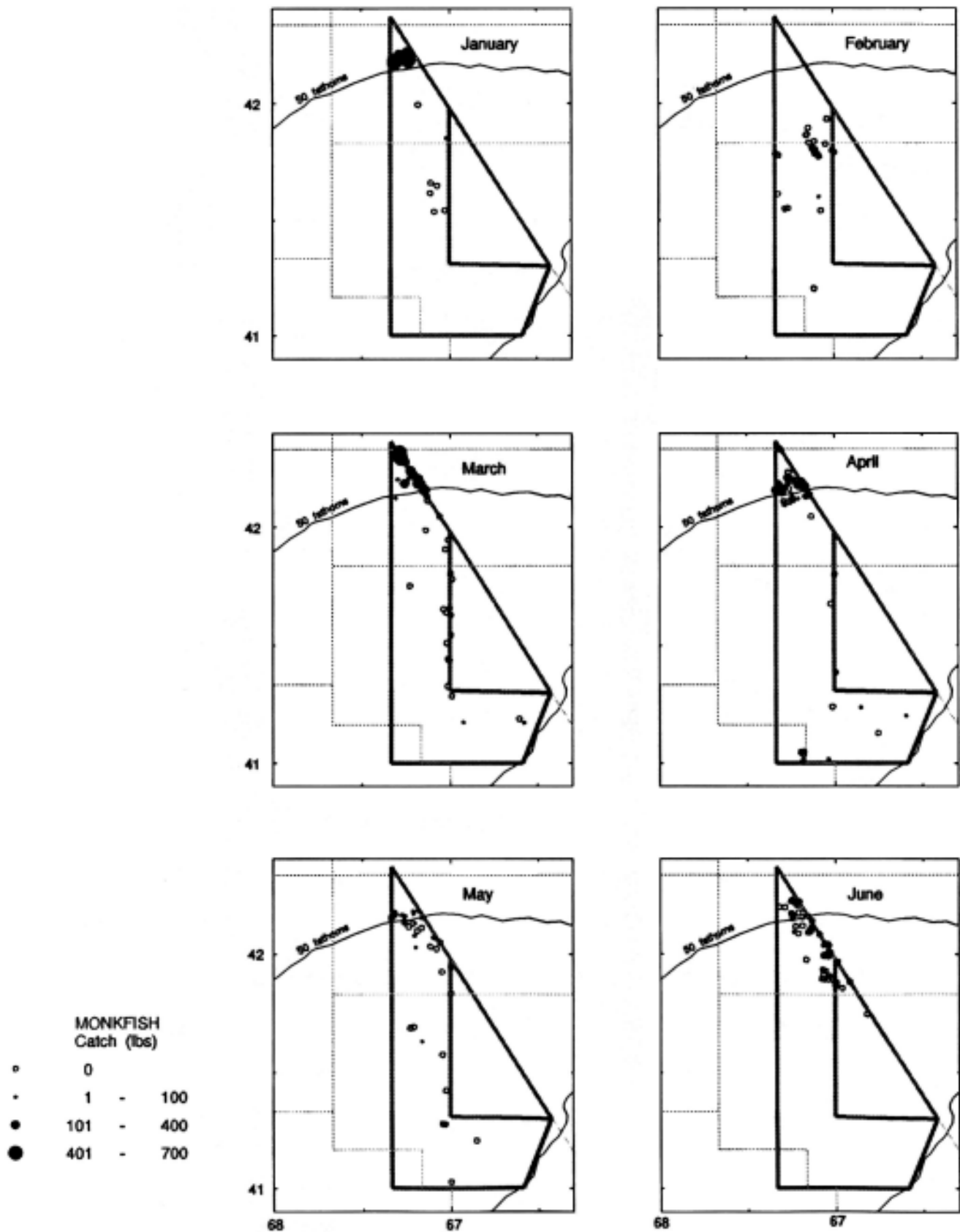


Figure 12. Distribution of goosefish catches by month in the January-June 1994 experimental fishery. (Data are for observed tows in Area II.)

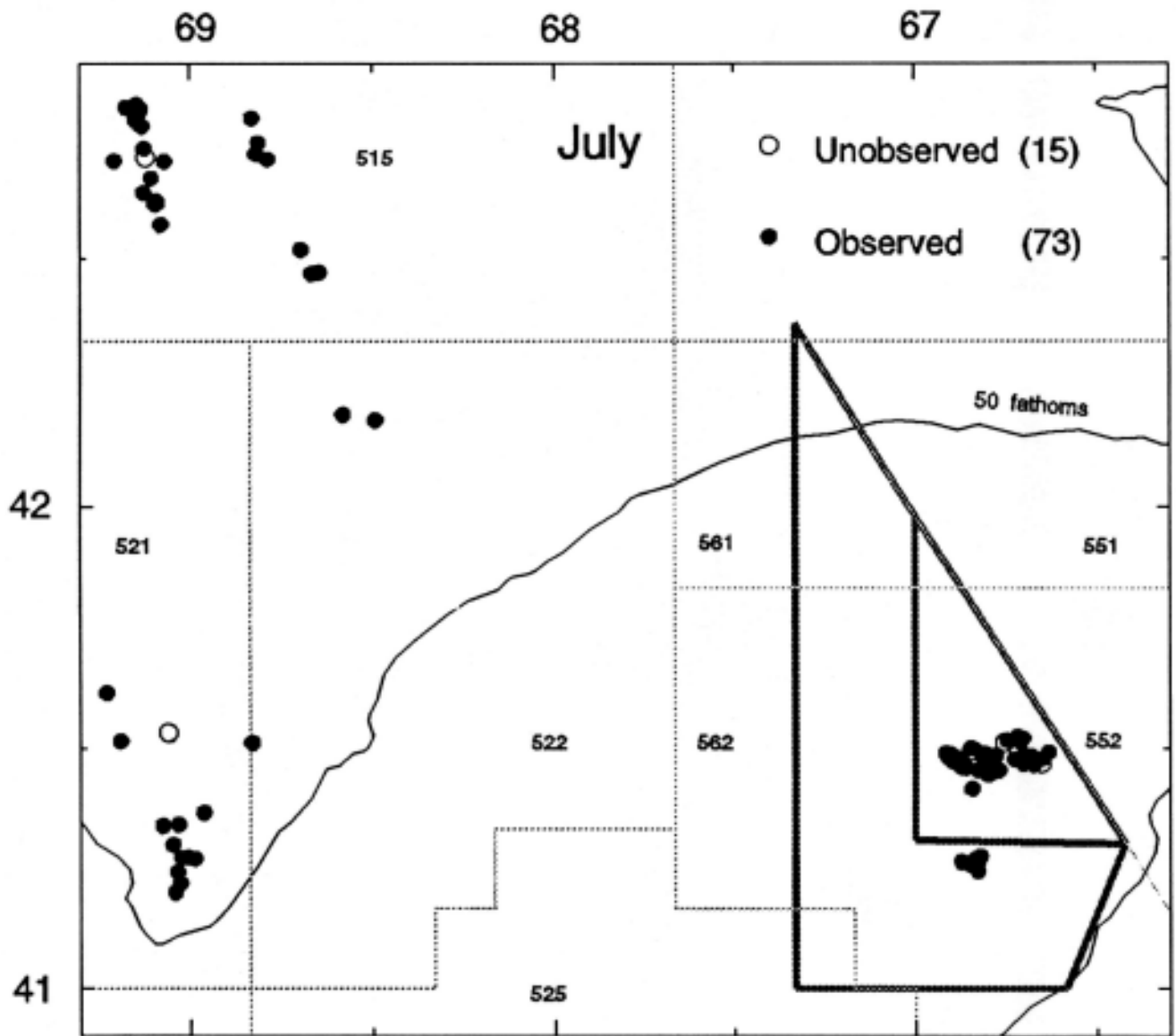


Figure 13. Location of all tows in the two July 1994 Georges Bank trips.

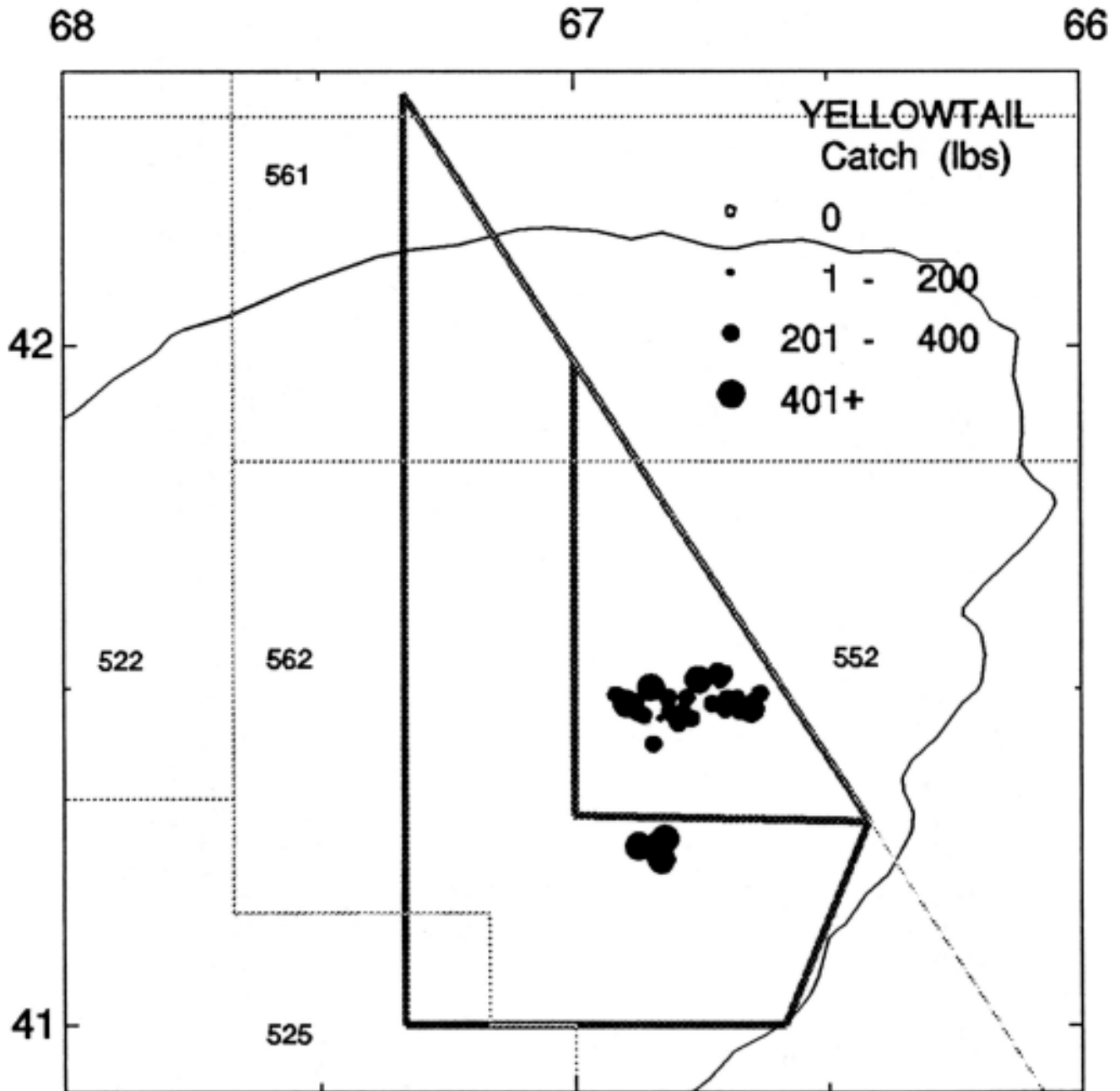


Figure 14. Distribution of yellowtail flounder catches in Area II in the two July 1994 Georges Bank trips. (Data are for observed tows.)

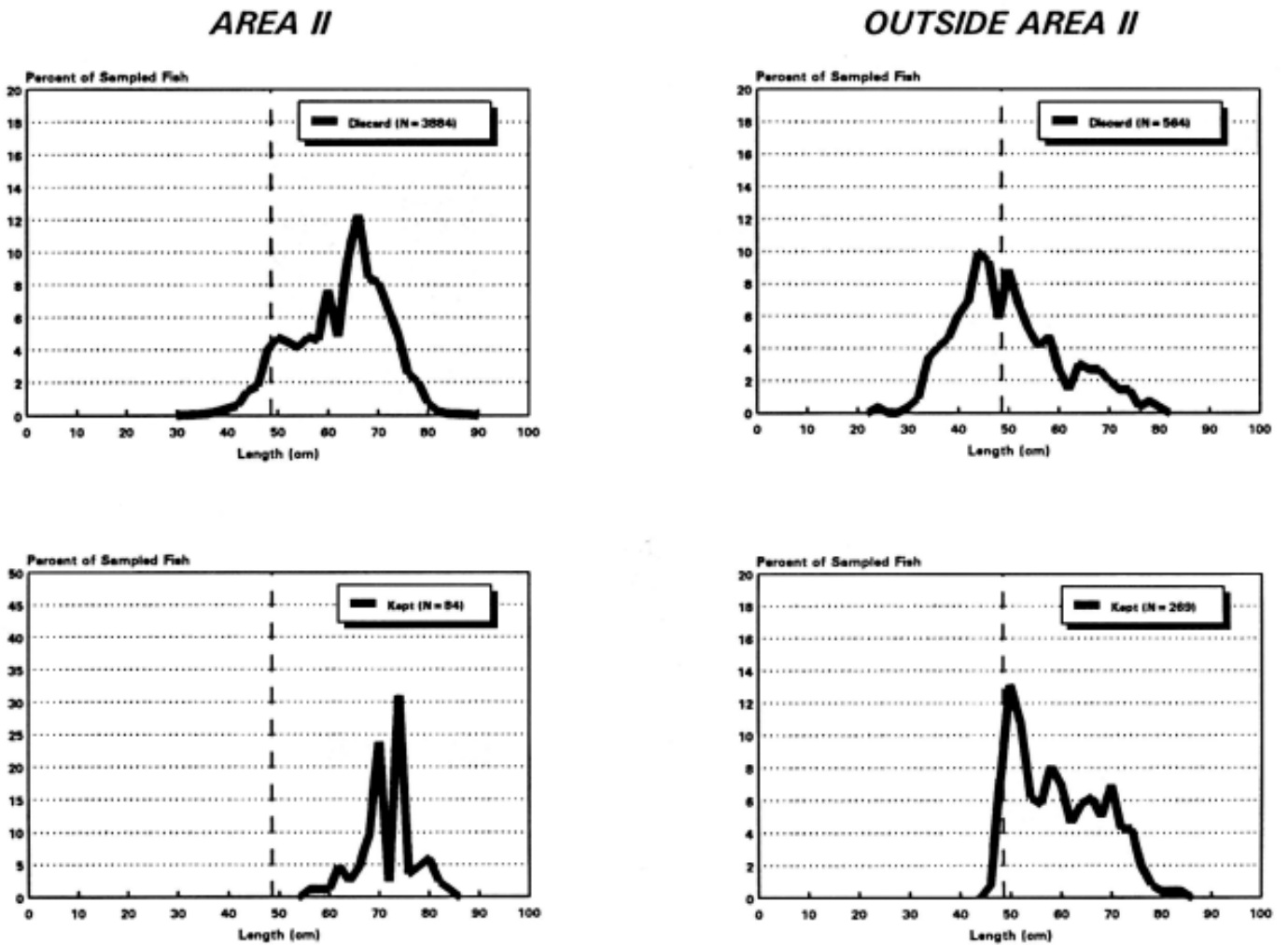


Figure 15. Size-frequency distributions of haddock samples (discards and kept) in the January-June 1994 experimental fishery. (Data are for observed tows and are provided separately for samples taken inside and outside Area II. The dotted line represents the minimum legal size for haddock of 48 cm.)



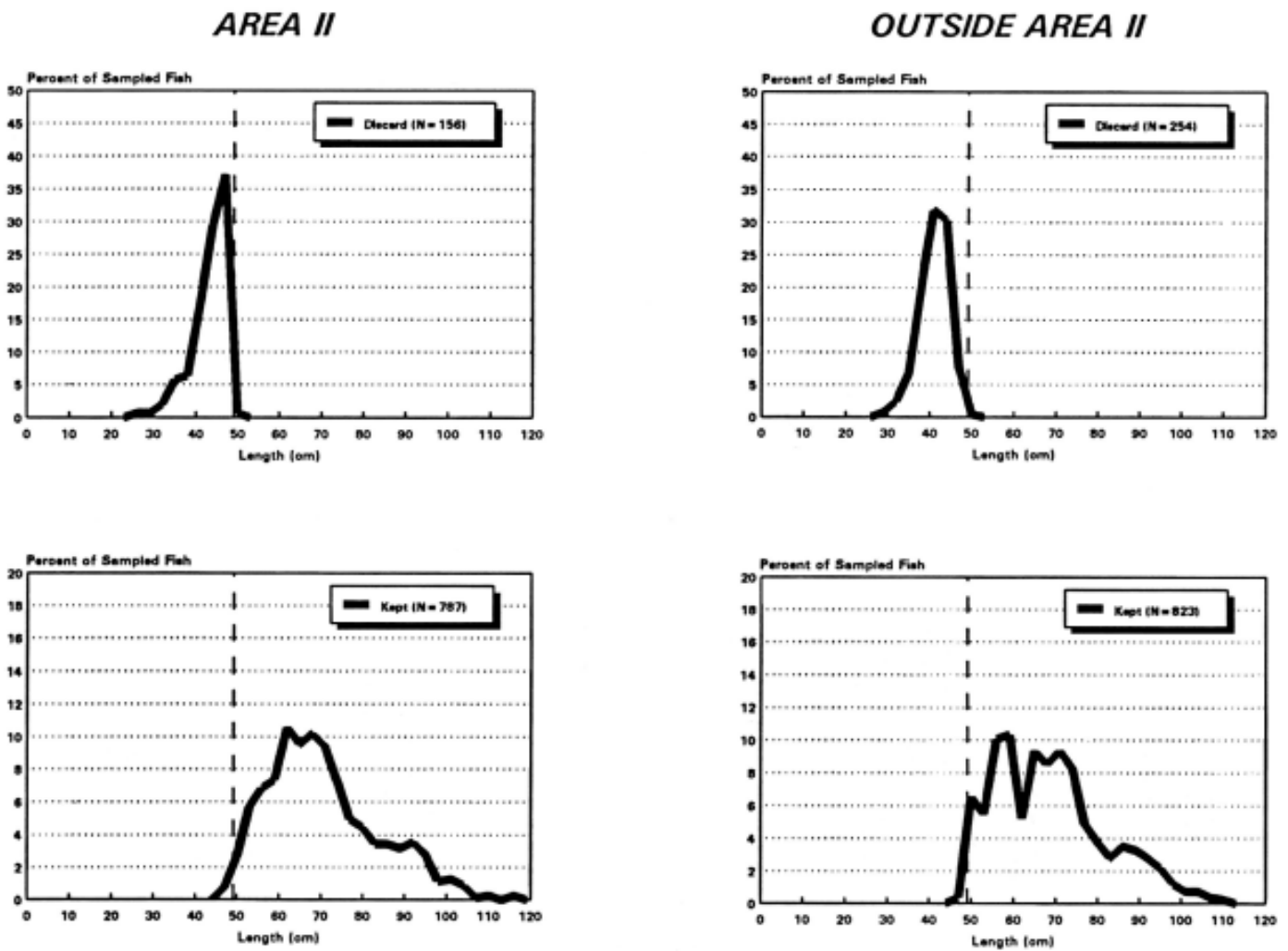


Figure 16. Size-frequency distributions of Atlantic cod samples (discards and kept) in the January-June 1994 experimental fishery. (Data are for observed tows and are provided separately for samples taken inside and outside Area II. The dotted line represents the minimum legal size for Atlantic cod of 48 cm.)

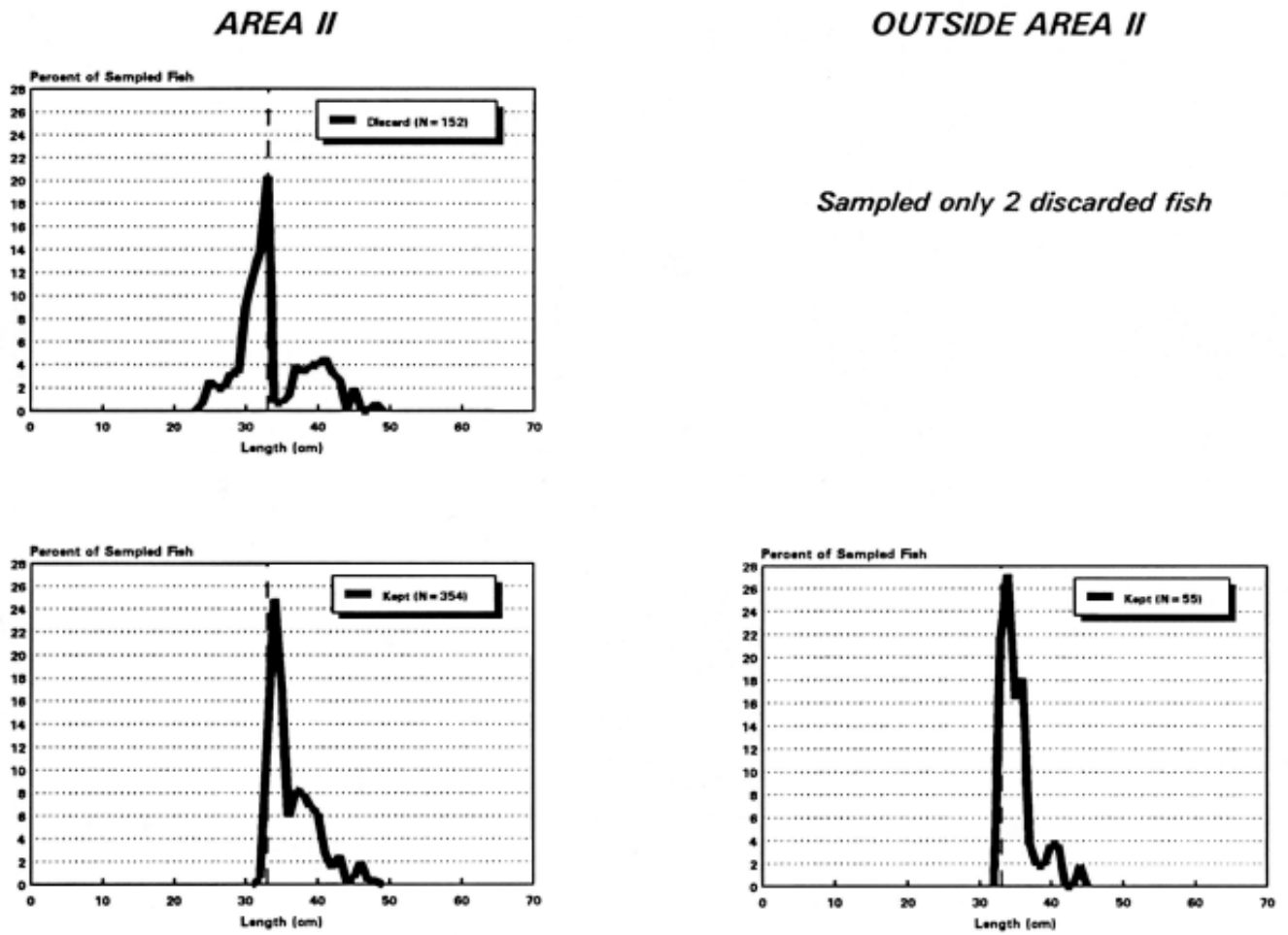


Figure 17. Size-frequency distributions of yellowtail flounder samples (discards and kept) in the January-June 1994 experimental fishery. (Data are for observed tows and are provided separately for samples taken inside and outside Area II. The dotted line represents the minimum legal size for yellowtail flounder of 33 cm.)

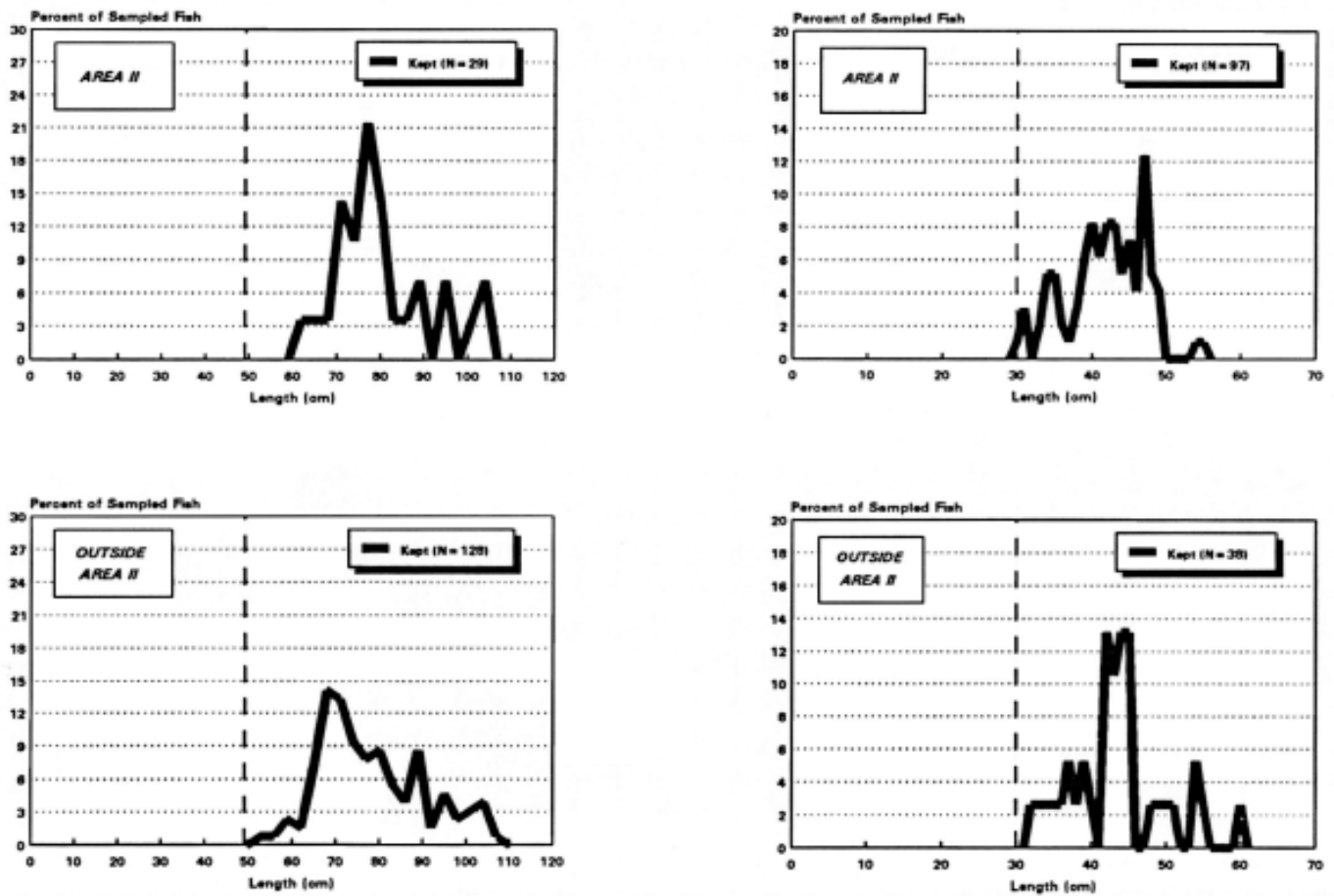


Figure 18. Size-frequency distributions of pollack (two leftside graphs) and winter flounder (two rightside graphs) samples (kept) in the January-June 1994 experimental fishery. (Data are for observed tows and are provided separately for samples taken inside and are provided separately for samples taken inside and outside Area II. The dotted line represents the minimum legal size for pollack of 48 cm and for winter flounder of 30 cm.)

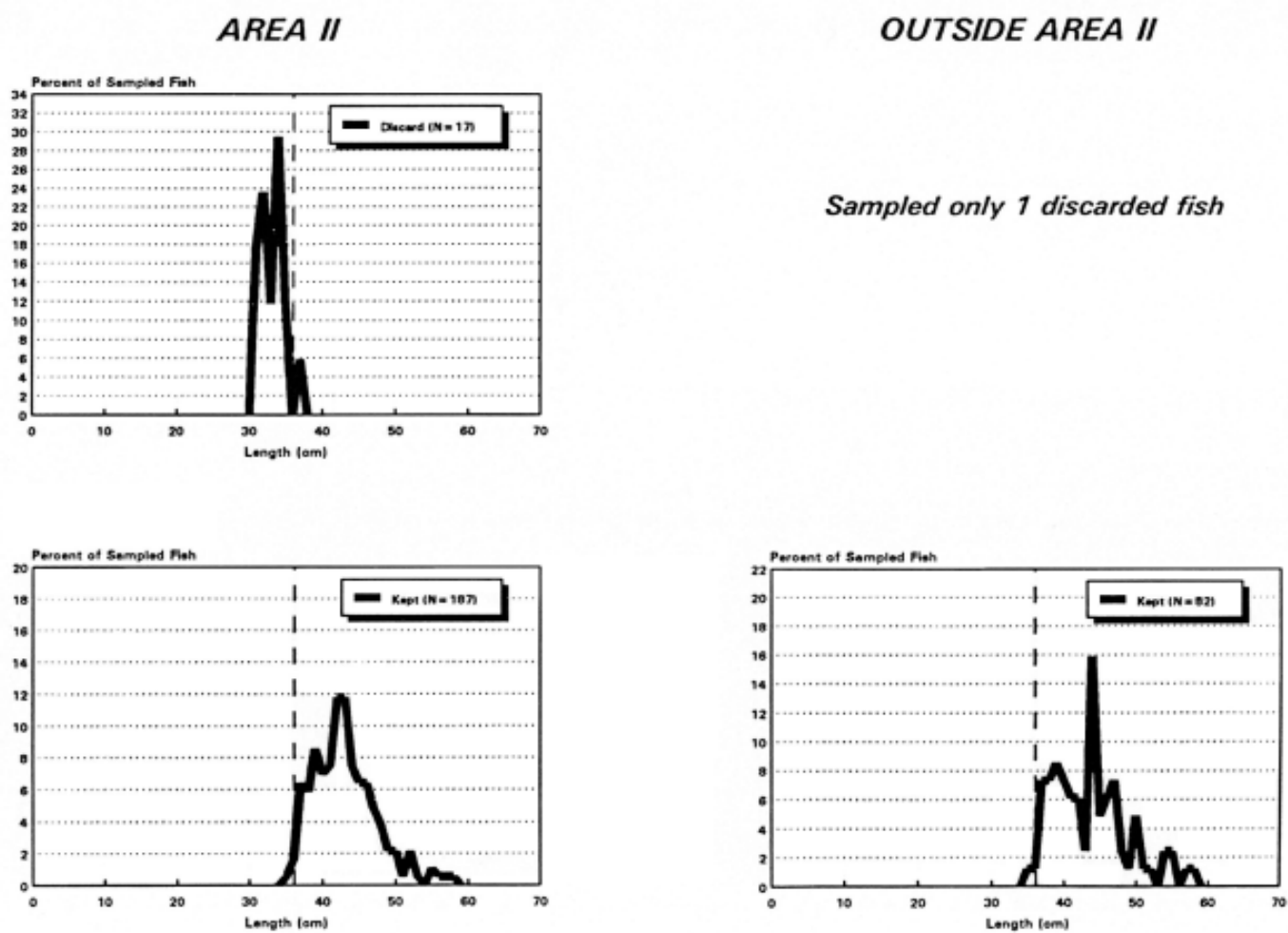


Figure 19. Size-frequency distributions of witch flounder samples (discards and kept) in the January-June 1994 experimental fishery. (Data are for observed tows and are provided separately for samples taken inside and are provided separately for samples taken inside and outside Area II. The dotted line represents the minimum legal size for witch flounder of 36 cm.)

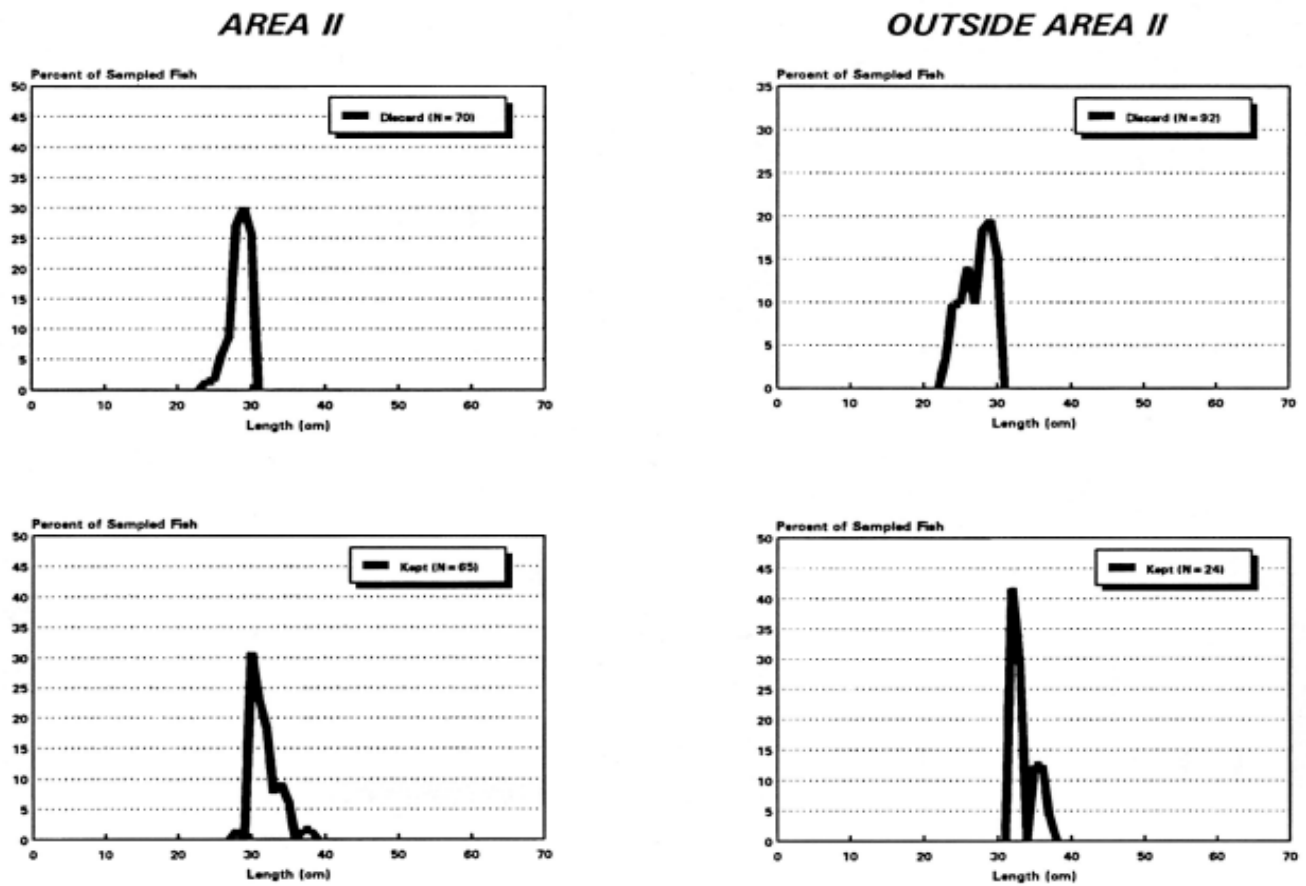


Figure 20. Size-frequency distributions of windowpane samples (discards and kept) in the January-June 1994 experimental fishery. (Data are for observed tows and are provided separately for samples taken inside and outside Area II.)

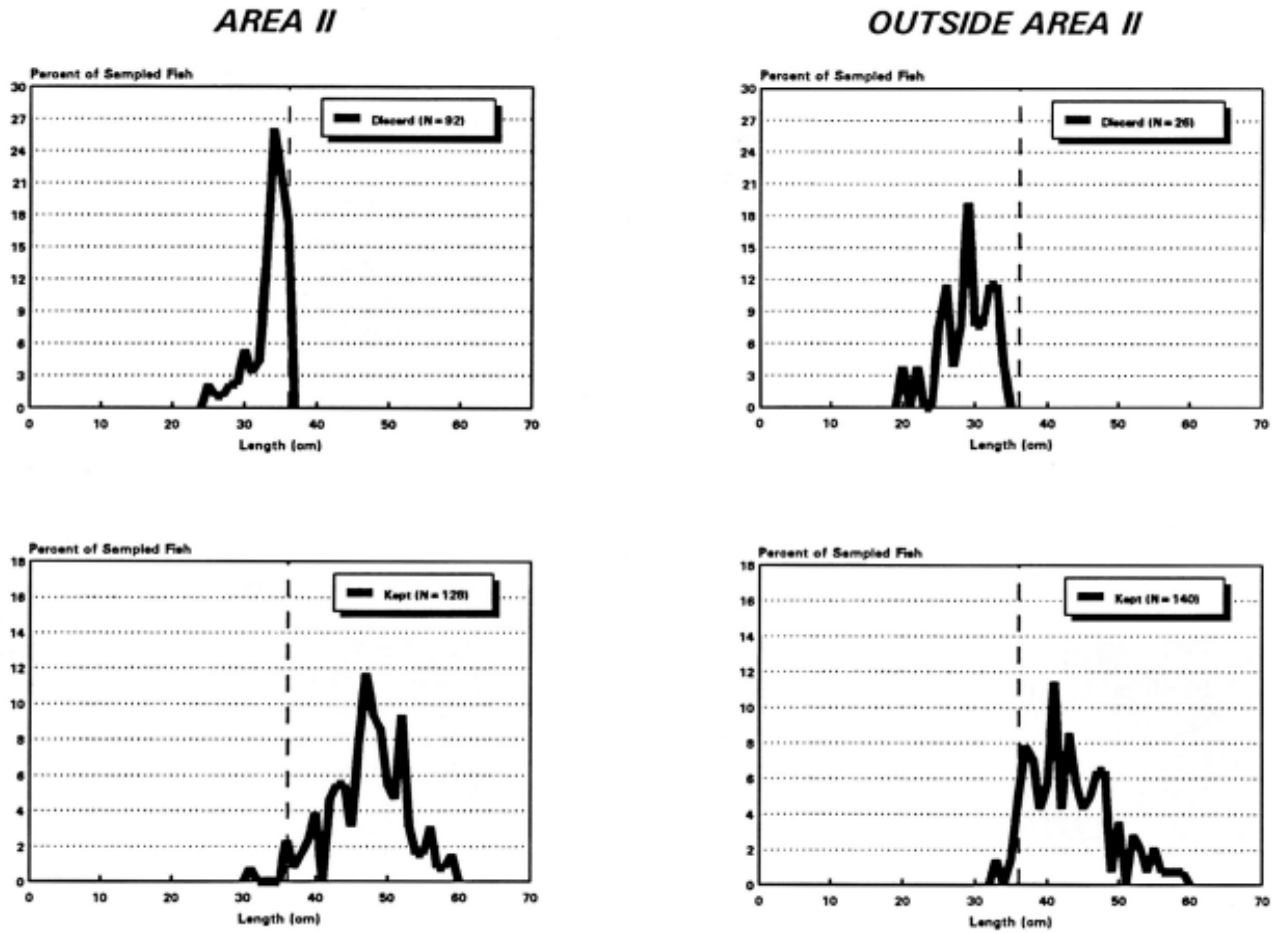


Figure 21. Size-frequency distributions of American plaice samples (discards and kept) in the January-June 1994 experimental fishery. (Data are for observed tows and are provided separately for samples taken inside and outside Area II. The dotted line represents the minimum legal size for American plaice of 36 cm.)

**AREA II**

*Sampled only 2 discarded fish*

**OUTSIDE AREA II**

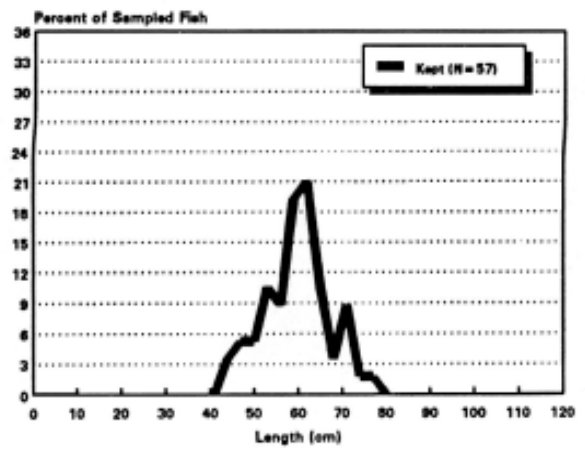
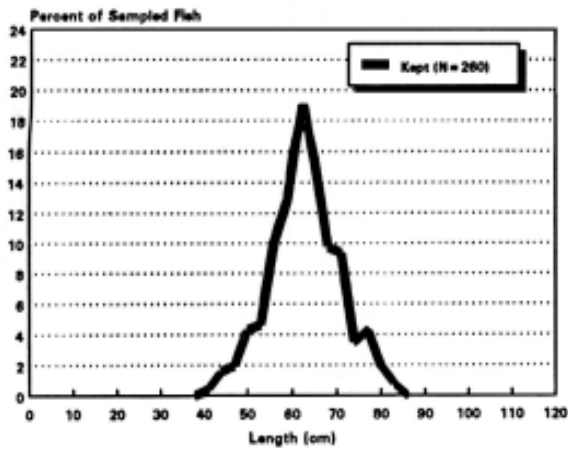
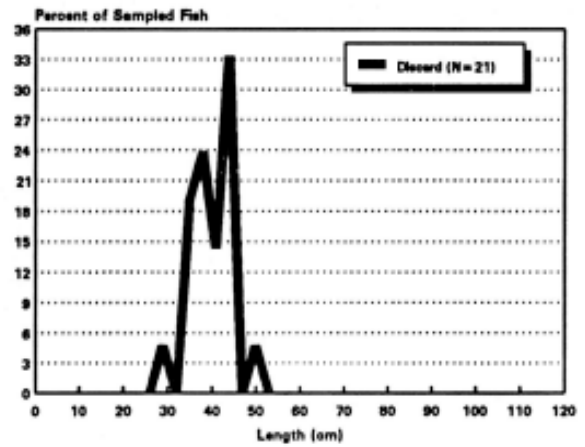


Figure 22. Size-frequency distributions of white hake samples (discards and kept) in the January-June 1994 experimental fishery. (Data are for observed tows and are provided separately for samples taken inside and are provided separately for samples taken inside and outside Area II.)

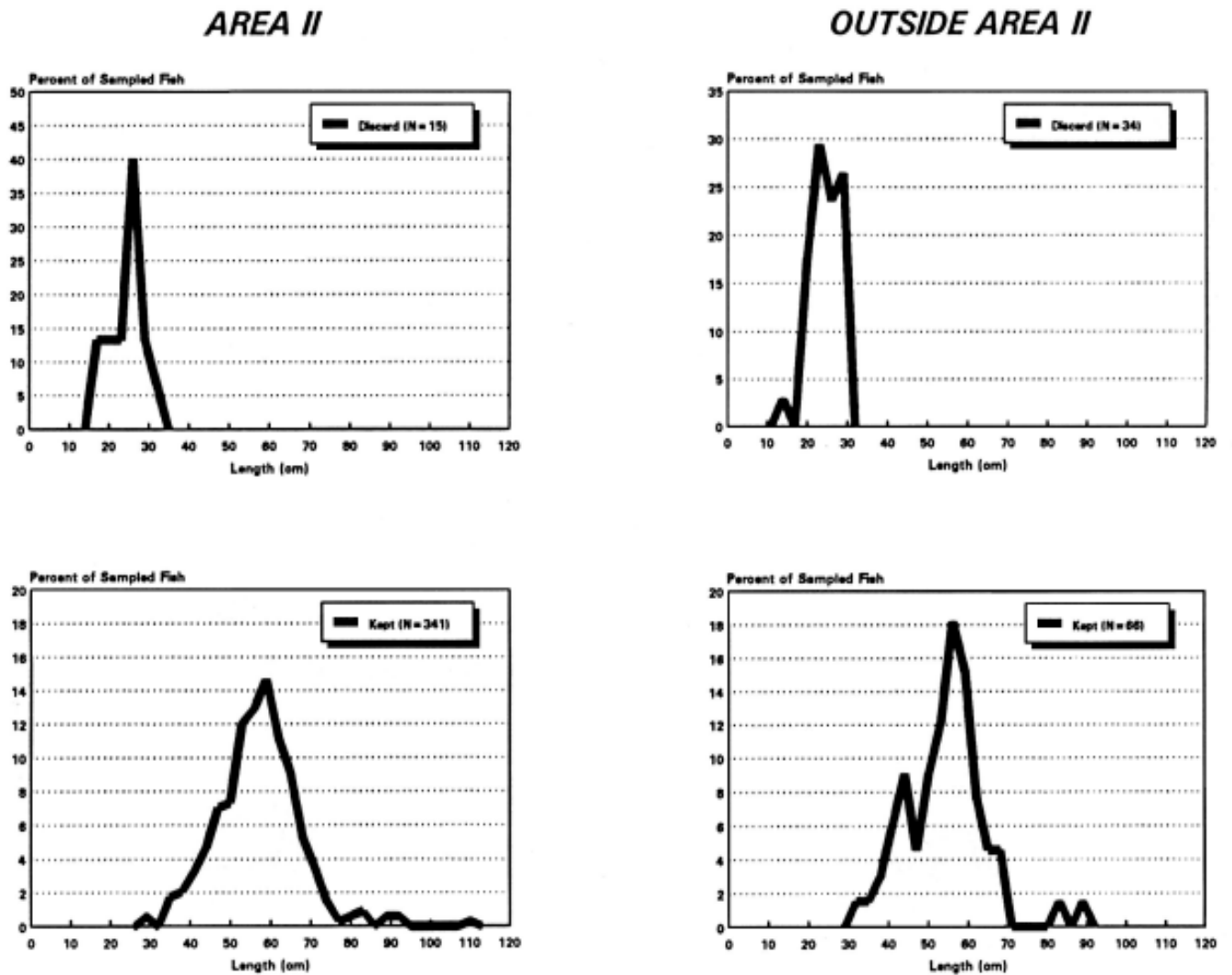


Figure 23. Size-frequency distributions of goosefish samples (discards and kept) in the January-June 1994 experimental fishery. (Data are for observed tows and are provided separately for samples taken inside and outside Area II.)



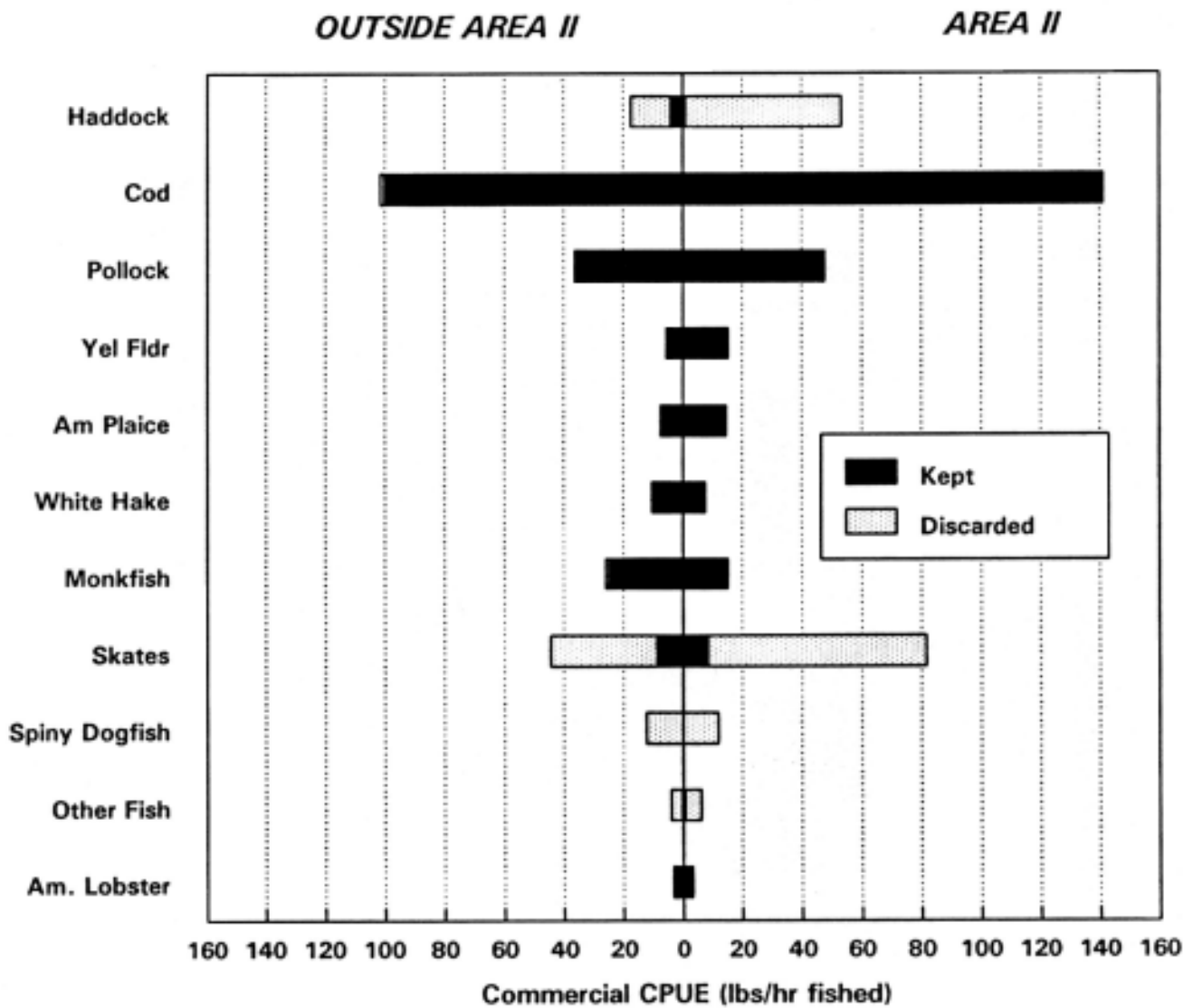


Figure 24. Catch per unit of effort (lb/hr fished) of retained catches and discards for 11 species taken in the January-June 1994 experimental fishery. (Data are for observed tows and are provided separately for samples taken inside an doutside Area II. Monkfish=goosefish.)

## Recent issues in this series:

94. **Summary of the Symposium on the Northeast U.S. Shelf Ecosystem: Stress, Mitigation, and Sustainability -- 12-15 August 1991, University of Rhode Island, Narragansett, Rhode Island.** By Kenneth Sherman, N. Jaworski, and T. Smayda, eds. October 1992. v + 30 p., 3 app. NTIS Access. No. PB94-103439.
95. **Status of Fishery Resources off the Northeastern United States for 1992.** By Conservation and Utilization Division, Northeast Fisheries Science Center. October 1992. iv + 133 p., 60 figs., 67 tables. NTIS Access. No. PB93-144103.
96. **An Indexed Bibliography of Northeast Fisheries Science Center Publications and Reports for 1989.** By Jon A. Gibson. November 1992. iii + 20 p. NTIS Access. No. PB93-213601.
97. **Water-column Thermal Structure in the Middle Atlantic Bight and Gulf of Maine during 1978-92.** By Robert L. Benway, Kevin P. Thomas, and Jack W. Jossi. March 1993. viii + 154 p., 147 figs., 2 tables. NTIS Access. No. PB93-223147.
98. **Marine Invertebrate Cell Culture: Breaking the Barriers -- Proceedings of an International Workshop, 16 June 1991, Anaheim, California.** By Aaron Rosenfield, ed. March 1993. vi + 25 p., 2 tables, 3 app. NTIS Access. No. PB93-213593.
99. **Sole Ownership of Living Marine Resources.** By Steven F. Edwards, Allen J. Bejda, and R. Anne Richards. May 1993. vii + 21 p., 6 figs., 1 table. NTIS Access. No. PB94-146651.
100. **Emerging Theoretical Basis for Monitoring the Changing States (Health) of Large Marine Ecosystems -- Summary Report of Two Workshops: 23 April 1992, National Marine Fisheries Service, Narragansett, Rhode Island, and 11-12 July 1992, Cornell University, Ithaca, New York.** By Kenneth Sherman, ed. September 1993. iii + 27 p., 1 fig., 9 tables, 5 app. NTIS Access. No. PB94-157476.
101. **Status of Fishery Resources off the Northeastern United States for 1993.** By Conservation and Utilization Division, Northeast Fisheries Science Center. October 1993. iv + 140 p., 62 figs., 70 tables. NTIS Access. No. PB94-142361.
102. **Indexed Bibliography of Northeast Fisheries Science Center Publications and Reports for 1990-91.** By Jon A. Gibson. May 1994. iii + 40 p. NTIS Access. No. PB95-200838.
103. **Marine Mammal Studies Supported by the Northeast Fisheries Science Center during 1980-89.** By Gordon T. Waring, Janeen M. Quintal, and Tim D. Smith. May 1994. iv + 27 p., 5 tables, 4 app. NTIS Access. No. PB95-108213.
104. **Quantitative Effects of Pollution on Marine and Anadromous Fish Populations.** By Carl J. Sindermann. June 1994. iii + 22 p., 12 figs. NTIS Access. No. PB95-138467.
105. **Review of American Lobster (*Homarus americanus*) Habitat Requirements and Responses to Contaminant Exposures.** By Renee Mercaldo-Allen and Catherine A. Kuropat. July 1994. v + 52 p., 29 tables. NTIS Access. No. PB96-115555.
106. **Selected Living Resources, Habitat Conditions, and Human Perturbations of the Gulf of Maine: Environmental and Ecological Considerations for Fishery Management.** By Richard W. Langton, John B. Pearce, and Jon A. Gibson, eds. August 1994. iv + 70 p., 2 figs., 6 tables. NTIS Access. No. PB95-270906.
107. **Invertebrate Neoplasia: Initiation and Promotion Mechanisms -- Proceedings of an International Workshop, 23 June 1992, Washington, D.C.** By A. Rosenfield, F.G. Kern, and B.J. Keller, comps. & eds. September 1994. v + 31 p., 8 figs., 3 tables. NTIS Access. No. PB96-164801.
108. **Status of Fishery Resources off the Northeastern United States for 1994.** By Conservation and Utilization Division, Northeast Fisheries Science Center. January 1995. iv + 140 p., 71 figs., 75 tables. NTIS Access. No. PB95-263414.
109. **Proceedings of the Symposium on the Potential for Development of Aquaculture in Massachusetts: 15-17 February 1995, Chatham/Edgartown/Dartmouth, Massachusetts.** By Carlos A. Castro and Scott J. Soares, comps. & eds. January 1996. v + 26 p., 1 fig., 2 tables. NTIS Access. No. PB97-103782.
110. **Length-Length and Length-Weight Relationships for 13 Shark Species from the Western North Atlantic.** By Nancy E. Kohler, John G. Casey, Patricia A. Turner. May 1996. iv + 22 p., 15 tables, 4 figs. NTIS Access. No. PB97-135032.

---

# Publishing in *NOAA Technical Memorandum NMFS-NE*

---

## Manuscript Qualification

This series represents a secondary level of scientific publishing in the National Marine Fisheries Service (NMFS). It employs thorough internal scientific review and technical and copy editing, but not necessarily external scientific review. Manuscripts that may warrant a primary level of scientific publishing should be initially submitted to one of NMFS's primary series (*i.e.*, *Fishery Bulletin*, *NOAA Technical Report NMFS*, or *Marine Fisheries Review*). See the outside back cover of this document for a fuller description of Northeast Fisheries Science Center (NEFSC) publication series.

Identical, or fundamentally identical, manuscripts should not be concurrently submitted to this and any other publication series. Manuscripts which have been rejected by any primary series strictly because of geographic or temporal limitations may be submitted to this series.

Manuscripts by NEFSC authors will be published in this series upon approval by the NEFSC Science & Research Director. Manuscripts by non-NEFSC authors may be published in this series if: (1) the manuscript serves the NEFSC's mission; (2) the manuscript meets the Science & Research Director's approval; and (3) the author arranges for the printing and binding funds to be transferred to the NEFSC's Research Communications Unit account from another federal account. For all manuscripts submitted by non-NEFSC authors and published in this series, the NEFSC will disavow all responsibility for the manuscripts' contents; authors must accept such responsibility.

The ethics of scientific research and scientific publishing are a serious matter. All manuscripts submitted to this series are expected to adhere -- at a minimum -- to the ethical guidelines contained in Chapter 1 ("Ethical Conduct in Authorship and Publication") of the *CBE Style Manual*, fifth edition (Chicago, IL: Council of Biology Editors). Copies of the manual are available at virtually all scientific libraries.

## Manuscript Preparation

**Organization:** Manuscripts must have an abstract, table of contents, and -- if applicable -- lists of tables, figures, and acronyms. As much as possible, use traditional scientific manuscript organization for sections: "Introduction," "Study Area," "Methods & Materials," "Results," "Discussion" and/or "Conclusions," "Acknowledgments," and "References Cited."

**Style:** All NEFSC publication and report series are obligated to conform to the style contained in the most recent edition of the *United States Government Printing Office Style Manual*. That style manual is silent on many aspects of

scientific manuscripts. NEFSC publication and report series rely more on the *CBE Style Manual*, fifth edition.

For in-text citations, use the name-date system. A special effort should be made to ensure that the list of cited works contains all necessary bibliographic information. For abbreviating serial titles in such lists, use the most recent edition of the *Serial Sources for the BIOSIS Previews Database* (Philadelphia, PA: Biosciences Information Service). Personal communications must include date of contact and full name and mailing address of source.

For spelling of scientific and common names of fishes, mollusks, and decapod crustaceans from the United States and Canada, use *Special Publications* No. 20 (fishes), 16 (mollusks), and 17 (decapod crustaceans) of the American Fisheries Society (Bethesda, MD). For spelling in general, use the most recent edition of *Webster's Third New International Dictionary of the English Language Unabridged* (Springfield, MA: G. & C. Merriam).

**Typing text, tables, and figure captions:** Text, including tables and figure captions, must be converted to WordPerfect 4.2, 5.0, or 5.1. In general, keep text simple (*e.g.*, don't switch fonts, don't use hard returns within paragraphs, don't indent except to begin paragraphs). Especially, don't use WordPerfect graphics for embedding tables and figures in text. If the automatic footnoting function is used, also save a list of footnotes as a separate WordPerfect file. When the final draft is ready for review, save the text, tables, figure captions, table titles, footnotes, and front matter as separate document files.

Tables should be prepared using all tabs or all spaces between columnar data, but not a combination of the two. Figures must be original (even if oversized) and on paper; they cannot be photocopies (*e.g.*, Xerox) unless that is all that is available, nor be on disk. Except under extraordinary circumstances, color will not be used in illustrations.

## Manuscript Submission

Authors must submit one paper copy of the double-spaced manuscript, one magnetic copy on a diskette, and original figures (if applicable). NEFSC authors must include a completely signed-off "NEFSC Manuscript Submission Form." Non-NEFSC authors who are not federal employees will be required to sign a "Release of Copyright" form.

Send all materials and address all correspondence to:

Jon A. Gibson, Technical Editor  
Northeast Fisheries Science Center  
166 Water Street  
Woods Hole, MA 02543-1026 USA  
(508) 495-2228

---

**NORTHEAST FISHERIES SCIENCE CENTER**  
**Michael P. Sissenwine, Science & Research Director**  
**Mary G. Laird, Program Support Staff Chief**  
**Teri L. Frady, Research Communications Unit Chief**  
**Jon A. Gibson, Technical Editor**

Research Communications Unit  
Northeast Fisheries Science Center  
National Marine Fisheries Service, NOAA  
166 Water St.  
Woods Hole, MA 02543-1026

THIRD CLASS MAIL

## Publications and Reports of the Northeast Fisheries Science Center

NOAA's National Marine Fisheries Service (NMFS) seeks to "achieve a continued optimum utilization of living marine resources for the benefit of the Nation." As the research arm of the NMFS's Northeast Region, the Northeast Fisheries Science Center (NEFSC) supports the NMFS mission by "planning, developing, and managing multidisciplinary programs of basic and applied research to: (1) better understand the living marine resources (including marine mammals) of the Northwest Atlantic, and the environmental quality essential for their existence and continued productivity; and (2) describe and provide to management, industry, and the public, options for the utilization and conservation of living marine resources and maintenance of environmental quality which are consistent with national and regional goals and needs, and with international commitments." To assist itself in providing data, information, and advice to its constituents, the NEFSC issues publications and reports in three categories:

***NOAA Technical Memorandum NMFS-NE***--This irregular series includes: data reports of long-term or large area studies; synthesis reports for major resources or habitats; annual reports of assessment or monitoring programs; documentary reports of oceanographic conditions or phenomena; manuals describing field and lab techniques; literature surveys of major resource or habitat topics; findings of task forces or working groups; and summary reports of scientific or technical workshops. Issues receive thorough internal scientific review and technical and copy editing. Limited free copies are available from authors or the NEFSC. Issues are also available from the National Technical Information Service, 5285 Port Royal Rd., Springfield, VA 22161.

***Northeast Fisheries Science Center Reference Document***--This irregular series includes: data reports on field and lab observations or experiments; progress reports on continuing experiments, monitoring, and assessments; and background papers for scientific or technical workshops. Issues receive minimal internal scientific review and no technical or copy editing. No subscriptions. Free distribution of single copies.

***Information Reports***--These reports are issued in several series, including: *Research Highlights*, *News Release*, *Fishermen's Report*, and *The Shark Tagger*. Content is timely, special-purpose data and/or information. Level of scientific review and technical and copy editing varies by series. All series available through free subscription except for *The Shark Tagger* which is available only to participants in the NMFS Cooperative Shark Tagging Program.

To obtain a copy of a technical memorandum or a reference document, or to subscribe to an information report, write: Research Communications Unit, Northeast Fisheries Science Center, 166 Water St., Woods Hole, MA 02543-1026. An annual list of NEFSC publications and reports is available upon request at the above address. Any use of trade names in any NEFSC publication or report does not imply endorsement.