

UNITED STATES GOVERNMENT

Memorandum

Certified Mail

File 800

TO : Laboratory Director, BCF, Biological
Laboratory, Woods Hole

DATE: April 29, 1963

FROM : Acting Chief, Branch of Marine Fisheries

SUBJECT: Paper entitled "Movements of Tagged Fluke in the Upper Middle Atlantic
Bight," by Fred E. Lux

Since the subject paper is to be used only as a basis for an informal talk and will not be formally presented or submitted for publication, it does not require official approval, in our judgement.

It is a good paper, however, and contains a lot of worthwhile information.

The original copy of the paper is returned herewith.


Joseph E. King

Attachment

cc: Regional Director, BCF, Gloucester, Mass.

Movements of Tagged Fluke in the Upper Middle Atlantic Bight ^{1/}

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Biological Laboratory
Woods Hole, Massachusetts

Lab Ref 63-03

^{1/} Preliminary unedited manuscript. The paper will not be read nor distributed at the meeting, but will form the basis for an informal presentation at the meeting of the Northeast Section of the American Fisheries Society in Portland, Maine April 14-17, 1963.

This report gives preliminary results from a joint program for the tagging of fluke, Paralichthys dentatus, by biologists from the State of New Jersey Marine Fisheries Laboratory and the Bureau of Commercial Fisheries Biological Laboratory at Woods Hole.^{2/} The distribution of fluke in the Middle Atlantic Bight and their seasonal and long-term movements in the upper part of the Bight, as indicated by recoveries of tagged fish, are described.

Fluke Distribution

Adult fluke are found in Atlantic coastal waters from Cape Cod to Florida. They are abundant in the Middle Atlantic Bight, the area between Cape Cod and Cape Hatteras. They move close inshore in summer months to shallow waters of bays, sounds, and open coasts. They move offshore to deeper waters between the 40 and 85 fathom curves in the winter.

Spawning fluke have not been reported. Maturing fluke, however, are caught inshore in the early fall, and fluke caught in the winter after they have reached offshore grounds generally are spawned out. In addition, commercial fishermen have reported ripe fish from 30 fathoms off the New Jersey coast in October. From this information it appears, therefore, that spawning occurs during the fall offshore movement.

^{2/}

The New Jersey part of this study was a contribution of Federal Aid in Fish and Wildlife Restoration, Project F-15-R.

Fluke postlarvae have been caught in plankton nets in sounds around Cape Hatteras and off the mouth of Chesapeake Bay. Small numbers also have been taken in areas to the north of Chesapeake at Indian River, Delaware, in Block Island Sound and in Narragansett Bay. While the distribution of larvae has not been well worked out, it appears that their abundance drops as one moves from south to north in the Bight.

Seining and otter trawling surveys and reports by fishermen have indicated that young fluke, after they have taken to the bottom, and before they have reached a length of 8 or 10 inches, are common in Chesapeake Bay and vicinity. They are relatively common in Delaware Bay and only occasionally are found in New Jersey and Long Island bays. They have not been reported from New England. This information fits in with what we know about the distribution and abundance of fluke postlarvae.

From the foregoing information it appears that nursery grounds for the young fluke are principally in the southern part of the Bight, probably in Chesapeake Bay and vicinity. Generally only large fish, over 10 inches, are present in the northern part of the Bight, suggesting that northern stocks are maintained not through local recruitment but through northward dispersal from the south. The larvae, and eggs also if they are pelagic, possibly are swept to southern Bight coastal areas, since data on nontidal surface water drift in the areas where spawning is believed to take place indicates that it is to the southwest. Thus it may be that some of the spawn from northern fluke drift to southern areas, remain in coastal bays for a year or two and return north upon approaching maturity.

The Fluke Fishery

Fluke are intensively fished in nearly all seasons. They are taken by otter trawlers, traps, and sport fishermen from late spring to fall when they are inshore. In the winter and early spring they are fished by medium otter trawlers on offshore grounds from Veatch Canyon to Cape Hatteras. Annual commercial landings for the entire Bight were 15 to 20 million pounds in recent years. The sport catch also is large, but we as yet, have no estimates of its overall magnitude. Some idea of its size may be obtained from a New York survey which reported that sport fishermen took an estimated 1.5 million fluke per year from the Great South Bay area alone in 1956-60.

Tagging Studies

Fluke tagging studies by Westman and Neville (1946) off New York and New Jersey established the annual inshore to offshore migration pattern. Their findings were confirmed by results from Long Island fluke tagging in the 1950's by Poole (1962). In analyzing his data, Poole also noted signs of an eastward dispersal of fluke from Long Island to inshore New England in the summers following tagging.

Our present cooperative fluke tagging program was set up to obtain further data on the fluke population in the upper Middle Atlantic Bight. Of particular interest were seasonal and long-term movement patterns, as an aid in identifying and delimiting subpopulations. Under the program, fluke have so far been tagged in three areas: offshore between Hudson and Veatch Canyons in April 1961, inshore along the New Jersey Coast in July and August 1961, and inshore along the southern New England coast in September 1962. Procedures followed and results obtained in these experiments follow.

It should first be pointed out that the movement patterns suggested by tag recoveries are affected to some extent by the non-randomness of fishing effort, and this should be borne in mind when viewing them. At present we have no accurate measure of fishing effort to use in adjusting the tag return data. Since our limited knowledge of effort indicates that it is fairly uniform over the Bight, however, we feel that general movement patterns are shown by our data.

6.

Offshore tagging - April 1961

Fluke tagging on offshore grounds was done aboard the Bureau of Commercial Fisheries research vessel Delaware during the latter part of the offshore fluke season in early April 1961. The fluke were caught by otter trawl in 45 to 83 fathoms of water. Most of the fish were released in the area between Hudson and Block Canyons (lat. 39° 55' N., long. 71° 55' W.) in about 50 fathoms. Plastic Petersen disc tags were used.

Tagging areas and locations of recoveries are shown in Figures 1, 2, and 3. In all, 1,834 fluke were tagged. Through July 1962, 150 recoveries (8.1 percent of those released) were reported. All except one of the recoveries were from the releases at location 4 (fig. 1). The following discussion, therefore, applies to movement from this release point.

In April - June 1961 most recoveries were from the vicinity of tagging (fig. 1). However, a few of the April and all May and June recoveries were obtained on inshore grounds on the ocean side of eastern Long Island and from coastal sounds and bays. This established the time of movement from offshore to inshore grounds as being in April and May.

Summer recoveries (July - September) were principally from bays and sounds from Long Island to southern New England (fig. 2). In general, they were from more easterly inshore areas than the spring recoveries. There were no recoveries from south of Sandy Hook or from east of Chatham on Cape Cod.

Recoveries during the fall (October - December), of which there were only two, were taken between inshore and offshore grounds south of Marthas Vineyard and Nantucket. This apparently is the season of offshore movement since fluke are found in some numbers on these intermediate grounds only in the fall.

Winter recaptures (January - March 1962) all were from offshore grounds, with many being taken near the place where they had been released in the preceding spring (fig. 3). However, a number were taken well to the eastward near Veatch Canyon, suggesting that an eastward trend in movement on offshore grounds took place. Only three of the fish were taken south of the release point and these only a short distance to the south of it, indicating that little southerly movement had occurred. The offshore grounds south of Hudson Canyon, while not fished intensively by New England boats are fished by vessels from New Jersey and to the south. Had many of the tagged fish moved there, more recaptures from those southern areas would, therefore, have been expected.

Of the five recaptures reported (April - July 1962), one was caught on offshore grounds about 70 miles east of the release point, and the other four were taken in waters from Long Island to southern New England (fig. 3). While the number of recoveries was small, their distribution indicated that the movement pattern of the preceding spring and summer was repeated.

8.

Inshore New Jersey tagging - July and August 1961

Fluke tagging in New Jersey inshore waters at Sandy Hook and Cape May was done in July and August 1961 aboard chartered otter trawlers fishing in 3 to 5 fathoms of water. Plastic Petersen disc tags were used on most of the fish, and Atkins vinyl tubing tags were used on the remainder. In the two areas 3,390 fluke were tagged, 1,568 at Sandy Hook and 1,822 at Cape May.

Areas where the fluke were tagged and locations of recoveries, the latter combined for the two release areas, are shown in Figures 4, 5, and 6. Through February 1963, 825 recoveries (24 percent of those released) were reported.

During the summer of tagging (July - September) most recoveries were caught near the release points by an intensive sport fishery at Sandy Hook and an otter trawl fishery at Cape May (fig. 4). There was no significant amount of northward or southward movement.

Fall recoveries (October - December) indicated that a definite offshore movement had begun, and a number of fluke were recaptured on grounds intermediate between inshore and offshore (fig. 4). Most of the returns were from southern New Jersey and to the southward. This unequal distribution of recoveries probably is due to variations in fishing effort, since fall fluke fishing intensity is greater in the south of New Jersey than in the north.

9.

Tag recoveries during the winter (January - March 1962) were obtained on offshore grounds all the way from Cape Hatteras on the southwest to Veatch Canyon on the northeast, with most recoveries being taken on grounds offshore from the release areas (fig. 5). Recoveries during March were generally from further to the southward than those of January and February, indicating that there may have been some southward movement on the offshore ground.

During April 1962 some tagged fluke were taken on offshore grounds, all but one of them to the south of Hudson Canyon (fig. 5). In May - July, however, all were caught on inshore grounds from Delaware Bay to Nantucket Sound, with most of them being caught at the release areas or along Long Island to the northeast. This pattern of summer recoveries suggested that a marked northeastward movement had occurred from points of release in the preceding summer. No significant southward movement was indicated.

The distribution of August and September recoveries was similar to that of earlier summer, but the proportion taken off Long Island was smaller (fig. 6). This indicated that the peak northeastward movement was past.

Recoveries from October 1962 - February 1963 showed a distribution similar to that of the preceding fall and winter (fig. 6). The picture is incomplete, however, since all winter recoveries were not yet available for this analysis.

Inshore New England tagging - September 1962

Additional tagging was done on inshore southern New England grounds in September 1962 to further clarify the movement patterns of fluke that had reached the northernmost part of the Bight. In the course of this, 1,006 fluke were tagged in Nantucket and Block Island Sounds. The tagging was done aboard commercial otter trawlers fishing in 9 to 17 fathoms of water. Plastic Petersen disc tags were used.

The release areas and recovery positions, the latter combined for the two release areas, are shown in Figure 7. In the six months following tagging, 143 recoveries (14 percent of those tagged) were reported.

Recoveries for September - November 1962 were principally from the release points. A few of the fish were caught between inshore and offshore grounds, however, presumably during the fall offshore migration. Two fluke had moved southwestward along the coast and were caught off New Jersey, far from the release point.

Recoveries during the winter (December 1962 - February 1963) all were from offshore grounds ranging from Veatch Canyon to grounds off Delaware and Maryland. The largest concentration of offshore returns was around the Block Canyon area, an important winter fishing ground.

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The pattern of fall recoveries indicated that some fish moved directly south from southern New England release areas to offshore grounds between Hudson and Block Canyons. It appeared that other fish moved along shore to the southeastward to the New Jersey coast and then moved to offshore grounds south of Hudson Canyon (fig. 7).

Discussion

General movement patterns for fluke in the upper Middle Atlantic Bight may be inferred from the pooled recovery data for all release groups. These movements are described below, with first consideration being given to seasonal movements.

The fluke occupied shallow coastal bays and sounds of the upper Bight in the summer months. In October to December they left these inshore waters, moving to offshore grounds between the 40 and 80 fathom curves. It appeared that some fluke moved directly offshore during this migration and that others moved along the coast for varying distances before moving offshore. The greatest coast-wise movement shown at the time was to the southwest.

The fluke remained on offshore grounds through winter. They tended to be found on the northern offshore grounds in January and February and further to the southward in March. A few of the March recoveries were taken as far to the south as Cape Hatteras. This pattern indicated that some southward movement probably occurred in late winter on the offshore grounds.

In April and May the fluke returned to coastal grounds and remained there through the summer. The pattern of recoveries suggested that the fish first moved to coastal grounds which were directly inshore from their offshore positions. Upon arrival on coastal grounds they tended to move northeastward along the coast. The peak northeastward movement was during the early part of summer.

The pattern of these seasonal movements showed that fluke of the northern half of the Bight were resident there, and that they were unlikely to move to the southern half of the Bight. There was some movement to the south while the fish were on offshore ^{grounds}, as noted above, but this movement was made up of a small proportion of total recoveries.

Contrary to a southward movement, there was, in fact, evidence of a northeastward dispersal with time. This was suggested mainly by recoveries obtained on inshore grounds a year after tagging. This movement was most pronounced along the coast in early summer, and it appeared that it more than equalled movement that occurred to the southward in the upper half of the Bight. Such a pattern of dispersal would result in a net movement of fluke to more northern areas.

A northward dispersal of fluke in the northern half of the Bight would fit in with our hypothesis that southern Bight fluke move north as they grow older. This suggested dispersal pattern is not clearly defined by present data, however, and a more detailed analysis of the question must await additional information.

We examined also the question of whether or not size was a factor in amount and direction of movement. For this we calculated average lengths of fish recovered north and south of the release areas. These data indicated that there were no significant differences, and we have tentatively concluded that size has no bearing on movement pattern in the northern Bight.

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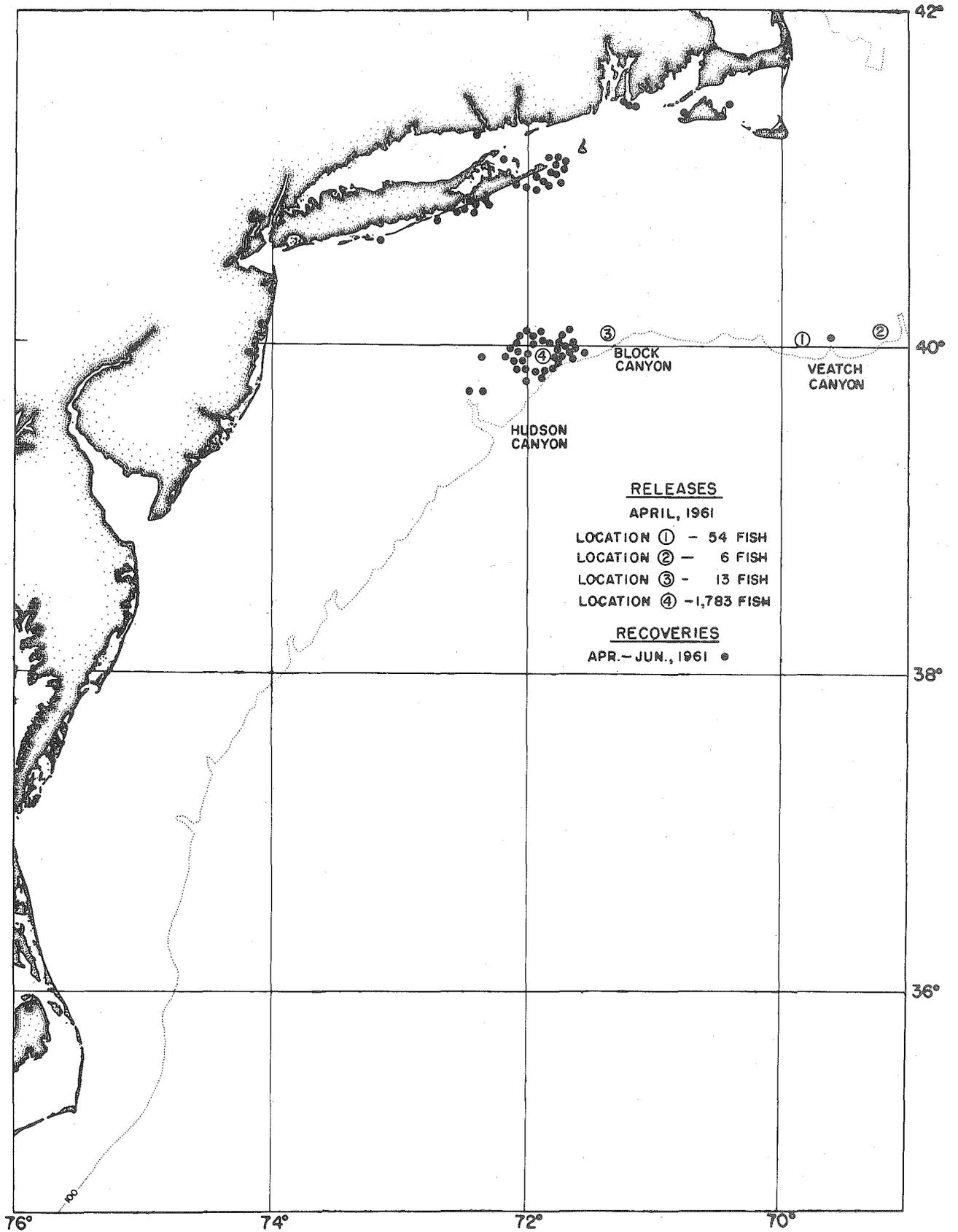


Figure 1. -- Areas where tagged fluke were released in April 1961 and locations of recoveries April - June 1961.

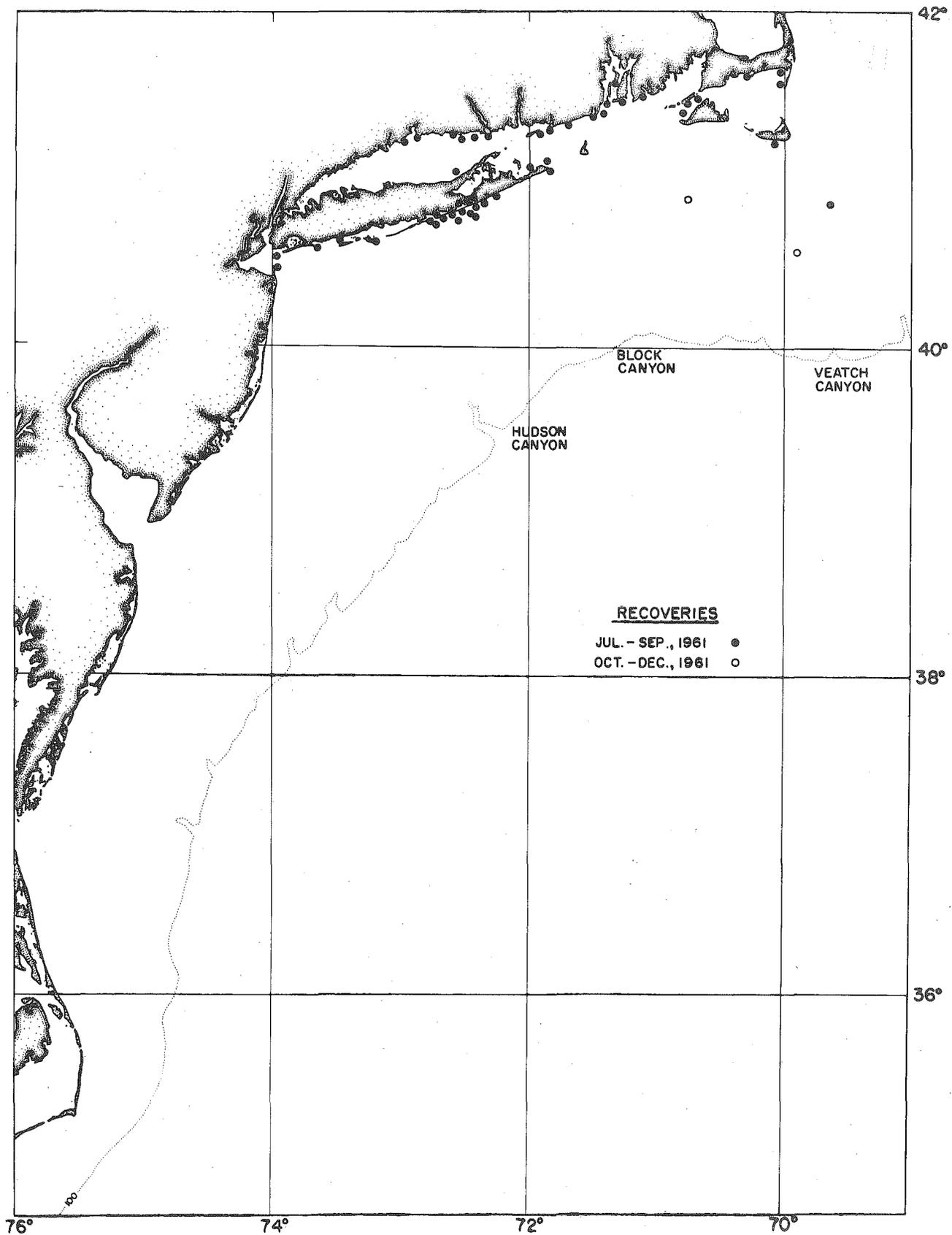


Figure 2. --Locations of recoveries of tagged fluke July - December 1961 from April 1961 releases.

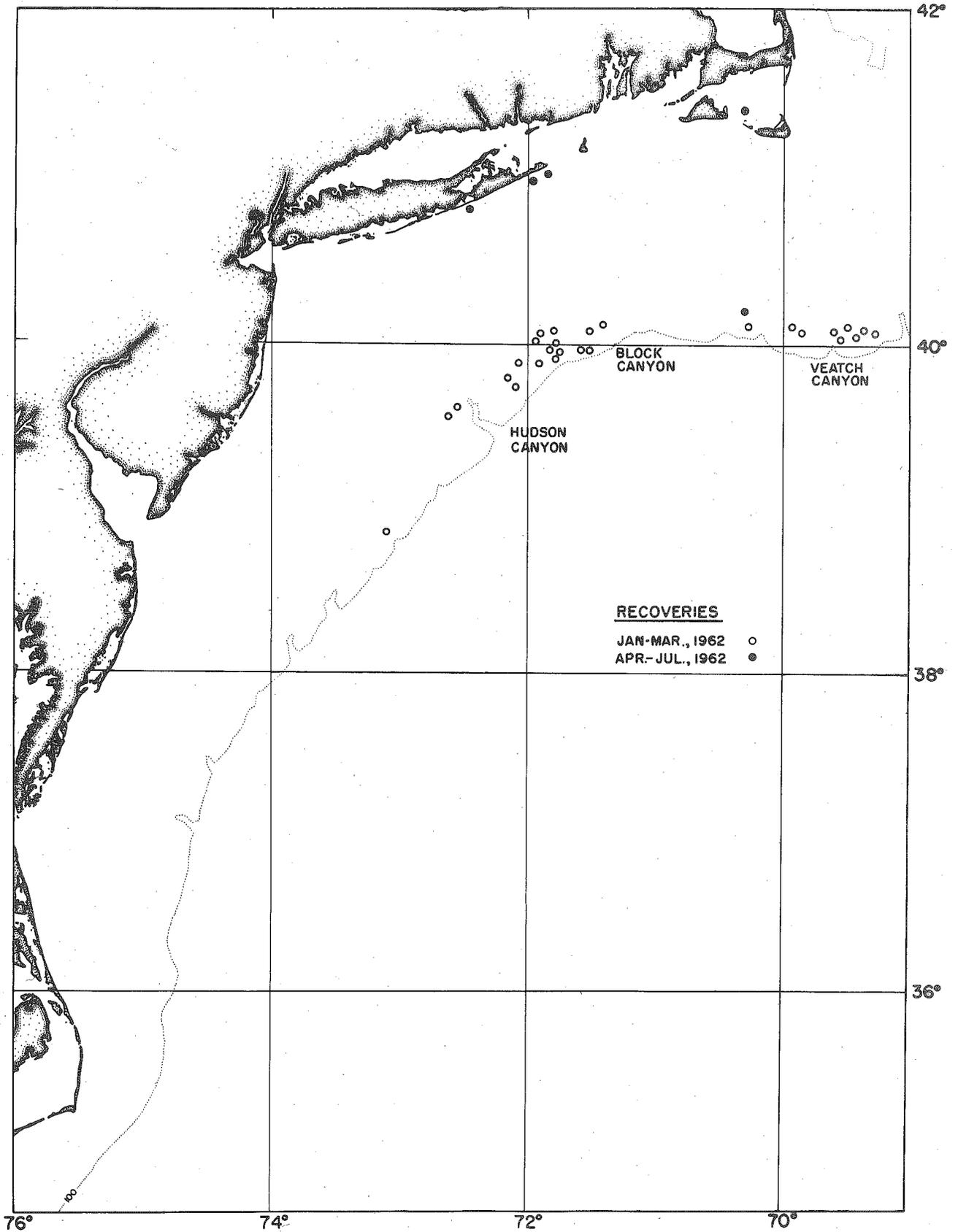


Figure 3. --Locations of recoveries of tagged fluke January - July 1962 from April 1961 releases.

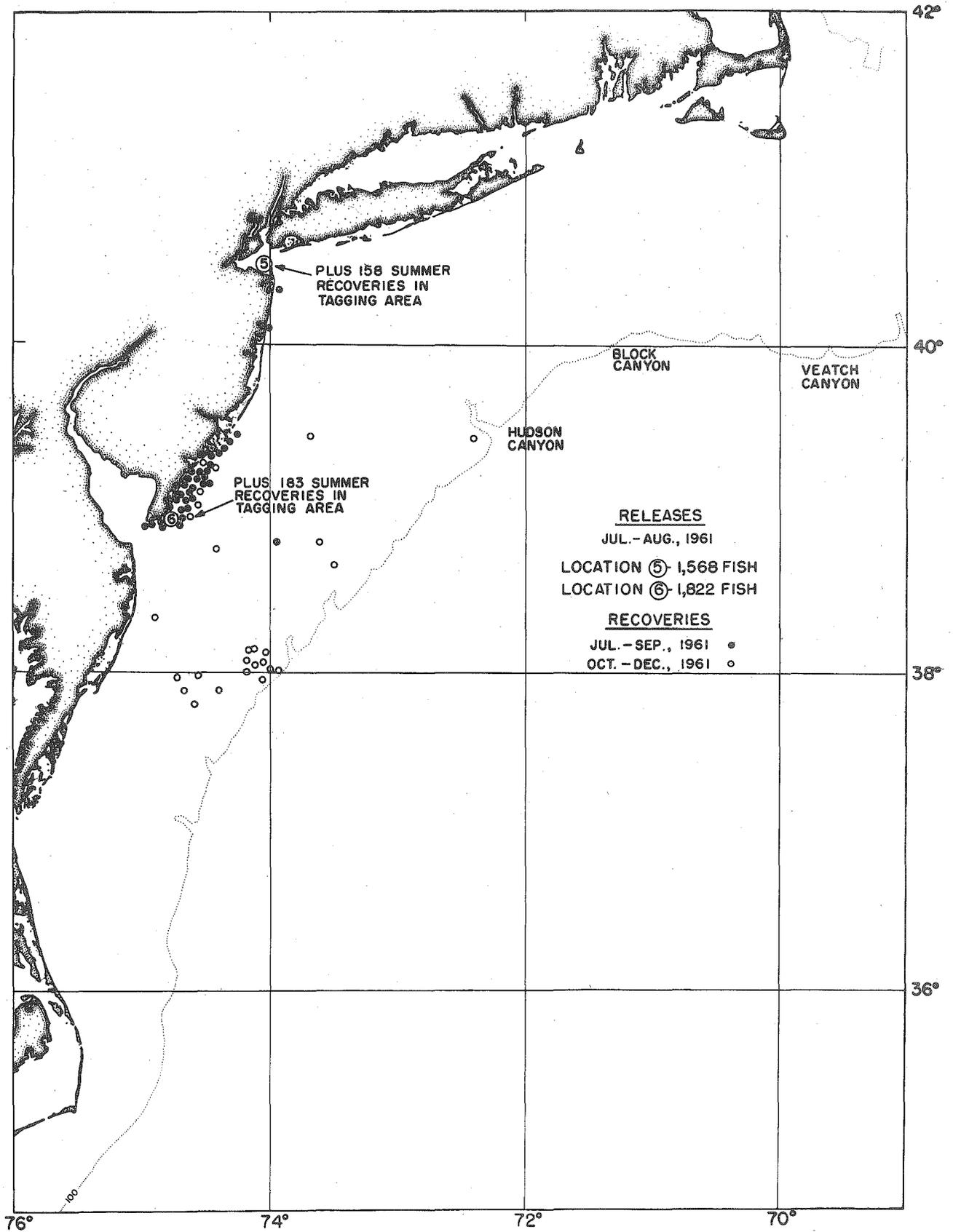


Figure 4. -- Areas where tagged fluke were released in July and August 1961 and locations of recoveries July - December 1961.

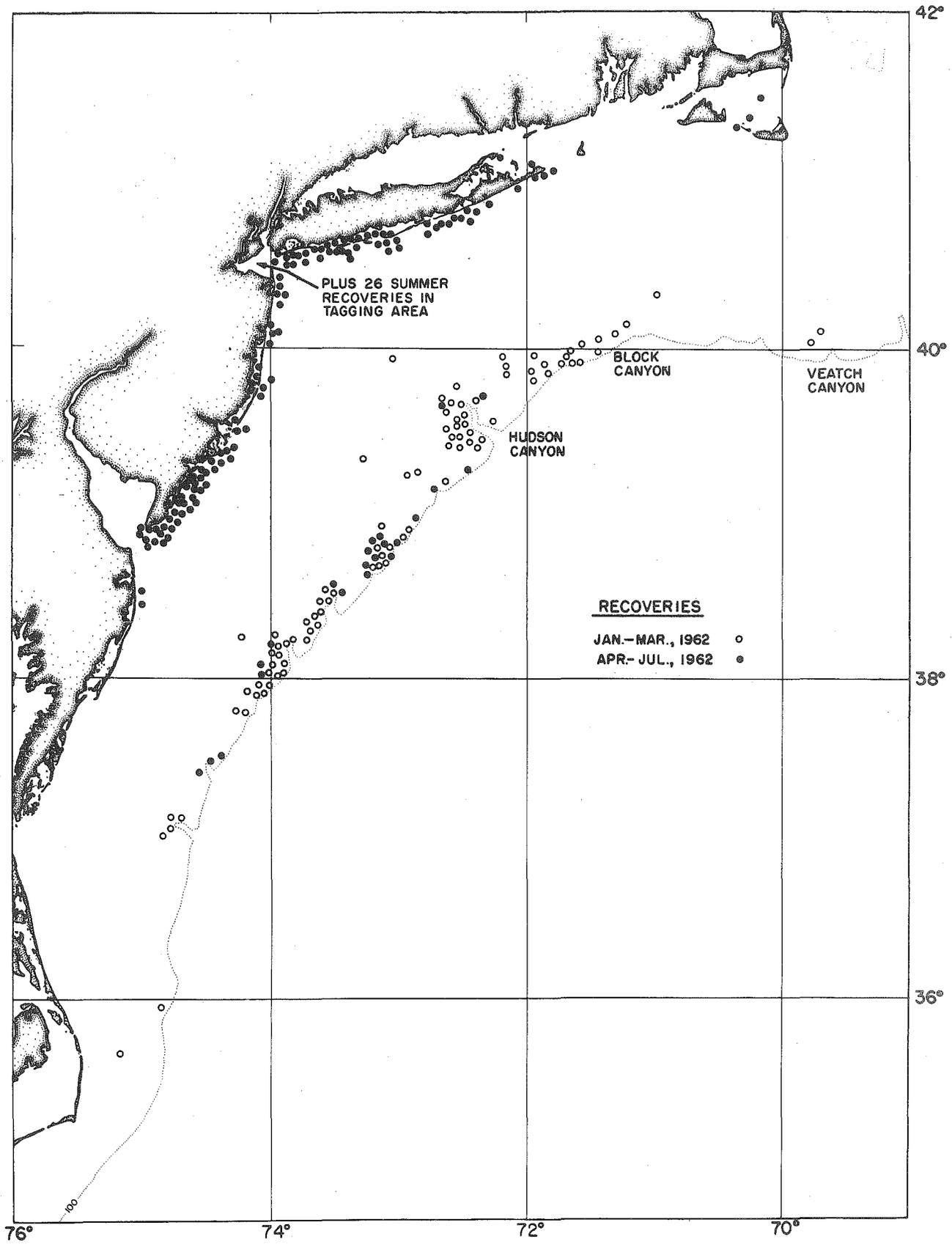


Figure 5.--Locations of recoveries of tagged fluke January - July 1962 from summer 1961 releases.

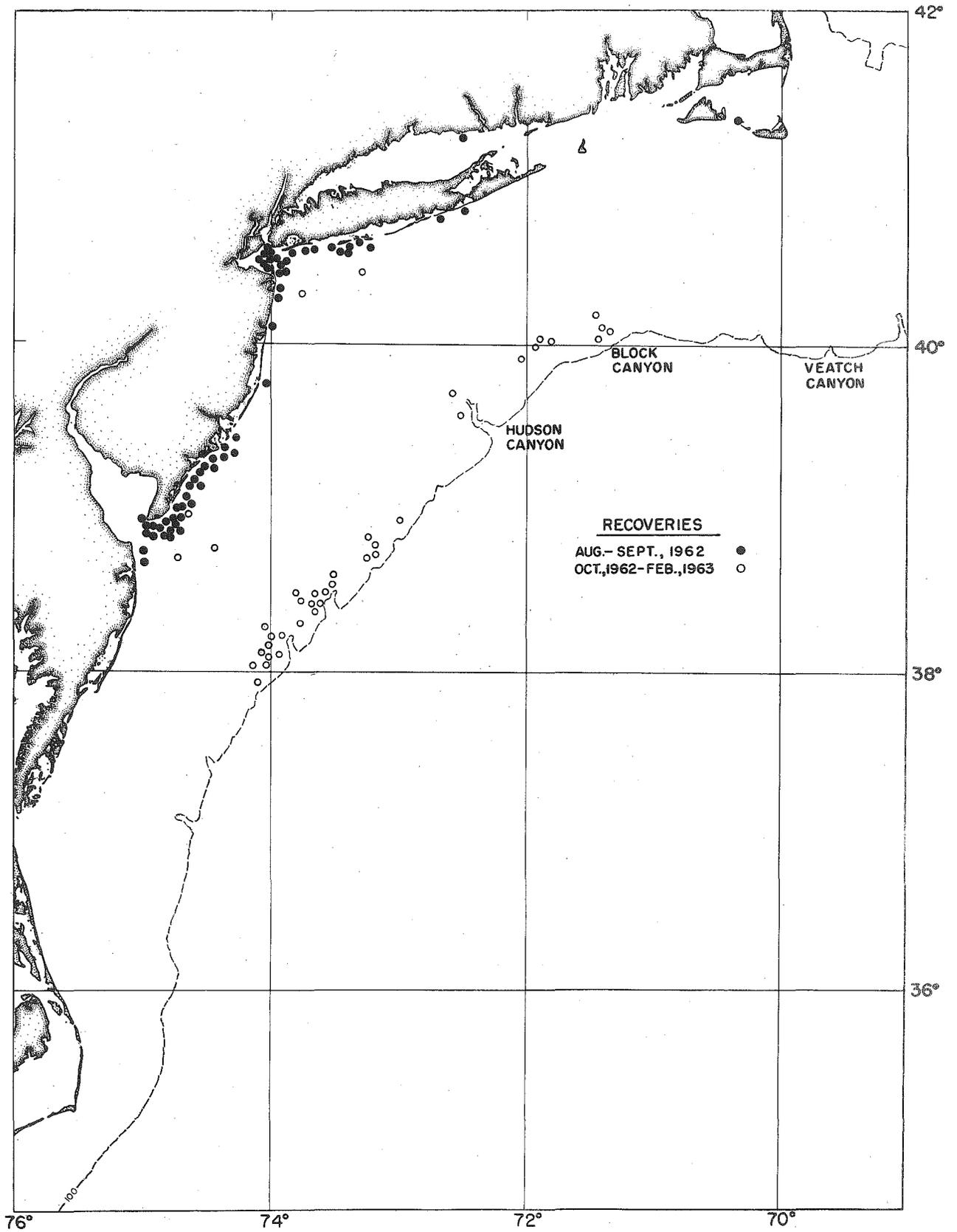


Figure 6. --Locations of recoveries of tagged fluke August 1962 - February 1963 from summer 1961 releases.

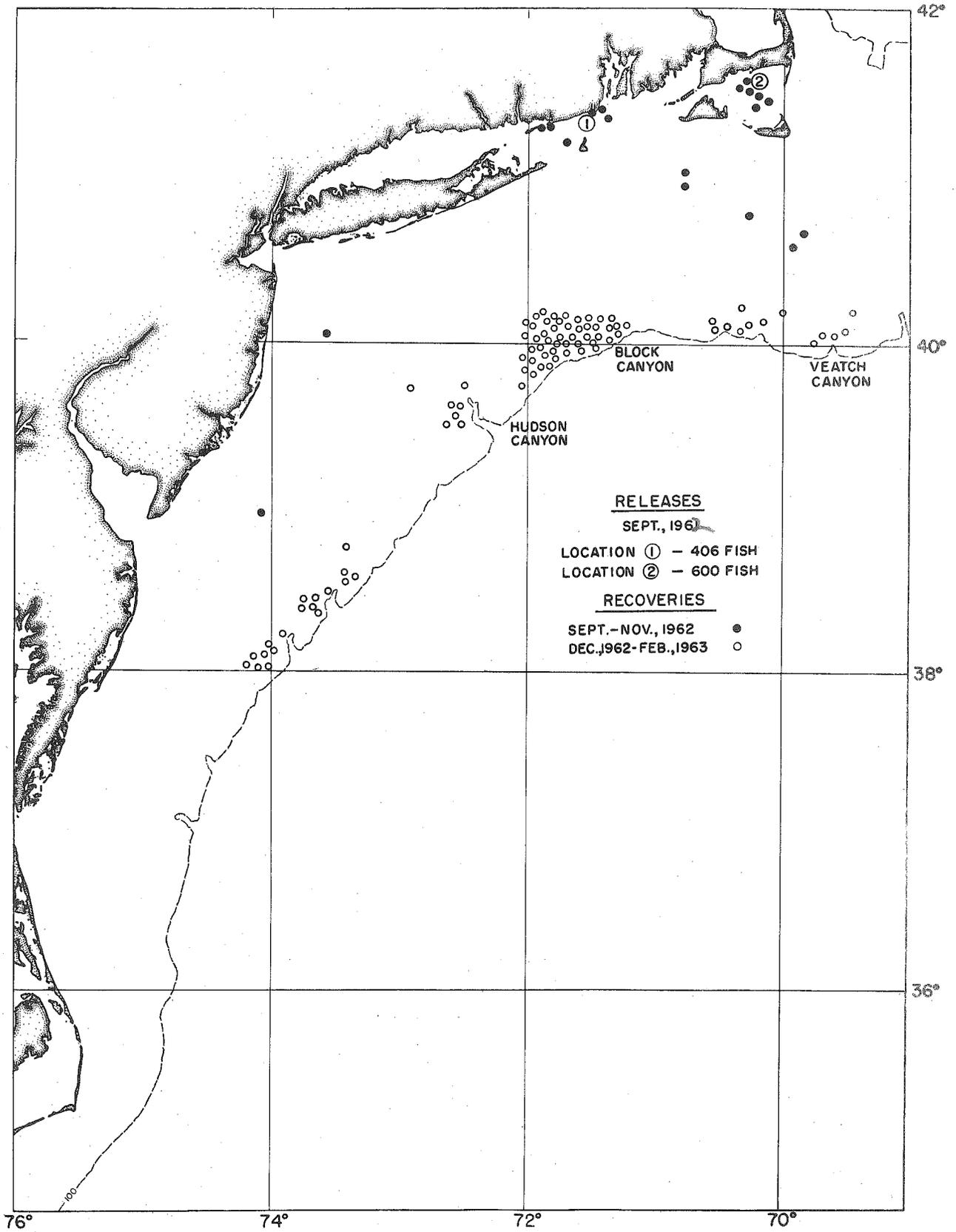


Figure 7. -- Areas where tagged fluke were released in September 1962 and locations of recoveries September 1962 - February 1963.