CANADIAN TAGGING OF COMMERCIAL GROUNDFISH AND SMALL PELAGIC FISH IN THE VICINITY OF THE SCOTIAN SHELF AND GULF OF ST. LAWRENCE, 1953-1985

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABSTRACT

Stobo, W.T. and G.M. Fowler, 2006. Canadian tagging of commercial groundfish and small pelagic fish in the vicinity of the Scotian Shelf and Gulf of St. Lawrence, 1953-1985. Can. Tech. Rep. Fish. Aquat. Sci. 2669: xii+ 137 p.

We examined marine finfish tagging studies conducted between 1953 and 1985, during which over 556,400 groundfish and small pelagic fish, representing 17 species, were tagged by personnel of the St. Andrews Biological Station and the Bedford Institute of Oceanography. The geographical area involved in these studies extended from the Gulf of St. Lawrence to the northeastern portion of the Gulf of Maine. Over 40,800 tags were recovered by the fishing industry.

This report documents tagging procedures, recovery parameters, and database formats developed to provide a permanent record of the work, and release length frequency information on species for which the data were not compatible with the databases. We provide maps detailing the locations, numbers and dates of release of all the species.

We provide individual species synopses, in which previously published recovery maps and conclusions on stock movements are updated for a number of tagging studies that were published using incomplete recovery periods, or have not been previously reported. We also provide a comprehensive list of publications and reports produced, related to those tagging studies.

RÉSUMÉ

Stobo, W.T. and G.M. Fowler, 2006. Canadian tagging of commercial groundfish and small pelagic fish in the vicinity of the Scotian Shelf and Gulf of St. Lawrence, 1953-1985. Can. Tech. Rep. Fish. Aquat. Sci. 2669: xii+ 137 p.

Nous avons examiné les études de marquage de poissons de mer effectuées entre 1953 et 1985, au cours desquelles plus de 556 400 poissons de fond et petits poissons pélagiques, représentant 17 espèces, ont été marqués par le personnel de la Station biologique de St. Andrews et de l'Institut océanographique de Bedford. La zone géographique sur laquelle portaient ces opérations de marquage allait du golfe du Saint-Laurent au nord-est du golfe du Maine. Plus de 40 800 étiquettes ont été récupérées par l'industrie de la pêche.

Le présent rapport décrit les procédures de marquage, les paramètres de récupération des étiquettes et les formats de la base de données ayant permis de créer un registre permanent des travaux, ainsi que les fréquences de longueur lors de la remise à l'eau dans le cas d'espèces pour lesquelles les données n'étaient pas compatibles avec la base de données. Il contient aussi des cartes détaillées indiquant les lieux et dates de remise à l'eau des poissons de chaque espèce ainsi que leur nombre.

Nous présentons ici des synopsis par espèce, comprenant des mises à jour des cartes des lieux de récupération et conclusions sur les migrations des stocks établies d'après diverses études de marquage publiées qui comportaient des périodes de récupération incomplètes ou d'études dont il n'avait pas encore été rendu compte. Nous établissons aussi une liste exhaustive des publications et rapports concernant ces études de marquage.

INTRODUCTION

Mark-recapture studies have been conducted in the Northwest Atlantic since the late 1800s (Needler, 1930; Templeman, 1963; McFarlane et al, 1990). These early investigations were often secondary objectives on research vessel cruises and were only concerned with elucidating the movements of populations or sub-populations in fairly general terms. In the 1950s, researchers became concerned with the population structure and seasonal movements of commercial fish stocks, and tagging efforts were intensified. Special-purpose cruises by research vessels and commercial charters, and inshore fixed gear, were used to apply large numbers of tags to various demersal and pelagic species of fish.

Prior to the mid-1970's, most of the tagging on the Scotian Shelf and in the western Gulf of St. Lawrence was carried out by researchers from the St. Andrews Biological Station. Although responsibility for conducting tagging studies in these waters subsequently became more dispersed throughout New Brunswick and Nova Scotia, a centralized tag clearing house was established at the Biological Station. A single return address was applied to all tags to reduce the chances of post-recovery data loss, enhance efforts to follow up on missing information, standardize data formatting and processing, improve quality control, and facilitate electronic data entry and accessibility. This resulted in a single database of groundfish mark-recapture data for the Scotian Shelf and Gulf of St. Lawrence areas covering tagging activities conducted from 1953 to 1973.

Separate database structures were designed to deal with the small pelagic tagging studies. The largest single species tagging effort occurred on herring (*Clupea harengus*) with over 500,000 tags applied. In 1957-58 a major tagging project on juvenile herring was conducted in the Bay of Fundy using operculum and dorsal fin clip tags. In 1970-71, a large scale adult herring tagging study was conducted in the southern Gulf of St. Lawrence and off southern Newfoundland (in conjunction with the Newfoundland laboratory) using internal magnetic tags. These studies pre-dated electronic data storage and the data from these studies were never entered into a computer data storage system. Between 1973 and 1982 additional major herring tagging studies were conducted throughout the Gulf of St. Lawrence, Scotian Shelf and Bay of Fundy using the external t-bar tag. The information from these studies was stored in an electronic database. Mackerel (*Scomber scombrus*) and large pelagic fish (tuna and shark) tagging studies also pre-dated electronic data storage; the release and recovery information on mackerel is, however, included in this report.

When tagging of groundfish species was resumed in 1977 following the extension of Canadian marine jurisdiction in 1977, the centralized groundfish tagging data processing procedure was also resumed, but with a revised data format and processing protocol. Thus the groundfish tagged between 1978 and 1985 were maintained on a different database than those tagged during the 1953-1973 phase of the program.

In 1985, it was decided to merge the historical databases for groundfish and small pelagics within a common format to facilitate analyses, and provide comprehensive documentation of the multitude of tagging studies and associated data considerations gathered within this single database (currently maintained by Population Ecology Division, Bedford Institute of Oceanography, Department of Fisheries & Oceans, Dartmouth, Nova Scotia, Canada, B2Y 4A2).

It is hoped that this document will serve as a useful guide for researchers interested in such data. Initial results of many of the 1953-76 tagging studies have been described, but the conclusions are often incomplete since they are generally based on only the first few years of recoveries. The incomplete reporting is likely due to the extended time lag between application and virtual completion of recoveries; for most groundfish this lag can be 5 or more years (Fowler and Stobo, 1991; Stobo et. al. 1988). Recoveries from many of the more recent studies have not yet been analysed even though recoveries are complete.

It is the purpose of this report to summarize the groundfish and small pelagics tagging studies conducted between 1953 and 1985 throughout the Gulf of St. Lawrence, Scotian Shelf and Bay of Fundy (NAFO Divisions 4R,S,T,V,W,X), and those releases made in the northeastern portion of the Gulf of Maine (NAFO Divisions 5Y,Z and southwestern Newfoundland (NAFO Divisions 3P,N,O) associated with the Scotia-Fundy region. We concentrate on describing the available data, with some comments on the completed tag recovery results, as an overview, and briefly review some of the studies conducted to date.

We have also provided an update on publications derived from these data, expanding, or revising, the inferences drawn by the authors, based on the additional recoveries made subsequent to earlier publication. Examinations of the results for species, for which only small numbers were tagged, were included if it was felt these releases might otherwise not warrant separate investigations of their own accord.

OVERVIEW

Figure 1 provides a depiction of the geographic areas, often referred to in the text as unit areas. Development of these areas was an action taken by both Canada and the United States to provide additional geographical sectioning of the northwestern Atlantic to the areas delineated by the North Atlantic Fisheries Organization (NAFO). Throughout this report we will use the NAFO areas and Canadian Fishing unit areas together without reference to origin.

Cod (*Gadus morhua*) was the prominent groundfish species in both the 1953-73 and 1978-85 groundfish programs, with lesser but consistent effort directed to haddock (*Melannogrammus aeglefinus*) and American plaice (*Hippoglossoides platessoides*). Pollock (*Pollachius virens*) tagging occurred primarily during the 1978-85 period and was directed at juveniles (ages 0-2). White hake (*Urophycis tenuis*), yellowtail flounder (*Limanda ferruginea*), witch flounder (*Glyptocephalus cynoglossus*), and Atlantic halibut (*Hippoglossus hippoglossus*) were tagged in sufficient numbers for analyses only during the 1953-73 period, and winter flounder

(*Pseudopleuronectes americanus*) only during the 1978-85 period. Herring and mackerel were the only two small pelagic species tagged during the study period (1953-85).

The majority of the groundfish tagged throughout 1953-73 and 1978-85 were caught by otter trawl. Handlining and inshore traps were the next most common capture methods; the pollock tagging work relied almost exclusively on commercial and research inshore traps. Most of the herring were captured close to shore by purse seine, using either chartered or commercially active vessels; commercially active weirs and traps were also frequent methods of capture. Mackerel were trapped, seined, or handlined.

Upon capture, the herring, mackerel and groundfish in the 1978-85 period were usually tagged with T-bar anchor tags, while groundfish from the 1953-73 period were usually tagged with Petersen discs. The T-bar anchor tags consisted of lengths of machine labelled, coloured, No. 20 vinyl tubing (8 cm long, and yellow the most common colour), attached to a nylon T-bar of the same sort used to attach price tags to clothing. The T-bar was inserted into the dorsal musculature of the fish using a hollow needle, and was applied to fish using a 'tagging gun', similar to that used in the clothing industry, although with stainless steel parts. Prior to the development of these T-bar tags, the vinyl tube alone, or with a wire inserted the length of the tube, was used as the tag. It was inserted through the dorsal musculature by means of a hollow needle and the ends of the vinyl, or wire, were tied together to form a loop; in this form it was called a spaghetti tag, and both are encountered today in general language and the literature. The T-bar anchor tag is often referred to as a spaghetti tag, as it uses the same vinyl tube. In this manuscript we distinguish the T-bar anchor tags from the older tied spaghetti tags, and sometimes elaborate where the T-bar version is termed a spaghetti tag in the literature. The Petersen disc tags were two 1.8 cm diameter discs of various compositions and colours (again, yellow was the favoured colour, though sometimes a different colour was used for each disc). They were typically secured together by passing a stainless steel wire through the dorsal musculature of the fish by means of a hollow needle, then passing each end of the wire through a disc, and then twisting the ends of the wire with pliers to hold the discs against the sides of the fish. In all cases, the tags were uniquely numbered and thus identified individual fish, as well as containing instructions for returning the tag, with associated recapture information, to obtain a reward. The labelling was English-only for most of the tagging studies considered here, but some of the early Gulf of St. Lawrence studies using Petersen disc tags included examples of French-only and bilingual labelling (by taking advantage of the two disc surfaces). Details of tagging methodology and data processing protocols for groundfish are provided by Beanlands and McGlade (1982) for both groundfish tagging periods, and by Stobo et al (1975) for herring. Parsons and Moores (1973) provide the description of the tagging method used in the mackerel studies we describe in this paper, which was initially reported by Beckett et. al. (1974). The various tagging studies have been tabulated (Appendix A) and mapped (Appendix B) to provide an overview of seasonal and geographic coverage. Numbers recovered are included in the tables to indicate where analyses might be worthwhile.

Both groundfish databases included fields for fish length (usually fork length) at both release and recapture. Appendix C provides a summary of the length ranges tagged. The herring database did not incorporate a field for either release or recapture length. Length frequency information is available in the database from tagging studies on all adult pollock but 12300 of the 55857 juvenile pollock tagged were not measured. Release length frequency information for tagged

but unmeasured juvenile pollock and all the herring tagging activity was obtained from subsamples of the catch rather than measuring the actual fish being tagged. The pollock length frequencies presented in Appendix C are the actual subsample counts. Much of the herring tagging activity was conducted during ongoing commercial purse seine operations, thus only a few hundred herring were tagged during each of several seine sets during a night of tagging activity; and tagging was conducted over several nights. The herring length frequencies were weighted by catch and combined for the length frequency information presented in this report. Mackerel were not measured. The existence of pollock recovery lengths in the absence of release length data sometimes caused confusion, such as blank lengths at initial capture being mathematically misconstrued as zeros. This departure from other groundfish protocols for pollock should be kept in mind if analyses are conducted on the pollock length data. Appendix D tabulates the subsample length frequencies for the indicated pollock and herring tagging, as this information is not part of the tagging database.

Most of the other differences between the tagging databases involve data coding, rather than substantive changes in procedures. Appendix E details the formats of the databases, and includes field summaries and background information for clarification. Two aspects of variation in data processing between tagging programs deserve special mention. Firstly, the 1953-73 groundfish tagging program did not consider day of the month relevant, such that release and recapture dates are only accurate to the month. And secondly, the apparent high precision of herring recovery locations is partially due to the use of a digitization procedure for data entry that created exact co-ordinates, even though the original data often provided more generalized locations.

Preliminary analyses of data fields commonly associated with data processing, and sometimes overlooked during mark-recapture analyses, were conducted to identify any factors that could conceivably bias results. Details of these examinations have been included with the format descriptions of the original databases in Appendix E. The most relevant observations (pervasive or critical) are briefly discussed in the Data Quality section. Simple summaries of data fields that might be of interest to researchers, but are not extensively discussed in this report, have also been incorporated into the format descriptions for the various databases.

The ‘Tagging Database Structure and Format as of January, 2006’ in Appendix E depicts the latest version of the finfish mark:recapture database. It represents a redesign of the database structure to combine historical and current tagging programs for various groundfish and pelagic species. It includes additional variables and codes beyond those pertaining to the tagging discussed in this report, but comparison with the preceding older database formats in Appendix E should clarify features applicable to post-1985 tagging studies. The PROGRAM code in the current database identifies broad suites of tagging studies, and preserves the specific origins of the data. The tagging studies presented in this report are contained in PROGRAMs 2 (1978-1985 groundfish tagging), 3 (1953-1973 groundfish tagging), and 4 (1973-1982 herring tagging). Many of the species dealt with in this report remained the subjects of tagging studies after 1985, so attention should be paid to the PROGRAM and/or YEAR of tagging when analyses might be affected by incomplete recoveries from more recent studies. This may be especially relevant with respect to cod, haddock, halibut, herring, American plaice, yellowtail flounder, and winter flounder, all of which have been the targets of post-1985 tagging studies.

As a general guideline to assist researchers in planning analytic approaches to the tagging data, we conducted cursory examinations of geographic and temporal recovery data to address trends in data volume with varying degrees of data precision, and to assess the impact of elapsed time since tagging on conclusions drawn from recovery data (e.g. short-term versus long-term post-release periods). Results of these analyses are presented in the Recovery Parameters section.

Reviews of the status of tagging studies are organized in the Species Synopses, with each species represented by three subsections – General Description, Updates to Historical Tagging Studies, and Summary of Unexamined Recoveries.

The General Description subsection provides a comprehensive summary of the tagging conducted on a species. A search through the historical literature pertaining directly to the tagging programs described in this paper was conducted in order to flag potentially 'forgotten' releases, to confirm completeness of the present databases, and to update or amend some of the earlier studies. Most of the results of the 1953-82 tagging and much of those for the later studies have been reported (Appendix F*)*. However, many of the reports analyzing the tag recovery data were based on recoveries made within a year of tagging, to portray fish movements in a timely fashion for stock assessments. These reports were commonly presented in the form of Research Documents to bodies deliberating international and national fish conservation measures, typically the International Commission for the Northwest Atlantic Fisheries (ICNAF) and the Canadian Atlantic Fisheries Scientific Advisory Committee (CAFSAC). Further, many of these reports appear only as summaries in ICNAF Annual Proceedings or in Research Station Annual Progress Reports. Since returns from longer periods at large could conceivably provide a more complete description of fish movements and migrations, we re-examined the results of the historical releases using the total recoveries.

In the Updates to Historical Tagging Studies subsection we document any discrepancies noted between previously published results and those from analyses of the complete recovery data sets; and, where appropriate, we confirm the conclusions of some past studies that were presented as being of a speculative nature at the time. We do not attempt a comprehensive review of the research to date (Appendix A outlines the associations between the various tagging groups and the historical literature), nor do we comment on discrepancies in earlier work where a subsequent publication has already resolved the issue. We chose 1992 as a cutoff date for the update exercise, as more recent publications would have included all recoveries in their analyses.

Tagging data for which we could find no evidence of a report being published, is noted in the Summary of Unexamined Recoveries subsections. Cases of unexamined tagging data from this period relate largely to incidental tagging of fish other than the species that a given study targeted. If there was also no indication of current or pending interest in these species, we conducted basic spatial/temporal analyses of the recoveries, and any further investigations that seemed warranted, on a case by case basis.

DATA QUALITY

The tagging data comprise a large number of separate tagging studies conducted over a great many years, and were subjected to differing degrees of auditing and editing, and some of

the original data records no longer exist. This is especially relevant to anyone analysing and interpreting the information associated with tag recoveries. Typically, bad or suspect data will not be clearly resolvable. Typographical entry errors, and imprecise or erroneous data collection procedures, are possible sources of error. Release data were generally subjected to reasonable levels of quality control since they were collected by scientific staff or under supervision of scientific staff. Although some errors in release locations have occurred we have corrected many in the course of this work and thus may no longer be of concern. Release length data likely contain transcription errors, mostly within the range of plausible values, and thus unlikely to be suspected unless subsequently paired with impossible recovery lengths. Very extreme release lengths should be regarded with caution, since we are unable to verify them. Recovery records of unusually small or large fish could be valid, or the result of transcription errors, or imprecise measurement by the individual recovering the fish (e.g. estimation of length rather than true measurement, or lack of documentation of whether the measurement unit was inches or centimeters). Invalid values for minutes of latitude or longitude (e.g. over 60) for recovery locations could be simple typographical errors, or failures to recognize decimal degrees for a returned tag. Another source of recovery location data error, that cannot be easily discerned, is technically valid coordinates, which are, nevertheless, incorrect. These could occur for a multitude of reasons – a fish plant worker assuming a fish came from the wrong ship, a fisherman active in more than one area making a guess where a fish was caught, etc. Some errors, such as extreme outliers, or recovery locations on or very near land (most often at or near a fish plant or home address), can be deduced from simple plots. But in many cases we can only speculate whether an unexpected or uncommon recovery location is valid.

The expectation of tag recovery from any large-scale marine finfish tagging study is usually low due to a number of factors (e.g. mortality, tag loss, reluctance to submit tags, etc.). In addition, however, there is a reduction in usable recoveries due to incomplete reporting of the recovery information, primarily date or location. As a result of the data omission, a significant proportion of all recovery tags submitted will be of limited use, or unusable, for many investigations. With some species, such as herring, overall chances of recovery are very low, so many thousands of fish have to be tagged to clearly determine movement patterns. As well, the mass processing involved in the herring fishery greatly diminishes the chances of detecting tags relative to the more individually-handled groundfish species.

Generally, about 60-75% of the recoveries for any major groundfish release will have both month and Cartesian co-ordinates (latitude and longitude) of recapture; only data with these attributes are useful in examining seasonal distribution and movements. The remaining recoveries, however, may still be useful in examining stock range (if geographical coordinates are provided), tag retention (if recovery date is provided), or growth (if recovery date and length are provided). As previously noted, some of the coordinates of geographic recovery location in the herring database (see Table 1) are partly due to the data entry procedure which imposes precision on generalized recovery locations. We note that a data quality code for the herring database identifies only 7660 of the 13806 recoveries as 'good'. The remainder break out as 4567 immediate recoveries (any recaptures within two weeks of tagging), 861 without any location data, 470 with incomplete dates, and a further 245 designated as ‘suspect’ for undefined reasons. These latter 245 recoveries might represent returns for which original geographic co-ordinates were not as precise as those derived

through digitization, but we suspect that some portion of the ‘good’ data also had precision added by the digitization procedure.

One of the recovery data attributes least likely to be documented is the method of capture. But it is often desireable to identify the actual fishery involved in order to properly weigh the recoveries against catch or to qualify conclusions on distribution against distribution of fishing effort. Although the data field in the database for gear type frequently indicates ‘unknown’ or ‘other’, we have attempted to ascertain likely recapture gears for species for which the likely fishery source can readily be identified from our knowledge of the fisheries or other data supplied with the recovered tag. Angling is the most likely source of ‘other’ recoveries from the 1978-85 groundfish tagging. Of the 1010 'other' recoveries in the 1978-85 database, 990 have month and Cartesian co-ordinates of recapture; so high a proportion of returns with such detailed information is only replicated in the case of angling, for which every recovery (800 tags) has similarly precise data. Angling is also the best candidate in cases in which groundfish recoveries caught by 'unknown' gears are associated with known capture depths for both programs. Roughly 75% of groundfish recoveries have capture depth, yet virtually all recoveries by angling have known depths. It would be fairly unusual to know the depth of capture without being aware of the method of capture, and for angled fish, it is easy to apply depths by reference to a pier or other near-shore structure. As well, during the 1953-73 program, there was no data code for angling, and the code only appears to have been used for 2 years (1981 and 1982) of the 1978-85 program. Thus the ‘unknown’ capture method designation in association with known capture depth may be a result of the absence of a proper code, not knowledge of the gear type. Most of the herring recoveries by undefined gears come from either Passamaquoddy Bay or Chaleur Bay, areas in which weirs and purse seines, respectively, are the most common gears used, and thus the most likely 'unknown' capture methods for these species in these areas.

RECOVERY PARAMETERS

A major consideration when analyzing temporal aspects of tag returns for any species is a roughly exponential decline in rates of recovery over time (Table 2). Discerning migration or dispersion patterns for groups of fish that take more than 2-3 years for the pattern to fully develop would require the initial application of a few thousand tags. Early studies, like those conducted during the 1953-73 period, rarely exceeded a thousand tags. Compounding this decrease in recovery information over time is the generally high probability of tagged fish being recaptured very soon after release in the same vicinity, providing information of limited value in studies concerned with seasonal migrations or stock boundaries. Usually 10-25% of the total tags recovered from a given groundfish release group, and 66% of a given herring release group will be recaptured within three months of being tagged, and in the area of release. We refer to such recoveries as ‘immediate recoveries’, since they generally only provide information on local movements. Exceptions would occur tagging in the absence of fishing activity, or just prior to initiation of migratory activity by the fish being tagged. Herring tend to be highly mobile, so two weeks is commonly used as the time duration for defining an immediate recovery for this species. Using a 2-week ‘immediate recovery’ period for herring, as opposed to the 3-months commonly

used for groundfish, would reduce the immediate recapture segment of the herring data from 66% to 33%. In practice, the only way to determine if short-term recoveries for any tagging study provide useful information is to examine them separately from the rest of the recoveries.

Longer-term comparisons within a fish stock, such as between a release in the 1950's and another in the 1980's, must consider historical changes in both the fisheries and the tagging programs before interpreting results. Cod, haddock, pollock and plaice were tagged in significant numbers during both the 1953-73 and 1978-85 groundfish programs. Consistently higher recoveries were obtained for the earlier program, which could lead to faulty conclusions without considering several factors related to the tagging that differed between programs. The influences of these disparate conditions of initial capture and release on subsequent recoveries were examined previously (Fowler and Stobo, 1999), so we restrict ourselves in this report to discussing those differences between the two programs that may not be apparent from scrutiny of the transcribed data itself.

The greatest difference between the two programs, best reflected by cod and plaice recoveries, was the deliberate avoidance of tagging activity in the presence of an active fishery during 1978-85. The immediate recaptures (i.e. within 3 months of release) are substantially higher for 1953-73 studies (23% of all cod and 27% of all plaice returns) compared with 1978-85 studies (13% of cod and 14% of plaice returns). The net result is that the actual proportions of 'usable' recoveries of cod and plaice for the two programs are much closer than their total recoveries might indicate. A more specific difference between pollock tagging projects was the emphasis on tagging juveniles in their inshore nursery areas during the 1978-85 studies. The earlier (1960) study on pollock predominantly targeted offshore adults. Low returns from the 1978-85 pollock releases relative to the 1960 release of adult pollock could partially reflect the lesser recruitment of the pollock to fisheries throughout their juvenile phase, during which time natural mortality would take its toll. As the individual juvenile pollock tagged were often not measured (see Overview) the contrast in maturity stage between these and other fish (of any species) is not always evident in the data itself. Although pollock tagged as juveniles provided fewer recoveries than pollock tagged as adults, immediate recaptures of the juvenile pollock were quite high (see Table 2) for a groundfish, and subsequent recoveries did not exhibit as great a degree of decline in recovery rates over time as groundfish tagged as adults. The higher immediate recaptures are probably due to the initial availability of juveniles to inshore fisheries (i.e. angling off the pier for harbour pollock), and by virtue of their schooling habit, to weirs, followed by a period of reduced availability to fishing gear when the young pollock are offshore but smaller than commercially sought. Subsequent recruitment to the adult fishery accounts for the lesser decline observed in recovery rates with time. Proportionately more fish may thus remain available a few years after tagging if released as juveniles rather than as adults.

Evolution in the fisheries themselves over the years can also impose differences in recovery rates that may be misconstrued as due to some other factor, or simply attributed to sampling variance (thus inflating the error component of contrasts). While draggers (otter trawlers) predominated the 1953-85 groundfish fisheries, longlining, handlining and gillnetting were consistently important. But use of the Danish seine was considerably greater, and that of hook-and-line gears drastically less, in commercial fisheries during the 1978-85 period compared to the 1953-73 period. Most of the hook-and-line recoveries (460 out of 540 total) were made during 1954-56.

Since that time hook-and-line fishing has been virtually eliminated. While the most obvious changes in favoured gear types over time may still serve as a crude index of long-term changes in the fishery, these changes may be less important than innovations within a gear type. In parallel with these changes in the fisheries, and of greater concern to tagging studies, has been evolution in the ways that fish are handled after they are caught. Groundfish recoveries from the 1953-73 program were usually made by fishermen themselves, whereas recoveries from the 1978-85 program were as likely to have been made by a plant worker as a fisherman. This may reflect increasing automation in the fishing industry over the years, such that tags became less likely to be observed by fishermen as on-board processing technology changed. If similar development is assumed for shore-based processing technology, and so long as human observation is necessary to affect discovery, we have the implication of continuously declining likelihoods of recovery of tags over time. The potential impact on tagging studies is perhaps best demonstrated by herring, where the low overall recovery rate of 4% may be a consequence of automated processing employed for the majority of the catch during those recovery periods (capture by purse seine; processed as fish meal).

In earlier periods of fisheries activity, a population of fish might disappear from the recovery record for certain months because the fishery was either not directing towards that species, or was unaware of their location. More recently, fisheries management plans often exclude effort from the fishing grounds for certain months when the fish are present as a conservation measure. Change in the application of fishery management practices may also affect the apparent results of tagging studies in more subtle ways. The best example concerns monthly trends in recovery rates. Comparing the total (all species combined) 1953-73 groundfish program recoveries to the 1978-85 groundfish program recoveries for like months (Figure 2), we observed that returns generally peaked around August for the earlier program and around June for the later program. This shift in the monthly probability of recapture between programs may reflect the initiation of Total Allowable Catches (TACs) in the 1970s, motivating fishermen to concentrate their effort on particular species earlier in the year to obtain as much of the higher economic value fish as possible before fisheries could be closed due to quota limits (the ‘race for the fish’). We use this example to draw attention to the biasing influence that fishing effort could have if quantitatively examining recovery data for seasonal trends.

With herring, the low recoveries in the Gulf of St. Lawrence and Sydney Bight during February through April correspond to the period of greatest icing over of fishing grounds or inclement sea state conditions in several areas; the drop-off in returns thus may reflect the species' unavailability to the fishery due to seasonal environmental events. In the Bay of Fundy, the herring fishery is prosecuted by gears types which target different phases and seasonal occurrences of herring. Weirs are immobile, restricted to along-the-shore locations, primarily target juvenile herring, and usually operate only from May to October. Gillnets primarily target spawning fish on the spawning grounds so their use is largely limited, both to the late summer-early fall and geographically restricted to the spawning grounds. Purse seines are highly mobile and the boats can follow concentrations of fish through all phases of their life cycle, inclusive of migrations. Thus most recoveries of herring between December and April are made by purse seiners. When examining returns from the perspective of seasonality the extent and duration of ice cover during specific years, and the other factors, would have to be assessed. As well, the anomalous drop in

recovery rates for December (total 550 returns) relative to November (total 1223 returns) and January (total 2203 returns) represents non-fishing over Christmas, rather than any intrinsic aspect of fish behaviour.

SPECIES SYNOPSES

Atlantic wolffish (Anarhichas lupus), often referred to as catfish

General Description

A total of 113 wolffish were tagged, all off southwest Nova Scotia (areas 4Xq,r) in May-June 1963 with spaghetti tags (Appendix B Figure 3). (As opposed to the more recent T-bar anchor tag, often called a spaghetti tag, the tag used in this study was the original spaghetti tag, a thin vinyl tube inserted through the flesh adjacent to the dorsal fin and the ends tied together to form a loop.) The majority of fish were between 88 and 97 cm in length (range: 76-109 cm).

Updates to Historical Tagging Studies

We could not find any published information on wolffish tagging results for the Scotian Shelf area. Thus, no updates were possible.

Summary of Unexamined Recoveries

There were 13 recoveries from the release of 113 wolffish near Yarmouth, N.S. in May-June 1963 (Figure 3). The recovery rate was 0.115 (Table 1), 7 being recovered within three months of release and all 13 within 4 years. Since all of the recoveries occurred near the release locations, perhaps it was not considered worth a formal report at the time; the species was of little commercial interest in the 1960s.

Cod (Gadus morhua)

General Description

Cod has been the most consistently tagged species in NAFO Subarea 4 during the 1953-85 period (Appendix B Figures 4-12), with tagging activity occurring in 21 of the 33 years (Appendix A). During the 1978-85 period, tagging activity occurred in 6 of the 8 years. Tagging in NAFO Subarea 5 occurred only in the eastern portion (areas 5Zj and 5Yb), and only during 1984-85. Of the almost 81,000 tags applied throughout Subareas 4 and 5, 67% were applied during the 1978-85 period (Table 1). During the 1953 to 1973 period, a combination of tags were used, but Petersen discs were the most prevalent. During the 1978-85 period, T-bar anchor tags were used almost exclusively; a major exception was 1001 Petersen disc tags applied in April 1979 in area 4Vc.

In area 4X, the 1953-73 releases were mainly in the inshore areas of southwestern Nova Scotia (area 4Xo, 1816 fish) and the Bay of Fundy (area 4Xr, 57 fish; area 4Xs, 1050 fish) during the April to October period (Appendix B Figures 4, 7, 8). Only 107 fish were tagged offshore (areas 4Xn,p), in the vicinity of Brown's Bank (Appendix B Figure 8). Between 1979 and 1985, over 13,600 cod were tagged in area 4X (Appendix B Figures 9-12). Most of these fish were tagged offshore (area 4Xp, 10787 fish) during February and March, 1984-85 in an attempt to target spawning components (Appendix B Figures 11, 12).

In area 5Zj, over 3,000 cod were tagged on the eastern edge of Georges Bank during February and March, 1984-85, (Appendix B Figures 11, 12). An additional 350 were tagged offshore, in area 5Yb, near the entrance to the Bay of Fundy (Appendix B Figure 12) in July, 1985.

Generally, very few cod under 30 cm were tagged; the majority of fish tagged were between 40-70 cm in all releases and areas. The absence of small fish is more a result of selective fishing than population structure, since areas known or found to contain small fish were avoided. As a result, a skew to larger sizes occurs in the frequency distributions; this was most apparent in the 1984 and 1985 releases near Brown's Bank (4Xp) where a substantial proportion of cod tagged were greater than 70 cm (see Appendix C).

The overall recovery rate for the 1953-73 releases was substantially higher (0.279 vs 0.161) than that obtained from the 1978-85 releases (Table 1). In both periods, however, the proportion recovered per year was similar (Table 2), with 60% of the total recoveries being recovered within one year of release and over 95% within four years.

Updates to Historical Tagging Studies

[Publications List references: 2, 3, 5, 6, 7, 8, 9, 10, 13, 14, 15, 16, 17, 19, 21, 22, 24, 25, 27, 28, 29, 30, 31, 32, 33, 34, 35, 37, 38, 39, 41, 45, 47, 48, 52, 53, 57, 67]

Kohler (1975) analysed cod tagging results from the Sydney Bight area and suggested a single stock occupied both 4Vn and 4T, but presented only a gross recoveries plot without any temporal breakdown. Since it is well known that Sydney Bight is an overwintering area for cod, this was doubtless an oversight. An analysis of the complete dataset indicated that the cod tagged in Sydney Bight overwintered there from January to March, entered the Gulf of St. Lawrence in April, then dispersed throughout the Gulf for the rest of the year.

More problematic than relevant today, an early paper on cod and haddock mortalities (Paloheimo, 1958) used tag return data to derive natural and fishing mortality estimates. Mortality rates were computed separately for each of three tag types applied in 1953, using recoveries through 1957. Unfortunately, the numbers for the Lea hydrostatic and Petersen disc tags for the cod recoveries in this study, were reversed. Beyond some comments comparing results between the two tags that would be reversed, the error did not alter the conclusion, as the estimated natural mortality for cod was considered too dubious in any case.

Lastly, in a paper comparing recovery rates between tag types (Fowler & Stobo, 1991), the symbols identifying Petersen disc and T-bar anchor tags (referred to as spaghetti tags in that paper) are reversed in the graphs displaying recovery rates by year. Petersen discs are really depicted by the white symbols and spaghetti tags by the black symbols.

Summary of Unexamined Recoveries

A case of apparently unexamined data relates to cod tagged in the Gulf of St. Lawrence in 1961 and 1964. In September-October, 1961 and in May, 1964, cod were tagged off Seven Islands (NAFO area 4Sz), Quebec and in the vicinity of Chaleur Bay (NAFO area 4Tk), New Brunswick, giving the appearance of deliberately paired tagging studies from each side of the Laurentian Channel. The mark:recapture data for these four release events exists in our database. However, in Lettaconnoux (1965) there is also some reference to a tagging event off Seven Islands in September of 1964. We have been unable to find any release or recovery data related to that release event.

There are several reports and publications which describe the results of the Gulf tagging in this area; but discrete reference to the actual tagging event is often not given and the associated information not helpful in determining which event is being reported. In a 1963 report, Jean described the results of the 1961 Seven Islands tagging, but made no reference to the Chaleur Bay releases made in the same year. Lettaconnoux (1963) provided a brief summary of tagging results for this area of the Gulf, but the report does not identify the tagging events involved, although that report would have to apply to pre-1964 tagging events. There are data in the database for the May, 1964, tagging events off Seven Islands and Chaleur Bay, but we were unable to find any mention of the results of these tagging events in the literature. The only mention of any discrete 1964 Gulf of St. Lawrence tagging we could find, (Lettaconnoux, 1965) refers to 2700 4S cod tagged in September of 1964, the tagging event for which we could find no data.

Somewhat confusingly, we have suggestions from the ICNAF Annual Proceedings for 1962 (Lettaconnoux, 1963) and in Jean (1964) that tagging results indicated that 4S and 4T stocks might not be independent. We cannot determine exactly which of the September-October 1961, May 1964, and September 1964 tagging studies were considered by Jean (1964), but the ICNAF Proceedings could only have relied on the May 1961 tagging, assuming no other studies of which we are unaware. Results of our update analyses (Figure 4a) indicate that the September and October 1961 and May 1964 Gulf of St. Lawrence tagging studies support the interpretation of Jean (1963). The total recoveries indicate that the cod tagged in the two NAFO Divisions exhibited overlap in their ranges for most of a year, but centres of concentration were sufficiently separate that two biological stocks were clearly evident. To clarify the situation we summarized the movements of these cod based solely on recoveries made subsequent to the calendar year in which they were tagged (i.e. excluded recoveries made between Oct-Dec, 1961, and May-Dec, 1964). Thus the suggestion that 4S and 4T stocks might not be independent seems a bit misleading. Possibly it only alludes to their overlapping distributions without intending to imply a stronger relationship.

Given the confusion over the identity of the data being considered by Jean (1964) and interpretations of ICNAF (Lettaconnoux,1963), we focused our update analyses on the tagging results reported by Jean (1963), with which we had consistent results and could confirm we had all the data previously analyzed. With the May 1964 tagging in 4Sz and 4Tk not available in time for Jean (1963), and about twice the recoveries from the 1961 tagging as Jean (1963) due to continuing tag returns after publication of results, we could break out individual months where desired, whereas Jean (1963) was limited to a more generalized seasonal (winter, summer, autumn)

breakdown of recoveries. The 4S fish favoured their area of release from about July through December (Figure 4a), with recoveries on the decline throughout that period. There was extensive movement into the Chaleur region during this period. In January recoveries were made in the southeastern portion of the Gulf of St. Lawrence, with increasing numbers from February through April. The recovery locations were highly concentrated along the west coast of Newfoundland from 3Pn to 4Rc. There were only a few recoveries from the Sydney Bight area. During the May-June period these fish appear to have returned to the Chaleur-4S areas, with recoveries in the Chaleur area slightly predominant. Not apparent to Jean (1963) due to the lesser amount of data available, we think recoveries in the northeastern Gulf suggest that movement through 4S to 4R may have been more common than through 4T.

Tag recoveries from cod tagged in the vicinity of the Bay of Chaleur (4Tn, and 4Tk just outside 4Tn) suggest the fish were concentrated in the Chaleur area from roughly May through November, with few recoveries occurring in November and none in December (Figure 4b). Recoveries next appeared in the Sydney Bight area (4Vn), with a few returns in January, but in greater numbers during February and March. During this period some recoveries were also made in the Cape Ray area (Newfoundland side of the Laurentian Channel). In April, recoveries declined, but those recoveries made, were concentrated in the Sydney Bight area. By May most of the recoveries were being made either from Chaleur Bay or the 'Lip', an area in 4Tf where cod tend to emerge from the greater depths of the Laurentian Channel to enter the southern Gulf of St. Lawrence shallows. May and June were months of the greatest dispersion in recoveries as the cod departed the southeastern entrance to the Gulf and returned to the Chaleur area across 4Tf.

In overview, both 4S and 4T-tagged fish underwent winter migrations out of the Gulf. During the winter sojourn at the southeastern entrance to the Gulf of St. Lawrence, the 4S cod were rarely recovered from the Sydney Bight fishery, most remaining on the Newfoundland side of the Laurentian Channel, while 4T cod were similarly pre-disposed to remain on the Nova Scotian side of the Channel. Both the 4S and 4T fish returned to the Gulf in the spring. The two groups appeared to mix in the summer-fall when the 4S cod ranged freely into the Chaleur area of 4T. Little reciprocal movement of the Chaleur-tagged cod into 4S was evident.

Four cod tagging events conducted between 1979 and 1981 have yet to be reported in the literature. They comprise: winter tagging in 4Wk in 1979; winter tagging in 4Wk in 1980; fall tagging in 4Wh,f in 1981; and fall tagging in Sydney Bight (4Vn) in 1980.

Cunner (Tautogolabrus adspersus)

General Description

Forty-seven cunner were tagged with T-bar anchor tags in July, 1980, in St. Margarets Bay in area 4Xm (Appendix B Figure 3). They were caught by research vessel otter trawl.

Updates to Historical Tagging Studies

We could not find any published information on cunner tagging results for the Scotian Shelf area. Thus, no updates were possible.

Summary of Unexamined Recoveries

The 47 cunner tagged in St. Margarets Bay in July of 1980 produced only three recoveries, all in the vicinity of the tagging location, approximately one week after release (Figure 5).

Haddock (Melannogrammus aeglefinus)

General Description

A total of 43,999 haddock were tagged between 1953 and 1985, the majority in the 1978-85 period (36,373 vs 7626 fish; Table 1). Petersen disc tags were most commonly used in the earlier years (1953-73) and T-bar anchor tags in later years (1978-85). In the Gulf of St. Lawrence tagging was limited to September-October, 1956, during which 999 fish were tagged (Appendix B Figure 13). On the Scotian Shelf, haddock tagging was concentrated in the southwest (4WX) between 1953 and 1986 (Appendix B Figures 13-17). Tagging on the central part of the Shelf (4W) was largely restricted to 1959 when 1,297 fish were tagged (Appendix B Figure 15). In the Bay of Fundy (areas 4Xr,s and 5Yb), haddock tagging occurred throughout the 1957-85 period, with releases in the years 1957, 1963, 1966, 1973, 1982 and 1985 of 818, 661, 319, 242, 2893 and 483 tagged fish respectively (Appendix B Figures 14-17). Off southern Nova Scotia (areas 4Xn,o,p) the largest releases occurred with 581, 1392, 251, 900, 3547, 10952 and 11993 fish tagged in 1953, 1957, 1969, 1971, 1983, 1984 and 1985 respectively. Releases on the eastern edge of Georges Bank (unit areas 5Zj,m; Appendix B Figure 17) occurred in 1984 (3189 fish) and 1985 (2944 fish).

The length range of haddock tagged was 10 - 93 cm; a single fish was documented as146 cm, but that may have been an entry error. The majority of fish tagged in the Gulf of St. Lawrence in 1956 ranged from 44-56 cm, similar to those tagged on the Scotian Shelf during the 1950's and 1960's. Generally fish tagged on the eastern Scotian Shelf (4W) and in the Bay of Fundy (unit areas 4Xr,s) tended to have relatively more small fish than those tagged on the southwestern part of the Shelf (unit areas 4Xn,o,p). This tendency was also apparent in the 1970's and 1980's releases. In a small release in February 1980, off Halifax, few fish were greater than 30 cm, and in a much larger release (2893 fish) in June, 1982, in St. Mary's Bay (area 4Xr) few fish were more than 40 cm. Haddock tagged in 1984 and 1985 on the northeast part of Georges Bank (areas 5Zj,m) tended to be slightly larger than southwestern Scotian Shelf fish (modal length of 60 vs 55 cm) tagged during the same period.

Recovery rates (Table 1) were much higher during the 1953-73 period than the 1978-85 period (0.124 vs 0.030). In fact, for the 1978-85 period, recoveries from the individual releases were heavily skewed to even lower recovery rates with 19 out of 23 releases having less than 3% recoveries; the higher overall rate was largely due to the recovery rate of 14.4% associated with the 1982 St. Mary's Bay release (Appendix A). The timing of recoveries however was similar between the two release periods; in both cases, over 50% of the recoveries were made within one year of release and over 90% within 3 years (Table 2).

Updates to Historical Tagging Studies

[Publications List references: 8, 11, 26, 27, 31, 32, 36, 37, 42, 43, 44, 46, 52]

None.

Summary of Unexamined Recoveries

During the process of verifying if tag recoveries had been analyzed in the past and reported in ICNAF Annual Proceedings (Martin, 1960; Martin, 1961; Beverton and Hodder, 1962; Lettaconnoux, 1963; Lettaconnoux, 1965; Hart, 1966; McCracken, 1973) , we came to suspect that some of the apparently unexamined haddock data may have actually been assessed, but results not published if they only served to substantiate conclusions drawn from previous tagging studies. There may also be some ambiguity concerning the identification of tagging studies in some of these reports. Probably all the haddock recoveries from apparently unexamined 1959-73 releases were considered by ICNAF during assessments without being well documented, as they replicate the observations noted for a March 1960 release, recoveries for which were discussed in the ICNAF Annual Proceedings for that year (Martin, 1961). For instance, we expect the March 1959 tagging would have contributed to the 1960 review of haddock movements, yet only the March 1960 tagging is explicitly mentioned. Although the analysis provided in 1960 was extremely cursory and preliminary, the authors observation of lack of movement of haddock from their release locations on the Scotian Shelf is substantiated across the various 1959-73 data sets (Figure 6). This lack of movement also applies to Bay of Fundy releases ('Scotian Shelf' may have been used in its context of a management unit, inclusive of the Bay of Fundy).

Results from tagging during the 1978-85 period have yet to be published.

Atlantic Halibut (Hippoglossus hippoglossus)

General Description

Halibut tagging was conducted on the Scotian Shelf (4VWX) and southern Grand Banks (3Ps,3NO) during the 1958-73 period. In total, 1296 halibut were tagged (Table 1). The largest single release was on Banquereau (area 4Vs; 704 fish) in March, 1963, just east of Sable Island (Appendix B Figure 18). The next largest- release (149 fish) was at the same location in February, 1964 (Appendix B Figure 19). The remainder of the releases on the Scotian Shelf (198 fish) were relatively small (Appendix B Figures 18-20) and spread across the Shelf. Almost all the halibut tagged off Newfoundland were initially captured near the edge of the continental shelf (Appendix B Figure 21). The largest single release was 81 fish in February 1963 south of the Avalon Peninsula. The remainder (164 fish) of the releases were again relatively small and dispersed along the Shelf edge from St. Pierre and Miquelon Islands to the tail of the Grand Banks. Petersen disc tags were used exclusively.

The lengths of the fish tagged ranged from 25-196 cm. Generally however, few halibut were more than 130 cm, and the majority from the Scotian Shelf were less than 70 cm while the

majority from off Newfoundland were greater than 70 cm. The overall recovery rate (Table 1) was high (0.224) with recoveries spread over several years. Within 2 years of release, less than 55% of total recoveries had been made and slightly more than 80% within 4 years (Table 2). One fish was recaptured after 18 years at large (Stobo et al. 1988).

Updates to Historical Tagging Studies

[Publications List references: 18, 69]
None.

Summary of Unexamined Recoveries

None.

Herring (Clupea harengus)

General Description

Between 1973 and 1982 over 341,000 more herring were tagged (Table 1) throughout NAFO Subarea 4 with T-bar anchor tags (Appendix B Figures 23, 24). The fish were caught by purse seines, weirs and traps. Over 66,000 fish were tagged in the Passamaquoddy Bay - Grand Manan region (area 4Xs) of the Bay of Fundy between 1973 and 1981, most during the June-December period. On the Nova Scotia side of the Bay, almost 117,000 herring were tagged, all between 1974 and 1979 during the months of June to September; the tagging sites extended from Minas Basin to south of Yarmouth (areas 4Xr,q). Almost 55,000 herring were tagged along the south shore of Nova Scotia between Chedabucto Bay and Cape Sable Island (areas 4Wd,k and 4Xm,o) during March to August in the 1976-82 period. During the 1976 to 1979 winter fishery seasons (October-March) along the coast of Cape Breton, over 31,000 herring were tagged in the vicinity of Chedabucto Bay (area 4Wd). In the Sydney Bight region (area 4Vn) over 18,000 herring were also tagged during the winter fishery seasons of l977 through 1980 (Appendix B Figure 24). An additional 2975 fish were tagged in April-May 1981 at the entrance to Bras d'Or Lakes in Sydney Bight to examine local stock movements.

In the Gulf of St. Lawrence, over 56,000 herring were tagged between 1976 and 1981 (Appendix B Figure 24). At the Magdalen Islands (area 4Tf) 9849 fish were tagged during the 1976 spring spawning fishery and in August-September of the same year 27,972 fish were tagged off the Gaspé Bay - Chaleur Bay region (areas 4Tm,n) during the fall spawning fishery. An additional 18298 herring were tagged at Souris, PEI (unit area 4Tg) in October of 1978 and 1981 to address herring movements associated with that localized fishery.

The herring were not measured individually when tagged, rather random samples of about 100 fish per release group were taken from the capture gear and measured. The lengths ranged from 10-42 cm with the smallest fish being caught by the traditional "sardine" fisheries in the Bay of Fundy (areas 4Xr,s) and off southwestern Nova Scotia (area 4Xo). Both inshore fixed gear (weirs and

traps) and more offshore gillnet and purse seine fisheries occur in these areas however, resulting in an extended length range (10-36 cm) of both juveniles and adults being routinely caught. Generally few herring under 18 cm were caught, or tagged, in other areas. The recovery rate for herring was 0.041 (Table 1), comparable to that obtained in the earlier studies. Over 65% of the recoveries were made within 3 months of release (Table 2), over 90% were made within 1 year and over 97% within 2 years, a shorter time frame than that observed for most groundfish species.

Updates to Historical Tagging Studies

[Publications List references: 58, 59, 61, 63, 64, 65, 66, 68, 70, 71, 72]

A Research Document on herring tagged in the Bay of Fundy (Stobo et al, 1975) merits attention, not for any problems with their conclusions, but rather to clarify the extreme variability in results that disturbed the authors at the time. Observing substantial differences in recovery rates between tagging experiments, ranging from 0.3% to 13.7% across 16 release groups, they unsuccessfully sought an explanation by examining the relationship between recovery rate and fish length. In fact most of the variation between groups was attributable to the combined effects of two factors, neither of which involved fish length. On the one hand, the authors used a data filter prior to analysis to remove immediate recaptures that provided no relevant information on fish movements. By convention, two weeks was used as a breakpoint to remove recoveries made shortly after release and before a suitable period for herring to disperse. Unfortunately the two week exclusion may have been too arbitrary, especially for Mill Cove, Campobello Island releases. Local recoveries were still being made at very high rates beyond the two weeks. Even one more week of exclusion would have fully halved the recovery rates for these releases. Coupled with this difference in the actual duration of 'immediate' recoveries between groups was a problem with non-representation of recoveries from the four August, 1974 releases. These latter fish were tagged just after the fishery was closed, and recoveries were tallied only to mid-April of 1975 (just in time for the stock assessment meetings), which was prior to the June start-up of the purse seine fishery. Had just a few more months passed before counting returns, the total recoveries available for analysis from these four groups would have been 2-3 times those presented. Overall, increasing the immediate recovery period by one week and incorporating recoveries made after April of 1975 removes most of the variability in recovery rates between experiments, although the first two taggings of the study remain anomalously both the lowest (at 0.3%) and highest (at 8.5%). They were also the smallest release groups in the study. If all current recoveries had been available, the immediate recapture period adjusted to three weeks, and the two first and smallest tagging experiments of the study disregarded, the range in recovery rates would have been 0.9% to 4.1%, which seems reasonable variation for this sort of data.

Summary of Unexamined Recoveries

None.

Mackerel (Scomber scombrus)

General Description

Between October, 1973 and October, 1974 over 12,600 mackerel were tagged (Table 1) using T-bar anchor tags. The Gulf of St. Lawrence releases (2622 fish) were hand- lined from small boats near the north side of Prince Edward Island (areas 4Tg,j), while the Scotian Shelf releases (3421 in area 4Vn, 6448 in area 4Xm and 173 in area 4Xs) were caught in commercial fish traps and weirs(Appendix B Figure 25). No length frequencies were taken, but the tagging protocol required that all fish tagged had to be at least 23cm in length.

The recovery rate was 0.014 with almost 95% of the recoveries being made within 1 year of release (Table 2), and all being made within 2 years.

Updates to Historical Tagging Studies

[Publications List references: 1, 62]

A research document (Stobo, 1976) on 1973-74 mackerel tagging off Halifax, N.S., northern Cape Breton, and Prince Edward Island, itself an update of Beckett et al (1974), noted that fisheries throughout NAFO Subareas 3-6 exploited the same fish to some degree at different times of the year, but the author did not consider the data at that time to be sufficient to indicate the extent of intermixing between northern and southern contingents of the stock.

A further 14 tags for the November-April recovery months were subsequently turned in, virtually all from the general vicinity of Cape Cod. Overwintering off New England is consistent for all tagged groups regardless of release location, and the wide dispersion of recoveries during the remaining months of the year gives no suggestion that the various releases are discrete from one another (Figure 7).

Summary of Unexamined Recoveries

None.

American Plaice (Hippoglossoides platessoides)

General Description

A total of 9512 plaice were tagged between 1953 and 1985 (Appendix B Figures 1,2), the majority in the 1978-85 period (6855 vs 2657; Table 1). Tagging was concentrated in the southern Gulf of St Lawrence (areas 4Tf,g,k,i,m,n) with 2185 and 5743 tags applied there in the 1958-63 and 1979-80 periods respectively. On the Scotian Shelf (including the Bay of Fundy) only 1584 tags have been applied, primarily in 3 localized areas and times: 200 in Passamaquoddy Bay in 1966 (area 4Xs), 236 off southern Nova Scotia in 1972 (area 4Xo) and 1065 off Halifax in l98O (area 4Xm). Petersen disc tags were used for most of the 1958-73 releases. In the 1979-84 releases, T-bar anchor tags were used exclusively on the Scotian Shelf, while in the Gulf of St. Lawrence a

combination of T-bar anchor tags (997) and Petersen discs (1078) were used, the Petersen discs being applied as part of an experiment to compare the retention of tag types on the fish.

Generally a wide size range of fish were tagged in all releases (between 10 – 69 cm with a single fish at 86 cm), the majority being between 23-55 cm. The recovery rate was much higher for the early than later period releases (0.354 vs 0.066; Table 1) and for both periods approximately 50% of the total recoveries occurred within 1 year of release; over 90% of total recoveries had occurred within 4 years (Table 2).

Updates to Historical Tagging Studies

[Publications List references: 7, 8, 23, 25, 26, 54, 55]

In a paper comparing recovery rates between tag types (Fowler and Stobo, 1991), the symbols identifying Petersen disc and T-bar anchor tags (referred to as spaghetti tags in the paper) were reversed in the graphs displaying recovery rates by year (Figure 2 of Fowler and Stobo, 1991). Petersen discs are really depicted by the white symbols and spaghetti tags by the black symbols. And within the text, in noting no significant difference between tags for plaice, the two tags were again switched - the spaghetti tag actually gave a marginally higher recovery rate than the Petersen disc.

Summary of Unexamined Recoveries

No results from post-1963 tagging have been published.

Pollock (Pollachius virens)

General Description

A total of 56,874 pollock were tagged between 1953 and 1985 (Appendix B Figures 25, 26), most in the period 1978-85 (55,865 of them; Table 1). Most of the 1008 fish tagged in the earlier period were caught in July, 1960, near the entrance to Passamaquoddy Bay (area 4Xs) and tagged with Petersen disc tags (Appendix B Figure 26). In the later period, tagging was conducted every year from 1978 to 1984. T-bar anchor tags were used exclusively, and almost all were obtained from inshore traps or handlining. Offshore tagging was attempted in 1978 using a bottom trawl, but was unsuccessful. Although the offshore tows were of short duration (averaging 10 minutes per tow), and substantial numbers of pollock were caught, almost all were moribund by the time they were removed from the trawl. Since the species did not appear to be capable of surviving the trawl-based tagging procedures, subsequent tagging efforts were concentrated on shallow inshore areas. The most consistent tagging effort was conducted in the Chedabucto Bay region (area 4Wd), where between 2728 and 5131 fish were tagged during May- June every year between 1979 and 1983. An additional 991 and 2942 fish, respectively, were tagged just outside Chedabucto Bay in 1978 and 1979 (Appendix B Figure 27). In the Passamaquoddy Bay region

(area 4Xs), fish were tagged every year from 1980 to 1984 although the dates and locations changed somewhat between years; the numbers tagged ranged from 800 to 3999. Most of the remaining pollock were tagged along the shore of south and southwest Nova Scotia (areas 4Wk, and 4Xm,o,r) between 1978 and 1981. A single release (312 fish) was made off southwestern Newfoundland (area 3Pn) in August, 1982 (Appendix B Figure 27).

Pollock tagged in the 1960's were relatively large fish, ranging from 52 to 88 cm in length. In contrast, the inshore, or 'harbour pollock' tagged during the 1978-84 period were almost all under 45 cm in length. Clay et al. (1989) suggested that pollock grow to a length of 17 cm during the first year of life and to 30 cm during their second year. That would suggest that most fish tagged in 4Wd and 4Xs were l-year old fish while most of those tagged around southwest Nova Scotia were a mixture of 0-group and l-year olds. Clay et al. (1989) also provide the length ranges of each of the juvenile tagging release groups; those length ranges include both the database and subsample length frequency data presented in this report.

The recovery rate of the 1960's releases was double that of the 1978-84 period (0.216 vs 0.101; Table 1). For both periods, over 90% of total recoveries occurred within 4 years (Table 2). But almost 40% of the tag recoveries from the 1978-94 releases occurred within 3 months of release; for the same period, less than 20% of the 1960's releases were recovered. The difference in short-term recovery rates was probably because 0-group and l-year old pollock move little during the first two summers of life and often re-entered traps in which they were originally caught. If the first 3 months of recoveries are removed from the year and total tallies, the revised proportional recovery rates for the 4 years post-release are 0.247, 0.503, 0.725 and 0.862 versus 0.470, 0.645, 0.863 and 0.952 for the 1978 and 1960's release periods, respectively. With that modification, the proportion recovered from the 1978-84 period is only half. Subsequently, natural mortality would have removed a large proportion of the 1978-84 fish before they recruited to the commercial fishery, while pollock tagged in the 1960's were of commercial fishing size.

Updates to Historical Tagging Studies

[Publications List references: 4, 8, 49, 50, 51, 60]

None.

Summary of Unexamined Recoveries

None.

Sea Raven (Hemitripterus americanus)

General Description

A total of 20 sea raven were tagged with T-bar anchor tags in January-February in 1979-80 (Table 1). The tagging area was nearshore in areas 4Xm and 4Wk (Appendix B Figure 3). No recoveries have been made.

Updates to Historical Tagging Studies

None.

Summary of Unexamined Recoveries

None.

Thorny Skate (Raja radiata)

General Description

Fifty-one thorny skate were tagged with T-bar anchor tags in February of 1979 and 1980 nearshore in areas 4Xm and 4Wk (Appendix B Figure 22). No recoveries have been made.

Updates to Historical Tagging Studies

None.

Summary of Unexamined Recoveries

None.

White Hake (Urophycis tenuis)

General Description

White hake tagging has been restricted to the south-eastern portion of the Gulf of St. Lawrence (areas 4Tg,h) (Figure 22). Twenty-two hundred and seventy-one were tagged with Petersen discs in August, 1967 and 196 were tagged with T-bar anchor tags in September, 1979.

The majority of the fish tagged in 1967 were between 52 and 70 cm, with an extended range from 37 to 106 cm. The length range of the fish tagged in 1979 was more restricted (40-82 cm) with the majority between 43 and 60 cm. The recovery rate for the 1967 releases was 0.293 (Table 1) with almost 90% of the recoveries being made within 2 years of release and over 96% within 4 years (Table 2). Only 4 recoveries were made from the 1979 release, all in the second year.

Updates to Historical Tagging Studies

[Publications List references: 20]

An example of the potential contribution that 'subsequent' recoveries of tags can make to our understanding of a situation is provided by the analysis of white hake movements in the Gulf of St Lawrence. Kohler (1971) used 606 recaptures to the end of 1969 to describe the movements of

fish tagged in August of 1967. Nearly 400 of these fish were of little use since they were 'immediate' recaptures, so the investigation was effectively left with about 200 recoveries made over a two year period. Another 63 recoveries were made during 1970-78, such that a redundant localized concentration of hake became apparent during June (and once continued into July) in the vicinity of Baie Verte in the Northumberland Strait (Figure 8). This grouping of hake coincides with the timing of spawning for these fish (Markle et al, 1982), and collaborates the belief of local fishermen that white hake spawn in the Strait (Halliday and Pinhorn, 1982; Clay et al, 1985). It also serves to better pinpoint just where in the Strait these fish spawn, and supports the hypothesis put forward by Markle et al (1982), based on larval surveys, that white hake in the southwestern Gulf undergo mass spawning as opposed to the prolonged and dispersed spawning associated with Scotian Shelf hake.

Summary of Unexamined Recoveries

The 196 white hake released off Pictou Island, N.S. (area 4Tg) in 1979 provided four recoveries, all during July-August of 1981. Three were recovered in the northern Nortumberland Strait and one was recovered near the tagging location (Figure 9).

Windowpane Flounder (Scophthalmus aquosus)

General Description

Twenty-eight windowpane were tagged with T-bar anchor tags in August, 1984 (Appendix B Figure 3) in the Passamaquoddy Bay area of the Bay of Fundy (area 4Xs). No recoveries have been made.

Updates to Historical Tagging Studies

None.

Summary of Unexamined Recoveries

None.

Winter Flounder (Pseudopleuronectes americanus)

General Description

Of the 1410 winter flounder tagged, forty-four were tagged between 1971 and 1973, the remainder between 1979 and 1985 (Table 1; Appendix B Figure 28). Petersen disc tags were used in the earlier period and T-bar anchor tags in the latter period. The early period tagging was restricted to the Passamaquoddy Bay region of the Bay of Fundy (area 4Xs). In January and February in 1979 and 1980, three hundred and fifty-nine fish were tagged off Halifax and St.

Margaret's Bay (areas 4Xm and 4Wk), while 1007 were tagged in the Passamaquoddy Bay region (area 4Xs) between August 1984 and November 1985.

The size of fish tagged ranged from 12-53 cm with the majority being between 23-40 cm. The recovery rate was much higher for the early releases (0.114 vs 0.023; Table 1) although due to the limited releases the overall number of recoveries was small. Over 90% of the recoveries had been made within 2 years of release (Table 2).

Updates to Historical Tagging Studies

None.

Summary of Unexamined Recoveries

The tagging of winter flounder in and around Passamaquoddy Bay, N.B., and off Halifax, N.S. may have been a deliberate investigation of the species that was never reported in the literature. A total of 1410 fish were released and 37 tags recovered across about 8 tagging studies (most targeting other species). We conducted a casual investigation of the recoveries and concluded that winter flounder movements, of short distances and no discernible pattern, probably represent directionless foraging (Figure 10). One of the fish tagged near Halifax was reported off the north tip of Cape Breton 8 years later. Given the long time period such a recovery is plausible, but we would want to see more occurrences before ruling out that it is merely a reporting error.

Winter Skate (Raja ocellata)

General Description

A total of 12 winter skate were tagged, all in February, 1980, nearshore in area 4Xm (Appendix B Figure 22). No recoveries have been made.

Updates to Historical Tagging Studies

None.

Summary of Unexamined Recoveries

None.

Witch Flounder (Glyptocephalus cynoglossus)

General Description

During the 1963-66 and 1972-73 periods, 2731 witch were tagged (Appendix B Figure 29). In 1963, tagging was conducted in October in the southeastern Gulf of St. Lawrence (areas 4Tf,g;

134 fish) and off the northeastern portion of Cape Breton (area 4Vn; 190 fish). In 1964-65 tagging was limited to the eastern Scotian Shelf (areas 4Vb,c,n and 4Wd,h; 2314 fish) during the October-April period. In April, 1972, sixteen fish were tagged off southwest Nova Scotia (area 4Xo), while all of the 1973 releases occurred within the Bay of Fundy (areas 4Xr,s; 66 fish).

In the 1960's the size range of fish tagged was extensive (29-90 cm) with no dominant modes in the distribution of lengths. In the 1970's the length range was more limited (41-64 cm) but again with a fairly even distribution of lengths over that range. The recovery rate was 0.050 (Table 1), but the recovery period has been prolonged, with slightly less than 85% being recovered within 4 years of release (Table 2).

Updates to Historical Tagging Studies

[Publications List references: 12, 56]

None.

Summary of Unexamined Recoveries

The only reference we could find to any of the witch flounder tagging was a brief mention in the ICNAF Annual Proceedings for 1965 (Hart, 1966), where it was reported that tagged witch stay in the vicinity of the tagging locations. But the only tagging study identified in this report was for 1965**,** ostensibly referring to both eastern Scotian Shelf studies in that year; however the authors may have also considered the 1964 tagging in forming their conclusions. In either case, some tagging studies were not reported in the literature, and the studies that were commented upon had only provided one or two years of recovery data by 1966. We took a preliminary look at all the recoveries (returns were still occurring during the 1970's) with respect to eight release group definitions, and formed the general impression that most of the witch flounder groups dispersed randomly or with a directional bias; therefore they would not be construed as remaining in the area of release. Some observations related to specific tagging studies:

Tagging near Passamaquoddy Bay (Figure 11): only two recoveries recorded, both local.

Tagging off Southwest Nova Scotia: no recoveries.

Tagging West of Sable Island, 1965 (Figure 12): reasonable numbers of tagged fish were recovered, 53 with coordinates for the recovery location. We suspect that the 24 releases farthest offshore are subject to incorrectly transcribed latitudes, and may belong with the 467 fish tagged directly north of them. Of 4 recoveries from these 24 fish, 3 were located where the northern group were tagged, and the other was recovered to the east of the northern tagging location. If this is correct, then almost all recoveries were local to the tagging area. Two recoveries were reported from the vicinity of the 'Lip', a small area off Cape North where fish converge in the spring and fall to enter or leave the Gulf of St Lawrence (the Lip represents a cut connecting the Cape Breton Trough and Laurentian Channel). As no witch flounder were recovered in between the release area and the

'Lip', these two recoveries seem dubious. However the intervening areas are also characterized by a preponderance of untrawlable bottom conditions.

Tagging in 4Vc (Figure 13): eight recoveries were made, suggesting quite extensive dispersal, especially to the north. One recovery was reported off Scaterie, two at the 'Lip', and one across the Laurentian Channel in the northern Gulf of St Lawrence (4Ss).

Tagging in 4Wd (Figure 14): seven recoveries were made, suggesting quite extensive dispersal, predominantly northeastwards, with five tags reported on or near the edge of the Laurentian Channel in 4Vc (2) and 4Vn (3).

We examined the Sydney Bight/Lip area recoveries from the 4W/4Vc releases described in the previous three subsections, checking for commonality in data that might suggest hoarding and subsequent batch submission of tags, as opposed to tags being treated as singular events. Such an occurrence could associate a single reporting error with multiple recoveries. However the Bight/Lip area recovery locations from Scotian Shelf tagging appear generally unique, with only two of the tags representing a common return event. We could still be seeing an effect of boats leaving regular fishing areas on the Shelf to prosecute the seasonally brief but intensive Lip fishery, with undetected, tagged witch in their holds from fishing in the 4W/4Vc area. But the apparent movement of witch flounder from 4W and Banquereau areas to the Sydney Bight area cannot be discounted.

Tagging on the Edge of the Laurentian Channel in 1964 (Figure 15): four recoveries were made, suggesting extensive dispersal north and west. It is hard to comment on the possibility of eastward movement down the slope into the Channel, as Channel depths are beyond most fishing. Thus we would not expect to see recoveries from fish moving east unless they crossed over to the Grand Banks. But the absence of recoveries from regularly fished depths and areas to the south (Banquereau) suggests there may be little movement in this direction**.**

Tagging in Northern Sydney Bight (Figure 16): thirteen recoveries were made, twelve indicating local dispersion and one from 3Ps directly across the Laurentian Channel from the release area.

Tagging in the Cape Breton Trough (Figure 17): four recoveries were made, three in the vicinity of the release area and one off the Madelene Islands near the edge of the Laurentian Channel.

Yellowtail Flounder (Limanda ferruginea)

General Description

A total of 3185 yellowtail have been tagged (Table 1; Appendix B Figure 30), the majority in June-September 1966 (2596 fish) and May 1967 (452 fish) on Sable Island Bank (areas 4We,f,h,j) and Banquereau (area 4VSc). Of the remaining 137, small numbers were tagged along

the south coast of Nova Scotia and 116 were tagged in Passamaquoddy Bay (area 4Xs) in 1984-85. In 1966-67, Petersen disc tags were used while in the 1979-85 period, T-bar anchor tags were used. The length range of the fish tagged was 18-54 cm with the majority between 30 and 42 cm.

The recovery rates (Table 1) were dramatically higher from the earlier period (0.082) with only 1 recovery being made from the more recent releases (0.007). Over 90% of the recoveries were made within 3 years of release (Table 2).

Updates to Historical Tagging Studies

None.

Summary of Unexamined Recoveries

None of the yellowtail tagging has been reported in the scientific literature. We looked at two major and two minor release groups. While a cursory examination of plottable recoveries might suggest some very pronounced movements, we concluded that yellowtail flounder probably do not move extensively, but exhibit highly localized random dispersal. We review the data for each release grouping below:

Tagging in the vicinity of Sable Island (4We, 4Wh, 4Vc) in 1966 (Figure 18): there were 52 plottable recoveries from tagging in this area, 16 of them depicting long-distance movements, including 11 reports from Georges Bank. However 10 of the Georges Bank recoveries were made from 3 recapture events in the same month that these fish were tagged, and the last recovery was made the following month. It is highly improbable that these 10 fish would have moved from Sable Island to Georges Bank in a month, so that information is probably erroneous. Of the remaining 5 non-local recoveries, 3 were reported from Banquereau and two from adjacent banks. When the improbable recoveries are discounted, the low number of apparently long-range movements suggest that yellowtail flounder are quite sedentary.

Tagging in 4Wj and 4Wh in 1967 (Figure 18): of 32 plottable recoveries from these fish, only 4 were both non-local and theoretically possible (we discounted a fifth recovery from 4Vc during the month of release).

Tagging off Southwest Nova Scotia (Figure 19): the single yellowtail tagged in 1972 was recovered in the vicinity of the release area in 1981.

Tagging near Halifax (Figure 19): Only one recovery occurred from the 20 yellowtail flounder tagged in January-February 1979-80 near Halifax, N.S., in the following spring in the vicinity of the tagging site.

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Table 1. Aspects of recovery data quality for different species and tagging programs.

Species	Program	Number Released	Number Recovered	Percent Recovered	Number with NAFO Division	plus Year	plus NAFO Unit Area	plus Month	plus Latitude and Longitude	Percent Recovered
ATLANTIC WOLFFISH	1953 - 1973	113	13	11.5%	13	13	12	12	11	9.7%
ATLANTIC COD	1953 - 1973	26777	7465	27.9%	7429	7409	6586	6432	5570	20.8%
	1978 - 1985	54214	8730	16.1%	8519	8467	7259	6988	5618	10.4%
CUNNER	1978 - 1985	47	3	6.4%	3	3	3	3	3	6.4%
HADDOCK	1953 - 1973	7626	948	12.4%	908	905	840	823	646	8.5%
	1978 - 1985	36373	1095	3.0%	1085	1084	987	963	877	2.4%
ATLANTIC HALIBUT	1953 - 1973	1296	290	22.4%	279	277	182	178	166	12.8%
HERRING	1973 - 1982	341091	13806	4.0%	13724	12910	12910	12641	12641	3.7%
MACKEREL	1973 - 1974	12664	178	1.4%	57	56	56	56	55	0.4%
AMERICAN PLAICE	1953 - 1973	2657	941	35.4%	932	932	673	665	523	19.7%
	1978 - 1985	6855	455	6.6%	441	441	355	331	265	3.9%
POLLOCK	1953 - 1973	1008	218	21.6%	218	211	196	195	195	19.3%
	1978 - 1985	55865	5615	10.1%	5464	5286	4590	4424	4095	7.3%
SEA RAVEN	1978 - 1985	20	0	0.0%						
THORNY SKATE	1978 - 1985	51	0	0.0%						
WHITE HAKE	1953 - 1973	2271	666	29.3%	656	654	643	634	597	26.3%
	1978 - 1985	196	4	2.0%	4	4	4	4	4	2.0%
WINDOWPANE FLOUNDER	1978 - 1985	28	0	0.0%						
WINTER FLOUNDER	1953 - 1973	44	5	11.4%	5	5	4	4	4	9.1%
	1978 - 1985	1366	32	2.3%	32	32	26	21	15	1.1%
WINTER SKATE	1978 - 1985	12	0	0.0%						
WITCH FLOUNDER	1953 - 1973	2731	136	5.0%	129	129	116	115	91	3.3%
YELLOWTAIL FLOUNDER	1953 - 1973	3049	251	8.2%	250	249	239	235	114	3.7%
	1978 - 1985	136	1	0.7%	1	1	1	1	1	0.7%

Table 2. Temporal breakdown of recovery data for different species and tagging programs.

				NUMBERS AND PERCENTS OF RECOVERIES					
Species	**Program**	**Number Released**	**Number Recovered with Date Known to Month**	**Within 3 Months of Release**	**Between 3 Months and 1 Year of Release**	**Between 1 and 2 Years of Release**	**Between 2 and 3 Years of Release**	**Between 3 and 4 Years of Release**	**Over 4 Years after Release**
ATLANTIC WOLFFISH	1953 - 1973	113	13	7 53.8%	1 7.7%	4 30.8%	0 .0%	1 7.7%	_
ATLANTIC COD	1953 - 1973	26777	7376	1694 23.0%	2668 36.2%	1672 22.7%	721 9.8%	309 4.2%	312 4.2%
	1978 - 1985	54214	8159	1032 12.6%	3874 47.5%	1877 23.0%	744 9.1%	374 4.6%	258 3.2%
CUNNER	1978 - 1985	47	3	3 100.0%	_	_	_	_	_
HADDOCK	1953 - 1973	7626	924	133 14.4%	407 44.0%	212 22.9%	92 10.0%	40 4.3%	40 4.3%
	1978 - 1985	36373	1053	135 12.8%	424 40.3%	286 27.2%	130 12.3%	53 5.0%	25 2.4%
ATLANTIC HALIBUT	1953 - 1973	1296	275	29 10.5%	46 16.7%	74 26.9%	40 14.5%	32 11.6%	54 19.6%
HERRING	1973 - 1982	341091	13066	8605 65.9%	3167 24.2%	944 7.2%	241 1.8%	75 .6%	34 .3%
MACKEREL	1973 - 1974	12664	176	128 72.7%	39 22.2%	9 5.1%	_	_	_
AMERICAN PLAICE	1953 - 1973	2657	922	247 26.8%	276 29.9%	203 22.0%	81 8.8%	53 5.7%	62 6.7%
	1978 - 1985	6855	408	55 13.5%	143 35.0%	95 23.3%	54 13.2%	29 7.1%	32 7.8%
POLLOCK	1953 - 1973	1008	207	39 18.8%	79 38.2%	29 14.0%	37 17.9%	15 7.2%	8 3.9%
	1978 - 1985	55865	5176	1955 37.8%	794 15.3%	826 16.0%	714 13.8%	442 8.5%	445 8.6%
SEA RAVEN	1978 - 1985	20	0	_	_	_	_	_	_
THORNY SKATE	1978 - 1985	51	0	_	_	_	_	_	_
WHITE HAKE	1953 - 1973	2271	655	349 53.3%	142 21.7%	98 15.0%	40 6.1%	16 2.4%	10 1.5%
	1978 - 1985	196	4	0 .0%	0 .0%	4 100.0%	_	_	_
WINDOWPANE FLOUNDER	1978 - 1985	28	0	_	_	_	_	_	_
WINTER FLOUNDER	1953 - 1973	44	5	0 .0%	3 60.0%	2 40.0%	_	_	_
	1978 - 1985	1366	30	16 53.3%	6 20.0%	5 16.7%	2 6.7%	0 .0%	1 3.3%
WINTER SKATE	1978 - 1985	12	0	_	_	_	_	_	_
WITCH FLOUNDER	1953 - 1973	2731	132	35 26.5%	24 18.2%	34 25.8%	12 9.1%	7 5.3%	20 15.2%
YELLOWTAIL FLOUNDER	1953 - 1973	3049	244	43 17.6%	54 22.1%	100 41.0%	29 11.9%	7 2.9%	9 3.7%
	1978 - 1985	136	1	0 .0%	0 .0%	1 100.0%	_	_	_

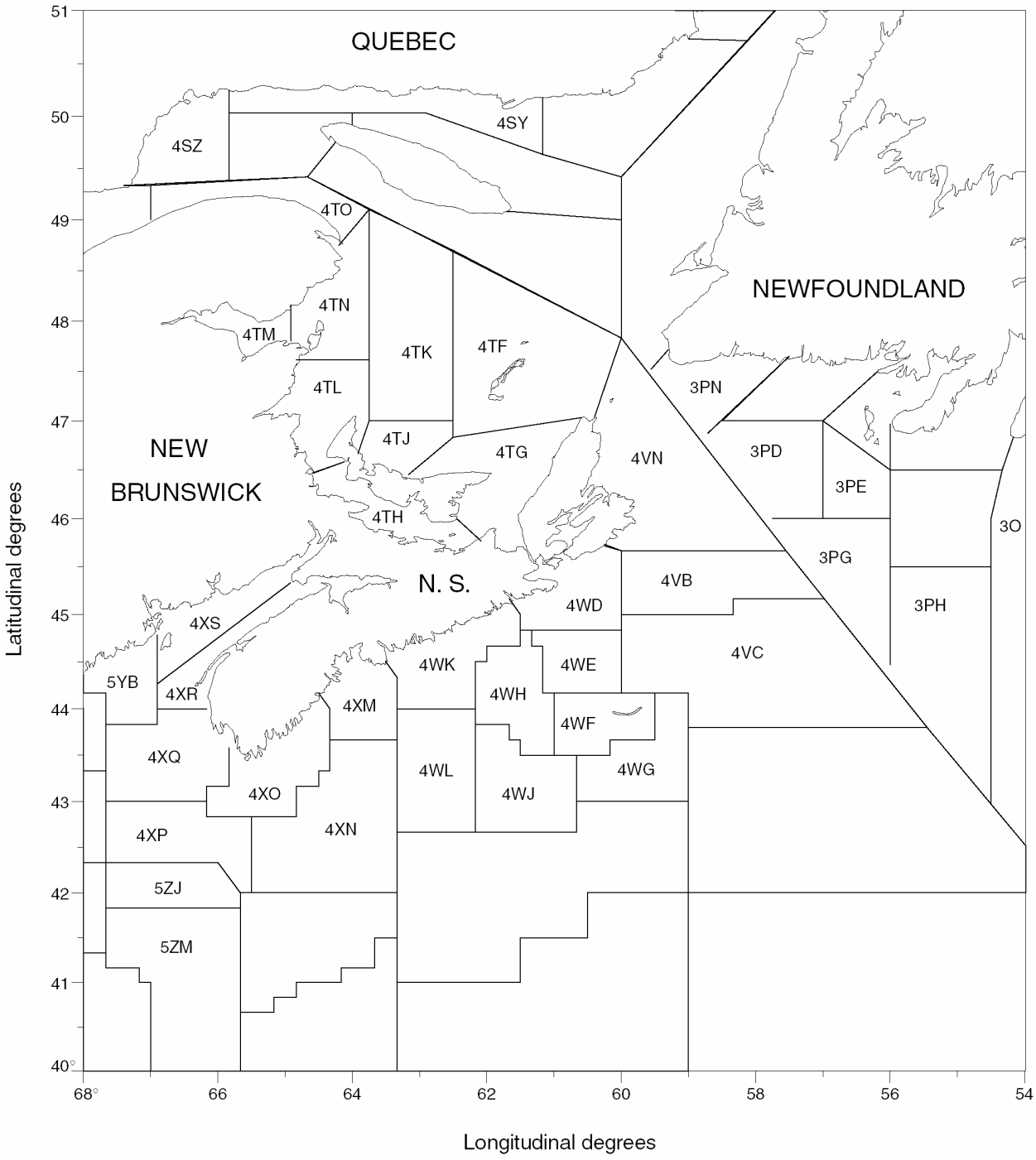

Figure 1. Map of the area encompassing most of the tagging activities discussed. NAFO unit areas referred to in Appendix B are labelled as far east as 3O.

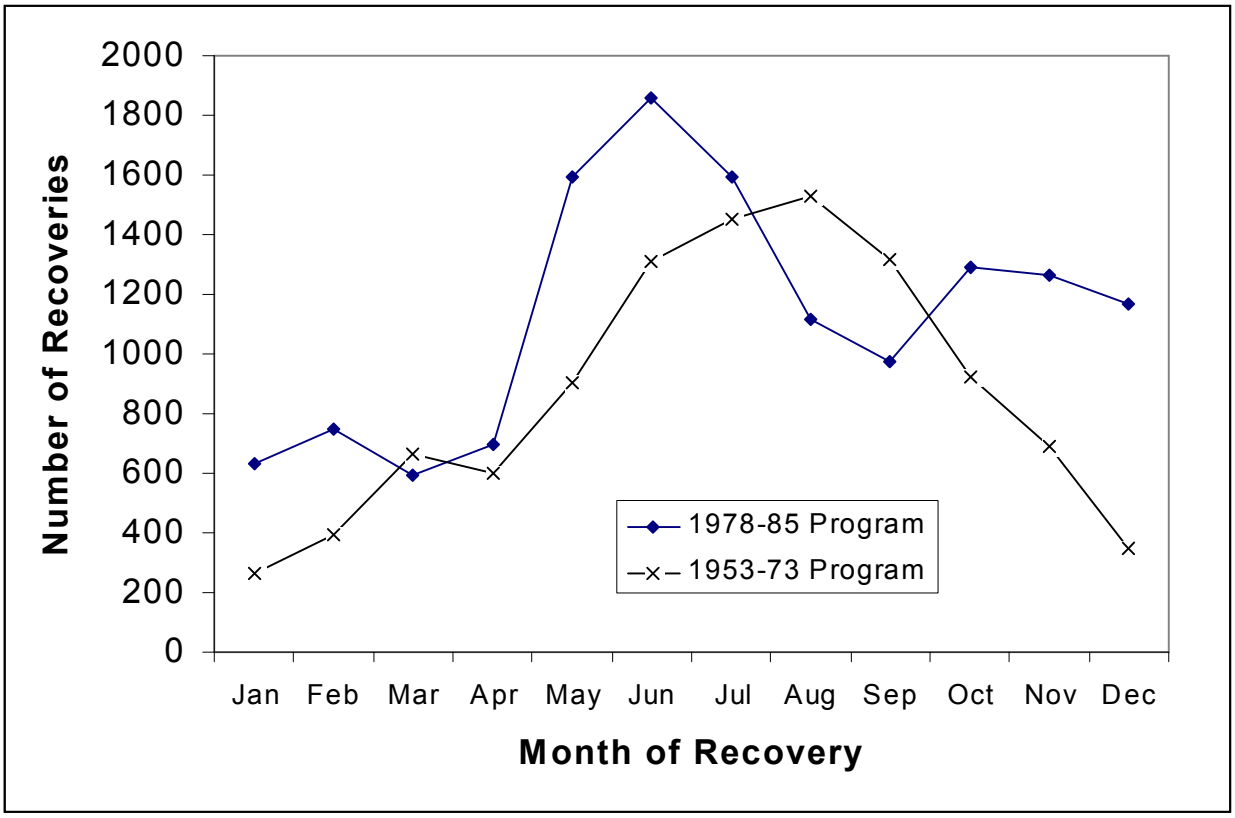

Figure 2. Overview of groundfish tag returns by month from the 1953-73 and 1978-85 tagging programs.

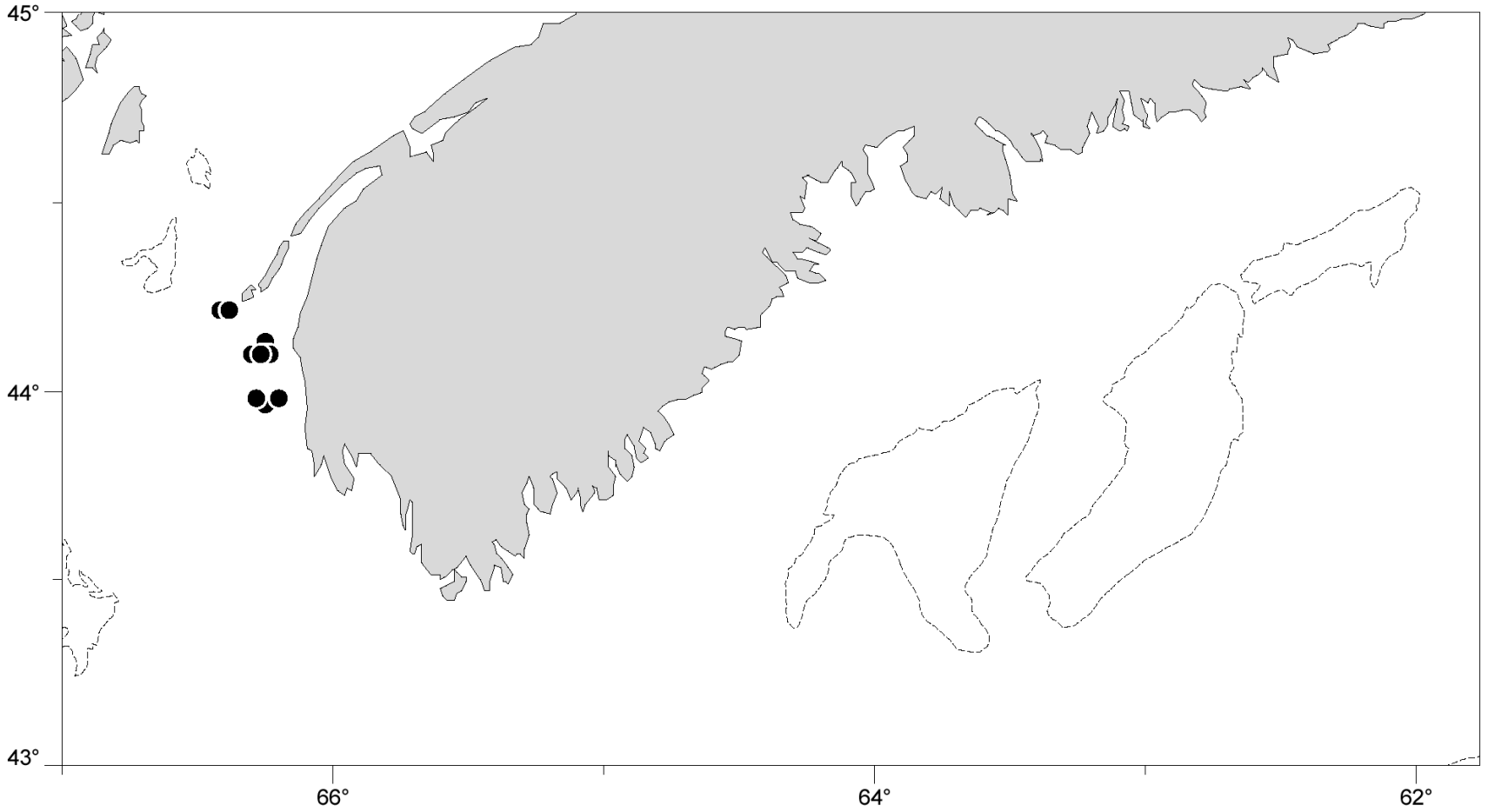

Figure 3. Recovery locations of Atlantic wolffish tagged off southwest Nova Scotia (4Xqr) in May-June 1963.

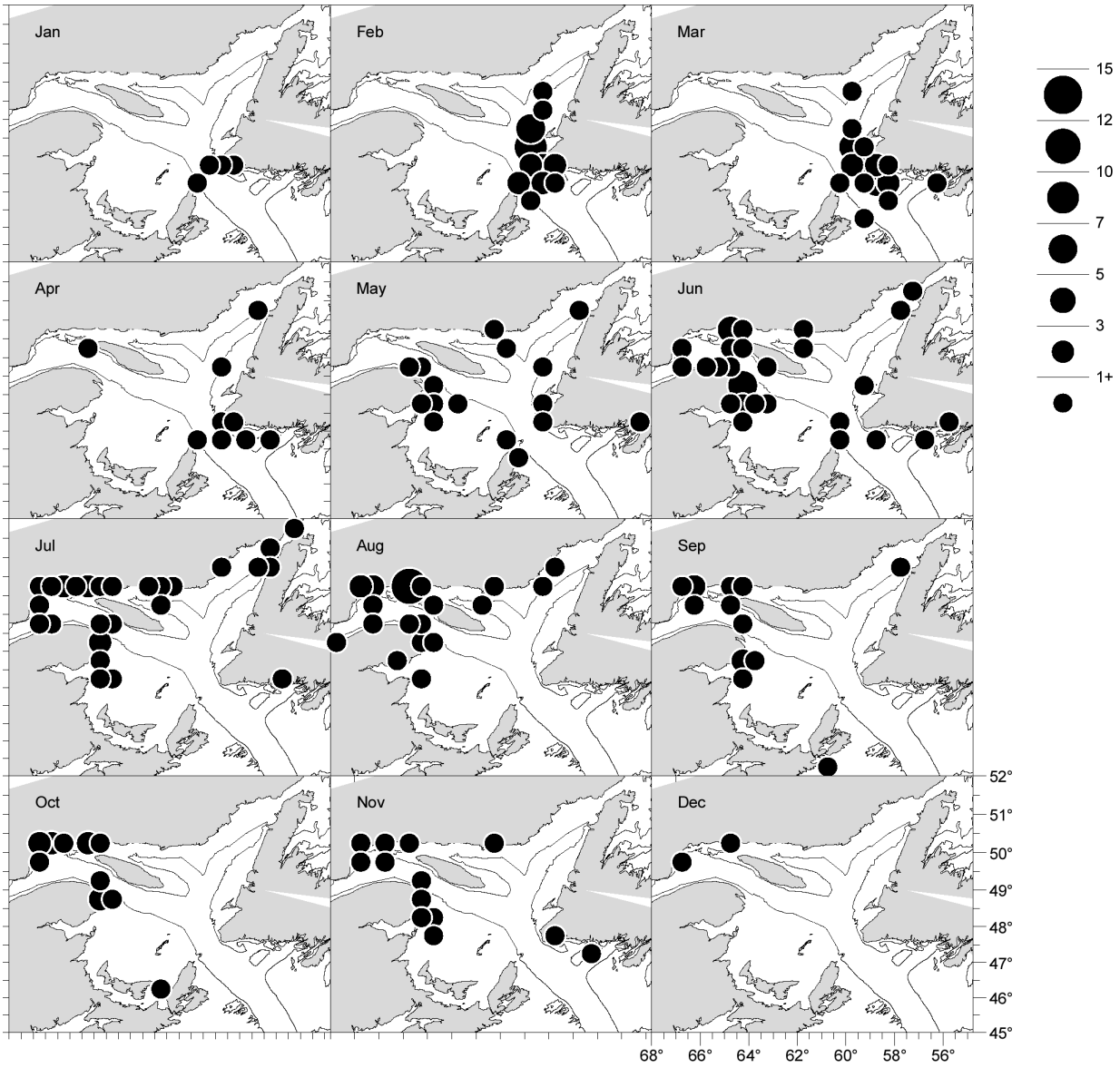

Figure 4a. Recoveries from cod tagged near Seven Islands, Quebec, in October of 1961 and May of 1964. Results from the two tagging groups were compared for similarity prior to combining as one plot series. Recoveries are aggregated over years and 5 minute squares, and plotted separately for each month. Recoveries within 3 months of release are not plotted.

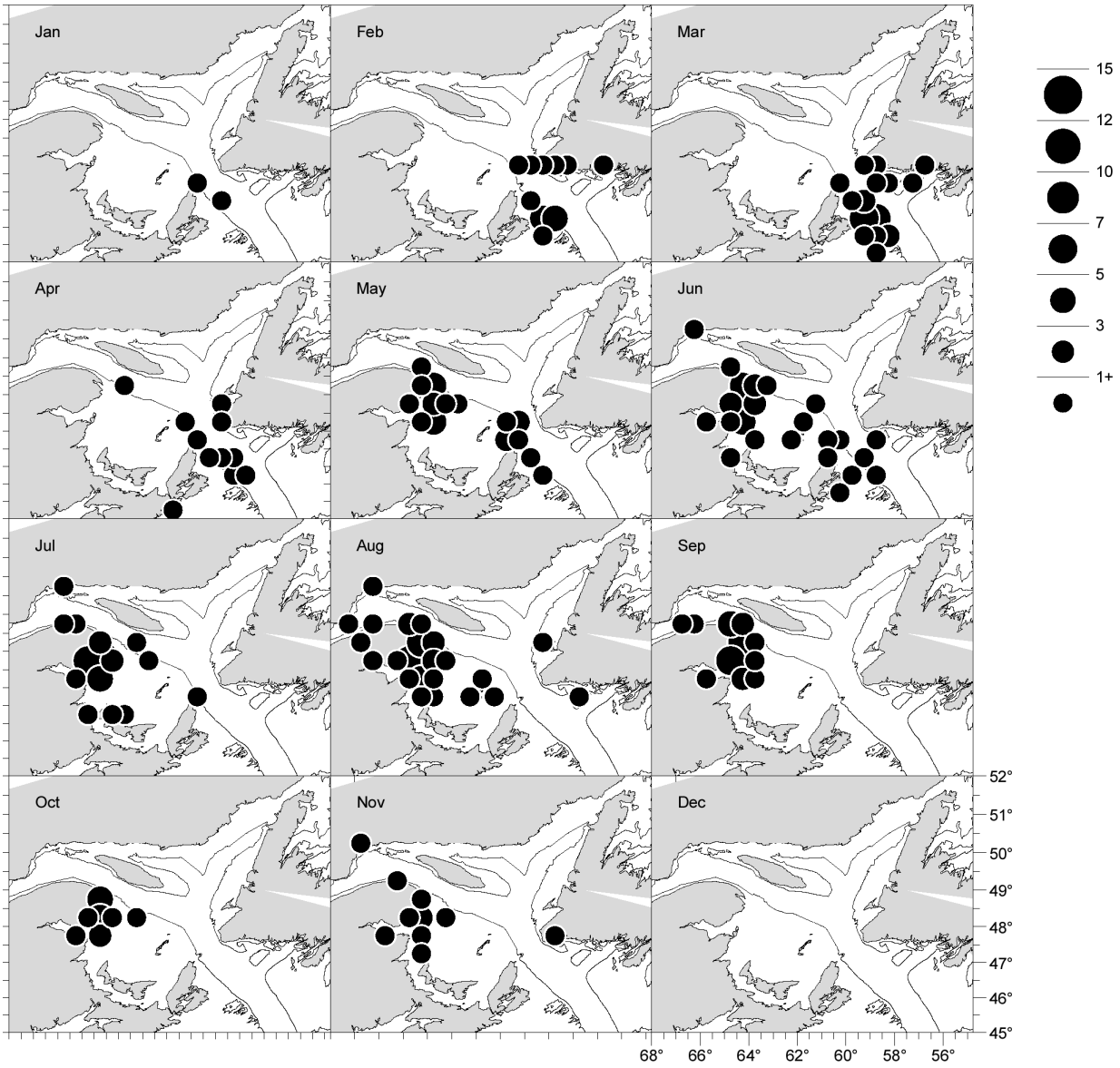

Figure 4b. Recoveries from cod tagged near Chaleur Bay, New Brunswick, in September of 1961 and May of 1964. Results from the two tagging groups were compared for similarity prior to combining as one plot series. Recoveries are aggregated over years and 5 minute squares, and plotted separately for each month. Recoveries within 3 months of release are not plotted.

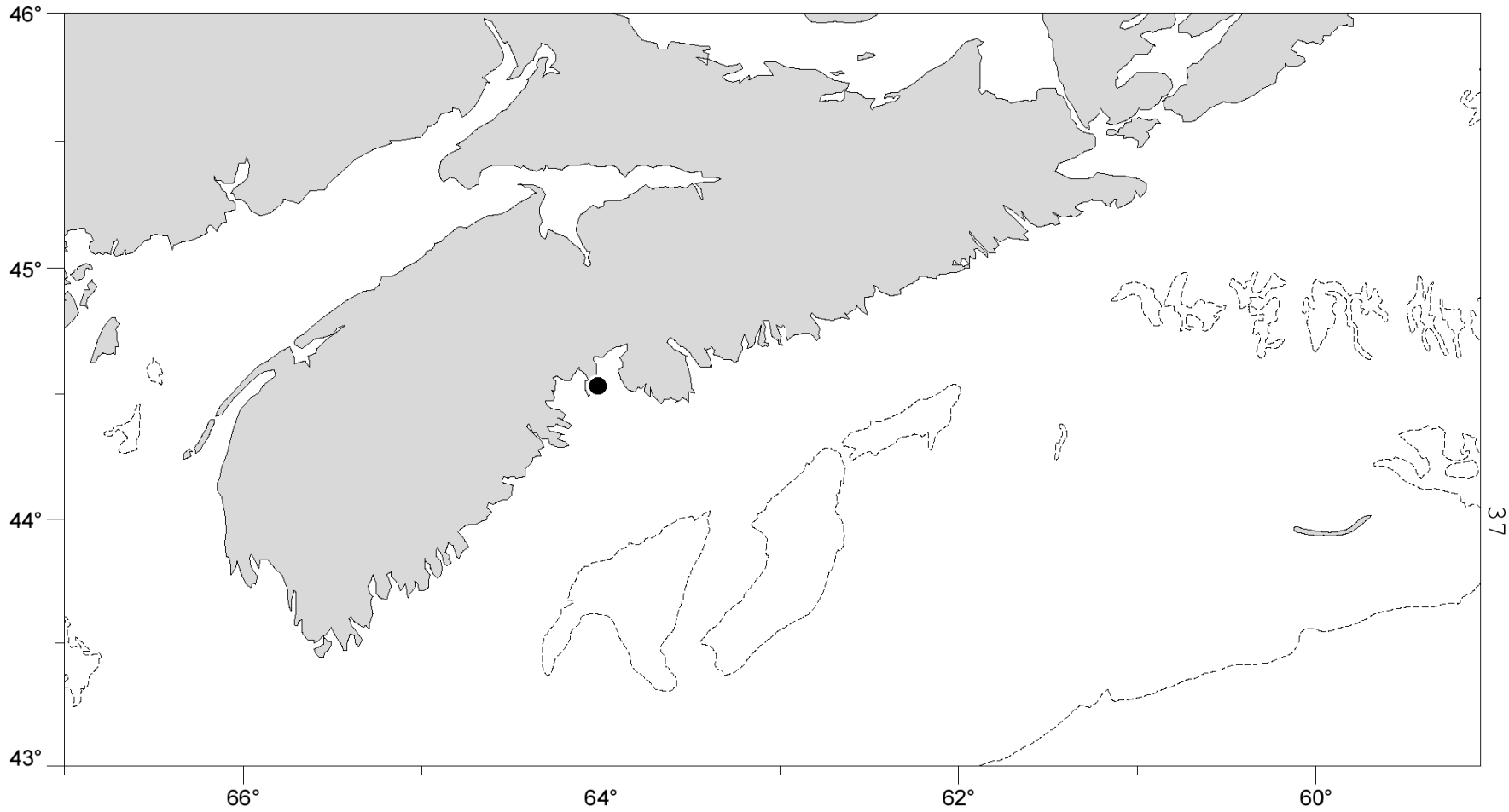

Figure 5. Recovery locations for cunner tagged in St Margarets Bay, Nova Scotia (4Xm) in July 1980. [All three recoveries are from the same location].

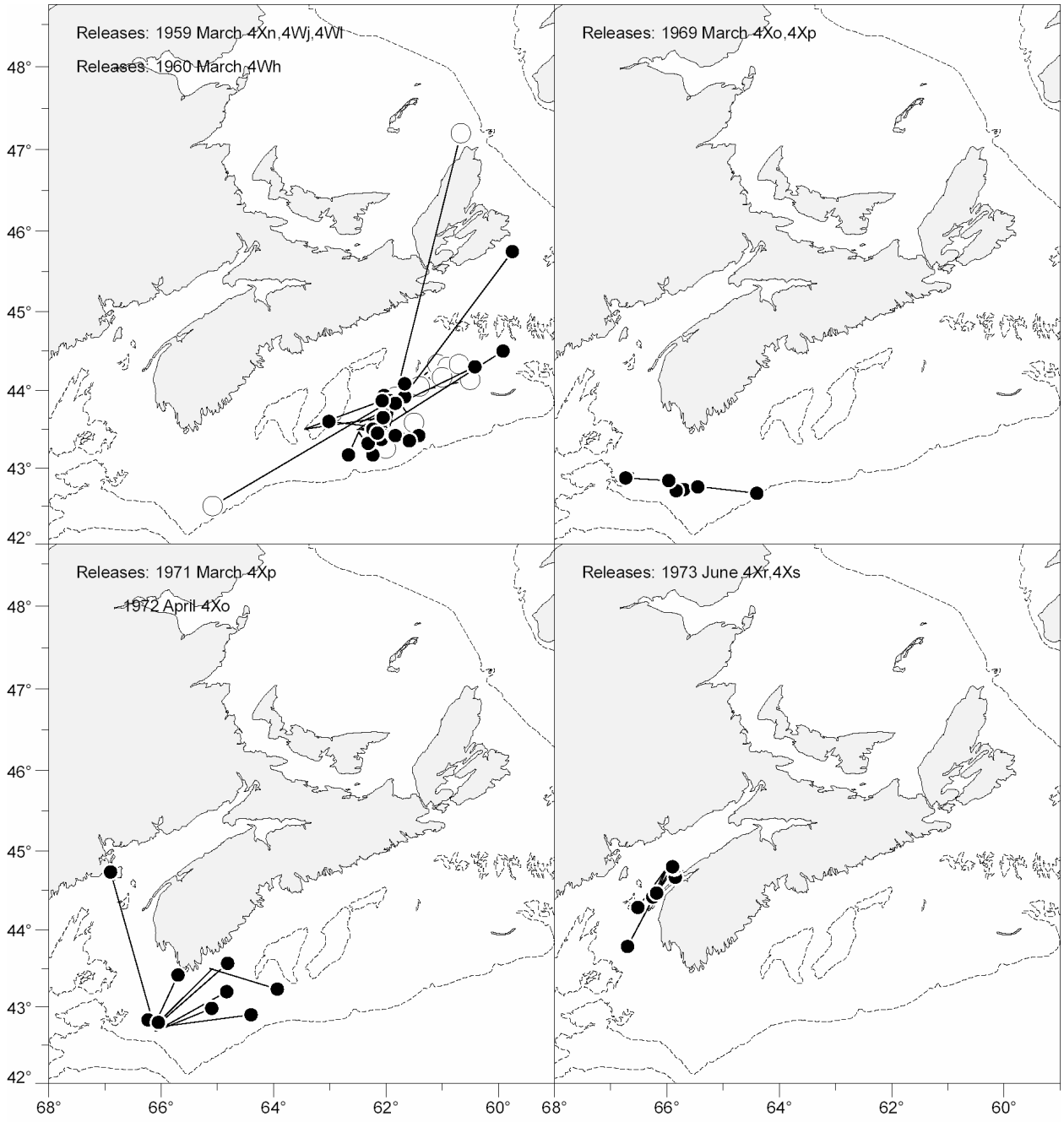

Figure 6. Unpublished movements (dots) of haddock tagged on the Scotian Shelf and in the Bay of Fundy during 1959-1973. The previously reported recoveries from the March, 1960 tagging are included in the first panel for comparison (circles). Dots or circles without lines denote recoveries at or near the location of release.

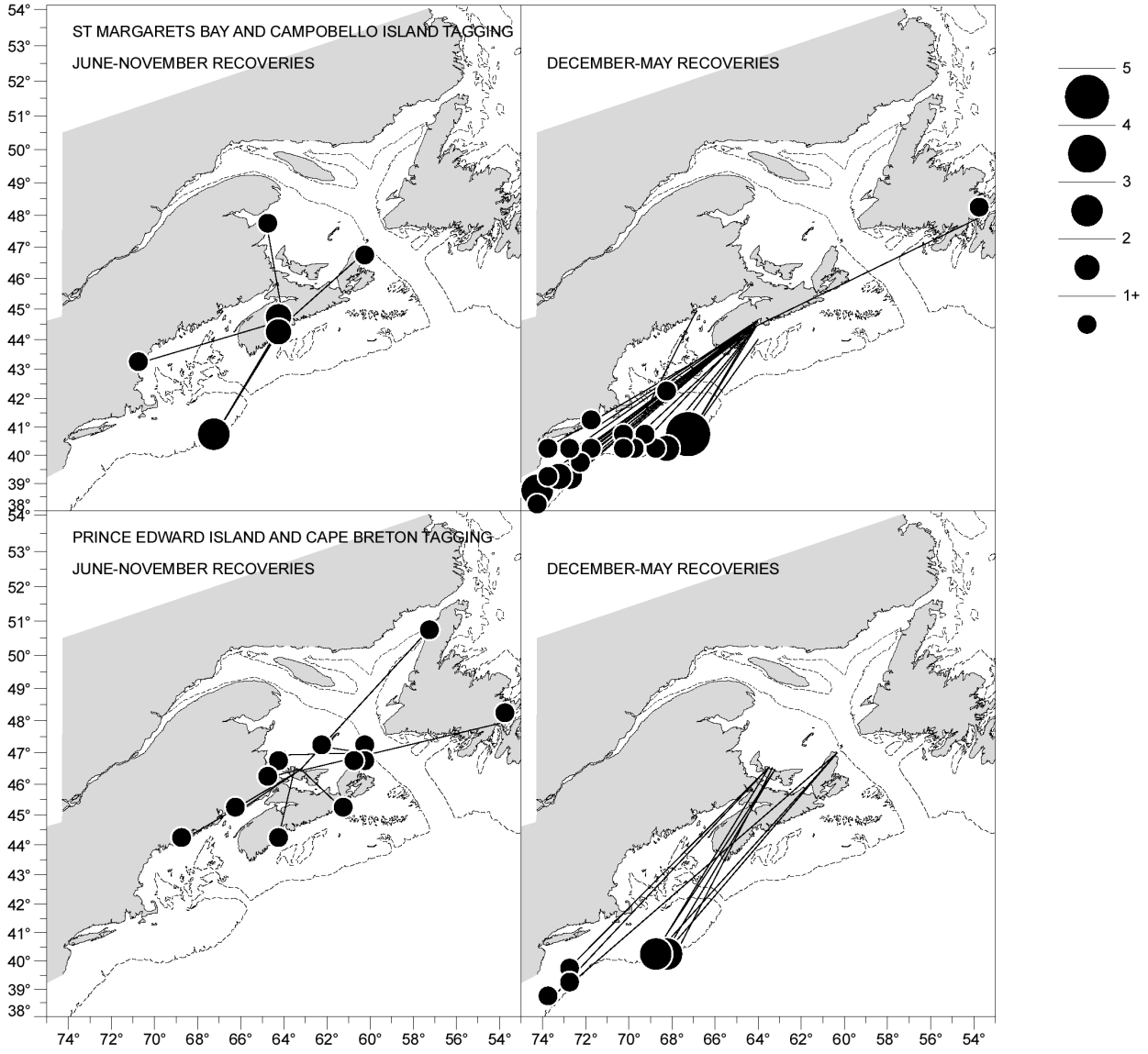

Figure 7. Recoveries from mackerel tagged throughout the Bay of Fundy (July,1974), Scotian Shelf (October, 1973-74), Sydney Bight (July,1974), and Gulf of St Lawrence (September-October 1973-74). Recoveries are aggregated over years and 5 minute squares. Recoveries within a month of release are not plotted.

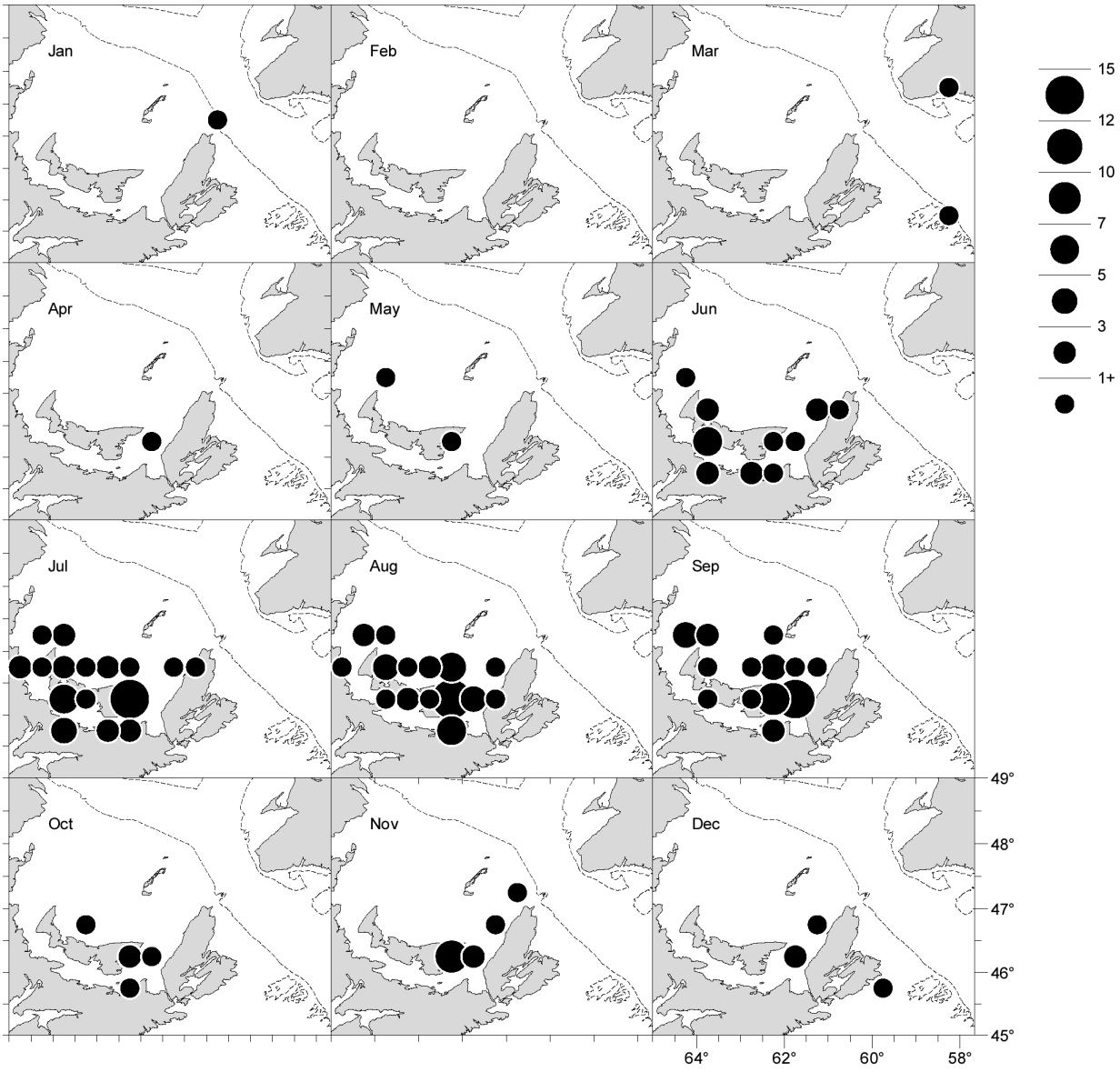

Figure 8. Recoveries from white hake tagged near Souris, PEI, in August of 1967. Recoveries are aggregated over years and 5 minute squares, and plotted separately for each month. Recoveries within 3 months of release are not plotted. There were no recoveries in February.

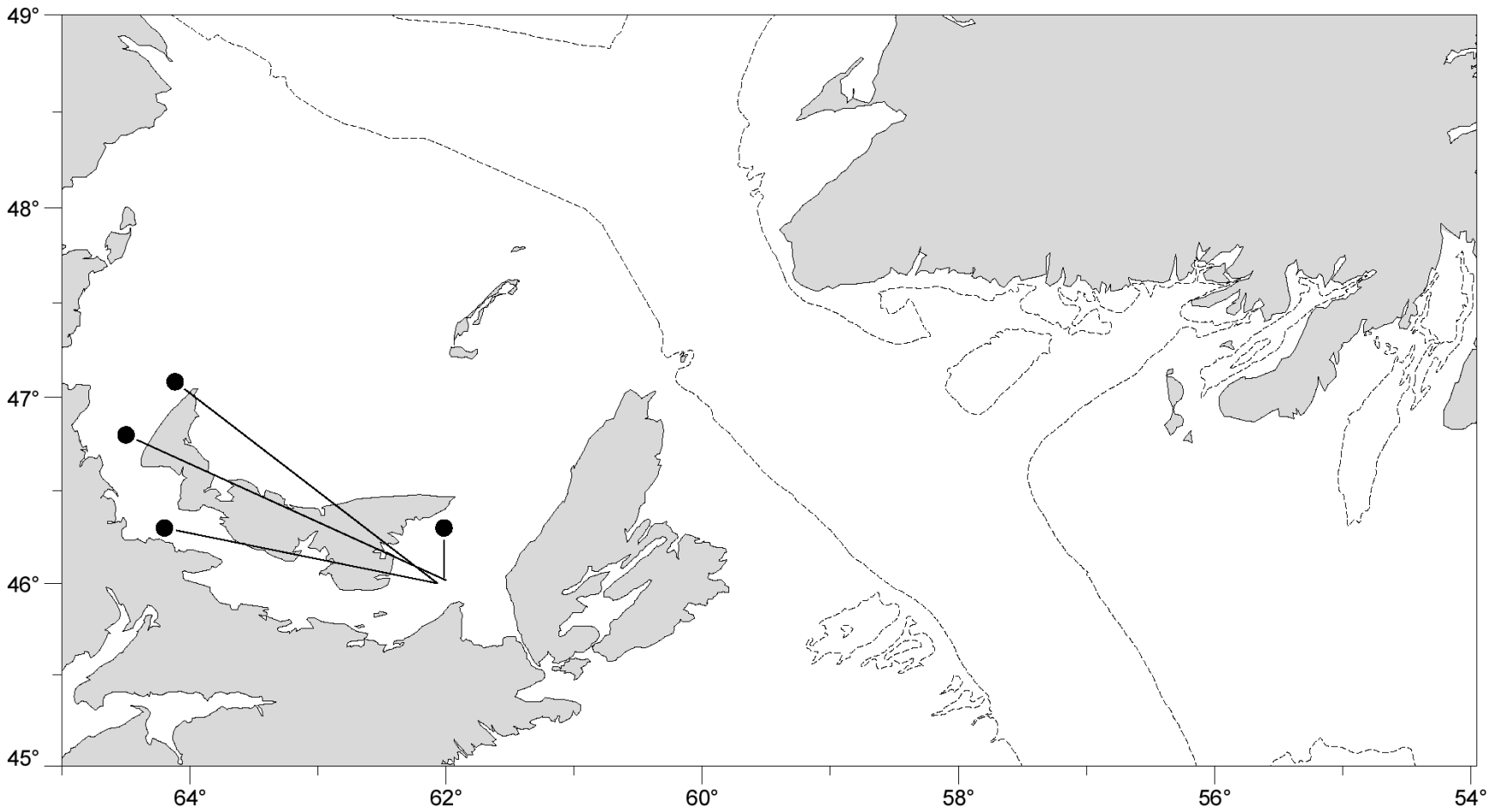

Figure 9. Movements of white hake tagged near Souris, PEI in September 1979. Dots without lines denote recoveries at the location of release.

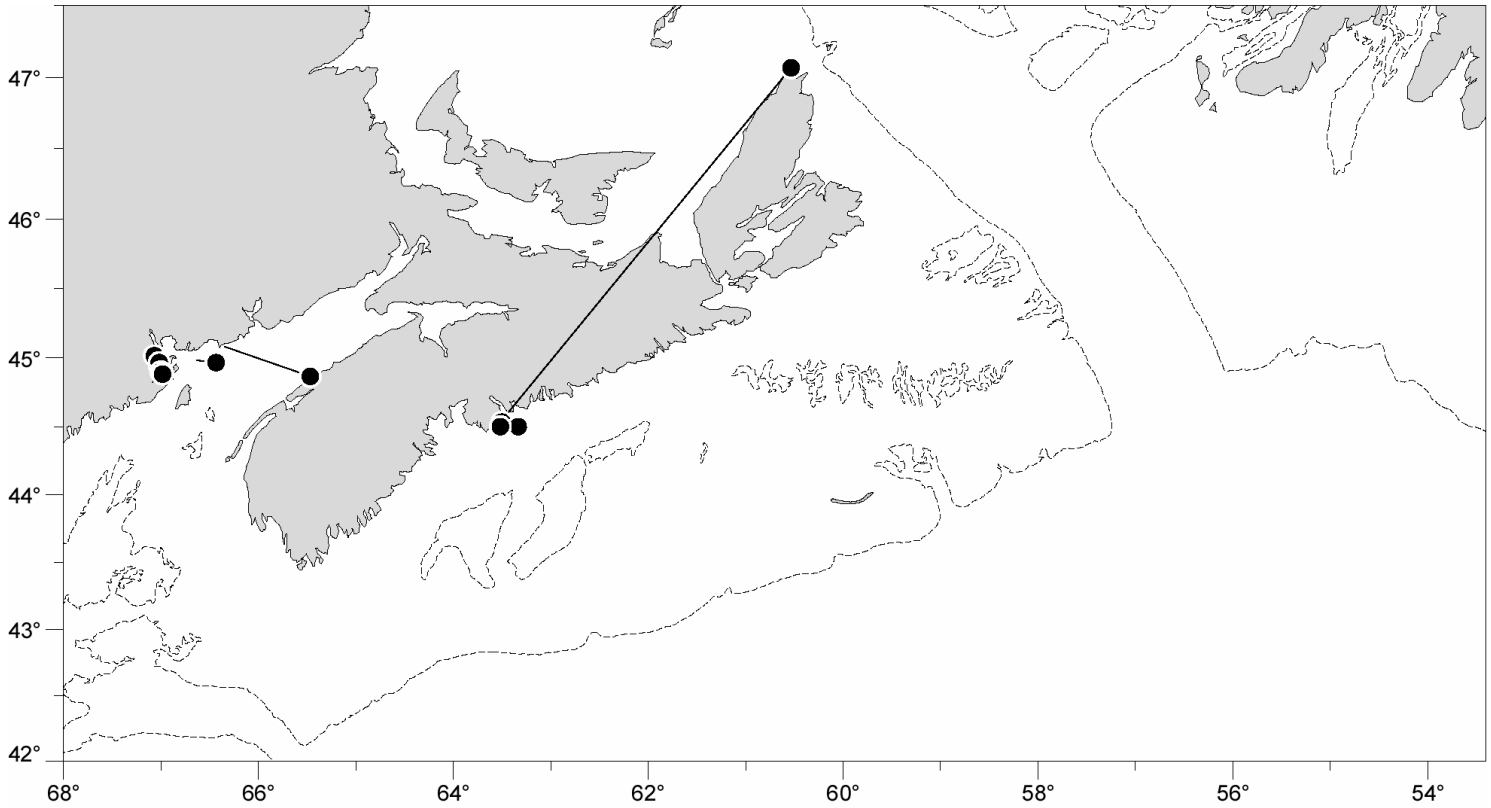

Figure 10. Movements of winter flounder tagged in and around Passamaquoddy Bay, New Brunswick, and off Halifax, Nova Scotia, between 1971 and 1985. Dots without lines denote recoveries at or near the location of release.

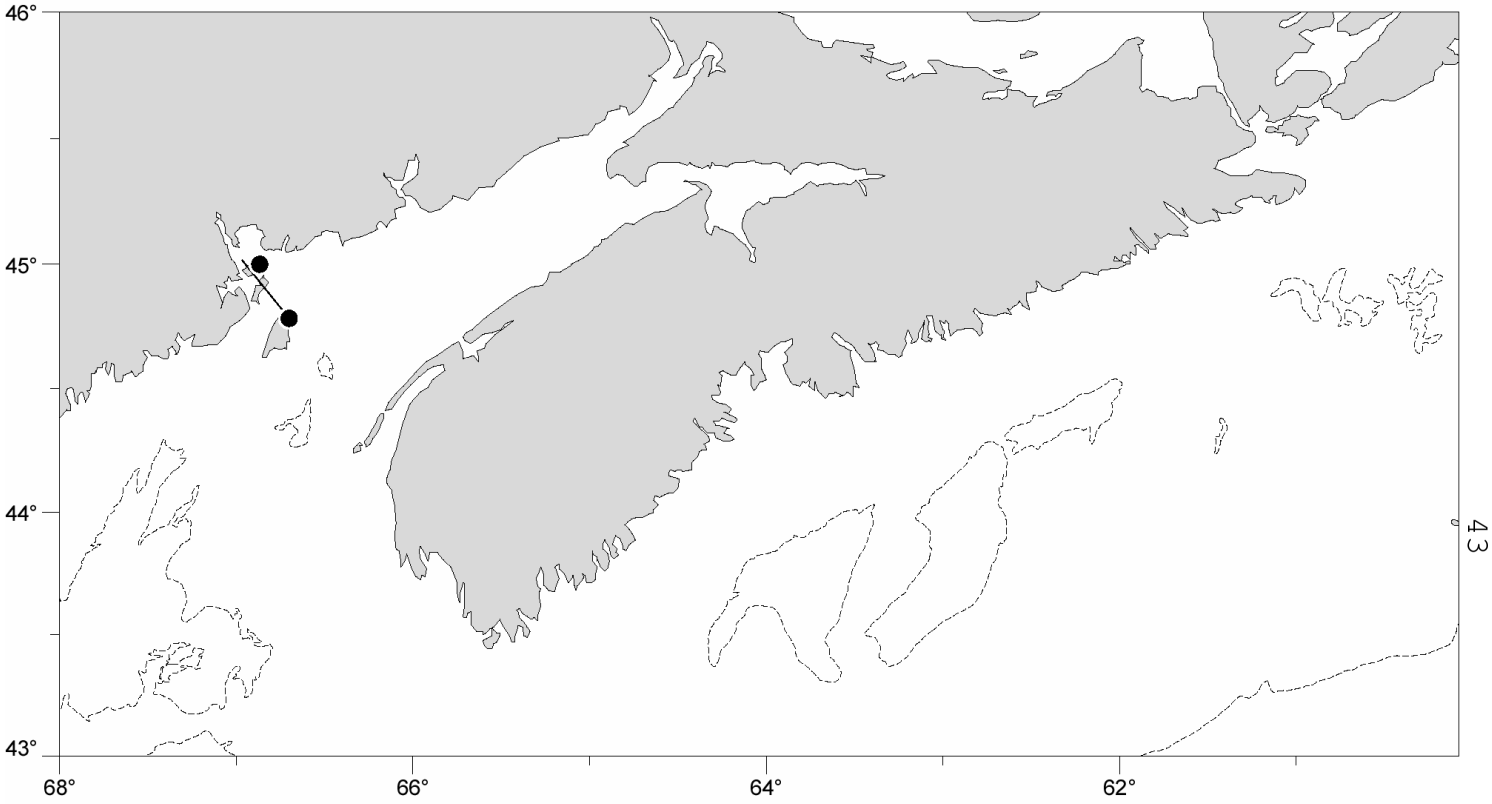

Figure 11. Movements of witch flounder tagged in and around Passamaquoddy Bay, New Brunswick, in the summer of 1973. Dots without lines denote recoveries at the location of release.

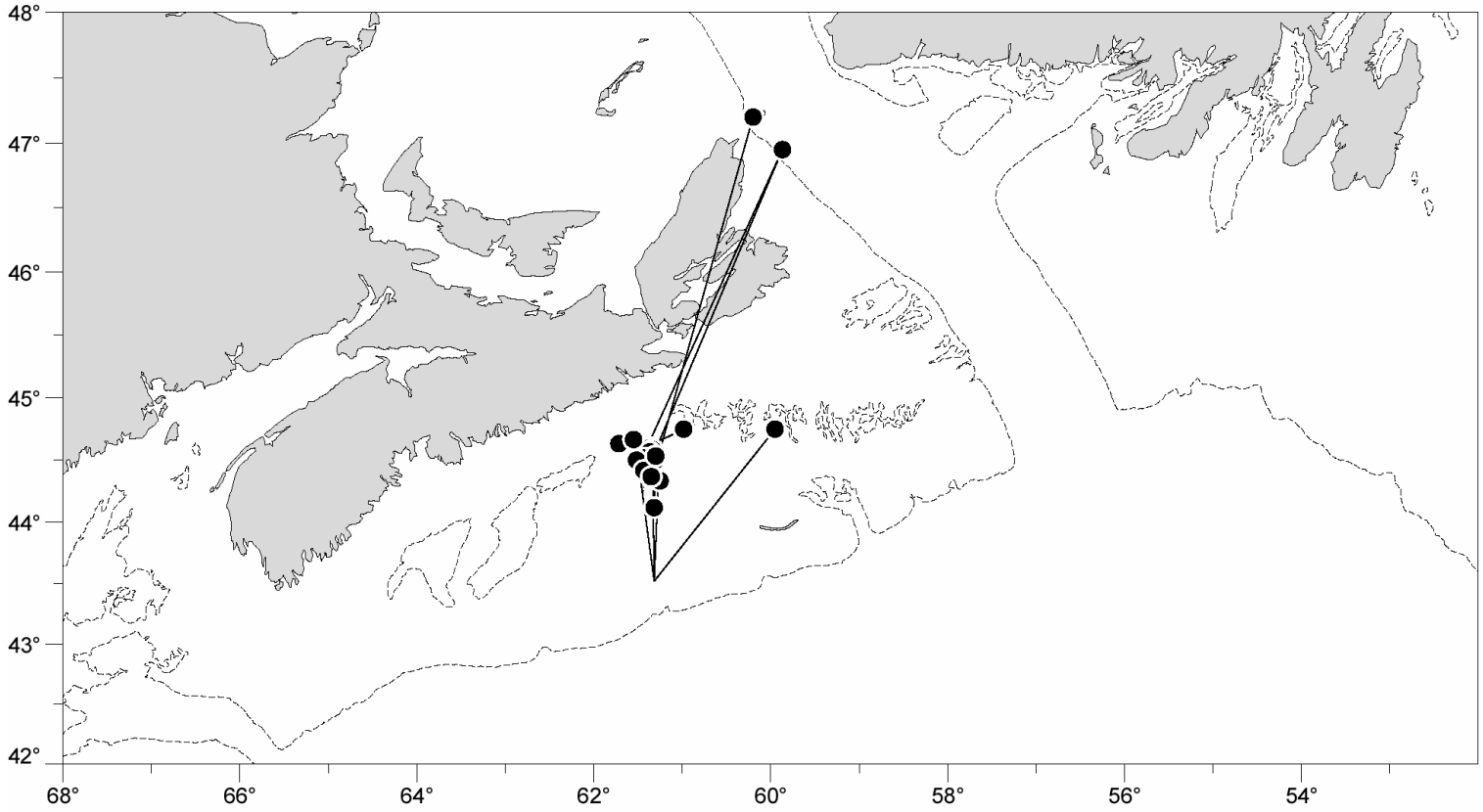

Figure 12. Movements of witch flounder tagged on the Scotian Shelf northwest of Sable Island in April of 1965. Dots without lines denote recoveries at the location of release.

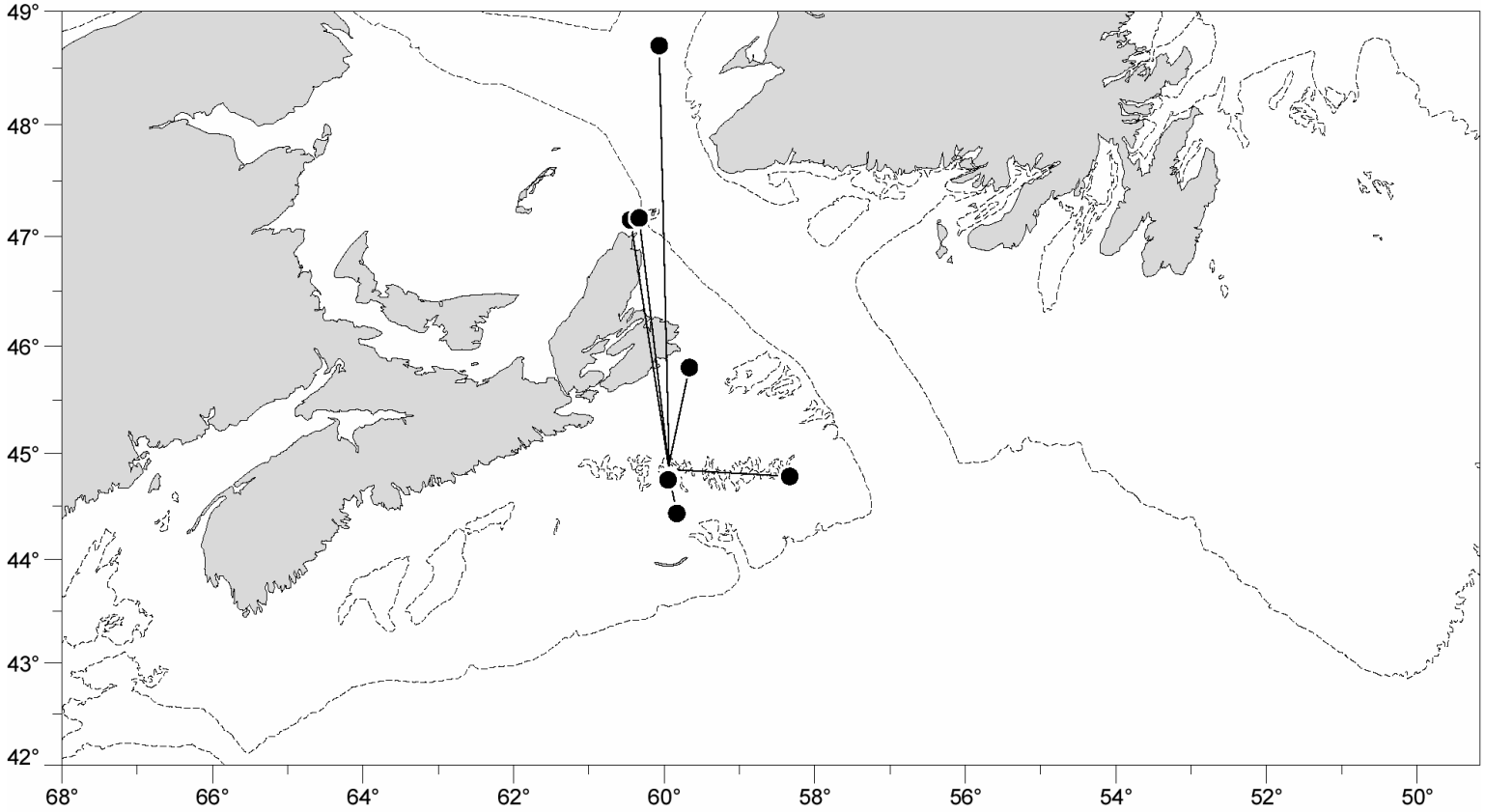

Figure 13. Movements of witch flounder tagged on Banquereau (4Vc) in March of 1965. Dots without lines denote recoveries at the location of release.

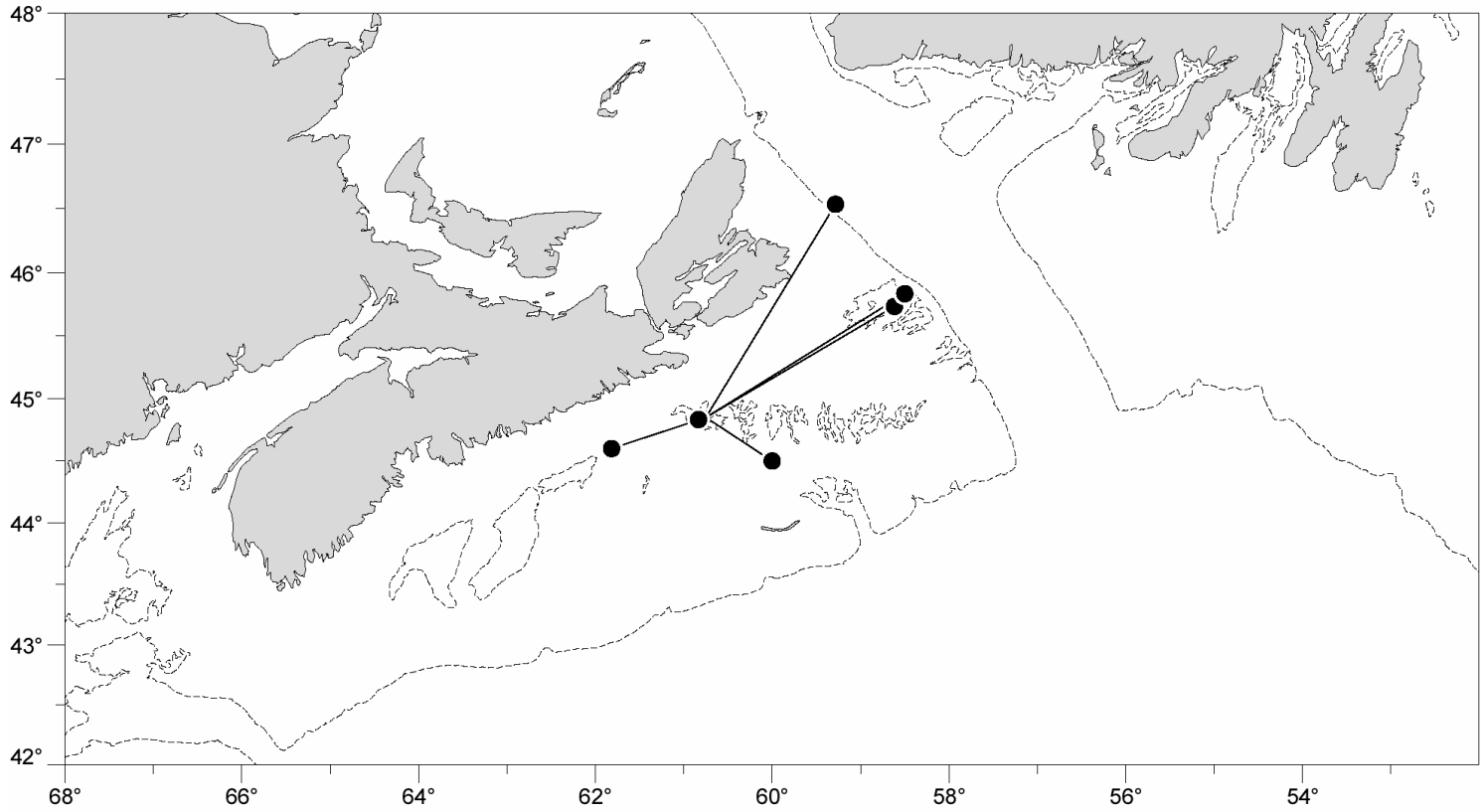

Figure 14. Movements of witch flounder tagged off Cape Canso (4Wd) in February, 1964. Dots without lines denote recoveries at the location of release.

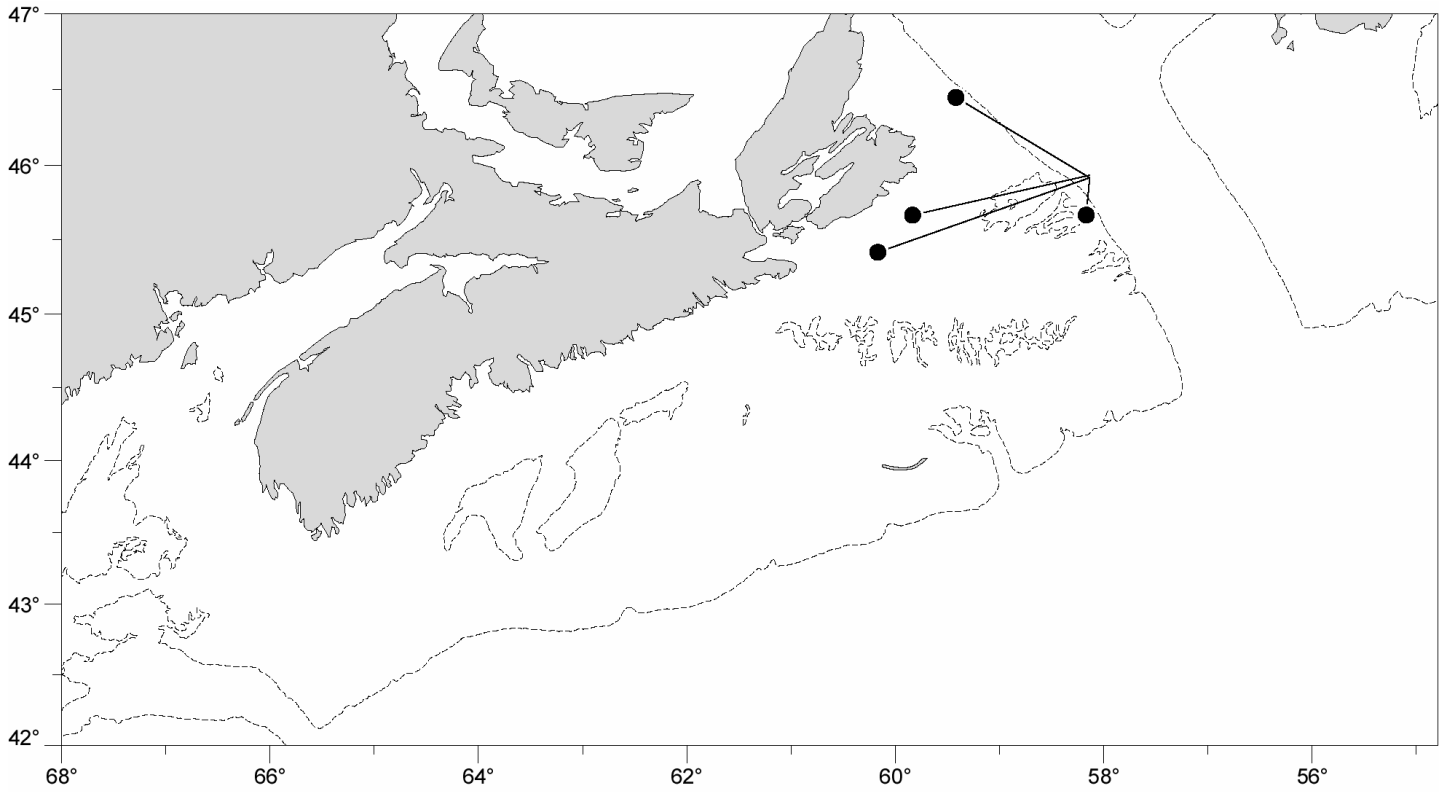

Figure 15. Movements of witch flounder tagged along the edge of the Laurentian Channel (4Vb) in October of 1964. Dots without lines denote recoveries at the location of release.

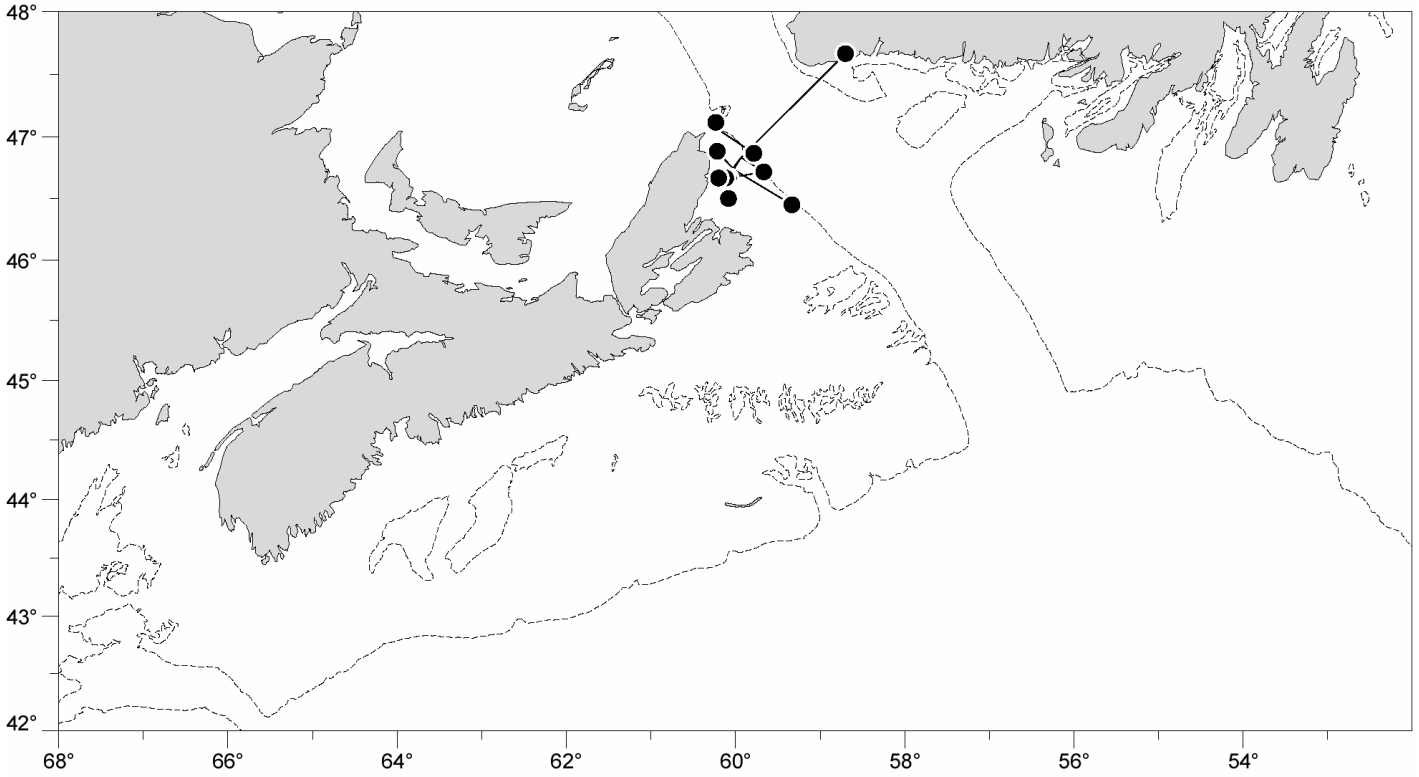

Figure 16. Movements of witch flounder tagged in the northern portion of Sydney Bight, Cape Breton (4Vn) in October, 1963. Dots without lines denote recoveries at the location of release.

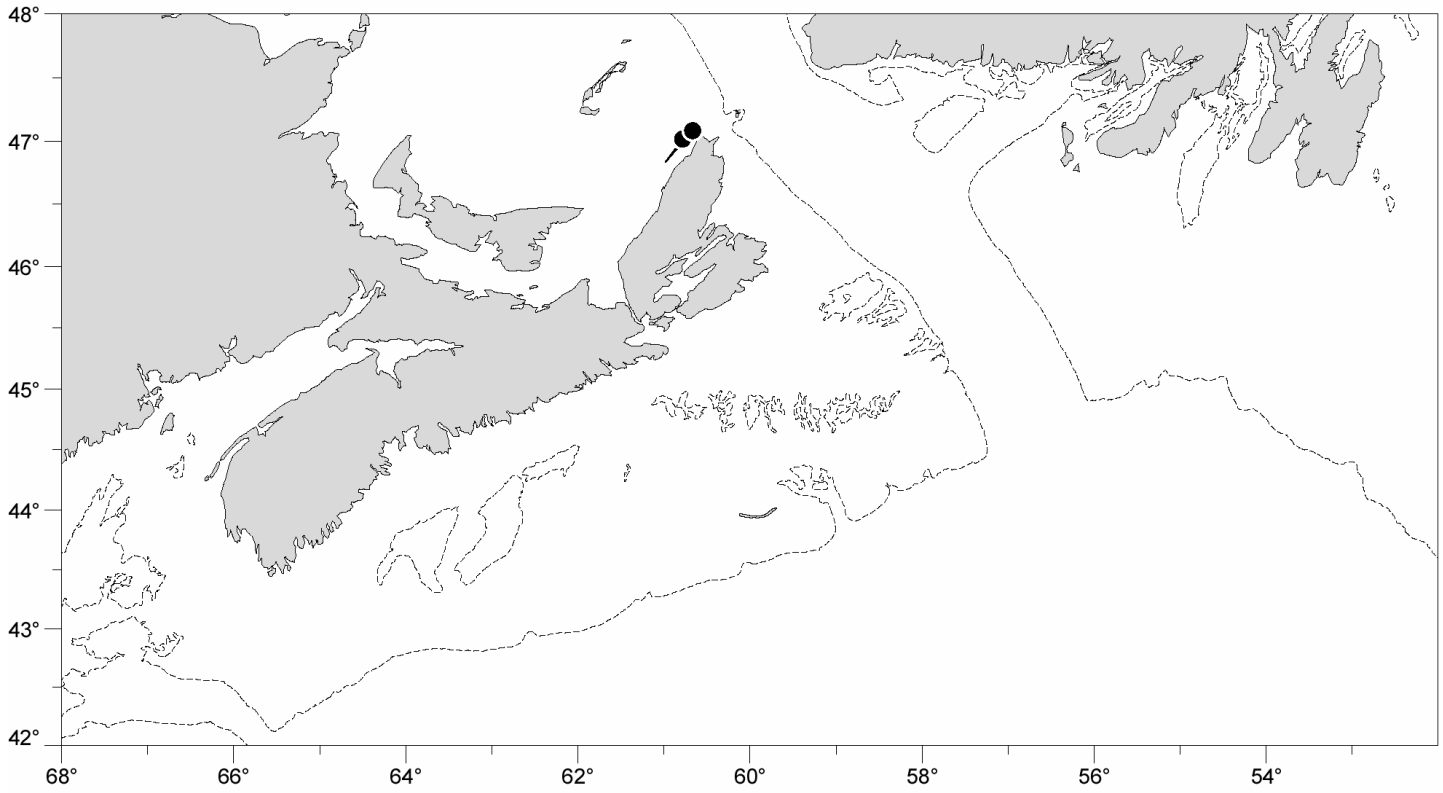

Figure 17. Recovery locations of witch flounder tagged in the Cape Breton Trough, Gulf of St Lawrence (4Tg) in October, 1963. Dots without lines denote recoveries at the location of release.

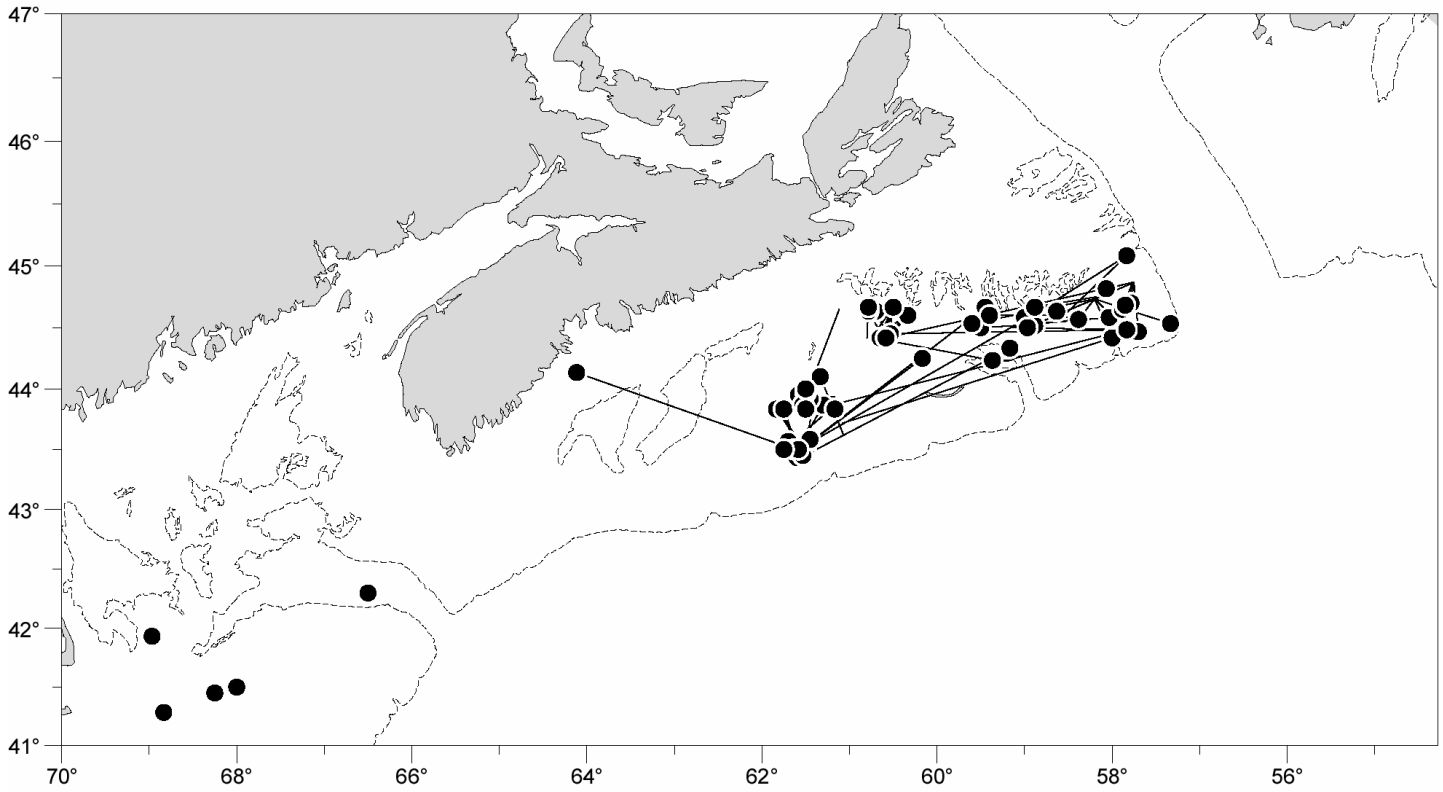

Figure 18. Movements of yellowtail flounder tagged on the Scotian Shelf near Sable Island in 1966-67. Dots without lines denote recoveries at the location of release. Georges Bank recoveries are plotted without lines (see text).

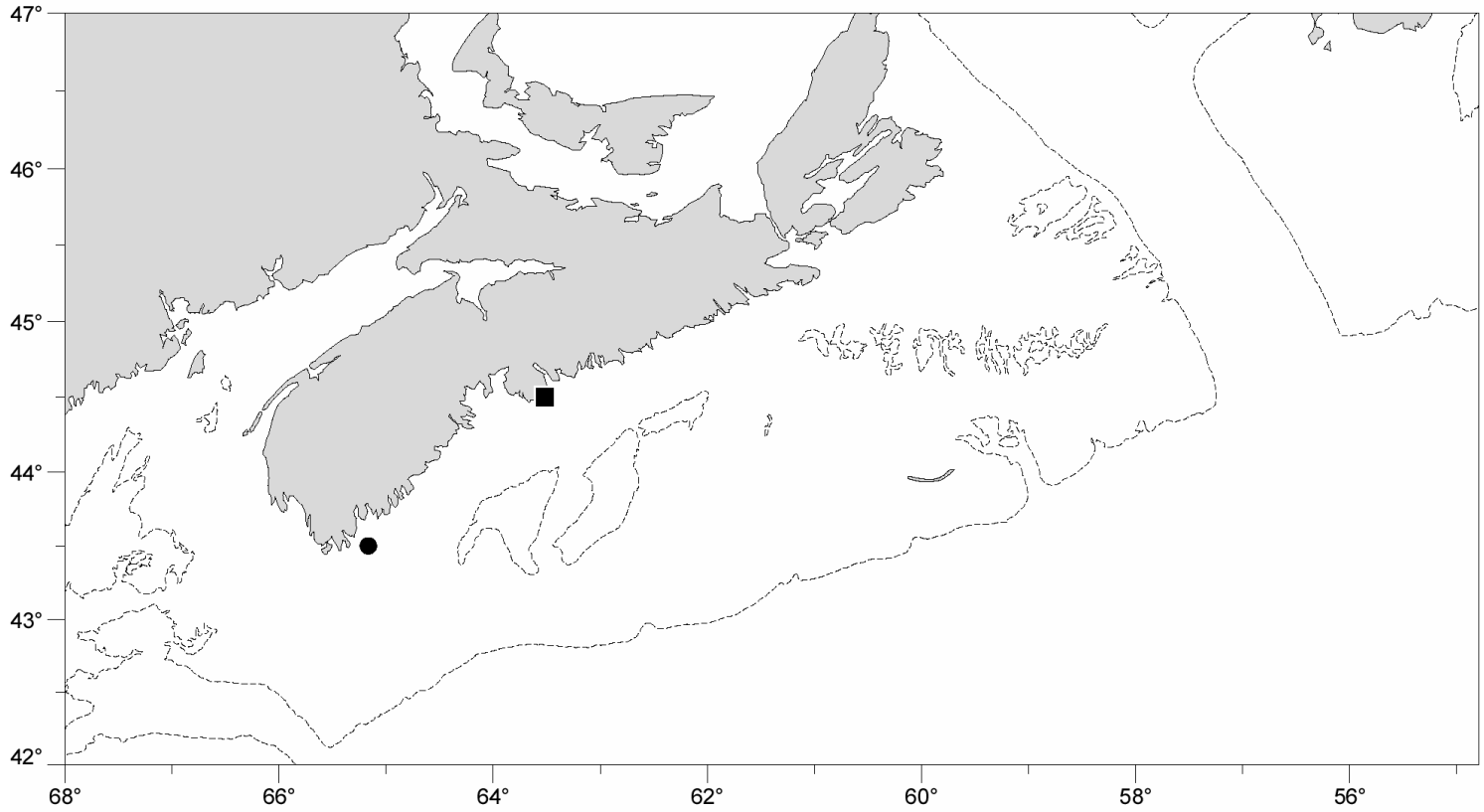

Figure 19. Recovery locations of yellowtail flounder tagged off southwest Nova Scotia in April, 1972 (dot) and off Halifax, Nova Scotia (square) in January-February, 1979.

Appendix A

Tabular summary of the tagging activities described in this document. Numeric labels in the References column denote publications in Appendix F. A question mark means the data does not appear to have been analyzed with respect to movements, although it may have been examined in other respects, and the amount of data is non-trivial. An asterisk is used to flag tagging of an incidental nature for which we have reported previously unpublished results in the text.

Species	Year	Month	NAFO Area	Number Released	Number Recovered	Percent Recovered	Tags Used	References
CATFISH	1963	May	4XR	5	1	20.0	Spaghetti Tag	*
CATFISH	1963	Jun	4XQ	23	2	8.7	Spaghetti Tag	*
CATFISH	1963	Jun	4XR	85	10	11.8	Spaghetti Tag	*
COD	1953	May	4XO	46	24	52.2	Various	8,14,31,32,34,35,37,39,45,52,57
COD	1953	Jun	4XO	366	187	51.1	Various	8,14,31,32,34,35,37,39,45,52,57
COD	1953	Jul	4XO	477	197	41.3	Various	8,14,31,32,34,35,37,39,45,52,57
COD	1953	Aug	4XO	337	98	29.1	Various	8,14,31,32,34,35,37,39,45,52,57
COD	1953	Sep	4XO	441	173	39.2	Various	8,14,31,32,34,35,37,39,45,52,57
COD	1953	Oct	4XO	129	46	35.7	Various	8,14,31,32,34,35,37,39,45,52,57
COD	1954	Jun	4VB	2	1	50.0	Petersen Disc (English, Yellow)	8,33,34,35,38,39,57
COD	1954	Jun	4VN	712	337	47.3	Various	8,33,34,35,38,39,57
COD	1954	Jun	4WD	3	0	0.0	Lea Hydrostatic Tag	8,33,34,35,38,39,57
COD	1954	Jul	4VN	91	29	31.9	Various	8,33,34,35,38,39,57
COD	1954	Jul	4WD	456	249	54.6	Various	8,33,34,35,38,39,57
COD	1954	Jul	4WK	7	6	85.7	Petersen Disc (English, Yellow)	8,33,34,35,38,39,57
COD	1954	Aug	4WD	15	6	40.0	Various	8,33,34,35,38,39,57
COD	1955	Jun	4TL	240	72	30.0	Various	5,6,8,17,21,34,35,39,41,45,57
COD	1955	Jun	4TM	126	51	40.5	Various	5,6,8,17,21,34,35,39,41,45,57
COD	1955	Jun	4TN	444	174	39.2	Various	5,6,8,17,21,34,35,39,41,45,57
COD	1955	Jul	4TL	113	23	20.4	Lea Hydrostatic Tag	5,6,8,17,21,34,35,39,41,45,57
COD	1955	Jul	4TM	538	205	38.1	Various	5,6,8,17,21,34,35,39,41,45,57
COD	1955	Jul	4TN	1224	423	34.6	Various	5,6,8,17,21,34,35,39,41,45,57
COD	1955	Aug	4TL	76	26	34.2	Various	5,6,8,17,21,34,35,39,41,45,57
COD	1955	Aug	4TM	8	2	25.0	Lea Hydrostatic Tag	5,6,8,17,21,34,35,39,41,45,57
COD	1955	Aug	4TN	629	192	30.5	Various	5,6,8,17,21,34,35,39,41,45,57
COD	1955	Sep	4TN	448	170	38.0	Various	5,6,8,17,21,34,35,39,41,45,57
COD	1956	May	4TF	371	127	34.2	Petersen Disc (English, Yellow)	5,8,21,24,35,39,57
COD	1956	May	4TG	363	115	31.7	Petersen Disc (English, Yellow)	5,8,21,24,35,39,57
COD	1956	May	4VN	4	1	25.0	Petersen Disc (English, Yellow)	8,35,39,57
COD	1956	Jun	4TK	164	78	47.6	Petersen Disc (French, Yellow)	5,8,17,21,35,39,41,45,57
COD	1956	Jun	4TL	422	113	26.8	Various	5,8,17,21,35,39,41,45,57
COD	1956	Jun	4TN	428	142	33.2	Various	5,8,17,21,35,39,41,45,57
COD	1956	Jul	4TN	267	50	18.7	Various	5,8,17,21,35,39,41,45,57
COD	1956	Aug	4TN	720	229	31.8	Various	5,8,17,21,35,39,41,45,57
COD	1957	Jul	4TF	1001	234	23.4	Various	5,8,21,24,39,53,57
COD	1957	Aug	4TF	199	39	19.6	Lea Hydrostatic Tag	5,8,21,24,57
COD	1958	May	4TF	911	300	32.9	Petersen Disc (English, Yellow)	5,8,21,25,57
COD	1958	Jun	4TL	846	87	10.3	Spaghetti Tag	5,8,21,27,57
COD	1958	Jun	4TN	197	28	14.2	Spaghetti Tag	5,8,21,27,57
COD	1958	Oct	4TL	1	1	100.0	Spaghetti Tag	2,5,8,21,57
COD	1958	Oct	4TN	733	169	23.1	Various	2,5,8,21,57
COD	1959	Mar	4VC	468	70	15.0	Petersen Disc (English, Yellow)	8,30,57
COD	1959	Mar	4WJ	25	8	32.0	Petersen Disc (English, Yellow)	8,30,57
COD	1959	Mar	4WL	37	12	32.4	Petersen Disc (English, Yellow)	8,30,57
COD	1959	Mar	4XN	4	1	25.0	Petersen Disc (English, Yellow)	8,14,30,57
COD	1959	Aug	4TN	1991	414	20.8	Petersen Disc (English, Yellow)	5,8,21,27,57
COD	1959	Sep	4TN	1	1	100.0	Petersen Disc (English, Yellow)	5,8,21,27,57

Species	Year	Month	NAFO Area	Number Released	Number Recovered	Percent Recovered	Tags Used	References
COD	1959	Sep	4WF	99	22	22.2	Petersen Disc (English, Yellow)	2,8,57
COD	1959	Sep	4WH	15	3	20.0	Petersen Disc (English, Yellow)	2,8,57
COD	1959	Sep	4WL	1	1	100.0	Petersen Disc (English, Yellow)	2,8,57
COD	1960	Feb	4VN	923	219	23.7	Various	2,8,28,29,57
COD	1960	Mar	4WH,J	506	157	31.0	Various	2,8,28,29,57
COD	1960	Aug	4TN	58	10	17.2	Petersen Disc (English, French)	5,8,21,27,57
COD	1960	Sep	4TN	1589	331	20.8	Various	5,8,21,27,57
COD	1960	Oct	4TN	52	22	42.3	Petersen Disc (English, French)	5,8,21,27,57
COD	1961	Sep	4TN	1814	453	25.0	Various	*,8,21,57
COD	1961	Oct	4SZ	1500	288	19.2	Petersen Disc (English, French)	8,15,16,22,57
COD	1962	Apr	4VN	501	147	29.3	Petersen Disc (English, Yellow)	8,30,57
COD	1964	May	4SY	4	0	0.0	Petersen Disc (English, French)	8,48,57
COD	1964	May	4SZ	888	205	23.1	Petersen Disc (English, French)	*,8,48,57
COD	1964	May	4TK	997	297	29.8	Petersen Disc (English, French)	*,8,21,57
COD	1966	May	4XS	504	209	41.5	Petersen Disc (English, Yellow)	3,8,13,14,47,57
COD	1969	Jan	4VN	1018	139	13.7	Petersen Disc (English, Yellow)	8,19,57
COD	1969	Jun	4XN	35	3	8.6	Petersen Disc (English, Yellow)	8,10,14,57
COD	1969	Jun	4XO	1	0	0.0	Petersen Disc (English, Yellow)	8,10,14,57
COD	1969	Jun	4XP	69	17	24.6	Petersen Disc (English, Yellow)	8,10,14,57
COD	1970	Mar	4XP	2	1	50.0	Petersen Disc (English, Yellow)	8,10,14,57
COD	1972	Apr	4XO	138	39	28.3	Petersen Disc (English, Yellow)	8,10,14,57
COD	1973	Jun	4WF	1	1	100.0	Petersen Disc (English, Yellow)	8,57
COD	1973	Jun	4WJ	2	2	100.0	Petersen Disc (English, Yellow)	8,57
COD	1973	Jun	4WL	1	1	100.0	Petersen Disc (English, Yellow)	8,57
COD	1973	Jun	4XR	57	12	21.1	Petersen Disc (English, Yellow)	8,14,47,57
COD	1973	Jun	4XS	535	115	21.5	Petersen Disc (English, Yellow)	8,14,47,57
COD	1973	Jul	4XS	11	3	27.3	Petersen Disc (English, Yellow)	8,14,47,57
COD	1978	Oct	4WE	2340	695	29.7	T-Bar Anchor Tag	8,57,67
COD	1978	Nov	4WE	3682	1065	28.9	T-Bar Anchor Tag	8,57,67
COD	1978	Nov	4WJ	5	0	0.0	Petersen Disc (English, Yellow)	8,57,67
COD	1978	Nov	4WL	7	1	14.3	Petersen Disc (English, Yellow)	8,57,67
COD	1979	Jan	4WK	75	10	13.3	T-Bar Anchor Tag	?,8,57
COD	1979	Feb	4WK	506	79	15.6	T-Bar Anchor Tag	?,8,57
COD	1979	Apr	4VC	4302	933	21.7	Various	7,8,57,67
COD	1979	Jun	4XO	696	238	34.2	T-Bar Anchor Tag	8,9,13,14,57
COD	1979	Jun	4XR	141	38	27.0	T-Bar Anchor Tag	8,9,13,14,57
COD	1979	Sep	4TG	1994	104	5.2	T-Bar Anchor Tag	5,8,21,57,67
COD	1979	Sep	4TL	1965	17	0.9	T-Bar Anchor Tag	5,8,21,57,67
COD	1979	Nov	4WK	27	1	3.7	T-Bar Anchor Tag	8,57
COD	1980	Feb	4WK	75	6	8.0	T-Bar Anchor Tag	?,8,57
COD	1980	Feb	4XM	815	110	13.5	T-Bar Anchor Tag	8,13,14,57
COD	1980	Apr	4WK	3	0	0.0	T-Bar Anchor Tag	8,57
COD	1980	May	4TG	61	5	8.2	T-Bar Anchor Tag	5,8,21,57,67
COD	1980	May	4WK	18	1	5.6	T-Bar Anchor Tag	8,57
COD	1980	Jun	4TG	249	7	2.8	T-Bar Anchor Tag	5,8,21,57,67
COD	1980	Sep	4VN	2923	527	19.7	T-Bar Anchor Tag	?,8,57
COD	1980	Oct	4VN	2852	317	11.1	T-Bar Anchor Tag	?,8,57
COD	1980	Nov	4TG	2481	572	23.1	T-Bar Anchor Tag	5,8,21,57,67
COD	1980	Dec	4TG	2396	495	20.7	T-Bar Anchor Tag	5,8,21,57,67

Species	Year	Month	NAFO Area	Number Released	Number Recovered	Percent Recovered	Tags Used	References
COD	1981	Apr	4TG	3530	403	11.4	T-Bar Anchor Tag	5,8,21,57,67
COD	1981	Apr	4VC	2148	487	22.7	T-Bar Anchor Tag	8,57,67
COD	1981	May	4VC	2300	479	20.8	T-Bar Anchor Tag	8,57,67
COD	1981	Sep	4WF	1999	43	2.2	T-Bar Anchor Tag	?,8,57
COD	1981	Sep	4WH	400	12	3.0	T-Bar Anchor Tag	?,8,57
COD	1984	Feb	4XP	4000	600	15.0	T-Bar Anchor Tag	8,13,14,57
COD	1984	Feb	5ZJ	1996	193	9.7	T-Bar Anchor Tag	8,13,14,57
COD	1984	Mar	4XP	787	124	15.8	T-Bar Anchor Tag	8,13,14,57
COD	1984	Aug	4XS	67	3	4.5	T-Bar Anchor Tag	8,13,14,57
COD	1985	Jan	4XS	4	0	0.0	T-Bar Anchor Tag	8,13,14,57
COD	1985	Feb	4XP	1625	223	13.7	T-Bar Anchor Tag	8,13,14,57
COD	1985	Mar	4XP	4375	481	11.0	T-Bar Anchor Tag	8,13,14,57
COD	1985	Mar	5ZJ	1050	139	13.2	T-Bar Anchor Tag	8,13,14,57
COD	1985	Jul	4XR	216	25	11.6	T-Bar Anchor Tag	8,13,14,57
COD	1985	Jul	4XS	1399	95	6.8	T-Bar Anchor Tag	8,13,14,57
COD	1985	Jul	5YB	350	48	13.7	T-Bar Anchor Tag	8,13,14,57
COD	1985	Nov	4XS	282	35	12.4	T-Bar Anchor Tag	8,13,14,57
COD	1985	Dec	4XS	73	6	8.2	T-Bar Anchor Tag	8,13,14,57
CUNNER	1980	Jul	4XM	47	3	6.4	T-Bar Anchor Tag	*
HADDOCK	1953	May	4XO	117	40	34.2	Various	8,31,32,36,37,40
HADDOCK	1953	Jun	4XO	55	22	40.0	Various	8,31,32,36,37,40
HADDOCK	1953	Jul	4XO	223	60	26.9	Various	8,31,32,36,37,40
HADDOCK	1953	Aug	4XO	126	38	30.2	Various	8,31,32,36,37,40
HADDOCK	1953	Sep	4XO	34	9	26.5	Various	8,31,32,36,37,40
HADDOCK	1953	Oct	4XO	25	5	20.0	Various	8,31,32,36,37,40
HADDOCK	1954	Jun	4VN	3	3	100.0	Petersen Disc (English, Yellow)	8
HADDOCK	1954	Jul	4WK	25	4	16.0	Petersen Disc (English, Yellow)	8
HADDOCK	1954	Jul	4XO	1	0	0.0	Petersen Disc (English, Yellow)	8
HADDOCK	1954	Aug	4WD	11	1	9.1	Petersen Disc (English, Yellow)	8
HADDOCK	1956	Sep	4TG	281	33	11.7	Petersen Disc (English, Yellow)	8,40,42,44,46
HADDOCK	1956	Sep	4TH	352	61	17.3	Petersen Disc (English, Yellow)	8,40,42,44,46
HADDOCK	1956	Oct	4TG	223	34	15.2	Petersen Disc (English, Yellow)	8,40,42,44,46
HADDOCK	1956	Oct	4TH	143	47	32.9	Petersen Disc (English, Yellow)	8,40,42,44,46
HADDOCK	1957	Mar	4XN	336	22	6.5	Petersen Disc (Red/White)	8,26,40,42,44
HADDOCK	1957	Mar	4XO	56	3	5.4	Petersen Disc (Red/White)	8,26,40,42,44
HADDOCK	1957	Mar	4XP	98	5	5.1	Petersen Disc (Red/White)	8,26,40,42,44
HADDOCK	1957	Apr	4XN	634	43	6.8	Various	8,26,40,42,44
HADDOCK	1957	Oct	4XS	112	18	16.1	Petersen Disc (English, Yellow)	8,40,42,43,44
HADDOCK	1957	Nov	4XS	706	197	27.9	Petersen Disc (English, Yellow)	8,40,42,43,44
HADDOCK	1957	Dec	4XO	268	66	24.6	Petersen Disc (English, Yellow)	8,40,42,43,44
HADDOCK	1958	Apr	4XS	31	0	0.0	Petersen Disc (English, Yellow)	8
HADDOCK	1959	Mar	4WJ	258	15	5.8	Petersen Disc (English, Yellow)	*,8,44
HADDOCK	1959	Mar	4WL	224	11	4.9	Petersen Disc (English, Yellow)	*,8,44
HADDOCK	1959	Mar	4XN	29	2	6.9	Petersen Disc (English, Yellow)	*,8,44
HADDOCK	1959	Sep	4WF	147	0	0.0	Petersen Disc (English, Yellow)	8,44
HADDOCK	1959	Sep	4WH	64	0	0.0	Petersen Disc (English, Yellow)	8,44
HADDOCK	1959	Sep	4WL	4	0	0.0	Petersen Disc (English, Yellow)	8,44
HADDOCK	1960	Mar	4WH	600	15	2.5	Petersen Disc (English, Yellow)	8,27,44
HADDOCK	1963	Nov	4XR	661	93	14.1	Petersen Disc (English, Yellow)	8,11

Species	Year	Month	NAFO Area	Number Released	Number Recovered	Percent Recovered	Tags Used	References
HADDOCK	1966	Oct	4XR	107	14	13.1	Petersen Disc (English, Yellow)	8,11
HADDOCK	1966	Oct	4XS	212	46	21.7	Petersen Disc (English, Yellow)	8,11
HADDOCK	1969	Jun	4XN	5	0	0.0	Petersen Disc (English, Yellow)	8
HADDOCK	1969	Jun	4XO	12	1	8.3	Petersen Disc (English, Yellow)	*,8
HADDOCK	1969	Jun	4XP	234	9	3.8	Petersen Disc (English, Yellow)	*,8
HADDOCK	1970	Mar	4XP	22	0	0.0	Petersen Disc (English, Yellow)	8
HADDOCK	1971	Mar	4XP	900	15	1.7	Petersen Disc (English, Yellow)	*,8
HADDOCK	1972	Apr	4XO	47	2	4.3	Petersen Disc (English, Yellow)	*,8
HADDOCK	1973	Jun	4XR	121	8	6.6	Petersen Disc (English, Yellow)	*,8
HADDOCK	1973	Jun	4XS	119	6	5.0	Petersen Disc (English, Yellow)	*,8
HADDOCK	1978	Nov	4WJ	28	0	0.0	Various	?,8
HADDOCK	1978	Nov	4WL	110	3	2.7	Various	?,8
HADDOCK	1979	Jan	4WK	10	0	0.0	T-Bar Anchor Tag	?,8
HADDOCK	1980	Feb	4WK	67	0	0.0	T-Bar Anchor Tag	?,8
HADDOCK	1980	Feb	4XM	74	0	0.0	T-Bar Anchor Tag	?,8
HADDOCK	1982	Jun	4XR	2973	429	14.4	T-Bar Anchor Tag	?,8
HADDOCK	1983	Mar	4XP	297	17	5.7	T-Bar Anchor Tag	?,8
HADDOCK	1983	Apr	4XN	2831	192	6.8	T-Bar Anchor Tag	?,8
HADDOCK	1983	Apr	4XP	419	11	2.6	T-Bar Anchor Tag	?,8
HADDOCK	1984	Feb	4XP	1999	13	0.7	T-Bar Anchor Tag	?,8
HADDOCK	1984	Feb	5ZJ	236	0	0.0	T-Bar Anchor Tag	?,8
HADDOCK	1984	Mar	4XN	4733	76	1.6	T-Bar Anchor Tag	?,8
HADDOCK	1984	Mar	4XP	4220	150	3.6	T-Bar Anchor Tag	?,8
HADDOCK	1984	Mar	5ZM	2953	49	1.7	T-Bar Anchor Tag	?,8
HADDOCK	1984	Aug	4XS	3	0	0.0	T-Bar Anchor Tag	?,8
HADDOCK	1985	Mar	4XN	2874	9	0.3	T-Bar Anchor Tag	?,8
HADDOCK	1985	Mar	4XP	5994	69	1.2	T-Bar Anchor Tag	?,8
HADDOCK	1985	Mar	5ZJ	2944	43	1.5	T-Bar Anchor Tag	?,8
HADDOCK	1985	Apr	4XN	2925	19	0.7	T-Bar Anchor Tag	?,8
HADDOCK	1985	Apr	4XP	200	0	0.0	T-Bar Anchor Tag	?,8
HADDOCK	1985	Jul	4XR	134	1	0.7	T-Bar Anchor Tag	?,8
HADDOCK	1985	Jul	4XS	50	0	0.0	T-Bar Anchor Tag	?,8
HADDOCK	1985	Jul	5YB	299	1	0.3	T-Bar Anchor Tag	?,8
WHITE HAKE	1967	Aug	4TG	1951	591	30.3	Petersen Disc (English, Yellow)	20
WHITE HAKE	1967	Aug	4TH	320	75	23.4	Petersen Disc (English, Yellow)	20
WHITE HAKE	1979	Sep	4TG	196	4	2.0	T-Bar Anchor Tag	*
HALIBUT	1958	Aug	4WJ	2	0	0.0	Petersen Disc (English, Yellow)	18,69
HALIBUT	1958	Aug	4WL	1	0	0.0	Petersen Disc (English, Yellow)	18,69
HALIBUT	1958	Sep	4WL	9	3	33.3	Petersen Disc (English, Yellow)	18,69
HALIBUT	1959	Mar	4WJ	3	2	66.7	Petersen Disc (English, Yellow)	18,69
HALIBUT	1959	Mar	4WL	19	3	15.8	Petersen Disc (English, Yellow)	18,69
HALIBUT	1959	Mar	4XN	6	0	0.0	Petersen Disc (English, Yellow)	18,69
HALIBUT	1959	Sep	4WF	1	0	0.0	Petersen Disc (English, Yellow)	18,69
HALIBUT	1959	Sep	4WH	1	0	0.0	Petersen Disc (English, Yellow)	18,69
HALIBUT	1960	Mar	4WH	29	9	31.0	Petersen Disc (English, Yellow)	18,69
HALIBUT	1960	Mar	4WJ	1	0	0.0	Petersen Disc (English, Yellow)	18,69
HALIBUT	1962	Feb	5YB	3	1	33.3	Petersen Disc (English, Yellow)	18,69
HALIBUT	1962	Mar	4VC	466	105	22.5	Petersen Disc (Yellow/Red)	18,69
HALIBUT	1962	Mar	4WG	238	47	19.7	Petersen Disc (Yellow/Red)	18,69

Species	Year	Month	NAFO Area	Number Released	Number Recovered	Percent Recovered	Tags Used	References
HALIBUT	1963	Feb	3OA	21	6	28.6	Petersen Disc (Yellow/Red)	18,69
HALIBUT	1963	Feb	3OC	35	8	22.9	Petersen Disc (Yellow/Red)	18,69
HALIBUT	1963	Feb	3OE	1	0	0.0	Petersen Disc (Yellow/Red)	18,69
HALIBUT	1963	Feb	3PH	28	5	17.9	Petersen Disc (Yellow/Red)	18,69
HALIBUT	1963	Aug	4XP	9	3	33.3	Petersen Disc (Yellow/Red)	18,69
HALIBUT	1963	Aug	4XR	3	2	66.7	Petersen Disc (Yellow/Red)	18,69
HALIBUT	1963	Aug	5YB	5	2	40.0	Petersen Disc (Yellow/Red)	18,69
HALIBUT	1964	Feb	4VC	139	42	30.2	Petersen Disc (Yellow/Red)	69
HALIBUT	1964	Feb	4WG	18	10	55.6	Petersen Disc (Yellow/Red)	69
HALIBUT	1964	Feb	4WK	1	0	0.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1964	May	3NE	5	2	40.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1964	Jun	3NC	1	0	0.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1964	Jun	3OC	9	0	0.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1964	Jun	3OD	5	2	40.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1964	Jun	3OE	13	0	0.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1964	Jun	3PD	1	0	0.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1964	Jun	3PE	3	1	33.3	Petersen Disc (Yellow/Red)	69
HALIBUT	1964	Jun	3PG	6	1	16.7	Petersen Disc (Yellow/Red)	69
HALIBUT	1964	Jun	4XN	8	1	12.5	Petersen Disc (Yellow/Red)	69
HALIBUT	1964	Jun	4XP	2	0	0.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1964	Oct	3OC	10	2	20.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1964	Oct	3OD	2	0	0.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1964	Oct	3OE	2	0	0.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1964	Nov	3NF	1	0	0.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1965	Jan	3OE	4	1	25.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1965	Mar	4VC	7	3	42.9	Petersen Disc (Yellow/Red)	69
HALIBUT	1965	Mar	4VN	1	1	100.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1965	Mar	4WH	9	1	11.1	Petersen Disc (Yellow/Red)	69
HALIBUT	1965	Mar	4WJ	2	0	0.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1965	Mar	4WL	3	0	0.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1965	Mar	4XM	2	1	50.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1965	Apr	4WH	7	2	28.6	Petersen Disc (Yellow/Red)	69
HALIBUT	1965	Apr	4WJ	1	0	0.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1965	Apr	4XN	3	0	0.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1965	May	3NC	5	1	20.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1965	May	3OC	10	1	10.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1965	May	3OD	22	1	4.5	Petersen Disc (Yellow/Red)	69
HALIBUT	1965	May	3OE	14	3	21.4	Petersen Disc (Yellow/Red)	69
HALIBUT	1965	Aug	4XN	2	2	100.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1966	Feb	4WJ	2	0	0.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1966	Feb	4WL	7	2	28.6	Petersen Disc (Yellow/Red)	69
HALIBUT	1966	Mar	4WJ	3	1	33.3	Petersen Disc (Yellow/Red)	69
HALIBUT	1966	May	3NC	1	1	100.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1966	May	3NE	2	0	0.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1966	May	3OD	6	0	0.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1966	May	3OE	16	1	6.3	Petersen Disc (Yellow/Red)	69
HALIBUT	1966	Nov	4WJ	1	0	0.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1966	Nov	4WL	6	1	16.7	Petersen Disc (Yellow/Red)	69
HALIBUT	1966	Nov	4XN	1	0	0.0	Petersen Disc (Yellow/Red)	69

Species	Year	Month	NAFO Area	Number Released	Number Recovered	Percent Recovered	Tags Used	References
HALIBUT	1967	May	4VC	1	0	0.0	Petersen Disc (English, Yellow)	69
HALIBUT	1967	May	4WJ	4	1	25.0	Petersen Disc (English, Yellow)	69
HALIBUT	1967	Nov	3NC	2	1	50.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1967	Nov	3NE	2	0	0.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1967	Nov	3OD	3	0	0.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1967	Nov	3OE	1	0	0.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1967	Nov	3PG	3	2	66.7	Petersen Disc (Yellow/Red)	69
HALIBUT	1967	Dec	3PD	1	0	0.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1967	Dec	3PG	1	0	0.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1968	May	3NC	2	0	0.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1968	May	3OD	1	1	100.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1968	May	3OE	3	0	0.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1968	May	3PD	1	0	0.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1968	May	3PG	2	2	100.0	Petersen Disc (Yellow/Red)	69
HALIBUT	1972	Apr	4XO	23	3	13.0	Petersen Disc (English, Yellow)	69
HALIBUT	1973	Jun	4XR	2	0	0.0	Petersen Disc (Yellow/Red)	69
HERRING	1973	Nov	4XS	3370	113	3.4	T-Bar Anchor Tag	61,63,66,68,70
HERRING	1973	Dec	4XS	8777	184	2.1	T-Bar Anchor Tag	61,63,66,68,70
HERRING	1974	Jun	4XS	3860	213	5.5	T-Bar Anchor Tag	61,63,65,68,70
HERRING	1974	Jul	4XS	8133	614	7.6	T-Bar Anchor Tag	61,63,65,68,70
HERRING	1974	Aug	4XQ	5978	91	1.5	T-Bar Anchor Tag	61,63,65,68,70
HERRING	1974	Aug	4XR	17960	357	2.0	T-Bar Anchor Tag	61,63,65,68,70
HERRING	1976	Jan	4WD	3000	2	0.1	T-Bar Anchor Tag	66,68
HERRING	1976	Feb	4WD	12692	3	0.0	T-Bar Anchor Tag	66,68
HERRING	1976	May	4TF	9849	237	2.4	T-Bar Anchor Tag	66,68
HERRING	1976	Aug	4TN	10822	340	3.1	T-Bar Anchor Tag	66,68
HERRING	1976	Sep	4TM	8501	453	5.3	T-Bar Anchor Tag	64,68
HERRING	1976	Sep	4TN	8649	545	6.3	T-Bar Anchor Tag	64,68
HERRING	1977	Jan	4WD	1025	46	4.5	T-Bar Anchor Tag	66,68,72
HERRING	1977	Jun	4XQ	254	15	5.9	T-Bar Anchor Tag	65,66,68
HERRING	1977	Jul	4XS	6541	525	8.0	T-Bar Anchor Tag	66,68
HERRING	1977	Aug	4XO	15984	512	3.2	T-Bar Anchor Tag	65,66,68
HERRING	1977	Aug	4XR	7917	173	2.2	T-Bar Anchor Tag	65,66,68
HERRING	1977	Aug	4XS	15894	3302	20.8	T-Bar Anchor Tag	66,68
HERRING	1977	Sep	4XO	12321	391	3.2	T-Bar Anchor Tag	65,66,68
HERRING	1977	Sep	4XQ	11044	298	2.7	T-Bar Anchor Tag	65,66,68
HERRING	1977	Sep	4XR	7000	127	1.8	T-Bar Anchor Tag	65,66,68
HERRING	1977	Nov	4VN	588	36	6.1	T-Bar Anchor Tag	58,59,65,66,68,71,72
HERRING	1977	Dec	4VN	2494	117	4.7	T-Bar Anchor Tag	58,59,65,66,68,71,72
HERRING	1978	Jan	4WD	4795	607	12.7	T-Bar Anchor Tag	66,68
HERRING	1978	Feb	4XS	50	3	6.0	T-Bar Anchor Tag	66,68
HERRING	1978	Mar	4XS	3949	32	0.8	T-Bar Anchor Tag	66,68
HERRING	1978	Apr	4XO	9991	4	0.0	T-Bar Anchor Tag	66,68
HERRING	1978	Jul	4XR	15097	336	2.2	T-Bar Anchor Tag	66,68
HERRING	1978	Aug	4XS	2375	121	5.1	T-Bar Anchor Tag	66,68
HERRING	1978	Oct	4TG	8000	92	1.2	T-Bar Anchor Tag	66
HERRING	1978	Nov	4VN	3178	169	5.3	T-Bar Anchor Tag	58,59,65,66,68,71
HERRING	1978	Nov	4WD	364	33	9.1	T-Bar Anchor Tag	66,68
HERRING	1978	Dec	4VN	816	35	4.3	T-Bar Anchor Tag	58,59,65,66,68,71

Species	Year	Month	NAFO Area	Number Released	Number Recovered	Percent Recovered	Tags Used	References
HERRING	1978	Dec	4WD	3364	288	8.6	T-Bar Anchor Tag	66,68
HERRING	1979	Jan	4WD	299	25	8.4	T-Bar Anchor Tag	68
HERRING	1979	Mar	4XO	10325	93	0.9	T-Bar Anchor Tag	66,68
HERRING	1979	Jun	4XR	9092	618	6.8	T-Bar Anchor Tag	66,68
HERRING	1979	Sep	4XS	2900	70	2.4	T-Bar Anchor Tag	66,68
HERRING	1979	Oct	4XS	2025	43	2.1	T-Bar Anchor Tag	66,68
HERRING	1979	Dec	4VN	4554	504	11.1	T-Bar Anchor Tag	58,65,66,68,71
HERRING	1980	Jan	4VN	6151	577	9.4	T-Bar Anchor Tag	65,66,68,71
HERRING	1980	Apr	4XM	3639	19	0.5	T-Bar Anchor Tag	66,68
HERRING	1980	May	4WD	7286	132	1.8	T-Bar Anchor Tag	66,68
HERRING	1980	Jun	4XO	10036	136	1.4	T-Bar Anchor Tag	66,68
HERRING	1980	Jul	4XR	1025	40	3.9	T-Bar Anchor Tag	66,68
HERRING	1980	Jul	4XS	3708	417	11.3	T-Bar Anchor Tag	66,68
HERRING	1981	Apr	4VN	2225	37	1.7	T-Bar Anchor Tag	68,71
HERRING	1981	May	4VN	750	4	0.5	T-Bar Anchor Tag	68,71
HERRING	1981	Jul	4XS	9515	144	1.5	T-Bar Anchor Tag	68
HERRING	1981	Sep	4XS	9290	484	5.2	T-Bar Anchor Tag	68
HERRING	1981	Oct	4TG	10298	32	0.3	T-Bar Anchor Tag	66,68
HERRING	1982	Apr	4WD	7117	17	0.2	T-Bar Anchor Tag	68
MACKEREL	1973	Jul	4XS	173	1	0.6	T-Bar Anchor Tag	1,62
MACKEREL	1973	Oct	4TJ	196	4	2.0	T-Bar Anchor Tag	1,62
MACKEREL	1973	Oct	4XM	1765	109	6.2	T-Bar Anchor Tag	1,62
MACKEREL	1974	Jul	4VN	3421	11	0.3	T-Bar Anchor Tag	62
MACKEREL	1974	Sep	4TJ	1626	5	0.3	T-Bar Anchor Tag	62
MACKEREL	1974	Oct	4TJ	800	5	0.6	T-Bar Anchor Tag	62
MACKEREL	1974	Oct	4XM	4683	44	0.9	T-Bar Anchor Tag	62
PLAICE	1958	Jun	4TL	320	217	67.8	Petersen Disc (Yellow/Red)	8,25,54,55
PLAICE	1958	Oct	4TK	151	11	7.3	Various	8,26,55
PLAICE	1958	Oct	4TN	180	43	23.9	Various	8,26,55
PLAICE	1959	May	4TF	166	91	54.8	Petersen Disc (Yellow/Red)	8,26,55
PLAICE	1959	May	4TG	139	75	54.0	Petersen Disc (Yellow/Red)	8,26,55
PLAICE	1959	May	4TN	151	60	39.7	Petersen Disc (Yellow/Red)	8,26,55
PLAICE	1959	Jun	4TM	167	124	74.3	Petersen Disc (Yellow/Red)	8,26,55
PLAICE	1959	Aug	4TK	107	12	11.2	Dagger Tag	8,26,55
PLAICE	1959	Aug	4TN	150	62	41.3	Dagger Tag	8,26,55
PLAICE	1960	May	4TF	219	63	28.8	Petersen Disc (Yellow/Red)	8,23,55
PLAICE	1960	May	4TK	209	37	17.7	Petersen Disc (Yellow/Red)	8,23,55
PLAICE	1963	Oct	4TF	6	4	66.7	Petersen Disc (Yellow/Red)	8,23,55
PLAICE	1963	Oct	4TG	217	79	36.4	Petersen Disc (Yellow/Red)	8,23
PLAICE	1963	Oct	4VN	13	4	30.8	Petersen Disc (Yellow/Red)	8,23
PLAICE	1966	Jun	4XS	121	28	23.1	Petersen Disc (English, Yellow)	?,8
PLAICE	1966	Jul	4XS	27	4	14.8	Petersen Disc (English, Yellow)	?,8
PLAICE	1966	Aug	4XS	9	0	0.0	Petersen Disc (Yellow/Red)	?,8
PLAICE	1966	Oct	4XS	23	1	4.3	Various	?,8
PLAICE	1966	Nov	4XS	20	1	5.0	Petersen Disc (English, Yellow)	?,8
PLAICE	1972	Apr	4XO	236	22	9.3	Petersen Disc (English, Yellow)	?,8
PLAICE	1973	Jun	4XR	1	0	0.0	Petersen Disc (Yellow/Red)	?,8
PLAICE	1973	Jun	4XS	13	2	15.4	Petersen Disc (Yellow/Red)	?,8
PLAICE	1973	Jul	4XS	12	1	8.3	Petersen Disc (Yellow/Red)	?,8
PLAICE	1979	Feb	4WK	43	4	9.3	T-Bar Anchor Tag	?,8
PLAICE	1979	Sep	4TG	2075	200	9.6	Various	?,7,8

Species	Year	Month	NAFO Area	Number Released	Number Recovered	Percent Recovered	Tags Used	References
PLAICE	1979	Sep	4TL	1999	52	2.6	Petersen Disc (English, Yellow)	?,8
PLAICE	1980	Feb	4WK	221	3	1.4	T-Bar Anchor Tag	?,8
PLAICE	1980	Feb	4XM	844	47	5.6	T-Bar Anchor Tag	?,8
PLAICE	1980	May	4TG	499	41	8.2	Petersen Disc (English, Yellow)	?,8
PLAICE	1980	Jun	4TG	1170	107	9.2	Petersen Disc (English, Yellow)	?,8
PLAICE	1984	Aug	4XS	4	0	0.0	T-Bar Anchor Tag	
POLLOCK	1960	Jul	4XS	999	216	21.6	Petersen Disc (English, Yellow)	8,60
POLLOCK	1963	Aug	5YB	8	2	25.0	Petersen Disc (English, Yellow)	8
POLLOCK	1972	Apr	4XO	1	0	0.0	Petersen Disc (English, Yellow)	8
POLLOCK	1978	Jun	4WD	991	186	18.8	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1978	Oct	4WK	28	1	3.6	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1978	Nov	4WJ	2	0	0.0	Petersen Disc (English, Yellow)	4,8,49,50,51
POLLOCK	1979	May	4WD	48	8	16.7	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1979	Jun	4WD	5622	1420	25.3	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1979	Jun	4XO	22	3	13.6	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1979	Jun	4XR	39	9	23.1	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1979	Jul	4XR	2313	282	12.2	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1979	Aug	4WK	297	12	4.0	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1979	Aug	4XR	657	73	11.1	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1979	Oct	4XO	151	0	0.0	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1979	Oct	4XR	348	1	0.3	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1979	Nov	4WK	2112	70	3.3	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1979	Dec	4XO	111	2	1.8	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1979	Dec	4XR	36	0	0.0	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1980	Jan	4WK	3	0	0.0	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1980	Jan	4XR	200	0	0.0	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1980	Feb	4WK	197	0	0.0	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1980	Feb	4XM	14	0	0.0	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1980	Mar	4WK	99	0	0.0	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1980	Apr	4WK	138	2	1.4	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1980	May	4WD	3000	544	18.1	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1980	May	4WK	1632	37	2.3	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1980	Jul	4WK	496	15	3.0	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1980	Jul	4XM	53	4	7.5	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1980	Jul	4XR	691	7	1.0	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1980	Aug	4XO	180	8	4.4	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1980	Aug	4XQ	6	0	0.0	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1980	Sep	4XR	1497	22	1.5	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1980	Nov	4XO	2496	94	3.8	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1980	Dec	4XS	1996	9	0.5	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1981	May	4WD	3013	266	8.8	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1981	Aug	4XR	300	5	1.7	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1981	Oct	4XO	3919	1524	38.9	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1981	Oct	4XS	800	2	0.3	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1982	May	4WD	3993	244	6.1	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1982	May	4XS	3999	182	4.6	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1982	Aug	3PN	312	35	11.2	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1983	May	4WD	2381	45	1.9	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1983	May	4XS	2297	37	1.6	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1983	Jun	4WD	2750	110	4.0	T-Bar Anchor Tag	4,8,49,50,51

Species	Year	Month	NAFO Area	Number Released	Number Recovered	Percent Recovered	Tags Used	References
POLLOCK	1983	Jun	4XS	2627	29	1.1	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1984	Jun	4XS	3998	221	5.5	T-Bar Anchor Tag	4,8,49,50,51
POLLOCK	1984	Aug	4XS	1	0	0.0	T-Bar Anchor Tag	4,8,49,50,51
SEA RAVEN	1979	Jan	4WK	1	0	0.0	T-Bar Anchor Tag	
SEA RAVEN	1979	Feb	4WK	2	0	0.0	T-Bar Anchor Tag	
SEA RAVEN	1980	Feb	4XM	17	0	0.0	T-Bar Anchor Tag	
THORNY SKATE	1979	Feb	4WK	12	0	0.0	T-Bar Anchor Tag	
THORNY SKATE	1980	Feb	4WK	1	0	0.0	T-Bar Anchor Tag	
THORNY SKATE	1980	Feb	4XM	38	0	0.0	T-Bar Anchor Tag	
WINTER FLOUNDER	1971	Jun	4XS	10	1	10.0	Petersen Disc (Yellow/Red)	*
WINTER FLOUNDER	1973	Jun	4XS	21	2	9.5	Petersen Disc (Yellow/Red)	*
WINTER FLOUNDER	1973	Jul	4XS	13	2	15.4	Petersen Disc (Yellow/Red)	*
WINTER FLOUNDER	1979	Jan	4WK	29	1	3.4	T-Bar Anchor Tag	*
WINTER FLOUNDER	1979	Feb	4WK	221	7	3.2	T-Bar Anchor Tag	*
WINTER FLOUNDER	1980	Feb	4WK	96	1	1.0	T-Bar Anchor Tag	*
WINTER FLOUNDER	1980	Feb	4XM	13	2	15.4	T-Bar Anchor Tag	*
WINTER FLOUNDER	1984	Aug	4XS	427	6	1.4	T-Bar Anchor Tag	*
WINTER FLOUNDER	1985	Jan	4XS	13	0	0.0	T-Bar Anchor Tag	*
WINTER FLOUNDER	1985	Nov	4XS	404	15	3.7	T-Bar Anchor Tag	*
WINTER FLOUNDER	1985	Dec	4XS	163	0	0.0	T-Bar Anchor Tag	*
WITCH FLOUNDER	1963	Oct	4TF	13	3	23.1	Petersen Disc (Yellow/Red)	*,56
WITCH FLOUNDER	1963	Oct	4TG	121	12	9.9	Petersen Disc (Yellow/Red)	*,56
WITCH FLOUNDER	1963	Oct	4VN	190	24	12.6	Petersen Disc (Yellow/Red)	*,56
WITCH FLOUNDER	1964	Jan	4VN	703	11	1.6	Petersen Disc (Yellow/Red)	*,56
WITCH FLOUNDER	1964	Feb	4WD	725	9	1.2	Petersen Disc (Yellow/Red)	*,56
WITCH FLOUNDER	1964	Oct	4VB	191	2	1.0	Petersen Disc (Yellow/Red)	*,56
WITCH FLOUNDER	1965	Mar	4VC	204	14	6.9	Petersen Disc (Yellow/Red)	*,12,56
WITCH FLOUNDER	1965	Apr	4WH	491	59	12.0	Petersen Disc (Yellow/Red)	*,12,56
WITCH FLOUNDER	1966	Jul	4XS	1	1	100.0	Petersen Disc (English,Yellow)	*
WITCH FLOUNDER	1972	Apr	4XO	16	0	0.0	Petersen Disc (English,Yellow)	*
WITCH FLOUNDER	1973	Jun	4XR	4	0	0.0	Petersen Disc (Yellow/Red)	*
WITCH FLOUNDER	1973	Jun	4XS	38	1	2.6	Petersen Disc (Yellow/Red)	*
WITCH FLOUNDER	1973	Jul	4XS	24	0	0.0	Petersen Disc (Yellow/Red)	
WITCH FLOUNDER	1984	Aug	4XS	1	0	0.0	T-Bar Anchor Tag	
WINDOWPANE FLOUNDER	1984	Aug	4XS	28	0	0.0	T-Bar Anchor Tag	
WINTER SKATE	1980	Feb	4XM	12	0	0.0	T-Bar Anchor Tag	
YELLOWTAIL FLOUNDER	1966	Jun	4WE	36	1	2.8	Petersen Disc (Yellow/Red)	*
YELLOWTAIL FLOUNDER	1966	Jun	4WH	57	0	0.0	Petersen Disc (Yellow/Red)	*
YELLOWTAIL FLOUNDER	1966	Jul	4WE	499	51	10.2	Petersen Disc (Yellow/Red)	*
YELLOWTAIL FLOUNDER	1966	Jul	4WH	504	29	5.8	Petersen Disc (Yellow/Red)	*
YELLOWTAIL FLOUNDER	1966	Sep	4VC	1408	112	8.0	Petersen Disc (English,Yellow)	*
YELLOWTAIL FLOUNDER	1966	Sep	4WG	90	0	0.0	Petersen Disc (English,Yellow)	*
YELLOWTAIL FLOUNDER	1967	May	4WH	40	3	7.5	Petersen Disc (English,Yellow)	*
YELLOWTAIL FLOUNDER	1967	May	4WJ	412	53	12.9	Petersen Disc (English,Yellow)	*
YELLOWTAIL FLOUNDER	1972	Apr	4XO	1	1	100.0	Petersen Disc (English,Yellow)	*
YELLOWTAIL FLOUNDER	1979	Jan	4WK	5	1	20.0	T-Bar Anchor Tag	*
YELLOWTAIL FLOUNDER	1979	Feb	4WK	3	0	0.0	T-Bar Anchor Tag	*
YELLOWTAIL FLOUNDER	1980	Feb	4WK	9	0	0.0	T-Bar Anchor Tag	*
YELLOWTAIL FLOUNDER	1980	Feb	4XM	3	0	0.0	T-Bar Anchor Tag	*
YELLOWTAIL FLOUNDER	1984	Aug	4XS	42	0	0.0	T-Bar Anchor Tag	
YELLOWTAIL FLOUNDER	1985	Nov	4XS	27	0	0.0	T-Bar Anchor Tag	
YELLOWTAIL FLOUNDER	1985	Dec	4XS	47	0	0.0	T-Bar Anchor Tag	

Appendix B

Maps of the release locations of the tagging activities described in this document. The numbers of fish tagged and the month(s) and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined. The shaded areas depicting release locations were created by drawing freehand polygons around discrete release coordinates documented in the database that had some association in terms of date or tagging trip. Hence they encompass the geographic areas of the releases, resulting in various shapes; they are not scaled to represent the numbers tagged (thus a large polygon represents a dispersed tagging event, not necessarily a large number of fish tagged).

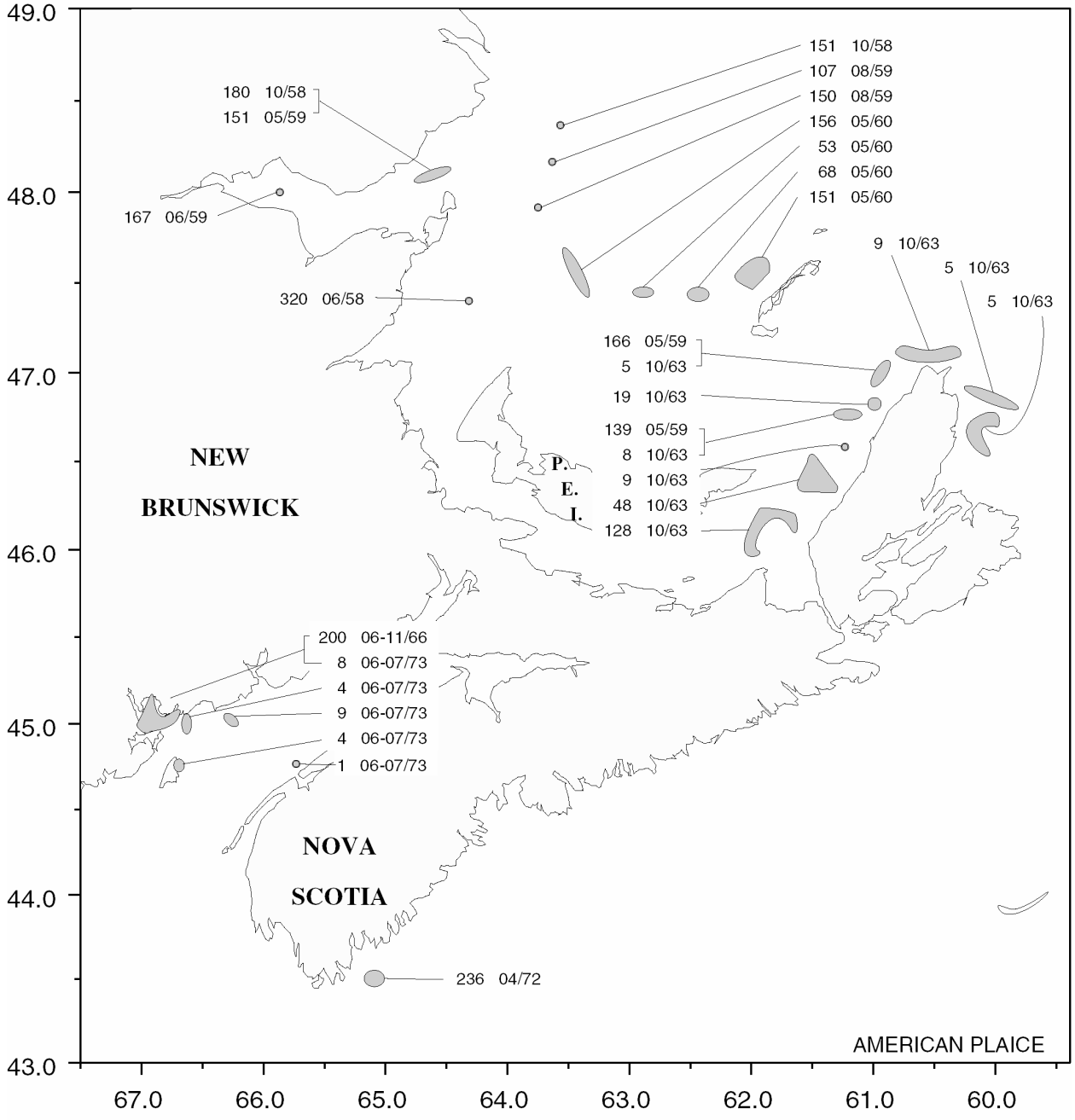

Figure 1. Locations of tagging releases of American plaice in NAFO Subarea 4 between 1953 and 1973. The numbers of fish tagged and the month and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

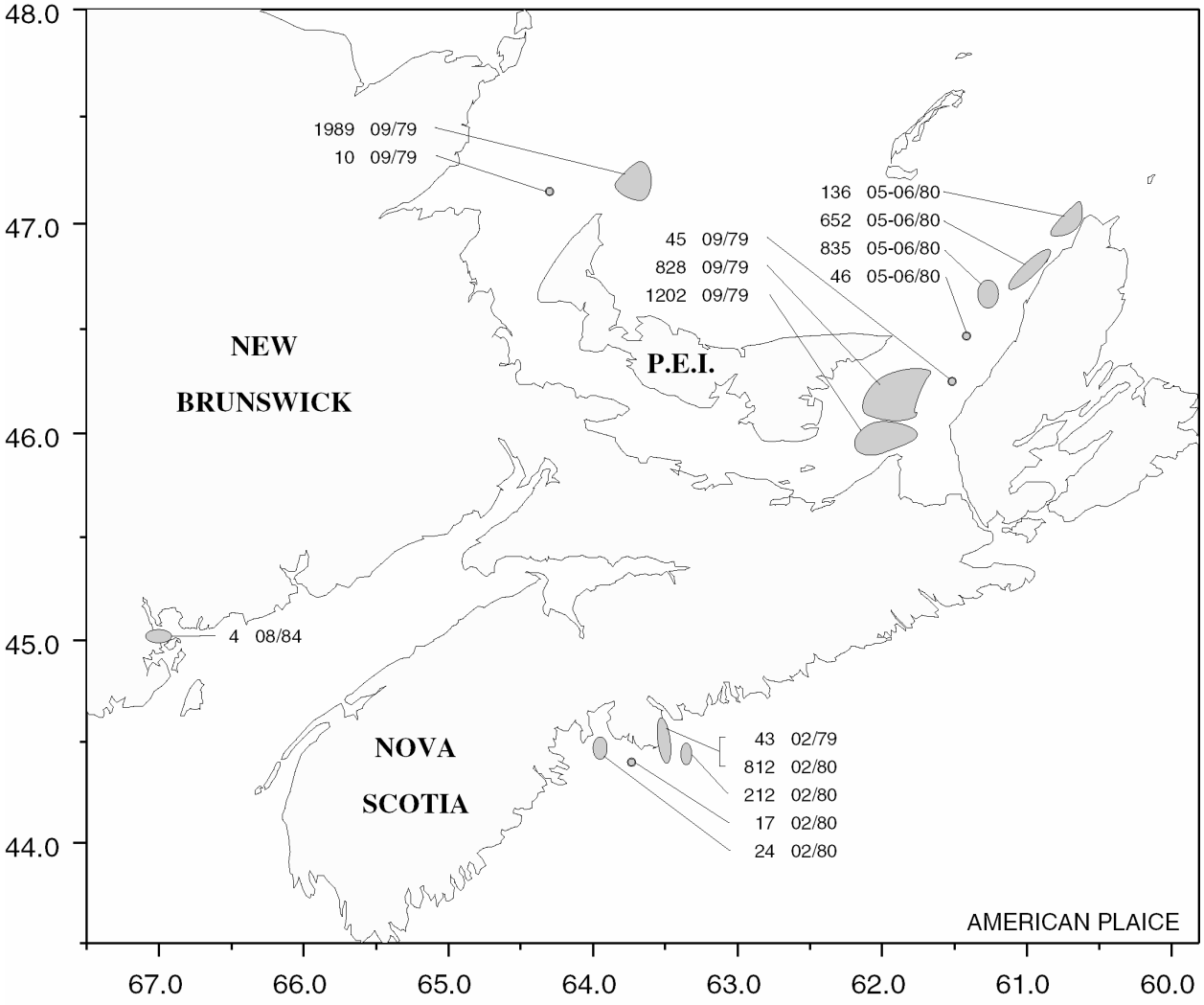

Figure 2. Locations of tagging releases of American plaice in NAFO Subarea 4 between 1978 and 1985. The numbers of fish tagged and the month and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

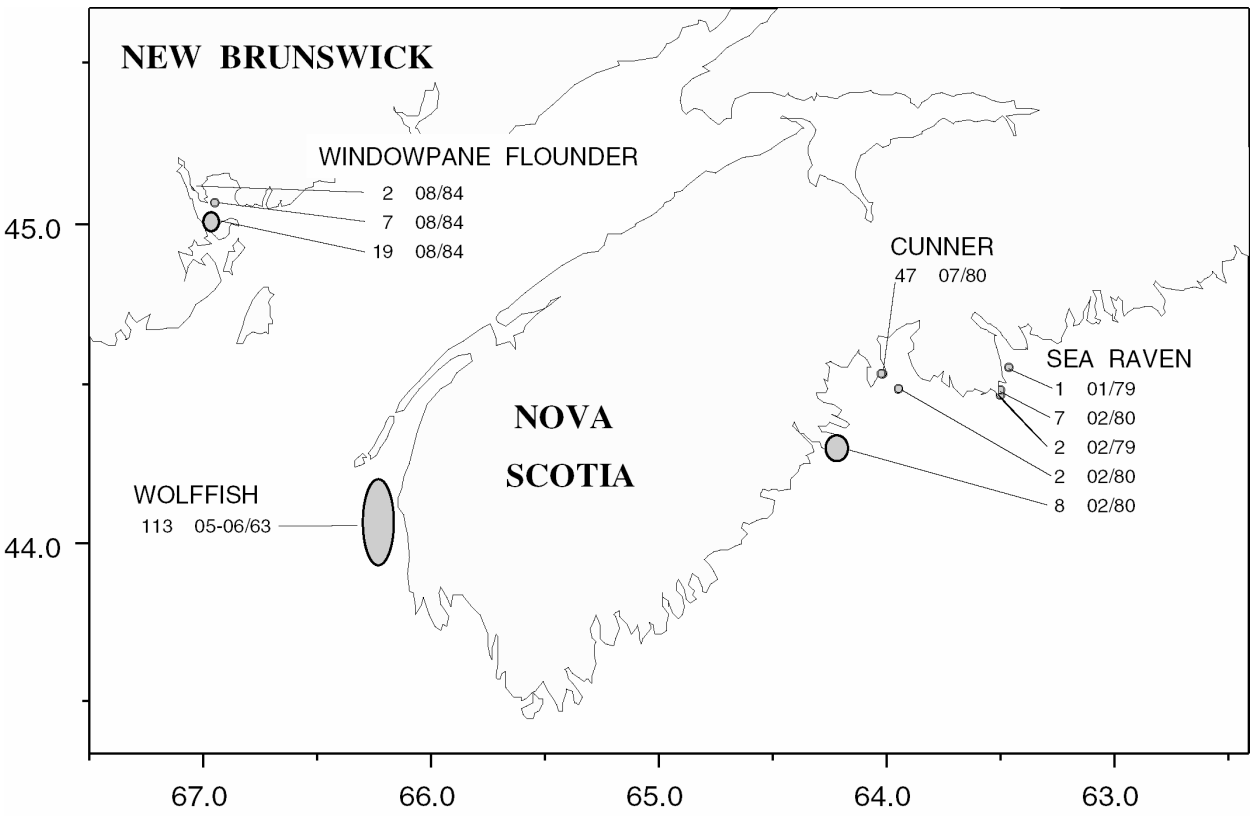

Figure 3. Locations of tagging releases of windowpane flounder, wolffish, cunner and sea raven in NAFO Subarea 4 between 1963 and 1984. The numbers of fish tagged and the month(s) and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

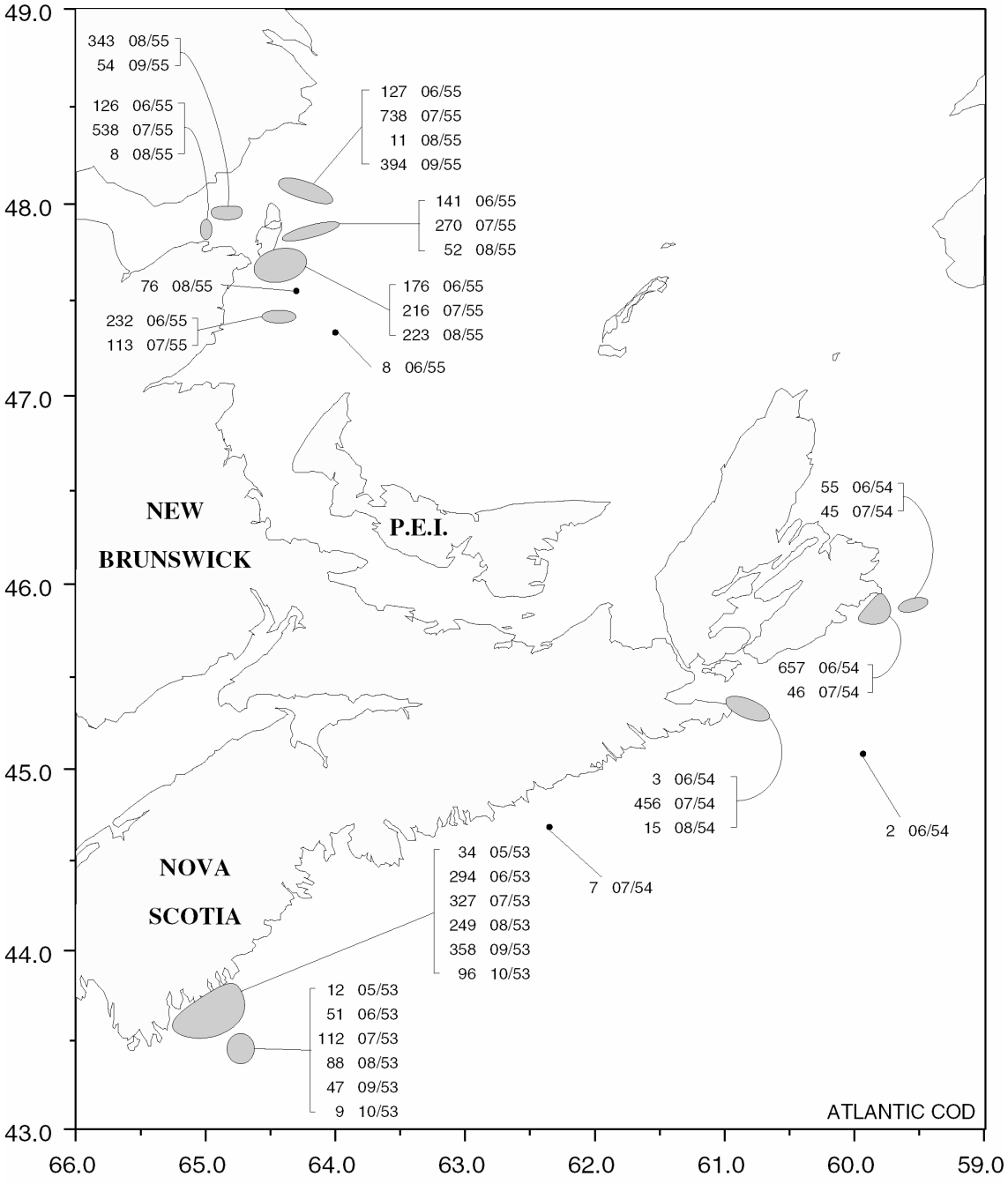

Figure 4. Locations of tagging releases of cod in NAFO Subarea 4 between 1953 and 1955. The numbers of fish tagged and the month and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

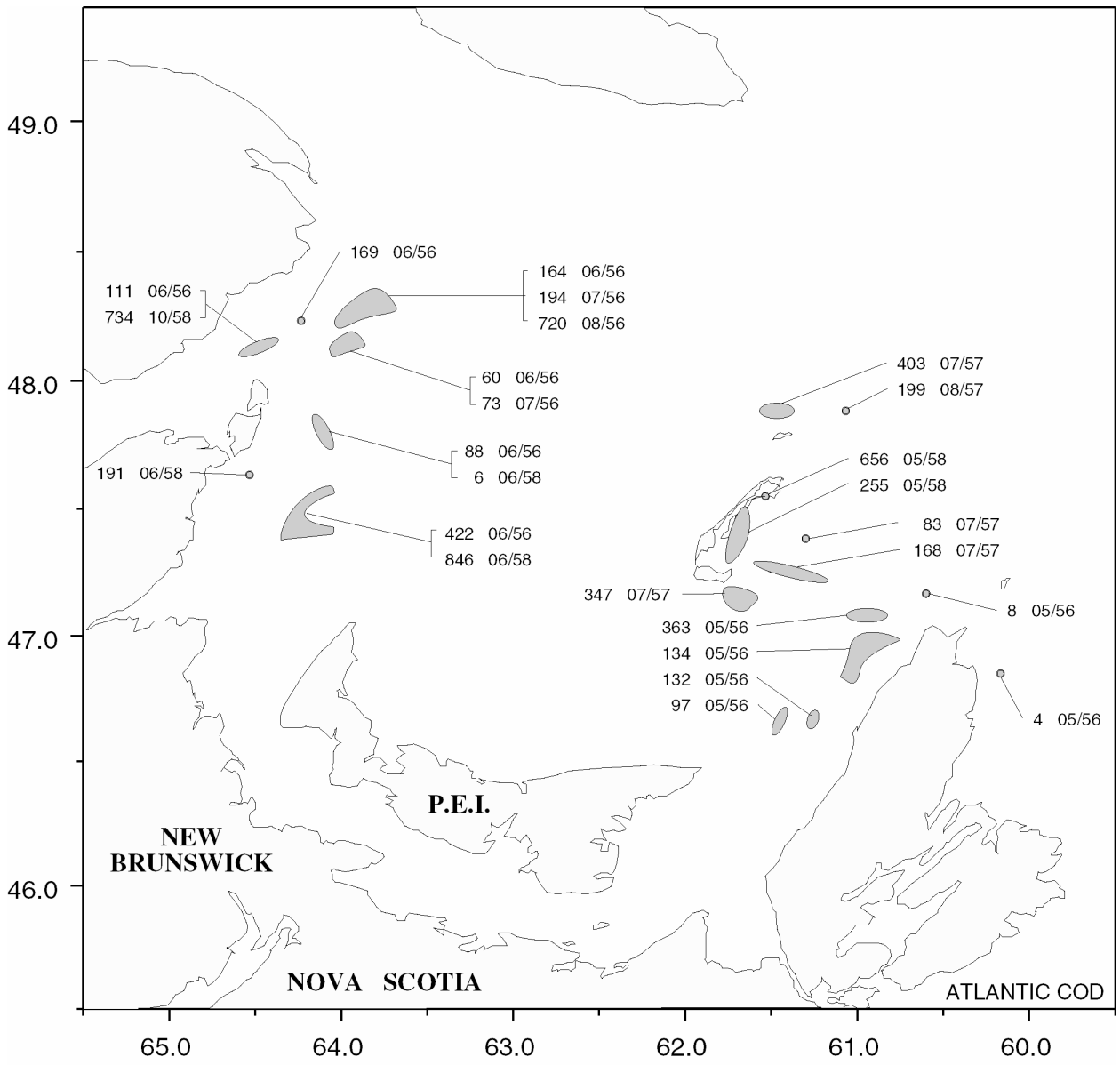

Figure 5. Locations of tagging releases of cod in NAFO Subarea 4 between 1956 and 1958. The numbers of fish tagged and the month and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

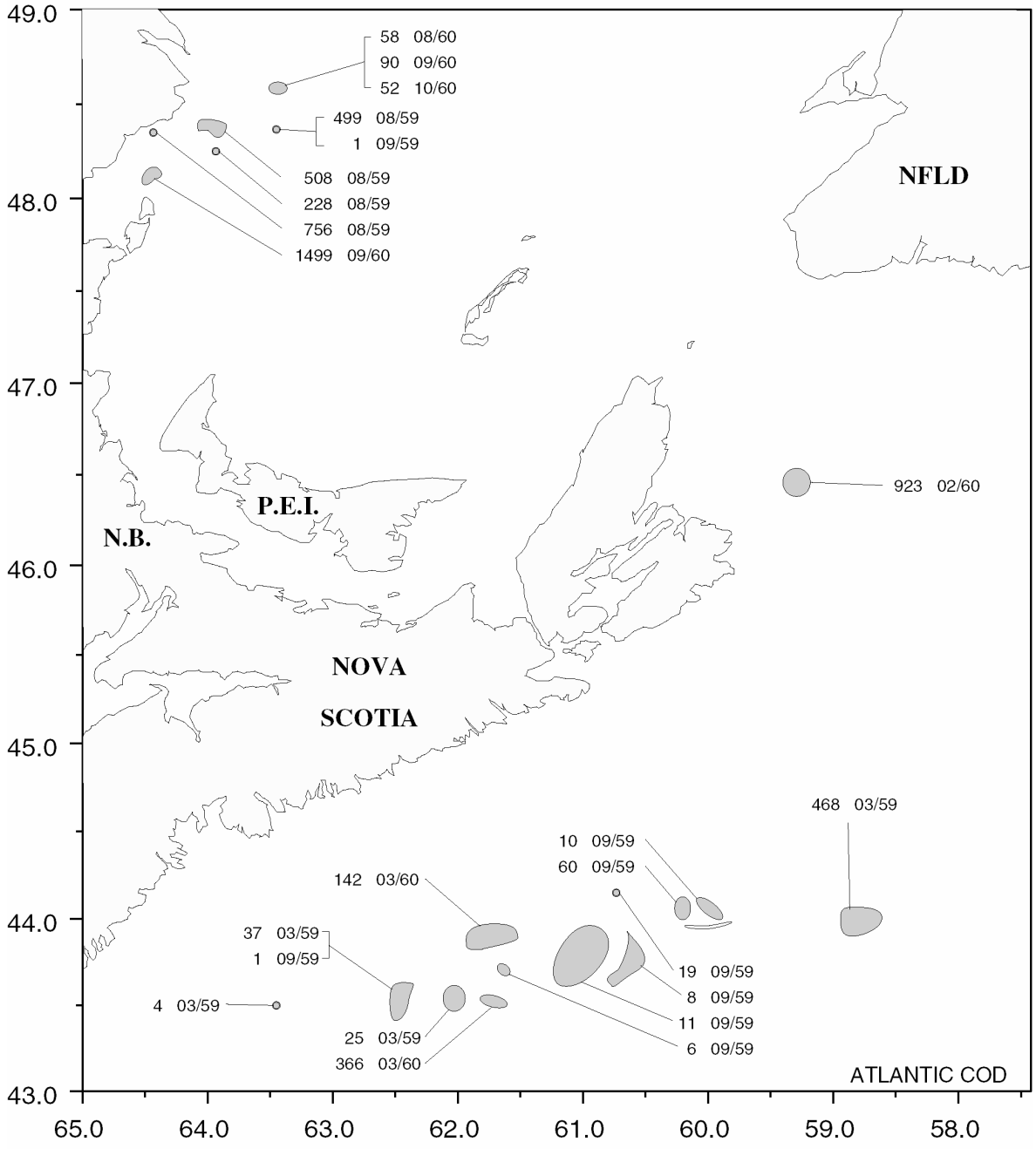

Figure 6. Locations of tagging releases of cod in NAFO Subarea 4 between 1959 and 1960. The numbers of fish tagged and the month and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

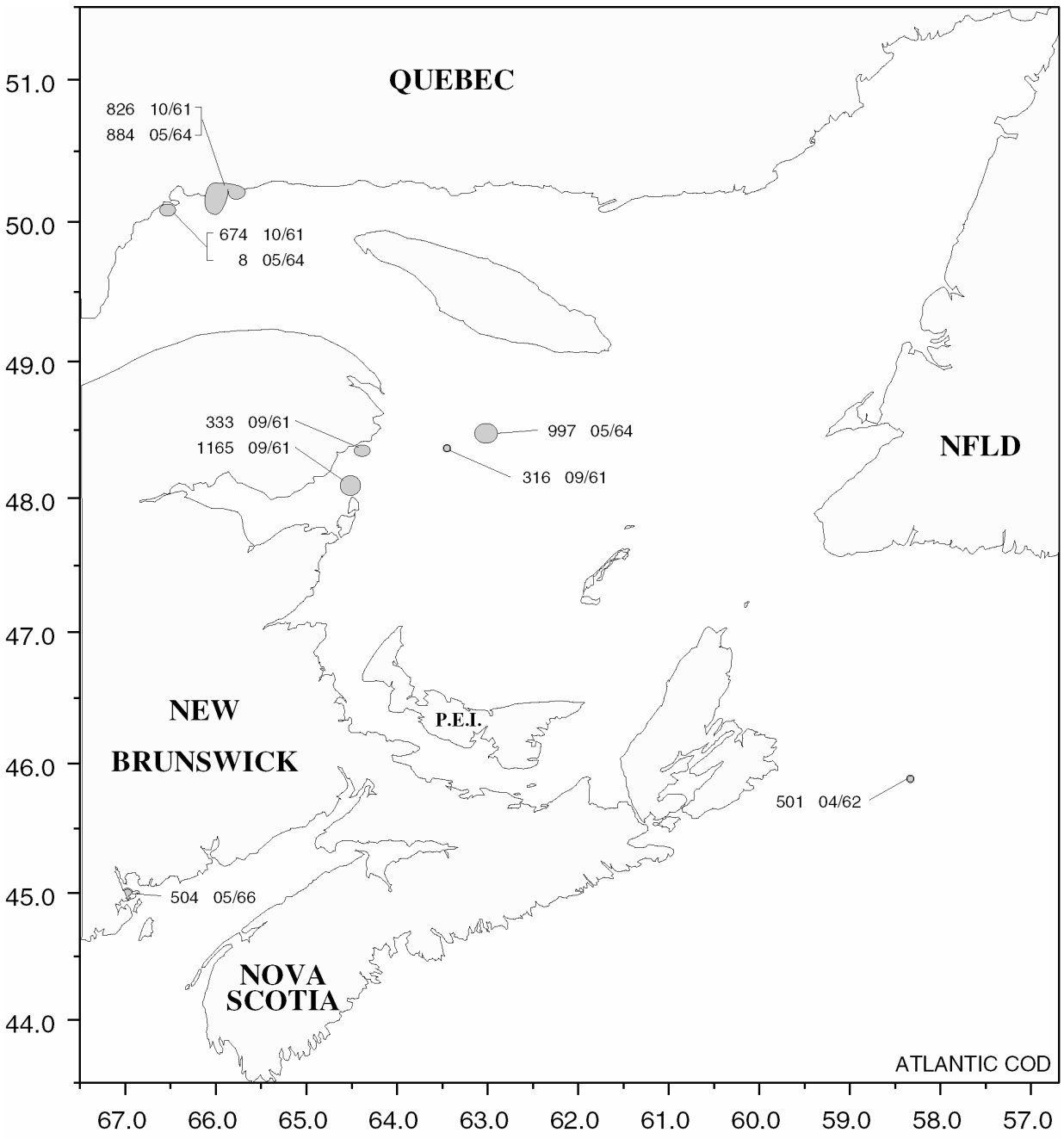

Figure 7. Locations of tagging releases of cod in NAFO Subarea 4 between 1961 and 1966. The numbers of fish tagged and the month and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

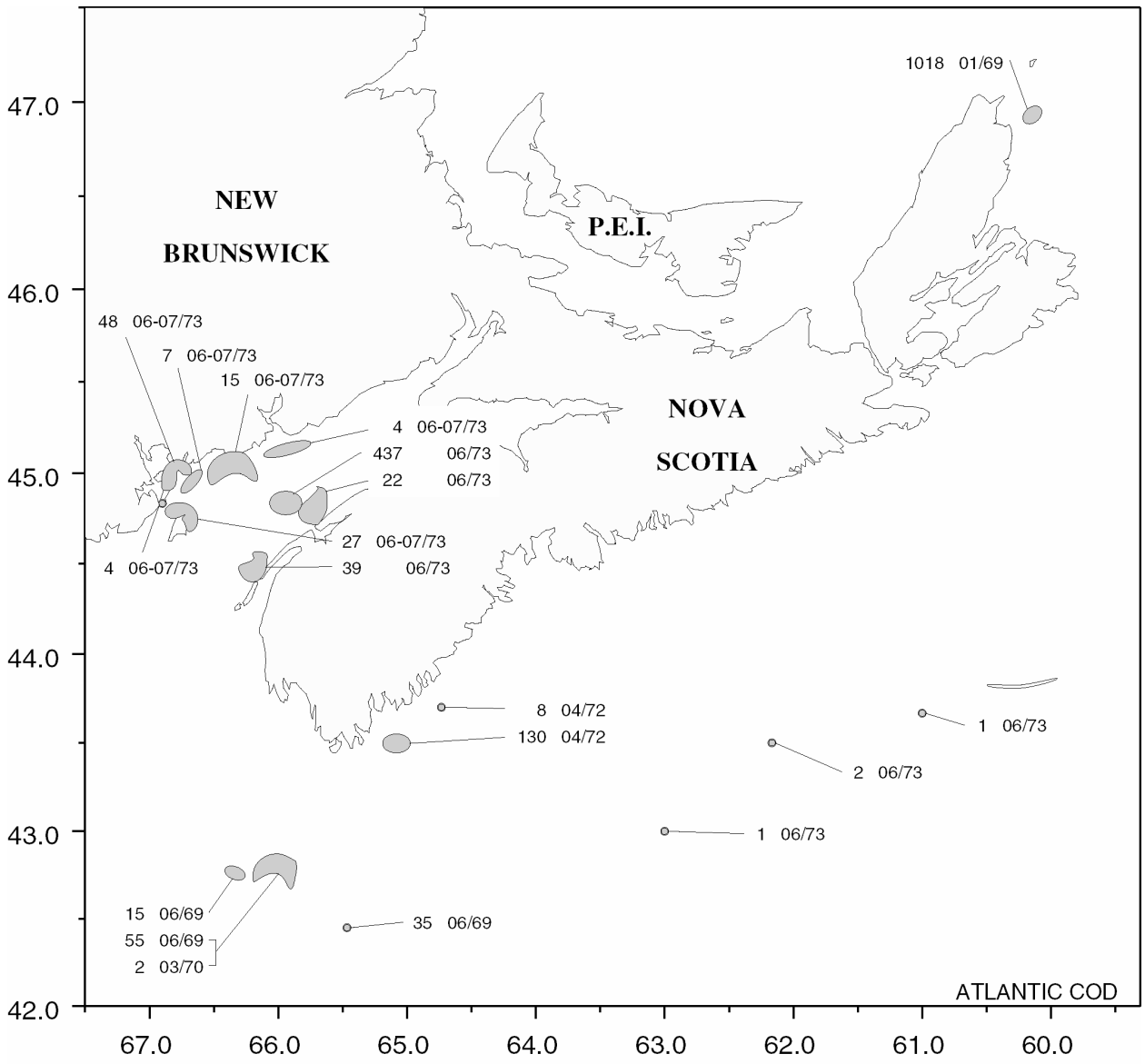

Figure 8. Locations of tagging releases of cod in NAFO Subarea 4 between 1969 and 1973. The numbers of fish tagged and the month(s) and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

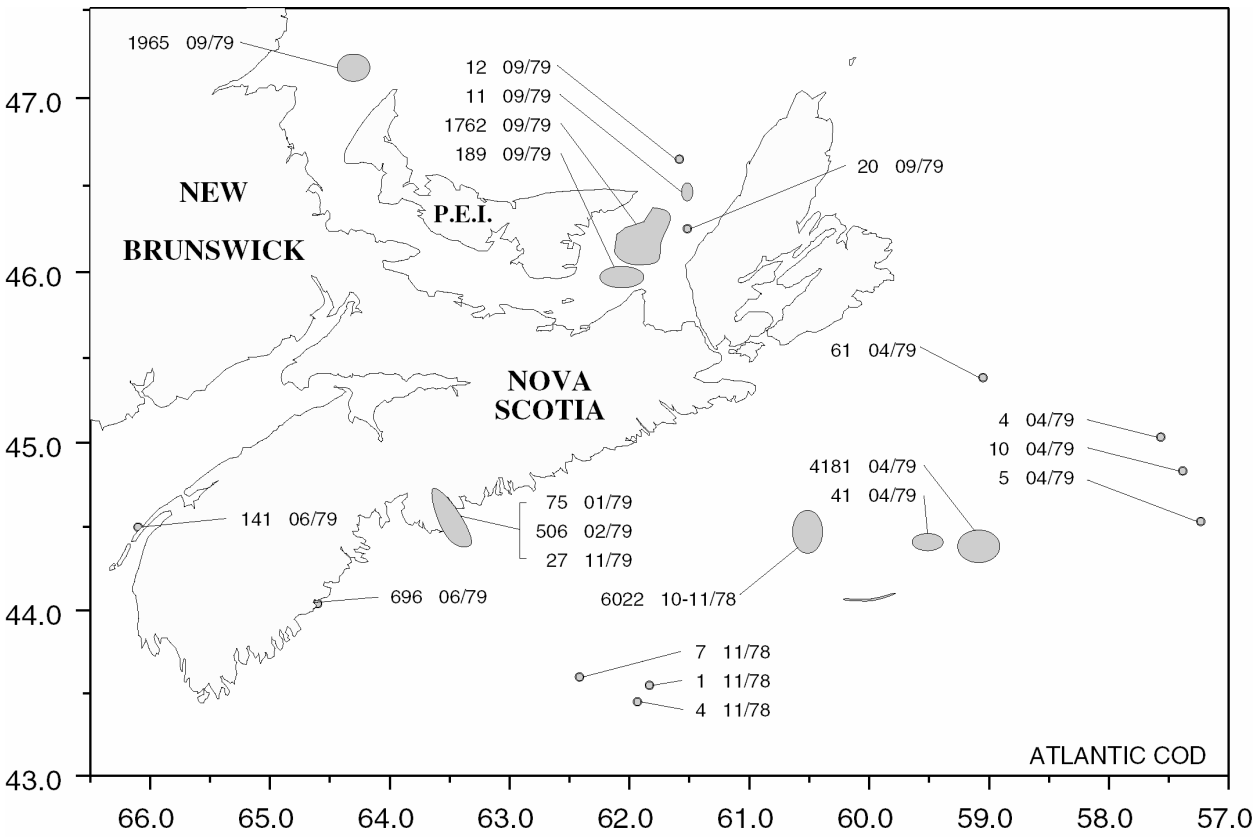

Figure 9. Locations of tagging releases of cod in NAFO Subarea 4 between 1978 and 1979. The numbers of fish tagged and the month(s) and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

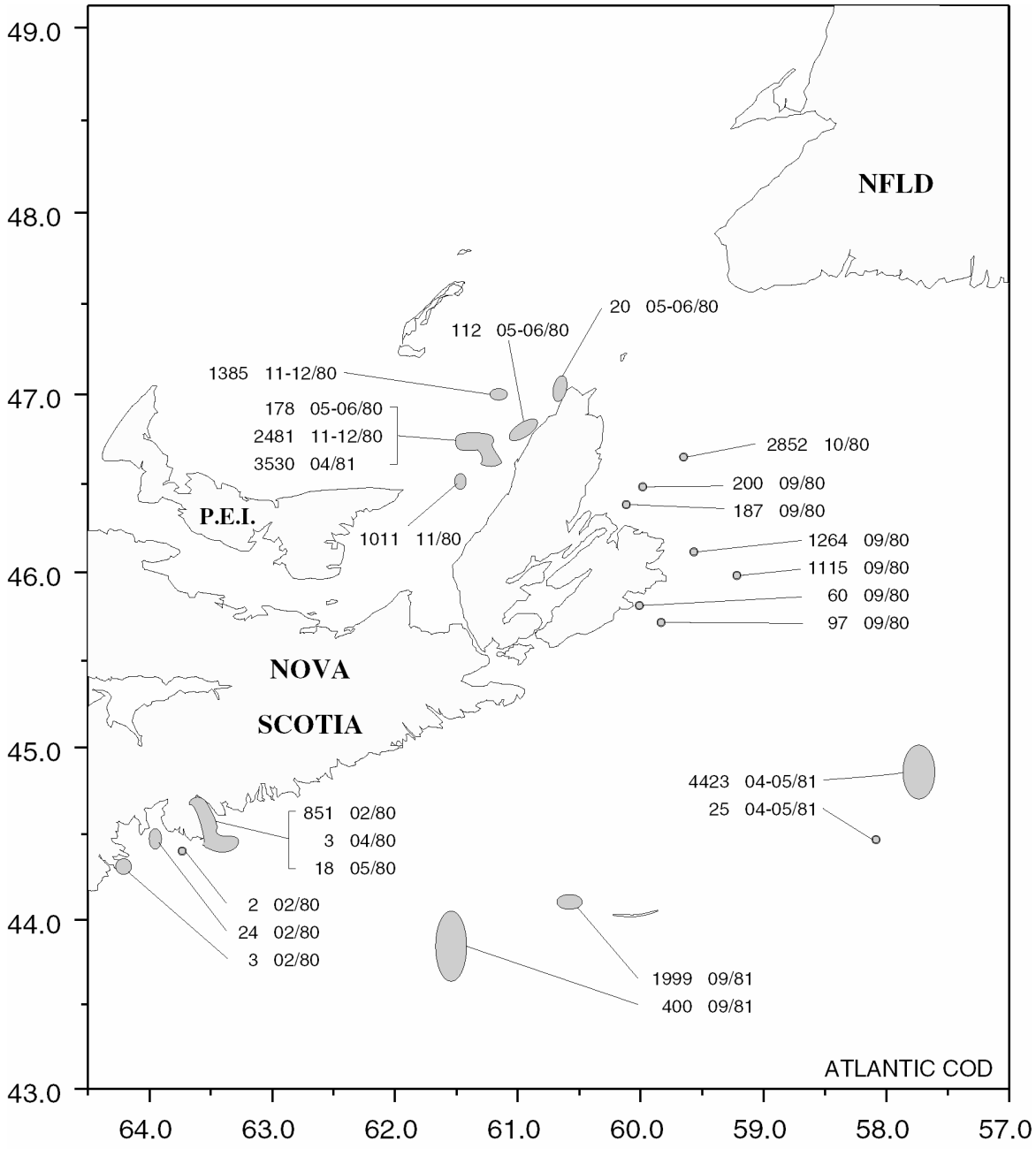

Figure 10. Locations of tagging releases of cod in NAFO Subarea 4 between 1980 and 1981. The numbers of fish tagged and the month and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

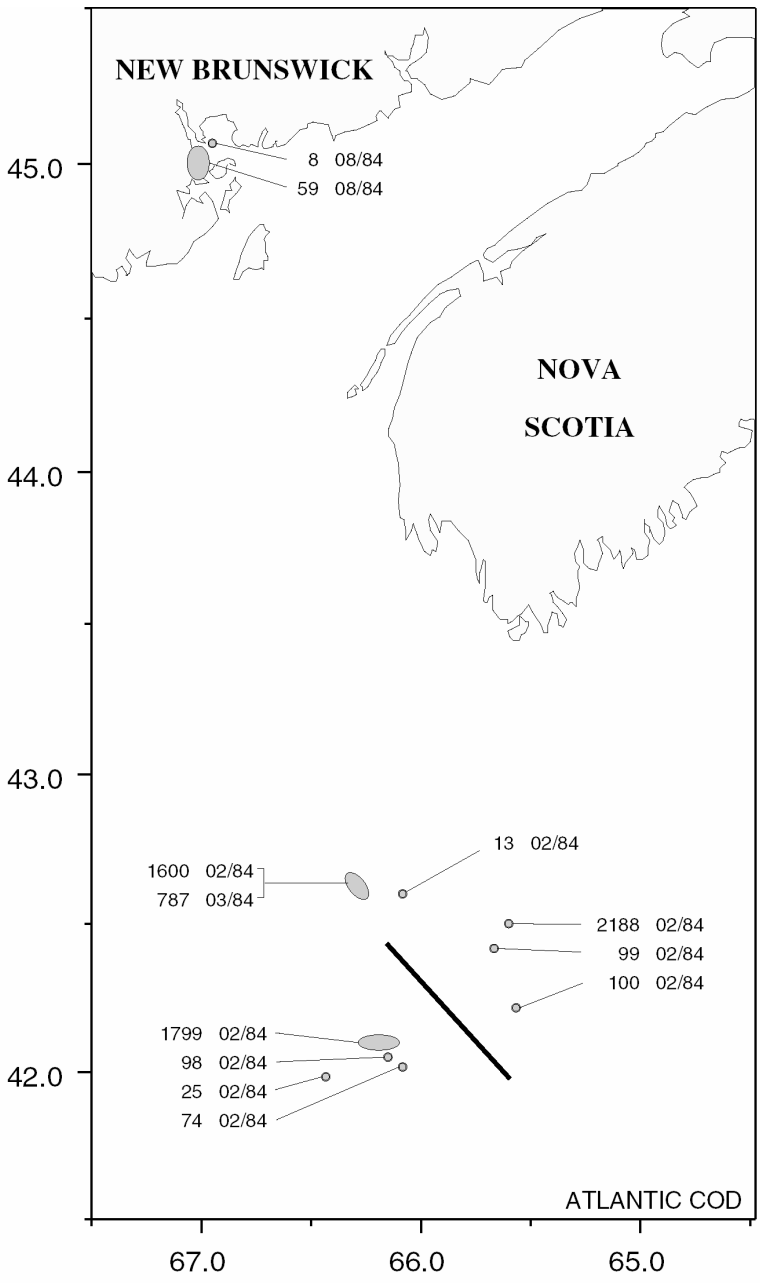

Figure 11. Locations of tagging releases of cod in NAFO Divisions 4X and 5Z in 1984 (the heavy line marks the Fundian Channel separating the two Divisions). The numbers of fish tagged and the month of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

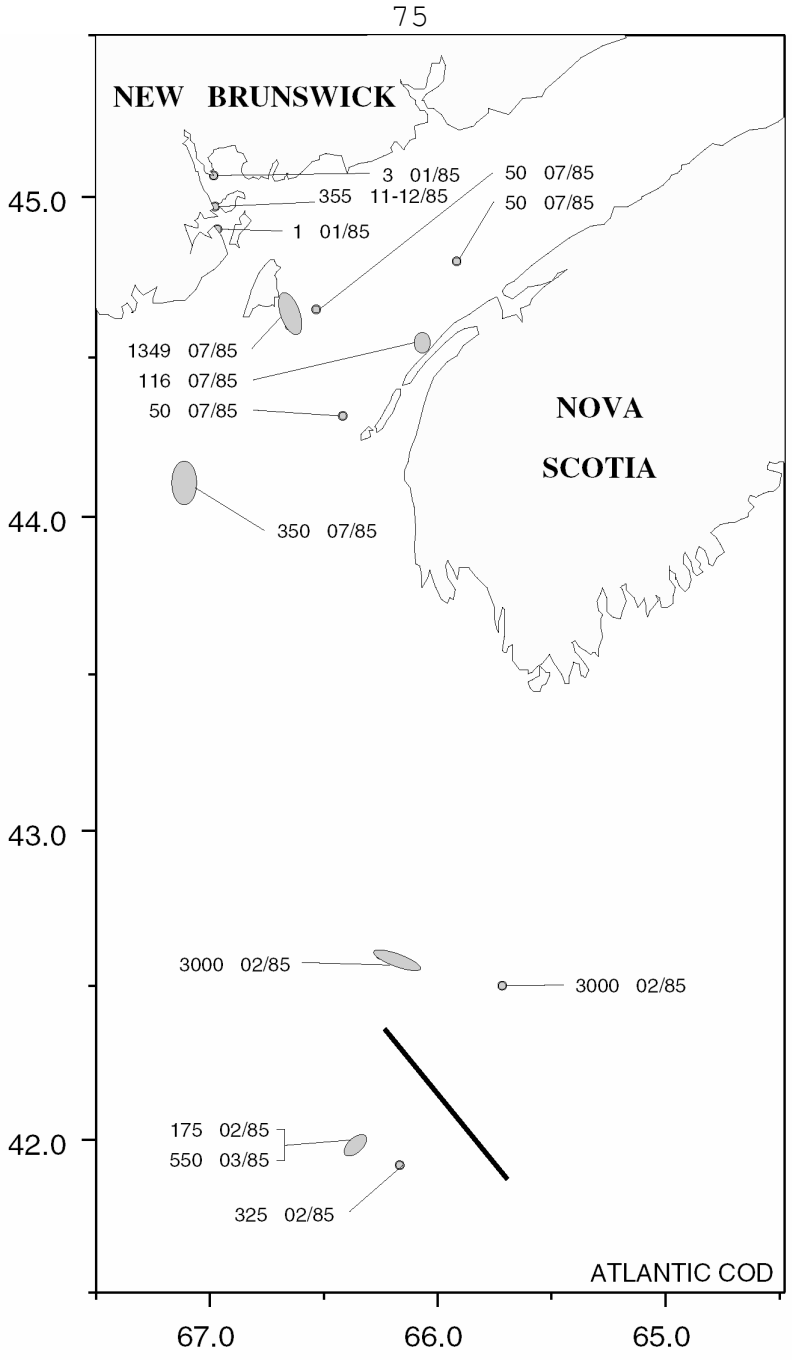

Figure 12. Locations of tagging releases of cod in NAFO Divisions 4X, 5Y and 5Z in 1985 (the heavy line marks the Fundian Channel separating Divisions 4X and 5Z). The numbers of fish tagged and the month of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

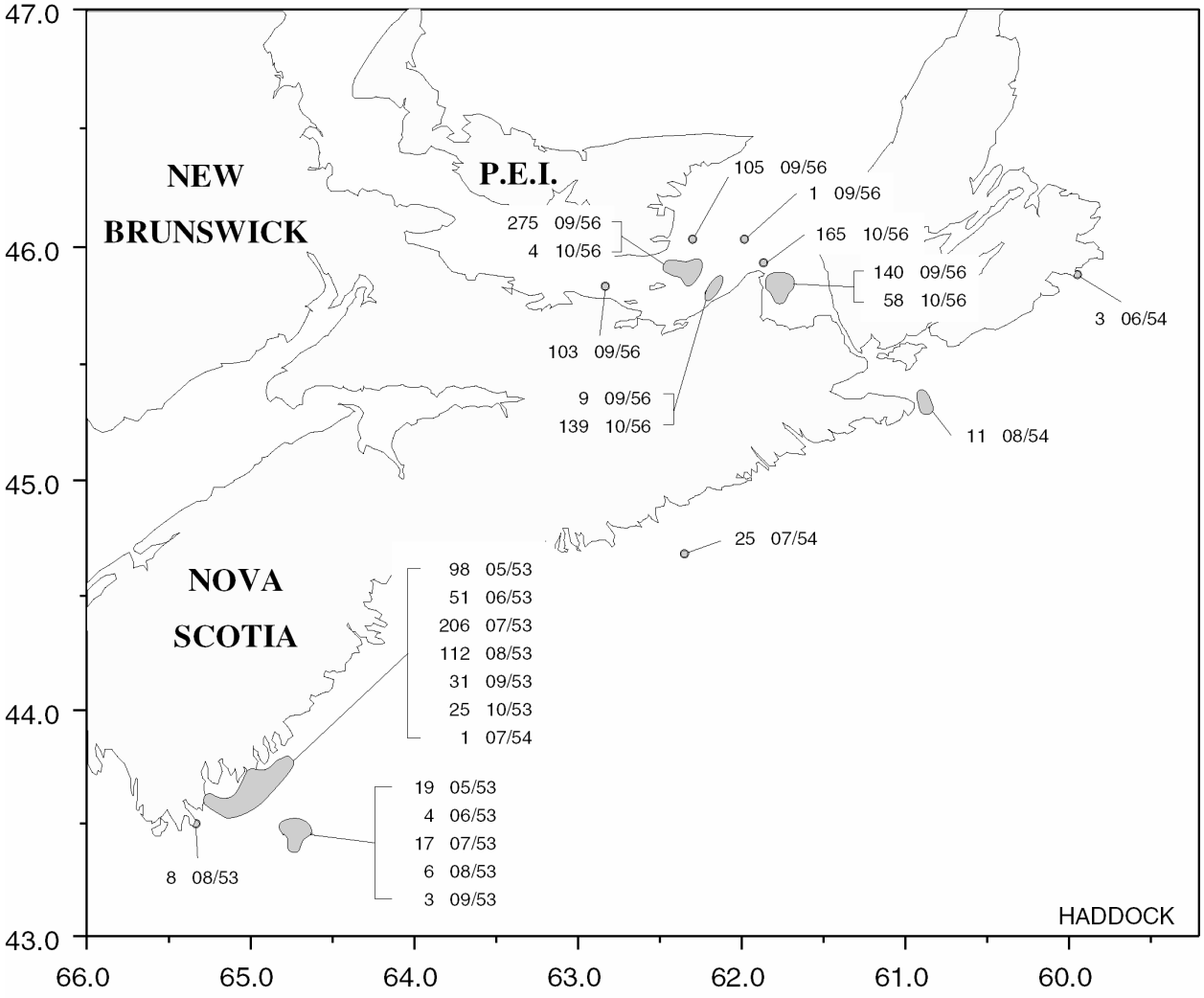

Figure 13. Locations of tagging releases of haddock in NAFO Subarea 4 between 1953 and 1956. The numbers of fish tagged and the month and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

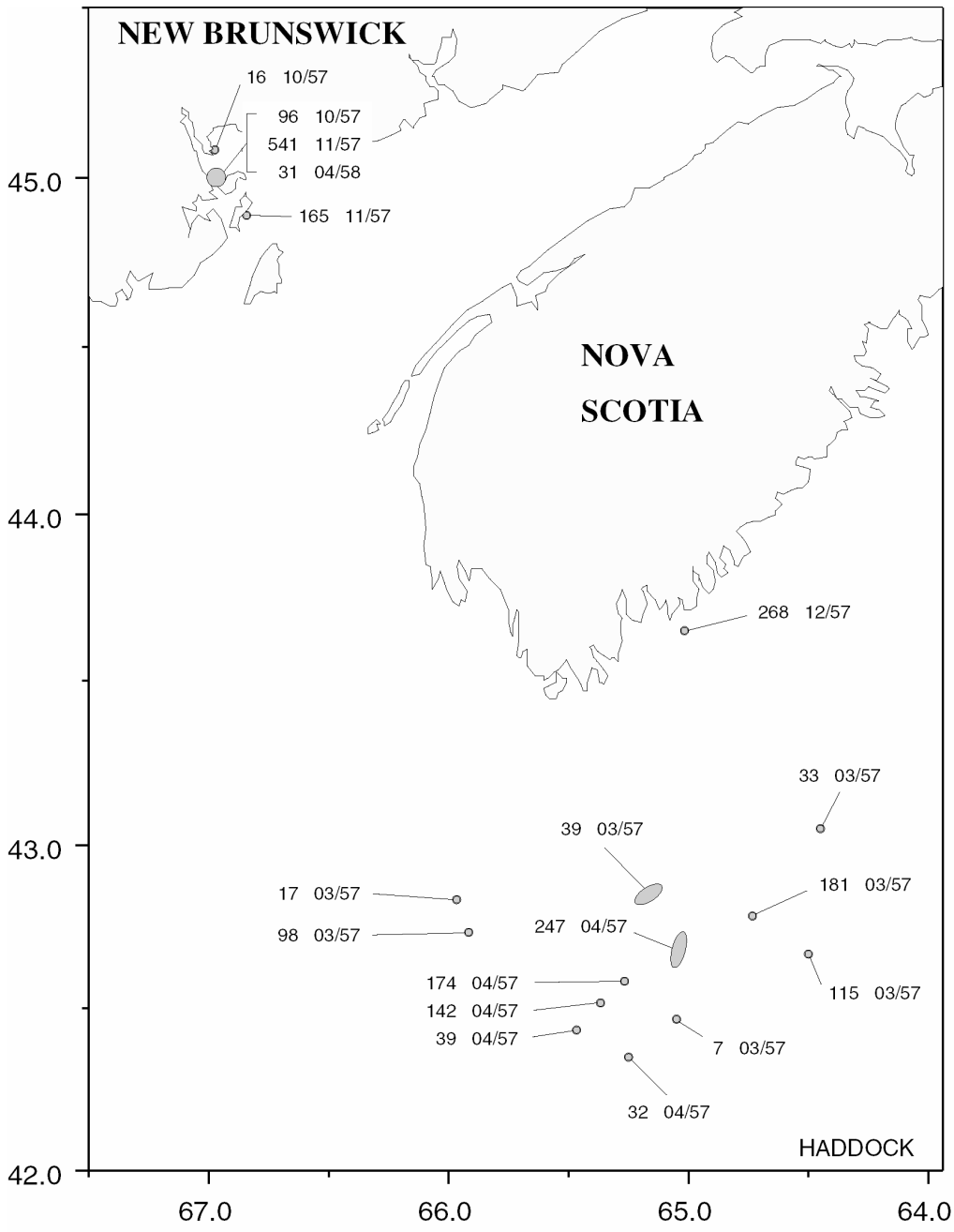

Figure 14. Locations of tagging releases of haddock in NAFO Subarea 4 between 1957 and 1958. The numbers of fish tagged and the month and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

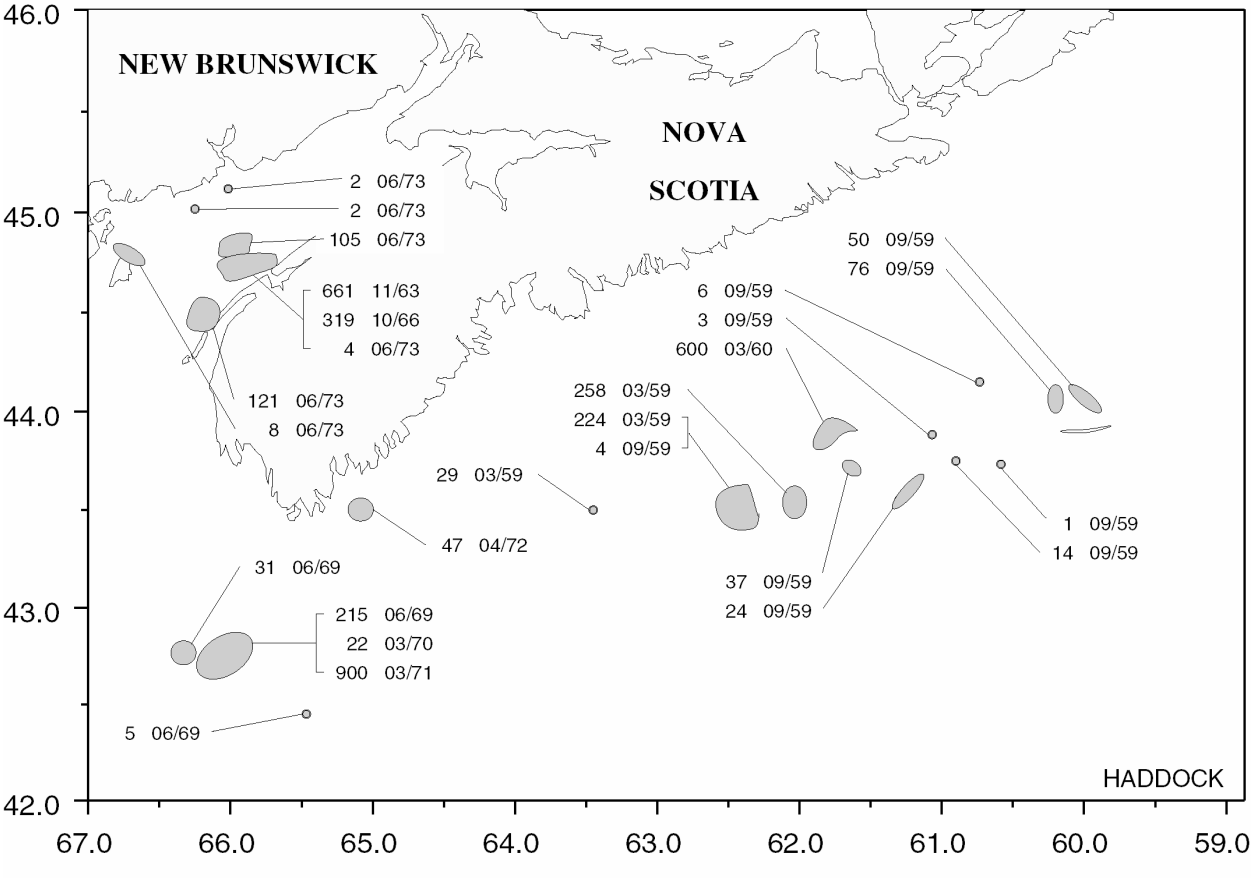

Figure 15. Locations of tagging releases of haddock in NAFO Subarea 4 between 1959 and 1973. The numbers of fish tagged and the month and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

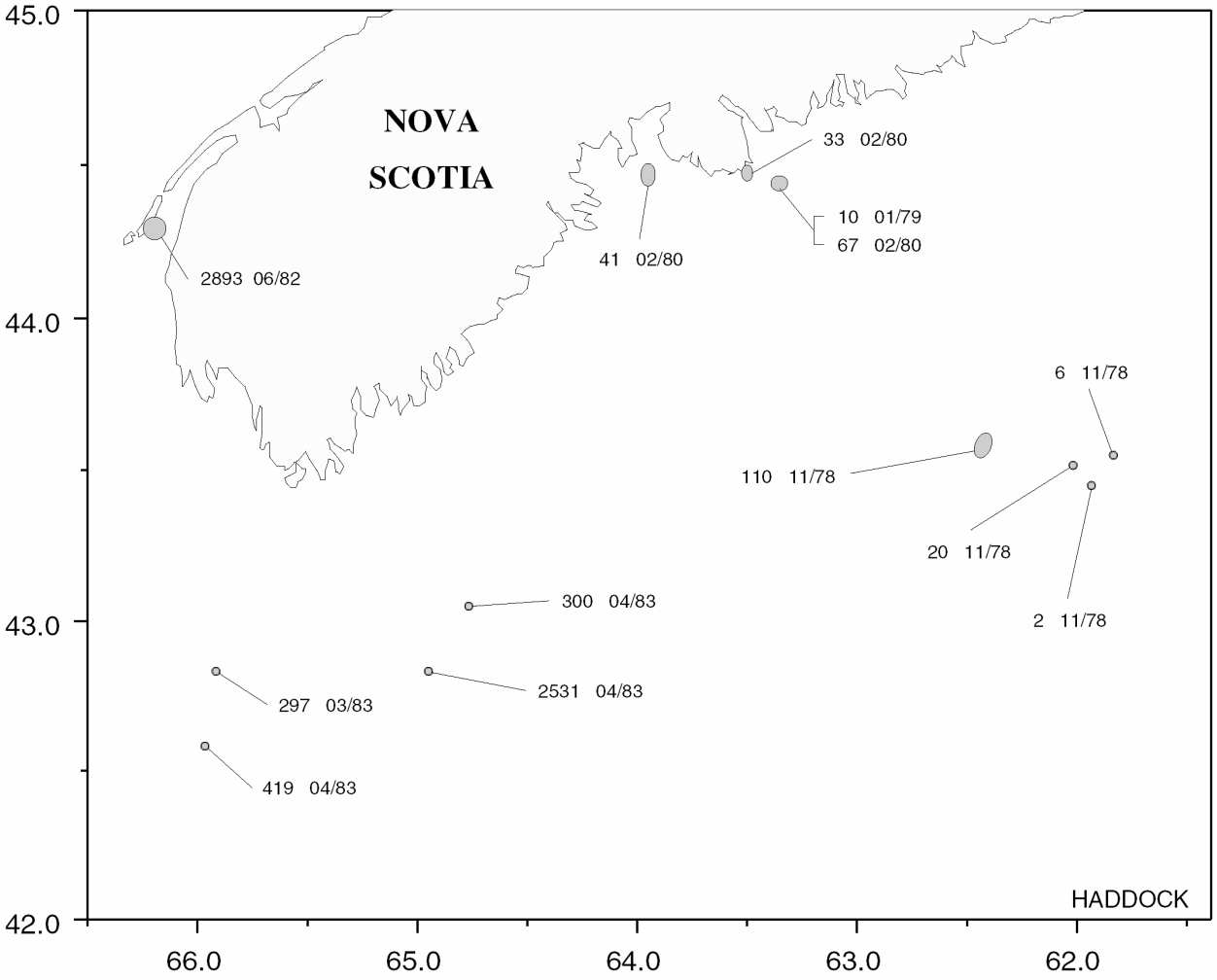

Figure 16. Locations of tagging releases of haddock in NAFO Subarea 4 between 1978 and 1983. The numbers of fish tagged and the month and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

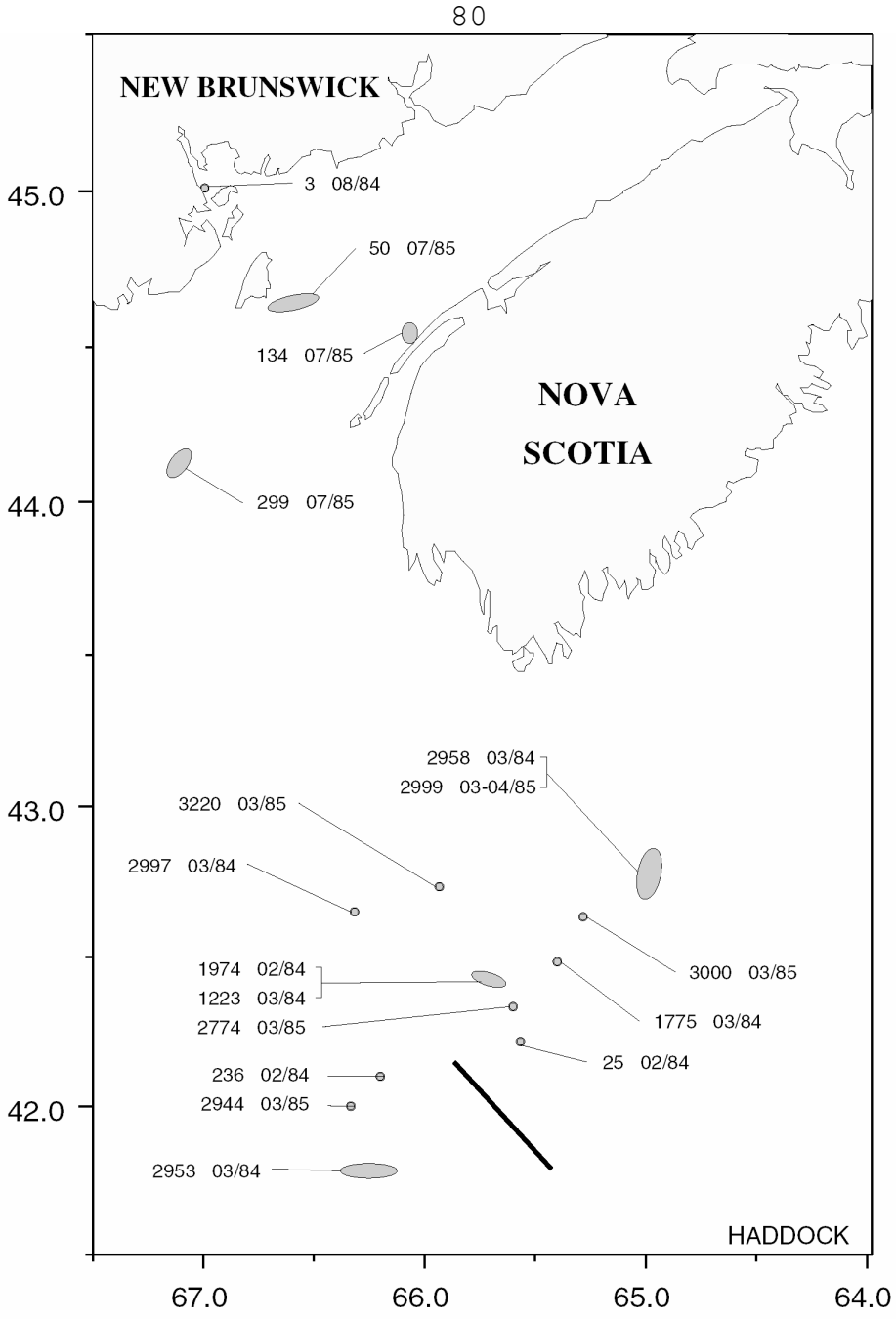

Figure 17. Locations of tagging releases of haddock in NAFO Divisions 4X, 5Y and 5Z between 1984 and 1985 (the heavy line marks the Fundian Channel separating Divisions 4X and 5Z). The numbers of fish tagged and the month and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

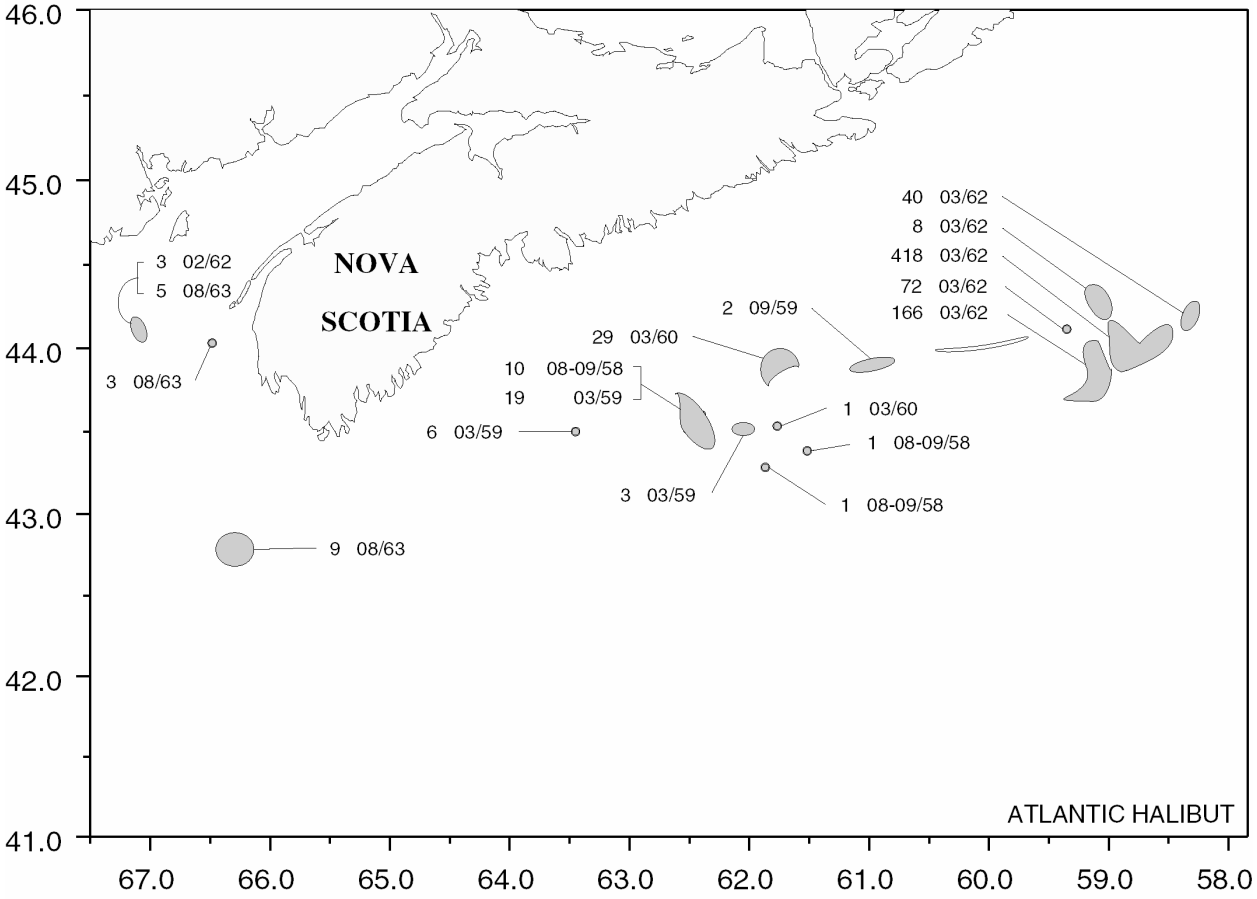

Figure 18. Locations of tagging releases of Atlantic halibut in NAFO Subarea 4 between 1958 and 1963. The numbers of fish tagged and the month(s) and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

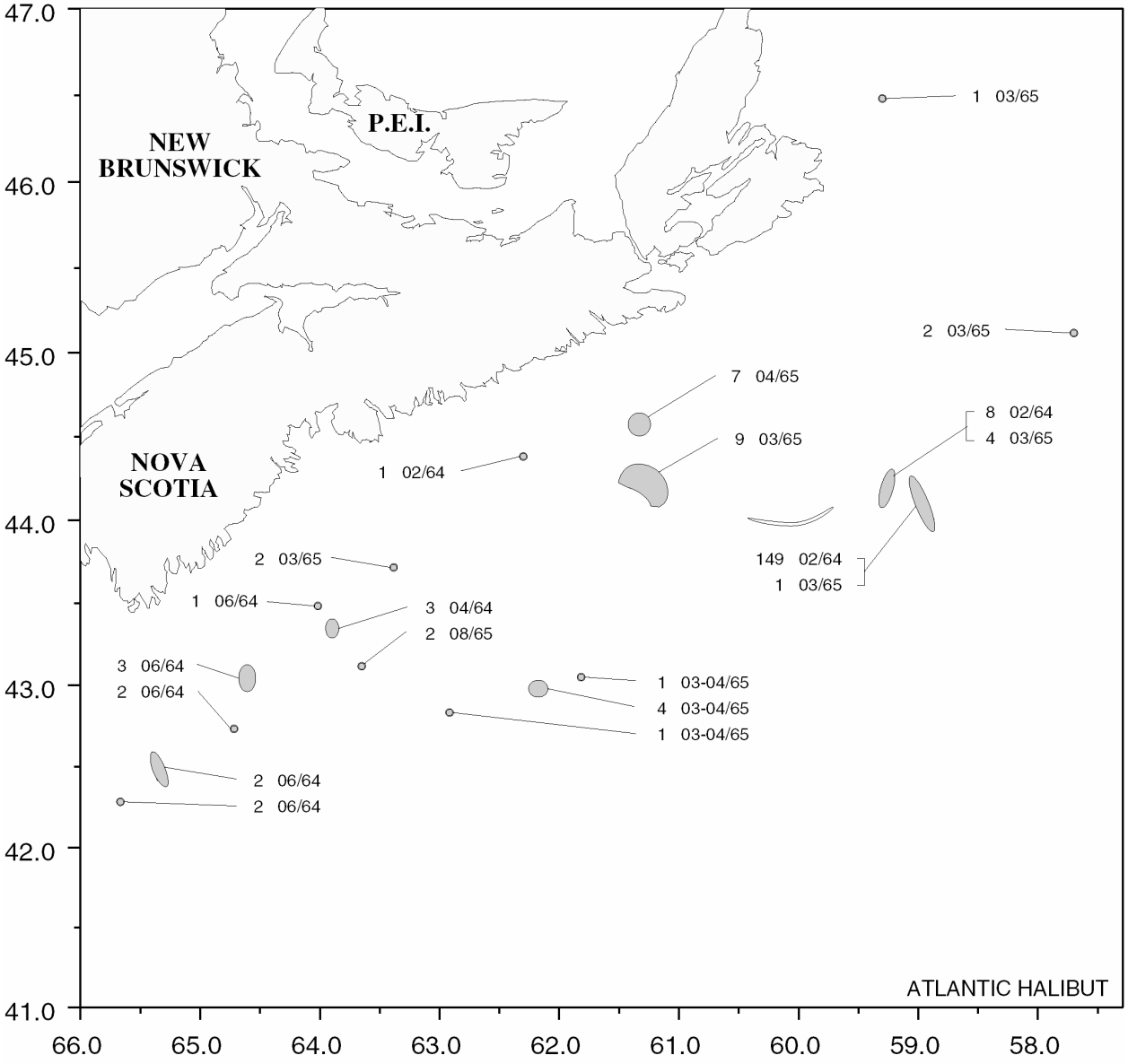

Figure 19. Locations of tagging releases of Atlantic halibut in NAFO Subarea 4 between 1964 and 1965. The numbers of fish tagged and the month(s) and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

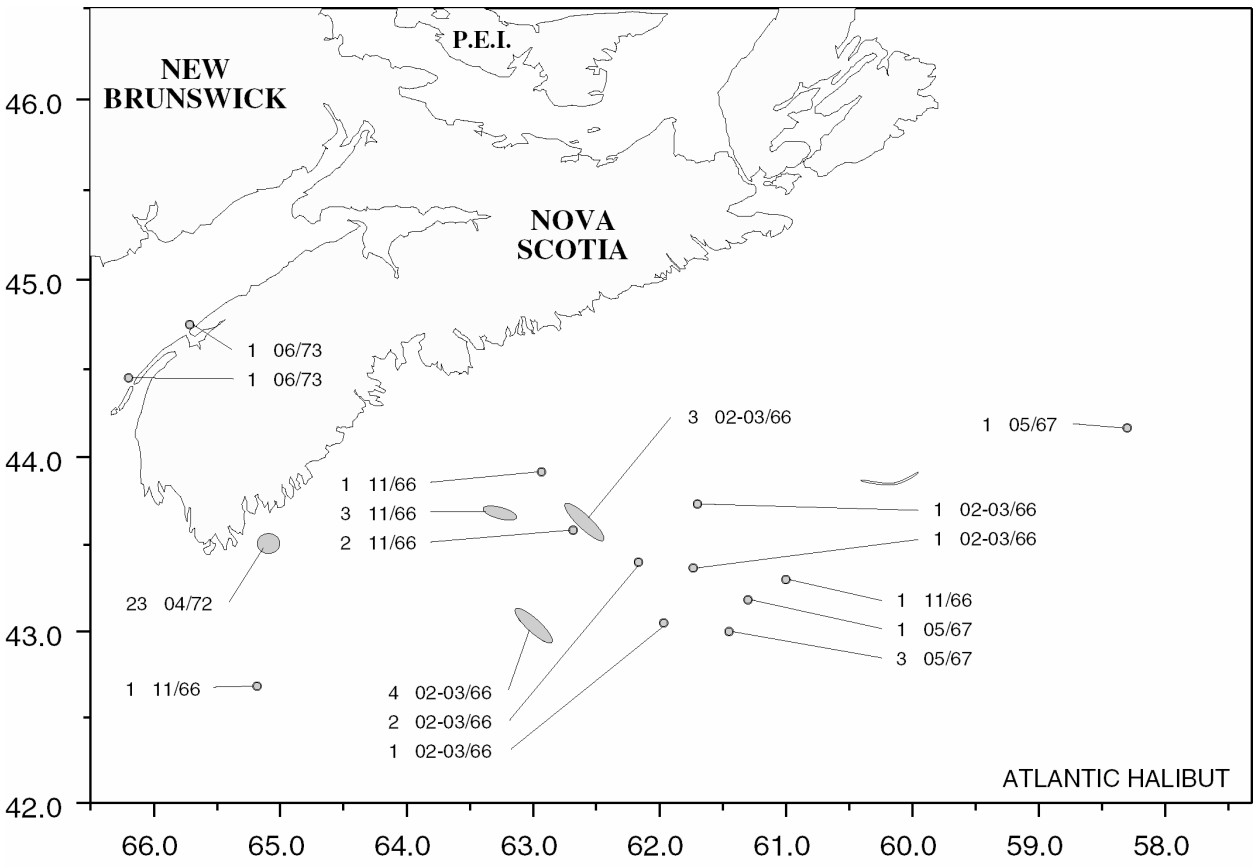

Figure 20. Locations of tagging releases of Atlantic halibut in NAFO Subarea 4 between 1966 and 1973. The numbers of fish tagged and the month(s) and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

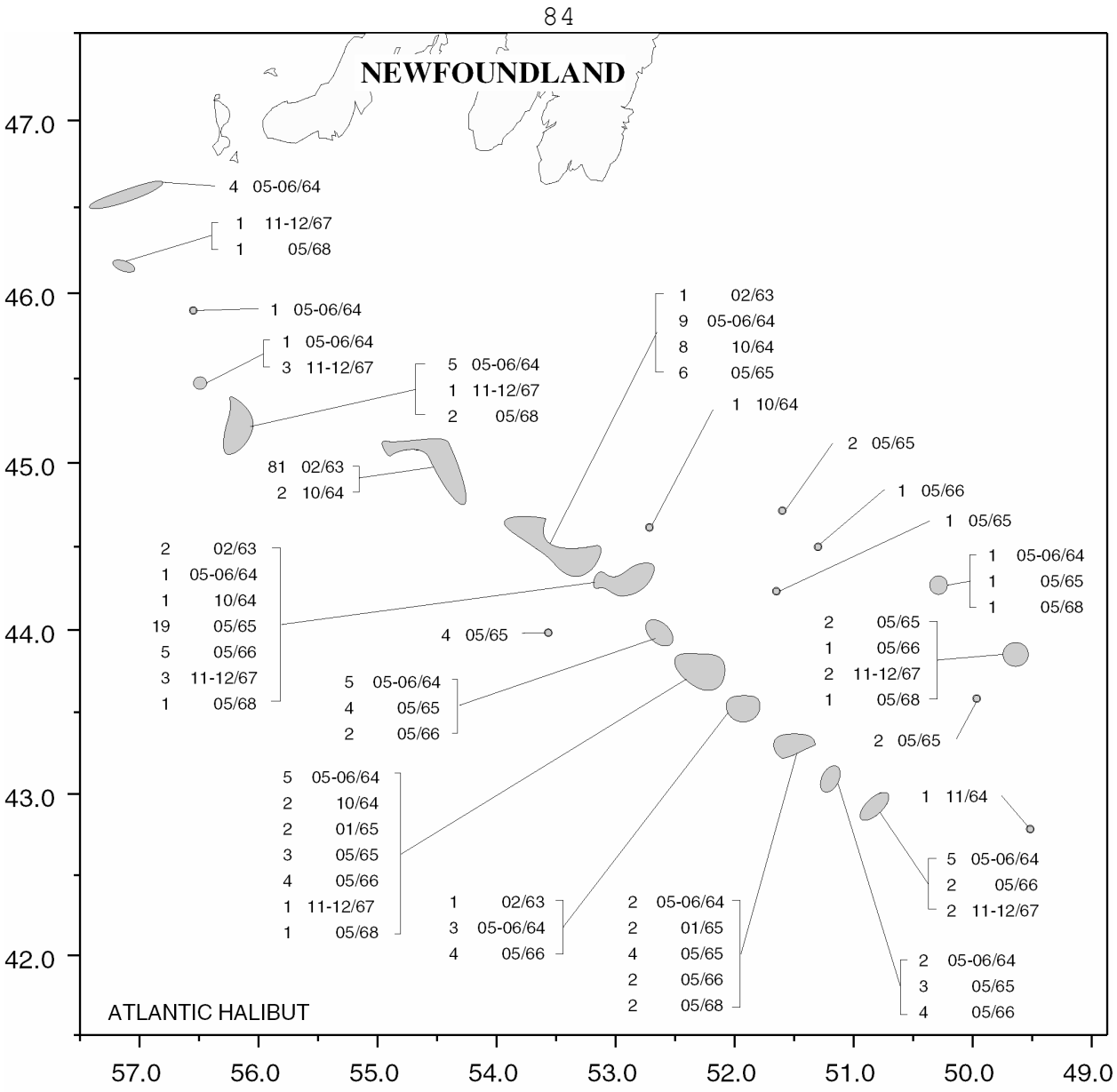

Figure 21. Locations of tagging releases of Atlantic halibut in NAFO Subarea 3 between 1963 and 1968. The numbers of fish tagged and the month(s) and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

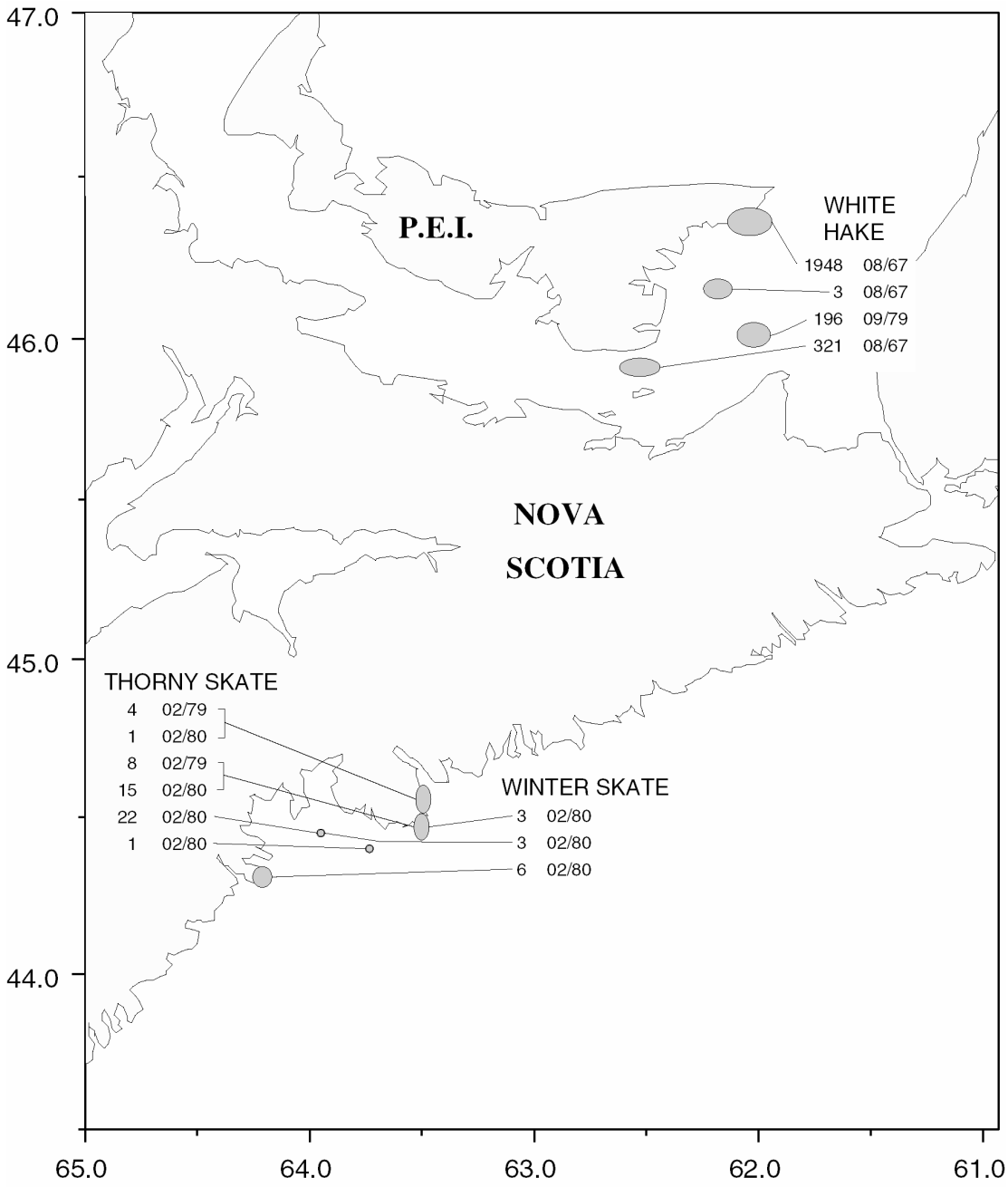

Figure 22. Locations of tagging releases of white hake, thorny skate and winter skate in NAFO Subarea 4 between 1967 and 1980. The numbers of fish tagged and the month and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

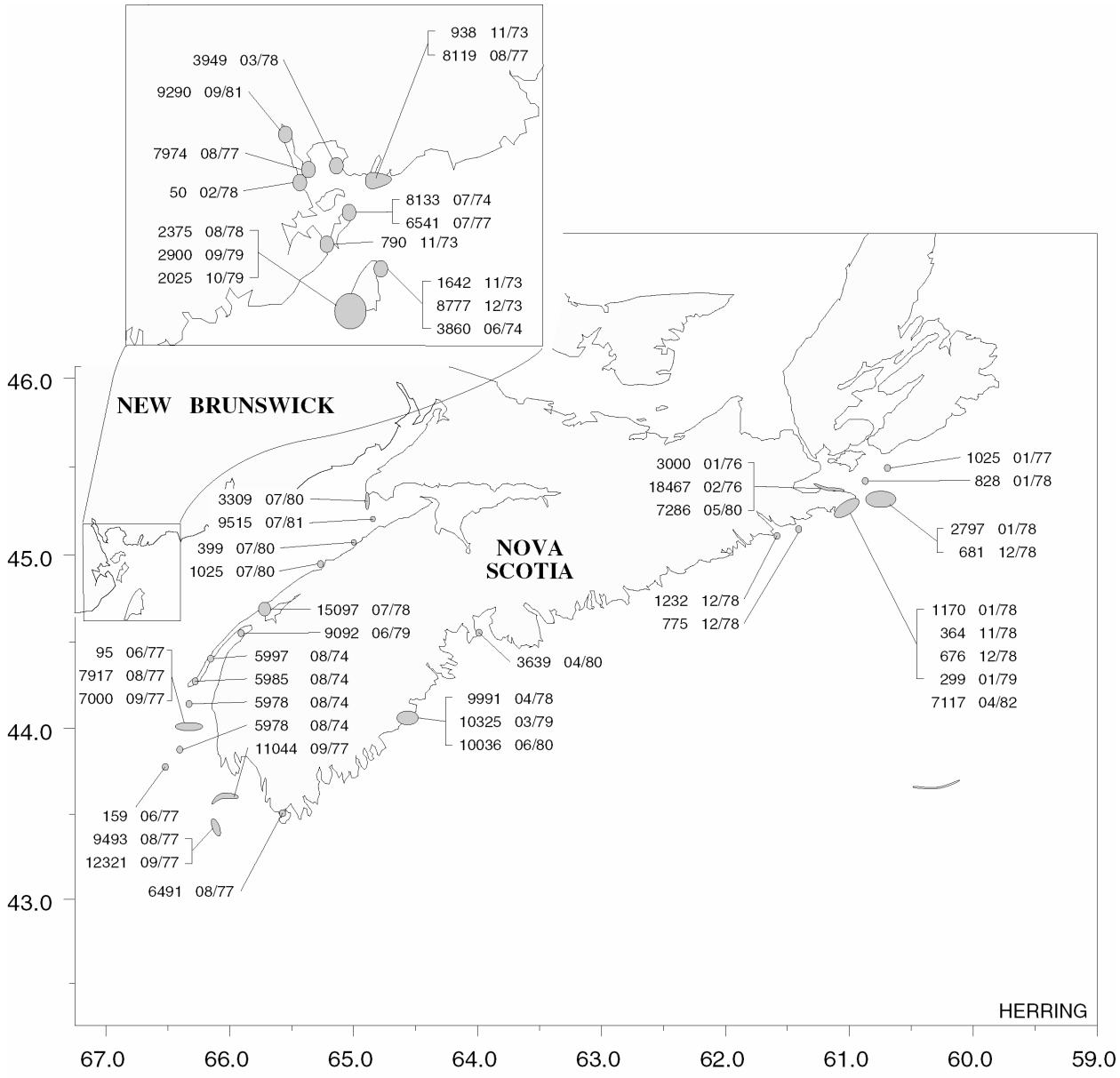

Figure 23. Locations of tagging releases of Atlantic herring in NAFO Subarea 4 between 1973 and 1982. The numbers of fish tagged and the month and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

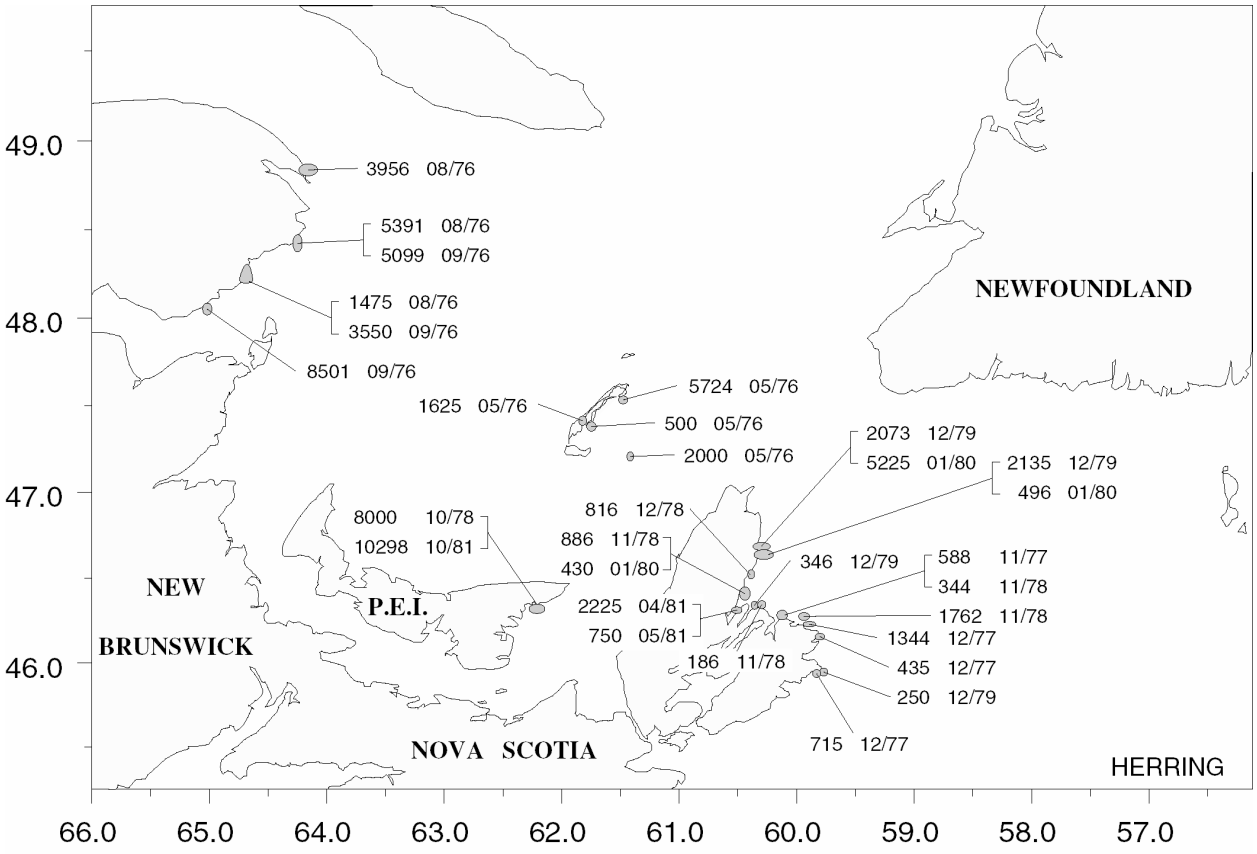

Figure 24. Locations of tagging releases of Atlantic herring in NAFO Subarea 4 between 1976 and 1981. The numbers of fish tagged and the month and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

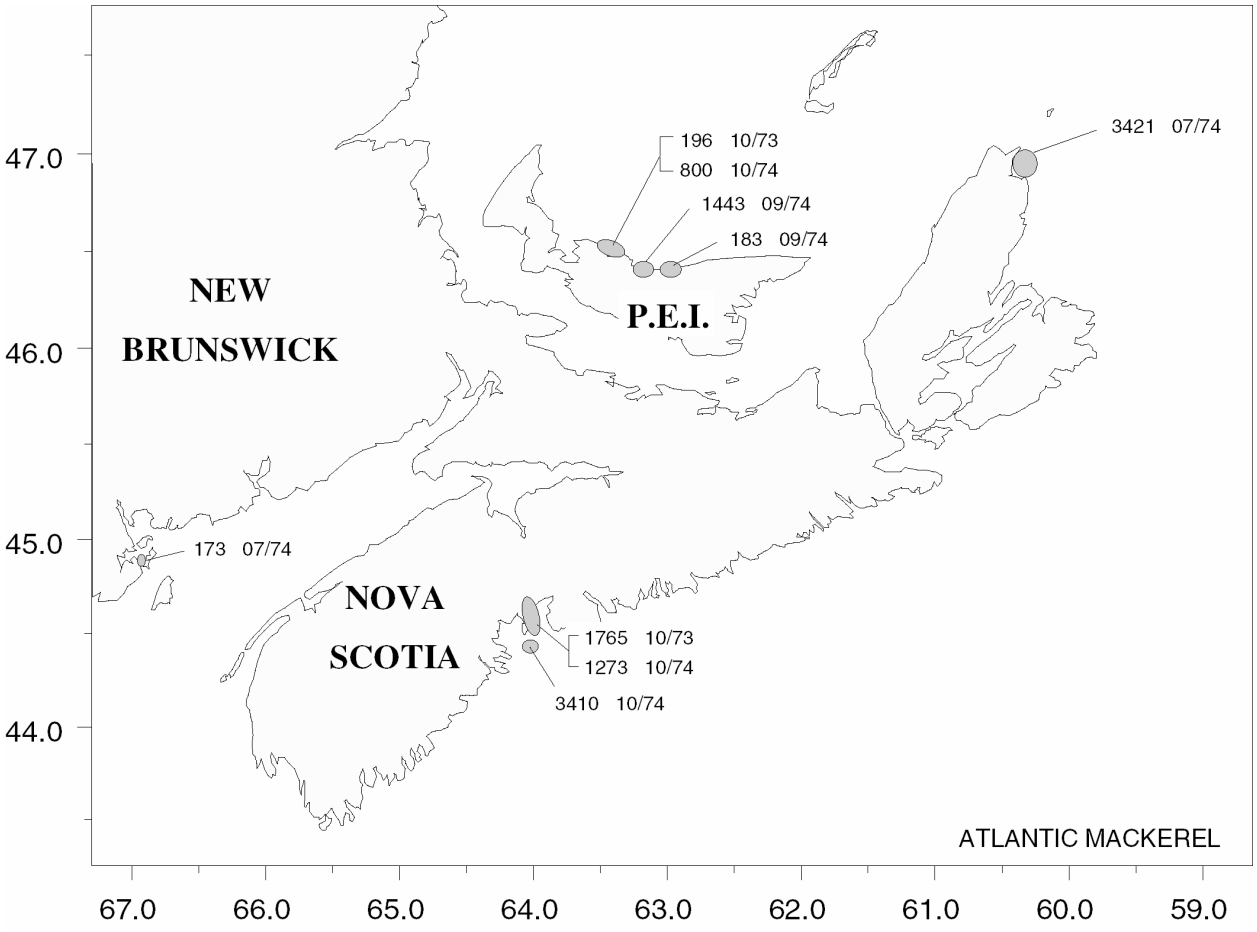

Figure 25. Locations of tagging releases of Atlantic mackerel in NAFO Subarea 4 between 1973 and 1974. The numbers of fish tagged and the month and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

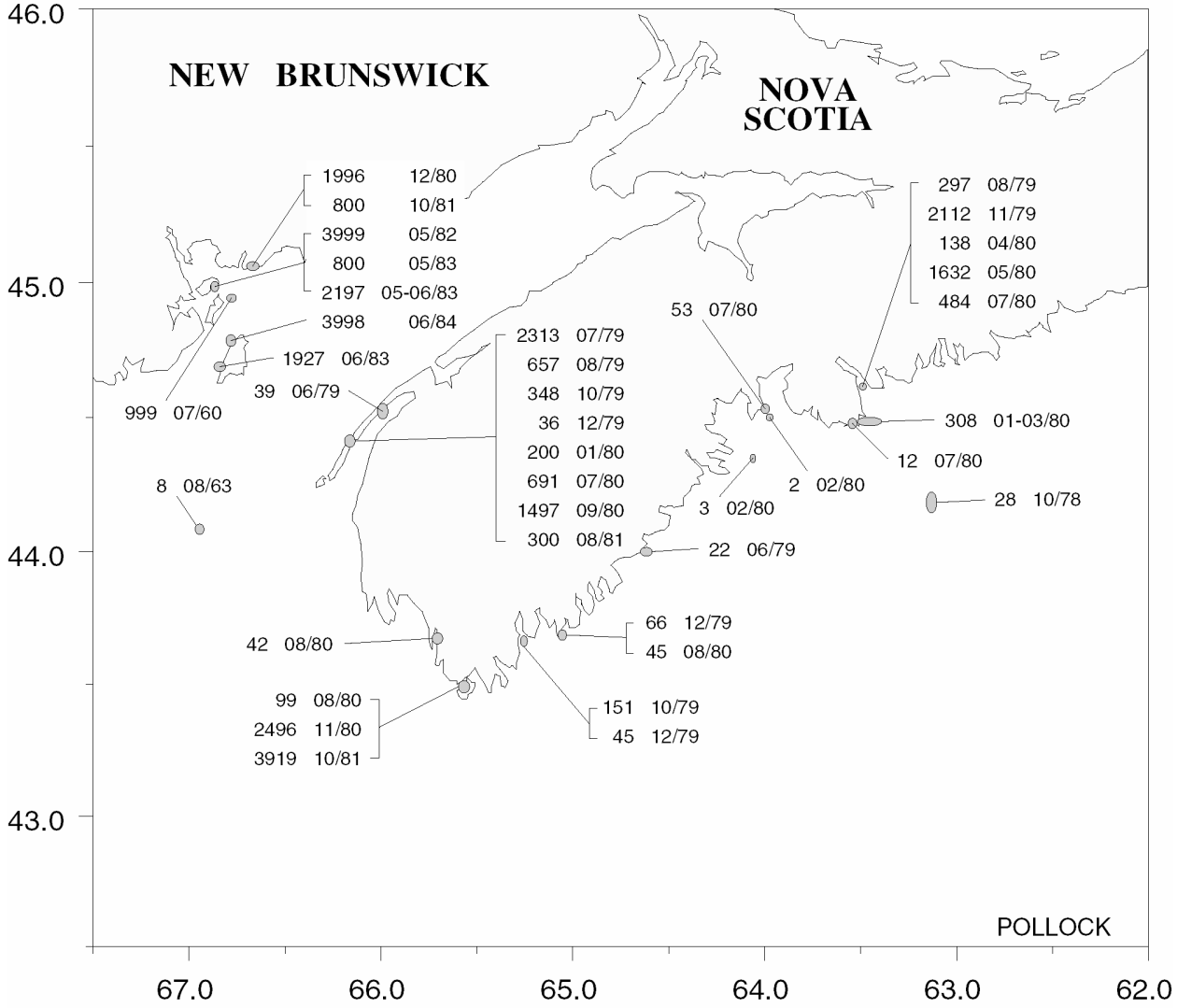

Figure 26. Locations of tagging releases of pollock in NAFO Divisions 4W and 4X between 1960 and 1984. The numbers of fish tagged and the month(s) and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

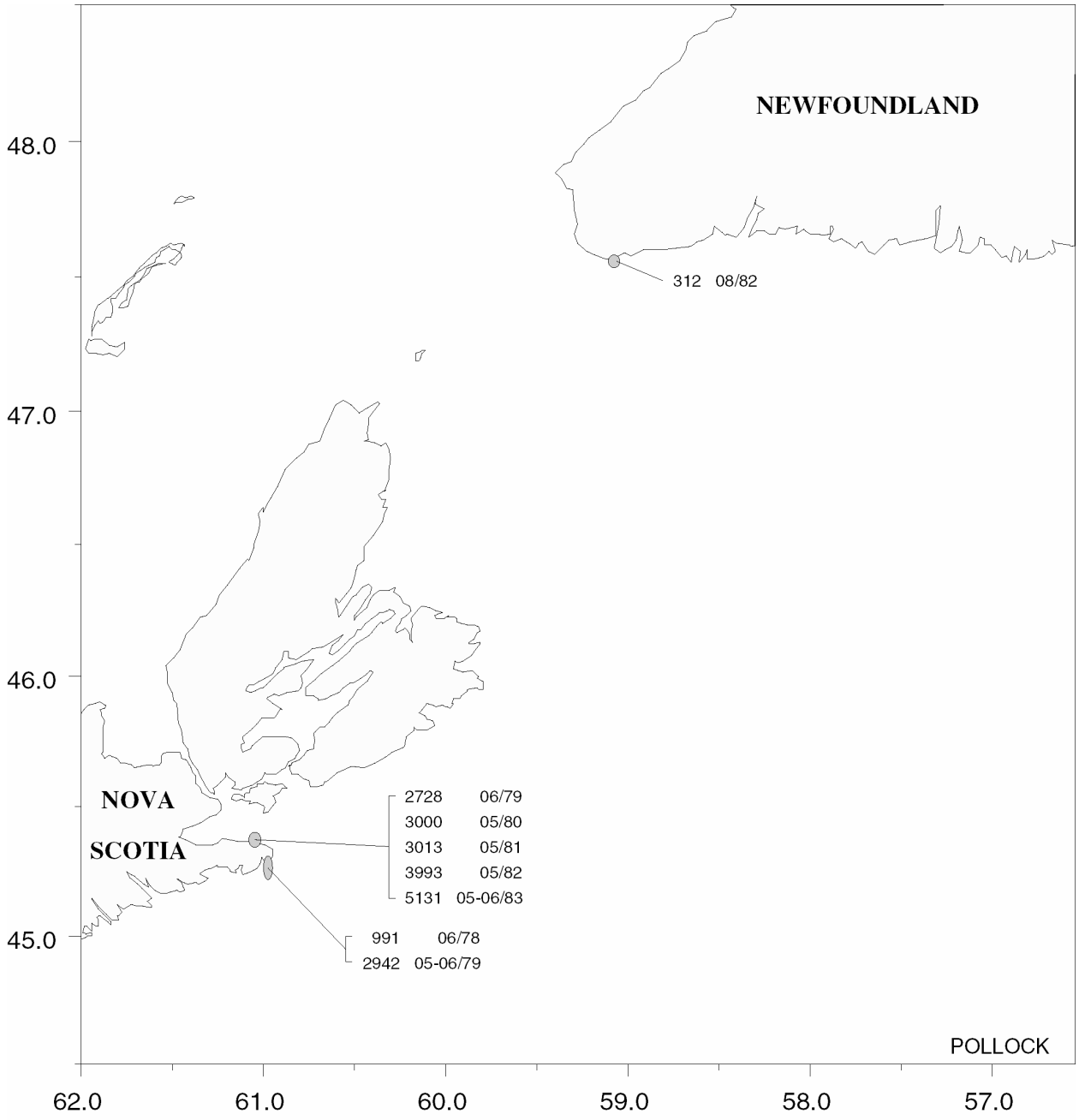

Figure 27. Locations of tagging releases of pollock in NAFO Divisions 4W and 3Pn between 1979 and 1983. The numbers of fish tagged and the month(s) and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

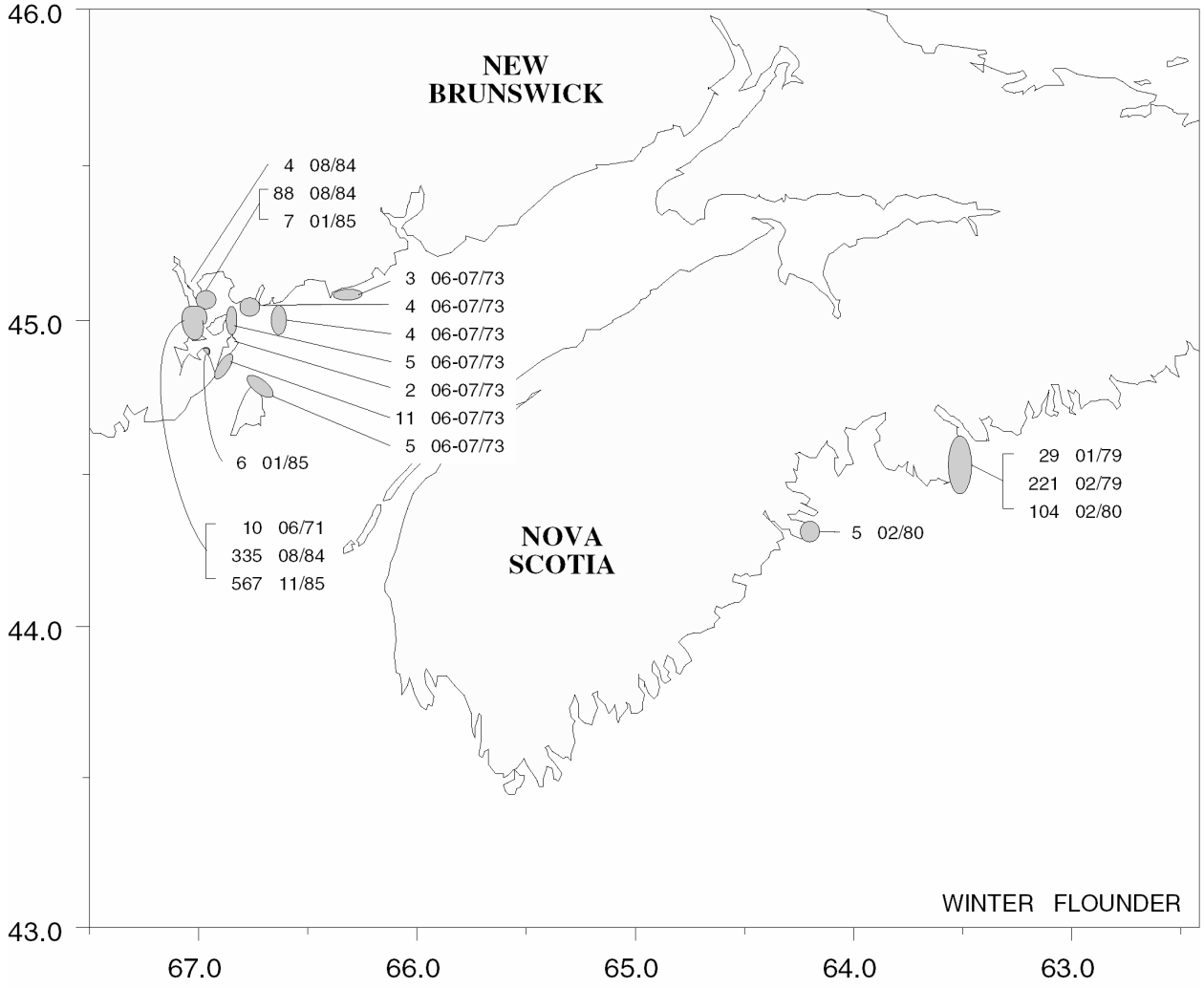

Figure 28. Locations of tagging releases of winter flounder in NAFO Subarea 4 between 1971 and 1985. The numbers of fish tagged and the month(s) and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

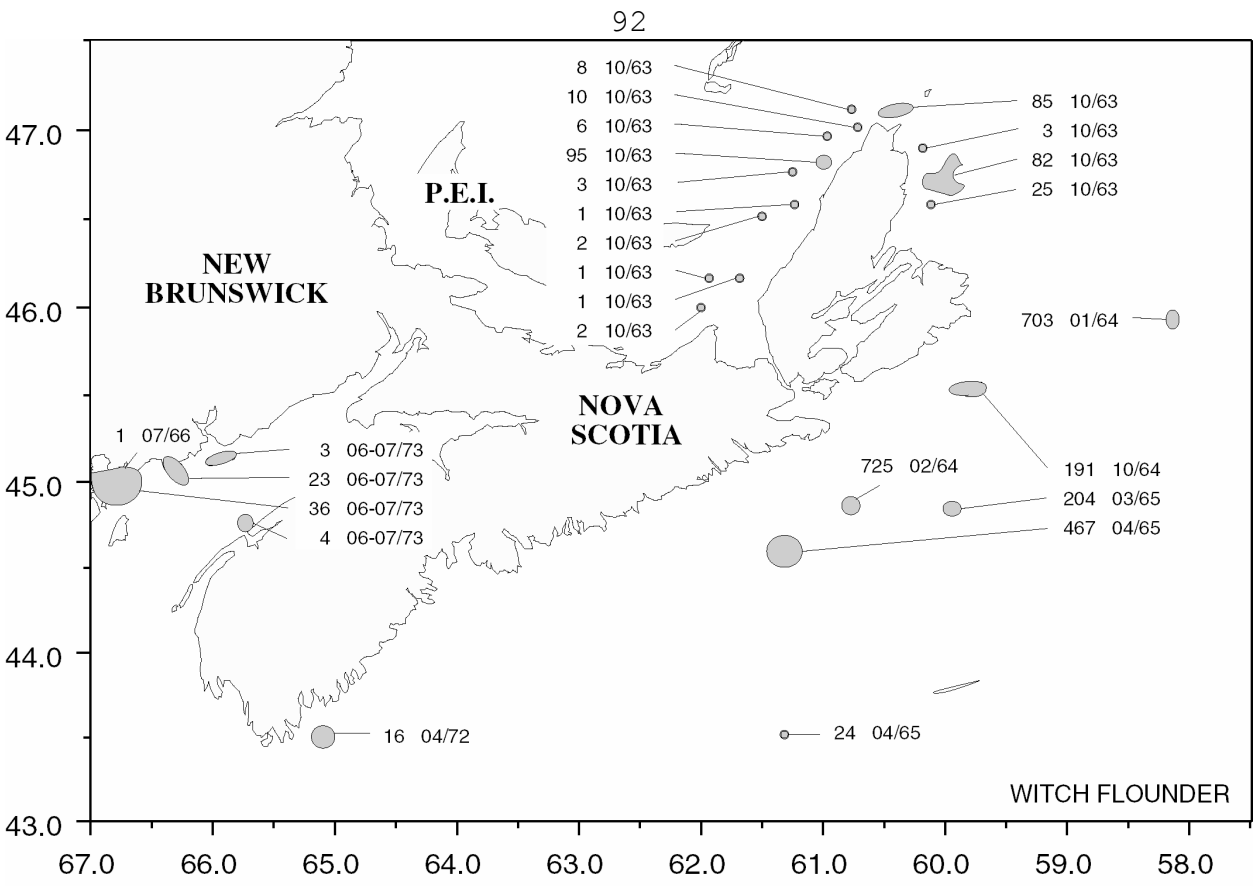

Figure 29. Locations of tagging releases of witch flounder in NAFO Subarea 4 between 1963 and 1973. The numbers of fish tagged and the month(s) and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

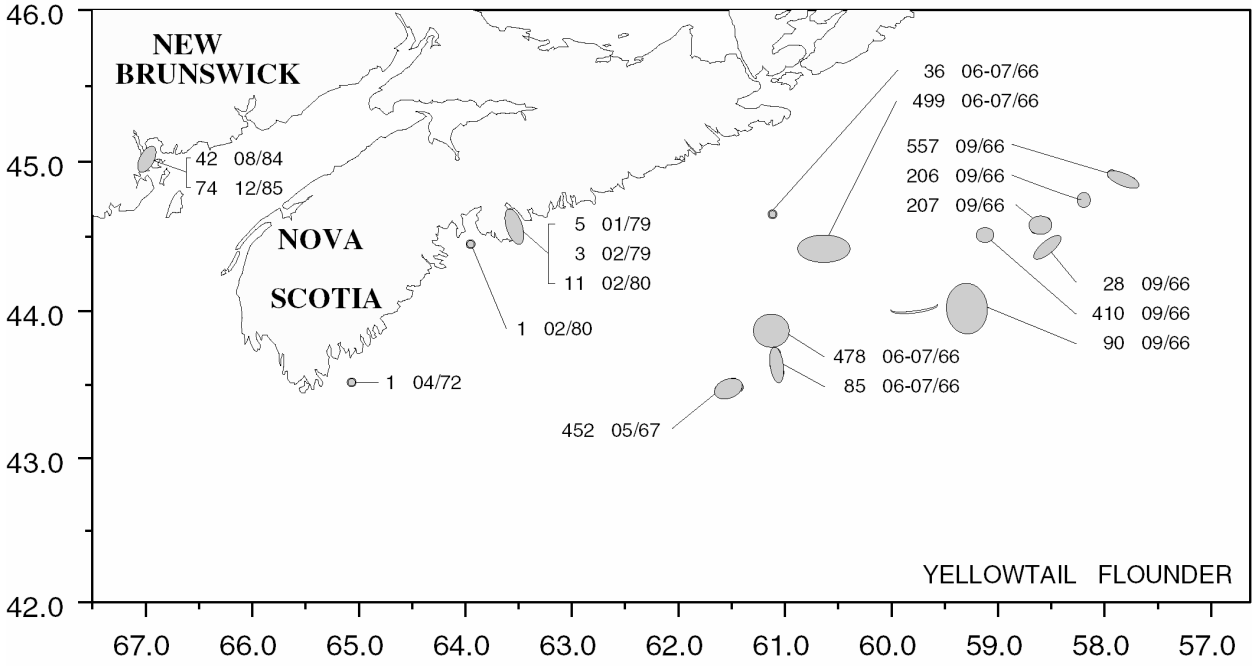

Figure 30. Locations of tagging releases of yellowtail flounder in NAFO Subarea 4 between 1966 and 1985. The numbers of fish tagged and the month(s) and year of release are given for each release location. In many cases several discrete releases of close geographic proximity and/or size range of fish were combined for this composite map.

Appendix C

Summary of length at release information contained in the database provided as modal length and 5th and 95th percentile lengths. Individual release lengths are given in the database. Measurements are fork or total length as appropriate due to the shape of the caudal fin of the species tagged (forked or rounded). This tabulation complements the tagging activities presented in Appendix A, but tagging events that are felt to be closely associated (based on objectives, proximity in timing and location, and similarity in length composition) have been combined. As well, no summaries are provided for releases that measured fewer than 100 fish. The months and NAFO areas indicate where grouping has occurred, and facilitate linking the length data summaries to the more detailed breakdown of Appendix A. Note that Number Measured will often be less than the corresponding Number Released of Appendix A due to fish tagged but not measured.

Species	Year	Months	NAFO Areas	Number Measured	5th Percentile	Mode	95th Percentile
CATFISH	1963	May-Jun	4XQ,4XR	111	84	90	105
COD	1953	May-Oct	4XO	1646	43	57	94
COD	1954	Jun-Jul	4VB,4VN	794	50	57	91
COD	1954	Jun-Aug	4WD,4WK	478	49	52	97
COD	1955	Jun-Sep	4TL,4TM,4TN	3807	48	54	77
COD	1956	May-Aug	4TF,4TG,4VN	726	46	53	80
COD	1956	May-Aug	4TK,4TL,4TN	1973	46	60	88
COD	1957	Jul-Aug	4TF	1193	48	70	89
COD	1958	May	4TF	888	52	90	100
COD	1958	Jun	4TL,4TN	1037	32	43	48
COD	1958	Oct	4TL,4TN	721	40	49	54
COD	1959	Mar-Sep	4WF,4WH,4WJ, 4WL,4XN	180	46	59	71
COD	1959	Mar	4VC	425	51	61	94
COD	1959	Aug-Sep	4TN	1957	48	56	79
COD	1960	Mar	4WH,4WJ	499	49	60	77
COD	1960	Feb	4VN	900	48	50	74
COD	1960	Aug-Oct	4TN	1668	43	54	68
COD	1961	Oct	4SZ	1457	51	58	75
COD	1961	Sep	4TN	1769	44	50	69
COD	1962	Apr	4VN	492	47	50	63
COD	1964	May	4SY,4SZ	860	41	46	66
COD	1964	May	4TK	976	40	44	63
COD	1966	May	4XS	493	35	36	77
COD	1969	Jun	4XN,4XO,4XP	105	48	58	82
COD	1969	Jan	4VN	1005	40	47	59

Species	Year	Months	NAFO Areas	Number Measured	5th Percentile	Mode	95th Percentile
COD	1972	Apr	4XO	138	47	54	108
COD	1973	Jun-Jul	4XR,4XS	592	42	76	93
COD	1978	Oct-Nov	4WE	6008	41	51	60
COD	1979	Jan-Feb	4WK	579	31	52	70
COD	1979	Apr	4VC	4283	40	57	77
COD	1979	Sep	4TG	1989	36	50	100
COD	1979	Sep	4TL	1955	33	41	61
COD	1979	Jun	4XO	694	25	50	60
COD	1979	Jun	4XR	141	27	38	46
COD	1980	May-Jun	4TG	297	33	43	89
COD	1980	Nov-Dec	4TG	4862	35	48	57
COD	1980	Feb-May	4WK,4XM	904	25	50	69
COD	1980	Sep-Oct	4VN	5762	36	50	68
COD	1981	Sep	4WF,4WH	2397	34	43	56
COD	1981	Apr	4TG	3532	33	38	58
COD	1981	Apr-May	4VC	4446	38	43	50
COD	1984	Feb-Mar	4XP	4766	50	66	101
COD	1984	Feb	5ZJ	1988	40	54	95
COD	1985	Jan-Dec	4XS,4XR,5YB	2322	37	40	74
COD	1985	Feb	4XP	1621	57	80	101
COD	1985	Mar	4XP	4363	52	70	97
COD	1985	Mar	5ZJ	1050	41	72	105
HADDOCK	1953	May-Oct	4XO	537	41	49	63
HADDOCK	1956	Sep-Oct	4TG,4TH	995	45	50	58
HADDOCK	1957	Mar-Apr	4XN,4XO,4XP	1080	44	48	61
HADDOCK	1957	Oct-Nov	4XS	813	41	50	59
HADDOCK	1957	Dec	4XO	267	43	51	62

Species	Year	Months	NAFO Areas	Number Measured	5th Percentile	Mode	95th Percentile
HADDOCK	1959	Mar-Sep	4WJ,4WL,4WH, 4XN	576	43	55	64
HADDOCK	1959	Sep	4WF	147	39	40	54
HADDOCK	1960	Mar	4WH	597	43	54	65
HADDOCK	1963	Nov	4XR	648	46	52	61
HADDOCK	1966	Oct	4XR,4XS	316	37	41	49
HADDOCK	1969	Jun	4XN,4XO,4XP	251	42	50	62
HADDOCK	1971	Mar	4XP	898	52	61	71
HADDOCK	1973	Jun	4XR,4XS	238	43	53	68
HADDOCK	1978	Nov	4WJ,4WL	135	31	34	56
HADDOCK	1980	Feb	4WK,4XM	141	12	17	33
HADDOCK	1982	Jun	4XR	2972	25	33	38
HADDOCK	1983	Mar-Apr	4XP	716	34	41	68
HADDOCK	1983	Apr	4XN	2831	38	54	68
HADDOCK	1984	Feb-Mar	4XN,4XP	10862	43	54	66
HADDOCK	1984	Feb-Mar	5ZJ,5ZM	3188	48	56	73
HADDOCK	1985	Mar-Apr	4XN,4XP	12175	40	50	63
HADDOCK	1985	Mar	5ZJ	2942	43	58	74
HADDOCK	1985	Jul	4XR	134	36	41	54
HADDOCK	1985	Jul	4XS,5YB	349	40	45	60
WHITE HAKE	1967	Aug	4TG,4TH	2246	48	64	77
WHITE HAKE	1979	Sep	4TG	193	44	55	63
HALIBUT	1962	Feb-Mar	4VC,4WG	675	45	53	98
HALIBUT	1964	Feb	4VC,4WG	151	41	44	101
PLAICE	1958	Jun	4TL	319	31	41	51
PLAICE	1958	Oct	4TK,4TN	326	22	28	46
PLAICE	1959	May	4TF,4TG	299	27	37	58
PLAICE	1959	May-Jun	4TN,4TM	316	30	36	54

Species	Year	Months	NAFO Areas	Number Measured	5th Percentile	Mode	95th Percentile
PLAICE	1959	Aug	4TK,4TN	254	33	42	50
PLAICE	1960	May	4TF,4TK	414	32	35	65
PLAICE	1963	Oct	4TF,4TG,4VN	222	32	36	50
PLAICE	1966	Jun-Nov	4XS	192	23	31	40
PLAICE	1972	Apr	4XO	235	32	34	59
PLAICE	1979	Sep	4TG	2073	27	34	47
PLAICE	1979	Sep	4TL	1997	27	40	50
PLAICE	1980	Feb	4WK,4XM	1055	15	23	38
PLAICE	1980	May-Jun	4TG	1666	25	31	51
POLLOCK	1960	Jul	4XS	987	61	68	82
POLLOCK	1978	Jun	4WD	980	29	31	38
POLLOCK	1979	May-Jun	4WD	5656	32	39	43
POLLOCK	1979	Aug-Nov	4WK	2118	14	16	34
POLLOCK	1979	Jun-Dec	4XO	280	13	14	26
POLLOCK	1979	Jun-Aug	4XR	648	24	27	38
POLLOCK	1979	Oct-Dec	4XR	384	16	18	32
POLLOCK	1980	May	4WD	3000	20	20	23
POLLOCK	1980	Jan-May	4WK	1003	16	19	22
POLLOCK	1980	Jan	4XR	198	14	16	17
POLLOCK	1981	May	4WD	3006	25	27	31
POLLOCK	1981	Oct	4XO	3915	17	27	29
POLLOCK	1981	Oct	4XS	182	15	16	22
POLLOCK	1982	May	4WD	3993	21	32	35
POLLOCK	1982	May	4XS	3990	17	20	23
POLLOCK	1983	May-Jun	4WD	5130	22	24	34
POLLOCK	1983	May-Jun	4XS	4921	18	18	21
POLLOCK	1984	Jun	4XS	3998	23	26	32
WINTER FLOUNDER	1979	Jan-Feb	4WK	249	26	35	41

Species	Year	Months	NAFO Areas	Number Measured	5th Percentile	Mode	95th Percentile
WINTER FLOUNDER	1980	Feb	4WK,4XM	106	26	34	42
WINTER FLOUNDER	1984	Aug	4XS	427	23	32	41
WINTER FLOUNDER	1985	Nov-Dec	4XS	567	26	30	38
WITCH FLOUNDER	1963	Oct	4TF,4TG	130	30	34	57
WITCH FLOUNDER	1963	Oct	4VN	187	31	37	55
WITCH FLOUNDER	1964	Jan	4VN	701	38	49	59
WITCH FLOUNDER	1964	Oct	4VB	191	40	44	59
WITCH FLOUNDER	1964	Feb	4WD	723	36	43	57
WITCH FLOUNDER	1965	Mar	4VC	203	34	41	56
WITCH FLOUNDER	1965	Apr	4WH	489	34	44	55
YELLOWTAIL FLOUNDER	1966	Jun-Sep	4WE,4WH	1091	31	32	42
YELLOWTAIL FLOUNDER	1966	Sep	4WG,4VC	1491	29	33	47
YELLOWTAIL FLOUNDER	1967	May	4WH,4WJ	451	29	34	45

Appendix D

Length frequency samples of juvenile (harbour) pollock tagged between 1978 and 1984, and of herring tagged between 1973 and 1982. All of the herring and a significant number of the pollock tagged and released during these tagging events were unmeasured. Hence the sample length frequency data presented in this appendix are not available in the tagging database. Both pollock and herring were measured to the nearest centimeter, however the pollock were subsequently binned to 3 cm increments for brevity. The large number of measured herring is a result of the tagging project protocol in which herring were tagged from successive commercial purse seine sets each night of several fishing vessels; only small numbers were tagged from each set in order to not impede the commercial operation. A length frequency subsample was taken from each set from which herring were tagged; the length frequencies were then grouped by time period and unit area for brevity in this report.

POLLOCK	4Xs	5Yb	4Wd	4Wk
	1960	1963	1978	1978
Length	JUL	AUG	JUN	OCT
22			2	
25			18	
28			171	
31			501	
34			188	
37			82	
40			17	2
43			1	1
46				4
49				7
52	4			5
55	4			2
58	30			5
61	73			
64	124	1		2
67	188	1		
70	212			
73	153	2		
76	97	2		
79	58	2		
82	42			
85	11			
88	3			

POLLOCK	4Wd	4Xo	4Xr	4Xr	4Xr	4Wk	4Xo	4Xr	4Wk	4Xo	4Xr
	1979	1979	1979	1979	1979	1979	1979	1979	1979	1979	1979
Length	MAY	JUN	JUN	JUL	AUG	AUG	OCT	OCT	NOV	DEC	DEC
10						6	11				
13						98	55	2	324	22	5
16						9	60	186	1053	40	23
19	33					1	21	63	250	42	8
22	150	5		64	2		1	1	12	5	
25	65	13	1	338	12	4		7	4		
28	17	1		97	59	54		38	30	1	
31	124			4	29	56		43	95		
34	959	2	3	1		13		7	83		
37	2104	1	14			1		1	15		
40	1782		10	1		1			1		
43	380			1					2		
46	36			1					2		
49	3					1			2		
52	2								1		
61	1										
82			1								
85			8								
94			1								

POLLOCK								
		4Xr	4Wk	4Xm	4Wk	4Wk	4Wd	4Xo
		1980	1980	1980	1980	1980	1980	1980
Length		JAN	JAN	FEB	MAR	MAY	MAY	AUG
	13	79	14	1	2	1		11
	16	118	198	3	84	118		
	19	1	77	7	46	374	1990	
	22		2	1	2	80	988	
	25			1		4	20	
	28					1	1	
	37						1	
	49			1				

POLLOCK									
	4Wd	4Xr	4Xo	4Xs	4Wd	4Xs	4Wd	4Xs	4Xs
	1981	1981	1981	1981	1982	1982	1983	1983	1984
Length	MAY	AUG	OCT	OCT	MAY	MAY	MAY	MAY	JUN
13			29	31					
16			337	104		856		2626	
19	2		157	38	370	2393	144	2098	59
22	4	12	202	7	634	686	1860	192	672
25	1710	53	2131	1	625	52	1017	7	1880
28	1117	29	995	1	714	2	1046		1002
31	158	3	64		1065		796		293
34	15	2			471		204		78
37					100		53		14
40					13		8		
43					1		1		
46							1		

HERRING								
	4Xs	4Xq	4Xr	4Xs	4Tf	4Tm	4Tn	4Wd
	1973	1974	1974	1974	1976	1976	1976	1976
Length	NOV-DEC	AUG	AUG	JUN-JUL	MAY	SEP	AUG-SEP	FEB
10								
11				11				
12				11				
13				32				
14	127			64				
15				96				
16	43			122				
17	42			1207				27
18	448			352				201
19	880	55		449		28		873
20	477	55		630				3706
21	202	55		546		106		2698
22	177	55		554		247		746
23	376			543		176	32	451
24	418		49	1027		459	57	72
25	836	329	99	1513		2696	1001	53
26	1506	165	607	1269	17	3352	4978	23
27	753	439	1827	644	17	940	3873	
28	84	1700	3240	748	75	144	1884	
29	42	2194	5279	566	462	101	739	
30	42	823	3672	214	1471	133	589	
31		110	746	13	2121	20	309	
32			629		853	33	667	
33			541		489	71	585	
34			906		1133		222	
35			365		971	5	176	
36					523		170	
37					90		112	
38							59	
39							91	
40								
41								
42								

HERRING						
	4Wd	4Vn	4Xq	4Xs	4Xo	4Xr
	1977	1977	1977	1977	1977	1977
Length	JAN	NOV-DEC	JUN-SEP	JUL-AUG	AUG-SEP	AUG-SEP
10				67		
11				100		
12				67		
13						
14						
15				344		
16				1440		
17				2599	197	
18				2505	197	
19				1522	98	
20				499		
21				735	101	
22			38	325	98	56
23	10		113	147	101	
24	10	6	38	288	89	
25	78	6		670	197	
26	130		38	723	326	6
27	219	8	143	560	2954	223
28	193	24	1158	993	4857	678
29	125	73	1335	1672	5589	1555
30	42	144	525	1107	2596	1504
31	83	349	581	559	2459	1631
32	47	370	1084	794	2220	2855
33	52	364	1149	656	1662	3735
34	16	370	724	155	439	1578
35	10	439	38	9	128	436
36	5	455	70	14		78
37	5	197				56
38		138				18
39		71				56
40		27				
41		6				
42						

HERRING							
	4Wd	4Xo	4Xr	4Xs	4Tg	4Vn	4Wd
	1978	1978	1978	1978	1978	1978	1978-79
Length	JAN	APR	JUL	AUG	OCT	NOV-DEC	NOV-DEC/78 + JAN/79
10		178	67				
11		870	179				
12		1015	548				
13		1419	2117				
14		1577	2125				
15		1845	1020				
16		1647	1078		40		
17		569	1125		24	7	
18		189	770		217	14	
19		47	785	14	354	21	
20		18	617	85	361		9
21	12	102	422	28	241		23
22	41	214	82	85	304		4
23	59	123	157	254	314	14	81
24	95	132	187	339	990	7	45
25	80	47	63	396	1846	43	2
26	120		144	509	1082	21	17
27	231		46	495	533	21	32
28	693		55	113	588	51	97
29	1093		142	28	376	199	110
30	732		527	14	282	250	187
31	443		734		141	141	200
32	356		644	14	188	153	493
33	272		470		47	267	565
34	171		570		47	363	708
35	119		196			466	747
36	138		30			473	440
37	69		16			690	171
38	33					267	79
39	32					100	17
40	6					74	12
41	1					6	
42							

HERRING												
	4Vn	4Xo	4Xr	4Xs	4Vn	4Xm	4Wd	4Xo	4Xr	4Xs	4Vn	4Xs
	1979	1979	1979	1979	1980	1980	1980	1980	1980	1980	1981	1981
Length	DEC	MAR	JUN	SEP-OCT	JAN	APR	MAY	JUN	JUL	JUL	APR-MAY	JUL-SEP
10		9										
11												
12												
13			58									
14			356									75
15		9	918									181
16		9	1059						13			243
17		64	1530									402
18		162	704						19			885
19		435	732								7	1824
20		989	749					50	31			2258
21	7	1910	1157	21		50		99	94			1845
22	123	2310	966	87	53	125		248	125	5	14	916
23	397	2607	449	66	354	224	12	198	113	30	77	512
24	849	1216	242	307	755	349		297	63	48	124	225
25	810	307	176	467	944	548	58	990	75	139	116	128
26	633	112		943	416	922	92	1683	100	233	167	352
27	269	91		939	159	897	69	2178	194	619	224	806
28	697	58		729	318	424	115	2277	94	751	481	1510
29	441	27		594	243	100	46	1238	50	417	391	3021
30	183			471	328		46	495	25	247	237	2215
31	28	9		211	307		69	50	13	98	233	1208
32	32			73	312		23			82	108	101
33	10			17	264		58	99		189	66	101
34	7				267		150	50	6	246	53	
35	16				289		219			352	17	
36	2				344		242	50		163	34	
37					284		449		13	89		
38	1				281		311					
39					95		184					
40					46		35					
41	1				6		12					
42					6		12					

Appendix E

Current and historical formats of the tagging data described in this document. The historical formats provide insights into the types of information that were collected in the past relative to recent or current tagging programs, providing some context for the various tagging studies. This also gives an appreciation for variables that exist in the current database design, yet can be expected to have no data from earlier programs. Details associated with data quality and characteristics are presented in the format descriptions of the original databases. It is hoped that keeping these descriptions separate reduces potential for confusion.

1953-73 Groundfish Tagging Data Format				
Field No.	**Column No.**	**No. of Columns**	**Items**	**Code**
RELEASE INFORMATION				
1	1	1	Vessel Identifier A = A.T. Cameron (1-100) B = A.T. Cameron (101+) D = Dover H = Harengus I = Investigator M = Mallotus P = E.E. Prince	A, B, D, H, I, M, P, blank
2	2-3	2	Cruise Number	01-99, blank
	Fields 1 and 2 combined form an alphanumeric code representing a vessel and sequential cruise number. This field is often blank, usually in association with handlined fish.			
3	4-5	2	Release Month	01-12
4	6-7	2	Release Year	53-73
5	8-9	2	Station Number	01-99, blank
6	10-11	2	Set Number	01-99, blank
	Fields 5 and 6 rarely recorded.			
7	12-15	4	Latitude (DEG/MIN)	00-99/00-59
8	16-19	4	Longitude (DEG/MIN)	00-99/00-59
9	20	1	NAFO Subarea	1-6
10	21	1	Division	A-Z
11	22	1	Unit Area	A-Z
12	23-25	3	Depth (FM)	000-999

1953-73 Groundfish Tagging Data Format

Field No.	Column No.	No. of Columns	Items	Code
13	26-27	2	Method of Capture 01 = otter trawl (36,453 releases) 02 = longline (616 releases) 03 = handline (10,084 releases) 07 = cod trap (838 releases) 10 = other (81 releases)	01-10
14	28-30	3	Species - wolffish - cod - haddock - hake - plaice - pollock - Greenland halibut - winter flounder - witch - yellowtail - halibut	 CAT COD HAD HAK PLA POL TUR WIN WIT YEL HAL
15	31-33	3	Fish Length (CM)	000-999, blank
			Rarely blank. Note for plaice the implicit existence of a decimal place between the last and second-last digits. All other species were measured to whole numbers.	
16	34-38	5	Tag Number	variable
			Unique to each individual fish.	

1953-73 Groundfish Tagging Data Format				
Field No.	**Column No.**	**No. of Columns**	**Items**	**Code**
17	39-41	3	Tag Type	
			- Engl. disc with flag	YNF
			- Engl. yellow Peterson disc	YDN
			- French yellow Peterson disc	YDF
			- yellow/red disc	YDR
			- Engl. disc with Fr. backing disc	YEF
			- Lea hydrostatic	OLH
			- red & white Peterson disc	ORD
			- strap flag	OSR
			- spaghetti tag	OSP
			- dagger tag	ODG
18	42-44	3	Type of Attachment	
			- stainless steel wire	SSW
			- stainless steel loop	SSL
			- nylon loop	ONL
			- stainless steel pin	SSP
			- single knot	OSK
			- double knot	ODK
			- operculum	OPE
			- dorsum	DOR
			- double twist wire	DTW

1953-73 Groundfish Tagging Data Format				
Field No.	**Column No.**	**No. of Columns**	**Items**	**Code**

The following table summarizes the tags/attachment methods applied:

TAG TYPE	ATTACHMENT METHOD	NUMBER APPLIED
ODG	DOR	159
ODG	OPE	55
ODG	SSW	158
OLH	ONL	1206
OLH	SSL	493
OLH	SSW	2566
ORD	SSW	1382
OSP	ODK	124
OSP	OSK	1674
OSR		382
YDF	SSW	3784
YDN	SSP	2149
YDN	SSW	21933
YDR	DTW	198
YDR	SSP	462
YDR	SSW	6234
YEF	SSW	4063
YNF	SSP	1050

1953-73 Groundfish Tagging Data Format				
Field No.	**Column No.**	**No. of Columns**	**Items**	**Code**
RECOVERY INFORMATION				
N.B.: Any of the following fields can be blank (all will be blank if the fish was never recovered). Where recovery data exists at all, any blanks mean unknown or inapplicable.				
19	45-46	2	Month of Recovery	00-12
20	37-48	2	Year of Recovery	53-99
21	49-50	2	Method of Capture blank = unknown (1,563 recoveries) 01 = otter trawl (5,877 recoveries) 02 = longline (1,418 recoveries) 03 = handline (862 recoveries) 04 = Danish seine (187 recoveries) 05 = Pair trawl (55 recoveries) 06 = gill net (457 recoveries) 07 = cod trap (40 recoveries) 08 = hook (540 recoveries) 09 = scallop drag (5 recoveries) 10 = other (86 recoveries)	01-10
22	51-54	4	Latitude (DEG/MIN)	00-99/00-59
23	55-58	4	Longitude (DEG/MIN)	00-99/00-59
24	59	1	NAFO Subarea	1-6
25	60	1	NAFO Division	A-Z
26	61	1	NAFO Unit Area	A-Z

1953-73 Groundfish Tagging Data Format

Field No.	Column No.	No. of Columns	Items	Code
27	62-64	3	Depth (FM)	000-999
			Recapture depth exists for about 75% of recoveries. Even half the recoveries without known recapture gears have recapture depth.	
28	65-67	3	Length (CM)	000-999
			Roughly 30% of the recoveries were measured.	
29	68	1	Measured By	
			- unknown (7,537 recoveries)	blank
			- technician (2,684 recoveries)	1
			- other (869 recoveries)	2
			'Other' is likely to denote a fisherman or plant worker.	
30	69	1	Sex	
			- unknown (9,528 recoveries)	blank
			- male (684 recoveries)	1
			- female (878 recoveries)	2
31	70	1	Material for Aged	
			- none (8,660 recoveries)	
			- otolith (2,418 recoveries)	Y
			- scales (12 recoveries)	S
32	71	1	Found By	
			- unknown (1,751 recoveries)	blank
			- fisherman (7,641 recoveries)	1
			- plant operator (1,698 recoveries)	2

1953-73 Groundfish Tagging Data Format				
Field No.	**Column No.**	**No. of Columns**	**Items**	**Code**
33	72-73	2	Nationality of Boat	
			- unknown (58 recoveries)	blank
			- Canada (9,773 recoveries)	CA
			- Denmark (55 recoveries)	DE
			- France (123 recoveries)	FR
			- Italy (34 recoveries)	IT
			- Norway (3 recoveries)	NO
			- Portugal (286 recoveries)	PG
			- Poland (4 recoveries)	PO
			- Spain (316 recoveries)	SP
			- United Kingdom (19 recoveries)	UK
			- United States (370 recoveries)	US
			- Russia (41 recoveries)	RU
			- Cuba (1 recovery)	CU
			- Germany (7 recoveries)	GE
34	74	1	Where Found	
			- unknown (361 recoveries)	blank
			- at sea (8,769 recoveries)	1
			- at processing plant (1,960 recoveries)	2
35	75	1	Sent In By	
			- unknown (491 recoveries)	blank
			- FRB employee (5,662 recoveries)	1
			- Government employee (2,779 recoveries)	2
			- industry (174 recoveries)	3
			- fisherman (1,984 recoveries)	4
36	76-77	2	Paid By	same as nationality of boat

1953-73 Groundfish Tagging Data Format

Field No.	Column No.	No. of Columns	Items	Code
37	78	1	Remarks - no remarks - associated comments for record in raw data	1 or blank blank 1
Remarks ostensibly exist (probably on original transcripts in St. Andrews) for 1,745 recoveries.				
38	79-80	2	Age	00-99
Roughly 20% of the recoveries were aged.				

NOTE: The original release data, comprising columns 1-44, resided in file HISTREL on EMF0201. The original recovery data, comprising release and recovery columns 1-80, resided in file HISTREC. The recovery file only contained records for which recoveries were obtained.

1978-85 Groundfish Tagging Release Data Format					
Field No.	**Column No.**	**No. of Columns**	**Items**	**Codes**	**Description**
1	1-5	5	TRIP or CRUISE	XXnnn	Left-oriented letter or letters, right-oriented number
An alphanumeric code representing either a vessel and sequential cruise number, or a geographic location and sequential trip number. The latter is most commonly associated with shore-based tagging operations, especially for juvenile pollock.					
2	6-11	6	RELEASE DATE	01-31 01-12 01-99	DDMMYY
3	12-14	3	STATION NO.	blank, 001-999	Consecutively assigned if used
4	15-17	3	SET NO.	blank, 001-999	Consecutively assigned if used
Fields 3 and 4 rarely recorded.					
5	18-20	3	ICNAF UNIT AREA	1-9 1-9 A-Z	Subarea Division Unit Area
6	21-28	8	LOCATION	00-90 00-59 00-90 00-59	Latitude - degrees North Latitude - minutes North Longitude - degrees North Longitude - minutes North

1978-85 Groundfish Tagging Release Data Format					
Field No.	**Column No.**	**No. of Columns**	**Items**	**Codes**	**Description**
7	29-31	3	DEPTH	000-999	Fathoms
8	32-33	2	CAPTURE METHOD	01-12	blank - unknown 01 - otter trawl (96,020 releases) 02 - longline (2,923 releases) 07 - cod trap (26,747 releases) 08 - hook (50 releases) 10 - other (24,214 releases) 11 - weir (180 releases) 12 - angling or dip net (5,561 releases)
Capture method 'other' is mostly associated with improvised trapping techniques for catching inshore juvenile pollock.					
9	34-37	4	SPECIES CODE	0010-0320	0010 - cod 0011 - haddock 0012 - white hake 0016 - pollock 0040 - American plaice 0041 - witch flounder 0042 - yellowtail flounder 0043 - winter flounder 0122 - cunner 0143 - windowpane flounder 0201 - thorny skate 0202 - smooth skate 0203 - little skate

1978-85 Groundfish Tagging Release Data Format

Field No.	Column No.	No. of Columns	Items	Codes	Description
					0204 - winter skate 0300 - longhorn sculpin 0320 - sea raven
10	38-40	3	LENGTH	000-999	Centimetres - flatfish have assumed decimal place between cols. 39 and 40
			Usually taken with the major exception of juvenile pollock.		
11	41-47	7	TAG NUMBER	nnnnnnn or Xnnnnnn	Left-oriented letter if exists, right-oriented number
			Unique to each individual fish.		
12	48-50	3	TAG TYPE	OSP YDN	Spaghetti tag Peterson disc (English, yellow)
13	51-53	3	ATTACHMENT TYPE	OTB SSW	T-bar Stainless steel wire
			Mostly spaghetti tags with T-bar anchors (149,848 releases). The English Yellow Petersen disc attached with stainless steel wire (5,847 releases) was unique to dedicated tag comparison studies.		

1978-85 Groundfish Tagging Recoveries Data Format					
Field No.	**Column No.**	**No. of Columns**	**Items**	**Codes**	**Description**
1	1-5	5	RELEASE TRIP or CRUISE	XXnnn	Left-oriented letter or letters, right-oriented number
2	6-9	4	SPECIES CODE	0010-0320	0010 - cod 0011 - haddock 0012 - white hake 0016 - pollock 0040 - American plaice 0041 - witch flounder 0042 - yellowtail flounder 0043 - winter flounder 0122 - cunner 0143 - windowpane flounder 0201 - thorny skate 0202 - smooth skate 0203 - little skate 0204 - winter skate 0300 - longhorn sculpin 0320 - sea raven
3	10-16	7	TAG NUMBER	nnnnnnn or Xnnnnnn	Left-oriented letter if exists, right - oriented number
4	17-19	3	TAG TYPE	OSP YDN	Spaghetti tag Peterson disc (English, yellow)
5	20-25	6	RECAPTURE DATE	01-31 01-12 01-99	DDMMYY

1978-85 Groundfish Tagging Recoveries Data Format					
Field No.	**Column No.**	**No. of Columns**	**Items**	**Codes**	**Description**
				blanks where unknown	
6	26-27	2	RECAPTURE METHOD	01-13, blank	blank - unknown (1,049 recoveries) 01 - otter trawl (8,656 recoveries) 02 - longline (1,265 recoveries) 03 - handline (1,132 recoveries) 04 - Danish seine (1,133 recoveries) 05 - pair trawl (1 recovery) 06 - gillnet (521 recoveries) 07 - cod trap (293 recoveries) 08 - hook (2 recoveries) 09 - scallop drag (14 recoveries) 10 - other (1,010 recoveries) 11 - weir (32 recoveries) 12 - angling or dip net (800 recoveries) 13 - pair seiner (10 recoveries)
7	28-35	8	LOCATION	00-90 00-59 00-90 00-59 blanks where unknown	Latitude - degrees North Latitude - minutes North Longitude - degrees North Longitude - minutes North
8	36-38	3	ICNAF UNIT AREA	1-9 1-9 A-Z blanks where unknown	Subarea Division Unit Area

1978-85 Groundfish Tagging Recoveries Data Format					
Field No.	**Column No.**	**No. of Columns**	**Items**	**Codes**	**Description**
9	39-41	3	DEPTH	blank-999	Fathoms
Recapture depth exists for about 77% of recoveries.					
10	42-44	3	LENGTH	blank-999	Centimetres
Roughly 43% of the recoveries were measured.					
11	45	1	MEASURED BY	1	Technician (4,003 recoveries)
				2	Other (2,895 recoveries)
				blank	Not Measured (9,020 recoveries)
12	46	1	SEX	0 or blank	Undetermined (15,199 recoveries)
				1	Male (421 recoveries)
				2	Female (298 recoveries)
13	47	1	AGEING MATERIAL	Y	Otolith (originally "YES" (1,836 recoveries)
				N or blank	None (14,077 recoveries)
				S	Scales (5 recoveries)
14	48	1	FOUND BY	1	Fisherman (8,462 recoveries)
				2	Plant operator (6,986 recoveries)
				3 or blank	Other (470 recoveries)
15	49-50	2	BOAT NATIONALITY	blank	Unknown (49 recoveries)
				CA	Canada (15,146 recoveries)
				FR	France (200 recoveries)
				NO	Norway (1 recovery)
				PG	Portugal (2 recoveries)
				RU	Russia (15 recoveries)
				UK	United Kingdom (1 recovery)

1978-85 Groundfish Tagging Recoveries Data Format

Field No.	Column No.	No. of Columns	Items	Codes	Description
				US	United States (504 recoveries)
16	51	1	WHERE FOUND	1	At sea (8,623 recoveries)
				2	At processing plant (6,939 recoveries)
				3 or blank	Other (356 recoveries)
17	52	1	SENT IN BY	1	FRB employee (10,928 recoveries)
				2	Government employee (2,664 recoveries)
				3	Industry (360 recoveries)
				4	Fisherman (1,465 recoveries)
				5 or blank	Other (501 recoveries)
18	53-54	2	WHO PAID REWARD	blank	Unknown
				CA	Canada
				FR	France
				UK	United Kingdom
				US	United States
19	55	1	REMARKS	blank	No remarks
				1	Remarks entered
	Remarks are known to have once existed for 5,364 recoveries, probably on the original transcripts, yet this field is blank for every record in the current database. But note that if the data processing person knew the cruise or trip code associated with a returned tag at the time of data entry, this was entered as a remark (and thus would have been deleted when cruise/trip code was incorporated into the data format).				
20	56-57	2	AGE	blank-99	
Roughly 10% of the recoveries were aged (essentially just the gadoids).					

Field specifications were initially derived from appendices 5 and 6 of the Laboratory Reference Manual "Groundfish Tagging Procedures" (Beanlands and McGlade, 1982).

Tagging Database Structure and Format as of January, 2006

	Variable	Format	Description
	SPECIES_RES	NUMBER(4,0)	Research species codes.
	SPECIES_COM	NUMBER(4,0)	Commercial species codes (non-generic) where they exist.
	PROGRAM	INTEGER	Tagging program codes. Never null. 1=CURRENT, 2=1978-1985, 3=1953-1973, 4=HERRING, 5=OTHER, 6=UNKNOWN, 7=FSRS; no release data for HERRING, cod in OTHER unless recovered.
	GEAR	NUMBER(2,0)	Custom release gear codes.
	GEAR_COM	NUMBER(2,0)	Commercial release gear codes. Non-commercial gears coded 90 (Miscellaneous).
	EFFORT_CNT	NUMBER	Number of effort units (e.g. hooks) used on the gear.
	EFFORT_MIN	NUMBER	Tow duration in minutes.
R	CRUISE	CHAR(10)	Any tagging event identifier (cruise, dock location, blank, etc).
E	YEAR	NUMBER(4,0)	Release year (yyyy).
L	MONTH	NUMBER(2,0)	Release month (mm).
E	DAY	NUMBER(2,0)	Release day (dd). Always NA for Program 3 (1953-1973).
A	TIME	NUMBER(4,0)	Local time 0000-2359.
S	TEMP	NUMBER	Sea surface temperature (Celsius).
E	STN	VARCHAR2	Variously defined (station identifier, sequential set, blank, etc).
	NAFO	CHAR(3)	NAFO division/subarea/unit area of release plus some combination codes for Program 4 (HERRING).
T	LATITUDE	NUMBER(8,2)	Release latitude (ddddmm.mm).
A	LONGITUDE	NUMBER(8,2)	Release longitude (ddddmm.mm).
B	DEPTH	NUMBER	Release location bottom depth (fathoms). Always NA for Program 4 (HERRING).
L	TEMPDEP	NUMBER	Temperature (Celsius) at gear or bottom depth.
E	**TAGTYPE**	CHAR(9)	Tag type/method codes. Used with TAGNUM to uniquely identify a fish. Never null.
	TAGNUM	CHAR(7)	Alphanumeric tag label. Uniquely identifies each fish in conjunction with TAGTYPE. Never null. All tag numbers for Program 3 (1953-73) are preceded with HT (Historical Tagging) to negate overlap with Program 2 (1978-85 tagging).
	REWARD	CHAR(5)	Any monetary value preceded with $, $$$$$=unspecified monetary value, $0=no reward, HAT=prize, LOT=lottery.
	SPECIAL	CHAR(1)	Q=Questionable if applied, any integer denotes the number of times the same fish was tagged if multiple or repeat tagging occurred.
	MTAGS	VARCHAR2	A TAGTYPE followed by tag numbers in chronological order where multiple or repeat tagging occurred. The first tag number designates the TAGNUM used on all records for that fish, provided the first tag number is known.
	LENGTH	NUMBER	Length at release in centimeters. Always NA for Program 4 (HERRING), pollock in Program 2 (1978-1985), which took independent LF samples instead.
	LENTYPE	NUMBER(2,0)	Release length measurement codes (1=fork length, 2=total length, 3 or blank=unspecified).
	WEIGHT	NUMBER	Live weight at release in kilograms.
	SEX	NUMBER(1,0)	Sex determined at release (0 or blank=undetermined, 1=male, 2=female, 3=immature, 4=ripe & running female). Always NA for HERRING.

	PROGRAM	INTEGER	Tagging program codes. Never null. 1=CURRENT, 2=1978-1985, 3=1953-1973, 4=HERRING, 5=OTHER, 6=UNKNOWN, 7=FSRS; no release data for HERRING, OTHER unless recovered.
	TAGTYPE	CHAR(9)	Tag type/method codes. Used with TAGNUM to uniquely identify a fish. Never null.
	TAGNUM	CHAR(7)	Alphanumeric tag label. Uniquely identifies each fish in conjunction with TAGTYPE. Never null. All tag numbers for Program 3 (1953-73) are preceded with HT (Historical Tagging) to negate overlap with Program 2 (1978-85 tagging).
	KEPT	CHAR(1)	R=Tag reported but fish released (tag not returned).
	CSPECIES_RES	NUMBER(4,0)	Research species codes.
	CSPECIES_COM	NUMBER(4,0)	Commercial species codes (non-generic) where they exist.
	CYEAR	NUMBER(4,0)	Recovery year (yyyy).
	CMONTH	NUMBER(2,0)	Recovery month (mm).
	CDAY	NUMBER(2,0)	Recovery day (dd). Always NA for Pogram 3 (1953-1973).
	CNAFO	CHAR(3)	NAFO division/subarea/unit area of recovery plus some combination codes for Program 4 (HERRING).
	CLAT	NUMBER(8,2)	Recovery latitude (ddddmm.mm).
	CLONG	NUMBER(8,2)	Recovery longitude (ddddmm.mm).
	AREADESC	CHAR(25)	Local or familiar name for area where fish caught.
	LOCDET	NUMBER(1,0)	1=lat/long given, 2=lat/long estimated on entry, 3 or blank=no lat/long.
	CGEAR	NUMBER(2,0)	Custom recovery gear codes.
	CGEAR_COM	NUMBER(2,0)	Commercial recovery gear codes. Non-commercial gears coded 90 (Miscellaneous).
	CVESSEL	CHAR(6)	CFV of vessel catching the fish.
	NATION	NUMBER(3,0)	Observer Program codes for nationality of vessel.
	FLAG	NUMBER(3,0)	Observer Program codes for nationality of license.
R	CDEPTH	NUMBER	Recovery location bottom depth (fathoms). Always NA for Program 4 (HERRING).
E	CTEMP	NUMBER	Sea surface temperature (Celsius) during recovery.
C	CTEMPDEP	NUMBER	Temperature (Celsius) at gear or bottom depth during recovery.
O	CLENGTH	NUMBER	Length (cm) at recovery. Always NA for Program 4 (HERRING).
V	CLENTYPE	NUMBER(2,0)	Recovery length measurement codes (1=fork length, 2=total length, 3 or blank=unspecified).
E	CWEIGHT	NUMBER	Weight at recovery in kilograms.
R	CWGTTYPE	NUMBER(2,0)	Recovery weight measurement codes (1=round, 2=dressed, 3 or blank=unspecified).
Y	CSEX	NUMBER(1,0)	Sex determined on recovery (0 or blank=undetermined, 1=male, 2=female, 3=immature, 4=ripe & running
	AGE	NUMBER(2,0)	Age at recovery. Always NA for HERRING.
T	AMAT	CHAR(1)	Notes if aging material collected as N or blank=not collected, Y=collected, 1=otoliths, 2=scales, 3=rays,
A			4=vertebrae, 5=otoliths & scales.

Herring Tag/Recovery Data Format			
Field No.	**Column No.**	**No. of Columns**	**Definition**
1	1-4	4	Release Vessel Code(s); usually one, sometimes two, each 2 characters
2	5-10	6	Release Date (ddmmyy)
3	11-16	6	Release Latitude (degrees, decimal minutes) [ddmmdd]
4	17-22	6	Release Longitude (ddmmdd)
5	23-25	3	Release ISN (RISN); one per release site
			The release information is redundant across recoveries from the same release "group". Unfortunately a given record will only exist for a recovered fish. Hence releases for which there were no recoveries do not formally exist in the data base. The "missing" releases appear to consist of only 4 tagging groups identified by release ISNs 113 (250 fish), 154 (2150 fish), 157 (3625 fish), and 162 (199 fish).
6	26-27	2	Release Area Code; fine scale arbitrarily assigned by Gerry Black; see attached map; see also attached appendix for ICNAF equivalents
7	28-29	2	Release Area Code; arbitrarily grouped from RA1 by Jacques Gagné
8	30-31	2	Release Area Code; pooled via filtering according to fisheries by Rob Stephenson
9	32-36	5	Total Number Released at a Site (per RISN)
10	37-38	2	Release Gear Type Code - 1 - weir (63,741 releases) 2 - purse seine (198,161 releases) 4 - shut-off (stop seine) (9,290 releases) 7 - trap (69,899 releases)
11	39-45	7	Tag Number; unique for every fish

Herring Tag/Recovery Data Format			
Field No.	**Column No.**	**No. of Columns**	**Definition**
12	46-48	3	Sample ISN; one per release sample
			The sample ISN identified subunits of a release group that related to the length-frequency data for the group. Note we had 26 release ISNs for which no sample ISN existed, and we had 48 length frequency ISNs for which no sample ISN existed in the release/recovery data. We also had two cases of the same sample ISN (i.e. same length frequency) being applied to two separate (but consecutive) release ISNs. It is not unusual for certain releases to lack a length frequency (e.g. juvenile tagging), or for one length frequency to be applied across two release groups (tagged in same spot on two days), but the unmatched length frequencies are a concern.
13	49-51	3	Number Measured for Length Frequency
14	52-57	6	Capture Date (ddmmyy)
15	58-59	2	Capture Gear Type Code - 1 - weir (3,432 recoveries) 2 - purse seine (3,834 recoveries) 3 - trap (268 recoveries) 4 - gillnet (182 recoveries) 5 - shut-off (stop seine) (239 recoveries) 6 - pair trawl (187 recoveries) 7 - otter trawl (2 recoveries) 8 - unknown (5,598 recoveries) 9 - midwater trawl (64 recoveries)
16	60-65	6	Capture Latitude (ddmmdd)
17	66-71	6	Capture Longitude (ddmmdd)
18	72-73	2	Recapture Area Code as per RA1
19	74-75	2	Recapture Area Code as per RA2

Herring Tag/Recovery Data Format			
Field No.	**Column No.**	**No. of Columns**	**Definition**
20	76-77	2	Recapture Area Code as per RA3
			Recapture locations were entered by digitization, such that existence of any location data in a record will imply existence of all location data. Both recapture area and latitude/ longitude, therefore, will either both exist or both be absent in all cases. We suspect that the 245 recaptures with full location data, but an asterisk (*) in Field 22 (data quality code) represent instances of more generalised recovery locations.
21	78-81	4	Number of Days Elapsed Since Released
22	82	1	W = captured less than 2 weeks after release, D = incomplete date field, * = general uncertainty (catch all); can be W, D or incomplete capture latitude/longitude, etc.
23	83	1	Data Processing Code; A = Atlantic, Q = Quebec, S = USA, C = S+A

NOTE: The original data base, as derived from the St. Andrews MINISUS system, was archived as HERDATOLD, with the old format including link variables used by MINISUS.

Herring Areas (RA1)
With Approximate ICNAF Equivalents

1	4XS, 4XR	31	4RD
2	4XS	32	4RC
3	4XS	33	4RB
4	4XS	34	4RA
5	4XR	35	4SW
6	4XS	36	4SV
7	4XS	37	4SY
8	4XS	38	4SX
9	4XR	39	4SS
10	4XS	40	4ST
11	4XR, 4XQ	41	4SZ
12	4XR, 4XQ	42	4TQ
13	4XQ	43	4TP
14	4XQ	44	4TD
15	4XQ	45	4TN
16	4XQ, 4XP	46	4TM
17	4XO	47	4TK
18	4XO	48	4TF
19	4XM	49	4TL
20	4WK	50	4TJ
21	4WK, 4WH, 4WE,	51	4TG
22	4WF	52	4TH
23	4VB, 4VC, 4VD	53	5ZQ
24	4WD	54	5ZG, 5ZH, 5ZJ, 5ZO, 5ZN,
25	4WD	55	5ZM
26	4VB, 4VN	56	5YE
27	4VN	57	5YD
28	4VN	58	5YD
29	4VN	59	5YC
30	4VN	60	5YB
	3PN		5YF

Appendix F

List of publications associated with the tagging activities described in this document. The numeric labels are keys to the 'References' column in Appendix A.

PUBLICATIONS LIST

1. Beckett, J.S., W.T. Stobo and C.A. Dickson. 1974. Southwesterly migration of Atlantic mackerel, Scomber scombrus, tagged off Nova Scotia. ICNAF Res. Doc. 74/94.

2. Beverton, R.J.H., and V.M. Hodder. 1962. Report of the working group of scientists on fishery assessment in relation to regulation problems. 7. Subarea 4. ICNAF Ann. Proc. 11 (sup):37-52.

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4. Clay, D., W.T. Stobo, B. Beck and P.C.F. Hurley. 1989. Growth of juvenile pollock (*Pollachius virens* L.) along the Atlantic Coast of Canada with inferences of inshore-offshore movements. J. Northw. Atl. Fish. Sci. 9:37-43.

5. D'Amours, D., K.T. Frank and G. Bugden. 1994. Report of the working group on oceanographic effects on stock migration and mixing – reviewed by the Fisheries Oceanography Committee (FOC). DFO Atl. Fish. Res. Doc. 94/54.

6. Dickie, L.M. 1963. Estimation of mortality rates of Gulf of St. Lawrence cod from results of a tagging experiment. ICNAF Spec. Publ. 4: 71-80.

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