

LABORATORY REFERENCE DOCUMENT NO. 81-17

FISHERY TRENDS OFF THE NORTHEASTERN COAST OF THE UNITED STATES, 1964-1980.

by

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Introduction

Management of the fishery resources off the Northeastern coast of the United States has traditionally been based on designating a 'target' species, and establishing quotas or other regulations for that species. However, in mixed trawl fisheries, as are prevalent in this area, single species management does not adequately account for interactions of the various species represented in the commercial catch. Determination of appropriate multiple species management units is important, and should account for annual, seasonal, geographical and depth related distributions of the various species which make up the commercial harvest.

Analyses resulting in determination of fishery units were based on a subset of this data, pooled over three recent years (1977-79), assuming these years would best represent the presently active fisheries and current levels of species abundance. Fishery units were defined by statistical area, depth zone and month, according to

similarity of species composition of the catch. This definition process is the subject of a separate document, by Murawski (et al. MS1981).

The present paper examines total nominal catch and effort, associated with the nine major fisheries between 1964 and 1980, by vessel tonclass category. These reflect changes in the principal vessel make-up of the defined fisheries, generally from smaller to larger vessels. An overall decline in total effort and catch during the late 1960's and early 1970's has been replaced by a gradual increase since 1975. Changes in the primary species composition of the major defined fisheries are also noted.

The Data Base

Data for the definition of the fisheries and analysis of changes in catches over time, were obtained from the New England commercial weighout data files of the National Marine Fisheries Service (NMFS), Northeast Fisheries Center (NEFC). These data files contain detailed information on the commercial landings from the New England, and to a lesser extent the Middle-Atlantic areas. Data for 1964 to

1980, provide catch (landings) and effort (days fished) data by tonclass and gear type, date landed, port landed at, area fished by 3 digit statistical area (Figure 1) and depth zone, species composition of the catch in pounds (converted to live weight); and effort in days fished and days absent from port, by trip. General tonclass and depth zone codes are given in Table 1. Otter trawl catches accounted for the greatest amount of the landings in each year, and our analyses are based on catches by that gear type. Catch and effort data were summarized within year, gear type and tonclass, over all trips which took place in each area-depth, within month. Landings for all ports were pooled in establishing our data base. Vessels of less than five GRT were excluded, since detailed trip information on these small vessels is not available.

The resulting yearly data files contained a series of records for each gear, month, tonclass, area and depth: one record for each species, containing weight landed, in pounds; and one trip record which contained the days fished, number of trips, days absent and total catch, all species. The number of records contained in each detailed annual data file, the number of records which were retrieved (for the 5

gear types, 12 tonclasses, and 29 statistical areas from Maine to North Carolina), and the resulting number of summarized records, by year after pooling, are given in Table 2. Data from the Maine - North Carolina area (Statistical Areas 511-632) were included in our analysis; however data from catches landed south of New England are incomplete and were not used in the determination of fisheries. Also, a significant portion of the catch in each year has been attributed to depth zones 8 and 9, which are mixed and unknown, respectively. Records from these depth zones were excluded from the analysis leading to the definition of fisheries, to prevent biases which would result from assigning them to specific depth zones.

However, once fisheries were defined and initial summaries of catch and effort, by fisheries, were prepared, catch data from depth zones 8 and 9 were apportioned to appropriate fisheries as described later. Also, to account for significant annual catches in the Middle-Atlantic area, state landings data (available on NEFC computer data files from 1974-79) were summarized by statistical area and assigned to appropriate fisheries in that area. Otter trawl

catches landed in the Middle Atlantic states (New York, New Jersey, Maryland and Virginia) from 1964-73 were summarized from annual editions of Fishery Statistics of the United States (NMFS) and are included as annual totals, since detailed information on season and location of these catches is not available. These totals provide an indication of the magnitude of the catches in the Middle Atlantic, while it is realized that they are not completely compatible with data in later years. Only the effort data recorded for trips to the Middle-Atlantic area landing in New England ports were considered, since effort for the remainder of Middle Atlantic catches is unavailable.

Methods

Initial steps in the present analysis were based on the catch (landings) and effort (days fished) data contained in the New England weighout files, since this represents the most complete and consistent data and the only source of effort data.

Nominal catch, effort (days fished) and catch per effort, for major fisheries (Table 3; also see Murawski, et

al. MS1981), defined by the data from trips made in depth zones 1-7, are assumed to be a representative subsample of all trips. Although this assumption is probably valid for the New England fisheries, which are sampled on a regular basis, it should be noted that biases may result in assuming the New England data adequately represent the Middle-Atlantic fisheries.

Days fished within the 12 tonclasses were summed for each year within each of the nine defined fisheries. This effort was then summed within three major tonclass categories (small, medium, large; Table 1) and an index of vessel size was calculated, as follows:

$$VI_j = \left[\frac{\sum_{i=1}^{n_j} E_{ij} \cdot i}{\sum_{i=1}^{n_j} E_{ij}} \right]$$

where: $i=1,2,\dots,n$ is the number of tonclasses within the vessel category, j

E_{ij} = the total effort in tonclass i , and
major tonclass category, j

This index demonstrates the annual changes in relative importance of each tonclass within the major tonclass

category, it provides an indication of changes in the makeup of the fleet.

The catches from depths 8 and 9 were prorated on an annual basis into appropriate fisheries, by tonclass category, within statistical area, as follows:

$$T_{ijk} = P_{ijk} \times c_{ij} + C_{ijk}$$

$$P_{ijk} = C_{ijk} / \sum_{k=1}^n C_{ijk}$$

n = the number of
fisheries defined in
statistical area i.

where: P_{ijk} = proportion of total statistical area i catch, by tonclass j in fishery k,

C_{ijk} = catch by tonclass j, in statistical area i, from fishery k,

c_{ij} = catch in statistical area i, by tonclass j from unknown fisheries, and

T_{ijk} = Total statistical area i catch by tonclass j, in fishery k.

Once catches from each area were prorated, all catches from each defined fishery, were summed over all statistical areas to produce estimates of total catch by fishery.

The method of prorating described above is subject to an important source of error. It assumes that catches from known depth zones are a random sample of total catches within each statistical area. This is not usually a valid assumption. Depth zone information is based on interviews of vessel captains by NMFS port agents. A higher proportion of multi-day offshore trips are interviewed than of single day inshore trips. Of course, the depth zones normally fished by offshore trips within a statistical area are usually different than inshore trips. For those trips not interviewed, depth zone is usually recorded as unknown.

An alternative method of prorating which does not depend on the assumption that catches from known depth are a random sample of total catch, makes use of species composition data to identify the proportion of catch from unknown or mixed depth zones derived for each major fishery and within a statistical area.

Assume that there are two fisheries within a statistical area. Let S_1 and S_2 be the proportion of the

catch (depth zones 1-7) of each fishery of a particular species, and S be the proportion of catch from unknown depth of the same species. If the unknown catch is a mixture of catches from the two fisheries (q the proportion from the first), then:

$$S = qS_1 + (1-q)S_2$$

Therefore, by solving for q , the unknown catch is allocated to the two fisheries based on consideration of species composition. The method can be extended to multiple (more than two) fisheries within a statistical area. Unfortunately, the results depend on the specific species selected as an indicator. Furthermore, it is more time consuming than the proration method described previously. Therefore, this method was only applied to the years 1977-79 (aggregated) as a basis for the analysis of bycatch, reported by Mayo et al. (MS1981).

Catches landed in Middle-Atlantic states, from 1974-79 were assigned to the two Middle-Atlantic fisheries (8 and 9) according to season. Fishery 9 is defined as a winter-summer fishery, so catches from January-March and

July-September, were added to catches from this fishery. Fishery 8 occurs during spring-autumn, so April-June and October-December catches from the Middle-Atlantic were assigned to that fishery. Tonclass information is not available for this component of the total catch, but based on the New England data, tonclass 3 (medium) vessels account for between 53 and 58 percent of the catch in each year (1974-79). Therefore, tonclass 3 was assumed to be the standard vessel in this area.

Effort associated with the catches from the Middle Atlantic area and depth zones 8 and 9 which were prorated or assigned to each fishery was estimated, assuming that the same catch per effort found in the initially defined fisheries was appropriate for each tonclass. Therefore:

$$E_{ij} = C_{ij} / (C/E)_{ij}$$

where: E_{ij} = estimated effort for tonclass i , in fishery j , from the Middle-Atlantic and depth zones 8 and 9,
 C_{ij} = catch from the Middle-Atlantic and depths 8 and 9 for tonclass i , assigned to fishery j ,

$(C/E)_{ij}$ = catch per effort in the defined fishery j, by tonclass i.

Middle-Atlantic and depth zone 8 and 9 catches and estimates of effort were added to previously defined catch and effort to provide estimates of the total catch and effort in each of the 9 fisheries. These final catch and effort estimates are presented in Table 4 and Figure 2, by tonclass. Catches in Fisheries 8 and 9 for 1974-79 reflect the addition of data prorated from the state landings files, assigned to medium size vessels, and do not relate directly to those of other years. In Figure 2 (h and i) total catches, only, are presented for these fisheries, with effort expressed in medium class vessel units.

Catch per effort (MT/days fished) and vessel index (size within vessel category), by major fishery are plotted in Figure 2. These plots reflect changes in the make-up of the fleets prosecuting each fishery, by revealing shifts in vessel size within tonclass category. Changes in catch per effort may indicate either changes in species abundance, or changes in relative efficiency of the fleet, within tonclass category.

Percentage catch composition of the five predominant species in each of the nine major fisheries for each year from 1964 to 1980, are presented in Table 5. These changes are based on the New England data only, as that data set was used in establishing fisheries according to species composition of the catch. Annual changes in these compositions may reflect changes in the abundance of major species as well as changes in market conditions. The totals given in the right hand column of Table 5 are the New England catches, only, while total catches, by fishery, are given in Table 8.

Total effort and catch from the nine major otter trawl fisheries accounted for between 47.7 and 74.0 percent and 47.8 and 66.0 percent, respectively, of the total otter trawl effort and catch from this data set, in each year. Most of the catch and effort not accounted for by the defined fisheries was from mixed or unknown depths (8 and 9), as summarized in Table 6. Note that the percents of catch and effort from these depth zones increased in the early 1970's, accounting for between 41 and 51 percent of the total, from 1971 to 1975. This may be the

result of changes in the proportions of trips which were interviewed in those years.

Results and Discussion

A similar trend in relative abundance indices for all species, from U.S.A. surveys, was noted by Clark and Brown (1979). They found that, after adjusting for differences in catchability of the various species, there was a 47-51% decline in biomass, from 1963 to 1974. They also noted that total biomass has increased since 1975.

Total otter trawl catches from all Fisheries (Table 8), declined steadily (53.9%) between 1964 and 1974, from 291,139 to 134,316 MT, but have increased (43.6%) since 1974, to 192,887 MT in 1979. (Middle-Atlantic catches for 1980 are not yet available, and are therefore not reflected in the Tables presented here.)

There is wide dispersion in the relative importance of the nine major fisheries, with average annual percents of the total catch ranging from 0.1% (Fishery 5; deepwater - Georges Bank) to 31.9% (Fishery 4; Central Georges Bank-Southern New England). Over the period of this study

(1964-80), Fishery 4 accounted for the greatest portion of the total catch in most years, ranging from 25.3 to 37.1% (32.1% over all years). However, since 1977, catches in Fishery 2 (deepwater - Gulf of Maine) have exceeded those in Fishery 4, by between .2 and 5.2% of the total, while for the entire time series, this Fishery accounted for 25.3% of all Fisheries' catch. It must be stressed that values given for Middle-Atlantic Fisheries (8 and 9), prior to 1974, are incomplete (fisheries 8 and 9, together with unapportioned Middle-Atlantic catches, are in fact, major contributors to the total catch for the time series, though the distribution of those catches between individual fisheries prior to 1974 is not known).

Differences between total catch estimates (from pooled 1977-79 data) based on the two described methods of proration of catches from unknown depths, (Table 7) varied among the fisheries (0.7 to 47.8%). Fishery 1 (inshore Gulf of Maine) catches prorated by tonclass were 34.2% less than when proration was based on species composition. As mentioned previously, this is due to disproportionate representation of offshore (multi-day) trips in the interviewed samples, causing a greater amount of the catches

to be assigned to the offshore fishery (2), when both fisheries operate in the same statistical area. In the Middle-Atlantic (fisheries 8 and 9) area, some statistical areas had no sampled catches upon which to base proration by species composition. Catches from these areas were assigned to Fishery 10 (Middle-Atlantic, undefined). Middle-Atlantic catches prorated by tonclass, were assigned to Fisheries 8 and 9 by season, and since all data (1977-79) were reported by month, no undefined fishery was needed for this method. This accounts for most of the differences in estimated catch between the two proration schemes.

Apparent discrepancies in estimates of annual effort for the defined fisheries may be the result of changes in the fishing practices of the fleet. For example, between 1973 and 1979 there was a net increase of 367 vessels (66.25%) landing in New England ports, while effort in days fished fluctuated $\pm 16.0\%$ annually and showed a net increase of only 18.9% over the same time period. Differences in effort are related both to the actual number of trips made in a year, and the average number of days fished per trip. In the Gulf of Maine, Georges Bank, and in Southern New England, the total number of trips declined

steadily, until 1972 to about 33% of the 1964 levels in each area, then increased to within $\pm 15\%$ of the 1964 levels by 1979. Mean days fished per trip, however, generally increases between 1964 and 1971, in the Gulf of Maine, and remained relatively constant on Georges Bank, and in the Southern New England area (Figure 2). The result was a fairly constant effort in the Gulf of Maine during that time, and a significant drop in total effort in the other two areas.

Average trip length between 1971 and 1979 remained constant in the Gulf of Maine, and in Southern New England, but decreased sharply on Georges Bank between 1974 and 1979, while the number of trips increased.

A summary of trends in catch and effort within each of the nine major fisheries and three vessel tonclasses, follows. Included is a description of trends in major species compositions in these fisheries, indicating how the fishery was defined and how that definition may have differed over time. Tables 4 and 5, and Figure 2 provide most of the information discussed here.

Fishery 1 - Gulf of Maine, Nearshore

Catches in this fishery averaged 8.5 percent of the total (annual range - 5.7 to 11.0%). Small vessels (35-50 GRT) have dominated this fishery in every year since 1964 (Table 4a; Figure 2a), and have accounted for between 38.5 % and 81.1% of the annual total. Medium size vessels accounted for less than 25% of the annual catches in the 1960's, but have accounted for 38% of the total catch since 1970. Large size vessels landed only 4.6% of total since 1964.

Small size vessel catches declined over the period 1964-76 (from about 20,000 to 6,000 MT), increased somewhat in 1977 and 1978, and then dropped to the lowest level observed, in 1979-80. This reflects a general decline in catch per effort by these vessels since 1964; there has been no overall decline in effort. Catch per effort (Figure 2a) did increase between 1976 and 1977, reflected by the increased catches noted in those years.

The primary species in this fishery during 1977-79, were cod (35%), pollock (14%), American plaice (12%), haddock (10%), with other groundfish and flounders comprising the remainder of the catch. However, in the 1960's (Table 5a), silver hake composed a much greater

portion of the catch in this fishery than during the period used in defining the fisheries.

Fishery 2 - Gulf of Maine, deep water

This fishery is one of the two predominant fisheries considered, accounting for between 15.6% and 39.4% of the total catch annually, and averaging 26.3% of the annual total during 1964-80. Medium size vessels contributed between 46.7 and 62.1% of the total effort, annually. Effort declined in the 1960's and early 1970's, primarily as a result of declines in effort by medium size vessels while slight increases occurred for small and large vessels. However, since 1977, total effort has increased significantly, approaching that observed in the early 1960's. Catches have followed the same general patterns as effort, and in 1978-1980 exceeded historical levels, in this fishery.

Catch per effort of medium size vessels (Figure 2b) remained at a fairly constant level during the study period, averaging 6.7 MT/day (+1.12), with a peak of 9.1 MT/day in 1977. There has also been a consistent mix of tonclasses within the medium size vessels, averaging in the upper third

of the size range (between 73 and 150 GRT). Catch per effort by large size vessels participating in this fishery, though generally greater than medium size vessels, has fluctuated similarly. The average vessel size within the large vessel class remained fairly constant at the lower end of the class range throughout the study period, indicating that there was no shift in very large vessels within this size class.

In the early 1960's, haddock was the predominant species taken in this fishery (about 45%), with redfish, cod, silver hake and pollock comprising a significant portion of the remainder of the catch (Table 5b). However, since the collapse of the Georges Bank and Gulf of Maine haddock stocks in the mid-1960's, redfish has predominated.

Fishery 3 - Georges Bank, Northern Edge

Catches in Fishery 3 have averaged 2.9% of the total since 1964, (annual range 1.8 to 5.4%). A general shift in effort has occurred since 1964, from large to medium size vessels, while effort by small size vessels has been minimal. Large size vessel effort had declined (Figure 2c) steadily between 1964 and 1977, but has since increased to

about 50% of earlier values. Effort by medium vessels (generally in the upper size ranges Table 1) has generally increased since the mid-1960's, when they became the dominant vessel size class.

Total catch declined sharply in the mid- 1960's, as large size vessels left the fishery, and were replaced by medium size vessels. Catches have increased continually since 1976, (Figure 2c), with increased effort by both large and medium size vessels. In 1980, total catches were about 20% less than observed in 1964 (the peak year). During 1977-79, cod and haddock made up 45% and 30% of the total catch, respectively (Table 5c). In the 1960's, haddock catches dominated this fishery (55-75%), while more recently cod has been predominant.

Fishery 4 - Central Georges Bank-Southern New England

This is the largest fishery considered, on the basis of catch and effort (range - 25.3 to 37.1 percent of annual catch). Medium size vessels have accounted for the major portion of the effort, while, that generated by small and large vessels have also been significant. Total catch (Figure 2d) declined between 1964 and 1972, after which

there has been a general increase in catch by medium and large vessels. Medium vessels have exhibited a steady increase in size within class, since 1965, (Figure 2d). Catch per effort for each tonclass, has remained fairly constant.

During 1977-79, this fishery was characterized by large catches of cod (37%), yellowtail flounder (21%), winter flounder (14%) and haddock (12%). Although the relative importance may change from year to year, these species have dominated this fishery since 1964.

Fishery 5 - Georges Bank, deep water

This is a minor fishery, with little associated effort and producing very low levels of catch each year (0.1% of total over all years). However, the deep water areas included in this fishery unit produce catches which are sufficiently different than those of the other fisheries to have been separated by cluster analysis.

Total catch in this fishery has been low, averaging about 105 MT per year, since 1971 (Table 4e; Figure 2e). Large vessels produced the greatest catches in 1965-67, while medium size vessels have been dominant since then.

This fishery was characterized, during the 1977-79 definition period, by predominant catches of lobster (43%), and significant catches of silver hake (20%) and redfish(19%). Lobster was the primary catch in this fishery in most years between 1968 and 1978, while prior to 1968, and in 1979 and 1980, other groundfish species as cod, haddock and silver hake (Table 5e) have been a major component of this fishery. In fact, this is probably a part of the Georges Bank groundfish fishery which occasionally moves into deeper waters, and as a consequence takes greater proportions of lobster.

Fishery 6 - Vineyard Sound, May-June

This fishery contributes a minor amount to the total catch (an average of 0.68%, and ranging from 0.10 to 1.81%, of the annual catches during the study period). However, cluster analysis indicated it to be very distinct in time and space, and it has recently been the target of a growing fleet of vessels. Small size vessels dominated this fishery (Table 4f), with effort varying by as much as 200% between years, until 1975. Since that time, medium size vessels have entered the fishery, and effort has increased (Figure

2f). Large vessels rarely participate in this fishery, as indicated in Table 4f.

Catches and effort in this fishery have fluctuated widely, but have increased since 1976, when medium size vessels entered the fishery in great numbers (Figure 2f).

This fishery was characterized as a Loligo squid (40%), scup (26%), and winter flounder (12%) fishery, in 1977-79, and increases in effort reflect a combination of the increased marketability of squid and closures in other fisheries (as Southern New England, yellowtail flounder) during May and June in recent years. Effort was directed primarily towards scup and winter flounder in earlier years (Table 5f).

Fishery 7 - Southern New England, inshore

Fishery 7 catches averaged 11.6% of the annual total since 1964 (between 7.2 and 20.0%, annually). This fishery was dominated by small vessels until 1976, at which time medium vessel effort increased to comparable levels. Effort for both small and medium tonclass vessels (Figure 2g) has fluctuated considerably since 1964. Large vessels have not

been a major component of this fishery (though they did account for 57% of the total effort in 1968).

Total catch in this fishery increased between 1964 and 1967, but began dropping in 1968 (Table 5g; Figure 2g). This decline has continued for small vessels, accompanied by continual decreases in catch per effort. However, while catch by medium vessels increased again until 1979, when it declined in 1980, catch per effort remained constant.

This fishery is characterized as the southern New England inshore fishery with 37% of 1977-1979 catches going for reduction purposes, while silver hake (18%), butterfish (9%), and mixed flounders (22%) were also landed separately. Historically, between 30% and 60% of the landings in this fishery have gone for reduction, while in recent years greater percents have been separated out as marketable species (Table 5g). This has been the third most significant of the nine major fisheries.

Fishery 8 - Middle-Atlantic, spring-autumn

In general, total catch in Fishery 8 has increased since 1974 (the first year that area and seasonal data for Middle-Atlantic state catches were available to permit

proration by season), although a significant drop occurred in 1978 (Table 4h; Figure 2h; note that 1980 Middle Atlantic State catches are not yet available). Total effort, fluctuated since 1974. Catch per effort (Figure 2h), has dropped steadily since 1977.

Fishery 8 catches (Middle Atlantic catches; prorated between fisheries 8 and 9 prior to 1974, as described for fishery 9) dropped (from 48,000 to 9,000 MT in 1971), while catches attributed to New England based vessels remained relatively constant (3,780±405MT), during that period.

Scup dominated landings during 1977-79 (New England based vessels), (34%), while butterfish (11%) and several flounder species (27%), contributed significantly to total landings (Table 5h). However, in the 1960's, as much as 69% of the landings from Fishery 8 were industrial.

Fishery 9 - Middle-Atlantic, winter-summer

Total catch in Fishery 9 has generally increased since 1974 (the first year that Middle-Atlantic state catches were available in adequate detail to permit proration between fisheries 8 and 9), with a significant peak, in 1976 (Figure

2i). Total effort, based on annual medium size vessel catch per effort values for the New England portion of landings, and total catch, all vessels, have paralleled catch, generally increasing since 1974 (Table 4). Total Middle-Atlantic catches prior to 1974, were prorated between fisheries 8 and 9 according to the 1974-79 ratio, and are shown in Figure 2i. There was a dramatic decline in these catches between 1964 and 1970, attributed to Middle-Atlantic based vessels, while New England based landings have remained at generally low levels throughout the time series.

In defining this fishery, the major species taken for the 1977-79 period were summer flounder (66%) and tilefish (16%). However, lobster, silver hake and industrial catches have dominated this fishery at various times in the past (Table 5i).

LITERATURE CITED

- Mayo, R.K., A.M.T. Lange, S.A. Murawaki, M.P. Sissenwine, and B.E. Brown. 1981. Estimation of discards in mixed trawl fisheries off the Northeast coast of the United States, based on bottom trawl survey catches. NMFS, NEFC, Lab. Ref. No. 81-18.
- Murawski, S.A., A.M.T. Lange, R.K. Mayo, M.P. Sissenwine, and B.E. Brown. 1981. Species similarity of otter trawl catches off the Northeast coast of the United States. NMFS, NEFC, Lab. Ref. No. 81-16.
- Clark, S.H. and B.E. Brown. 1979. Trends in Biomass of finfishes and squids in ICNAF Subarea 5 and Statistical Area 6, 1964-1977, as determined from Research vessel survey data. Investigacion Pesquera. Vol. 43(1), p107-122.

Table 1. Vessel class and depth codes used in fishery definition analysis

Vessel Ton class				Depth Zone	
Code	Class		Tonnage	Code	Depth (Fathoms)
1	21	Small	5-10	1	0-30
2	22	"	11-15	2	31-60
3	23	"	16-22	3	61-100
4	24	"	23-33	4	101-150
5	25	"	34-50	5	151-200
6	31	Medium	51-72	6	201-300
7	32	"	73-104	7	over300
8	33	"	105-150	8	mixed
9	41	Large	151-215	9	unknown
10	42	"	216-310		
11	43	"	311-440		
12	44	"	441-500		

Table 2. Number of Commercial data records used in the initial analysis of fisheries from the New England weighthout file, 1964-1980

Number of Records

Year	Examined[1]	Used[2]	Summarized[3]
1964	175479	161433	21498
1965	171777	161334	21261
1966	174423	163200	20355
1967	160473	150740	20636
1968	143280	136040	19526
1969	140613	135391	19481
1970	147589	140485	20945
1971	138818	132967	23249
1972	129048	119182	23880
1973	141997	132424	22980
1974	175035	163694	26012
1975	196434	179876	28692
1976	200724	182219	30059
1977	225337	205958	33440
1978	273264	216489	33881
1979	302181	249024	39240
1980	325978	262143	39449

[1]Number of records on the annual data tapes, all gears, areas, depths, ports, etc.

[2]Number of records for gears, areas, depths and ports used in analysis.

[3]Final number of records, summed over vessels and ports within month, ton class, area, depth, and gear categories.

Table 3. General description of the nine major defined fisheries

General		
Fishery	Description	Season
1	Gulf of Main {Nearshore}	Year round
2	Gulf of Main {Deep water}	Year round
3	Georges Bank {Northern Edge}	Year round
4	Central Georges Bank -	Year round
	Southern New England	
5	Georges Bank {Deep water}	Year round
6	Vineyard Sound	Summer
7	Southern New England {Inshore}	Year round
8	Mid-Atlantic	Spring-autumn
9	Mid-Atlantic	Winter-summer

Table . Catch, catch per effort and effort, by vessel tonclass category, 1964-80, within the 9 major defined fisheries.

a. Fishery 1.

Year	Small Vessels			Medium Vessels			Large Vessels			Total Catch	Total Effort
	Catch	C/E	Effort	Catch	C/E	Effort	Catch	C/E	Effort		
1964	11428	7.24	1578.45	31086	6.66	4667.57	8716	6.90	1263.19	51230	7509.21
1965	8938	7.09	1260.65	24586	5.97	4118.26	10210	6.54	1561.16	43734	6940.07
1966	8987	8.08	1112.25	29901	7.04	4247.30	10765	7.72	1394.43	49653	6753.98
1967	13084	6.81	1921.29	21666	5.20	4166.54	13654	8.98	1520.49	48404	7608.32
1968	16478	8.74	1885.35	20978	5.44	3856.25	11319	7.15	1583.08	48775	7324.68
1969	14638	5.49	2666.30	19446	5.67	3429.63	14425	8.11	1778.67	48509	7874.60
1970	14984	7.25	2066.76	21081	6.30	3346.19	15516	6.27	2474.64	51581	7887.59
1971	15391	8.27	1861.06	23483	6.06	3875.08	13809	10.64	1297.84	52683	7033.98
1972	11803	5.90	2000.51	17654	6.37	2771.43	9280	11.11	835.28	38737	5607.22
1973	9876	5.72	1726.57	19306	8.34	2314.87	8474	10.98	771.77	37656	4813.21
1974	9999	4.60	2173.70	15689	6.80	2307.21	8670	9.26	936.29	34358	5417.19
1975	9857	5.52	1785.69	17885	7.41	2413.63	9037	9.06	997.46	36779	5196.78
1976	8656	5.89	1469.61	17196	7.82	2198.98	10066	10.21	985.90	35918	4654.48
1977	11348	7.49	1515.09	23417	9.06	2584.66	12352	11.08	1114.80	47117	5214.55
1978	6726	5.48	1227.37	27645	7.90	3499.37	17124	12.23	1400.16	51495	6126.90
1979	13545	4.97	2725.35	28818	5.56	5183.09	16380	9.37	1748.13	58743	9656.58
1980	17131	4.70	3644.89	28844	5.66	5096.11	17608	8.08	2179.21	63583	10920.21

1. Estimated total catch by tonclass, within fishery, from all data sources.

2. Catch per effort based on the New England catch and effort data, assuming to be representative of the entire fishery.

Table 4b. Fishery 2.

Year	Small Vessels			Medium Vessels			Large Vessels			Total Catch	Total Effort
	Catch	C/E	Effort	Catch	C/E	Effort	Catch	C/E	Effort		
1964	11428	7.24	1578.45	31086	6.66	4667.57	8716	6.90	1263.19	51230	7509.21
1965	8938	7.09	1260.65	24586	5.97	4118.26	10210	6.54	1561.16	43734	6940.07
1966	8987	8.08	1112.25	29901	7.04	4247.30	10765	7.72	1394.43	49653	6753.98
1967	13084	6.81	1921.29	21666	5.20	4166.54	13654	8.98	1520.49	48404	7608.32
1968	16478	8.74	1885.35	20978	5.44	3856.25	11319	7.15	1583.08	48775	7324.68
1969	14638	5.49	2666.30	19446	5.67	3429.63	14425	8.11	1778.67	48509	7874.60
1970	14984	7.25	2066.76	21081	6.30	3346.19	15516	6.27	2474.64	51581	7887.59
1971	15391	8.27	1861.06	23483	6.06	3875.08	13809	10.64	1297.84	52683	7033.98
1972	11803	5.90	2000.51	17654	6.37	2771.43	9280	11.11	835.28	38737	5607.22
1973	9876	5.72	1726.57	19306	8.34	2314.87	8474	10.98	771.77	37656	4813.21
1974	9999	4.60	2173.70	15689	6.80	2307.21	8670	9.26	936.29	34358	5417.19
1975	9857	5.52	1785.69	17885	7.41	2413.63	9037	9.06	997.46	36779	5196.78
1976	8656	5.89	1469.61	17196	7.82	2198.98	10066	10.21	985.90	35918	4654.48
1977	11348	7.49	1515.09	23417	9.06	2584.66	12352	11.08	1114.80	47117	5214.55
1978	6726	5.48	1227.37	27645	7.90	3499.37	17124	12.23	1400.16	51495	6126.90
1979	13545	4.97	2725.35	28818	5.56	5183.09	16380	9.37	1748.13	58743	9656.58
1980	17131	4.70	3644.89	28844	5.66	5096.11	17608	8.08	2179.21	63583	10920.21

Table 4c. Fishery 3.

Year	Small Vessels			Medium Vessels			Large Vessels			Total Catch	Total Effort
	Catch	C/E	Effort	Catch	C/E	Effort	Catch	C/E	Effort		
1964	389	5.07	76.73	3324	6.13	542.25	7339	7.85	934.90	11052	1553.88
1965	1547	3.24	477.47	2887	5.35	539.63	4097	6.59	621.70	8531	1638.79
1966	947	3.61	262.33	2897	5.68	510.04	4198	6.19	678.19	8042	1450.55
1967	614	3.04	201.97	2160	4.92	439.02	1929	5.58	345.70	4703	986.70
1968	269	1.20	224.17	2293	4.75	482.74	2663	5.94	448.32	5225	1155.22
1969	182	0.52	350.00	2152	4.90	439.18	1884	6.49	290.29	4218	1079.48
1970	0			1814	4.50	403.11	2033	5.57	364.99	3847	768.10
1971	0			2537	3.90	650.51	1441	4.98	289.36	3978	939.87
1972	0			1500	3.69	406.50	1564	5.20	300.77	3064	707.27
1973	0			2517	4.23	595.04	1809	8.25	219.27	4326	814.31
1974	18	2.16	8.33	1918	3.43	559.18	1992	6.73	295.99	3928	863.51
1975	22	1.51	14.57	1604	3.54	453.11	1826	6.72	271.73	3452	739.40
1976				1804	2.96	609.46	887	4.79	185.18	2691	794.64
1977	270	2.03	133.00	2213	5.16	428.88	1659	9.77	169.81	4142	731.69
1978	21	3.30	6.36	3373	5.03	670.58	2318	12.22	189.69	5712	866.63
1979	531	1.02	520.59	4674	4.96	942.34	3362	7.56	444.71	8567	1907.64
1980	14	2.76	5.07	4406	5.60	786.79	4217	8.05	523.85	8637	1315.71

Table 4d. Fishery 4.

Year	Small Vessels			Medium Vessels			Large Vessels			Total Catch	Total Effort
	Catch	C/E	Effort	Catch	C/E	Effort	Catch	C/E	Effort		
1964	18297	5.57	3284.92	50581	5.90	8573.05	13992	6.74	2075.96	82870	13933.93
1965	19500	4.43	4401.81	57135	5.20	10987.50	21895	7.09	3088.15	98530	18477.46
1966	16283	4.25	3831.29	50674	4.36	11622.48	19445	6.03	3224.71	86402	18678.48
1967	15671	5.20	3013.65	45899	4.56	10065.57	16076	5.16	3115.50	77646	16194.73
1968	11148	5.67	1966.14	47664	4.55	10475.60	13938	5.35	2605.23	72750	15046.98
1969	8757	5.17	1693.81	44436	4.06	10944.83	11511	5.57	2066.61	64704	14705.24
1970	8484	4.42	1919.46	41307	3.73	11074.26	7458	5.08	1468.11	57249	14461.83
1971	7066	3.91	1807.16	35064	3.38	10373.96	8432	5.02	1679.68	50562	13860.81
1972	6164	3.67	1679.56	31440	3.92	8020.41	4944	4.23	1168.79	42548	10868.77
1973	6640	4.37	1519.45	32688	3.18	10279.25	7100	5.81	1222.03	46428	13020.73
1974	6803	3.60	1889.72	33070	2.88	11482.64	7654	4.77	1604.61	47527	14976.97
1975	4370	3.70	1181.08	29817	3.25	9174.46	6524	4.14	1575.85	40711	11931.39
1976	3951	4.21	938.48	29288	3.87	7567.96	7492	5.33	1405.63	40731	9912.07
1977	5322	3.96	1343.94	34825	4.12	8452.67	6661	6.99	952.93	46808	10749.54
1978	7261	4.11	1766.67	34266	4.29	7987.41	6386	6.83	934.99	47913	10689.07
1979	5451	3.26	1672.09	34646	4.81	7202.91	8623	6.32	1364.40	48720	10239.40
1980	5637	3.61	1561.50	40091	13.16	3046.43	11692	7.22	1619.39	57420	6227.31

Table 4e. Fishery 5.

Year	Small Vessels			Medium Vessels			Large Vessels			Total Catch	Total Effort
	Catch	C/E	Effort	Catch	C/E	Effort	Catch	C/E	Effort		
1964				13	8.68	1.50	32	5.87	5.45	45	6.95
1965		1.21		12	1.03	11.65	255	7.81	32.65	267	44.30
1966				18	4.53	3.97	606	10.84	55.90	624	59.88
1967				205	0.89	230.34	292	5.62	51.96	497	282.29
1968	3	0.48	6.25	218	0.81	269.14	66	2.22	29.73	287	305.12
1969	3			197	0.75	262.67	25	15.03	1.66	225	264.33
1970				73	1.51	48.34	39	1.17	33.33	112	81.68
1971				62	0.67	92.54	32	0.77	41.56	94	134.10
1972				15	0.48	31.25	84	3.30	25.45	99	56.70
1973				33	0.67	49.25	21	1.72	12.21	54	61.46
1974				58	0.62	93.55	27	0.74	36.49	85	130.03
1975				62	0.72	86.11	41	1.53	26.80	103	112.91
1976				46	1.29	35.66	83	1.55	53.55	129	89.21
1977	41			69	1.43	48.25	82	1.23	66.67	192	114.92
1978				52	0.70	74.29	55	1.65	33.33	107	107.62
1979				6	0.88	6.82	68	14.64	4.64	74	11.46
1980				53	2.45	21.63	59	3.07	19.22	112	40.85

Table 4f. Fishery 6.

Year	Small Vessels			Medium Vessels			Large Vessels			Total Catch	Total Effort
	Catch	C/E	Effort	Catch	C/E	Effort	Catch	C/E	Effort		
1964	241	4.04	59.65	11	8.45	1.30				252	60.96
1965	402	4.06	99.01	64	8.54	7.49				466	106.51
1966	744	3.35	222.09	243	6.32	38.45				987	260.54
1967	630	2.83	222.61	62	6.43	9.64	19	5.28	3.60	711	235.86
1968	439	3.09	142.07	119	3.60	33.06				558	175.13
1969	555	3.82	145.29	154	5.92	26.01				709	171.30
1970	800	4.65	172.04	88	7.55	11.66				888	183.70
1971	795	4.42	179.86	75	2.79	26.88				870	206.75
1972	406	3.97	102.27	60	5.73	10.47				466	112.74
1973	601	3.82	157.33	434	7.00	62.00				1035	219.33
1974	453	3.26	138.96	195	6.45	30.23				648	169.19
1975	764	5.55	137.66	289	5.96	48.49				1053	186.15
1976	1178	2.39	492.89	910	4.76	191.18				2088	684.06
1977	974	4.22	230.81	737	5.05	145.94				1711	376.75
1978	757	2.96	255.74	347	4.12	84.22				1104	339.97
1979	1199	3.43	349.56	2029	6.82	297.51	15	22.40	0.67	3243	647.74
1980	732	5.42	135.06	2027	9.06	223.73	153	4.46	34.30	2912	393.09

Table 4g. Fishery 7.

Year	Small Vessels			Medium Vessels			Large Vessels			Total Catch	Total Effort
	Catch	C/E	Effort	Catch	C/E	Effort	Catch	C/E	Effort		
1964	16573	15.15	1093.93	8028	18.53	433.24	7	2.40	2.92	24608	1530.09
1965	17531	14.70	1192.59	7402	25.27	292.92				24933	1485.50
1966	20659	16.61	1243.77	6485	13.06	496.55	102	7.17	14.23	27246	1754.55
1967	22040	20.81	1059.11	6257	7.19	870.24	12	0.40	30.00	28309	1959.34
1968	23923	19.87	1203.98	10421	6.63	1571.79	8314	2.22	3745.05	42658	6520.82
1969	20476	22.39	914.52	10549	14.60	722.53	223	2.34	95.30	31248	1732.35
1970	12258	10.88	1126.65	13865	16.49	840.81	5963	5.42	1100.18	32086	3067.65
1971	8812	9.27	950.59	9194	13.83	664.79	44	5.88	7.48	18050	1622.86
1972	8216	9.35	878.72	6487	13.19	491.81	130	11.19	11.62	14833	1382.15
1973	9855	9.26	1064.25	8821	14.75	598.03	26	5.38	4.83	18702	1667.12
1974	7629	6.51	1171.89	5923	5.91	1002.20	19	3.38	5.62	13571	2179.71
1975	6786	6.28	1080.57	4646	6.35	731.65	462	6.74	68.55	11894	1880.77
1976	8882	7.06	1258.07	6807	5.23	1301.53	399	1.70	234.71	16088	2794.31
1977	5657	9.40	601.81	7282	10.82	673.01	374	5.88	63.61	13313	1338.43
1978	4346	7.39	588.09	10243	9.13	1121.91	4777	12.61	378.83	19366	2088.82
1979	5683	6.40	887.97	11733	13.44	872.99	665	18.60	35.75	18081	1796.71
1980	2966	4.53	654.75	8407	13.16	638.83	208	5.63	36.94	11581	1330.52

Table 4h. Fishery 8.

Year	Small Vessels			Medium Vessels			Large Vessels			Total Catch	Total Effort
	Catch	C/E	Effort	Catch	C/E	Effort	Catch	C/E	Effort		
1964	3187	8.09	393.94	590	9.69	60.89	24	5.67	4.23	3801	459.06
1965	2880	8.55	336.84	839	9.89	84.83	104	5.12	20.31	3823	441.99
1966	2495	9.10	274.18	1151	5.86	196.42	5	5.86	0.85	3651	471.45
1967	2498	10.61	235.44	1222	8.83	138.39				3720	373.83
1968	2544	13.57	187.47	1757	6.04	290.89				4301	478.37
1969	1492	10.78	138.40	1537	13.51	113.77	1	8.20	0.12	3030	252.29
1970	1075	7.35	146.26	2913	16.48	176.76	147	2.26	65.04	4135	388.06
1971	501	4.99	100.40	373	7.30	51.10				874	151.50
1972	1041	4.63	224.84	1019	7.51	135.69				2060	360.52
1973	213	2.67	79.78	175	2.48	70.56				388	150.34
1974	1176	2.91	404.12	10717	4.82	2223.44				11893	2627.57
1975	1259	5.11	246.38	16070	3.97	4047.86	7	1.56	4.49	17336	4298.73
1976	655	2.03	322.66	20043	3.43	5843.44				20698	6166.10
1977	825	7.02	117.52	20049	6.82	2939.74	82	1.50	54.67	20956	3111.92
1978	580	5.42	107.01	12336	4.70	2624.68	393	1.59	247.17	13309	2978.86
1979	810	3.88	208.76	23281	4.51	5162.08	236	7.35	32.11	24327	5402.96
1980	698	2.51	278.09	1369	4.64	295.04	10	1.36	7.35	2077	580.48

1. Catches from 1974-80 include Middle-Atlantic data from state landings files, prorated between Fishery 8 and 9 according to season. Seasonal data is not available for earlier years. All catches are assumed to be by tonclass 3.

Table 4i. Fishery 9.

Year	Small Vessels			Medium Vessels			Large Vessels			Total Catch	Total Effort
	Catch	C/E	Effort	Catch	C/E	Effort	Catch	C/E	Effort		
1964	160	1.35	118.52	289	1.29	224.03				449	342.55
1965	1087	2.16	503.24	1350	4.78	282.43	111	2.69	41.26	2548	826.93
1966	573	3.43	167.06	482	7.66	62.92	77	12.52	6.15	1132	236.13
1967	464	3.35	138.51	662	1.54	429.87	99	1.36	72.79	1225	641.17
1968	331	1.58	209.49	587	1.22	481.15	824	0.79	1043.04	1742	1733.68
1969	564	2.86	197.20	775	2.37	327.00	61	3.17	19.24	1400	543.45
1970	184	1.38	133.33	534	1.65	323.64	363	2.75	132.00	1081	588.97
1971	230	5.01	45.91	969	4.15	233.49				1199	279.40
1972	66	5.23	12.62	82	2.61	31.42	13	2.92	4.45	161	48.49
1973	304	6.22	48.87	731	6.58	111.09	0	0.00		1035	159.97
1974	83	2.92	28.42	10311	4.49	2296.44	110	4.65	23.66	10504	2348.52
1975	112	4.37	25.63	15656	3.14	4985.99	81	4.67	17.34	15849	5028.96
1976	141	1.96	71.94	24804	2.34	10600.00	94	2.40	39.17	25039	10711.11
1977	71	2.06	34.47	17080	2.33	7330.47	42	1.58	26.58	17193	7391.52
1978	292	3.79	77.04	13275	2.15	6174.42	34	2.33	14.59	13601	6266.06
1979	139	2.95	47.12	19864	2.36	8416.95	209	5.14	40.66	20212	8504.73
1980	120	7.60	15.79	430	4.83	89.03	494	6.92	71.39	1044	176.20

1. Catches from 1974-79 include Middle-Atlantic data from State landings files, prorated between Fisheries 8 and 9 according to season. Seasonal data is not available for earlier years. All catches are assumed to be by Tonclass 3 vessels.

Table 5. Summary of major species composition (first five species), in per cent, by weight for the nine major fisheries, in total catch (MT) by New England based vessels, 1964-1980.

a. Fishery 1.

Year	Species Rank										Catch(MT)
	1 Species	%	2 Species	%	3 Species	%	4 Species	%	5 Species	%	
1964	S. Hake	73.0	Haddock	6.5	Redfish	3.1	Pollock	3.1	Cod	2.6	16,533
1965	S. Hake	63.3	Haddock	8.6	Pollock	6.2	Cod	5.1	YTF	5.0	8,101
1966	S. Hake	51.0	Haddock	16.3	Cod	8.2	YTF	7.8	Wintr F	4.6	5,776
1967	Cod	26.6	Haddock	24.0	YTF	17.2	S. Hake	8.6	Wintr F	5.9	4,749
1968	S. Hake	51.4	Haddock	15.4	Cod	14.9	Wintr F	4.8	YTF	3.6	4,138
1969	S. Hake	36.5	Cod	27.7	Haddock	11.2	Wintr F	7.0	Pollock	4.4	2,721
1970	S. Hake	27.5	Cod	20.1	Redfish	13.8	Haddock	6.7	Winter F	6.5	1,830
1971	S. Hake	31.3	Herring	14.0	Cod	11.7	Pollock	10.1	Redfish	9.0	1,804
1972	Herring	23.0	Pollock	16.3	Cod	14.7	S. Hake	8.8	Wintr F	8.3	3,869
1973	S. Hake	40.0	Pollock	11.7	Cod	11.4	Shrimp	8.3	YTF	6.6	3,401
1974	S. Hake	21.4	Cod	20.5	Pollock	18.0	Shrimp	11.7	Oth red	4.2	4,155
1975	Cod	22.7	S. Hake	14.1	Shrimp	10.9	Pollock	10.7	A plaic	6.7	2,893
1976	Cod	33.9	S. Hake	18.8	Pollock	13.4	Haddock	8.0	A plaic	5.8	4,098
1977	Cod	36.8	Pollock	17.5	A plaic	10.9	Haddock	7.2	S. Hake	6.1	5,088
1978	Cod	30.2	Pollock	16.6	A plaic	14.2	Haddock	10.2	S. Hake	6.9	5,197
1979	Cod	37.9	Haddock	16.2	A plaic	10.7	Pollock	6.2	YTF	5.4	3,308
1980	Cod	34.5	Pollock	15.5	Haddock	11.1	Redfish	7.7	A plaic	7.6	6,622

Table 5b. Fishery 2.

Year	Species Rank										Catch(MT)
	1 Species	%	2 Species	%	3 Species	%	4 Species	%	5 Species	%	
1964	Haddock	45.7	Redfish	17.2	S. Hake	14.2	Cod	6.8	Pollock	5.9	36,812
1965	Haddock	51.2	Redfish	16.2	S. Hake	8.2	Cod	7.9	Pollock	6.2	30,767
1966	Haddock	48.0	S. Hake	17.9	Redfish	14.3	Cod	6.1	Wintr F	4.1	35,699
1967	Haddock	42.3	Redfish	23.0	Cod	9.4	S. Hake	9.0	Wintr F	5.3	27,954
1968	Haddock	37.2	S. Hake	20.2	Redfish	13.0	Cod	12.7	Wintr F	5.0	23,806
1969	Redfish	24.0	Haddock	22.9	Cod	20.6	Pollock	8.1	S. Hake	7.9	20,171
1970	Redfish	22.7	S. Hake	21.3	Cod	16.5	Haddock	13.4	Pollock	8.6	16,326
1971	Redfish	46.6	S. Hake	11.2	Cod	10.7	Pollock	7.6	Haddock	7.4	19,622
1972	Redfish	51.0	Cod	11.5	Pollock	8.6	S. Hake	5.8	Haddock	4.0	18,586
1973	Redfish	44.2	S. Hake	17.0	Cod	10.8	Pollock	8.4	Shrimp	6.2	22,955
1974	Redfish	36.1	Cod	15.1	Pollock	13.0	Shrimp	9.4	S. Hake	8.8	20,781
1975	Redfish	32.3	S. Hake	20.6	Cod	14.6	Pollock	11.0	Haddock	5.8	23,260
1976	Redfish	36.9	S. Hake	18.9	Cod	14.0	Pollock	12.7	Haddock	5.6	22,439
1977	Redfish	37.6	S. Hake	20.8	Cod	11.8	Haddock	8.4	Pollock	8.0	29,653
1978	Redfish	31.7	S. Hake	18.2	Haddock	13.8	Cod	12.4	Pollock	10.9	36,620
1979	Redfish	32.5	Haddock	18.0	Cod	16.5	Pollock	11.5	A plaic	6.2	34,003
1980	Haddock	21.8	Cod	20.2	Redfish	18.9	Pollock	11.4	A plaic	7.5	36,785

Table 5c. Fishery 3.

Year	Species Rank										Catch (MT)
	1 Species	%	2 Species	%	3 Species	%	4 Species	%	5 Species	%	
1964	Haddock	61.9	Cod	20.3	YTF	7.1	Pollock	3.8	Wintr F	3.4	9,163
1965	Haddock	70.5	Cod	17.4	Wintr F	4.9	Pollock	2.4	YTF	2.4	6,150
1966	Haddock	75.1	Cod	12.5	Wintr F	4.5	YTF	2.3	Pollock	2.2	6,038
1967	Haddock	61.5	Cod	21.7	Wintr F	6.7	YTF	4.2	Pollock	3.2	3,628
1968	Haddock	54.7	Cod	32.2	Wintr F	4.6	YTF	3.5	Pollock	2.1	4,185
1969	Haddock	44.3	Cod	27.4	YTF	15.6	Wintr F	6.8	Pollock	2.6	3,620
1970	Cod	33.8	Haddock	30.5	YTF	15.2	S. Hake	7.1	Winter F	6.6	3,172
1971	Cod	25.0	Haddock	22.1	YTF	21.5	S. Hake	9.4	Wintr F	7.3	3,060
1972	Cod	41.2	Haddock	21.6	Pollock	11.3	YTF	10.0	Wintr F	7.4	2,363
1973	Cod	38.9	YTF	23.5	Haddock	15.9	Pollock	6.0	Wintr F	5.7	3,847
1974	Cod	43.4	YTF	23.4	Haddock	9.2	Pollock	9.1	S. Hake	4.8	3,400
1975	Cod	43.3	Haddock	20.0	YTF	12.7	Pollock	9.2	Wintr F	6.8	3,215
1976	Cod	35.6	YTF	23.2	Haddock	16.3	Wintr F	7.9	Pollock	7.5	2,394
1977	Cod	53.4	Haddock	21.7	YTF	8.6	Wintr F	6.2	Pollock	5.3	3,600
1978	Cod	40.9	Haddock	32.7	Wintr F	7.3	Pollock	5.1	YTF	4.2	4,883
1979	Cod	43.0	Haddock	33.9	Wintr F	5.5	Pollock	4.9	YTF	4.6	6,416
1980	Cod	47.6	Haddock	31.8	Pollock	5.1	YTF	5.1	Wintr F	3.8	7,300

Table 5d. Fishery 4.

Year	Species Rank										Catch(MT)
	1 Species	%	2 Species	%	3 Species	%	4 Species	%	5 Species	%	
1964	YTF	40.9	Haddock	28.6	Cod	8.6	Wintr F	6.9	S. Hake	6.7	70,839
1965	YTF	35.6	Haddock	35.2	Wintr F	8.2	Cod	7.6	S. Hake	5.7	76,615
1966	Haddock	32.7	YTF	32.7	Wintr F	11.4	Cod	8.7	S. Hake	5.8	73,251
1967	YTF	29.1	Haddock	26.9	Cod	10.8	Wintr F	10.1	S. Hake	9.9	61,299
1968	YTF	41.5	Haddock	19.9	Cod	12.5	Oth red	8.2	Wintr F	7.6	55,898
1969	YTF	44.0	Cod	15.4	Haddock	15.3	Wintr F	11.7	Oth red	8.0	52,996
1970	YTF	49.6	Cod	14.2	Winter F	13.5	Haddock	8.4	Oth red	7.2	48,002
1971	YTF	37.5	Cod	21.9	Wintr F	13.2	Haddock	11.1	Oth red	6.6	35,058
1972	YTF	49.0	Cod	19.6	Wintr F	12.8	Haddock	6.4	Oth red	2.6	27,775
1973	YTF	45.6	Cod	24.1	Wintr F	10.6	S. Hake	6.8	Haddock	3.8	31,486
1974	YTF	42.9	Cod	28.8	Wintr F	10.9	Haddock	4.0	Pollock	2.7	30,098
1975	YTF	39.8	Cod	24.2	Wintr F	13.3	Haddock	5.0	Wndpn F	4.3	30,338
1976	YTF	33.6	Cod	27.3	Wintr F	10.6	S. Hake	8.0	Wndpn F	4.0	28,777
1977	Cod	32.4	YTF	26.9	Wintr F	13.7	Haddock	10.8	Pollock	5.2	34,211
1978	Cod	38.3	YTF	17.2	Wintr F	14.5	Haddock	13.6	Pollock	4.2	33,228
1979	Cod	41.3	YTF	19.3	Wintr F	13.5	Haddock	13.0	Pollock	3.1	35,091
1980	Cod	39.0	YTF	18.3	Wintr F	17.3	Haddock	14.7	Pollock	3.5	42,549

Table 5e. Fishery 5.

Year	Species Rank										Catch(MT)
	1 Species	%	2 Species	%	3 Species	%	4 Species	%	5 Species	%	
1964	Haddock	91.0	Cod	1.3	Pollock	1.0	Wintr F	0.8	YTF	0.3	45
1965	Haddock	56.2	Cod	20.6	Lobster	8.7	Pollock	8.7	Cusk	2.2	277
1966	Haddock	83.6	Cod	10.9	Pollock	4.4	Cusk	0.4	Wintr F	0.3	613
1967	Haddock	50.8	Shrimp	36.9	Cod	7.8	Wintr F	1.5	Pollock	1.5	468
1968	Lobster	76.9	Cod	8.7	Haddock	5.4	Pollock	4.5	Sum Fld	1.7	292
1969	Lobster	87.6	S. Hake	10.5	Btrfish	1.3	W. Hake	0.6	-	-	219
1970	Lobster	54.9	Winter F	8.8	Haddock	8.1	S. Hake	7.2	Witch F	6.5	110
1971	Lobster	99.2	W. Hake	0.4	S. Hake	0.3	-	-	-	-	71
1972	Cod	53.2	Lobster	18.7	Redfish	13.6	Haddock	4.4	W. Hake	3.3	83
1973	Lobster	64.8	Redfish	28.9	W. Hake	2.8	Witch F	2.5	Cusk	0.5	40
1974	Lobster	72.0	Redfish	18.2	YTF	3.3	Wintr F	2.7	Witch F	2.3	644
1975	Lobster	45.9	Redfish	30.6	Haddock	7.0	Cod	4.2	Wintr F	3.7	87
1976	Lobster	40.0	Redfish	22.8	Cod	10.5	Pollock	7.3	Goosefish	6.1	100
1977	Lobster	45.7	Redfish	32.8	Goosefish	7.7	W. Hake	4.5	R. Hake	3.1	124
1978	Lobster	67.7	Redfish	13.4	Goosefish	11.3	W. Hake	4.0	O. pout	2.0	90
1979	S. Hake	79.3	Lobster	8.6	<u>Illex</u>	6.3	Redfish	2.1	W. Hake	1.1	72
1980	Redfish	23.4	Lobster	19.4	Cod	19.0	Haddock	16.6	Pollock	11.1	106

Table 5f. Fishery 6.

Year	Species Rank										Catch(MT)
	1 Species	%	2 Species	%	3 Species	%	4 Species	%	5 Species	%	
1964	Scup	59.0	Wintr F	31.9	Sum Fld	5.0	Cod	1.5	YTF	0.9	247
1965	Scup	58.0	Wintr F	30.8	Squid	4.8	Sum Fld	2.8	Cod	1.0	306
1966	Scup	61.9	Wintr F	32.2	Sum Fld	3.2	YTF	1.5	Tautog	0.4	840
1967	Wintr F	74.3	Scup	9.7	YTF	5.8	Cod	4.0	Sum Fld	2.3	565
1968	Wintr F	61.2	Oth red	14.4	Scup	8.0	Cod	5.1	Squid	4.8	309
1969	Scup	39.7	Wintr F	37.9	Oth red	10.0	Squid	6.2	Cod	2.7	440
1970	Winter F	59.2	Scup	25.3	Squid	4.0	Oth red	3.9	Cod	3.6	481
1971	Wintr F	55.5	Oth red	18.2	Scup	17.7	Squid	2.4	Cod	1.9	270
1972	Wintr F	58.3	Scup	22.1	Squid	9.9	YTF	3.3	Cod	3.1	184
1973	Wintr F	33.9	Squid	27.6	Oth red	22.3	Sum Fld	6.9	Scup	5.4	288
1974	Sum Fld	43.7	Wintr F	21.9	Scup	20.0	Cod	6.3	Squid	3.2	136
1975	Scup	41.2	Squid	15.4	Wintr F	15.0	Sum Fld	9.4	Wdpn F	7.0	333
1976	Squid	44.1	Sum Fld	32.7	Wintr F	9.1	Wdpn F	6.9	Scup	3.1	698
1977	Scup	43.2	Squid	22.0	Wintr F	10.2	Wdpn F	10.0	Sum Fld	7.5	534
1978	Wintr F	45.8	Scup	18.9	Wdpn F	15.0	<u>Loligo</u>	5.3	Sum Fld	5.2	347
1979	<u>Loligo</u>	61.9	Scup	20.7	Squid	4.6	Wintr F	4.6	Sum Fld	2.4	1,492
1980	<u>Loligo</u>	33.8	Wintr F	25.4	Oth red	20.9	Scup	10.6	Wdpn F	3.1	1,166

Table 5g. Fishery 7.

Year	Species Rank										
	1 Species	%	2 Species	%	3 Species	%	4 Species	%	5 Species	%	Catch(MT)
1964	Oth red	67.0	S. Hake	10.4	YTF	10.1	Wintr F	8.0	Btrfsh	1.0	17,274
1965	Oth red	68.2	YTF	9.0	S. Hake	8.1	Wintr F	7.2	Scup	1.8	17,712
1966	Oth red	66.2	S. Hake	12.3	YTF	8.2	Wintr F	7.3	Cod	1.3	19,761
1967	Oth red	75.5	YTF	11.1	Wintr F	5.4	S. Hake	2.3	Cod	1.8	23,850
1968	Oth red	66.8	YTF	10.9	S. Hake	9.0	Wintr F	4.6	Cod	2.3	24,431
1969	Oth red	69.6	YTF	7.6	Herring	7.1	S. Hake	4.5	Wintr F	4.3	27,951
1970	Oth red	57.5	S. Hake	10.8	YTF	10.4	WINTER F	6.2	Herring	5.3	18,668
1971	Oth red	50.4	YTF	15.6	Herring	10.5	Wintr F	7.3	S. Hake	7.1	10,765
1972	Oth red	35.1	YTF	27.8	S. Hake	13.7	Wintr F	8.4	Herring	6.8	7,784
1973	Oth red	54.4	YTF	12.4	Wintr F	10.5	S. Hake	8.6	Cod	2.3	9,376
1974	Oth red	33.0	YTF	23.4	S. Hake	11.2	Wintr F	6.9	Sum Fld	5.9	3,279
1975	Oth red	33.1	S. Hake	19.9	Sum Fld	6.6	Wintr F	6.3	Scup	5.4	6,383
1976	Oth red	31.3	S. Hake	26.9	Sum Fld	11.9	Scallop	5.6	Red Hake	4.3	6,665
1977	Oth red	42.4	S. Hake	18.4	YTF	7.3	Wintr F	6.3	Cod	4.6	7,479
1978	Oth red	33.3	S. Hake	19.1	Btrfsh	14.8	Wintr F	7.1	Sum Fld	5.9	6,089
1979	Oth red	33.1	S. Hake	16.0	Herring	12.2	Btrfsh	10.4	YTF	10.0	5,224
1980	Btrfsh	23.9	S. Hake	16.1	Oth red	14.9	Wintr F	13.1	YTF	9.1	3,833

Table 5h. Fishery 8.

Year	1		2		Species Rank		3		4		5		Catch(MT)
	Species	%	Species	%	Species	%	Species	%	Species	%	Species	%	
1964	Oth red	55.9	YTF	16.6	S. Hake	8.0	Scup	7.4	Wintr F	7.2			3,347
1965	Oth red	60.0	Scup	13.6	YTF	9.5	Wintr F	5.4	S. Hake	3.4			2,759
1966	Oth red	51.8	Scup	12.9	YTF	10.6	Wintr F	8.1	S. Hake	7.4			2,814
1967	Oth red	69.4	Scup	10.3	YTF	6.4	Wintr F	5.9	Sum Fld	2.1			3,030
1968	Oth red	53.0	Scup	15.8	YTF	10.9	Wintr F	5.6	S. Hake	4.3			2,844
1969	Oth red	52.7	YTF	15.8	Squid	7.4	Wintr F	7.2	Scup	5.1			2,431
1970	Oth red	61.1	YTF	15.8	Winter F	4.7	S. Hake	4.1	Scup	3.5			2,806
1971	Oth red	35.8	YTF	25.4	Scup	13.4	Wintr F	5.8	S. Hake	5.6			467
1972	Oth red	27.1	YTF	22.3	Wintr F	16.5	Scup	10.5	Squid	6.3			1,040
1973	Scup	22.8	Sum Fld	11.9	YTF	11.9	Squid	9.7	Mackrl	8.2			153
1974	Scup	32.9	Oth red	13.9	Sum Fld	12.1	Squid	9.5	Btrfsh	8.6			539
1975	Scup	23.3	Oth red	21.9	Sum Fld	16.2	Squid	11.0	S. Hake	8.6			1,369
1976	Sum Fld	27.5	Scallop	22.1	Scup	16.3	Oth red	14.3	Btrfsh	4.3			817
1977	Scup	44.5	Oth red	16.6	Sum Fld	9.4	Btrfsh	7.4	Squid	4.6			935
1978	Scup	28.5	Btrfsh	21.3	Sum Fld	12.2	Wintr F	7.4	Oth red	7.1			913
1979	Scup	29.8	Wintr F	17.8	YTF	13.5	Sum Fld	9.9	S. Hake	5.9			992
1980	Scup	26.7	Wintr F	17.4	Sum Fld	12.7	Btrfsh	11.1	s. Hake	6.9			728

Table 5i. Fishery 9.

Year	Species Rank										Catch(MT)
	1 Species	%	2 Species	%	3 Species	%	4 Species	%	5 Species	%	
1964	Lobster	32.8	Tilefsh	26.6	Sum Fld	24.3	S. Hake	5.0	YTF	2.9	377
1965	S. Hake	43.8	Tilefsh	27.3	Lobster	18.1	Sum Fld	3.3	Haddock	3.1	1,654
1966	S. Hake	49.2	Tilefsh	28.2	Cod	4.0	Pollock	3.8	Haddock	3.7	860
1967	Butrfsh	22.8	Lobster	18.6	S. Hake	16.1	Sum Fld	12.9	Squid	12.8	755
1968	Lobster	43.7	S. Hake	11.2	Scup	9.4	Oth red	7.8	Sum Fld	6.8	567
1969	Oth red	43.8	Lobster	19.6	S. Hake	15.6	Butrfsh	6.8	Squid	2.8	776
1970	Lobster	34.0	S. Hake	24.4	Oth red	12.7	YTF	8.6	Sum Fld	7.8	608
1971	Oth red	52.8	YTF	17.7	S. Hake	10.3	Lobster	3.9	Sum Fld	3.0	619
1972	YTF	78.0	Lobster	9.5	Wintr F	3.0	Sum Fld	2.4	Squid	2.2	112
1973	YTF	43.0	Oth red	12.0	Squid	9.2	Mackrl	7.0	Butrfsh	5.9	545
1974	YTF	77.6	Squid	12.1	Cod	2.9	Scup	1.9	Wintr F	1.2	331
1975	Sum Fld	26.1	Btrfsh	23.5	Squid	10.6	Scallop	10.2	YTF	9.6	315
1976	Sum Fld	77.9	Oth red	5.1	Squid	5.1	Btrfsh	2.8	S. Hake	1.6	1,095
1977	Sum Fld	74.1	Btrfsh	15.5	S. Hake	3.4	Oth red	2.7	Squid	0.8	629
1978	Sum Fld	61.4	Tilefsh	13.9	Btrfsh	7.5	S. Hake	4.5	Mackrl	2.3	637
1979	Sum Fld	64.4	Tilefsh	19.0	<u>Loligo</u>	3.5	Btrfsh	2.3	Scup	2.2	676
1980	Btrfsh	34.7	Sum Fld	21.5	Tilefsh	6.4	S. Hake	6.2	Mackrl	5.9	354

Table 6. Total catch and effort from the 9 defined fisheries, and from depth zones 8 and 9, including percents from depth zones 8 and 9, for 1964-80.

YEAR	DEFINED FISHERIES		DEPTH ZONES 8 & 9		PERCENT IN 8 & 9	
	EFFORT	CATCH	EFFORT	CATCH	EFFORT	CATCH
1964	21911.1	154753	6951.4	46345	24.08	23.05
1965	22920.3	144584	9249.1	61659	28.75	29.90
1966	24327.2	145706	6979.6	51138	22.29	25.98
1967	21763.6	126338	7416.2	52589	25.42	29.39
1968	19610.5	116473	8015.8	60245	29.02	34.09
1969	17765.5	111501	8676.1	56422	32.81	33.60
1970	17038.1	91789	10159.8	65350	37.36	41.59
1971	13793.1	71769	12575.8	70360	47.69	49.50
1972	12512.4	61820	12926.7	56678	50.81	47.83
1973	12448.1	72085	10938.9	48730	46.77	40.33
1974	13988.2	62813	11145.7	48062	44.35	43.35
1975	15749.8	68221	10886.1	38102	40.87	35.84
1976	14447.5	67096	11978.3	42286	45.33	38.66
1977	14009.8	82280	11086.1	46722	44.17	36.22
1978	14566.9	88026	12445.1	53336	46.07	37.73
1979	15804.9	87300	13673.6	64399	46.38	42.45
1980	17101.9	99443	14351.2	61562	45.63	38.24

* Catch in Metric tons and effort in days fished.

Table 7. Comparison of total catches, by fishery, estimated by the two described proration methods, for catch data averaged over the three year definition period (1977-79).

Fishery	Total Catch (MT) Prorated by:	
	Tonclass	Species Composition
1	14,537	22,108
2	52,452	47,889
3	6,140	6,096
4	47,814	43,899
5	124	108
6	2,019	1,889
7	16,920	11,916
8	1,953	13,210
9	17,002	20,539
10*		6,681
Total	176,539	174,335

* Middle-Atlantic catches which could not be apportioned to defined fisheries by species composition.

Table 8. Total catches in the nine major fisheries, including Middle-Atlantic state totals (1964-73); and totals over all years (1964-80).

FISHERY	1	2	3	4	5	6	7	8	9	MID-(1)	GRAND
YEAR	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	ATLANTIC	TOTAL
1964	31059	51230	11052	82870	45	252	24608	3801	449	85773	260080
1965	25424	43734	8531	98530	267	466	24933	3823	2548	71498	254330
1966	20609	49653	8042	86402	624	987	27246	3651	1132	42487	220224
1967	16667	48404	4703	77646	497	711	28309	3720	1225	27391	192606
1968	15743	47875	5225	72750	287	558	42658	4301	1742	22152	197548
1969	15860	48509	4218	64704	225	709	31248	3030	1400	16936	170979
1970	15107	51581	3847	57249	112	888	32086	4135	1081	16338	167317
1971	13760	52683	3978	50562	94	870	18050	874	1199	14271	142581
1972	14723	38737	3064	42548	99	466	14833	2060	161	17278	119246
1973	11308	37656	4326	46428	54	1035	18702	388	1035	19079	128703
1974	11802	34358	3928	47527	85	648	13571	11893	10504		122514
1975	9411	36779	3452	40711	103	1053	11894	17336	15849		127177
1976	10473	35918	2691	40731	129	2088	16088	20698	25039		143382
1977	14385	47117	4142	46808	192	1711	13313	20956	17193		151432
1978	18307	51495	5712	47913	107	1104	19366	13309	13601		152607
1979	10920	58743	8567	48720	74	3243	18081	24327	20212		181967
1980	13942	63583	8637	57420	112	2912	11581	2077	1044		147366
TOTALS	269500	798055	94115	1009519	3106	19701	366567	140379	115414	333203	2880059
MIN VALUE	9411	34358	2691	40711	45	252	11581	388	161	0	119246
MAX VALUE	31059	63583	11052	98530	624	3243	42658	24327	25039	85773	260080
AVERAGE	15852.94	46944.41	5536.18	59383.47	182.71	1158.88	21562.76	8257.59	6789.06	33320.30	169415

[1] Unapportioned Middle-Atlantic catches.

[2] 1980 Values do not include Middle Atlantic catches.

Figure 1. Distribution of numbers of days fished per trip for the Gulf of Maine, Georges Bank, and southern New England areas, for 1964, 1972, and 1979, demonstrating changes in fishing practices.

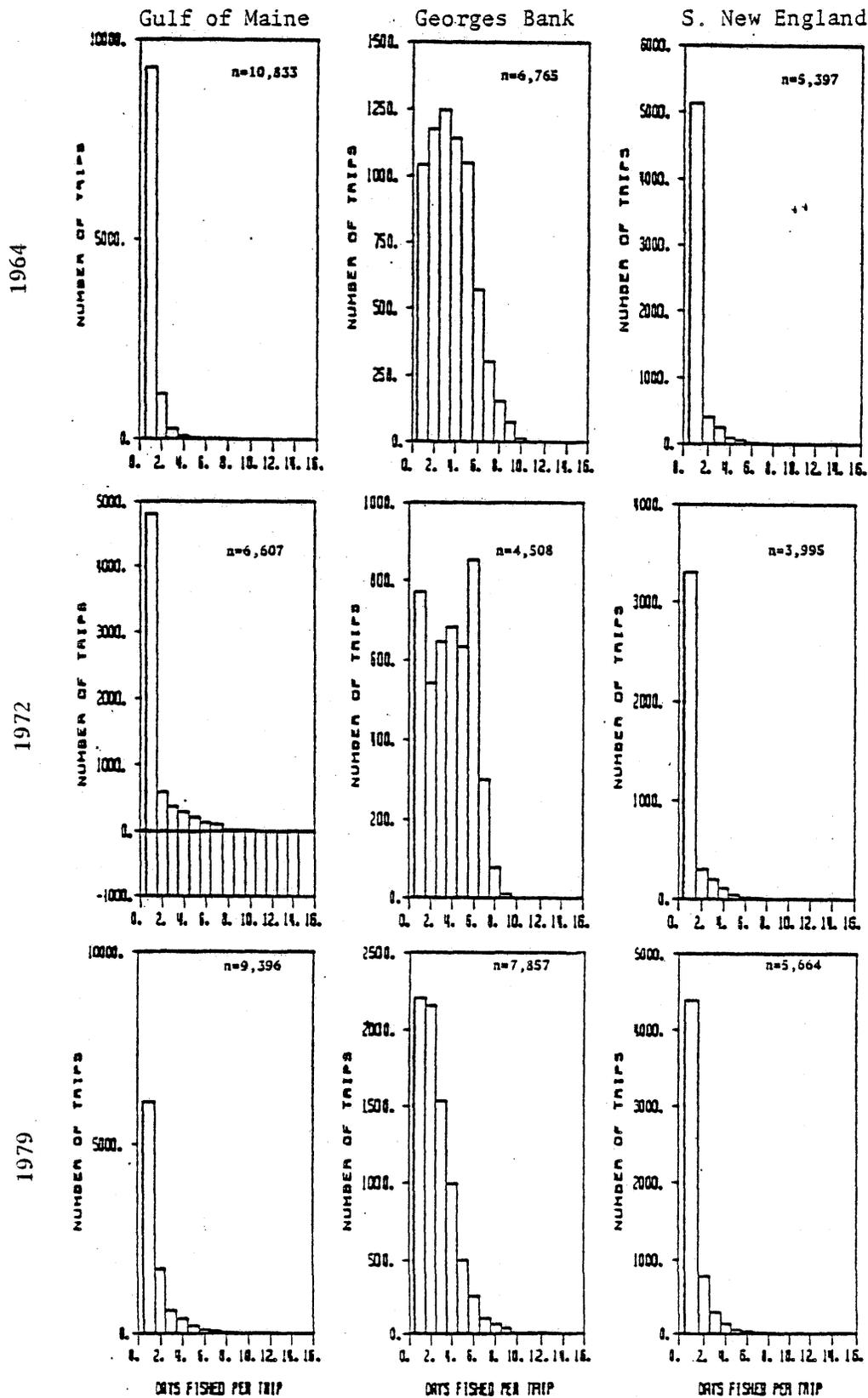
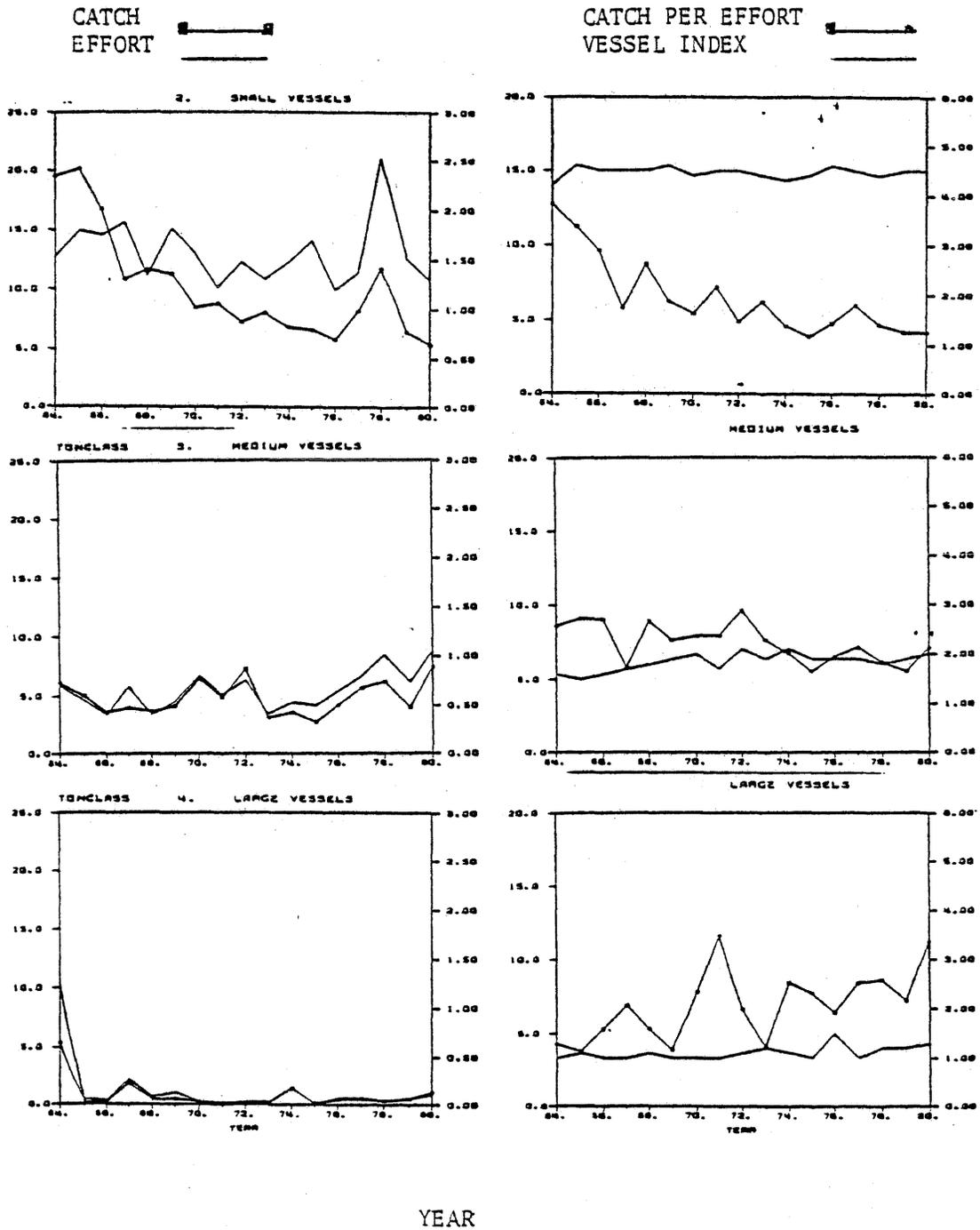


Figure 2. Total annual catch and effort, and catch per effort and vessel class indices, by fishery and vessel class, 1964-80.

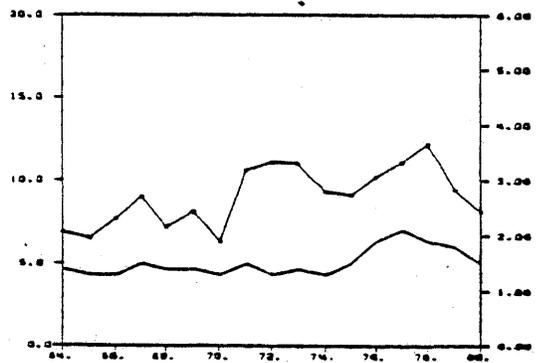
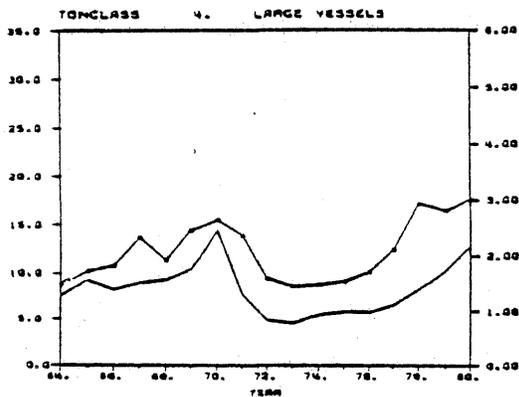
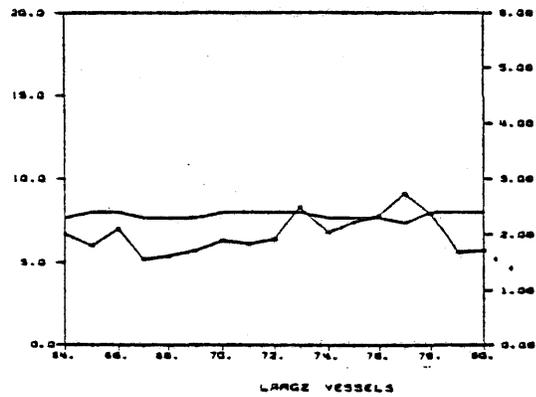
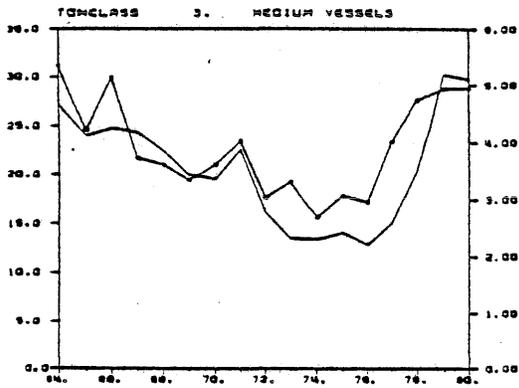
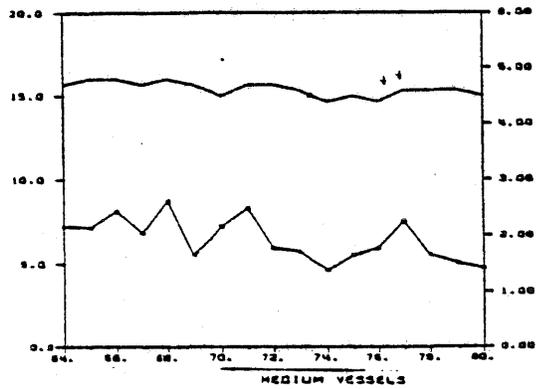
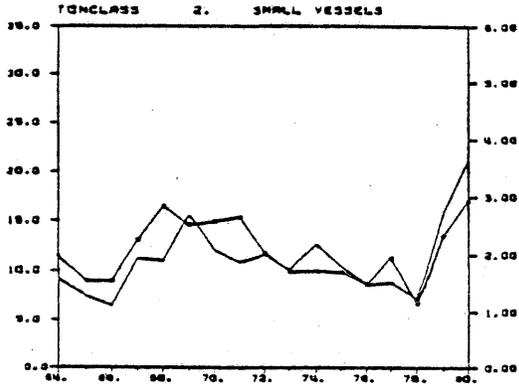
a. Fishery 1.



b. Fishery 2.

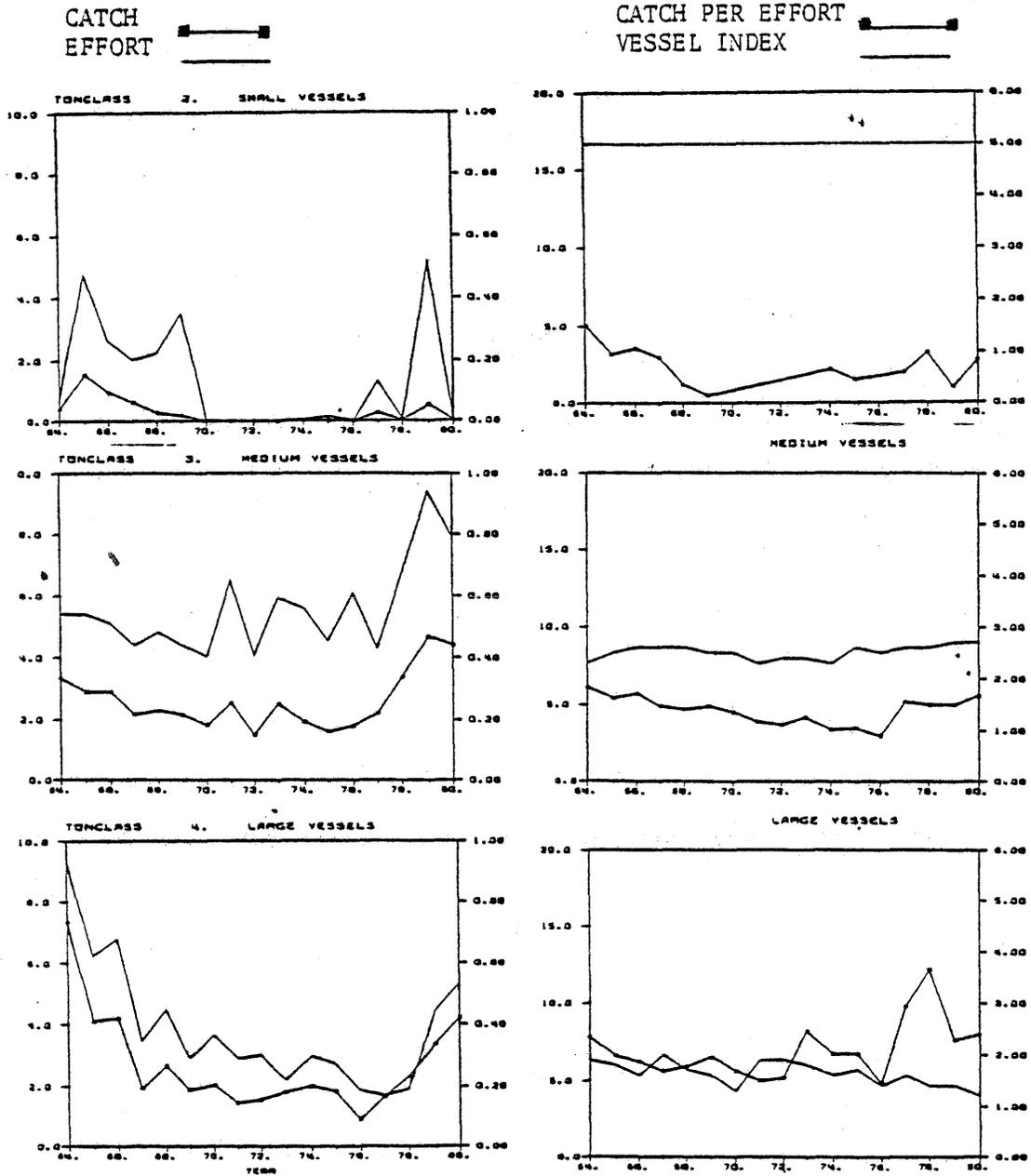
CATCH EFFORT

CATCH PER EFFORT VESSEL INDEX



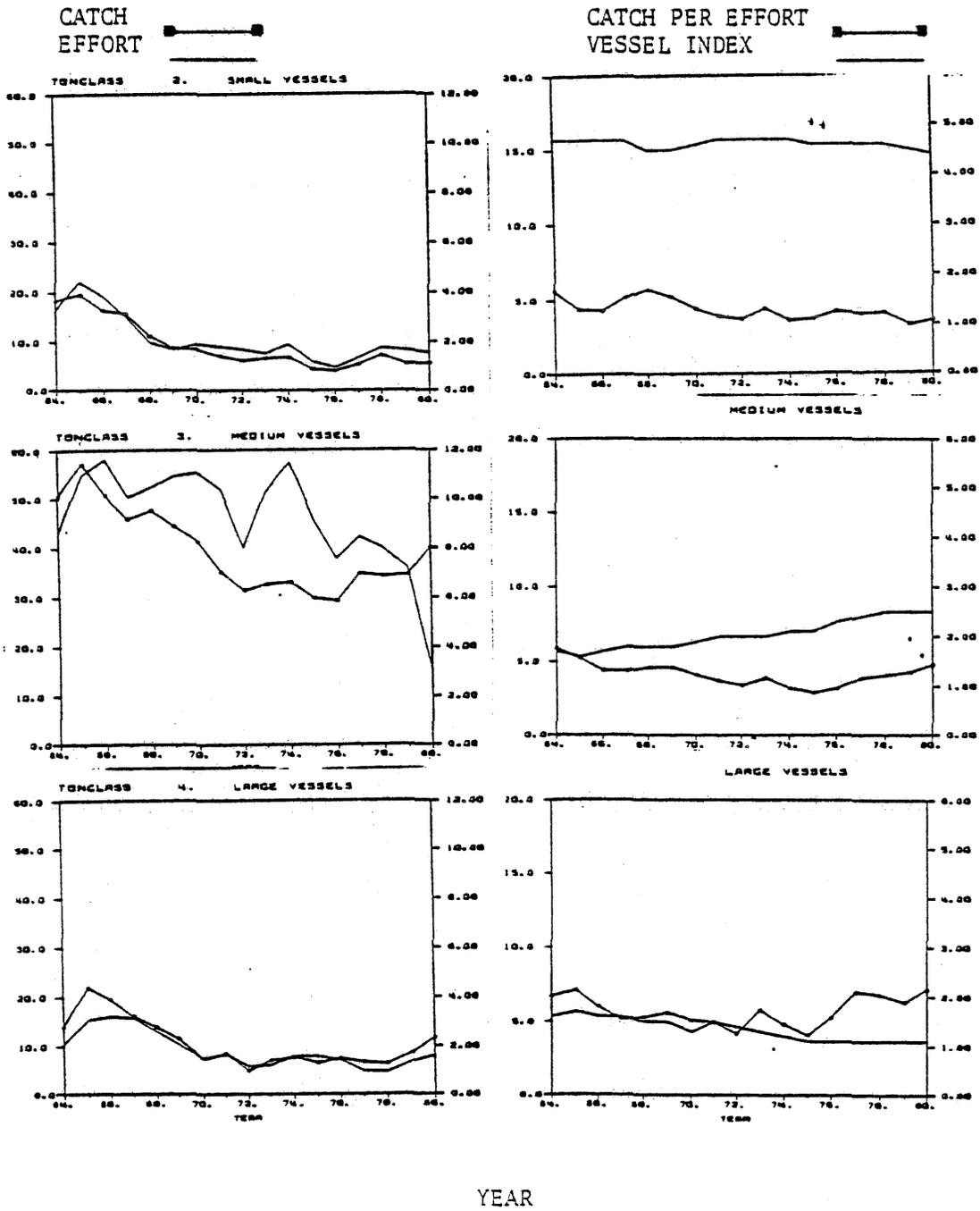
YEAR

2c. Fishery 3.



YEAR

Figure 2d. Fishery 4.



YEAR

Figure 2e. Fishery 5.

CATCH
EFFORT

CATCH PER EFFORT
VESSEL INDEX

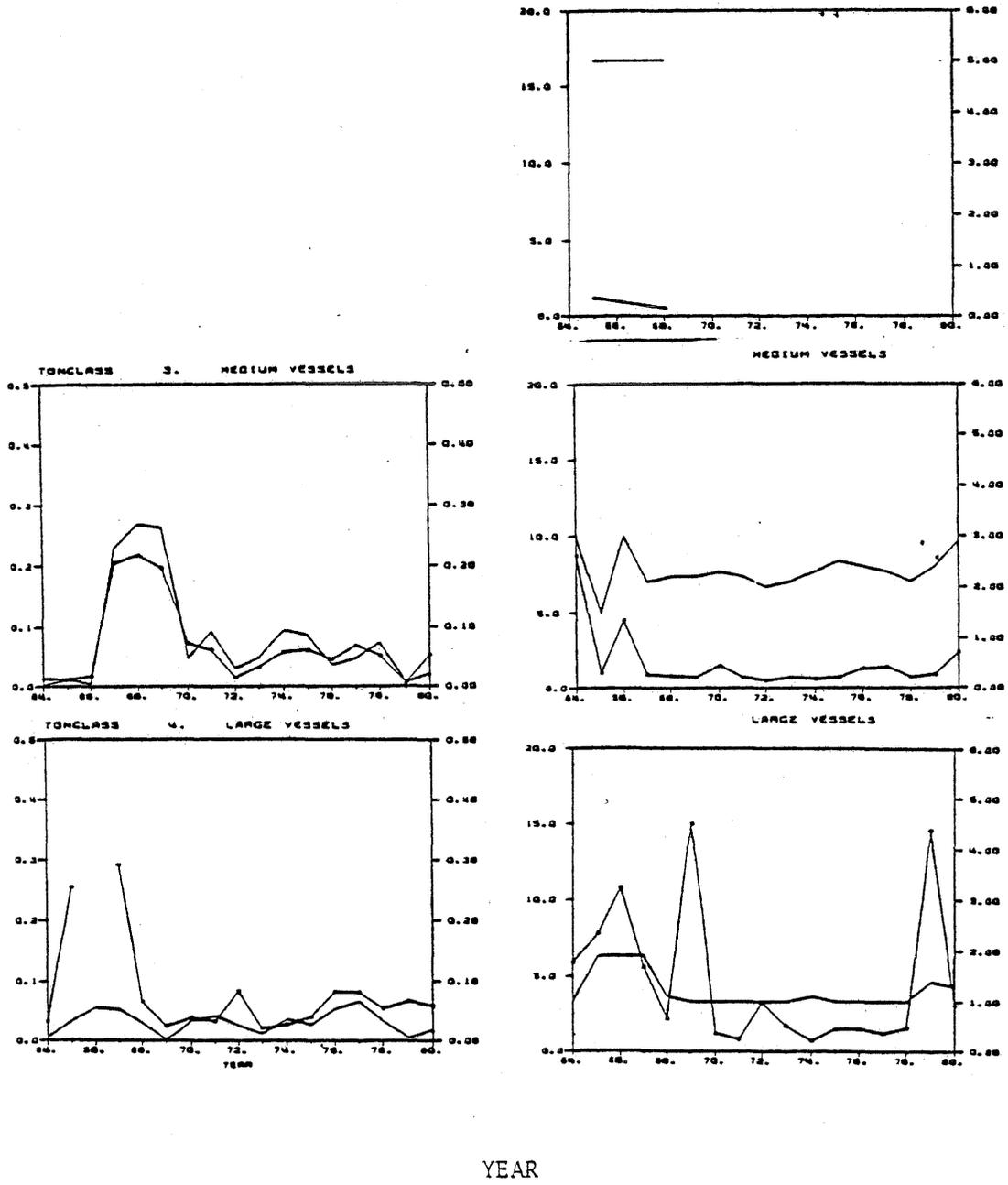


Figure 2f. Fishery 6.

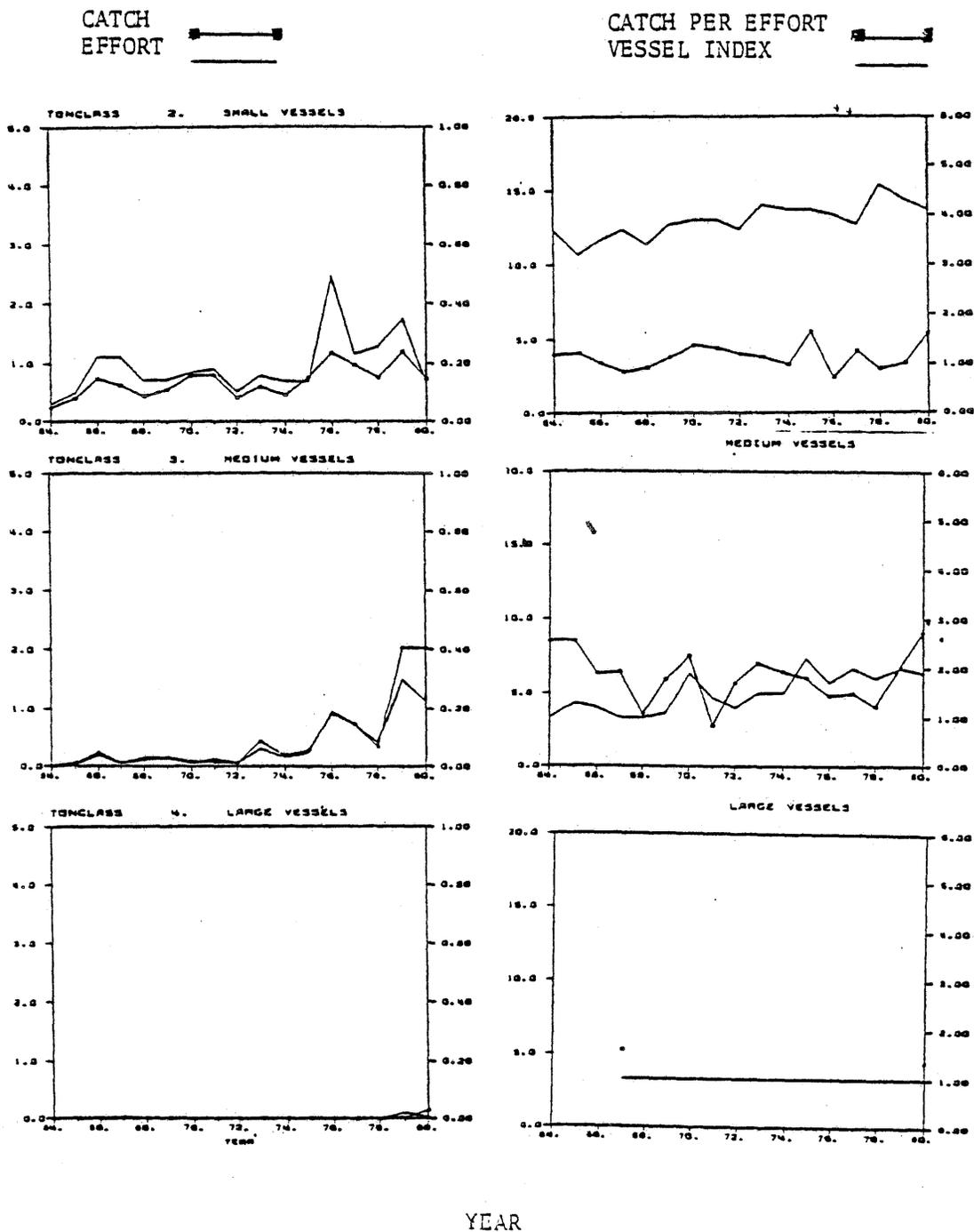


Figure 2g. Fishery 7.

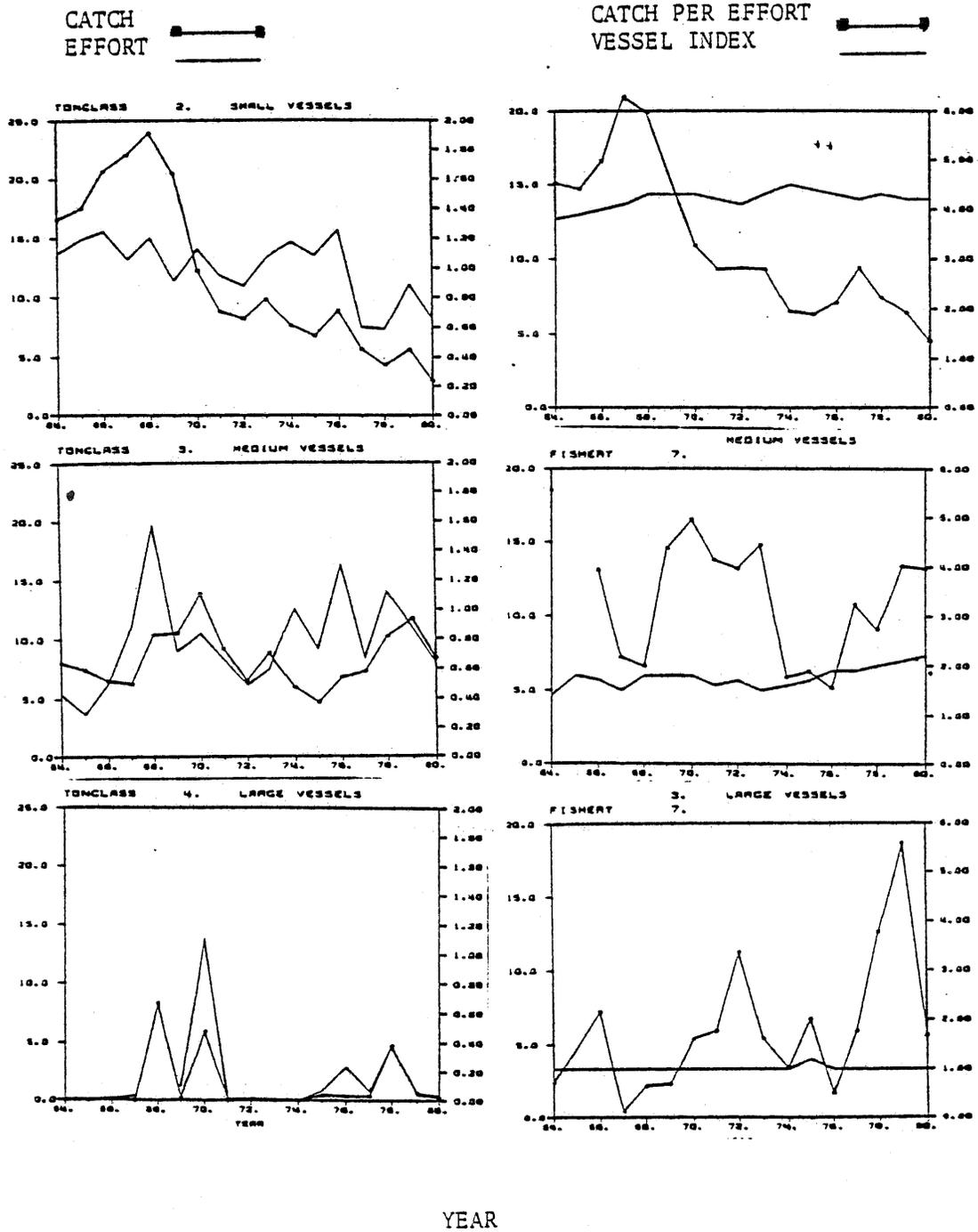


Figure 2h. Fishery 8.

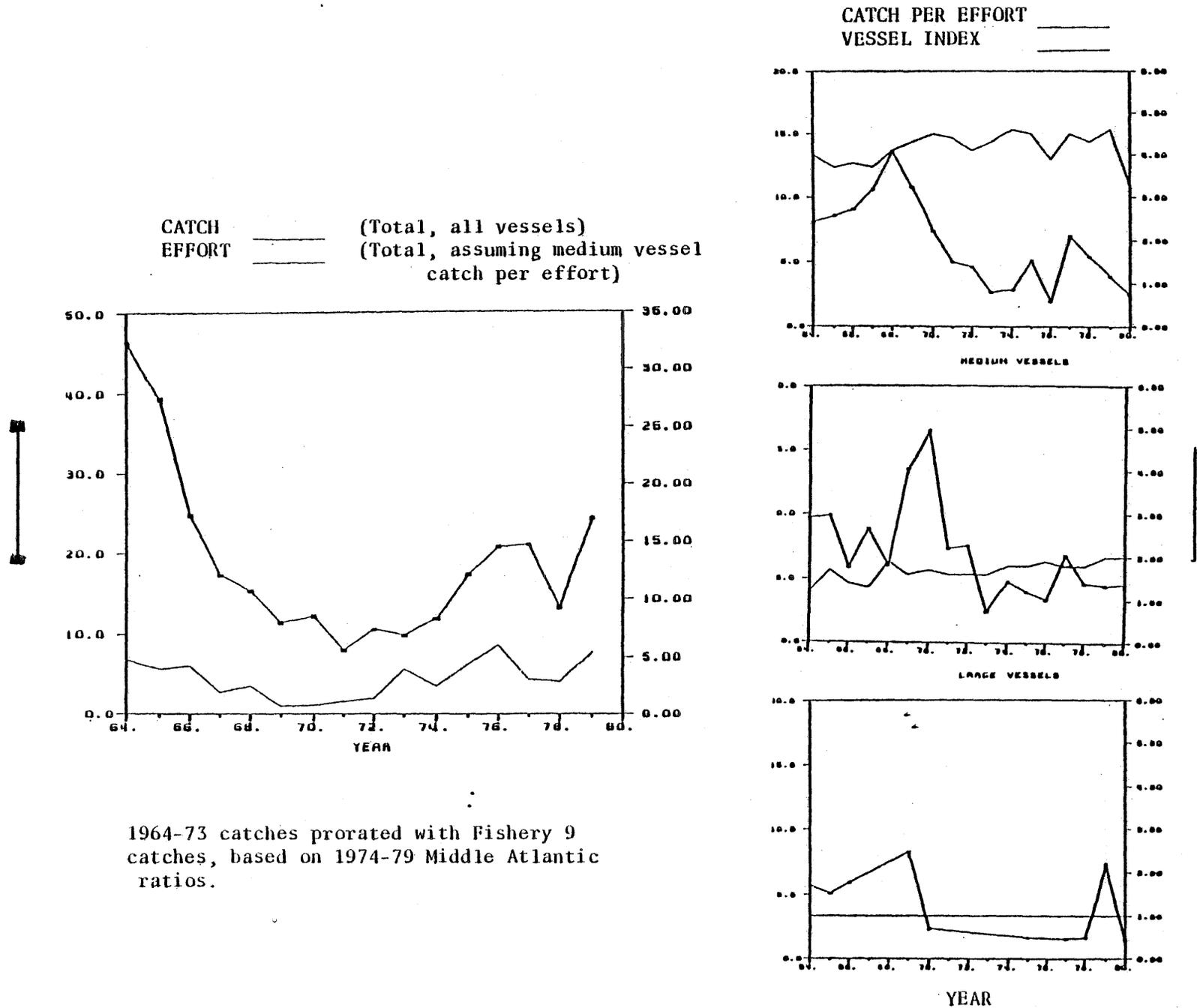
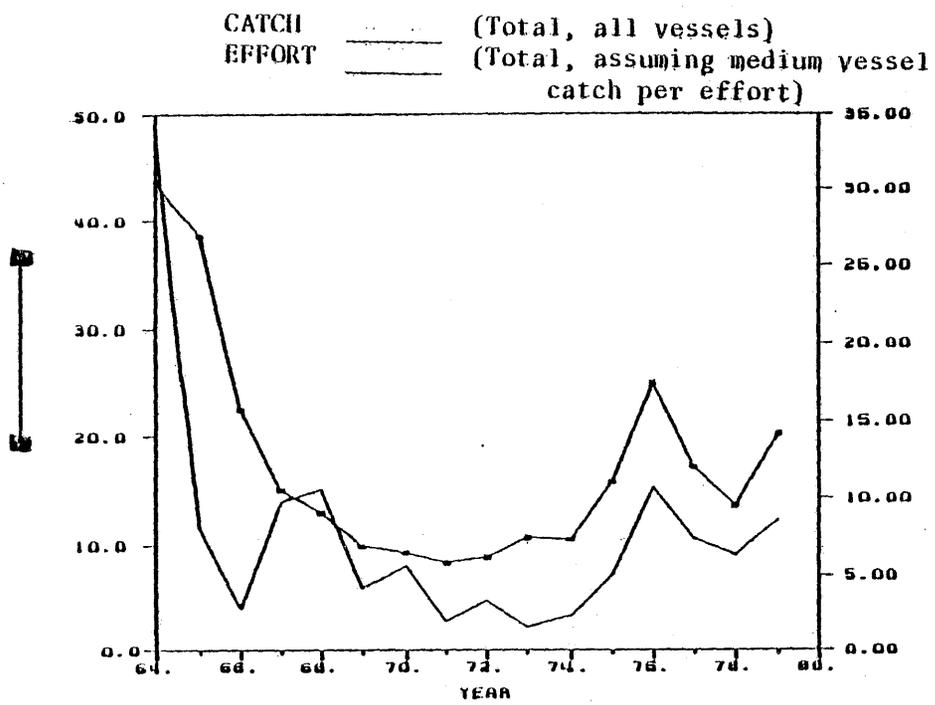


Figure 2i. Fishery 9.



1964-73 catches prorated with Fishery 8 catches, based on Middle Atlantic ratios for 1974-79,

