St. Pierre Bank: An offshore scallop buffer zone

by

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Abstract

The scallop fishery on St. Pierre Bank is prosecuted exclusively by Maritime-based offshore vessels which make intermittent, opportunistic excursions to buffer declining catches elsewhere on the Atlantic seaboard, particularly Georges Bank. An unprecedented diversion of effort into St. Pierre Bank in 1982 resulted in record removals approximating 800 MT meats. The Bank is unique in that two species of scallops are found, often occurring coextensively in the two NAFO strata where offshore fishing effort is directed. Historically the fleets have had a decided preference for sea scallops but larger Iceland scallops are now being increasingly retained as well. Their relative contributions are highly variable and impose undue problems to species-specific management.

The status of the fishery in 1982-83 is assessed using estimates of biomass and age-frequency distributions in the two target areas where effort was expended. The high removals in 1982 particularly of accumulated age cohorts and the depletion of younger recruited scallops (4 and 5-yr-olds) from the northern most stratum suggest that the above-average sea scallop landings of 1982 cannot be sustained much longer. An imminent collapse is likely in the near future and the fishery will have to await the arrival and growth of another strong recruitment pulse or direct more effort into exploiting the smaller Iceland scallop, hitherto incidental, elsewhere on the Bank.

Yield-per-recruit analysis is not appropriate to the assessment of scallop stocks in this area as fishery is sporadic, and under present fishing strategy, unlikely to ever reach steady-state conditions. Management options for this mixed-species fishery should however address the problem of growth overfishing in order to optimize yield per recruit.

Résumé

La pêche des pétoncles sur le banc Saint-Pierre est pratiquée presque exclusivement par des bateaux de grande pêche dont le port d'attache est dans les Maritimes et qui, lorsque l'occasion se présente, font des incursions intermittentes dans cette région afin de compenser des prises en déclin ailleurs le long de la côte atlantique, en particulier sur le banc Georges. Après une diversion de l'effort de pêche sans précédent vers le banc Saint-Pierre en 1982, une récolte approchant 800 tm de chairs a été la plus abondante jamais enregistrée. Une caractéristique unique du banc est qu'on y rencontre deux espèces de pétoncles, souvent coexistantes, dans les deux strate où l'effort de pêche hauturier est dirigé. Les flottilles ont toujours eu une préférence marquée pour le pétoncle géant, mais on conserve maintenant de plus en plus de pétoncles d'islande de grande taille. Leurs contributions relatives sont très variables, ce qui cause des problèmes de gestion spécifique à l'une ou l'autre espèce.

Nous évaluons l'état de la pêche en 1982-83 à l'aide d'estimations de biomasse et de distributions de fréquences d'âges dans les deux endroits cibles où l'effort a été intensifié. Quand on considère l'abondante récolte de 1982, en particulier des cohortes d'âges accumulés et l'épuisement des plus jeunes recrues (âgées de 4 et 5 ans), prélevée dans la strate la plus septentrional, on se rend compte que les débarquements de pétoncles géants de 1982 ne peuvent être soutenus encore bien longtemps. Il est probable qu'il y aura affaissement prochainement et qu'on devra attendre l'arrivée et la croissance d'une autre poussée de recrutement ou orienter un effort accru vers l'exploitation du pétoncle d'Island, plus petit et jusqu'ici capturé fortuitement, ailleurs sur le banc.

L'analyse du rendement par recrue convient mal à l'évaluation des stocks de pétoncles dans cette région, car la pêche est intermittente et, avec la présente stratégie de pêche, est peu susceptible d'atteindre un état d'équilibre. Les options de gestion de cette pêche d'espèces mixtes devraient cependant s'attaquer au problème de la surexploitation de la croissance, afin d'optimiser le rendement par recrue.

Introduction

St. Pierre Bank lies off the south coast of Newfoundland and is included in NAFO Subdivision 3Ps. Largest of three fishing banks in the area, it is the one most commonly associated with the scallop fishery (Fig. 1). Burgeo Bank is characterized by a paucity of scallops whereas Green Bank (31-40 fms) contains only Iceland scallops (Naidu et al. 1983). St. Pierre Bank is unique in that two species of scallops occur, frequently on the same beds. In Newfoundland waters the giant scallop, Placopecten magellanicus, is towards the northern limit of its distributional range and commercial densities (beds) in the target area are restricted to waters shallower than 30 fm (total area 2294 nautical sq. miles). The smaller Iceland scallop, Chlamys islandica, is more widely distributed, its bathymetric range extending down to about 100 fms (corresponding to an area of 4582 nautical sq. miles). The species has its main distribution within the subarctic transitional zone, subarctic or northern boreal (Ekman 1953). The occurrence of the species as far south as latitude 45°N is explained by the presence of cold arctic water brought down by the Labrador Current. Bottom temperature on the Bank circumscribed by the 30 fm contour is in the range of-1.28 to 7.15°C.

Although research and management of 3Ps are mandated to the Newfoundland Region the scallop fishery is prosecuted exclusively by the offshore scallop fleet from the Maritimes which traditionally fish the rich scallop grounds on Georges Bank (5Ze). Catches, therefore, escape the Newfoundland Fishery Statistics. Over the last 25 years the Georges Bank scallop fishery has experienced wide fluctuations in total landings with two periods of high landings (Table 1, Fig. 2). The first from 1959-63 when combined U.S. and Canada landings reached 10,000-15,600 MT meats; dropping to 5,000-6,000 MT before rising again during the 1974-77 period to approximately 8,000 to 14,000 MT respectively. The "boom" years on Georges Bank correspond to periods of relative inactivity east of Subdivision 4X, including St. Pierre Bank, pointing to opportunistic excursions away from preferred fishing grounds only when catch rates declined significantly and/or when offshore scallop regulatory requirements (Appendix A) precluded continued fishing on Georges Bank (Fig. 2). Eastward excursions were primarily into Middle Bank, Emerald Bank, Western Bank, Sable Island Bank, Banquereau and St. Pierre Bank.

History of production

The fishery on St. Pierre Bank started in 1953 soon after the discovery there of a sea scallop bed. Mean annual landings in the first three years of the fishery exceed those from Georges Bank for corresponding years (Table 1, 121 MT vs. 134 MT meats in favour of St. Pierre Bank). Landings declined sharply in subsequent years due primarily to increased landings from Georges Bank. There was little or no effort expended on St. Pierre Bank between 1958-62 inclusive. The fishery resumed in 1963 when 40 MT were taken. Landings have fluctuated widely since 1964 when a record 343 MT meats was removed. During the 1974-81 period only 59 MT were taken, mostly in 1978 and 1980. The demise of the Georges Bank scallop fishery beginning in 1978 encouraged the offshore fleet to extend eastward into areas heretofore fished more or less on an opportunistic basis. With reduced stock status and a reinforced management

strategy of the common fishery on Georges Bank there has been a dramatic decline in total landings. It reached crisis proportions in the summer of 1982 when several boats alleged fishing Georges Bank was no longer profitable (catch/trip had dropped to 10,000-12,000 lb. meats). This resulted in an unprecedented diversion of effort into other areas including St. Pierre Bank with as many as 44 vessels participating in an intense fishery that landed nearly 800 MT meats.

While offshore scallop regulations, including the meat-count restriction (at 45/500 gm) specific to sea scallops continued to apply, they could not be easily enforced because of the presence in the catch of the smaller Iceland scallop (see Appendix A). The latter had been technically excluded from the definition of "scallop" in the Atlantic Fishery Regulations which equates it specifically to Placopecten magellanicus. An amendment was subsequently introduced into the Fisheries Act (Atlantic Fisheries Regulations, 28 October 1982) making the Regulations applicable to Iceland scallops as well as sea scallops (Appendix B).

The inordinate effort diversion into St. Pierre Bank has management implications for the total offshore scallop fishery. Senior management has therefore requested advice on stock status and possible management strategies particularly to address the problem of mixed-species composition peculiar to this fishery. This document takes a first look at the available scientific data that may address some of the concerns relevant to management.

Scope of study

The paucity of essential biological and fishery data precludes a detailed stock assessment at this time. The sporadic and irregular nature of the fishery has been problematical to aspects of monitoring of the fishery and has precluded systematic sampling in years when scallops were harvested from the area. This has been further compounded by the exclusive Maritime content of the fishery which nearly always results in catches being discharged at Maritime ports. In spite of its proximity, scallops from St. Pierre Bank are seldom landed in Newfoundland ports and nearly always escape attention till after the fact.

Several sources have been pooled here to produce a composite and somewhat fragmentary account of past fishery performance, current stock characteristics, and possible future trends of the scallop fishery on St. Pierre Bank. Anecdotal information from industry, skippers and observers has also been used as necessary.

Materials and Methods

The analyses presented in this document are based on the following and in chronological sequence include:

1. Catch and preliminary effort statistics compiled from a variety of sources including: Canada Fishery Statistics (1953-1968); Economics and

Intelligence Branch, East Coast Fishery Statistics (1969-1975); NAFO Statistical Bulletins (1955-1980); and G. Robert (pers. comm. 1982).

2. A general exploratory survey of NAFO Division 3Ps (Green, St. Pierre and Burgeo banks) was conducted in 1979. Funded by the Provincial Department of Fisheries, it was intended primarily to chart the distribution (presence or absence) of scallops over the banks and was specifically directed at identifying scallop concentrations (beds). The funding agency had agreed to our formulating a survey design that might assist in quantifying survey results. A random-stratified survey was run using the standard groundfish stratification scheme for 3Ps (Pitt 1976). Details of the survey have been documented (Naidu et al. 1983). Samples of scallop shells collected during this survey were used to generate an age shell-height key for St. Pierre Bank.

3. In conjunction with an exploratory survey of the Grand Banks in 1982 (Div. 3L, 3N and 3O) it became necessary to determine the selectivity charcteristics of the New Bedford dredge, specifically for the capture of Iceland scallops. Selectivity trials were conducted on board the commercial scallop dragger Charlotte and Rickey in an area on St. Pierre Bank where Iceland scallops were known to be abundant. Top: bottom link configurations of 2:2, 3:3, and 3:4 were employed, the first two link combinations were used along the northwest slope of St. Pierre Bank and the 3:4 link combination in Stratum 320, in an area where commercial effort had been expended in the summer of 1982.

4. Meat samples procured at sea in 1982 for possible meat-count violations and in-port sampling of individual meat weights. The latter were converted to scallop ages. Absence of requisite site-specific data forced extrapolations into other areas.

5. Observer data. One observer had been placed on a scallop boat in 1980 and two more on separate vessels in 1982. Observer data relate primarily to size composition and relative species contribution to the catches.

6. Unscheduled research vessel time (Needler, 15 days) was made available to the scallop group, Fisheries Research Branch, Newfoundland Region, in January 1983 to assess the state of scallop stocks on St. Pierre Bank after the intense fishery there in 1982. Two grids were established on the basis of the distribution of fishing effort in 1982 (Fig. 3 and 4) and a transect survey run. Target areas were delineated on the basis of 135 vessel sightings of 44 scallop draggers identified by surveillance in 1982 (tracker aircraft and patrol vessel sightings.) Despite severe weather conditions a total of 158 sets (0.5 mile tows) were completed over a 4.5 day period with an 8 ft New Bedford dredge equipped with 3 in rings and lined with a nylon net liner on the inside of the bag. Of these 109 sets were in Stratum 314 (northern area, Grid A, Fig. 3) and the remaining (49 sets) were in Stratum 320 (southern area, Grid B, Fig. 4).

Scallop catches were sorted by species, "bushelled" into baskets and weighed separately, to the nearest kilogram. Shell-height measurements were made on both species on either the whole catch or a random weighed

subsample, depending on the amount caught and the anticipated arrival time at the next station. Shell samples were retained for ageing as were individual sea and Iceland scallop meats. The latter were kept in 6 oz whirl pak plastic bags for laboratory weight determinations. These were combined with shell-height:meat-weight data from earlier cruises to the area, including the 1979 Beothic Venture survey.

Cluckers (persistent paired valves still attached at the hinge line) were also measured, again by species and their measurements kept separate from those of live scallops.

A number of approaches to biomass estimation was attempted. Data from the 1979 Beothic Venture survey were reexamined (Naidu, et al. 1983). Stratum-specific biomass estimates were derived for each species using three types of data for the two target areas: (a) preselected stations only extrapolated to total stratum area, (b) preselected stations and survey stations extrapolated to total stratum area, and (c) user-defined stratification employing sets yielding $\geq$ 5 kg and extrapolated to estimated area of scallop abundance.

Statistical drawbacks notwithstanding a user-defined post-stratification was again adopted for the Needler (1983) data. Only sets yielding $\geq$ 5 kg were used and areal expansion to generate standing stock was limited to contagions likely to attract commercial effort.

Gear selectivity

Although size selectivity of the offshore dredge has been previously examined for the capture of the sea scallop, (Caddy, 1972) the authors feel that the 1:2 (back:belly) link combination used in the study has little application to the 3:3, 3:4, and even 4:4 combinations preferred by scallopers, particularly on hard bottom as is the case on St. Pierre Bank. In the latter some selection may occur during the first few minutes of the tow but this quickly disappears as ring apertures and inter-ring spaces become rapidly obstructed with various components of the catch. Zero escapement is assumed in this study for $\geq$ 4+ giants (approximately 80 mm). This occurs at a size slightly greater than the mean shell-height of southern Icelandics (73 mm) versus a mean of only 65 mm in the north (Table 2a, b). A comparision of Iceland scallop shell-height frequencies between lined and unlined commercial gear (Fig. 5) supports our belief that selection does not feature prominently in commercial gear particularly when tows are made to saturation.

Results

Growth

Rings on the upper valve were used to determine ages and in back calculations in both sea and Iceland scallops. Von Bertalanffy growth parameters were calculated from back measurements (Table 3). Although depth appeared to have an effect on growth rate (K) and L_∞ values for Iceland scallops on St. Pierre Bank, no attempt was made to factor this into this

preliminary assessment. Sea scallop growth parameters were estimated for Stratum 320 only using scallop shells from the Beothic Venture cruise. The Needler cruise has provided shell samples from Straturm 314 but time constraints have precluded their detailed examination and analysis. The age-length key developed for Stratum 320 giants was, therefore, used to estimate numbers at age in both strata.

Shell-height:meat-weight relationships

Relationships between $W = cL^b$ were calculated for each of the two scallop species where W = weight in grams of the adductor muscle, c and b are constants. These were derived from the least square regressions of their logarithmic transformations.

Iceland scallop $\log_e y = 2.89 \log_e x - 4.60$ (n = 601)

Giant scallop $\log_e y = 2.97 \log_e x - 4.75$ (n = 227)

Natural mortality

Natural mortality was computed directly from the percent occurrence of cluckers that died from natural causes according to the equation (Dickie, 1955):

$$a = 1 - e^{-(\frac{c}{t})(\frac{1}{L})^{365}}$$

where a is the natural mortality rate, c is the number of cluckers in a sample, L is the number of live scallops in the same sample, and t is the average time in days required for the valves of cluckers to separate naturally. Time required for natural clucker disarticulation for sea (70 days) and Iceland scallops (211 days) were those determined by Dickie (1955) and Mercer (1974) respectively. Stratum-specific natural mortality are summarized in Table 4.

Age composition

Research

Age compositions of both species in the two target areas in 1979 have been described.

Sea scallops with shell-heights in the range 75-90 mm were predominant in the north (Stratum 314) during the 1983 Needler cruise (Fig. 6). The older age cohorts ($\geq$ 7+) had been fished up from this area during the 1982 fishing season. Age composition here had shifted downwards with 3 to 5-yr-olds being the most abundant (Fig. 7). The dominance of the 1978 year-class is particularly evident, contributing over 56% of all scallops from the stratum. While sea scallops with shell-heights in excess of 100 mm are still evident

from the south (Stratum 320) their numbers have been considerably reduced from those observed in 1979, pointing to removals by the fishery in both 1980 and 1982. Nine and ten-yr-olds as well as accumulations of older animals (≥13 yr) are still present. As in 1979 a broad range of ages is evident (Fig. 7). The 4 and 5-yr-olds again feature prominently in the overall age structure as was seen in the adjacent stratum in the north.

Needler (1983) catches were generally smaller in the southern target area (Stratum 320) and the mixture of sea and Iceland scallops more variable. Iceland scallops were larger in this area with substantial numbers in excess of 80 mm (Fig. 8) corresponding to ages ≥7 yrs. Five, six and four-yr-olds were the most abundant groups in the north, with 4-yr-olds contributing over 56% of the population sampled (Fig. 9). Older Iceland scallops have all but disappeared. The principal age cohorts (5 to 8-yr-olds) in the south evident in 1979 have again been reduced.

Commercial

Commercial shell-height frequencies were obtained during vessel boardings (1982) and from observer deployment (1980 and 1982). The 1980 sea-scallop frequency from the south (Fig. 10) consisted only of large scallops (>100 mm) corresponding to scallops over 9 yrs, the majority (31%) being ≥13 yrs (Table 5). Typically the 1982 shell-height frequencies are unimodal in the north and bimodal in the south (Fig. 6, and 10), pointing to the availability of two widely separated shell-height groups to the fishery - 4 and 5-yr-olds to the north and 4, 9 and 10-yr-olds to the south (Table 5).

Commercial age frequencies were also inferred from individual meat-weight data when the catch was known to be "pure" (consisting of one species only). This was possible for two samples of sea scallops only (Fig. 11). Unfortunately a site-specific key was not available for sea scallops and approximations were made through extrapolation into Port au Port Bay (Naidu 1969). Age-specific meat-weight frequencies were also attempted for two other meat samples, one containing "mostly sea scallops" and a second one of unknown composition (Table 6, Fig. 12)). These showed that principal sea scallop ages landed came from 4, 3, and 5-yr-olds (45, 36, and 12% respectively, Table 6). Because of the higher meat-weight at age of inshore Port au Port Bay scallops there was a tendency to underestimate scallop ages. The variable species composition (Table 7) of catches and/or selective retention practices in this fishery limits the use of this method. The problem is compounded by the overlap in the meat-weight distributions in two species (Table 8), as well as fishery-induced variations in the relative species contribution to the catch. About the only generalization possible at this time is that vessels generally catch (retain?) more sea than Iceland scallops in the north (one vessel was taking 12-16 bushels/tow; 80% small giants, in Stratum 314). Catch composition appears to be more variable in the south and weighted in favour of Iceland scallops. As much of 70% of contributions here come from Iceland scallops. The same vessel fishing in Stratum 320 took 62 bags (approx. 2,500 lb) in 1.5 days' fishing. Mobility of vessels and hence changing catch composition make it impossible to derive scallop ages from meat-weights for the two

species. In any case we must await the requisite site-specific keys for meat-weight-to-age conversions.

Catch per unit effort

While catches have fluctuated widely depending on effort expended, CPUEs have remained relatively constant averaging at 0.81 MT meats per day over the 14-year period for which catch and effort data are available (Table 9). The only exception was in 1978 when CPUE peaked at 1.3 MT per fishing day. It is to be noted that this record was reached after a 4-year lapse in the fishery. In nearly every instance significant removals have been followed by reduction in CPUEs (Fig. 13).

Yield-per-recruit considerations

The yield equation is an explicit long-term representation of a fishery between yield and fishing and assumes equilibrium or steady-state conditions. As the St. Pierre Bank area has not been fished on a sustained basis and probably never likely to be by Maritime-based vessels, yield-per-recruit considerations must necessarily be viewed with caution. The problem in this area is further complicated by the somewhat variable mixed-species composition in the catches, a problem that is ignored in this consideration of yield per recruit.

Adductor muscle weights at age (Table 8) were used to determine yield (kg) per 10,000 recruits for varying levels of F as in Thompson and Bell (1934). Yield isopleths for the two species were generated for t_0', between 3 and 13 years using M values of 0.084 and 0.128 for sea and Iceland scallops respectively (Fig. 14 and 15).

Sea scallops

The yield curves for age $\geq$ 8 were flat topped and showed asymptotic yields as $F \rightarrow \infty$. Age at first capture in this species is between 3 and 4. Observed performance (Table 10) in Stratum 314 is between 45-50 meats/500 g (meats on) or between 100 and 110 kg per 10,000 recruits. Numerical values notwithstanding, this suggests that the fishery is harvesting sea scallops well below what can be achieved by delaying age of first capture. Assuming knife-edge recruitment (selection), delaying age at first capture to 7 from 4, for example would result in a 76% increase in yield at F = 0.4 (or reduce meat count to 34 from 42/500 g, Fig. 14). Pulse fishing stocks at moderate to high F's (say, F = 2.0) will result in even greater gains in yield. Because fishing these stocks has usually been sporadic it would be advantageous to delay exploitation until mean scallop ages approach those providing best yields.

Iceland scallops

Mean size in Stratum 320 where comparatively more Iceland scallops are taken, is about 73 mm corresponding to a meat weight of 6.2 g. Assuming this to form the bulk of Iceland scallop harvested in Stratum 320, this would be equivalent to harvesting at 62 kg/10,000 recruits (or 73 meats/lb., Fig. 15). It is apparent, however, that this meat count is unrealistically high for this fishery suggestive perhaps of considerable culling at sea and the selective shucking of only larger Icelandics. Modal shell height from Stratum 314 (Table 13) was well above the calculated mean (85 mm vs. 73). This would support our contention that scallops smaller than about 85 mm were by and large discarded. Modal shell height in the north (65 mm) would point to considerable discarding in that area. There are no data on how widespread the phenomenon is but observers and Fishery Officers report that frequently only larger Iceland scallops are "bushelled" for shucking, particularly when operations are directed at the preferred scallop species, the sea scallop.

The modal shell height of 85 mm corresponds to a yield of 9.5 g (or 53 meats/500 g). This is probably close to the current yield in the south. While further small gains may be indicated (Fig. 15) they are unlikely to be attained in this mixed-species fishery.

Biomass

Stratum-specific biomass estimates (Table 11a-d) are given for the two target areas on St. Pierre Bank. Of the three estimates from the Beothic Venture cruise, the one generated using a post-stratification scheme (Table 11 c), is probably the most realistic. A similar approach has been used in analyzing the more recent (1983) Needler data. It is apparent that the most obvious difference has been the significant increase in sea scallop biomass in Stratum 314 - a 218-fold increase by weight. Overall average densities of the two species in the target areas (Table 12) point to the continued presence of sea scallops at densities capable of supporting commercial activity, particularly in Stratum 314. Although mean densities for Iceland scallops were slightly higher in 314 than in 320 they would contribute less to total yield in terms of weight by virtue of their being, on the average, 12% smaller.

Discussion

Biomass estimation is fraught with difficulties. The only defence we advance to post-stratification for biomass estimates relate to the inappropriateness and on inadequacy of randomized resource surveys over large areas, particularly for a sedentary, contiguously distributed species. This approach admittedly ignores other scallop contagions that may occur within the strata. But past and recent directed effort into these areas, as well as our own research vessel surveys suggest that sea scallop concentrations are found in fairly restricted, well-defined areas. The approach adopted here manifestly is more advantageous for purposes of management.

Naidu et al. (1983) reported on the accumulation of year-classes in Stratum 314 with the majority (83%) of animals greater than 12 years. The accumulations were probably a result of the very feeble effort expended in this area at that time. Fishing had occurred only once (in 1978) in the five-year period preceeding it when 23 MT meats had been removed. A marked paucity of younger age groups had also been noted (Naidu et al. 1983). While a number of age cohorts was evident in the southern area (Stratum 320) age-frequency distribution was skewed to the right, again pointing to the accumulation of age groups related to the absence of recent effort in the area. The presence of several consecutive year-classes of Iceland scallops, on the other hand, led the authors to postulate that larval drift, settlement and recruitment mechanisms in this species were relatively more stable in this area than appeared to be the case for the sea scallop. A similar phenomenon has been reported for this species in the northeastern Gulf of St. Lawrence (Naidu et al., 1982).

The most recent survey (Needler, 1983) showed that significant recruitment had taken place on St. Pierre Bank, particularly of the 1977 and 1978 year-classes. The 1978 year-class is especially evident in Stratum 314 accounting for 57% (in numbers) of the total population sampled. These year-classes were conspicuous by their absence during the 1979 survey when only an accumulation of older age groups had been evident. The strength of this recruitment is borne out dramatically when one compares relative numbers in the two surveys (Table 14). The spectacular increase in numbers between 1979 and 1983 is all the more impressive when one considers significant removals by the fishery in 1982. While some recruitment in both species is evident in the two strata, it does not approach the magnitude of additions to sea scallop biomass in the north. It is too early to evaluate contributions from the 1979 year-class, one that has been forcasted to feature prominently in inshore areas of Newfoundland.

It is apparent that the offshore fleet directed most of the initial effort into fishing up the accumulated biomass of sea scallops. Because of the relative abundance of large scallops, average exploitation initially was probably close to that providing maximum Y/R. With continued heavy fishing and consequent removals of larger scallops, average age of exploitation decreased and Y/R reduced. During the latter part of the season most vessels appear to have diverted effort into the northern area of the Bank to fish the younger age cohorts (3 to 5-yr-olds) there. Larger Iceland scallops taken incidentally were selectively shucked in most instances with few boats, if any, directing effort exclusively into taking Iceland scallops. Since meat count requirements could not be met some skippers alluded to the possibility of increasing the meat count, the excuse being there were too many Iceland scallops in the catches. Industry alleged that there was confusion regarding regulations for St. Pierre Bank. The issue of meat separation from a mixed-species fishery was raised. It was then the Department realized that there were problems related to enforcement, particularly with respect to meat counts. The Iceland scallop had indeed been excluded from the gazetted definition of "scallop" in the Atlantic Fishery Regulations (see Appendix I) and convictions, therefore, became problematical. Electrophoretic meat separation is possible but impractical for large numbers of meats as prescribed in the Regulations. In late October 1982 an amendment to the Fisheries Act made the offshore

regulations applicable to Iceland as well as sea scallops. While a meat count of 45/500 g may well approach optimal Y/R for Iceland scallops it is likely to result in growth overfishing and increase pre-recruit mortality in sea scallops.

Pulse fishing at high fishing rates may be the only practical option particularly in areas where there is a mixed-species fishery. Fortunately this is confined to only two strata of the Banks, both located in waters shallower than 30 fms. Management objectives in these areas should include protection of sea scallop pre-recruits until they reach a size approaching optimum Y/R. Requiring vessels fishing in this area to land meats separately may be the only way to generate species-specific management advice. Development of more rapid and easily administered tests to differentiate the two meat types will considerably facilitate the implementation of such a regulation

Conclusions

Current estimates of exploitable biomass point to continued short-term production on St. Pierre Bank. Since most of the accumulated, older scallops have been fished down by varying amounts over target areas in the Banks, the 1977 and 1978 year-classes will continue to be the mainstay of the sea scallop fishery. With their removals during the next fishing pulse, CPUEs in Stratum 314 may be expected to drop to levels that may discourage extensive deployment of effort into St. Pierre Bank until another strong year-class comes along. The discovery of hitherto unfished contagions of sea scallops and/or the shifting of effort to exploiting Iceland scallops will naturally effect short-to-medium-term fishery performance. By and large the fleet appears to have had a decided preference for sea scallops and their exhaustion may provide the necessary impetus to exploiting the smaller Iceland scallop, particularly in deeper water. There has always been an attitudinal problem amongst offshore fishermen to shucking large numbers of Iceland scallops. Their meats are often labelled "dirty" because of the frequency with which portions of the excretory organ and gonad (collectively called "guts") remain attached to the meats.

The St. Pierre Bank scallop fishery will continue to be peripheral to other perhaps more traditional areas of scallop production, particularly Georges Bank and the Scotian Shelf areas. Fishery performance in these areas and scallop prices will affect extent of effort diversion into St. Pierre Bank and the pattern of exploitation there.

Management options for this mixed-species fishery are extremely limited and fraught with implementation difficulties. Given steady-state conditions, it is apparent that if maximizing Y/R is the primary concern then age at first exploitation should be delayed until critical ages are approached for each of the two species and then harvesting at high F.

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References

Caddy, J. F. 1972. Size selectivity of Georges Bank offshore dredge and mortality estimate for scallops from the northern edge of Georges in the period June 1970 to 1971. ICNAF Res. Doc. 72/5.

Dickie, L. M. 1955. Fluctuations in abundance of the giant scallop, Placopecten magellanicus (Gmelin) in the Digby area of the Bay of Fundy. J. Fish. Res. Bd. Canada 12(6): 797-857.

Ekman, S. 1953. Zoogeography of the sea. Sidgwick and Jackson, London, 417 p.

Mercer, M. C. 1974. Natural mortality of the Iceland scallop (Chlamys islandica) in the Gulf of St. Lawrence. ICES C.M.1974/K:7, 11 p.

Naidu, K. S. 1969. Growth, reproduction and unicellular endosymbiotic alga in the giant scallop, Placopecten magellanicus (Gmelin) in Port au Port Bay, Newfoundland. M.Sc. Thesis, Memorial University of Newfoundland, 181 p.

Naidu, K. S., F. M. Cahill, and D. B. Lewis. 1982. Status and assessment of the Iceland scallop, Chlamys islandica in the northeastern Gulf of St. Lawrence. CAFSAC Res. Doc. No. 82/02.

1983. Scallop survey in NAFO Division 3Ps (including Green, St. Pierre and Burgeo Banks). CAFSAC Res. Doc. 83/4.

Pitt, T. K. 1976. Contributions to a manual on ICNAF groundfish survey. ICNAF Res. Doc. 76/VI/119. 14 p.

Thompson, W. F., and F. H. Bell. 1934. Biological statistics of the Pacific Halibut Fishery, (2) Effect of changes in intensity upon total yield and yield per recruit of gear. Rep. Int. Fish. Comm. No. 8, 49 p.

Table 1. Canadian scallop landings (MT meat) from Georges and St. Pierre Banks.

Year	Georges Bank	St. Pierre Bank
1951	91	-
1952	91	-
1953	136	106
1954	91	143
1955	136	153
1956	317	107
1957	771	70
1958	1179	2
1959	1950	-
1960	3401	9
1961	4580	-
1962	5669	-
1963	5941	40
1964	5986	343
1965	4434	14
1966	4878	-
1967	5019	164
1968	4822	9
1969	4318	83
1970	4097	127
1971	3908	27
1972	4161	29
1973	4223	36
1974	6137	-
1975	7414	-
1976	9726	-
1977	13089	-
1978	12189	23
1979	9207	1
1980	5221	35
1981	8013	-
1982		

Table 2a. East to west and south to north variation in mean shell heights of giant and Iceland scallops in survey area (Stratum 314).

Longitude	56°	50.4'	51.9'	53.3'	54.8'	56.2'	57.6'	59.1'	57°00.5'	02.0'	03.4'	04.9'	06.3'	Mean
Stratum 314	Transect No.	11	12	13	14	15	16	17	18	19	20	21	22	
	Giants	86.1	80.5	87.7	83.4	84.7	84.6	85.1	82.8	87.9	85.3	88.0	84.1	85.0
	N	23	50	68	385	1256	809	811	1199	732	510	450	17	6310
	Icelandics	56.0	72.0	64.3	65.5	61.7	66.0	64.1	65.0	64.8	64.7	61.4	-	64.6
	N	1	1	4	80	169	326	371	642	881	551	163	-	3189

Latitude	46°	16'	17'	18'	19'	20'	21'	22'	23'	24'	25'	26'	27'	28'	29'	30'	31'	Mean
Stratum 314	Giants	88.7	85.0	84.7	82.3	81.4	83.3	85.0	86.8	83.4	87.9	86.4	87.4	86.2	86.9	83.1	86.2	85.0
	N	32	34	67	520	868	553	316	551	458	397	1039	439	472	59	46	459	6310
	Icelandics	-	64.0	68.5	64.7	65.0	64.7	64.7	65.6	64.8	63.5	64.8	62.8	65.3	62.7	66.7	58.6	64.6
	N	-	1	2	184	137	46	11	512	455	173	684	341	517	12	15	99	3189

Table 2b. East to west and south to north variation in mean shell heights of giant and Iceland scallops in survey area (Stratum 320).

Longitude	55°	47.4'	50.3'	53.1'	56.0'	58.9'	56°01.8'	04.6'	Mean
Stratum 320	Transect No.	60	62	64	66	68	70	72	
	Giants	109.3	125.0	115.6	94.6	114.8	106.3	118.3	109.3
	N	112	24	51	58	108	210	19	582
	Icelandics	70.5	75.3	76.8	70.5	75.4	67.3	75.8	73.4
	N	132	116	325	220	266	186	149	1394

Latitude	45°	33'	34'	35'	36'	37'	38'	39'	40'	41'	42'	43'	44'	45'	46'	Mean
Stratum 320	Giants	100.6	-	104.7	-	97.3	112.0	105.2	-	110.8	129.0	122.9	-	133.8	110.7	109.3
	N	52	-	99	-	33	15	157	-	118	40	30	-	20	18	582
	Icelandics	62.5	-	65.4	-	64.3	72.4	72.7	-	76.5	-	76.0	-	72.6	79.0	73.4
	N	11	-	61	-	75	14	271	-	266	-	284	-	365	47	1394

Table 3. Summary of von Bertalanffy parameters for sea and Iceland scallops from various depth strata on St. Pierre Bank.

A. Sea Scallops (Placopecten magellanicus)

Depth (fms)	Stratum	L_∞	K	t_o
0-30	314	N.A.	N.A.	N.A.
	320	146.9	0.216	0.349

B. Iceland Scallops (Chlamys islandica)

Depth (fms)	Stratum	L_∞	K	t_o
0-30	314	110.0	0.181	0.380
	320	106.5	0.203	0.367
31-50	312	93.5	0.176	0.242
	315	92.4	0.173	0.174
	321	89.6	0.174	0.345
	325	102.1	0.126	0.148
51-100	317	96.6	0.173	0.478
	319	89.9	0.166	0.239
	322	85.9	0.153	0.160
	323	97.2	0.131	0.100
	324	114.0	0.120	0.051

Table 4. Stratum-specific natural mortality for sea and Iceland scallops on St. Pierre Bank.

Stratum	Sea scallops	Iceland scallops
314	0.080	0.085
320	0.159	0.206
Combined	0.084	0.128

Table 5. Summary of scallop ages fished in 1980 and 1982 (shell-height data).

Species	Year	Stratum	N	Scallop age (%)										
				3	4	5	6	7	8	9	10	11	12	≥13
Sea scallop	1980	320	1043		0.2	1.1	4.2	3.5	3.5	12.5	26.3	14.7	3.0	31.1
	1982	314	1527	19.8	58.6	20.6	0.8	0.1	0.1					0.1
		320	731	2.9	37.6	6.6	4.5	4.0	8.6	15.0	15.3	4.1	0.3	1.1
				3	4	5	6	7	8	9	≥10			
Iceland scallop	1982	Vessel A, 320	539			5.6	21.7	29.5	26.3	9.5	7.4			
		Vessel B, 320	3009	0.2	0.9	7.5	26.8	30.4	20.7	8.3	5.2			

Table 6. Age frequencies inferred from individual meat weights using sea scallop key.

Age	Vessel A (sea scallops only)	Vessel B (mostly giants)	Vessel C (unknown)
1	-	-	-
2	3 (0.2)	-	30 (1.7)
3	674 (36.3)	128 (22.0)	789 (44.1)
4	843 (45.4)	284 (48.7)	664 (37.1)
5	230 (12.4)	55 (9.4)	164 (9.2)
6	61 (3.3)	49 (8.4)	65 (3.6)
7	17 (0.9)	23 (3.9)	26 (1.5)
8	22 (1.2)	30 (5.1)	39 (2.2)
9	7 (0.4)	11 (1.9)	12 (0.7)
10		3 (0.5)	
Totals	1857	583	1789

Table 7. Relative species composition by numbers and weights in two target strata in 3Ps (1-lined gear; 2-unlined gear).

Stratum	Source	Number		Percent	
		Giant	Iceland	Giant	Iceland
A. Relative contributions by numbers					
314	Beothic Venture, 1979 (1)	47	2318	2	98
	Alfred Needler, 1983 (1)	8659	4111	68	32
320	Beothic Venture (1)	800	3556	18	82
	Charlotte & Rickey, 1982 (2)	244	5639	4	96
	Charlotte & Rickey, 1982 (1)	81	4549	2	98
	Alfred Needler, 1983 (1)	426	1368	24	76

Stratum	Source	Weight (kg)		Percent	
		Giant	Iceland	Giant	Iceland
B. Relative contribution by weights					
314	Beothic Venture, 1979 (1)	22	180	11	89
	Kathryn M., 1982 (2)	16,836	169	99	1
	Alfred Needler, 1983 (1)	652	183	78	22
320	Beothic Venture (1)	215	268	45	55
	Charlotte & Rickey (1)	20	289	7	93
	Charlotte & Rickey (2)	57	430	12	88
	Kathryn M., 1982 (2)	2535	8515	23	77
	Alfred Needler (1)	104	94	52	48

Table 8. Age-specific meat yields for sea and Iceland scallops from St. Pierre Bank.

	Sea scallops		Iceland scallops	
Age	Mean shell height (mm)	Muscle weight (g) (catch and quick)	Mean shell height (mm)	Muscle weight (g) (catch and quick)
1	19.3	0.12	11.7	0.03
2	44.1	1.35	28.0	0.38
3	64.1	4.08	41.6	1.20
4	80.2	7.94	52.9	2.40
5	93.1	12.36	62.4	3.87
6	103.6	16.97	70.3	5.47
7	112.0	21.38	76.9	7.08
8	118.8	25.46	82.4	8.65
9	124.3	29.13	86.9	10.09
10	128.7	32.29	90.8	11.45
11	132.2	34.97	93.9	12.62
12	135.1	37.30	96.6	13.69
13	137.4	39.21	98.8	14.61

Table 9. Catch and effort data for St. Pierre Bank scallop fishery. (From ICNAF and NAFO Statistical Bulletins.)

Year	MT meats	Effort days	CPUE (MT meats/day)
1963	20	19	1.1
1964	262	277	0.9
1965	13	16	0.8
1966	-	-	-
1967	138	172	0.8
1968	9	13	0.7
1969	82	147	0.6
1970	125	172	0.7
1971	27	55	0.5
1972	29	45	0.6
1973	20	35	0.6
1974	-	-	-
1975	-	-	-
1976	-	-	-
1977	-	-	-
1978	9	7	1.3
1979	1	2	0.5
1980	23	26	0.9
1981	-	-	-
1982	664	762	0.9
Totals	1,422	1,748	0.8

Table 10. Sea scallop meat-counts for selected boats fishing St. Pierre Bank in Stratum 314 (September 1982).

Vessel	Position	Sample weight (g)	No. of meats in sample	Meat count/500 g
A	46°24'N/57°00'W	4049.4	390	48.2
B	46°25'N/57°00'W	4040.5	330	40.8
C	46°24'N/56°59'W	4552.3	467	51.3
D	46°28'N/57°00'W	5047.7	491	48.6
E	46°30'N/57°01'W	5071.3	510	50.3
F	46°26'N/56°58'W	2035.0	210	51.6
G	46°26'N/56°58'W	3546.9	328	46.2
H	46°28'N/57°03'W	5110.0	449	43.9
I	46°24'N/57°00'W	5130.2	500	48.7
J	46°26'N/57°01'W	4543.9	389	42.8
K	46°24'N/56°55'W	5042.4	546	54.1
L	46°24'N/56°55'W	4610.9	446	48.4
M	46°22'N/56°58'W	4523.4	435	48.1
Totals		57303.9	5491	47.9

Table 11a. Stratum-specific biomass on St. Pierre Bank. Random stratified survey employing the standard Groundfish stratification scheme. Only pre-determined stations used (Beothic Venture, May-July 1979).

Stratum	No. sets	Stratum area (nautical sq. mi)	Biomass (MT, round) 95% confidence limits (mean) Giants	Iceland
314	17	974	(-249)-1025 (388)	(-5039)-28,988(11,972)
320	41	1320	16,301-60,593(38,447)	(-2799)-65,556(31,376)
Totals	58	2294	(38,835)	(43,347)

Table 11b. Stratum-specific biomass on St. Pierre Bank. Random stratified survey employing the standard Groundfish stratification scheme. Pre-determined and survey stations used (Beothic Venture, May-July 1979).

Stratum	No. sets	Stratum area (nautical sq. mi)	Biomass (MT, round) 95% confidence limits (mean) Giants	Iceland
314	40	974	28-8121(4074)	(-1840)-67,218(32,689)
320	64	1320	18,300-47,824(33,062)	8955-73,447(41,201)
Totals	104	2294	21,877-52,396(37,136)	27,245-120,539(73,892)

Table 11c. Stratum-specific biomass on St. Pierre Bank. User-defined post stratification employing sets yielding ≥5 kg; G-Giant scallops; I-Iceland scallops. (Beothic Venture, May-July 1979).

Stratum	No. sets >5 kg G	No. sets >5 kg I	Estimated area (nautical sq. mi) G	Estimated area (nautical sq. mi) I	Biomass (MT, round) 95% confidence limits (mean) Giants	Biomass (MT, round) 95% confidence limits (mean) Iceland	Biomass/ nautical sq. mi (MT) G	Biomass/ nautical sq. mi (MT) I
314	2	6	10	25	0.3-83(42)	(-47)-1725(839)	4.1	33.5
320	18	8	75	10	1040-2717(1878)	340-2782(1561)	25.3	31.2
Totals	20	14	85	35	1081-2760(1920)	909-3891(2400)	22.3	31.8

Table 11d. Stratum-specific biomass on St. Pierre Bank. User-defined post stratification employing sets yielding >5 kg; G-Giant scallops; I-Iceland scallops (Needler, January 1983).

Stratum	No. sets >5 kg G	No. sets >5 kg I	Estimated area (nautical sq. mi) G	Estimated area (nautical sq. mi) I	Biomass (MT, round) 95% confidence limits (mean) Giants	Biomass (MT, round) 95% confidence limits (mean) Iceland	Biomass/ nautical sq. mi (MT) G	Biomass/ nautical sq. mi (MT) I
314	35	15	55	17	6505-11812(9158)	487-1105(796)	166.4	46.5
320	14	7	40	28	1557-3754(2656)	516-2860(1688)	66.4	60.0
Totals	49	22	95	45	8986-14642(11,814)	1283-3685(2484)	124.1	55.3

Table 12. Density approximations (no./sq. meter) of giant and Iceland scallops from two target areas in St. Pierre Bank. (Data from Needler, 1983, computed from area-specific biomass).

Depth range	Stratum	Area nautical sq. mi G	Area nautical sq. mi I	95% confidence limits (mean) Giants	95% confidence limits (mean) Iceland
0-30	314	55	17	0.45-0.84(0.64)	0.19-0.42(0.31)
0-30	320	40	28	0.04-0.12(0.08)	0.09-0.41(0.25)
Totals		95	45	0.29-0.52(0.41)	0.17-0.38(0.27)

Table 13. Modal shell heights for scallops from two strata on St. Pierre Bank.

Species	Stratum	Modal shell height (mm)
Sea scallops	314 (northern)	84
	320 (southern)	127
Iceland scallops	314	65
	320	85

Table 14. Estimated numbers ($x10^3$) of sea and Iceland scallops in Strata 314 and 320 during the Beothic Venture (1979) and the Needler (1983) surveys. Mean numbers parenthesized.

Species	Stratum	Beothic Venture	Needler
Sea scallops	314	15 to 160 (88)	85,292 to 157,943 (121,618)
	320	3,886 to 10,079 (6,983)	5,559 to 16,198 (10,879)
Totals		3,973 to 10,167 (7,070)	95,867 to 169,126 (132,497)
Iceland scallops	314	-156 to 21,737 (10,791)	11,005 to 24,689 (17,847)
	320	4,350 to 37,034 (20,692)	9,052 to 39,856 (24,454)
Totals		12,025 to 50,941 (31,483)	25,799 to 58,803 (42,301)

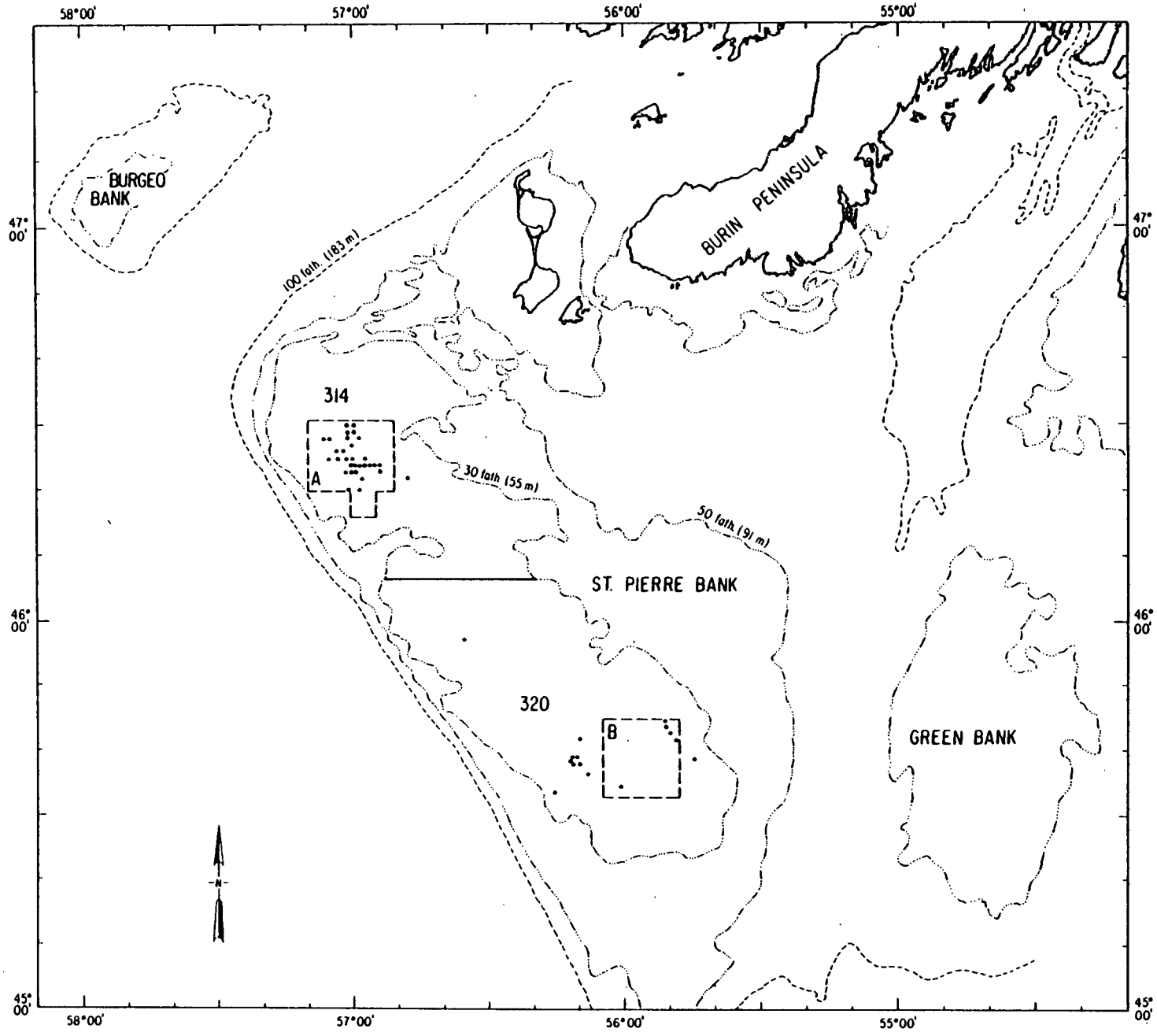

Fig. 1. Location of fishing areas on St. Pierre Bank.

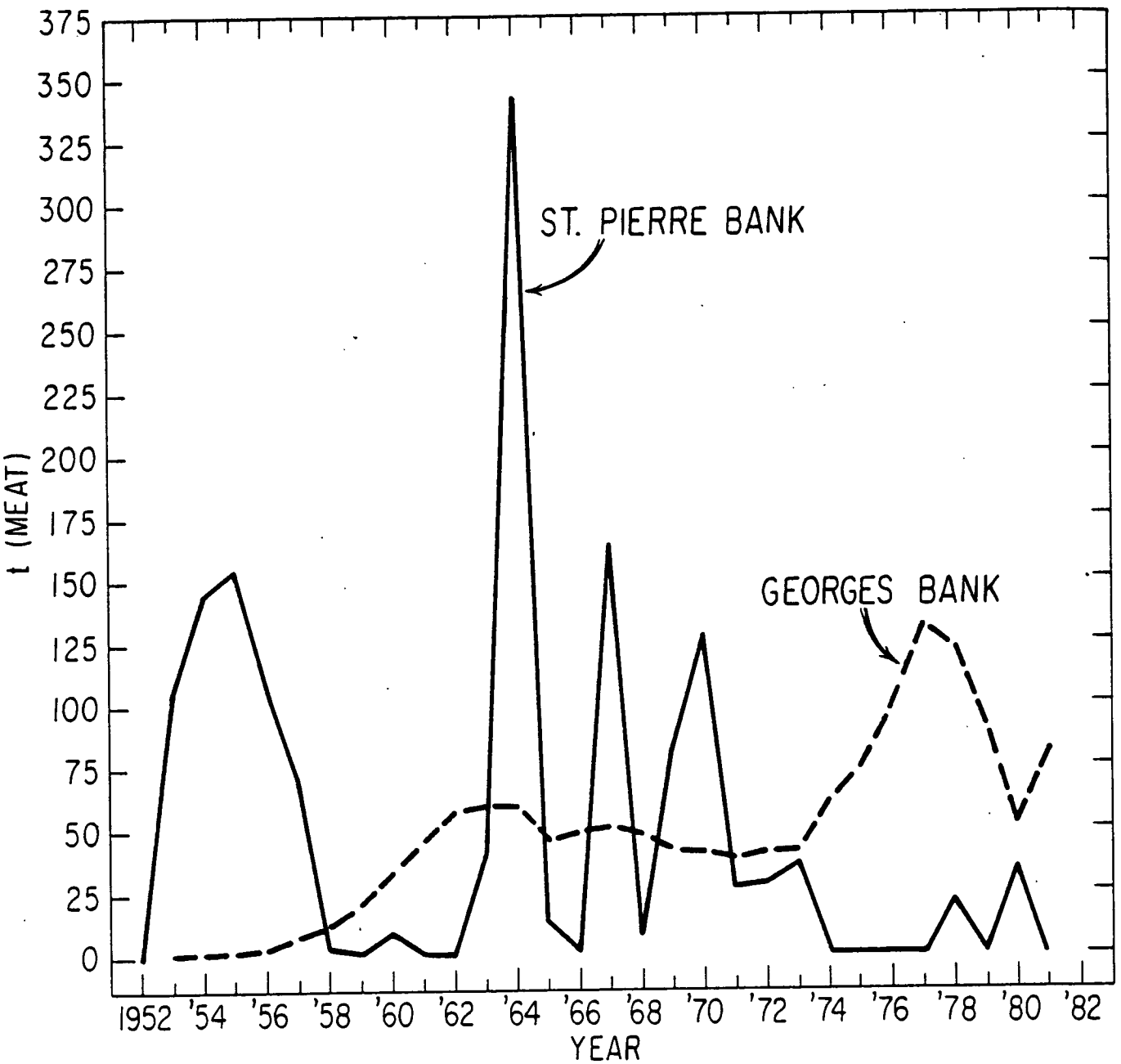

Fig. 2 Scallop landings (MT meats) from St. Pierre (X100) and Georges Bank.

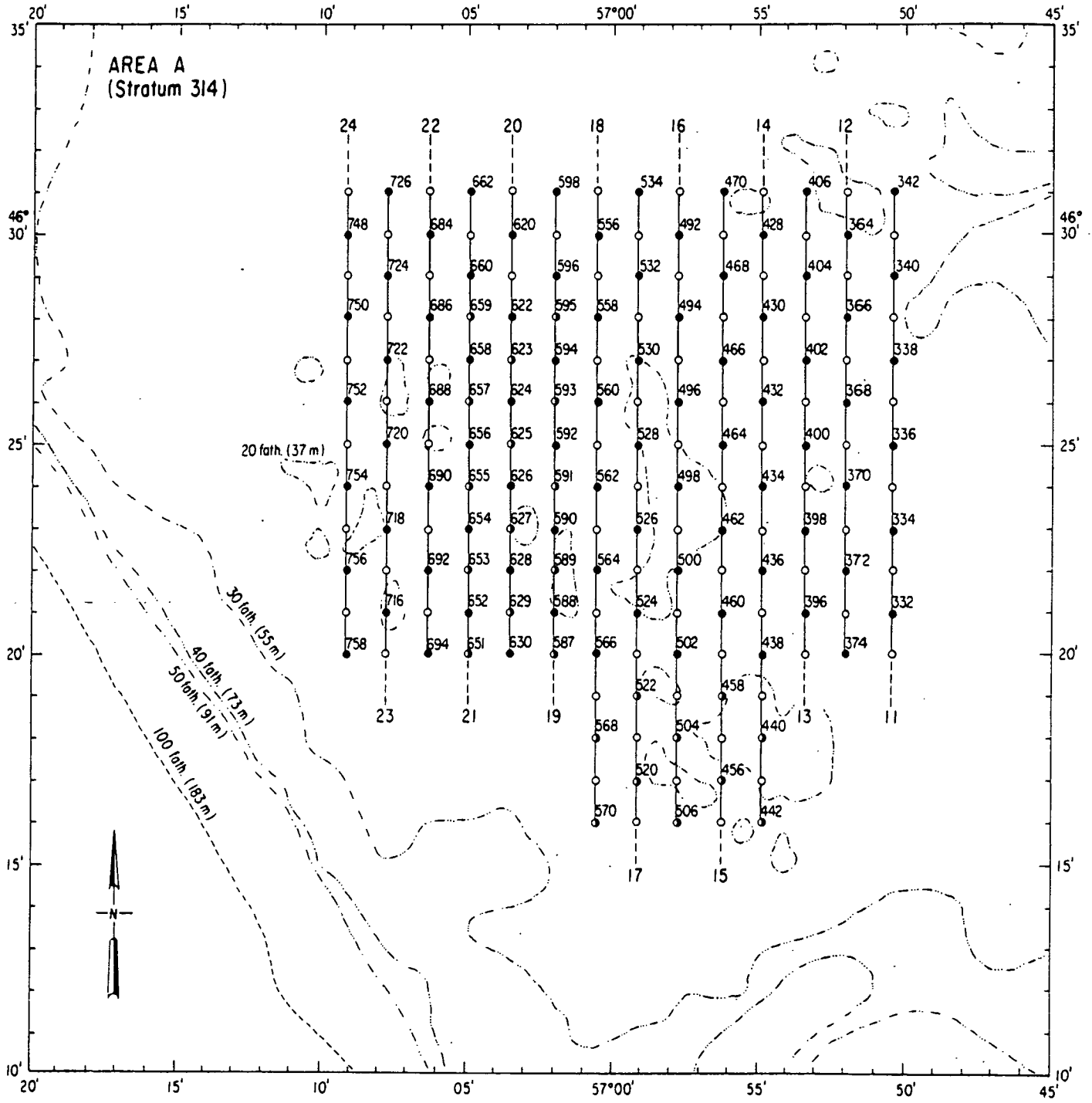

Fig. 3. Distribution of stations occupied in Stratum 314 (northern area) during Needler cruise (January 1983). Solid circles occupied during first phase. Half-shaded circles represent additional fishing stations fished during the third phase of the cruise.

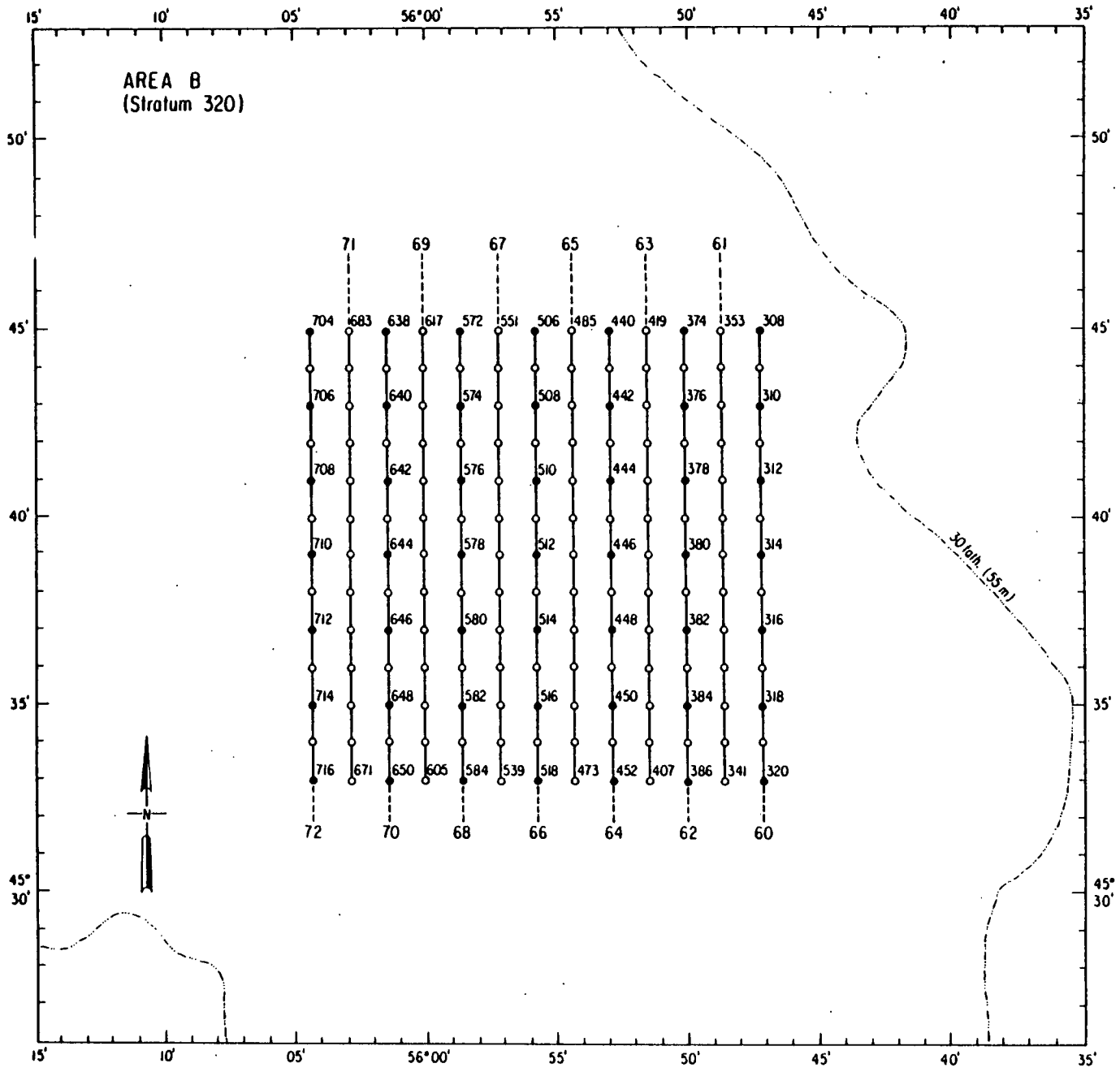

Fig. 4. Distribution of stations occupied in Stratum 320 (southern area) during Needler cruise (January 1983).

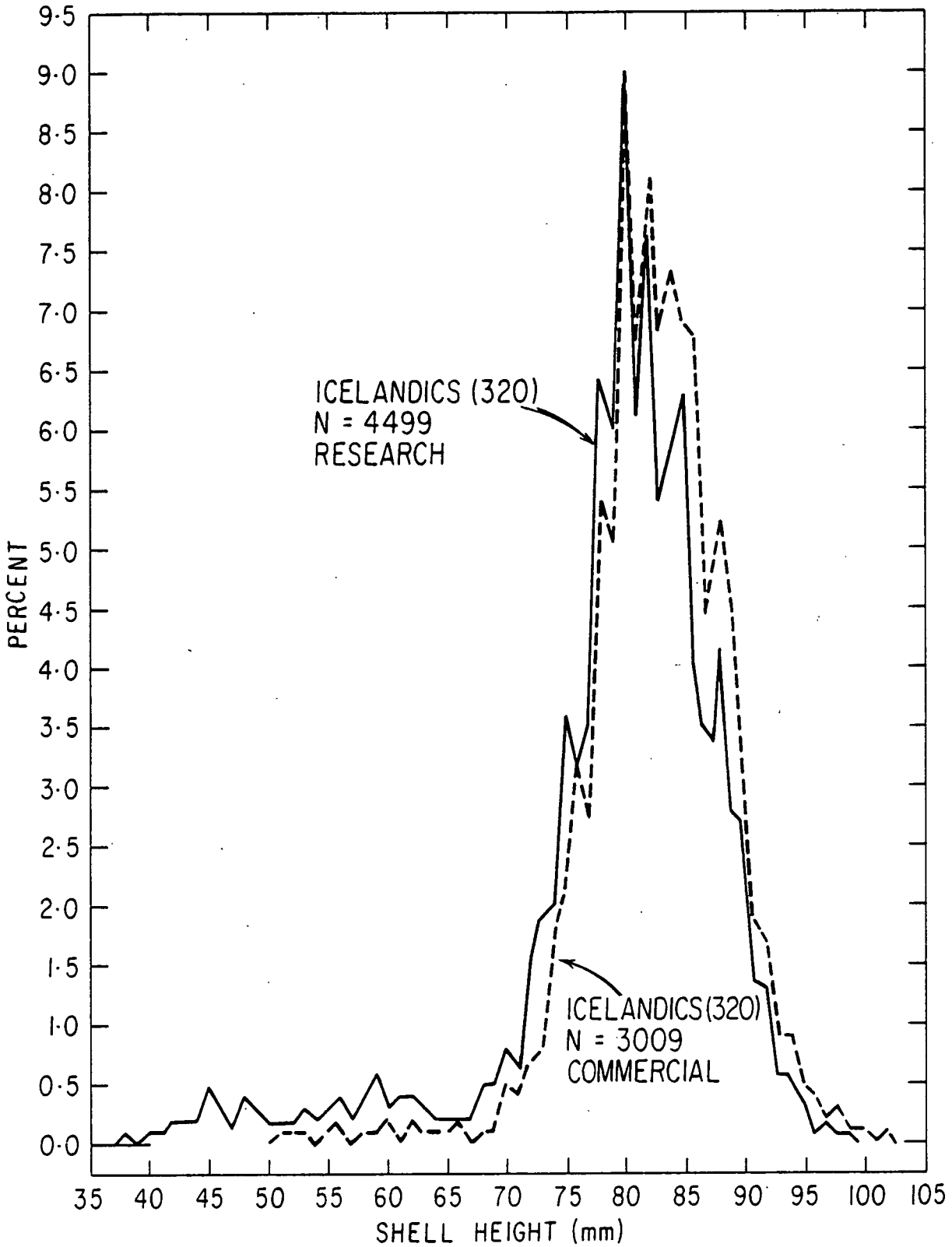

Fig. 5. Percent retention by size in research (lined) and commercial gear with top: bottom link configuration of 3:4.

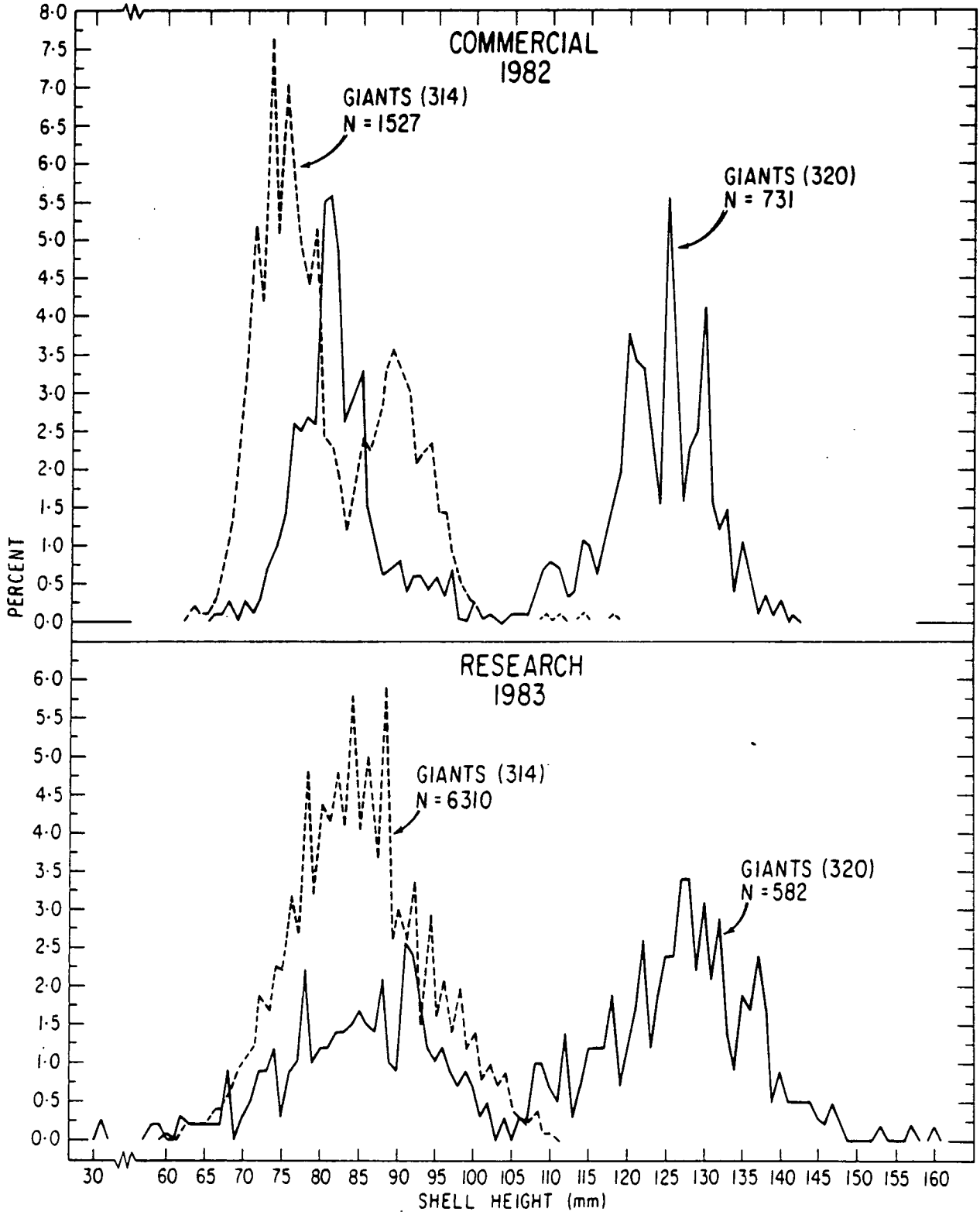

Fig. 6. Research and commercial shell-height frequencies of sea scallops from two target strata on St. Pierre Bank (1982, 1983).

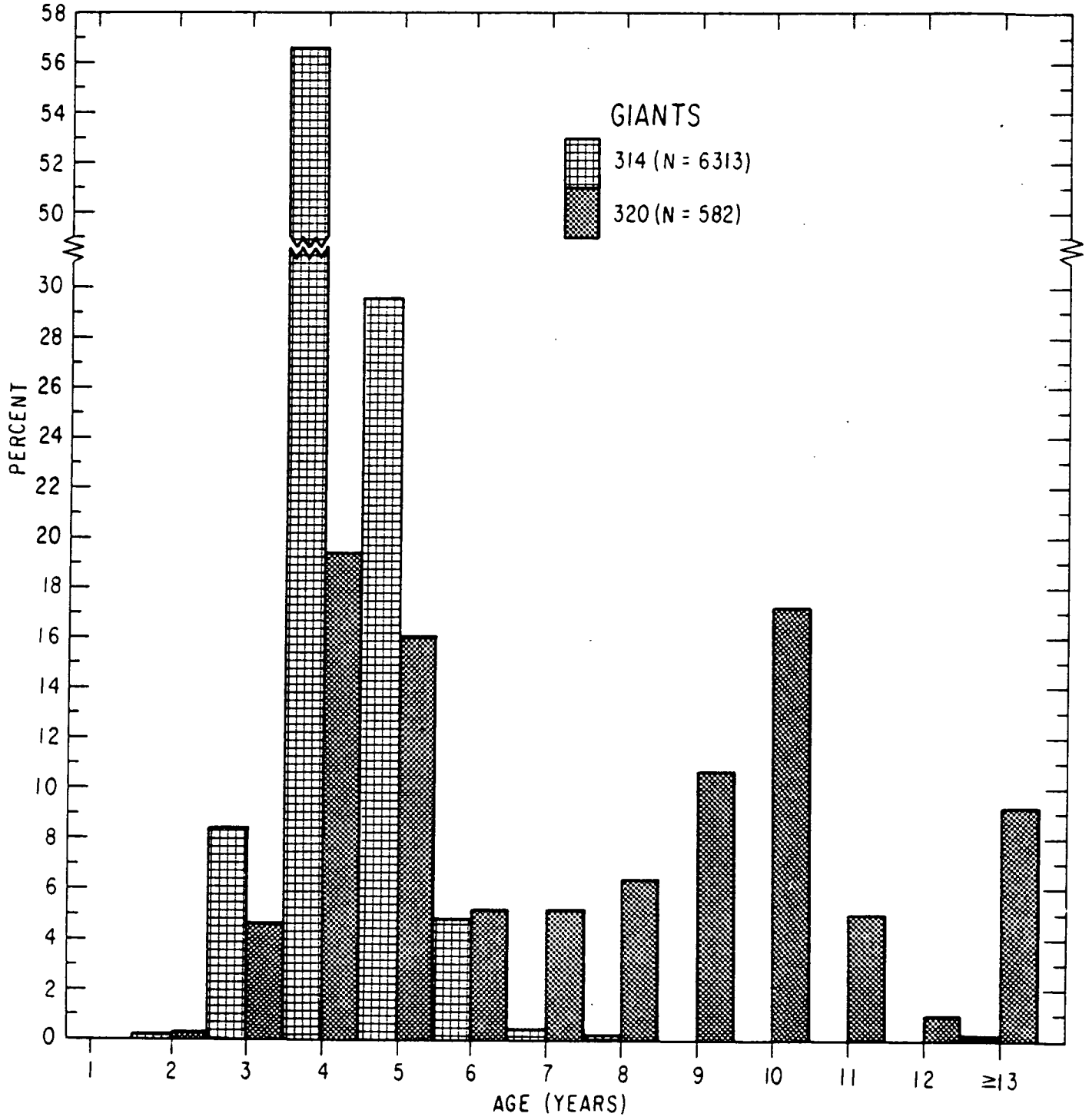

Fig. 7. Age frequencies (research) of sea scallops from Strata 314 and 320 (St. Pierre Bank) in 1983.

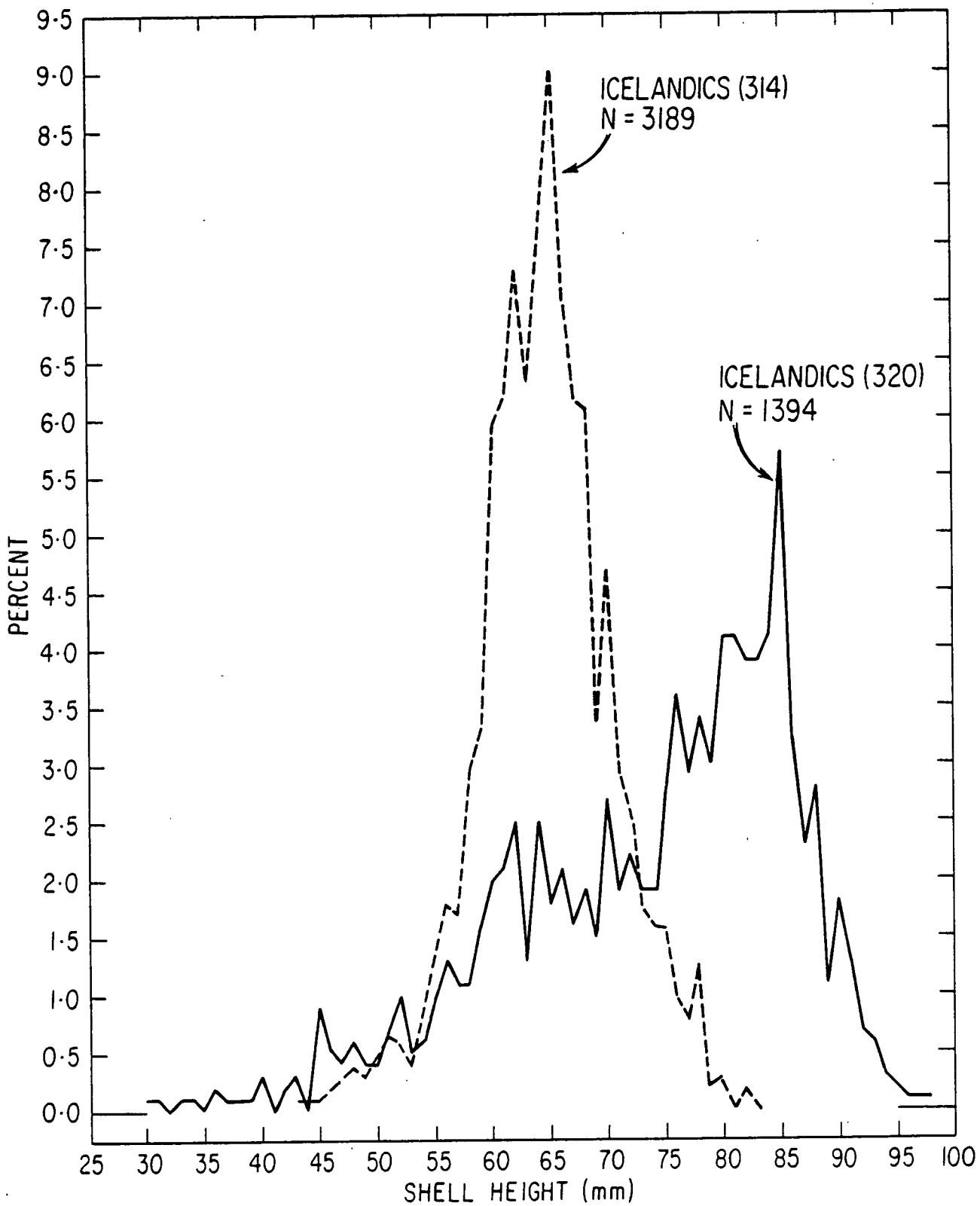

Fig. 8. Research shell-height frequencies of Iceland scallops from Strata 314 and 320 (St. Pierre Bank).

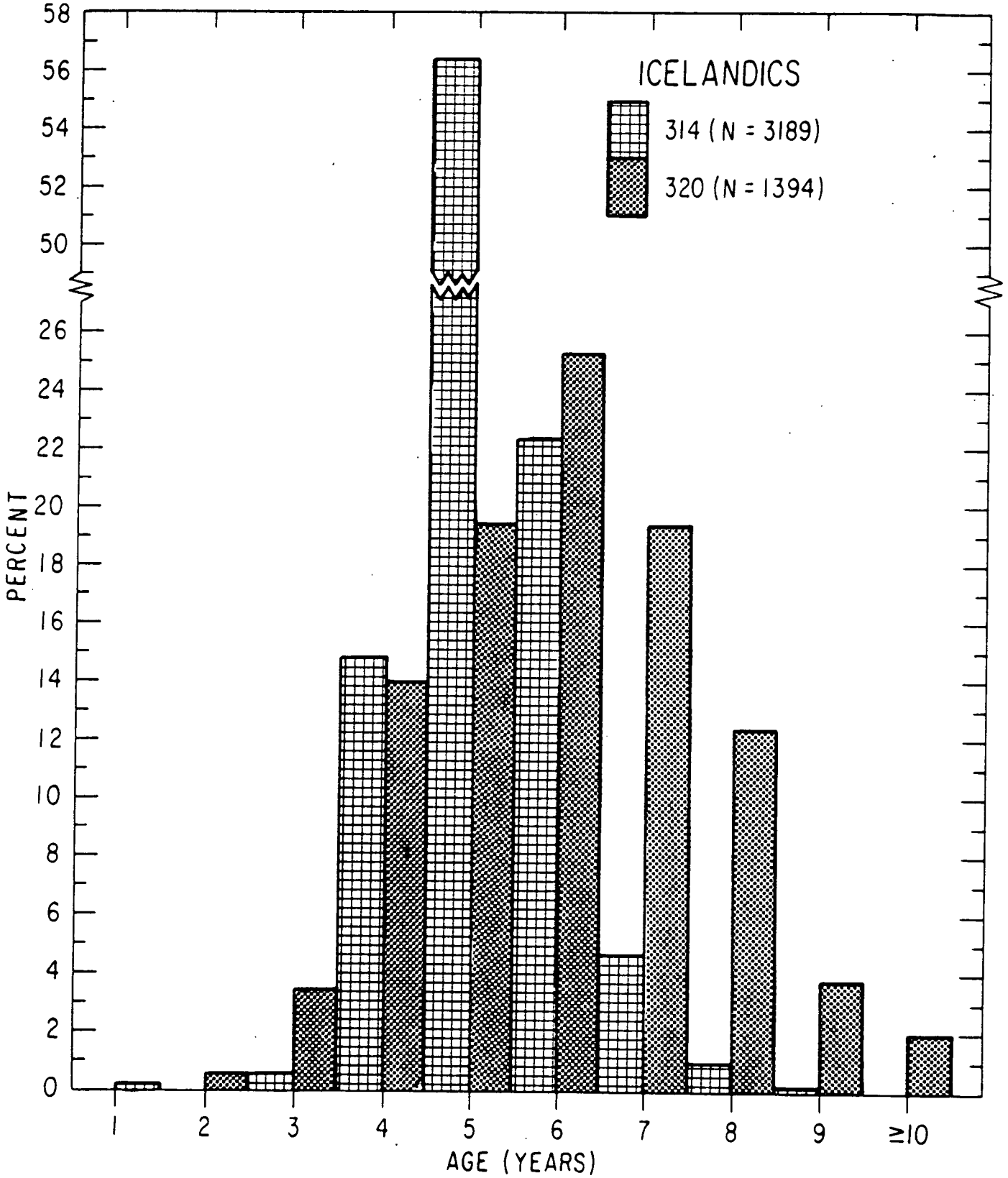

Fig. 9. Age frequencies (research) of Iceland scallops from Strata 314 and 320 (St. Pierre Bank).

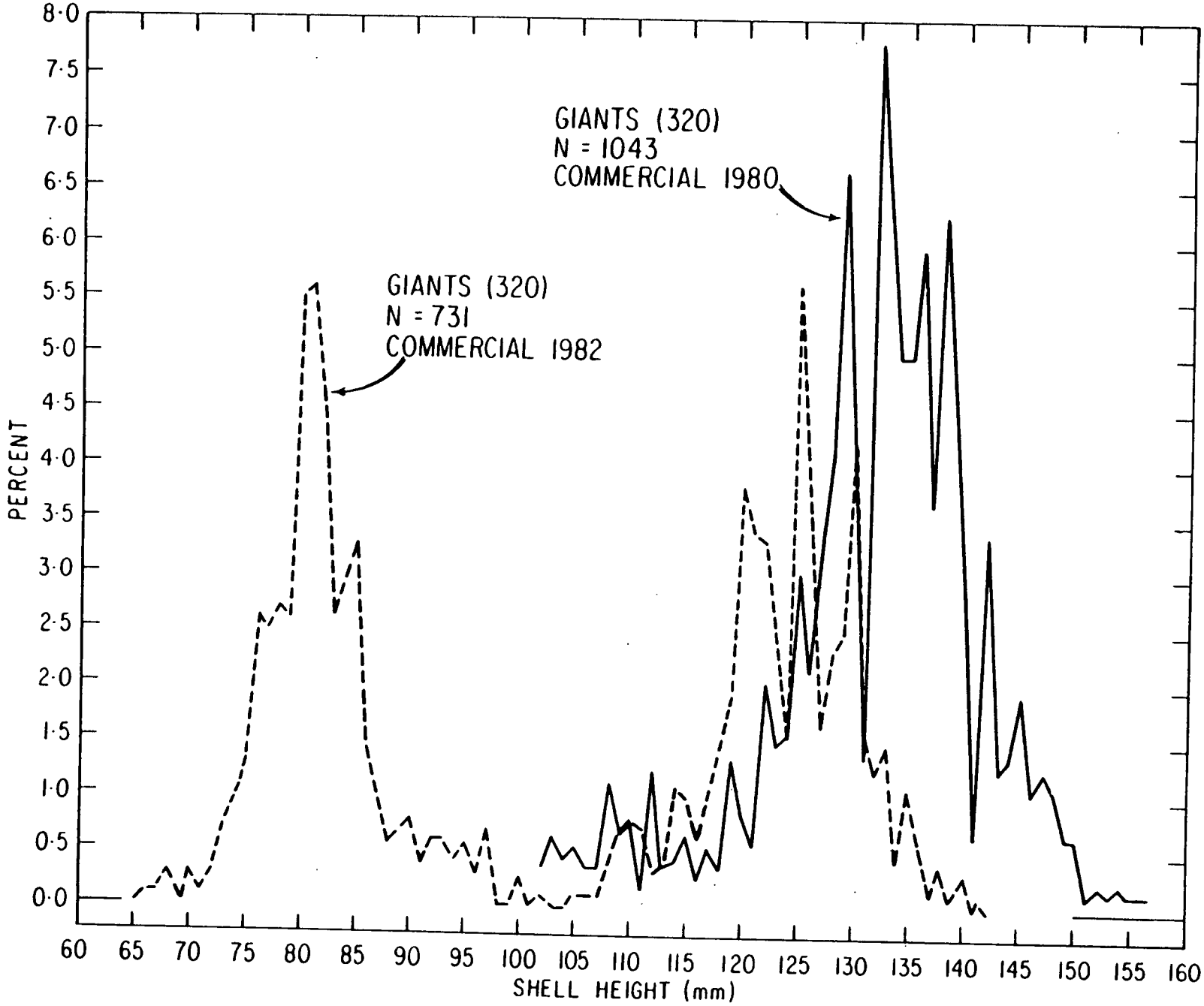

Fig. 10. Commercial shell-height frequencies in sea scallops (1980, 1982) from the southern Stratum (314) on St. Pierre Bank.

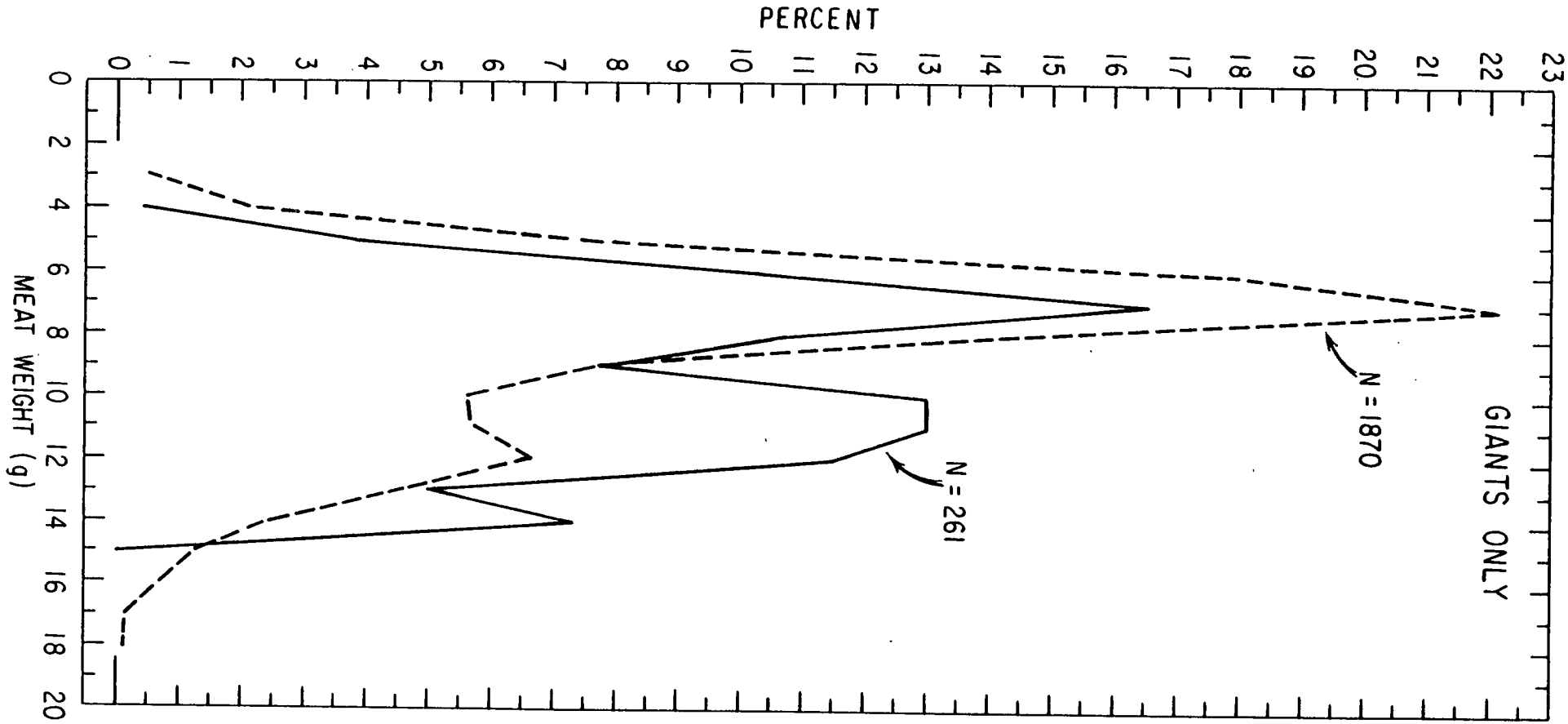

Fig. 11. Commercial meat-weight frequency distribution of two sea scallop samples from St. Pierre Bank (1982).

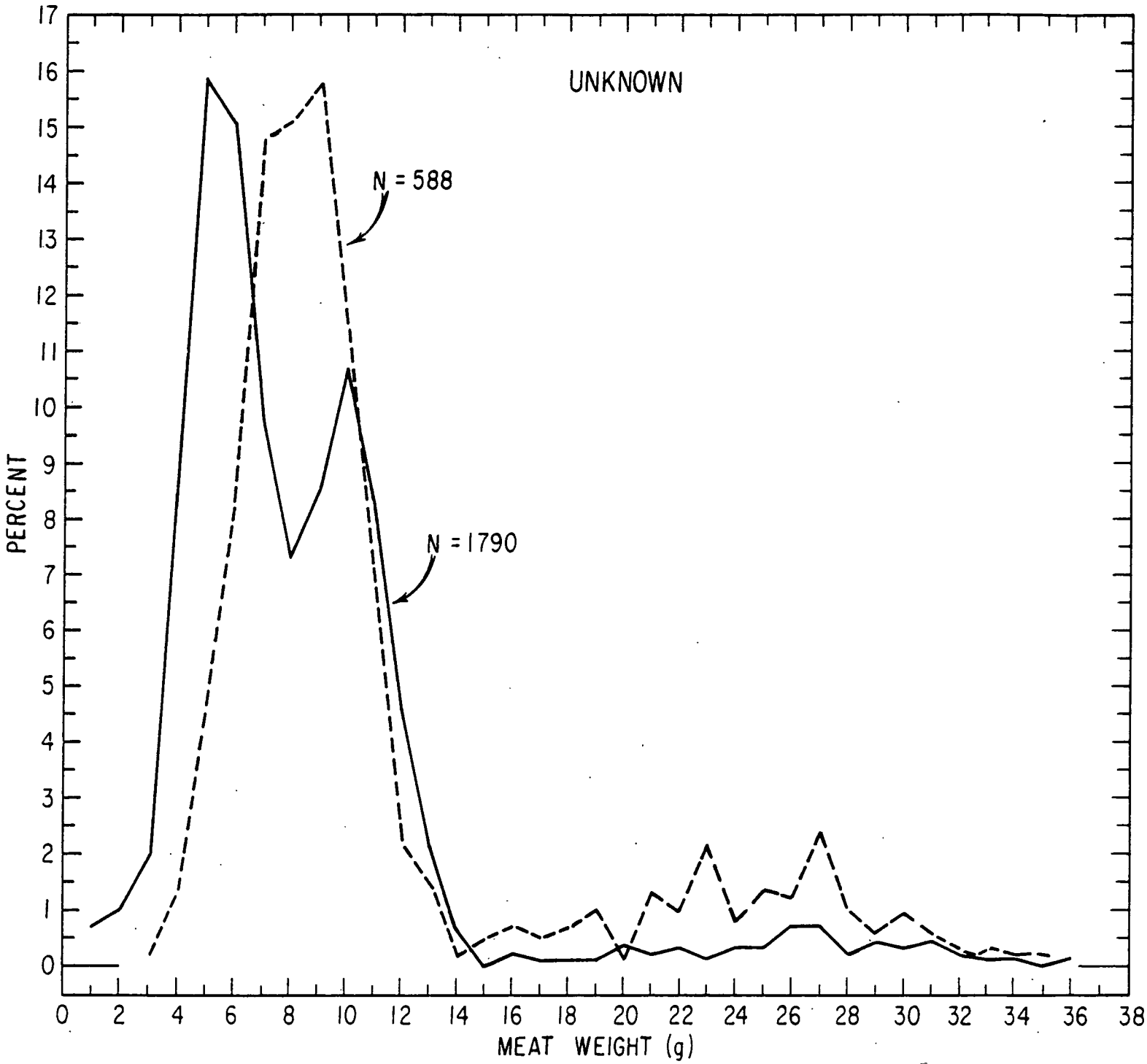

Fig. 12. Commercial meat-weight frequency distributions of two samples (unknown species composition) from St. Pierre Bank (1982).

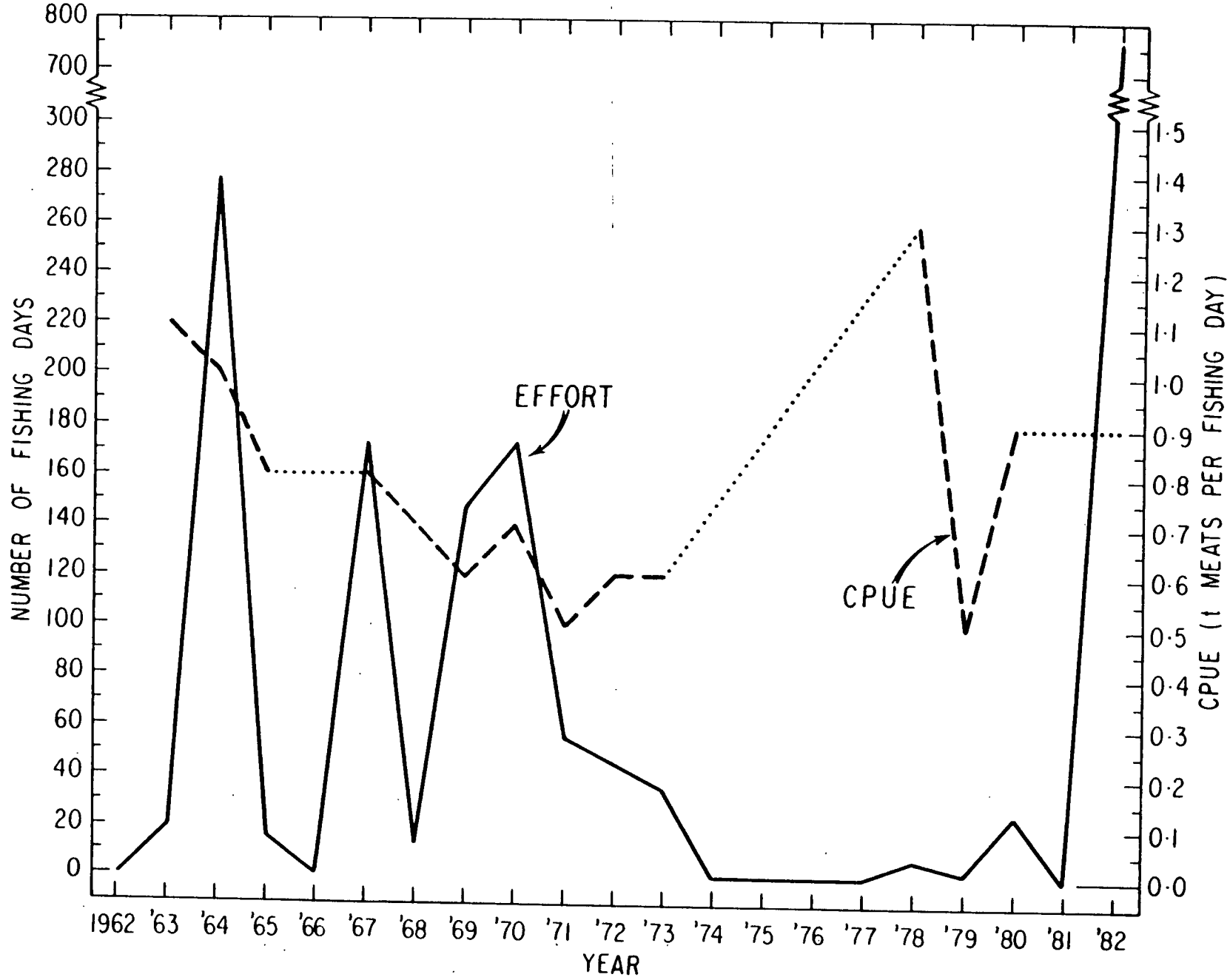

Fig. 13. Effort and catch per unit of effort (MT meats/day) on St. Pierre Bank (1963-1982).

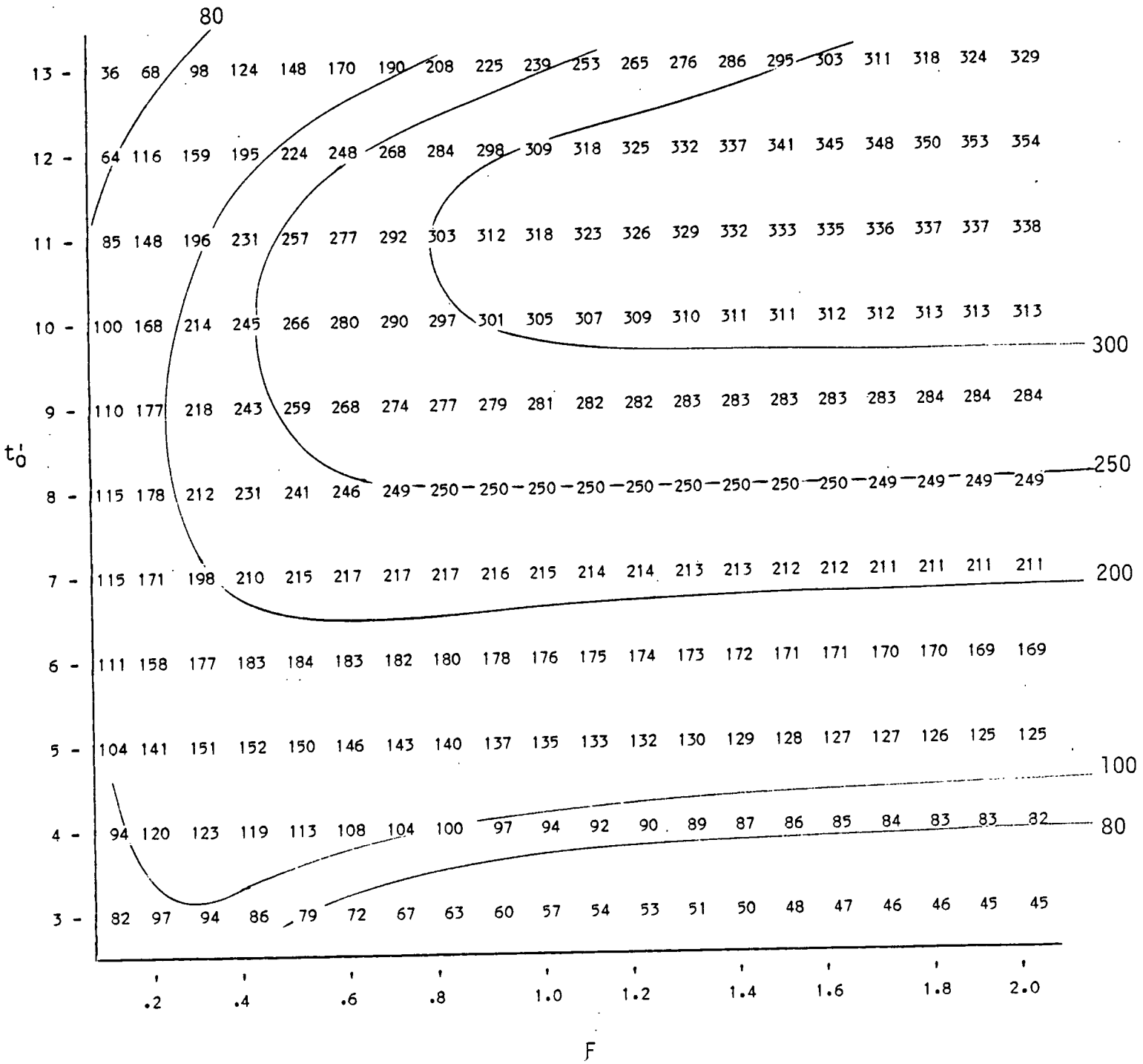

Fig. 14. Yields and yield isopleths (kg/10,000 recruits) calculated for sea scallops from St. Pierre Bank (t_0' = age (yr) of first capture, F = fishing mortality).

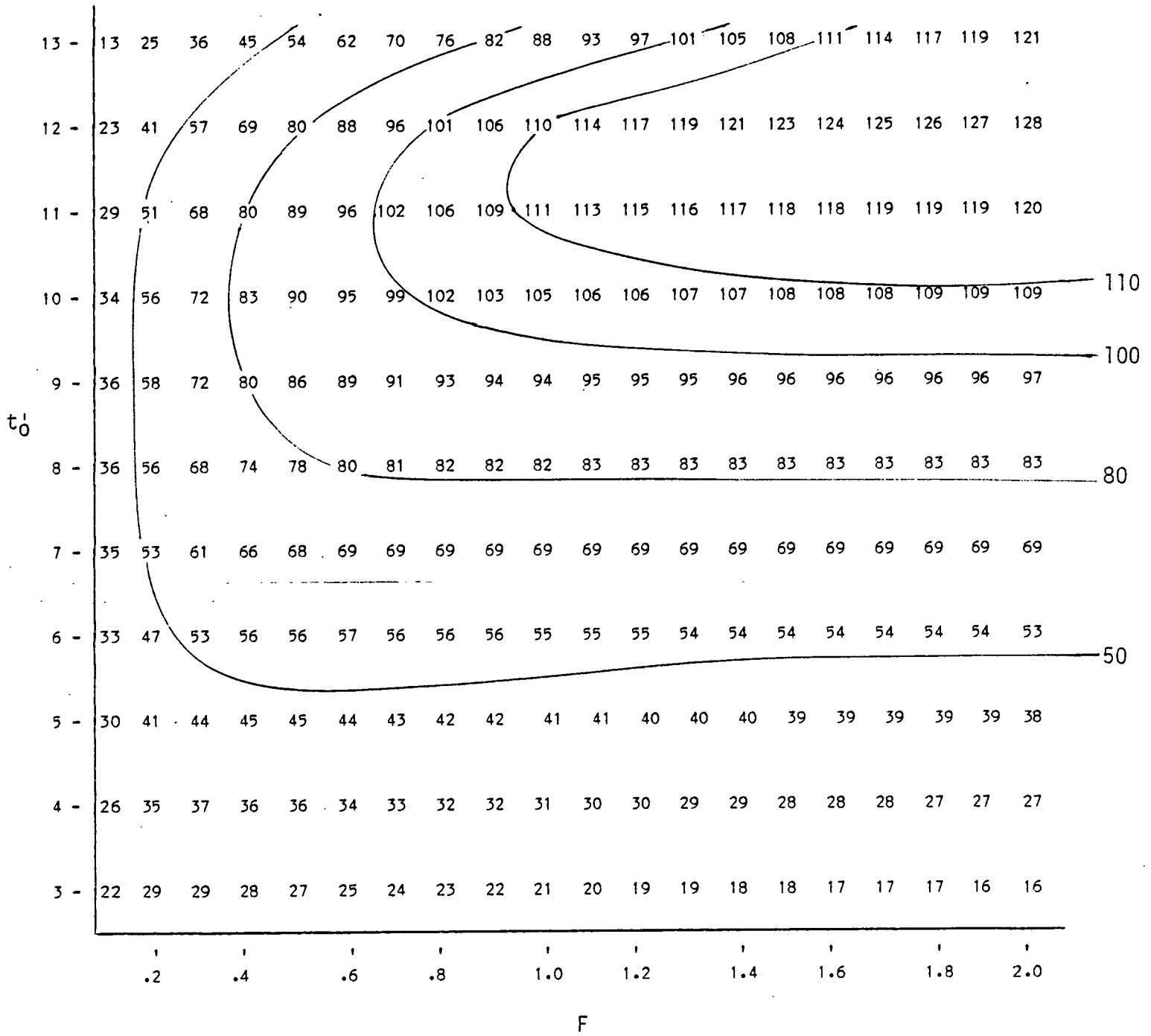

Fig. 15. Yields and yield isopleths (kg/10,000 recruits) calculated for Iceland scallops from St. Pierre Bank (t_0' = age (yr) of first capture, F = fishing mortality).

APPENDIX A

Scallops

18. (1) Subject to subsection (3), no person fishing by means of a vessel shall catch and retain any scallops, the number of meats of which exceed an average count of 45 meats to 500 g.

(2) The average count referred to in subsection (1) shall be determined on the basis of not less than eight representative samples of scallops, each sample weighing not less than 500 g.

(e)

(3) Subsection (1) does not apply to any person fishing for scallops by means of a vessel less than 19.8 m in overall length in any area other than subdivision 5Ze.

(4) No person fishing for scallops by means of a vessel shall catch and retain

(a) (*a*) during any fishing trip, such an amount of scallops that the meats thereof weigh more than 13 608 kg; or

(b) (*b*) during any of the periods

(i) April 1 to July 31, in any year,

(c) (ii) August 1 to November 30, in any year, or

(f) (iii) December 1 in any year to March 31 in the year next following,

such an amount of scallops that the meats thereof weigh more than 81 648 kg,

(d) (4.1) In weighing scallop meats for the purposes of subsection (4), the fact that such meats may have increased in weight as a result of the absorption of water between the time of catching and the time of weighing shall be disregarded.

(5) For the purposes of paragraph (4)(*b*), where a scallop fishing vessel arrives in port from a fishing trip within a period referred to therein, the vessel shall be regarded as having fished during that period.

(6) No person fishing for scallops by means of a vessel shall exceed 12 calendar days at sea during any fishing trip, including the day of departure and the day of landing.

(a) *P.C. 1978-751*
(b) *P.C. 1978-2094*
(c) *P.C. 1979-1457*
(d) *P.C. 1980-1354*
(e) *P.C. 1981-2210*
(f) *P.C. 1982-307*

Amendment List March 2, 1982

Pétoncles

18. (1) Sous réserve du paragraphe (3), il est interdit à quiconque pêche au moyen d'un bâtiment, de prendre ou de garder des pétoncles dont la chair a un poids tel qu'il faut en moyenne, plus de 45 pétoncles pour faire 500 g de chair.

(2) La moyenne visée au paragraphe (1) est déterminée sur la base d'au moins huit échantillons représentatifs de pétoncles, chaque échantillon pesant au moins 500 g chacun.

e)

(3) Le paragraphe (1) ne s'applique pas à quiconque pêche le pétoncle dans une autre zone que la sous-division 5Ze, au moyen d'un bâtiment d'une longueur hors tout inférieure à 19,8 m.

(4) Il est interdit à quiconque pêche le pétoncle au moyen d'un bâtiment de prendre et de garder

a) plus de 13 608 kg de pétoncles décoquillés, au cours d'une excursion de pêche; ou

a)

b) plus de 81 648 kg de pétoncles décoquillés,

b)

(i) du 1er avril au 31 juillet de chaque année,
(ii) du 1er août au 30 novembre de chaque année, ou

c)

(iii) du 1er décembre de chaque année au 31 mars de l'année suivante.

(4.1) Aux fins du paragraphe (4), il n'est pas tenu compte, dans le calcul du poids des pétoncles décoquillés, de l'eau qu'ils peuvent avoir absorbée entre le moment de la capture et du pesage.

d)

(5) Aux fins de l'alinéa 4*b*), c'est le jour où un bateau qui pêche des pétoncles rentre au port après une excursion de pêche qui détermine la période des prises de cette excursion.

(6) Il est interdit à quiconque pêche des pétoncles au moyen d'un bateau de passer plus de 12 jours civils en mer lors d'une excursion de pêche, y compris le jour de départ et le jour de débarquement.

a) *C.P. 1978-751*
b) *C.P. 1978-2094*
c) *C.P. 1979-1457*
d) *C.P. 1980-1354*
e) *C.P. 1981-2210*

Liste de modifications 2 mars 1982

APPENDIX A (Cont'd.)

SCHEDULE I

(s. 2)

SCIENTIFIC AND COMMON NAMES

Column I Common Names	Column II Species Names
1. American plaice	• *Hippoglossoides platessoides* (Fab.)
2. Argentine	• *Argentina silus*
3. Billfish	• *Scomberesox saurus*
4. Capelin	• *Mallotus villosus*
5. Cod	• *Gadus morhua*
6. Dogfish	• *Squalus acanthias*
7. Flounder	• Fish of the order *heterosomata*
8. Greenland halibut	• *Reinhardtius hippoglossoides* (Walb.)
9. Haddock	• *Melanogrammus aeglefinus*
10. Halibut	• *Hippoglossus hippoglossus* (L.)
11. Herring	• *Clupea harengus* (L.)
12. Mackerel	• *Scomber scombrus*
13. Menhaden	• *Brevoortia tyrannus*
14. Pollock	• *Saithe* or *Pollachius virens*
15. Redfish	• *Sebastes marinus*
16. Red hake	• *Urophycis chuss*
17. Roundnose Grenadier	• *Macrourus rupestris*
18. Salmon	• Any of the several species of the order *salmonidae*
19. Scallops	• *Placopecten magellanicus* (Gmelin)
20. Shark	• Any of the several species of the order *Pleurotremata* (*Squaliforms*)
21. Shrimp	• *Pandalus borealis*
22. Silver hake	• *Merluccius bilinearis*
23. Squid	• *Illex illecebrasus* and *Loligo pealei*
24. Swordfish	• *Xipias gladius*
25. Tuna	• Any of: *Thunnus albacares, Thunnus thynnus, Thunnus atlanticus, Thunnus alalunga, Thunnus obesus, Euthynnus pelamis, Sarda sarda, Sarda chiliensis* and *Euthynnus alletteratus*
26. White hake	• *Urophycis tenuis*
27. Winter flounder	• *Pseudopleuronectes americanus* (Walb.)
28. Witch flounder	• *Glyptocephalus cynoglossus*
29. Yellowtail flounder	• *Limanda ferruginea* (Storer)

ANNEXE I

(art. 2)

NOMS COMMUNS ET SCIENTIFIQUES

Colonne I Noms communs	Colonne II Noms scientifiques
1. Plie du Canada	• *Hippoglossoides platessoides* (Fab.)
2. Argentine	• *Argentina silus*
3. Balaou	• *Scomberesox saurus*
4. Capelan	• *Mallotus villosus*
5. Morue	• *Gadus morhua*
6. Aiguillat	• *Squalus acanthias*
7. Poisson plat	• Poisson de l'ordre des *heterosomata*
8. Flétan du Groenland	• *Reinhardtius hippoglossoides* (Walb.)
9. Aiglefin	• *Melanogrammus aeglefinus*
10. Flétan	• *Hippoglossus hippoglossus* (L.)
11. Hareng	• *Clupea harengus* (L.)
12. Maquereau bleu	• *Scomber scombrus*
13. Alose tyran	• *Brevoortia tyrannus*
14. Goberge	• *Saithe* ou *Pollachius virens*
15. Sébaste	• *Sebastes marinus*
16. Merluche	• *Urophycis chuss*
17. Grenadier de roche	• *Macrourus rupestris*
18. Saumon	• Tout poisson des espèces de l'ordre des *salmonidae*
19. Pétoncles	• *Placopecten magellanicus* (Gmelin)
20. Requin	• Tout poisson des espèces de l'ordre des *Pleurotremata* (*Squaliformes*)
21. Crevette	• *Pandalus borealis*
22. Merlu argenté	• *Merluccius bilinearis*
23. Calmar	• *Illex illecebrasus* et *Loligo pealei*
24. Espadon	• *Xiphias gladius*
25. Thon	• Toutes les espèces suivantes: *Thunnus albacares, Thunnus thynnus, Thunnus atlanticus, Thunnus alalunga, Thunnus obesus, Euthynnus pelamis, Sarda sarda, Sarda chiliensis* et *Euthynnus alletteratus*
26. Merluche	• *Urophycis tenuis*
27. Plie rouge	• *Pseudopleuronectes americanus* (Walb.)
28. Plie grise	• *Glyptocephalus cynoglossus*
29. Limande à queue jaune	• *Limanda ferruginea* (Storer)

APPENDIX B

Registration
SOR/82-977 28 October, 1982

FISHERIES ACT

Atlantic Fishery Regulations, amendment

P.C. 1982-3286 28 October, 1982

His Excellency the Governor General in Council, on the recommendation of the Minister of Fisheries and Oceans, pursuant to section 34 of the Fisheries Act, is pleased hereby to amend the Atlantic Fishery Regulations, C.R.C., c. 807, in accordance with the schedule hereto.

SCHEDULE

1. All that portion of item 19 of Schedule I to the *Atlantic Fishery Regulations* in column II thereof is revoked and the following substituted therefor:

	Column II Species Names
19.	"*Placopecten magellanicus* (Gmelin) and *Chlamys islandica*"

EXPLANATORY NOTE

(This note is not part of the Regulation, but is intended only for information purposes.)

This amendment makes the Regulations applicable to Iceland scallops as well as sea scallops.

Enregistrement
DORS/82-977 28 octobre 1982

LOI SUR LES PÊCHERIES

Règlement de pêche de l'Atlantique—Modification

C.P. 1982-3286 28 octobre 1982

Sur avis conforme du ministre des Pêches et des Océans et en vertu de l'article 34 de la Loi sur les pêcheries, il plaît à Son Excellence le Gouverneur général en conseil de modifier, conformément à l'annexe ci-après, le Règlement de pêche de l'Atlantique, C.R.C., c. 807.

ANNEXE

1. La colonne II de l'article 19 de l'annexe I du *Règlement de pêche de l'Atlantique* est abrogée et remplacée par ce qui suit:

	Colonne II Noms scientifiques
19.	«*Placopecten magellanicus* (Gmelin) et *Chlamys islandica*»

NOTE EXPLICATIVE

(La présente note ne fait pas partie du règlement et n'est publiée qu'à titre d'information.)

Cette modification rend le règlement applicable aux pétoncles d'Islande et aux pétoncles de mer.