

FISHERIES RESEARCH BOARD OF CANADA

MANUSCRIPT REPORT SERIES (BIOLOGICAL)

No. 809

TITLE

Gulf of St. Lawrence Scallop Survey - 1964 ✓

AUTHORSHIP

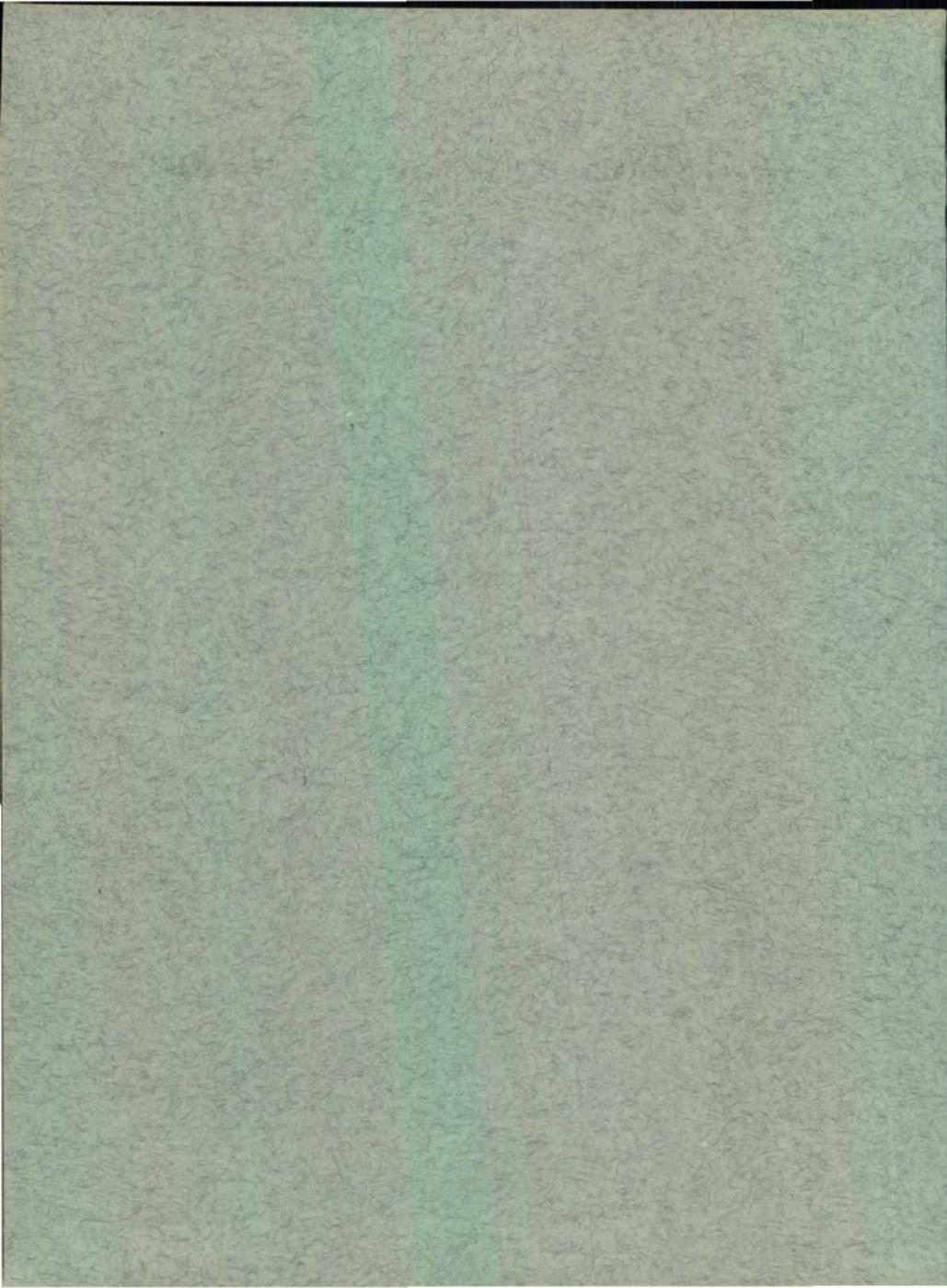
N. Bourne and T. W. Rowell

Establishment

Biological Station,
St. Andrews, N. B.

Dated April 30, 1965

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GULF OF ST. LAWRENCE SCALLOP SURVEY - 1964

By N. Bourne and T. W. Rowell

Introduction

Frequent explorations have been undertaken by the Fisheries Research Board to discover new sea scallop (Placopecten magellanicus, Gmelin) beds or to re-assess scallop populations on known beds in the southern Gulf of St. Lawrence. The last survey of the area was carried out in 1963 when we undertook a 1-week survey of scallop populations on five known beds (Bourne and Rowell, MS, 1965). We did not attempt to establish boundaries of beds but we did briefly assess scallop populations on each bed and made a rough estimate of its potential for commercial fishing. Fishing did occur on two of the beds and may have taken place on two others.

In 1964 we conducted a more extensive 2-week survey which included a resurvey of the five beds visited in 1963 and an assessment of scallop populations on six more beds. Following our 1963 procedure, we did not attempt to outline the boundaries of any beds but simply assessed scallop populations on each bed. In addition we were anxious to observe the 1963-64 population changes on the five beds surveyed in 1963, measure the effect of fishing on the populations and note any evidence of mass mortalities (Dickie and Medcof, 1963).

Along with this work, we continued our studies of paralytic shellfish poison (p.s.p.) in scallops from the southern Gulf of St. Lawrence. This study attained more importance in 1964 because the experimental marketing of scallop roes which was begun by the Gulf of St. Lawrence industry in 1963 was greatly expanded in 1964. If this practice was to expand in this region it was necessary to know if roes from all areas in the southern Gulf of St. Lawrence were free of p.s.p. During this survey we carried out bioassays for p.s.p. in scallops from seven beds.

We also compared the accuracies of two types of odometers during this survey but this work will be reported separately.

Results of the population assessment and p.s.p. studies are reported here.

Areas Surveyed

Scallop populations on eleven beds were assessed in this survey (Fig. 1). All the beds are in the southern Gulf of St. Lawrence and included the Boughton Island, Cape Bear, Pictou Island East, Pictou Island West, Richibucto, Cape Wolfe, Miminegash, Neguac, Miscou Island, Magdalen Islands and George Bay beds. Only minor work was done on the Pictou Island East and Miminegash beds.

The Richibucto, Pictou Island West, Cape Bear, Boughton Island and George Bay beds were surveyed in 1963 (Bourne and Rowell, MS, 1965) and all beds were included in either the 1957 or 1961 surveys (Dickie and MacInnes, MS, 1958; Bourne and McIver, 1962).

Survey Methods

The methods used in 1964 were similar to those of 1963. We again used the 85-ft (109 G.T.) research vessel M.V. Harengus for this survey. The 8-ft offshore drag used in 1963 was used throughout this 1964 work since comparative work with five types of drags in 1963 (Bourne, unpublished MS) showed it to be the most efficient and furthermore it is easily handled by the Harengus.

The junior author served as an observer throughout the survey.

Dragging Procedure

Random tows were made over each bed to cover as much of them as possible (Figs. 2-8). All tows were made in a straight line and the exact position at the beginning and end of each tow was established by Decca navigator. Each tow was 15 minutes duration, unless noted otherwise. The depth of water and type of bottom were also recorded.

An odometer (in some cases two odometers) was attached to the drag and read just before it was shot away and again when it was boarded. The distance in feet that the drag travelled can be calculated by multiplying either the number of revolutions made by the roller odometer by 4, or the number of revolutions by the wheel odometer by 2.61.

At least half a day was spent on the most promising beds.

Measurement of Catch

The catch from all areas was handled in the same manner. It was dumped, sorted, and the volume of scallops and trash recorded in bushels. The shell height (distance from umbone to the ventral margin of the shell) was recorded in 5-mm groups for all or for a fraction of the scallop catch. The number and shell height of clappers (paired empty shells) were recorded to determine any evidence of mass mortalities. The major invertebrates in the catch were also recorded.

Potential Commercial Fishery

As pointed out in the 1963 survey (Bourne and Rowell, MS, 1965) it is difficult to predict if a bed can support commercial fishing from surveys as brief as this one and the one in 1963. In neither survey did we attempt to establish the boundaries of the beds and hence we do not have an accurate estimate of the extent and size of the population. Furthermore, a commercial fishery depends not only on the extent and density of the scallop populations but also on wharf price and the attractiveness of other fisheries. In the 1963 survey we estimated we should have caught at least $1\frac{1}{2}$ bushels of commercial-size scallops (scallops 90 mm shell height or larger) with the 8-ft offshore drag for a 15-minute tow to make commercial fishing profitable. We have used this same standard in evaluating our 1964 results.

Results and Discussion

Scallops were found in all areas but again, as in 1963, only a few of the beds could support a small-boat commercial fishery. The exact position of each tow is shown in Figs. 2 to 8 and the results of each tow are summarized in Table I. In this section we have considered and assessed each bed separately.

Boughton Island Bed

This was one of the two beds which we felt could support commercial fishing in 1963 and some fishing did take place on it in 1963. Thirteen tows were made here in the 1964 survey (Fig. 2). The total scallop catch was 12 bushels (Table I); average catch; 0.9 bushel of scallops per tow. Four tows yielded catches over $1\frac{1}{2}$ bushels per tow. Extra tows were made here to try and delimit the bed but we did not achieve this. The population size appeared to be about the same as in 1963.

The size-distribution of scallops differed from that found in 1963. In 1963 the dominant size group was 75-90 mm with a mode at 70-75 mm but in 1964 the dominant size group was 85-100 mm with a mode at 90-95 mm. (These are probably 5-year-olds.) About two-thirds of the catch (65.2%) were scallops 90 mm shell height or larger.

Fewer clappers were found in 1964 than in 1963, 2.4% compared to 15.8%. In 1964 there was a bimodal distribution of clappers with modes at 85-90 mm and 100-105 mm. The smaller size clappers appear to have resulted from deaths shortly before the time of sampling.

The bottom was in 10-14 fathoms, mostly 11-14, and it varied from smooth sand to large rock. Some tows were on extremely rough bottom and small boats would have to avoid these areas. Less trash was caught in 1964 than in the previous year, 23 bushels in 11 tows, (Table I). However, in 3 tows the bag was one-third to

half full of rocks. Best scallop catches were made in areas of sand or mud with small rocks.

Bottom invertebrates observed in the catch included moon-shell (Lunatia heros), whelks (Neptunea sp), horse mussels (VolSELLA modiolus), ocean quahaugs (Arctica islandica), sand dollars (Echinarachnius parma), sea urchins (Strongylocentrotus dröbachiensis), purple starfish (Asterias vulgaris) and hermit crabs (Pagurus sp). Starfish were not very common in any of the catches here.

This bed supported an intensive small-boat fishery in the late summer and early fall of 1964 which landed approximately 156,000 pounds of meats. Our results show that scallop distribution on this bed is patchy and the boats will have to search and find good tows, mark them with spot buoys and remain on the good tows. Small scallops did not form as large a proportion of the population in 1964 as in 1963 but if no mass mortalities occur, this bed should offer fairly good fishing in 1965.

Cape Bear Bed

Scallop abundance on this bed was similar to that observed in 1963 and in 1964 the bed had moderate quantities of market-size scallops. Five tows were made on it (Fig. 3) for a total scallop catch of 6 bushels; average catch, 1.2 bushels of scallops per tow (Table I). Two of the 5 tows yielded catches of 1½ bushels or more of scallops per tow and 2 others produced 1¼ bushels per tow (Table I).

The size-distribution of scallops (Fig. 9) differed slightly to that found in 1963. In 1963 the dominant size group was 95-110 mm with a mode at 100-105 mm; in 1964 the dominant size group had increased slightly to 100-115 mm with a mode at 105-110 mm (probably 7-year-olds). The scallops apparently grew about 5 mm in shell height in the year. Most of the animals (80.3%) measured 90 mm shell height or larger.

Fewer clappers were found here in 1964 than in 1963, 4% compared to 7.4%.

The bottom was in 12-22 fathoms of water and it varied from smooth and muddy with little rock to uneven, rough and small boulders. The total catch of trash was only 11½ bushels (Table I) but in one tow the bag was half filled with large boulders. Best catches were made on areas with relatively smooth bottom of mud and small rock.

Bottom invertebrates observed in the catch included: spindle shell (Colus stimpsoni), common whelk (Buccinum undatum), common neptune (Neptunea despecta tornata), ten-ridged whelk (Neptunea decemcostata), pelican's foot (Aporrhais occidentalis), oyster drill (Urosalpinx cinerea), moon-shell (Lunatia heros), waved astarte (Astarte undata), Iceland cockle (Clinocardium ciliatum), horse mussel (VolSELLA modiolus), Greenland cockle

(Serripes groelandicus), ocean quahaug (Arctica islandica), sea urchin (Strongylocentrotus dröbachiensis), sand dollar (Echinarachnius parma), purple starfish (Asterias vulgaris), eyed finger sponge (Chalina oculata) and hermit crab (Pagurus sp). Starfish and drills were numerous in most catches but there were few sand dollars.

Although this bed is not too large, it probably could support a limited small-boat fishery and we believe some fishing took place here in 1964. Scallop distribution here is not as patchy as on the Boughton Island bed and most of the scallops were 90 mm shell height or larger. The bottom is rough in several places and small boats would have to avoid these areas.

Pictou Island East Bed

In the past we have received frequent reports from fishermen of scallop concentrations on this bed but to our knowledge it has never supported a fishery in the last 5 years. We only made 2 tows on this bed (Fig. 3). One tow had no scallops and the other had one-sixth of a bushel (Table I).

Since the sample is so small little can be said about size-distribution other than the scallops ranged from 70-110 mm. Only three clappers were brought up.

The bottom was in 13 fathoms of water and was muddy with large boulders. In one tow the bag was three-quarters filled with rock.

Bottom invertebrates in the two tows included: common whelk (Buccinum undatum), horse mussel (VolSELLA modiolus) and purple starfish (Asterias vulgaris). Starfish were very numerous.

We cannot assess this bed from two tows but judging from past history and the results of our work this bed will not support commercial fishing in 1965.

Pictou Island West Bed

Scallop abundance on this bed was slightly higher in 1964 than in 1963 and this area could probably support limited fishing. Eight tows were made on it (Fig. 4) for a total catch of 10½ bushels of scallops, an average catch of 1.28 bushels per tow (Table I). The bed is fairly widespread and the best tows were made on the eastern part of the bed.

The size-distribution of scallops (Fig. 11) differed slightly from that found in 1963. In 1963 the dominant size group was 95-115 mm with a mode at 100-105 mm; in 1964 the dominant size group was 100-115 mm with a mode at 105-110 mm. The bulk of the 1964 catch was in the size range 80-115 mm and 78% of the scallops were 90 mm shell height or larger.

As noted on the Boughton Island and Cape Bear beds, there were fewer clappers here in 1964 than in 1963, 5.4% compared to 12.2%.

This bed is fairly widespread and the depth ranged from 11-26 fathoms. The bottom varied from smooth and muddy to rough with boulders. It was extremely rough in some places. The total catch of trash was 20 bushels (Table I), a great deal of it rock.

Bottom invertebrates observed in the catch included: horse mussel (VolSELLA modiolus), ocean quahaug (Arctica islandica), purple starfish (Asterias vulgaris), sea urchin (Strongylocentrotus dröbachiensis), rock crab (Cancer irroratus) and hermit crab (Pagurus sp.).

Large numbers of starfish, horse mussels and sea urchins were observed in the catches.

This bed probably could support limited fishing. Half of the tows yielded catches of 1½ bushels or more of scallops and 78% of them were 90 mm or larger. The bottom is rough in some places and these areas would have to be avoided by small boats.

Richibucto Bed

We carried out comparative gear work on this bed in 1963 (Bourne, unpublished MS) and during the course of this work thoroughly surveyed scallop populations here. This bed supported a very intensive fishery in 1963. In 1964 we made 6 tows on the bed (Fig. 5) for a total catch of 8½ bushels of scallops, an average catch of 1.4 bushels per tow (Table I). Half of the tows yielded commercial quantities of scallops. Scallop catches were less in 1964 than in 1963. This reduction in scallop abundance was undoubtedly due to the intensive fishery in 1963 and 1964.

The size-distribution of scallops on this bed differed slightly to that found in 1963. In 1964 most of the animals caught (95%) were 90 mm shell height or larger, and the mode was 110-115 mm (Fig. 11). There were few small scallops in the catch. In 1963 the modes of scallops caught at the four fishing stations were 100-105 mm, 105-110 mm, 100-105 mm and 95-100 mm. In 1963 there were large numbers of small scallops at two of the stations which were not in evidence in our 1964 sampling.

Very few clappers were found in the 1964 catch. They amounted to less than 1% of the catch.

The bottom was in 10-14 fathoms, mostly 11-12, and it was mostly smooth sand with some small rock. Moderate quantities of trash were caught, 14 1/3 bushels for the 6 tows. The best scallop catches were found on very smooth sand bottom.

Bottom invertebrates observed in the catch included: common whelk (Buccinum undatum), ocean quahaug (Arctica islandica), propeller clam (Cyrtodaria siliqua), horse mussel (VolSELLA

modiolus), purple starfish (Asterias vulgaris), blood star (Henricia sanguinolenta), sand dollar (Echinarachnius parma), rock crab (Cancer irroratus), toad crab (Hyas sp) and hermit crab (Pagurus sp). There were large numbers of starfish in this area but few crabs and no sea urchins.

This bed supported an intensive fishery in 1963 and again in 1964. We counted 19 boats fishing this bed when we visited it in 1964. Scallop distribution was more patchy in 1964 than in 1963 but the good productive areas were sought out by the boats and they remained in these areas. We found few small scallops in 1964 (Fig. 11) and the outlook for 1965 is not as promising as the outlook was for 1964.

Cape Wolfe Bed

Results of our work on this bed in 1964, like those of previous surveys, were disappointing since we caught very little. However we have frequently received reports from fishermen of abundant scallop populations on this bed. Four tows were made here (Fig. 5); the total catch was only 1 bushel of scallops (Table I), an average catch of $\frac{1}{4}$ bushel per tow.

Little can be said about the size-distribution of scallops on this bed from such a small sample, other than they ranged in size from 70-140 mm shell height (Fig. 10). Only two clappers were caught.

The bottom was in 12-15 fathoms of water, mostly 15, and was smooth sand or mud with some rock. Very little trash was brought up (Table I), 2.2 bushels for the 4 tows.

Bottom invertebrates observed in the catch included: pelican's foot (Aporrhais occidentalis), horse mussel (VolSELLA modiolus), ocean quahaug (Arctica islandica), purple starfish (Asterias vulgaris), sand dollar (Echinarachnius parma), basket star (Gorgonocephalus arcticus), brittle stars, rock crab (Cancer irroratus), toad crab (Hyas sp) and hermit crab (Pagurus sp). Starfish were present in moderate to heavy concentrations. In one tow (36) there was 1 bushel of trash which was all starfish.

This bed has supported some commercial fishing in the past but none took place here in 1964 and our results indicate there will be none in 1965.

Miminegash Bed

At the start of the survey we did not plan to sample this bed but when we were in the general area we noted three boats dragging on this bed. We made a single tow here (Fig. 5) and caught $3\frac{1}{4}$ bushels of scallops (Table I).

The size-distribution of scallops in this single tow ranged from 75-130 mm with a mode at 95-100 mm and a second smaller mode at 105-110 mm (Fig. 12). Only two clappers were found in the catch.

The bottom was in 15 fathoms of water and was smooth sand with small rocks. It was trashy bottom and we caught 6 bushels of trash (Table I).

Bottom invertebrates observed in the one tow included: moon-shell (Lunatia heros), common whelk (Buccinum undatum), whelk (Neptunea sp), ocean quahaug (Arctica islandica), propeller clam (Cyrtodaria siliqua), Iceland scallop (Chlamys islandicus), Arctic saxicave (Hiatella arctica), bar clam (Spisula solidissima), purple starfish (Asterias vulgaris), mud star (Crossaster papposus), brittle stars and hermit crab (Pagurus sp).

Three boats were working this area at the time of the survey and we ourselves made a good catch for the single tow. The bed appeared to be quite small and could offer commercial fishing to only a limited number of boats. There were numerous small scallops in the catch and this bed may continue to offer good fishing for a few boats in 1965.

Neguac Bed

This is another area which fishermen claim frequently has commercial quantities of scallops. However, we have failed to locate concentrations of scallops on this bed in past surveys and this year's work was no exception. In 5 tows (Fig. 6) the total scallop catch was less than $\frac{1}{4}$ bushel (Table I).

The scallops ranged in size from 80-120 mm (Fig. 10) and no clappers were found.

The bottom was in 10-16 fathoms and varied from moderately smooth with small rock to very rough. Although the bottom was not trashy (Table I), we brought up a great deal of rock; in 2 tows the bag was three-quarters filled with rock.

Bottom invertebrates observed in the catch included: ocean quahaug (Arctica islandica), bar clam (Spisula solidissima), mud star (Crossaster papposus), polar starfish (Leptasterias polaris), basket star (Gorgonocephalus arcticus), sand dollar (Echinarachnius parma), sea cucumber (Cucumaria frondosa), sponge (Bolymastia robusta), sea anemones and hermit crab (Pagurus sp).

Large numbers of bar clams were brought up in some tows. Most of the starfish in this area were 6-rayed and appeared to be L. polaris, although identification was not positive.

It is doubtful if this area has ever supported a commercial fishery and it will not support one in 1965.

Miscou Island Bed

A small but productive bed was found here in 1957 (Dickie and MacInnes, MS, 1958) but to our knowledge little or no fishing has taken place on it. The bed had an interesting history during the course of the 1957 survey. When first surveyed on July 10 and 11, catches as high as 19 pails were obtained; 16 pails on July 26;

14 pails on August 23 but less than 4 pails on August 29 and 30. In early November catches of 12 to 14 pails were again made. This fluctuation in population size was attributed to a shifting or scattering of the bed caused by gale force winds.

We made 8 tows on this bed (Fig. 6) for a total catch of 3.7 bushels, an average catch of 0.46 bushel per tow (Table I). Only 1 tow yielded more than $1\frac{1}{2}$ bushels of scallops per tow. Best catches were made south and east of the area outlined in earlier surveys. We did not explore this bed further since the Industrial Development Service of the Department of Fisheries in co-operation with the Department of Fisheries of the Province of New Brunswick also carried out a small-boat survey for scallop beds in this general area in 1964 and we did not wish to duplicate effort.

Most of the scallops caught on this bed were large (Fig. 12). There is a bimodal distribution in size with modes at 105-110 mm and 115-120 mm.

Clappers comprised only 2.25% of the total catch.

Moderate quantities of Iceland scallops (Chlamys islandicus) were caught in most tows. These catches were of the order of $\frac{1}{8}$ to $\frac{1}{4}$ bushel per tow and we estimated that in numbers the ratio of the two species was about 50:50.

The depth varied from 10-37 fathoms but the best catches were in 10-20 fathoms. The bottom was smooth, mostly sand with moderate quantities of small rock. Moderate quantities of trash were brought up, $22\frac{1}{2}$ bushels for the 8 tows (Table I).

Bottom invertebrates observed in the catch included: moon-shell (Lunatia heros), whelk (Neptunea sp), Iceland cockle (Clinocardium ciliatum), Iceland scallop (Chlamys islandicus), propeller clam (Cyrtodaria siliqua), waved astarte (Astarte undata), jingle shell (Anomia sp), bar clam (Spisula solidissima), ocean quahaug (Arctica islandica), horse mussel (Volvella modiolus), razor clam (Ensis directus), brittle stars, purple starfish (Asterias vulgaris), polar starfish (Leptasterias polaris), mud star (Crossaster papposus), blood star (Henricia sanguinolenta), basket star (Gorgonocephalus arcticus), sand dollar (Echinarachnius parma), sea urchin (Strongylocentrotus dröbachiensis), sea cucumber (Cucumaria frondosa), rock crab (Cancer irroratus), toad crab (Hyas sp), hermit crab (Pagurus sp), sea anemones (Sagarita sp), ascidian (Boltenia ovifera) and sponges.

Large numbers of razor clams were found in some tows.

The meats of sea scallops on this bed were approximately 1.5 times the size and weight of those taken from animals of comparable shell height from other areas in the survey. We believe that a bushel of scallops from this bed would give about the same number of pounds of meats as $1\frac{1}{2}$ bushels of scallops from the Richibucto bed. However, in spite of this, we did not find quantities of scallops sufficient to attract a commercial fishery.

The IDS survey may have found more productive areas than we did but preliminary results do not indicate this.

Magdalen Islands Bed

This bed was the most promising area surveyed during the 1964 work. A total of 30 tows were made here (Fig. 7); 19 were used to assess scallop populations and 12 to compare the two odometers. The entire area is undoubtedly a single scallop bed but for the sake of convenience was divided into three beds in this survey. In the following we shall consider beds 1 and 2 together and bed 3 separately.

Beds 1 and 2. This area was the most productive part of the bed. Sixteen tows were made here (Fig. 7), for a total scallop catch of 32 bushels, an average catch of 2 bushels per tow. Seven tows yielded scallop catches of $1\frac{1}{2}$ bushels or more per tow and one tow had as high as $6\frac{3}{4}$ bushels of scallops (Table I).

The size-distribution of scallops on beds 1 and 2 (Fig. 13), was similar to that encountered on the Boughton Island bed (Fig. 2). The dominant size class was 85-100 mm with a mode at 90-95 mm (probably 5-year-olds). The bulk of the catch (83%) was in the size range 80-120 mm. Scallops 90 mm shell height and larger formed 72% of the catch.

Few clappers were found in the catch, 2.5%.

The depth of water ranged from 10-20 fathoms but most tows were in 16-19 fathoms. The bottom varied from smooth sand with small rock to very rough and rocky. In general bed 2 was smoother than bed 1. Both areas were quite trashy and the total catch of trash was $88\frac{1}{2}$ bushels (Table I). In three tows the bag was one-fifth to completely filled with rock and on one tow (76) the drag was badly damaged.

Bottom invertebrates observed in the catch included: white chiton (Ischnochiton albus), ocean quahaug (Arctica islandica), bar clam (Spisula solidissima), Iceland scallop (Chlamys islandicus), propeller clam (Cyrtodaria siliqua), horse mussel (Volvella modiolus), Arctic saxicave (Hiatella arctica), razor clam (Ensis directus), Greenland cockle (Serripes groenlandicus), sea cucumber (Cucumaria frondosa), basket star (Gorgonocephalus arcticus), purple star (Asterias vulgaris), polar star (Leptasterias polaris), blood star (Henricia sanguinolenta), mud star (Crossaster papposus), sea urchin (Strongylocentrotus dröbachiensis), sand dollar (Echinarachinus parma), brittle stars, toad crab (Hyas sp), rock crab (Cancer irroratus), hermit crab (Pagurus), brachiopods, sea anemones and ascidian (Halocynthia pyriformis).

There were large numbers of sea cucumbers, sea urchins, sea peaches, sand dollars, toad crabs, bar clams, propeller clams and horse mussels. One oyster shell was brought up. This area

and the Miscou Island bed were the only areas where razor clams were found.

Scallops in this area, like those on the Miscou Island bed, had meats which were approximately 1.5 times as large and heavy as scallops of comparable shell height on the Richibucto bed.

This bed offers good prospects for commercial fishing. The distribution is patchy but boats could find the good tows and stay on them. The bottom is rough in some places but these areas could easily be avoided. There were good quantities of small-size scallops in the catch and this area should offer profitable fishing in 1965.

Bed 3. Only 3 tows were made on this part of the bed (Fig. 7), so our assessment of scallop populations here is limited. We caught one bushel of sea scallops and $1\frac{1}{2}$ bushels of Iceland scallops in one tow and nothing in the other 2 tows (Table I).

The scallops ranged in size from 55-135 mm with a mode at 85-90 mm (Fig. 12). This is slightly smaller than the mode of scallops from beds 1 and 2. No clappers were found in catches from bed 3.

The bottom was in 17-21 fathoms and was smooth sand with small rock. There was a lot of trash, in the 3 tows $26\frac{1}{2}$ bushels were caught (Table I).

Bottom invertebrates observed in the catch included: moon-shell (Lunatia heros), whelk (Neptunea sp), common whelk (Buccinum undatum), Iceland scallop (Chlamys islandicus), ocean quahaug (Arctica islandica), bar clam (Spisula solidissima), propeller clam (Cyrtodaria siliqua), horse mussel (VolSELLA modiolus), sea urchin (Strongylocentrotus dröbachiensis), polar star (Leptasterias polaris), basket star (Gorgonocephalus arcticus), toad crab (Hyas sp) and (Psolus fabricii).

Large numbers of Iceland scallops and toad crabs were caught in this area.

This part of the bed does not appear to be as densely populated as beds 1 and 2. However, our sampling here was very limited and there may be more productive areas on this part of the bed. The rough areas of bottom would have to be avoided by small boats.

George Bay Bed

Scallop populations on this bed in 1964 were similar to those found in 1963. In 1959 this bed supported a large fishery but since that time little has been landed from here. We made 9 tows (Fig. 8) on this bed for a total catch of 5 bushels, an average catch of 0.55 bushel of scallops per tow (Table I). The largest catch was 1 bushel.

The size-distribution of scallops in both 1963 and 1964 was very similar. The dominant size groups in both years were 100-115 mm and the mode in both years was 105-110 mm. In 1964, 96.6% of the catch measured 90 mm shell height or larger.

This area had the highest percentage of clappers found on all beds in the 1964 survey, 6% of the catch. However, this was a reduction of 4% from 1963.

The bottom was in 15-18 fathoms and was smooth and muddy. The least amount of trash in both 1963 and 1964 surveys was caught here. In 1964 the total catch of trash was only 1 bushel (Table I). However, the scallops were very dirty, riddled by worms and covered by sponge.

Bottom invertebrates observed in the catch included: purple starfish (Asterias vulgaris), sea urchins (Strongylocentrotus dröbachiensis) and sponges. Very few bottom invertebrates were caught in this area.

We do not believe this bed will support any commercial fishing in 1965.

Bioassays for Paralytic Shellfish Poison

During the 1964 survey we continued our studies begun in 1963 (Bourne and Rowell, MS, 1965) to measure levels of paralytic shellfish poison (p.s.p.) in Gulf of St. Lawrence scallops. Extracts of scallop livers from seven beds were prepared for bioassay. Scallop livers (which include the stomach and digestive diverticulum) were used since they are sensitive indicators of p.s.p. The seven beds sampled were Boughton Island, Cape Bear, Pictou Island West, Richibucto, Miscou Island, Magdalen Islands and George Bay. The extracts were prepared on board the M.V. Harengus, after the method described by Bourne (1965). The bioassays were carried out by the Department of National Health and Welfare's Laboratory of Hygiene in Ottawa.

Results are presented in Table II. Little or no p.s.p. was detected in scallop livers from the seven areas. No p.s.p. was detected in scallop livers from Boughton Island, Cape Bear, Pictou Island West, and George Bay. Virtually none was found in scallops from the Magdalen Islands. Scallop livers from the Richibucto bed were barely toxic and slight p.s.p. was detected in scallop livers from the Miscou Island bed.

Bourne (1965) has shown that scallop livers are usually the most toxic part of the scallop when p.s.p. is present and that toxicity scores in livers are many times higher than scores of roes. Roes from the scallops sampled in the southern Gulf of St. Lawrence in 1964 would undoubtedly have no detectable p.s.p. in them.

Conclusions

1. The best scallop populations in the 1964 survey were found on the Magdalen Islands bed.
2. Scallop populations capable of supporting commercial fishing were also found on the Boughton Island and Richibucto beds. The Miminegash bed appeared to be productive but small.
3. Limited fishing might be possible on the Cape Bear and Pictou Island West beds.
4. Scallop populations on the other beds surveyed were too small to support commercial fishing in 1964 and probably will not support fishing in 1965.
5. None or virtually no p.s.p. was found in scallops from the seven beds sampled.

References

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- Bourne, N., and A. McIver. 1962. Gulf of St. Lawrence scallop explorations - 1961. Fish. Res. Bd. Canada, Biol. Sta., St. Andrews, Circular, General Series, No. 35, 4 pp.
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Table I. Gulf of St. Lawrence scallop explorations - 1964, M.V. Harengus. Catch of individual tows on the Boughton Island, Cape Bear, Pictou Island East, Pictou Island West, Richibucto, Cape Wolfe, Miminegash, Neguac, Miscou Island, Magdalen Islands and George Bay beds. W is the wheel-type odometer and R the roller-type odometer. To calculate the distance travelled by the drag in feet, multiply either the number of revolutions of the wheel-type odometer (W) by 2.61 or the number of revolutions of the roller-type odometer (R) by 4.

		<u>Boughton Island Bed</u>						
Tow no.	Date	Depth (fath)	Type of Bottom	No. of Revolutions of Odometer		Catch (Bushels)		Remarks
				W	R	Scallops	Trash	
1	July 6	13	Sand: small boulders	796	964	$\frac{2}{3}$	2	-
2	"	13	Sand: larger boulders	538	1,030	1 $\frac{2}{3}$	2	-
3	"	13-14	Sand: boulders	906	1,053	1 $\frac{1}{2}$	3	-
4	"	13-14	Sand: small boulders	1,498	964	$\frac{2}{3}$	1 $\frac{1}{2}$	-
5	"	13-14	Sand: large boulders	1,618	1,153	8 scallops	5 (rock)	Bottom getting rough
6	July 7	13	Large boulders	-	975	-	-	Bag 1/3 full of rocks
7	"	11	Small rock	-	1,258	1	4	-
8	"	10-11	Small boulders	-	609	Few	-	Bag half full rocks
9	"	11-13	Sand and mud	-	1,706	1 $\frac{1}{2}$	2 $\frac{1}{2}$	-
10	"	12	Sand: small rock	-	1,259	1 $\frac{1}{2}$	2	-
11	"	11-12	Sand: small boulders	-	909	2 scallops	-	Bag half full rocks
12	"	11-13	Sand: small boulders	-	1,273	2/3	1	-
13	"	12	Sand - mud	-	1,138	1	-	Bag $\frac{1}{4}$ full of rocks
		<u>Cape Bear Bed</u>						
14	July 7	12-17	Uneven: small boulders	-	1,067	1 $\frac{1}{2}$	3	-
15	"	18-22	Smooth: mud	-	1,451	2	5 $\frac{1}{2}$	-
16	"	12-21	Rough: mud	-	1,152	7 scallops	-	Bag half full rocks; large boulders
17	"	13-21	Mud: little rock	-	1,418	1 $\frac{1}{2}$	2 $\frac{1}{2}$	Large number starfish
18	"	18-20	Mud: little rock	-	1,501	1 $\frac{1}{2}$	$\frac{2}{3}$	Large number oyster drills

Table I (cont'd.)

<u>Pictou Island East Bed</u>									
Tow no.	Date	Depth (fath)	Type of Bottom	No. of Revolutions of Odometer		Catch (Bushels)		Remarks	
				W	R	Scallops	Trash		
19	July 8	13	Mud: few large rocks		1,131		1/6	1	Large number starfish
20	"	13	Mud: large boulders		1,186		-	-	Bag $\frac{1}{2}$ full rock; large number starfish
<u>Pictou Island West Bed</u>									
21	July 8	12-20	Rough: mud & boulders		1,426		3	3 $\frac{1}{2}$	Hole in drag
22	"	15-20	" " "		1,486		1 $\frac{1}{2}$	2	Large number starfish and sea urchins
23	"	11-13	Smooth: mud		942		1	3	Large number horse mussels
24	"	19-26	Mud: few rocks		1,510		2	3 $\frac{1}{2}$	-
25	"	19	Mud		1,064		1 $\frac{1}{2}$	4 $\frac{1}{2}$	Large number starfish
26	"	19-26	Very muddy		1,369		1	2 $\frac{1}{2}$	Dirty catch: mud and weeds
27	"	15-16	Smooth		830		-	1 $\frac{1}{2}$	No catch at all
28	"	17-24	Uneven: mud		1,503		$\frac{1}{4}$	2 $\frac{1}{2}$	Large number starfish
<u>Richibucto Bed</u>									
29	July 9	12	Smooth: sand		1,430		1/6	1/3	Few starfish
30	"	11-12	Smooth: sand: small rock		1,461		3 $\frac{1}{4}$	7 $\frac{1}{2}$	Large number starfish
31	"	12	Smooth: sand		1,565		1 $\frac{1}{2}$	1 $\frac{1}{2}$	-
32	"	12 $\frac{1}{2}$	Smooth: sand		1,610		1 $\frac{1}{2}$	1	Fleet fishing this area
33	"	10-11	Smooth: sand		1,501		1	1 $\frac{1}{2}$	-
34	"	13-14	Smooth: sand: some large rock		1,376		$\frac{1}{2}$	2 $\frac{1}{2}$	Large number starfish

Table I (cont'd.)

<u>Cape Wolfe Bed</u>								
Tow no.	Date	Depth (fath)	Type of Bottom	No. of Revolutions of Odometer		Catch (Bushels)		Remarks
				W	R	Scallops	Trash	
35	July 9	15	Smooth: mud		1,354	3/8	1/5	Moderate number starfish
36	"	15	Smooth: sand & mud		1,525	3/8	1	1 bu. starfish
37	"	12-13	Smooth: small rock		1,776	7 scallops	$\frac{1}{2}$	Basket stars
38	"	15	Smooth: sand & mud		1,765	$\frac{1}{2}$	$\frac{1}{2}$	Basket stars
<u>Miminegash Bed</u>								
39	July 9	15	Smooth: sand: small rocks		1,397	3 $\frac{1}{2}$	6	3 boats working here
<u>Neguac</u>								
40	July 10	10-11	Smooth: sand: small rock		1,300	2 scallops	-	$\frac{1}{2}$ bag rock; little else but rock
41	"	13	Moderately smooth		1,213	2 scallops	-	$\frac{2}{3}$ bag rock; just rock
42	"	14	Moderately smooth: rock		1,319	2 scallops	-	$\frac{2}{3}$ bag rock; just rock
43	"	15-16	Sand and small rock		1,357	1/6	1	-
44	"	14-15	Very rough		935	-	1	Tow only 13 minutes

Table I (cont'd.)

<u>Miscou Island Bed</u>								
Tow no.	Date	Depth (fath)	Type of Bottom	No. of Revolutions of Odometer		Catch (Bushels)		Remarks
				W	R	Scallops	Trash	
45	July 13	12-21	Smooth: sand: small rock		1,140	1/6	2	1/8 bu. Iceland scallops
46	"	12-18	Smooth: sand & small rock		1,079	1	4 1/2	1/4 bu. Iceland scallops
47	"	23-24	Smooth: small rock		1,340	-	1	6 Iceland scallops
48	"	25-37	Smooth: sand & small rock		1,294	-	1 1/2	Iceland scallop
49	"	20-27	"		1,402	-	1	-
50	"	18-20	"		1,453	2 scallops	2 1/2	Mainly Iceland scallops
51	"	10-13	"		1,165	1 1/2	6 1/2	Only one Iceland scallop
52	"	10-15	"		1,393	1/2	6 1/2	Large number razor clams & sand dollars
<u>Magdalen Islands Bed I</u>								
53	July 14	19-20	Very rough: rock		1,123	1/10	5 1/2	Large number sea cucumbers & peaches
54	"	12-17	Smooth: sand & small rock		1,367	1/2	2	Large number sand dollars
55	"	16-18	Gravel & small rock		1,094	1	-	Bag full of rocks; large no. sea cucumbers
56	"	17-18	Smooth: sand & small rock		677	1 1/2	8	9-minute tow
57	"	18-20	Uneven: large rock		983	-	-	Bag 1/2 rock; large no. sea cucumbers
58	"	18	Smooth: small rock		1,314	6 1/2	11	Iceland scallops
59	"	18-20	Uneven		1,419	6 scallops	6	Large no. bar clams, propeller clams & sand dollars

Table I (cont'd.)

Magdalen Islands Bed II

Tow no.	Date	Depth (fath)	Type of Bottom	No. of Revolutions of Odometer		Catch (Bushels)		Remarks
				W	R	Scallops	Trash	
60	July 14	10-17	Smooth: sand	1,952	1,470	1 scallop	$\frac{1}{2}$	Very little in catch
61	"	16-17	Smooth: sand	412	1,891	$5\frac{1}{2}$	10	22-minute tow; 1 $\frac{1}{2}$ miles
62	"	17	"	1,190	1,884	4	9	24-minute tow; 1 $\frac{1}{2}$ miles
63	"	17	"	431	1,857	$4\frac{1}{2}$	10	22-minute tow; 1 $\frac{1}{2}$ miles
73	July 15	18	Smooth: sand and small rock	1,723	1,014	1	6	5 Iceland scallops
74	"	17-18	"	1,881	1,072	$\frac{1}{2}$	9	Large no. sea cucumbers & urchins
75	"	18-19	"	1,158	812	$3\frac{1}{2}$	7	9-minute tow
76	"	11-13	Extremely rough	420	195	-	-	1/5 bag rock;
77	"	17	Smooth: sand	1,857	1,078	3	$4\frac{1}{2}$	5-minute tow Load of red algae

Magdalen Islands Bed III

78	July 15	17	Smooth: sand and small rock	2,341	1,220	$2\frac{1}{2}$	13	18-minute tow; 1 $\frac{1}{2}$ bu. of catch Iceland scallops
79	"	20-21	"	2,144	1,256	-	$7\frac{1}{2}$	-
80	"	21	Uneven: small rock	2,015	290	-	6	-

Table I (cont'd.)

George Bay Bed

Tow no.	Date	Depth (fath)	Type of Bottom	No. of Revolutions of Odometer		Catch (Bushels)		Remarks
				W	R	Scallops	Trash	
81	July 16	18	Smooth: mud	1,699	1,006	$\frac{1}{2}$	1/10	Only old shell in trash
82	"	17 $\frac{1}{2}$	"	1,197	1,382	$\frac{3}{4}$	$\frac{1}{4}$	-
83	"	17	"	1,737	1,159	$\frac{3}{4}$	$\frac{1}{4}$	Mostly old scallop shell
84	"	17	"	1,849	827	$\frac{3}{4}$	1/10	Mud: weeds: a few starfish
85	"	18	"	1,634	823	1	1/10	"
86	"	17-18	"	1,769	1,037	$\frac{1}{2}$	1/10	"
87	"	16-17	"	1,939	773	$\frac{1}{2}$	-	"
88	"	16	"	1,924	28	$\frac{1}{2}$	-	"
89	"	15	"	1,626	34	$\frac{1}{2}$	-	"

Table II. Toxicity scores of sea scallop livers from seven areas in the southern Gulf of St. Lawrence - 1964.

Date 1964	Location	Toxin - $\mu\text{g}/100\text{ g}$ sample
July 6	Boughton Island	< 32
July 6	Boughton Island	< 32
July 7	Cape Bear	< 32
July 7	Cape Bear	< 32
July 8	Pictou Island West	< 32
July 8	Pictou Island West	< 32
July 9	Richibucto	34
July 9	Richibucto	33
July 13	Miscou Island	40
July 13	Miscou Island	40
July 14	Magdalen Islands	< 32) slightly
July 14	Magdalen Islands	< 32) toxic
July 16	George Bay	< 32
July 16	George Bay	< 32

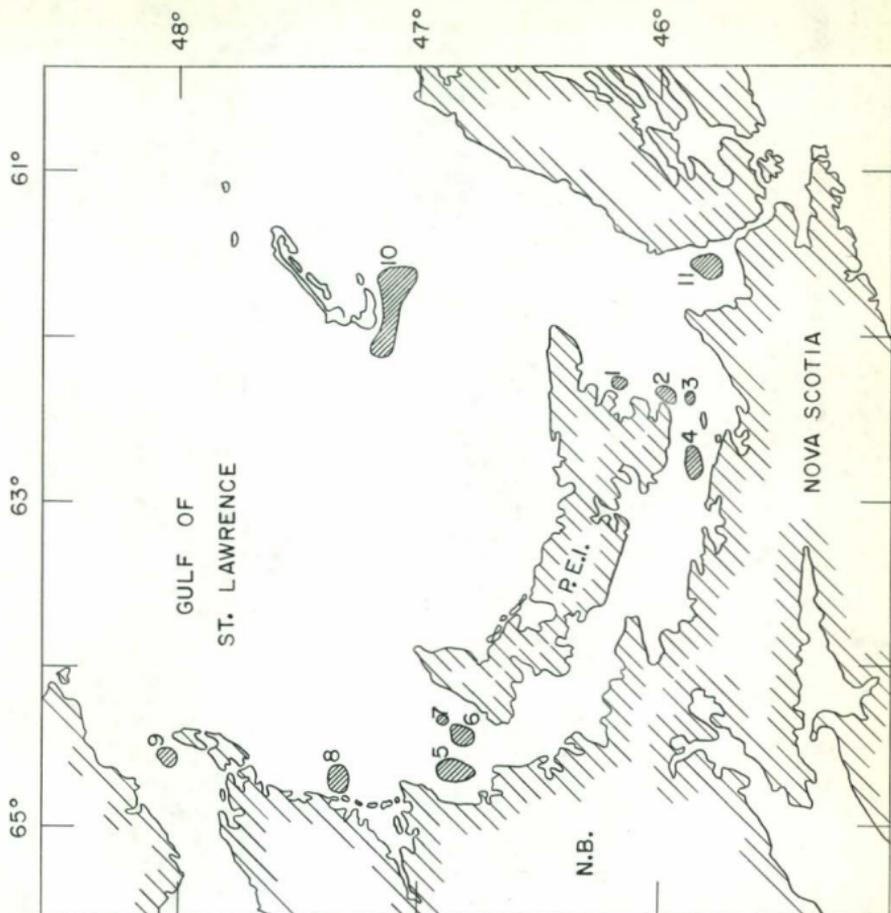


Fig. 1. Location of eleven areas in southern Gulf of St. Lawrence surveyed in 1964: 1. Boughton Island; 2. Cape Bear; 3. Pictou Island East; 4. Pictou Island West; 5. Richibucto; 6. Cape Wolfe; 7. Miminegash; 8. Neguac; 9. Miscou Island; 10. Magdalen Islands, and 11. George Bay.

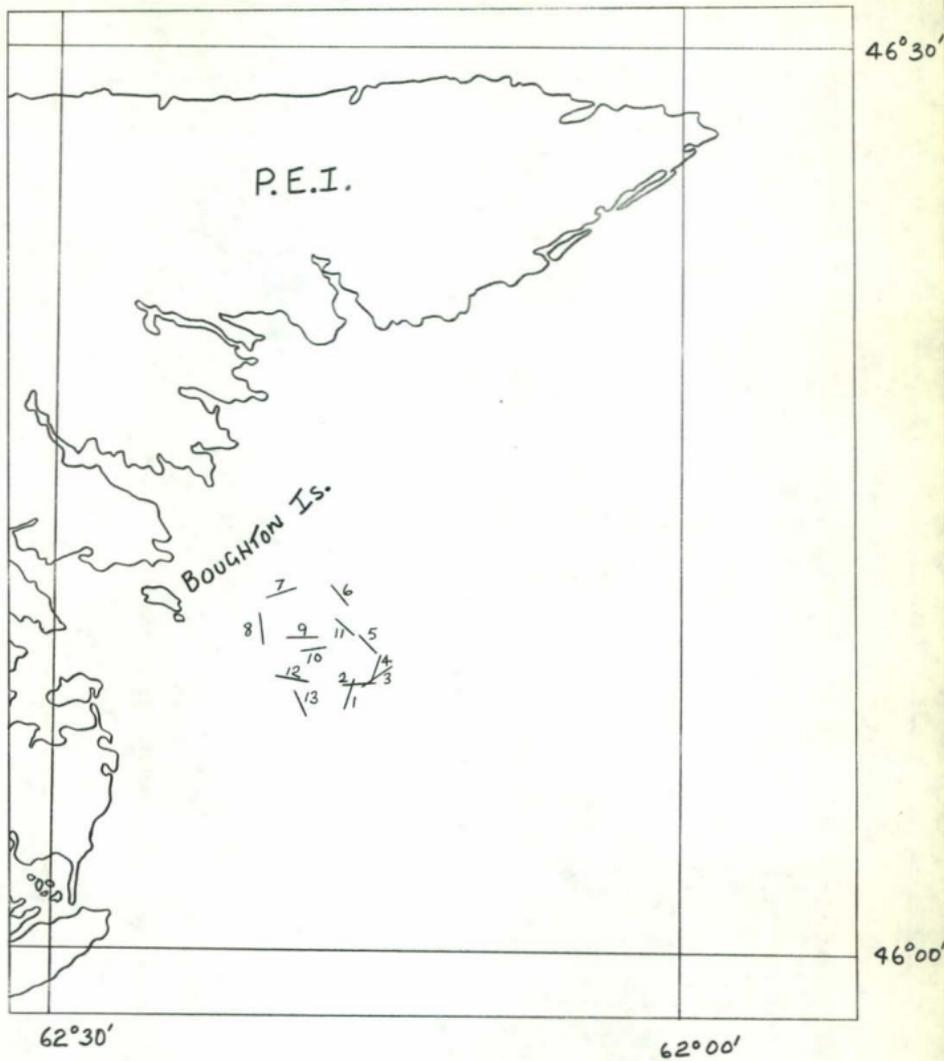


Fig. 2. Position of tows on Bouchon Island Bed.

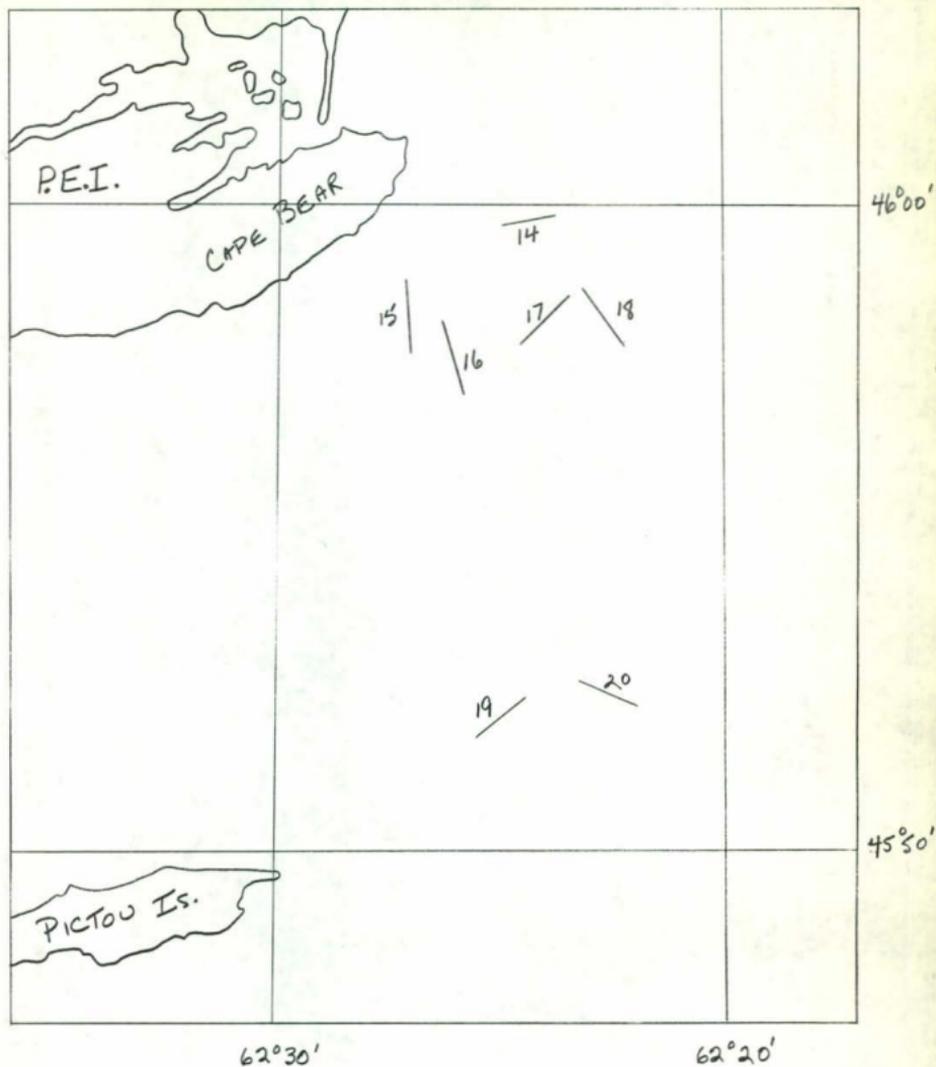


Fig. 3. Position of tows on Cape Bear and Pictou Island East Beds.

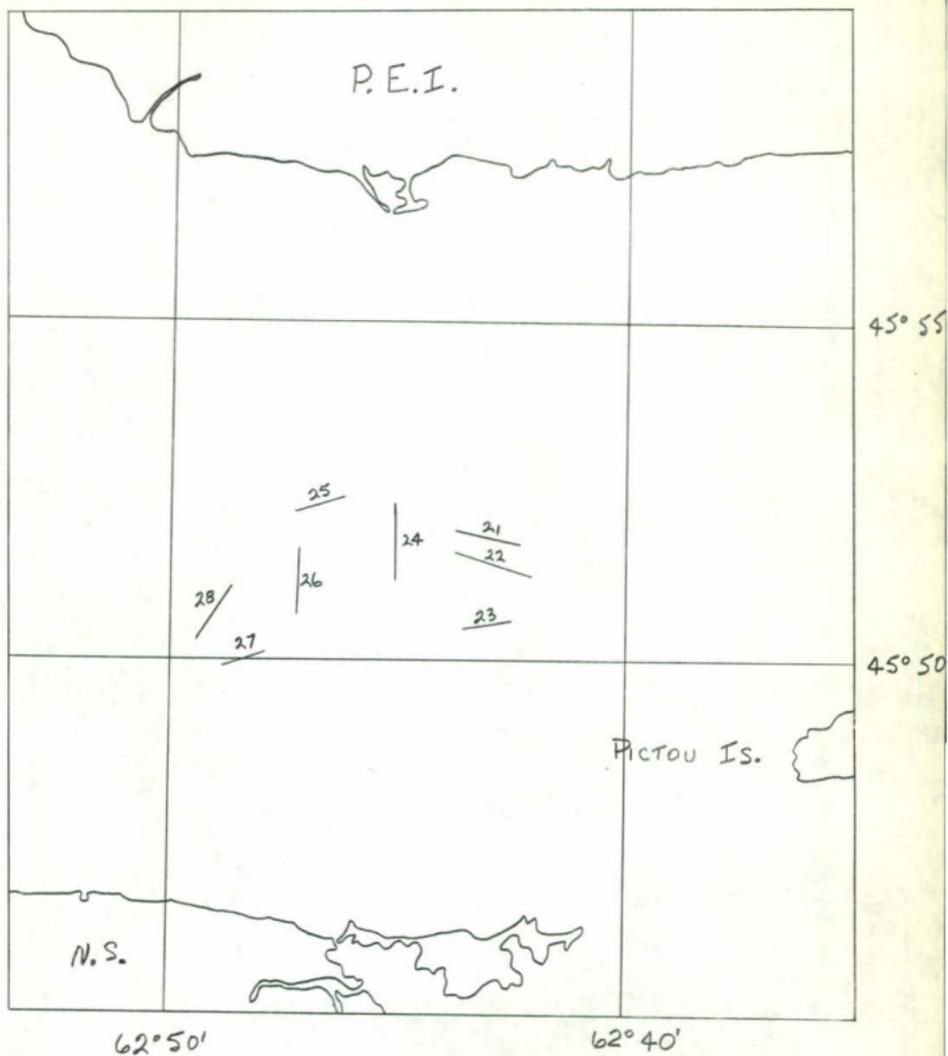


Fig. 4. Position of tows on Pictou Island West Bed.

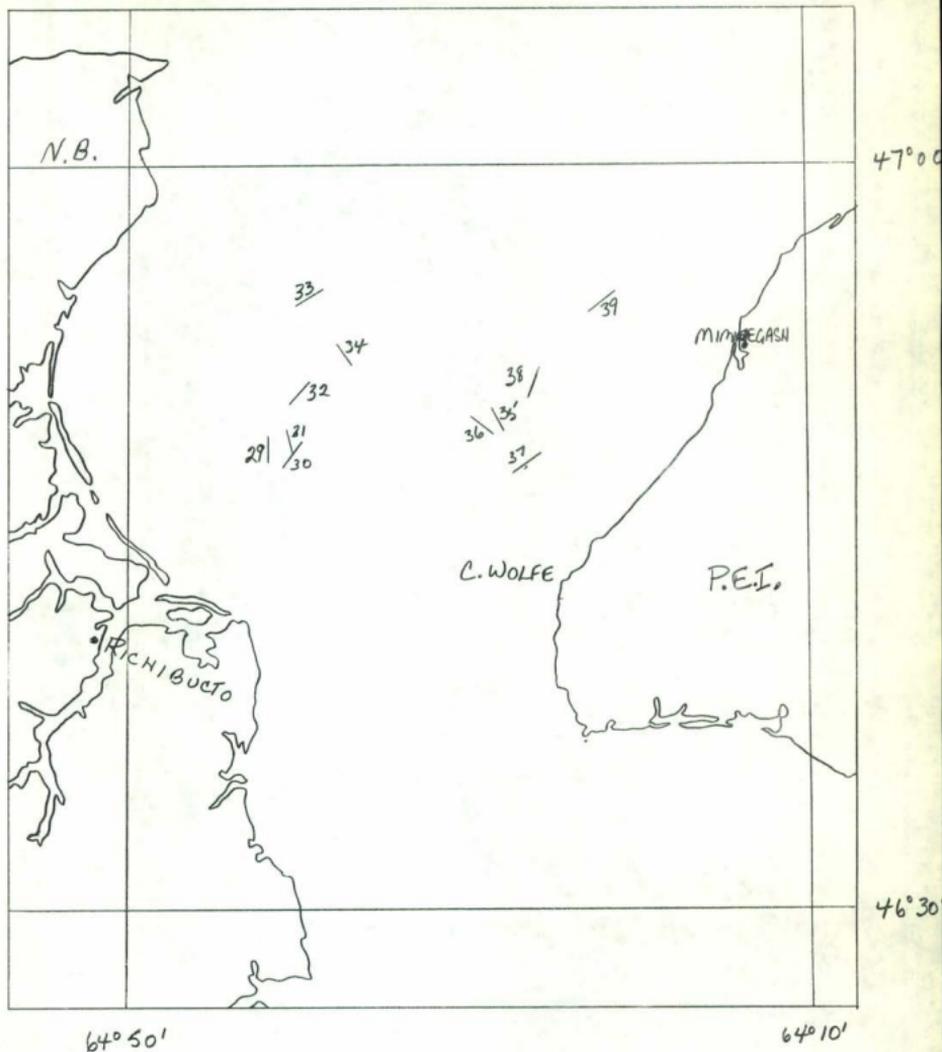


Fig. 5. Position of tows on Richibucto, Cape Wolfe, and Miminegash Beds.

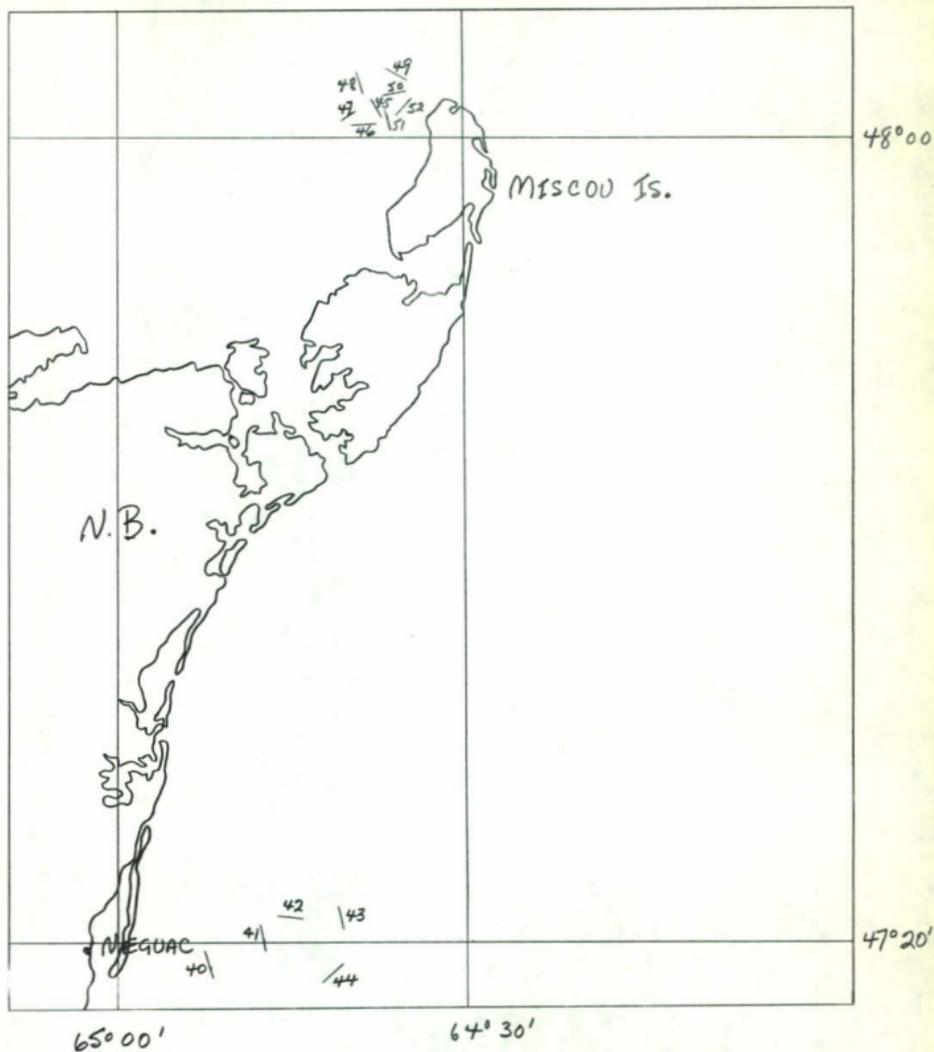


Fig. 6. Position of tows on Neguac and Miscou Island Beds.

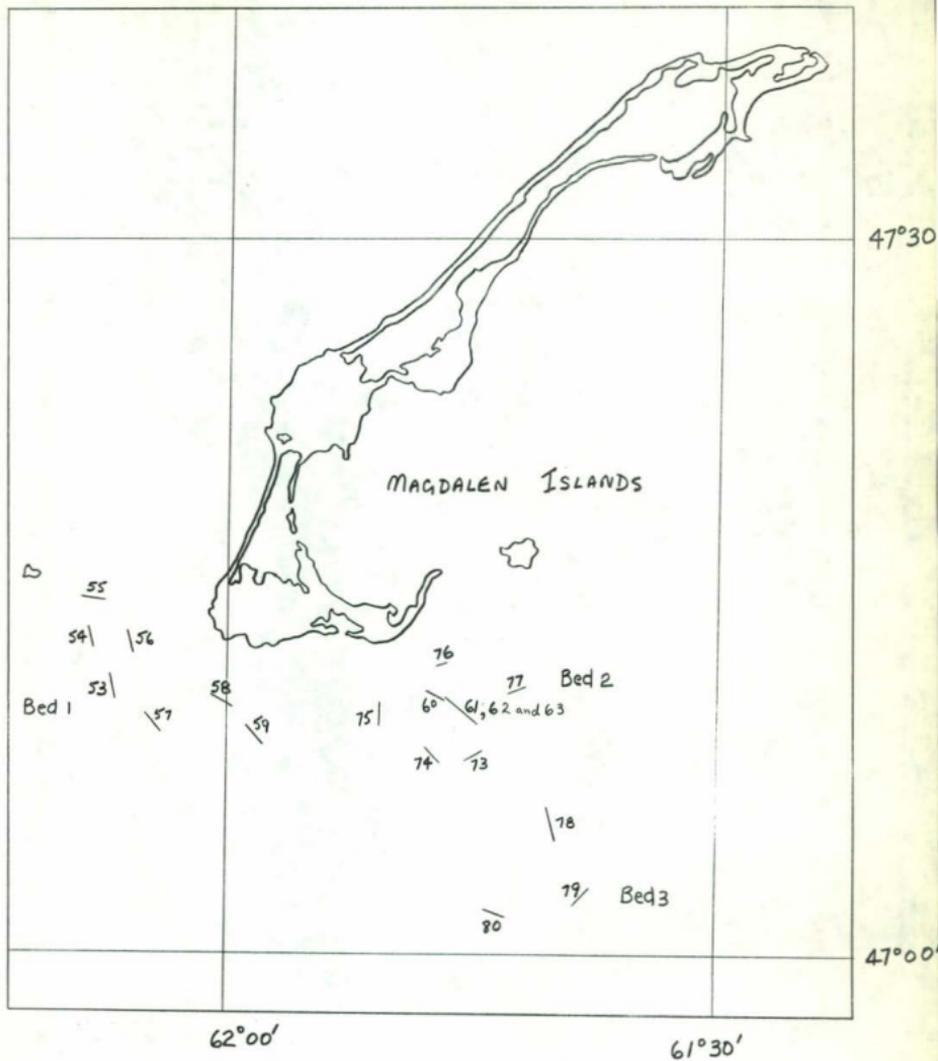


Fig. 7. Position of tows on three parts of Magdalen Islands Bed.

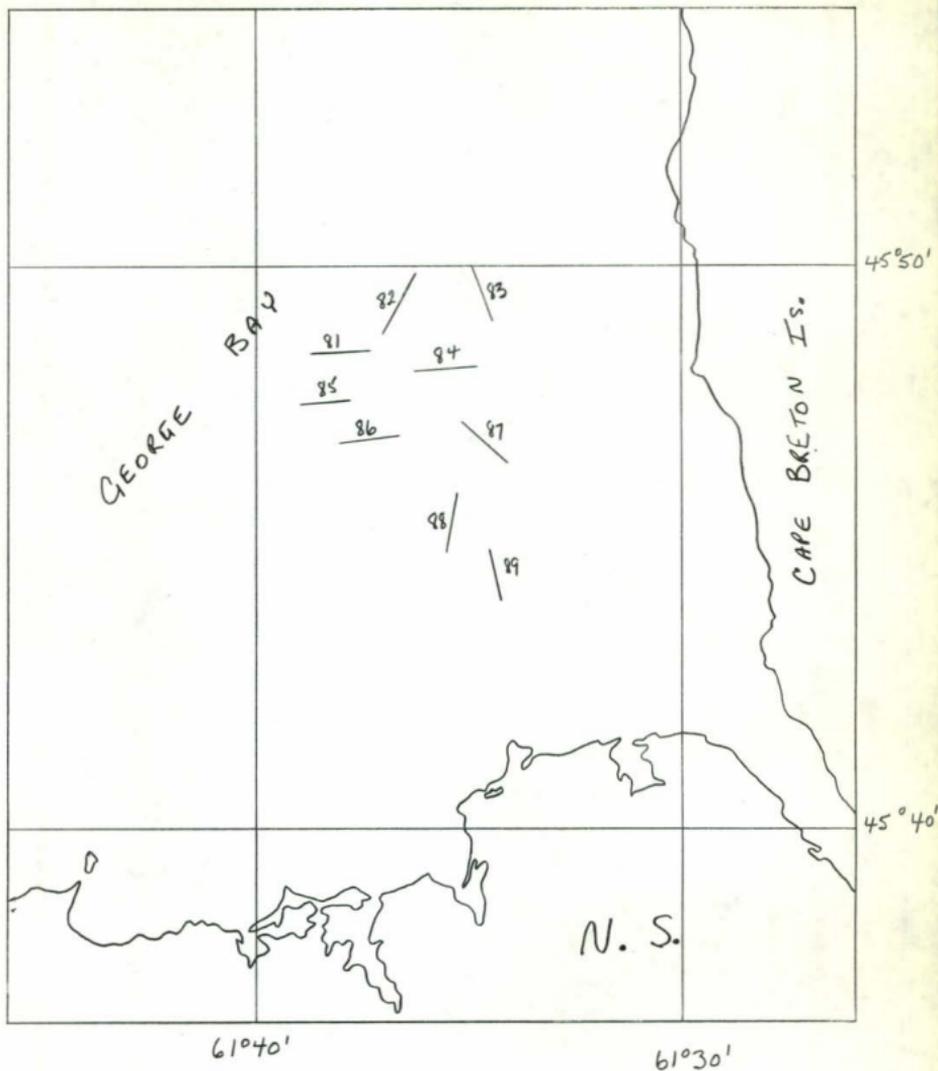


Fig. 8. Position of tows on George Bay Bed.

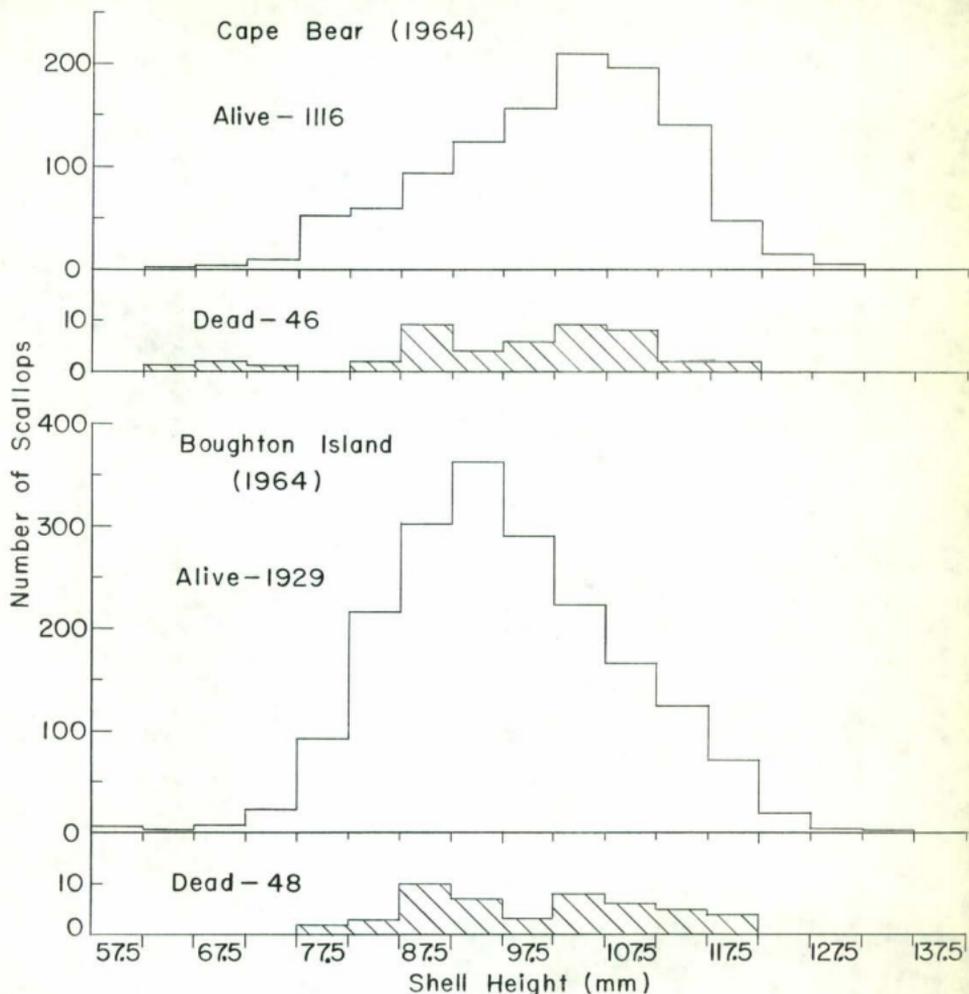


Fig. 9. Size-frequency distribution of scallops from the Boughton Island and Cape Bear Beds.

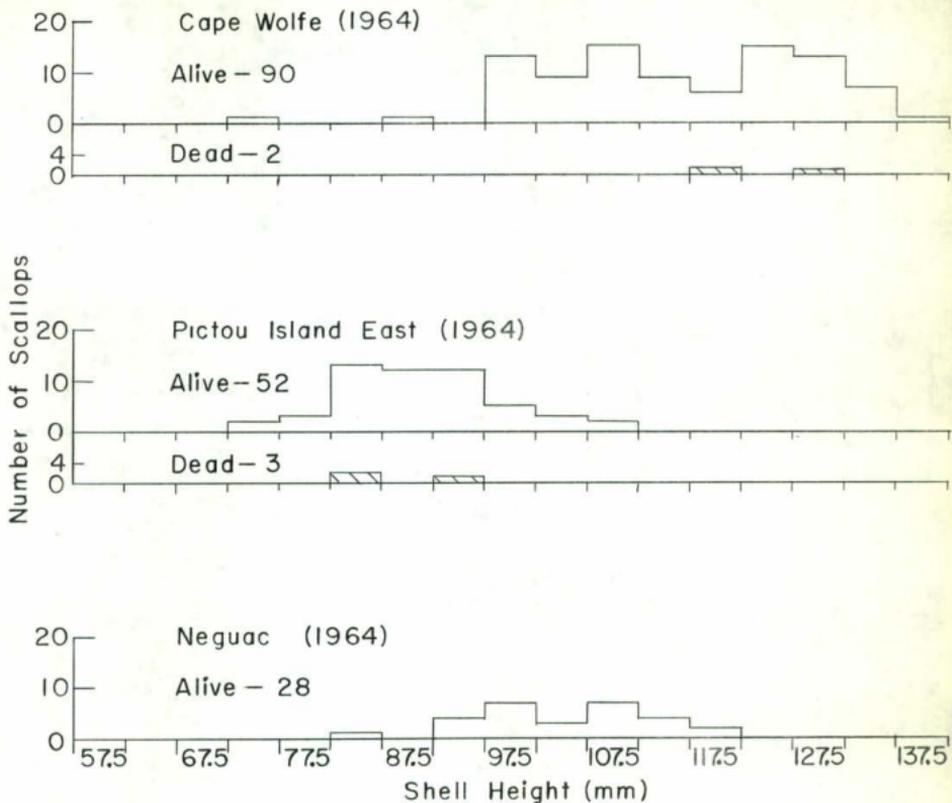


Fig. 10. Size-frequency distribution of scallops from the Neguac, Pictou Island East and Cape Wolfe Beds.

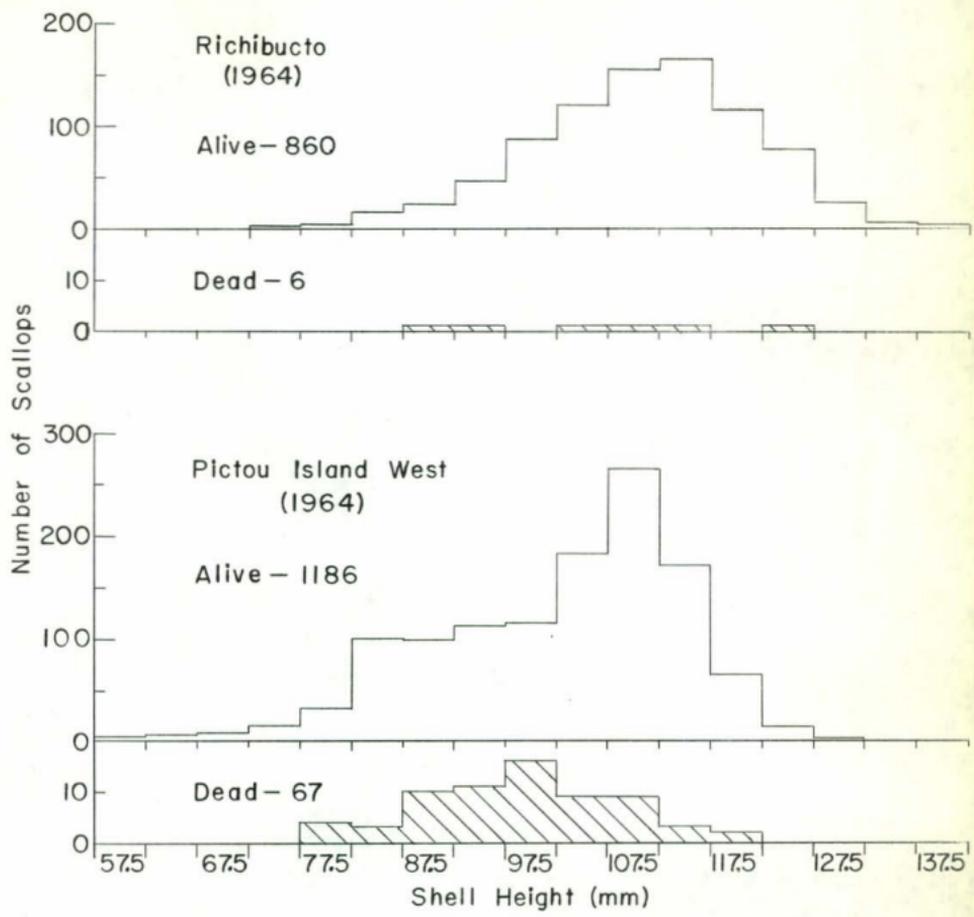


Fig. 11. Size-frequency distribution of scallops from the Pictou Island West and Richibucto Beds.

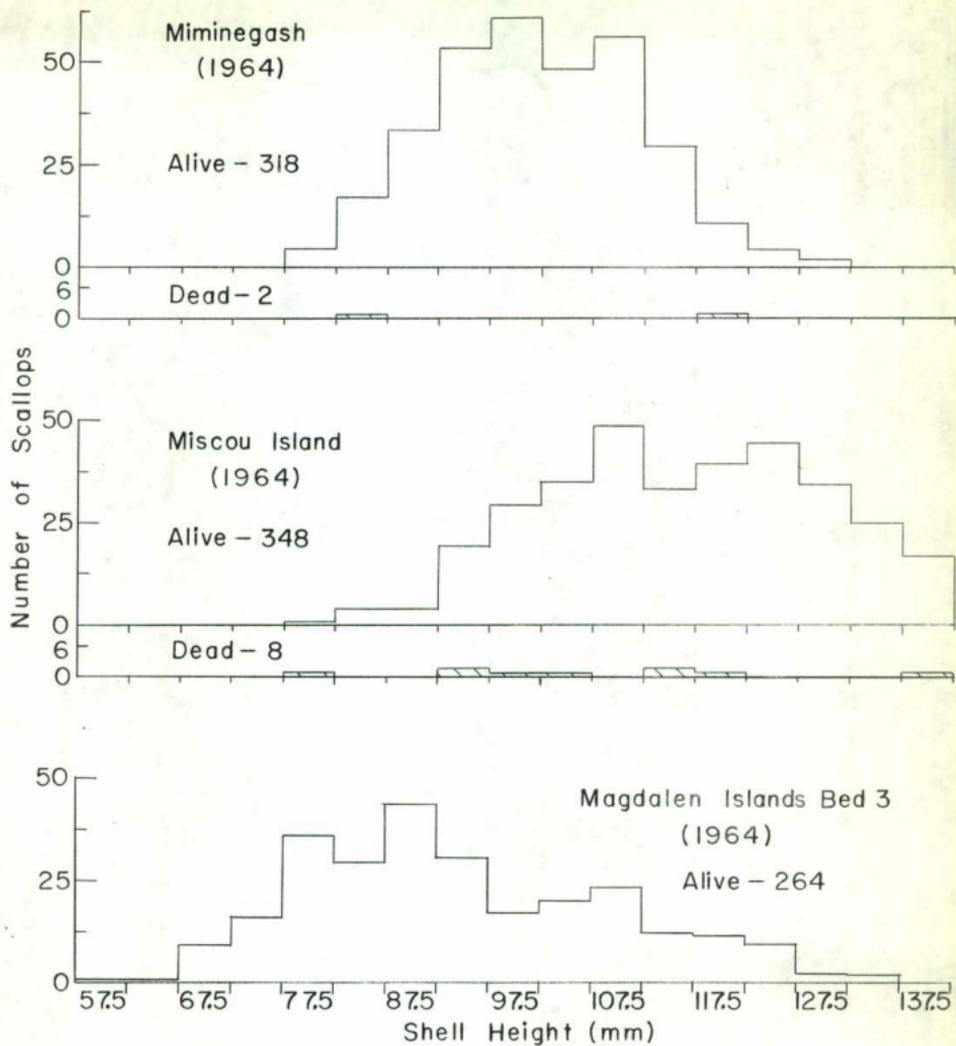


Fig. 12. Size-frequency distribution of scallops from the Magdalen Islands Bed 3, Miscou Island and Miminegash Beds.

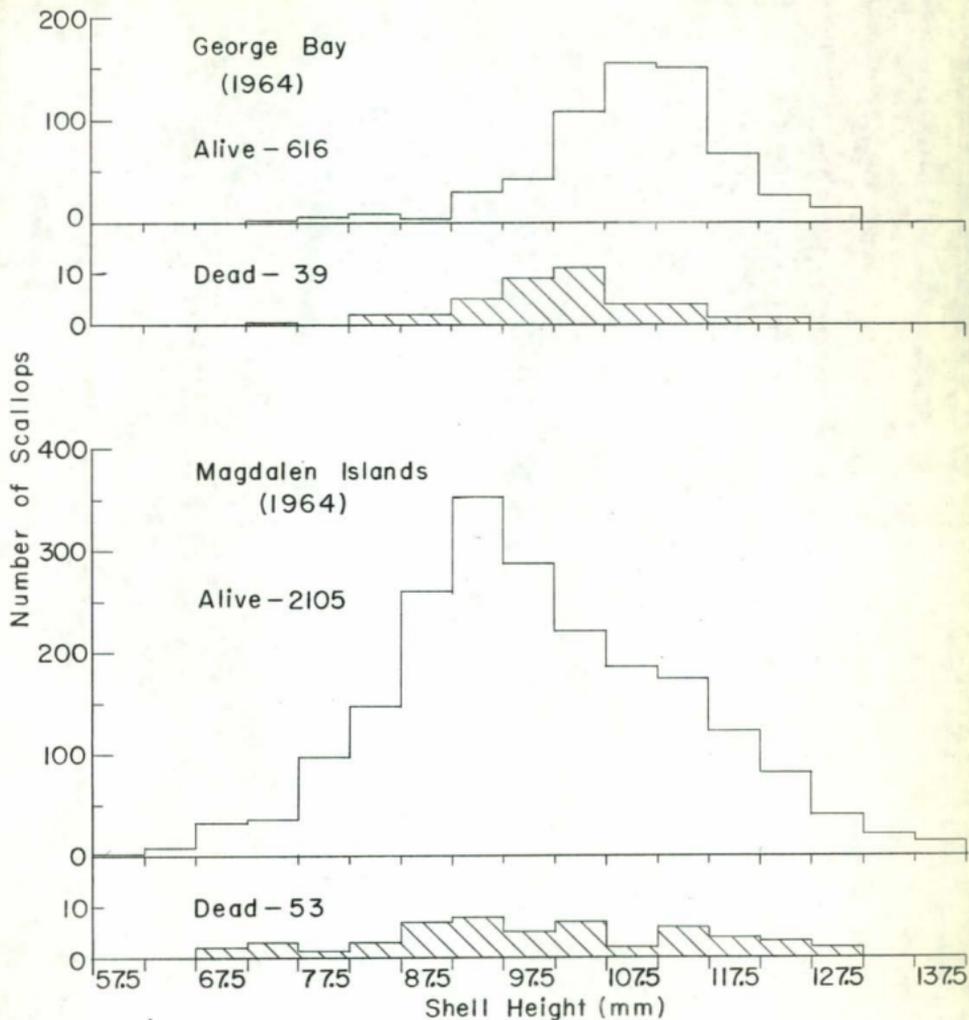


Fig. 13. Size-frequency distribution of scallops from the Magdalen Islands Beds 1 and 2, and George Bay Bed.

George Box

(1924)

174-110

174-110

174-110

(1924)

174-110

303

174-110

174-110

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