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Sea urchin resource survey for the northern and eastern regions of New Brunswick I - Compilation of data obtained by means of a questionnaire[1]

by

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Abstract

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A questionnaire was given to lobster and/or scallop fishermen operating along the northern and eastern coasts of New Brunswick. The objective of the questionnaire was to gather information on the green sea urchin (*Strongylocentrotus droebachiensis*) with a view to surveying this inshore resource. The information collected was used to produce maps of the probable distribution of concentrations of sea urchins and beds of laminaria. A qualitative assessment of sea urchin abundance and size is also presented.

Key words: Green sea urchin; *Strongylocentrotus droebachiensis*; laminaria; distribution.

Introduction

The green sea urchin (*Strongylocentrotus droebachiensis*) is currently harvested in the Gaspé Peninsula (Gendron, 1984), in the Bay of Fundy, and along the entire eastern coast of Nova Scotia as far as Cape Breton. Most of the catch is exported; some of it goes to Europe, but the bulk is shipped to Japan, where prime sea urchins will fetch prices of as much as $ 65/kg. While there have been a number of studies on the stocks that are currently being subjected to harvesting (see the list of references in Appendix I), to date there has been no investigation of the possibility of developing a viable sea urchin fishery along the northern and eastern coasts of New Brunswick.

Lobster fishermen, who frequently catch sea urchins in their traps, assert that there are substantial concentrations of them along the New Brunswick coast. In view of this anecdotal evidence, and in view of the fact that green sea urchins are harvested commercially in the Gaspé Peninsula and in Nova Scotia, it seems reasonable to assume that they are present in sufficient numbers to support a commercial fishery. But while observation and anecdotal evidence do provide useful qualitative information about this potential resource, quantitative information will be required before it will be feasible to develop an appropriate management plan for a New Brunswick sea urchin fishery. According to Gendron (1984), a sea urchin population is suitable for commercial harvesting only provided the following conditions are met:

- The test must be 50 mm or more in diameter.
- The density of the beds must be adequate to sustain harvesting by divers at a rate of 1.5 tonnes per day.
- The gonadosomatic index must be 10% or greater. We may note at this point that gonad production appears to be associated with the proximity of kelp beds (Gendron, 1984).

A resource survey project was prepared with a view to gathering qualitative and quantitative information about sea urchin stocks and assessing the potential viability of a fishery along the northern and eastern coasts of New Brunswick. The project was divided into three components. The first of these, which is covered in this report, called for the preparation of preliminary maps indicating the distribution of sea urchins insofar as this could be determined from qualitative information obtained from inshore lobster and/or scallop fishermen. The object of the second component was to locate sea urchin beds that were suitable for commercial harvesting in terms of accessibility, abundance and individual size. The third component involved a survey carried out by divers with a view to determining the characteristics of exploitable sea urchin beds and thereby obtaining the information needed in order to develop a rational resource management plan.

Materials and methods

Information about concentrations of sea urchins and beds of laminaria was gathered by means of a questionnaire which was distributed to selected lobster and/or scallop fishermen operating along the northern and eastern coasts of New Brunswick. Figure 1 shows the locations of the inshore areas involved and indicates the numbers of fishermen who answered the questionnaire. The questionnaire was completed in the presence of an investigator (the same in all cases) who asked the questions and compiled the responses.

The questionnaire (see Appendix II) was accompanied by bathymetric charts which were used to identify areas of hard, rocky bottom where sea urchins were likely to be found (Gendron, 1984; Moore *et al.*, 1986). For each inshore area, the number of fishermen who were asked to complete the questionnaire depended on the accuracy and quality of the information gathered by the investigator: if that information indicated the presence of promising numbers of sea urchins, more fishermen were asked to complete the questionnaire. The questions were designed mainly to elicit qualitative information about the locations of concentrations of sea urchins, the size of the individual sea urchins, the water depth, the tye of bottom, and whether or not kelp beds were present.

We subsequently analysed the data by taking the information we had gathered by means of the questionnaire and superimposing it on nautical charts. The results thereby obtained were used to prepare base maps indicating the possible distribution of concentrations of green sea urchins that were sufficiently dense to support commercial harvesting and other habitat characteristics of relevance to the distribution of the species under consideration.

Results

Île-au-Héron - Bathurst

None of the fishermen said anything about sea urchins or kelp in the region west of l'Île-au-Héron and Petit-Rocher as far as Salmon Beach (see Figs. 2, 3 and 4). They did say that sea urchins had been caught in the area between l'Île-au-Héron and Petit-Rocher (see Figs. 2 and 3). It appeared that sea urchins were present all along the littoral at depths of between 2 and 12 metres. In addition, colonies were identified off the eastern tip of l'Île-au-Héron, off Black Point, off Jacquet River, both east and west of Belledune Point, southeast of Pointe-Verte, and near the Petit-Rocher wharf.

The sea urchin bed located off the eastern tip of l'Île-au-Héron appeared to be characterized by great variability in individual size, but the information gather seemed to indicate that inviduals in the 50-to-65-mm size range predominated. These sea urchins were said to live on a rocky bottom at a depth of between 5 and 10 metres. According to the answers to the questionnaires, there would seem to be no beds of laminaria east of the island (see Fig. 3).

The sea urchin population in the water off Black Point appeared to be less dense than its Île-au-Héron counterpart, but according to the answers to the questionnaire, there is a kelp bed there (see Figs. 2 and 3). The water depth reportedly ranges between 6 and 10 metres, and the bottom is characterized by a rocky substrate. Sea urchins captured in this area were said to display great variability in terms of size.

Sea urchins caught in the area off Jacquet River were reported to be generally large in size. The population appeared to be concentrated at depths of between 3 and 14 metres, with a dense kelp bed adjacent to it (see Figs. 2 and 3).

The sea urchin colonies near Belledune Point did not appear to be associated with kelp beds (see Figs. 2 and 3). According to the fishermen, the colony located west of the point consists mainly of large specimens, while there was said to be a wide range of variability in the specimens caught east of the point.

The colony located southeast of Pointe-Verte reportedly lives on an area of rocky bottom in a water depth of between 2 and 14 metres (see Fig. 4). Individuals measuring 50 mm in diameter appeared to predominate, and there was said to be an adjacent kelp bed.

The respondents referred to laminaria beds of varying density all along the northern shore of l'Île-au-Héron and the mainland coast between Jacquet River and Belle-dune, at depths of between 2 and 8 metres (see Fig. 3). Large sea urchins were reported to have been caught off the northern end of l'Île-au-Héron, while great variability in size frequency was indicated for the inshore waters between Jacquet River and Belledune.

Bathurst - Pokeshaw

Five beds of sea urchins were reported from the region extending between Salmon Beach and Pokeshaw (see Fig. 5). Sea urchins were reported to have been caught elsewhere in the region; the heaviest concentrations appeared to occur at depths of between 4 and 7 metres. Most of the individual specimens that were caught were said to have been large in size.

Two regions with dense concentrations of large specimens were identified between Salmon Beach and Cape Cranberry. The bottom there was described as rocky, with the water depth ranging from 4 to 14 metres. While the presence of laminaria was reported for virtually the entire region, no kelp beds as such were identified. A population with similar characteristics was reported at a location northeast of Cape Cranberry in water from 3 to 8 metres deep.

A small but very high-density bed was reported at a location west of Cape Cranberry. The sea urchins there were said to vary widely in size, but individuals measuring 50 mm were reportedly common. No information was obtained as to the presence of kelp beds.

The reported population in the waters of New Bandon was said to extend for a distance of 3 to 4 kilometres along the littoral in water ranging between 4 and 10 metres in depth. The individual sea urchins were reportedly large in size, and there was said to be a kelp bed nearby.

Pokeshaw - Caraquet Island

Catches of sea urchins were reported all along the stretch of coast extending from Pokeshaw to Maisonnette at depths ranging between 4 and 15 metres (see Fig. 6). There were said to be concentrations located out from the Grande-Anse and Anse-Bleu wharves, along Cape Pelé, and east of the Anse-Bleu wharf. While there appeared to be great variability in terms of size, individuals in the 50 to 65 mm range were thought to be most common. The presence of laminaria in these regions was mentioned, but no definite kelp bed could be clearly identified.

A concentration of large (> 65 mm) sea urchins was said to be located off the eastern tip of Caraquet Island (see Fig. 6), with an adjacent kep bed extending along the entire northern shore of the island at a depth ranging between 3 and 6 metres (see Fig. 7). Catches of large sea urchins were reported along the entire length of the northern side of Caraquet Island, but the frequency was reportedly lower than in the case of the eastern tip of the island.

Sea urchins were also said to have been caught on the rock located off Caraquet Island at a depth of 9 to 10 metres (see Fig. 6). It appeared that there was no kelp there, and our informants reported that most of the individual specimens were small (< 50 mm).

Lamèque Island - Miscou Island (Chaleur Bay side)

In this sector, the presence of sea urchins was reported from all fishing grounds characterized by a rocky substrate. It appeared, however, that density values were low and the individual specimens small, except in three locations, as shown in Fig. 8.

One bed of large (> 65 mm) sea urchins was said to be located near the buoy at the entrance to the Shippagan channel, at a depth of between 10 and 15 metres. The respondents indicated that the bottom was rocky there, but that there did not appear to be any kelp. A second bed was reportedly located directly out from Sainte-Cécile at a depth of between 4 and 10 metres on a rocky bottom.

The third bed of sea urchins was placed northwest of the Miscou channel buoy, in an area characterized by a rocky bottom under 10 to 15 metres of water. The fishermen who answered the questionnaire stated that there was a wide variety of individual sizes, but specimens in the 50 to 65 mm range predominated. A bed of laminaria was reported south of this sea urchin colony at a depth of between 10 and 12 metres.

Lamèque Island - Miscou Island (Gulf of St. Lawrence side)

Fishermen in the Miscou region indicated that quantities of sea urchins were caught northeast and east of Miscou (see Fig. 9). Individual sizes were said to be widely variable, but it was not uncommon to catch specimens measuring 65 mm or more. Two concentrations were identified in this region. The first of these was said to be located northeast of Miscou, opposite Birch Point, at a depth of between 8 and 10 metres, and it appeared there was an adjacent kelp bed toward the 6 to 8 metre line (see Fig. 10). The location of the second concentration, whose characteristics were described as similar to those of the first, was identified as being in the region of Wilson Bank, off Wilson Point (see Fig. 9).

South of the Miscou channel as far as the Shippagan channel, sea urchins are reportedly caught along the entire length of the littoral in areas of rocky bottom in water depths of from 4 to 10 metres (see Fig. 9). Colonies were reported between Pigeon Hill and Cap Bateau, off Cap Bateau, off Chiasson Office, and near the Shippagan channel buoy. Individual sizes were said to be widely variable, but with 50-mm specimens predominant. Nearshore beds of laminaria, in water between 4 and 6 metres deep, were reported in close proximity to all these sea urchin colonies except the one located near the Shippegan channel buoy (see Fig. 10).

Le Goulet - Miramichi estuary

The local fishermen indicated that sea urchins could be caught along the entire length of the littoral in areas of rocky bottom in water from 6 to 12 metres deep (see Figs. 11 and 12). However, they were said to be less common further south, in the region extending from Tracadie to Tabusintac Bay, and absent altogether opposite the islands known as l'Île au Portage and Fox Island, where the bottom was reportedly sandy for the most part (see Fig. 13).

Dense concentrations of sea urchins were reported near the Shippagan channel buoy (see the preceding section, Fig. 11), off Le Goulet, between Le Goulet and Inkerman, off Val-Comeau and outside Tabusintac Bay (see Fig. 12), and also north of l'Île-au-Portage (see Fig. 13).

In all the above cases, the colonies of sea urchins appeared to be associated with areas of rocky bottom. The informants confirmed that there were small kelp beds located off Pointe-à-Barreau and Val-Comeau (see Figs. 11 and 12). Small specimens appeared to be predominant in all areas except off Le Goulet and Val-Comeau.

Escuminac - Pointe-Sapin

The bottom off Escuminac and Pointe-Escuminac was said to be rocky in nature and hence suitable as sea urchin habitat. Catches of sea urchins were reported along the entire length of the littoral at Escuminac and Pointe-Escuminac, with colonies both north and south of Pointe-Escuminac (see Fig. 14). Individual sizes were said to be widely variable, but with 50-to-65-mm specimens predominant. The presence of kelp beds was not confirmed in the case of these concentrations of sea urchins, but the fishermen indicated that kelp was frequently found in lobster traps (see Fig. 15).

In the Pointe-Sapin region, only one bed of sea urchins was reported, near the Sapin Ledge marker buoy, on rocky bottom, under between 6 and 10 metres of water (see Fig. 14). The informants reported that specimens caught in their lobster traps varied widely in size. A bed of laminaria was reportedly located near this colony of sea urchins (see Fig. 15).

South of Pointe-Sapin

There would seem to be very few sea urchins in this part of Northumberland Strait. South of Pointe-Sapin the completed questionnaires mentioned only one colony of them, in an area of rocky bottom off Pointe-des-Mares, northwest of Cap Lumière (see Fig. 16). The presence of a kelp bed in the same region was also mentioned.

Sea urchins were reported as having been caught in the strait, but only in very small numbers. Fishermen operating in the strait indicated that the characteristics of the sediment there (sandy, sandy and muddy) were probably the reason why sea urchins were scarce in that region.

Conclusion

Thanks to the information we obtained from the questionnaires which were completed by local fishermen, we were able to make a preliminary determination of the distribution of sea urchin colonies along the coast of New Brunswick and to identify areas that might be capable of supporting commercial harvesting. However, our findings have not enabled us to determine whether the numbers of sea urchins inhabiting these areas and the quality of their gonads would be adequate for the purposes of a commercial fishery. These quantitative aspects--sea urchin abundance and gonad quality--remain to be investigated more fully.

Gonadosomatic index, individual size (test diameter) and density are the three criteria used to assess the commercial harvesting potential of any given bed of sea urchins. In view of the fact that colonies located along the fringes of beds of laminaria appear to be characterized by higher gonadosomatic index values, a sampling strategy based on the presence of such beds might yield a clearer picture of the prospects for a commercial green sea urchin fishery on the coasts of New Brunswick. Once maps showing the locations of potential sea urchin beds and kelp beds have been prepared and examined, information relating to density, resource distribution and size frequency distribution could be obtained from a survey carried out by divers. On the basis of this information, commercial harvesting potential could be assessed and a rational approach to resource management developed.

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References

Gendron, L., 1984. État des connaissances sur les populations d'oursins verts des côtes québécoises et analyse du potentiel d'exploitation [the present state of knowledge about green sea urchin colonies in Quebec's coastal waters and analysis of harvesting potential]. Department of Agriculture, Fisheries and Food, Marine Fisheries Branch, Scientific and Technical Research Directorate. Gaspé, Quebec. Working document 84/4: 15 pp.

Moore, D.S., R.J. Miller and L.D. Meade, 1986. Survey of shallow benthic habitat: eastern shore and Cape Breton, Nova Scotia. Can. Tech. Rep. Fish. Aqua. Sci. 1546: 49 pp.

Appendix 1. List of references dealing with the biology and harvesting of the green sea urchin

Canada/Newfoundland Inshore Fisheries Development Agreement (Underutilized Species Program), 1990. Newfoundland sea urchin roe: potential for development. Project summary (Canada/Newfoundland Inshore Fisheries Development Agreement), 4, St. John's, Newfoundland; 3 pp.

Bedard, R.W. 1973. Oursin de mer [the sea urchin]. Department of Industry, Trade and Commerce. Fisheries and Fish Products Division; 29 pp.

Berthiaume, G. 1988. Étude du potential commercial de l'oursin et le bigorneau du Québec [study of the commercial potential of Quebec's sea urchin and periwinkle stocks]. Department of Fisheries and Oceans (Quebec Region), Technological, Industrial and Infrastructure Development Division. Report on project 31; 30 pp.

Bérubé, G. and A. Strachan. 1984. Étude de la possibilité d'exploitation des gonades d'oursins [sea urchin gonad harvesting feasibility study]. Department of Fisheries and Oceans (Quebec Region), Economic and Development Services Division. Report on project 11; 63 pp.

Fletcher, G.L. and L.C. Haggerty. 1975. A survey of the inshore marine resources of St. Lewis Bay, Alexis Bay, St. Michael's Bay and Sandwich Bay, Labrador, with particular reference to Iceland scallops, mussels, clams, sea urchins and seaweed. Memorial University of Newfoundland. Marine Sciences Research Laboratory. MSRL Tech. Rep. 15; 109 pp.

Fletcher, G.L., V.A. Perrer and J.C. Kean. 1974. A study of the biology of the Newfoundland sea urchin with emphasis on aspects important to the development of a fishery. Memorial University of Newfoundland. Marine Sciences Research Laboratory. MSRL Tech. Rep. 11; 41 pp.

Fletcher, G.L., R.P. Scaplen, R.G. Buggein and D.R. Idler. 1974. A survey of the inshore marine resources of Forteau Bay, L'Anse au Loup Bay, Pinware Bay and Red Bay, Labrador with particular emphasis on shellfish, sea urchins and seaweed. Memorial University of Newfoundland. Marine Sciences Research Laboratory. MSRL Tech. Rep. 9; 33 pp.

Fowler, B.M. and G.L. Fletcher. 1975. A survey of the marine inshore resources of Bonavista Bay, Belle Bay and Fortune Bay with particular reference to giant mussels, clams, sea urchins and seaweed. Memorial University of Newfoundland. Marine Sciences Research Laboratory. MSRL Tech. Rep. 17; 131 pp.

Himmelman, J., F. Axelsen and Y. Lavergne. 1979. Étude des populations et du cycle sexuel de l'oursin vert au Québec [study of green sea urchin colonies and the sexual cycle of the green sea urchin in Quebec]. Marine Fisheries Branch, Research Directorate, Quebec City, Information publication 93; 41 pp.

Keats, D.W. 1986. The effects of the experimental removal of green sea urchins and of ice-scour on sublittoral benthic macroalgal communities in eastern Newfoundland. Ph.D. thesis, Memorial University of Newfoundland, National Library of Canada, 233 pp.

Keats, D.W., D.H. Steele and G.R. South. Food relations and short-term aquaculture potential of the green sea urchin (*Strongylocentrotus droebachiensis*) in Newfoundland. Memorial University of Newfoundland. Marine Sciences Research Laboratory. MSRL Tech. Rep. 24, Development Branch report new series, 29; 24 pp.

Kramer, D.E. 1980. Outlook for establishing a fishery for the green sea urchin (*Strongylocentrotus droebachiensis*) in the St. Lawrence River. Can. Ind. Rep. Fish. Aqua. Sci. 114; 15 pp.

Kramer, D.E. 1978. Physical data from a study of size, weight and gonad quality for the green sea urchin (*Strongylocentrotus droebachiensis*) over a one-year period. Fisheries and Marine Service manuscript report 1476; 68 pp.

Lavergne, Y. and J.H. Himmelman. 1984. Localisation des stocks d'oursins de l'estuaire du Saint-Laurent et leur situation dans la communauté benthique [locations of sea urchin stocks in the estuary of the St. Lawrence and their position in the benthic community]. Marine Fisheries Branch, Research Directorate, Quebec City, Information publication 108; 39 pp.

Li, M.F. and J.W. Cornick. 1982. Studies of recent mortalities of the sea urchin (*Strongylocentrotus droebachiensis*) in Nova Scotia. ICES CM. 1982/L:46; 8 pp.

MacKay, A.A. 1976. The sea urchin roe industry on New Brunswick's Bay of Fundy coast. Marine Research Associates, 92 pp.

Mann, K. 1981. Management of resources in the coastal zone: Laminaria and lobsters in Nova Scotia. Lindbergh lecture series in ecology, 16 pp.

Miller, R.J. 1982. Stability of a sea urchin front in southwest Nova Scotia. Can. MS Rep. Fish. Aqua. Sci. 1662; 11 pp.

Miller, R.J. and C.A. Bishop. 1973. A sea urchin fishery for Atlantic Canada. Fisheries and Marine Service, Biological Station, St. John's, Newfoundland, Circular 19; 9 pp.

Moore, D.S. and R.J. Miller. 1983. Recovery of macroalgae following widespread sea urchin mortality with a description of the nearshore hard-bottom habitat on the Atlantic coast of Nova Scotia. Can. Tech. Rep. Fish. Aqua. Sci. 1230; 94 pp + (2) maps.

Mottet, M.G. 1976. The fishery biology of sea urchins in the family Strongylocentrotidae. Department of Fisheries. Washington (State), U.S., Technical report 20; 66 pp.

Neish, I.C. 1973. The distribution of sea urchins in Charlotte County, New Brunswick. Applied Marine Research Limited, Reference AMP 73-3B; 22pp.

Pringle, J.D., G.J. Sharp and J.F. Caddy. 1980. Proceedings of the Workshop on the Relationship between Sea Urchin Grazing and Commercial Plant/Animal Harvesting. Can. Tech. Rep. Fish. Aqua. Sci. 954; 273 pp.

Scattergood, L.W. 1947. The sea urchin fishery. Fish and Wildlife Service, U.S., Fishery leaflet 231; 2 pp.

Smith, J. 1980. Preliminary study of the sea urchin harvest potential in Placentia and Conception Bay. Development Branch, Department of Fisheries, Newfoundland, Development Branch report new series 12; 18 pp.

Way, E., P. Wood and E. Quigley. 1986. The green sea urchin. Department of Fisheries and Oceans (Newfoundland Region), Fisheries Development Branch; 4 pp.