

**GEOLOGICAL
SURVEY
OF
CANADA**

**DEPARTMENT OF MINES
AND TECHNICAL SURVEYS**

Paper 61-27

**FAUNAL REPORT, SUBMARINE GEOLOGY PROGRAM,
POLAR CONTINENTAL SHELF PROJECT, ISACHSEN,
DISTRICT OF FRANKLIN**

(Report, 2 figures and 2 tables)

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By

Frances J.E. Wagner

DEPARTMENT OF
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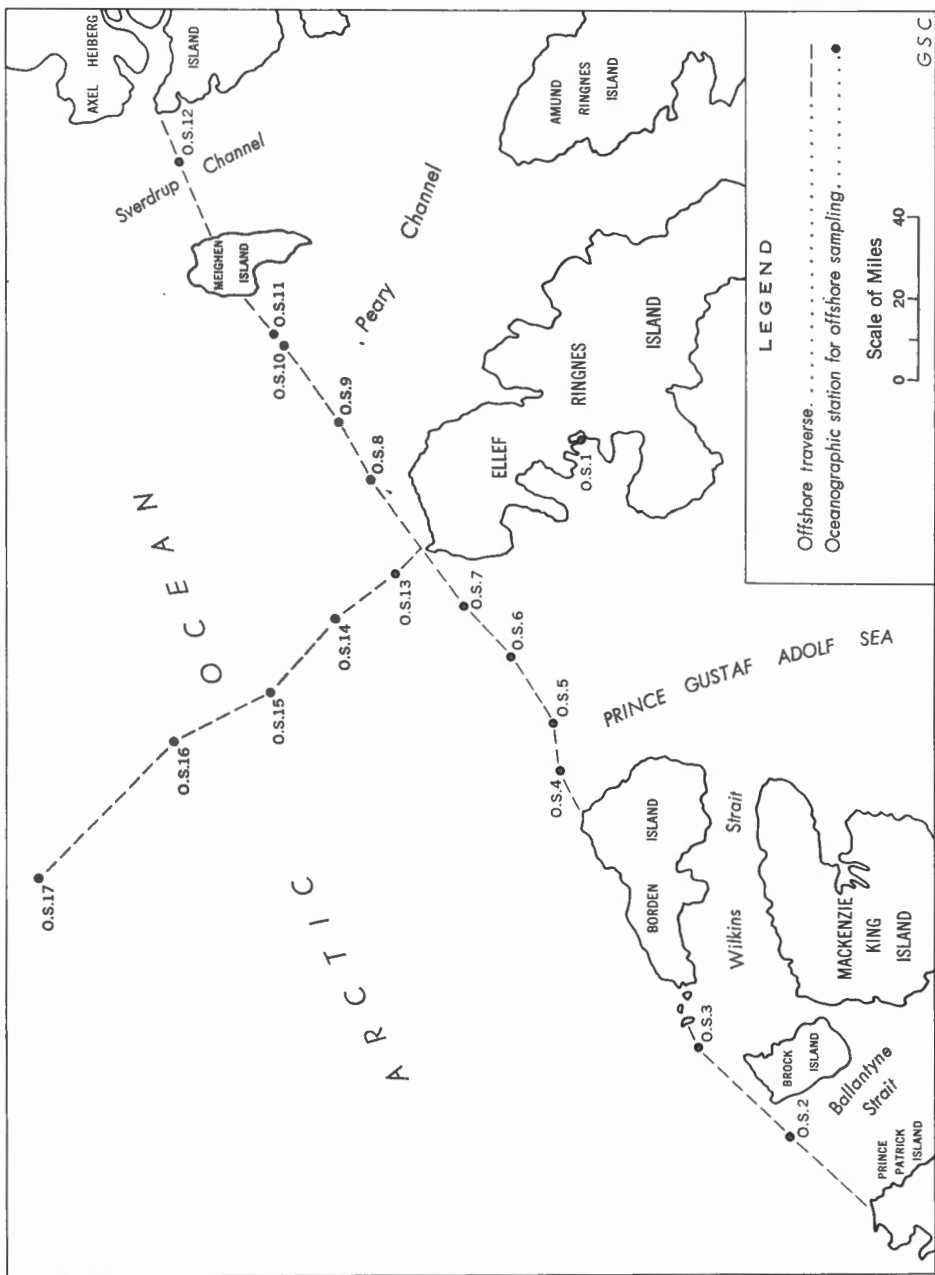


Figure 1. Location of oceanographic stations

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Introduction

During the 1960 field season, sixteen offshore stations were located by personnel of the Polar Continental Shelf Project and the Geological Survey of Canada (Collin, 1961; Pelletier, 1961)¹ along two lines off the western margin of the Queen Elizabeth Islands—one between 77°51.5'N. lat., 115°36'W. long. and 80°04.5'N. lat., 97°10'W. long., and the other northwest from Cape Isachsen, Ellef Ringnes Island to 80°42'N. lat., 112°50'W. long. (see Fig. 1). One additional station was located in Isachsen Bay. Depths of the water at these stations are between 143 and 1,239 metres (see Table I).

Because of the long-term nature of the Polar Continental Shelf Project, the writer proposes to present the results of the faunal study periodically as the investigation progresses. The study will cover material from elsewhere in the Arctic and from sub-Arctic regions as well as from the Polar Shelf Project area, and will be concerned with both living and fossil organisms. The main aims of the faunal study are these: 1) to add to the already known data regarding depth range, optimum depth, preferred bottom-conditions, temperature tolerance, etc. of the various species now living in Arctic waters, 2) to determine faunal zones and their index species, and 3) to apply these data to interpret the fossil faunas from both sea-bottom cores and raised beaches. This report deals with Recent organisms from the surface of the sea bottom at fifteen of the seventeen above-mentioned stations. No samples were available from the other two stations, nor were long core samples available at this time for stratigraphic studies.

The writer is indebted to A. E. Collin of the Polar Continental Shelf Project and B. R. Pelletier of the Geological Survey for the material supplied and for information regarding depth and water temperature pertaining thereto, and to Mrs. Irene Lubinsky, Department of Zoology, McGill University and Dr. A. H. Clarke, Jr., National Museum of Canada, for their assistance in the identification of some of the minute pelecypods.

¹ Names and dates in parentheses refer to publications listed in the Selected Bibliography.

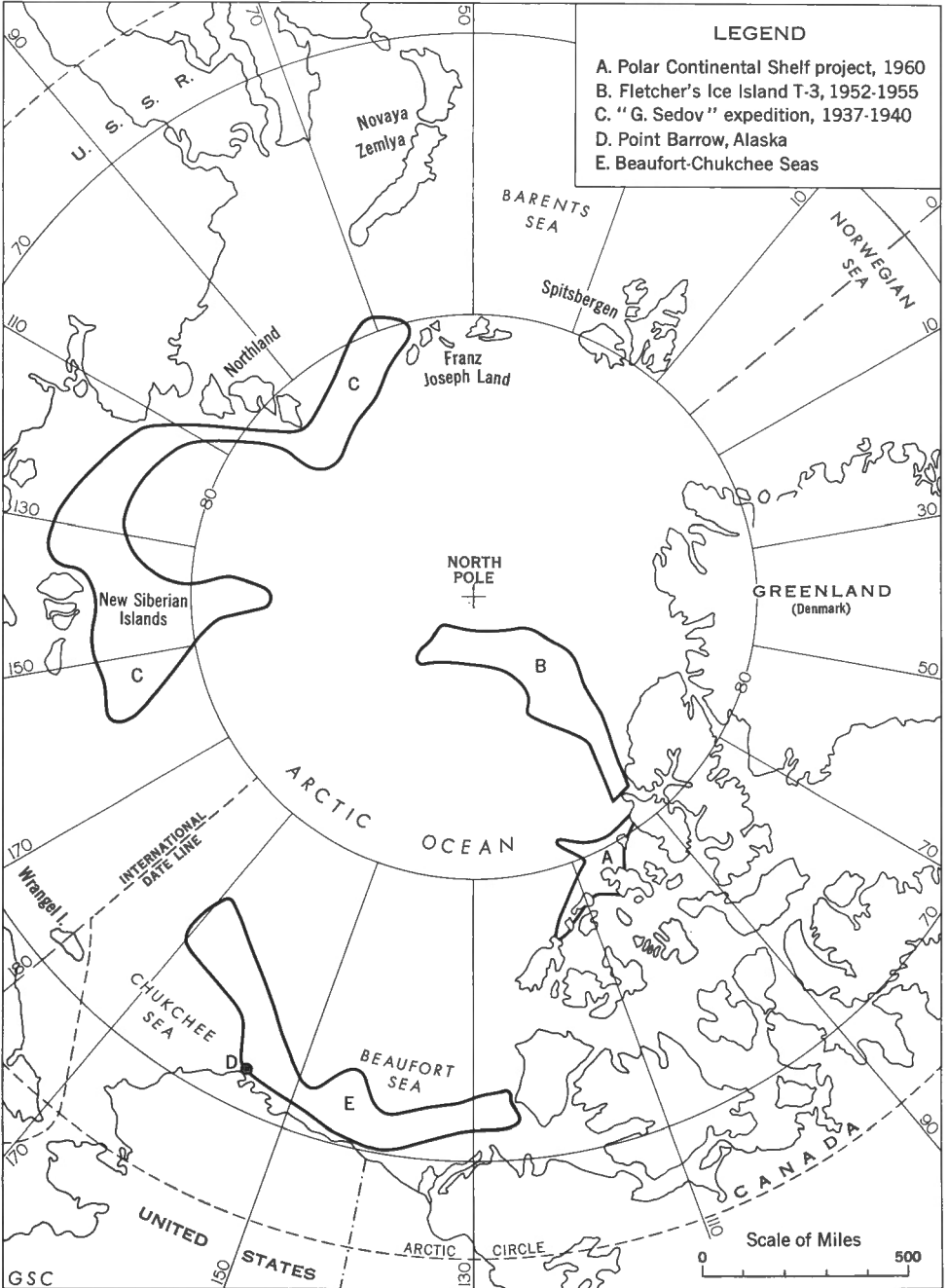


Figure 2. Areas covered by various investigations

Faunal Study

The Polar Continental Shelf Project area lies between two areas whose faunas have come under study in recent years. To the north is the area covered by Fletcher's Ice Island, T-3, during the years 1952 to 1955 inclusive; and to the southwest is the area of Beaufort and Chukchee Seas investigated by Carsola in 1950 and 1951 (see Fig. 2). Core samples were obtained by personnel manning Fletcher's Ice Island, T-3, from depths of between 433 and 2,760 metres. Green (1959) has reported on the Foraminifera, listing one hundred and five species. A brief report on other invertebrate groups in the T-3 collections has been given by Mohr (1959). Carsola (1952) has listed sixty-three species of Foraminifera from Beaufort and Chukchee Seas from depths of between 18 and 3,541 metres. Fifty of his sixty-three localities were at depths of less than 500 metres. The Foraminifera of the area around Point Barrow, Alaska (see Fig. 2) have been studied intensively by Loeblich and Tappan (1953). Other groups of marine invertebrates from the Point Barrow area are included in the report by G.E. MacGinitie (1955). The Mollusca of the same area have received further attention from N. MacGinitie (1959). In the Russian Arctic, widespread investigations were carried out by the "G. Sedov" Expedition, 1937-1940 (Fig. 2).

Species from the Polar Shelf Project area are listed in Tables I and II. Foraminifera (Table I) are by far the most important group represented in the samples, both in variety and in numbers of individuals. They comprise sixty of the eighty-three species identified. Molluscs and ostracods (Table II) are next in order of abundance, with eleven and seven species respectively. The remaining five species belong to the echinoderms, bryozoans, and sponges (Table II). In Table I, abundance of the foraminiferal species is given as a percentage wherever possible to facilitate comparison with lists for other areas. However, where only a very few individuals were present in a sample, recording of the abundance in terms of percentage was found to give a distorted picture of the relative significance of the various species. Therefore, for the samples having eleven species or fewer, the actual number of individuals is shown in the table, and the figure is in parentheses to indicate this.

The closest relationship of the foraminiferal assemblages seems to be with the Point Barrow area; the two areas have thirty-two species in common. Twenty-two species from the Polar Shelf Project area are recorded also from the T-3 area, and twelve of the species appear on Carsola's list for Beaufort and Chukchee Seas. Only one species, Trochammina nana, is definitely listed from all four areas, although a second species may also be common to all. Pateoris hauerinoides appears on the Shelf Project, T-3, and Point Barrow lists. The species identified by Carsola as Quinqueloculina subrotunda is possibly the P. hauerinoides of the other lists.

Green (1959) was able to select indicator species for four bathymetric zones (shelf, slope, apron, and abyssal) on the basis of percentage occurrence. Seven of these indicator species, identified by the writer from the Polar Shelf Project area, are the following: Cassidulina teretis, Cassidulina islandica (C. islandica of Green's list), Nummoloculina sp., Trochammina nana, Valvulineria horvathi, Eponides tener, and Cibicides wuellerstorfi. Green found the highest percentages of Cassidulina teretis, C. islandica, and Nummoloculina sp. in his shelf-zone samples (433-510 metres). The percentages of these species decreased rapidly with depth. Trochammina nana was found to have its greatest abundance in the slope zone (619-1,142 metres), Valvulineria horvathi in the apron zone (1,532-2,000 metres), and Eponides tener and Cibicides wuellerstorfi in the abyssal zone (2,250-2,760 metres). In the Polar Shelf Project area, samples were obtained only from shelf-zone (143-534 metres) and slope-zone (1,239 metres) depths. The writer has found that, although her percentages for these species are not exactly the same as Green's, for the two zones represented the same relationships exist, in most cases, between percentage occurrence and depth. Globigerina pachyderma, a species generally considered to be pelagic but believed by Green (1959, p. 69) to be benthonic, is also significant bathymetrically. Green (p. 68) stated, "in the shallower stations (400-500 meters) the species of Globigerina comprise an average of seventy-five per cent of the fauna; as the depth of water increases the percentages of Globigerina increase until in the deeper stations of 2,000-2,760 meters they average ninety-eight per cent of the fauna". In the Shelf Project area, Globigerina was found to average 63 per cent of the fauna of the shelf-zone stations, and to comprise 91 per cent of the fauna at station 17 in the slope zone.

Three other species in the Polar Shelf Project area would seem at this time to be useful depth indicators. They are Cibicides lobatulus and Quinqueloculina arctica for the shelf zone, and Quinqueloculina sp. (?=Q. sp. of Green) for the slope zone. However, further studies will be needed to prove or disprove their value.

The groups of organisms other than Foraminifera are very sparsely represented in the samples from the Shelf Project area. Small taxodont pelecypods are the most common molluscs present. Gorbunov (1946) described Ledella tamara from north of the New Siberian Islands (82°51'N. lat., 137°23'E. long., depth 3,700-3,800 metres). Clarke¹ believes it to be present in samples he is

¹ Clarke, A.H., Jr., National Museum of Canada, personal communication.

currently studying from the Chukchee Rise, north of Bering Sea. If the minute pelecypod from station 4 (see Table II) is indeed Ledella tamara, its presence off the Queen Elizabeth Islands at a depth of 472 metres indicates a considerable extension of its heretofore known geographic and bathymetric range. The ostracod ?Cythereis tuberculata (station 4), and the pelecypods Yoldiella frigida (stations 5 and 15), and Nucula bellotii (station 16) were found with their valves unseparated, indicating little or no transport after death. The rest of the pelecypods and ostracods occurred as single valves or fragments.

Summary

This preliminary study has shown that some of the foraminifers are of value as depth-indicator species for certain broad bathymetric zones, i. e. shelf, slope, etc. Some of the species are the same as Green (1959) found to be zonally characteristic in the Fletcher's Ice Island, T-3 area, to the north; others are apparently diagnostic only in the Polar Continental Shelf Project area. Any attempt to work out a more detailed zonation of the faunas must await the examination of many more samples of wider areal distribution and greater range in depth. Applying the information gained from the Recent faunas to the study of fossil assemblages should eventually make possible an evaluation of past water-temperature and sea-level changes. Also, future work should give an indication of the affinities —Atlantic or Pacific—of the Arctic faunas, thus enabling some conclusion to be reached regarding water circulation within the Arctic region.

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Table II. List of species other than foraminifera

Station Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
PORIFERA																		
unident. spicule																		x
BRYOZOA																		
<u>Hornera lichenoides</u> (Linné)															x			
unident. bryozoan						x												
PELECYPODA																		
<u>Nucula bellotii</u> Adams																		x
? <u>Yoldia</u> sp.																		x x
<u>Yoldiella frigida</u> (Torrell)					x										x			
<u>Yoldiella lenticula</u> (Möller)												x						
cf. <u>Ledella tamara</u> Gorbunov				x														
? <u>Musculus</u> sp.									x					x				
<u>Mytilus</u> sp., probably <u>M. edulis</u> Linné															x			
<u>Cyrtodaria kurriana</u> Dunker											x							
unident. pelecypods															x		x	
SCAPHOPODA																		
<u>Dentalium entalis</u> Linné															x			
<u>Dentalium</u> sp.			x															
OSTRACODA																		
<u>Krithe bartonensis</u> (Jones)				?											x			
? <u>Krithe</u> sp.					x													
? <u>Cythereis tuberculata</u> (Sars)					x													
<u>Cytheropteron</u> cf. <u>C. alatum</u> Sars						x												
<u>Cytheropteron</u> cf. <u>C. hamatum</u> Sars															x			
<u>Cytheropteron</u> sp.					x													
unident. ostracod						x												x
ECHINODERMATA																		
echinoid spines					x										x			
? ophiuroid fragments			x															

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