

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

INVESTIGATOR'S ANNUAL REPORT 1984
(Natural Sciences Research)

in cat 12/2003 under
1984-85 study.

This form is to be completed by the researcher and returned to the Superintendent of the Park by JANUARY 1. See reverse for additional instructions.

TO SUPERINTENDENT	PARK Isle Royale	REGION Midwest
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1. Project Title
Bacteriological Water Quality in and around Rock Harbor, Isle Royale National Park

2. Name(s) of Researcher(s) and Institution(s)
Dr. Susan T. Bagley, Dept. Biological Sciences, Michigan Technological University

3. Source(s) and Amount(s) of Funds Other Than NPS, if Any

4. Starting Date of Project April, 1984	5. Percent Completion of Project to Date: 100%	6. Est. Additional Time Required for Completion Beyond January 1st: ____ Years ____ Months
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7. Summary: (a) of progress; (b) of significant findings, if any, to date; (c) recommendations regarding future course, i.e., on basis of work so far, should it proceed as planned, be reoriented, expanded, reduced, time schedule and support level adjusted, etc.; Water samples for bacteriological analysis were collected from up to eleven sites in and around Rock Harbor on a weekly basis from May 15 through October 23, 1984 (19 sampling dates). Analyses were conducted for three standard indicators of water quality, i.e., total coliforms (TC), fecal coliforms (FC), and fecal streptococci (FS). The sampling sites were designated as Benson Creek 1, 2, 3 (old and new), Mott Island, Moskey Basin (old and new), Three Mile, Caribou Island, Rock Harbor, and Lake Superior (SE of Mott Island). TC and FS were routinely detected in all samples except from the Lake Superior site. All of the Lake Superior samples had few or no detectable indicator organisms/100ml. Although some of the TC levels were over 3,000/100 ml (primarily in the Benson Creek samples), FC levels were usually in the range of <1 to 20/100 ml. In general, this indicates that the TC in the samples tested were derived largely from vegetation and run-off from land and not necessarily from recent human fecal contamination. In particular, there was no real evidence of human fecal contamination in samples from the Rock Harbor site, which was located near the outlet of the stream receiving treated sewage. Some of the variation in FC levels was in response to water temperature, with the lowest values found in May (water temperatures 2 - 10°C) and the highest values in early September (water temperatures 13 - 16°C).

With one exception, the FC/FS ratios were always less than 4.0 and usually less than 0.6, indicating that the bacterial contamination was primarily from vegetation, non-human fecal sources, and/or differential survival and growth of the TC and FS indicator organisms. Water from the (old) Moskey Basin sampling site had a FC/FS ratio >4.0 on August 28, with ratios between 0.6 and 4.0 on several other sampling dates. Lower levels of both FC and TC and FC/FS ratios of <0.6 were found in samples from a second (i.e., "new") Moskey Basin site, indicating a localized but consistent input of TC and FC to the first (i.e., "old") site. Other sampling sites periodically having FC/FS ratios between 0.6 and 4.0 in August and September were at Benson Creek 3 ("new"), Mott Island, Three Mile, and Caribou Island.

(Use Additional Sheets if Necessary)

8. Signature of Investigator <i>Susan T. Bagley</i>	Date Dec 13, 1984
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9. RSP Number

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There are several areas which could be studied further. Although there was no conclusive evidence of recent human fecal contamination, FC and at times high (>50-100/100 ml) TC levels were detected in all samples from Rock Harbor itself. These levels are not typical of Lake Superior water (based on data from this and other studies); some of this bacterial loading may be due to human-related activities in and around Rock Harbor. It would be interesting to sample other sites in Rock Harbor (i.e., not right at campgrounds, etc.) and other sites around the island to determine whether this bacterial loading is localized or widespread in incidence.

The relatively high levels of TC found at times in all of the Rock Harbor samples and in particular in the Benson Creek and Moskey Basin samples are of some concern because many of the TC are also opportunistic human pathogens. Few people would likely bathe in these waters, but it is possible they might not treat their drinking water properly and/or may wash dishes or food in untreated water containing TC. (Only the Lake Superior samples consistently were of drinking water quality.) Some tests were also conducted to determine levels of Klebsiella and Aeromonas; besides being opportunistic pathogens, increased levels of these genera usually correlate with increases in nutrient levels in aquatic systems. Klebsiella levels followed the same trends as TC levels being a member of the TC group, although comprising varying percentages of the total TC counts. Aeromonas levels also generally varied with TC levels; however, Aeromonas were often found when TC counts were at or near <1/100 ml, perhaps indicating an increase in nutrients but not TC/FC/FS loading. It would be interesting to more fully characterize the TC and FC populations. This would aid in assessing possible human health impacts of the indicator bacterial loading and possibly their source(s).

1984
Data and
results notes.

(NO coliform bacteria)
(data 1984 ISRO
meldrum bagley.xls)
created 12-12-2003