NIAGARA MOHAWK POWER CORPORATION

POWER AUTHORITY OF THE STATE OF NEW YORK

1976

NINE MILE POINT AQUATIC ECOLOGY STUDIES

LMS Project Nos. 191-040, 041, 042

VOLUME I

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May 27, 1977
File: 191-40,41,42

Mr. G. K. Rhode
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Niagara Mohawk Power Corporation
300 Erie Boulevard West
Syracuse, New York 13202

Mr. George T. Berry
General Manager and Chief Engineer
Power Authority of the
State of New York
10 Columbus Circle
New York, New York 10019

Dear Messrs. Rhode and Berry:

In accordance with Niagara Mohawk Power Corporation and the Power Authority of the State of New York's authorization and the Environmental Technical Specifications for Nine Mile Point Nuclear Station Unit 1 (Docket 50-220) and the James A. FitzPatrick Nuclear Power Plant (Docket 50-333), we submit herein a report on the results of the ecological investigations conducted at Nine Mile Point during 1976.

Dr. Thomas E. Pease served as Project Manager for these investigations and Dr. Edythe Humphries as Project Biologist. The report was prepared by our Biological Sciences Section. The field and laboratory studies were conducted by our Oswego Laboratory.

Very truly yours,

Michael J. Skelly, Ph.D.

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I. ABSTRACT

The results of the Aquatic Ecological Studies conducted at Nine Mile Point on Lake Ontario during 1976 are reported. Nine Mile Point is the site of the 610 MWe Nine Mile Point Unit 1 Nuclear Station and the 821 MWe James A. FitzPatrick Nuclear Power Plant. These studies are a continuation of investigations conducted at the power plant site during 1973, 1974 and 1975. The studies during 1976 represent the first full year of post-operational studies for the FitzPatrick plant. The sampling program includes lake collections from April through December over an area extending approximately 6 km (3.6 miles) alongshore and out to the 33-meter (100 ft) depth contour. Sampling for impinged and entrained organisms was conducted throughout the year.

Water quality data are summarized and the abundances of selected taxa of phytoplankton, zooplankton, ichthyoplankton, benthos, and nekton are discussed in the report. Comparisons among samples from the discharge plume, from the lake locations, and from within the plants indicate few impacts of the power plants' operation. Most of the _Gammarus fasciatus_ population was found to be benthic and only a small percentage of those entering the plant suffered mortality. In general, plant survival was high and little or no mortality was observed from the plume entrainment simulation. Comparison of these results with the lake monitoring program indicates that no trends in the abundance of the selected taxa were found or would be expected.

Collections of fish eggs and larvae were dominated by alewife and rainbow smelt. The dominant nekton in both lake and impingement collections was alewife. Rainbow smelt and threespine stickleback were also abundant in impingement collections, while rainbow smelt and spottail shiner were abundant in lake collections. A general, but not persistent trend of higher abundance of alewife, spottail shiner, and white perch near the plants' discharge was observed. The report includes a data appendix.

II. SUMMARY OF FINDINGS AND CONCLUSIONS

A. WATER QUALITY

Both the Nine Mile Point (NMP) and FitzPatrick (JAF) plants were operating near capacity load during the lake monitoring studies in 1976. Similar surface temperature characteristics were observed at NMPE and NMPW transects along the 15, 20, and 40-ft depth contours. The NMPP transect exhibited consistently higher temperatures than NMPE, NMPW, and the FITZ transects. The James A. FitzPatrick Nuclear Power Plant discharge has a lesser temperature effect in the nearshore region due to its submerged diffuser outfall. The observed temperature distribution demonstrates that the NMPP and FITZ-15, 20 and 40 ft stations selected for the majority of the biological interpretations are directly within the discharge plume of one or both stations. No effects of power plant operation on water quality other than temperature were discernible from the data set.

B. PLANKTON

1. Phytoplankton

Plant effects on the lake phytoplankton community, as defined by phytoplankton abundance and biovolume, chlorophyll *a*, and productivity, could not be consistently separated from natural variability (including cold water intrusions). Plume entrainment studies (lake collections and plume simulations), however, indicate stimulation of phytoplankton productivity and no effect on chlorophyll *a* production

The greatest "annual" mean abundance for Bacillariophyceae (diatoms), Chlorophyceae (green algae), and Myxophyceae (blue-green algae) was observed at the NMPW transect. No discernible pattern was observed along the 20 and 40-ft contours for the numerically dominant phytoplankton species collected in the Nine Mile Point vicinity during 1976.

Chlorophyll a and productivity ratios, based on discharge/intake values for the JAF and NMP plants, showed a general trend of pigment degradation and photosynthetic inhibition during the warmer months and a possible stimulation during the cooler months (April-May and late-November through December). It was not possible to detect the local entrainment effects of JAF outside of the immediate discharge area as evidenced by the comparison of either chlorophyll or productivity along the 40 ft depth contour.

2. Zooplankton

No consistent temporal/spatial distribution patterns were observed for the major taxa of zooplankton collected at the 20 and 40-ft contours. The following trends were observed for lake zooplankton:

- Cyclopoid abundances were usually greater at the FITZ transect than the other three transects along the 20-ft depth contour.

- Although there were no consistent inter-transect patterns at either the 20 or 40-ft depth contours, mean cladoceran abundances tended to be greater over the year at the 20-ft depth contour than at the 40-ft depth contour. Spatial patterns of Bosmina longirostris, a numerically dominant cladoceran, were

similar to those of all cladocerans combined for the May through September sampling period, however, the abundance of B. longirostris was greater at the 40-ft depth contour than at the 20-ft for the October through December sampling period.

- Rotifers composed up to 90% of the total zooplankton community by numbers during their peak period in June. Mean concentrations at the 20-ft contour were greater than at the 40-ft depth contour on all survey dates except December. No consistent inter-transect distribution patterns were observed at either depth contour for all rotifers combined, or for Keratella crassa, Synchaeta lackowitziana, Polyarthra major, or Synchaeta pectinata.

The above spatial distributions are characteristic for these organisms in Lake Ontario and are not associated with plant operation.

Zooplankton viability studies indicated some mortality (about 40%) due to plant passage for rotifers, cyclopoids, and cladocerans, and particularly during the warmer months for cyclopoids and cladocerans. Little or no mortality associated with plume entrainment was observed from lake and simulation plume entrainment studies for cyclopoids, cladocerans and rotifers.

3. Macrozooplankton

No temporal/spatial distribution patterns attributable to plant operation were observed for dipterans, hydroids or Leptodora kindtii from day collections, or for Gammarus fasciatus from night collections.

Planktonic dipteran concentrations were greater west of Nine Mile Point Nuclear Station Unit 1 along the 20 and 40-ft depth contours than east of the plant.

Concentrations of Leptodora kindtii in the immediate vicinity (approximately 1/2 mile radius) of the power plants were greatest at 0.5-NMPW-20-ft and lowest at 0.5-NMPE-40-ft stations. Generally, L. kindtii was more abundant at the 20-ft contour than at the 40-ft contour and in the mid-depth samples.

Concentrations of Gammarus fasciatus were greater in benthic samples than in lake ichthyoplankton tows at comparable stations. Concentrations were greater also in night ichthyoplankton collections than in comparable day collections. The grand mean concentration of planktonic G. fasciatus was greatest at 1-NMPE-20-ft and 0.5-NMPW-40-ft stations, with slightly greater concentrations to the east than to the west of the Nine Mile Point station. Effects of the Nine Mile Point Plant and the James A. FitzPatrick Plant discharge plumes on the distribution were not discernible.

4. Ichthyoplankton

The periods of ichthyoplankton occurrence in both entrainment and lake collections generally coincided. The table summarizes the occurrence of selected species of eggs and larvae in entrainment and lake collections.

The occurrence of eggs and larvae of selected species in lake and in-plant collections during 1976 was as follows:

Representative Important Species	Nine Mile Point	FitzPatrick	Lake
Alewife	E,L	E,L	E,L
Brown trout	-	-	-
Coho salmon	-	-	-
Rainbow smelt	E,L	E,L	E,L
Smallmouth bass	-	-	-
Threespine stickleback	-	-	L
Yellow perch	E,L	L	L

Other Species	Nine Mile Point	FitzPatrick	Lake
Burbot	L	E,L	L
Carp	L	L	E,L
Catostomus sp.	-	-	E*
Emerald shiner	-	-	L
Gizzard shad	E	-	-
Johnny darter	E,L	E,L	L
Lake herring	E	E	E,L
Mottled sculpin	E,L	L	L
Walleye	E	E	-
White bass	-	L	-
White perch	E,L	E,L	E,L

* Eggs of Casostomus sp. were only collected in benthic collections
E = Fish eggs
L = Fish larvae
\- = Not present

The temporal/spatial distribution patterns observed for alewife and rainbow smelt apparently were not attributable to power plant operation. Alewife eggs were more abundant in bottom and mid-depth tows than surface tows in both day and night collections. Alewife larvae were more abundant in surface collections at night, and bottom collections during the day. There was generally greater concentrations of larvae and eggs collected in night tows as compared to day tows.

FitzPatrick and Nine Mile Point in-plant concentrations of alewife eggs were generally greater than those in bottom collections at the lake station closest to the intake structure of both plants during daylight hours; the opposite trend was observed at night at the FitzPatrick plant. Alewife larvae were generally entrained in higher concentrations at the FitzPatrick plant than were collected at the nearest lake station, the 0.5-NMPE-20-ft.

Rainbow smelt egg concentrations were greater in the FitzPatrick and Nine Mile Point entrainment collections than in any lake collection due to their demersal nature; none were collected at 0.5-NMPE-20-ft station.

C. BENTHOS

1. Natural Habitats

The spatial distribution of benthic macroinvertebrates in the Nine Mile Point vicinity apparently was not influenced by the thermal discharge of the FitzPatrick and/or Nine Mile Point power plants during the May through December sampling period.

2. Artificial Substrates

The Nine Mile Point and/or FitzPatrick plumes stimulate n growth (measured by chlorophyll a and biomass), as by values at the NMPP/FITZ buoy station which exceeded th control sites on 12 of 14 occasions. However, the p community is typically a bottom community, forming on na substrates. No apparent difference was observed among eit depths at any buoy station or depth contours along a

Biomass values for bottom periphyton substrates did not e increased levels observed in the buoy substrates in the p This observation demonstrates that the plume from either not result in increased growth of the periphytic community the natural habitat for these organisms. The results of study are thus not directly applicable, since the periphyt nity does not naturally inhabit the upper regions of column in 40 ft of water.

D. NEKTON

Alewives dominated the lake and impingement collections followed by rainbow smelt and threespine stickleback FitzPatrick and Nine Mile Point impingement collections rainbow smelt and spottail shiner in all lake collections

The representative important species (alewife, rainbo smallmouth bass, yellow perch, threespine stickleback, coh and brown trout) were identified from lake and FitzPatrick Mile Point impingement collections. No threatened or e species were collected during 1976.

The following trends were observed from the lake collections:

- The abundance of gizzard shad in seine collections increased, with the greatest numbers recorded at NMPP transect

- The number of alewife, spottail shiner, and white perch caught in gill nets was generally greater at either one or both plume stations (FITZ-40-ft and NMPP-40-ft) at sometime during the year.

- For alewife, yellow perch, white perch, rainbow smelt, and smallmouth bass, no differences could be discriminated between experimental and control site-collected fish for gonad maturation and fecundity.

- Alewives exhibited a similar annual cycle of relative abundance in gill nets as in impingement collections; the same was generally true for rainbow smelt. Recruitment of young-of-the-year alewife and rainbow smelt was observed in collections from both impingement and gill nets.

Alewife numerically dominated the FitzPatrick and Nine Mile Point impingement collections from April through July, threespine stickleback from April through June at the Nine Mile Point plant and from May through July at the FitzPatrick plant, and rainbow smelt from March through May and November-December at both plants. The estimated total annual impingement for the James A. FitzPatrick Nuclear Power Plant was 4.3 million fish (89.9% alewife, 6.0% rainbow smelt, and 2.2% threespine stickleback). Annual impingement at the Nine Mile Point Nuclear Station Unit 1 was 3.4 million fish (89.1% alewife, 4.4% threespine stickleback and 4.0% rainbow smelt).

Length frequency distribution of alewife, rainbow smelt, white perch, yellow perch, smallmouth bass, and threespine stickleback from impingement collections appear to be more representative of the lake population than that from gill net collections. Young alewives represented a larger proportion of impingement samples than of gill net collections due to the inability of the gill nets to collect younger fish (i.e., one and two years old).

III. INTRODUCTION

A. OBJECTIVES OF STUDY

Ecological studies in the Nine Mile Point vicinity during 1976 represent the continuing efforts of the Power Authority of the State of New York (PASNY) and Niagara Mohawk Power Corporation (NMPC) to evaluate the impact of existing and proposed power station operations at the site on the local aquatic ecosystem of Lake Ontario. Ecological studies began at the site in 1963 and have increased in scope and diversity since that time.

This annual report fulfills the utilities' commitment to assess aquatic impacts of power stations, and the monitoring requirements imposed by the Nuclear Regulatory Commission (NRC) in their licenses. issued to the Nine Mile Point Nuclear Station Unit 1 (Docket #50-220) and the James A. FitzPatrick Nuclear Power Plant (Docket #50-333). Certain aspects of these studies have been extended beyond the NRC requirements to provide a fuller understanding of potential impacts.

The program is designed to provide the following information in addition to fulfilling the requirements noted above:

- postoperational data relating to the aquatic ecology in the vicinity of Nine Mile Point Nuclear Station Unit 1 and the James A. FitzPatrick Nuclear Power Plant

- analyses of the field data for both stations for use in regulatory submissions such as NPDES Permit applications and requests for alternative effluent limitations.

- analyses to support recommended levels at which the monitoring of the aquatic environment should be continued in order to assure the protection of the ecosystem over the life of the stations.

B. NUCLEAR STATION DESCRIPTION

1. General Description

There are two nuclear electric generating stations located on the Nine Mile Point promontory on the south shore of Lake Ontario: Nine Mile Point Nuclear Station Unit 1 which has been operating since December 1969, and James A. FitzPatrick Nuclear Power Plant which began commercial operation on 28 July 1975. Between November 1974 and July 1975, the FitzPatrick plant went through a period of start-up testing during which there was intermittent operation at increasingly high power levels (LMS 1976). A third nuclear station is under construction at this site (Nine Mile Point Nuclear Station Unit 2), with commercial startup anticipated in the autumn of 1982.

Figure III-1 presents a map of the area indicating the sampling transect locations and the general location of the two nuclear power stations. For the purpose of this study, the "vicinity" of Nine Mile Point is defined as the area within a three-mile radius of the generating station.

The operating station, Nine Mile Point Nuclear Station Unit 1, and the future station, Nine Mile Point Nuclear Station Unit 2, are owned and operated by Niagara Mohawk Power Corporation. Both stations will occupy the same 900-acre site in the Town of Scriba, Oswego County, New York. Immediately adjacent to this site is the 702-acre site owned by the Power Authority of the State of New York. This is the site of the James A. FitzPatrick Nuclear Power Plant.

NINE MILE POINT ECOLOGICAL STUDY AREA

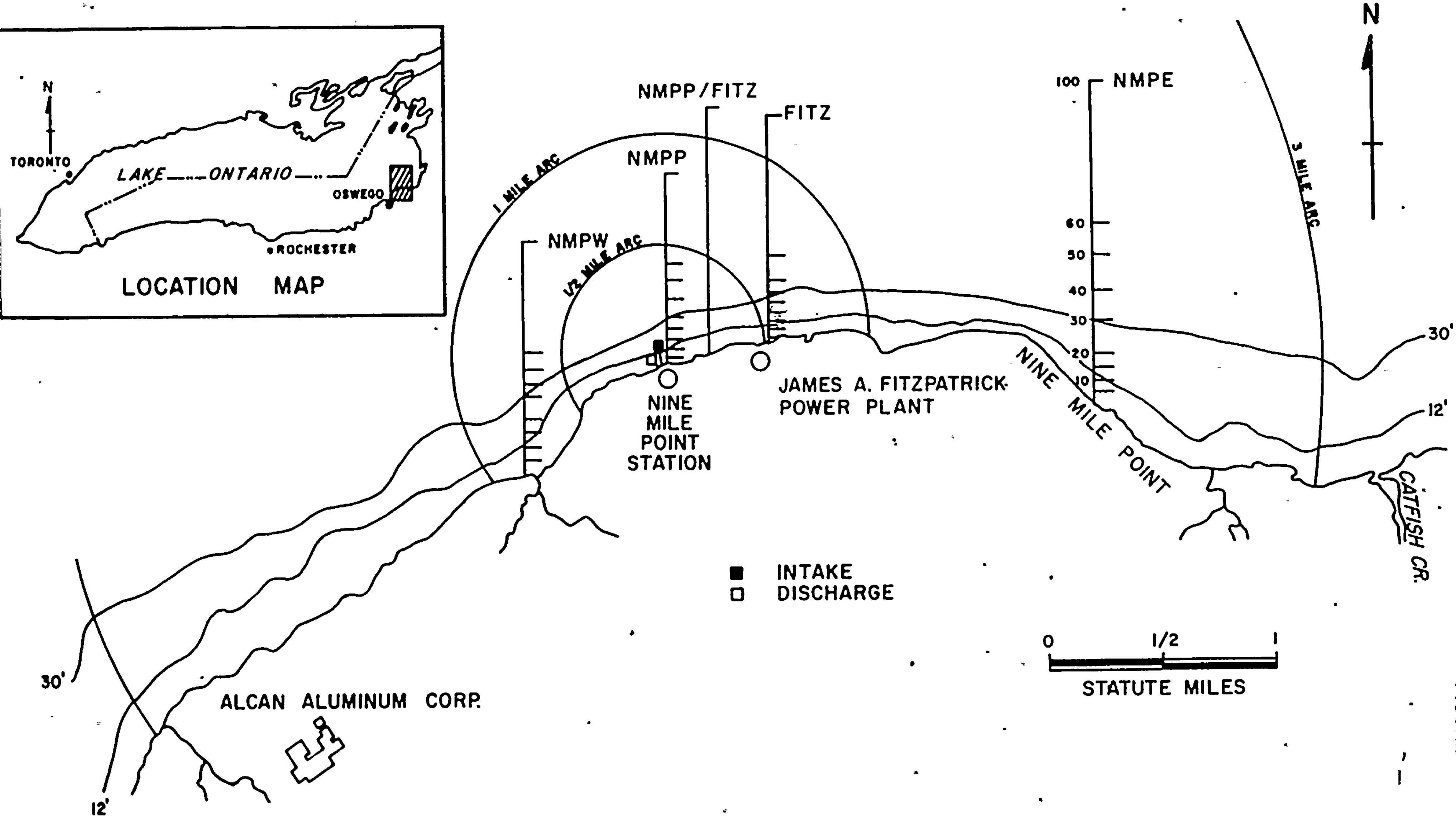


FIGURE III-1

Operating, intake, and discharge characteristics of the Nine Mile Point and FitzPatrick nuclear stations are presented in Table III-1. The James A. FitzPatrick Nuclear Power Plant intake is located in approximately 24 ft of water with the intake openings facing toward shore. The FitzPatrick discharge is a high-velocity multiport diffuser located in 30 ft of water approximately 300 ft lakeward of the intake. The discharge is designed to achieve high dilution of the discharge waters with ambient lake water in the near-field submerged jets. The Nine Mile Point Unit 1 intake is located in approximately 25 ft of water to the west of the FitzPatrick intake and discharge. The Nine Mile Point Unit 1 intake withdraws water from 360° in the horizontal plane. The Nine Mile Point Unit 1 discharge is located inshore of the intake in approximately 17 ft of water and discharges through a 360° horizontal angle. The Nine Mile Point discharge design is for a lower velocity than the FitzPatrick design and subsequently achieves less initial dilution of the discharge waters. The locations of the intakes and discharges of the two plants is such that the main influence of plant operations would be at the 20 and 40-ft depth contours in the lake at the NMPP and FITZ transects.

2. 1976 Operating History in Relation to the Biological Sampling Program

Tables III-2 through III-5 summarize the electrical output (gross megawatts) of both plants from January through December 1976 during lake and in-plant (i.e., impingement, entrainment, and viability sampling) collections. During the April-December lake sampling period, there were a total of four days recorded for the Nine Mile Point plant and eight days for FitzPatrick when the daily generation (from 0000-2400 hrs) was zero; these outages occurred simultaneously

TABLE III-1

NINE MILE POINT AND JAMES A. FITZPATRICK NUCLEAR STATIONS CHARACTERISTICS

OPERATING CHARACTERISTICS	Nine Mile Point UNIT 1		James A. FitzPatrick	
Generating capacity (MWe)	610		821	
Cooling water flow (gpm)				
Condenser (all pumps)	250000		352300	
Sevice water/pump	18000		17900	
Heat rejection (BTU/hr)	4.0×10^9		5.7×10^9	
Cooling water temperature Rise (°F)	31.2		31.5	
STRUCTURAL CHARACTERISTICS	**Intake**	**Discharge**	**Intake**	**Discharge**
Length of main tunnel from existing shoreline	850 ft	335 ft	900 ft	1260 ft
Number of openings	6	6	4	12
Size of opening	5.5 ft high x 10.3 ft wide	3.5 ft high x 7.3 ft wide	8 ft x 17.7 ft wide	2.5 ft (inside diameter)
Other dimensions	3 ft sill 6 in roof	3 ft sill 6 in roof	3 ft sill 2 ft roof	5-6 ft above lake bed Double ports at 150 ft spacing
Velocity through openings	1.8 fps	4 fps	1.2 fps	14 fps
Tunnel velocity	8 fps	8 fps	1.4 fps (maximum)	4.7 fps
Tunnel cross-section	78 ft^2	78 ft^2	117 ft^2	117 ft^2
Water velocity at screens	0.85 fps	-	1.4 fps	-
Water depth at structure	24.5 ft (LWD)	17 ft (LWD)	24 ft (LWD)	30 ft (LWD) (aver.)
Water depth to top of structure	15.3 ft (LWD)	10.0 ft (LWD)	10 ft (LWD)	23 ft (LWD) (aver.)
Total Flow	268000 gpm (597 cfs)	268000 gpm (597 cfs)	370200 gpm (825 cfs)	370200 gpm (825 cfs)

TABLE III-2

PLANT OPERATING CONDITIONS (ELECTRICAL OUTPUT) DURING LAKE COLLECTIONS

NINE MILE POINT NUCLEAR STATION UNIT 1 AND JAMES A. FITZPATRICK
NUCLEAR POWER PLANT - 1976

DATE	NINE MILE POINT		FITZPATRICK	
	NO. CIRC. WATER PUMPS	PLANT LOAD* (MWe)	NO. CIRC. WATER PUMPS	PLANT LOAD* (MWe)
7 APR	2	0	3	601
9 APR	2	0	3	671
14 APR	2	0	3	700
19 APR	2	90	3	687
20 APR	2	147	3	697
21 APR	2	334	3	676
22 APR	2	377	3	558
29 APR	2	520	3	726
30 APR	2	540	3	692
10 MAY	2	560	3	743
11 MAY	2	565	3	739
13 MAY	2	572	3	315
14 MAY	2	536	2	0
22 MAY	2	562	3	727
23 MAY	2	536	3	704
24 MAY	2	546	3	770
25 MAY	2	572	3	781
28 MAY	2	591	3	778
2 JUN	2	570	3	771
4 JUN	2	580	3	NA
8 JUN	2	577	2	516
9 JUN	2	578	3	693
14 JUN	2	576	3	778
15 JUN	2	576	3	785
16 JUN	2	584	3	782
17 JUN	2	585	3	775
18 JUN	2	584	2	139
21 JUN	2	578	3	710
23 JUN	2	336	3	446
24 JUN	2	214	2	505
28 JUN	2	576	3	714
29 JUN	2	577	3	755
30 JUN	2	583	2	215
1 JUL	2	579	2	248
6 JUL	2	477	3	771
7 JUL	2	479	3	773
15 JUL	2	344	2	0
16 JUL	2	365	2	0

TABLE III-2 (Continued)

PLANT OPERATING CONDITIONS (ELECTICAL OUTPUT) DURING LAKE COLLECTIONS (Continued)

NINE MILE POINT NUCLEAR STATION UNIT 1 AND JAMES A. FITZPATRICK
NUCLEAR POWER PLANT - 1976

DATE	NINE MILE POINT		FITZPATRICK	
	NO. CIRC. WATER PUMPS	PLANT LOAD* (MWe)	NO. CIRC. WATER PUMPS	PLANT LOAD* (MWe)
19 JUL	2	498	3	637
21 JUL	2	524	3	462
27 JUL	2	514	2	0
28 JUL	2	514	2	73
2 AUG	2	522	3	751
3 AUG	2	523	3	748
4 AUG	2	526	3	747
9 AUG	2	468	3	769
10 AUG	2	532	3	771
11 AUG	2	526	3	771
12 AUG	2	531	3	783
18 AUG	2	57	3	792
19 AUG	2	377	3	791
20 AUG	2	461	3	785
23 AUG	2	516	3	786
25 AUG	2	520	3	789
26 AUG	2	NA	3	786
27 AUG	2	522	3	763
1 SEP	2	525	3	603
2 SEP	2	529	3	723
3 SEP	2	532	3	772
4 SEP	2	533	3	780
7 SEP	2	532	3	786
8 SEP	2	529	3	785
9 SEP	2	532	3	782
13 SEP	2	532	3	735
15 SEP	2	NA	3	733
16 SEP	2	523	3	731
20 SEP	2	521	3	730
23 SEP	2	546	3	735
24 SEP	2	556	3	730
25 SEP	2	557	3	733
26 SEP	2	556	3	733
28 SEP	2	558	3	733
29 SEP	2	557	3	730
30 SEP	2	556	3	730

TABLE III-2 (Continued)

PLANT OPERATING CONDITIONS (ELECTRICAL OUTPUT) DURING LAKE COLLECTIONS (Continued)

NINE MILE POINT NUCLEAR STATION UNIT 1 AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

DATE	NINE MILE POINT		FITZPATRICK	
	NO. CIRC. WATER PUMPS	PLANT LOAD * (MWe)	NO. CIRC. WATER PUMPS	PLANT LOAD * (MWe)
4 OCT	2	549	3	721
5 OCT	2	551	3	729
6 OCt	2	552	3	728
8 OCT	2	553	3	607
11 OCT	2	553	2	0
12 OCT	2	548	2	0
13 OCT	2	550	2	0
15 OCT	2	549	2	322
19 OCT	2	536	2	512
20 OCT	2	536	2	530
27 OCT	2	550	3	712
30 OCT	2	572	3	581
31 OCT	2	564	3	682
2 NOV	2	574	3	778
3 NOV	2	585	3	770
9 NOV	2	548	3	435
12 NOV	2	0	2	0
15 NOV	2	200	2	48
16 NOV	2	436	2	421
25 NOV	2	581	2	513
26 NOV	2	577	3	605
27 NOV	2	575	3	660
2 DEC	2	578	3	735
4 DEC	2	577	3	688
6 DEC	2	572	3	707
8 DEC	2	567	3	736
10 DEC	2	564	3	718
14 DEC	2	585	3	738
15 DEC	2	584	3	644
16 DEC	2	583	2	NA
19 DEC	2	585	3	587
20 DEC	2	584	3	675

*From LMS field data taken at time of collection

NA = Not available

TABLE III-3

PLANT OPERATING CONDITIONS (ELECTRICAL OUTPUT) DURING IMPINGEMENT COLLECTIONS

NINE MILE POINT NUCLEAR STATION UNIT 1 and JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

DATE	NINE MILE POINT		FITZPATRICK	
	NUMBER OF CIRCULATING WATER PUMPS	MEAN* ELECTRICAL OUTPUT (MWe)	NUMBER OF CIRCULATING WATER PUMPS	MEAN** ELECTRICAL OUTPUT (MWe)
JANUARY 1976				
2-3	2	557.5	3	506.0
5-6	2	580.0	2	572.5
7-8	2	586.0	2	580.0
9-10	2	588.0	2/3[a]	652.5
12-13	2	586.0	3	800.0
14-15	2	561.5	3	800.5
16-17	2	560.0	3/2[b]	236.5[a]
19-20	2	564.0	1	UNIT DOWN
21-22	2	567.5	1	UNIT DOWN
23-24	2	553.0	1	UNIT DOWN
26-27	2	571.5	1	UNIT DOWN
28-29	2	571.0	1	UNIT DOWN
30-31	2	570.0	1	UNIT DOWN
FEBRUARY				
2-3	2	569.5	1	UNIT DOWN
4-5	2	544.0	1	UNIT DOWN
6-7	2	552.0	1	UNIT DOWN
9-10	2	545.0	1	UNIT DOWN
11-12	2	543.0	1	UNIT DOWN
13-14	2	530.0	1	UNIT DOWN
16-17	2	526.5	1	UNIT DOWN
18-19	2	548.5	1	UNIT DOWN
20-21	2	552.0	1	UNIT DOWN
23-24	2	545.0	1	UNIT DOWN
25-26	2	544.0	1	UNIT DOWN
27-28	2	543.5	1	UNIT DOWN
MARCH				
1-2	2	459.0	1	UNIT DOWN
3-4	2	UNIT DOWN	1	UNIT DOWN
5-6	2	271.0	1	UNIT DOWN
8-9	2	486.0	1	UNIT DOWN
10-11	2	528.0	1	UNIT DOWN
12-13	2	544.5	2	UNIT DOWN
15-16	2	531.0	2	UNIT DOWN
17-18	2	528.0	2	UNIT DOWN
19-20	2/1[a]	384.0	2	UNIT DOWN
22-23	2	130.5[a]	2	UNIT DOWN
24-25	2	UNIT DOWN	2	184.0[b]
26-27	2	UNIT DOWN	2	369.5
29-30	2	UNIT DOWN	2	518.5
31-APR 1	2	UNIT DOWN	2	505.0
APRIL				
2-3	2	UNIT DOWN	3	567.5
5-6	2	UNIT DOWN	3	531.5
6-7	2	UNIT DOWN	3	602.5
7-8	2	UNIT DOWN	3	607.5
9-10	2	UNIT DOWN	3	688.5
12-13	2	UNIT DOWN	3	713.5
14-15	2	UNIT DOWN	3	692.0
16-17	2/1[b]	UNIT DOWN	3	700.0
19-20	1/2[c]	118.5[b]	3	700.0
20-21	2	240.5[c]	3	686.5
21-22	2	355.5	3	617.0
23-24	2	387.0	3	677.5
24-25	2	399.5	3	709.5
25-26	2	431.5	3	715.0
26-27	2	479.5	3	720.5
28-29	2	513.0	3	729.5
29-30	2	530.0	3	709.0
30-MAY 1	2	543.5	3	678.5

TABLE III-3 (Continued)

PLANT OPERATING CONDITIONS (ELECTRICAL OUTPUT) DURING IMPINGEMENT COLLECTIONS (Continued)

NINE MILE POINT NUCLEAR STATION UNIT 1 and JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

DATE	NINE MILE POINT		FITZPATRICK	
	NUMBER OF CIRCULATING WATER PUMPS	MEAN* ELECTRICAL OUTPUT (MWe)	NUMBER OF CIRCULATING WATER PUMPS	MEAN** ELECTRICAL OUTPUT (MWe)
MAY				
3-4	2	546.5	3	735.5
4-5	2	548.0	3	734.5
5-6	2	547.5	3	744.0
6-7	2	550.0	3	749.0
7-8	2	553.0	3	750.5
10-11	2	562.5	3	741.0
12-13	2	569.0	3	526.0[c]
14-15	2	270.0[d]	2	UNIT DOWN[d]
17-18	2	353.5	2/3[c]	572.0
19-20	2	461.5	3	730.0
20-21	2	516.5	3	743.5
21-22	2	556.0	3	736.5
22-23	2	549.0	3	715.5
23-24	2	541.0	3	737.0
24-25	2	559.0	3	775.5
25-26	2	576.5	3	781.0
26-27	2	586.5	3	781.5
28-29	2	588.0	3	777.0
31-JUN 1	2	562.0	3	776.5
JUNE				
2-3	2	576.0	3	771.0
4-5	2	577.0	3	175.5[e]
7-8	2	575.5	2	498.0
9-10	2	578.5	3	728.5
11-12	2	580.0	3	771.5
14-15	2	576.0	3	781.5
16-17	2	584.5	3	778.5
18-19	2	584.0[e]	2	168.5[f]
21-22	2	581.0	3	741.5
23-24	2	275.0[f]	3/2[d]	475.5[g]
25-26	2	523.0	3	744.0
28-29	2	576.5	3	753.0
30-JUL 1	2	578.0	3/2[e]	231.5[h]
JULY				
2-3	2	536.0	3	688.0
5-6	2	479.0	3	769.0
7-8	2	477.0	3	771.0
9-10	2	206.0[g]	3	751.0[i]
12-13	2	UNIT DOWN	3	740.0
14-15	2	219.5[h]	2	UNIT DOWN[j]
16-17	2	376.0	2	56.5[k]
19-20	2	511.5	3	679.0
21-22	2	529.0	3/2[f]	231.0[l]
23-24	2	531.5	2	UNIT DOWN
26-27	2	517.5	2	UNIT DOWN
28-29	2	513.0	2	271.5[m]
30-31	2	512.5	3	665.0
AUGUST				
2-3	2	522.2	3	749.5
4-5	2	525.0	3	747.0
6-7	2	206.2[i]	3	678.5
9-10	2	500.0	3	770.0
11-12	2	528.7	3	777.0
13-14	2	530.5	3	781.0
16-17	2	442.5	3	788.0
18-19	2	217.2[j]	3	791.5
20-21	2	479.6	3	786.5
23-24	2	518.2	3	789.0
25-26	2	519.8[k]	3	787.5
27-28	2	523.0	3	692.5
30-31	2	521.6	3/2[g]	403.5[n]

TABLE III-3 (Continued)

PLANT OPERATING CONDITIONS (ELECTRICAL OUTPUT) DURING IMPINGEMENT COLLECTIONS (Continued)

NINE MILE POINT NUCLEAR STATION UNIT 1 and JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

DATE	NINE MILE POINT		FITZPATRICK	
	NUMBER OF CIRCULATING WATER PUMPS	MEAN* ELECTRICAL OUTPUT (MWe)	NUMBER OF CIRCULATING WATER PUMPS	MEAN** ELECTRICAL OUTPUT (MWe)
SEPTEMBER				
1-2	2	527.0	3	663.0
3-4	2	532.4	3	776.0
6-7	2	528.2	3	784.0
8-9	2	530.4	3	783.5
10-11	2	531.5[l]	3	729.0
13-14	2	530.7	3	733.0
15-16	2	522.8[m]	3	732.0
17-18	2	510.6	3	728.5
20-21	2	519.8	3	731.0
22-23	2	539.2	3	732.5
24-25	2	556.8	3	731.5
27-28	2	557.7	3	733.0
29-30	2	556.5	3	730.0
OCTOBER				
1-2	2	553.9	3	727.0
4-5	2	549.9	3	725.0
6-7	2	551.2	3	727.5
8-9	2	552.7	3/2[h]	365.0[o]
11-12	2	550.3	2	UNIT DOWN
13-14	2	550.7	2	48.5[p]
15-16	2	549.0	2	346.0
18-19	2	534.6	2	475.5
20-21	2	535.8[n]	2	531.5
22-23	2	451.2	2/3[i]	583.0
25-26	2	495.8	3	715.5
27-28	2	557.0	3	710.0
29-30	2	572.4	3	634.0
NOVEMBER				
1-2	2	568.6	3	753.0
3-4	2	585.8	3	770.0
5-6	2	584.1	3	665.5
8-9	2	562.6	3	586.5[q]
10-11	2	UNIT DOWN[o]	2	15.0[r]
12-13	2	UNIT DOWN	2	UNIT DOWN
15-16	2	318.1[p]	2	234.5[s]
17-18	2	553.8	3	692.0
18-19	NO SAMPLE		3/2[j]	380.5[t]
19-20	2	585.8	2	12.0[u]
22-23	2	586.0	2	UNIT DOWN
24-25	2	582.3	2	389.0[v]
26-27	2	575.8	3	632.5
29-30	2	575.8	3	736.0
DECEMBER				
1-2	2	579.6	3	735.0
3-4	2	576.0	3	702.0
6-7	2	569.4	3	721.0
8-9	2	566.6	3	737.0
10-11	2	527.8	3	719.0
13-14	2	583.5	3	738.0
15-16	2	583.7	3/2[k]	324.0[w]
17-18	2	584.2	2	261.5[x]
20-21	2	583.8	3	703.0
22-23	2	584.4	3	739.0
24-25	2	584.4	3	724.5
27-28	2	582.3	3	739.5
29-30	2	585.8	3	742.0
31-JAN 1 1977	2	582.9	3	725.5

TABLE III-3(Continued)

FOOTNOTES: PLANT OPERATING CONDITIONS (ELECTRICAL OUTPUT) DURING IMPINGEMENT COLLECTIONS

*Nine Mile Point Unit #1 "401" Monthly Report (Niagara Mohawk Power Corp., 1976); mean of the daily means for each collection period

**James A. FitzPatrick Nuclear Power Plant "401" Monthly Report (Niagara Mohawk Power Corp., 1976); mean of the daily means for each collection period

NINE MILE NUCLEAR STATIONS UNIT 1

Circulating Water Pumps

[a]Two pumps operating 1000-2100 hrs 19 Mar and 0700-1000 hrs 20 Mar, one pump operating 2100 hrs 19 Mar - 0700 hrs 20 Mar
[b]Two pumps operating 1000 hrs 16 Apr - 0907 17 Apr, one pump operating 0907-1000 hrs 17 Apr
[c]Two pumps operating 1000-1445 hrs 19 Apr and 0730-1000 hrs 20 Apr; one pump operating 1445 hrs 19 Apr - 0730 hrs 20 Apr

Electrical Generation

UNIT DOWN = plant off-line during impingement collection
[a]Unit down 1900 hrs 22 Mar - 1000 hrs 23 Mar
[b]Unit down through 18 Apr, unit down 1600 hrs 19 Apr - 0700 hrs 20 Apr
[c]Unit down 0000-0700 hrs 20 Apr; collection 1000 hrs 20 Apr - 1000 hrs 21 Apr
[d]Unit down 0300-1000 hrs 15 May
[e]Mean electrical output for 18 Jun only
[f]Unit down 1500 hrs 23 Jun - 1000 hrs 24 Jun
[g]Unit down 2209 hrs 9 Jul - 1000 hrs 10 Jul
[h]Unit down 1000-1146 hrs 14 Jul
[i]Unit down 1610 hrs 6 Aug - 1000 hrs 7 Aug
[j]Unit down 1606 hrs 17 Aug - 1700 hrs 18 Aug; collection 1012 hrs 18 Aug - 1012 hrs 19 Aug
[k]Mean electrical output for 25 Aug
[l]Mean electrical output for 10 Sep
[m]Mean electrical output for 16 Sep
[n]Mean electrical output for 20 Oct
[o]Unit down after 1000 hrs 9 Nov collection
[p]Plant on-line for 1000 hrs 15 Nov collection

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

Circulating Water Pumps

[a]Two pumps operating 1000-1506 hrs on 9 Jan; Three pumps operating 1506 hrs 9 Jan - 1000 hrs 10 Jan
[b]Three pumps operating 1000-1500 hrs 16 Jan; Two pumps operating 1500 hrs 16 Jan - 1000 hrs 17 Jan
[c]Two pumps operating 1000 hrs 17 May - 0111 hrs 18 May; Three pumps operating 0111-1000 hrs 18 May
[d]Three pumps operating 0500-1350 hrs 23 Jun; Two pumps operating 1350 hrs 23 Jun - 0500 hrs 24 Jun
[e]Three pumps operating 0500-0652 hrs 30 Jun; Two pumps operating 0652 hrs 30 Jun - 0500 hrs 1 Jul
[f]Three pumps operating 0500-1520 hrs 21 Jul; Two pumps operating 1520 hrs 21 Jul - 0600 hrs 22 Jul
[g]Three pumps operating 1000-1947 hrs 30 Aug; Two pumps operating 1947 hrs 30 Aug - 1000 hrs 31 Aug
[h]Three pumps operating 1000-1828 hrs 8 Oct; Two pumps operating 1828 hrs 8 Oct - 1000 hrs 9 Oct
[i]Two pumps operating 1000 hrs 22 Oct - 0605 hrs 23 Oct; Three pumps operating 0605-1000 hrs 23 Oct
[j]Three pumps operating 1000 hrs 18 Nov - 0053 hrs 19 Nov; Two pumps operating 0053-1000 hrs 19 Nov
[k]Three pumps operating 0700-2150 hrs 15 Dec; Two pumps operating 2150 hrs 15 Dec - 0700 hrs 16 Dec

Electrical Generation

[a]Unit down approximately 1500 hrs 16 Jan - 1000 hrs 17 Jan
[b]Unit down 1000-1700 hrs 24 Mar, mean electrical output for 25 Mar only
[c]Unit down 1200 hrs 13 May, collection 1037 hrs 12 May - 1037 hrs 13 May
[d]Unit down during collection 1037 hrs 14 May - 1037 hrs 15 May
[e]Unit down 1045 hrs 4 Jun - 1020 hrs 5 Jun
[f]Unit down 1120 hrs 18 Jun - 1100 hrs 19 Jun

TABLE III-3 (Continued)

FOOTNOTES: PLANT OPERATING CONDITIONS (ELECTRICAL OUTPUT) DURING IMPINGEMENT COLLECTIONS (Continued)

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

Electrical Generation (Continued)

[g]Unit down 1430 hrs 23 Jun - 0200 hrs 24 Jun
[h]Unit down 0652 hrs 30 Jun - 0416 1 Jul
[i]Mean electrical output for 10 Jul only
[j]Unit down after 1015hrs 13 Jul collection
[k]Unit down during collection 1015 16 Jul - 1015 17 Jul
[l]Unit down 1900 hrs 21 Jul - 0600 hrs 22 Jul
[m]Unit down 0600-1651 hrs 28 Jul
[n]Unit down 1947 hrs 30 Aug - 1000 hrs 31 Aug
[o]Unit down after 1015 hrs 9 Oct collection
[p]Unit down 0700 hrs 13 Oct - 0700 hrs 14 Oct
[q]Unit down after 1033 9 Nov collection
[r]Unit down during collection 0710 hrs 10 Nov - 0700 hrs 11 Nov
[s]Unit down 1115-1836 hrs 15 Nov
[t]Unit down 0053-0700 hrs 19 Nov
[u]Unit down during collection 1033 hrs 19 Nov - 1033 hrs 20 Nov
[v]Unit on-line (0620 hrs 24 Nov) during collection 0720 hrs 24 Nov - 0700 hrs 25 Nov
[w]Unit down 0045-0700 hrs 16 Dec
[x]Unit down 1035-1804 hrs 17 Dec

TABLE III-4

PLANT OPERATING CONDITIONS (ELECTRICAL OUTPUT) DURING REGULAR ENTRAINMENT PROGRAM

NINE MILE POINT NUCLEAR STATION UNIT 1 AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

DATE[a]	NINE MILE POINT			JAMES A. FITZPATRICK		
	NO. CIRC. WATER PUMPS	PLANT LOAD[b] (MWe)		NO. CIRC. WATER PUMPS	PLANT LOAD[b] (MWe)	
		MEAN	RANGE		MEAN	RANGE
7 JAN	NS	-	-	2	579.8	579-581
14	NS	-	-	3	800.7	799-803
4 FEB	NS	-	-	1	0	0
18	NS	-	-	1	0	0
3 MAR	NS	-	-	1	0	0
17	NS	-	-	2	0	0
14 APR	2	0	0	3	704.2	702-706
28	2	526.0	524-528	3	734.0	732-738
5 MAY	2	564.0	563-566	3	740.8	740-741
12	2	590.0	582-593	3	740.1	738-742
19	2	471.8	451-487	3	730.5	721-741
26	2	605.5	594-613	3	780.2	778-781
2 JUN	2	596.2	591-603	3	776.2	772-778
9	2	598.8	596-600	3	720.2	678-752
16[c]	2	604.8	604-605	3	780.2	775-785
23	2	150.2	0-601	3/2[d]	288.5	0-778
30	2	599.3	597-601	2	14.8	0- 59
3 JUL	2	597.0[f]	-	NS	-	-
7	2	493.3	492-495	3	769.8	768-772
14[c]	2	206.5	0-305	2	0	0
21	2	539.2	525-546	3/2[d]	229.5	0-772
28	2	531.5	530-532	2	221.0	0-492
4 AUG	2	543.2	538-546	3	745.8	743-747
11	2	547.8	539-552	3	771.5	770-774
18[c]	2	180.8	0-361	3	793.2	791-794
25	2	537.8	536-540	3	789.0	787-791
1 SEP	2	544.0	543-545	3	625.0	596-654
8[c]	2	548.8	548-549	3	784.0	780-787
22	2	560.8	558-563	3	733.5	733-734
6 OCT[c]	2	574.0	569-578	3	727.5	727-728
20	2	554.2	553-555	2	534.0	533-535
3 NOV	NS	-	-	3	770.5	770-771
17	NS	-	-	3	639.5	563-716
1 DEC	NS	-	-	3	737.0	736-738
15	NS	-	-	3/2[e]	473.5	210-737

[a] Ichthyoplankton collections: 1100, 1700, 23, and 0500 hrs at both plants prior to 22 Sep; only 1100 and 2300 hr collections at FitzPatrick from 22 Sep - 15 Dec

[b] From LMS field data taken at time of collection

[c] <u>Gammarus</u> enumeration also at FitzPatrick

[d] 3 pumps: 1100 hr sample; 2 pumps: 1700, 2300, 0500 hr samples

[e] 3 pumps: 1100 hr sample; 2 pumps: 2300 hr sample

f 1100 hr sample

- = Not applicable
NS = No sample

TABLE III-5

PLANT OPERATING CONDITIONS (ELECTRICAL OUTPUT) DURING VIABILITY SAMPLING PROGRAMS
JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

			PLANT LOAD (MWe)																					
			PLANT VIABILITY								SIMULATIONS								LAKE VIABILITY					
		NO. CIRC.	PHYTO-PLANKTON		ZOO-PLANKTON		GAMMARUS		ICHTHYO-PLANKTON		PHYTO-PLANKTON		ZOO-PLANKTON		GAMMARUS		ICHTHYO-PLANKTON		PHYTO-PLANKTON		ZOO-PLANKTON		ICHTHYO-PLANKTON	
DATE	DAY/NIGHT	WATER PUMPS	R-1	R-2	R-1	R-2	R-1	R-2	R-1	R-2	R-1	R-2	R-1	R-2	R-1	R-2	R-1	R-2	R-1	R-2	R-1	R-2	R-1	R-2
14 APR	D	3	703	703	703	703																		
	N	3	706	706	704	704																		
28	D	3	706	706	737	737	740	740	740	740														
	N	3	732	732	732	732	732	732	732	732														
12 MAY	D	3	737	737	738	738	738	738	738	738	737	737	739	739	739[a]	739[a]	739[a]	739[a]						
	N	3	739	739	741	741	739[b]	739[b]	739[b]	739[b]	739	739	741	741	741	741	741	741						
26	D	3	783	783	782	782	782[c]	782[c]	782[c]	782[c]									782	782	782	782	NA	NA
	N	3	780	780	781	781	781	781	781	781	780[d]	780[d]	781	781	781	781	781	781						
9 JUN	D	3	770	770	654	654	678	678	678	678	770	770	654	654									678	678
	N	3	777	777	741	741	741	741	741	741	777	777	741	741									741	741
23	D	3	778	778	778	778[e]	778	778	778	778									NA	NA	782	782	775	775
28	N	3	778	778	778	778	778	778	778	778	778	778	778	778			778	778					778	778
20 JUL	D	3	NA	NA	NA	NA			NA	NA	NA	NA	NA	NA			NA	NA					NA	NA
	N	3	748	748	754	759	754	754	754	754	753	753	759	763	754	754	754	759					NA	NA
29	D	3	539	539	541	541			539	539[f]									541	541	541	541	NA	NA
	N	3	613	613	613	614	613	613	613	613	613	613	617	617	NA	NA	NA	NA					NA	NA
11 AUG	D	3	773	773	772	772			772	772	772	772	772	772									772	772
	N	3	768	768	770	772	770	770	770	770	770	770	771	771	770	770	770	770					770	770
25	D	3	791	791	790	790			791	791[g]									791	791	791	791	790	790
	N	3	790	790	790	790	789	789[h]	789	789[h]	789	789	788	788	787	787	787	787					789	789
8 SEP	D	3	786	786	787	787			787	787	786	787	787	786			787	787						
	N	3	780	780	780	781	780	780	780	780	780	780	781	782	781[i]	781[i]	781[i]	781[i]						
22	D	3	734	734	735	735			734	734	734	734	734	734			735	735						
	N	3	733	733							733	727												
27	N	3			734	734	734	734	734	734			735	735	734	734	734	734						
6 OCT	D	3	728	728	728	728					728	728	728	728										
	N	3	728	728	729	729					729	727	727	727										
20	D	2	534	534	533[j]	533[j]													537	537	537	537		
	N	2	534	534	535	536	535	535	535	535	533	533	536	536	535	535	535	535						
3 NOV	D	3	770	770	770	770					771	771	770	770										
	N	3	770	770	770	770					769	769	769	769										
17	D	3	646	646	661	664					653	653	664	NA										
	N	3	706	706	716	741	706	706[k]	706	706[k]	697	697	741	740	741	741	741	741						
1 DEC	D	3	736	736	735	735					736	736	736	736										
	N	3	738	738	738	739					739	739	739	NA										
9	N	3	739	739							739	739												
10	D	3	738	738																				
15	D	3	737	737							738	738												
19	D	3			587	591							594	594										
	N	3	623	623	630	634	630	630	630	630	619	619	635	635	630[m]	630[m]	630[m]	630[m]						

Plant loads from LMS viability sample history sheets and impingement field data sheets. Loads listed under plant viability are for intake and discharge samples unless otherwise noted. Loads listed under simulation are for 2° and 3° unless otherwise noted.

[a] 2° Simulation = 739, 3° Simulation = 738
[b] Intake = 739, Discharge = 741
[c] Intake = 782, Discharge = 781
[d] 2° Simulation = 780, 3° Simulation = 781
[e] Intake = 778, Discharge = 782
[f] Intake = 539, Discharge = 541
D = Day
N = Night

[g] Intake = 791, Discharge = 790
[h] Intake = 789, Discharge = 790
[i] 2° Simulation = 781, 3° Simulation = 782
[j] Intake = 533, Discharge = 537
[k] Intake = 706, Discharge = 716
[m] 2° Simulation = 630, 3° Simulation = 634
NA = Not available

at both plants only on 12 November. The maximum "daily average" gross electrical outputs during lake collections were 591 and 792 MWe for the Nine Mile Point and FitzPatrick plants, respectively. Therefore, both plants were operating at essentially full capacity during the majority of the lake sampling program.

Only sixteen of the 168 impingement collections at the Nine Mile Point station and 35 of the 167 impingement collections at the FitzPatrick plant were conducted during plant outages in 1976. The outages were coincident between plants during the impingement collections from 1000 hrs on 3 May to 1000 hrs on 4 May, and from 1000 hrs on 12 November to 1000 hrs on 13 November.

One set of the 25 regular entrainment collections at the Nine Mile Point plant and six sets of the 34 regular entrainment collections at the FitzPatrick station were obtained during plant outages. The viability sampling program was conducted only on those days when the FitzPatrick plant was generating; the electrical output during the 14 April-19 December sampling period ranged from 533 to 791 megawatts.

Tables III-6 through III-9 summarize the temperature rise (ΔT) for both plants during lake and in-plant sampling for the respective sampling periods during 1976.

C. AQUATIC MONITORING PROGRAM SUMMARY

The studies in the Nine Mile Point vicinity included an analysis of virtually all aspects of the aquatic community. Table III-10 summarizes the extent of the program and the scheduled intensity of the various sampling efforts. Table III-11 and III-12, respectively, summarize the actual lake and in-plant collections by date. The 1976 lake sampling effort ranged from collections on 33% of the

TABLE III-6

PLANT OPERATING CONDITIONS (ΔT) DURING LAKE COLLECTIONS

NINE MILE POINT NUCLEAR STATION UNIT 1 AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

DATE	ΔT (°C)	
	NINE MILE POINT[a]	JAMES A. FITZPATRICK[b]
7 APR	0.2[c]	13.9
9 APR	0.2[c]	15.6
14 APR	0.4[c]	15.6
19 APR	4.5[c]	15.6
20 APR	5.7[c]	15.6
21 APR	9.5[c]	15.6
22 APR	10.4	13.3
29 APR	13.9	16.7
30 APR	13.9	16.7
10 MAY	14.8	16.7
11 MAY	14.9	16.7
13 MAY	15.1	7.2[c]
14 MAY	14.4	7.2[c]
22 MAY	15.1	16.7
23 MAY	14.6	15.6
24 MAY	14.7	17.2
25 MAY	15.4	17.8
28 MAY	15.9	17.8
2 JUN	15.6	17.8
4 JUN	15.8	8.9[c]
8 JUN	15.7	15.0
9 JUN	15.9	15.6
14 JUN	15.8	17.8
15 JUN	16.1	17.8
16 JUN	16.4	17.2
17 JUN	16.3	17.2
18 JUN	16.6	3.9[c]
21 JUN	16.9	15.6
23 JUN	16.8[c]	10.0[c]
24 JUN	15.4[c]	13.3[c]
28 JUN	17.2	17.2
29 JUN	17.5	17.8
30 JUN	17.2	5.0[c]
1 JUL	17.1	8.3[c]
6 JUL	13.7	17.2
7 JUL	14.3	17.2
15 JUL	10.9	0.0[c]
16 JUL	12.3	0.6[c]

TABLE III-6

PLANT OPERATING CONDITIONS (ΔT) DURING LAKE COLLECTIONS (Continued)

NINE MILE POINT NUCLEAR STATION UNIT 1 AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

DATE	ΔT (°C)	
	NINE MILE POINT[a]	JAMES A. FITZPATRICK[b]
19 JUL	16.5	14.4
21 JUL	16.2	11.1[c]
27 JUL	16.3	0.0[c]
28 JUL	16.2	4.4[c]
2 AUG	13.6	16.1
3 AUG	14.4	16.1
4 AUG	16.1	16.1
9 AUG	15.6	16.7
10 AUG	16.3	16.7
11 AUG	16.2	16.7
12 AUG	16.4	17.2
18 AUG	3.7[c]	17.8
19 AUG	13.6[c]	17.8
20 AUG	14.6	17.8
23 AUG	16.1	17.8
25 AUG	16.1	17.8
26 AUG	16.3	17.8
27 AUG	16.3	17.8
1 SEP	16.6	17.2
2 SEP	16.7	16.7
3 SEP	16.0	17.2
4 SEP	16.6	16.7
7 SEP	16.9	17.2
8 SEP	16.6	17.8
9 SEP	16.4	17.8
13 SEP	16.9	16.7
15 SEP	16.7	16.7
16 SEP	16.7	16.1
20 SEP	16.5	16.1
23 SEP	16.8	16.7
24 SEP	17.3	16.1
25 SEP	17.1	16.7
26 SEP	17.1	16.7
28 SEP	17.1	16.1
29 SEP	17.1	16.1
30 SEP	16.9	16.7

TABLE III-6

PLANT OPERATING CONDITIONS (ΔT) DURING LAKE COLLECTIONS (Continued)

NINE MILE POINT NUCLEAR STATION UNIT 1 AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

DATE	ΔT (°C)	
	NINE MILE POINT[a]	JAMES A. FITZPATRICK[b]
4 OCT	17.2	16.1
5 OCT	16.8	16.7
6 OCT	16.0	16.1
8 OCT	16.0	14.4
11 OCT	16.5	0.6[c]
12 OCT	16.6	0.6[c]
13 OCT	15.5	0.6[c]
15 OCT	16.3	10.6
19 OCT	16.3	14.4
20 OCT	16.2	15.6
27 OCT	16.3	15.6
30 OCT	17.2	13.3
31 OCT	16.9	14.4
2 NOV	16.8	17.2
3 NOV	17.1	17.2
9 NOV	15.5	9.4[c]
12 NOV	UNIT DOWN	7.2[c]
15 NOV	9.6[c]	3.3[c]
16 NOV	13.3	13.3
25 NOV	16.9	13.9
26 NOV	16.8	13.9
27 NOV	16.6	15.0
2 DEC	17.2	16.7
4 DEC	16.9	15.6
6 DEC	16.9	16.1
8 DEC	17.0	16.7
10 DEC	17.2	16.1
14 DEC	18.6	17.2
15 DEC	17.5	17.2
16 DEC	15.8	3.9
19 DEC	16.3	13.3
20 DEC	16.6	15.6

[a]Mean Discharge - Mean Intake Temperature (°C) for collection date; from Nine Mile Point Unit #1 "401" Monthly Report (Niagara Mohawk Power Corp., 1976)

[b]Mean Discharge - Mean Intake Temperature (°C) for collection date; from James A. FitzPatrick Nuclear Power Plant "401" Monthly Report (Niagara Mohawk Power Corp., 1976)

[c]Plant off-line for some portion or entire day

UNIT DOWN = Plant off-line, no temperature data available

TABLE III-7

PLANT OPERATING CONDITION (ΔT) DURING IMPINGEMENT COLLECTIONS

NINE MILE POINT NUCLEAR STATION UNIT 1 and JAMES A. FITZPATRICK NUCLEAR POWER PLANT - JANUARY - MARCH, 1976

DATE	NMP [a]	FITZ [b]
JAN		
2	14.8	17.2
3	14.9	15.6
5	15.2	16.1
6	15.6	16.7
7	15.6	16.7
8	15.7	16.7
9	15.6	16.1
10	15.6	15.0
12	16.0	17.8
13	15.7	17.8
14	14.9	17.8
15	15.0	17.8
16	15.3	10.6
17	15.4	0.6[c]
19	16.1	1.1[c]
20	16.1	2.2[c]
21	16.1	1.7[c]
22	16.1	1.1[c]
23	16.1	3.9[c]
24	14.3	6.1[c]
26	15.2	8.3[c]
27	15.2	7.2[c]
28	15.2	6.1[c]
29	15.2	3.9[c]
30	15.1	2.2[c]
31	15.2	5.0[c]
FEB		
2	15.1	5.0[c]
3	15.1	6.7[c]
4	15.1	7.2[c]
5	14.2	5.6[c]
6	14.3	4.4[c]
7	14.5	4.4[c]
9	14.4	5.6[c]
10	14.5	4.4[c]
11	14.4	3.9[c]
12	14.5	3.3[c]
13	14.3	3.3[c]
14	13.4	2.2[c]
16	13.9	2.8[c]

DATE	NMP [a]	FITZ [b]
FEB		
17	14.2	2.8[c]
18	14.6	2.2[c]
19	14.7	4.4[c]
20	14.6	4.4[c]
21	14.4	4.4[c]
23	14.3	4.4[c]
24	14.2	3.9[c]
25	14.2	4.4[c]
26	14.4	4.4[c]
27	14.6	3.9[c]
28	14.3	4.4[c]
MAR		
1	14.3	5.6[c]
2	9.4	6.1[c]
3	0.0[c]	5.0[c]
4	0.1[c]	5.0[c]
5	7.6	2.2[c]
6	9.9	1.1[c]
8	12.6	1.1[c]
9	13.4	1.1[c]
10	14.2	1.7[c]
11	13.4	1.1[c]
12	14.2	0.6[c]
13	14.3	0.6[c]
15	13.9	0.6[c]
16	13.8	1.1[c]
17	13.8	0.6[c]
18	13.8	1.1[c]
19	14.0	0.6[c]
20	14.1	1.1[c]
22	9.2[c]	2.2[c]
23	0.3[c]	0.6[c]
24	0.3[c]	3.9[c]
25	0.2[c]	8.3
26	0.5[c]	12.2
27	0.2[c]	15.0
29	0.7[c]	15.6
30	0.4[c]	15.0
31	0.6[c]	15.0

TABLE III-7 (Continued)

PLANT OPERATING CONDITION (ΔT) DURING IMPINGEMENT COLLECTIONS (Continued)

NINE MILE POINT NUCLEAR STATION UNIT 1 and JAMES A. FITZPATRICK
NUCLEAR POWER PLANT - APRIL - JUNE, 1976

DATE	NMP[a]	FITZ[b]
APR		
1	0.9[c]	13.3
2	0.2[c]	13.9
3	0.2[c]	13.9
5	0.2[c]	11.1
6	0.2[c]	13.9
7	0.2[c]	13.9
8	0.2[c]	13.9
9	0.2[c]	15.6
10	0.5[c]	15.6
12	0.7[c]	16.1
13	0.4[c]	16.1
14	0.4[c]	15.6
15	0.9[c]	15.6
16	0.4[c]	15.0
17	3.0[c]	15.6
19	4.5[c]	15.6
20	5.7[c]	15.6
21	9.5[c]	15.6
22	10.4	13.3
23	10.6	15.0
24	10.7	15.6
25	11.8	16.1
26	12.7	16.7
27	13.7	16.1
28	13.8	16.1
29	13.9	16.7
30	13.9	16.7
MAY		
1	14.4	15.6
3	14.1	17.2
4	14.9	16.7
5	14.6	16.7
6	15.1	16.7
7	14.7	16.7
8	14.8	17.2
10	14.8	16.7
11	14.9	16.7
12	14.9	16.7
13	15.1	7.2[c]
14	14.4	7.2[c]
15	0.4[c]	7.2[c]
17	9.3	15.6

DATE	NMP[a]	FITZ[b]
MAY		
18	10.7	13.9
19	12.5	16.1
20	13.2	16.7
21	14.6	16.7
22	15.1	16.7
23	14.6	15.6
24	14.7	17.2
25	15.4	17.8
26	15.8	17.8
27	15.9	17.8
28	15.9	17.8
29	15.8	17.8
31	15.1	17.8
JUN		
1	15.4	15.0
2	15.6	17.8
3	15.8	17.8
4	15.8	8.9[c]
5	15.6	0.6[c]
7	15.8	14.4
8	15.7	15.0
9	15.9	15.6
10	16.0	17.2
11	15.9	17.2
12	16.0	17.8
14	15.8	17.8
15	16.1	17.8
16	16.4	17.2
17	16.3	17.2
18	16.6	3.9[c]
19	16.7	6.7[c]
21	16.9	15.6
22	16.8	17.2
23	16.8[c]	10.0[c]
24	15.4[c]	13.3[c]
25	15.2	16.1
26	16.6	17.8
28	17.2	17.2
29	17.5	17.8
30	17.2	5.0[c]

TABLE III-7

PLANT OPERATING CONDITION (ΔT) DURING IMPINGEMENT COLLECTIONS (Continued)

NINE MILE POINT NUCLEAR STATION UNIT 1 and JAMES A. FITZPATRICK
NUCLEAR POWER PLANT - JULY - 4 OCTOBER, 1976

DATE	NMP[a]	FITZ[b]
JUL		
1	17.1	8.3[c]
2	16.9	13.9
3	15.0	16.1
5	14.3	17.2
6	13.7	17.2
7	14.3	17.2
8	14.2	17.2
9	13.8[c]	16.7
10	UNIT DOWN	16.7
12	UNIT DOWN	17.2
13	UNIT DOWN	16.1
14	UNIT DOWN	0.0[c]
15	10.9	0.0[c]
16	12.3	0.6[c]
17	12.9	5.0[c]
19	16.5	14.4
20	16.6	15.6
21	16.2	11.1[c]
22	16.4	0.0[c]
23	16.5	7.2[c]
24	16.9	6.7[c]
26	16.6	0.0[c]
27	16.3	0.0[c]
28	16.2	4.4[c]
29	16.1	13.9
30	16.3	12.2
31	15.9	15.0
AUG		
2	13.6	16.1
3	14.4	16.1
4	16.1	16.1
5	16.3	16.1
6	16.6[c]	13.3
7	1.5[c]	15.6
9	15.6	16.7
10	16.3	16.7
11	16.2	16.7
12	16.4	17.2
13	16.6	17.2
14	17.7	17.2
16	17.7	17.2
17	17.1[c]	17.8
18	3.7[c]	17.8
AUG		
19	13.6	17.8
20	14.6	17.8
21	15.7	17.8
23	16.1	17.8
24	16.2	17.8
25	16.1	17.8
26	16.3	17.8
27	16.3	17.8
28	16.8	17.2
30	16.6	17.8[c]
31	16.7	17.2[c]
SEP		
1	16.6	17.2
2	16.7	16.7
3	16.0	17.2
4	16.6	16.7
6	16.4	17.2
7	16.9	17.2
8	16.6	17.8
9	16.4	17.8
10	16.8	16.1
11	16.7	16.1
13	16.9	16.7
14	16.9	16.1
15	16.7	16.7
16	16.7	16.1
17	16.7	16.1
18	15.8	16.1
20	16.5	16.1
21	17.0	16.1
22	16.7	16.7
23	16.8	16.7
24	17.3	16.1
25	17.1	16.7
27	17.2	16.1
28	17.1	16.1
29	17.1	16.1
30	16.9	16.7
OCT		
1	17.2	16.1
2	17.2	16.1
4	17.2	16.1

TABLE III-7 (Continued)

PLANT OPERATING CONDITION (ΔT) DURING IMPINGEMENT COLLECTIONS (Continued)

NINE MILE POINT NUCLEAR STATION UNIT 1 and JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 5 OCTOBER, 1976 - 1 JANUARY, 1977

DATE	NMP [a]	FITZ [b]	DATE	NMP [a]	FITZ [b]
OCT			NOV		
5	16.8	16.7	20	17.1	1.1 [c]
6	16.0	16.1	22	17.1	1.1 [c]
7	15.8	16.7	23	17.1	0.6 [c]
8	16.0	14.4	24	17.1	10.6
9	16.1	4.4 [c]	25	16.9	13.9
11	16.5	0.6 [c]	26	16.8	13.9
12	16.6	0.6 [c]	27	16.6	15.0
13	15.5	0.6 [c]	29	17.0	16.7
14	16.1	4.4 [c]	30	17.1	17.2
15	16.3	10.6			
16	16.6	11.7	DEC		
18	16.2	13.9	1	17.0	16.7
19	16.3	14.4	2	17.2	16.7
20	16.2	15.6	3	16.9	16.1
21	16.3	15.6	4	16.9	15.6
22	16.4	16.1	6	16.9	16.1
23	11.3	14.4	7	18.1	16.7
25	13.9	15.6	8	17.0	16.7
26	16.0	16.1	9	17.1	16.7
27	16.3	15.6	10	17.2	16.1
28	16.8	13.3	11	14.2	16.7
29	17.1	15.6	13	17.9	17.2
30	17.2	13.3	14	18.6	17.2
			15	17.5	17.2
NOV			16	15.8	3.9 [c]
1	16.9	16.1	17	16.2	4.4 [c]
2	16.8	17.2	18	16.3	13.3
3	17.1	17.2	20	16.6	15.6
4	16.8	17.2	21	16.3	17.8
5	16.9	16.7	22	16.3	17.8
6	16.9	18.3	23	16.1	17.2
8	16.7	16.1	24	16.2	16.7
9	15.5 [c]	9.4 [c]	25	16.6	16.7
10	UNIT DOWN	1.1 [c]	27	15.6	16.1
11	UNIT DOWN	7.2 [c]	28	16.2	16.1
12	UNIT DOWN	7.2 [c]	29	16.3	16.1
13	UNIT DOWN	0.6 [c]	30	16.3	16.1
15	9.6 [c]	3.3 [c]	31	16.2	15.6
16	13.3	13.3			
17	15.6	15.0	JAN		
18	16.7	17.2	1	16.1	16.1
19	17.0	17.2 [c]	1977		

TABLE III-7 (Continued)

FOOTNOTES: PLANT OPERATING CONDITIONS (ΔT) DURING IMPINGEMENT COLLECTIONS

[a]Mean Discharge - Mean Intake Temperature (°C) for collection date; from Nine Mile Point Unit #1 "401" Monthly Report (Niagara Mohawk Power Corp., 1976)

[b]Mean Discharge - Mean Intake Temperature (°C) for collection date; from James A. FitzPatrick Nuclear Power Plant "401" Monthly Report (Niagara Mohawk Power Corp., 1976)

[c]Plant off-line for some portion or entire day

UNIT DOWN = Plant off-line; no temperature data available

TABLE III-8

PLANT OPERATING CONDITIONS (ΔT) DURING REGULAR ENTRAINMENT SAMPLING PROGRAM

NINE MILE POINT NUCLEAR STATION UNIT 1 AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

	ΔT (°C)	
DATE[c]	NINE MILE POINT[a]	JAMES A. FITZPATRICK[b]
7 JAN	NS	16.7
14	NS	17.8
4 FEB	NS	7.2[e]
18	NS	2.2[e]
3 MAR	NS	5.0[e]
17	NS	0.6[e]
14 APR	0.4[e]	15.6
28	13.8	16.1
5 MAY	14.6	16.7
12	14.9	16.7
19	12.5	16.1
26	15.8	17.8
2 JUN	15.6	17.8
9	15.9	15.6
16[d]	16.4	17.2
23	16.8[e]	10.0[e]
30	17.2	5.0[e]
3 JUL	15.0	NS
7	14.3	17.2
14[d]	UNIT DOWN	0.0[e]
21	16.2	11.1[e]
28	16.2	4.4[e]
4 AUG	16.1	16.1
11	16.2	16.7
18[d]	3.7[e]	17.8
25	16.1	17.8
1 SEP	16.6	17.2
8[d]	16.6	17.8
22	16.7	16.7
6[d] OCT	16.0	16.1
20	16.2	15.6
3 NOV	NS	17.2
17	NS	15.0
1 DEC	NS	16.7
15	NS	17.2

[a] Mean Discharge - Mean Intake Temperature (°C) for calendar day listed, from Nine Mile Point Unit #1 "401" Monthly Report (Niagara Mohawk Power Corp., 1976)

[b] Mean Discharge - Mean Intake Temperature (°C) for calendar day listed, from James A. FitzPatrick Nuclear Power Plant "401" Monthly Report (Niagara Mohawk Power Corp., 1976)

[c] Collections: 1100, 1700, 2300, and 0500 hrs at both plants 7 Jan - 8 Sep; 1100 and 2300 hr, 22 Sep - 15 Dec

[d] *Gammarus* enumeration also at FitzPatrick

[e] Plant off-line for some portion or entire day

UNIT DOWN = Plant off-line; no temperature data available

NS = No sample

TABLE III-9

PLANT OPERATING CONDITIONS (ΔT[a]) DURING VIABILITY SAMPLING PROGRAMS

JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

DATE	DAY/ NIGHT	NO. CIRC. WATER PUMPS	PLANT VIABILITY								SIMULATIONS								LAKE VIABILITY					
			PHYTO- PLANKTON[b]		ZOO- PLANKTON[b]		GAMMARUS[c]		ICHTHYO- PLANKTON[c]		PHYTO- PLANKTON[b]		ZOO- PLANKTON[b]		GAMMARUS[c]		ICHTHYO- PLANKTON[c]		PHYTO- PLANKTON		ZOO- PLANKTON		ICHTHYO- PLANKTON	
			TIME[d]	ΔT	TIME[d]	ΔT	TIME[d]	ΔT	TIME[d]	ΔT	TIME[d]	ΔT	TIME[d]	ΔT	TIME[d]	ΔT	TIME[d]	ΔT	TIME[d]	ΔT	TIME[d]	ΔT	TIME[d]	ΔT
14 APR	D	3	1202	13.5	1130	14.0																		
	N	3	2254	13.6	2200	13.7																		
28	D	3	1311	14.6	1200	14.6	1400	14.5	1400	14.5														
	N	3	0132[e]	13.4	0045[e]	13.4	2300	13.9	2300	13.9														
12 MAY	D	3	0958	14.4	1120	14.4	1038	14.0	1038	14.0	0958	14.4	1120	14.4	1038	14.0	1038	14.0						
	N	3	2225	14.6	2400	14.5	2325	14.4	2325	14.4	2225	14.6	2400	14.5	2325	14.4	2325	14.4						
26	D	3	1012	15.5	1000	14.4	1100	15.8	1100	15.8									1012	15.5	1000	14.4	1100	15.8
	N	3	2144	15.2	2400	14.4	2300	15.6	2300	15.6	2144	15.2	2400	14.4	2300	15.6	2300	15.6					2300	15.6
9 JUN	D	3	1021	12.9	1130	12.4	1100	13.1	1100	13.1	1021	12.9	1130	12.4									1100	13.1
	N	3	2145	14.3	2300	14.3	2300	15.0	2300	15.0	2145	14.3	2300	14.3									2300	15.0
23	D	3	1018	15.8	1100	15.5	1100	16.1	1100	16.1									1018	15.8	1100	15.5	1100	16.1
28	N	3	2143	NA	2245	15.6	2300	15.5	2300	15.5	2143	NA	2245	15.6									2300	15.5
20 JUL	D	3	1019	14.2	1200	14.2			1045	14.6	1019	14.2	1200	14.2									1045	14.6
	N	3	2149	14.8	2305	15.1	2245	15.0	2245	15.0	2149	14.8	2305	15.1	2245	15.0							2245	15.0
29	D	3	1016	13.6	1200	14.0			1045	13.8									1016	13.6	1200	14.0	1045	13.8
	N	3	2142	12.0	2320	12.2	2245	11.9	2245	11.9	2142	12.0	2320	12.2	2245	11.9	2245	11.9					2245	11.9
11 AUG	D	3	0951	15.1	1140	15.6			1045	15.2			1140	15.6					0951	15.1			1045	15.2
	N	3	2112	14.7	2315	14.5	2245	15.0	2245	15.0	2112	14.7	2315	14.5	2245	15.0							2245	15.0
25	D	3	0950	15.0	1145	15.7			1045	15.4									0950	15.0	1145	15.7	1045	15.4
	N	3	2116	15.8	2350	17.7	2245	16.2	2245	16.2	2116	15.8	2350	17.7	2245	16.2	2245	16.2					2245	15.2
8 SEP	D	3	1000	15.8	1130	15.9			1030	15.5	1000	15.8	1130	15.9			1030	15.5						
	N	3	2109	15.8	2305	16.0	2247	14.9	2247	14.9	2109	15.8	2305	16.0	2247	14.9	2247	14.9						
22	D	3	1038	14.4	1205	14.8			1045	14.3	1038	14.4	1205	14.8			1045	14.3						
	N	3	2116	14.8							2116	14.8												
27	N	3			2318	14.7	2250	14.8	2250	14.8			2318	14.7	2250	14.8	2250	14.8						
6 OCT	D	3	1023	14.3	1027	14.7					1023	14.3	1027	14.7										
	N	3	2126	13.9	2142	14.4					2126	13.9	2142	14.4										
20	D	2	1004	12.9	1110	13.6													1004	12.9	1110	13.6		
	N	2	2121	13.0	2358	13.5	2230	13.2	2230	13.2	2121	13.0	2358	13.5	2230	13.2	2230	13.2						
3 NOV	D	3	1030	15.0	1210	15.5					1030	15.0	1210	15.5										
	N	3	2104	15.1	2345	15.4					2104	15.1	2345	15.4										
17	D	3	1030	12.9	1210	13.6					1030	12.9	1210	13.6										
	N	3	2247	14.1	2254	15.0	2218	12.8	2218	12.8	2247	14.1	2254	15.0	2218	12.8	2218	12.8						
1 DEC	D	3	1105	14.5	1230	14.8					1105	14.5	1230	14.8										
	N	3	2232	14.6	2308	14.9					2232	14.6	2308	14.9										
9	N	3	2109	16.3							2109	16.3												
10	D	3	0925	16.5							0925	16.5												
15	D	3	1106	15.3							1106	15.3												
19	D	3			1155	12.8							1155	12.8										
	N	3	2130	13.1	2321	13.8	2255	13.8	2255	13.8	2130	13.1	2321	13.8	2255	13.8	2255	13.8						

[a] Discharge-Intake Temperature (°C), from viability sample history sheets
[b] Intake forebay sample taken on lake side of entrainment rack, prior to tempering
[c] Intake forebay sample taken on plant side of tempering gates, after tempering
[d] [illegible]e in 2400 hrs; Intake Sample
[e] [illegible]ril

D = Day
N = Night
NA = Not available

TABLE III-10

FREQUENCY OF SAMPLING FOR ECOLOGICAL STUDIES IN NINE MILE POINT AREA OF LAKE ONTARIO - 1976
(Scheduled Frequency)

STUDY	FREQUENCY[a]	PERIOD
A. GENERAL ECOLOGICAL SURVEY		
Fish - Trawls	Twice monthly (D/N)	April-December
Comparative trawl study	Yearly	June
Seines	Twice monthly	April-December
Gill nets (general ecol.)	Twice monthly (48-hour period: 12-hour retrievals)	April-December
(gut analysis)	Yearly	August
Benthos		
Natural Habitats		
non-Cladophora Community	Alternate months	April-December
Bottom sediment (grain size analysis)	Twice Yearly	June, October
Sediment accumulation	Monthly	May-December
Bottom quality (organic carbon)	Alternate Months	April-December
Artificial Substrates (Periphyton)		
Bottom	Monthly	May-December
Buoy	Monthly	May-December
Water Quality		
Monthly (11 & 48 parameters)	Monthly	April-December
Bimonthly (17 parameters)	Twice monthly	April-December
Thermal stratification	Weekly	April-December
Radiological water	Monthly	April-December
Plankton		
Phytoplankton		
Chlorophyll a, C-14, community	Monthly (D)	April-December
Zooplankton	Monthly (D)	May-December
Macrozooplankton[b]		
enumeration of all taxa	Monthly (D)	April-December
enumerate Pontoporeia, Gammarus, and Mysis	Monthly (N)	June-September
Ichthyoplankton	Weekly (D/N)	June-mid-September
	Weekly (D)	April, May, mid-September-December
B. NINE MILE POINT NUCLEAR STATION UNIT 1		
Entrainment		
Ichthyoplankton (forebay only)[c]	Weekly (2 D/2 N)	May-September 8
	Twice monthly (2 D/2 N)	April, September 8-October
Impingement	Three times/week[d]	January-December

TABLE III-10 (Continued)

FREQUENCY OF SAMPLING FOR ECOLOGICAL STUDIES
IN NINE MILE POINT AREA OF LAKE ONTARIO - 1976
(Scheduled Frequency)

STUDY	FREQUENCY[a]	PERIOD
C. JAMES A. FITZPATRICK NUCLEAR POWER PLANT		
Entrainment		
Phytoplankton: discharge aftbay, enumeration	Monthly (D)	April-December
C-14 and Chlorophyll a: phytoplankton viability, intake & discharge bays[e]	Twice monthly (D/N)	April-December
Zooplankton (> 76μ)		
enumeration: discharge aftbay	Monthly (D)	April-December
viability[f]	Twice monthly (D/N)	April-December
Gammarus: intake forebay, enumeration[c]	Monthly (2 D/2 N)	January-September
	Monthly (D/N)	October-December
Ichthyoplankton: intake forebay, enumeration[c]	Weekly (2 D/2 N)	May-September 8
	Twice monthly (2 D/2 N)	January-April
	Twice monthly (D/N)	September 22-December
Viability of Gammarus[c]: intake forebay & discharge aftbay	Twice monthly (N)	May-September
	Monthly (N)	April, October-December
Viability of Ichthyoplankton: intake forebay & discharge aftbay	Monthly (D/N)	April
	Twice monthly (D/N)	May-September
Simulated Laboratory Studies (3°F Mixing Zone & 2°F Area) (scheduled)[g]		
C-14 & Chlorophyll a	Monthly (D)	April-December
	Twice monthly (N)	
Zooplankton[f]	Monthly (D)	April-December
	Twice monthly (N)	
Ichthyoplankton	Twice monthly (N)	April-May
	Monthly (N)	September
Gammarus	Twice monthly (N)	April-September 30
	Monthly (N)	October-December
Lake Viability Studies (3°F Mixing Zone & 2°F Area)		
C-14 & Chlorophyll a	Monthly (D)	April-December
Zooplankton	Monthly (D)	April-December
Ichthyoplankton	Twice Monthly (D)	April-August 31
	Twice Monthly (N)	June-August 31
	Monthly (D/N)	September
Impingement	Three times/week[d,h]	January-December

[a]Sampling contingent on weather conditions
[b]Macrozooplankton analyzed from ichthyoplankton collection
[c]Sampling date and time the same for Nine Mile Point and FitzPatrick Nuclear Stations (Hours: 1100, 1700, 2300, 0500, or 1100 and 2300); 30 minute sample
[d]Monday and Friday: 24-hr composite sample; Wednesday: 24 hourly samples; frequency increased during periods of high impingement (>20,000 fish)
[e]Incubation periods: 7, 24, 48, and 72 hous for day and night collections for C-14 & Chlorophyll a analyses (after 22 September); 4 hours for day collections for C-14 only; immediate analysis for day and night collections for Chlorophyll a analyses; 2 replicates
[f]Viability: ~8 hours after collection (sample maintained in ambient water); enumeration of the same sample
[g]Additional samples if lake conditions are hazardous
[h]Wednesday: day/night collections as of 2 June
D = Day collection
N = Night collection

TABLE III-1

NINE MILE AQUATIC ECOLOGY STUDIES LAKE SAMPLING PROGRAMS

NINE MILE POINT NUCLEAR STATION UNIT I AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - APRIL 1976

DATE	NEKTON					BENTHOS				PERIPHYTON		WATER QUALITY				PLANKTON			
	TRAWLS	COMPARATIVE TRAWLS[a]	SEINES	GILL NETS	STOMACHS (GILL NETS)	MACROINVERTEBRATES	ORGANIC CARBON	SUBSTRATE ELEVATION	GRAIN SIZE ANALYSIS	BUOY	BOTTOM	MONTHLY (20' & 40')	MONTHLY (25' & 45')	BIMONTHLY (20' & 60')	THERMALS	PHYTOPLANKTON[b]	ZOOPLANKTON	MACROZOOPLANKTON	ICHTHYOPLANKTON
APR																			
2																			
5																			
6																			
7																			D
9	DN														D				
12																			
13																			
14			D	↑								D		D	D			D	D
15																			
16				↓															
19						D	D												
20													D		D				
21																			D
22	D																		
23																			
24																			
25																			
26																			
27																			
28																			
29	N			↑										D	D				D
30		D														D			

a Special study, not part of regular sampling program

b Includes phytoplankton enumeration, Carbon-14, and Chlorophyll a programs

↑ = One collection

TABLE III-11 (Continued)

NINE MILE AQUATIC ECOLOGY STUDIES LAKE SAMPLING PROGRAMS

NINE MILE POINT NUCLEAR STATION UNIT I AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - MAY 1976

DATE	NEKTON					BENTHOS				PERIPHYTON		WATER QUALITY				PLANKTON			
	TRAWLS	COMPARATIVE TRAWLS[a]	SEINES	GILL NETS	STOMACHS (GILL NETS)	MACROINVERTEBRATES	ORGANIC CARBON	SUBSTRATE ELEVATION	GRAIN SIZE ANALYSIS	BUOY	BOTTOM	MONTHLY (20' & 40')	MONTHLY (25' & 45')	BIMONTHLY (20' & 60')	THERMALS	PHYTOPLANKTON[b]	ZOOPLANKTON	MACROZOOPLANKTON	ICHTHYOPLANKTON
MAY																			
1				↓															
3																			
4																			
5																			
6																			
7																			
10												D		D	D				
11				↑				D		D	D								
12																			
13	DN			↓														D	D
14			D			D													
17																			
19																			
20																			
21																			
22																			D
23				↑											D				
24			D										D	D					
25	DN			↓											D				
26																			D
27																D			
28																	D		
31																			

[a]Special study, not part of regular sampling program

[b]Includ[illegible]hytoplankton enumeration, Carbon-14, and Chloro[illegible]l a programs

↕ = One [illegible]llection

TABLE III-1[illegible] (Continued)

NINE MILE AQUATIC ECOLOGY STUDIES LAKE SAMPLING PROGRAMS

NINE MILE POINT NUCLEAR STATION UNIT I AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - JUNE 1976

DATE	NEKTON					BENTHOS				PERIPHYTON		WATER QUALITY				PLANKTON			
	TRAWLS	COMPARATIVE TRAWLS[a]	SEINES	GILL NETS	STOMACHS (GILL NETS)	MACROINVERTEBRATES	ORGANIC CARBON	SUBSTRATE ELEVATION	GRAIN SIZE ANALYSIS	BUOY	BOTTOM	MONTHLY (20' & 40')	MONTHLY (25' & 45')	BIMONTHLY (20' & 60')	THERMALS	PHYTOPLANKTON[b]	ZOOPLANKTON	MACROZOOPLANKTON	ICHTHYOPLANKTON
JUN																			
2								D		D									DN
4			D												D				
7																			
8	DN			↕								D		D	D				
9				↕															DN
10				↕															N
11																			
14											D		D						
15						D	D		D										
16						D	D		D									DN	DN
17						D			D							D	D		D
18			D														D		
21				↕										D	D				
22				↕															
23				↕															DN
24	D																		
25																			
28	D	D																	
29	N	N																	
30																			D

[a]Special study, not part of regular sampling program

[b]Includes phytoplankton enumeration, Carbon-14, and Chlorophyll a enumeration

↕ = One collection

TABLE III-11 (Continued)

NINE MILE AQUATIC ECOLOGY STUDIES LAKE SAMPLING PROGRAMS

NINE MILE POINT NUCLEAR STATION UNIT I AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - JULY 1976

DATE	NEKTON					BENTHOS				PERIPHYTON		WATER QUALITY				PLANKTON			
	TRAWLS	COMPARATIVE TRAWLS[a]	SEINES	GILL NETS	STOMACHS (GILL NETS)	MACROINVERTEBRATES	ORGANIC CARBON	SUBSTRATE ELEVATION	GRAIN SIZE ANALYSIS	BUOY	BOTTOM	MONTHLY (20' & 40')	MONTHLY (25' & 45')	BIMONTHLY (20' & 60')	THERMALS	PHYTOPLANKTON[b]	ZOOPLANKTON	MACROZOOPLANKTON	ICHTHYOPLANKTON
JUL																			
1								D		D					D				N
2																			
3																			
5																			
6			D	↕								D		D	D				
7				↕															DN
8				↕															
9																			
12																			
14																			
15	N[c]		D												D			DN	DN
16	D										D								
19				↕									D	D	D				
20				↕															
21				↕															DN
23																			
26																			
27	D																		
28	N														D	D	D		DN
29																			
30																			

[a] Special study, not part of regular sampling program

[b] Includes phytoplankton enumeration, Carbon-14, and Chlorophyll a programs

[c] Earliest sample occurred 0040 hr 16 Jul

↕ = One collection

TABLE II (Continued)

NINE MILE AQUATIC ECOLOGY STUDIES LAKE SAMPLING PROGRAMS

NINE MILE POINT NUCLEAR STATION UNIT I AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - AUGUST 1976

DATE	NEKTON					BENTHOS				PERIPHYTON		WATER QUALITY				PLANKTON			
	TRAWLS	COMPARATIVE TRAWLS[a]	SEINES	GILL NETS	STOMACHS (GILL NETS)	MACROINVERTEBRATES	ORGANIC CARBON	SUBSTRATE ELEVATION	GRAIN SIZE ANALYSIS	BUOY	BOTTOM	MONTHLY (20' & 40')	MONTHLY (25' & 45')	BIMONTHLY (20' & 60')	THERMALS	PHYTOPLANKTON[b]	ZOOPLANKTON	MACROZOOPLANKTON	ICHTHYOPLANKTON
AUG																			
2												D		D	D				
3			D	↕															
4										D									DN
6																			
9													D		D				
10	N																		
11																			DN
12	D																		
13																			
16																			
17																			
18				↕														DN	DN
19											D				D				
20			D																
23					↕									D	D				
24																			
25																			DN
26	DN															D	D		
27																	D		
30																			

[a]Special study, not part of regular sampling program
[b]Includes phytoplankton enumeration, Carbon-14, and Chlorophyll a programs
↕ = One collection

TABLE III-11 (Continued)

NINE MILE AQUATIC ECOLOGY STUDIES LAKE SAMPLING PROGRAMS

NINE MILE POINT NUCLEAR STATION UNIT I AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - SEPTEMBER 1976

DATE	TRAWLS	COMPARATIVE TRAWLS[a]	SEINES	GILL NETS	STOMACHS (GILL NETS)	MACROINVERTEBRATES	ORGANIC CARBON	SUBSTRATE ELEVATION	GRAIN SIZE ANALYSIS	BUOY	BOTTOM	MONTHLY (20' & 40')	MONTHLY (25' & 45')	BIMONTHLY (20' & 60')	THERMALS	PHYTOPLANKTON[b]	ZOOPLANKTON	MACROZOOPLANKTON	ICHTHYOPLANKTON
	NEKTON					BENTHOS				PERIPHYTON		WATER QUALITY				PLANKTON			
SEP																			
1															D				D
2				↕															N
3						D	D												N
4						D													
6																			
7	DN					D	D	D				D		D	D				
8	N									D								DN	DN
9			D																
10																			
13													D		D				
14				↕															
15																			DN
16											D								
17																			
20														D	D				
22																			
23	D															D	D		
24	N																		
25	D																		D
26																	D		D
27																			
28																			
29																			D
30			D												D				D

[a] Special study, not part of regular sampling program

[b] Incl[illegible] phytoplankton enumeration, Carbon-14, and Chlorop[illegible] a programs

↕ = One collection

TABLE III-11 (Continued)

NINE MILE AQUATIC ECOLOGY STUDIES LAKE SAMPLING PROGRAMS

NINE MILE POINT NUCLEAR STATION UNIT I AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - OCTOBER 1976

DATE	NEKTON					BENTHOS				PERIPHYTON		WATER QUALITY				PLANKTON			
	TRAWLS	COMPARATIVE TRAWLS[a]	SEINES	GILL NETS	STOMACHS (GILL NETS)	MACROINVERTEBRATES	ORGANIC CARBON	SUBSTRATE ELEVATION	GRAIN SIZE ANALYSIS	BUOY	BOTTOM	MONTHLY (20' & 40')	MONTHLY (25' & 45')	BIMONTHLY (20' & 60')	THERMALS	PHYTOPLANKTON[b]	ZOOPLANKTON	MACROZOOPLANKTON	ICHTHYOPLANKTON
OCT																			
1																			
3																			
4				↕								D		D	D				
5										D									
6																		D	D
8								D		D									
11													D		D				
12	DN		D			D	D		D										
13						D	D		D										D
15																			D
18																			
19	N			↕										D	D	D	D		
20																			D
21																			
22																			
23																			
24																			
25																			
27	DN										D								
29																			
30	D										D								D
31															D				

[a]Special study, not part of regular sampling program

[b]Includes phytoplankton enumeration, Carbon-14, and Chlorophyll a programs

↕ = One collection

TABLE III-11 (Continued)

NINE MILE AQUATIC ECOLOGY STUDIES LAKE SAMPLING PROGRAMS

NINE MILE POINT NUCLEAR STATION UNIT I AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - NOVEMBER 1976

	NEKTON					BENTHOS				PERIPHYTON		WATER QUALITY				PLANKTON			
DATE	TRAWLS	COMPARATIVE TRAWLS[a]	SEINES	GILL NETS	STOMACHS (GILL NETS)	MACROINVERTEBRATES	ORGANIC CARBON	SUBSTRATE ELEVATION	GRAIN SIZE ANALYSIS	BUOY	BOTTOM	MONTHLY (20' & 40')	MONTHLY (25' & 45')	BIMONTHLY (20' & 60')	THERMALS	PHYTOPLANKTON[b]	ZOOPLANKTON	MACROZOOPLANKTON	ICHTHYOPLANKTON
NOV																			
1																			
2			D					D		D		D		D	D				
3	N			↕														D	D
4																			
5																			
8																			
9	N												D						
10																			
12	D		D												D				D
15														D	D				
16				↕												D	D		
17																			
18																			
19																			
22																			
24																			
25										D	D								
26	DN										D								D
27			D												D				
29																			

[a] Special study, not part of regular sampling program

[b] Includes phytoplankton enumeration, Carbon-14, and Chlorophyll a programs

↕ = One collection

TABLE [illegible]-11 (Continued)

NINE MILE AQUATIC ECOLOGY STUDIES LAKE SAMPLING PROGRAMS

NINE MILE POINT NUCLEAR STATION UNIT I AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - DECEMBER 1976

DATE	NEKTON					BENTHOS				PERIPHYTON		WATER QUALITY				PLANKTON			
	TRAWLS	COMPARATIVE TRAWLS[a]	SEINES	GILL NETS	STOMACHS (GILL NETS)	MACROINVERTEBRATES	ORGANIC CARBON	SUBSTRATE ELEVATION	GRAIN SIZE ANALYSIS	BUOY	BOTTOM	MONTHLY (20' & 40')	MONTHLY (25' & 45')	BIMONTHLY (20' & 60')	THERMALS	PHYTOPLANKTON[b]	ZOOPLANKTON	MACROZOOPLANKTON	ICHTHYOPLANKTON
DEC																			
1																			
2															D				
3																			
4																			D
6			D	↑								D		D	D				
7				↕															
8				↓									D						
10								D		D								D	D
13																			
14						D										D			
15	N																		
16											D				D				
17																			
19																D	D		D
20	D														D				
22																			
24																			
27																			
29																			
31																			

[a]Special study, not part of regular sampling program
[b]Includes phytoplankton enumeration, Carbon-14, and Chlorophyll a programs

↕ = One collection

TABLE III-12

NINE MILE AQUATIC ECOLOGY STUDIES IN-PLANT SAMPLING PROGRAMS

NINE MILE POINT NUCLEAR STATION UNIT I AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - APRIL 1976

DATE	NINE MILE UNIT I		JAMES A. FITZPATRICK																	
			ENTRAINMENT				PLANT VIABILITY					SIMULATION				LAKE VIABILITY			
	ICHTHYOPLANKTON ENTRAINMENT	IMPINGEMENT	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS	ICHTHYOPLANKTON	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS [a]	ICHTHYOPLANKTON [a]	IMPINGEMENT	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS [a]	ICHTHYOPLANKTON [a]	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS	ICHTHYOPLANKTON [a]
APR																			
2		DN									DN								
5		DN									DN								
6		DN									DN								
7		DN									DN								
9		DN									DN								
12		DN									DN								
13																			
14	DN	DN			DN	DN	DN	DN			DN								
15																			
16		DN									DN								
19		DN									DN								
20		DN									DN								
21		DN									DN								
22																			
23		DN									DN								
24		DN									DN								
25		DN									DN								
26		DN									DN								
27		DN																	
28	DN	DN	D	D		DN	DN	DN	DN	D	DN								
29		DN									DN								
30		DN									DN								

[a] Dates represent viability analysis; not necessarily the sample collection

TABLE III-12 (Continued)

NINE MILE AQUATIC ECOLOGY STUDIES IN-PLANT SAMPLING PROGRAMS

NINE MILE POINT NUCLEAR STATION UNIT I AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - MAY 1976

DATE	NINE MILE UNIT I		JAMES A. FITZPATRICK																
			ENTRAINMENT				PLANT VIABILITY					SIMULATION				LAKE VIABILITY			
	ICHTHYOPLANKTON ENTRAINMENT	IMPINGEMENT	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS	ICHTHYOPLANKTON	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS [a]	ICHTHYOPLANKTON [a]	IMPINGEMENT	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS [a]	ICHTHYOPLANKTON [a]	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS [b]	ICHTHYOPLANKTON [a]
MAY																			
1		DN																	
3		DN									DN								
4		DN									DN								
5	DN	DN				DN					DN								
6		DN									DN								
7		DN									DN								
10		DN									DN								
11																			
12	DN	DN			DN	DN	DN	DN	DN	N	DN	DN	DN	DN					
13																			
14		DN									DN								
17		DN									DN								
19	DN	DN				DN					DN								
20		DN									DN								
21		DN									DN								
22		DN									DN								
23		DN									DN								
24		DN									DN								
25		DN									DN								
26	DN	DN	D	D		DN	DN	DN	DN	N	DN	N	N	N		D	D	D	D
27																			
28		DN									DN								
31		DN									DN								

a Dates represent viability analysis; not necessarily the sample collection

b Collection required in original workscope

TABLE III-12 (Continued)

NINE MILE AQUATIC ECOLOGY STUDIES IN-PLANT SAMPLING PROGRAMS

NINE MILE POINT NUCLEAR STATION UNIT I AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - JUNE 1976

DATE	NINE MILE UNIT I		JAMES A. FITZPATRICK																		
			ENTRAINMENT				PLANT VIABILITY					SIMULATION				LAKE VIABILITY			
	ICHTHYOPLANKTON ENTRAINMENT	IMPINGEMENT	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS	ICHTHYOPLANKTON	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS[a]	ICHTHYOPLANKTON[a]	IMPINGEMENT	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS[a]	ICHTHYOPLANKTON[a]	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS[b]	ICHTHYOPLANKTON[a]
JUN																			
2	DN	DN				DN					DN								
4		DN									DN								
7		DN									DN								
8																			
9	DN	DN				DN	DN	DN	DN	DN	DN	DN	DN					DN	DN
10																			
11		DN									DN								
14		DN									DN								
15																			
16	DN	DN			DN	DN					DN								
17																			
18		DN									DN								
21		DN									DN								
22																			
23	DN	DN	D	D		DN	D	D	D		DN					D	D	D	D
24																			
25		DN									DN								
28		DN					N	N	N	N	DN	N	N					N	N
29																			
30	DN	DN				DN					DN								

[a] Dates represent viability analysis; not necessarily the sample collection
[b] Collection required in original workscope

TABLE III-12 (Coninued)

NINE MILE AQUATIC ECOLOGY STUDIES IN-PLANT SAMPLING PROGRAMS

NINE MILE POINT NUCLEAR STATION UNIT I AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - JULY 1976

DATE	NINE MILE UNIT I		JAMES A. FITZPATRICK																
			ENTRAINMENT				PLANT VIABILITY					SIMULATION				LAKE VIABILITY			
	ICHTHYOPLANKTON ENTRAINMENT	IMPINGEMENT	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS	ICHTHYOPLANKTON	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS [a]	ICHTHYOPLANKTON [a]	IMPINGEMENT	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS [a]	ICHTHYOPLANKTON [a]	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS	ICHTHYOPLANKTON [a]
JUL																			
1																			
2		DN									DN								
3	DN																		
5		DN									DN								
6																			
7	DN	DN				DN					DN								
8																			
9		DN									DN								
12		DN									DN								
14	DN	DN			DN	DN					DN								
15																			
16		DN									DN								
19		DN									DN								
20							DN	DN	N	DN		DN	DN	N	N				DN
21	DN	DN				DN					DN								
23		DN									DN								
26		DN									DN								
27																			
28	DN	DN				DN					DN								
29			D	D			DN	DN	N	DN		N	N	N	N	D	D		DN
30		DN									DN								

[a]Dates represent viability analysis; not necessarily the sample collection

TABLE III-12 (Coninued)

NINE MILE AQUATIC ECOLOGY STUDIES IN-PLANT SAMPLING PROGRAMS

NINE MILE POINT NUCLEAR STATION UNIT I AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - AUGUST 1976

DATE	NINE MILE UNIT I		JAMES A. FITZPATRICK																
			ENTRAINMENT				PLANT VIABILITY					SIMULATION				LAKE VIABILITY			
	ICHTHYOPLANKTON ENTRAINMENT	IMPINGEMENT	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS	ICHTHYOPLANKTON	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS[a]	ICHTHYOPLANKTON[a]	IMPINGEMENT	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS[a]	ICHTHYOPLANKTON[a]	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS	ICHTHYOPLANKTON[a]
AUG																			
2		DN									DN								
3																			
4	DN	DN				DN					DN								
6		DN									DN								
9		DN									DN								
10																			
11	DN	DN				DN	DN	DN	N	DN	DN	DN	DN	N	N				DN
12																			
13		DN									DN								
16		DN									DN								
17																			
18	DN	DN			DN	DN					DN								
19																			
20		DN									DN								
23		DN									DN								
24																			
25	DN	DN	D	D		DN	DN	DN	N	DN	DN	N	N	N	N	D	D		DN
26																			
27		DN									DN								
30		DN									DN								

[a]Dates represent viability analysis; not necessarily the sample collection

TABLE III-12 (Continued)

NINE MILE AQUATIC ECOLOGY STUDIES IN-PLANT SAMPLING PROGRAMS

NINE MILE POINT NUCLEAR STATION UNIT I AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - SEPTEMBER 1976

DATE	NINE MILE UNIT I		JAMES A. FITZPATRICK																
			ENTRAINMENT				PLANT VIABILITY					SIMULATION				LAKE VIABILITY			
	ICHTHYOPLANKTON ENTRAINMENT	IMPINGEMENT	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS	ICHTHYOPLANKTON	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS[a]	ICHTHYOPLANKTON[a]	IMPINGEMENT	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS[a]	ICHTHYOPLANKTON[a]	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS	ICHTHYOPLANKTON[a]
SEP																			
1	DN	DN				DN					DN								
2																			
3		DN									DN								
4																			
6		DN									DN								
7																			
8	DN	DN			DN	DN	DN	DN	N	N	DN	DN	DN	N	N				
9																			
10		DN									DN								
13		DN									DN								
14																			
15		DN									DN								
16																			
17		DN									DN								
20		DN									DN								
22	DN	DN	D	D		DN	DN	D			DN	DN	D						
23																			
24		DN									DN								
25																			
26																			
27		DN						N	N	N	DN		N	N	N				
28																			
29		DN									DN								
30																			

[a]Dates represent viability analysis; not necessarily the sample collection

TABLE III-12 (Continued)

NINE MILE AQUATIC ECOLOGY STUDIES IN-PLANT SAMPLING PROGRAMS

NINE MILE POINT NUCLEAR STATION UNIT I AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - OCTOBER 1976

DATE	NINE MILE UNIT I: ICHTHYOPLANKTON ENTRAINMENT	NINE MILE UNIT I: IMPINGEMENT	JAMES A. FITZPATRICK ENTRAINMENT: PHYTOPLANKTON	ENTRAINMENT: ZOOPLANKTON	ENTRAINMENT: GAMMARUS	ENTRAINMENT: ICHTHYOPLANKTON	PLANT VIABILITY: PHYTOPLANKTON	PLANT VIABILITY: ZOOPLANKTON	PLANT VIABILITY: GAMMARUS [a]	PLANT VIABILITY: ICHTHYOPLANKTON [a]	IMPINGEMENT	SIMULATION: PHYTOPLANKTON	SIMULATION: ZOOPLANKTON	SIMULATION: GAMMARUS [a]	SIMULATION: ICHTHYOPLANKTON [a]	LAKE VIABILITY: PHYTOPLANKTON	LAKE VIABILITY: ZOOPLANKTON [c]	LAKE VIABILITY: GAMMARUS	LAKE VIABILITY: ICHTHYOPLANKTON [a]
OCT																			
1		DN									DN								
3																			
4		DN									DN								
5																			
6	DN	DN			DN	DN	DN	DN			DN	DN	DN						
8		DN									DN								
11		DN									DN								
12																			
13		DN									DN								
15		DN									DN								
18		DN									DN								
19																			
20	DN	DN	D	D		DN	DN	DN	N		DN	N	N	N		D	D		
21																			
22		DN									DN								
23																			
24																			
25		DN									DN								
27		DN									DN								
29		DN									DN								
30																			
31																			

[a] Dates represent viability analysis; not necessarily the sample collection
[c] Extra lake collection in addition to the regular lake viability program

TABLE III-12 (Continued)

NINE MILE AQUATIC ECOLOGY STUDIES IN-PLANT SAMPLING PROGRAMS

NINE MILE POINT NUCLEAR STATION UNIT I AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - NOVEMBER 1976

DATE	NINE MILE UNIT I		JAMES A. FITZPATRICK																	
			ENTRAINMENT				PLANT VIABILITY					SIMULATION				LAKE VIABILITY			
	ICHTHYOPLANKTON ENTRAINMENT	IMPINGEMENT	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS	ICHTHYOPLANKTON	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS[a]	ICHTHYOPLANKTON[a]	IMPINGEMENT	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS[a]	ICHTHYOPLANKTON[a]	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS	ICHTHYOPLANKTON[a]
NOV																			
1		DN									DN								
2																			
3		DN			DN	DN	DN	DN			DN	DN	DN						
4																			
5		DN									DN								
8		DN									DN								
9																			
10		DN									DN								
12		DN									DN								
15		DN									DN								
16																			
17		DN	D	D		DN	DN	DN	N	N	DN	DN	DN	N	N				
18											DN								
19		DN									DN								
22		DN									DN								
24		DN									DN								
25																			
26		DN									DN								
27																			
29		DN									DN								

[a]Dates represent viability analysis; not necessarily the sample collection

TABLE III-12 (Continued)

NINE MILE AQUATIC ECOLOGY STUDIES IN-PLANT SAMPLING PROGRAMS

NINE MILE POINT NUCLEAR STATION UNIT I AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - DECEMBER 1976

DATE	NINE MILE UNIT I		JAMES A. FITZPATRICK																
			ENTRAINMENT				PLANT VIABILITY					SIMULATION				LAKE VIABILITY			
	ICHTHYOPLANKTON ENTRAINMENT	IMPINGEMENT	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS	ICHTHYOPLANKTON	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS[a]	ICHTHYOPLANKTON[a]	IMPINGEMENT	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS[a]	ICHTHYOPLANKTON[a]	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS	ICHTHYOPLANKTON[a]
DEC																			
1		DN				DN	DN	DN			DN	DN	DN						
2																			
3		DN									DN								
4																			
6		DN									DN								
7																			
8		DN									DN								
10		DN									DN								
13		DN									DN								
14																			
15		DN			DN	DN	D				DN	D							
16																			
17		DN									DN								
19				D			N	DN	N			N	DN	N					
20		DN	D								DN								
22		DN									DN								
24		DN									DN								
27		DN									DN								
29		DN									DN								
31		DN									DN								

[a]Dates represent viability analysis; not necessarily the sample collection

days in April and July to 60% of the days in September. Weather conditions affected the completion of sampling at all prescribed stations on any one date for all programs except seine collections. The execution of the scheduled benthic sampling program was most dependent upon the sea-state in the Nine Mile Point vicinity.

Figures III-2 through III-5 illustrate the location of the sampling stations relative to both power plants. Table III-13 summarizes those sampling programs conducted along specified depth contours and transects; the ichthyoplankton station designations are by radius and not transect. The relative distance from each sampling station to the intake and discharge structures for both plants are presented in Table III-14. The NMPE-100-ft station is the station furthest from the lake structures of both plants.

D. REPORT ORGANIZATION

The discussion of the temporal and spatial distribution of selected taxa/species is limited to a comparison of plume vs. non-plume stations along the 15, 20, and 40-ft depth contours when temperature data recorded at the time of the biological collections permits such a comparison, or experimental versus control sites. The experimental site includes all samples collected from the shoreline to the 40-ft depth contour enclosed by NMPP and FITZ transects; the control sites are those from the shore to the 40-ft depth contour in the vicinity of NMPE and NMPW transects. Where possible, direct effects of plant operation have been quantified.

The report chapters are organized according to broad sampling programs which encompass various aspects of the ecosystem (receiving water body characteristics and quality, plankton, benthos, and nekton) and plant effects (entrainment and impingement). Analyses

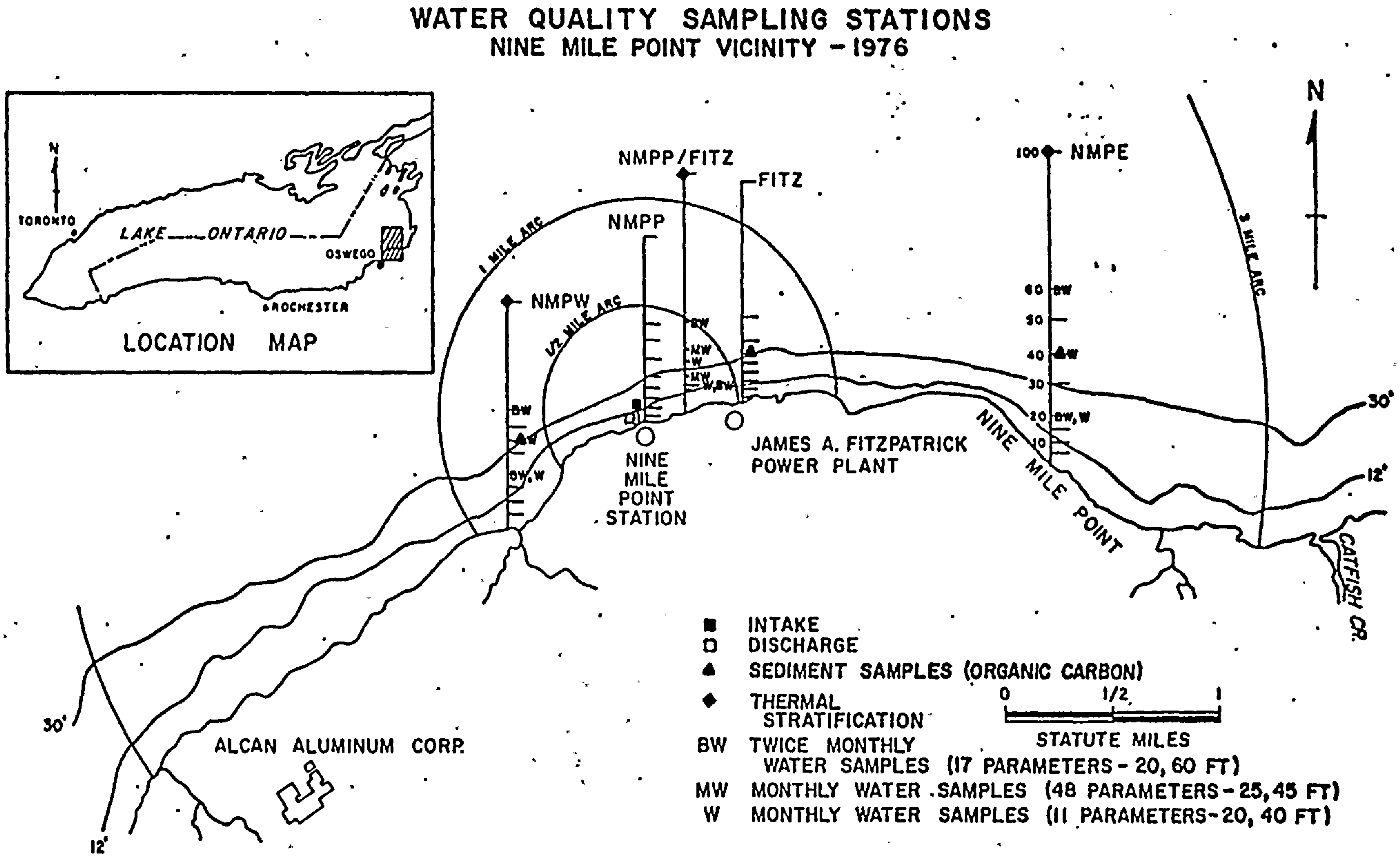

WATER QUALITY SAMPLING STATIONS
NINE MILE POINT VICINITY - 1976
LAKE ONTARIO
TORONTO
OSWEGO
ROCHESTER
LOCATION MAP
N
NMPP/FITZ
FITZ
NMPP
NMPW
NMPE
1 MILE ARC
1/2 MILE ARC
3 MILE ARC
NINE MILE POINT STATION
JAMES A. FITZPATRICK POWER PLANT
NINE MILE POINT
CATFISH CR.
ALCAN ALUMINUM CORP.
INTAKE
DISCHARGE
SEDIMENT SAMPLES (ORGANIC CARBON)
THERMAL STRATIFICATION
BW TWICE MONTHLY WATER SAMPLES (17 PARAMETERS - 20, 60 FT)
MW MONTHLY WATER SAMPLES (48 PARAMETERS - 25, 45 FT)
W MONTHLY WATER SAMPLES (11 PARAMETERS - 20, 40 FT)
0 1/2 1
STATUTE MILES

FIGURE III-2

PLANKTON SAMPLING STATIONS
NINE MILE POINT VICINITY – 1976

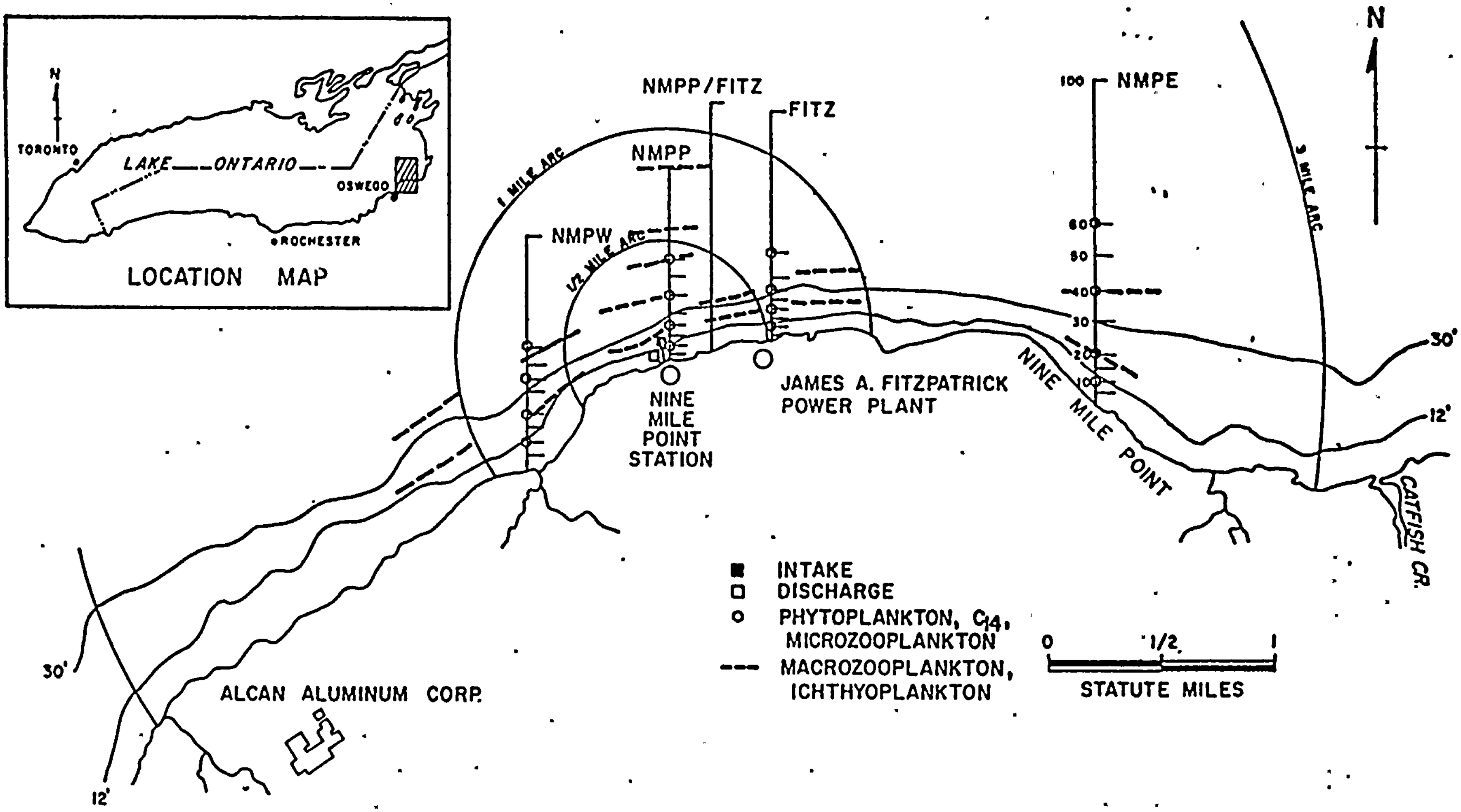


FIGURE III-3

BENTHOS SAMPLING STATIONS
NINE MILE POINT VICINITY - 1976

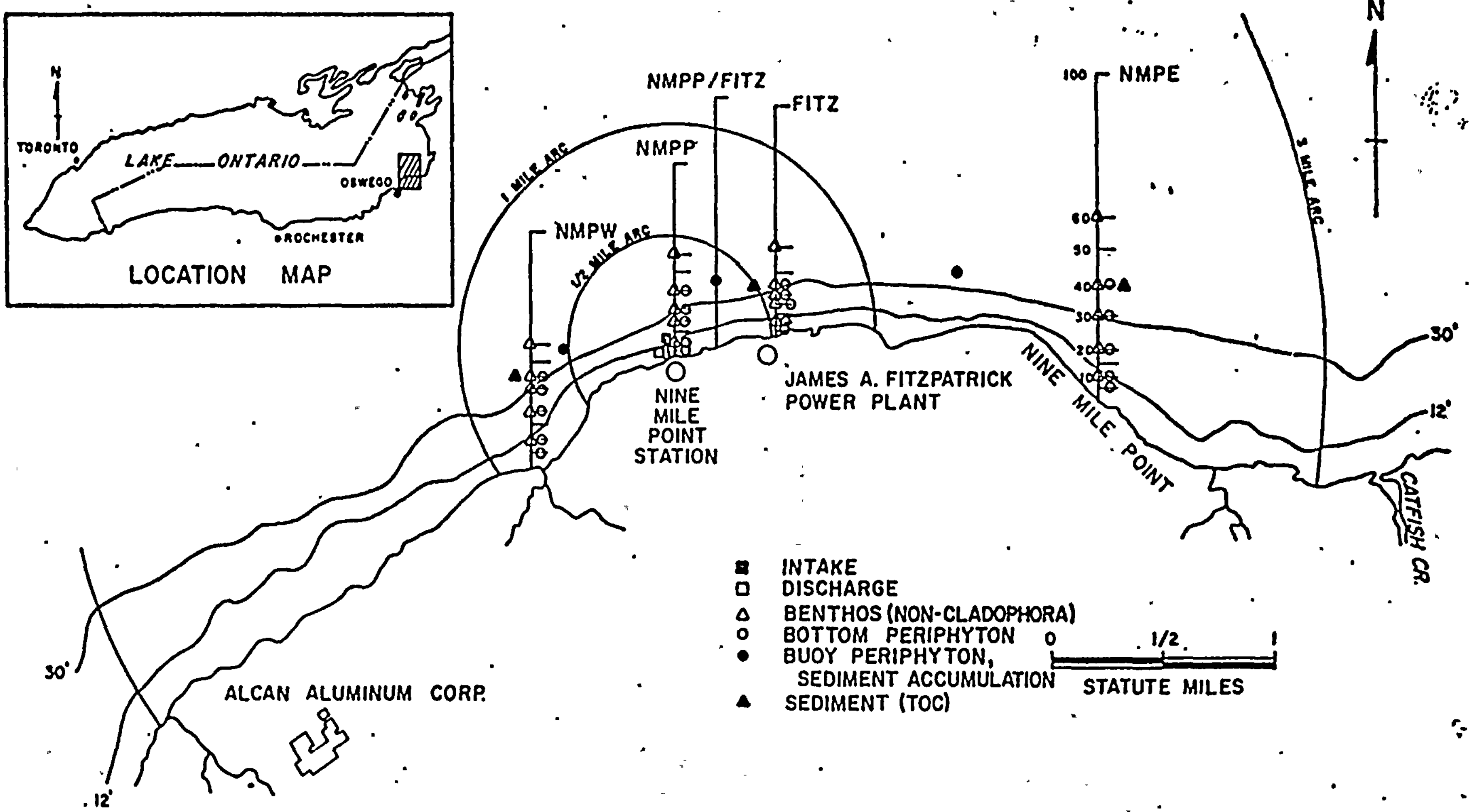


FIGURE III-4

FISH SAMPLING STATIONS
NINE MILE POINT VICINITY – 1976

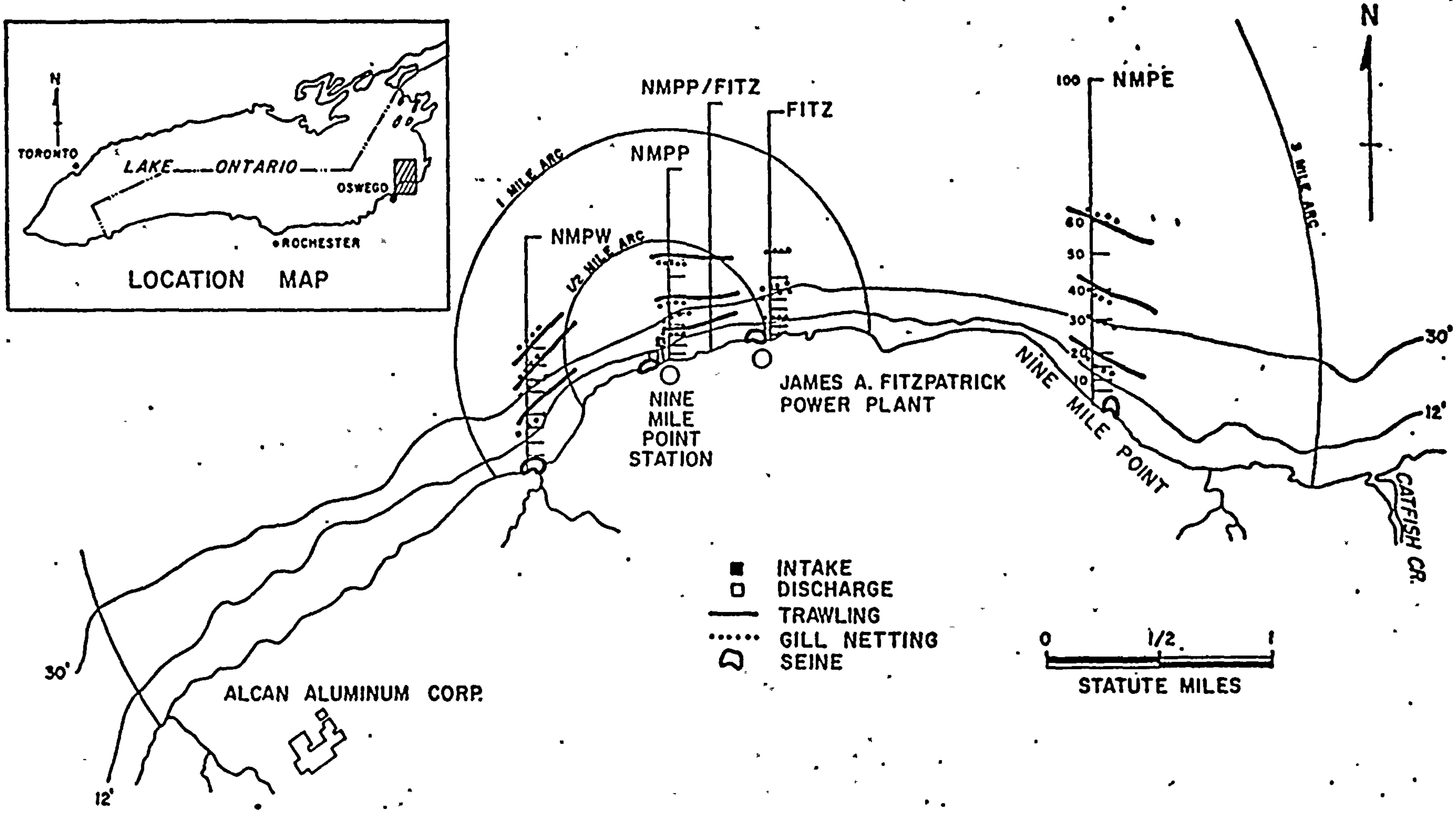


FIGURE III-5

TABLE III-13

SCHEMATIC OF LAKE COLLECTIONS

NINE MILE POINT VICINITY - 1976

DEPTH CONTOUR (ft)	PROGRAM: STUDY	SAMPLE DEPTH	TRANSECTS: NMPW	NMPP	NMPP/FITZ	FITZ	NMPE
Shore	Seines		B	B		B	B
5	Bottom Periphyton	BOT	D	D		D	D
10	Benthos (non-Cladophora community)	BOT	D	D		D	D
	Bottom Periphyton	BOT	D	D		D	D
	Phytoplankton*	S	C	C		C	C
	Zooplankton (>76μ)	oblique tow	C	C		C	C
15	Gill Nets (Fish)	BOT	B	B		B	B
	(Stomachs)	BOT	B	B		B	B
20	Trawls (Otter)	BOT	B		B		B
	Benthos (non-Cladophora community)	BOT	D	D		D	D
	Twice monthly H_2O quality (17 parameters)	S	A		A		A
	Monthly H_2O quality (11 parameters) & Radiological	S	A		A		A
	Bottom Periphyton	BOT	D	D		D	D
	Phytoplankton*	S	C	C		C	C
	Zooplankton (>76μ)	oblique tow	C	C		C	C
25	Monthly H_2O Quality (48 parameters) & Radiological	S			A		
		BOT			A		
30	Gill Nets (Fish)	BOT	B	B		B	B
	Benthos (non-Cladophora community)	BOT	D	D		D	D
	Bottom Periphyton	BOT	D	D		D	D
40	Trawls (Otter)	BOT	B		B		B
	(Standard Yankee Trawl)	BOT					B
	Gill Nets (Fish)	S-night;BOT-day	B	B		B	B
	Benthos (non-Cladophora community & grain size)	BOT	D	D		D	D
	Sediment (organic carbon)	BOT	D			D	D
	Buoy Periphyton	2 ft, 7 ft, 12 ft, 17 ft	D		D		D
	Sediment Accumulation	BOT	D		D		D
	Monthly H_2O Quality (11 parameters) & Radiological	S	A		A		A
	Bottom Periphyton	BOT	D	D		D	D
	Phytoplankton*	S	C	C		C	
		S/50%, 25%, 1% separate					C
	Zooplankton (> 76μ)	oblique tow	C	C		C	C
45	Monthly H_2O Quality (48 parameters) & Radiological	S			A		
		BOT			A		
60	Trawls (Otter)	BOT	B		B		B
	(Standard Yankee Trawl)	BOT					B
	Gill Nets (Fish)	BOT	B	B		B	B
	Benthos (non-Cladophora community)	BOT	D	D		D	D
	Twice monthly H_2O Quality (17 parameters)	S	A		A		A
	Phytoplankton*	S	C	C		C	C
	Zooplankton (> 76μ)	oblique tow	C	C		C	C
100	Thermal Stratification		A		A		A

A = Water Quality Program
B = Fish Program
C = Plankton Program
D = Benthic Program (Benthos and Periphyton)
S = Surface
BOT = Bottom
*Phytoplankton program = Species enumeration, C-14, and chlorophyll a determination

TABLE III-14

DISTANCE* OF SAMPLING SITES FROM LAKE STRUCTURES OF NUCLEAR STATIONS

NINE MILE POINT VICINITY

SITE		NINE MILE POINT NUCLEAR POWER PLANT UNIT 1		JAMES A. FITZPATRICK NUCLEAR POWER STATION	
DEPTH CONTOUR (FT)	TRANSECT OR RADIUS	INTAKE	DISCHARGE	INTAKE	DIFFUSER
Shore	NMPW	1.3	1.2	2.1	2.3
	NMPP	0.1	0.1	0.9	1.0
	FITZ	0.7	0.8	0.3	0.4
	NMPE	3.1	3.2	2.3	2.2
5	NMPW	1.2	1.1	2.0	2.2
	NMPP	0.1	0.1	0.9	1.0
	FITZ	0.8	0.9	0.2	0.4
	NMPE	3.1	3.1	2.3	2.2
10	NMPW	1.2	1.1	2.0	2.3
	NMPP	0.1	0.2	0.8	1.0
	FITZ	0.7	0.8	0.1	0.3
	NMPE	3.1	3.1	2.3	2.2
20	3 mile-NMPW	1.9	1.8	2.7	2.9
	NMPW	1.1	1.0	1.9	2.0
	1 mile-NMPW	0.8	0.8	1.7	1.9
	1/2 mile-NMPW	0.2	0.2	1.0	1.2
	NMPP	0.2	0.3	0.8	1.0
	NMPP/FITZ	0.4	0.5	0.5	0.7
	1/2 mile-NMPE	0.6	0.7	0.3	0.5
	FITZ	0.8	0.9	<0.1	0.2
	1 mile NMPE	1.2	1.3	0.4	0.3
	NMPE (=3 mile NMPE)	3.1	3.1	2.3	2.1
25	NMPP/FITZ	0.5	0.4	0.5	0.7
30	NMPW	1.0	0.9	1.9	2.0
	NMPP	0.2	0.3	0.7	0.9
	FITZ	0.8	0.9	0.1	0.2
	NMPE	3.1	3.1	2.2	2.1
40	3 mile-NMPW	1.8	1.7	2.7	2.8
	NMPW	1.0	0.9	1.9	2.0
	1 mile-NMPW	0.8	0.8	1.7	1.8
	1/2 mile-NMPW	0.4	0.4	1.1	1.2
	NMPP	0.3	0.4	0.8	0.9
	NMPP/FITZ	0.5	0.6	0.5	0.6
	1/2 mile-NMPE	0.6	0.7	0.4	0.5
	FITZ	0.9	1.0	0.2	0.2
	1 mile-NMPE	1.3	1.4	0.5	0.3
	NMPE (=3 mile NMPE)	3.1	3.1	2.2	2.1

TABLE III-14 (Continued)

DISTANCE* OF SAMPLING SITES FROM LAKE STRUCTURES OF NUCLEAR STATIONS (Continued)

NINE MILE POINT VICINITY

SITE		NINE MILE POINT NUCLEAR POWER PLANT UNIT 1		JAMES A. FITZPATRICK NUCLEAR POWER STATION	
DEPTH CONTOUR (FT)	TRANSECT OR RADIUS	INTAKE	DISCHARGE	INTAKE	DIFFUSER
45	NMPP/FITZ	0.6	0.7	0.6	0.6
60	NMPW	1.0	0.9	1.8	2.0
	NMPP (=1/2 mile-NMPW)	0.6	0.7	0.9	1.0
	NMPP/FITZ	0.7	0.8	0.6	0.7
	FITZ	1.0	1.1	0.4	0.4
	NMPE	3.1	3.2	2.3	2.1
80	NMPP	0.8	0.9	1.0	1.0
100	NMPW	1.2	1.2	1.9	2.0
	NMPP	1.2	1.3	1.2	1.3
	NMPP/FITZ	1.7	1.8	1.5	1.5
	NMPE	3.5	3.6	2.4	2.5

*Distance in kilometers as a straight line between two points

of data related to fisheries near the site are more extensive than analyses of other trophic levels. The fishery data include age class distribution (alewife and rainbow smelt), mortality estimates among age classes (alewife and rainbow smelt), length frequency distribution of selected species in the entire study area (alewife, yellow perch, white perch, rainbow smelt, smallmouth bass) and selected stations (alewife and rainbow smelt), coefficient of maturity (yellow perch, alewife, white perch, rainbow smelt, smallmouth bass), fecundity (alewife, rainbow smelt, white perch, yellow perch and smallmouth bass) as well as data on abundance of eggs and larvae (Chapter V) by species present in the study area.

Each chapter presents the analysis of only the 1976 data from a specific sampling program, and is organized according to the following format:

- INTRODUCTION: Defines organisms or parameters studied.

- MATERIALS AND METHODS: Describes any changes in the field and laboratory procedures between 1975 and 1976, illustrates sampling station locations, and indicates frequency of sampling. The detailed sampling procedures and laboratory techniques for the 1976 monitoring program are presented in Appendices I, II, and III of this report.

- RESULTS AND DISCUSSION: Presents a species inventory in taxonomic order and the occurrence of each species by date with dominant taxa indicated for selected programs. Dominance is defined within each trophic level.

Data summaries are presented primarily in graphic form in the text and in tabular form in the appendix to the report. Consistent with the emphasis in the report on plume versus non-plume

locations or experimental versus control sites, all graphic comparisons are limited to stations along the 20 and 40-ft depth contours; stations along these contours were most likely affected directly by the discharge from either or both power plants (LMS 1976). The taxonomic level for data interpretation varied with the sampling programs as did the criteria for the discussion at the specific level.

- CONCLUSIONS: Present a synopsis of the chapter findings and, where appropriate, the effect of the Nine Mile Point and James A. FitzPatrick nuclear stations on the near-field lake ecosystem.

REPORT APPENDIX: The organization of the appendix follows the numbering system of the text and parallels that of the 1976 Nine Mile Point Aquatic Ecology Studies Data Report, wherever possible. This report encompasses all the data presented in the 1976 Nine Mile Point Aquatic Ecology Studies Data Report, 28 February, submitted to the Nuclear Regulatory Commission. Tables which have undergone data revisions are marked "revised." The appendix also includes the complete field and laboratory work plans for the 1976 monitoring program in addition to tables containing supplementary data not contained in the main body of the chapter.

REFERENCES CITED

Lawler, Matusky & Skelly Engineers. 1976. Power Authority of the State of New York - James A. FitzPatrick Nuclear Power Plant 316(a) demonstration submission. Permit No. NY0020109. Prepared for Power Authority of the State of New York.

IV. RECEIVING WATER BODY CHARACTERISTICS AND QUALITY

A. INTRODUCTION AND MATERIALS AND METHODS

The objectives of the water quality studies for 1976 were:

a. to monitor water quality, including temperature, and summarize the findings of the monitoring program

b. to describe and discuss the differences in water quality among transects and depth contours, and to identify any such differences attributable to the operation of the Nine Mile Point Nuclear Station Unit 1 and James A. FitzPatrick Nuclear Power Plant.

In evaluations of lake water quality data, the 20 and 40-ft depth contours of the study area were emphasized since these contours were judged most likely to be affected by the intakes and discharges of the two plants.

Three water quality sampling programs were conducted during 1976: the Nine Mile Point monthly water quality program, the FitzPatrick monthly water chemistry program, and the FitzPatrick twice-monthly water quality program. A summary of the sampling dates of the three water quality programs is presented in Table IV-1.

The Nine Mile Point water quality program consisted of monthly surface sampling at the 20 and 40-ft depth contours of three transects (NMPW, NMPP/FITZ, and NMPE). For the FitzPatrick monthly water chemistry program, surface and bottom samples were collected at the 25 and 45-ft depth contours along the NMPP/FITZ transect, while for the twice-monthly program, surface samples only were collected at the 20 and 60-ft depth contours along three transects (NMPW, NMPP/FITZ, and NMPE). In 1975, samples were collected

TABLE IV-1

WATER QUALITY SAMPLING PROGRAM[a]

NINE MILE POINT VICINITY - 1976

DATE	MONTHLY[b] (20 ft & 40 ft)	MONTHLY[c] (25 ft & 45 ft)	TWICE MONTHLY[d] (20 ft & 60 ft)	THERMAL PROFILES
9 APR				D
14	D		D	D
20		D		D
29			D	D
10 MAY	D		D	D
23				D
24		D	D	
25				D
4 JUN				D
8	D		D	D
14		D		D
21			D	D
1 JUL				D
6	D		D	D
15				D
19		D	D	D
28				D
2 AUG	D		D	D
9		D		D
19				D
23			D	D
1 SEP				D
7	D		D	D
13		D		D
20			D	D
30				D
4 OCT	D		D	D
11		D		D
19			D	D
31				D
2 NOV	D		D	D
9		D		
12				D
15			D	D
26				D
2 DEC				D
6	D		D	D
8		D		
16				D
20				D

[a] Date on which a minimum of one sample was taken, day collection
[b] Monthly Water Chemistry Program (Nine Mile Point Water Quality Program)
[c] Water Chemistry Program (FitzPatrick Monthly Water Quality Program)
[d] FitzPatrick Water Quality Program

D = Day collection

just below the surface and at the bottom, twice a month, at the 20, 40 and 60-ft depth contours along NMPW, NMPP/FITZ, and NMPE transects. Selenium and total organic carbon were added to the list of parameters measured in the FitzPatrick monthly water quality program in 1976. Four water quality parameters were measured only once monthly: calcium, chromium, sodium, and sulfate; in addition, their analysis in the 60-ft water quality samples was discontinued.

Temperature was measured for the thermal profile program approximately weekly at the 100-ft contour of three transects (NMPW, NMPP/FITZ, and NMPE). Temperature measurements were also made in conjunction with each of the biological sampling programs.

Figure IV-1 shows the location of the thermal profile stations and all water quality sampling sites for 1976.

The field and laboratory procedures followed during 1976 are presented in Appendix I. The analytical procedures followed the current methods set forth by APHA (1976) and EPA (625-16-74-003).

Results of the radiological monitoring portion of the FitzPatrick monthly water quality program and the Nine Mile Point water quality program are presented in Chapter X of this report.

B. RESULTS AND DISCUSSION

1. Lake Temperature Data

The natural seasonal progression of temperature in the Nine Mile Point vicinity from mid-April through December is shown in Figures IV-2 and IV-3 for the 20 and 40-ft depth contours,

WATER QUALITY SAMPLING STATIONS
NINE MILE POINT VICINITY - 1976

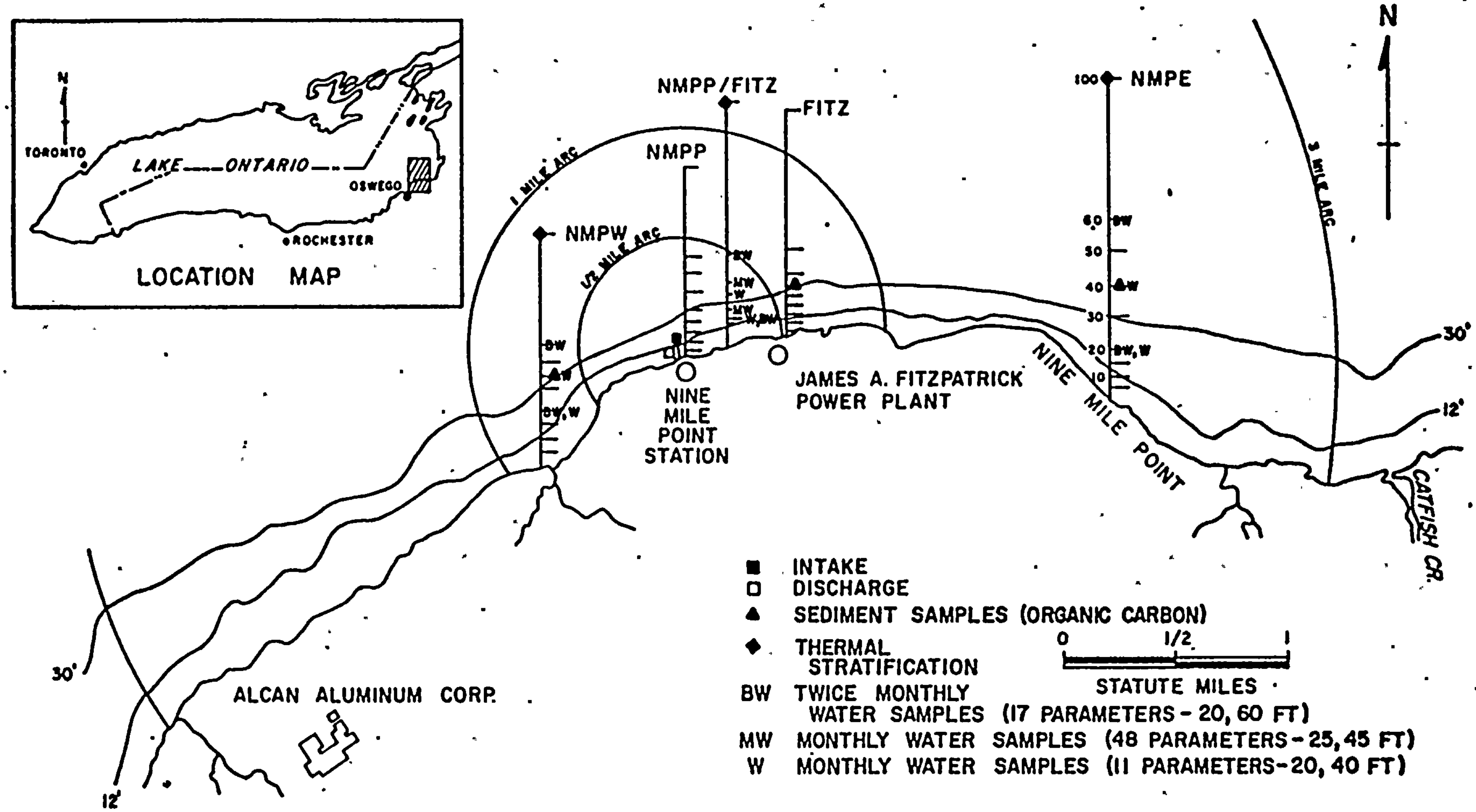
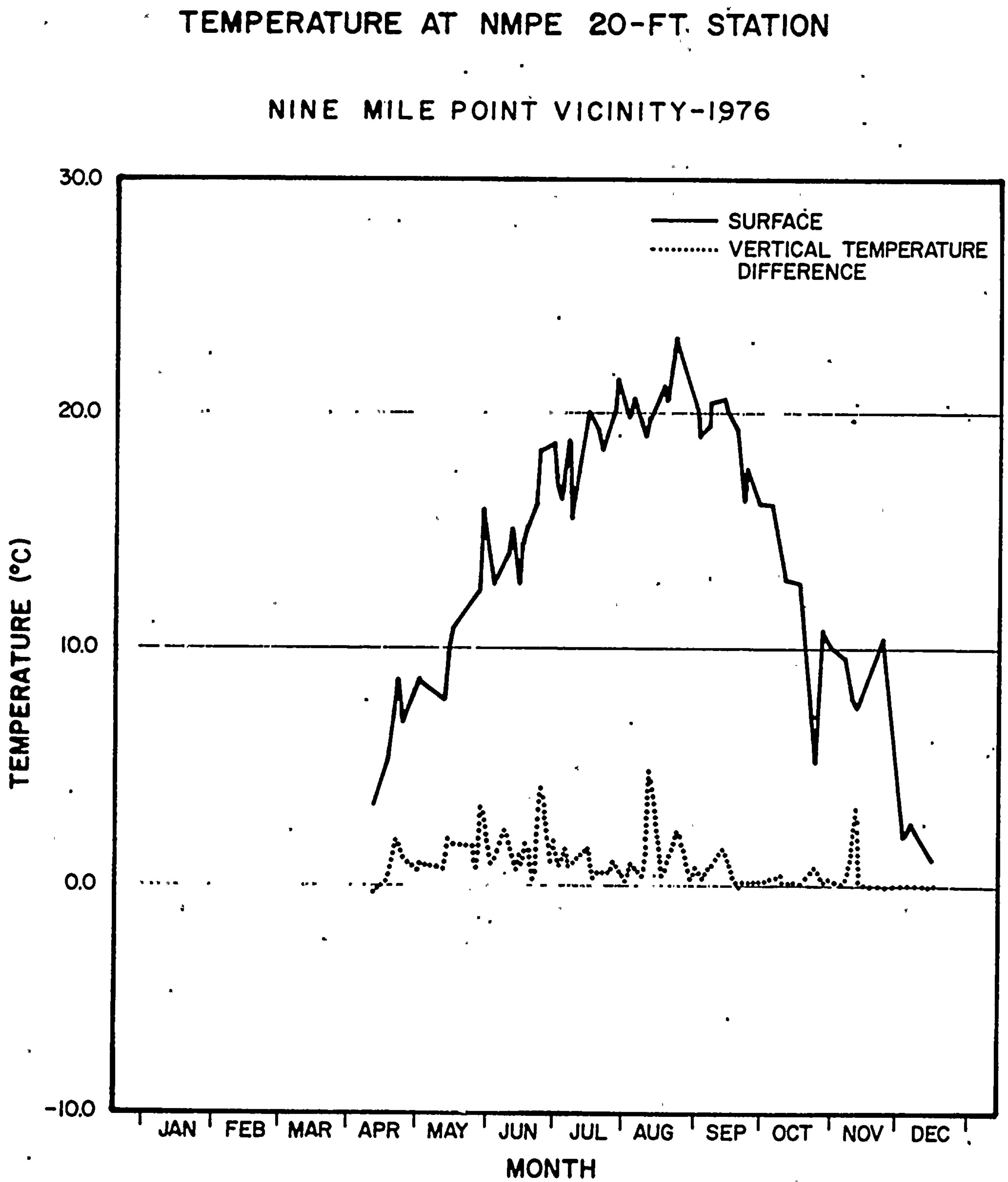
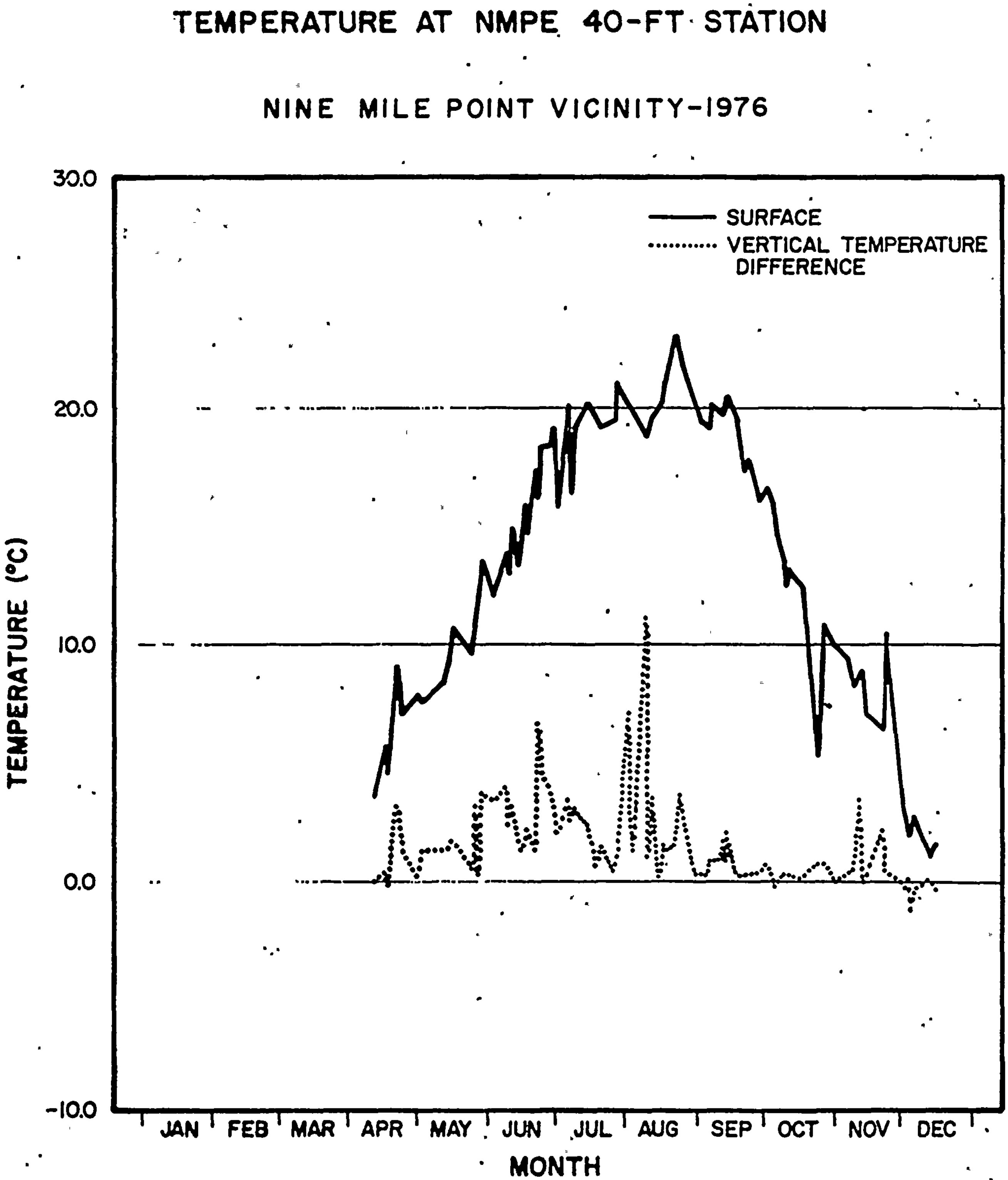


FIGURE IV-1



SURFACE TEMPERATURE = MEAN OF ALL SURFACE TEMPERATURES RECORDED WITH THE BIOLOGICAL SAMPLING PROGRAMS PER DATE

VERTICAL TEMPERATURE DIFFERENCE = DIFFERENCE BETWEEN THE MEAN SURFACE AND BOTTOM TEMPERATURES



SURFACE TEMPERATURE = MEAN OF ALL SURFACE TEMPERATURES RECORDED WITH THE BIOLOGICAL SAMPLING PROGRAMS PER DATE

VERTICAL TEMPERATURE DIFFERENCE = DIFFERENCE BETWEEN THE MEAN SURFACE AND BOTTOM TEMPERATURES

respectively, at the NMPE transect. This transect was selected to represent the natural temperature cycle in the lake as it had the highest density of data over the year and is sufficiently distant from the NMP and FITZ discharges to minimize any influence of the thermal discharges. The degree of natural short-term variation in surface temperature and the vertical stratification imposed on the long-term seasonal temperature cycle is evident from both figures. Although the degree of variation in surface temperature is similar between the 20 and 40-ft locations, the magnitude of vertical stratification is consistently greater at the 40-ft depth contour as a result of increased insulation from surface warming and the greater effect of cold water masses intruding from the deeper areas of the lake. The maximum surface temperatures recorded at the 20 and 40-ft contours were 23.2 and 22.3 C on 23 and 25 August, respectively. Minimum surface temperature at both locations was 1.1 C during mid-December.

The plot of vertical temperature differences shows approximately ten occurrences of cold water intrusions at the NMPE-40-ft station during the sampling period. Table IV-2 indicates the dates of these occurrences along with the approximate duration and magnitude of the stratification. Table IV-2 also identifies the cold water intrusions which affected the NMPE-20-ft station. Temperature effects at the 20-ft contour as a result of the intrusions were generally smaller than at the 40-ft contour along this transect. The largest observed intrusions at NMPE-40-ft station during the sampling year occurred on 2 and 10 August. The 2 August event apparently began about 26 July. A secondary intrusion also occurred on or about 25 August.

In order to evaluate possible effects of the thermal discharges on water temperatures in the Nine Mile Point vicinity, the temperature

TABLE IV-2

COLD WATER INTRUSIONS AT NMPE-20 AND 40-FT STATIONS

NINE MILE POINT VICINITY - 1976

DATE	APPROXIMATE DURATION (DAYS)	MAXIMUM OBSERVED STRATIFICATION AT NMPE-40 FT STATION (°C)	INTRUSION OBSERVED AT NMPE-20 FT STATION
19 APR	1	3.2	x
28 MAY	1	3.7	x
2 JUN	8	5.4	x
22 JUN	8	6.9	x
7 JUL	2-7	3.0	
2 AUG	2	12.3	
10 AUG	1	11.2	x
25 AUG	2	2.6	x
16 SEP	2	1.9	x
15 NOV	1	3.4	x
26 NOV	1	1.5	

data obtained during biological collections at the 15, 20, and 40-ft contours of NMPW, NMPP, FITZ, and NMPE transects were analyzed. Tables IV-3 and IV-4 give the monthly mean values and standard deviations for surface temperature and vertical temperature differences, respectively.

A comparison between NMPW and NMPE transects showed that monthly mean surface temperatures differed by more than 1.0 C on only four of the 27 month-location combinations (July at 20 ft, November at 15 and 20 ft, and October at 40 ft). No consistent trend in temperature differences between the transects was observed.

Vertical temperature differences were also compared between the two control transects; six of the 27 combinations showed values that differed by more than 1.0 C. Three of these occurred during August, when several intrusions of cold water masses into the area were indicated by the data; during these events, the intrusion was greater at NMPW than at NMPE. The NMPW transect had slightly greater (by less than 1.0 C) vertical temperature differences than NMPE during most months sampled. The magnitude of vertical stratification at both NMPE and NMPW transects generally increased with increasing depth, as was observed above. Monthly average surface temperatures at the two transects showed a slight decrease with increasing depth.

The monthly mean surface values at the FITZ and NMPP transects were compared with those at the NMPW and NMPE transects to determine the effect of the thermal discharges. Due to the generally good agreement between temperatures at the NMPE and NMPW transects, the plant transect temperatures were examined for average temperatures exceeding one or both control transect values by 1.0 C or more.

TABLE IV-3

MONTHLY SURFACE WATER TEMPERATURE (°C) AT SELECTED DEPTH CONTOURS*

NINE MILE POINT VICINITY - 1976

MONTH	DEPTH CONTOUR (ft)	NMPW			NMPP			FITZ			NMEH		
		TEMPERATURE		NO. SAMPLES	TEMPERATURE		NO. SAMPLES	TEMPERATURE		NO. SAMPLES	TEMPERATURE		NO. SAMPLES
		MEAN	STANDARD DEVIATION		MEAN	STANDARD DEVIATION		MEAN	STANDARD DEVIATION		MEAN	STANDARD DEVIATION	
APR	15	8.8	2.64	9	9.7	3.86	9	8.3	2.77	8	7.9	1.89	7
	20	7.2	1.69	6	8.0	2.90	4	10.2	3.00	3	6.8	2.25	6
	40	6.4	1.54	7	6.0	1.96	7	7.1	2.06	7	6.2	1.98	8
MAY	15	10.0	1.53	6	12.0	0.71	6	9.7	2.06	6	9.5	0.94	6
	20	11.0	2.30	8	12.0	1.59	8	10.4	3.70	5	11.4	2.64	6
	40	10.2	2.12	10	11.3	2.54	10	10.0	1.73	9	10.3	2.01	8
JUN	15	16.9	2.14	5	18.9	1.94	5	17.2	2.56	5	16.0	1.47	5
	20	16.5	2.66	7	17.9	2.19	6	16.1	2.63	4	15.5	2.12	13
	40	15.9	2.52	12	16.4	3.07	10	16.1	1.91	8	15.2	2.22	13
JUL	15	19.7	1.44	6	23.0	1.98	6	19.6	1.56	6	19.3	1.17	6
	20	19.6	0.89	5	21.9	1.70	5	21.2	1.77	2	18.5	3.15	9
	40	19.0	1.34	10	20.8	1.98	11	19.8	1.36	7	19.4	1.53	11
AUG	15	20.3	1.69	9	22.5	2.66	9	21.3	1.12	8	21.1	1.49	8
	20	20.6	2.98	7	23.3	2.44	7	22.1	0.14	2	21.0	1.41	10
	40	19.8	1.73	8	20.8	2.72	9	21.0	0.65	7	20.2	1.13	11
SEP	15	19.4	0.76	5	23.8	1.43	5	20.6	0.98	5	19.3	0.26	4
	20	18.3	1.87	9	21.0	1.73	6	19.2	2.05	3	19.2	1.47	12
	40	18.8	1.74	13	20.3	1.96	10	20.3	0.79	8	18.8	1.35	11
OCT	15	13.1	2.15	7	16.6	3.20	7	14.1	3.51	7	13.7	2.54	7
	20	13.6	1.32	4	15.8	3.69	4	14.3	2.50	3	12.6	1.93	7
	40	16.4	1.91	2	18.3	-	1	-	-	NA	15.2	0.78	2
NOV	15	7.2	2.44	6	11.1	2.05	6	9.0	2.51	6	8.9	1.34	6
	20	7.2	1.93	7	9.2	2.03	6	8.3	2.17	3	8.4	1.85	7
	40	7.9	1.85	8	9.4	1.94	9	9.2	1.71	6	8.6	1.31	9
DEC	15	1.8	0.50	2	7.1	1.17	3	1.6	0.95	3	1.8	0.57	2
	20	1.1	-	1	4.3	2.35	4	2.0	0.21	2	1.8	0.70	3
	40	1.8	0.72	5	2.6	1.18	6	2.3	1.06	4	1.9	0.69	8

*Temperature recorded with biological monitoring program
NA = Not available
– = Not applicable

TABLE IV-4

MONTHLY MEAN VERTICAL STRATIFICATION* AT SELECTED DEPTH CONTOURS

NINE MILE POINT VICINITY - 1976

MONTH	DEPTH CONTOUR (ft)	NMPW			NMPP			FITZ			NMPE		
		TEMPERATURE (°C)			TEMPERATURE (°C)			TEMPERATURE (°C)			TEMPERATURE (°C)		
		MEAN	STANDARD DEVIATION	NO. SAMPLES	MEAN	STANDARD DEVIATION	NO. SAMPLES	MEAN	STANDARD DEVIATION	NO. SAMPLES	MEAN	STANDARD DEVIATION	NO. SAMPLES
	15	0.7	1.03	9	2.0	2.67	9	1.3	0.90	8	0.5	0.32	7
APR	20	0.2	0.86	6	1.8	1.32	4	3.3	2.61	3	0.6	0.89	6
	40	0.3	0.85	7	0.8	2.15	7	1.6	1.38	7	0.5	1.20	8
	15	1.1	0.60	6	3.6	0.67	6	1.6	1.02	6	0.5	0.43	6
MAY	20	1.6	1.22	8	3.2	1.61	8	2.0	1.68	5	1.6	1.08	6
	40	2.2	1.44	10	3.6	2.24	10	1.8	0.70	9	1.6	1.42	8
	15	1.8	1.24	5	4.6	0.66	5	2.4	1.26	5	1.3	0.82	5
JUN	20	2.5	2.12	7	3.3	1.29	6	2.4	1.79	4	1.6	1.14	13
	40	3.1	2.28	12	3.4	2.46	10	3.4	3.36	8	3.0	2.10	13
	15	0.8	0.55	6	4.0	1.31	6	0.9	0.50	6	0.6	0.52	6
JUL	20	0.8	0.66	5	2.2	1.07	5	2.2	1.13	2	1.2	0.78	9
	40	1.6	0.94	10	2.9	1.38	11	1.5	1.15	7	1.5	1.08	11
	15	1.0	1.86	9	2.2	2.09	9	1.0	0.65	8	-0.8	3.69	8
AUG	20	4.4	2.73	7	6.1	3.79	7	1.4	0.79	2	1.7	2.08	10
	40	5.1	4.70	8	6.4	4.97	9	4.6	4.78	7	3.6	4.24	11
	15	0.3	0.28	5	4.5	1.85	5	1.0	1.00	5	0.2	0.46	4
SEP	20	0.6	0.59	9	2.6	1.12	6	0.6	1.35	3	0.5	0.48	12
	40	0.7	1.10	13	1.7	1.16	10	1.3	0.58	8	0.6	0.62	11
	15	0.3	0.19	7	3.4	1.39	7	0.9	1.49	7	0.3	0.43	7
OCT	20	0.4	0.14	4	2.0	1.40	4	0.9	0.25	3	0.4	0.41	7
	40	1.4	0.71	2	2.3	-	1	-	-	NA	-0.2	0.21	2
	15	0.3	0.41	6	2.8	1.47	6	1.0	1.71	6	1.6	2.12	6
NOV	20	0.6	0.69	7	1.6	1.34	6	0.4	0.21	3	1.0	1.37	7
	40	0.5	0.74	8	1.3	0.83	9	0.8	0.58	6	0.6	1.16	9
	15	0.6	0.92	2	-0.5	5.24	3	-0.3	0.20	3	0.0	0.00	2
DEC	20	0.0	-	1	0.7	2.69	4	-0.3	0.00	2	0.0	0.14	3
	40	0.9	0.45	5	-0.3	1.14	6	-0.7	0.75	4	-0.6	0.24	8

*Difference between surface and bottom temperatures recorded with biological collections
NA = Not available
- = Not applicable

At NMPP transect, monthly average surface temperatures were at least 1.0 C higher than the surface temperature at a control transect on all but two occasions (April at 40 ft, and August at 40 ft). The FITZ transect showed differences of 1.0 C or more for only 13 of the 26 contour-month averages. It should be noted that two of the observed differences at the FITZ transect were based on only two measurements each, making the conclusion of a difference in those cases questionable. Table IV-3 indicates that monthly mean surface temperatures along the FITZ transect were generally greater than at either control transect but with the above exceptions, differences were less than 1.0 C.

A similar comparison of vertical stratification (Table IV-4) showed that stratification at the NMPP transect exceeded that at either control transect for 21 of the 27 contour-month combinations, while at the FITZ transect only seven of the 26 values showed differences of 1.0 C or greater. Only two of the seven differences observed at the FITZ transect occurred at the 40-ft depth contour, where FitzPatrick discharge effects would be expected. Similarly, the degree of vertical stratification along the FITZ transect generally exceeded the control transect values but with the exceptions noted, differences were less than 1.0 C. The fact that greater temperature effects were observed at NMPP transect than at FITZ is attributed to the difference in discharge designs between the two plants. The deeper, higher velocity FitzPatrick diffuser achieves better near-field dilutions of the discharge waters than does the shallower, lower velocity discharge of the Nine Mile Point plant.

2. Summary of Water Quality Parameters

Summaries of the monthly water quality program at the 25 and 45-ft contours along NMPP/FITZ transect, the monthly water chemistry program at the 20 and 40-ft contours of NMPW, NMPP/FITZ, and NMPE

transects, and the twice-monthly water chemistry program at the 20 and 60-ft contours of NMPW, NMPP/FITZ, and NMPE transects for 1976 are presented in Tables IV-5, IV-6 and IV-7, respectively. Each summary table includes the number of samples taken, the maximum and minimum values, and the mean and standard deviation for each measured parameter.

3. Selected Water Quality Parameters

Of the 52 water quality parameters measured in the Nine Mile Point vicinity in 1976, ten are discussed below in detail: dissolved oxygen (DO), chlorophyll a, ammonia-nitrogen, nitrate-nitrogen, calcium, sodium, sulfate, total solids, total suspended solids, and total dissolved solids. These parameters were selected for analysis because of their roles in the biological processes in the waters of the Nine Mile Point vicinity, or because of their importance in general water quality evaluations.

Data for chloride, silicate, organic nitrogen, and specific conductance are summarized in Appendix IV.

- Dissolved Oxygen (Appendices IVA-2, IVB-2, IVC-3, and IVD-2)

A time series plot of surface DO concentrations, averaged over depth contour and transect, is shown in Figure IV-4. DO concentrations generally follow a pattern of being high in the spring, fall, and winter when both biological activity and water temperatures are low, and low in the summer when water temperature and biological activity are high. The lowest measured DO concentration of 8.4 mg/l (90% saturation), a surface measurement on one date (2 August at NMPE-40-ft station, Appendix IVD-2), is more than adequate to

TABLE IV- 5

MONTHLY WATER QUALITY VALUES AT NMPP/FITZ TRANSECT [a]

NINE MILE POINT VICINITY - 1976

PARAMETER	ABBREVIATION	UNITS	NO. OF SAMPLES	MAXIMUM	MINIMUM	MEAN[b]	STANDARD DEVIATION
SILVER	Ag	mg/l	36	<0.01	<0.01	-	-
ALUMINUM	Al	mg/l	36	0.67	<0.02	<0.190	0.184
ALKALINITY		mg/l $CACO_3$	36	105.0	89.0	95.43	4.71
ARSENIC	As	mg/l	36	<0.028	<0.002	-	-
BARIUM	Ba	mg/l	36	0.86	<0.03	<0.317	0.209
BERYLLIUM	Be	mg/l	36	<0.005	<0.005	-	-
CALCIUM	Ca	mg/l	36	56.800	32.270	44.0766	5.7174
CADMIUM	Cd	mg/l	36	0.004	<0.002	-	-
CHLORIDE	Cl	mg/l	36	89	25	38.67	16.54
CYANIDE	Cn	mg/l	28	<0.02	<0.02	-	-
COLOR		color units	36	40	5	14.03	13.14
CHROMIUM	Cr	mg/l	36	0.19	<0.02	-	-
COPPER	Cu	mg/l	36	<0.01	<0.01	-	-
DISSOLVED OXYGEN	DO	mg/l	36	13.3	8.6	10.50	1.40
FLUORIDE	F	mg/l	36	0.6	<0.2	<0.24	0.10
FECAL COLIFORMS		cts/100 ml	36	166	1	27.67	33.66
IRON	Fe	mg/l	36	0.46	<0.02	<0.132	0.144
MERCURY	Hg	mg/l	36	0.005	<0.001	<0.0017	0.0013
POTASSIUM	K	mg/l	36	3.625	1.281	1.8830	0.6900
MAGNESIUM	Mg	mg/l	36	17.653	7.757	10.522	3.015
MANGANESE	Mn	mg/l	36	0.06	<0.01	<0.014	0.009
SODIUM	Na	mg/l	36	37.740	9.915	21.1745	9.3764
AMMONIA NITROGEN	NH_3N	mg/l-N	36	0.45	0.10	0.263	0.086
NICKEL	Ni	mg/l	36	0.03	<0.02	-	-
NITRATE NITROGEN	NO_3N	mg/l-N	36	0.506	0.035	0.2412	0.1273
ORTHOPHOSPHATE		mg/l-P	36	0.058	0.002	0.0117	0.0107
ORGANIC NITROGEN		mg/l	31	1.19	0.05	0.436	0.348
LEAD	Pb	mg/l	36	<0.05	<0.05	-	-
pH		units	36	8.5	7.9	8.16	0.14
PHENOLS		mg/l	36	0.018	<0.001	0.0033	0.0055
SELENIUM	Se	mg/l	36	0.082	<0.001	<0.0241	0.0260
SETTLEABLE SOLIDS		ml/l	36	0.2	<0.1	0.006	0.033
SILICATE	SiO_2	mg/l	36	1.68	<0.04	-	-
SULFATE	SO_4	mg/l	36	41	23	29.58	4.77

TABLE IV-5 (Continued)

MONTHLY WATER QUALITY VALUES AT NMPP/FITZ TRANSECT
(Continued)

NINE MILE POINT VICINITY - 1976

PARAMETER	ABBREVIATION	UNITS	NO. OF SAMPLES	MAXIMUM	MINIMUM	MEAN	STANDARD DEVIATION
SPECIFIC CONDUCTANCE		μmho/cm @ 25°C	36	590	296	366.61	75.28
SURFACTANTS		mg/l	36	0.078	0.002	0.0224	0.0175
TEMPERATURE	T	°C	36	20.6	0.4	12.48	5.62
BIOCHEMICAL OXYGEN DEMAND (BOD_5)	BOD	mg/l	36	5	1	1.92	0.97
CHEMICAL OXYGEN DEMAND	COD	mg/l	36	22	5	11.42	3.64
TOTAL COLIFORMS		cts/100 ml	32[c]	772[c]	8	-	-
TOTAL DISSOLVED SOLIDS		mg/l	36	366	181	224.33	43.91
TOTAL KJELDAHL NITROGEN	TKN	mg/l-N	35	1.50	0.23	0.641	0.348
TOTAL PHOSPHORUS		mg/l-P	36	0.110	0.010	0.0274	0.0176
TOTAL SOLIDS	TS	mg/l	36	392	185	234.89	49.26
TOTAL SUSPENDED SOLIDS	TSS	mg/l	36	69	2	10.58	12.91
TOTAL ORGANIC CARBON	TOC	mg/l	24[d]	15	<1	<7.29	4.40
TURBIDITY		FTU	36	26	1	4.47	5.23
TOTAL VOLATILE SOLIDS	TVS	mg/l	36	126	36	69.89	17.99
VANADIUM	V	mg/l	36	<0.2	<0.2	-	-
ZINC	Zn	mg/l	36	0.120	<0.005	<0.0139	0.0263

[a]FitzPatrick Monthly Water Quality Program
[b]Mean not calculated when ≥ 75% of samples are below detection limit
[c]April sample - too numerous to count
[d]Not required prior to 19 Jul
- = Not applicable

TABLE IV-6

MONTHLY WATER CHEMISTRY[a]

NINE MILE POINT VICINITY - 1976

PARAMETERS	ABBREVIATIONS	UNITS	NO. OF SAMPLES	MAXIMUM	MINIMUM	MEAN[b]	STANDARD DEVIATION
CALCIUM	Ca	mg/l	46	59.000	35.328	41.8031	4.5073
CHROMIUM	Cr	mg/l	46	<0.02	<0.02	-	-
DISSOLVED OXYGEN	DO	mg/l	54	13.9	8.4	10.66	1.66
SODIUM	Na	mg/l	46	42.000	11.403	18.4133	7.4975
pH		Units	54	8.6	8.1	8.37	0.16
SULFATE	SO_4	mg/l	54	60	22	29.37	6.38
TEMPERATURE	T	°C	54	21.4	0.2	12.90	6.25
TOTAL PHOSPHORUS		mg/l-P	54	0.043	0.006	0.0211	0.0078
TOTAL SOLIDS	TS	mg/l	54	463	177	230.6	47.7
TOTAL SUSPENDED SOLIDS	TSS	mg/l	54	11	2	4.4	2.4

[a]Nine Mile Point Monthly Water Quality Program; 20 and 40 ft contours along NMPW, NMPP/FITZ, and NMPE Transects

[b]Mean not calculated when ≥75% of samples are below detection limit

TABLE IV-7

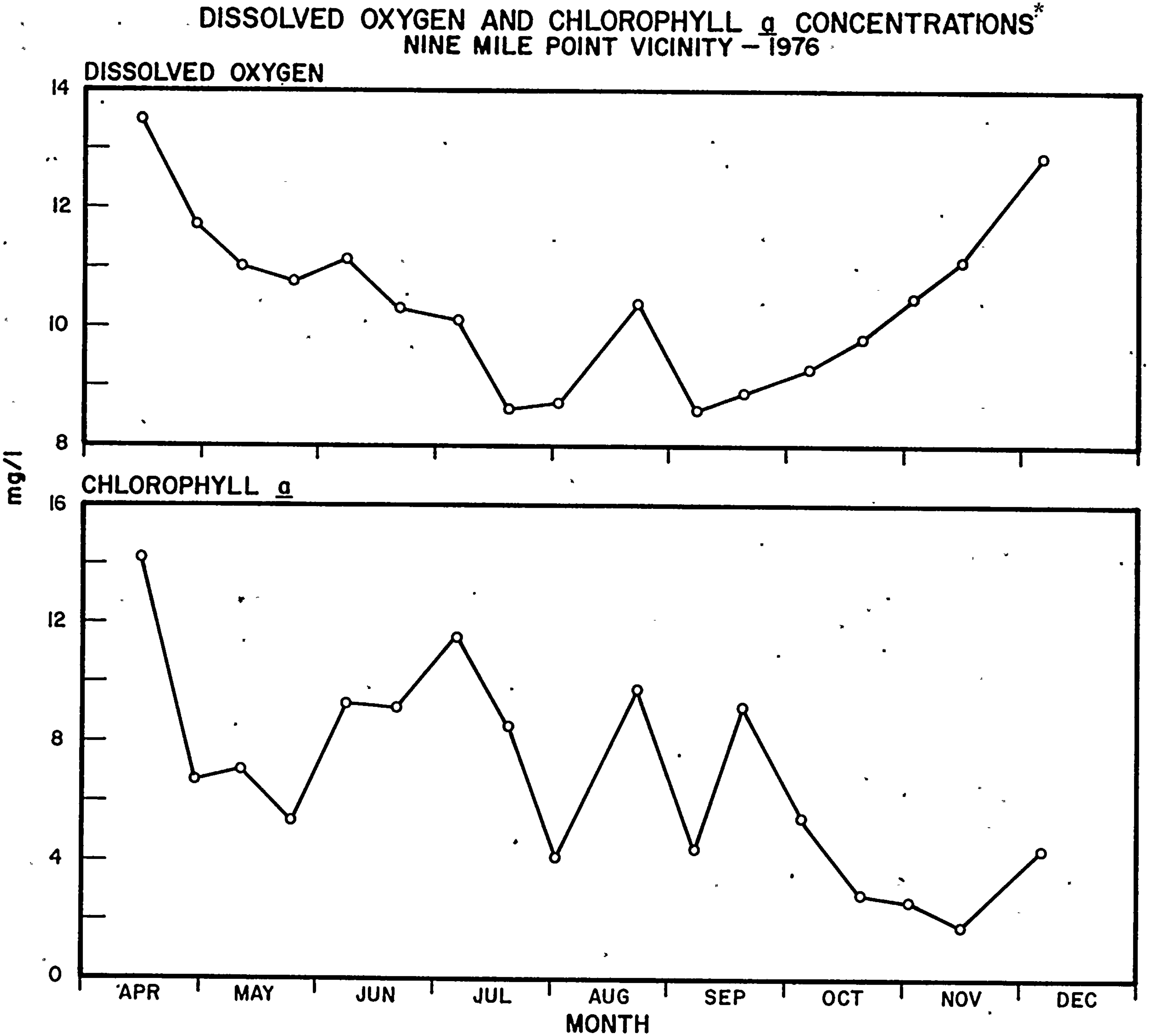
TWICE MONTHLY WATER CHEMISTRY (BIOLOGICAL WATER)[a]

NINE MILE POINT VICINITY - 1976

PARAMETER	ABBREVIATION	UNITS	NO. OF SAMPLES	MAXIMUM	MINIMUM	MEAN[b]	STANDARD DEVIATION
CHLOROPHYLL A		μg/1	102	17.8	<0.1	<6.83	3.86
CARBON DIOXIDE	CO_2	mg/1	101	4	0	1.62	0.91
DISSOLVED OXYGEN	DO	mg/1	102	13.9	8.4	10.44	1.43
AMMONIA NITROGEN	NH_3N	mg/1-N	102	0.508	0.044	0.229	0.100
NITRATE NITROGEN	NO_3N	mg/1-N	102	0.476	0.013	0.201	0.135
ORTHOPHOSPHATE		mg/1-P	102	0.036	0	0.0085	0.0079
pH		Units	102	8.8	7.9	8.33	0.22
SILICATE	SiO_2	mg/1	102	5.6	<0.02	–	–
SPECIFIC CONDUCTANCE		μmho/cm @ 25°C	102	695	268	363.66	67.34
TEMPERATURE	T	°C	102	26.1	-0.6	13.83	6.28
BIOCHEMICAL OXYGEN DEMAND (BOD_5)	BOD	mg/1	102	7	1	1.94	1.02
CHEMICAL OXYGEN DEMAND	COD	mg/1	102	40	2	13.46	6.70
TOTAL KJELDAHL NITROGEN	TKN	mg/1-N	101	0.96	0.05	0.521	0.212
TOTAL PHOSPHORUS		mg/1-P	101	0.066	0.004	0.0222	0.0119
TOTAL SOLIDS	TS	mg/1	102	463	177	226.18	44.72
TOTAL SUSPENDED SOLIDS	TSS	mg/1	102	22	1	5.23	4.25
TURBIDITY		FTU	102	7	1	2.99	1.55

[a]FitzPatrick Bimonthly Water Quality Porgram; 20 and 60 ft contours along NMPW, NMPP/FITZ, NMPE Transects

[b]Mean not calculated when ≥75% of samples are below detection limit



*MEAN OF ALL DEPTH CONTOURS AND TRANSECTS FROM TWICE MONTHLY COLLECTIONS, SURFACE SAMPLES

FIGURE IV-4

maintain and protect aquatic life in the Nine Mile Point vicinity. The percent saturation of DO in the Nine Mile Point vicinity during 1976 never fell below 86% and was as high as 127%.

- Chlorophyll a

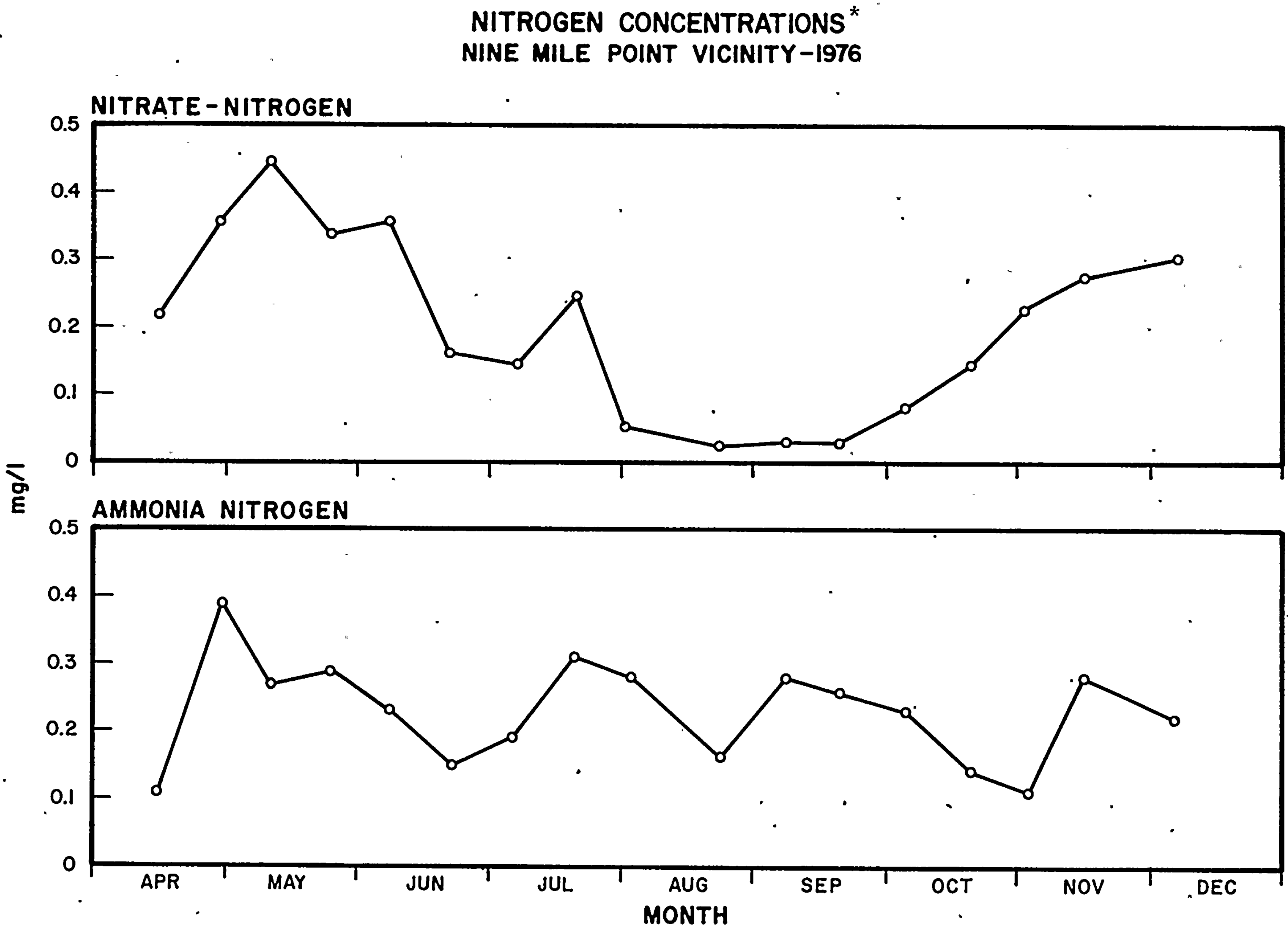
Chlorophyll a reflects the extent of phytoplankton activity in the Nine Mile Point vicinity. A time series plot of surface measurements of chlorophyll a, averaged over depth contour and transect, is shown in Figure IV-4. Surface chlorophyll concentrations show four peaking periods occurring in mid-April, late June/early July, mid-August, and mid-September.

- Nitrogen

Ammonia-nitrogen (NH_3N) and nitrate-nitrogen (NO_3N) are products of excretion and nutrients for growth. Figure IV-5 shows time series plots of surface concentrations of soluble NH_3N and NO_3N averaged over depth contour and transect. Concentrations of NO_3N are high in the spring months, gradually decline to a low in the summer months, and rise in the fall and winter months. The NO_3N peaks in spring and fall most likely correspond to periods of mixing in the Nine Mile Point vicinity, when nitrates from bottom sediments replenish the water column.

- Calcium, Sodium, and Sulfate

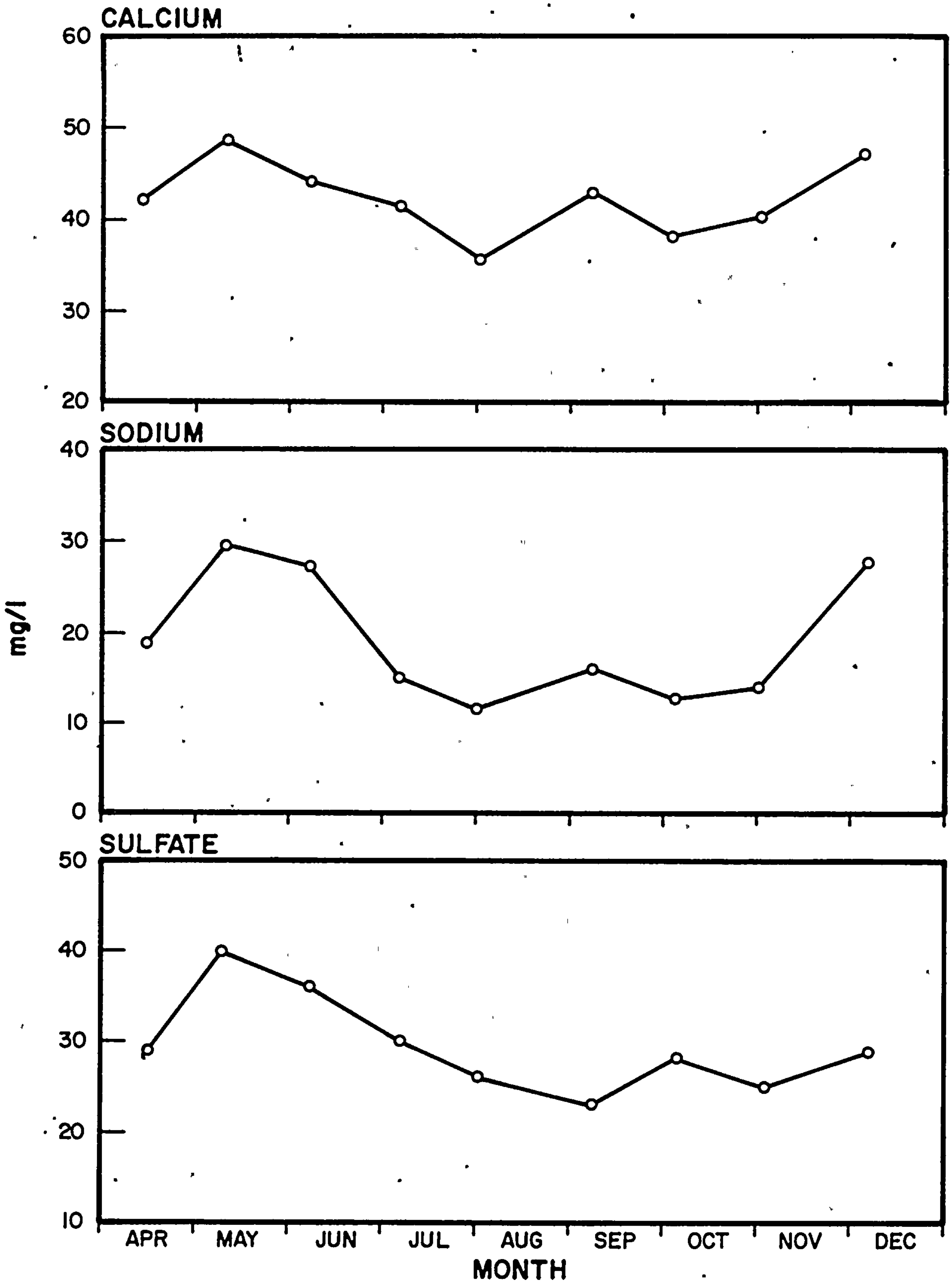
Seasonal variations in the surface concentrations of three major ionic forms (Ca, Na and SO_4) are presented in Figure IV-6. Similarities are apparent, i.e., high concentrations occur in spring and fall with the lowest concentrations observed during the summer months. Such seasonal variations are attributed to the natural hydrological cycle of high tributary input (i.e., primarily the



*MEAN OF ALL DEPTH CONTOURS AND TRANSECTS FROM TWICE MONTHLY COLLECTIONS, SURFACE SAMPLES

FIGURE IV-5

CONCENTRATIONS OF CALCIUM, SODIUM AND SULFATE*
NINE MILE POINT VICINITY - 1976



*MEAN OF ALL DEPTH CONTOURS AND TRANSECTS FROM MONTHLY COLLECTIONS, SURFACE SAMPLES; 20 and 40 ft CONTOURS AT NMPW, NMPP/FITZ AND NMPE

Oswego River) during the spring and fall with low inputs during the summer. No consistent spatial trends in the concentrations of these parameters (Appendices IVB and IVC) were observed, indicating no measurable plant effect.

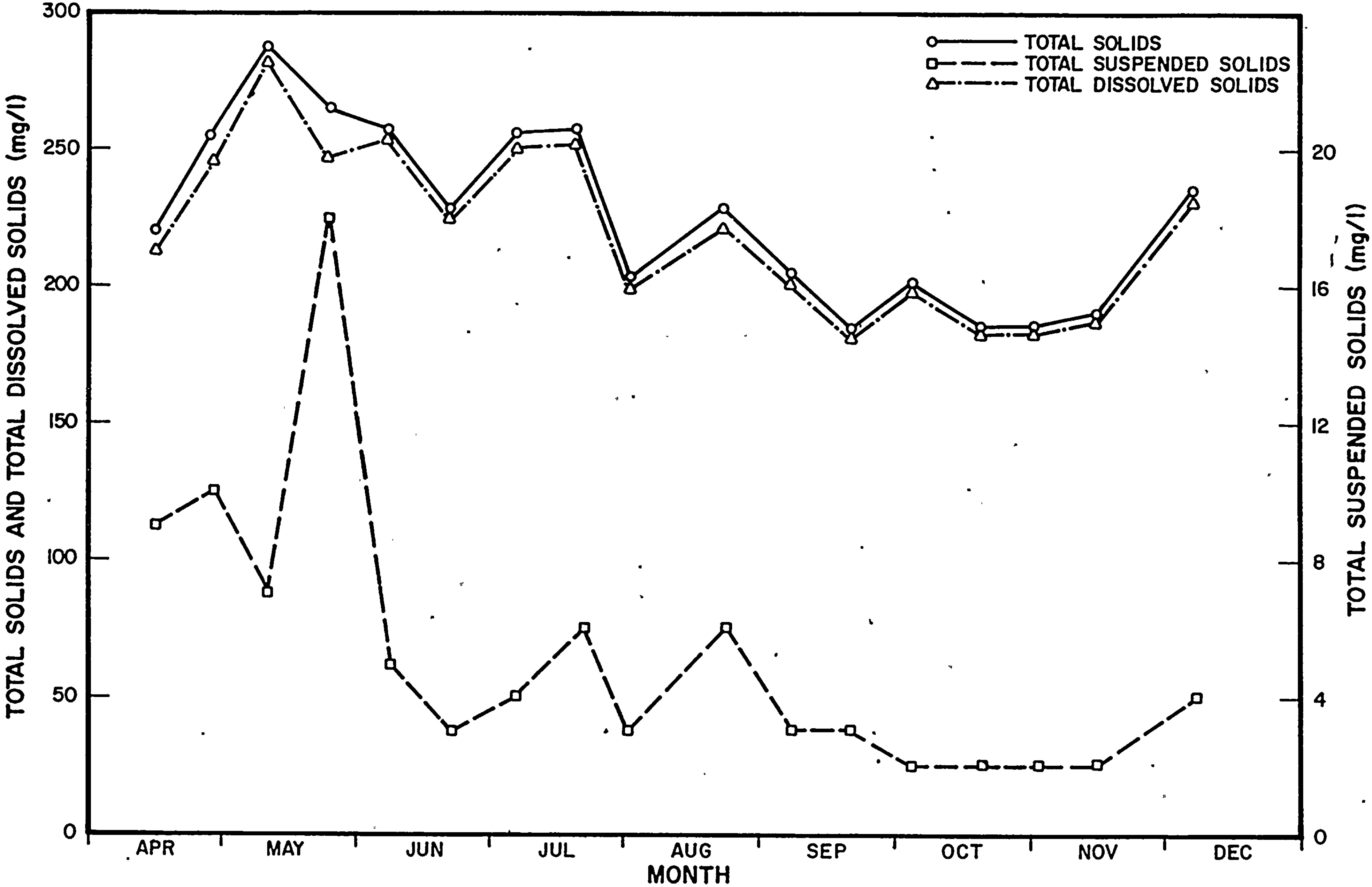
- Solids

Figure IV-7 presents the seasonal variations in surface concentrations of total solids (TS), total suspended solids (TSS), and total dissolved solids (TDS) as measured in the Nine Mile Point vicinity averaged over all depth contours and transects. A table summarizing the actual surface measurements for each station is presented in Appendices IVA, IVC, and IVD-4. Both TS and TDS (a measure of dissolved salts) show similar seasonal fluctuations with no discernible effect of plant operation on the spatial distributions. The spatial distributions do, however, show generally higher values for TS and TDS at NMPW transect. This trend is attributed to the greater influence of the Oswego River plume at the west transect.

C. CONCLUSIONS

The natural lake temperature cycle in the vicinity of Nine Mile Point Nuclear Station Unit 1 during 1976 consisted of the normal seasonal cycle with natural short-term variations imposed due to variable meteorological conditions and cold water intrusions from deeper areas of the lake. The NMPE and NMPW transects exhibited similar temperature characteristics with few substantial differences in the monthly mean values of surface temperature or vertical stratification at the 15, 20, and 40-ft depth contours. The NMPP transect exhibited consistently higher temperatures than both NMPE or NMPW, as well as those recorded at the FITZ transect. The FITZ

CONCENTRATIONS OF SOLIDS *
NINE MILE POINT VICINITY-1976



*MEAN OF ALL DEPTH CONTOURS AND TRANSECTS FROM TWICE MONTHLY COLLECTIONS, SURFACE SAMPLES

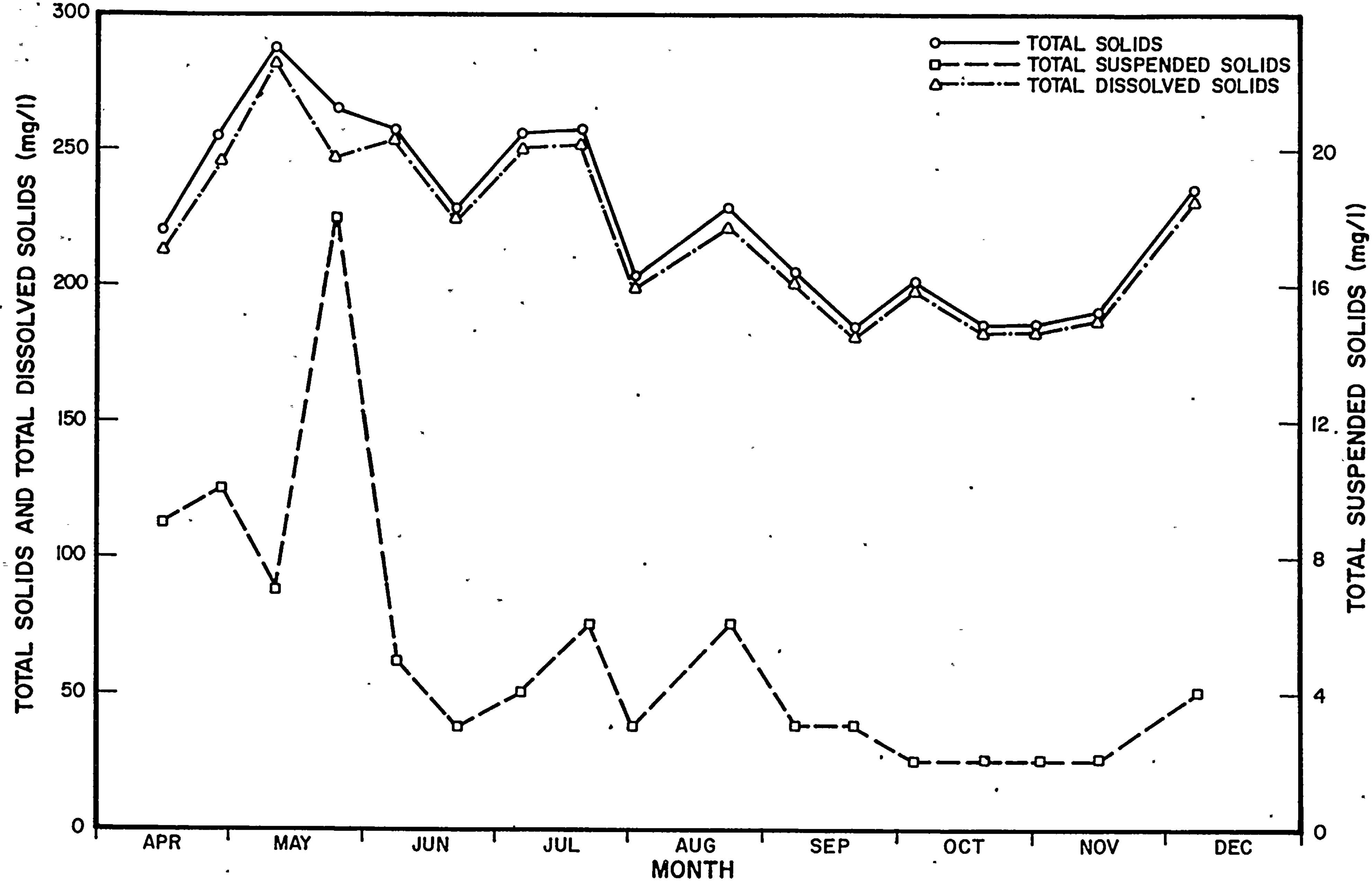
FIGURE IV-7

transect showed some temperature effects when compared to NMPE and NMPW, but the effects were generally of a lesser magnitude than those measured at NMPP.

The conclusions of the temperature data analysis are that the Nine Mile Point Nuclear Station Unit 1 discharge affects the lake surface temperatures, especially in the nearshore region. The James A. FitzPatrick Nuclear Power Plant discharge appears to have less of a temperature effect, although some of the observed temperature effects at the NMPP-40-ft station are probably attributable to the FitzPatrick plume. The greater temperature influence of the Nine Mile Point plume is attributable to the low-velocity shallow discharge as compared to the high-velocity deeper FitzPatrick diffuser.

No effect of the power plant operation on water quality other than temperature were discernible from the data. The presence of Oswego River water at the west transect was indicated by generally higher values of total solids and total dissolved solids at NMPW than at either the plant transects or at NMPE transect.

CONCENTRATIONS OF SOLIDS *
NINE MILE POINT VICINITY-1976



*MEAN OF ALL DEPTH CONTOURS AND TRANSECTS FROM TWICE MONTHLY COLLECTIONS, SURFACE SAMPLES

FIGURE IV-7

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American Public Health Association (APHA). 1976. Standard method for the examination of water and wastewater. 14th ed. Amer. Public Health Assoc., Amer. Water Works Assoc. and Water Poll. Cont. Fed., Washington, D.C. 1193p.

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V. PLANKTON

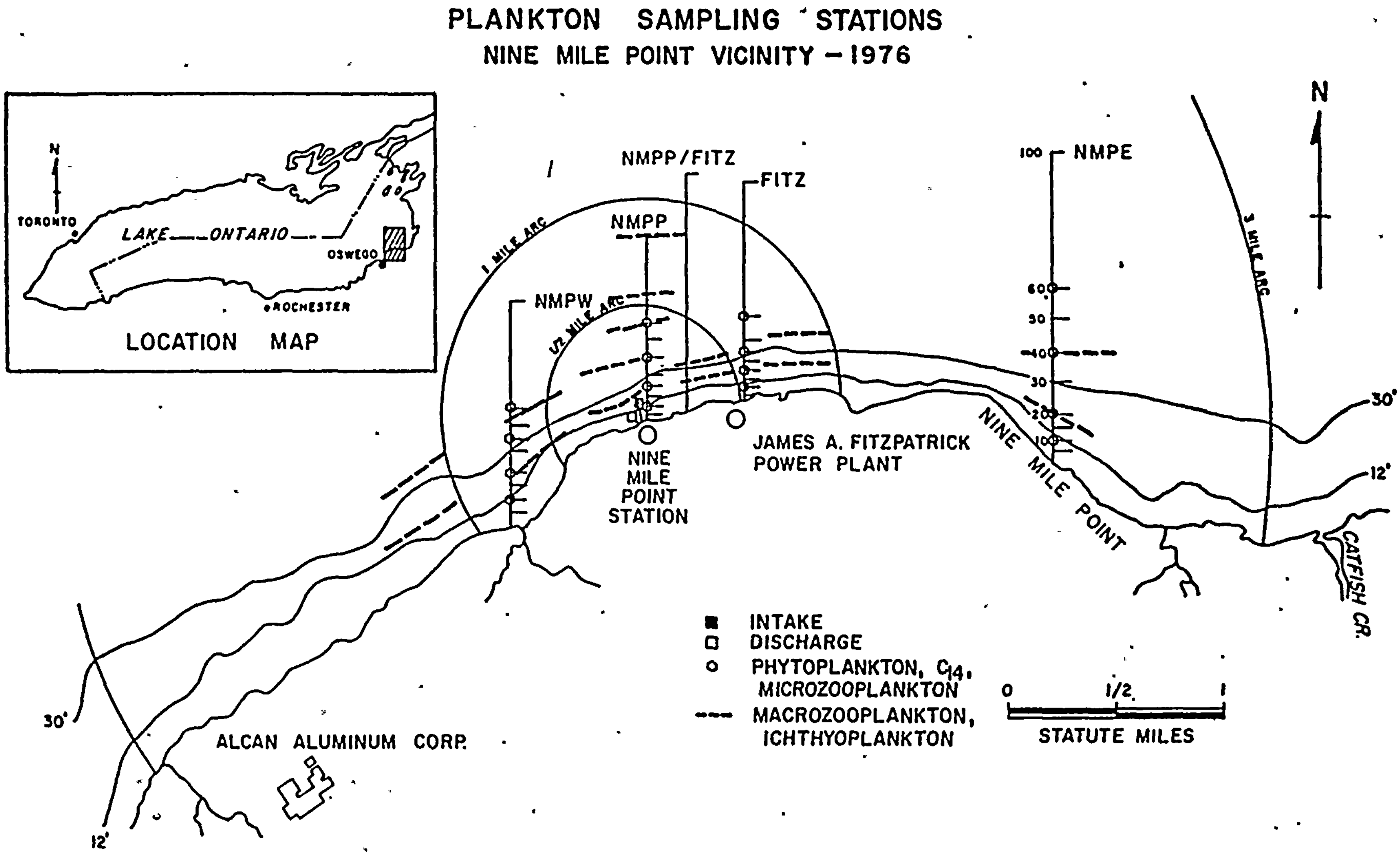
A. PHYTOPLANKTON

1. Introduction and Materials and Methods

Phytoplankton are microscopic plants distributed throughout the water column. They contain chlorophyll pigments which, through the process of photosynthesis, convert inorganic materials to organic matter by utilizing the sun's energy. This primary production of organic matter provides a food source for planktonic and benthic invertebrates and constitutes part of the base of the Lake Ontario food web.

The primary productivity of a lake is a function of the phytoplankton standing crop and its growth rate, which is influenced primarily by temperature, nutrient availability, and light. Standing crop at a particular site may be affected by water circulation phenomena (e.g., upwelling, downwelling, advection) which dilute or disperse the phytoplankton; sinking of the phytoplankton; grazing by zooplankton, epibenthic invertebrates, and fish larvae; and by variations in phytoplankton growth rate. The effects of these and other factors on Lake Ontario phytoplankton are reviewed in LMS (1975).

The techniques used to evaluate the phytoplankton community in the Nine Mile Point vicinity are essentially the same as those used in 1975 and are described in Appendix I, except that samples for ^{14}C determination were incubated in situ in 1975 and in the laboratory in 1976. The frequency of sampling is shown in Table VA-1 and the locations sampled are shown on Figure VA-1.



PLANKTON SAMPLING STATIONS
NINE MILE POINT VICINITY - 1976
N
TORONTO
LAKE ONTARIO
OSWEGO
ROCHESTER
LOCATION MAP
NMPP/FITZ
FITZ
NMPP
NMPW
NMPE
1 MILE ARC
1/2 MILE ARC
3 MILE ARC
100
60
50
40
30
20
10
NINE MILE POINT STATION
JAMES A. FITZPATRICK POWER PLANT
NINE MILE POINT
CATFISH CR.
30'
12'
INTAKE
DISCHARGE
PHYTOPLANKTON, C14, MICROZOOPLANKTON
MACROZOOPLANKTON, ICHTHYOPLANKTON
0
1/2
1
STATUTE MILES
ALCAN ALUMINUM CORP.

FIGURE VA-1

TABLE VA-1

PLANKTON SAMPLING PROGRAM

NINE MILE POINT VICINITY - 1976

DATE	PHYTOPLANKTON[a]	ZOOPLANKTON	MACROZOOPLANKTON[b]	LARVAE
7 APR				D
14			D	D
21				D
29				D
30	D			
13 MAY			D	D
22				D
26				D
27	D			
28		D		
2 JUN				D N
9				D N]
10				N]
16			D N	D] N
17	D	D]		D]
18		D]		
23				D N]
30				D
1 JUL				N]
7				D N
15			D N	D N
21				D N
28	D	D		D N
4 AUG				D N
11				D N
18			D N	D N
25				D N
26	D	D]		
27		D]		
1 SEP				D]
2				N
3				N]
8			D N	D N
15				D N
23	D	D]		
25				D]
26		D]		D]
29				D]
30				D]
6 OCT			D	D
13				D]
15				D]
19	D	D		
20				D
30				D
3 NOV			D	D
12				D
16	D	D		
26				D
4 DEC				D
10			D	D
14	D]			
19	D]	D		D

[a]Includes Phytoplankton enumeration, Carbon-14, and Chlorophyll *a* programs

[b]*Gammarus fasciatus*, *Pontoporeia affinis*, and *Mysis oculata relicta* only from night collections

] = One collection D = Day collection N = Night collection

2. Results and Discussion

a. Community Composition

The phytoplankton taxa identified in surface samples from the Nine Mile Point vicinity during 1976 are presented in Table VA-2. A total of 247 taxa were identified and include 32 Myxophyceae, 104 Chlorophyceae, 5 Euglenophyceae, 24 Chrysophyceae, 52 Bacillariophyceae, 20 Cryptophyceae, and 10 Dinophyceae.

In all, 178 taxa (Table VA-3) were identified from the 50%, 25%, and 1% light transmittance levels at the NMPE-40-ft station. The 50% light level samples were collected 0.2-0.5 meters below the surface, the 25% light level samples were collected 0.5-2.0 meters below the surface, and the 1% light level samples were collected 3.0-12.0 meters below the surface (Appendix VA-1). The taxa collected at the NMPE-40-ft station include 18 Myxophyceae, 79 Chlorophyceae, 2 Euglenophyceae, 17 Chrysophyceae, 36 Bacillariophyceae, 17 Cryptophyceae, and 9 Dinophyceae.

b. Seasonal and Spatial Patterns

Phytoplankton data from the April through December sampling period were summarized for each major algal division (i.e., class taxonomic level), for all phytoplankton combined, and for selected species (species taxonomic level), which were those comprising at least 10% of the total phytoplankton abundance at any station for a minimum of two months.

TABLE VA-2

OCCURRENCE OF PHYTOPLANKTON BY DATE

NINE MILE POINT VICINITY - 1976

TAXON	30 APR	27 MAY	17 JUN	28 JUL	26 AUG	23 SEP	19 OCT	16 NOV	14 DEC
MYXOPHYCEAE									
ANACYSTIS SP.						X			
ANACYSTIS AERUGINOSA				X	X	X			
ANACYSTIS INCERTA				X					
APHANOCAPSA DELICATISSIMA					X	X	X	X	
CHROOCOCCUS LIMNETICUS						X	X	X	
CHROOCOCCUS MINUTUS					X				
CHROOCOCCUS DISPERSUS	X	X	X	X	X	X	X	X	X
CHROOCOCCUS DISPERSUS VAR. MINOR	X	D	D	D	D	D	D	D	X
COELOSPHAERIUM KUETZINGIANUM					X	D	D	X	D
COELOSPHAERIUM NAEGELIANUM			X		X	X	X	X	X
GOMPHOSPHAERIA LACUSTRIS	X	X	X		X	X	X	X	X
MERISMOPEDIA TENUISSIMA			X	X	X	X		X	
SYNECHOCCUS SP.						X			
MARSONIELLA ELEGANS			X						
LYNGBYA LIMNETICA						X	X		X
LYNGBYA MAJOR						X			
OSCILLATORIA SP.									X
OSCILLATORIA AGARDHII			X	X		X	X	X	X
OSCILLATORIA LIMNETICA	D	D	D	X	X	X	D	D	X
OSCILLATORIA TENUIS						X	X		
OSCILLATORIA GEMINATA			X			X		X	
OSCILLATORIA MINIMA				X		X			X
OSCILLATORIA AMPHIBIA		X	X	X	X	X	X		
PHORMIDIUM SP.			X				D	D	D
PHORMIDIUM MUCICOLA				X					
RHAPHIDIOPSIS SP.				X	X	X	X	X	
ANABAENA SP.	X	X	X	X	X		X		
ANABAENA CIRCINALIS					X	X		X	X
ANABAENA FLOS-AQUAE					X		X	X	X
ANABAENA SPIROIDES					X	X			
ANABAENA PLANCTONICA					X	X			
APHANIZOMENON FLOS-AQUAE		X	X	X	X	D	X	X	X
CHLOROPHYCEAE									
CARTERIA SP.		X			X	X	X	X	X
CARTERIA CORDIFORMIS	X	X		X	X	X	X	X	
CHLAMYDOMONAS SP.	X	X	X	X	X	X	X	X	X
CHLAMYDOMONAS GLOBOSA	X								
EUDORINA ELEGANS	X	X		X	X	X	X	X	X

TAXON	DATE								
	30 APR	27 MAY	17 JUN	28 JUL	26 AUG	23 SEP	19 OCT	16 NOV	14 DEC
CHLOROPHYCEAE(cont.)									
PANDORINA MORUM		X	X	X	X	X	X	X	
PEDINOMONAS MINUTISSIMA	X	X							
LOBOMONAS AMPLA				X					
POLYTOMA SP.			X				X	X	X
POLYTOMA MICROSPHAERICUM	X								
POLYTOMA GRANULIFERUM	X	X	X			X	X	X	X
GYROMITUS SP.						X	X		
POLYTOMELLA SP.	X	X							
ELAKOTOTHRIX GELATINOSA								X	
GLOEOCYSTIS SP.		X							
GLOEOCYSTIS GIGAS				X	X	X	X		X
GLOEOCYSTIS PLANKTONICA								X	
SPHAEROCYSTIS SCHROETERI		X	X	X	X	X	X	X	X
TETRASPORA LACUSTRIS		X	X	X	X	X	X		
GEMINELLA MUTABILIS								X	
ULOTHRIX SP.								X	X
ULOTHRIX SUBTILISSIMA							X		
OEDOGONIUM SP.		X	X		X	X	X	X	X
MOUGEOTIA SP.	X	X	X	X	X	X	X	X	X
CLOSTERIUM SP.		X	X		X	X	X	X	X
CLOSTERIUM ACICULARE	X	X	X	X	X	X	X	X	X
CLOSTERIUM VENUS					X	X			
CLOSTERIUM GRACILE						X	X	X	X
COSMARIUM SP.		X	X	X	X	X	X	X	X
STAURASTRUM SP.	X		X	X	X	X	X	X	X
ACTINASTRUM HANTZSCHII	X	X	X	X	X	X			
ANKISTRODESMUS FALCATUS	X	X	X	X	X	X	X	X	X
ANKISTRODESMUS SPIROTAENIA	X	X	X	X	X	X	X	X	X
ANKISTRODESMUS NANNOSELENE	X	X	X	X	X	X	X	X	X
CHODATELLA CILIATA					X	X	X	X	X
CHODATELLA CITRIFORMIS						X	X		X
CHODATELLA SUBSALSA			X			X	X		
CHODATELLA QUADRISETA	X	X	X	X	X	X	X	X	X
CHLORELLA SP.			X	X	X	X	X	X	X
CLOSTERIOPSIS LONGISSIMA				X	X				
COELASTRUM CAMBRICUM				X	X		X		
COELASTRUM MICROPORUM	X	X	X	X	X	X	X	X	X
COELASTRUM RETICULATUM					X	X	X	X	X
COELASTRUM SPHAERICUM							X		
CRUCIGENIA RECTANGULARIS				X					
CRUCIGENIA IRREGULARIS				X					
CRUCIGENIA TETRAPEDIA	X		X	X	X	X	X	X	
DICTYOSPHAERIUM EHRENBERGIANUM			X			X			
DICTYOSPHAERIUM PULCHELLUM	X	X	X	X	X	X	X		X
DICTYOSPHAERIUM ELEGANS	X			X	X	X	X		X
ECHINOSPHAERELLA LIMNETICA			X	X	X	X	X		
ERRERELLA BORNHEMIENSIS				X	X	X			
FRANCEIA DROESCHERI		X	X	X	X	X	X	X	X
FRANCEIA OVALIS		X				X			
GOLENKINIA RADIATA	X	X	X	X	X	X	X	X	
KIRCHNERIELLA CONTORTA	X	X	X	X	X	X	X	X	
KIRCHNERIELLA OBESA				X					

TABLE VA-2 (Continued)

TAXON	DATE 30 APR	27 MAY	17 JUN	28 JUL	26 AUG	23 SEP	19 OCT	16 NOV	14 DEC
CHLOROPHYCEAE (cont.)									
KIRCHNERIELLA SUBSOLITARIA				X	X				
MICRACTINIUM PUSILLUM	X	X	X	X	X	X		X	
NEPHROCYTIUM AGARDIANUM				X					
NEPHROCYTIUM LIMNETICUM					X				
OOCYSTIS SP.	X	X	X	X	X	X	X	X	
OOCYSTIS BORGEI	X	X	X	X	X	X	X	X	X
OOCYSTIS LACUSTRIS					X		X	X	X
OOCYSTIS PARVA	X	X		X	X	X	X	X	X
OOCYSTIS PUSILLA	X	X	X	X	X	X	X	X	X
OOCYSTIS SOLITARIA	X					X	X		
OOCYSTIS SUBMARINA		X				X	X		
PEDIASTRUM BORYANUM		X	X	X	X	X	X	X	X
PEDIASTRUM DUPLEX	X	X		X	X	X	X		X
PEDIASTRUM SIMPLEX					X	X	X	X	X
PEDIASTRUM TETRAS				X	X	X	X	X	
QUADRIGULA CHODATII	X	X	X	X					
QUADRIGULA LACUSTRIS		X			X				
SCENEDESMUS ABUNDANS	X	X	X	X	X	X	X	X	X
SCENEDESMUS ACUMINATUS		X		X		X	X	X	
SCENEDESMUS BIJUGA	X	X	X	X	X	X	X	X	X
SCENEDESMUS DENTICULATUS			X	X	X	X	X	X	X
SCENEDESMUS DIMORPHUS	X	X	X	X	X	X	X	X	X
SCENEDESMUS INCRASSATULUS					X				
SCENEDESMUS LONGUS								X	
SCENEDESMUS OBLIQUUS				X					
SCENEDESMUS OPOLIENSIS	X	X	X	X		X	X		
SCENEDESMUS QUADRICAUDA	X	X	X	X	X	X	X	X	X
SCENEDESMUS BIJUGATUS			X	X					
SCENEDESMUS INTERMEDIUS			X	X		X	X		
SCENEDESMUS BIJUGA V. FLEXUOSUS				X					
SCHROEDERIA JUDAYI		X		X	X	X	X	X	X
SCHROEDERIA SETIGERA	X	X	X	X	X	X	X	X	X
SELENASTRUM GRACILE	X								
SELENASTRUM MINUTUM	X	X	X	X	X	X	X	X	X
TETRAEDRON SP.					X	X	X		
TETRAEDRON CAUDATUM	X	X	X	X		X			
TETRAEDRON MINIMUM	X			X	X	X	X	X	X
TETRAEDRON MUTICUM	X			X	X	X			
TETRAEDRON REGULARE			X	X	X				
TETRASTRUM HETERACANTHUM	X	X	X	X	X	X		X	X
TETRASTRUM STAUROGENIAEFORME	X	X	X	X	X	X	X	X	X
TETRASTRUM ELEGANS	X	X							
TREUBARIA SETIGERUM	X	X				X	X		
TREUBARIA TRIAPPENDICULATA	X	X	X	X			X	X	
TROCHISCIA SP.						X			
CORANASTRUM AESTIVALE				X					
PARAMASTIX SP.	X	X						X	

TABLE VA-2 (Continued)

TAXON	DATE								
	30 APR	27 MAY	17 JUN	28 JUL	26 AUG	23 SEP	19 OCT	16 NOV	14 DEC
EUGLENOPHYCEAE									
EUGLENA GASTEROSTEUS	X	X	X						X
PHACUS SP.				X		X			
PHACUS PYRUM	X	X							
TRACHELOMONAS SP.		X							
LEPOCINCLIS SP.	X								
CHRYSOPHYCEAE									
DINOBRYON SP.						X	X		
DINOBRYON BAVARICUM			X					X	
DINOBRYON SOCIALE	X	X	X	X				X	X
DINOBRYON SOCIALE VAR. AMERICANUM								X	X
MALLOMONAS SP.	X	X	X	X	X	X	X	X	X
CHRYSOCHROMULINA PARVA	X	X	D	X	X	X	X	X	X
CHROMULINA SP.	X	X	X	X	X	X	X	X	X
STELEXMONAS DICHOTOMA	X	X							X
KEPHYRION SP.	X								
AULOMONAS PURDYI	X	X					X	X	X
RHIZOCHRYSIS SP.	X	X	X		X	X	X	X	X
CHRYSOCOCCUS SP.	X		X			X			
CHRYSAMOEBA SP.	X								
OCHROMONAS SP.	X	X	X	X	X	X	X	X	X
UROGLENA SP.	X	X	X					X	X
CODONOSIGA BOTRYTIS	X	X	X				X		
CODONOSIGA FURCATA						X	X		
BICOECA SP.	X	X	X	X		X	X	X	X
BICOECA CRYSTALLINA	X	X							
CODONOSIGOPSIS ROBINI	X	X	X				X	X	
MONOSIGA OVATA						X	X	X	X
MONAS SP.	X	X	X	X	X	X	X	X	X
BODO SP.	X	X				X	X		
ERKENIA SUBAEQUICILATA	X	X							
BACILLARIOPHYCEAE									
COSCINODISCUS ROTHII		X		X	X	X	X	X	
CYCLOTELLA ATOMUS	X	X	X	D	X	X	X	D	D
CYCLOTELLA GLOMERATA	X	X	X	X	X	X	X	X	
CYCLOTELLA MENEGHINIANA	X	X	X	D	X	X	X	X	X
MELOSIRA BINDERANA	D	X	X			X		X	X
MELOSIRA DISTANS	X	X	X	X				X	
MELOSIRA GRANULATA			X		X	X			
MELOSIRA ISLANDICA	X	X	X					X	X
MELOSIRA ITALICA		X	X			X			
MELOSIRA ITALICA VAR. SUBARCTICA	X	X	X	X		X	X	X	

TABLE VA-2 (Continued)

TAXON	30 APR	27 MAY	17 JUN	28 JUL	26 AUG	23 SEP	19 OCT	16 NOV	14 DEC
BACILLARIOPHYCEAE(cont.)									
MELOSIRA GRANULATA VAR. ANGUSTISSIMA				X		X	X		
RHIZOSOLENIA SP.								X	X
STEPHANODISCUS ASTREA	X			X		X	X	X	
STEPHANODISCUS HANTZSCHII	D	X	X	X		X	X	X	D
STEPHANODISCUS NIAGARAE	X		X			X	X		X
STEPHANODISCUS ASTREA VAR. MINUTULA	X	X	X	X	X	X	X	X	X
ACHNANTHES SP.						X			
AMPHIPRORA SP.	X								
ASTERIONELLA FORMOSA	X	X	X	X		X	X	X	X
CYMATOPLEURA SOLEA	X	X							
DIATOMA ELONGATUM	X	X	X			X	X	X	X
DIATOMA VULGARE	X	X				X	X	X	
DIATOMA ELONGATUM V. TENUIS	X	X	X			X	X		
FRAGILARIA SP.									X
FRAGILARIA CAPUCINA	X	X	X	X	X	X	X	X	X
FRAGILARIA CROTONENSIS	X	X	X	X	X	X	X	X	D
FRAGILARIA VAUCHERIAE	X	X	X		X	X		X	
GOMPHONEMA OLIVACEUM		X							X
GYROSIGMA SP.		X							
NAVICULA SP.	X	X					X	X	X
NAVICULA CRYPTOCEPHALA		X							X
NAVICULA TRIPUNCTATA	X							X	X
NAVICULA SALINARUM VAR. INTERMEDIA						X			
NAVICULA LANCEOLATA		X				X		X	
NITZSCHIA SP.	X	X	X	X		X		X	X
NITZSCHIA ACICULARIS	X	X	X	X			X		
NITZSCHIA DISSIPATA	X	X				X		X	X
NITZSCHIA FONTICOLA						X			
NITZSCHIA GRACILIS	X	X	X						
NITZSCHIA HOLSATICA	X	X	X	X		X	X		
NITZSCHIA LINEARIS		X							
NITZSCHIA PALEA	X	X		X	X	X	X	X	
RHOICOSPHENIA CURVATA	X	X	X	X		X		X	X
SURIRELLA SP.			X						
SURIRELLA ANGUSTATA		X				X			
SURIRELLA OVATA				X				X	
SYNEDRA SP.	X	X	X						
SYNEDRA ACUS	X								
SYNEDRA ULNA	X	X	X				X	X	X
SYNEDRA ACUS VAR. RADIANS			X	X		X		X	X
SYNEDRA RUMPENS								X	X
TABELLARIA FENESTRATA		X	X			X	X	X	X
CRYPTOPHYCEAE									
CRYPTOMONAS SP.		X						X	
CRYPTOMONAS EROSA	X	X	X	D	X	X	X	X	X
CRYPTOMONAS OVATA	X	X	X	X	X	X	X	X	X
CRYPTOMONAS EROSA VAR. REFLEXA	X	X	X	X	X	X	X	X	X
CRYPTOMONAS CAUDATA						X			
CRYPTOMONAS MARSSONII			X	X	X	X	X	X	X

TABLE VA-2 (Continued)

TAXON	*DATE* 30 APR	27 MAY	17 JUN	28 JUL	26 AUG	23 SEP	19 OCT	16 NOV	14 DEC
CRYPTOPHYCEAE(cont.)									
CRYPTOMONAS REFLEXA	X	X	X	X	X	X	X	X	X
CRYPTOMONAS ROSTRATA	X	X	X						
CRYPTOMONAS PARAPYRENOIDIFERA	X								
CRYPTOMONAS PYRENOIDIFERA	X	X	X	X	X	X	X	X	X
CRYPTOMONAS CURVATA	X	X				X	X	X	X
CRYPTOMONAS ROSTRATIFORMIS		X	X				X	X	
KATABLEPHARIS OVALIS	X	X	X	X	X	X	X	X	X
RHODOMONAS MINUTA	X	X	X	X	X	X	X	X	X
RHODOMONAS MINUTA VAR. NANNOPLANCTICA*	D	D	X	D	D	X	D	D	X
SENNIA PARVULA		X							
CRYPTAULAX SP.								X	X
CRYPTAULAX RHOMBOIDEA		X							
MONOMASTIX SP.	X						X		
CHILOMONAS PARAMAECIUM		X							
DINOPHYCEAE									
GYMNODINIUM SP.	X	X	X	X		X	X	X	X
GYMNODINIUM HELVETICUM	X	X	X			X	X	X	X
GYMNODINIUM VARIANS	X	X	X	X	X	X	X	X	X
GYMNODINIUM EURYTOPUM		X							
CERATIUM HIRUNDINELLA					X	X	X		
GLENODINIUM SP.	X	X	X	X	X	X	X	X	X
GLENODINIUM PULVISCULUS	X								
PERIDINIUM SP.	X			X	X	X	X	X	
PERIDINIUM ACICULIFERUM	X	X	X		X				
PERIDINIUM CINCTUM			X	X	X	X			

X *PRESENT AT ONE OR MORE STATIONS* ; MEAN OR R-1 AND R-2; SURFACE COLLECTION
D *ABUNDANCE OF 15 PCT. OR MORE AT ONE OR MORE STATIONS* PER DATE

* Identified as Chroomonas acuta in 1975

TABLE VA-3

OCCURRENCE OF PHYTOPLANKTON BY DATE

50, 25, AND 1 PCT. LIGHT TRANSMITTANCE LEVELS AT NMPE 40 STATION

TAXON	30 APR	27 MAY	17 JUN	28 JUL	26 AUG	23 SEP	19 OCT	16 NOV	14,19 DEC
MYXOPHYCEAE									
ANACYSTIS AERUGINOSA				X					
APHANOCAPSA DELICATISSIMA						X		X	
CHROOCOCCUS LIMNETICUS							X		
CHROOCOCCUS DISPERSUS	X		X	X	X		X		
CHROOCOCCUS DISPERSUS VAR. MINOR	X	D	D	D	D	D	D	D	D
COELOSPHAERIUM KUETZINGIANUM					X	X	X	X	
COELOSPHAERIUM NAEGELIANUM					X	X	D	X	X
GOMPHOSPHAERIA LACUSTRIS	X	X				X	D	X	
MERISMOPEDIA TENUISSIMA					X				
OSCILLATORIA AGARDHII								X	X
OSCILLATORIA LIMNETICA	D	X	D	X	X	X		X	D
OSCILLATORIA GEMINATA			X			X			
OSCILLATORIA AMPHIBIA		X	X	X	X	X	X		
PHORMIDIUM SP.								X	D
PHORMIDIUM MUCICOLA	X			X					
ANABAENA FLOS-AQUAE							X		
ANABAENA SPIROIDES					X				
APHANIZOMENON FLOS-AQUAE		X		X	X	X	X	X	
CHLOROPHYCEAE									
CARTERIA SP.		X				X			
CARTERIA CORDIFORMIS	X			X		X	X		
CHLAMYDOMONAS SP.	X	X	X	X	X	X	X	X	X
CHLAMYDOMONAS GLOBOSA	X								
EUDORINA ELEGANS			X	X	X			X	
PANDORINA MORUM					X	X		X	
PEDINOMONAS MINUTISSIMA	X								
POLYTOMA SP.		X					X	X	X
POLYTOMA GRANULIFERUM	X	X	X			X	X	X	
GLOEOCYSTIS SP.	X								
GLOEOCYSTIS GIGAS				X	X				
GLOEOCYSTIS VESICULOSA						X			
SPHAEROCYSTIS SCHROETERI				X	X	X	X		X
TETRASPORA LACUSTRIS			X	X	X	X			
ULOTHRIX SP.								X	X
OEDOGONIUM SP.			X			X	X	X	X
MOUGEOTIA SP.	X	X	X		X				
CLOSTERIUM SP.			X		X			X	X
CLOSTERIUM ACICULARE	X	X		X	X	X	X	X	

TABLE VA-3 (Continued)

TAXON CHLOROPHYCEAE(cont.)	DATE 30 APR	27 MAY	17 JUN	28 JUL	26 AUG	23 SEP	19 OCT	16 NOV	14,19 DEC
CLOSTERIUM VENUS						X			
CLOSTERIUM GRACILE						X	X		
COSMARIUM SP.						X	X	X	
STAURASTRUM SP.					X	X	X	X	
ACTINASTRUM HANTZSCHII	X	X							
ANKISTRODESMUS FALCATUS	X	X	X	X	X	X	X	X	X
ANKISTRODESMUS SPIROTAENIA	X	X	X	X		X		X	X
ANKISTRODESMUS NANNOSELENE	X	X	X		X	X		X	
CHODATELLA CILIATA					X	X	X	X	
CHODATELLA CITRIFORMIS							X		
CHODATELLA SUBSALSA						X			
CHODATELLA QUADRISETA	X	X	X	X	X	X	X	X	
CHLORELLA SP.			X	X	X	X	X	X	
CLOSTERIOPSIS LONGISSIMA				X					
COELASTRUM CAMBRICUM					X				
COELASTRUM MICROPORUM.		X		D	X	X	X	X	X
COELASTRUM RETICULATUM					X	X	X	X	
CRUCIGENIA TETRAPEDIA		X	X			X	X		
DICTYOSPHAERIUM EHRENBERGIANUM			X						
DICTYOSPHAERIUM PULCHELLUM	X			X	X	X	X		
DICTYOSPHAERIUM ELEGANS				X					
ECHINOSPHAERELLA LIMNETICA				X			X		
ERRERELLA BORNHEMIENSIS					X	X			
FRANCEIA DROESCHERI				X	X	X	X	X	
GOLENKINIA RADIATA	X	X	X	X	X	X	X	X	
KIRCHNERIELLA CONTORTA		X		X	X		X		
MICRACTINIUM PUSILLUM	X	X	X	X	X	X			
OOCYSTIS SP.	X				X	X			
OOCYSTIS BORGEI			X	X	X	X	X	X	X
OOCYSTIS LACUSTRIS								X	
OOCYSTIS PARVA							X	X	
OOCYSTIS PUSILLA			X	X	X	X	X	X	X
OOCYSTIS SOLITARIA						X			
OOCYSTIS CRASSA					X				
OOCYSTIS SUBMARINA							X		
PEDIASTRUM BORYANUM			X	X	X	X	X		
PEDIASTRUM DUPLEX				X	X	X	X		
PEDIASTRUM SIMPLEX					X	X	X		
PEDIASTRUM TETRAS								X	
QUADRIGULA CHODATII			X		X				
SCENEDESMUS ABUNDANS	X	X	X	X	X	X	X		
SCENEDESMUS ACUMINATUS					X	X	X		
SCENEDESMUS BIJUGA	X	X	X	X	X	X	X	X	X
SCENEDESMUS DENTICULATUS				X		X	X	X	
SCENEDESMUS DIMORPHUS	X	X	X	X	X	X		X	X
SCENEDESMUS INCRASSATULUS					X	X			
SCENEDESMUS OPOLIENSIS		X	X						
SCENEDESMUS QUADRICAUDA	X	X	X	X	X	X	X	X	X
SCENEDESMUS BIJUGATUS			X						
SCENEDESMUS BIJUGA V. FLEXUOSUS				X					
SCHROEDERIA JUDAYI			X	X	X	X	X		X
SCHROEDERIA SETIGERA					X				

TABLE VA-3 (Continued)

TAXON	DATE								
CHLOROPHYCEAE(cont.)	30 APR	27 MAY	17 JUN	28 JUL	26 AUG	23 SEP	19 OCT	16 NOV	14,19 DEC
SELENASTRUM MINUTUM	X		X	X	X	X			X
TETRAEDRON MINIMUM	X			X	X	X	X	X	
TETRAEDRON MUTICUM					X	X			
TETRASTRUM HETERACANTHUM	X	X	X	X					X
TETRASTRUM STAUROGENIAEFORME	X	X	X	X	X		X		X
TREUBARIA SETIGERUM							X		
TREUBARIA TRIAPPENDICULATA	X	X	X	X					
PARAMASTIX SP.	X								
EUGLENOPHYCEAE									
EUGLENA GASTEROSTEUS	X	X							
PHACUS PYRUM	X								
CHRYSOPHYCEAE									
DINOBRYON SP.						X			
DINOBRYON SOCIALE	X	X	X					X	
MALLOMONAS SP.	X			X	X	X	X	X	X
CHRYSOCHROMULINA PARVA	X	X	X	X	X	X	X	X	X
CHROMULINA SP.	X	X	X	X	X	X	X	X	X
STELEXMONAS DICHOTOMA	X								X
AULOMONAS PURDYI	X	X							X
RHIZOCHRYSIS SP.	X	X	X	X			X		X
OCHROMONAS SP.	X	X	X	X	X	X	X	X	X
UROGLENA SP.	X	X							X
CODONOSIGA BOTRYTIS	X		X				X		
BICOECA SP.	X	X	X				X	X	
BICOECA CRYSTALLINA	X								
CODONOSICOPSIS ROBINI					X		X		
MONOSIGA OVATA						X	X	X	X
MONAS SP.	X		X		X			X	
ERKENIA SUBAEQUICILATA	X								
BACILLARIOPHYCEAE									
COSCINODISCUS ROTHII				X		X	X	X	
CYCLOTELLA ATOMUS	X	X	X	X	X	X	X	X	D
CYCLOTELLA GLOMERATA	X		X	X			X		
CYCLOTELLA MENEGHINIANA	X	X	X	D	X	X	X	X	X
MELOSIRA SP.	X								
MELOSIRA BINDERANA	D	X	X						X
MELOSIRA DISTANS				X					
MELOSIRA GRANULATA			X						
MELOSIRA ISLANDICA	X	X	X						X
MELOSIRA ITALICA						X			
MELOSIRA ITALICA VAR. SUBARCTICA	X	X	X	X					
STEPHANODISCUS ASTREA								X	
STEPHANODISCUS HANTZSCHII	X	X	X			X	X	X	X

TAXON	DATE								
BACILLARIOPHYCEAE (cont.)	30 APR	27 MAY	17 JUN	28 JUL	26 AUG	23 SEP	19 OCT	16 NOV	14,19 DEC
STEPHANODISCUS NIAGARAE							X		X
STEPHANODISCUS ASTREA VAR. MINUTULA	X		X		X	X	X	X	X
ASTERIONELLA FORMOSA	X	X	X	X			X	X	X
DIATOMA ELONGATUM	X	X	X					X	X
DIATOMA ELONGATUM V. TENUIS	X	X	X						
FRAGILARIA SP.									X
FRAGILARIA CAPUCINA	X	X					X		X
FRAGILARIA CROTONENSIS	X	X	X	X					X
FRAGILARIA VAUCHERIAE		X	X		X	X			X
NAVICULA SP.		X							
NITZSCHIA SP.	X		X						X
NITZSCHIA ACICULARIS				X					
NITZSCHIA DISSIPATA	X								
NITZSCHIA GRACILIS	X	X	X						
NITZSCHIA HOLSATICA		X							
NITZSCHIA PALEA	X			X					
RHOICOSPHENIA CURVATA						X			X
SYNEDRA SP.		X	X						
SYNEDRA ACUS	X								
SYNEDRA ULNA	X	X	X					X	X
SYNEDRA ACUS VAR. RADIANS			X	X		X			X
SYNEDRA RUMPENS									X
TABELLARIA FENESTRATA		X					X	X	X
CRYPTOPHYCEAE									
CRYPTOMONAS SP.								X	
CRYPTOMONAS EROSA	X	X	X	D	X	X	X	X	X
CRYPTOMONAS OVATA	X	X		X		X		X	
CRYPTOMONAS EROSA VAR. REFLEXA	X	X	X	X	X	X	X	X	X
CRYPTOMONAS CAUDATA						X			
CRYPTOMONAS MARSSONII				X	X	X	X		
CRYPTOMONAS REFLEXA	X	X	X	X		X	X	X	X
CRYPTOMONAS PLATYURIS	X								
CRYPTOMONAS PARAPYRENOIDIFERA				X					
CRYPTOMONAS PYRENOIDIFERA				X		X	X		X
CRYPTOMONAS CURVATA	X						X		
CRYPTOMONAS ROSTRATIFORMIS		X	X						
KATABLEPHARIS OVALIS	X	X	X	X	X	X	X	X	X
RHODOMONAS MINUTA	X	X	X	X	X	X	X	X	X
*RHODOMONAS MINUTA VAR. NANNOPLANTICA**	X	D	X	X	X	X	D	D	X
CRYPTAULAX SP.								X	X
MONOMASTIX SP.							X		
DINOPHYCEAE									
GYMNODINIUM SP.	X	X			X			X	X
GYMNODINIUM HELVETICUM	X	X					X	X	X
GYMNODINIUM VARIANS	X	X	X			X		X	X
CERATIUM HIRUNDINELLA					X	X	X		
GLENODINIUM SP.		X	X	X	X		X	X	X
GLENODINIUM PULVISCULUS	X								
PERIDINIUM SP.							X	X	X
PERIDINIUM ACICULIFERUM	X	X							
PERIDINIUM CINCTUM			X	X	X				

X *PRESENT AT ONE OR MORE LEVELS*; MEAN OF R-1 AND R-2
D *ABUNDANCE OF* 15 *PCT. OR MORE AT ONE OR MORE LEVELS* PER DATE

*Identified as Chroomonas acuta in 1975

(i) Major Taxa

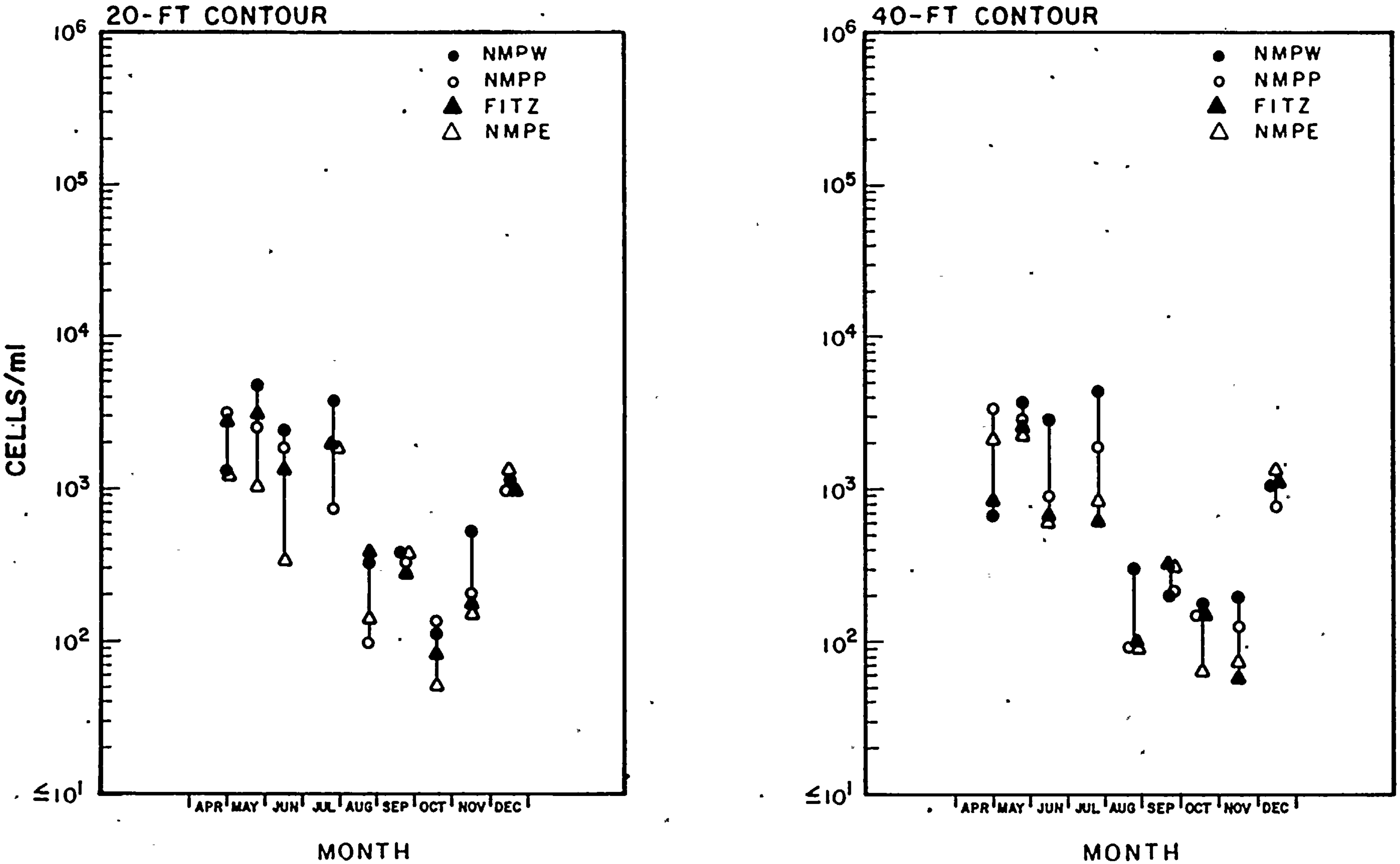
Phytoplankton (all taxa combined) collected in surface samples exhibited peak abundances in June and August and minimum levels in the fall (Appendix VA-2h). Maximum biovolume of total phytoplankton was recorded in July (Appendix VA-3h). At all depth contours, NMPW transect exhibited the highest "annual" mean (based on an April-December sampling period) abundance and biovolume.

The distribution of Bacillariophyceae (diatoms) in surface samples at the 20 and 40-ft depth contours is shown in Figure VA-2. Diatoms were most abundant in the spring and early summer when water temperatures were cool, declined in abundance during the warmer months, and bloomed again in the late fall. The dominant diatom species (those having an abundance of at least 15% at one or more stations for at least one month) were Melosira binderana and Stephanodiscus hantzschii in the spring, Cyclotella atomus and C. meneghiniana during midsummer, and C. atomus, S. hantzschii and Fragilaria crotonensis during the fall bloom. While the spatial distribution was variable throughout the year, the "annual" mean abundance at the NMPW transect was greater at all depth contours than at any of the other transects (Appendix VA-2a), and a west-to-east trend of decreasing abundance is evident. The distribution of diatoms at three light transmittance levels (Figure VA-3) showed greatest variability during the summer months when incident light intensity was greatest (Appendix VA-1). At this time, the diatoms were most abundant at the 1% light transmittance level.

Chlorophyceae (green algae) were most abundant on 26 August at the 40-ft depth contour and on 23 September at the 20-ft

ABUNDANCE OF BACILLARIOPHYCEAE IN SURFACE WHOLE WATER COLLECTIONS*

NINE MILE POINT VICINITY - 1976

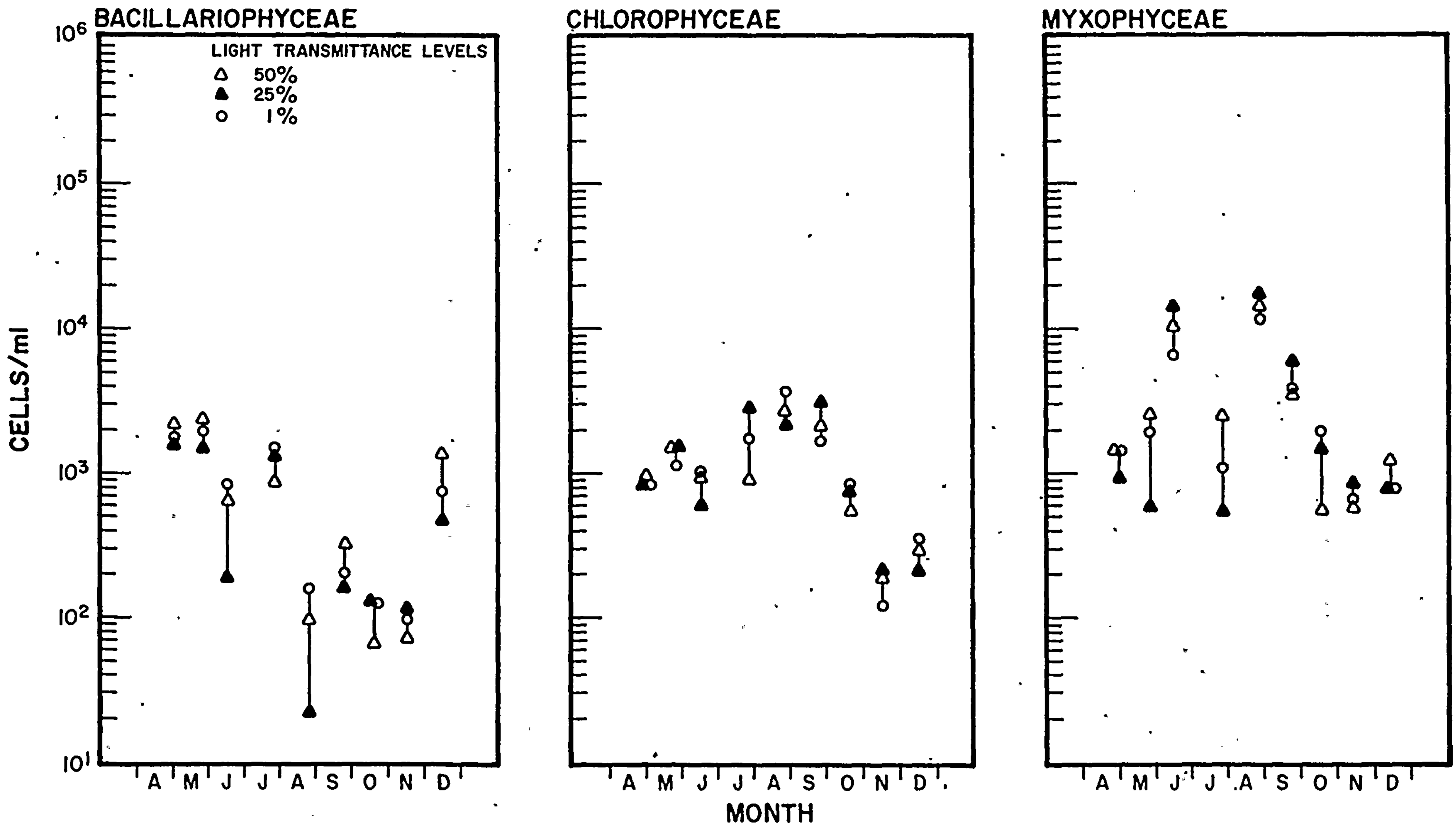


*MEAN OF R-1 and R-2; DAY COLLECTION

FIGURE VA-2

ABUNDANCE OF SELECTED PHYTOPLANKTON TAXA AT SELECTED LIGHT LEVELS*

NMPE-40 FT STATION - NINE MILE POINT VICINITY - 1976



*WHOLE WATER COLLECTIONS, MEAN OF R-1 and R-2 ; DAY COLLECTION

FIGURE VA-3

depth contour based on the mean value taken over transects (Appendix VA-2b). The distribution of Chlorophyceae at the 20 and 40-ft depth contours is presented in Figure VA-4. A distinct west-to-east trend of decreasing "annual" mean abundance is evident for Chlorophyceae at all contours (Appendix VA-2b); however, the difference in distribution with depth (Figure VA-3) was not as noticeable as it was for diatoms.

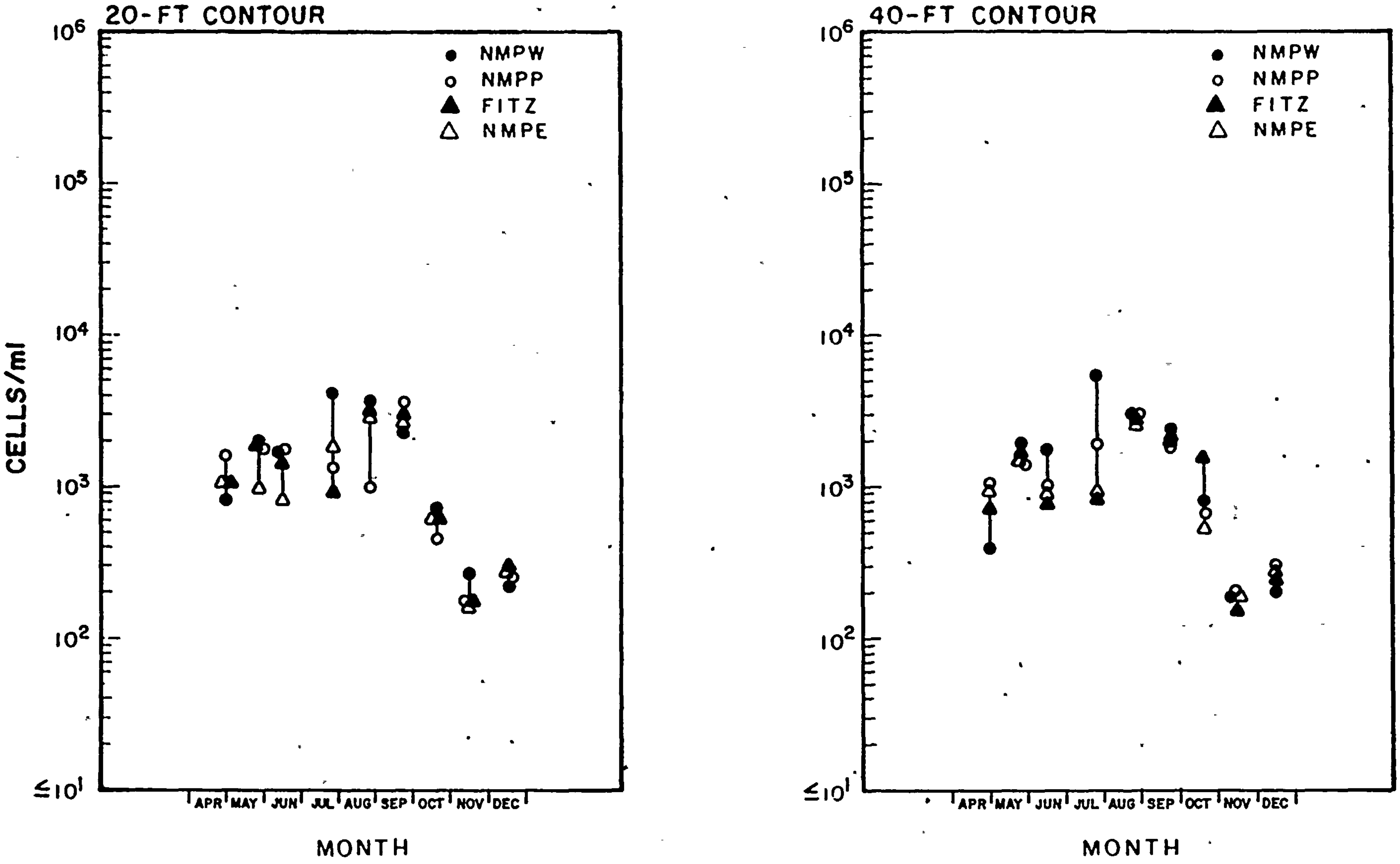
The distribution of Myxophyceae along the 20 and 40-ft contours is shown in Figure VA-5. Peaks of abundance were observed in June and August with decreased numbers evidenced in July; this pattern was also observed for total phytoplankton. Dominant taxa were Chroococcus dispersus var. minor, Coelosphaerium kuetzingianum, Oscillatoria limnetica, Phormidium sp., and Aphanizomenon flos-aquae. Myxophyceae were abundant in surface samples in three of the nine collections and in mid-depth samples (25% light transmittance level) in four of the nine collections. As with all the groups discussed above, the greatest mean "annual" abundance was found at the NMPW transect (Appendix VA-2g); however, the lowest abundances recorded were found at the NMPP transect at three of the four depth contours. The west-to-east trend of decreasing abundance was not so evident for Myxophyceae.

(ii) Selected Species

Several species of phytoplankton found in the Nine Mile Point vicinity were selected for additional analysis based on their composing at least 10% of the total phytoplankton

ABUNDANCE OF CHLOROPHYCEAE IN SURFACE WHOLE WATER COLLECTIONS*

NINE MILE POINT VICINITY – 1976

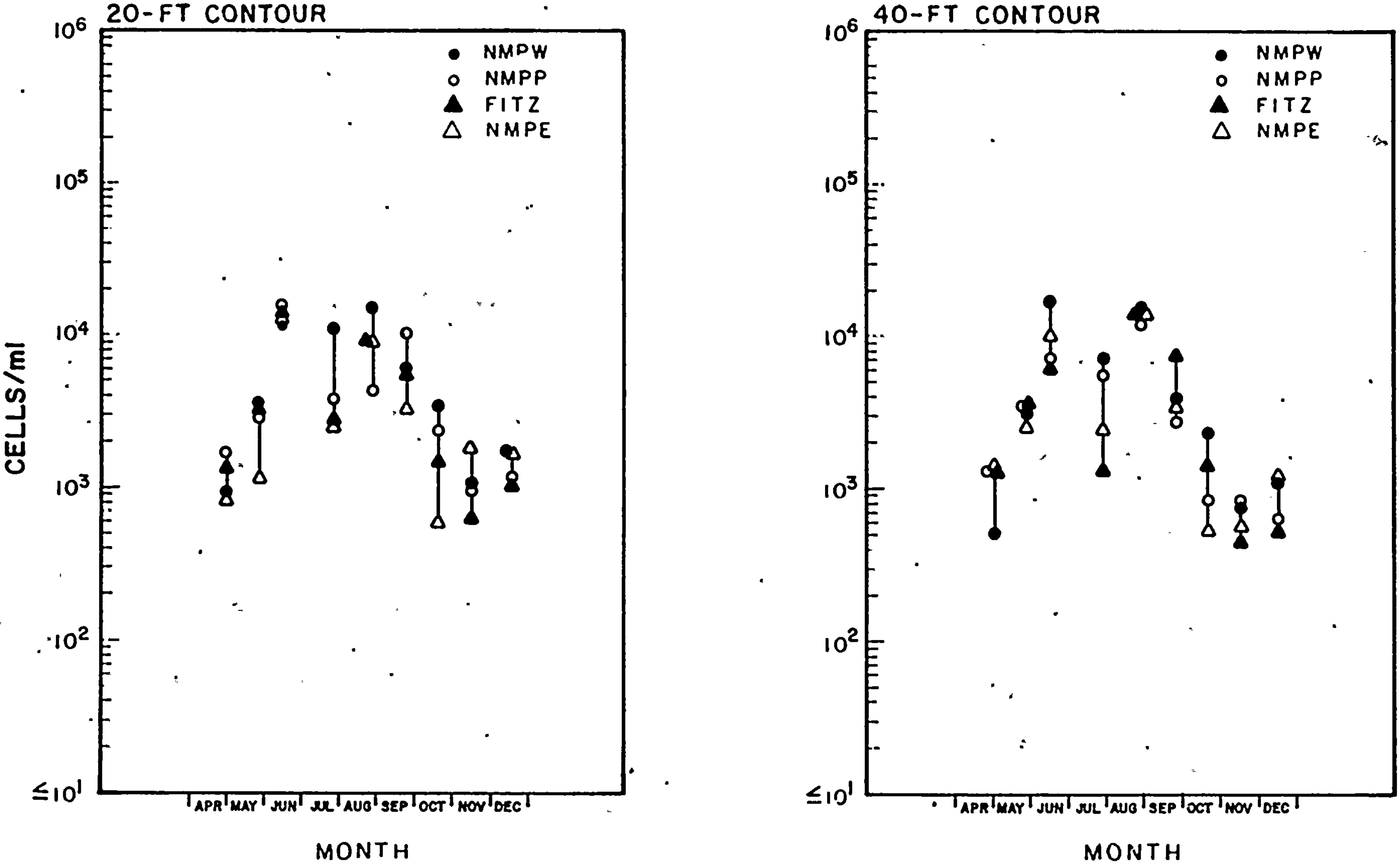


*MEAN OF R-1 and R-2 ; DAY COLLECTION

FIGURE VA-4

ABUNDANCE OF MYXOPHYCEAE IN SURFACE WHOLE WATER COLLECTIONS*

NINE MILE POINT VICINITY – 1976



*MEAN OF R-1 and R-2; DAY COLLECTION

FIGURE VA-5

abundance at any station for a minimum of two months (not necessarily consecutive), and being identified to the species level. Eleven species met these criteria and belong to the following taxa: 4 Myxophyceae, 1 Chlorophyceae, 1 Chrysophyceae, 3 Bacillariophyceae, and 2 Cryptophyceae (Appendix VA-4 and VA-5). The distribution of each of these species is discussed in this section, which is organized by class.

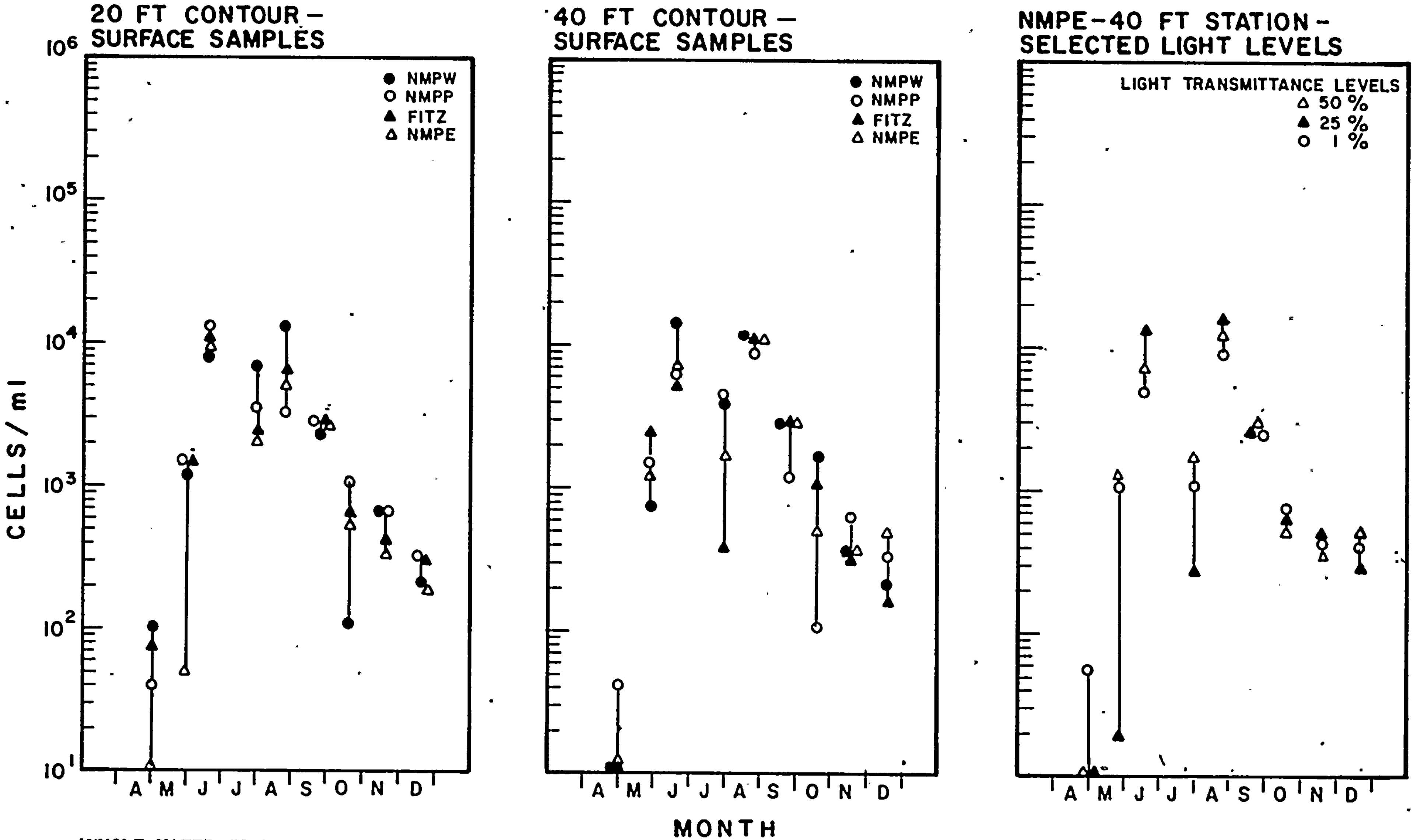
- Myxophyceae

Chroococcus dispersus var. minor is a blue-green alga present throughout the year in the Nine Mile Point vicinity. Its distribution at the 20 and 40-ft contours is shown in Figure VA-6. As with most blue-green algae, its numerical abundance reached high levels during the summer, but its biovolume remained relatively low due to the small size of the individual cells (Appendix VA-5e). While the "annual" mean abundance was higher at the NMPW transect (Appendix VA-4e), no consistent distributional pattern was evident throughout the year.

Coelosphaerium kuetzingianum is a member of the Myxophyceae reported to be toxic when present in high numbers (Palmer 1962). It was present only in the August through December collections (Appendix VA-4e), and although there were large differences in its abundance among stations at both the 20 and 40-ft depth contours, no trend was noticed (Figure VA-7).

Coelosphaerium naegelianum is also a member of the Myxophyceae and its distribution is shown in Figure VA-8. It was identified during the latter part of the year (Appendix VA-4e) and it was present at all four transects only once,

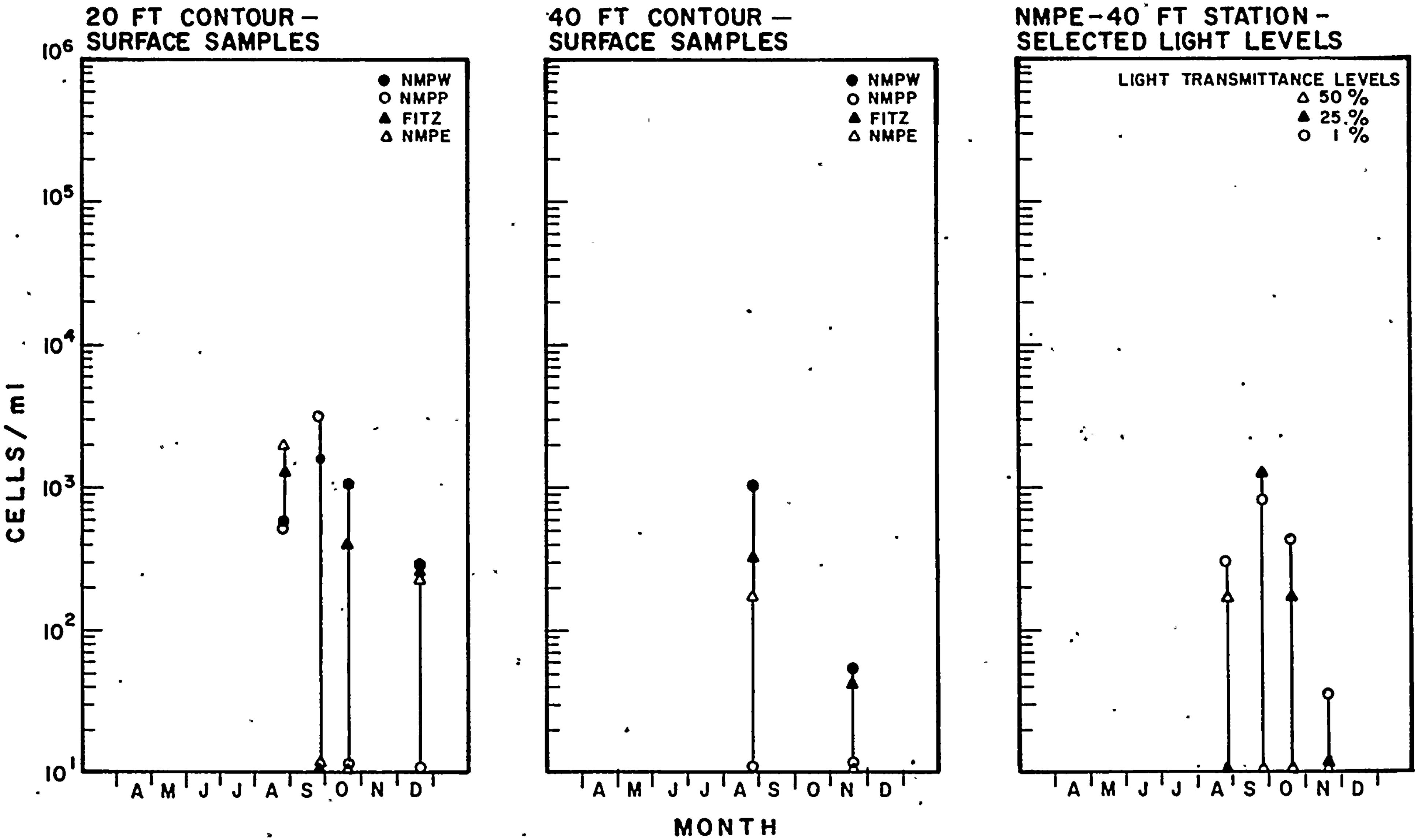
ABUNDANCE* OF CHROOCOCCUS DISPERSUS VAR. MINOR (MYXOPHYCEAE) AT SELECTED STATIONS NINE MILE POINT VICINITY – 1976



*WHOLE WATER COLLECTIONS, MEAN OF R-1 and R-2, DAY COLLECTION, THIS SPECIES NOT COLLECTED IN THE REMAINING SAMPLES

FIGURE VA-6

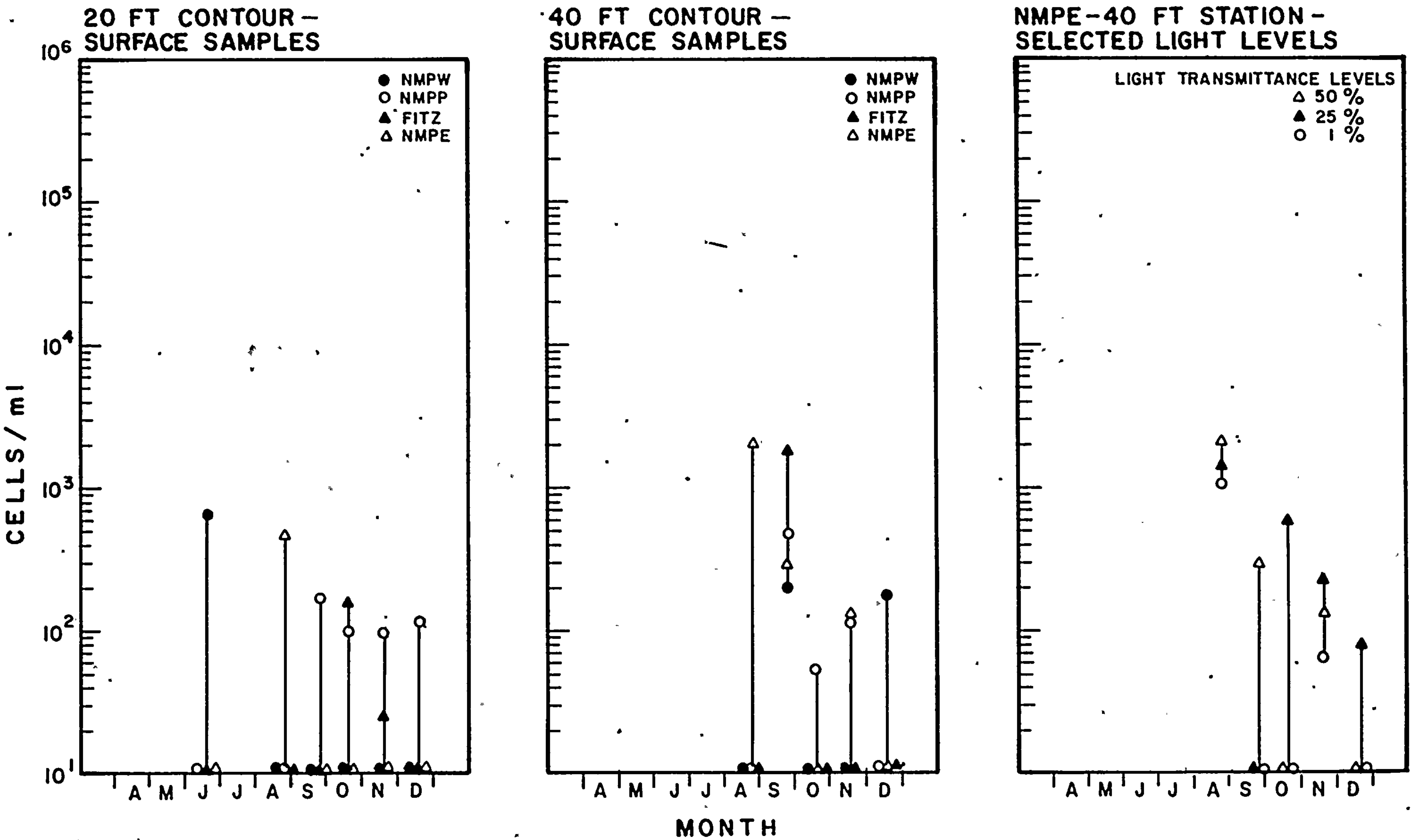
ABUNDANCE* OF COELOSPHAERIUM KUETZINGIANUM (MYXOPHYCEAE) AT SELECTED STATIONS
NINE MILE POINT VICINITY – 1976



*WHOLE WATER COLLECTIONS, MEAN OF R-1 and R-2, DAY COLLECTION, THIS SPECIES NOT COLLECTED IN THE REMAINING SAMPLES

FIGURE VA-7

ABUNDANCE* OF COELOSPHAERIUM NAEGELIANUM (MYXOPHYCEAE)
AT SELECTED STATIONS
NINE MILE POINT VICINITY – 1976



*WHOLE WATER COLLECTIONS, MEAN OF R-1 and R-2, DAY COLLECTION, THIS SPECIES NOT COLLECTED IN THE REMAINING SAMPLES

FIGURE VA-8

on 23 September (40-ft depth contour). Its abundance was high when it was found, but it always represented less than 2% of the total phytoplankton biovolume (Appendix VA-5e). At the 20-ft depth contour, it was present at NMPP from 23 September to 14, 19 December.

Oscillatoria limnetica is a filamentous blue-green alga which occurred in high abundance from April through July (Appendix VA-4e). While its "annual" mean abundance was greatest at the NMPW transect at the 20 and 40-ft depth contours, its spatial distribution exhibited no consistent pattern over the year (Figure VA-9). As with the other selected blue-green algal species, its contribution to total biovolume of the community was always less than 2% (Appendix VA-5e).

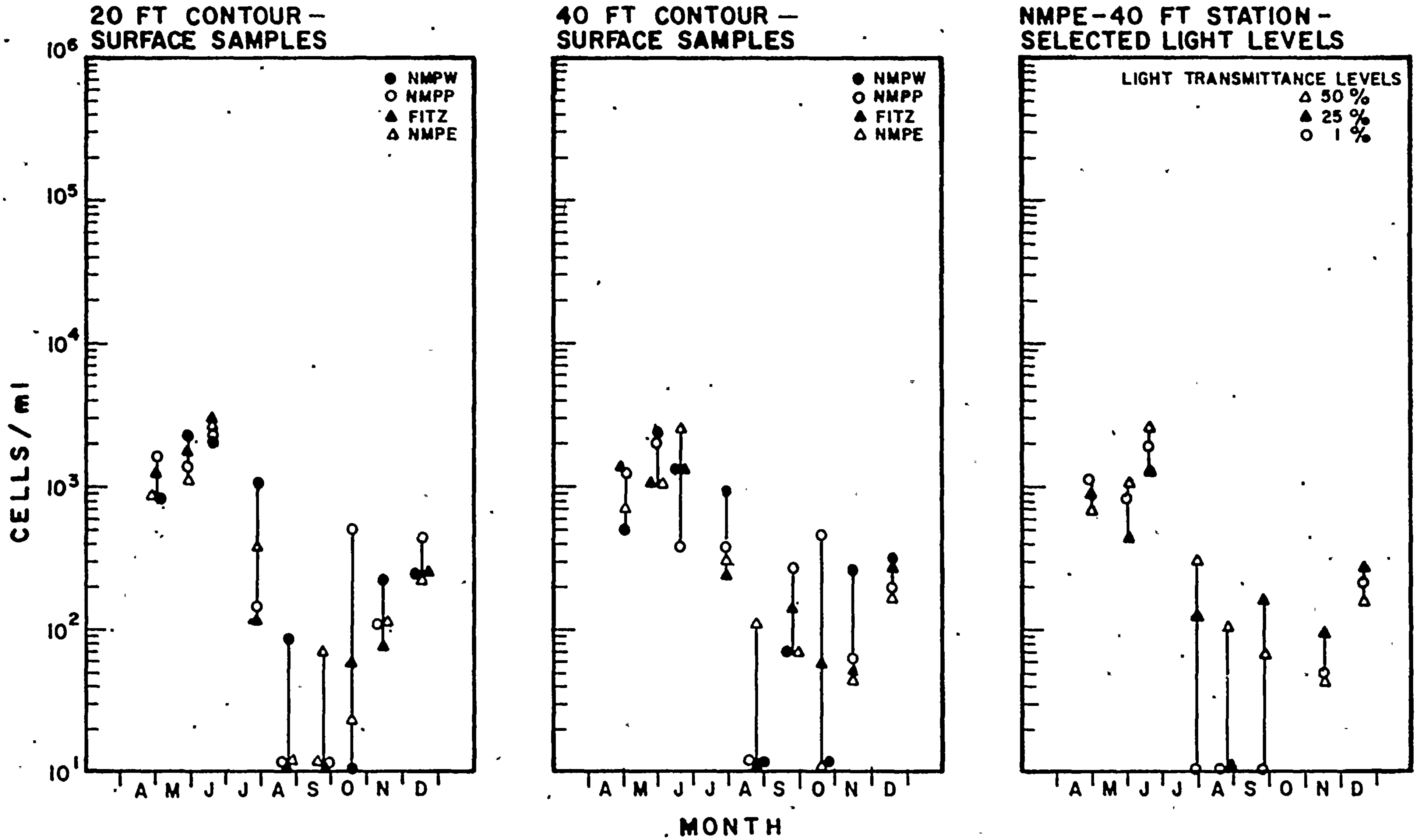
- Chlorophyceae

Ankistrodesmus falcatus, a chlorophyte, is a perennial, ubiquitous species in the Nine Mile Point vicinity, and was present in all collections during 1976 (Appendix VA-4b). No apparent difference in abundance was detectable at the 20 and 40-ft depth contours (Figure VA-10) based on plant operation.

-Chrysophyceae

Chrysochromulina parva, the only chrysophyte of quantitative importance in Lake Ontario (Munawar and Nauwerck, 1971), was present at all stations throughout the year and was most abundant on 17 June (Appendix VA-4c). The "annual" mean abundance was similar at all depth contours and transects

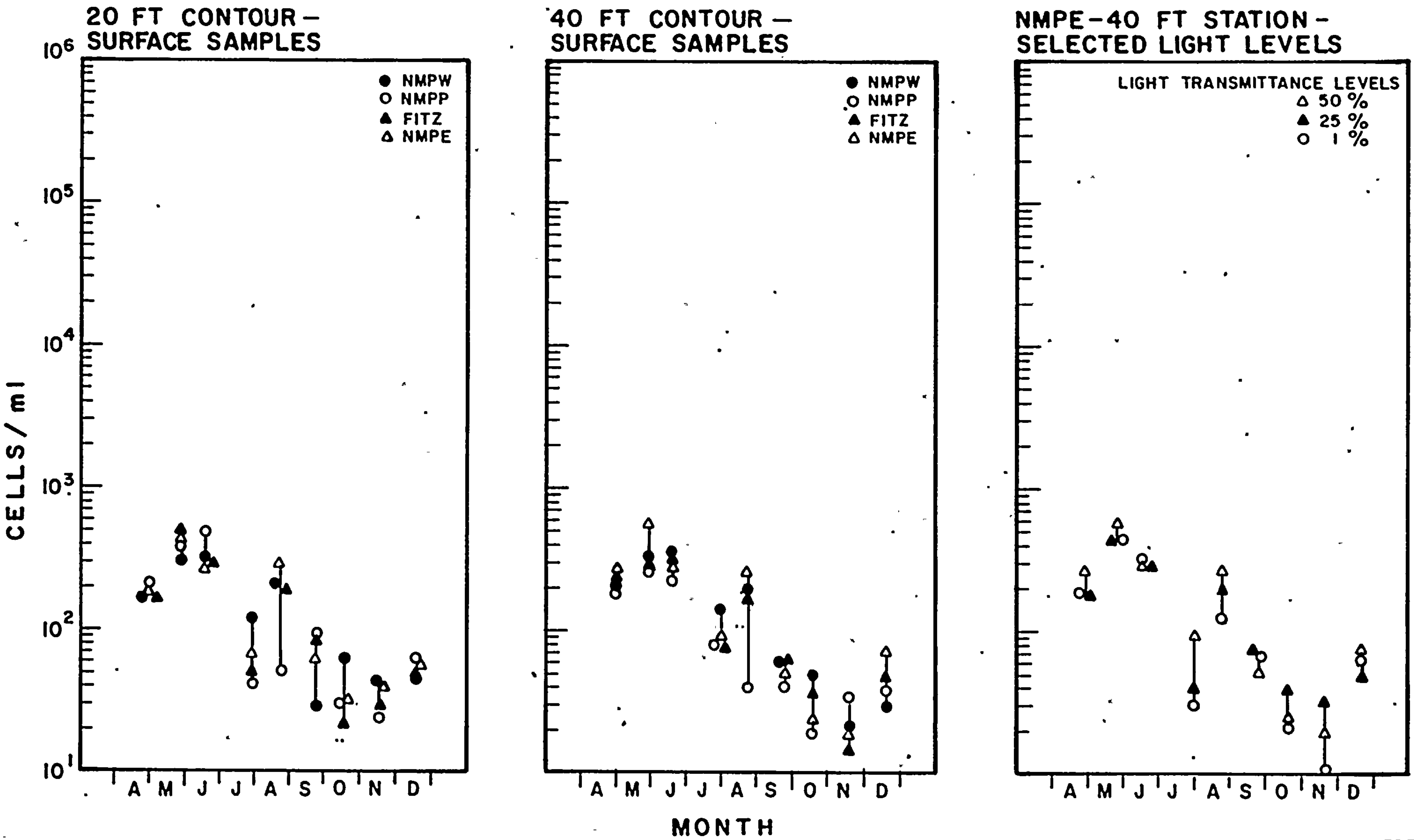
ABUNDANCE*OF OSCILLATORIA LIMNETICA (MYXOPHYCEAE)
AT SELECTED STATIONS
NINE MILE POINT VICINITY - 1976



*WHOLE WATER COLLECTIONS, MEAN OF R-1 and R-2, DAY COLLECTION, THIS SPECIES NOT COLLECTED IN THE REMAINING SAMPLES

FIGURE VA-9

ABUNDANCE* OF ANKISTRODESMUS FALCATUS (CHLOROPHYCEAE) AT SELECTED STATIONS
NINE MILE POINT VICINITY – 1976



*WHOLE WATER COLLECTIONS, MEAN OF R-1 and R-2, DAY COLLECTION, THIS SPECIES NOT COLLECTED IN THE REMAINING SAMPLES

FIGURE VA-10

except at the NMPW-40-ft station where the "annual" mean was nearly twice that of all stations except NMPP-60 ft. The distribution of C. parva at the 20 and 40-ft depth contours is presented in Figure VA-11.

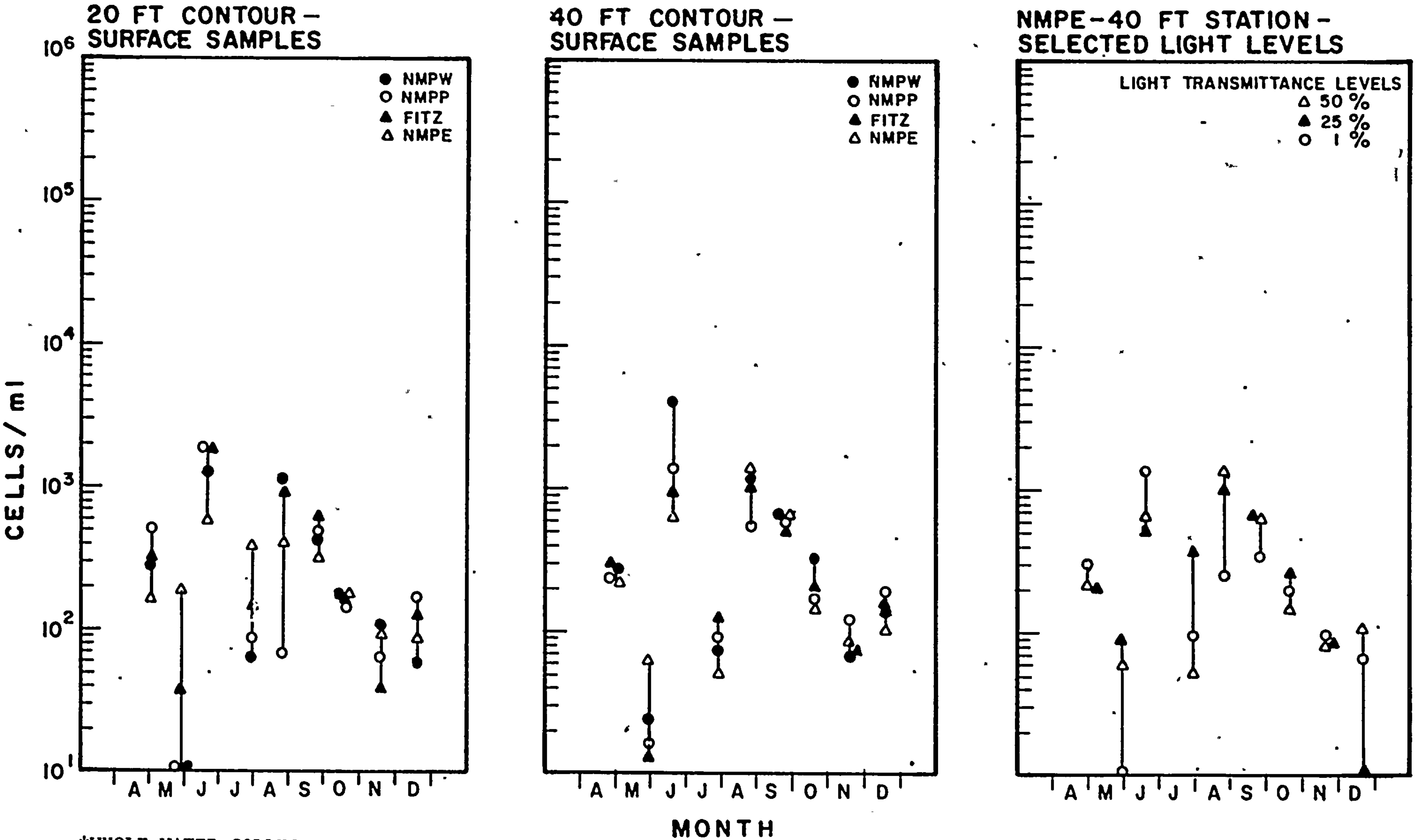
- Bacillariophyceae

Asterionella formosa is a cool-water diatom, as evidenced by its temporal distribution (Appendix VA-4a). At times of maximum abundance, it also represented a large percentage of the biovolume of the Nine Mile Point phytoplankton community (Appendix VA-5a). The variability in its spatial distribution (Figure VA-12) is not consistent with the operation of either power plant.

Cyclotella atomus is a small centric diatom which was present throughout the sampling period (Appendix VA-4a). Its greatest average abundance was observed in July, but no distinct seasonal pattern was evident for the other months. Its mean "annual" abundance, like that of many other phytoplankton taxa during 1976, was greatest at the NMPW transect (Appendix VA-4a), especially at the 10 and 20-ft contours; the difference was smaller at the 40-ft contour, and insignificant at the 60-ft contour. No discernible pattern was observed along the 20 and 40 ft-depth contours as related to power plant operation (Figure VA-13).

Melosira italica var. subarctica, a chain-forming centric diatom, was present in large numbers during the spring and early summer, and absent or observed in very low numbers from August through December (Appendix VA-4a). Its distribution among transects at the 20 and 40-ft contours was

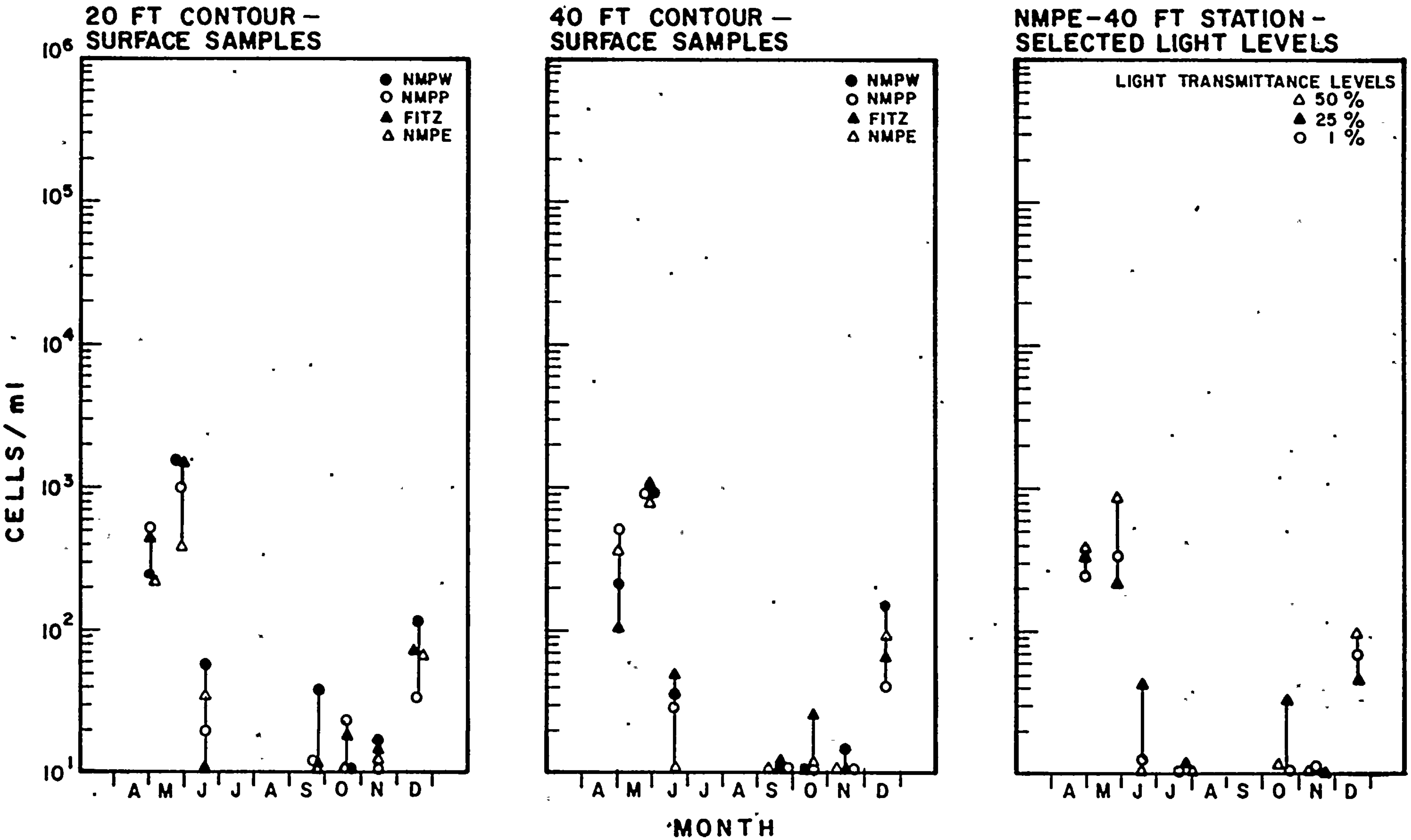
ABUNDANCE* OF CHRYSOCHROMULINA PARVA (CHRYSOPHYCEAE) AT SELECTED STATIONS NINE MILE POINT VICINITY – 1976



*WHOLE WATER COLLECTIONS, MEAN OF R-1 and R-2, DAY COLLECTION, THIS SPECIES NOT COLLECTED IN THE REMAINING SAMPLES

FIGURE VA-11

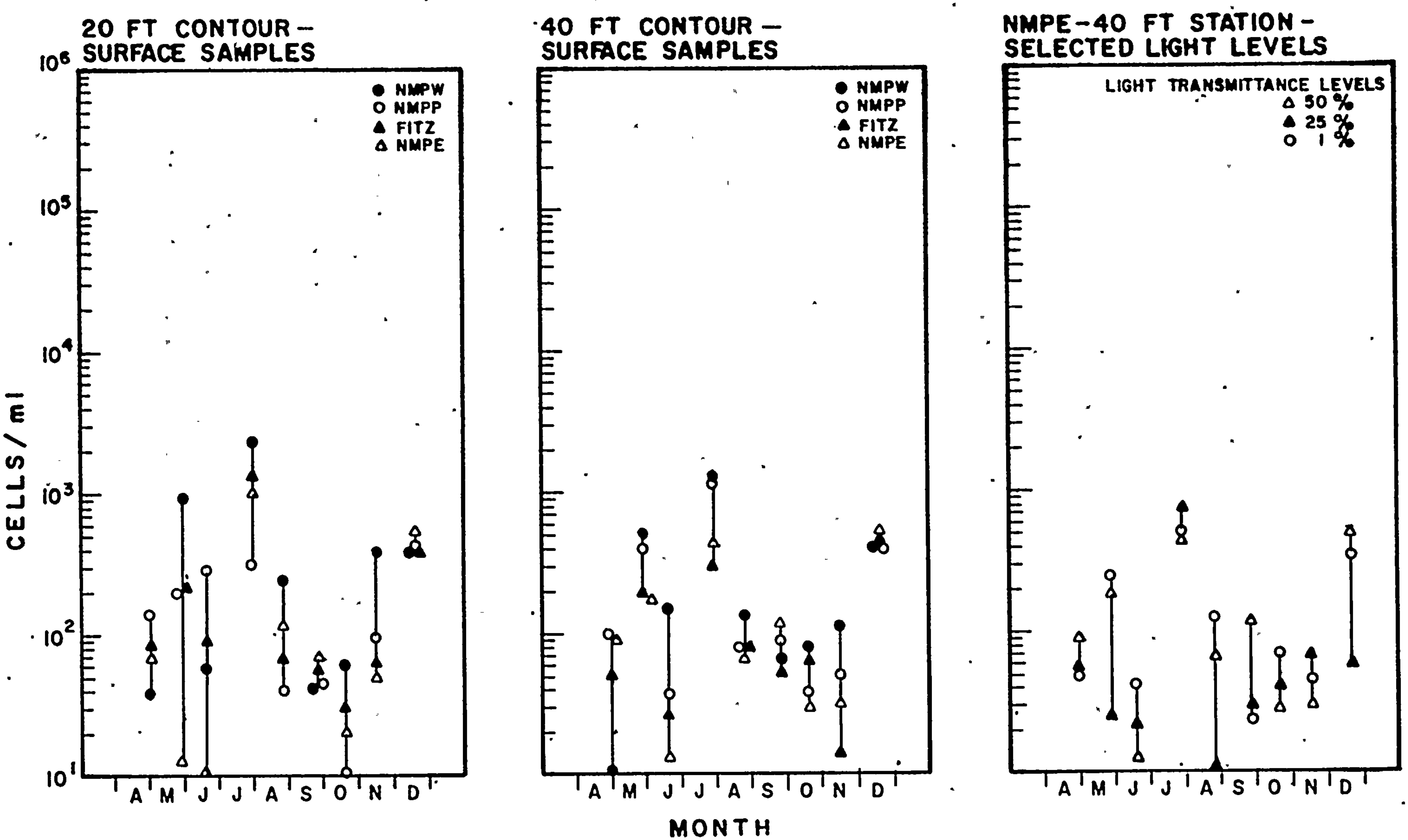
ABUNDANCE* OF ASTERIONELLA FORMOSA (BACILLARIOPHYCEAE) AT SELECTED STATIONS NINE MILE POINT VICINITY – 1976



*WHOLE WATER COLLECTIONS, MEAN OF R-1 and R-2; DAY COLLECTION, THIS SPECIES NOT COLLECTED IN THE REMAINING SAMPLES

FIGURE VA-12

ABUNDANCE* OF CYCLOTELLA ATOMUS (BACILLARIOPHYCEAE) AT SELECTED STATIONS NINE MILE POINT VICINITY — 1976



WHOLE WATER COLLECTIONS, MEAN OF R-1 and R-2, DAY COLLECTION, THIS SPECIES NOT COLLECTED IN THE REMAINING SAMPLES

FIGURE VA-13

variable (Figure VA-14), but the "annual" mean abundance was greatest at the NMPW transect along these contours.

- Cryptophyceae

Katablepharis ovalis is a chryptophyte present throughout the year (Appendix VA-4d). It was most abundant during the spring and summer with maxima on 27 May and 23 September based on the mean of all surface samples per date. Differences in spatial distribution (Figure VA-15) were small during most of the year.

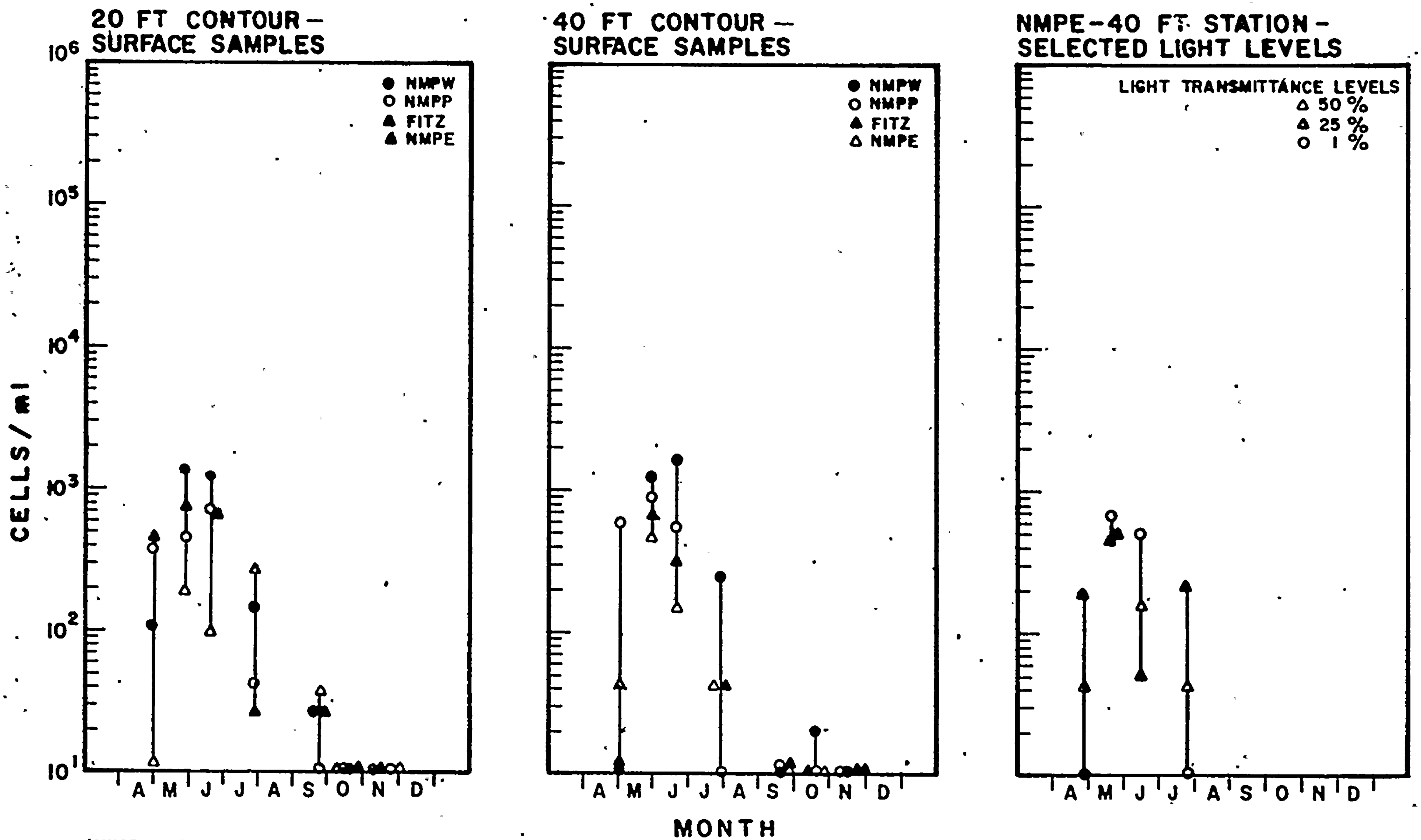
Rhodomonas minuta var. nannoplanctica, a cryptophyte, is a perennial species in the Nine Mile Point vicinity. It was most abundant in July and August (Appendix VA-4d), and contributed substantially to the biovolume of the community throughout the year (Appendix VA-5d). It was the only "selected species" whose "annual" mean abundance was greatest at the NMPE transect at all depth contours except the 60-ft. Its spatial distribution at the 20 and 40-ft contours on a monthly basis was variable (Figure VA-16).

(iii) Chlorophyll a and Phaeopigment Concentration

Chlorophyll a concentration is a measure of the standing crop of phytoplankton. While the concentration varies with light intensity, species composition of the community and age of the populations present, it has been found to represent 1-2% of the whole weight of the algae (APHA 1976).

The distribution of chlorophyll a at the 20 and 40-ft depth contours and at three light levels is shown in Figure VA-17.

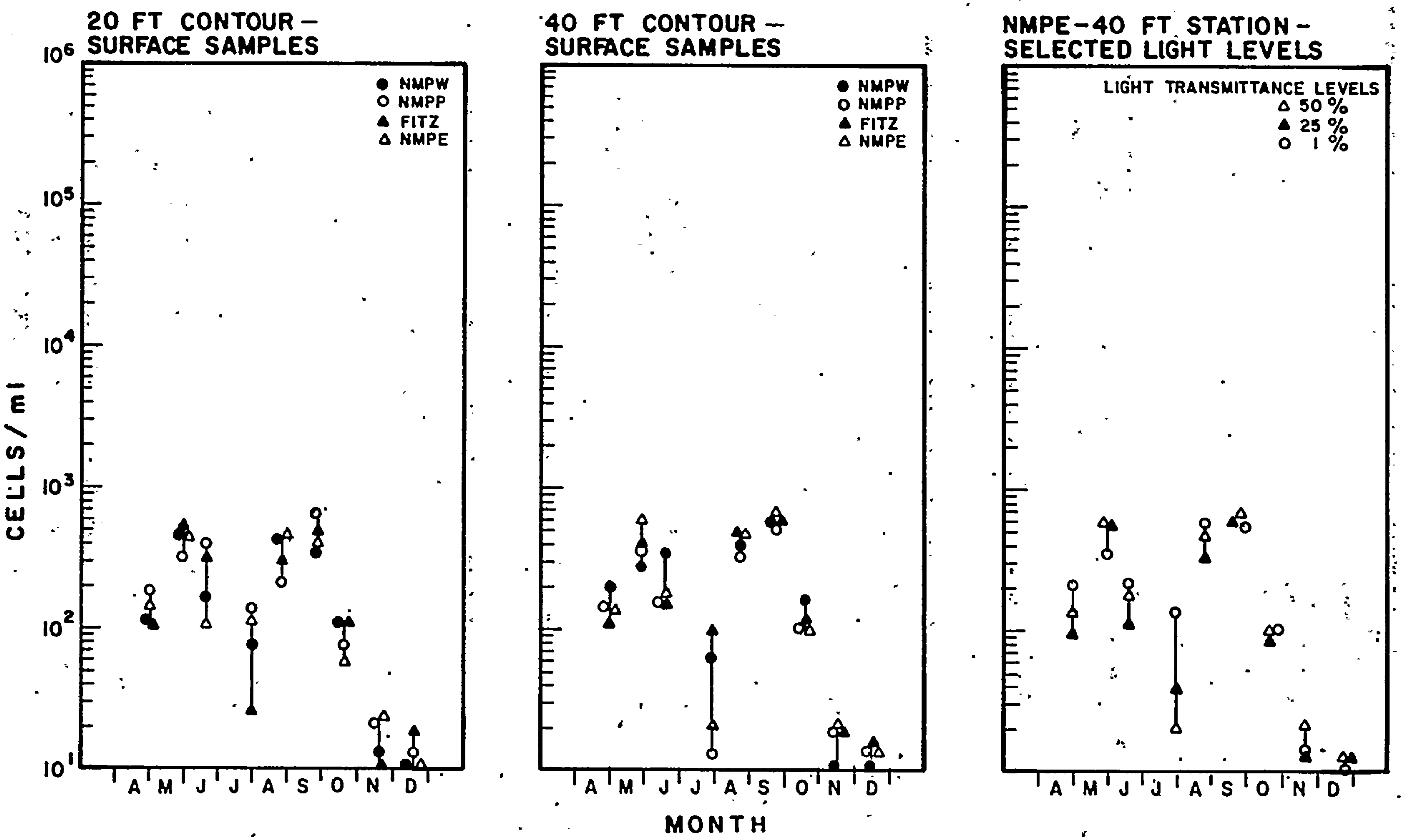
ABUNDANCE* OF MELOSIRA ITALICA VAR. SUBARCTICA (BACILLARIOPHYCEAE) AT SELECTED STATIONS
NINE MILE POINT VICINITY – 1976



*WHOLE WATER COLLECTIONS, MEAN OF R-1 and R-2, DAY COLLECTION; THIS SPECIES NOT COLLECTED IN THE REMAINING SAMPLES

FIGURE VA-14

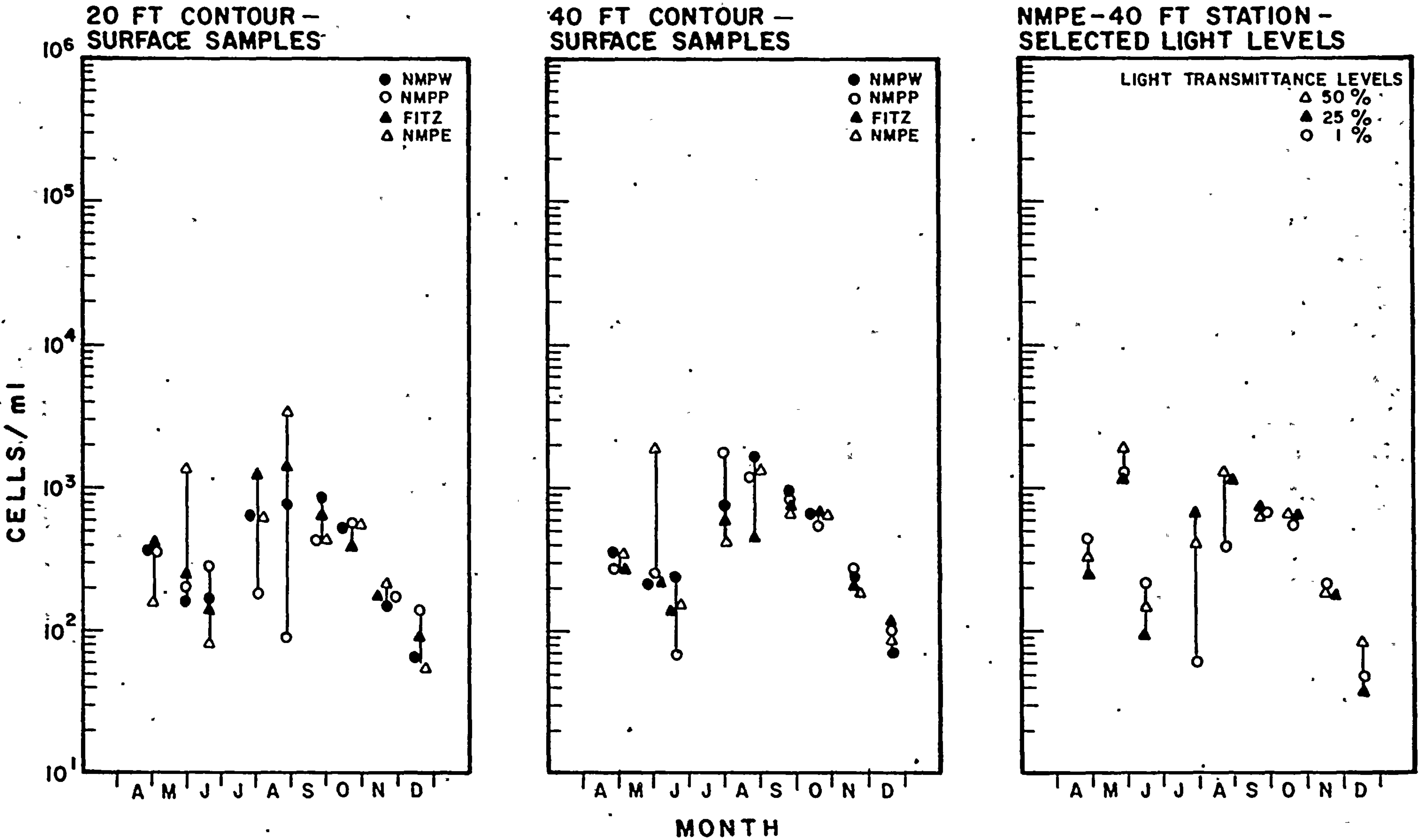
ABUNDANCE* OF KATABLEPHARIS OVALIS (CRYPTOPHYCEAE) AT SELECTED STATIONS NINE MILE POINT VICINITY – 1976



*WHOLE WATER COLLECTIONS, MEAN OF R-1 and R-2, DAY COLLECTION, THIS SPECIES NOT COLLECTED IN THE REMAINING SAMPLES

FIGURE VA-15

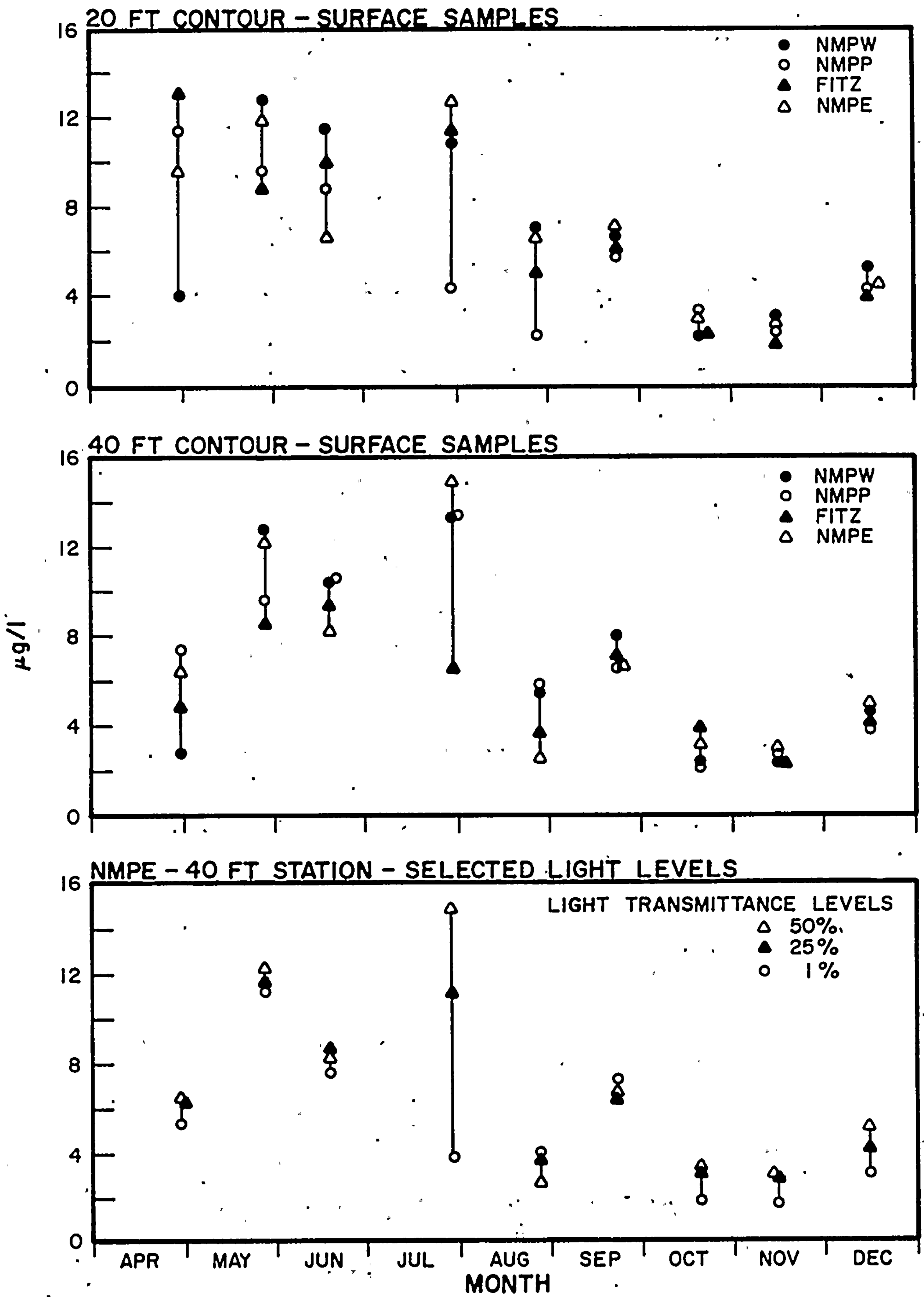
ABUNDANCE* OF RHODOMONAS MINUTA VAR. NANNOPLANCTICA (CRYPTOPHYCEAE) AT SELECTED STATIONS NINE MILE POINT VICINITY – 1976



*WHOLE WATER COLLECTIONS, MEAN OF R-1 and R-2, DAY

FIGURE VA-16

CHLOROPHYLL A CONCENTRATIONS* AT SELECTED PHYTOPLANKTON STATIONS NINE MILE POINT VICINITY - 1976



*DAY COLLECTIONS: MEAN OF R-1 and R-2

The photic zone appeared well mixed on all sampling dates except 28 July, when a significant difference in chlorophyll a concentrations was seen between the surface and 1% light level. On that date, the 1% light transmittance level extended to 12 meters, which was the greatest depth recorded for it during the entire sampling period (Appendix VA-1). On the same date, a reduction in chlorophyll a was seen in the surface collections at NMPP-10-ft and 20-ft, and the FITZ-40-ft stations (Appendix VA-6). Temperature data recorded on 28 July indicated the presence of elevated surface water temperatures at both the 10 and 20-ft contours of NMPP transect. A substantial intrusion of cold water was observed on 2 August (see Chapter IV); this could have indicated that nearshore surface waters were moving offshore on 28 July. These waters would be replaced by water from deeper portions of the lake, which would be expected to have low chlorophyll a values. The low chlorophyll a concentrations observed at the FITZ-40-ft station on 28 July were not attributable to plant operation, since the FITZ plant was not operating on 27 July and had low generation (approximately 70 megawatts) on 28 July (Tables III-2 and III-6).

Low chlorophyll a values were also recorded on 26 August at NMPP-20-ft, and elevated temperatures were noted. An intrusion of cold bottom water was also measured on 25 and 26 August (see Chapter IV). Little or no effect was seen during the remainder of the sampling period.

(iv) Primary Productivity After Four-Hour Incubation

Primary productivity measured by uptake of ^{14}C in surface samples at the 20 and 40-ft depth contours and at three

light levels at the NMPE-40-ft station is presented in Figure VA-18. The highest daily mean productivity was observed in April, and the lowest in November; the "annual" mean was greatest at the NMPW transect at all depth contours (Appendix VA-8). Spatial differences were variable throughout the year; however, reduced values were observed at the NMPP 10-ft and 20-ft, and FITZ-40-ft stations on 28 July, as they were for chlorophyll a.

3. Conclusions

The most consistent trend noted in the data which have been presented is the higher "annual" mean abundances observed for most taxa at the NMPW transect; primary productivity also exhibited this trend. The spatial variability found at the other transects indicates that plant effects cannot be consistently separated from natural variability.

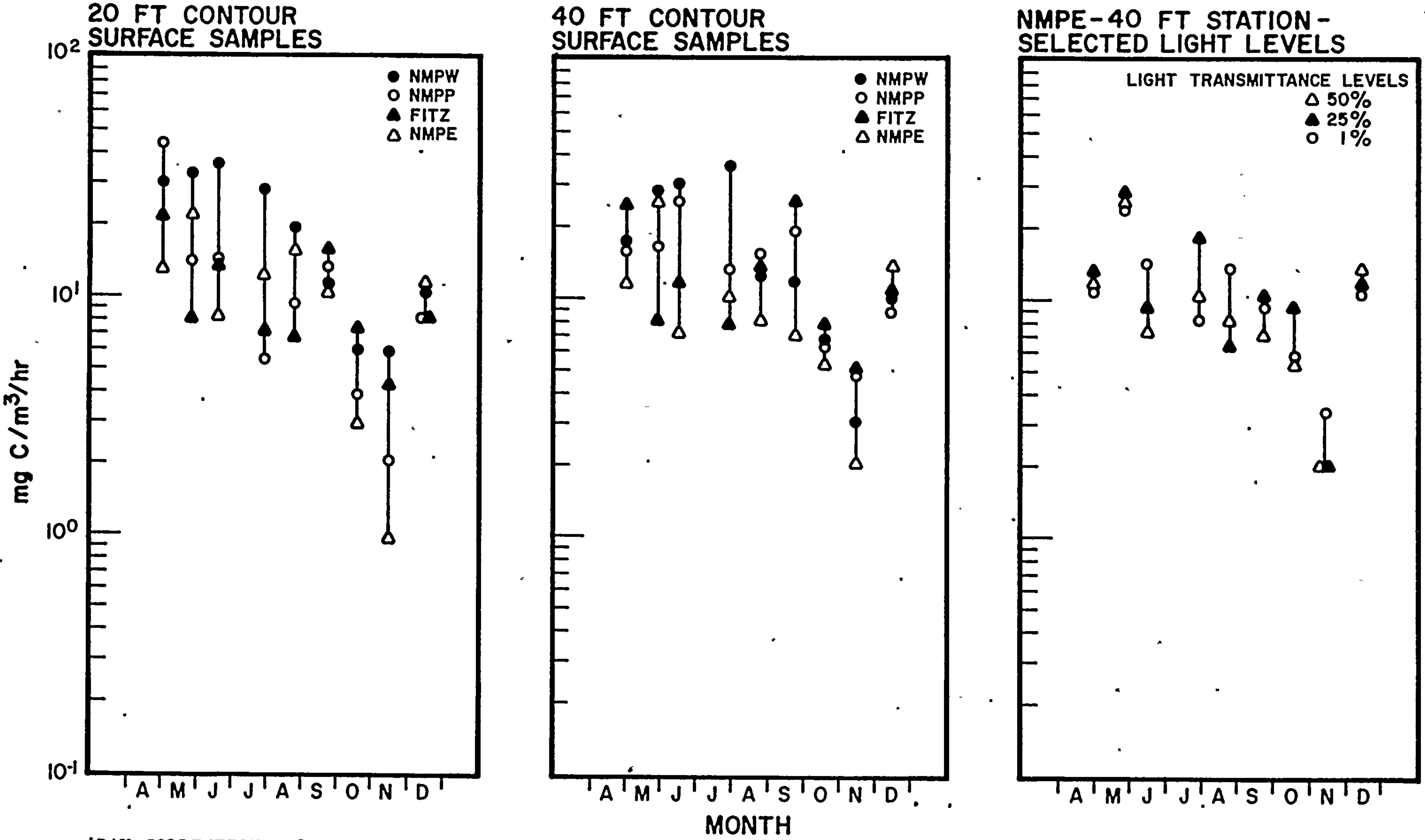
B. ZOOPLANKTON

1. Introduction and Methods and Materials

The zooplankton community was included in this postoperational study because of the important position of these organisms in the trophic structure of Lake Ontario. Changes in their abundance or composition could result, through trophic interaction, in alterations of other lake communities such as macrozooplankton and fish. Zooplankton are defined, for the purpose of this study, as ranging in size from 76 to 571 μ.

PRIMARY PRODUCTIVITY AT SELECTED STATIONS *

NINE MILE POINT VICINITY - 1976



*DAY COLLECTIONS, 2 LIGHT and 1 DARK BOTTLE READINGS, 4-HR INCUBATION PERIOD IN THE LABORATORY FOR BOTH REPLICATES

FIGURE VA-18

Field and laboratory procedures were the same as those used during 1975 except for the following changes:

- Oblique tows were conducted with paired Clarke-Bumpus samplers during 1976; a single Clarke-Bumpus sampler was towed at each station during 1975.

- A minimum of two hundred organisms from each of two samples were counted during the 1976 laboratory analysis; whereas two aliquots from one sample were analyzed during the 1975 program.

The sampling locations are shown on Figure VA-1.

2. Results and Discussion

a. Community Composition

The zooplankton taxa identified in samples collected with a 76 μ mesh net are presented in Table VB-1. The major groups present were protozoans, rotifers, cladocerans, and copepods. Of the 69 taxa identified, the majority were rotifers, while the protozoans, cladocerans, and copepods combined contributed less than 40% of the total identified. Only the protozoan family Epistylidae, the cladoceran *Bosmina longirostris*, copepod nauplii, and juvenile cyclopoid copepods were dominant (15% of total abundance at one or more stations) for more than two consecutive months.

TABLE VB-1

OCCURRENCE OF ZOOPLANKTON BY DATE

NINE MILE POINT VICINITY - 1976

TAXON	28 MAY	17,18 JUN	28 JUL	26,27 AUG	23,26 SEP	19 OCT	16 NOV	19 DEC
PROTOZOA								
SARCODINA								
DIFFLUGIA SP.		X		X	X	X		
SUCTORIA								
ACINETA SP.	X	X	X	X	X			X
TOKOPHRYA SP.	X	X						
THECACINETA SP.	X						X	X
PARACINETA SP.			X					
STAUROPHRYA ELEGANS	X							
CILIATA								
CODONELLA CRATERA	D	X	X	X	X	X	X	X
VORTICELLIDAE	X	X	X	X		X		X
EPISTYLIDAE	X	X	X	X	D	D	X	X
ROTIFERA (ASCHELMINTHES)								
BDELLOIDEA (class)	X	X						
MONOGONONTA (class)								
BRACHIONIDAE								
BRACHIONUS ANGULARIS	X	X	X	X		X		X
BRACHIONUS CALYCIFLORUS	X	X						X
BRACHIONUS URCEOLARIS	X							
BRACHIONUS BUDAPESTINENSIS				X				
EUCHLANIS DILATATA				X	X			
KELLICOTTIA LONGISPINA	X	D	X	X	X	X	X	X
KERATELLA CRASSA	X	X	X	D	X	X	X	X
KERATELLA COCHLEARIS	D	X	X	X	X	X	X	X
KERATELLA EARLINAE	X	D	X	X	X	X	X	X
KERATELLA HIEMALIS	X						X	X
KERATELLA QUADRATA	X	X	X	X		X	X	X
NOTHOLCA ACUMINATA	X	X						X
NOTHOLCA SQUAMULA	X	X						X
NOTHOLCA LAURENTIA	X	X						X
NOTHOLCA FOLIACEA	X							
LECANIDAE								
MONOSTYLA SP.								X
NOTOMMATIDAE								
CEPHALODELLA SP.	X							
TRICHOCERCIDAE								
TRICHOCERCA SP.					X			
TRICHOCERCA CYLINDRICA				X	X	X		X
TRICHOCERCA LONGISETA		X			X			
TRICHOCERCA MULTICRINIS	X	X	X	X	X	X	X	X
TRICHOCERCA PORCELLUS				X			X	X
TRICHOCERCA SIMILIS				X				
GASTROPIDAE								
ASCOMORPHA SP.				X	X	X		
ASCOMORPHA ECAUDIS				X	X	X		X
ASPLANCHNIDAE								
ASPLANCHNA PRIODONTA	X	D	X	X	X	X	X	X
SYNCHAETIDAE								
PLOESOMA LENTICULARE			X	X	X			
PLOESOMA HUDSONI		X	X	X	X	X		
PLOESOMA TRUNCATUM	X	X	D	X	D	X		
POLYARTHRA EURYPTERA			X	X	X	X	X	X
POLYARTHRA VULGARIS	X	X	X	X	X	X	X	X
POLYARTHRA DOLICHOPTERA	X	X	X	X	X	X	X	X
POLYARTHRA MAJOR	X	X	X	X	D	X	X	X
POLYARTHRA REMATA	X	X	X	X	X	X	X	X
SYNCHAETA LACKOWITZIANA	D	X				X	X	X
SYNCHAETA PECTINATA	X	X		X	X	X	X	X
SYNCHAETA STYLATA	X	D	X	X	D	X	X	X

TABLE VB-1 (Continued)

OCCURRENCE OF ZOOPLANKTON BY DATE (Continued)

NINE MILE POINT VICINITY - 1976

TAXON	DATE							
	28 MAY	17,18 JUN	28 JUL	26,27 AUG	23,26 SEP	19 OCT	16 NOV	19 DE
HEXARTHRIDAE								
HEXARTHRA SP.				X				
TESTUDINELLIDAE								
FILINIA LONGISETA	X	X	X	D	X	X	X	X
TESTUDINELLA SP.	X							
CONOCHILIDAE								
CONOCHILOIDES SP.				X				
CONOCHILUS UNICORNIS	X	X	X	D	X	X		
COLLOTHECACEAE								
COLLOTHECA MUTABILIS	X	X	X	X	X	X	X	X
\DOCERA (ARTHROPODA)								
HOLOPEDIDAE								
HOLOPEDIUM GIBBERUM				X				
DAPHNIDAE								
CERIODAPHNIA LACUSTRIS			X	X	X	X	X	X
DAPHNIA RETROCURVA			X	X	X	X	X	X
DAPHNIA PULEX							X	X
BOSMINIDAE								
BOSMINA COREGONI	X	X		X	X	X	X	X
BOSMINA LONGIROSTRIS	X	X	D	D	D	D	D	X
CHYDORIDAE								
ALONA AFFINIS	X			X				
CHYDORUS SPHAERICUS					X	X		X
?EPODA (ARTHROPODA)								
COPEPODA NAUPLII	X	X	D	D	X	D	X	D
CALANOIDA JUVENILE	X	X	X	X	X	X	X	X
EURYTEMORA AFFINIS (adult)							X	X
DIAPTOMUS SP. (adult)							X	X
CYCLOPOIDA JUVENILE	X	X	D	X	D	D	D	D
ACANTHOCYCLOPS VERNALIS (adult)								X
DIACYCLOPS BICUSPIDATUS THOMASI (adult)			X	X	X	X	X	X
TROPOCYCLOPS PRASINUS MEXICANUS (adult)				X	X	X	X	X

X PRESENT AT ONE OR MORE STATIONS, MEAN OF R-1 AND R-2
D ABUNDANCE OF 15 PCT. OR MORE AT ONE OR MORE STATIONS PER DATE: MEAN OF R-1 AND R-2

b. Seasonal and Spatial Patterns

Zooplankton data from the April through December sampling period were summarized for each major group (i.e., not a specific taxonomic level), all zooplankton combined, and for selected species (i.e., organisms identified at the species level). The entire data set was summarized for all species which comprised at least 5% of the total zooplankton at any station for a minimum of two months; data were plotted for those species comprising more than 10% of the total zooplankton at any station for at least two months.

(i) Selected taxa

- Calanoida. This group of organisms generally composed a small fraction of total zooplankton numbers (Appendices VB-1a and VB-1h), but they were present in the study area from May through December. Juvenile forms were present in all collections, and adults were present only in November and December samples (Table VB-1).

Maximum calanoid abundances (averaged over all stations) were recorded during the late fall (November). Mean abundance tended to be greater at the 20-ft depth contour than the 40-ft contour. The NMPP transect exhibited higher abundances than other transects of the 20-ft depth contour, except in midsummer (July and August) when NMPE transect had the greatest abundance (Figure VB-1).

- Cyclopoida. Cyclopoid juveniles composed a larger fraction of total zooplankton than calanoid juveniles (Appendices VB-1b and VB-1h), and were present in substantial numbers

ABUNDANCE OF CALANOIDA (COPEPODA)*

NINE MILE POINT VICINITY - 1976

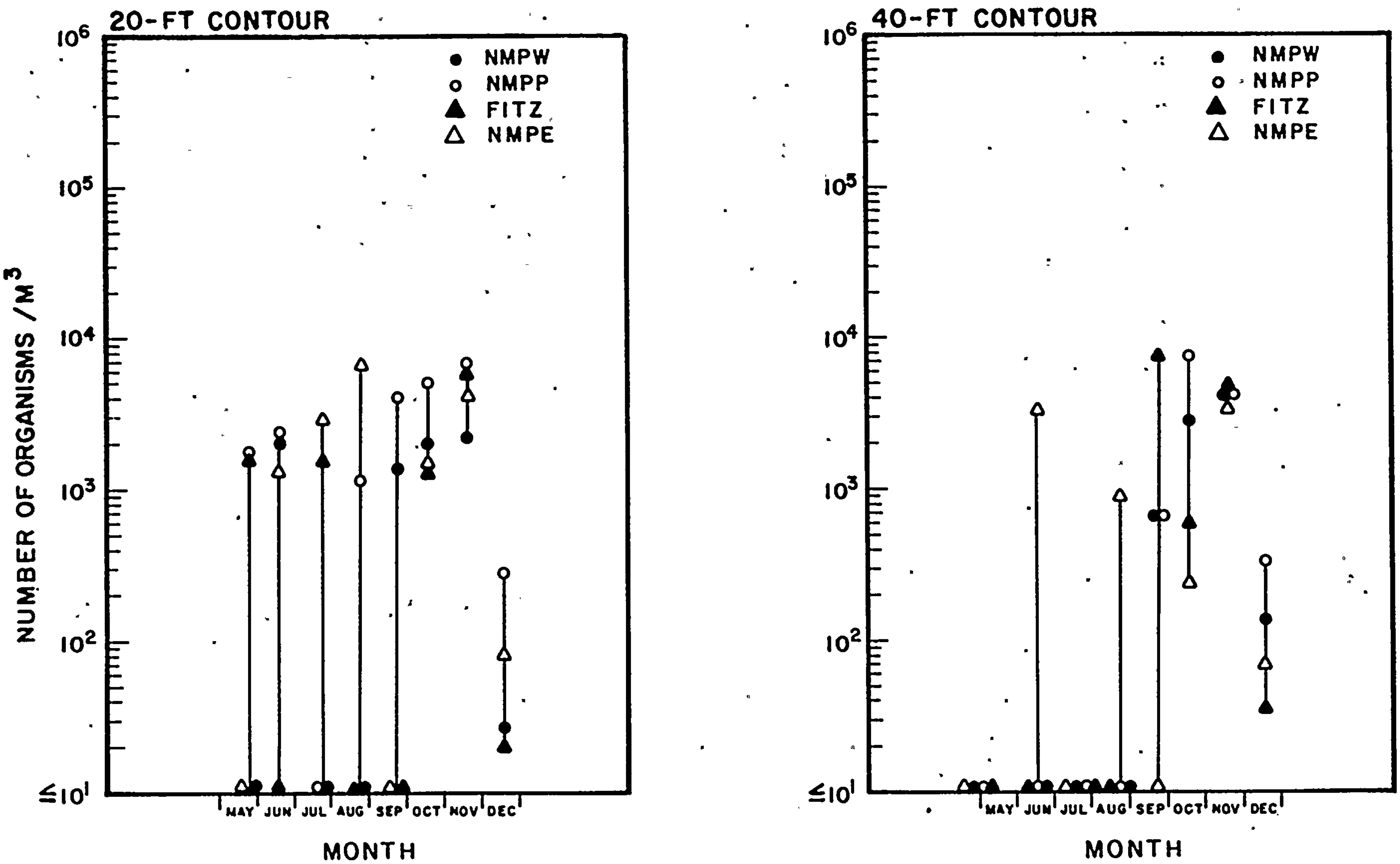


FIGURE VB-1

*ZOOPLANKTON COLLECTIONS, MEAN OF R-1 and R-2 ; JUVENILE STAGE

throughout the 1976 study period. Cyclopoid adults were identified in July collections and persisted through December (Table VB-1).

The temporal pattern of abundance appeared to be bimodal, with a maximum recorded during July and a second, larger maximum recorded during November; minimum abundance was found during December (Appendix VB-1a). Based on the daily mean abundance over all stations, there was no consistent pattern in cyclopoid abundance between the 20 and 40-ft depth contours. Abundances were usually greater at the FITZ transect on the 20-ft depth contour (Figure VB-2); this pattern was not observed at the 40-ft depth contour. There is no obvious reason for the observed spatial distribution patterns in the Nine Mile Point study area. It should be noted, however, that differences in juvenile cyclopoid abundance among stations were within generally accepted limits (i.e., less than an order of magnitude) for natural variation.

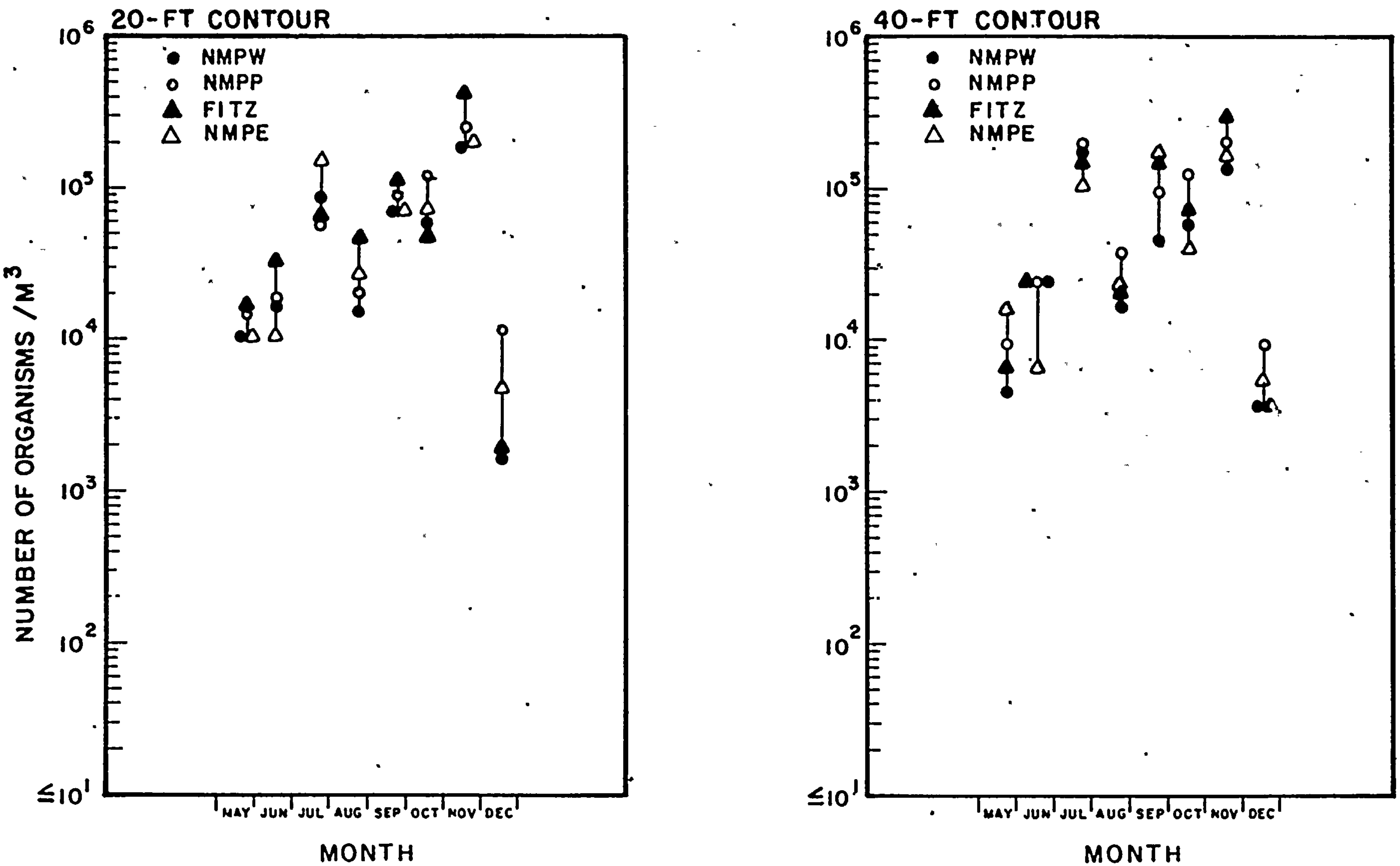
-Copepod nauplii. They were present in substantial numbers throughout the 1976 study program, and peak abundances were recorded during the July survey (Appendix VB-1c).

-Copepoda. This group (Appendix VB-1d) is composed of calanoid and cyclopoid juveniles and copepod nauplii, and its temporal/spatial distribution therefore reflects the combined distributions of those groups.

-Cladocera. Cladocerans were recorded in all but four collections during 1976 and at times composed a large fraction of the total zooplankton (Appendices VB-1e and VB-1h).

ABUNDANCE OF CYCLOPOIDA (COPEPODA)*

NINE MILE POINT VICINITY - 1976



*ZOOPLANKTON COLLECTIONS, MEAN OF R-1 and R-2: JUVENILE STAGE

FIGURE VB-2

Two peaks in cladoceran abundance were recorded, the first and largest during July and a secondary peak during November; minimum levels were recorded in December (Appendix VB-1e). Mean cladoceran abundances over the year tended to be greater at the 20-ft depth contour than at the 40-ft depth contour, but there were no consistent inter-transect patterns (Figure VB-3) at either depth contour.

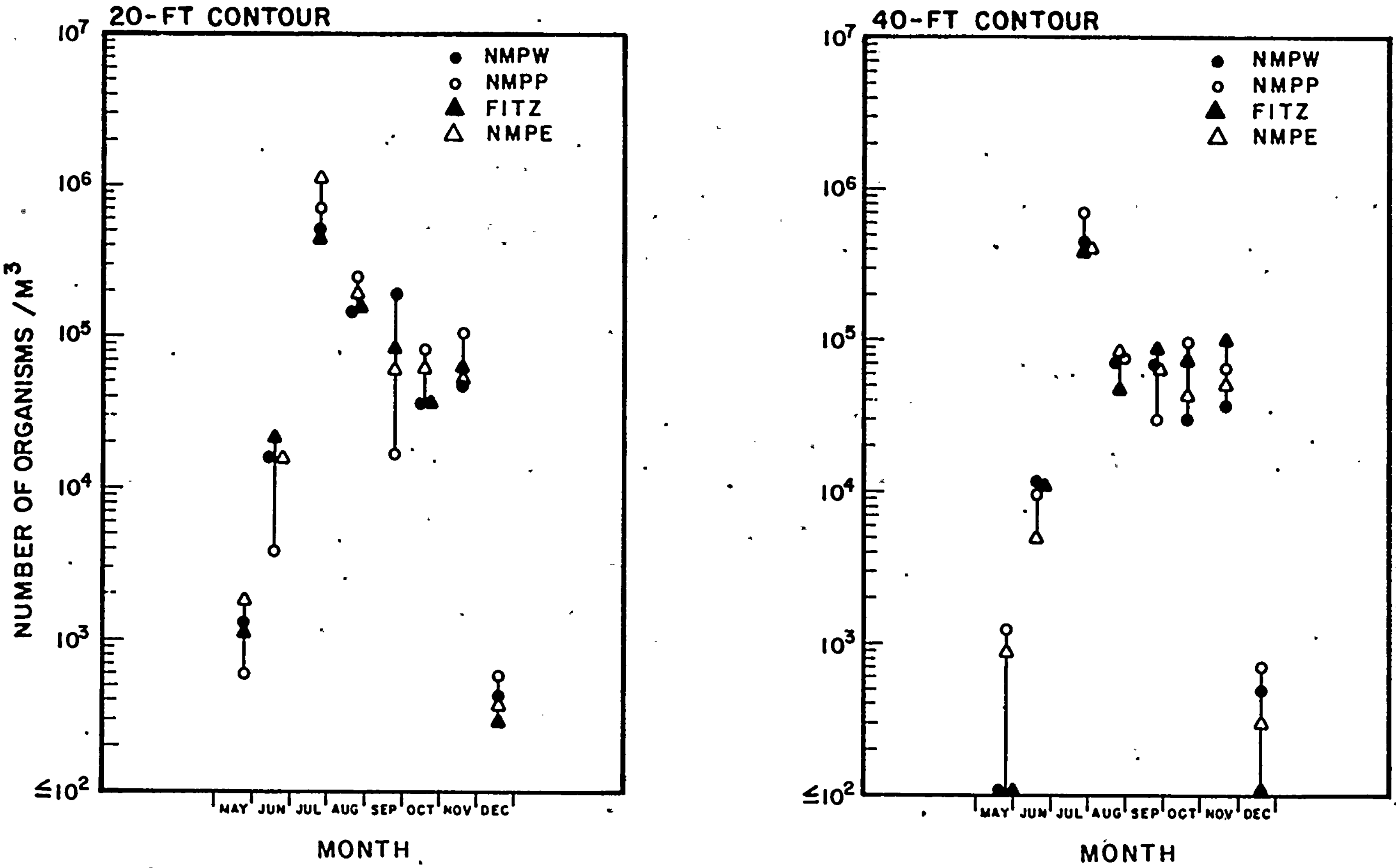
-Protozoa. The sampling method employed in the Nine Mile Point/FitzPatrick studies provided a selected sample of these organisms, since many are smaller than the 76 μ mesh net used. They were present in all but nine collections in 1976, and when they were present they represented approximately 20% of the zooplankton enumerated (Appendices VB-1f and VB-1h).

-Rotifera. Members of this taxon were present in all 1976 collections and composed up to about 90% of total zooplankton numbers, during its peak period in June (Appendices VB-1g and VB-1h). Rotifers were most abundant during the spring and summer surveys.

Greater mean concentrations were recorded at the 20-ft depth contour than at the 40-ft depth contour on all survey dates except December (Appendix VB-1g), but there were no consistent inter-transect distribution patterns at either depth contour (Figure VB-4).

ABUNDANCE OF CLADOCERA*

NINE MILE POINT VICINITY - 1976

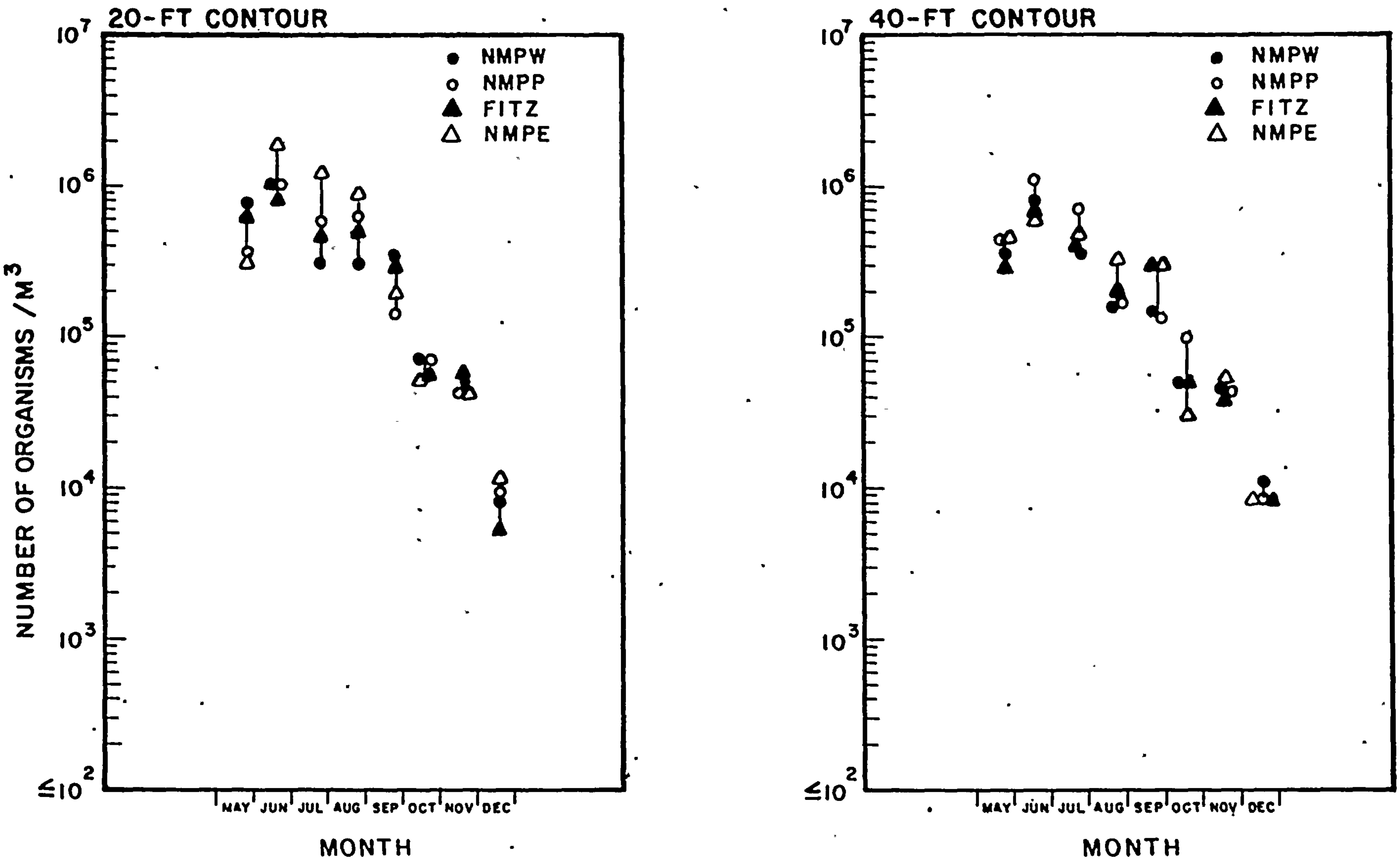


*ZOOPLANKTON COLLECTIONS, MEAN OF R-1 and R-2

FIGURE VB-3

ABUNDANCE OF ROTIFERA*

NINE MILE POINT VICINITY - 1976



*ZOOPLANKTON COLLECTIONS, MEAN OF R-1 and R-2

FIGURE VB-4

-Total Zooplankton. Total zooplankton abundance data are compiled in Appendix VB-1h. The temporal/spatial distribution of this community reflects the combined patterns for the major taxa described in the preceding subsections.

(ii) Selected Species

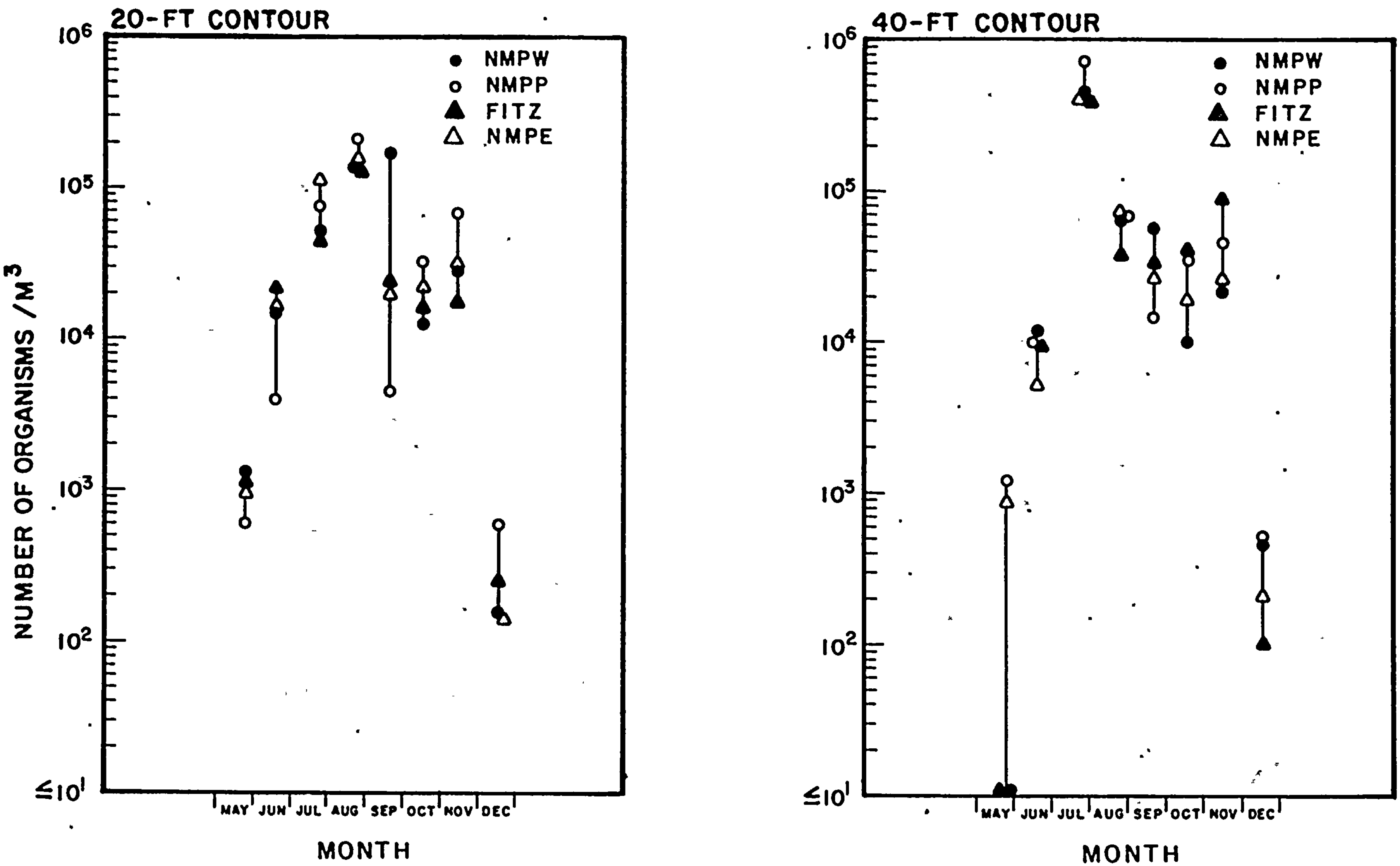
-Cladocera

-Bosmina longirostris. This was the most abundant cladoceran in zooplankton collections and it comprised more than 15% of the zooplankton sampled at one more stations in five out of eight monthly collections during 1976 (Table VB-1). Peak B. longirostris concentrations were recorded during July at the 20 and 40-ft depth contours based on a mean abundance over transect; a smaller peak in abundance was observed at these depth contours in November.

The spatial distribution of B. longirostris was similar to that described for total Cladocera. Mean abundance over transects was consistently greater at the 20-ft depth contour than at the 40-ft depth contour from May through September; the reverse was observed from October through December (Appendix VB-2a). There were no consistent intertransect patterns in B. longirostris concentrations at either the 20 or 40-ft depth contours (Figure VB-5).

-Daphnia retrocurva. This cladoceran was present in zooplankton collections from July through December. Peak concentrations were recorded during the October and November

ABUNDANCE OF
BOSMINA LONGIROSTRIS (CLADOCERA)*
NINE MILE POINT VICINITY - 1976



*ZOOPLANKTON COLLECTIONS; MEAN OF R-1 and R-2

FIGURE VB-5

surveys. There was no consistent pattern in its spatial distribution among transects at the 20 and 40-ft depth contour.

- Rotifera

- Asplanchna priodonta. This rotifer was collected during all months of the 1976 survey; however in August it was collected at only one station (Appendix VB-2b). Peak abundance of this cool-water species was recorded during June at both the 20 and 40-ft depth contours; a smaller peak, based on mean abundance over transects, was observed in May for the 20-ft contour and July for the 40-ft contour (Appendix VB-2b). There were no consistent spatial distribution patterns in A. priodonta concentrations among the transects at the 20 and 40-ft depth contours.

- Kellicottia longispina. This rotifera, like A. priodonta, was present during all months of the 1976 study (Appendix VB-2b), but was observed at only one station in August and September. The greatest abundance was observed in the June collection. While there were no consistent differences in abundance between the transects across the 20 and 40-ft depth contours, there did appear to be higher concentrations of K. longispina at the two easternmost transects (FITZ, NMPE) on the 20-ft depth contour. No consistent inter-transect patterns were apparent along the 40-ft depth contour.

- Keratella cochlearis. A bimodal pattern with a major peak during May and a secondary peak during August characterized the temporal abundance of this rotifer, which occurred during

all 1976 surveys (Appendix VB-2b). There was no consistent pattern in the spatial distribution of K. cochlearis along the 20 and 40-ft depth contours.

- Keratella crassa. This rotifer species was also present during all 1976 surveys (Appendix VB-2b). Its seasonal distribution was unimodal, increasing from May to peak numbers in July with a steady decrease thereafter through December. There were no consistent spatial distribution patterns among transects across the 20 and 40-ft depth contours (Figure VB-6).

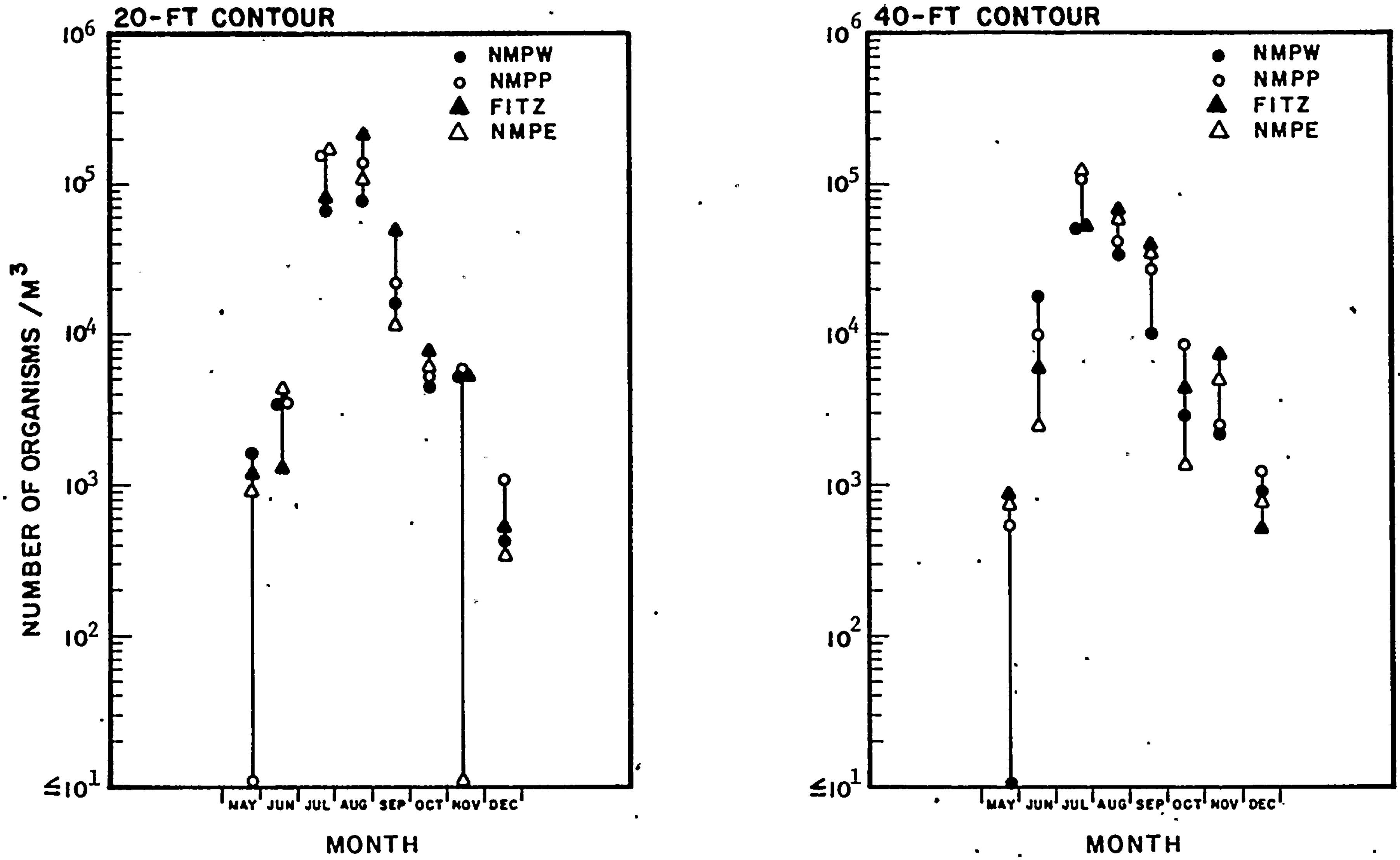
- Keratella earlinae. This rotifer was collected throughout the 1976 study at substantial levels of abundance; maximum concentrations were recorded at all depth contours during June (Appendix VB-2b). There were no consistent spatial distribution patterns in K. earlinae concentrations along the 20 and 40-ft depth contours (Figure VB-7).

- Keratella quadrata. This rotifer was most abundant during May; it was entirely absent from the September survey and present in low abundance at a few stations in August, October, and November 1976. Because K. quadrata was not collected in adequate numbers through 1976 (Appendix VB-2b), its spatial distribution patterns cannot be meaningfully described.

- Ploesoma truncatum. This rotifer was present from May through October, with peak mean daily abundance recorded during July (Appendix VB-2b). While P. truncatum was consistently more abundant at the 20-ft than at the 40-ft

ABUNDANCE OF
KERATELLA CRASSA (ROTIFERA)*

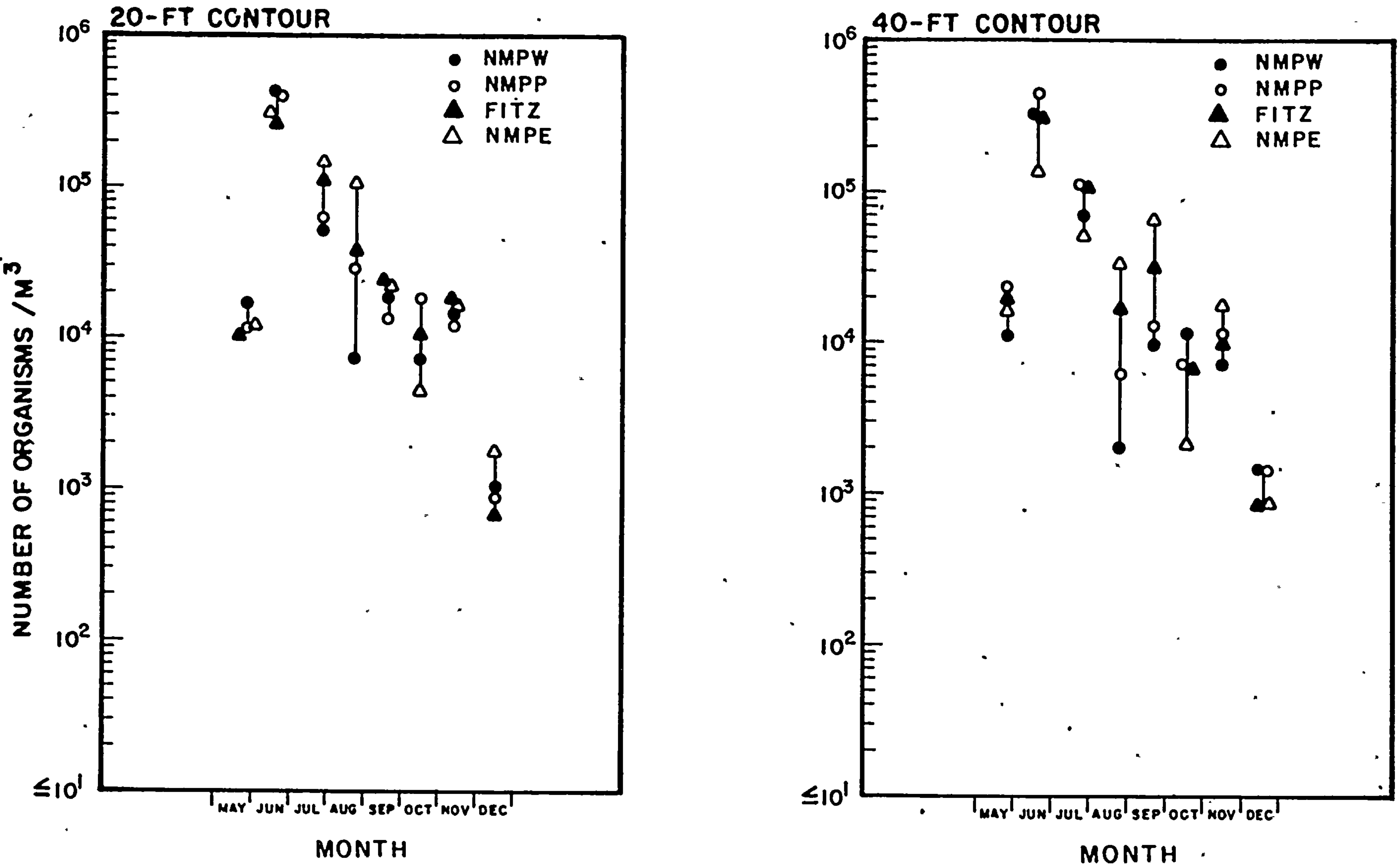
NINE MILE POINT VICINITY - 1976



*ZOOPLANKTON COLLECTIONS; MEAN OF R-1 and R-2

FIGURE VB-6

ABUNDANCE OF
KERATELLA EARLINAE (ROTIFERA)*
NINE MILE POINT VICINITY - 1976



*ZOOPLANKTON COLLECTIONS; MEAN OF R-1 and R-2

FIGURE VB-7

depth contour (Appendix VB-2b), there were no consistent inter-transect patterns of abundance at either depth contour (Figure VB-8).

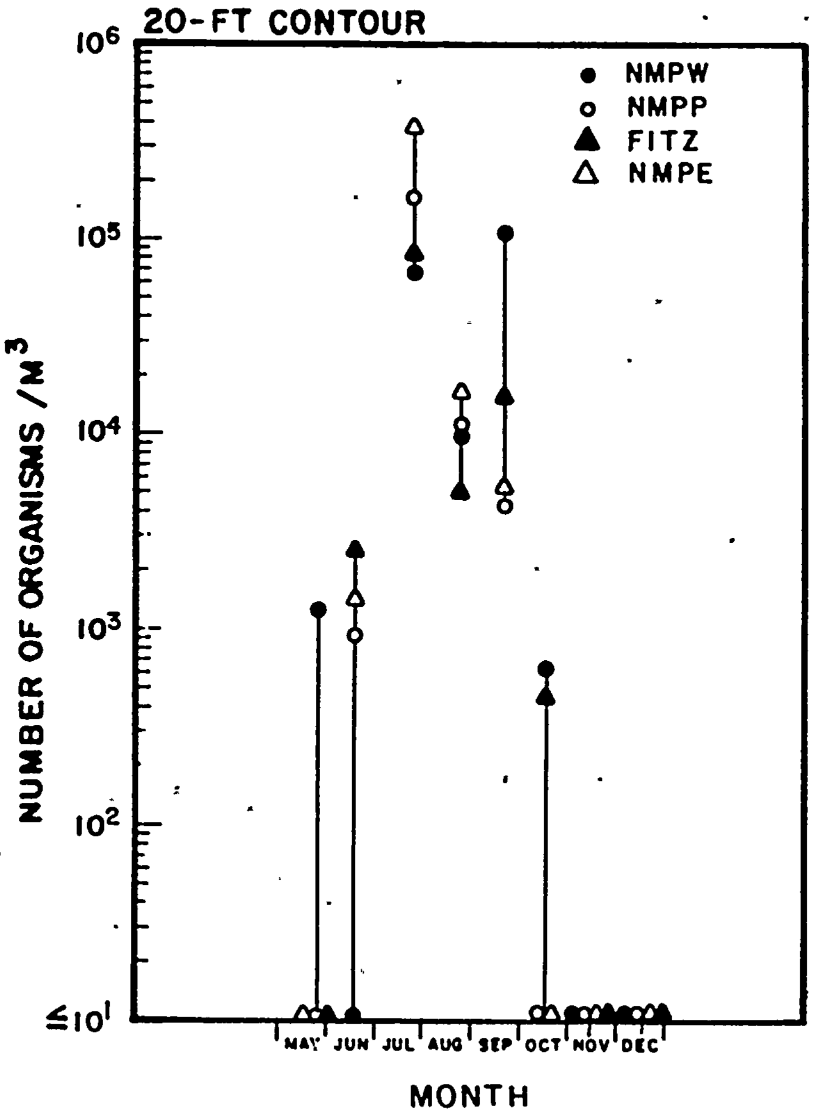
-<u>Polyartha</u> <u>major</u>. This rotifer was collected throughout the 1976 sampling program, but at only three of the 16 stations in May (Appendix VB-2b). Its seasonal distribution was unimodal, with maximum mean concentrations per date and depth contour recorded during September. While there were no consistent patterns of <u>P</u>. <u>major</u> abundance between depth contours, greater mean concentrations were recorded at the 20-ft depth contour from August through October and at the 40-ft depth contour in June and July (Appendix VB-2b).

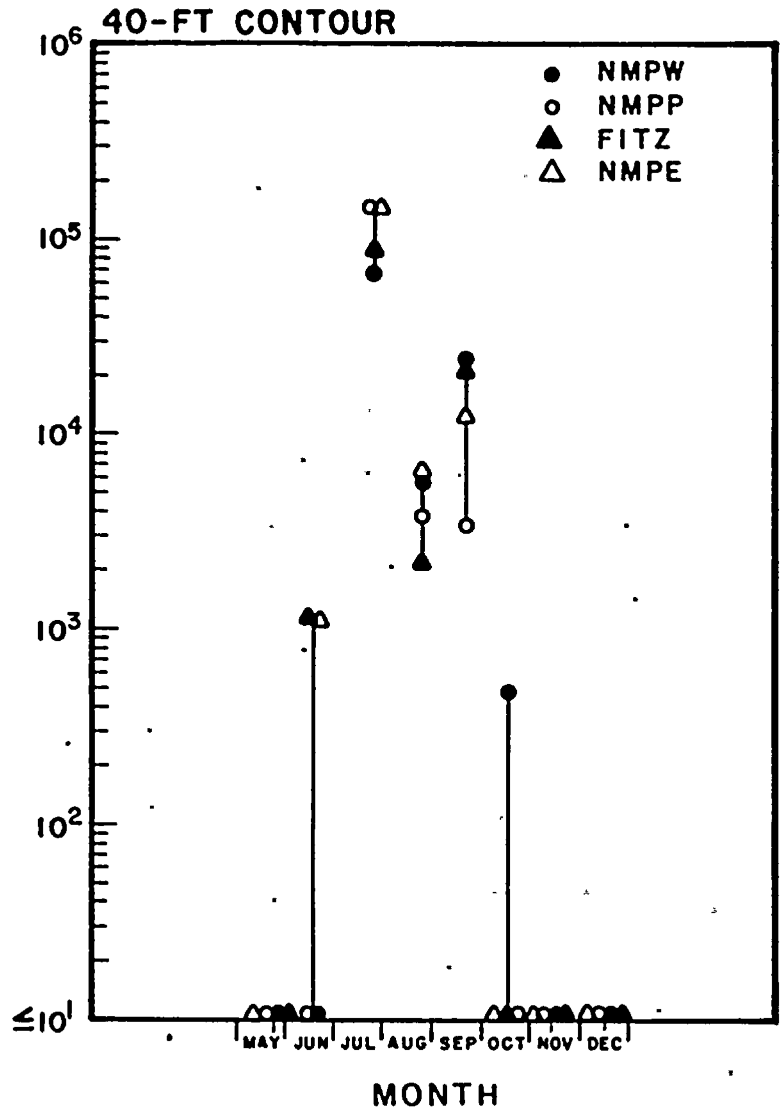
There were no consistent inter-transect patterns by depth contour in <u>P</u>. <u>major</u> numbers during the July through October period of greatest abundance (Figure VB-9).

-<u>Polyarthra</u> <u>vulgaris</u>. This species, like <u>P</u>. <u>major</u>, was collected throughout the 1976 study and the seasonal pattern of abundance was unimodal (Appendix VB-2b), with peak concentrations recorded during July. There was no consistent spatial distribution pattern at the 20 and 40-ft contours (Figure VB-10).

-<u>Synchaeta</u> <u>lackowitziana</u>. This species was collected in substantial numbers, during only three of the eight surveys conducted during 1976 (Appendix VB-2b); they were present in collections at only one station in October and November.

ABUNDANCE OF
PLOESOMA TRUNCATUM (ROTIFERA)*
NINE MILE POINT VICINITY - 1976

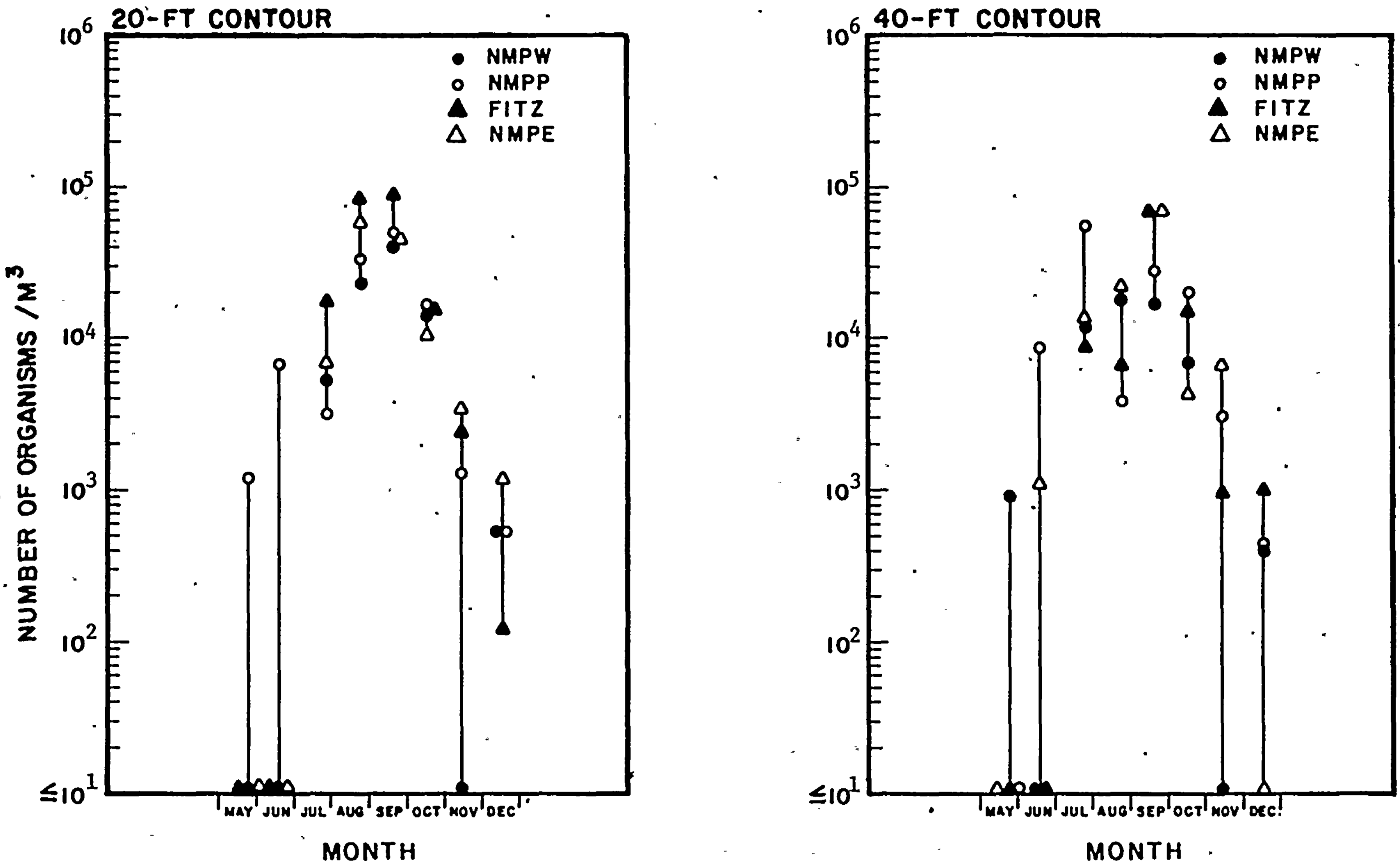




*ZOOPLANKTON COLLECTIONS; MEAN OF R-1 and R-2

FIGURE VB-8

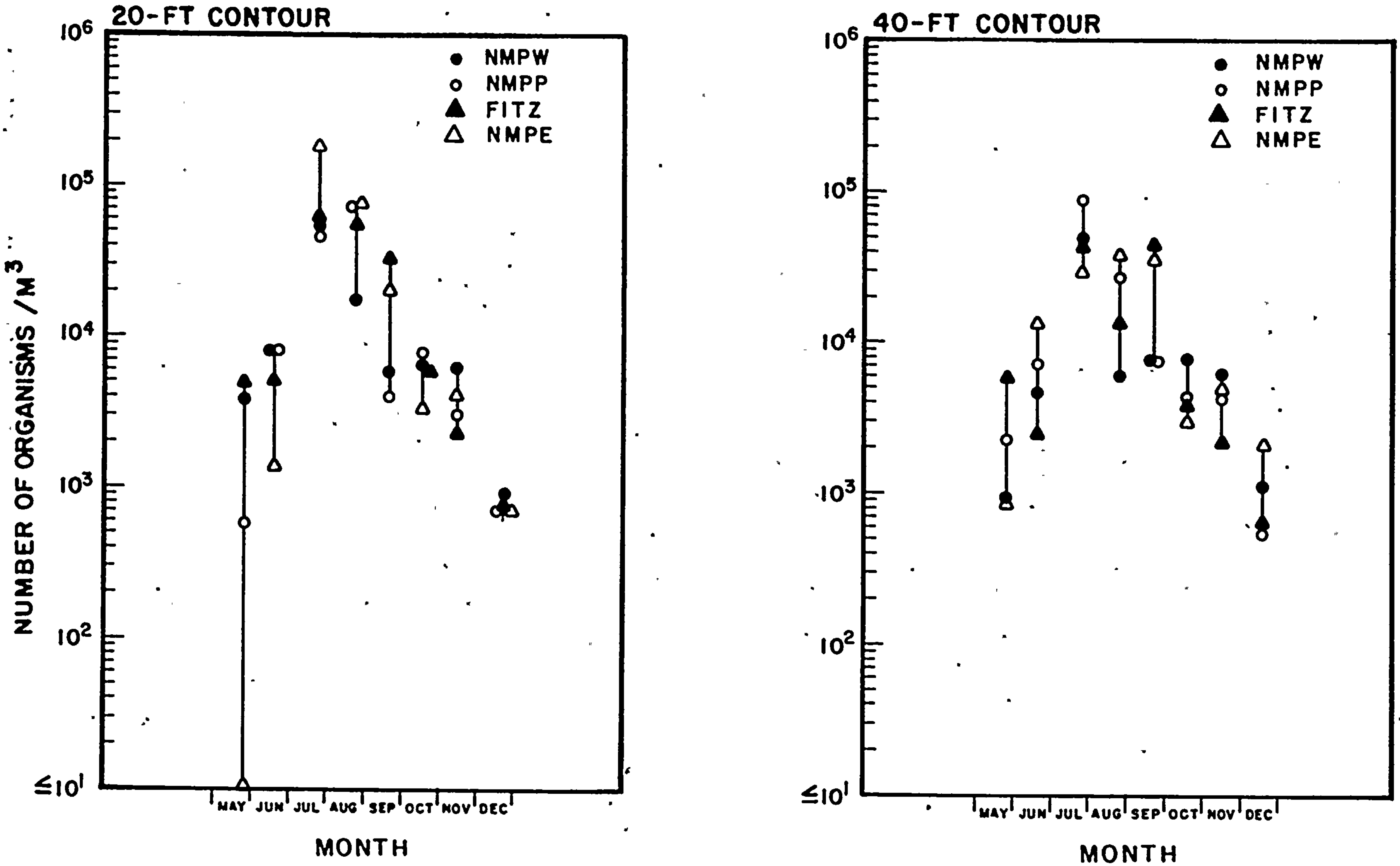
ABUNDANCE OF
POLYARTHRA MAJOR (ROTIFERA)*
NINE MILE POINT VICINITY - 1976



*ZOOPLANKTON COLLECTIONS; MEAN OF R-1 and R-2

FIGURE VB-9

ABUNDANCE OF
POLYARTHRA VULGARIS (ROTIFERA)*
NINE MILE POINT VICINITY - 1976



*ZOOPLANKTON COLLECTIONS; MEAN OF R-1 and R-2

FIGURE VB-10

During the months when S. lacowitziana was abundant (May, June, and December), mean concentrations over transects were greatest at the 20-ft depth contour. There were no consistent inter-transect distribution patterns across the 20 and 40-ft depth contours (Figure VB-11).

-Synchaeta pectinata. The abundance data for S. pectinata are presented in Appendix VB-2b. Concentrations were greater at the 20-ft depth contour on three of the five dates on which significant numbers of organisms were collected at all stations. There were no consistent inter-transect distribution patterns across the 20 and 40-ft contours.

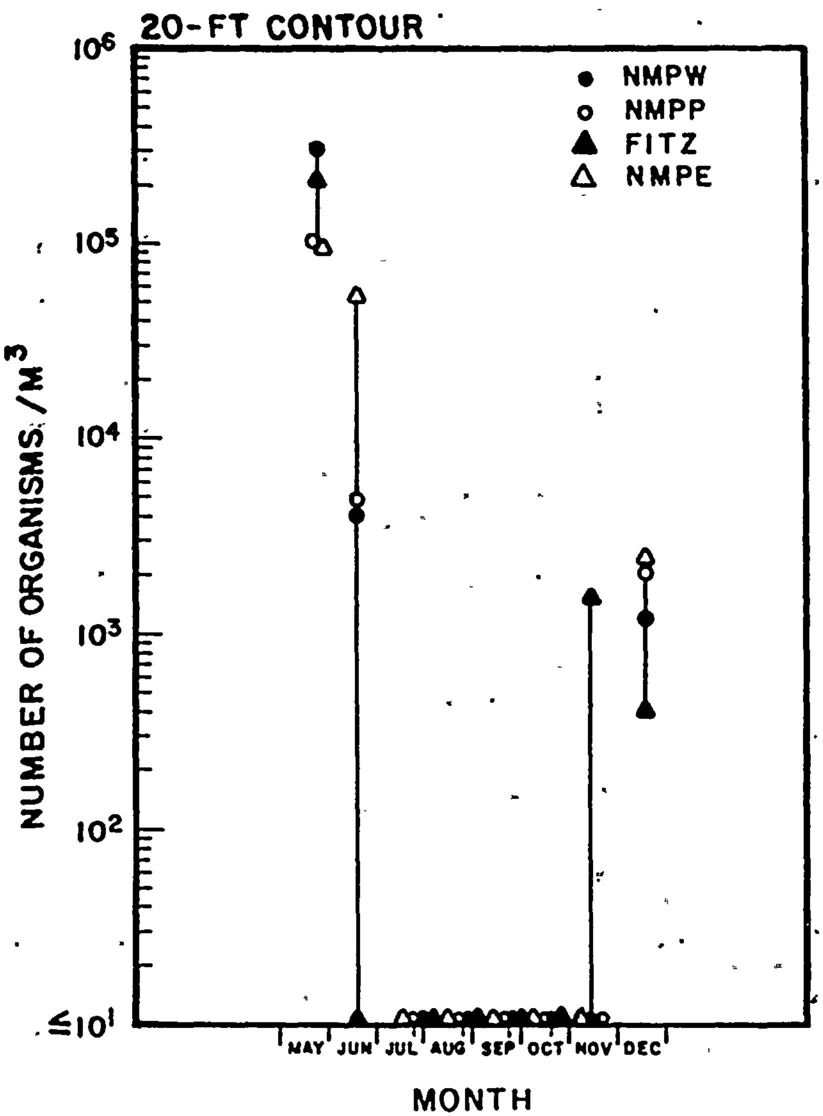
-Synchaeta stylata. Unlike the preceding two species of this genus, S. stylata was abundant from July through September (Appendix VB-2b). A major peak in abundance by date and depth contour was observed in June followed by a decline in abundance and, subsequently, a secondary peak in September. There were no consistent spatial distribution patterns in concentrations of S. stylata along the 20 and 40-ft depth contours (Figure VB-12).

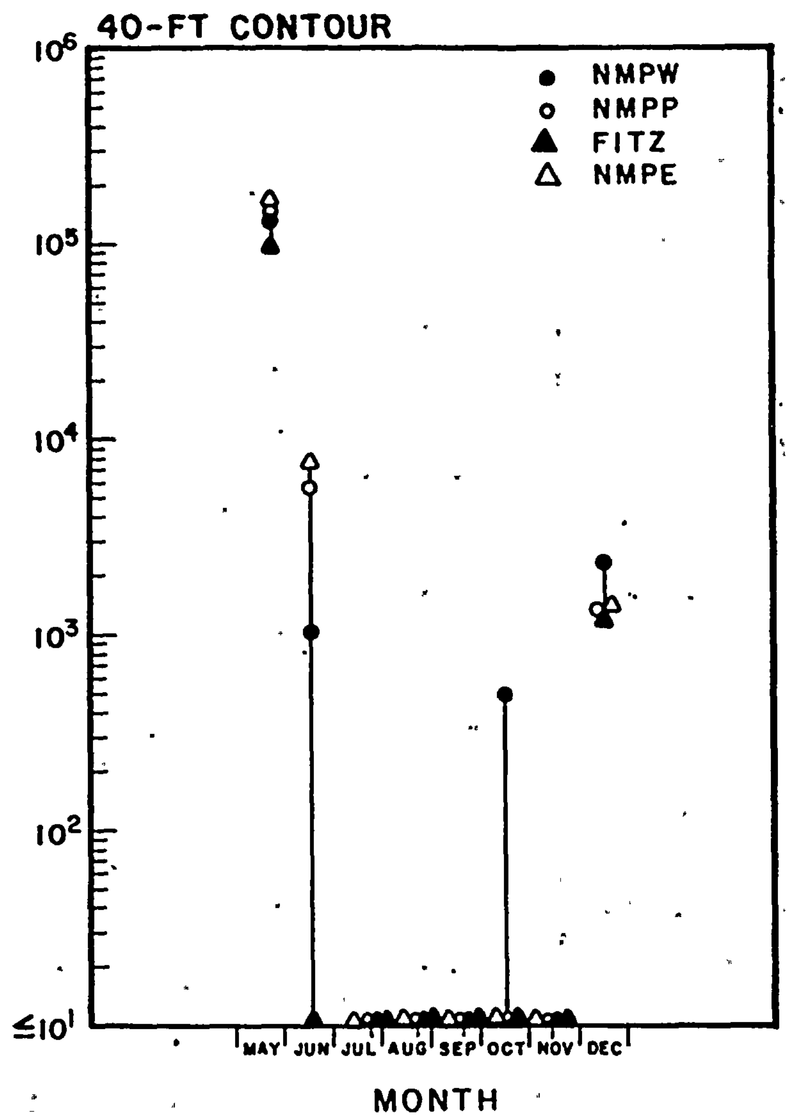
3. Conclusions

Overall, based on the 1976 data, no temporal/spatial distribution patterns were observed reflecting solely the effects of the operation of the Nine Mile Point and FitzPatrick generating stations. Differences in abundance were within the range of natural variation (approximately an order of magnitude) and were thus related to the interaction of several natural biological, chemical, and physical factors.

ABUNDANCE OF SYNCHAETA LACKOWITZIANA (ROTIFERA)*

NINE MILE POINT VICINITY - 1976



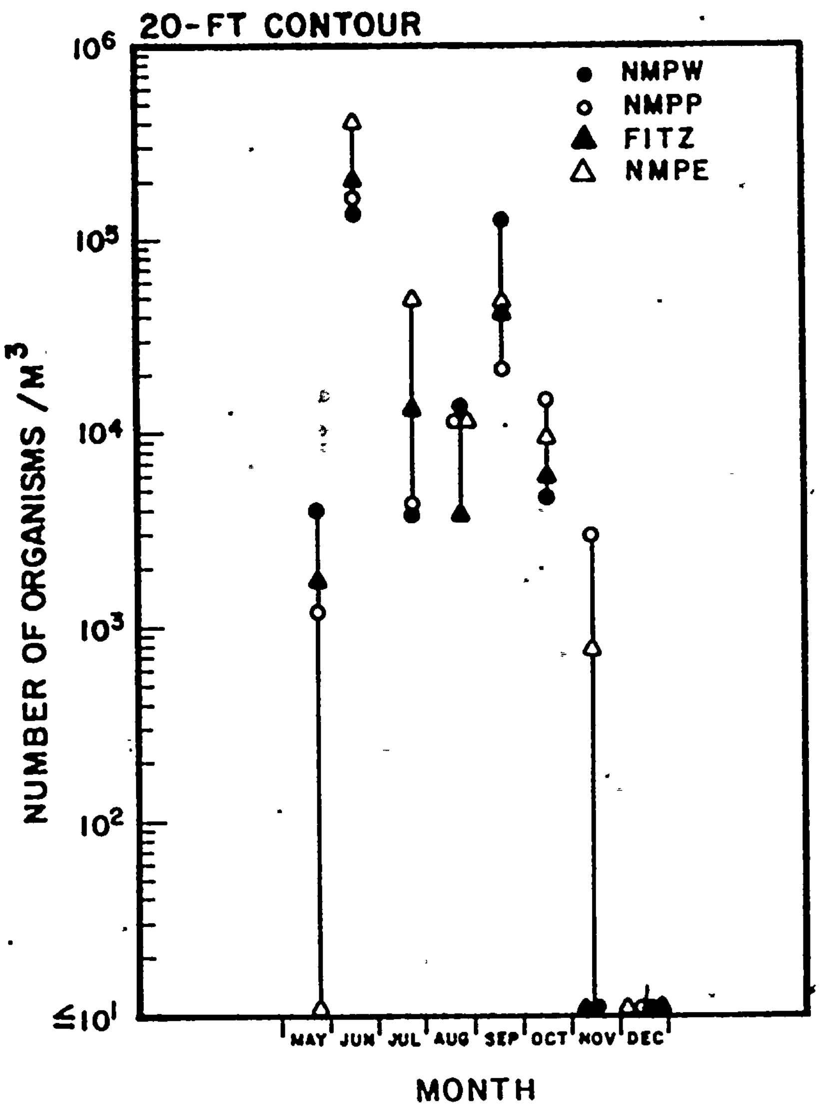


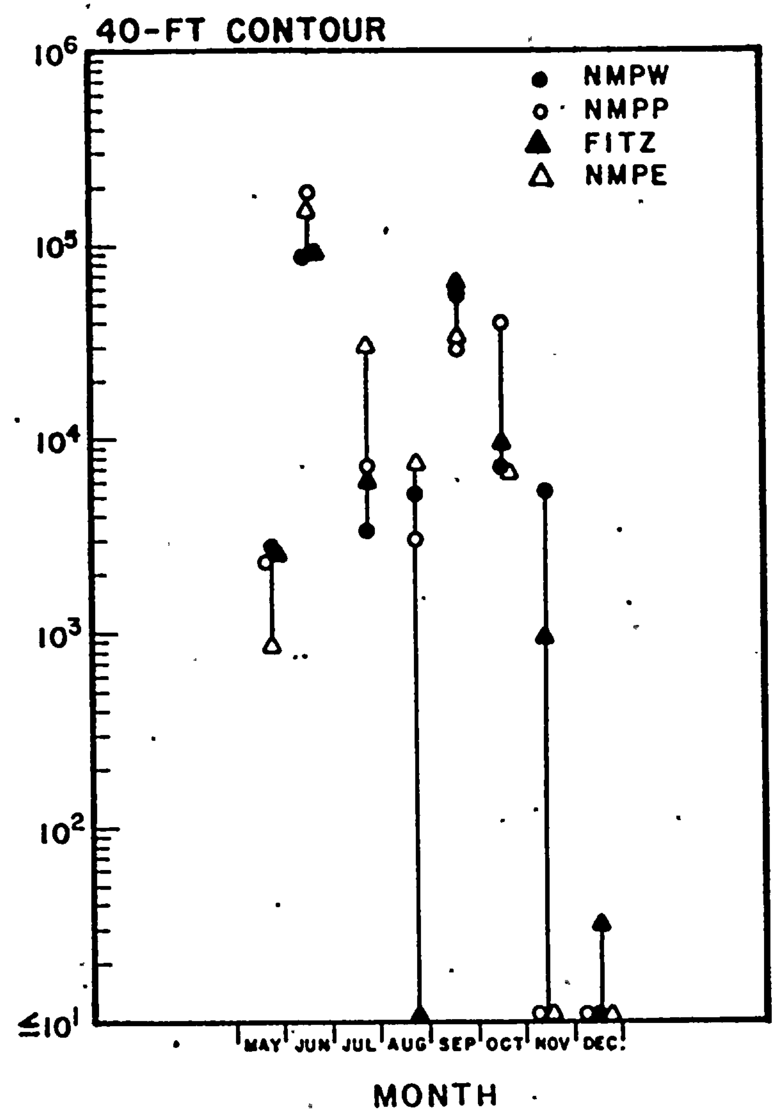
*ZOOPLANKTON COLLECTIONS; MEAN OF R-1 and R-2

FIGURE VB-11

ABUNDANCE OF *SYNCHAETA STYLATA* (ROTIFERA)*

NINE MILE POINT VICINITY - 1976





*ZOOPLANKTON COLLECTIONS; MEAN OF R-1 and R-2

FIGURE VB-12

C. MACROZOOPLANKTON AND ICHTHYOPLANKTON

1. Introduction and Material and Methods

The lake monitoring program for macrozooplankton and ichthyoplankton was conducted using a 571 μ mesh net from April through December 1976. Dates of collection are presented in Table VA-1, and sampling locations are presented in Figure VA-1.

Field and laboratory procedures followed in 1976 are described in Appendix I. The procedure followed was similar to that used in 1975 (LMS 1976), with the following exceptions:

- Surface, mid-depth, and bottom nets were towed simultaneously during 1976. The mid-depth net was towed independently from the surface and bottom nets, which were towed concurrently during 1975.

- Night samples were analyzed for all ichthyoplankton, fish eggs, and once a month for selected species of macrozooplankton (Gammarus spp., Pontoporeia affinis, and Mysis oculata relicta). During 1975, all macrozooplankton collected in day and night samples were enumerated and identified.

2. Results and Discussion - Macrozooplankton

a. Community Composition - Species Inventory by Date

Twenty-two taxa were identified from the Nine Mile Point vicinity between April and December 1976 (Table VC-1). The greatest number of taxa identified from day collections was 15 and 14, on 8 September and 16 June, respectively, and the lowest number

TABLE VC-1

MACROZOOPLANKTON SPECIES OCCURRENCE BY DATE

NINE MILE POINT VICINITY - 1976

TAXA		14 APR	13 MAY	16 JUN D	16 JUN N	15 JUL D	15 JUL N	18 AUG D	18 AUG N	8 SEP D	8 SEP N	6 OCT	3 NOV	10 DEC
CNIDARIA (COELENTERATA)														
Hydrozoa														
Hydroida - Athecata	S	D	D											
	M	D	D											
	B	D	D											
Clavidae														
<u>Cordylophora</u>														
<u>C. lacustris</u>	S											X		D
	M											X	X	
	B									X		X	X	
Hydridae														
<u>Hydra</u>														
<u>H. americana</u>	S		D	X		X				X		X		D
	M		D	X		X		X				D	X	D
	B		D	D		X		X		X		D	X	D
PLATYHELMINTHES														
Turbellaria	S													
	M													
	B		D							X			X	
ASCHELMINTHES														
Nematoda	S		D											
	M		X										X	D
	B			X						X				D
MOLLUSCA														
Gastropoda	S												X	
	M													
	B	D		X		X				X		X	X	
Bivalvia (Pelecypoda)	S	D											X	
	M		X											
	B	D		X						X			X	
ANNELIDA														
Polychaeta														
Sabellida														
Sabellidae														
<u>Manayunkia</u>														
<u>M. speciosa</u>	S	D						X					X	
	M													
	B	D		D				X		X			X	
Oligochaeta	S		D					X		X				
	M		D	X		X		X						
	B	D	D	X				X		X		X	X	D
ARTHROPODA														
Arachnoidea (Arachnida)														
Acari (Hydracarina)	S	D	D	X		X		X		X		X	D	D
	M		D	X		X		X		X		X	X	
	B	D	D	D		X		X		X		X	X	D
Insecta														
Trichoptera	S													
	M									X				
	B			D										
Odonata	S							X						
	M													
	B													
Diptera	S	D		X		X		X		X				
	M	D	X	X		X		X		X		X		
	B	D	D	D		X		X		X		X		
Culicidae														
<u>Chaoborus</u>	S													
	M			X										
	B													

TABLE VC-1 (Continued)

MACROZOOPLANKTON SPECIES OCCURRENCE BY DATE (Continued)

NINE MILE POINT VICINITY - 1976

TAXA	SAMPLE DEPTH	14 APR	13 MAY	16 JUN		15 JUL		18 AUG		8 SEP		6 OCT	3 NOV	10 DEC
				D	N	D	N	D	N	D	N			
ARTHROPODA (CONT.)														
Insecta														
Lepidoptera	S		D											
	M		D									X		
	B													
Crustacea														
Cladocera														
Leptodoridae														
Leptodora														
L. kindtii	S		D	D		D		D		D		D	D	D
	M		D	D		D		D		D		D	D	
	B		D	D		D		D		D		D	D	
Amphipoda														
Gammaridae														
Gammarus														
G. fasciatus	S		D	X	D	X	D	X	D	X	D	X	X	D
	M	D		D	D	X	D	X	D	X	D		X	
	B	D	D	D	D	X	D	X	D	X	D	X	D	
Crangonyx	S													
	M												X	
	B													
Haustoriidae														
Pontoporeia														
P. affinis	S				X		D		X					
	M			X	D		X		X	X	D			
	B				D		D		D	X	D		X	
Talltridae														
Hyalella														
H. azteca	S													
	M													
	B							X						
Mysidacea														
Mysidae														
Mysis														
M. oculata relicta	S				X									
	M				X									
	B	X			D				X					
Ostracoda (Podocopa)	S			X		X		X		X				
	M		D			X		X		X				
	B	X	D	X		X		X		X		X		

D/N IN COLUMN HEADING:

D = Day collection

N = Night collection

S = Surface sample

M = Mid-depth sample

B = Bottom sample

Only species counted in night samples are *Gammarus fasciatus*, *Pontoporeia affinis*, and *Mysis oculata relicta*.

D $\geq$ 5% of total macrozooplankton at one or more stations per date

X = Occurrence at one or more stations per date

identified was seven, on 10 December. Gammarus fasciatus Appendices VC-1a and VC-1b), Hydracarina, and oligochaetes were identified from each collection date.

b. Seasonal and Spatial Patterns of Selected Taxa

Data for selected taxa were summarized based on the occurrence of these organisms in the benthic collections, their comparability between years (1974 through 1976), and/or their classification as a representative important species (i.e., Gammarus fasciatus) in the Nine Mile Point vicinity of Lake Ontario.

- Diptera (Class Insecta)

Planktonic dipteran concentrations were relatively low (less than 11 organisms/1000 m^3) in the Nine Mile Point vicinity during April and May 1976 (Appendix VC-1a). Mean concentrations over all stations increased from July through September (maximum concentration of 94 organisms/1000 m^3 recorded from 1-NMPW-40-ft station) and then declined in October, with none collected in November and December. Dipteran abundance was greater at the western transects along the 20 and 40-ft depth contours based on the mean abundance per station over all dates.

- Hydroida (Phylum Coelenterata)

Hydroids (Hydra americana, Cordylophora lacustris, and unidentified hydroids) exhibited a bimodal seasonal pattern (Appendix VC-1a) with the major peak observed in May, when mean abundance at the 20-ft depth contour was predominant, and a secondary peak in October, when mean abundance at the 40-ft contour was predominant. The greatest abundance was observed at the 0.5-NMPE-40 ft station. Generally, hydroids were collected in greater concentrations at the eastern stations than at the west; distribution along depth contours did not correspond to a general trend.

-Leptodora kindtii (Order Cladocera)

This species increased in abundance from May to September and then decreased markedly. The grand mean (based on an April-December sampling period) for 3-NMPE-20-ft, 0.5-NMPW-20-ft and 3-NMPW-20-ft stations was the greatest (Appendix VC-1a); lowest concencentrations were observed at 0.5-NMPE-40-ft and 1-NMPW-20-ft stations along the 20 and 40-ft contours. Generally, L. kindtii was more abundant in mid-depth samples. Mean concentrations over sample depth were greater 85% of the time at the 20-ft than at the 40-ft depth contour at the same station. The distribution along the 20 and 40-ft contours is presented in Figure VC-1.

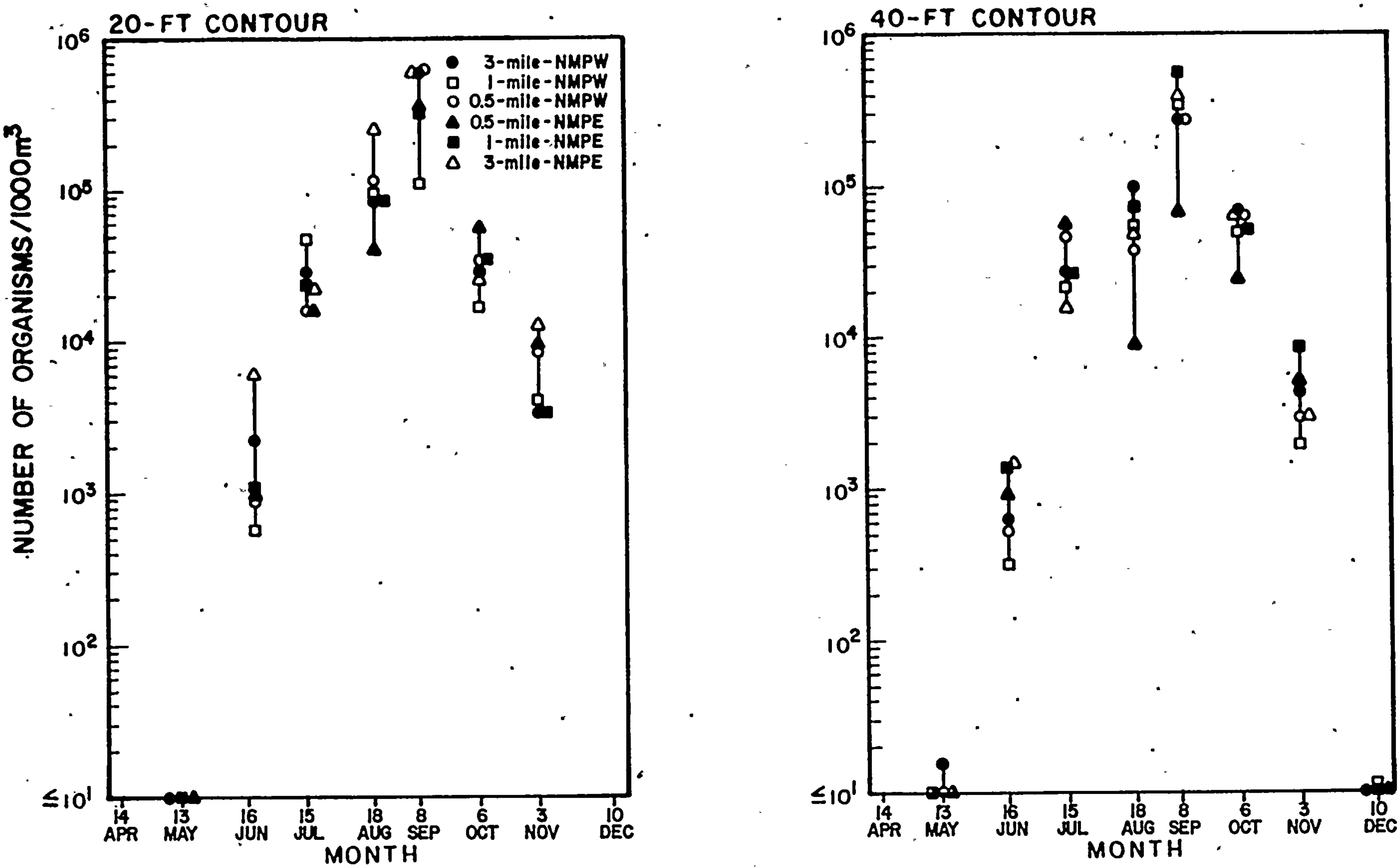
-Gammarus fasciatus (Order Amphipoda)

The grand mean concentration of planktonic Gammarus fasciatus by station was greatest at 1-NMPE and least at 3-NMPW along the 20-ft depth contour; along the 40-ft depth contour, abundances were greatest at 0.5-NMPW and lowest at 3-NMPW for night collections. Based on a June through September night sampling regime, concentrations peaked in August (Appendix VC-1b).

The distribution of Gammarus fasciatus along the 20 and 40-ft depth contours is presented in Figure VC-2. The concentrations were on the same order of magnitude along both contours with slightly greater concentrations to the east than to the west of the Nine Mile Point station. Effects of the Nine Mile Point and FitzPatrick plant discharge plumes on G. fasciatus distribution

ABUNDANCE* OF LEPTODORA KINDTII IN DAY COLLECTIONS

NINE MILE POINT VICINITY - 1976

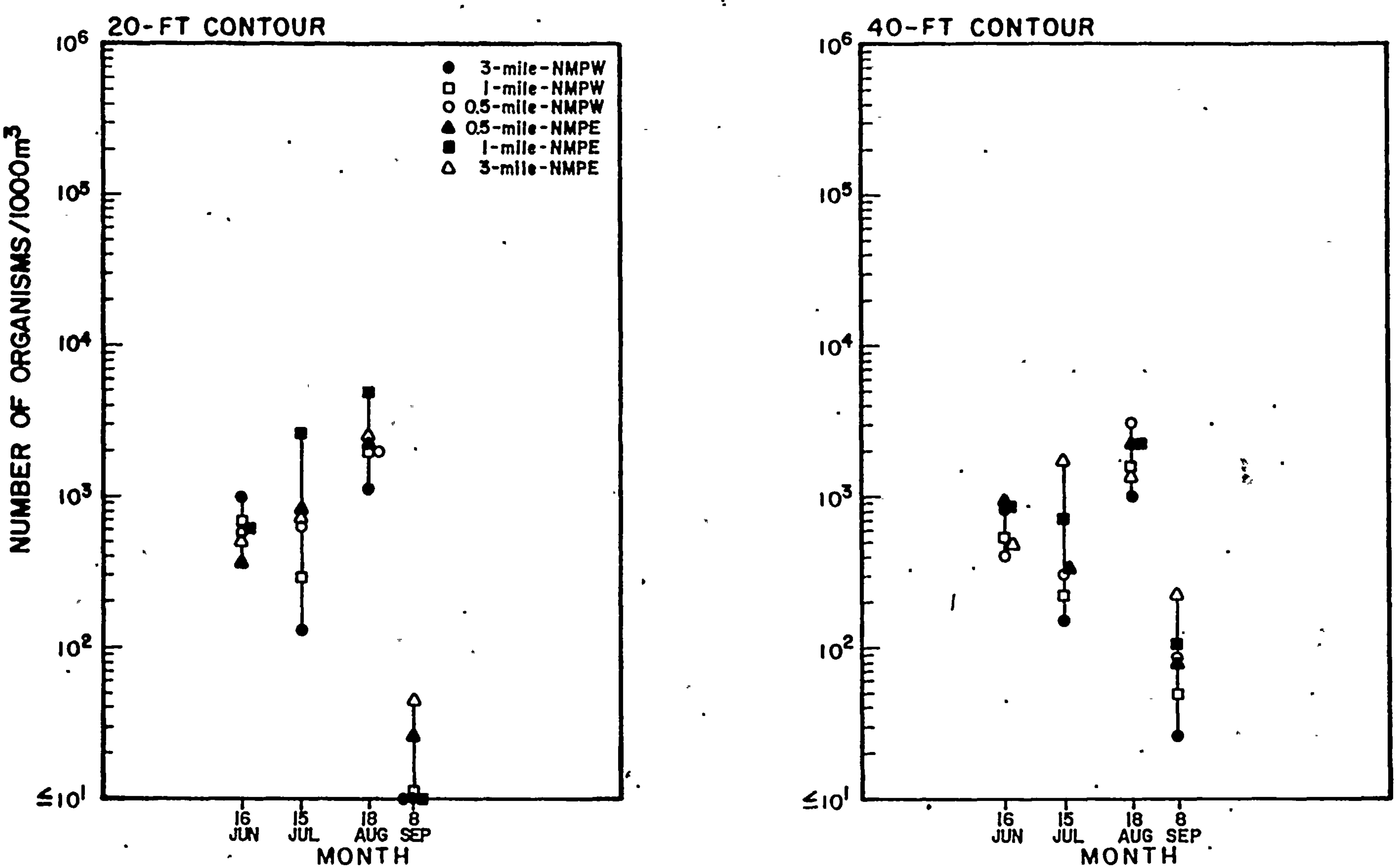


*MEAN OF SURFACE, MID-DEPTH AND BOTTOM COLLECTIONS, ENUMERATION FROM ICHTHYOPLANKTON COLLECTIONS; NONE COLLECTED 14 APR

FIGURE VC-1

ABUNDANCE* OF GAMMARUS FASCIATUS IN NIGHT COLLECTIONS

NINE MILE POINT VICINITY - 1976



*MEAN OF SURFACE, MID-DEPTH AND BOTTOM COLLECTIONS, ENUMERATION FROM ICHTHYOPLANKTON COLLECTIONS

FIGURE VC-2

could not be discerned. Along the 20-ft depth contour, stations closest to the discharges (1-NMPE and 0.5-NMPW) ranked first and fourth, respectively, in abundance; and at the 40-ft contour, station 1-NMPE ranked second in Gammarus abundance of the six transects along the 40-ft contour. Rankings are based on grand mean by station (Appendix VC-1b).

Gammarus fasciatus concentrations were 10-200 times greater in the night collections than in the day collections over the same period (Appendices VC-1a and VC-1b). The low abundances in day collections suggest that G. fasciatus is either benthic and/or epibenthic during the day, remaining at a depth below which the sampling gear is effective. Increased concentrations in mid-depth and bottom collections at night indicate that some segment of the population undergoes vertical migration.

Data for Gammarus fasciatus collected with a benthic pump are summarized in Chapter VI.

3. Results and Discussion - Ichthyoplankton and Fish Eggs

a. Community Composition - Species Inventory by Date

Fifteen taxa of fish larvae, twelve of these species, and six species of fish eggs were identified from ichthyoplankton collections in the Nine Mile Point vicinity during 1976 (Table VC-2). The occurrence of ichthyoplankton and fish eggs by date is presented in Table VC-3. Eggs were collected in the Nine Mile Point vicinity from 21 April (rainbow smelt) through 18 August (alewife). Larvae, defined as pro-larvae, larvae, and

TABLE VC-2

ICHTHYOPLANKTON AND FISH EGGS SPECIES INVENTORY FROM LAKE COLLECTIONS

NINE MILE POINT VICINITY - 1976

FAMILY	SCIENTIFIC NAME	COMMON NAME	DEVELOPMENTAL STAGE	
			LARVAE*	EGGS
Centrarchidae	Lepomis sp.	UID sunfish	*	
Clupeidae	Alosa pseudoharengus	Alewife	*	*
	Dorosoma cepedianum	Gizzard shad		*
Cottidae	Cottus bairdi	Mottled sculpin	*	
Cyprinidae	Cyprinus carpio	Carp	*	*
	Notropis sp.	UID shiner	*	
	N. atherinoides	Emerald shiner	*	
	UID Cyprinidae	-	*	
Gadidae	Lota lota	Burbot	*	
Gasterosteidae	Gasterosteus aculeatus	Threespine stickleback	*	
Osmeridae	Osmerus mordax	Rainbow smelt	*	*
Percichthyidae	Morone americana	White perch	*	*
Percidae	Etheostoma nigrum	Johnny darter	*	
	Perca flavescens	Yellow perch	*	
Percopsidae	Percopsis omiscomaycus	Trout-perch	*	
Salmonidae	Coregonus artedii	Cisco or Lake herring	*	*

*Larvae = pro-larva, larva, and juvenile

TABLE VC-3

ICHTHYOPLANKTON AND FISH EGGS SPECIES OCCURRENCE BY DATE*

NINE MILE POINT NUCLEAR STATION UNIT 1, JAMES A. FITZPATRICK NUCLEAR POWER PLANT AND VICINITY - FEBRUARY - JUNE 1976

SPECIES	LOCATION	FEB	MAR	APR					MAY						JUN						
		4	17	7	14	21	28	29	5	12	13	19	22	26	2	9	10	16	17	23	30
ALEWIFE	NMP														E	E		E		E	EL
	FITZ									L		L		L				E		EL	EL
	LAKE D															E		EL	L	EL	EL
	N																E	EL		EL	
BURBOT	NMP				L																
	FITZ		E		L		L					L									
	LAKE D			L	L	L		L					L	L							
	N														L						
CARP	NMP																	L			
	FITZ																	L			L
	LAKE D																	L		L	
	N																	L		EL	
EMERALD SHINER	LAKE D																				
	N																	L			
GIZZARD SHAD	NMP																				
JOHNNY DARTER	NMP											L								L	EL
	FITZ											L				EL				L	L
	LAKE D																				
	N																L	L		L	
LAKE HERRING (CISCO)	NMP													E							
	FITZ								E												
	LAKE D							L			E										
LEPOMIS SP. (UID)	LAKE D														L			L			
	N														L		L				
MINNOWS AND CARPS (UID)	LAKE N																			L	
MOTTLED SCULPIN	NMP																	EL		L	L
	FITZ															L		L		L	
	LAKE D																				
	N																L	L		L	
NOTROPIS SP.	FITZ																				L
	LAKE N																	L		L	
RAINBOW SMELT	NMP				E				EL	E		EL		E	EL	EL		L			
	FITZ				L		E		E	EL		L		EL	EL	L		L			
	LAKE D					E		E			EL		EL	EL	L	L		L	L	L	L
	N														EL	L	L	L		L	

TABLE VC-3 (Continued)

ICHTHYOPLANKTON AND FISH EGGS SPECIES OCCURRENCE BY DATE*(Continued)

NINE MILE POINT NUCLEAR STATION UNIT 1, JAMES A. FITZPATRICK NUCLEAR POWER PLANT AND VICINITY - 1976

		FEB	MAR	APR					MAY						JUN						
SPECIES	LOCATION	4	17	7	14	21	28	29	5	12	13	19	22	26	2	9	10	16	17	23	30
THREESPINE STICKLEBACK	LAKE N																				
TROUT PERCH	NMP																				
	FITZ																				
	LAKE N																				
WALLEYE	NMP								E			E			E	E					
	FITZ						E			E		E		E							
WHITE BASS	FITZ									L											
WHITE PERCH	NMP									E		E		E	EL	E		L		L	
	FITZ								E			E		E	EL	L		L		L	
	LAKE D										E			L	EL	L		EL	L	L	L
	N														L	L	L	EL		L	
YELLOW PERCH	NMP				L				L	E		L			E						
	FITZ						L			L		L									
	LAKE D							L					L								
	N																				
UID	NMP				E				E			E		E	E	E		E			L
	FITZ	E	E				E			E		EL		E	E	E		EL		E	EL
	LAKE D							EL			E		EL	L	L	EL		L	L	EL	
	N														E		EL	EL		EL	

Ichthyoplankton includes pro-larva, larva, and juvenile life stages
*Dates listed when larvae and/or eggs collected

D = Day collection
N = Night collection
E = Fish eggs
L = Fish larvae
UID = Unidentified organism

NMP = Nine Mile Point Nuclear Station Unit 1 entrainment program
FITZ = James A. FitzPatrick Nuclear Power Plant entrainment program
LAKE = Lake ichthyoplankton collection

TABLE VC-3 (Continued)

ICHTHYOPLANKTON AND FISH EGGS SPECIES OCCURRENCE BY DATE*

NINE MILE POINT NUCLEAR STATION UNIT 1, JAMES A. FITZPATRICK NUCLEAR POWER PLANT AND VICINITY - JULY-DECEMBER 1976

		JUL							AUG				SEP									OCT			NOV		DEC
SPECIES	LOCATION	1	3	7	14	15	21	28	4	11	18	25	1	2	3	8	15	22	26	30	6	13	20	3	17	1
ALEWIFE	NMP		EL	EL	EL		EL	EL	EL	EL	L	L	L			L		L			L		L			
	FITZ			EL	EL		EL	EL	EL	EL	L	L	L			L		L			L		L	L	L	
	LAKE D			EL		EL	EL	EL	EL	EL	EL	L	L			L	L		L	L		L				
	N	EL		EL		EL	EL	EL	EL	EL	L	L		L	L	L	L									
BURBOT	NMP																									
	FITZ																									
	LAKE D																									
	N																									
CARP	NMP							L																		
	FITZ			L				L	L																	
	LAKE D					L		L	L																	
	N	L		EL		L	L	L	L	L		L														
EMERALD SHINER	LAKE D									L	L															
	N																									
GIZZARD SHAD	NMP				E																					
JOHNNY DARTER	NMP			L	L		L	L	L																	
	FITZ			L	L		L	L		L								L								
	LAKE D			L		L																				
	N	L		L		L	L	L	L	L		L		L												
LAKE HERRING (CISCO)	NMP																									
	FITZ																									
	LAKE D																									
LEPOMIS SP. (UID)	LAKE D										L															
	N	L		L		L	L							L												
MINNOWS AND CARPS (UID)	LAKE N																									
MOTTLED SCULPIN	NMP				L																					
	FITZ																									
	LAKE D							L	L																	
	N	L		L		L	L	L	L		L															
NOTROPIS SP.	FITZ																									
	LAKE N	L		L			L																			

TABLE VC-3 (Continued)

ICHTHYOPLANKTON AND FISH EGGS SPECIES OCCURRENCE BY DATE* (Continued)

NINE MILE POINT NUCLEAR STATION UNIT 1, JAMES A. FITZPATRICK NUCLEAR POWER PLANT AND VICINITY - JULY-DECEMBER 1976

SPECIES	LOCATION	JUL							AUG				SEP								OCT			NOV		DEC	
		1	3	7	14	15	21	28	4	11	18	25	1	2	3	8	15	22	26	30	6	13	20	3	17	1	15
RAINBOW SMELT	NMP			L	L				L	L	L	L															
	FITZ			L	L		L			L	L		L					L								L	L
	LAKE D			L								L															
	N	L		L		L	L	L	L	L	L	L		L	L		L										
THREESPINE STICKLEBACK	LAKE N							L																			
TROUT-PERCH	NMP							L																			
	FITZ				L																						
	LAKE N					L										L											
WALLEYE	NMP																										
	FITZ																										
WHITE BASS	FITZ																										
WHITE PERCH	NMP		L		L			L	L	L	L																
	FITZ			L	L		L	L	L	L	L							L									
	LAKE D			L		L	L	L	L	L	L	L															
	N	L		L		L	L	L	L	L	L	L		L													
YELLOW PERCH	NMP																										
	FITZ																										
	LAKE D																										
	N						L																				
UID	NMP		E	EL	L		EL	L	E																		
	FITZ			E	E			E	E	E	E																
	LAKE D			EL		EL	EL	EL	EL	EL	EL	L	L														
	N	EL		EL		EL	E	EL	EL	EL																	

Ichthyoplankton includes pro-larva, larva, and juvenile life stages
*Dates listed when larvae and/or eggs collected

D = Day collection
N = Night collection
E = Fish eggs
L = Fish larvae
UID = Unidentified organism

NMP = Nine Mile Point Nuclear Station Unit 1 entrainment program - day/night collections
FITZ = James A. FitzPatrick Nuclear Power Plant entrainment program - day/night collections
LAKE = Lake ichthyoplankton collection

juveniles, were collected from 7 April (burbot) through 13 October (alewife). The maximum numbers of species represented in the collections for any month occurred in June (10 positively identified species) and July (11 species).

JUNE		JULY	
EGGS AND LARVAE	LARVAE	EGGS AND LARVAE	LARVAE
Alewife	Burbot	Alewife	Johnny darter
Carp	Emerald shiner	Carp	*Lepomis* sp.
Rainbow smelt	Johnny darter		Mottled sculpin
White perch	*Lepomis* sp.		*Notropis* sp.
	Mottled sculpin		Rainbow smelt
	Notropis sp.		Threespine stickleback
			Trout-perch
			White perch
			Yellow perch

Data have been summarized for certain species present, as eggs or larvae, in day and night ichthyoplankton collections in the lake. They were chosen based on several criteria: representative important species as defined in communication from Mr. Gerald Hansler to Mr. George Berry on August 11, 1975 (alewife, rainbow smelt, threespine stickleback, and yellow perch); occurrence in viability sampling program at FitzPatrick (johnny darter, mottled sculpin, and white perch); and significant concentrations in the entrainment program at either plant (i.e., white perch: maximum egg concentration of 1228/1000 m^3 at Nine Mile Point plant). Coho salmon, brown trout, and smallmouth bass, which are also representative important species, were not collected in the Nine Mile Point vicinity of Lake Ontario during the 1976 sampling program.

b. Seasonal and Spatial Distribution Patterns of Fish Eggs and Larvae of Selected Species

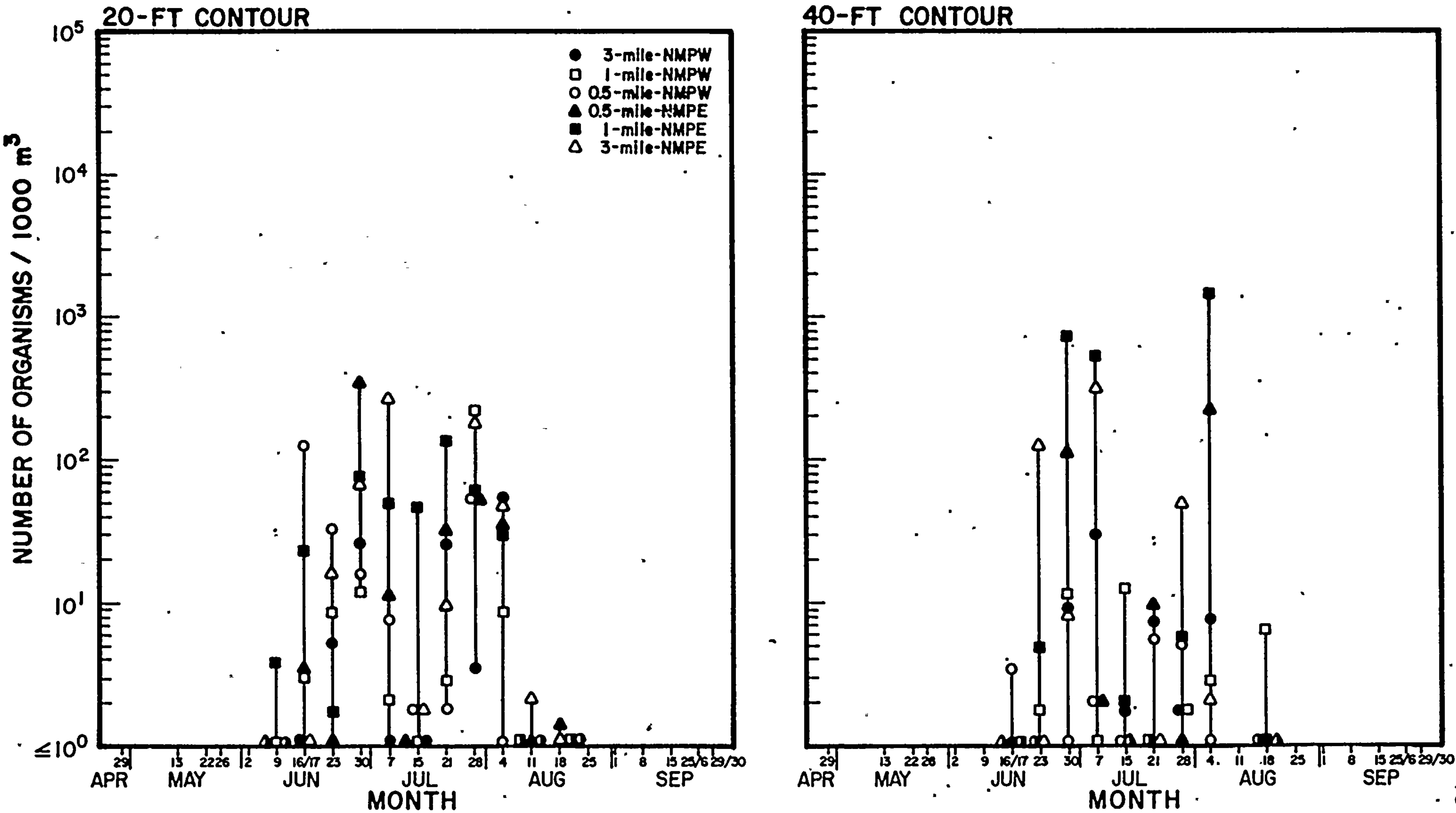
- Alewife (Alosa pseudoharengus)

Alewife eggs were collected in the Nine Mile Point vicinity from 9 June to 18 August 1976, with greatest numbers collected at night on 7 and 15 July (Appendix VC-2c). The spatial distribution suggested that more eggs were deposited along the 20-ft contour than at the 40-ft depth contour and particularly at the three western stations and 0.5-NMPE station, based on night collections. Eggs were generally more abundant in day collections at the eastern stations along the 20 and 40-ft contour. Spawning activity, as indicated by the number of eggs, appeared to be greater at night. Alewife eggs were more abundant in bottom and mid-depth tows than surface tows in both day and night collections (Appendix VC-2c).

The distribution of alewife eggs in day and night collections along the 20 and 40-ft contours is presented in Figures VC-3 and VC-4.

Alewife larvae were first collected on 16 June and persisted in the Nine Mile Point area until 13 October; the seasonal maxima occurred on 4 and 18 August (Appendices VC-2a and VC-2b). Concentrations at night were generally greater than those observed during the daytime. Spatial distribution also appeared to differ with photoperiod; greatest mean densities by station over date were indicated at 3-NMPE station at night and at 0.5-NMPW station during the day for the 20 and 40-ft contours. Alewife larvae were generally

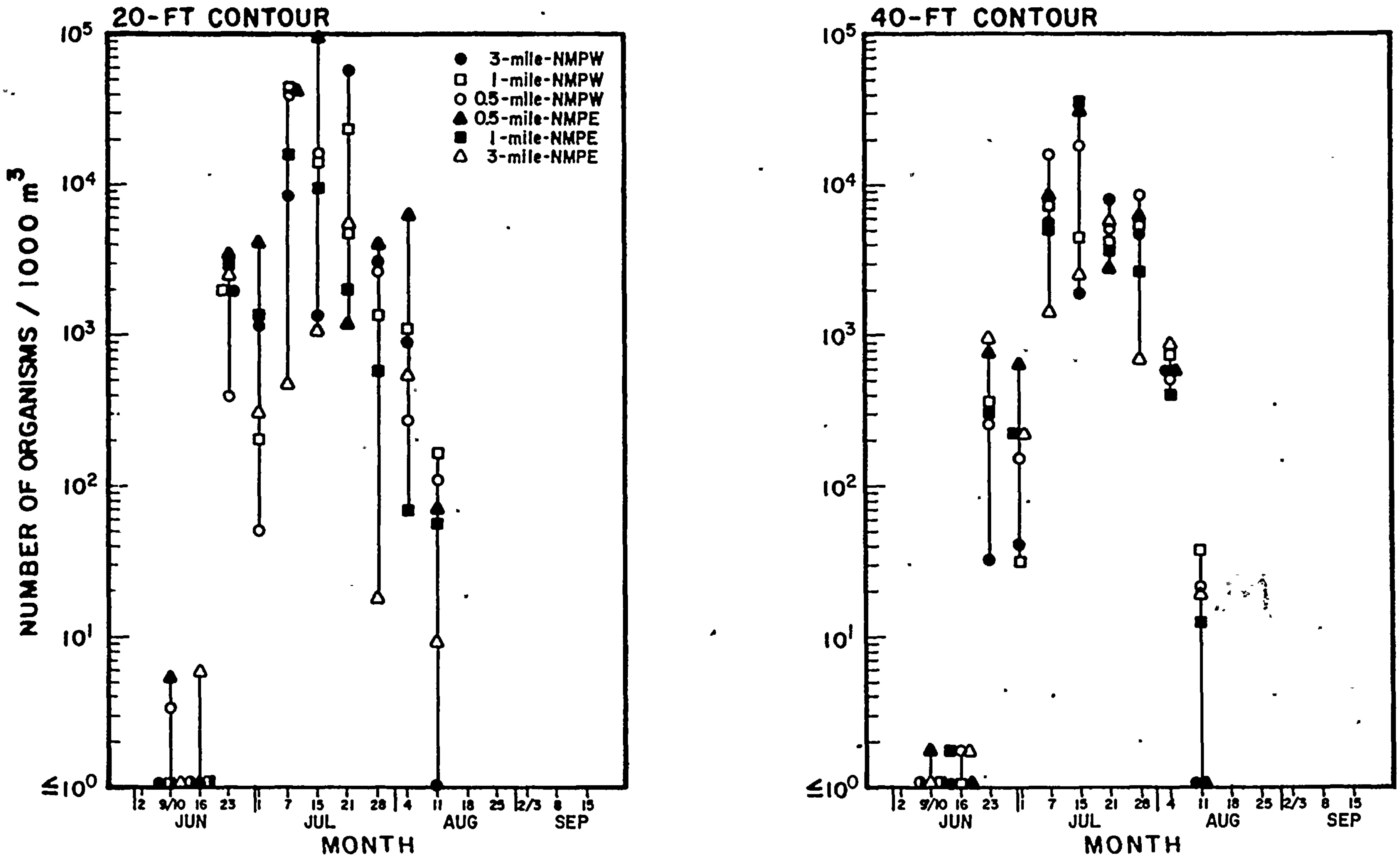
ABUNDANCE* OF ALEWIFE EGGS IN DAY COLLECTIONS
NINE MILE POINT VICINITY - 1976



*MEAN OF SURFACE, MID-DEPTH, AND BOTTOM COLLECTIONS, NONE COLLECTED IN THE REMANING COLLECTIONS

FIGURE VC-3

ABUNDANCE* OF ALEWIFE EGGS IN NIGHT COLLECTIONS
NINE MILE POINT VICINITY - 1976



*MEAN OF SURFACE, MID-DEPTH, AND BOTTOM COLLECTIONS, NONE COLLECTED IN THE REMAINING COLLECTIONS

FIGURE VC-4

more abundant in surface collections along the 20 and 40-ft depth contours based on night collections. Concentrations tended to be greater in the bottom tows taken during the day at the 20-ft depth contour.

The distribution of alewife larvae in day and night collections is presented in Figures VC-5 and VC-6.

- Rainbow Smelt (Osmerus mordax)

Smelt eggs were collected infrequently during 1976 (Table VC-3, Appendix VC-2c; Figure VC-7); they were, however, present in the Nine Mile Point vicinity between 21 April and 2 June.

Larvae were collected from 13 May through 15 September, with a peak on 2 June for night collections and 9 June for day collections (Appendices VC-2a and VC-2b).

The spatial distribution of smelt larvae along the 20 and 40-ft contours could not be evaluated due to the low numbers observed (Figures VC-8 and VC-9).

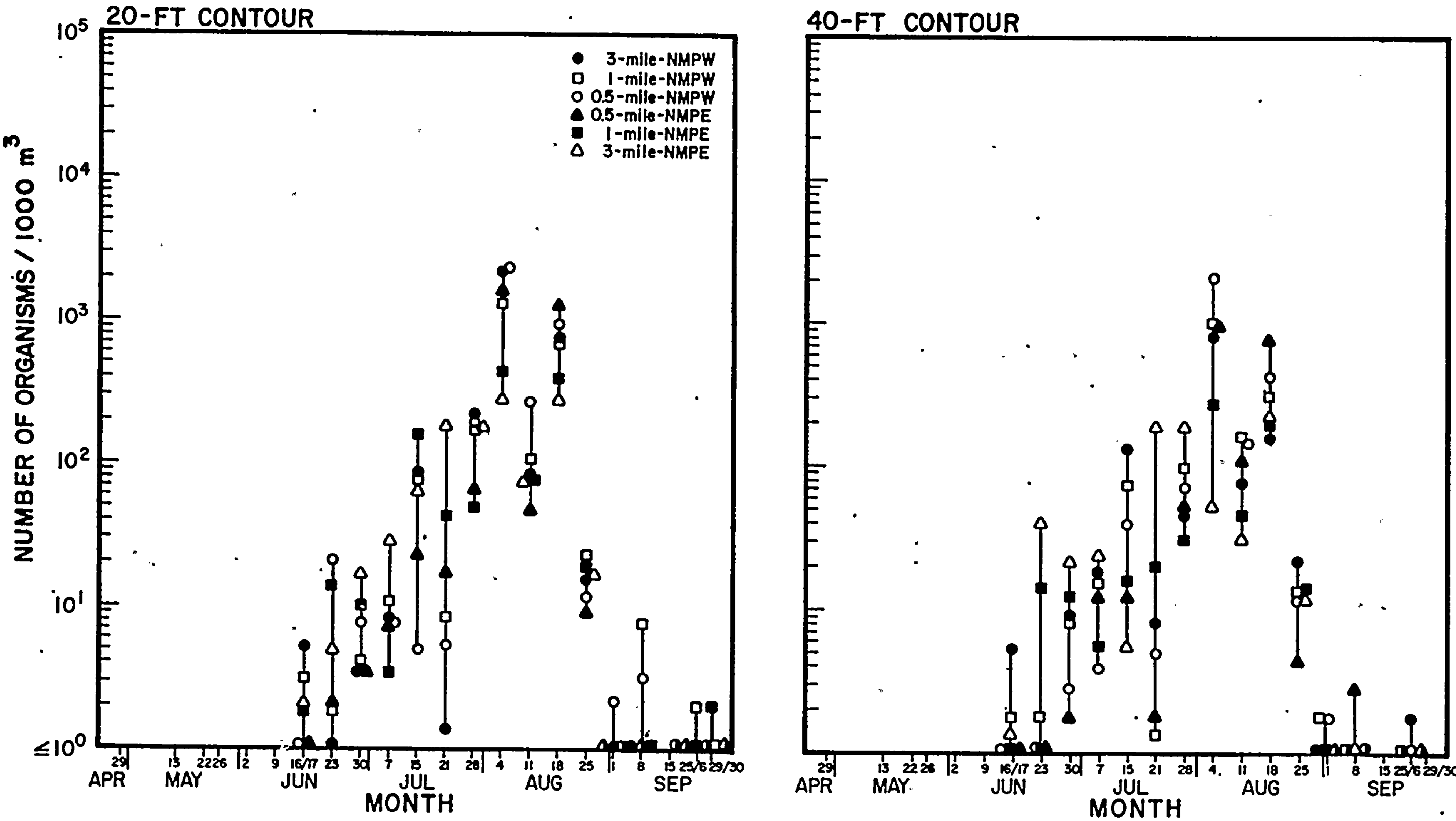
- Threespine Stickleback (Gasterosteus aculeatus)

Stickleback larvae were collected on 28 July only, and in low concentrations (Appendix VC-2b).

- Yellow Perch (Perca flavescens)

Larvae were collected on three dates (29 April, 22 May, and 21 July) with a maximum on 29 April, a day collection

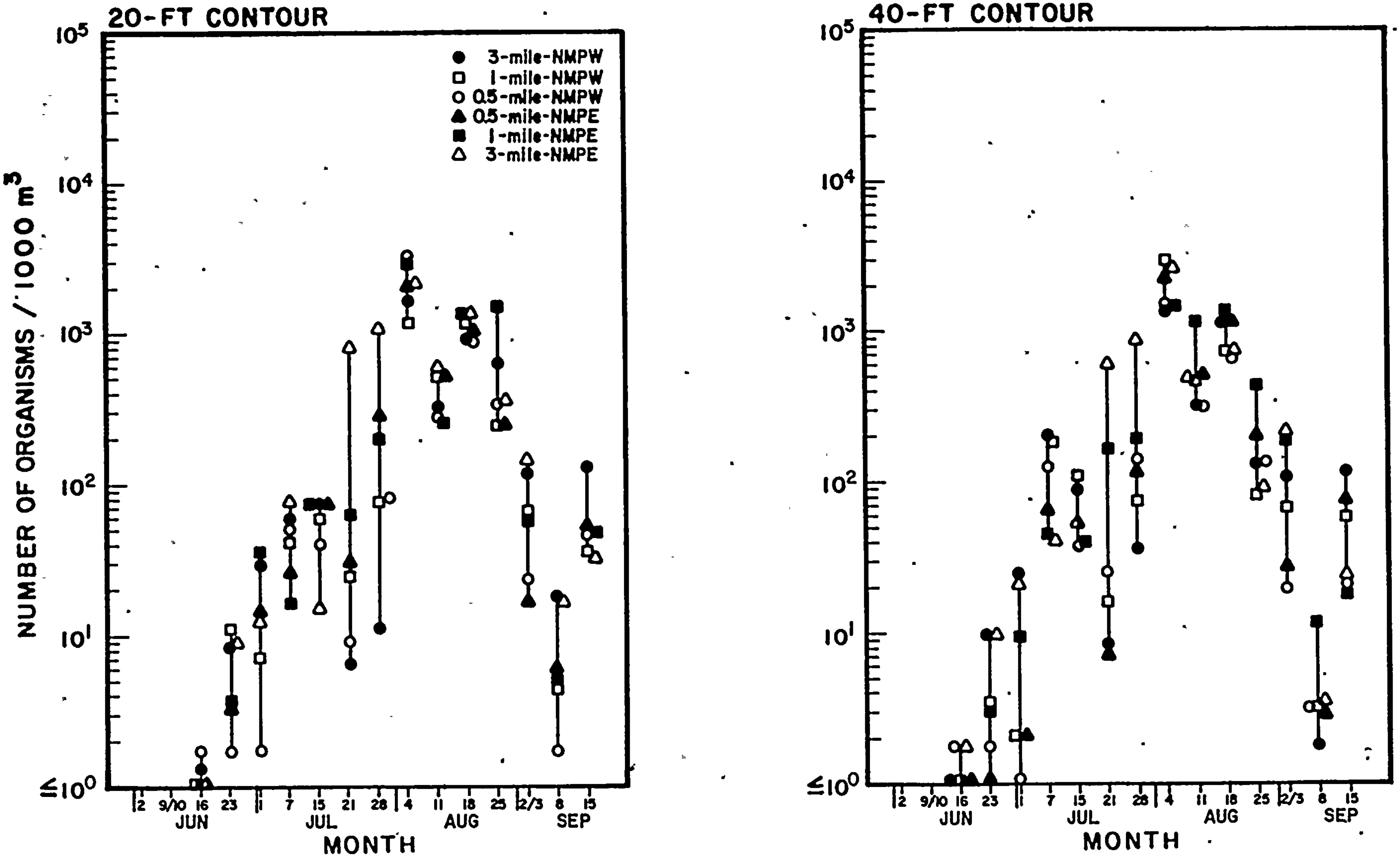
ABUNDANCE* OF ALEWIFE LARVAE IN DAY COLLECTIONS
NINE MILE POINT VICINITY – 1976



*MEAN OF SURFACE, MID-DEPTH, AND BOTTOM COLLECTIONS, NONE COLLECTED IN THE REMAINING COLLECTIONS

FIGURE VC-5

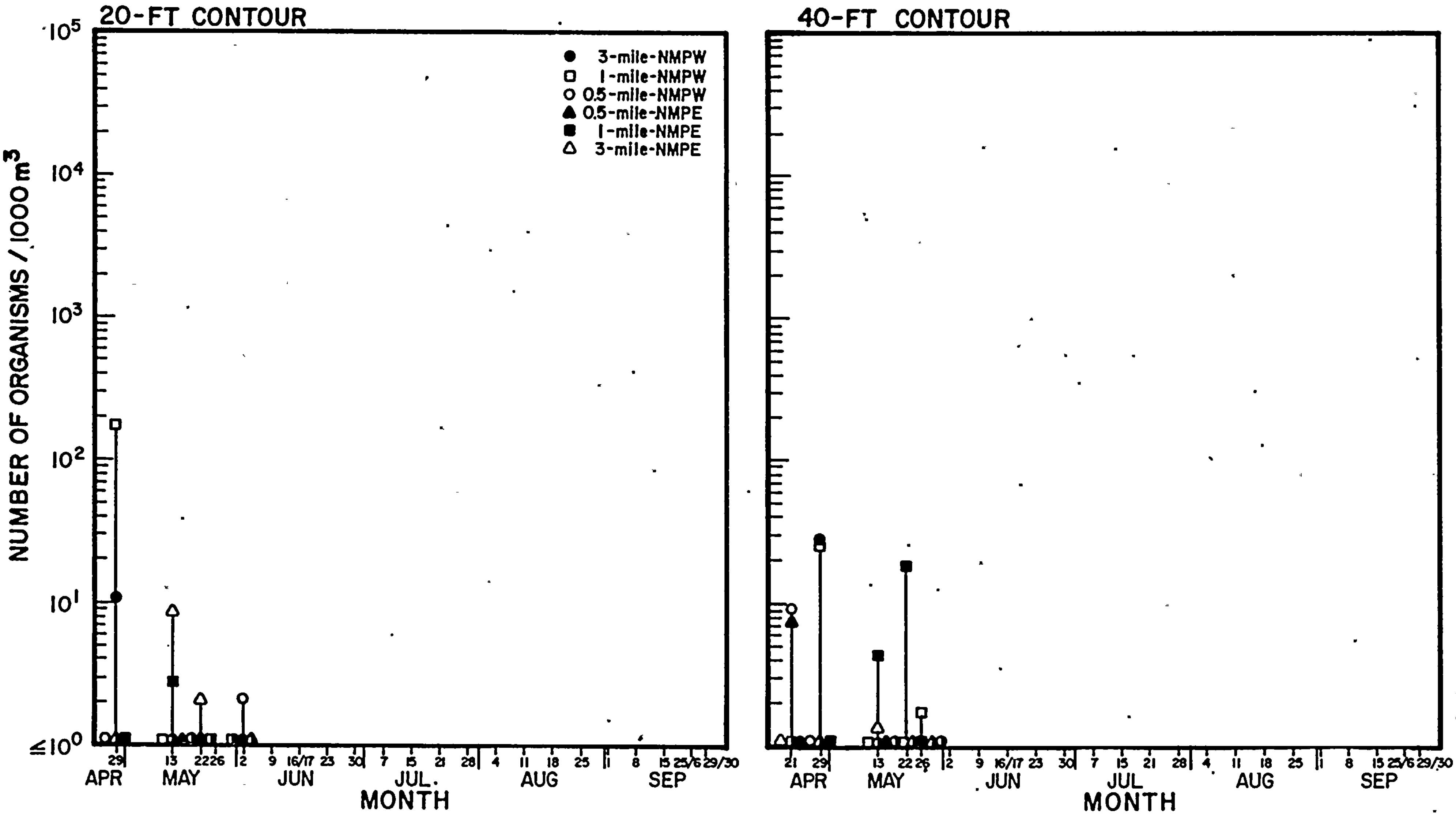
ABUNDANCE* OF ALEWIFE LARVAE IN NIGHT COLLECTIONS
NINE MILE POINT VICINITY - 1976



*MEAN OF SURFACE, MID-DEPTH, AND BOTTOM COLLECTIONS, NONE COLLECTED IN THE REMAINING COLLECTIONS

FIGURE VC-6

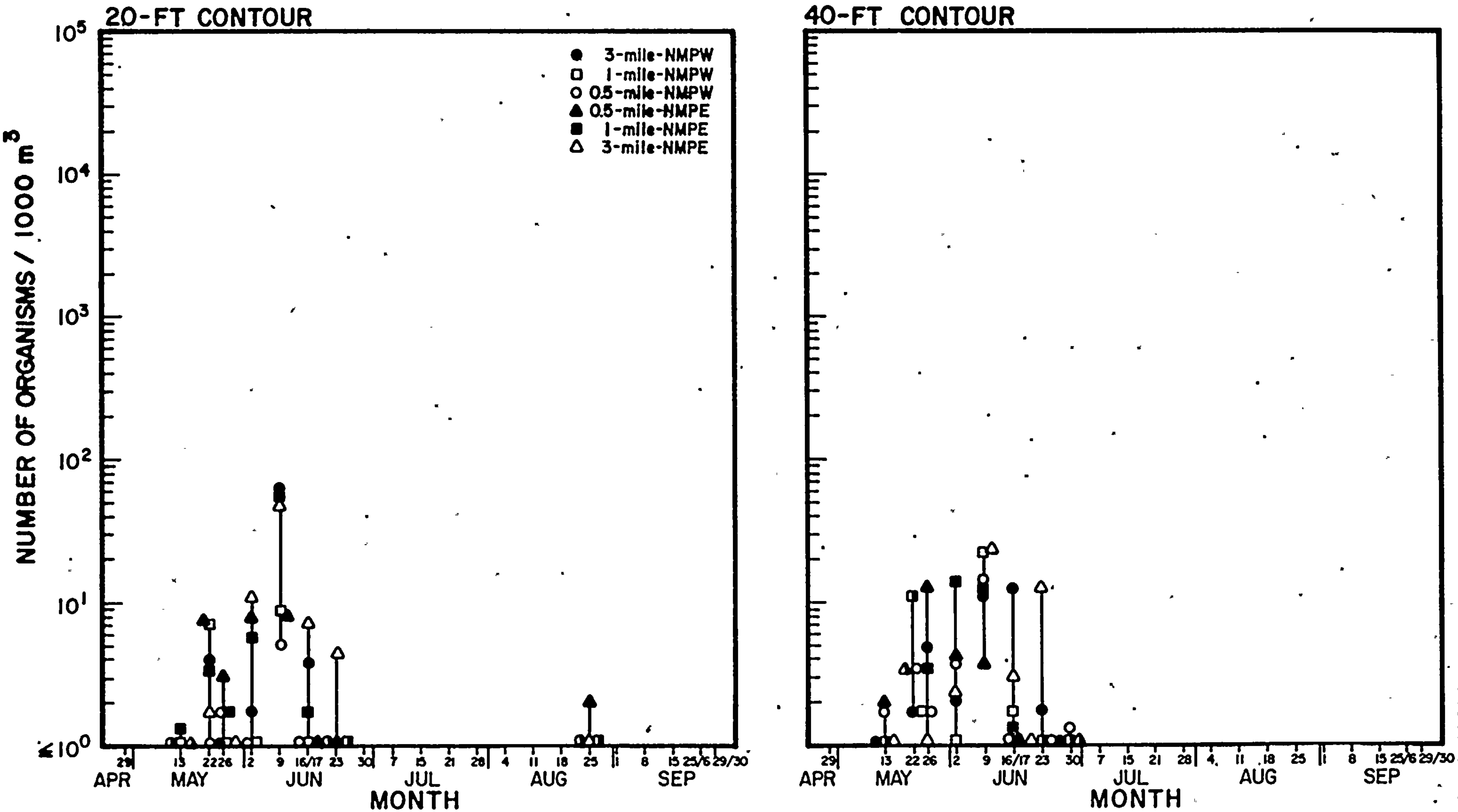
ABUNDANCE OF RAINBOW SMELT EGGS IN DAY AND NIGHT COLLECTIONS
NINE MILE POINT VICINITY – 1976



*MEAN OF SURFACE, MID-DEPTH, AND BOTTOM COLLECTIONS, NONE COLLECTED IN THE REMAINING COLLECTIONS
APRIL AND MAY, DAY COLLECTIONS; JUNE, NIGHT COLLECTION

FIGURE VC-7

ABUNDANCE* OF RAINBOW SMELT LARVAE IN DAY COLLECTIONS
NINE MILE POINT VICINITY - 1976

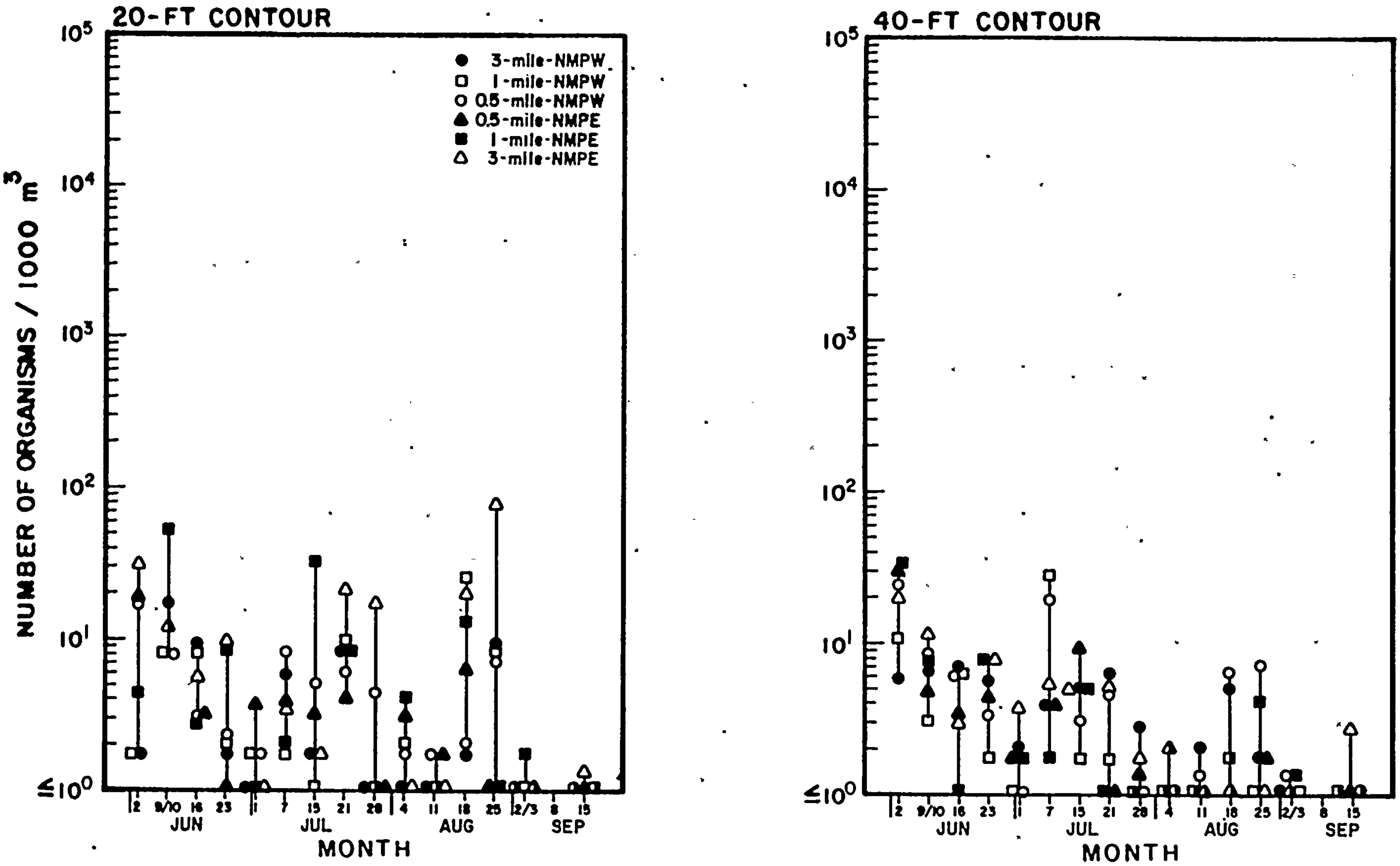


*MEAN OF SURFACE, MID-DEPTH, AND BOTTOM COLLECTIONS, NONE COLLECTED IN THE REMAINING COLLECTIONS

FIGURE VC-8

ABUNDANCE* OF RAINBOW SMELT LARVAE IN NIGHT COLLECTIONS

NINE MILE POINT VICINITY - 1976



*MEAN OF SURFACE, MID-DEPTH, AND BOTTOM COLLECTIONS, NONE COLLECTED IN THE REMAINING COLLECTIONS

FIGURE VC-9

(Appendices VC-2a and VC-2b). Greatest concentrations were found in surface day collections at 1-NMPE-20-ft station.

- Other Species

The distributions of eggs and larvae of white perch, johnny darter, and mottled sculpin are presented in Appendices VC-2a, VC-2b, and VC-2c.

4. Conclusions

- Macrozooplankton

No temporal/spatial distribution patterns attributable to plant operation were observed for dipterans, hydroids, or Leptodora kindtii from day collections or for Gammarus fasciatus from night collections in 1976. Concentrations of Gammarus fasciatus in night collections were greater than in comparable day collections at all stations and sample depths, indicating vertical migration of this epibenthic organism.

- Ichthyoplankton and Fish Eggs

The temporal/spatial distribution patterns observed for alewife and rainbow smelt were not attributable to power plant operation. Low concentrations of threespine stickleback and yellow perch did not permit assessment of the effect of plant operation on these species. Larvae or eggs of coho salmon, brown trout, and smallmouth bass, all representative important species, were not collected in the Nine Mile Point vicinity during the 1976 sampling program.

REFERENCES CITED

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Lawler, Matusky & Skelly Engineers. 1976. 1975 Nine Mile Point aquatic ecology studies. Prepared for Niagara Mohawk Power Corp. and Power Authority of the State of New York.

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VI. BENTHOS

A. INTRODUCTION AND MATERIALS AND METHODS

1. Natural Habitats

The benthic community was sampled as part of a study to assess the postoperational effects of the Nine Mile Point and FitzPatrick plants on the nearshore lake ecosystem. The benthos were sampled because they are important in the ecosystem's trophic structure and because their sedentary/sessile existence results in the inability of many benthic forms to escape environmental perturbations by migration.

In 1976, benthic collections were made at the same transects and depths as had been sampled from 1973 through 1975 (Figure VIA-1). Collections made as part of the benthic monitoring program are indicated in Table VIA-1. The scheduled December collection was not made at every station because of adverse weather conditions. The field sampling procedure and laboratory techniques were similar to those of 1975 except for the following:

- Surface and bottom water temperatures were recorded at each station with each collection.

- Macrofauna samples were collected from defined substrate types in non-Cladophora areas.

- Samples were collected and analyzed for organic carbon.

- The criteria for subsampling benthic samples in the laboratory were redefined.

BENTHOS SAMPLING STATIONS
NINE MILE POINT VICINITY - 1976

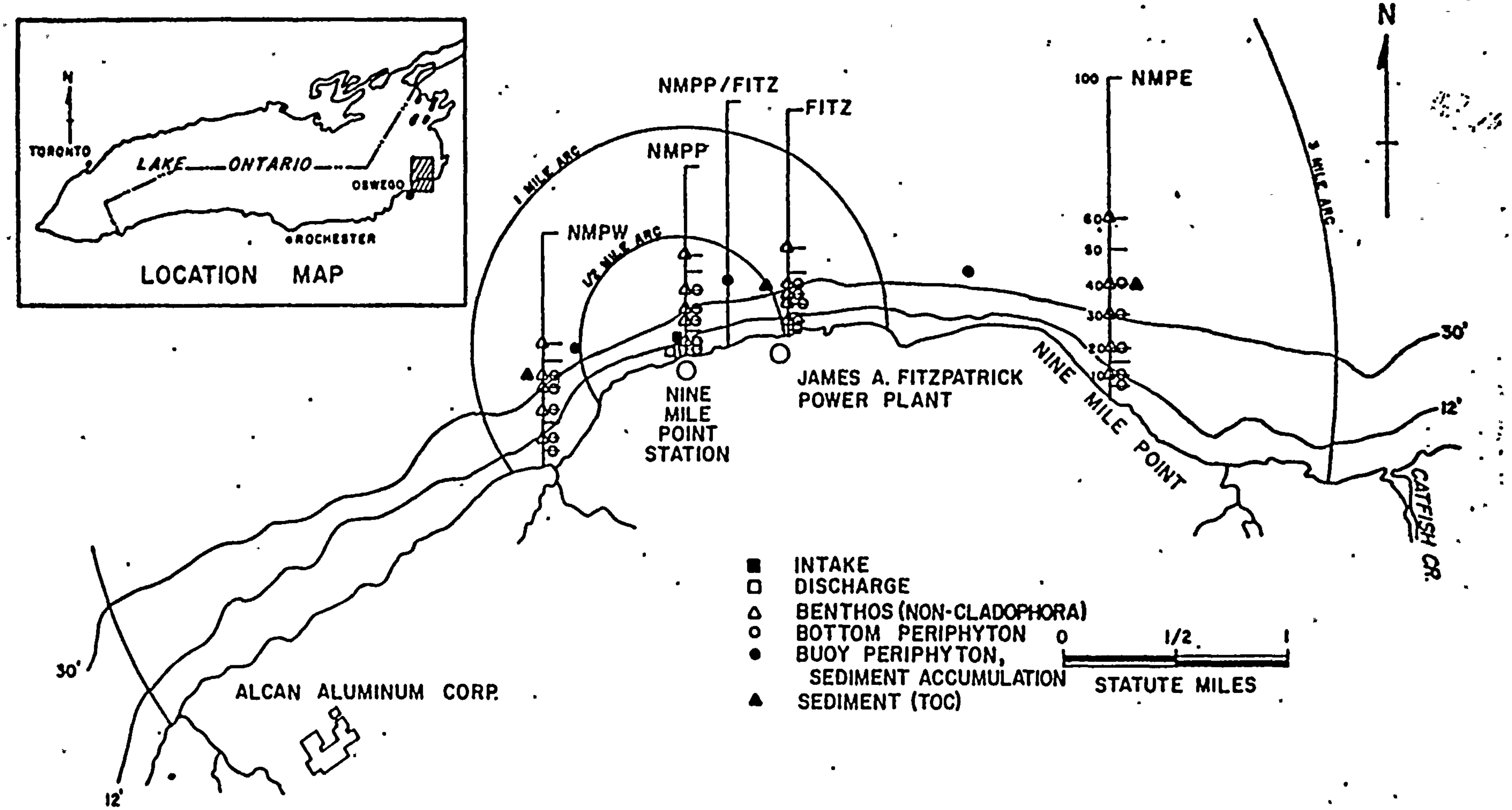


FIGURE VIA-1

TABLE VIA-1

BENTHOS SAMPLING PROGRAM*

NINE MILE POINT VICINITY - 1976

DATE	ORGANIC CARBON	GRAIN SIZE ANALYSIS	SEDIMENT ACCUMULATION	MACROINVERTEBRATES (NON-CLADOPHORA)
19 APR	D			D]
11 MAY			D	
14				D]
2 JUN			D	
15	D]	D]		D]
16	D]	D		D
17		D]		D]
1 JUL			D	
3 SEP	D]			D]
4				D
7	D]		D	D]
8 OCT			D	
12	D]	D]		D]
13	D]	D]		D]
2 NOV			D	
10 DEC			D	
14				D

*Minimum of one sample per date at a minimum of one station;
day collection ; D = Day
] = One collection

The detailed field and laboratory work plans are presented in Appendix. I.

2. Artificial Substrates

The organisms that rapidly colonize immersed artificial and natural substrates are significant sources of primary and secondary production in aquatic ecosystems. These organisms (periphyton), as an assemblage, provide a tool for identifying and evaluating certain water quality changes within aquatic systems. The 1973 through 1975 studies (QLM 1974; LMS 1975, 1976) in the Nine Mile Point vicinity revealed that water temperature, light intensity/photoperiod, and nutrient limitation were of primary importance in determining periphyton growth. Other factors contributing to biomass/production on immersed substrates include the seeding density from whole water phytoplankton, and the frequency and duration of adverse weather conditions which result in turbulence, abrasion, and increased turbidity.

The trend of a higher biomass/production at the NMPP/FITZ-40 ft buoy station than at the control stations (NMPE-40-ft and NMPW-40-ft) and at the 12 and 17-ft sample depths as revealed by the 1975 data was further investigated in 1976.

In 1976 periphyton collections were made on a four-week interval at the same sites as were sampled in 1973-1975 (Figure VIA-1). The exact dates on which the plates were harvested are listed in Table VIA-2.

The sampling procedure and laboratory techniques were the same as those used in 1975 except for the following:

TABLE VIA-2

PERIPHYTON SAMPLING PROGRAM[a]

NINE MILE POINT VICINITY - 1976

DATE	BOTTOM	BUOY
1 APR		D[b]
15	D[b]	
11 MAY	D	D
2 JUN		D
14	D]	
17	D]	
1 JUL		D
16	D[c]	
4 AUG		D[c]
19	D[c]	
8 SEP		D[c]
16	D[c]	
5 OCT		D[c]]
8		D]
27	D]	
30	D]	
2 NOV		D]
25	D]	D[d]]
26	D]	
10 DEC		D
16	D[e]	

[a] Initial set
[b] Approximately a 4-week exposure period
[c] Plates collected with a winch
[d] Some plates set 2 Nov
[e] Some plates set 6 Dec
D = Day collection
] = One collection

- The artificial substrates were exposed and collected at approximately four-week intervals; in 1975 plates were harvested on two and four-week periods.

- Plates were harvested either by scuba divers or with the aid of a mechanical winch in 1976.

- The concentration of chlorophyll a was determined for only the buoy periphyton substrates.

B. RESULTS AND DISCUSSION - NATURAL HABITATS

1. Community Composition

During 1976, 129 macroinvertebrate taxa were recorded from the benthos collections; of these, 27.1% (35 taxa) each comprised at least 5.0% of the total benthos abundance in one or more samples at one or more stations for a given sampling date (Table VIB-1). This indicates that the organisms were fairly evenly distributed among the groups collected. The major phyla (Mollusca, Annelida, and Arthropoda) were present on all sampling dates.

In general, taxa noted as abundant on the species inventory (Table VIB-1) generally occurred on all sampling dates, corresponding to their life history patterns, while taxa that occurred sporadically were those which occurred in small numbers in the study area.

Fish eggs and larvae occurred in the benthos collections (Table VIB-2) only during the period April-June (eggs) and June-September (larvae). Eggs of six fish species and larvae of three species were identified from these samples.

TABLE VIB-1

OCCURRENCE OF MACROINVERTEBRATES IN BENTHIC COLLECTIONS BY DATE **

NINE MILE POINT VICINITY - 1976

TAXON	DATES APR	JUN	AUG	OCT	DEC
CNIDARIA (COELENTERATA)					
HYDROZOA	D	D	D	D	D.
HYDROIDA-ATHECATA					
CLAVIDAE					
CORDYLOPHORA					
C.LACUSTRIS	(X)	(D)	(D)	(D)	
HYDRIDAE					
HYDRA					
H.AMERICANA	(D)	(D)	(X)	(X)	(D)
RHYNCHOCOELA	X	X	X	(D)	
PLATYHELMINTHES	D	X	X	D	
TURBELLARIA	(X)	(X)			
TRICLADIDA					
PLANARIIDAE	(D)	(X)	(X)	(D)	
ASCHELMINTHES					
NEMATODA	D	D	D	D	X
CHROMADOROIDEA					
PLECTIDAE					
ANONCHUS *	(X)			(X)	
ENOPLIDA					
ALAIMIDAE					
ALAIMUS	(X)	(X)	(X)	(X)	
DORYLAIMIDA					
DORYLAIMIDAE					
DORYLAIMUS	(D)	(D)	(D)	(D)	(X)
RHABDITIDA					
RHABDITIDEA					
BUTLERIUS	(X)	(X)			
MOLLUSCA					
GASTROPODA	D	D	D	D	D
PROSOBRANCHIA-MESOGASTROPODA	(X)				
VALVATIDAE	(X)				
VALVATA	(X)	(X)	(X)	(X)	
V.PERDEPRESSA	(D)	(D)	(D)	(D)	(D)
V.SINCERA				(X)	
V.PISCINALIS		(X)	(X)	(X)	
VALVATA TRICARINATA PERCONFUSA				(X)	

D ABUNDANCE OF 5 OR 5+ PERCENT OF TOTAL BENTHOS IN ONE OR MORE SAMPLES AT ONE OR MORE STATIONS PER DATE.

X PRESENCE IN ONE OR MORE SAMPLES AT ONE OR MORE STATIONS PER DATE.

(D) NUMERICAL DOMINANCE AT THE SPECIFIC LEVEL OR THE LOWEST LEVEL AT WHICH AN ORGANISM WAS IDENTIFIED

* ID pending

** Exact dates of benthic collection indicated on daily computer print-outs.

TABLE VIB-1 (Continued)

OCCURRENCE OF MACROINVERTEBRATES IN BENTHIC COLLECTIONS TO DATE**
(CONTINUED)

TAXON (CONTD.)	DATES APR	JUN	AUG	OCT	DEC
BULIMIDAE (HYDROBIIDAE)	(X)			(X)	
AMNICOLA	(X)	(X)	(D)	(D)	(X)
A. INTEGRA	(D)	(D)	(D)	(D)	(D)
A. LIMOSA	(X)	(D)	(D)	(D)	(X)
AMNICOLA SP.		(X)			
A. LUSTRICA	(X)	(X)	(D)	(D)	
BITHINIA					
B. TENTACULATA	(X)	(D)	(X)	(X)	
PLEUROCERIDAE	(X)				
GONIOBASIS			(X)		
G. LIVESCENS	(D)	(X)	(D)	(D)	(X)
PULMONATA-BASOMMATOPHORA					
PHYSIDAE					
PHYSA	(X)	(D)	(X)	(X)	
P. INTEGRA	(X)	(X)	(X)	(X)	
P. SAYII	(X)	(X)			(X)
PHYSA HETEROSTROPHA*		(X)			
PHYSA ELLIPTICA*		(X)		(X)	
LYMNAEIDAE	(X)				
LYMNAEA	(X)	(X)	(X)	(X)	
L. CATASCOPIUM	(X)	(X)	(X)	(X)	(X)
L. EMARGINATA*				(X)	
PLANORBIDAE					
GYRAULUS					
G. PARVUS	(X)	(X)	(X)	(X)	
HELISOMA			(X)	(X)	
H. ANCEPS	(X)	(X)	(X)	(X)	
H. TRIVOLVIS				(X)	
ANCYLIDAE				(X)	
FERRISSIA	(X)				(X)
F. TARDA	(X)	(X)		(X)	
LAEVAPEX					
L. FUSCUS	(X)				
BIVALVIA (PELECYPODA)	D	D	D	D	D
EULAMELLIBRANCHIA					
MARGARITIFARIDAE					
ADADONTA					
ANADONTA GRANDIS				(X)	
UNIONIDAE	(X)		(X)	(X)	
HETERODONTIDA					
SPHAERIIDAE			(X)		
MUSCULIUM			(X)	(X)	
PISIDIUM	(D)	(D)	(D)	(D)	(D)
SPHAERIUM	(D)	(D)	(D)	(D)	(D)

D ABUNDANCE OF 5 OR 5+ PERCENT OF TOTAL BENTHOS IN ONE OR MORE SAMPLES AT ONE OR MORE STATIONS PER DATE.

X PRESENCE IN ONE OR MORE SAMPLES AT ONE OR MORE STATIONS PER DATE.

*ID pending

**Exact dates of benthic collections indicated on daily computer printouts.

(D) NUMERICAL DOMINANCE AT THE SPECIFIC LEVEL OR THE LOWEST LEVEL AT WHICH AN ORGANISM WAS IDENTIFIED

TABLE VIB-1 (Continued)

OCCURRENCE OF MACROINVERTEBRATES IN BENTHIC COLLECTION BY DATE**
(CONTINUED)

TAXON (CONTD.)	APR	JUN	AUG	OCT	DEC
ANNELIDA					
POLYCHAETA	D	D	D	D	
SABELLIDA					
SABELLIDAE					
MANAYUNKIA					
M.SPECIOSA	(D)	(D)	(D)	(D)	
OLIGOCHAETE	D	D	D	D	D
PROSOPORA					
LUMBRICULIDAE	(X)			(X)	
STYLODRILUS					
S.HERINGIANUS	(D)	(X)	(X)	(X)	
PLESIOPORA					
TUBIFICIDAE	(D)	(D)	(D)	(D)	(D)
AULODRILUS	(X)			(X)	
A.AMERICANUS	(X)	(X)	(X)		
A.LIMNOBIUS		(X)	(X)	(X)	(X)
A.PLURISETA	(X)	(X)	(D)	(X)	
A.PIQUETI	(X)	(X)	(X)	(X)	(X)
LIMNODRILUS					
L.HOFFMEISTERI	(D)	(D)	(X)	(X)	
L.UDEKEMIANUS	(X)	(X)			
L.CLAPAREDIANUS	(X)				
L.PROFUNDICOLA	(X)	(X)	(X)	(X)	
L. HOFFMEISTERI VARIANT		(X)	(X)		
ILYODRILUS					
I.TEMPLETONI		(X)			
PELOSCOLEX					
P.FREYI	(X)	(X)		(X)	
P.FEROX	(X)		(X)		
P.MULTISETOSUS MULTISETOSUS		(X)	(X)	(X)	
P.MULTISETOSUS LONGIDENTUS	(X)		(X)	(X)	
TUBIFEX					
T.IGNOTUS	(X)				
T.TUBIFEX	(X)	(X)			
UID TUBIFICIDAE		(X)			
POTAMOTHRIX				(X)	
P.MOLDAVIENSIS	(D)	(D)	(D)	(X)	(X)
P. VEJDOVSKYI	(D)	(D)	(X)	(D)	(X)

D ABUNDANCE OF 5 OR 5+ PERCENT OF TOTAL BENTHOS IN ONE OR MORE SAMPLES AT ONE OR MORE STATIONS PER DATE.

X PRESENCE IN ONE OR MORE SAMPLES AT ONE OR MORE STATIONS PER DATE.

(D) NUMERICAL DOMINANCE AT THE SPECIFIC LEVEL OR THE LOWEST LEVEL AT WHICH AN ORGANISM WAS IDENTIFIED

** Exact dates of benthic collection indicated on daily computer print-outs

TABLE VIB-1 (Continued)
OCCURRENCE OF MACROINVERTEBRATES IN BENTHIC COLLECTIONS BY DATE**
(CONTINUED)

TAXON (CONTD.)	DATES APR	JUN	AUG	OCT	DEC
NAIDIDAE	(X)	(X)	(X)	(X)	
ARCTEONAIS					
A.LOMONDI		(X)			
NAIS		(X)			
N.BRETSCHERI	(D)	(D)	(X)	(X)	
N.ELINGUIS		(X)		(X)	
N.SIMPLEX	(X)	(X)			
PARANAIS					
P.SIMPLEX*	(X)	(X)			
PIGUETIELLA					
P.MICHIGANENSIS	(X)	(X)	(X)	(X)	
CHAETOGASTER					
C.DIASTROPHIS		(X)	(X)	(X)	
SPECARIA					
S.JOSINAE *		(X)			
STYLARIA					
S.LACUSTRIS	(X)	(X)		(X)	
UNCINAIS					
U.UNCINATA	(X)	(X)	(X)	(X)	
VEJDOVSKYELLA					
V.INTERMEDIA	(X)	(X)	(X)		
PRISTINA		(X)	(X)	(X)	
PRISTINA AEQUISETA*				(X)	
PRISTINA OSBORNII			(X)		
ENCHYTRAEIDAE	(X)	(X)	(X)	(X)	
HIRUDINEA			X	X	
RHYNCHOBDELLIDA					
GLOSSIPHONIIDAE					
HELOBDELLA					
H.STAGNALIS				(X)	
PISCICOLIDAE					
PISCICOLA			(X)		
ARTHROPODA					
ARACHNIDA					
ACARI	D	D	D	D	D
LIMNESIIDAE					
LIMNESIA	(X)	(X)	(X)	(X)	
HYGROBATIDAE					
HYGROBATES		(X)	(X)	(X)	
H.SP 1	(D)	(D)	(D)	(D)	(X)
H.SP 3	(X)	(X)		(D)	(X)
H.SP 4	(X)	(X)	(X)		
H.SP 5				(X)	
UNIONICOLIDAE					
NEUMANIA		(X)			
UNIONICOLA	(X)			(X)	
U.SP 1	(X)	(D)	(X)	(X)	
U.SP 2				(X)	
PIONIDAE					
FORELIA	(X)	(D)	(X)	(X)	
PIONA		(X)	(X)	(X)	
LEBERTIIDAE					
LEBERTIA	(D)	(D)	(X)	(D)	
TORRENTICOLIDAE					
TORRENTICOLA			(X)		

D ABUNDANCE OF 5 OR 5+ PERCENT OF TOTAL BENTHOS IN ONE OR MORE SAMPLES AT ONE OR MORE STATIONS PER DATE.
X PRESENCE IN ONE OR MORE SAMPLES AT ONE OR MORE STATIONS PER DATE.

*ID pending

**Exact dates of benthic collection indicated on daily computer printouts

(D) NUMERICAL DOMINANCE AT THE SPECIFIC LEVEL OR THE LOWEST LEVEL AT WHICH AN ORGANISM WAS IDENTIFIED

TABLE VIB-1 (Continued)
OCCURRENCE OF MACROINVERTEBRATES IN BENTHIC COLLECTIONS BY DATE **
(CONTINUED)

TAXON (CONTD.)	DATES APR	JUN	AUG	OCT	DEC
INSECTA					
EPHEMEROPTERA	X	X		X	
HEPTAGENIIDAE					
STENONEMA	(X)	(X)		(X)	
TRICHOPTERA	X	D	X	X	X
HYDROPTILIDAE		(X)			
AGRAYLEA	(X)	(X)			
LEPTOCERIDAE		(X)			
OECETIS	(X)	(X)	(X)	(X)	
ARTHRIPSODES	(X)	(D)	(X)	(X)	
LEPTOCERUS					
LEPTOCERUS AMERICANUS				(X)	
HYDROPSYCHIDAE					
CHEUMATOPSYCHE SP.					(X)
DIPTERA	D	D	D	D	D
TENDIPEDIDAE (CHIRONOMIDAE)	(D)	(X)	(X)	(X)	
CHIRONOMUS	(X)	(X)	(D)	(D)	
CLADOTANYTARSUS		(X)	(X)		
COELOTANYPUS			(X)		
CRICOTOPUS	(D)	(X)	(X)	(X)	
CRYPTOCHIRONOMUS	(D)	(X)	(X)	(X)	(D)
DEMICRYPTOCHIRONOMUS	(X)	(X)	(X)	(X)	
DICROTENDIPES	(X)	(X)	(X)	(X)	
ENDOCHIRONOMUS			(X)		
GLYPTOTENDIPES		(X)	(X)		
CRYPTOCLADOPELMA (HARNISCHIA)		(X)			
HETEROTRISSOCLADIUS	(X)		(X)		
MICROSPECTRA	(X)	(X)	(X)		
MICROTENDIPES	(X)	(X)	(X)	(X)	
PARACLADOPELMA	(X)	(X)	(X)		
PARACHIRONOMUS	(X)	(X)	(X)		
PHAENOPSECTRA	(X)		(X)		
POLYPEDILUM	(X)	(D)		(X)	
PROCLADIUS	(X)	(X)	(X)	(X)	
PSEUDOCHIRONOMUS	(X)	(X)	(D)	(X)	
PSECTROCLADIUS	(X)	(X)	(X)		
POTTHASTIA	(X)		(X)	(X)	(X)
RHEOTANYTARSUS	(D)	(X)	(D)	(X)	
STICTOCHIRONOMUS	(X)	(X)	(X)		
TRISSOCLADIUS	(X)				
XENOCHIRONOMUS	(X)				
EINFELDIA *		(X)			
TANYTARSUS (+MICROPSECTRA)	(X)	(X)	(D)		
PARATANYTARSUS		(X)			
CERATOPOGONIDAE		(X)			
EMPIDIDAE	(X)				

D ABUNDANCE OF 5 OR 5+ PERCENT OF TOTAL BENTHOS IN ONE OR MORE SAMPLES AT ONE OR MORE STATIONS PER DATE.
X PRESENCE IN ONE OR MORE SAMPLES AT ONE OR MORE STATIONS PER DATE.

*ID pending

** Exact dates of benthic collection indicated on daily computer printouts

TABLE VIB-1 (Continued)

OCCURRENCE OF MACROINVERTEBRATES IN BENTHIC COLLECTIONS BY DATE **
(CONTINUED)

TAXON (CONTD.)	APR	JUN	AUG	OCT	DEC
CRUSTACEA					
ISOPODA	X	X	X	X	
ASELLIDAE					
ASELLUS	(X)	(X)	(X)	(X)	
AMPHIPODA	D	D	D	D	D
GAMMARIDAE			(X)	(D)	(D)
GAMMARUS			(X)		
G.FASCIATUS	(D)	(D)	(D)	(D)	
CRANGONYX	(X)	(X)	(X)	(X)	
HAUSTORIIDAE					
PONTOPOREIA					
P.AFFINIS	(D)	(D)	(D)	(D)	(D)
TALITRIDAE					
HYALELLA					
H. AZTECA	(X)		(X)		
MYSIDACEA	X				
MYSIDAE					
MYSIS					
M.OCULATA RELICTA	(X)				
DECAPODA	X	X	X	X	
ASTACIDAE					
CAMBARUS					
C.BARTONI		(X)			
ORCONECTES					
O.PROPINQUUS PROPINQUUS	(X)	(X)	(X)		
OSTRACODA	D	D	D	D	X
BRYOZOA	D	D	D	D	

(D) NUMERICAL DOMINANCE AT THE SPECIFIC LEVEL OR THE LOWEST LEVEL AT WHICH AN ORGANISM WAS IDENTIFIED

D ABUNDANCE OF 5 OR 5+ PERCENT OF TOTAL BENTHOS IN ONE OR MORE SAMPLES AT ONE OR MORE STATIONS PER DATE.

X PRESENCE IN ONE OR MORE SAMPLES AT ONE OR MORE STATIONS PER DATE.

* ID pending

** Exact dates of benthic collection indicated on daily computer print-outs

TABLE VIB-2

ICHTHYOPLANKTON AND FISH EGGS SPECIES OCCURRENCE IN BENTHIC COLLECTIONS BY DATE*

NINE MILE POINT VICINITY - APRIL-SEPTEMBER 1976

SPECIES	APR 19	MAY 14	JUN 15	JUN 16	JUN 17	SEP 4
ALEWIFE			E	E	E	L
CATOSTOMUS sp.		E				
GIZZARD SHAD			E			
JOHNNY DARTER			EL			L
MOTTLED SCULPIN			L	L		
RAINBOW SMELT	E		E			
UNIDENTIFIED		E	E	EL	E	
WHITE PERCH	E					

* Dates listed when larvae and/or eggs collected

E = Fish eggs

L = Fish larvae

2. Study Area Description

The benthos sampling program was accompanied by visual observations and chemical analysis of the substratum (Appendices VIB-1 through VIB-4) in order to define any spatial distribution patterns that were affected, at least in part, by the nature of the substratum.

Data from grain size analysis of the sand-silt fraction (Appendix VIB-2) at the 40-ft depth contour of the four transects showed similar sand and silt percentages.

Visual observations of the substratum, however, showed that the presence of rock was highly variable, both spatially and seasonally (Appendix VIB-3). Sand and silt were more prevalent at FITZ and at NMPE than at NMPW and NMPP (30, 40 and 60-ft depth contours). Transects NMPW and NMPP were typically composed of a flatrock or cobble substratum overlain with a layer of silt; this was not as prominent a feature at shallow depth contours of FITZ or NMPE transects, which displayed more seasonal variability than the two westernmost transects.

Organic carbon measurements at the 40-ft depth contours revealed highest values at NMPW and lowest percentages at FITZ (Appendix VIB-1). Values at NMPE were similar to those at FITZ during June and September, and similar to those at NMPW during October.

3. Spatial Distribution of Selected Taxa

Cladophora

The biomass of Cladophora collected with the macroinvertebrate benthic sample (Appendix VIB-8) was variable.

Coelenterata

The two identified coelenterate genera, Hydra and Cordylophora, were collected at each transect (Appendix VIB-6d), although they were absent from some depth contours. Hydra was most abundant in June and at the shallow (10 and 20-ft) stations. On an annual basis, Hydra was more abundant at the 10-ft stations of control transects than of experimental transects; however, the reverse was true at the 20-ft stations. This spatial trend does not appear to be related to Cladophora growth, but is probably linked to availablity of surface area for attachment of the organism's basal disc.

In contrast to Hydra, Cordylophora was found along all transects and in large numbers at the deep stations. Mean annual abundance was greater at control than at experimental transects at the 30 and 40-ft depths but was higher at experimental transects along the 10, 20, and 60-ft depth contours. For the 10-ft depth, Cordylophora was most abundant at NMPP during April, June, and October but at FITZ during August. At this water depth, spatial and seasonal differences were observed in substrate characteristics as well.

Mollusca

Gastropods (Appendix VIB-5f) were a dominant component of the benthos community and exhibited greatest abundance at the 60-ft depth contour. Largest numbers were generally found at NMPE except at the 10-ft depth where maximum abundances occurred at NMPW. At the 60-ft depth contour, there was a west-to-east increase in gastropod abundance. These patterns did not appear to be related to the plumes from the power plants, to the extent of Cladophora growth, or to the type of substratum (rock vs. sand or silt).

Valvata perdepressa (Appendix VIB-6e) was a dominant gastropod and its abundances increased with increasing depth. Densities of Valvata were consistently highest at NMPE, the transect most characterized by a soft substratum. FITZ transect ranked second in abundance of Valvata and it appears that distribution and density of this snail may have been closely related to substrate type.

Similar trends were observed for Amnicola (Appendix VIB-6e) at the 60-ft stations; however, unlike the pattern assumed by Valvata, large numbers of Amnicola were seen also at 20-ft stations and the trend noted at deep stations was not consistent for all depth contours. NMPE generally had highest abundance of Amnicola, but densities were also high at intermediate depths at NMPW.

Bivalves showed a trend of increased abundance with increased depth (Appendix VIB-5f), which is a well-documented distributional pattern for the major component, the fingernail clams (Sphaeriidae). In general, abundances at the experimental transects were within the range of values at control transects, although there seems to be a correlation between abundance and the presence of a soft substratum which is consistent with the burrowing mode of existence of these organisms. Abundances at shallow stations are probably related to localized areas of available sand or silt.

Annelida

Nearly all of the polychaetes identified from the benthos collections were Manayunkia speciosa. This species was most common at the 10, 20, and 30-ft depth contours (Appendix VIB-6b).

This worm is found in tubes of mud attached to stones, and thus escapes notice due to its small size (Pettibone 1953). Rolan (1974) noted the presence of M. speciosa in a Lake Erie thermal discharge channel and suggested that this species is a thermally tolerant organism, able to tolerate a range of temperature from 17 to 31 C and a 7 C temperature shift within a few hours. Hiltunen

(1965) recorded the abundance of *M. speciosa* as reaching 45,292 worms/m^2 near the mouth of Detroit River, suggesting that this may be a more abundant species in the Great Lakes than has been suspected.

In the Nine Mile Point vicinity, *M. speciosa* showed large fluctuations in spatial abundance on a seasonal basis. There was no consistent seasonal trend among stations. At the 20 and 30-ft contours, the two westernmost transects had greater abundances than FITZ and NMPE. However, no pattern of distribution is apparent between stations.

Oligochaetes were both diverse and numerous during 1976 (Appendix VIB-5a), especially at the 60-ft depth contour where greatest abundance was seen at NMPW. However, at the 40-ft depth, very few oligochaetes were collected from NMPW. Overall, oligochaetes were seasonally abundant at both control and experimental transects.

The oligochaete *Nais bretscheri* (Appendix VIB-6a) was most common at the 10-ft depth and in April and June samples. Maximum abundance was noted at NMPP, but its spatial pattern was not correlated with *Cladophora* abundance.

Arthropoda

The major groups of arthropods (Acari, Insecta, and Crustacea) were all represented in the benthos collections. Data for Acari (Appendix VIB-5b) revealed a tendency for higher numbers at NMPW and NMPP than at FITZ and NMPE. However, in some seasonal samples, maximum abundance occurred at FITZ. Variability between control stations was similar to that seen between experimental stations.

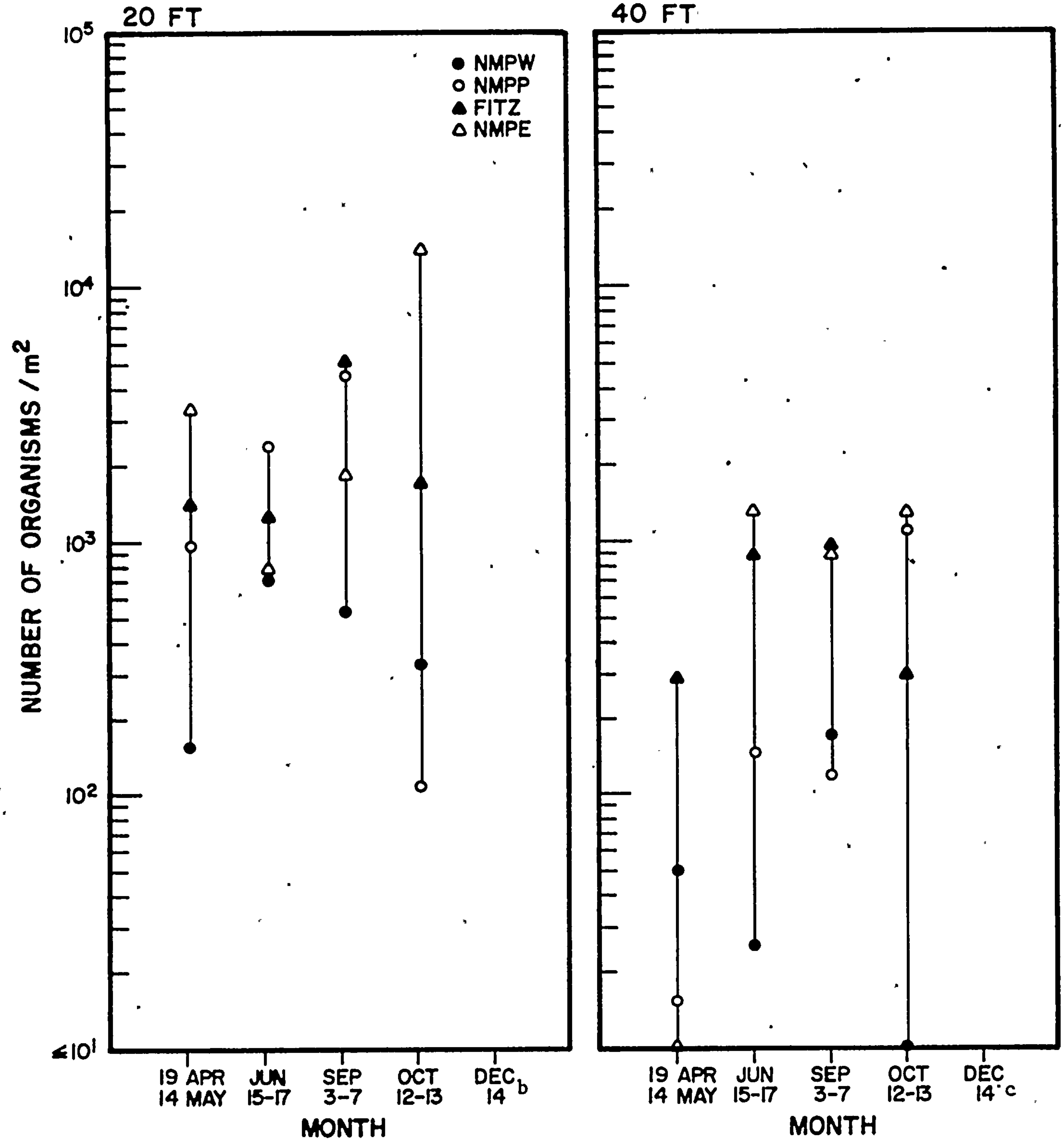
Crustaceans (Appendix VIB-5b) included isopods, mysids, decapods, ostracods, and amphipods, of which amphipods and ostracods formed the numerically dominant groups. Amphipods were most abundant at the 10-ft contour and, at that depth, were highest in abundance at the experimental transects ("annual" [based on an April-December sampling period] mean values). In June and October, maximum abundance occurred at NMPP and during August, at FITZ. During April, the two control transects had higher mean amphipod abundance than the experimental transects. At the 20, 40, and 60-ft depths, maximum annual abundance was recorded at NMPE.

The amphipod Pontoporeia affinis (Appendix VIB-6c) occurred in very low numbers at the two shallowest depth contours and increased in density at the deeper stations. Maximum abundance was reached at the 60-ft depth contour; maximum "annual" mean abundance for this contour was noted at NMPE. At 30 and 40-ft depths, P. affinis was rare at NMPW and NMPP, but abundant at FITZ and NMPE. At 40 and 60-ft contours, there was a west-to-east difference in substrate characteristics which may have affected distribution of P. affinis.

Gammarus fasciatus (Appendix VIB-6c), in contrast to P. affinis, showed a preference for the shallow depth contours; at 10 and 30-ft contours, annual abundances were lowest at control stations; however, at 20-ft, the maximum mean abundance was seen at NMPE. Data from the 20-ft contour (Figure VIB-1) show that the interstation difference in G. fasciatus abundance was seasonally variable, as was the case for the 40-ft stations. It appeared that abundances tended to be low at NMPW and high at NMPE, but there was no clear consistent pattern of abundance for control vs. experimental sites. Variation at the control transects was as high as at the experimental transect. It should be noted that the abundance of Gammarus

ABUNDANCE[a] OF GAMMARUS FASCIATUS IN BENTHIC COLLECTIONS

NINE MILE POINT VICINITY-1976



[a] NUMBER OF ORGANISMS/M^2; MEAN OR R-1 AND R-2

[b] NO SAMPLE COLLECTED IN DECEMBER AT NMPW, NMPP, AND FITZ TRANSECTS; NO GAMMARUS COLLECTED IN NMPE TRANSECT SAMPLE

[c] NO SAMPLE COLLECTED IN DECEMBER AT THE 40 FT DEPTH CONTOUR

in the benthic collections (Appendix VIB-6c) was more than 100 times the concentrations in the water column, including night samples, as shown in the surface, mid-depth, and bottom tows (Appendices VC-1a and VC-1b). This indicates that the majority of the Gammarus community maintains itself at or near the lake bottom.

Ichthyoplankton and Fish Eggs

As expected, fish eggs were collected only during April-June. Alewife eggs (Appendix VIB-7) were essentially limited to the 10-ft contour, but were not recorded from that depth at NMPW. There did not appear to be a relationship between Cladophora biomass and numbers of alewife eggs. Eggs of other identified fish species were collected in small numbers at each depth contour, but there was no apparent pattern to their spatial distribution.

Total Macroinvertebrates

At the 10-ft contour, mean annual abundance of macrofauna (Appendix VIB-6) was greatest at the experimental transects and was influenced by amphipod patterns at these transects. At the deeper contours, total macrofauna was generally most abundant at NMPE. Seasonal fluctuations were such that NMPP varied within the range of values seen at the control transects and the spatial variability seen throughout the year did not form a consistent pattern.

C. RESULTS AND DISCUSSION - ARTIFICIAL SUBSTRATES

1. Buoy Periphyton

a. Community Composition - Species Inventory by Date

The species inventory by date is presented in Table VIC-1. A total of 140 taxa were identified; the phytoplankton identified

TABLE VIC-1

OCCURRENCE OF ORGANISMS ON BUOY PERIPHYTON SUBSTRATES BY DATE

NINE MILE POINT VICINITY - 1976

TAXON	DATE MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
PHYTOPERIPHYTON*								
CHLOROPHYTA								
UID GREEN	D	D						D
CHLAMYDOMONAS SP.			D					
PANDORINA MORUM						X		
STICHOCOCCUS SP.			D					
ULOTHRIX TENERRIMA	D	D	D					
STIGEOCLONIUM SP.			X	D	D	D	D	
CLADOPHORA SP.				X	D			
MOUGEOTIA SP.		D			D	D		X
MOUGEOTIA GENUFLEXA		D						
MOUGEOTIA SP.A		D	D	D				
MOUGEOTIOPSIS SP.			D					
SPIROGYRA SP.			D	D	D			
CLOSTERIUM SP.			X	D	D	D		
COSMARIUM SP.			X	D	D	D		
STAURASTRUM SP.					D	D		
ACTINASTRUM HANTZSCHII					X			
ANKISTRODESMUS SP.					X	D		
ANKISTRODESMUS FALCATUS		X	D	X	D		X	
ANKISTRODESMUS FRACTUS			X					
CHODATELLA (LAGERHEIMIA)					D	D		
CHLORELLA VULGARIS		D						
CLOSTERIOPSIS SP.			X		X	D	X	
COELASTRUM SP.					D	D		
COELASTRUM MICROPORUM		D	X	X				
CRUCIGENIA SP.				X				
COLENKINIA SP.					D	X		
KIRCHNERIELLA SP.						X		
OOCYSTIS SP.			X		X	D		
PEDIASTRUM BORYANUM			D		D	D		
PEDIASTRUM DUPLEX			X	D	D	D		
PEDIASTRUM SIMPLEX				X		D		
PEDIASTRUM TETRAS					D	D		
SCENEDESMUS SP.			X	D	D	D		
SCENEDESMUS BIJUGA			X	X	D	X	X	
SCENEDESMUS DENTICULATUS					D			
SCENEDESMUS DIMORPHUS		X	D	D	D	D		
SCENEDESMUS OBLIQUUS	D	D	D	D	D	D		
SCENEDESMUS OPOLIENSIS					X			
SCENEDESMUS QUADRICAUDA		X	D	D	D	D	D	
SCHROEDERIA SP.					D	D	X	
TETRADESMUS SP.					X			
TETRAEDRON SP.			X		X	X		

TABLE VIC-1 (Continued)

OCCURRENCE OF ORGANISMS IN BUOY PERIPHYTON SUBSTRATES BY DATE (Continued)

TAXON	DATE							
	MAY	JUN.	JUL	AUG	SEP	OCT	NOV	DEC
CHRYSOPHYTA								
PERONIELLA PLANCTONICA					X	X		
CHARACIOPSIS SP.						X		
CHARACIOPSIS CYLINDRICA					X			
DINOBRYON SP.		X						
EUGLENOPHYTA								
EUGLENA SP.	D							
PHACUS SP.	D	X	D					
PHACUS PYRUM	D							
BACILLARIOPHYCEAE								
CENTRATE (group)		D	D	X	D	D	D	D
COSCINODISCUS ROTHII			X	X	X	X		
CYCLOTELLA SP.			X	D				
CYCLOTELLA GLOMERATA				X				X
CYCLOTELLA MENEGHINIANA		X	X	X	X	X		
CYCLOTELLA STRIATA			X	X				
MELOSIRA SP.				X	D			
MELOSIRA BINDERANA			X					
MELOSIRA DISTANS				X	X			
MELOSIRA GRANULATA	X		X		D	X		
MELOSIRA VARIANS	D	X	D					
STEPHANODISCUS SP.	D	X			D			
STEPHANODISCUS ASTREA	X	X	X	X	X	X	X	X
STEPHANODISCUS NIAGARAE.			X		X	X		
STEPHANODISCUS INVISITATUS	X	X			X	X		
PENNATE (group)		D		D	D			
ACHNANTHES SP.	X		X	X				
ACHNANTHES LANCEOLATA	X						D	D
ACHNANTHES MINUTISSIMA					X			
AMPHIPRORA SP.	D							
AMPHORA PERPUSILLA						X		
ASTERIONELLA FORMOSA	D	D	D	X	X			
COCCONEIS SP.	D				X	X	X	
COCCONEIS PLACENTULA	X			X	X			
COCCONEIS PEDICULUS				X	X	X	X	
CYMATOPLEURA SOLEA			X	D				
CYMBELLA SP.			D		X	X		
CYMBELLA PROSTRATA			X	X	D	D		
CYMBELLA TUMIDA				X				
CYMBELLA VENTRICOSA	D		D	X	D	X		
CYMBELLA MEXICANUM					X	X		
DIATOMA SP.	D	D	D	X	X	X	D	
DIATOMA ELONGATUM				D	X	X	X	D
DIATOMA VULGARE	D	D	X	X		X	D	D
FRAGILARIA SP.	X				X	X		
FRAGILARIA ARCUS (F. HANNAEA)	X	D	D			X	D	
FRAGILARIA CAPUCINA	D	D	D			D	D	D
FRAGILARIA CROTONENSIS		D	X	X	X	X		X
FRAGILARIA VAUCHERIAE	D	D	D			X		
GOMPHONEMA SP.			X		X	D		
GOMPHONEMA OLIVACEUM	D	D	D	X	X		D	

TABLE VIC-1. (Continued)

OCCURRENCE OF ORGANISMS IN BUOY PERIPYTON SUBSTRATES BY DATE (Continued)

TAXON	DATE							
	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
BACILLARIOPHYCEAE (continued)								
GOMPHONEMA PARVULUM		D	X	X	D	D		
GYROSIGMA SP.	X						D	X
GYROSIGMA ATTENUATUM	X							
GYROSIGMA ACUMINATUM			X					
MERIDION CIRCULARE	D				X			
NAVICULA SP.	D	D	X	D	D	D	D	D
NAVICULA CRYPTOCEPHALA	D	D	D		D	D	D	
NAVICULA TRIPUNCTATA	D	D	D	D	D	D	D	X
NAVICULA CAPITATA	X			X				
NAVICULA ELGINENSIS		X						
NAVICULA RHYNCHOCEPHALA		X						
NAVICULA SALINARUM	D	D	D	D				
NAVICULA PSEUDOREINHARDTII		D	X	D	D	X		
NAVICULA ODIOSA					D	D		
NAVICULA VIRIDULA VAR. AVENACEA	D	D						
NAVICULA HEUFLERI					X	D		
NITZSCHIA SP.	D	D	D	D	D	D	D	X
NITZSCHIA ACICULARIS	D	D	D	D	D	D	X	
NITZSCHIA SALINARUM					X			
NITZSCHIA DISSIPATA	D	D	D	D	D			D
NITZSCHIA HOLSATICA		D	D	X				
NITZSCHIA LINEARIS	X							
NITZSCHIA PALEA		D			X			X
NITZSCHIA PARADOXA			D		D			
NITZSCHIA TRYBLIONELLA					X			
NITZSCHIA PALEA-HOLSATICA		D	D					
RHOICOSPHENIA CURVATA	D	D	D	D	D	D	D	X
SURIRELLA SP.	X	X	D	X				
SURIRELLA ANGUSTATA			X					
SYNEDRA SP.							D	
SYNEDRA ACUS			D		X	D		
SYNEDRA ULNA	D	D	D	D	D	D		X
SYNEDRA PULCHELLA	D	X	D			D		
SYNEDRA CYCLOPUM							D	D
TABELLARIA FENESTRATA			X			X		
MYXOPHYTA								
ANACYSTIS SP.					D			
CHROOCOCCUS SP.					D	D		
CHROOCOCCUS LIMNETICUS				X				
COELOSPHAERIUM SP.						X		
GOMPHOSPHAERIA SP.						D		
MERISMOPOEDIA SP.			X					
LYNGBYA DIGUETTI				D	D	D	D	
OSCILLATORIA ARTICULATA				X				
OSCILLATORIA NIGRA				D	D			
PHORMIDIUM MINNESOTENSE			D	D	D	D		
NOSTOCALES					D	X		
ZOOPERIPHYTON**								
CILIATA								
CILIAPHORA			D	D	D	D	D	

TABLE VIC-1 (Continued)

OCCURRENCE OF ORGANISMS ON BUOY PERIPHYTON SUBSTRATES BY DATE (Continued)

TAXON	DATE							
	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CILIATA (continued)								
VORTICELLIDAE	D	D	D	D	D	D		
EPISTYLIDAE		D	D			D		
SUCTORIA								
ACINETA SP.			X					
TOKOPHRYA SP.		D	D	D	D	D	D	
THECACINETA SP.	D	D			X	D	D	
OTHER ZOOPERIPHYTON								
HYDRA SP.					D	D		
ASCHELMINTHES		D						

X PRESENCE IN ONE OR MORE SAMPLES AT ONE OR MORE STATIONS
D MEAN ABUNDANCE OF ≥ 5 OF TOTAL PHYTOPERIPHYTON* OR ZOOPERIPHYTON** AT ONE OR MORE STATIONS

include 45 Chlorophyta, 4 Chrysophyta, 3 Euglenophyta, 73 Bacillariophyceae, and 11 Myxophyta, while taxa of 3 Ciliata, and 3 Suctoria represented the major portion of the zooplankton community. Other zooplankton collected on the buoy periphyton substrates included Hydra sp. and Aschelminthes. No individuals of Dinophyta and Cryptophyta were collected on buoy periphyton substrates.

b. Spatial and Temporal Distribution

- Chlorophyll a

Peak mean chlorophyll a values at 2 and 7-ft sample depths were observed on 4 August (Appendix VIC-1b), while peak values at 12 and 17-ft depths occurred on 8 September. Buoy chlorophyll a values of 11 May and 2 June may be biased, as these resulted from six-week and three-week exposure periods, respectively; however, data from all transects were judged to be comparable within a particular set period.

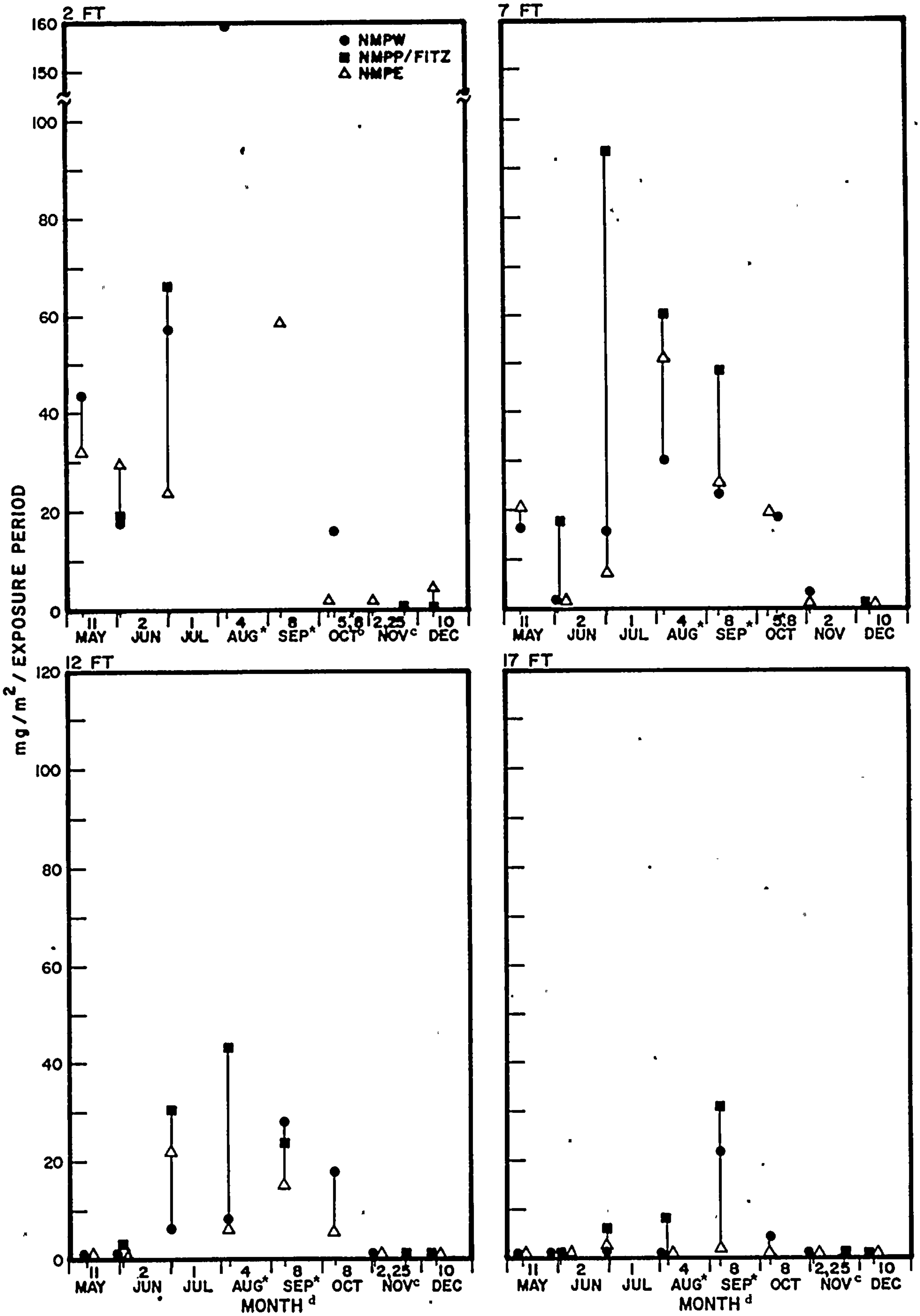
The seasonal pattern (Figure VIC-1) appeared to be unimodal, with chlorophyll a peaks at 12 and 17-ft depths occurring four to eight weeks after near-surface peaks. The bimodal pattern revealed by twice-monthly collections in 1975 (LMS 1976) may have been obscured by the monthly sampling interval of the 1976 program.

Buoy chlorophyll a values from the NMPP/FITZ transect exceeded those of both control transects on 12 of 14 occasions when comparisons were possible. Chlorophyll a levels were lowest at NMPE and NMPW on nine and five occasions, respectively; the NMPP/FITZ transect never exhibited minimum pigment concentrations. The generally higher temperatures in the vicinity of the

FIGURE VIC-1

BUOY PERIPHYTON: CHLOROPHYLL A

NINE MILE POINT VICINITY — 1976



[a]ORIGINAL SAMPLE; PLATES INITIALLY SET 1 APR
[b]PLATES HARVESTED 5 OCT WERE SET 9 SEP
NO SAMPLE FOR REMAINING STATIONS AND DATES.

[c]PLATE AT NMPP/FITZ HARVESTED 25 NOV WAS SET 2 NOV
[d] SEE APPENDIX VIC-16 FOR INFORMATION ON LOST SUBSTRATES
*SAMPLE COLLECTED WITH A WINCH

NMPP/FITZ transect (see Chapter IV) apparently had a stimulatory effect on periphyton growth (Figure VIC-1, Appendix VIC-1b).

Mean chlorophyll a values consistently decreased with depth for all transects from May through September (Appendix VIC-1b). A similar trend was demonstrated in the 1975 study (LMS 1976). From 5 October through 10 December, this vertical effect was obscured, due in part to missing samples and to very low values in November and December.

- Biomass

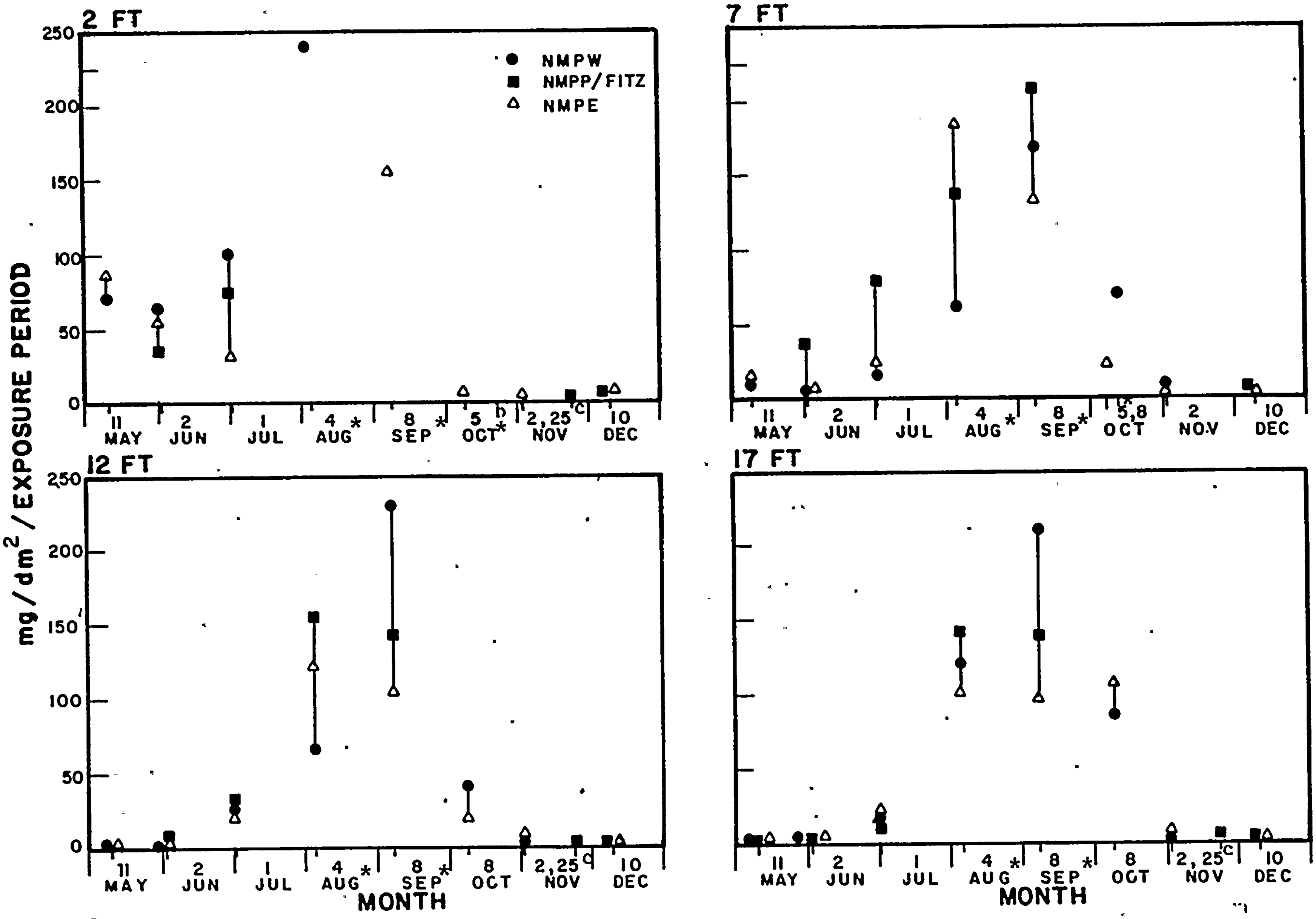
Mean biomass by sample depth for buoy periphyton was greatest on 8 September for 7, 12 and 17-ft samples (Appendix VIC-1d). The mean biomass value of the 2-ft buoy samples on 4 August exceeded that of 8 September, but this value was based on sampling only one transect. As was the case for chlorophyll a data, 11 May and 2 June biomass values may be misleading due to other than a four-week exposure period. The seasonal pattern (Figure VIC-2) was again unimodal, with peak values decreasing markedly after 8 September.

Biomass from buoy samples was greater at NMPP/FITZ transect than at the control stations on 10 of 16 occasions when data were available for all sites, indicating a possible stimulatory effect similar to that observed in the pigment analysis. Biomass from the 2-ft sample depth at the NMPW-40-ft station was greater than the corresponding sample at NMPP/FITZ and NMPE on 2 June and 1 July.

- Relation to Physical Parameters

Examination of data by transect and depths shows that chlorophyll a and biomass levels peaked in August and September,

BUOY PERIPHYTON: BIOMASS[a]
NINE MILE POINT VICINITY – 1976



[a]ASH-FREE DRY WEIGHT; MEAN OF R-1 and R-2; PLATES INITIALLY SET 1 APR
[b]PLATES HARVESTED 5 OCT WERE SET 9 SEP
[c]PLATE AT NMPP/FITZ HARVESTED 25 NOV WAS SET 2 NOV

*SAMPLE COLLECTED WITH A WINCH

FIGURE VIC-2

except for the 1 July chlorophyll a maximum at NMPP/FITZ. Increased periphytic chlorophyll a and biomass levels occurred when lake surface temperatures generally exceeded 20 C, from mid-July through early September (see Chapter IV).

- Abundance of Selected Taxa and Species of Phytoperiphyton

The data from the phytoplankton portion of the periphytic community from the monthly set periods from April through December were summarized for each major algal division (Appendix VIC-1e) and for seven selected species (Appendix VIC-1f). The entire data set for 1976 was summarized for all species comprising at least 10% of the total phytoperiphyton at any sample depth at the 40 ft stations for a minimum of two months based on the mean of R-1 and R-2. Data was summarized for the following species: six diatoms (Diatoma elongatum, Diatoma vulgare, Fragilaria vaucheriae, Gomphonema olivaceum, Nitzschia dissipata, and Synedra cyclopum) and one blue-green algae (Lyngbya diguetii).

Data summarized for the zooperiphytic portion of the periphyton community was presented in Appendix VIC-1g.

2. Bottom Periphyton

a. Community Composition - Species Inventory by Date

The species inventory for the bottom periphyton community is presented in Table VIC-2. A total of 203 taxa were identified; these included 50 taxa of Chlorophyta, 7 Chrysophyta, 6 Euglenophyta, 114 Bacillariophyceae, 19 Myxophyta, and 1 Dinophyta, for the phytoperiphyton community. No cryptophytes were collected on bottom periphyton substrates. A total of 16 taxa were identified from the zooplankton component of the community, and

TABLE VIC-2

OCCURRENCE OF ORGANISMS ON BOTTOM PERIPHYTON SUBSTRATES BY DATE

NINE MILE POINT VICINITY - 1976

TAXON	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
PHYTOPERIPHYTON*								
CHLOROPHYTA								
UID GREEN	D	D			X			
CHLAMYDOMONAS SP.	X	D	D	D	D	D		
PANDORINA MORUM					D			
STICHOCOCCUS SP.		D						
STICHOCOCCUS BACILLARIS		X						
STICHOCOCCUS SUBTILIS		D						
ULOTHRIX SP.			D		X			
ULOTHRIX TENERRIMA		D						
ULOTHRIX ZONATA		D						
ULOTHRIX AEQUALIS			D					
STIGEOCLONIUM SP.		D	D	D	D	D	D	
STIGEOCLONIUM TENUE		D						
CLADOPHORA SP.			D		D			
ZYGNEMATALES			D					
MOUGEOTIA SP.		D	D	D	D			
MOUGEOTIA SP.A		D						
MOUGEOTIOPSIS SP.							D	
SPIROGYRA SP.		D	D	X				
CLOSTERIUM SP.		D	X	D	D			
CLOSTERIUM ACICULARE		D						
COSMARIUM SP.	X		X	D	D	D		
STAURASTRUM SP.			X	X	D			
ANKISTRODESMUS SP.		D		X	X	D		
ANKISTRODESMUS BRAUNII				X				
ANKISTRODESMUS FALCATUS		D		D				
ANKISTRODESMUS FRACTUS		X						
CHODATELLA SP.(LAGERHEIMIA)		X		X				
CHLORELLA SP.	D	X			D	D		
CHLORELLA VULGARIS	X	X	D	X	D			
CLOSTERIOPSIS SP.		X	X		X			
COELASTRUM SP.					D	D		
COELASTRUM MICROPORUM		D	D	D	X			
FRANCEIA SP.					X			
OOCYSTIS SP.	X	X		D	[illegible]			
PEDIASTRUM BORYANUM				D	D			
PEDIASTRUM DUPLEX		D	D	D	D			
PEDIASTRUM SIMPLEX					D			
PEDIASTRUM TETRAS				D	D			
PLANKTOSPHAERIA SP.					X			
SCENEDESMUS SP.		X				D		
SCENEDESMUS ARCUATUS		X						
SCENEDESMUS BIJUGA		D	D	D	D	D		
SCENEDESMUS DENTICULATUS			D		D			

TABLE VIC-2 (Continued)

OCCURRENCE OF ORGANISMS ON BOTTOM PERIPHYTON SUBSTRATES BY DATE (Continued)

TAXON	DATE							
	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CHLOROPHYTA (continued)								
SCENEDESMUS DIMORPHUS		D	D	D	D			
SCENEDESMUS OBLIQUUS	D	D	D	D	D			D
SCENEDESMUS QUADRICAUDA		D	D	D	D	D		
SCHROEDERIA SP.				D				
TETRADESMUS SP.		D						
TETRAEDRON SP.			D	D	D	D		
TETRAEDRON MINIMUM				D				
TETRAEDRON TRIGONUM		X						
CHRYSOPHYTA								
PERONIELLA PLANCTONICA			D	D				
CHARACIOPSIS *SP.*					X			
CHARACIOPSIS CYLINDRICA			D	D				
DISTEPHANUM SP.								D
CHRYSOPHYCEAE		D	X	D	D			
KEPHYRION *SP.*			X					
ISOCHRYSIDALES SP.		X						
EUGLENOPHYTA								
EUGLENA *SP.*	D		D	X	D			
EUGLENA MINUTA			D					
PHACUS *SP.*		X	X		X			
PHACUS PYRUM	X	X		X				
PHACUS ALATUS		D						
TRACHELOMONAS SP.		D						
BACILLARIOPHYCEAE								
CENTRATE (group)		D	D	D	D	D		D
COSCINODISCUS LACUSTRIS			X					
COSCINODISCUS ROTHII	X	X	D	X	X	X		
CYCLOTELLA *SP.*	D	D	D	X				
CYCLOTELLA ATOMUS			X	X	X			
CYCLOTELLA GLOMERATA	X	X	X		X		D	
CYCLOTELLA MENEGHINIANA	X	X	D	X	X	X	X	
CYCLOTELLA STELLIGERA			X	X				
CYCLOTELLA PSEUDOSTELLIGERA	X							
MELOSIRA *SP.*	D		D	X	D			
MELOSIRA BINDERANA			X		X			
MELOSIRA GRANULATA		X	X	X	D			
MELOSIRA ISLANDICA			X					
MELOSIRA ITALICA		D						
MELOSIRA VARIANS	D	D	X					
MELOSIRA GRANULATA VAR. AUGUSTISSIMA			D	X				
STEPHANODISCUS SP.		X	X					
STEPHANODISCUS ASTREA	X	X	X	X	X		D	
STEPHANODISCUS HANTZSCHII		X	X		X	X		
STEPHANODISCUS NIAGARAE		D						
STEPHANODISCUS TENUIS					X			
STEPHANODISCUS INVISITATUS	X		X	X	X			
PENNATE (group)		X			X			
ACHNANTHES *SP.*				X	X			
ACHNANTHES LANCEOLATA	X				X	X	D	
ACHNANTHES LINEARIS			X	D	X			

TABLE VIC-2(Continued)

OCCURRENCE OF ORGANSIMS ON BOTTOM PERIPHYTON SUBSTRATES BY DATE(Continued)

TAXON	DATE							
	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
BACILLARIOPHYCEAE (continued)								
ACHNANTHES PINNATA			X					
ACHNANTHES MINUTISSIMA				X				
AMPHIPRORA SP.		X						
AMPHORA SP.					X			
AMPHORA OVELIS VAR. PEDICULUS				X				
AMPHORA PERPUSILLA			X	X	X	X	X	
ASTERIONELLA FORMOSA	D	D	X		X			X
COCCONEIS SP.			D	D	X	D		
COCCONEIS PLACENTULA		X		X	X	X	X	
COCCONEIS DIMINUATA		X						
COCCONEIS PEDICULUS	X	X	X	D	D	D	D	X
CYMATOPLEURA SP.		X						
CYMATOPLEURA SOLEA		X	X	X				
CYMBELLA SP.			D				X	
CYMBELLA PROSTRATA		X	X	X	X			
CYMBELLA VENTRICOSA	D	D	D			D		
CYMBELLA SINUATA						X		
CYMBELLA BREHMI			X					
DIATOMA SP.		X						
DIATOMA ELONGATUM	D	D	D	D		D	D	D
DIATOMA VULGARE	X	X	X				X	D
DIATOMA HIEMALE VAR. MESODOM		X						
DIATOMA VULGARE VAR. OVALIS	X							
DIPLONEIS ELLIPTICA	X							
DIPLONEIS OCULATA						X		
FRAGILARIA SP.					X			
FRAGILARIA ARCUS (F. HANNAEA)		D				D		
FRAGILARIA BREVISTRIATA	D		X					
FRAGILARIA CAPUCINA	D	D	D	D	D	D	D	D
FRAGILARIA CONSTRUENS						X		
FRAGILARIA CROTONENSIS		D	D	X	X			
FRAGILARIA VAUCHERIAE	D	D	D		D	D	D	D
GOMPHONEMA SP.		D		X	X			D
GOMPHONEMA ANGUSTATUM				X				
GOMPHONEMA OLIVACEUM	D	D	D	X	D	D	D	D
GOMPHONEMA PARVULUM	D	D	D	X	X		D	D
GOMPHONEMA SIMUS						X		
GYROSIGMA SP.		D	X	X	X	D		D
GYROSIGMA ATTENUATUM	X							
GYROSIGMA ACUMINATUM	X	X				X		
MERIDION CIRCULARE		X	X				D	X
NAVICULA SP.	D	D	D	X	D	D	D	D
NAVICULA CRYPTOCEPHALA	D	D	D	X	D	X	D	
NAVICULA RADIOSA	D	D			X			
NAVICULA TRIPUNCTATA	D	D	D	D	D	D	D	D
NAVICULA ANGLICA					X			
NAVICULA CAPITATA			X					
NAVICULA ELGINENSIS			X					
NAVICULA EXIQUA VAR. CAPITATA				X				
NAVICULA GRACILOIDES	X							
NAVICULA SALINARUM		D	X	X				
NAVICULA ARENARIA	X							
NAVICULA PSEUDOREINHARDTII	X	D	D	D	X	X		

TABLE [illegible]-2 (Continued)

OCCURRENCE OF ORGANISMS ON BOTTOM PERIPHYTON SUBSTRATES BY DATE (Continued)

TAXON	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
BACILLARIOPHYCEAE (continued)								
NAVICULA ODIOSA	X				X	X	D	D
NAVICULA GLOBULIFERA	X							
NAVICULA SALINARUM		X			X	D		
NAVICULA NOTHA							X	
NAVICULA HEUFLERI		X						D
NAVICULA MENISCULES	D		D	D				
NAVICULA RADIOSA VAR. TENELLA						X		
NITZSCHIA SP.	X	X	D	X	D	D		
NITZSCHIA ACICULARIS	X	D		D	X		X	D
NITZSCHIA SALINARUM			D		X			
NITZSCHIA APICULATA	X							
NITZSCHIA DISSIPATA	D	D	D	D	D	D	D	D
NITZSCHIA FILIFORMIS		X	X					
NITZSCHIA FONTICOLA						X		
NITZSCHIA GRACILIS		X						
NITZSCHIA HOLSATICA		D	X		D			
NITZSCHIA LINEARIS		D	X	X	X		D	
NITZSCHIA PALEA	X	D	D	D	D	D	D	
NITZSCHIA PARADOXA	X							
NITZSCHIA SIGMOIDEA			D	X	X			
NITZSCHIA TRYBLIONELLA			X	X				
NITZSCHIA CLOSTERIUM	X							
NITZSCHIA PALEA-HOLSATICA	D	D	D		D			
NITZSCHIA ANGUSTATA						X		
RHOICOSPHENIA CURVATA	D	D	D	D	D	D	X	D
SURIRELLA SP.		X	D					
SURIRELLA OVALIS		X	X			X		
SURIRELLA OVATA	X	X		X				
SYNEDRA SP.					X			
SYNEDRA ACUS								X
SYNEDRA ULNA	D	D	X	X	D	D	D	D
SYNEDRA PULCHELLA				X			X	X
SYNEDRA FASCICULATA VAR. TRUNCATA	X							
SYNEDRA CYCLOPUM							D	D
TABELLARIA SP.						D		
TABELLARIA FENESTRATA		D						D
TABELLARIA QUADRISEPTA					X			
MYXOPHYTA								
CHROOCOCCALES					X			
ANACYSTIS SP.		D			D	D		
ANACYSTIS AERUGINOSA				D				
APHANOCAPSA SP.					D			
CHROOCOCCUS SP.	X	D	X	D	D			
CHROOCOCCUS LIMNETICUS			X					
CHROOCOCCUS DISPERSUS		D	X	D				
GOMPHOSPHAERIA SP.			D		D			
MERISMOPOEDIA SP.		D	X		D			
HORMOGONALES					X			
LYNGBYA SP.							X	
LYNGBYA DIGUETII		D	D	D	D	D	D	
OSCILLATORIA SP.					D	D		
OSCILLATORIA NIGRA			D	D	X			

TABLE VIC-2 (Continued)

OCCURRENCE OF ORGANISMS ON BOTTOM PERIPHYTON SUBSTRATES BY DATE (Continued)

TAXON	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
MYXOPHYTA (continued)								
PHORMIDIUM SP.		D						
PHORMIDIUM MINNESOTENSE		D	D	D	D	D		
NOSTOCALES			D	D				
ANABAENA SP.					X			
CALOTHRIX SP.					D			
DINOPHYTA								
CERATIUM SP.					X			
ZOOPERIPHYTON**								
CILIATA								
CILIAPHORA		D	D	D	D	X	D	
PARAMECIIDAE			X					
CODONELLA SP.		X	D	D	D			
VORTICELLIDAE	D	D	D	D	D	D	D	
EPISTYLIDAE	D	D	D	D	D	D		
EPISTILIS SP.			D					
SUCTORIA								
SUCTORIA		D	D		D			
ACINETA SP.		X	D	D	D	D	D	
TOKOPHRYA SP.		D	D	D	D	D		
THECACINETA SP.	D	D	D	D	X	D	D	
OTHER ZOOPERIPHYTON								
AMBOEBINA			D	D				
HYDRA SP.		D	X	D	D		D	
NEMATODA		D	D	X				
OLIGOCHAETA			X					
CLADOCERA		D	X					
BOSMINA SP.		X						
BRYOZOA		D	X					

X PRESENCE IN ONE OR MORE SAMPLES AT ONE OR MORE STATIONS
D MEAN ABUNDANCE OF ≥ 5 OF TOTAL PHYTOPERIPHYTON* OR ZOOPERIPHYTON** AT ONE OR MORE STATIONS

included 6 taxa of Ciliata, and 3 Suctoria, in addition to bryozoa, hydroids, nematoda, oligochaetes, cladocerans, and sarcodina protozoan.

b. Spatial and Temporal Distribution

- Biomass

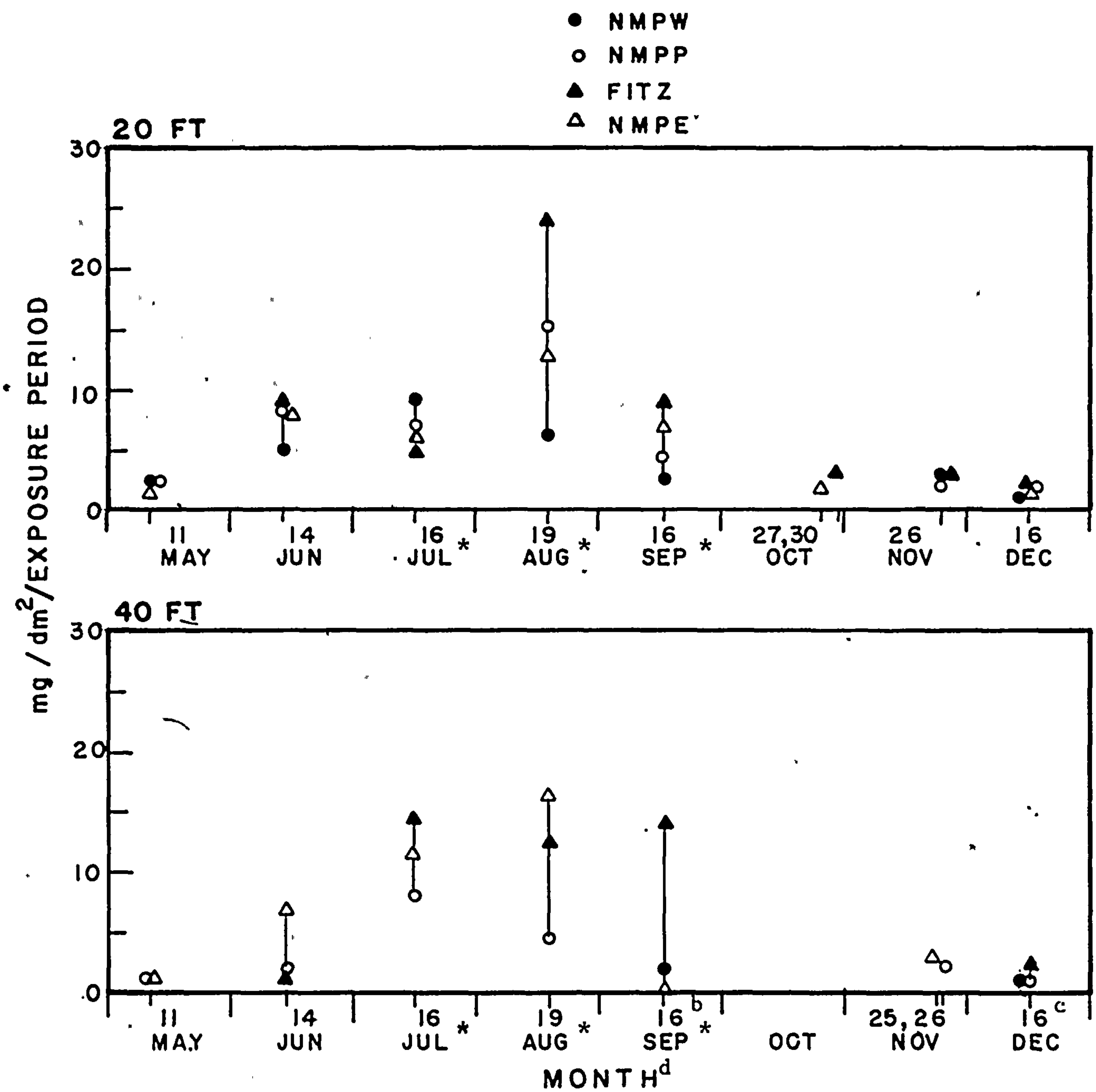
Biomass of bottom periphyton was greatest on 19 August for all 20-ft depth contour stations except NMPW (Figure VIC-3). On this date, mean values at FITZ and NMPP transects were 23.90 and 15.30 mg/dm^2, respectively.

Biomass obtained from 40-ft bottom samples was comparatively lower than that from 20-ft depths, most likely due to lower light levels at the 40-ft location. Maximum values at FITZ (14.55 mg/dm^2) and NMPP (8.00 mg/dm^2) were recorded on 16 July, while at NMPE biomass peaked (16.55 mg/dm^2) on 19 August. A unimodal pattern was indicated for both depth contours, with a relatively early and somewhat flattened peak produced by the 40-ft data (Appendix VIC-2b).

- Relation to Physical Parameters

Peak biomass values for bottom periphyton were observed in July-August, preceding the buoy maxima by several weeks. However, it is difficult to define such trends narrowly because of the monthly collection interval and occasional missing samples. Increased biomass values of bottom periphyton correspond with periods of elevated temperatures (approximately 21-23 C at the bottom in mid-August).

BOTTOM PERIPHYTON: BIOMASS[a]
NINE MILE POINT VICINITY – 1976



[a]ASH-FREE DRY WEIGHT; MEAN OF R-1 and R-2; PLATES INITIALLY SET 15 APR
[b]PLATES SET AT NMPW ON 20 AUG
[c]PLATES SET AT NMPW AND FITZ ON 6 DEC
[d]SEE APPENDIX VIC-2b FOR INFORMATION ON LOST SUBSTRATES
* SAMPLE COLLECTED WITH A WINCH

- Abundance of Major Taxa and Selected Species of Phytoperiphyton

The data from the bottom periphyton substrates are summarized by month for the following major taxa: Chlorophyta, Chrysophyta, Euglenophyta, Bacillariophyceae, Myxophyta, Dinophyta, Cryptophyta, Ciliata, Suctoria, and Rotifera (Appendices VIC-2c and VIC-2e).

The data set for fifteen dominant species of the phytoperiphyton community was also summarized (Appendix VIC-2d). Dominance was defined as any species comprising at least 10% of the total phytoplankton at any station for a minimum of two months based on the mean of R-1 and R-2. Data was summarized for the following species 10 diatoms (*Asterionella formosa*, *Diatoma elongatum*, *Fragilaria capucina*, *Fragilaria vaucheriae*, *Gomphonema olivaceum*, *Navicula cryptocephala*, *Navicula tripunctata*, *Nitzschia dissipata*, *Synedra cyclopum*, *Synedra ulna*), 3 green algae (*Pediastrum boryanum*, *Scenedesmus obliquus*, and *Scenedesmus quadricauda*), and 2 blue-green algae (*Lyngbya diguetii* and *Phormidium minnesotense*).

D. CONCLUSIONS

1. Natural Habitats

The spatial and temporal distribution of macroinvertebrates in the Nine Mile Point vicinity apparently was not influenced by the thermal discharges of the FitzPatrick and Nine Mile Point power plants during the May through December sampling period.

All fish eggs and larvae identified in benthic macroinvertebrate samples were also collected in lake ichthyoplankton tows, except for eggs of *Catostomus* sp., which was collected only from the NMPP-20-ft benthos station.

2. Artificial Substrates

Chlorophyll a values at the NMPP/FITZ buoy station exceeded those at the control sites on 12 of 14 occasions, indicating that the plumes apparently stimulated periphyton growth. Biomass values showed a similar trend. Peak values for both chlorophyll a and biomass were observed when lake temperatures exceeded 20 C.

No apparent difference in either chlorophyll a or biomass was observed with sample depth at any of the three longshore stations.

Six species of diatoms and one species of blue-green algae were dominant in the buoy periphyton collections, while ten species of diatoms, two blue-green algae, and three species of green algae were dominant in bottom periphyton collections. The following species were dominant on both types of substrates: *Diatoma elongatum*, *Fragilaria vaucheriae*, *Gomphonema olivaceum*, *Nitzschia dissipata*, *Synedra Cyclopum*, and *Lyngbya diguetii*.

Biomass values for bottom periphyton subtrates did not exhibit the increased levels observed in the buoy substrates in the plume area. This observation demonstrates that the plume from either plant does not result in increased growth of the periphytic community which is the natural habitat for these organisms. The results of the buoy study are thus not directly applicable, since the periphytic community does not naturally inhabit the upper regions of the water column in 40 ft of water.

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VII. NEKTON

A. INTRODUCTION, AND MATERIALS AND METHODS

The 1976 aquatic ecological studies carried out in the Nine Mile Point vicinity were part of an ongoing program to evaluate and monitor the effects of the thermal discharges and intakes from the James A. FitzPatrick Nuclear Power Plant and the Nine Mile Point Nuclear Station Unit 1 on the near-field aquatic community. In the past few years, general trends have been observed in abundance, community composition, and species diversity in the Lake Ontario fish community (Beeton 1969; Smith 1970; Christie 1973). Any contribution to such changes by power plants should be detected by continued monitoring studies such as the current one.

The fish community in the Nine Mile Point vicinity has been characterized as having resident and migratory fish species (QLM 1974; LMS 1975, 1976a). Because thermal discharges have the potential to alter resident and migratory fish behavior, (e.g., spawning and feeding patterns), fish diversity, and spatial and temporal distributions may occur near such discharges.

In light of these possibilities, the 1976 report includes the results of the following studies:

a. A comparison of the abundance of selected species between plume and non-plume or control and experimental sites. Species were selected for data presentation and/or discussion based on their classification as representative important species (alewife, rainbow smelt, smallmouth bass, yellow perch, brown trout, coho salmon, and threespine

stickleback) or their occurrence in at least 1% of the total fish collected by a gear. Plume:non-plume station comparisons were done along 15 and 40-ft depth contours based on temperature measurements taken at time of all biological collections; alternately, NMPP-15-ft and FITZ-40-ft were selected to represent plume stations and the 15 and 40-ft depth contours of NMPW and NMPE represented non-plume stations. The experimental site included the 15, 30, and 40-ft depth contours along both the NMPP and FITZ transects; the control site included NMPW and NMPE transects (15, 30, and 40-ft depth contours).

b. The population dynamics of the representative important species: fecundity, length frequency, age class distribution, mortality estimates among age classes, and feeding are discussed.

1. <u>Summary of Field and Laboratory Procedures</u>

The field and laboratory program employed during the 1976 lake monitoring program was similar to the program employed during 1975 (LMS 1976) with the following exceptions:

a. Seine collections were conducted only at the four transects; the special seine hauls in Mexico Bay were eliminated in 1976.

b. Trawl collections were conducted with either the otter trawl or the standard Yankee trawl.

c. Day-night surface gill nets were eliminated at the 30 and 60-ft contours and the day surface gill net collection was eliminated at the 40-ft contour in 1976.

d. Gill nets were set only at the 15-ft contour for the stomach analysis program; the 30-ft contour nets were eliminated in 1976.

e. Surface and bottom temperatures were recorded with each collection during 1976.

f. Crayfish caught in all fishing gears were enumerated in 1976.

g. The age structure of the population of selected species was determined by counting the total number of annuli per scale; the distance between the annuli and the total length of the scale was not measured in 1976.

h. Partial weight was defined as the weight of a fish after the removal of the stomach and gonads; all viscera, except the heart, were removed in the 1975 program.

i. Fecundity was determined by the volumetric procedure for alewife and rainbow smelt in 1976; the gravimetric procedure was followed in 1975.

The details of the field and laboratory procedures are presented in Appendix I. The sampling locations are shown in Figure VII-1.

2. <u>Sampling Program</u>

The 1976 sampling program included fish collected by gill nets, trawls, and seines from 9 April 1976 through 20 December 1976; collection date, type of gear, and day-night collections are summarized in Table VII-1.

FISH SAMPLING STATIONS
NINE MILE POINT VICINITY – 1976

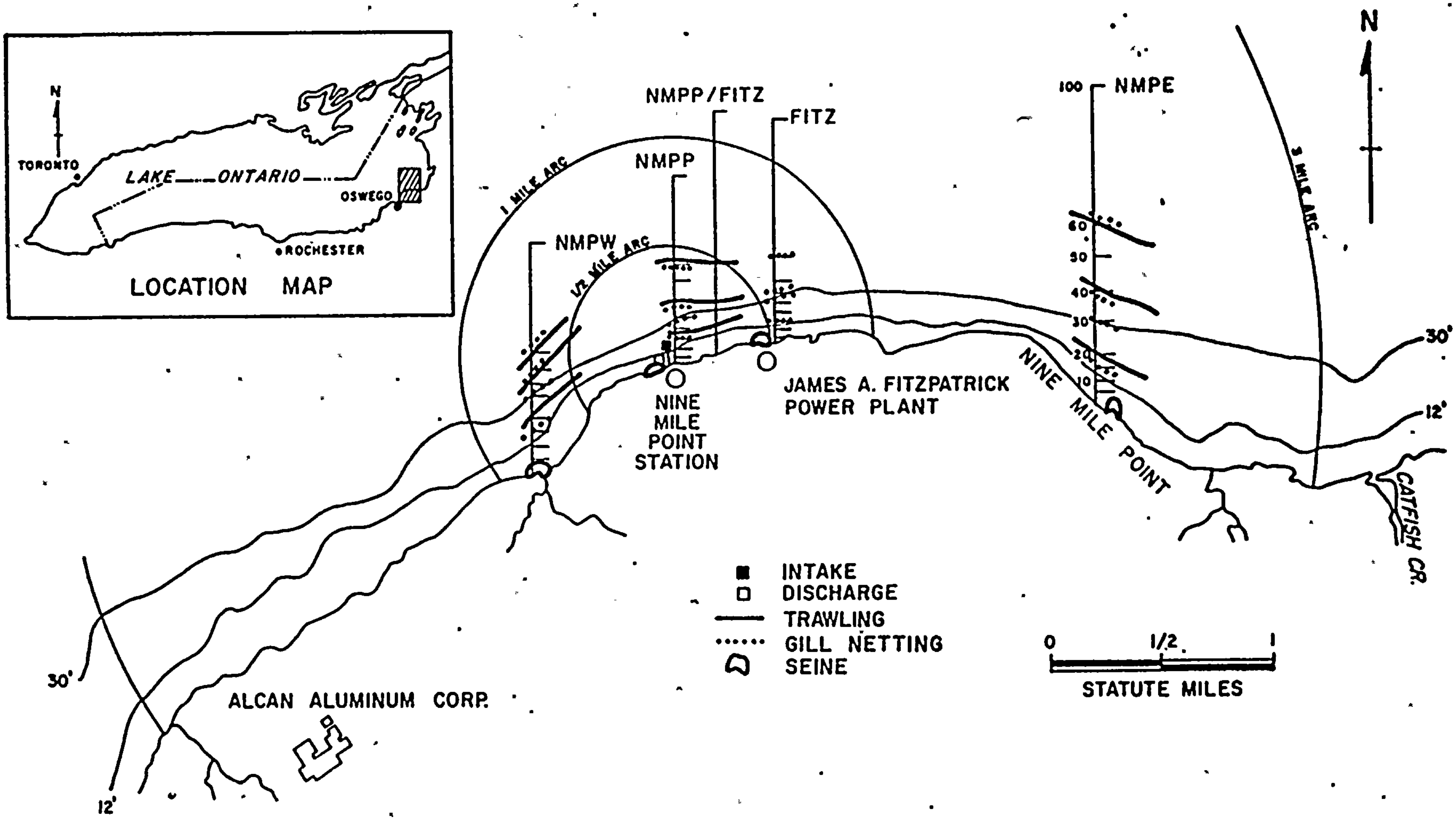


FIGURE VII-1

TABLE VII-1

FISH SAMPLING PROGRAM

NINE MILE POINT VICINITY - 1976

DATE	GILL NETS: GENERAL ECOLOGICAL	GILL NETS: STOMACH ANALYSIS	TRAWLS: REGULAR PROGRAM	TRAWLS: COMPARATIVE TRAWLS	SEINES
9 APR			DN		
14	↑				D
15	│				
16	↓				
22			D]		
29	↑		N]		
30	│				D
1 MAY	↓				
11	↑				
12	│				
13	↓		DN		
14					D
23	↑				
24	│				D
25	↓		DN		
4 JUN					D
8	↑		DN		
9	│				
10	↓				
18					D
21	↑				
22	│				
23	↓				
24			D]		
28			D]	D]	
29			N]	N]	
6 JUL	↑				D
7	│				
8	↓				
15			N]		D
16			D]		
19	↑				
20	│				
21	↓				
27			D]		
28			N]		
2 AUG	↑				
3	│				D
4	↓				
10			N]		
12			D]		
17	↑				
18	│				
19	↓				
20		↑			D
23		│			
24		↓			
26			DN		

] = One collection

↕ = One collection

D = Day collection
N = Night collection

TABLE VII-1 (Continued)

FISH SAMPLING PROGRAM

NINE MILE POINT VICINITY - 1976

DATE	GILL NETS: GENERAL ECOLOGICAL	GILL NETS: STOMACH ANALYSIS	TRAWLS: REGULAR PROGRAM	TRAWLS: COMPARATIVE TRAWLS	SEINES
1 SEP	↑				
2	│				
3	↓				
7			DN]		
8			N]		
9					D
13	↑				
14	│				
15	↓				
23			D]		
24			N]		
25			D]		
30					D
4 OCT	↑				
5	│				
6	↓				
12			DN]		D
19	↑		N]		
20	│				
21	│				
22	│				
23	│				
24	↓				
27			DN]		
30			D]		
2 NOV	↑		]		D
3	│		N]		
4	↓				
9			N]		
12			D]		D
15	↑				
16	│				
17	↓				
26			DN		
27					D
6 DEC	↑				D
7	│				
8	↓				
15			N]		
20			D]		

] = One collection

↕ = One collection

D = Day collection

N = Night collection

B. COMMUNITY COMPOSITION

1. Species Inventory by Gear

A total of 82,180 fishes representing 46 species were collected from April through December by all three types of sampling gears (Tables VII-2 and VII-3). The species occurrence by date for seines and trawls and for gill nets are presented in Tables VII-4 and VII-5, respectively.

Three species - alewife, rainbow smelt, and spottail shiner - comprised approximately 80% of all fish collected in 1976 (Table VII-2), and approximately 14 species made up approximately 99% of the total catch. Alewife was the most frequently encountered species and accounted for the greatest percentage of the total catch (all gears) in 1976 (56.7%). Rainbow smelt was the second most abundant species in 1976, constituting 12.2% of all fish combined.

The majority of the fish collected in 1976 were collected by gill nets, surface and bottom combined. Trawls yielded unprecedented numbers of fish in 1976 due to the use of the Yankee trawl, while seines yielded the fewest fish in 1976.

2. Abundance of Selected Species by Gear

a. Seine Collections

Alewife

The results of the twice monthly seine collections of alewife from the four transects (NMPW, NMPP, FITZ, and NMPE) are shown in Appendix VIIA-1. Alewife were represented in seine collections beginning in the second half of April 1976 but were not

TABLE VII-2

TOTAL FISH COLLECTED BY SEINES, TRAWLS, AND GILL NETS

NINE MILE POINT VICINITY - 1976

SPECIES	SEINE		DAY TRAWL*		NIGHT TRAWL*		TOTAL TRAWLS*		BOTTOM GILL NETS		SURFACE GILL NETS		TOTAL GILL NETS		TOTAL (ALL GEARS)	
	TOTAL CATCH	CATCH/ HAUL	TOTAL CATCH	CATCH/ 15 MIN EFFORT	TOTAL CATCH	CATCH/ 15 MIN EFFORT	TOTAL CATCH	CATCH/ 15 MIN EFFORT	TOTAL CATCH	CATCH/ 12 HR EFFORT	TOTAL CATCH	CATCH/ 12 HR EFFORT	TOTAL CATCH	CATCH/ 12 HR EFFORT	TOTAL CATCH	%
ALEWIFE	12659	186.16	6051	39.42	3131	20.87	9182	30.30	13308	14.10	11412	84.45	24720	21.94	46561	56.7
RAINBOW SMELT	15	0.22	5871	38.37	2124	14.16	7995	26.39	1559	1.78	427	3.01	1986	1.92	9996	12.2
SPOTTAIL SHINER	30	0.44	838	5.48	526	3.51	1364	4.50	8112	7.89	17	0.15	8129	7.03	9523	11.6
JOHNNY DARTER			478	3.12	3069	20.46	3547	11.71	1	<0.01			1	<0.01	3548	4.3
WHITE PERCH	65	0.96	39	0.25	171	1.14	210	0.69	2741	2.52	20	0.14	2761	2.26	3036	3.7
TROUT-PERCH			936	6.12	646	4.31	1582	5.22	830	0.83	1	0.01	831	0.74	2413	2.9
GIZZARD SHAD	1632	24.00	2	0.01	4	0.03	6	0.02	306	0.24	99	0.73	405	0.30	2043	2.5
YELLOW PERCH	28	0.41	22	0.14	38	0.25	60	0.20	1785	1.77	1	0.01	1786	1.57	1874	2.3
THREESPINE STICKLEBACK	446	6.56	199	1.30	14	0.09	213	0.70							659	0.8
WHITE SUCKER			1	0.01	17	0.11	18	0.06	625	0.53	3	<0.01	628	0.47	646	0.8
EMERALD SHINER	534	7.85	27	0.18	1	0.01	28	0.09	1	<0.01			1	<0.01	563	0.7
ROCK BASS			1	0.01	3	0.02	4	0.01	183	0.17	1	<0.01	184	0.15	188	0.2
SMALLMOUTH BASS					2	0.01	2	0.01	169	0.19			169	0.17	171	0.2
WHITE BASS	91	1.34	5	0.03	9	0.06	14	0.05	38	0.03	7	0.05	45	0.04	150	0.2
GOLDEN SHINER	140	2.06							2	<0.01			2	<0.01	142	0.2
BROWN TROUT	5	0.07	1	0.01			1	<0.01	113	0.11	19	0.15	132	0.11	138	0.2
LAKE CHUB									109	0.09			109	0.08	109	0.1
MOTTLED SCULPIN			4	0.03	72	0.51	76	0.25	6	0.01			6	0.01	82	0.1
SPLAKE (Hybrid Trout)			1	0.01	1	0.01	2	0.01	79	0.08	1	<0.01	80	0.07	82	0.1
BROWN BULLHEAD			1	0.01			1	<0.01	59	0.05			59	0.05	60	0.1
STONECAT									42	0.02			42	0.02	42	0.1
COHO SALMON	20	0.29							13	0.01	8	0.06	21	0.02	41	<0.1
CHINOOK SALMON	2	0.03							7	<0.01	6	0.05	13	0.01	15	<0.1
LAKE TROUT									8	0.01			8	0.01	8	<0.1
RAINBOW TROUT									8	0.01	6	0.02	14	0.01	14	<0.1
PUMPKINSEED									5	0.01			5	0.01	5	<0.1
CARP	5	0.07							9	0.01			9	0.01	14	<0.1
AMERICAN EEL					1	0.01	1	<0.01	4	<0.01			4	<0.01	5	<0.1
LARGEMOUTH BASS									1	<0.01			1	<0.01	1	<0.1
FRESHWATER DRUM					1	0.01	1	<0.01	4	<0.01			4	<0.01	5	<0.1
BURBOT									10	0.01			10	0.01	10	<0.1
LONGNOSE DACE	1	0.01													1	<0.1
LONGNOSE GAR									1	<0.01			1	<0.01	1	<0.1
BROOK STICKLEBACK	3	0.04													3	<0.1
SEA LAMPREY									4	<0.01			4	<0.01	4	<0.1
NORTHERN PIKE									3	<0.01			3	<0.01	3	<0.1
NORTHERN HOG SUCKER									4	<0.01			4	<0.01	4	<0.1
BLUEGILL									1	<0.01			1	<0.01	1	<0.1
BOWFIN									2	<0.01			2	<0.01	2	<0.1
BROOK TROUT									1	<0.01			1	<0.01	1	<0.1
CHANNEL CATFISH			1	0.01			1	<0.01							1	<0.1
CISCO OR LAKE HERRING									1	<0.01			1	<0.01	1	<0.1
GOLDFISH									1	<0.01			1	<0.01	1	<0.1
LOGPERCH			1	0.01			1	<0.01							1	<0.1
SALVELINUS SP.									7	0.01			7	0.01	7	<0.1
BLUNTNOSE MINNOW	1	0.01													1	<0.1
UID *SALMONIDAE*	4	0.06													4	<0.1
TOTAL (ALL SPECIES)	15681		14479		9830		24309		30162		12028		42190		82180	

*Re[illegible] Trawl Program

TABLE VII-3

FISH SPECIES INVENTORY
FROM SEINE, TRAWL, AND GILL NET COLLECTIONS

NINE MILE POINT VICINITY - 1976

SCIENTIFIC NAME*	COMMON NAME	SEINES	TRAWLS	GILL NETS
Family Petromyzontidae				
Petromyzon marinus	Sea lamprey			X
Family Lepisosteidae				
Lepisosteus osseus	Longnose gar			X
Family Amiidae				
Amia calva	Bowfin			X
Family Anguillidae				
Anguilla rostrata	American eel		X	X
Family Clupeidae				
Alosa pseudoharengus	Alewife ✓	X	X	X
Dorosoma cepedianum	Gizzard shad	X	X	X
Family Salmonidae				
Coregonus artedii	Cisco or Lake herring			X
Oncorhynchus tshawytscha	Chinook salmon	X		X
O. kisutch	Coho salmon ✓	X		X
Salmo gairdnerii	Rainbow trout			X
S. trutta	Brown trout ✓	X	X	X
Salvelinus sp.				X
Salvelinus fontinalis	Brook trout			X
S. namaycush	Lake trout			X
S. namaycush x *fontinalis*	Splake trout		X	X
Family Osmeridae				
Osmerus mordax	Rainbow smelt ✓	X	X	X
Family Esocidae				
Esox lucius	Northern pike			X
Family Cyprinidae				
Carassius auratus	Goldfish			X
Couesius piumbeus	Lake chub			X
Cyprinus carpio	Carp	X		X
Notemigonus crysoleucas	Golden shiner	X		X
Notropis atherinoides	Emerald shiner	X	X	X
N. hudsonius	Spottail shiner	X	X	X
Pimephales notatus	Bluntnose minnow	X		
Rhinichthys cataractae	Longnose dace	X		

TABLE VII- 3 (Continued)

FISH SPECIES INVENTORY
FROM SEINE, TRAWL, AND GILL NET COLLECTIONS
(Continued)

NINE MILE POINT VICINITY - 1976

SCIENTIFIC NAME*	COMMON NAME	SEINES	TRAWLS	GILL NETS
Family Catostomidae				
Catostomus commersoni	White sucker		X	X
Hypentelium nigricans	Northern hog sucker			X
Family Ictaluridae				
Ictalurus nebulosus	Brown bullhead		X	X
I. punctatus	Channel catfish		X	X
Noturus flavus	Stonecat			X
Family Percopsidae				
Percopsis omiscomaycus	Trout-perch		X	X
Family Gadidae				
Lota lota	Burbot			X
Family Gasterosteidae				
Culaea inconstans	Brook stickleback	X		
Gasterosteus aculeatus	Threespine stickleback✓	X	X	
Family Percichthyidae				
Morone americana	White perch	X	X	X
M. chrysops	White bass	X	X	X
Family Centrarchidae				
Ambloplites rupestris	Rock bass	X	X	X
Lepomis gibbosus	Pumpkinseed	X		X
L. macrochirus	Bluegill	X		X
Micropterus dolomieui	Smallmouth bass ✓	X	X	X
M. salmoides	Largemouth bass	X		X
Family Percidae				
Etheostoma nigrum	Johnny darter		X	X
Perca flavescens	Yellow perch ✓	X	X	X
Percina caprodes	Logperch		X	
Family Sciaenidae				
Aplodinotus grunniens	Freshwater drum		X	X
Family Cottidae				
Cottus bairdi	Mottled sculpin		X	X

*According to A List of Common and Scientific Names of Fishes from the United States and Canada. Amer. Fish. Soc. Spec. Publ. No. 6 3rd ed.

✓Representative important species

TABLE VII-4

OCCURRENCE OF FISH IN SEINE AND BOTTOM TRAWL COLLECTIONS

NINE MILE POINT VICINITY - APRIL-AUGUST, 1976

	APRIL				MAY				JUNE				JULY				AUGUST			
SPECIES	9	14[a]	22,29	30[a]	13	14[a]	24[a]	25	4[a]	8	18[a]	24,28,29	6[a]	15[a]	16	27,28	3[a]	10,12	20[a]	26
ALEWIFE																				
Seines				X		X	X		X		X		X	X			X		X	
Bottom Trawls	X		X		X			X		X		X			X	X		X		X
AMERICAN EEL																				
Seines																				
Bottom Trawls															X					
BLUNTNOSE MINNOW																				
Seines											X									
Bottom Trawls																				
BROOK STICKLEBACK																				
Seines				X							X									
Bottom Trawls																				
BROWN BULLHEAD																				
Seines																				
Bottom Trawls																				
BROWN TROUT																				
Seines				X									X							
Bottom Trawls															X					
CARP																				
Seines						X	X													
Bottom Trawls																				
CHANNEL CATFISH																				
Seines																				
Bottom Trawls																				
CHINOOK SALMON																				
Seines													X							
Bottom Trawls																				
COHO SALMON																				
Seines							X				X			X						
Bottom Trawls																				
EMERALD SHINER																				
Seines		X		X		X	X				X			X			X			
Bottom Trawls																				
FRESHWATER DRUM																				
Seines																				
Bottom Trawls								X												
GIZZARD SHAD																				
Seines		X		X		X	X		X		X		X				X			
Bottom Trawls			X																	
GOLDEN SHINER																				
Seines				X		X	X		X		X		X				X			
Bottom Trawls																				
JOHNNY DARTER																				
Seines																				
Bottom Trawls								X		X		X			X	X		X		X

All dates are for Bottom Trawl collections unless otherwise specified

[a]Seine collection

TABLE VII-4 (Continued)

OCCURRENCE OF FISH IN SEINE AND BOTTOM TRAWL COLLECTIONS (Continued)

NINE MILE POINT VICINITY - APRIL-AUGUST, 1976

	APRIL				MAY				JUNE				JULY				AUGUST			
SPECIES (Cont.)	9	14[a]	22,29	30[a]	13	14[a]	24[a]	25	4[a]	8	18[a]	24,28,29	6[a]	15[a]	16	27,28	3[a]	10,12	20[a]	26
LOGPERCH																				
Seines																				
Bottom Trawls												X								
LONGNOSE DACE																				
Seines							X													
Bottom Trawls																				
MOTTLED SCULPIN																				
Seines																				
Bottom Trawls	X							X				X			X	X				X
RAINBOW SMELT																				
Seines		X					X													
Bottom Trawls	X		X		X			X		X		X			X	X		X		X
ROCK BASS																				
Seines																				
Bottom Trawls																X				
SMALLMOUTH BASS																				
Seines																				
Bottom Trawls																				
SPLAKE (Hybrid Lake Trout)																				
Seines																				
Bottom Trawls																				
SPOTTAIL SHINER																				
Seines							X		X		X						X			
Bottom Trawls	X		X					X				X			X					X
THREESPINE STICKLEBACK																				
Seines						X	X		X		X			X						
Bottom Trawls			X		X			X				X			X					
TROUT-PERCH																				
Seines																				
Bottom Trawls					X			X				X			X	X		X		X
WHITE BASS																				
Seines				X		X	X		X		X						X			
Bottom Trawls												X								
WHITE PERCH																				
Seines				X		X	X		X		X		X						X	
Bottom Trawls					X							X			X					X
WHITE SUCKER																				
Seines																				
Bottom Trawls												X								X
YELLOW PERCH																				
Seines									X		X									
Bottom Trawls										X		X			X					
UID SALMONIDAE																				
Seines									X											
Bottom Trawls																				

All dates are for Bottom Trawl collections unless otherwise specified

[a]Seine collection

TABLE VII- 4

OCCURRENCE OF FISH IN SEINE AND BOTTOM TRAWL COLLECTIONS (Continued)

NINE MILE POINT VICINITY - SEPTEMBER-DECEMBER, 1976

	SEPTEMBER				OCTOBER			NOVEMBER					DEC
SPECIES	7,8	9[a]	23,24,25	30[a]	12[b]	19	27,30	3	9	12[b]	26	27[a]	15,20
ALEWIFE													
Seines		X		X	X								
Bottom Trawls	X		X		X	X	X	X	X	X	X		X
AMERICAN EEL													
Seines													
Bottom Trawls													
BLUNTNOSE MINNOW													
Seines													
Bottom Trawl													
BROOK STICKLEBACK													
Seines													
Bottom Trawls													
BROWN BULLHEAD													
Seines													
Bottom Trawls							X						
BROWN TROUT													
Seines													
Bottom Trawls													
CARP													
Seines													
Bottom Trawls													
CHANNEL CATFISH													
Seines													
Bottom Trawls											X		
CHINOOK SALMON													
Seines													
Bottom Trawls													
COHO SALMON													
Seines													
Bottom Trawls													
EMERALD SHINER													
Seines		X		X	X					X		X	
Bottom Trawl					X								X
FRESHWATER DRUM													
Seines													
Bottom Trawls													
GIZZARD SHAD													
Seines				X									
Bottom Trawls					X	X	X				X		X
GOLDEN SHINER.													
Seines				X									
Bottom Trawls													
JOHNNY DARTER													
Seines													
Bottom Trawls	X		X		X	X	X	X	X		X		X

All dates are for Bottom Trawl collections unless otherwise specified

[a] Seine collection

[b] Seine and Bottom Trawl collections.

TABLE VII-4 (Continued)

OCCURRENCE OF FISH IN SEINE AND BOTTOM TRAWL COLLECTIONS (Continued)

NINE MILE POINT VICINITY - SEPTEMBER-DECEMBER, 1976

	SEPTEMBER				OCTOBER			NOVEMBER					DEC
SPECIES (Cont.)	7,8	9[a]	23,24,25	30[a]	12[b]	19	27,30	3	9	12[b]	26	27[a]	15,20
LOGPERCH													
Seines													
Bottom Trawls													
LONGNOSE DACE													
Seines													
Bottom Trawls													
MOTTLED SCULPIN													
Seines													
Bottom Trawls			X					X			X		X
RAINBOW SMELT													
Seines													
Bottom Trawls	X		X		X	X	X	X	X	X	X		X
ROCK BASS													
Seines													
Bottom Trawls			X		X			X					
SMALLMOUTH BASS													
Seines													
Bottom Trawls			X										X
SPLAKE (Hybrid Lake Trout)													
Seines													
Bottom Trawls											X		
SPOTTAIL SHINER													
Seines				X									
Bottom Trawls	X		X		X	X		X	X		X		X
THREESPINE STICKLEBACK													
Seines													
Bottom Trawls													
TROUT-PERCH													
Seines													
Bottom Trawls					X	X		X			X		
WHITE BASS													
Seines													
Bottom Trawls					X						X		X
WHITE PERCH													
Seines					X					X			
Bottom Trawls	X		X		X	X		X	X		X		X
WHITE SUCKER													
Seines													
Bottom Trawls			X					X	X		X		X
YELLOW PERCH													
Seines													
Bottom Trawls			X		X			X		X	X		X
UID SALMONIDAE													
Seines													
Bottom Trawls													

All dates are for Bottom Trawl collections unless otherwise specified

[a] Seine collection

[b] Seine and Bottom Trawl collections

TABLE VII- 5

OCCURRENCE OF FISH IN GILL NET COLLECTIONS

NINE MILE POINT VICINITY - 1976

SPECIES	DEPTH	DATES																
		14-16 APR	29 APR-1 MAY	11-13 MAY	23-25 MAY	8-10 JUN	21-23 JUN	6-8 JUL	19-21 JUL	2-4 AUG	17-19 AUG	1-3 SEP*	13-15 SEP	4-6 OCT	19-24 OCT	2-4 NOV	15-17 NOV	6-8 DEC
ALEWIFE	S	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	
	B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
AMERICAN EEL	S																	
	B			X	X			X										
BOWFIN	S																	
	B									X			X					
BLUEGILL	S																	
	B						X											
BROWN BULLHEAD	S																	
	B	X			X			X	X	X	X	X	X		X			
BROOK TROUT	S																	
	B																	X
BROWN TROUT	S			X	X	X	X	X		X	X		X	X	X		X	
	B	X	X	X	X	X	X	X	X		X	X		X	X	X	X	X
BURBOT	S																	
	B	X		X	X	X			X							X		X
CARP	S																	
	B		X		X			X	X		X	X	X					
CHINOOK SALMON	S			X	X	X								X				
	B		X		X							X						
CISCO OR LAKE HERRING	S																	
	B					X												
COHO SALMON	S	X	X	X	X	X												
	B	X	X	X	X	X	X	X										
EMERALD SHINER	S																	
	B		X															
FRESHWATER DRUM	S																	
	B								X	X					X			
GIZZARD SHAD	S	X		X	X	X		X	X	X	X		X	X	X	X		
	B	X		X	X	X			X	X	X	X	X	X	X	X	X	X
GOLDFISH	S																	
	B									X								
GOLDEN SHINER	S																	
	B									X	X							
JOHNNY DARTER	S																	
	B								X									

TABLE VII- 5 (Continued)

OCCURRENCE OF FISH IN GILL NET COLLECTIONS (Continued)

NINE MILE POINT VICINITY - 1976

SPECIES (continued)	DEPTH	DATES 14-16 APR	29 APR-1 MAY	11-13 MAY	23-25 MAY	8-10 JUN	21-23 JUN	6-8 JUL	19-21 JUL	2-4 AUG	17-19 AUG	1-3* SEP	13-15 SEP	4-6 OCT	19-24 OCT	2-4 NOV	15-17 NOV	6-8 DEC
LAKE CHUB	S																	
	B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
LAKE TROUT	S																	
	B			X	X	X										X		X
LARGEMOUTH BASS	S																	
	B								X									
LONGNOSE GAR	S																	
	B											X						
MOTTLED SCULPIN	S																	
	B	X	X															
NORTHERN HOG SUCKER	S																	
	B	X													X	X		
NORTHERN PIKE	S																	
	B	X													X			X
PUMPKINSEED	S																	
	B									X	X	X						
RAINBOW TROUT	S	X		X											X	X		
	B	X						X				X			X		X	X
RAINBOW SMELT	S	X	X	X	X	X								X	X	X	X	X
	B	X	X	X	X	X	X	X		X			X	X	X	X	X	X
ROCK BASS	S														X			
	B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
SALVELINUS SP.	S																	
	B			X						X						X		X
SEA LAMPREY	S																	
	B	X					X											
SMALLMOUTH BASS	S																	
	B	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X
SPLAKE	S														X			
	B	X	X	X	X	X	X		X	X			X		X	X	X	X
STONECAT	S																	
	B			X	X			X	X			X	X	X	X	X	X	
SPOTTAIL SHINER	S				X													
	B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
TROUT-PERCH	S														X			
	B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	

TABLE VII- 5 (Continued)

OCCURRENCE OF FISH IN GILL NET COLLECTIONS (Continued)

NINE MILE POINT VICINITY - 1976

SPECIES (continued)	DEPTH	DATES 14-16 APR	29 APR-1 MAY	11-13 MAY	23-25 MAY	8-10 JUN	21-23 JUN	6-8 JUL	19-21 JUL	2-4 AUG	17-19 AUG	1-3 SEP*	13-15 SEP	4-6 OCT	19-24 OCT	2-4 NOV	15-17 NOV	6-8 DEC
WHITE BASS	S								X	X	X		X					
	B	X	X		X	X				X	X	X	X	X	X	X	X	
WHITE PERCH	S			X	X	X		X	X		X		X		X			
	B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WHITE SUCKER	S														X			
	B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
YELLOW PERCH	S														X			
	B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

S = Surface gill nets, 40 ft stations only
B = Bottom gill nets, all stations
*No surface nets set on Sep 1-3

present on or after 2 November. This April-October span coincides with the inshore-offshore migration of the species: adult alewife move inshore to spawn during April in the Nine Mile Point vicinity (LMS 1975), and move from the inshore zone to the deeper waters of Lake Ontario in late August after spawning is completed. Most individuals were caught on 20 August, and at the NMPW transect.

On the average, similar numbers of alewife were caught by seines at NMPW and NMPP, while fewer alewife were collected from FITZ and NMPE transects. Fish were caught in greater numbers at NMPE transect than the other three on only two dates out of 12. This represents an opposite trend to that found in 1975, when more individuals were caught at NMPE than at the remaining transects (LMS 1976a).

Brown Trout

Brown trout are seldom collected in the Nine Mile Point vicinity, and were represented in the 1976 seine collections by only five specimens (Appendix VIIA-2): three from the FITZ transect and two at NMPE.

Coho Salmon

As was the case for other salmonids, coho salmon apparently do not reside in the Nine Mile Point vicinity; however, the traveling screen collections of each power plant yielded one specimen (Tables IX-4 and IX-10). A total of 20 coho salmon were collected by seines in 1976 (Appendix VIIA-3), and 85% of these were caught on 18 June at all transects.

Gizzard Shad

Gizzard shad were not represented in the seine collections in 1973; they increased in numbers from two in 1974 to eight individuals in the regular seine program in 1975. This trend continued throughout 1976 (Appendix VIIA-5) when a total of 1,632 individuals were collected. The increase was apparent at all transects and the mean number of gizzard shad per collection was higher at NMPP than at any other transect.

Rainbow Smelt

Rainbow smelt were seldom caught by seines in the Nine Mile Point vicinity. In 1976, rainbow smelt were represented by 15 specimens, eight of which were collected from NMPW transect (Appendix VIIA-6).

Other Species

Data on emerald shiner (which represented >1% of the total fish collected in seines), threespine stickleback and yellow perch (representative important species), and spottail shiner and white perch caught in seine collections at the four transects are shown in Appendix VII-A. In general, few fish of these five species were caught, and these primarily during the warmer months (May-September), with few individuals seined in April or after September. Emerald shiner were more abundant at NMPP transect than FITZ, NMPW or NMPE transects (Appendix VIIA-4).

b. Bottom Trawl Collections

Alewife

Alewife were collected by bottom otter trawl (flat otter trawl) at NMPW, NMPP/FITZ, and NMPE transects at the 20, 40, and 60-ft depth contours from 9 April to 8 June 1976 (Appendix VIIB-1). Beginning on 29 June and continuing through 15 December, a standard Yankee trawl was employed at NMPE-40-ft and 60-ft stations. Data at these two stations may be compared to data from the remaining stations between late June and mid-December using the gear comparison data summarized in Section VIIE.

Alewife in bottom otter trawl catches were as abundant in 1976 as they were in 1974 and 1975 (LMS 1975, 1976a). Average catch per effort of alewife in otter trawls was much greater at night than in the corresponding day sample in April 1976; in May, there was no consistent difference between day and night collections.

Very few alewife were collected by otter trawls from late June through mid-December (maximum number of 45 fish per 15-minute effort); with the majority of the collections yielding no fish. However, large numbers of alewife (a catch/effort of more than 1,798 for one daylight trawl) were collected by the standard Yankee trawl, which was used at the NMPE-40 and NMPE-60-ft stations. On the average, more alewife were collected by the Yankee trawl at NMPE transect during daylight hours than at

night and at the 40-ft than at the 60-ft depth contour (Appendix VIIB-1). The majority of alewife collected by Yankee trawl were observed in October.

Brown Trout

This species was represented in trawl collections by only one specimen, caught on 16 July 1976 in the Yankee trawl at the NMPE-60-ft station (Appendix VIIB-2).

Rainbow Smelt

Data on rainbow smelt collected in bottom trawls are summarized in Appendix VIIB-5. The majority of rainbow smelt were caught in the Yankee trawl at NMPE-40-ft and 60-ft stations. The greatest numbers of rainbow smelt collected during 9 April through 24,28 June sampling period were collected at NMPE-40-ft and NMPE-60-ft stations on 28 June, 99 and 216 fish/15-minute effort, respectively. The remaining otter trawl collections during this period yielded no more than ten fish/effort.

Other Species

Data for smallmouth bass, threespine stickleback, and yellow perch, all representative important species, and johnny darter and trout-perch, species composing more than 1% of the total fish collected in trawls, and spottail shiner, gizzard shad, and white perch are presented in Appendix VII-B.

C. SPATIAL DISTRIBUTION OF SELECTED SPECIES: DAY GILL NET COLLECTIONS

Fish collected in gill nets were summarized according to catch per 12-hour effort. Data were then examined according to day and

night. A day collection was defined as a net set up to two hours before sunrise and/or a net pulled no later than two hours before sunset; a night collection was defined as a net set up to two hours before sunset and/or a net pulled no later than two hours after sunrise. These definitions were dictated by the difficulty of simultaneously retrieving and setting gill nets at 16 locations on a strict day-night sequence. Data were summarized for all representative important species (threespine stickleback was the only representative important species not collected in gill nets), those species that composed at least 1% of all fish collected in gill nets (i.e., trout-perch and white sucker), and spottail shiner.

This section contains a comparison between plume and non-plume stations based on the proximity of the NMPP-15 ft station to the Nine Mile outfall and of the FITZ-40 ft station to the FitzPatrick outfall. Times of setting, fishing duration, and harvesting of gill nets at 15 and 40-ft depth contours for 1976 are listed in Appendix VIID-1.

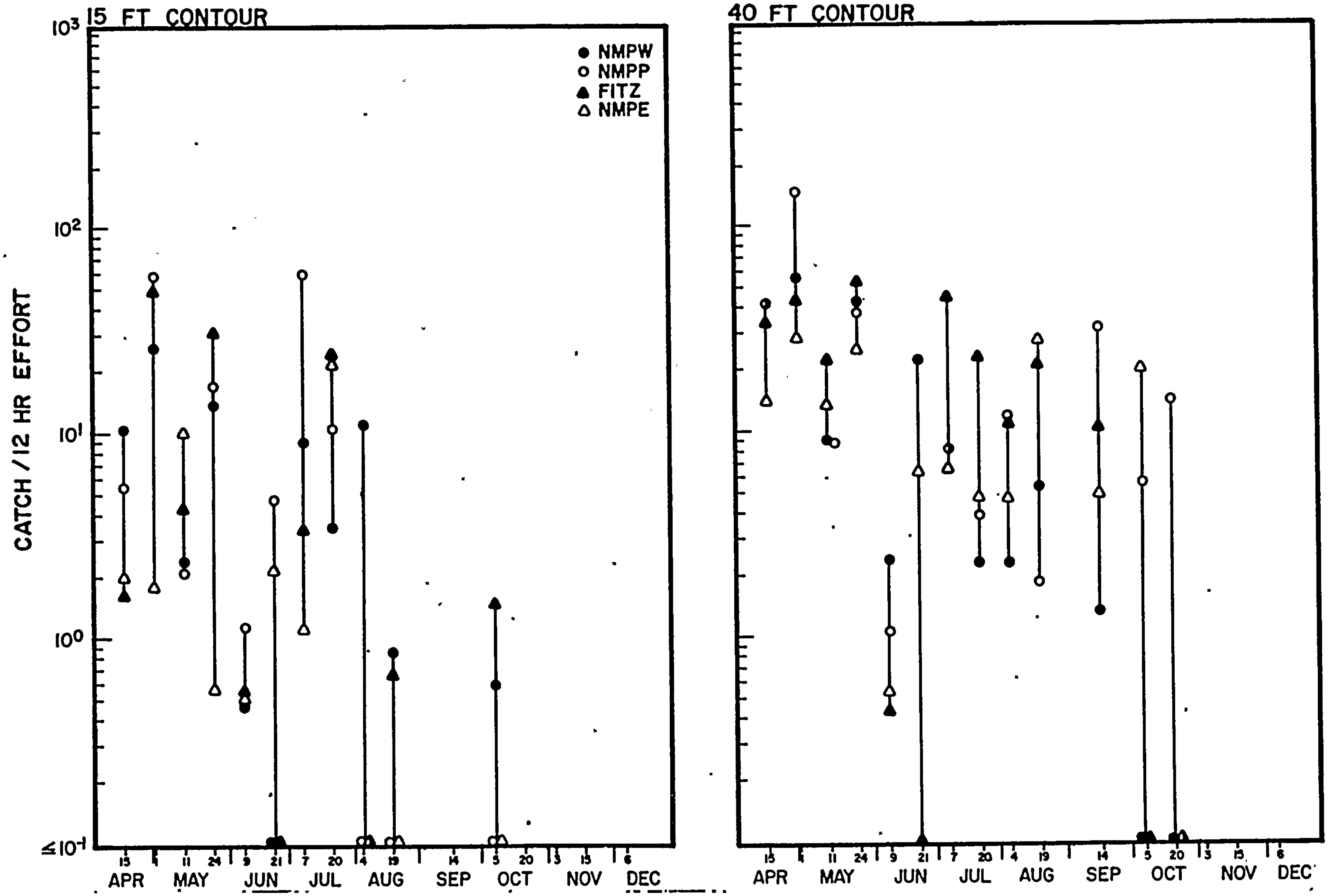
1. Comparisons at the 15-ft Depth Contour

- Alewife

The catch per unit of effort (number/12 hours) for alewife collected during the day at the 15-ft depth contour at the four transects is plotted versus time in Figure VII-2 and tabulated in Appendix VIID-2a.

Both NMPP and NMPE-15-ft stations yielded no fish during the period 2 August through 17 November 1976. In 1976, there was no evidence of a west-east or east-west trend in abundance of

ABUNDANCE* OF ALEWIFE IN SELECTED DAY GILL NET COLLECTIONS NINE MILE POINT VICINITY – 1976



NONE COLLECTED AT THE 15 FT CONTOUR ON 14 SEP, AND 20 OCT - 6 DEC, AND AT THE 40 FT CONTOUR 3 NOV - 6 DEC.

*MEAN OF TWO COLLECTIONS; DAY COLLECTION IS DEFINED AS FOLLOWS: A NET SET A MAXIMUM OF 2 HOURS BEFORE SUNRISE AND/OR A NET PULLED NO LATER THAN 2 HOURS BEFORE SUNSET; DATA PLOTTED BY DATE OF FINAL DAY HARVEST OF AN APPROXIMATELY 48-HOUR SET PERIOD

FIGURE VII-2

alewife. The alewife distribution at the plume stations varied with sampling date. For example, catch/effort at NMPP transect exceeded that at FITZ in April, June and early July, while the opposite was true in May and late July. In addition, the FITZ-15 ft plume station yielded a few alewife in mid-August and early October when no individuals were collected at the 15 ft depth contour at NMPP transect.

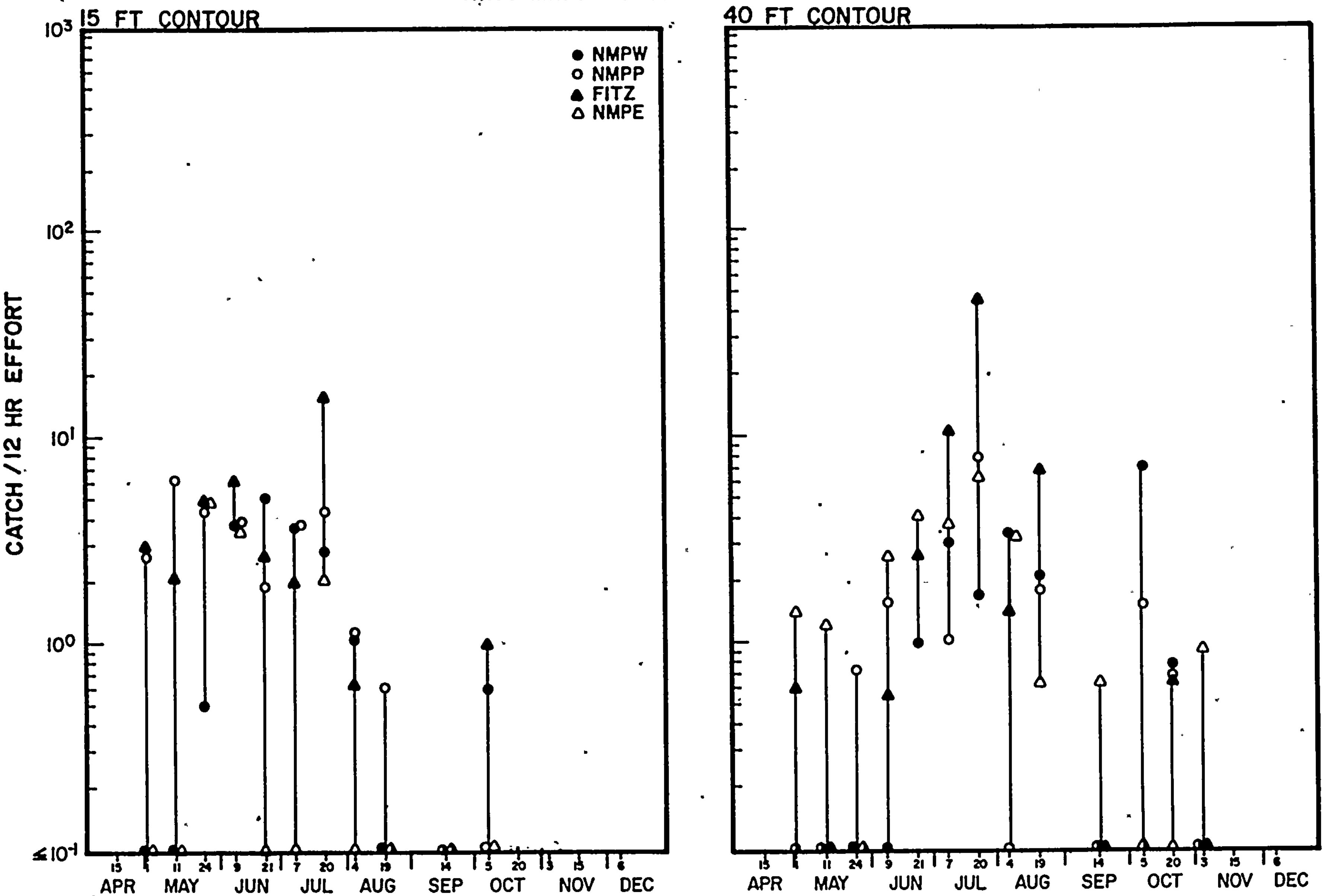
- Yellow Perch

Catch/effort (number/12-hours) for yellow perch was greater in the day collections in the spring and summer (end of April to mid-August) than in the fall (Figure VII-3).

- White Perch

The vast majority of white perch collected by day gill nets from plume and non-plume stations at the 15-ft depth contour were obtained from mid-April (14-16 April set) to mid-August (17-19 August set) 1976 (Figure VII-4). Catch/effort showed a bimodal distribution at the plume stations with a peak in May and late June/early July (21-23 June and 6-8 July), after which it declined sharply toward mid-August. White perch were collected only at NMPE-15 ft station after 19 August 1976. Catch/effort of white perch at the non-plume stations showed a similar distribution to that of the plume stations: a peak in mid-May and early-June for NMPW transect and in late June and late July for NMPE transect. No substantial differences could be detected among the four stations based on the data available. This suggests that white perch do not congregate in either plume or non-plume stations at the 15-ft depth contour.

ABUNDANCE* OF YELLOW PERCH
IN SELECTED DAY GILL NET COLLECTIONS
NINE MILE POINT VICINITY - 1976



NONE COLLECTED AT THE 15 FT CONTOUR ON 15 APR, 14 SEP, 20 OCT, AND 3 NOV - 6 DEC, AND AT THE 40 FT CONTOUR ON 15 APR, 15 NOV, AND 6 DEC.

*MEAN OF TWO COLLECTIONS; DAY COLLECTION IS DEFINED AS FOLLOWS: A NET SET A MAXIMUM OF 2 HOURS BEFORE SUNRISE AND/OR A NET PULLED NO LATER THAN 2 HOURS BEFORE SUNSET; DATA PLOTTED BY DATE OF FINAL DAY HARVEST OF AN APPROXIMATELY 48-HOUR SET PERIOD.

FIGURE VII-3

ABUNDANCE* OF WHITE PERCH
IN SELECTED DAY GILL NET COLLECTIONS
NINE MILE POINT VICINITY - 1976

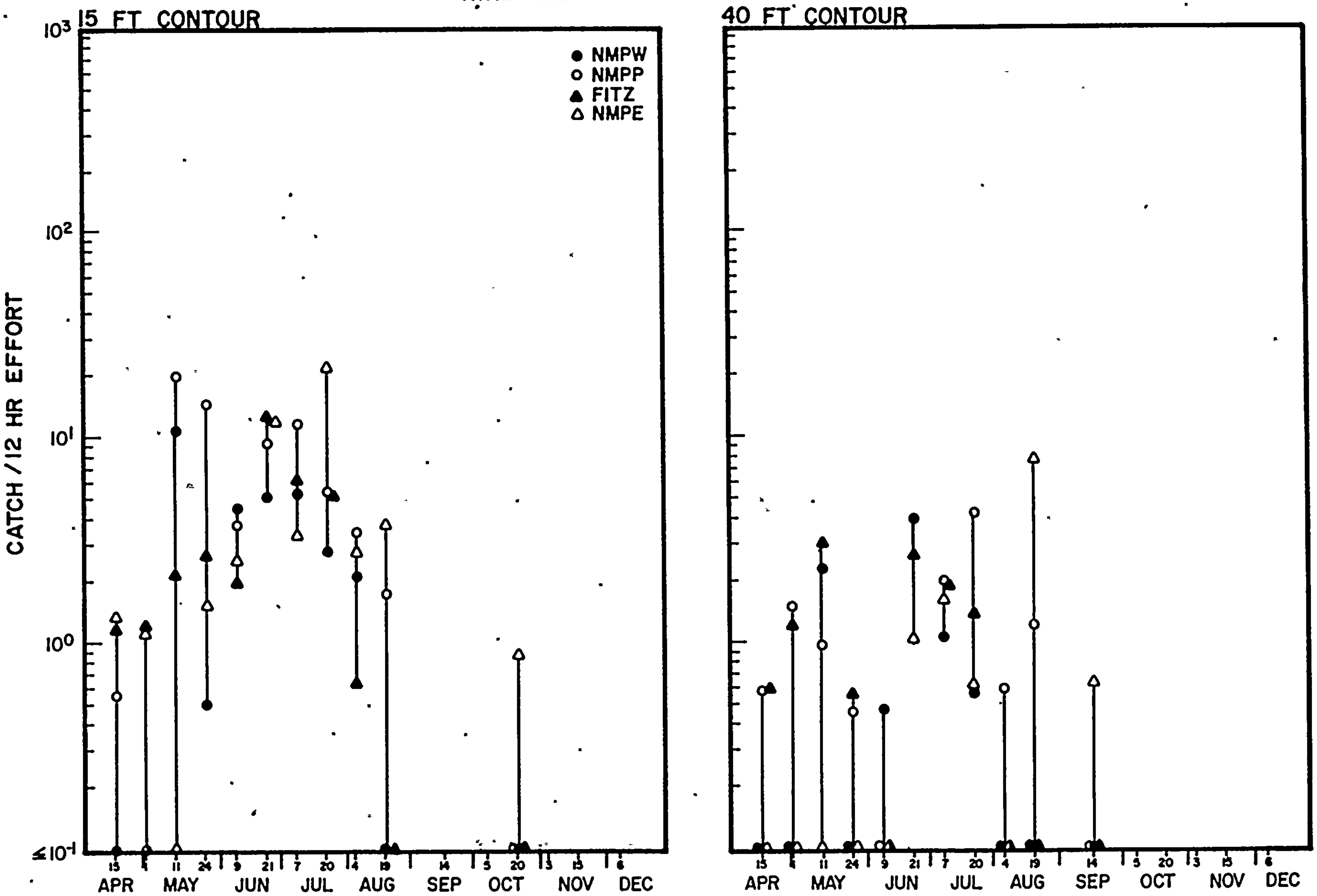


FIGURE VII-4

NONE COLLECTED AT THE 15 FT CONTOUR ON 14 SEP, 5 OCT, AND 3 NOV - 6 DEC, AND AT THE 40 FT CONTOUR 5 OCT - 6 DEC.

*MEAN OF TWO COLLECTIONS; DAY COLLECTION IS DEFINED AS FOLLOWS: A NET SET A MAXIMUM OF 2 HOURS BEFORE SUNRISE AND/OR A NET PULLED NO LATER THAN 2 HOURS BEFORE SUNSET; DATA PLOTTED BY DATE OF FINAL DAY HARVEST OF AN APPROXIMATELY 48-HOUR SET PERIOD

- <u>Spottail Shiner</u>

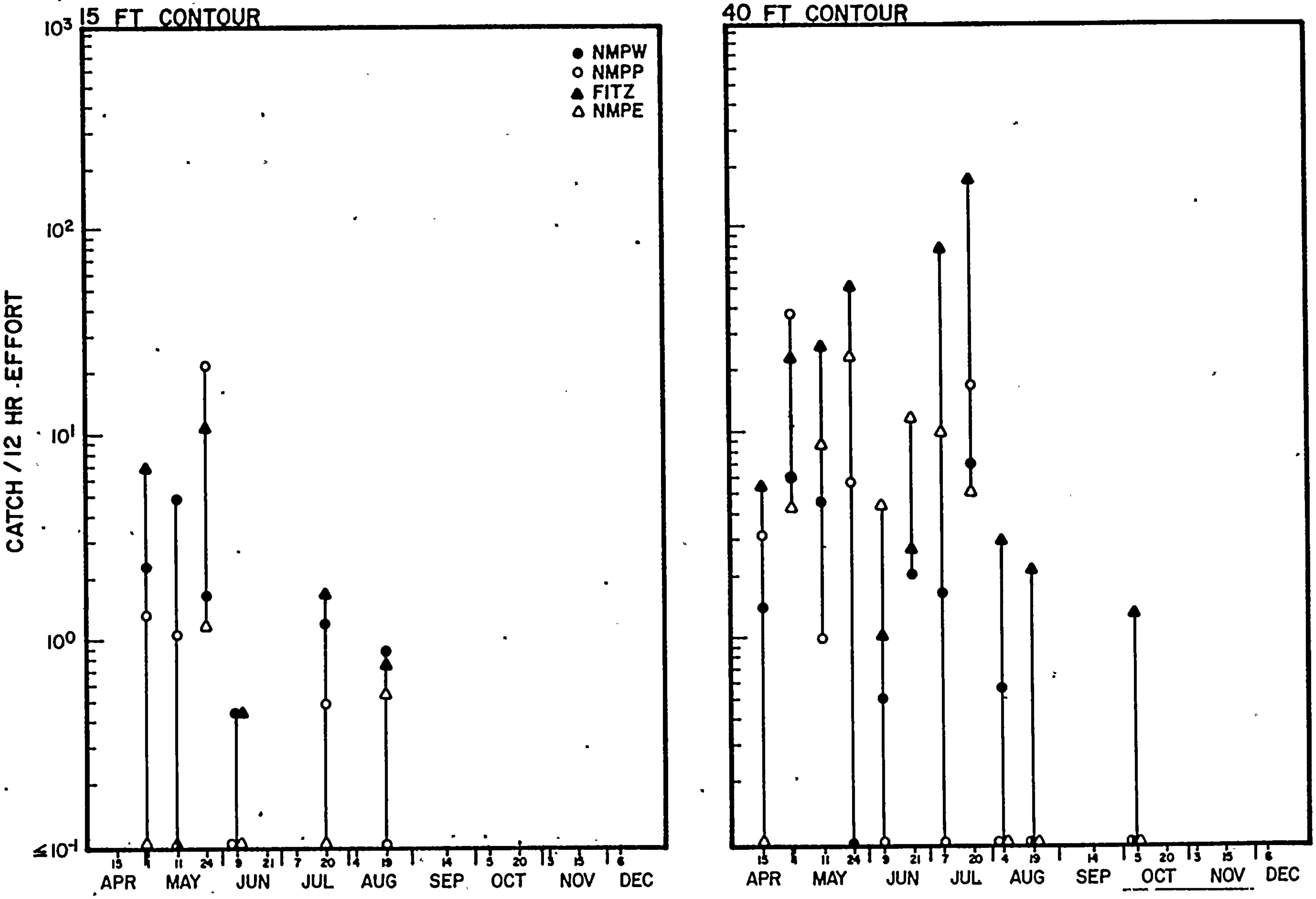
Results for catch/effort of spottail shiner in day gill net collections at plume and non-plume stations at the 15-ft depth contour are plotted versus time of collection (Figure VII-5). Catch/effort during the daylight hours was variable throughout the collection period, with no fish caught after mid-August. Similarly, no fish were collected in day sets for 14-16 April, although, they were gillnetted at night on these dates at NMPW and NMPE 15 ft stations (Appendix VIID-2a).

Spottail shiner, like alewife and smelt, display shoreward spawning movements to sandy shoal areas in spring and early summer, when water temperatures reach about 20 C (Peer 1961; Carlander 1969); however, evidence that this species spawns in the Nine Mile Point vicinity was not observed. Catch/unit effort was generally greater at FITZ and NMPW than NMPP or NMPE, except in late May when catch/effort was greatest at the 15 ft depth contour at NMPP transect (Figure VII-7). In general, the NMPE transect showed the smallest catch/effort of the four transects.

- <u>Smallmouth Bass</u>

Sonic tagging studies in the vicinity of the Pickering Generating station discharge have shown that smallmouth bass enter the plume for a few minutes, then return to the area outside the plume where they remained until the next foray (Personal communication from John Kelso, Canada Center for Island Waters). Based on this observation, catch/effort of smallmouth bass would be expected to be greater at the plume stations than at the non-plume stations. Data on smallmouth bass taken from day collections at the 15-ft stations were plotted versus time (Figure VII-6).

ABUNDANCE* OF SPOTTAIL SHINER IN SELECTED DAY GILL NET COLLECTIONS NINE MILE POINT VICINITY – 1976

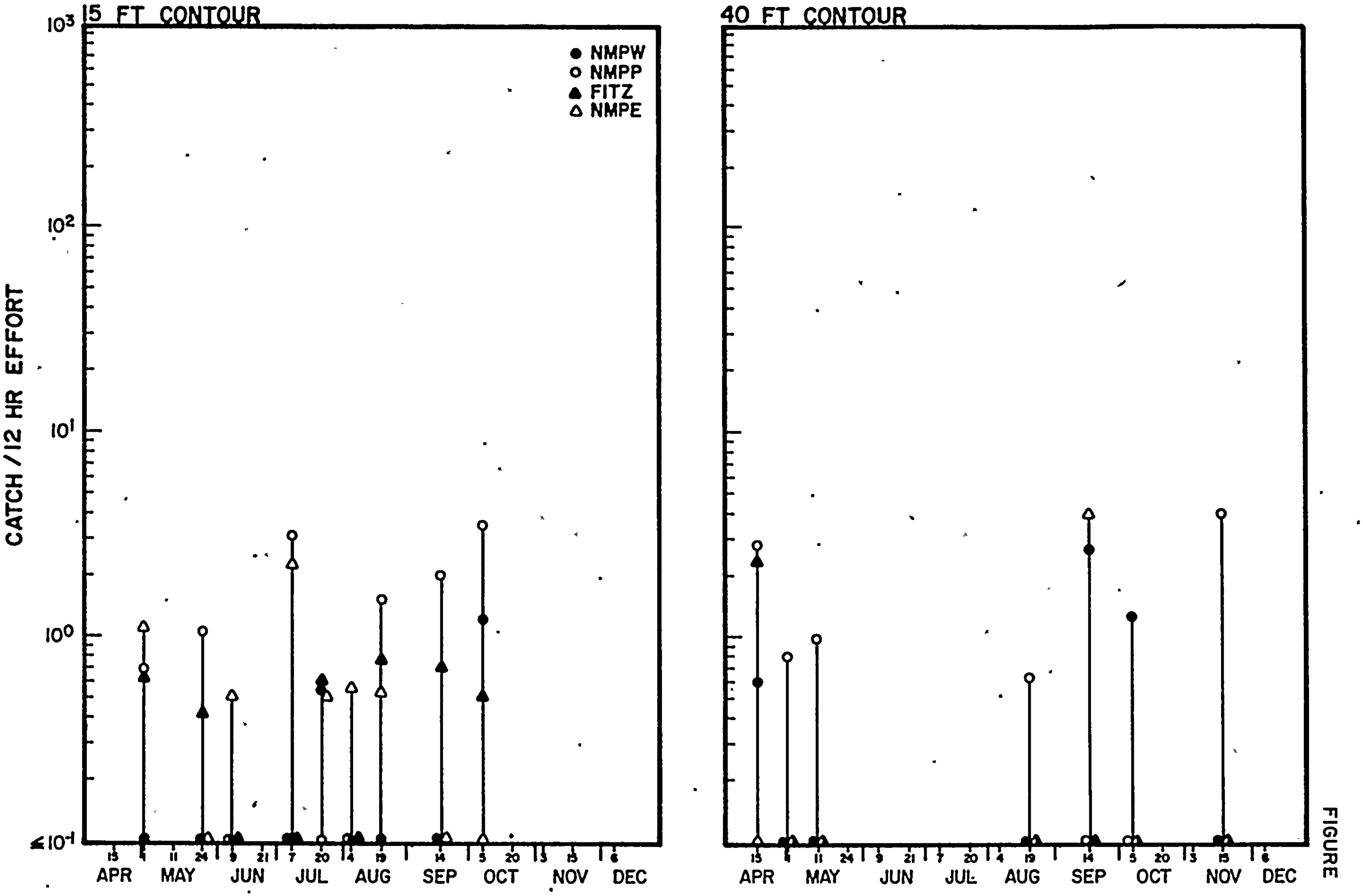


NONE COLLECTED AT THE 15 FT CONTOUR ON 15 APR, 21 JUN, 7 JUL, 4 AUG. AND 14 SEP – 6 DEC, AND AT THE 40 FT CONTOUR ON 14 SEP AND 20 OCT – 6 DEC.

*MEAN OF TWO COLLECTIONS; DAY COLLECTION IS DEFINED AS FOLLOWS: A NET SET A MAXIMUM OF 2 HOURS BEFORE SUNRISE AND/OR A NET PULLED NO LATER THAN 2 HOURS BEFORE SUNSET; DATA PLOTTED BY DATE OF FINAL DAY HARVEST OF AN APPROXIMATELY 48-HOUR SET PERIOD

FIGURE VII-5

ABUNDANCE* OF SMALLMOUTH BASS IN SELECTED DAY GILL NET COLLECTIONS
NINE MILE POINT VICINITY - 1976



NONE COLLECTED AT THE 15 FT CONTOUR ON 15 APR, 11 MAY, 21 JUN, AND 20 OCT - 6 DEC, AND AT THE 40 FT CONTOUR ON 24 MAY - 4 AUG, 20 OCT, 3 NOV, AND 6 DEC.

*MEAN OF TWO COLLECTIONS; DAY COLLECTION IS DEFINED AS FOLLOWS: A NET SET A MAXIMUM OF 2 HOURS BEFORE SUNRISE AND/OR A NET PULLED NO LATER THAN 2 HOURS BEFORE SUNSET; DATA PLOTTED BY DATE OF FINAL DAY HARVEST OF AN APPROXIMATELY 48 HOUR SET PERIOD

FIGURE VII-6

Catch/12 hour effort was low at all stations, ranging from 0 to 6.9 fish/12-hour effort at the plume stations (NMPP and FITZ) and 0 to 2.4 fish/12-hour effort at the non-plume stations. In mid-August, mid-September and early October, peak abundance occurred at NMPP transect. Abundance data for the remaining sampling period were fragmentary.

- Other Fish

Abundance data for rainbow smelt, coho salmon, trout perch, white sucker, and brown trout are presented in Appendix VIID-2a.

2. Comparisons at the 40-ft Depth Contour

- Alewife

Catch/12-hour effort of alewife at the 40-ft stations is plotted in Figure VII-2. No fish were collected at any transect in November and December, and none at NMPW and FITZ in October. During the April collections, catch/effort was greatest at NMPP transect; the greatest difference among transects was observed for the 29 April-1 May gill net period when the mean catch per effort at NMPP was 2.5 to 5.0 times greater than at the other three transects. Catch/effort was greater at FITZ during the May and July collections; the greatest difference among transects was observed in late July where catch/effort was 4.7 to 9.7 times greater at FITZ than at the other three transects. Only in early August and mid-September did the catch/effort at both plume stations (NMPP and FITZ) exceed that of the non-plume stations (NMPW and NMPE); catch/effort at NMPP was greater than at FITZ for these collections.

During the April through December sampling period, the catch per effort was generally low at NMPE transect. There were only two occasions (mid-August and early October) when more alewife were collected at NMPE than at the other three transects; the difference was the largest only in October.

- Rainbow smelt

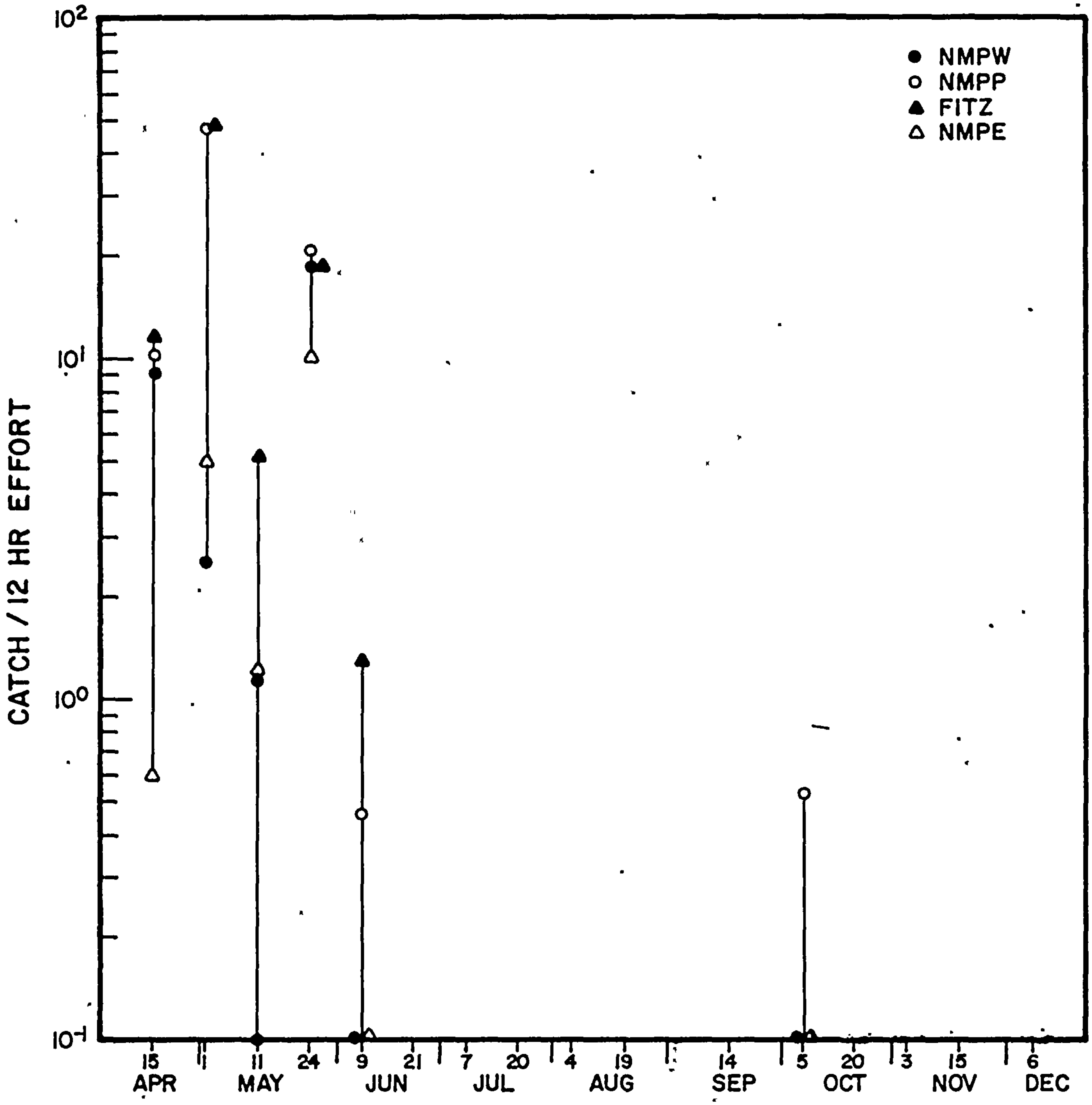
Gill net collections in 1976 at the 40-ft stations indicated that rainbow smelt were equally abundant at plume (NMPP and FITZ) and non-plume (NMPW and NMPE) stations; catch/effort at the four transects is presented in Figure VII-7. Rainbow smelt were present in day collections at the 40-ft stations from mid-April through early October. The maximum catch was observed in late April, and at the plume stations (NMPP and FITZ); however, this period represents the normal inshore spawning migration of the species (McKenzie 1964; LMS 1976b). Water temperature measurements taken at the plume and non-plume stations at the 15 and 40-ft depth contours on 30 April and again on 1 May indicated the presence of the thermal plume at the surface at NMPP transect. A secondary peak was observed in late May, and plume stations and the NMPW-40-ft station exhibited a similar catch per effort.

- Spottail Shiner

The catch/effort for spottail shiner was greatest at the FITZ-40-ft station several times throughout the sampling period (Figure VII-5). Catch/effort at FITZ-40-ft station exhibited maxima in late May and early and late July (mean catch/12 hour effort of 49.8, 74.9, and 160.5 for these collections, respectively).

ABUNDANCE*OF RAINBOW SMELT IN SELECTED DAY GILL NET COLLECTIONS

40 FT CONTOUR, NINE MILE POINT VICINITY – 1976



NONE COLLECTED 21 JUN - 14 SEP AND 20 OCT - 6 DEC.

*MEAN OF TWO COLLECTIONS; DAY COLLECTION IS DEFINED AS FOLLOWS: A NET SET A MAXIMUM OF 2 HOURS BEFORE SUNRISE AND/OR A NET PULLED NO LATER THAN 2 HOURS BEFORE SUNSET; DATA PLOTTED BY DATE OF FINAL DAY HARVEST OF AN APPROXIMATELY 48-HOUR SET PERIOD

A review of the water temperature data taken on 23-25 May, 6-8 July, and 19-21 July indicated the presence of a thermal plume at both NMPP and NMPW-40 ft stations on 23-25 May and during the 19-21 July period. Temperature differences between plume and non-plume stations were not clear for the 6-8 July period. Thus, no consistent or persistent pattern of temperature distribution could be accounted for in determining fish distribution on these days.

Spottail shiner were relatively abundant at the NMPP-40-ft station on two collection periods: 29 April-1 May and 19-21 July 1976, with a mean catch/effort of 36.9 and 16.6 fish, respectively (Figure VII-5); the catch/effort at NMPP exceeded that at FITZ in the late May period.

Spottail shiner were not collected at the 40-ft stations in September and from late October through December; they were collected only at FITZ and NMPW in early August, and only at FITZ in late August and early October. Catch/effort at the FITZ-40 ft station was generally greater than at the other three transects.

- Yellow Perch

Catch/effort of yellow perch at the 40-ft stations is plotted versus time in Figure VII-3. Few fish were collected in the April-June, September, and November sampling periods; the maximum catch/effort was observed in July and at the FITZ-40-ft station. Differences in spatial distribution of yellow perch between plume and non-plume stations could not be discriminated based on the available data set.

- <u>White Perch</u>

The distribution of white perch in day collections at the 40-ft stations is presented in Figure VII-4. The limited data set precludes a detailed discussion of catch/effort at the plume versus non-plume stations; however, the following observations can be made:

(1) White perch were collected from mid-April through August and in mid-September; they were collected during April only at the plume stations (NMPP and FITZ), and in August and mid-September at NMPP and/or NMPE transects along the 40-ft contour.

(2) The mean catch/effort per gill net set period at NMPP and FITZ or FITZ and NMPW was generally greater than at the remaining two transects.

- <u>Smallmouth Bass</u>

The abundance and distribution of smallmouth bass collected at the 40-ft stations are plotted against time in Figure VII-6. Because the data are fragmentary, no conclusion can be drawn regarding plume and non-plume differences in distribution.

- <u>Other Species</u>

Data for brown trout and coho salmon, both representative important species, and trout-perch and white sucker are presented in Appendices VIID-2b and VIID-3b.

D. LIFE HISTORY INFORMATION FOR SELECTED SPECIES

1. Coefficient of Maturity

Coefficient of maturity, defined by the equation:

$$\text{Coefficient of maturity} = \frac{\text{gonad weight}}{\text{partial weight} - \text{gonad weight}} \times 100,$$

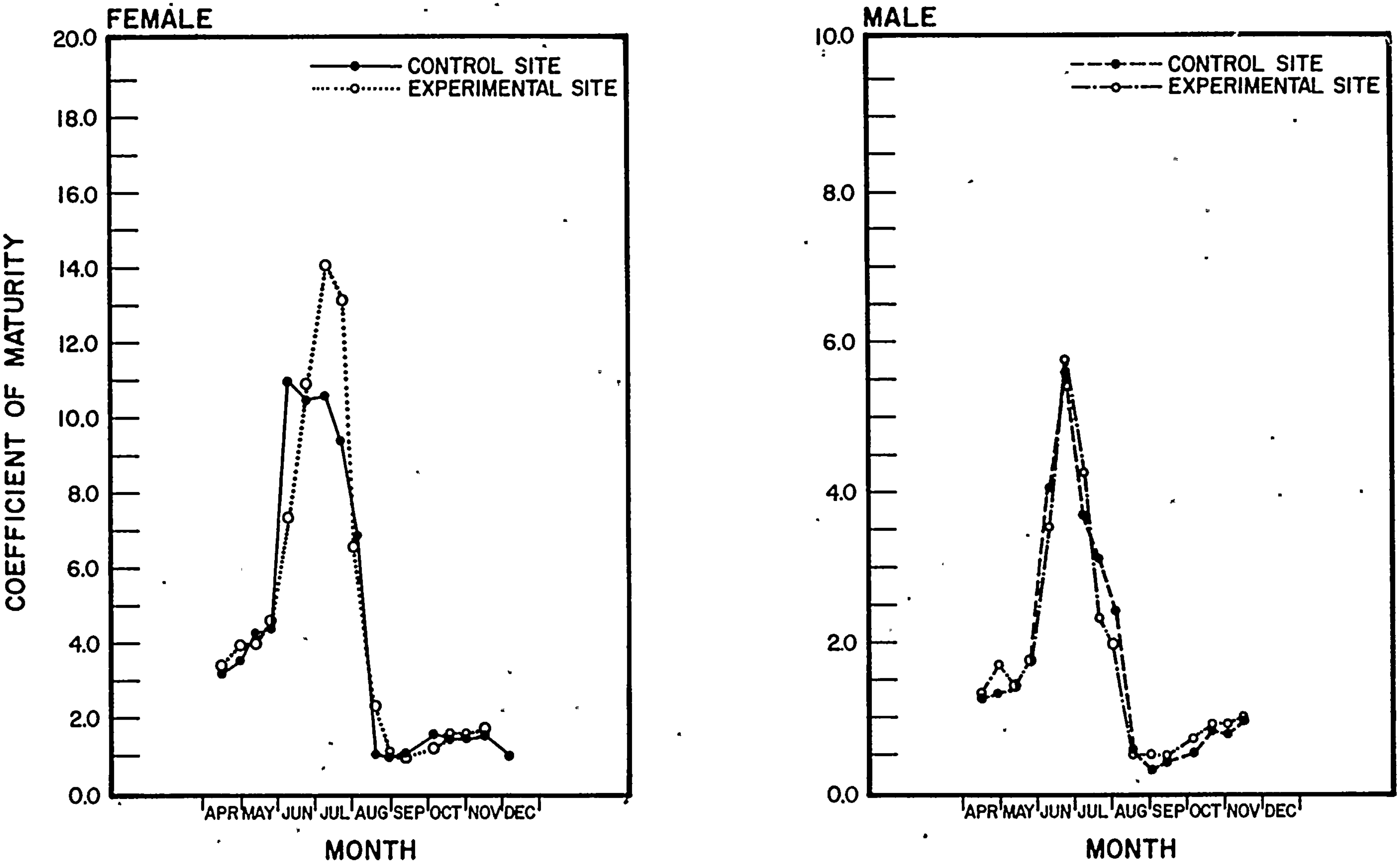
was determined for male and female alewife, yellow perch, white perch, rainbow smelt, and smallmouth bass collected by gill nets from the experimental and control sites.

a. Alewife

Coefficient of maturity for both males and females from experimental and control sites increased rapidly from April to late June (June-July for females), after which it declined rapidly until August (Figure VII-8). Surface and bottom water temperatures varied from approximately 13.6 to 22.0 C, and from 6 to 17 C, respectively during the late June/mid-July collections. Similar temperatures were recorded in 1974 (LMS, 1975) during the period of peak maturity.

Peak maturity for male alewife occurred approximately mid-June at both the experimental and control sites. Maximum maturity of female alewife occurred in early June for fish collected at the control sites; a second peak, slightly less in magnitude, was observed in early July. The July peak for the control site coincided with the peak maturity of female alewife collected from the experimental site. Peak spawning activity apparently

ALEWIFE: REPRODUCTIVE CYCLE
EXPERIMENTAL AND CONTROL SITES,* NINE MILE POINT VICINITY - 1976



*EXPERIMENTAL SITE: gill nets, 15, 30 and 40-ft depth contours along NMPP and FITZ transects
CONTROL SITE: gill nets, 15, 30 and 40-ft depth contours along NMPW and NMPE transects

FEMALE: CONTROL SITE, 616 fish; EXPERIMENTAL SITE, 753 fish
MALE: CONTROL SITE, 428 fish; EXPERIMENTAL SITE, 469 fish

FIGURE VII-8

started a few days earlier for the control group than for fish collected at the experimental site; however, this peak is based on a small sample size (25 fish).

b. Yellow Perch

The coefficient of maturity data for yellow perch are presented in Figure VII-9. A plot of these data, based on a twice-monthly monitoring program, indicated the occurrence of peak maturation for female yellow perch in early spring; spawning apparently commenced about mid-April and fish were spent by mid-August. A second peak in coefficient of maturity was apparent at the end of the summer; this peak may represent either the beginning of gonadal maturation for the next season or a "false" peak indicative of the small sample size (2 fish in December and 5 fish in mid-November).

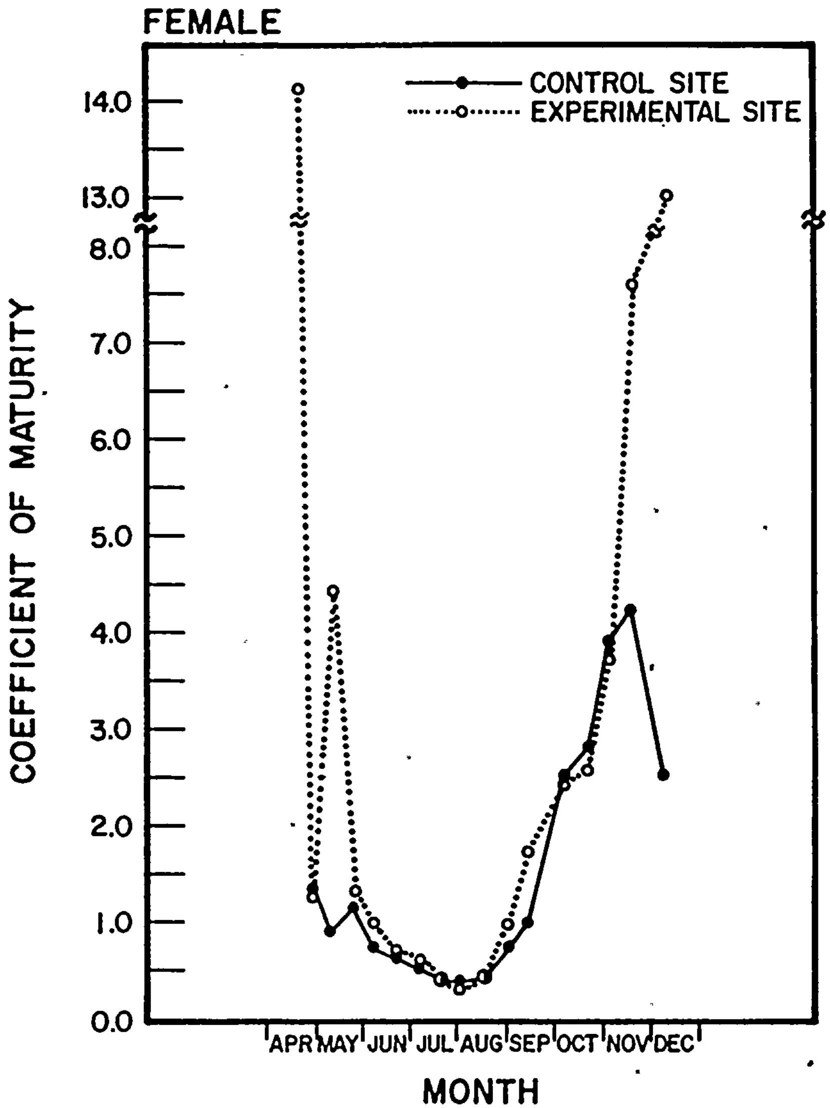
The mid-April peak in coefficient of maturity of females from experimental sites was not observed for the control site. The time of peak spawning for males from experimental and control fish was similar. The peak in coefficient of maturity was slightly higher for the experimental site than the control site for both sexes; however, the data are not conclusive as the sample sizes were small.

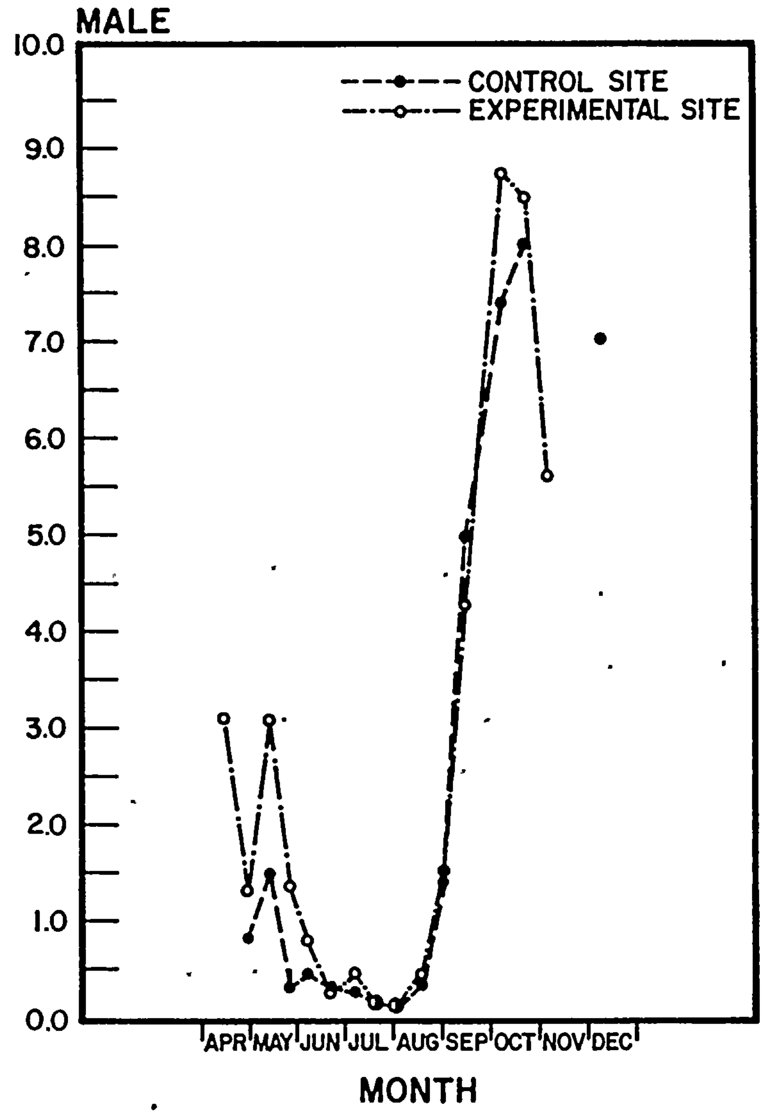
c. White Perch

Coefficient of maturity was determined for white perch collected at experimental and control sites from 14 April through 6 December 1976.

Gonad maturation of female and male white perch was evident in April; spawning apparently commenced in May, and gonads were

YELLOW PERCH: REPRODUCTIVE CYCLE
EXPERIMENTAL AND CONTROL SITES,* NINE MILE POINT VICINITY - 1976





*EXPERIMENTAL SITE: gill nets, 15, 30 and 40-ft depth contours along NMPP and FITZ transects
CONTROL SITE: gill nets, 15, 30 and 40-ft depth contours along NMPW and NMPE transects

FEMALE: CONTRAL SITE, 323 fish; EXPERIMENTAL SITE, 289 fish
MALE: CONTROL SITE, 177 fish; EXPERIMENTAL SITE, 141 fish

FIGURE VII-9

emptied by July (Figure VII-10a). Both males and females from experimental and control sites exhibited a close synchronization; maturation for both sexes occurred at similar times.

d. Rainbow Smelt

The majority of rainbow smelt examined for gonad development were collected from 14 April through 23 May. Additional fish were analyzed from the 4 October through 6 December sampling period (Table VII-6). Because of no data prior to 14 April and only scarce data between May and October, the time of spawning cannot be defined with certainty. The April-May data set, however, indicates that female and male rainbow smelt apparently spawn during May at both the experimental and control sites.

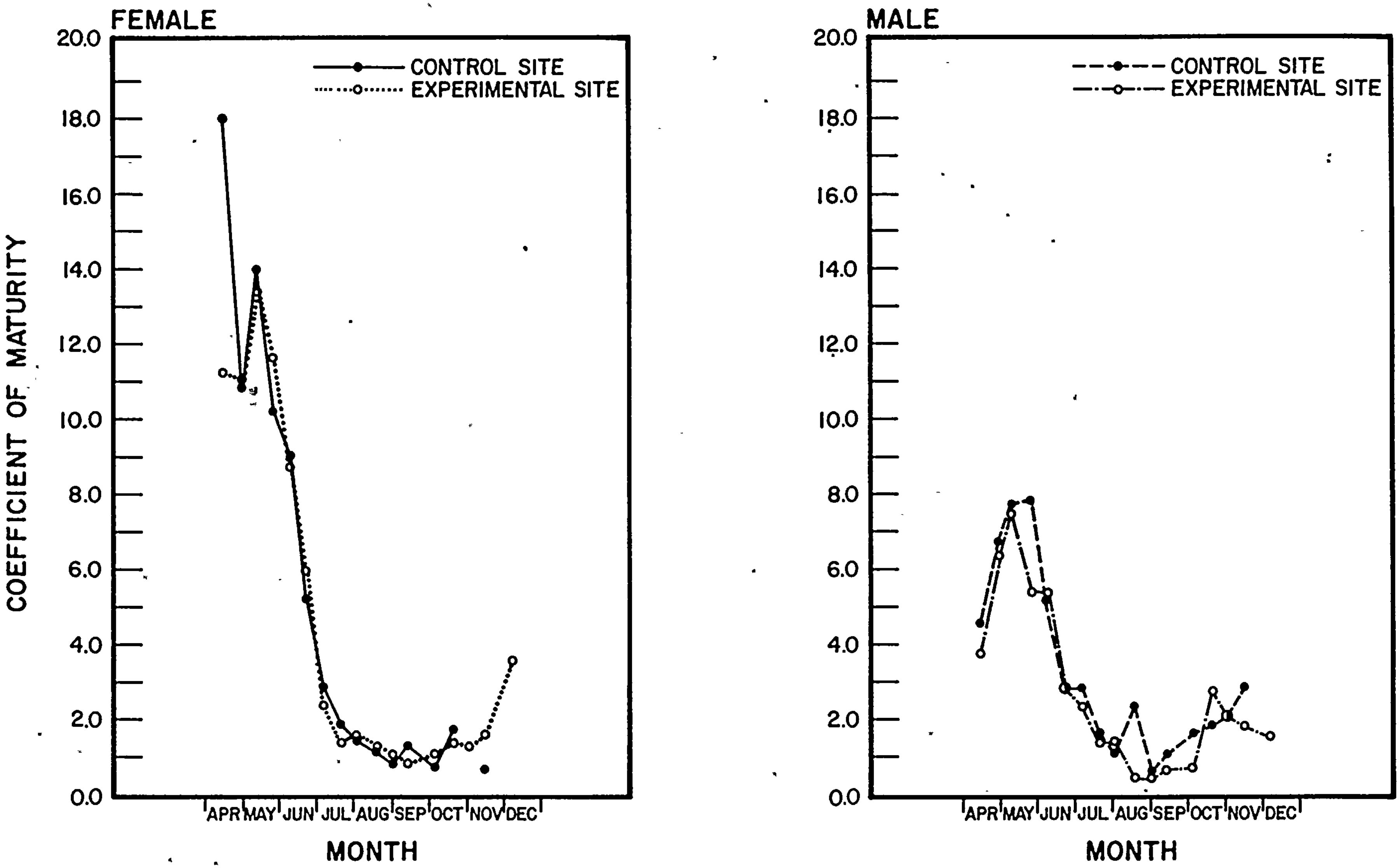
e. Smallmouth Bass

Coefficient of maturity was determined for male and female smallmouth bass from the experimental and control sites; however, the sample size was too small to be interpreted. Data are presented in Appendix VIIE-1.

2. Fecundity

Fecundity was determined for five selected species collected by trawls and gill nets combined from both the experimental and the control sites. All fish were classified into age groups since fecundity differs with age and size (Nikolsky 1963). Relative fecundity (the number of eggs per unit of fish body weight) was used as an index to compare experimental and control fish of the same species.

WHITE PERCH: REPRODUCTIVE CYCLE
EXPERIMENTAL AND CONTROL SITES,* NINE MILE POINT VICINITY - 1976



*EXPERIMENTAL SITE: gill nets, 15, 30 and 40-ft depth contours along NMPP and FITZ transects
CONTROL SITE: gill nets, 15, 30 and 40-ft depth contours along NMPW and NMPE transects

FEMALE: CONTROL SITE, 339 fish; EXPERIMENTAL SITE, 419 fish
MALE: CONTROL SITE, 336 fish; EXPERIMENTAL SITE, 334 fish

FIGURE VII-10a

TABLE VII-6

RAINBOW SMELT: REPRODUCTIVE CYCLE

EXPERIMENTAL AND CONTROL SITES[a], NINE MILE POINT VICINITY - 1976

DATE[b]	MALE				FEMALE			
	EXPERIMENTAL SITE (N=143)		CONTROL SITE (N=121)		EXPERIMENTAL SITE (N=233)		CONTROL SITE (N=260)	
	COEF. MATURITY + STD. DEV.	NO. FISH	COEF. MATURITY + STD. DEV.	NO. FISH	COEF. MATURITY + STD. DEV.	NO. FISH	COEF. MATURITY + STD. DEV.	NO. FISH
14 APR	2.88 ± 0.92	67	3.34 ± 1.56	54	21.48 ± 5.09	83	20.77 ± 3.69	69
29 APR	3.01 ± 1.10	43	3.33 ± 1.52	30	21.40 ± 8.58	64	20.96 ± 7.91	43
11 MAY	2.24 ± 0.93	3	1.20 ± 1.37	2	13.72 ±12.69	10	8.99 ±13.49	7
23 MAY	1.82 ± 1.34	14	0.81 ± 0.80	20	2.64 ± 5.59	76	3.27 ± 6.75	92
8 JUN							0.53 ± 0.3	6
21 JUN			0.14	1				
6 JUL								
19 JUL								
2 AUG								
17 AUG								
1 SEP								
13 SEP								
4 OCT	0.95 ± 0.21	2	1.01	1			0.60 ± 0.16	2
19 OCT	4.00	1						
2 NOV	3.24 ± 2.00	10	4.03 ± 2.85	8			1.28 ± 0.58	24
15 NOV	4.01	1	4.44 ± 1.49	4			2.09 ± 1.10	14
6 DEC	3.94 ± 0.26	2	2.42	1			4.57 ± 4.94	3

COEF. MATURITY = coefficient of maturity

N = Number of fish analyzed

[a]Experimental Site: gill nets, 15, 30, and 40 ft depth contours along NMPP and FITZ transects
Control Site: gill nets, 15, 30, and 40 ft depth contours along NMPW and NMPE transects

[b]Date of initial gill net set; set period approximately 48 hrs; coefficient of maturity data available for selected sampling dates (fish not collected or collected and not analyzed for the remaining sampling dates)

a. Alewife

Alewife from age II to age V showed an increase in the number of eggs per female at the experimental site; the increase in the number of eggs with age was less evident in those fish collected at the control site (Table VII-7). The mean number of eggs per female was greater for alewife collected from the control sites for age II and III, but was similar for age IV.

b. Rainbow Smelt

Data on fecundity of rainbow smelt for ages II through VI are shown in Table VII-8. Fecundity for smelt collected at both experimental and control sites steadily increased with age (size). Fish at the experimental site showed slightly higher fecundity than those fish of the same age (ages II and III) at the control site; the reverse trend was observed for ages IV, V and VI. Fecundity, however, varied considerably among all age classes, and thus no definitive conclusion could be drawn.

3. Length Frequency

Analysis of the length frequency distribution of fish populations is necessary in evaluating population growth as well as in estimating survival and mortality rates among year classes (Ricker 1975). This parameter also gives an insight into size (age) structure, size class dominancy, and longevity.

a. Alewife

The monthly length frequency distributions for alewives collected in the vicinity of Nine Mile Point during 1976 are presented in Figure VII-10b.

TABLE VII-7

FECUNDITY DATA : ALEWIFE

NINE MILE POINT VICINITY - JUNE-JULY 1976

I. CONTROL SITE[a]

AGE	NUMBER OF FISH	TOTAL LENGTH (mm)		PARTIAL WEIGHT (g)		OVARY WEIGHT/FISH		TOTAL EGGS/OVARY	
		MEAN	RANGE	MEAN	RANGE	MEAN	STANDARD DEVIATION	MEAN	STANDARD DEVIATION
II	15	156	145 - 170	25.6	20.2 - 31.8	3.74	0.96	23435	7309
III	15	157	129 - 179	26.3	18.9 - 36.0	3.87	1.12	28779	8199
IV	15	170	157 - 181	28.9	23.9 - 33.9	4.40	0.74	27211	6713
V	6	168	156 - 180	28.8	24.1 - 33.3	3.93	1.19	26914	6662

II. EXPERIMENTAL SITE[b]

AGE	NUMBER OF FISH	TOTAL LENGTH (mm)		PARTIAL WEIGHT (g)		OVARY WEIGHT/FISH		TOTAL EGGS/OVARY	
		MEAN	RANGE	MEAN	RANGE	MEAN	STANDARD DEVIATION	MEAN	STANDARD DEVIATION
II	15	157	129 - 168	24.5	15.0 - 31.0	4.12	1.42	21756	5889
III	15	152	130 - 172	23.7	16.9 - 29.6	4.01	0.97	24653	8253
IV	15	166	137 - 180	27.0	18.5 - 35.1	4.47	1.44	27333	8367
V	11	167	137 - 184	28.2	19.6 - 36.0	4.76	1.34	30097	9144

[a]Bottom Gill Net: NMPW-15', NMPW-30', NMPE-15', NMPE-30', NMPE-40'
Surface Gill Net: NMPW-40', NMPE-40'

[b]Bottom Gill Net: NMPP-15', NMPP-30', NMPP-40', FITZ-15', FITZ-30', FITZ-40'
Surface Gill Net: NMPP-40', FITZ-40'

TABLE VII-8

FECUNDITY DATA : RAINBOW SMELT

NINE MILE POINT VICINITY - APRIL-MAY 1976

I. CONTROL SITE[a]

AGE	NUMBER OF FISH	TOTAL LENGTH (mm)		PARTIAL WEIGHT (g)		OVARY WEIGHT/FISH		TOTAL EGGS/OVARY	
		MEAN	RANGE	MEAN	RANGE	MEAN	STANDARD DEVIATION	MEAN	STANDARD DEVIATION
II	7	144	137 - 154	16.2	13.5- 17.7	3.17	0.64	9041	1688
III	15	153	142 - 172	21.4	17.1- 27.0	4.42	0.93	11764	3558
IV	14	168	145 - 209	29.7	18.1- 49.3	5.96	2.97	16261	6398
V	12	207	163 - 248	55.1	27.3- 97.7	13.36	4.97	36895	20105
VI	5	231	211 - 264	72.9	56.1-105.3	20.92	8.98	55477	20241

II. EXPERIMENTAL SITE[b]

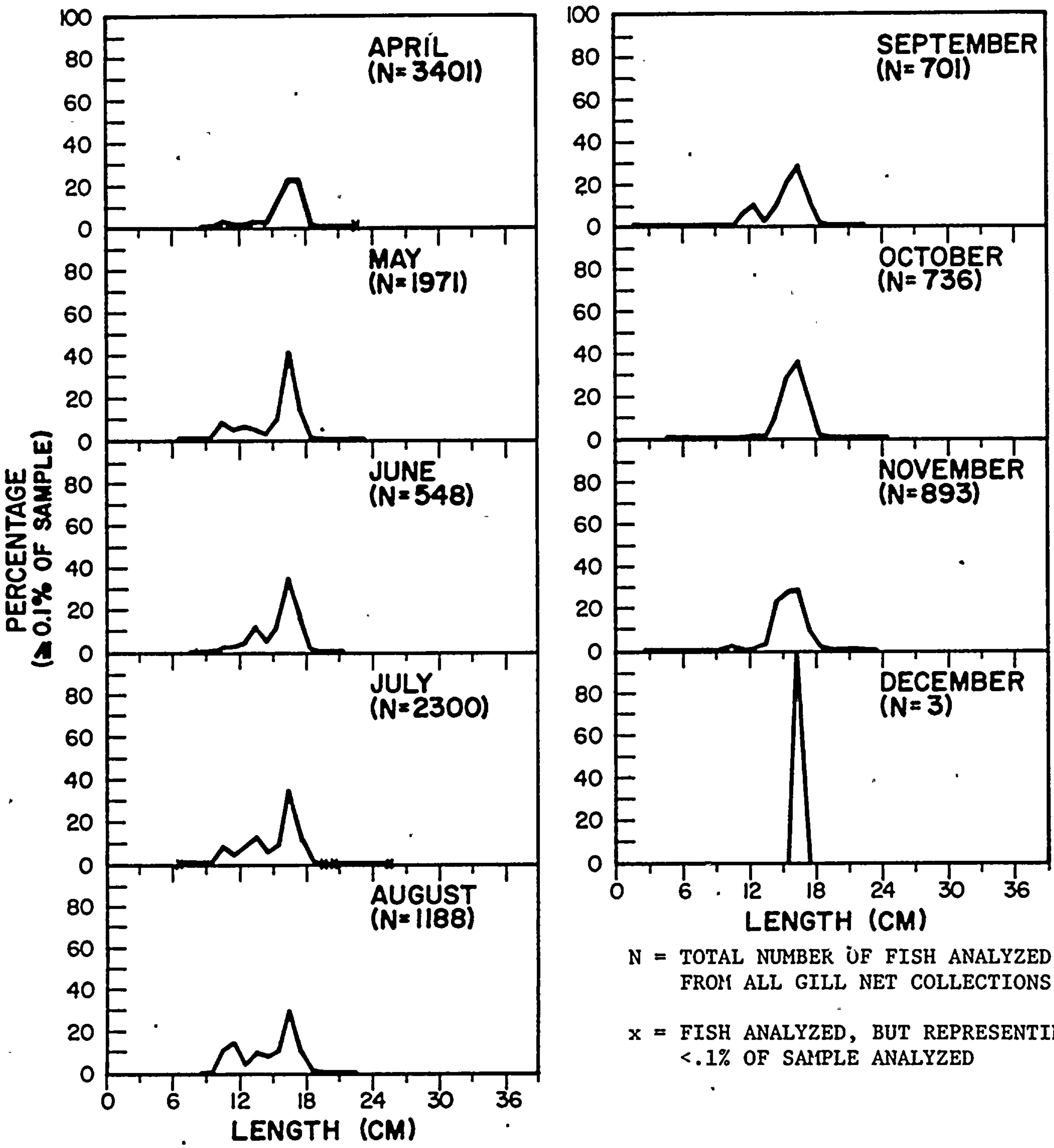
AGE	NUMBER OF FISH	TOTAL LENGTH (mm)		PARTIAL WEIGHT (g)		OVARY WEIGHT/FISH		TOTAL EGGS/OVARY	
		MEAN	RANGE	MEAN	RANGE	MEAN	STANDARD DEVIATION	MEAN	STANDARD DEVIATION
II	10	145	133 - 162	19.2	14.8- 25.3	3.89	1.14	10049	1876
III	15	157	137 - 215	23.4	14.9- 52.5	5.18	3.67	13949	7092
IV	16	165	146 - 193	26.7	16.9- 40.2	6.12	2.00	15614	4408
V	15	209	158 - 250	60.2	23.9-112.1	12.90	7.00	33490	15030
VI	3	224	222 - 228	68.5	60.2- 76.5	15.93	2.12	40344	4885

[a] Bottom Gill Net: NMPW-15', NMPW-30', NMPW-40', NMPE-15', NMPE-30', NMPE-40'
Surface Gill Net: NMPW-40', NMPE-40'
Bottom Trawl: NMPW-20', NMPW-40', NMPE-40'

[b] Bottom Gill Net: NMPP-15', NMPP-30', NMPP-40'
Surface Gill Net: NMPP-40', FITZ-40'
Bottom Trawl: NMPP/FITZ-20', NMPP/FITZ-40'

LENGTH FREQUENCY DISTRIBUTION FOR ALEWIFE

NINE MILE POINT VICINITY — APRIL-DECEMBER, 1976



N = TOTAL NUMBER OF FISH ANALYZED FROM ALL GILL NET COLLECTIONS

x = FISH ANALYZED, BUT REPRESENTING <.1% OF SAMPLE ANALYZED

During April, two size categories were observed: yearlings, (i.e., fish spawned the previous summer) and fish two years old and older. The percent composition of yearling fish increased from May to August. This increase in recruitment of yearlings may reflect the greater susceptibility of these growing fish to gill net collection or their increased relative abundance.

The main peak in the length frequency distributions during each month represents older fish collected by one mesh size. Young-of-the-year fish (spawned during 1976) were recruited to the gill net collections during August, and they represented a small proportion of the fish collected through November.

The length frequency distributions of alewives were plotted by month to compare the catches between the control and experimental sites (Figures VII-11 and VII-12). This analysis was conducted separately for 15-ft and 40-ft collections. During April at the 15-ft depth contour, the catch in both areas appeared to be quite similar. In May, a greater percentage of young fish (smaller) was collected from the FITZ transect as opposed to the control sites where older fish predominanted. From June to November, the control and experimental length frequency distributions from the 15-ft depth contour were similar, suggesting that the size distribution of the fish in the control and experimental areas was also similar (Figure VII-11).

The length frequency distribution for fish collected along the 40-ft depth contour shows that young fish represented a greater percentage of the catch in deeper waters than in the nearshore area (Figure VII-12), especially during July and August at the control sites. For the most part, the length frequency

LENGTH FREQUENCY DISTRIBUTION FOR ALEWIFE

15 - FT DEPTH CONTOUR
NINE MILE POINT VICINITY
APRIL — JUNE, 1976

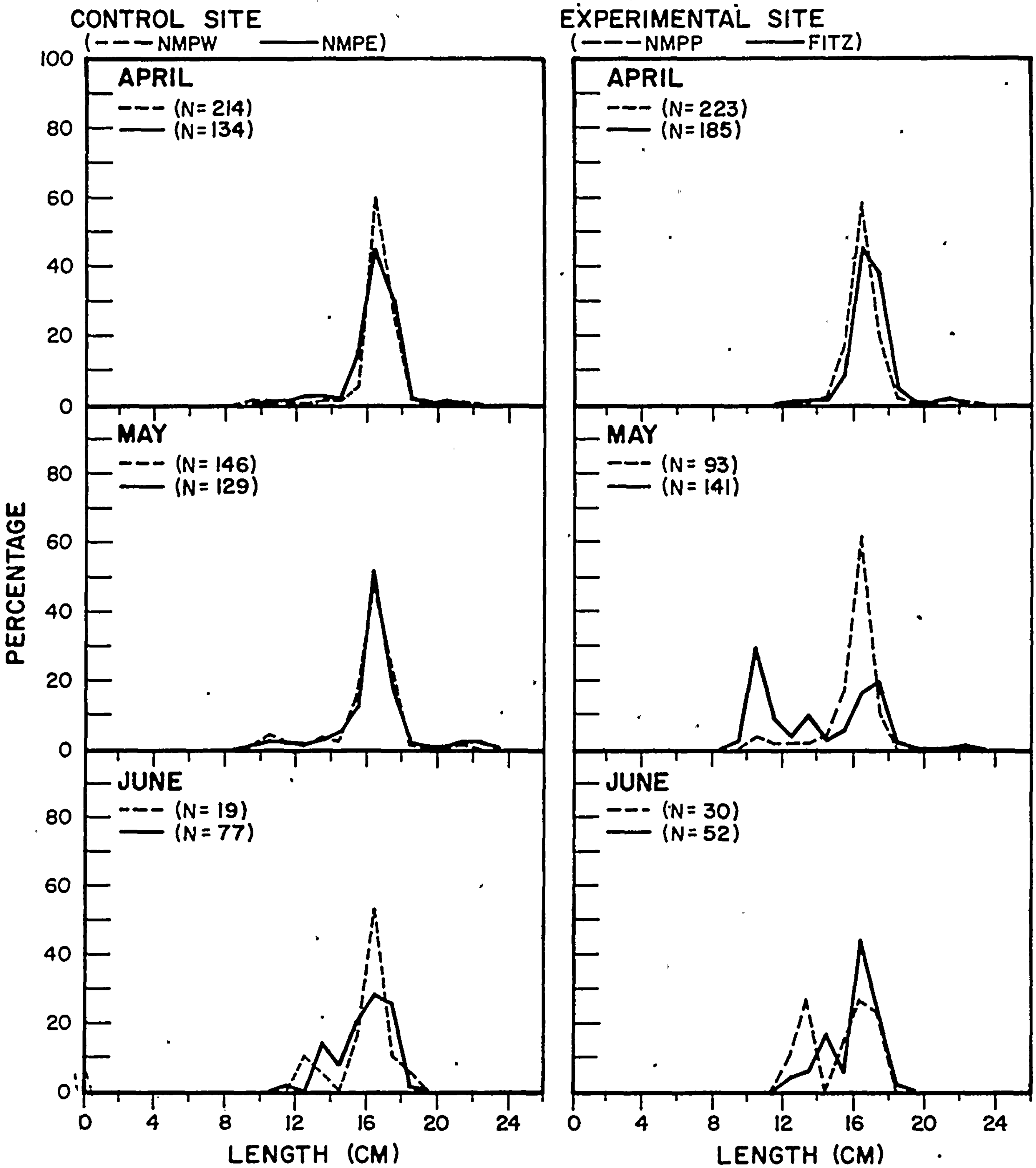
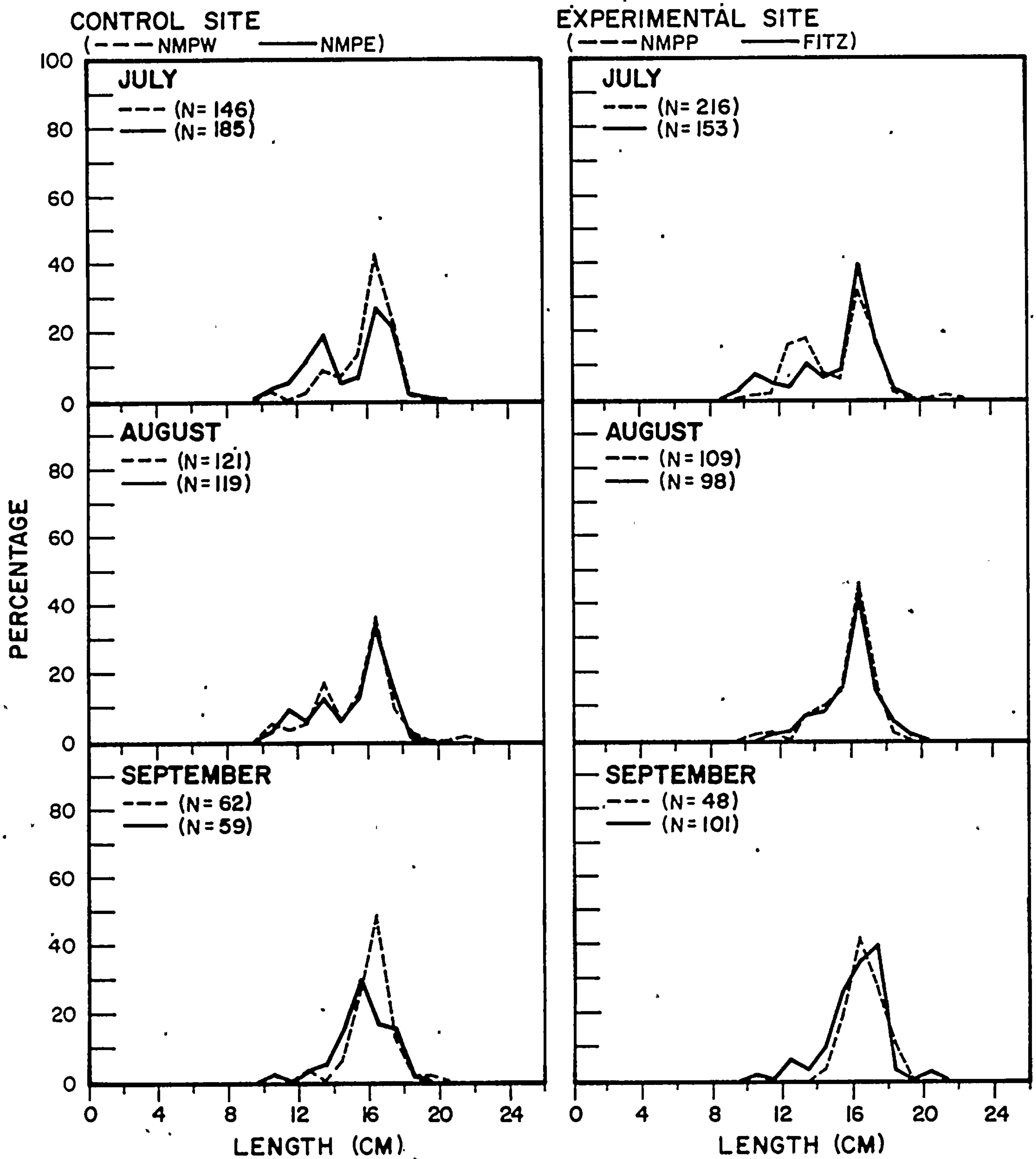


FIGURE VII-11
(continued)

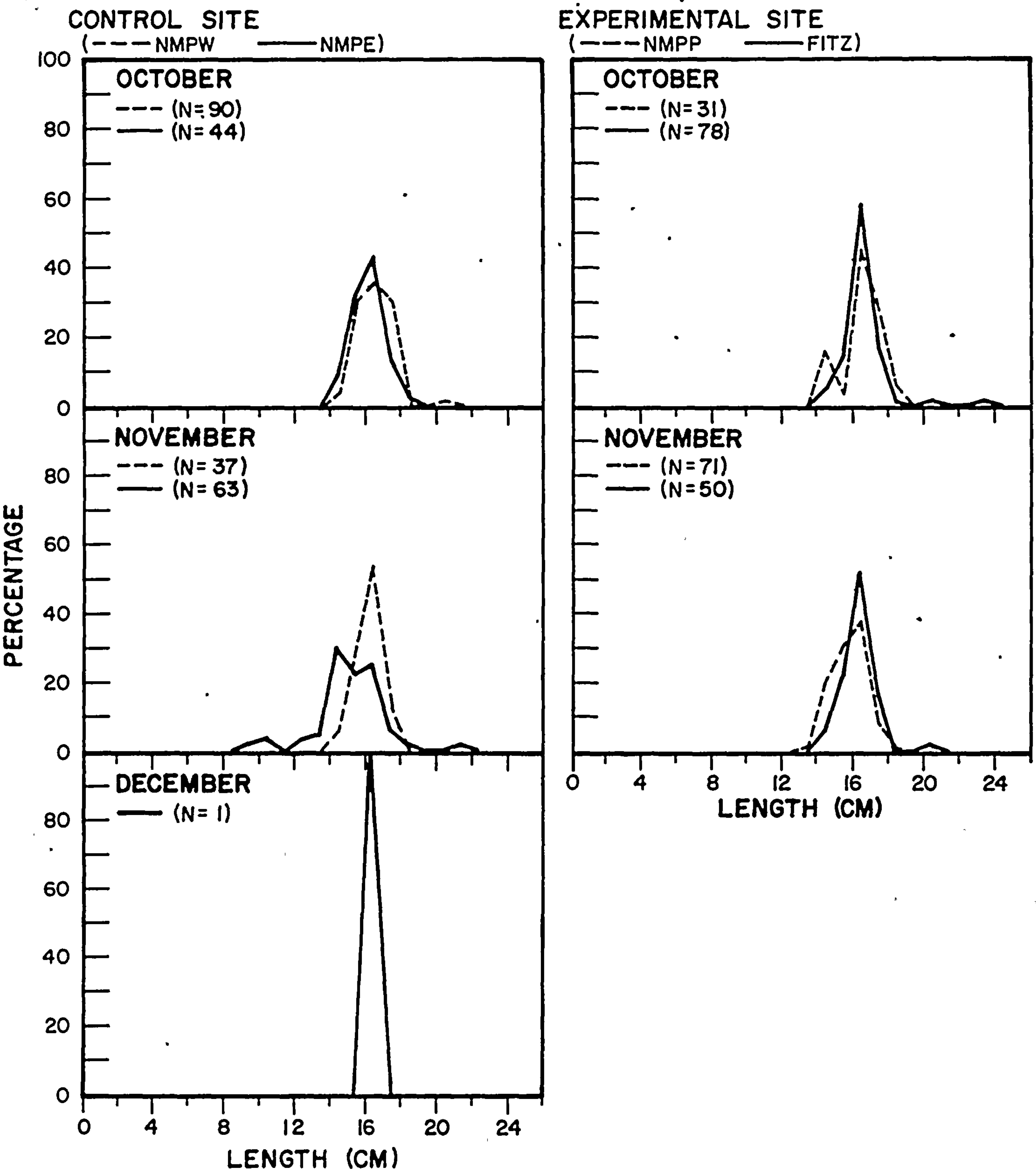
LENGTH FREQUENCY DISTRIBUTION FOR ALEWIFE

15 - FT DEPTH CONTOUR
NINE MILE POINT VICINITY
JULY — SEPTEMBER, 1976



LENGTH FREQUENCY DISTRIBUTION FOR ALEWIFE

15 -FT DEPTH CONTOUR
NINE MILE POINT VICINITY
OCTOBER — DECEMBER, 1976



LENGTH FREQUENCY DISTRIBUTION FOR ALEWIFE

40 - FT DEPTH CONTOUR NINE MILE POINT VICINITY APRIL - JUNE, 1976

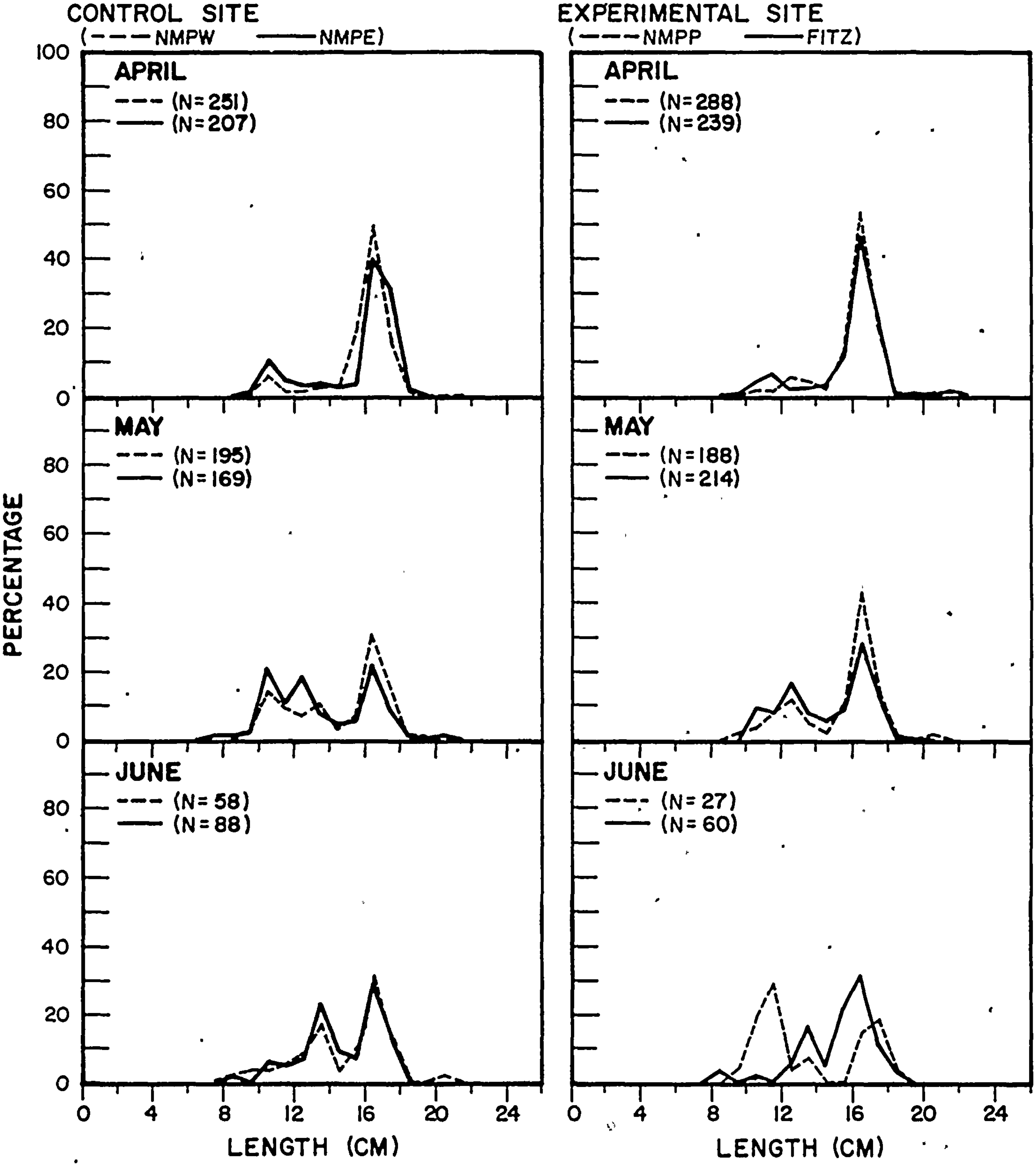


FIGURE VII-12
(continued)

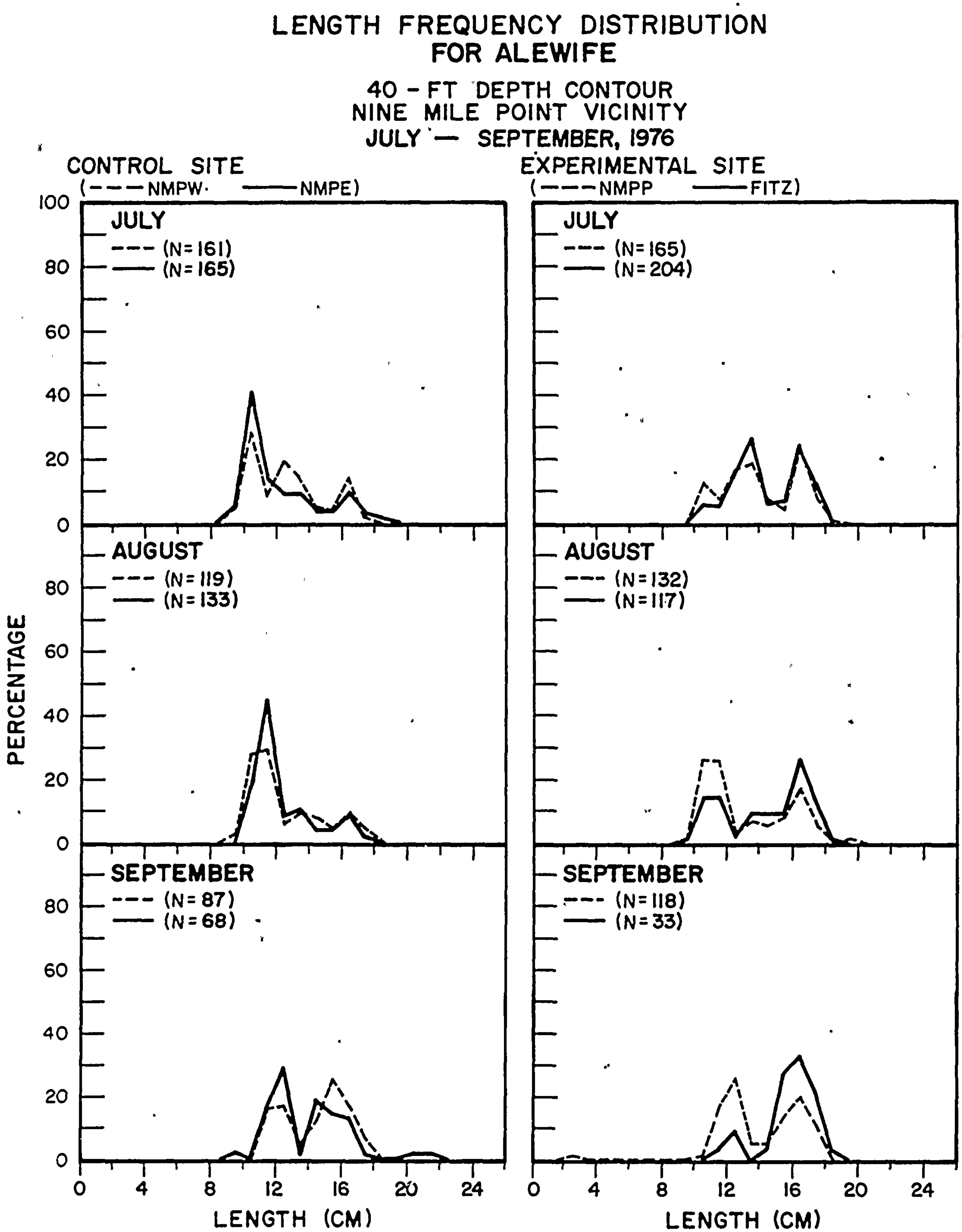
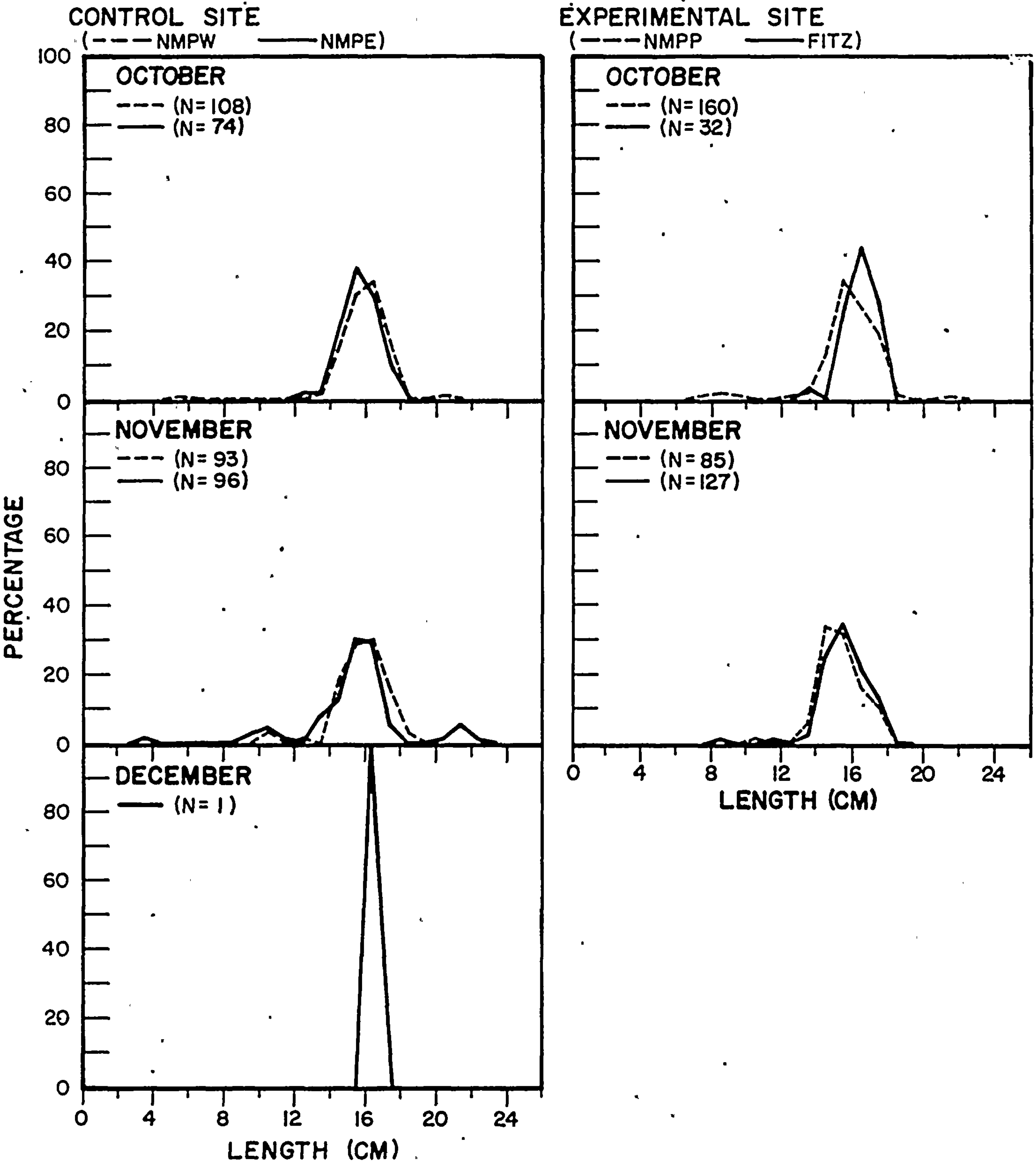


FIGURE VII-12
(continued)

LENGTH FREQUENCY DISTRIBUTION FOR ALEWIFE

40 - FT DEPTH CONTOUR
NINE MILE POINT VICINITY
OCTOBER — DECEMBER, 1976



distributions for fish collected at the control sites and at the experimental sites were similar. Only during July and August is there an apparent difference between control and experimental areas, when young fish were relatively more abundant at the control sites. This is opposite to the observation made from the 15-ft depth contour length frequency data, where relatively more young fish were collected from the FITZ transect during May.

b. Rainbow Smelt

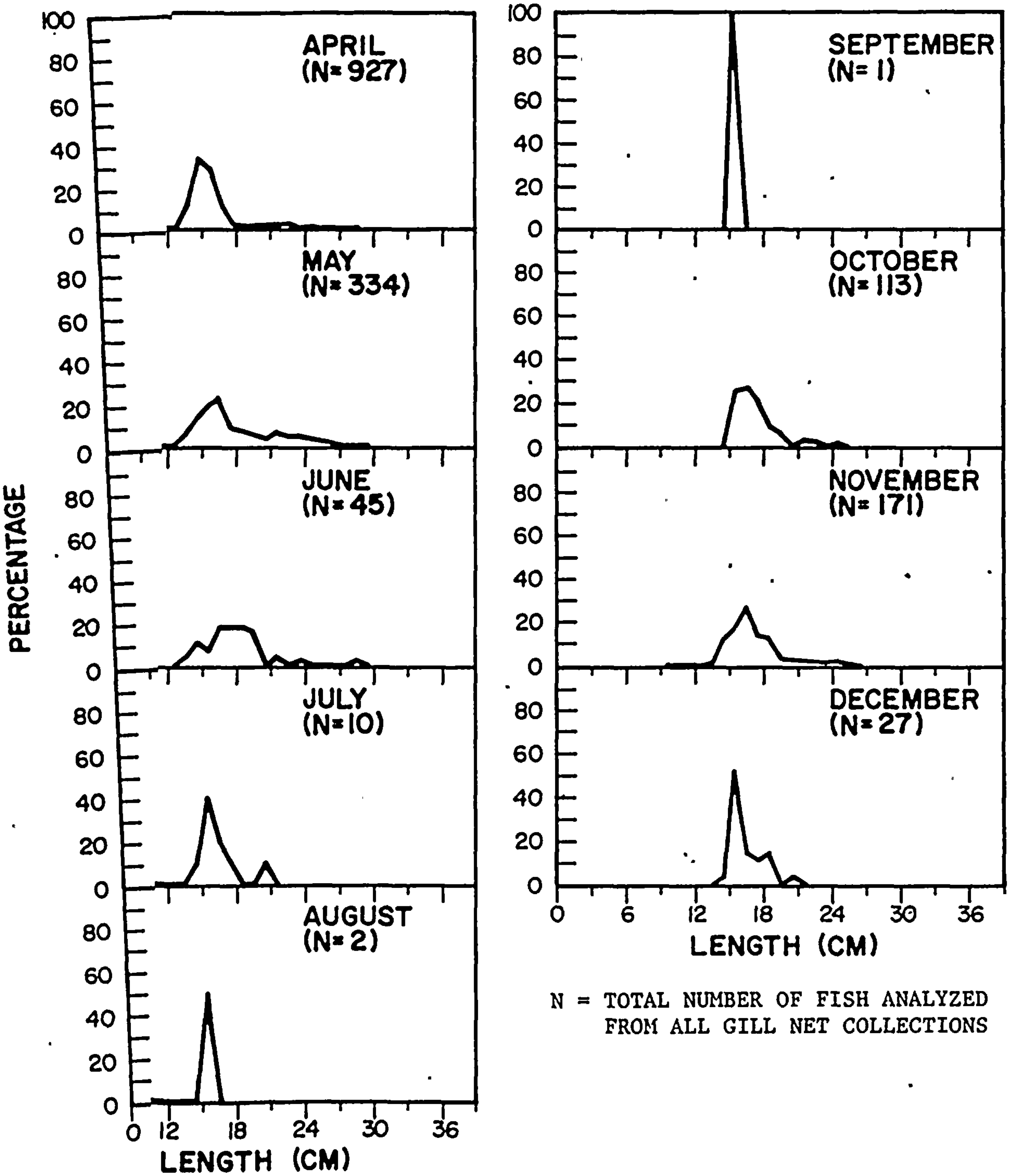
The majority of rainbow smelt collected by gill nets in the Nine Mile Point vicinity were 12-19 cm in total length (Figure VII-13). Fish within the 20-26 cm range (age group VI and VII) were occasionally collected in April, May, and June. The recruitment of young-of-the-year rainbow smelt to the gear occurred during July. The low numbers of fish collected from June to September reflects the post-spawning offshore movement of the rainbow smelt.

A comparison of the control and experimental rainbow smelt catch was conducted by plotting the length frequency distribution separately for the two areas and separately for the 15-ft and 40-ft depth contours (Figures VII-14 and VII-15).

Few rainbow smelt were collected along the 15-ft depth contour in either the control or experimental areas and thus the form of the length-frequency distributions may represent sampling error to a greater extent than had large catches occurred. Nonetheless, the distributions are similar between the control and experimental sites.

LENGTH FREQUENCY DISTRIBUTION FOR RAINBOW SMELT

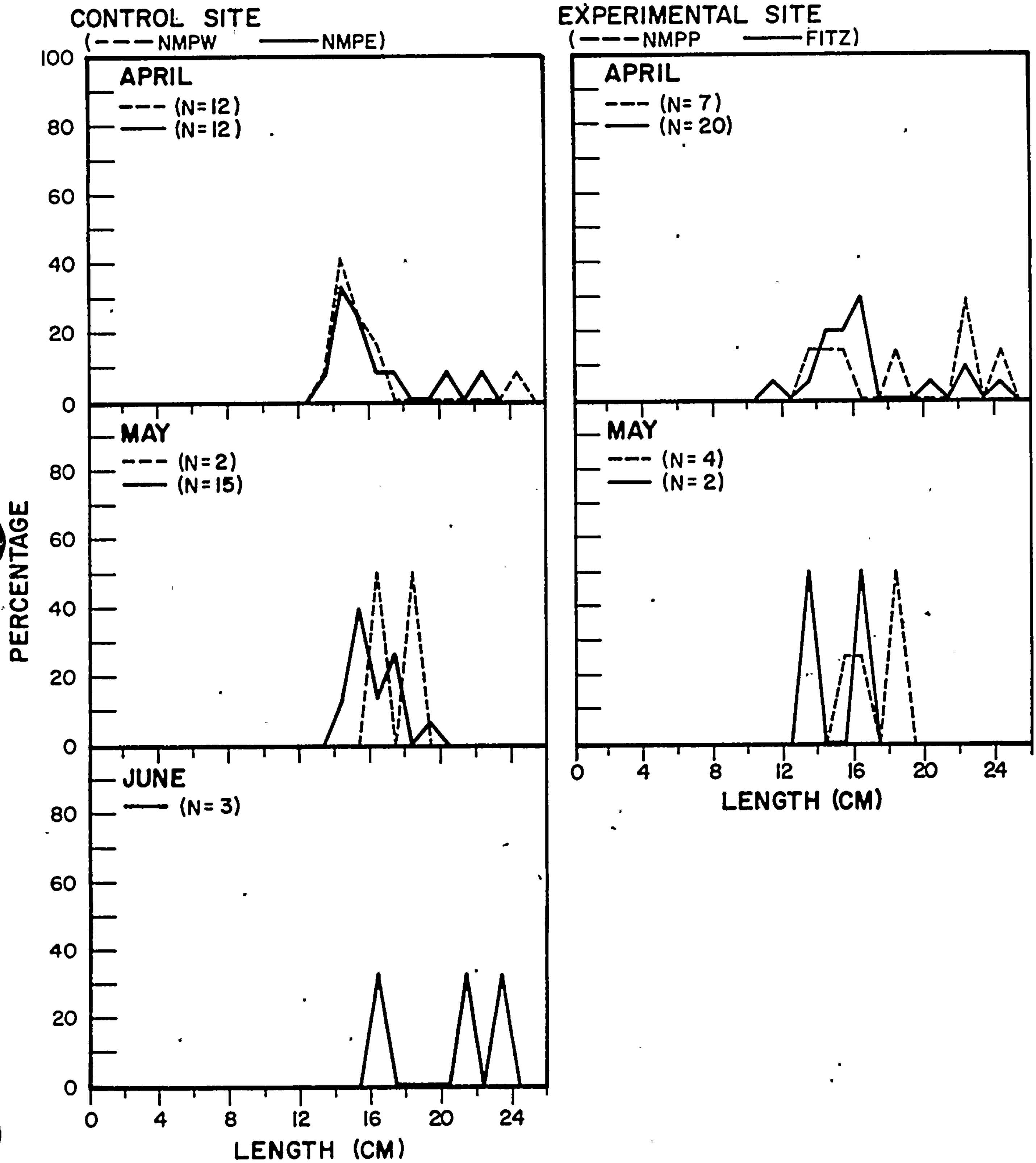
NIMILE POINT VICINITY — APRIL-DECEMBER, 1976



N = TOTAL NUMBER OF FISH ANALYZED FROM ALL GILL NET COLLECTIONS

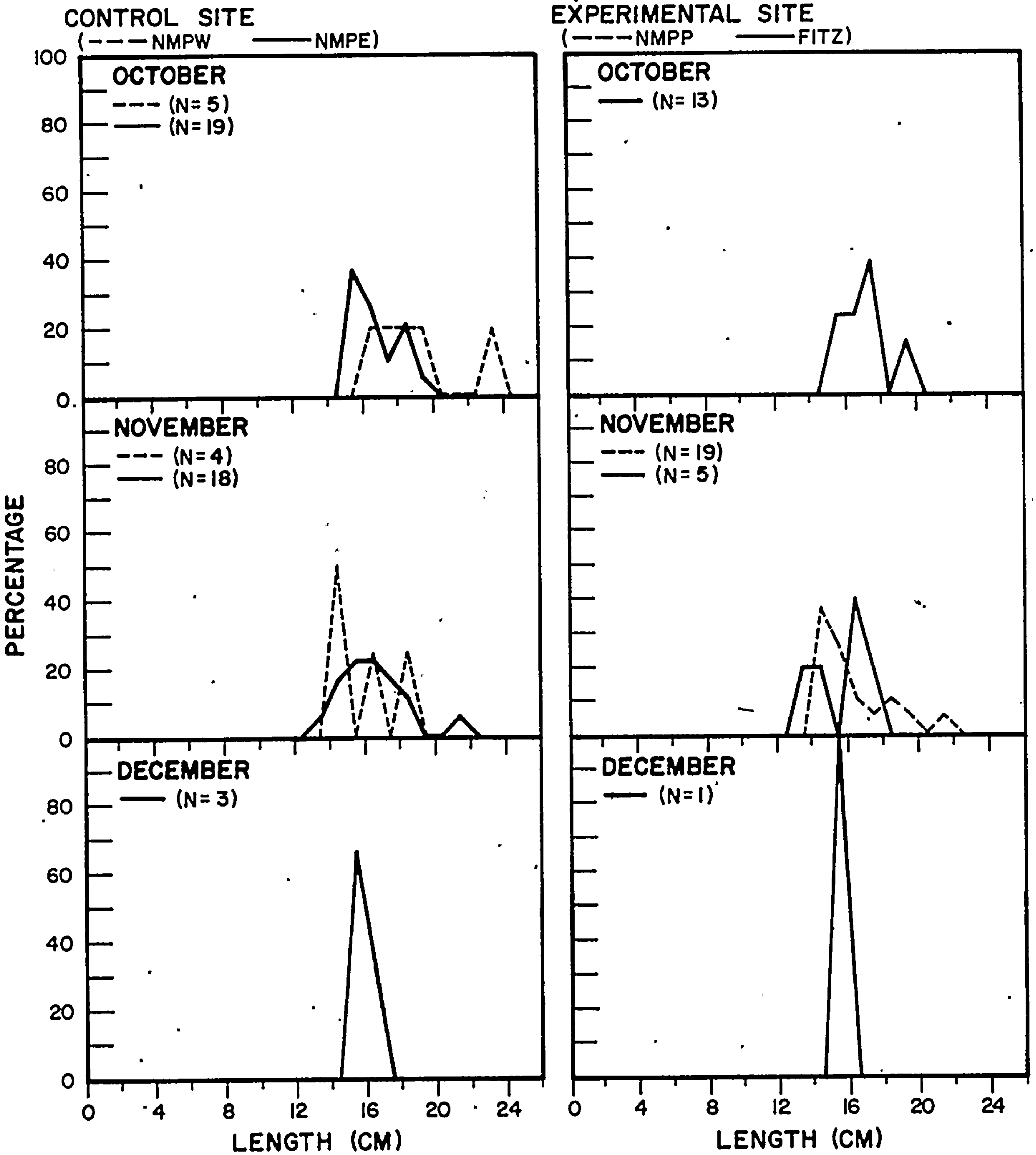
LENGTH FREQUENCY DISTRIBUTION FOR RAINBOW SMELT

15 - FT DEPTH CONTOUR NINE MILE POINT VICINITY APRIL — JUNE, 1976



LENGTH FREQUENCY DISTRIBUTION FOR RAINBOW SMELT

15-FT DEPTH CONTOUR
NINE MILE POINT VICINITY
OCTOBER — DECEMBER, 1976

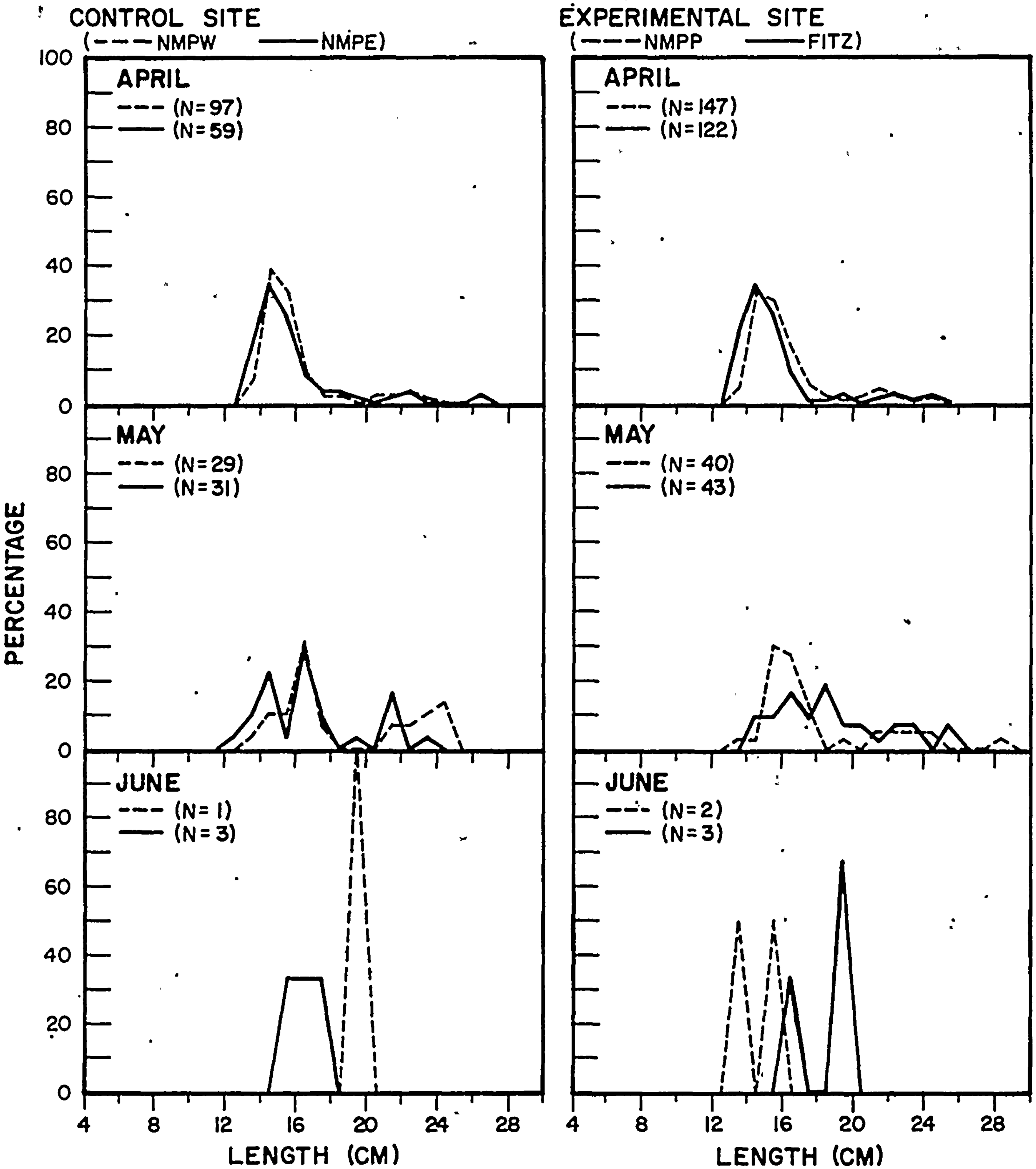


NOTE LENGTH INTERVALS

NO FISH ANALYZED JULY - SEPTEMBER

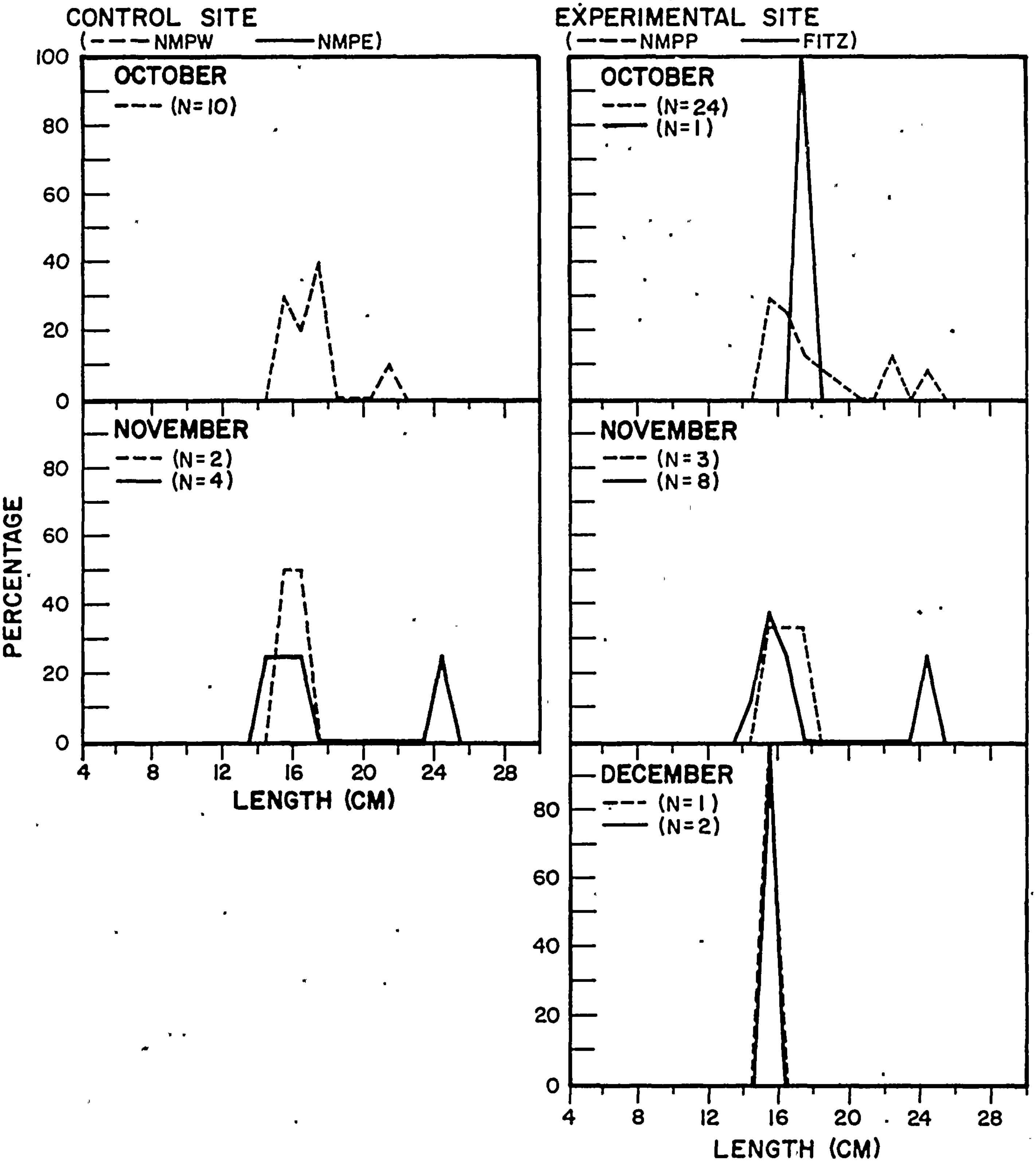
LENGTH FREQUENCY DISTRIBUTION FOR RAINBOW SMELT

40-FT DEPTH CONTOUR NINE MILE POINT VICINITY APRIL — JUNE, 1976



LENGTH FREQUENCY DISTRIBUTION FOR RAINBOW SMELT

40-FT DEPTH CONTOUR
NINE MILE POINT VICINITY
OCTOBER — DECEMBER, 1976



NOTE LENGTH INTERVALS

NO FISH ANALYZED JULY - SEPTEMBER

The collection during April and May along the 40-ft depth contour contained more fish and may be more representative than other months of the length frequency of the populations. During April the length frequency distribution appeared similar between the control and experimental sites (Figure VII-15). During May the length frequency distribution showed greater variability, but in general the same size categories were represented in the control as in the experimental areas.

c. White Perch

The monthly length frequency distributions for white perch collected in the Nine Mile Point vicinity are presented in Figure VII-16. From April to October larger (older) fish dominated in the collections, with yearling fish representing a minority of the catch. Recruitment to gill net catches of young-of-the-year white perch occurred during October and November.

d. Yellow Perch

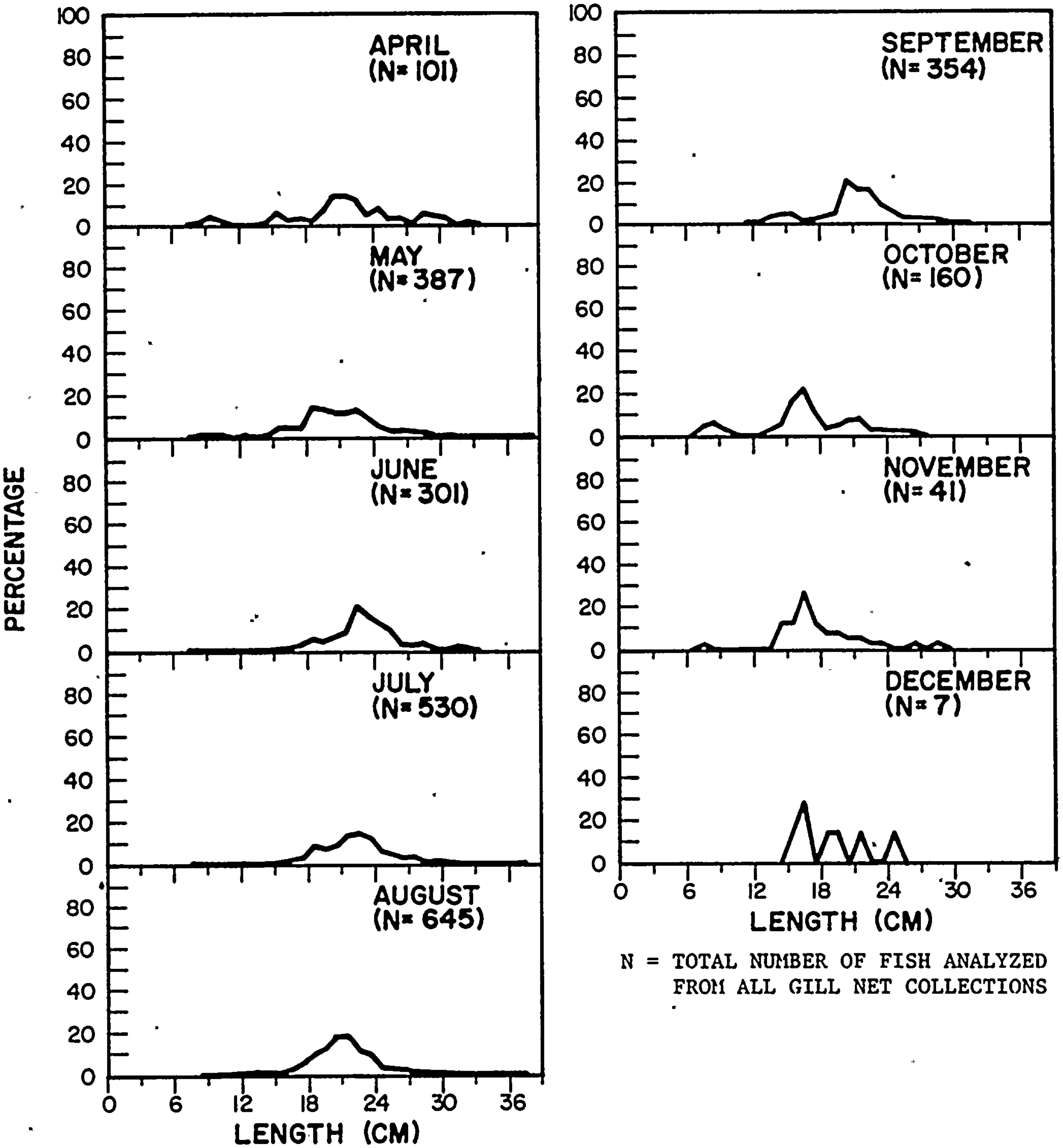
The length frequency distribution data for yellow perch are tabulated in Appendix VIIH. Yellow perch collected were generally at least 10 cm in total length, with the majority 10-20 cm. There was a definite progression in the modal length with time from July through December 1976.

4. Age Class Distribution

The age class distribution of a fish population is a function of natality (birth rate) and mortality, both of which are regulated by environmental factors. In an ideal situation where the population is neither increasing nor decreasing, natality is equal to mortality, and a fish population will assume a stable age class structure.

LENGTH FREQUENCY DISTRIBUTION FOR WHITE PERCH

NINE MILE POINT VICINITY — APRIL-DECEMBER, 1976



N = TOTAL NUMBER OF FISH ANALYZED FROM ALL GILL NET COLLECTIONS

Age was determined for alewife and rainbow smelt collected in the vicinity of Nine Mile Point during 1976 and the age distribution computed separately for the control and experimental area fish.

a. Alewife

The male alewife population was dominated by age class III at both experimental and control sites (Table VII-9), with no apparent difference observed in the percent frequency of this age class between experimental (43.7%) and control (45.2%) sites. These fish were also similar in mean length.

In contrast to the male population, female alewife were dominated by age class IV at both sites. Female alewife of age classes II, III, and VI occurred at both sites with similar frequencies. No apparent differences existed in the mean length of alewife taken from experimental and control sites for ages II through V.

b. Rainbow Smelt

Age class distribution of rainbow smelt indicated that males of age class III represented a significantly greater proportion than any other age class for males or any age class for females (Table VII-10); age class III males represented 85 and 88% at experimental and control sites, respectively. No appreciable size difference was apparent for male smelt from experimental or control sites.

Female rainbow smelt, like males, were dominated by age class III, which composed 59 and 57% at experimental and control sites, respectively. Females of age group IV and V were also

TABLE VII-9

AGE CLASS DISTRIBUTION OF ALEWIFE FROM NIGHT GILL NET COLLECTIONS

NINE MILE POINT VICINITY - 1976

I. MALES[a]

AGE CLASS	EXPERIMENTAL SITE[c] (N = 103)			CONTROL SITE[d] (N = 124)		
	% FREQUENCY	TOTAL LENGTH		% FREQUENCY	TOTAL LENGTH	
		MEAN	RANGE		MEAN	RANGE
I	2.9	12.07	11.0 - 14.1	0.8	11.30	-
II	27.2	13.39	11.8 - 16.9	13.7	13.72	12.0 - 16.8
III	43.7	13.97	12.2 - 17.1	45.2	14.66	11.7 - 17.7
IV	20.4	16.29	15.5 - 17.4	33.1	16.47	13.4 - 17.9
V	4.8	16.62	15.6 - 18.4	6.4	16.28	15.3 - 17.1
VI	1.0	17.10	-	0.8	22.00	-

II. FEMALES[b]

AGE CLASS	EXPERIMENTAL SITE[c] (N = 149)			CONTROL SITE[d] (N = 147)		
	% FREQUENCY	TOTAL LENGTH		% FREQUENCY	TOTAL LENGTH	
		MEAN	RANGE		MEAN	RANGE
I	0	-	-	0	-	-
II	8.0	14.70	10.9 - 17.3	8.2	13.98	11.5 - 17.5
III	26.2	15.37	13.0 - 17.7	28.6	15.67	12.5 - 18.8
IV	47.7	16.84	13.6 - 20.7	35.4	16.92	15.7 - 18.3
V	17.4	16.92	15.9 - 18.3	27.2	17.10	15.6 - 18.3
VI	0.7	16.80	-	0.7	23.00	-

[a]Collected 11 May - 22 Jun, surface and bottom gill nets

[b]Collected 11 May - 24 May, surface and bottom gill nets

[c]Experimental Site: gill nets, 15, 30, and 40 ft depth contours along NMPP and FITZ transects

[d]Control Site: gill nets, 15, 30, and 40 ft depth contours along NMPW and NMPE transects

- = Not applicable

TABLE VII-10

AGE CLASS DISTRIBUTION OF RAINBOW SMELT FROM NIGHT GILL NET COLLECTIONS[a]

NINE MILE POINT VICINITY - 1976

I. MALES

AGE CLASS	EXPERIMENTAL SITE[b] (N = 99)			CONTROL SITE[c] (N = 92)		
	% FREQUENCY	TOTAL LENGTH MEAN	TOTAL LENGTH RANGE	% FREQUENCY	TOTAL LENGTH MEAN	TOTAL LENGTH RANGE
I	0	-	-	0	-	-
II	4.0	14.13	12.4 - 15.1	6.5	13.80	12.9 - 14.8
III	84.9	15.09	13.5 - 17.7	88.0	14.87	13.0 - 16.9
IV	8.1	15.50	14.5 - 16.4	4.4	15.65	14.1 - 17.3
V	2.0	17.75	16.7 - 18.8	1.1	20.40	-
VI	1.0	20.40	-	0	-	-

II. FEMALES

AGE CLASS	EXPERIMENTAL SITE[b] (N = 117)			CONTROL SITE[c] (N = 127)		
	% FREQUENCY	TOTAL LENGTH MEAN	TOTAL LENGTH RANGE	% FREQUENCY	TOTAL LENGTH MEAN	TOTAL LENGTH RANGE
I	0	-	-	0	-	-
II	5.1	14.90	13.6 - 16.2	3.9	14.50	13.7 - 15.4
III	59.0	15.59	13.6 - 21.5	56.7	15.35	13.0 - 17.9
IV	9.4	16.04	14.6 - 17.0	20.5	16.41	14.3 - 21.9
V	23.9	21.62	16.2 - 24.5	15.0	21.37	16.0 - 24.9
VI	2.6	22.40	22.2 - 22.8	3.1	23.40	21.1 - 26.4
VII	0	-	-	0.8	26.70	-

[a]Collected 14 Apr - 24 May, surface and bottom gill nets

[b]Experimental Site: 15, 30, and 40 depth contours along NMPP and FITZ transects

[c]Control Site: 15, 30, and 40 depth contours along NMPW and NMPE transects

- = Not applicable

relatively abundant, age class IV at the control site (20.5%) and age class V at the experimental site (23.9%). No fish belonging to age class I were collected at either site. Size class distribution, i.e., mean total length, was similar among experimental and control sites for females, indicating similar age class distribution for both sexes of rainbow smelt at both sites.

5. Mortality Estimate Among Age Classes

The mortality estimates between age classes measure the number of fish lost per unit of the population per unit of time. Natural mortality is not uniform among different age classes. The analyses conducted in this section, however, assume that (1) survival and mortality are similar for each age class, and (2) the gill nets are sampling all age groups adequately and in proportion to their abundances in the lake, i.e., all ages are equally vulnerable to the fishing gear. This study also assumes that the population sampled is a single population, and that there is no immigration or emigration. When these conditions do not apply, the mortality estimates will be either negatively or positively biased. For example, a strong year class will tend to bias the mortality rate of older fish negatively, i.e., the mortality of older fish will appear greater than it really is.

Several methods have been developed to estimate mortality (or survival) rates in animal populations and are reviewed and summarized in Ricker (1975).

A simple way of estimating mortality rate is by comparing the number of fish which die between successive ages.

$$M = \left(1 - \frac{n_{t+1}}{n_t}\right) \times 100 \qquad (1)$$

where M = percent mortality

n_t = number of fish in age class t

n_{t+1} = number of fish in age class (t+1).

Because gill nets were used to collect alewife and rainbow smelt for the mortality study, and this method of capture was considered selective for age classes I and II and non-selective for age classes IV through VII, age classes I and II were eliminated from the analysis, and cumulative mortality estimates were determined.

Cumulative mortality for age groups IV and older would be compared to mortality at III according to the following formula:

$$M = 1 - \frac{n_4 + n_5 + n_6}{n_3 + n_4 + n_5 + n_6} \quad X\ 100 \qquad (2)$$

where n_3, n_4, n_5, and n_6 are the number of fish (or percent frequency) in age groups III, IV, V, and VI, respectively.

a. Alewife

Alewife mortality data are presented in Table VII-11, and include mortality due to all causes. Mortality between successive age classes of alewife increased from age III to age VI for males and from age IV to age VI for females at both the experimental and control sites.

TABLE VII-11

MORTALITY ESTIMATE AMONG AGE CLASSES OF ALEWIFE

NINE MILE POINT VICINITY - 1976

AGE CLASS	EXPERIMENTAL SITE[a]						CONTROL SITE[b]						SITES COMBINED	
	MALE[c]		FEMALE[d]		BOTH SEXES		MALE[c]		FEMALE[d]		BOTH SEXES			
	NO. ANALYZED	% MORT.	NO. ANALYZED	% MORT.	NO. ANALYZED	% MORT.	NO. ANALYZED	% MORT.	NO. ANALYZED	% MORT.	NO. ANALYZED	% MORT.	TOTAL ANALYZED	% MORTALITY
I	3	-	0	-	3	-	1	-	0	-	1	-	4	-
II	28	-	12	-	40	-	17	-	12	-	29	-	69	-
III	45	-	39	-	84	-	56	-	42	-	98	-	182	-
IV	21	53	71	-	92	-	41	27	52	-	93	5	185	-
V	5	76	26	63	31	66	8	80	40	23	48	48	79	57
VI	1	80	1	96	2	94	1	88	0	100	1	98	3	96

[a]Experimental Site: gill nets, 15, 30, and 40 ft depth contours along NMPP and FITZ transects

[b]Control Site: gill nets, 15, 30, and 40 ft depth contours along NMPW and NMPE transects

[c]Collected night 11 May - 22 Jun, surface and bottom gill nets

[d]Collected night 11 May - 24 May, surface and bottom gill nets

$$\text{Mortality} = \left[1 - \frac{\text{No. fish in age class (n+1)}}{\text{No. fish in age class n}}\right] \times 100$$

- = Not applicable

Assuming a constant survival rate for males and using equation (2), mortality of ages IV and older can be compared to mortality at age III. Thus cumulative mortality for males of age IV and older was 63% and 53% for experimental and control, respectively.

$$M = 1 - \frac{21 + 5 + 1}{45 + 21 + 5 + 1} \times 100 = 63\% \text{ for experimental males,}$$

and

$$M = 1 - \frac{41 + 8 + 1}{56 + 41 + 8 + 1} \times 100 = 53\% \text{ for control males.}$$

Cumulative mortality for female alewife of age class V and older was related to age class IV in the same manner as above; mortality estimates of 73 and 57% were obtained for experimental and control, respectively.

b. Rainbow Smelt

Mortality between age classes for male and females smelt collected in April and May were estimated in a manner similar to that for alewife; the results are summarized in Table VII-12. Females of age class IV did not appear to be adequately represented at either the experimental or the control site and no males of age class VI were collected at the control sites.

Mortality for males between age classes IV and V was 75% for both experimental and control sites. Assuming a constant survival rate, cumulative mortality for males of age class IV and older was 88% at experimental site and 94% at control site.

TABLE VII-12

MORTALITY ESTIMATE AMONG AGE CLASSES OF RAINBOW SMELT[a]

NINE MILE POINT VICINITY - 1976

AGE CLASS	EXPERIMENTAL SITE[b]						CONTROL SITE[c]						SITES COMBINED	
	MALE		FEMALE		BOTH SEXES		MALE		FEMALE		BOTH SEXES			
	NO. ANALYZED	% MORT.	NO. ANALYZED	% MORT.	NO. ANALYZED	% MORT.	NO. ANALYZED	% MORT.	NO. ANALYZED	% MORT.	NO. ANALYZED	% MORT.	TOTAL ANALYZED	% MORTALITY
I	0	-	0	-	0	-	0	-	0	-	0	-	0	-
II	4	-	6	-	10	-	6	-	5	-	11	-	21	-
III	84	-	69	-	153	-	81	-	72	-	153	-	306	-
IV	8	90	11	84	19	88	4	95	26	64	30	80	49	84
V	2	75	28	-	30	-	1	75	19	27	20	33	50	-
VI	1	50	3	89	4	87	0	100	4	79	4	80	8	84
VII	0	100	0	100	0	100	0	-	1	75	1	75	1	88

[a]Collected night 14 Apr - 24 May, surface and bottom gill nets

[b]Experimental Site: gill nets, 15, 30, and 40 ft depth contours along NMPP and FITZ transects

[c]Control Site: gill nets, 15, 30, and 40 ft depth contours along NMPW and NMPE transects

$$\text{Mortality} = \left[1 - \frac{\text{No. fish in age class (n+1)}}{\text{No. fish in age class n}}\right] \times 100$$

- = Not applicable

The mortality between females of age V and VI was 89% for experimental and 79% for control sites. Cumulative mortality for females age IV and older of experimental and control females was 62 and 41% morality, respectively.

6. Feeding

a. Smallmouth Bass

A total of 35 stomachs were examined for food preference; 10 of these fish were collected at the experimental site and 25 fish at the control site; all fish were adults over 300 mm in length. The small sample size, where only 34% of all stomachs examined had food particles, did not facilitate characterization of the progression in food habits with age (size). In addition, since all fish examined were collected by gill nets, and fish were not necessarily gillnetted at time of feeding, food particles were partially digested.

The diet of adult smallmouth bass from experimental and control sites consisted essentially of fish and crayfish. Fish composed about 90% by weight of the stomach contents of smallmouth bass collected at both sites; fish were present in 75 and 88% of the stomachs from experimental and control sites, respectively. Of the fish identified in smallmouth bass stomachs, alewife made up 40% by weight; these were identified in stomachs from fish collected at the experimental site (Table VII-13).

Two species of crayfish, Orconectes propinquus propinquus and Cambarus robustus, were recovered from the stomachs of smallmouth bass. Crayfish made up a small portion of the stomach contents of fish collected at both the experimental (11% by weight) and control (8% by weight) sites.

TABLE VII-13

GUT CONTENTS OF SMALLMOUTH BASS

NINE MILE POINT VICINITY - AUGUST 1976

TAXON	EXPERIMENTAL[a] n = 10(6)					CONTROL[b] n = 25 (17)				
	NUMBER PRESENT[c]	DRY WEIGHT[d] mg	DRY WEIGHT[d] %	OCCURRENCE[e] NO. GUTS[e]	OCCURRENCE[e] %	NUMBER PRESENT[c]	DRY WEIGHT mg	DRY WEIGHT %	OCCURRENCE[e] NO. GUTS[e]	OCCURRENCE[e] %
PISCES										
Alosa pseudoharengus	1	1839.4	40.3	1	25.0					
UID (head missing)	2	1520.0	33.3	1	25.0	1	2334.6	39.2	1	12.5
UID (vertebral column)	2	711.4	15.6	1	25.0	6	3157.2	53.0	6	75.0
TOTAL (Pisces)	5	4070.8	89.2	3	75.0	7	5491.8	92.2	7	87.5
ARTHROPODA										
Crustacea										
Decapoda										
Orconectes propinquus propinquus	1	165.5	3.6	1	25.0	1	464.3	7.8	1	12.5
Cambarus robustus	1	329.0	7.2	1	25.0					
TOTAL (Decapoda)	2	494.5	10.8	2	50.0	1	464.3	7.8	1	12.5
TOTAL (All Prey Items)	7	4565.3	100.0	-	-	8	5956.1	100.0	-	-

[a]Experimental Site
NMPP - 15 ft Bottom Gill Net: 4 fish
FITZ - 15 ft Bottom Gill Net: 6 fish

[b]Control Site
NMPE - 15 ft Bottom Gill Net: 25 fish

[c]Number present = number of prey species recorded in all stomachs analyzed

[d]Dry weight = dry weight of that prey species in all stomachs analyzed

[e]Occurrence = number of guts in which a particular prey species occurs

n = Total number of fish analyzed (number of empty stomachs)
- = Not applicable

b. White Perch

Twenty white perch were examined from the Nine Mile Point vicinity for feeding habits in 1976; the sample size was insufficient to permit a comparison between experimental (only 6 fish contained food particles) and control (11 fish contained food) sites (Appendix VIIG). White perch analyzed for this study ranged in total length from approximately 20.0 to 30 cm for both sites.

The major food items (by dry weight) identified from fish collected at the experimental site were fish (11%), the amphipod *Gammarus fasciatus* (84%), and chironomids (3.4%). Stomachs collected from the control site yielded the following major food items; fish (26% by dry weight), *Gammarus fasciatus* (28%), and *Pontoporeia affinis* (37%).

E. OTTER TRAWL AND YANKEE TRAWL COMPARISON

On 28-29 June, a special fish sampling program was conducted at the NMPE transect to compare the fishing efficiency of a Yankee trawl and the otter trawl which has been used by LMS for fish collections in the Nine Mile Point vicinity since 1973. Samples were taken at the 40 and 60-ft depth contours at NMPE transect; the nature of the bottom configuration precluded the use of the Yankee trawl at other transects.

Catch per unit effort was recorded as number/1000 m^3 or number/acre; estimates were based on net dimensions and duration of towing (approximately 15 minutes) and the assumption of 100% trawl efficiency. The bottom area spanned by the Yankee trawl was 40% greater than that sampled by the otter trawl and the water volume fished was twice as great as that of the otter trawl.

1. Catch Per Acre

Number collected/acre of selected species and for all fish collected was estimated for day and night otter and Yankee trawl collections (Appendix VIIC-1). Catch/acre was calculated for each run, and for the mean of the three replicates.

a. Alewife

Number of alewife collected/acre by both trawl nets and at both sites was greater during the daylight hours than at night. An average of 295.4 fish/acre (range 67-558) and 410.9 fish/acre (range 315-571) were collected by the Yankee trawl at the 40 and 60-ft stations, respectively, during the daylight hours. The corresponding values for otter trawl were 2.2 (range 0-5) and 5.0 (range 1-8) fish/acre, respectively. The Yankee trawl was also apparently more efficient than the otter trawl during the night collections; mean catch/acre of 32.3 and 50.5 was recorded for the Yankee trawl as compared to 0.9 and 1.2 fish/acre for the otter trawl at the 40 and 60-ft depth contour, respectively.

b. Rainbow Smelt

Most rainbow smelt were caught during the daylight hours by both gears. Rainbow smelt, like alewife, exhibit a diel distribution. being less abundant near the bottom at night (LMS 1976a). This accounts for the smaller catch/acre at night than during the day for both otter trawl and Yankee trawl nets, which are primarily bottom gear.

More rainbow smelt were collected per unit effort by the Yankee trawl at the 40 and 60-ft stations than by the otter trawl. The mean numbers of rainbow smelt collected/acre at the 40-ft station during day and night collections were 79.2 and 9.4 fish,

respectively, as compared to 12.5 and 1.2 fish/acre for the otter trawl. Catch/acre of rainbow smelt estimated from the Yankee trawl was approximately three times greater at the 60-ft station than at the 40-ft station for both day and night collections; this trend was not evident with the otter trawl.

c. Spottail Shiner

Catch/acre data for spottail shiner collected by the otter and the Yankee trawls are summarized in Appendix VIIC-1. Catch/acre for day collections was greater for the Yankee trawl than the otter trawl at both the 40 and 60-ft depth contours. No spottail shiner were caught by the Yankee trawl at the 40-ft station, nor by the otter trawl at the 60-ft station; the remaining low catch/effort precludes any further comparison.

d. Johnny Darter

In contrast to alewife, rainbow smelt, and spottail shiner, catch/acre of johnny darter estimated for the otter trawl at the 40-ft depth contour exceeded that of the Yankee trawl for night collections; this trend was less evident for day collections. More johnny darter were collected at night than during the day by the otter trawl at the 40-ft station; night collections yielded a range of 8-33 fish/acre.

The reverse trend was observed at the 60-ft station; day collections yielded more fish than night collections. More johnny darters were also collected in the daylight hours with the Yankee trawl.

e. Threespine Stickleback

Catch/acre of threespine stickleback was generally greater for the Yankee trawl than for otter trawl at both depth contours during both day and night collections. Catch/acre was greater for day collections than night collections at both the 40 and 60-ft contours, except in one replicate when the night collection exceeded the day.

f. All Fish

In general, the Yankee trawl collected more fish than the bottom otter trawl during both day and night and at the 40 and 60-ft depth contours. When all fish collected in day collections were considered, the ratio of Yankee trawl catch/acre to that of the otter trawl was approximately 17:1 for both 40 and 60-ft stations. This ratio was approximately 2:1 and 26:1 for night collections at the 40-ft and 60-ft stations, respectively.

2. Catch Per Thousand Cubic Meters

The number of fish collected/1000 m^3 was estimated for bottom otter trawl and Yankee trawl, for alewife, rainbow smelt, spottail shiner, johnny darter, threespine stickleback, and for all species combined (Appendix VIIC-2), for day-night and at two depth contours, 40-ft and 60-ft.

The ratio of the catch/effort between the two types of gears changed by a constant factor for all comparisons discussed above; the Yankee trawl apparently fished more effectively than the otter trawl at the 40 and 60-ft depths along NMPE transect.

F. CONCLUSIONS

- A total of 82,180 fish were collected in the Nine Mile Point vicinity by all three types of gear. Alewife, rainbow smelt, and spottail shiner comprised approximately 80% of all fish collected in 1976. The representative important species - alewife, rainbow smelt, and yellow perch - were collected in all gears, while threespine stickleback were collected only in seines and trawls, smallmouth bass in night Yankee trawls and bottom gill nets, and brown trout in seines, day Yankee trawls and gill nets, and coho salmon in seines and bottom gill nets.

- An increase was apparent in the number of gizzard shad collected in seines during 1976 compared to 1975, and the number of fish collected was higher at NMPP transect than the other three transects.

- No consistent trend in spatial distribution of alewife, brown trout, and rainbow smelt was observed in trawl collections in the Nine Mile Point vicinity. On the average, however, more fish were collected by the Yankee trawl at the 40 and 60-ft depths along NMPE transect than by the otter trawl.

- No consistent trend in spatial distribution was observed for alewife, yellow perch, white perch, spottail shiner and smallmouth bass collected during the day at the 15-ft depth contour. However, along the 40-ft contour a trend was evident for an increase in the number of alewife, spottail shiner, and white perch caught in gill nets at either one or both plume stations (FITZ and NMPP).

- Gonad maturation of fish collected from the 15 through 40-ft depth contours in the Nine Mile Point vicinity indicated a peak in maturity for yellow perch in April, for white perch in April/May,

and fewife in June. The small sample size precluded interpretaof the differences in maturation of fish collected at the eiental and control sites.

- Fecundfor alewife and rainbow smelt was variable among age classl between fish collected at the experimental and control sites.

- The l frequency distribution of alewife collected at the 15 and 4 contours were similar, except during July and August when y fish were relatively more abundant at the 40-ft control sites at the experimental sites, and during May, when proportionamore young fish were collected from the FITZ-15-ft statiMales of age class III and females of age class IV dominathe gill net collections at both the experimental and controtes; no apparent difference was observed in the mean lengthalewife between sites. There was no apparent difference in ler frequency distribution of rainbow smelt between the experinal and control sites at either the 15 or 40-ft contour; males females of age class III dominated the collections.

- Cumulat mortality for females of rainbow smelt of age class IV and olwas greater for fish collected at the experimental site than ae control site; the reverse trend was observed for males. mulative mortality for both male and female alewife was greater the experimental site compared to the control site; the compari was made for males of age IV and older and females of age V alder.

- Stomach alyses on fish gillnetted at experimental and control sites at the 15-ft depth contour indicated that the diet of smallmou bass consisted primarily of fish and crayfish. The major fc items identified from white perch collected at one or

both sites were amphipods (Gammarus fasciatus or Pontoporeia affinis), fish, and chironomids.

- In general, the Yankee trawl collected more fish than the bottom otter trawl at the 40 and 60-ft depth contours along NMPE transect during both day and night collections. The greatest difference in the fishing efficiency of these two types of gear, based on number of fish per acre, was observed for alewife. The smallest difference in fishing efficiency was observed for johnny darter.

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VIII. ENTRAINMENT

The 1976 entrainment program included the collection and analysis of samples from the intake and discharge of the James A. FitzPatrick Nuclear Power Plant and the Nine Mile Point Nuclear Station Unit 1, and from the Nine Mile Point vicinity of Lake Ontario.

The materials and methods used in the 1976 entrainment programs at Nine Mile Point Nuclear Station Unit 1 and James A. FitzPatrick Nuclear Power Plant, are presented in Appendix II. The following changes were initiated in the 1976 sampling program compared to the 1975 program:

- Phytoplankton and zooplankton were identified and enumerated from the FitzPatrick discharge samples.

- Only four ichthyoplankton collections were conducted for each date in 1976, compared to eight in 1975. The sampling frequency was further reduced at the FitzPatrick plant to only one day and one night sample per date beginning with the 22 September collection.

- Gammarus was the only macrozooplankter identified from the FitzPatrick ichthyoplankton samples in 1976, as opposed to all macrozooplankton taxa in 1975. Ichthyoplankton was the only planktonic form analyzed in the entrainment samples at Nine Mile Point plant in 1976; both macrozooplankton and ichthyoplankton were analyzed in 1975.

- Samples were collected at the FitzPatrick plant to evaluate the survival of phytoplankton, zooplankton, macrozooplankton, and ichthyoplankton subjected to the effects of the plant cooling water systems.

Plant operating conditions during the regular entrainment sampling program at FitzPatrick and Nine Mile Point plants (Table VIII-1) are presented in Tables VIII-2 and VIII-3. FitzPatrick operating history during the viability sampling program is presented in Tables VIII-4 and VIII-5.

A. JAMES A. FITZPATRICK NUCLEAR POWER PLANT

1. Introduction and Materials and Methods

In general, samples for estimating the abundance of plant-entrained organisms were collected from the intake or discharge bays of the FitzPatrick plant. Samples for viability analysis were collected from the intake and discharge bays, as well as from the discharge plume and in the vicinity of the intake in the lake. In addition to examining the effects of passage through the plant cooling system, the study also attempted to evaluate the effects of entrainment into the submerged jet in the lake. This was done both by collecting samples from the lake plume and by subjecting in-plant-collected organisms to time-temperature exposures similar to those of plume-entrained organisms.

The effects of passage through the plant cooling system were evaluated from the intake and discharge bay samples. All samples collected from the discharge bay for each program were held at the discharge temperature for an additional period equivalent to the estimated travel time from the collection point to the diffuser ports. After the holding time, the sample temperature was reduced by a variety of methods, depending on the individual program, to simulate the temperature reduction occurring in the plume. Phytoplankton discharge samples were put in an ice bath until the sample temperature dropped to within 2-3 F of the intake temperature. The time required to reduce the temperature to within 2-3 F of the intake temperature using this method was greater than the actual

TABLE VIII - 1

REGULAR ENTRAINMENT SAMPLING PROGRAM

NINE MILE POINT NUCLEAR STATION UNIT 1 AND
JAMES A. FITZPATRICK NUCLEAR POWER PLANT-1976

DATE	NINE MILE POINT	JAMES A. FITZPATRICK			
	ICHTHYOPLANKTON	PHYTOPLANKTON	ZOOPLANKTON	GAMMARUS	ICHTHYOPLANKTON
7 JAN					DN
14.				DN	DN
4 FEB					DN
18				DN	DN
3 MAR					DN
17				DN	DN
14 APR	DN			DN	DN
28	DN	D	D		DN
5 MAY	DN				DN
12	DN			DN	DN
19	DN				DN
26	DN	D	D		DN
2 JUN	DN				DN
9	DN				DN
16	DN			DN	DN
23	DN	D	D		DN
30	DN				DN
3 JUL	DN				
7	DN				DN
14	DN			DN	DN
21	DN				DN
28	DN				DN
29		D	D		
4 AUG	DN				DN
11	DN				DN
18	DN			DN	DN
25	DN	D	D		DN
1 SEP	DN				DN
8	DN			DN	DN
22	DN	D	D		DN
6 OCT	DN			DN	DN
20	DN	D	D		DN
3 NOV				DN	DN
17		D	D		DN
1 DEC					DN
15				DN	DN
19			D		
20		D			

D = Day collection
N = Night collection

TABLE VIII-2

PLANT OPERATING CONDITIONS (ELECTRICAL OUTPUT) DURING REGULAR ENTRAINMENT PROGRAM

NINE MILE POINT NUCLEAR STATION UNIT 1 AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

DATE[a]	NINE MILE POINT			JAMES A. FITZPATRICK		
	NO. CIRC. WATER PUMPS	PLANT LOAD[b] (MWe)		NO. CIRC. WATER PUMPS	PLANT LOAD[b] (MWe)	
		MEAN	RANGE		MEAN	RANGE
7 JAN	NS	-	-	2	579.8	579-581
14	NS	-	-	3	800.7	799-803
4 FEB	NS	-	-	1	0	0
18	NS	-	-	1	0	0
3 MAR	NS	-	-	1	0	0
17	NS	-	-	2	0	0
14 APR	2	0	0	3	704.2	702-706
28	2	526.0	524-528	3	734.0	732-738
5 MAY	2	564.0	563-566	3	740.8	740-741
12	2	590.0	582-593	3	740.1	738-742
19	2	471.8	451-487	3	730.5	721-741
26	2	605.5	594-613	3	780.2	778-781
2 JUN	2	596.2	591-603	3	776.2	772-778
9	2	598.8	596-600	3	720.2	678-752
16[c]	2	604.8	604-605	3	780.2	775-785
23	2	150.2	0-601	3/2[d]	288.5	0-778
30	2	599.3	597-601	2	14.8	0- 59
3 JUL	2	597.0[f]	-	NS	-	-
7	2	493.3	492-495	3	769.8	768-772
14[c]	2	206.5	0-305	2	0	0
21	2	539.2	525-546	3/2[d]	229.5	0-772
28	2	531.5	530-532	2	221.0	0-492
4 AUG	2	543.2	538-546	3	745.8	743-747
11	2	547.8	539-552	3	771.5	770-774
18[c]	2	180.8	0-361	3	793.2	791-794
25	2	537.8	536-540	3	789.0	787-791
1 SEP	2	544.0	543-545	3	625.0	596-654
8[c]	2	548.8	548-549	3	784.0	780-787
22	2	560.8	558-563	3	733.5	733-734
6 OCT[c]	2	574.0	569-578	3	727.5	727-728
20	2	554.2	553-555	2	534.0	533-535
3 NOV	NS	-	-	3	770.5	770-771
17	NS	-	-	3	639.5	563-716
1 DEC	NS	-	-	3	737.0	736-738
15	NS	-	-	3/2[e]	473.5	210-737

[a] Ichthyoplankton collections: 1100, 1700, 23, and 0500 hrs at both plants prior to 22 Sep; only 1100 and 2300 hr collections at FitzPatrick from 22 Sep - 15 Dec

[b] From LMS field data taken at time of collection

[c] *Gammarus* enumeration also at FitzPatrick

[d] 3 pumps: 1100 hr sample; 2 pumps: 1700, 2300, 0500 hr samples

[e] 3 pumps: 1100 hr sample; 2 pumps: 2300 hr sample

f 1100 hr sample

- = Not applicable
NS = No sample

TABLE VIII-3

PLANT OPERATING CONDITIONS (ΔT) DURING REGULAR ENTRAINMENT SAMPLING PROGRAM

NINE MILE POINT NUCLEAR STATION UNIT 1 AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

DATE[c]	ΔT (°C)	
	NINE MILE POINT[a]	JAMES A. FITZPATRICK[b]
7 JAN	NS	16.7
14	NS	17.8
4 FEB	NS	7.2[e]
18	NS	2.2[e]
3 MAR	NS	5.0[e]
17	NS	0.6[e]
14 APR	0.4[e]	15.6
28	13.8	16.1
5 MAY	14.6	16.7
12	14.9	16.7
19	12.5	16.1
26	15.8	17.8
2 JUN	15.6	17.8
9	15.9	15.6
16[d]	16.4	17.2
23	16.8[e]	10.0[e]
30	17.2	5.0[e]
3 JUL	15.0	NS
7	14.3	17.2
14[d]	UNIT DOWN	0.0[e]
21	16.2	11.1[e]
28	16.2	4.4[e]
4 AUG	16.1	16.1
11	16.2	16.7
18[d]	3.7[e]	17.8
25	16.1	17.8
1 SEP	16.6	17.2
8[d]	16.6	17.8
22	16.7	16.7
6[d] OCT	16.0	16.1
20	16.2	15.6
3 NOV	NS	17.2
17	NS	15.0
1 DEC	NS	16.7
15	NS	17.2

[a] Mean Discharge - Mean Intake Temperature (°C) for calendar day listed, from Nine Mile Point Unit #1 "401" Monthly Report (Niagara Mohawk Power Corp., 1976)

[b] Mean Discharge - Mean Intake Temperature (°C) for calendar day listed, from James A. FitzPatrick Nuclear Power Plant "401" Monthly Report (Niagara Mohawk Power Corp., 1976)

[c] Collections: 1100, 1700, 2300, and 0500 hrs at both plants 7 Jan - 8 Sep; 1100 and 2300 hr, 22 Sep - 15 Dec

[d] Gammarus enumeration also at FitzPatrick

[e] Plant off-line for some portion or entire day

UNIT DOWN = Plant off-line; no temperature data available

NS = No sample

TABLE VIII-4

PLANT OPERATING CONDITIONS (ELECTRICAL OUTPUT) DURING VIABILITY SAMPLING PROGRAMS
JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

			PLANT LOAD (MWe)																					
			PLANT VIABILITY								SIMULATIONS								LAKE VIABILITY					
		NO. CIRC.	PHYTO-PLANKTON		ZOO-PLANKTON		GAMMARUS		ICHTHYO-PLANKTON		PHYTO-PLANKTON		ZOO-PLANKTON		GAMMARUS		ICHTHYO-PLANKTON		PHYTO-PLANKTON		ZOO-PLANKTON		ICHTHYO-PLANKTON	
DATE	DAY/NIGHT	WATER PUMPS	R-1	R-2	R-1	R-2	R-1	R-2	R-1	R-2	R-1	R-2	R-1	R-2	R-1	R-2	R-1	R-2	R-1	R-2	R-1	R-2	R-1	R-2
14 APR	D	3	703	703	703	703																		
	N	3	706	706	704	704																		
28	D	3	706	706	737	737	740	740	740	740														
	N	3	732	732	732	732	732	732	732	732														
12 MAY	D	3	737	737	738	738	738	738	738	738	737	737	739	739	739[a]	739[a]	739[a]	739[a]						
	N	3	739	739	741	741	739[b]	739[b]	739[b]	739[b]	739	739	741	741	741	741	741	741						
26	D	3	783	783	782	782	782[c]	782[c]	782[c]	782[c]									782	782	782	782	NA	NA
	N	3	780	790	781	781	781	781	781	781	780[d]	780[d]	781	781	781	781	781	781						
9 JUN	D	3	770	770	654	654	678	678	678	678	770	770	654	654									678	678
	N	3	777	777	741	741	741	741	741	741	777	777	741	741									741	741
23	D	3	778	778	778	778[e]	778	778	778	778									NA	NA	782	782	775	775
28	N	3	778	778	778	778	778	778	778	778	778	778	778	778			778	778					778	778
20 JUL	D	3	NA	NA	NA	NA			NA	NA	NA	NA	NA	NA			NA	NA					NA	NA
	N	3	748	748	754	759	754	754	754	754	753	753	759	763	754	754	754	759					NA	NA
29	D	3	539	539	541	541			539	539[f]									541	541	541	541	NA	NA
	N	3	613	613	613	614	613	613	613	613	613	613	617	617	NA	NA	NA	NA					NA	NA
11 AUG	D	3	773	773	772	772			772	772	772	772	772	772									772	772
	N	3	768	768	770	772	770	770	770	770	770	770	771	771	770	770	770	770					770	770
25	D	3	791	791	790	790			791	791[g]									791	791	791	791	790	790
	N	3	790	790	790	790	789	789[h]	789	789[h]	789	789	788	788	787	787	787	787					789	789
8 SEP	D	3	786	786	787	787			787	787	786	787	787	786			787	787						
	N	3	780	780	780	781	780	780	780	780	780	780	781	782	781[i]	781[i]	781[i]	781[i]						
22	D	3	734	734	735	735			734	734	734	734	734	734			735	735						
	N	3	733	733							733	727												
27	N	3			734	734	734	734	734	734			735	735	734	734	734	734						
6 OCT	D	3	728	728	728	728					728	728	728	728										
	N	3	728	728	729	729					729	727	727	727										
20	D	2	534	534	533[j]	533[j]													537	537	537	537		
	N	2	534	534	535	536	535	535	535	535	533	533	536	536	535	535	535	535						
3 NOV	D	3	770	770	770	770					771	771	770	770										
	N	3	770	770	770	770					769	769	769	769										
17	D	3	646	646	661	664					653	653	664	NA										
	N	3	706	706	716	741	706	706[k]	706	706[k]	697	697	741	740	741	741	741	741						
1 DEC	D	3	736	736	735	735					736	736	736	736										
	N	3	738	738	738	739					739	739	739	NA										
9	N	3	739	739							739	739												
10	D	3	738	738																				
15	D	3	737	737							738	738												
19	D	3			587	591							594	594										
	N	3	623	623	630	634	630	630	630	630	619	619	635	635	630[m]	630[m]	630[m]	630[m]						

Plant loads from LMS viability sample history sheets and impingement field data sheets. Loads listed under plant viability are for intake and discharge samples unless otherwise noted. Loads listed under simulation are for 2° and 3° unless otherwise noted.

[a] 2° Simulation = 739, 3° Simulation = 738
[b] Intake = 739, Discharge = 741
[c] Intake = 782, Discharge = 781
[d] 2° Simulation = 780, 3° Simulation = 781
[e] Intake = 778, Discharge = 782
[f] Intake = 539, Discharge = 541
D = Day
N = Night

[g] Intake = 791, Discharge = 790
[h] Intake = 789, Discharge = 790
[i] 2° Simulation = 781, 3° Simulation = 782
[j] Intake = 533, Discharge = 537
[k] Intake = 706, Discharge = 716
[m] 2° Simulation = 630, 3° Simulation = 634
NA = Not available

TABLE VIII-5

PLANT OPERATING CONDITIONS (ΔT^{a}) DURING VIABILITY SAMPLING PROGRAMS

JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

			PLANT VIABILITY								SIMULATIONS								LAKE VIABILITY					
			PHYTO-PLANKTON[b]		ZOO-PLANKTON[b]		GAMMARUS[c]		ICHTHYO-PLANKTON[c]		PHYTO-PLANKTON[b]		ZOO-PLANKTON[b]		GAMMARUS[c]		ICHTHYO-PLANKTON[c]		PHYTO-PLANKTON		ZOO-PLANKTON		ICHTHYO-PLANKTON	
DATE	DAY/NIGHT	NO. CIRC. WATER PUMPS	TIME[d]	ΔT	TIME[d]	ΔT	TIME[d]	ΔT	TIME[d]	ΔT	TIME[d]	ΔT	TIME[d]	ΔT	TIME[d]	ΔT	TIME[d]	ΔT	TIME[d]	ΔT	TIME[d]	ΔT	TIME[d]	ΔT
14 APR	D	3	1202	13.5	1130	14.0																		
	N	3	2254	13.6	2200	13.7																		
28	D	3	1311	14.6	1200	14.6	1400	14.5	1400	14.5														
	N	3	0132[e]	13.4	0045[e]	13.4	2300	13.9	2300	13.9														
12 MAY	D.	3	0958	14.4	1120	14.4	1038	14.0	1038	14.0	0958	14.4	1120	14.4	1038	14.0	1038	14.0						
	N	3	2225	14.6	2400	14.5	2325	14.4	2325	14.4	2225	14.6	2400	14.5	2325	14.4	2325	14.4						
26	D	3	1012	15.5	1000	14.4	1100	15.8	1100	15.8									1012	15.5	1000	14.4	1100	15.8
	N	3	2144	15.2	2400	14.4	2300	15.6	2300	15.6	2144	15.2	2400	14.4	2300	15.6	2300	15.6					2300	15.6
9 JUN	D	3	1021	12.9	1130	12.4	1100	13.1	1100	13.1	1021	12.9	1130	12.4									1100	13.1
	N	3	2145	14.3	2300	14.3	2300	15.0	2300	15.0	2145	14.3	2300	14.3									2300	15.0
23	D	3	1018	15.8	1100	15.5	1100	16.1	1100	16.1									1018	15.8	1100	15.5	1100	16.1
28	N	3	2143	NA	2245	15.6	2300	15.5	2300	15.5	2143	NA	2245	15.6									2300	15.5
20 JUL	D	3	1019	14.2	1200	14.2			1045	14.6	1019	14.2	1200	14.2									1045	14.6
	N	3	2149	14.8	2305	15.1	2245	15.0	2245	15.0	2149	14.8	2305	15.1	2245	15.0							2245	15.0
29	D	3	1016	13.6	1200	14.0			1045	13.8									1016	13.6	1200	14.0	1045	13.8
	N	3	2142	12.0	2320	12.2	2245	11.9	2245	11.9	2142	12.0	2320	12.2	2245	11.9	2245	11.9					2245	11.9
11 AUG	D	3	0951	15.1	1140	15.6			1045	15.2			1140	15.6					0951	15.1			1045	15.2
	N	3	2112	14.7	2315	14.5	2245	15.0	2245	15.0	2112	14.7	2315	14.5	2245	15.0							2245	15.0
25	D	3	0950	15.0	1145	15.7			1045	15.4									0950	15.0	1145	15.7	1045	15.4
	N	3	2116	15.8	2350	17.7	2245	16.2	2245	16.2	2116	15.8	2350	17.7	2245	16.2	2245	16.2					2245	15.2
8 SEP	D	3	1000	15.8	1130	15.9			1030	15.5	1000	15.8	1130	15.9			1030	15.5						
	N	3	2109	15.8	2305	16.0	2247	14.9	2247	14.9	2109	15.8	2305	16.0	2247	14.9	2247	14.9						
22	D	3	1038	14.4	1205	14.8			1045	14.3	1038	14.4	1205	14.8			1045	14.3						
	N	3	2116	14.8							2116	14.8												
27	N	3			2318	14.7	2250	14.8	2250	14.8			2318	14.7	2250	14.8	2250	14.8						
6 OCT	D	3	1023	14.3	1027	14.7					1023	14.3	1027	14.7										
	N	3	2126	13.9	2142	14.4					2126	13.9	2142	14.4										
20	D	2	1004	12.9	1110	13.6													1004	12.9	1110	13.6		
	N	2	2121	13.0	2358	13.5	2230	13.2	2230	13.2	2121	13.0	2358	13.5	2230	13.2	2230	13.2						
3 NOV	D	3	1030	15.0	1210	15.5					1030	15.0	1210	15.5										
	N	3	2104	15.1	2345	15.4					2104	15.1	2345	15.4										
17	D	3	1030	12.9	1210	13.6					1030	12.9	1210	13.6										
	N	3	2247	14.1	2254	15.0	2218	12.8	2218	12.8	2247	14.1	2254	15.0	2218	12.8	2218	12.8						
1 DEC	D	3	1105	14.5	1230	14.8					1105	14.5	1230	14.8										
	N	3	2232	14.6	2308	14.9					2232	14.6	2308	14.9										
9	N	3	2109	16.3							2109	16.3												
10	D	3	0925	16.5							0925	16.5												
15	D	3	1106	15.3							1106	15.3												
19	D	3			1155	12.8							1155	12.8										
	N	3	2130	13.1	2321	13.8	2255	13.8	2255	13.8	2130	13.1	2321	13.8	2255	13.8	2255	13.8						

[a] Discharge-Intake Temperature (°C), from viability sample history sheets
[b] Intake forebay sample taken on lake side of entrainment rack, prior to tempering
[c] Intake forebay sample taken on plant side of tempering gates, after tempering
[d] Time in 2400 hrs; Intake Sample
[e] 29 April

D = Day
N = Night
NA = Not available

time the phytoplankton would experience in the prototype. Therefore, the phytoplankton samples were exposed to more severe temperature effects than they would experience in the rapid mixing of the near-field plume.

Two temperature reduction procedures were used on the zooplankton discharge samples. The first procedure (used from 28 April through June) was to place the discharge sample into the incubation chamber at intake temperature, thus lowering the sample temperature. The sample was incubated for eight hours prior to analysis (14 April collections were analyzed immediately and after 24 hours). For the July through December period, a technique that more rapidly reduced the temperature was used to better simulate the actual conditions of the discharge to the lake. The discharge samples were serially diluted with filtered intake water in a time-series dilution that simulated the predicted dilution time in the near-field plume. After the temperature reduction, the samples were incubated at intake temperature for eight hours.

The procedures for the ichthyoplankton and Gammarus discharge samples were essentially the same as for zooplankton, except that samples were examined immediately after the temperature reduction was achieved (April collection after eight hours delay time).

As a result of these procedures, discharge samples all represent organisms subjected to passage through the plant cooling water system and subsequent temperature reduction as would occur in the lake.

The effects of entrainment into the discharge jet were evaluated by subjecting in-plant samples to various time-temperature exposures and by collecting samples from the discharge plume in the lake. In order to evaluate the effect of jet entrainment on phytoplankton, intake sample water was added to discharge sample water to

simulate the mixing of ambient lake water and discharge water. From April through June, the addition was accomplished in one step with the ratio of intake to discharge water volume being determined by the required dilution to reduce the measured plant temperature rise to either 2 or 3 F. From July through December, several additions were made over time periods similar to the predicted time of dilution in the near-field plume. Thus, the phytoplankton simulation samples represent a mixture of plant-passed and lake dilution water organisms in proportions similar to those that would be found at the 2 or 3 F isotherms in the lake.

The effects of jet entrainment on zooplankton during May and June were evaluated by diluting discharge samples to a temperature rise of 2 or 3 F with intake water and then incubating them for eight hours at intake temperatures. In this way, most organisms in these samples were subjected to simulated plant passage. From July through the remainder of the year, the simulation technique was changed to better simulate jet entrainment. During that period, organisms collected from the intake were serially added, along with water at intake temperature, to a volume of filtered water at discharge temperature water. The addition was designed to simulate the time-temperature regime within the near-field plume. As a result, these simulation samples represent only organisms entrained at various points in the near-field plume out to the 2 and 3 F isotherms, with none of the organisms having been subjected to plant passage. These samples were subsequently incubated at intake temperature for eight hours.

Initial plume entrainment evaluations for ichthyoplankton and Gammarus (May and June) were done by a method similar to that used for zooplankton with no incubation period. Thus, the May through June simulation samples represent plant-passed organisms with

subsequent temperature reduction to 3 or 2 F. The July through December methodology was designed to examine two cases of plume entrainment. The 3 F simulation was done by instantaneously raising the temperature of an intake sample to the discharge temperature and then serially diluting the resultant sample back down to 3 F. These 3 F simulations represent organisms entrained at the immediate point of discharge and subsequently transported to the 3 F isotherm. The 2 F simulation was similar but the initial temperature increase was only half of the plant temperature rise. In this way, the 2 F simulations represent organisms entrained at approximately the 15 F isotherm and transported to the 2 F isotherm.

A summary of the dates of the regular entrainment and viability collections is presented in Table VIIIA-1 through VIIIA-3.

2. Results and Discussion - Phytoplankton

a. Occurrence by Date - Discharge Aftbay

The phytoplankton taxa identified in 1976 at the discharge aftbay of the James A. FitzPatrick Nuclear Power Plant are presented in Table VIII-4. One hundred twenty-nine taxa were identified during the sampling period and are distributed as follows: 16 Myxophyceae, 51 Chlorophyceae, 2 Euglenophyceae, 14 Chrysophyceae, 28 Bacillariochyceae, 11 Cryptophyceae, and 6 Dinophyceae.

b. Temporal Distribution

Abundance and biovolume data for each major taxa are presented in Appendix VIIIA-1a. Seasonal trends were observed in phytoplankton abundance and composition in the discharge aftbay of

TABLE VIIIA-1

PHYTOPLANKTON[a] VIABILITY SAMPLING PROGRAM

JAMES A. FITZPATRICK NUCLEAR POWER PLANT AND VICINITY - 1976

SAMPLE TYPE	FREQUENCY[b]	DAY/NIGHT[c]	LOCATION OF SAMPLING	PROCEDURE OUTLINE[d]
INTAKE	2/MON(Apr-Dec)	Day and night	INTAKE FOREBAY[e]	Pump
DISCHARGE	2/MON(Apr-Dec)	Day and night	DISCHARGE AFTBAY	Pump; hold for travel time to diffuser; put in ice bath until within 3°F of intake water temperature
SIMULATION[f] 3°F	1/MON(Apr-Dec) 2/MON(Apr-Dec)	Day Night	DISCHARGE AFTBAY (May -June Collections) DISCHARGE AFTBAY (Jul-December Collections)	Pump; hold for travel time to diffuser; instantaneous dilution of discharge water with unfiltered intake water following dilution ratios appropriate for recorded ΔT Pump; hold for travel time to diffuser; dilute discharge sample with unfiltered intake water, time series dilution scheme
SIMULATION[f] 2°F	Same as 3°F simulation	Same as 3°F simulation	Same as 3°F simulation	Same as 3°F simulation
3°F PLUME ISOTHERM (LAKE)[b]	1/MON(Apr-Dec)	Day	VISIBLE BOIL (0.5 m below surface)	Pump
2°F PLUME ISOTHERM (LAKE)[b]	1/MON(Apr-Dec)	Day	1200-1500 ft FROM BOIL ALONG TRAJECTORY OF PLUME	Pump

2/MON = Twice monthly
1/MON = Once monthly

[a]Chlorophyll a and ^{14}C determination
[b]Frequency of lake collections contingent on weather conditions
[c]Day = 1000 hrs; Night = 2200 hrs
[d]Incubation periods variable:
C-14 determination: day samples: 4,7,24,48, and 72 hr incubation periods
night samples: 7,24,48, and 72 hr incubation periods
Chlorophyll a determination: immediate analysis: April-December collections
7,24,48, and 72 hr incubation periods: 22 September-December collections
[e]Intake forebay sample taken on lake side of entrainment rack, prior to tempering
[f]Simulated studies for phytoplantkon are conducted whenever lake sampling is cancelled due to inclement weather

TABLE VIIIA-2

ZOOPLANKTON[a] VIABILITY SAMPLING PROGRAM

JAMES A. FITZPATRICK NUCLEAR POWER PLANT AND VICINITY - 1976

SAMPLE TYPE	FREQUENCY[b]	DAY/NIGHT[c]	LOCATION OF SAMPLING	PROCEDURE OUTLINE
INTAKE	2/MON(Apr-Dec)	Day and night	INTAKE FOREBAY[e] (14 April Collection)	Pump through net for 5-15 minutes (~200 cells/counting chamber); immediate analysis and after 24 hr incubation period
			INTAKE FOREBAY[e] (28 April-December Collections)	Pump through net for 5-15 minutes (~200 cells/counting chamber); analysis after 8 hr incubation period
DISCHARGE	2/MON(Apr-Dec)	Day and night	DISCHARGE AFTBAY (14 April Collection)	Pump through net for 5-15 minutes; hold for travel time to diffuser; immediate analysis and after 24 hr incubation period
			DISCHARGE AFTBAY (28 April-June Collections)	Pump through net for 5-15 minutes; hold for travel time to diffuser; analysis after 8 hr incubation period
			DISCHARGE AFTBAY (July-December Collections)	Pump through net for 5-15 minutes; hold for travel time to diffuser; bring sample to 0.5 liters with filtered discharge water; dilute with filtered intake water to 2°F, time series dilution scheme; refilter through net; analysis after 8 hr incubation period
SIMULATION 3°F	1/MON(Apr-Dec) 2/MON(Apr-Dec)	Day Night	DISCHARGE AFTBAY (May & June Collections)	Pump through net for 5-15 minutes; hold for travel time to diffuser; instantaneous dilution with unfiltered (May-9June collections)/filtered (23,28 June collections) intake water following dilution ratios appropriate for recorded ΔT; refilter and analyze after 8 hr incubation period
			INTAKE FOREBAY[e] (July-December Collections)	Pump through net for 1.5 times the collection time of the intake sample; add 12 liters of filtered intake water to intake sample; add resultant sample to 1 liter of filtered discharge water, time series dilution scheme; refilter and analyze after 8 hr incubation period
SIMULATION[d] 2°F	Same as 3°F simulation	Same as 3°F simulation	Same as 3°F simulation	Same as 3°F simulation
3°F PLUME ISOTHERM (LAKE)[b]	1/MON(Apr-Dec)	Day	VISIBLE BOIL (0.5 m below surface)	Pump; analyze after 8 hr incubation period
2°F PLUME ISOTHERM (LAKE)[b]	1/MON(Apr-Dec)	Day	1200-1500 ft FROM BOIL ALONG TRAJECTORY OF PLUME	Pump; analyze after 8 hr incubation period.
LAKE(FITZ INTAKE)[b]	1/MON(Oct-Dec)	Day	VICINITY OF FITZ INTAKE STRUCTURE; 24 ft DEPTH CONTOUR, 1000 ft OFF-SHORE, 500 ft BEHIND VISIBLE BOIL	Pump; analyze after 8 hr incubation period

[a]Zooplankton: >76μ but less than 571μ in size
[b]Frequency of lake collections contingent on weather conditions
[c]Day = 1030 hrs; Night = 2230 hrs
[d]Simulated studies for zooplankton are conducted whenever lake sampling is cancelled due to inclement weather
[e]Intake forebay sample taken on lake side of entrainment rack, prior to tempering

2/MON = Twice monthly

1/MON = Once monthly

TABLE VIII-A-3

ICHTHYOPLANKTON (FISH LARVAE ONLY) AND GAMMARUS VIABILITY SAMPLING PROGRAM

JAMES A. FITZPATRICK NUCLEAR POWER PLANT AND VICINITY - 1976

SAMPLE TYPE	FREQUENCY [a]	DAY/NIGHT [b]	LOCATION OF SAMPLING	PROCEDURE OUTLINE
INTAKE	2/MON(Apr-Sep) 2/MON(Apr-Sep) 1/MON(Oct-Dec) [d]	ICHTHYOPLANKTON: day and night GAMMARUS: night	INTAKE FOREBAY [f] (April Collection) INTAKE FOREBAY [f] (May-December Collections)	30-minute net set; analysis after 8 hr incubation period 5-minute net set; immediate analysis
DISCHARGE	2/MON(Apr-Sep) 2/MON(Apr-Sep) 1/MON(Oct-Dec) [d]	ICHTHYOPLANKTON: day and night GAMMARUS: night	DISCHARGE AFTBAY (April Collection) DISCHARGE AFTBAY (May-June Collections) DISCHARGE AFTBAY (July-December Collections)	Pump through net for 30-minutes; hold for travel time to diffuser; analysis after 8 hr incubation period Pump through net for 30-minutes; hold for travel time to diffuser; immediate analysis Pump through net for 5-minutes; hold for travel time to diffuser; dilute with with filtered intake water to 2°F; refilter and analyze immediately
SIMULATION [e] 3°F	2/MON(Apr,May) 1/MON(Sep) 2/MON(Apr-Sep) 1/MON(Oct-Dec) [cd]	ICHTHYOPLANKTON: night ICHTHYOPLANKTON: day and night GAMMARUS: night	DISCHARGE AFTBAY (May & June Collections) INTAKE FOREBAY [f] (July-December Collections)	Pump through net for 5-minutes; hold for travel time to diffuser; instantaneous dilution with filtered (571μ) (May collection)/unfiltered(June collection) intake water following dilution ratios appropriate for recorded ΔT (intake minus discharge temperature recorded at time of sampling); refilter and analyze immediately Add filtered discharge water; dilute with filtered intake water, time series dilution scheme; refilter and analyze immediately
SIMULATION [e] 2°F	Same as 3°F simulation	Same as 3°F simulation	Same as 3°F simulation	Same as 3°F simulation except only one-half of full ΔT
3°F/2°F PLUME ISOTHERMS (LAKE) [a]	2/MON(Apr,May) 2/MON(Jun-Aug) 1/MON(Sep)	ICHTHYOPLANKTON: day ICHTHYOPLANKTON: day and night ICHTHYOPLANKTON: day and night	COMBINED SAMPLE: TOW FROM BOIL OUT ALONG PLUME TRAJECTORY	Tow for 5-minutes at 1 fps (2.5 minutes in boil and 2.5 minutes in 2°F isotherm)

2/MON = Twice monthly
1/MON = Once monthly

[a] Frequency of lake collections contingent on weather conditions
[b] Day = 1100 hrs; Night = 2300 hrs
[c] Ichthyoplankton viability by species and life stage from each simulated sample analyzed for Gammarus viability
[d] Through December if zero mortality is not recorded in two previous consecutive experiments
[e] Simulated studies for ichthyoplankton are conducted whenever lake sampling is cancelled due to inclement weather
[f] Intake forebay sample taken plant side of tempering gates; after tempering

TABLE VIIIA-. 4

OCCURRENCE OF PHYTOPLANKTON BY DATE IN SURFACE WHOLE WATER COLLECTIONS AT THE DISCHARGE AFTBAY*

JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

TAXON	DATE 28 APR	26 MAY	23 JUN	29 JUL	25 AUG	22 SEP	20 OCT	17 NOV	20 DEC
MYXOPHYCEAE									
ANACYSTIS AERUGINOSA						C			
CHROOCOCCUS LIMNETICUS					X		X		
CHROOCOCCUS DISPERSUS		A			X				
CHROOCOCCUS DISPERSUS VAR. MINOR	X	A	A	A	A	A	A	A	A
COELOSPHAERIUM KUETZINGIANUM					X	A		X	
COELOSPHAERIUM NAEGELIANUM					A	A			
GOMPHOSPHAERIA LACUSTRIS						X	X		
UNIDENTIFIED OSCILLATORIALES									A
OSCILLATORIA AGARDHII								A	A
OSCILLATORIA LIMNETICA	A	A	X	X		A	A	A	A
PHORMIDIUM SP.							X		
ANABAENA SP.							X		
ANABAENA FLOS-AQUAE					X				
ANABAENA SPIROIDES					X				
ANABAENA PLANCTONICA					X				
APHANIZOMENON FLOS-AQUAE				X	A		X		
CHLOROPHYCEAE									
CHLAMYDOMONAS SP.	X	X	X	X	X	B	X	X	
EUDORINA ELEGANS	X				B				
PANDORINA MORUM		X			X				
POLYTOMA SP.							X	X	X
POLYTOMA GRANULIFERUM								X	
GLOEOCYSTIS GIGAS				X					
SPHAEROCYSTIS SCHROETERI				A	A		X	X	
ULOTHRIX SP.								X	X
OEDOGONIUM SP.		X				B	X	X	
MOUGEOTIA SP.	X		X				X		
CLOSTERIUM SP.						X	X		
CLOSTERIUM ACICULARE						X	X		
STAURASTRUM SP.					X	X	B	B	
ACTINASTRUM HANTZSCHII	X								
ANKISTRODESMUS FALCATUS	X	A	A	X	X	X	X	X	X
ANKISTRODESMUS SPIROTAENIA	X		X					X	
ANKISTRODESMUS NANNOSELENE	X	X			X			X	
CHODATELLA CILIATA					X		X		
CHODATELLA CITRIFORMIS							X		
CHODATELLA QUADRISETA		X	X						
CHLORELLA SP.				X	X	X	X	X	X
COELASTRUM MICROPORUM			X		X	C	X		
COELASTRUM RETICULATUM				X	X		C		
DICTYOSPHAERIUM PULCHELLUM					X	X			

	DATE								
CHLOROPHYCEAE	28 APR	26 MAY	23 JUN	29 JUL	25 AUG	22 SEP	20 OCT	17 NOV	20 DEC
DICTYOSPHAERIUM ELEGANS			X						
ERRERELLA BORNHEMIENSIS					X				
FRANCEIA DROESCHERI							X		
GOLENKINIA RADIATA	X				X	X			
KIRCHNERIELLA CONTORTA								X	
MICRACTINIUM PUSILLUM	X		X						
OOCYSTIS BORGEI			X		X	X	X	X	
OOCYSTIS LACUSTRIS								X	
OOCYSTIS PARVA					X		X	X	
OOCYSTIS PUSILLA				X	X	X	X	X	
PEDIASTRUM BORYANUM	X		X		X			X	
PEDIASTRUM DUPLEX					X	X			
PEDIASTRUM SIMPLEX					X	X	X		
PEDIASTRUM TETRAS							X		
QUADRIGULA CHODATII					X				
QUADRIGULA LACUSTRIS						X			
SCENEDESMUS ABUNDANS						X		X	
SCENEDESMUS ACUMINATUS						X			
SCENEDESMUS BIJUGA	X	A	X	X	X	X	X	X	X
SCENEDESMUS DENTICULATUS			X		X	X	X		
SCENEDESMUS DIMORPHUS	X	X	X	X		X	X		
SCENEDESMUS OPOLIENSIS			C						
SCENEDESMUS QUADRICAUDA		X	X	X	X	X	X	X	
SCHROEDERIA JUDAYI					X	X	X		
SELENASTRUM MINUTUM			X						
TETRAEDRON MINIMUM					X	X	X	X	X
TETRASTRUM HETERACANTHUM		X							
EUGLENOPHYCEAE									
EUGLENA GASTEROSTEUS	C	X							
PHACUS PYRUM	X								
CHRYSOPHYCEAE									
DINOBRYON SOCIALE VAR. AMERICANUM								X	
MALLOMONAS SP.				X			X	X	
CHRYSOCHROMULINA PARVA	X		X	X	X		X	X	A
CHROMULINA SP.	X	X	X		X	X	X	X	
STELEXMONAS DICHOTOMA									X
AULOMONAS PURDYI	X								X
RHIZOCHRYSIS SP.		X	X						
OCHROMONAS SP.	X		A	X	X	X	X	X	X
UROGLENA SP.	X								
CODONOSIGA FURCATA						X			
BICOECA SP.	X	X					X		X
CODONOSIGOPSIS ROBINI	X								
MONOSIGA OVATA									X
MONAS SP.									X

TABLE VIIIA-4 (Continued)

	DATE 28 APR	26 MAY	23 JUN	29 JUL	25 AUG	22 SEP	20 OCT	17 NOV	20 DEC
BACILLARIOPHYCEAE									
COSCINODISCUS ROTHII						B			
CYCLOTELLA ATOMUS	X	A	A	C	X	X	X	A	A
CYCLOTELLA GLOMERATA		X	X				X		
CYCLOTELLA MENEGHINIANA		X	X	B	X		X	X	
MELOSIRA BINDERANA	C	C							
MELOSIRA DISTANS		X	X						
MELOSIRA GRANULATA			B						B
MELOSIRA ISLANDICA	X								
MELOSIRA ITALICA						B			
MELOSIRA ITALICA VAR. SUBARTICA	X	X	X			X			
STEPHANODISCUS ASTREA						B			
STEPHANODISCUS HANTZSCHII	C	X	B			X	X	X	B
STEPHANODISCUS NIAGARAE							B		B
STEPHANODISCUS ASTREA VAR. MINUTULA	X		X	X		X	X	X	B
ASTERIONELLA FORMOSA	X	C					X	X	B
DIATOMA ELONGATUM		B	X			X		X	X
DIATOMA VULGARE	X								
DIATOMA ELONGATUM VAR. TENUIS	X	X							
FRAGILARIA CAPUCINA								X	
FRAGILARIA CROTONENSIS		X			B	X		X	
NAVICULA SP.	X								
NAVICULA CRYPTOCEPHALA	X								
NITZSCHIA SP.			X			X			X
NITZSCHIA DISSIPATA			X						
NITZSCHIA GRACILIS	X	X							
SURIRELLA SP.									B
SYNEDRA ULNA		B							X
SYNEDRA ACUS VAR. RADIANS			X					X	X
TABELLARIA FENESTRATA							B	B	B
CRYPTOPHYCEAE									
CRYPTOMONAS SP.				B					
CRYPTOMONAS EROSA	X	X		B		B	B	B	X
CRYPTOMONAS OVATA				B			X		
CRYPTOMONAS EROSA VAR. REFLEXA							X	X	
CRYPTOMONAS MARSSONII				X			X	X	
CRYPTOMONAS PYRENOIDIFERA				B		X		X	
CRYPTOMONAS ROSTRATIFORMIS								X	
KATABLEPHARIS OVALIS	X	A	A	A		X	X	X	X
RHODOMONAS MINUTA	X	X				X	X	X	X
RHODOMONAS MINUTA VAR. NANNOPLANCTICA*	X	A	X			X	C	C	X
CRYPTAULAX SP.								X	
DINOPHYCEAE									
GYMNODINIUM SP.	X				X				
GYMNODINIUM HELVETICUM							X		
GYMNODINIUM VARIANS							X	X	
GLENODINIUM SP.		X				X		X	
PERIDINIUM SP.				X					
PERIDINIUM CINCTUM		B			B				

* *ORIGINAL SAMPLE*

* Identified as Chroomonas acuta in 1975

X PRESENT IN SAMPLE
A 5 PCT. OR MORE OF TOTAL ABUNDANCE PER DATE
B 5 PCT. OR MORE OF TOTAL BIOVOLUME PER DATE
C 5 PCT. OR MORE OF BOTH TOTAL ABUNDANCE AND TOTAL BIOVOLUME PER DATE

the FitzPatrick plant similar to the trend observed in the lake (Chapter VA). Bacillariophyceae were numerically dominant ($\geq$5% of total phytoplankton per date) in April and May (codominant with green algae), and comprised the greatest portion of the biovolume from April through June and again in December. Chlorophyceae were present in large numbers from April through November (16.6-34.0% of the total abundance), and represented more than 20% of the biovolume from August through November.

The top ten species in abundance, biovolume, and both abundance and biovolume for the sampling period are presented in Appendix VIIIA-1b; these species were also important members of the lake phytoplankton community (Table VA-2) during one or more sampling periods.

c. Chlorophyll a Concentration

(i) Immediate Analysis and 7, 24, 48, and 72-Hour Incubation Periods (Appendix VIIIA-2)

Mean immediate chlorophyll a values (Appendix VIIIA-2a) were 19.4 and 17.8 µg/l at intake and discharge, respectively, for the day sample on the first survey date (14 April). Pigment levels (Appendix VIII-3) generally declined through May, and with the exception of 20 July night values; remained below 9.0 µg/l from 26 May through December. After 6 October, mean chlorophyll a concentrations were always lower than 5 µg/l until 1 December when intake and discharge values exceeded 7 µg/l. There were relatively small variations between corresponding day and night samples but the described seasonal pattern remained clear.

Incubation experiments were initiated on 22 September (see Appendix II). From 22 September through December, mean chlorophyll a values for samples incubated for seven hours (Appendix VIII-2b) were similar in magnitude to those analyzed immediately. Intake and discharge chlorophyll a concentrations on 1 December ranged from 7.4 to 9.4 µg/l; this was considerably greater than the typical November and December values. Day and night samples differed occasionally, but overall trends were similar (Appendix VIIIA-2b).

The 24-hour incubation results (Appendix VIIIA-2c) were similar to those for samples given immediate analysis and seven-hour incubation. Concentrations on 1 December ranged from 8.0 to 10.6 µg/l.

The 48-hour incubation (Appendix VIIIA-2d) produced a similar pattern of chlorophyll a levels to those noted for the shorter holding periods with the exception of a nearly threefold increase in 22 September night intake and discharge samples (22.5 and 16.9 µg/l, respectively). Values for 22 September day collections, 4.4 and 3.5 µg/l, were very similar to corresponding values of other incubation periods.

Mean chlorophyll a concentrations for the 72-hour incubation (Appendix VIIA2-e) resembled the established pattern from 22 September through December, with the 1 December increase still notable. The 48-hour anomalous increase observed for the 22 September night sample was no longer apparent. The 15 December day intake chlorophyll a level of 15.5 µg/l was nearly three times greater than the corresponding immediate value.

(ii) Chlorophyll a Ratios (immediate analysis): Day and Night-Discharge/Intake (Figures VIIIA-1 and VIIIA-2)

Daytime discharge/intake chlorophyll a ratios (Figure VIIIA-1) were less than one (i.e., discharge value less than intake value) on ten of eleven dates from 28 May through 20 October, indicating general degradation of photosynthetic pigment after plant passage during this period. The effect was greatest on 23 June and 20 July when ratios were calculated as 0.62 and 0.65, respectively. Ratios from early and late in the year displayed small and inconsistent deviations from the "no effect" value of one.

Discharge/intake ratios for night samples (Figure VIIIA-2) were variable about the 1.0 value with no consistent trend. Samples from six of the eighteen dates indicated ratios greater than 1.0 while nine dates were less than 1.0. The greatest negative effect (0.68 ratio) was again found on 20 July while the highest positive effect was 1.45 on 28 April.

- Lake (3 F and 2 F)/Intake (Figure VIIIA-3)

Lake 3 F and 2 F isotherm/intake chlorophyll a ratios were plotted for four dates from May through October. Results were variable, however, the 2 F isotherm data indicate that plant operation did not affect the chlorophyll a concentrations.

- Simulation (3 F and 2 F)/Intake (Figures VIIIA-1 and VIIIA-2)

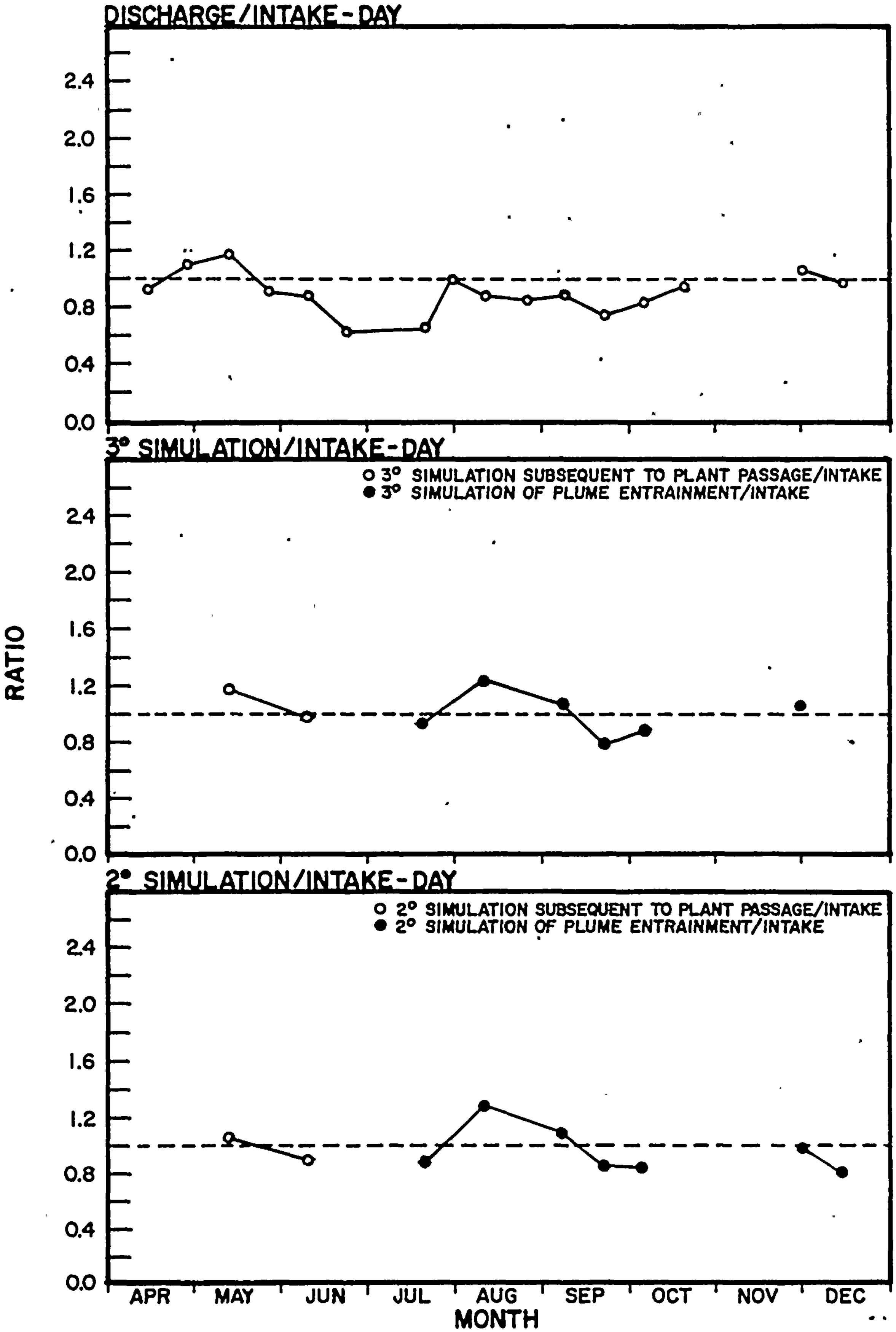
May and June simulations were conducted with instantaneous dilutions; subsequently, a serial dilution technique was

FIGURE VIIIA-1

CHLOROPHYLL A RATIOS:*

DISCHARGE/INTAKE AND SIMULATIONS/INTAKE

JAMES A. FITZPATRICK NUCLEAR POWER PLANT – 1976



*DAY COLLECTIONS; IMMEDIATE ANALYSIS; MEAN OF R-1 and R-2 EXCEPT 9 and 23 JUNE (R-1 ONLY FOR DISCHARGE AND INTAKE RESPECTIVELY)

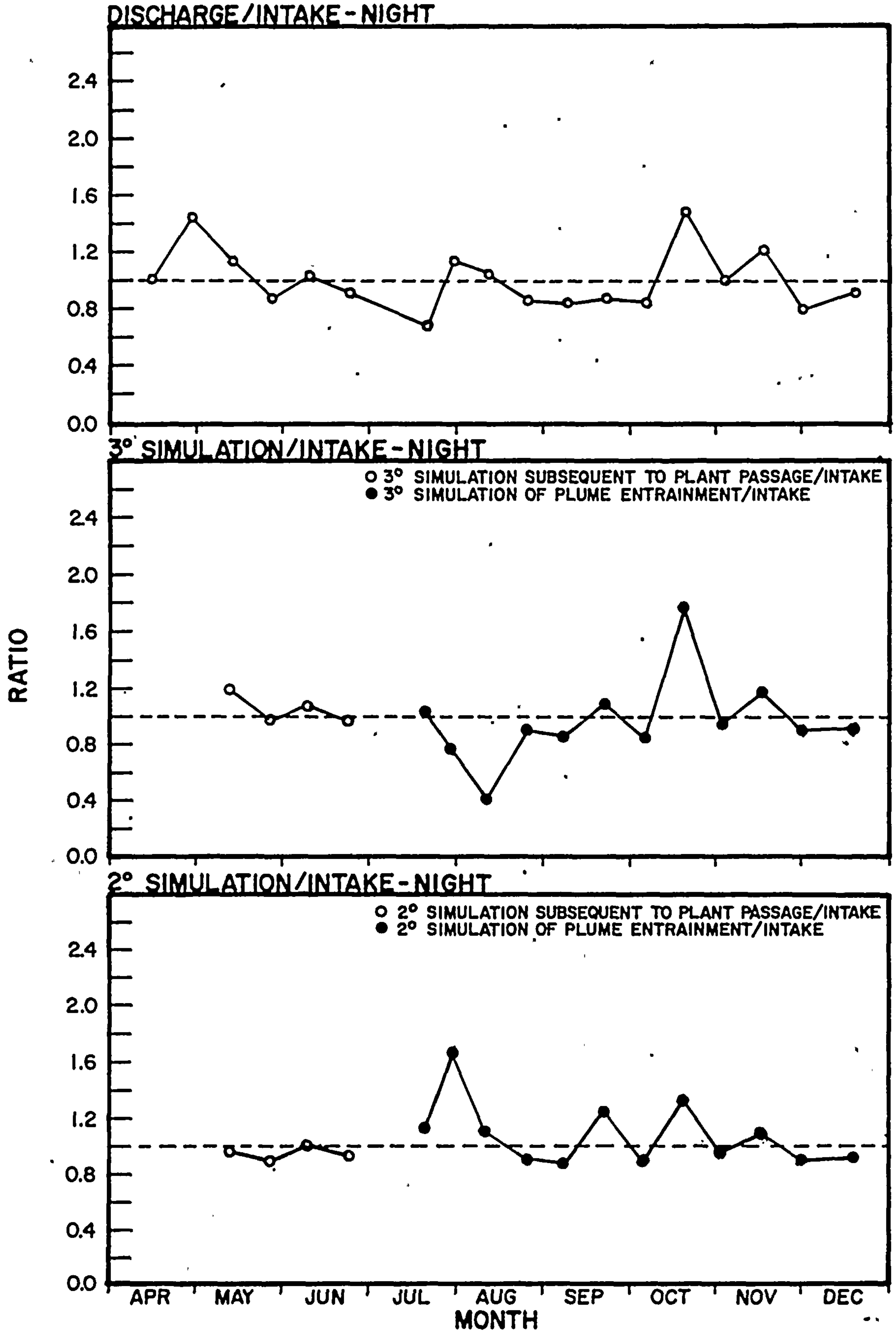
FIGURE

VIIIA-2

CHLOROPHYLL A RATIOS:*

DISCHARGE/INTAKE AND SIMULATIONS/INTAKE

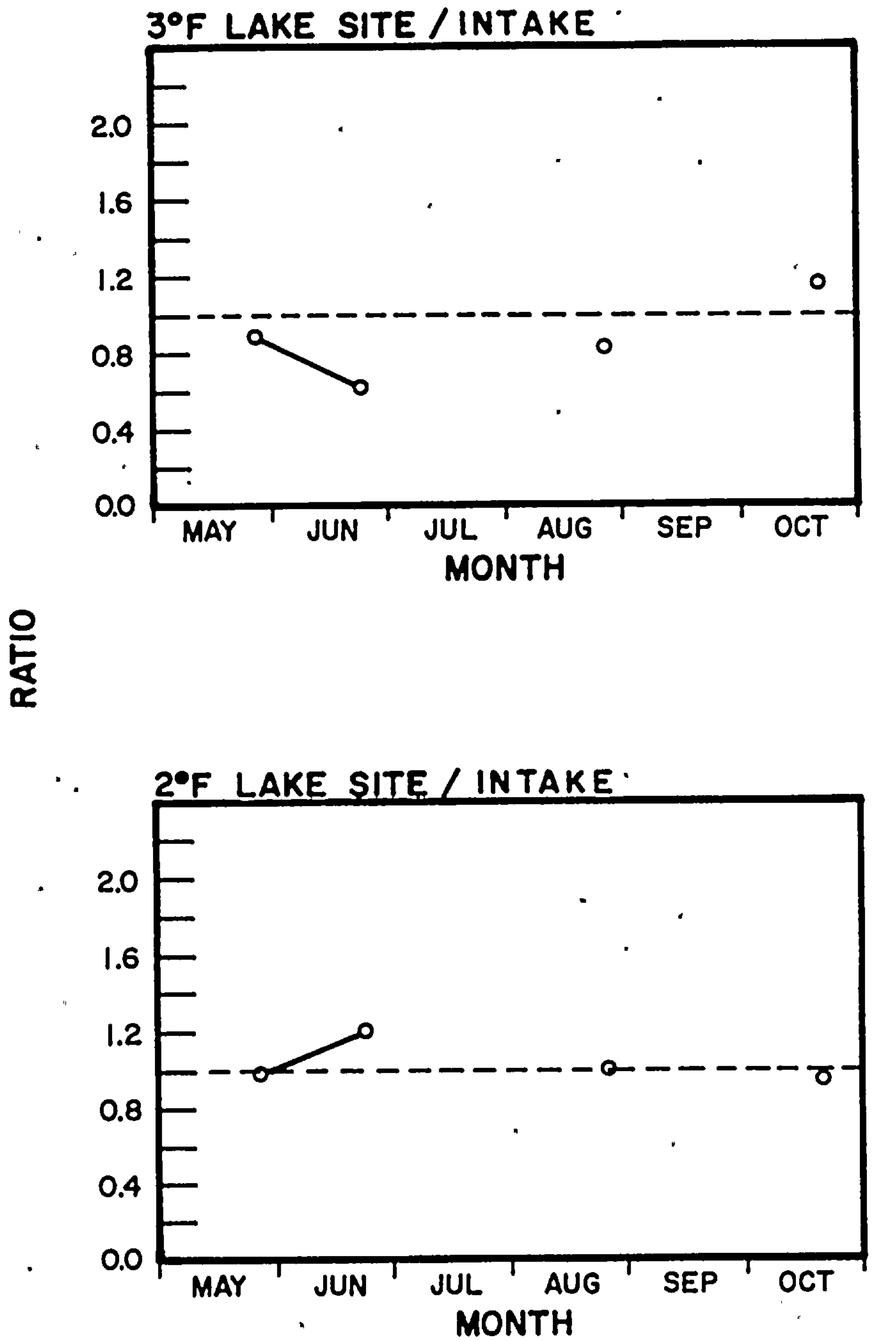
JAMES A. FITZPATRICK NUCLEAR POWER PLANT – 1976



*NIGHT COLLECTIONS; IMMEDIATE ANALYSIS; MEAN OF R-1 and R-2

CHLOROPHYLL A RATIOS:*
LAKE/INTAKE

JAMES A. FITZPATRICK NUCLEAR POWER PLANT AND VICINITY – 1976



*DAY COLLECTIONS; IMMEDIATE ANALYSIS; MEAN OF R-1 and R-2 EXCEPT FOR 23 JUNE (R-1 ONLY) FOR INTAKE.

utilized as outlined in the Entrainment Work Plan (Appendix II). Simulation/intake chlorophyll a ratios showed no discernible pattern for either 3 F or 2 F simulations. Most ratios for day and night deviated only slightly from a value of one, with the larger deviations generally being values greater than one. Neither natural (lake) nor simulated plume conditions caused substantial degradation of chlorophyll a concentrations compared to intake values.

d. Phaeopigment Concentrations (immediate analysis): Intake and Discharge Bays

Intake phaeopigment values equalled or exceeded 4.0 μg/l on 12 May (day and night samples), 11 August (day only), and 22 September (night only). Discharge values were relatively high on these dates but never reached the intake concentrations. The greatest discharge value (4.1 μg/l) was recorded during the day on 23 June. Except for the dates noted, mean phaeopigment values at both intake and discharge generally ranged from 1.0 to 2.5 μg/l with no distinct seasonal spatial or diel pattern observed. Phaeopigment concentrations rarely approached corresponding chlorophyll a levels (Appendix VIIIA-2).

e. Primary Production

(i) Intake and Discharge Bays After 4, 7, 24, 48 and 72 -Hour Incubation Periods (Appendix VIIIA-4)

For 26 May through 6 October (Appendix VIIIA-4a), values were generally between 10 and 25 mg $C/m^3/hr$ at both intake and discharge, except on 29 July when productivity was depressed at both locations. After 6 October, production

remained below 10 mg $C/m^3/hr$, except for 1 December when marked increases to 28.34 and 33.64 mg $C/m^3/hr$ were recorded at the intake and discharge, respectively. These increases correspond to a simultaneous increase in chlorophyll a (Appendix VIIIA-2a). Greatest mean four-hour incubation values (day only) for intake and discharge samples for the entire sampling period were recorded on 25 August (28.50 mg $C/m^3/hr$) for the intake and 12 May (44.21 mg $C/m^3/hr$) for the discharge.

Mean seven-hour productivity values and patterns resembled those of four-hour incubation experiments. May through July night intake collections frequently yielded productivity values 50% lower than corresponding day samples. Productivity was again low at the intake and discharge on 29 July. The 22 September night discharge productivity (27.18 mg $C/m^3/hr$) was three times the day value; day and night intake values for this date were similar (Appendix VIIA-4b).

Twenty-four-hour primary production values and seasonal trends were more erratic than those described above, however, low levels were similarly recorded from late October through December. A decrease in productivity was again noted on 29 July, and the 22 September night values were two to three times higher than day values for both intake and discharge (Appendix VIIIA-4c).

The day 48-hour incubation yielded maximum productivity at the intake and discharge on 12 May. The 22 September night intake and discharge values (respectively 16.28 and 20.92 mg $C/m^3/hr$) were approximately three and five times greater

than corresponding day values. The 1 December productivity values (approximately 3 mg $C/m^3/hr$ at the discharge) were again greater than typical November and December values, which frequently declined to 1 mg $C/m^3/hr$ or less (Appendix VIIIA-4d). As for the other incubation time regimes, intake-discharge and diel differences were not apparent.

Mean 72-hour data resembled those of 48-hour incubations. A low productivity value was still evident on 29 July, but the 22 September diel effect was not observed. Absolute values were consistently below those recorded for four and seven-hour incubations, with markedly lower values from 22 September through 15 December (Appendix VIIIA-4e).

(ii) Productivity Ratios: Day, Four-Hour Incubation Period (Figures VIIIA-4 and VIIIA-5)

- Discharge/Intake (Figure VIIIA-4)

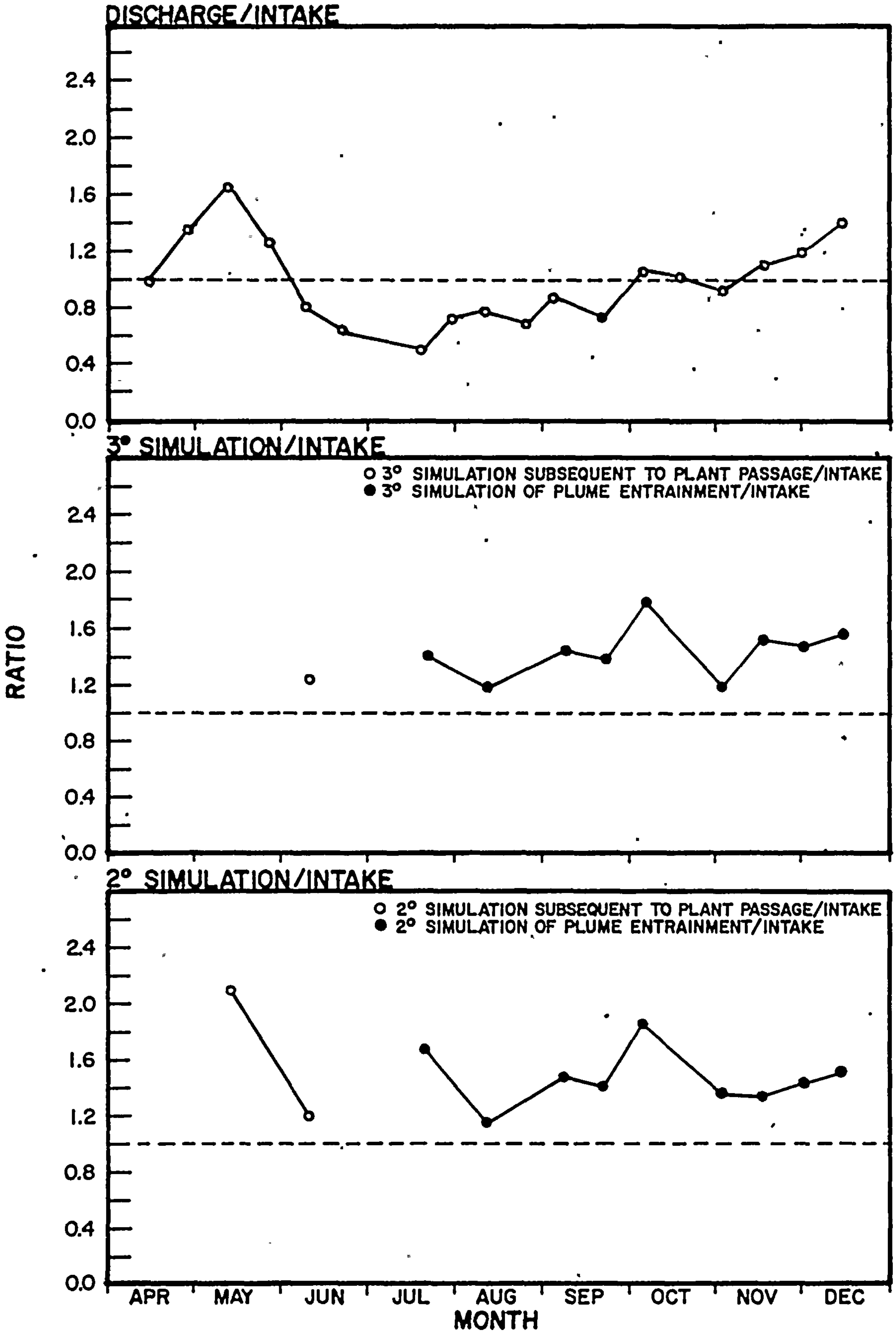
Daytime discharge/intake productivity ratios were less than one (i.e., discharge values were less than intake values) for eight consecutive sampling dates from 9 June through 22 September, with the lowest ratio (0.50) recorded on 20 July. From 28 April through 26 May, in October, and from 17 November through 15 December, productivity ratios were generally greater than one. These trends suggest entrainment-caused photosynthetic inhibition of 15 to 50% from June through September, and possible stimulation during cooler months.

- Lake (3 F and 2 F)/Intake (Figure VIIIA-5)

Lake 3 F and 2 F isotherm/intake productivity ratios were plotted on four dates between 26 May and 20 October. For

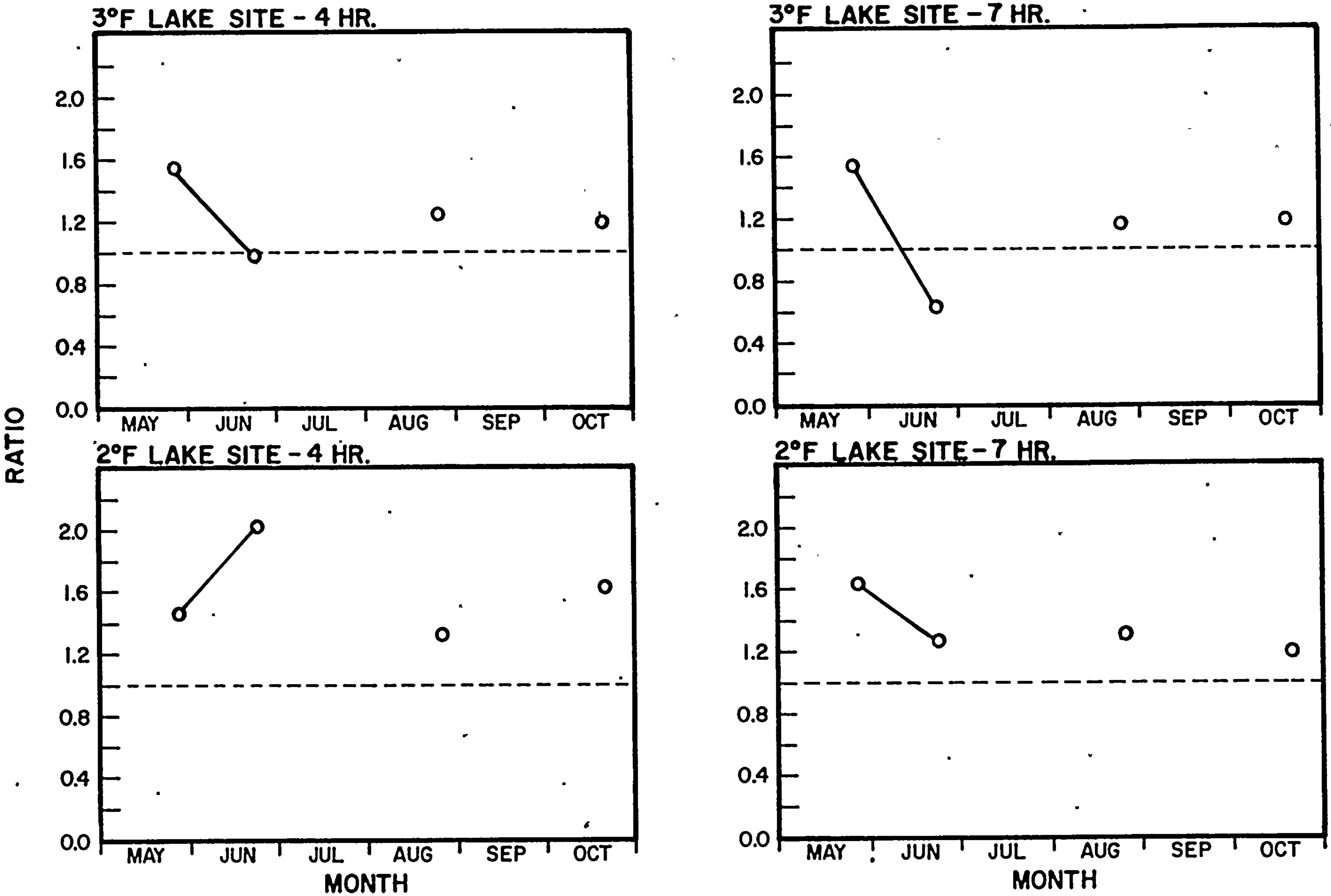
FIGURE VIIIA-4

FOUR-HOUR INCUBATION PRIMARY PRODUCTION RATIOS:*
DISCHARGE/INTAKE AND SIMULATIONS/INTAKE
JAMES A. FITZPATRICK NUCLEAR POWER PLANT – 1976



*DAY COLLECTIONS; 2 LIGHT and 1 DARK BOTTLE READINGS PER REPLICATE; APRIL COLLECTIONS, R-1 ONLY; mg C/m^3/hr.

FOUR AND SEVEN-HOUR INCUBATION PRIMARY PRODUCTION RATIOS:* LAKE/INTAKE
JAMES A. FITZPATRICK NUCLEAR POWER PLANT AND VICINITY – 1976



*DAY COLLECTIONS; MEAN OF R-1 and R-2; 2 LIGHT and 1 DARK BOTTLE READINGS PER REPLICATE EXCEPT FOR INTAKE and LAKE 7-HOUR INCUBATION SAMPLES (1 LIGHT and 1 DARK); mg C/m^3/hr.

FIGURE VIIIA-5

seven of the eight lake collections incubated for four hours, ratios ranged from approximately 1.2 (20 October, 3 F isotherm) to 2.0 (23 June, 2 F isotherm). The 23 June, 3 F lake/intake ratio of approximately 1.0 was the only exception to this trend. These data suggest stimulation of phytoplankton productivity by plume entrainment. The effect appears similar for both plume temperatures, except on 23 June as noted.

- Simulation (3 F and 2 F)/Intake (Figure VIIIA-4)

Plume simulations (3 F sample) invariably displayed higher productivity than intake control samples. 3F simulation/intake ratios ranged from approximately 1.2 on 11 August and 3 November to 1.8 on 6 October based on the June through December data set.

Results of 2 F simulation experiments paralleled those of 3 F experiments. Dates of maximum and minimum simulation/intake ratios and the observed ranges were similar for the two exposure temperatures. The 12 May simulation/intake ratio of 2.1 was the highest observed, but this may not be a comparable value, as instantaneous dilutions were used at that time. Both sets of temperature simulation results indicate possible photosynthetic enhancement of plume entrained phytoplankton.

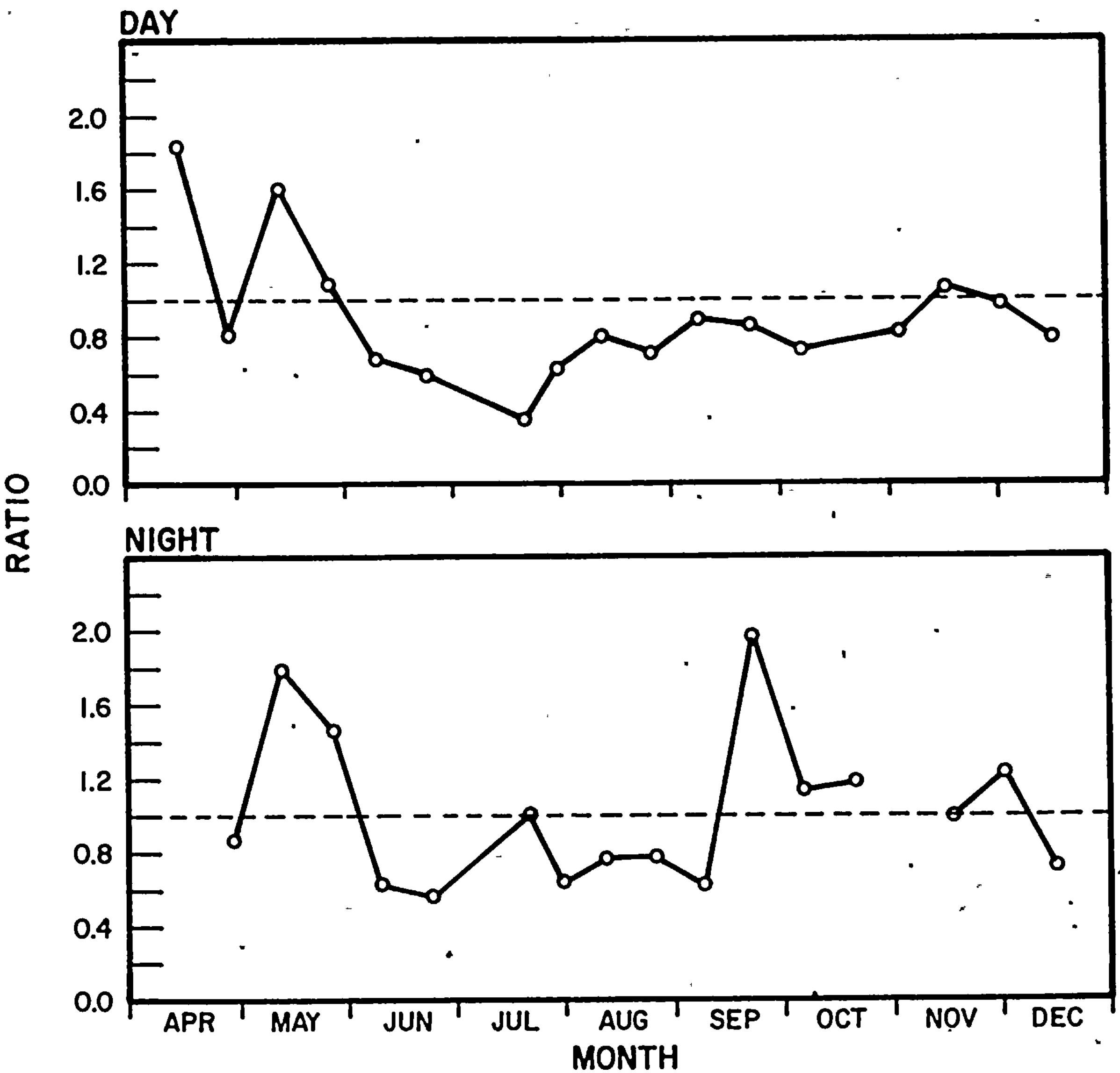
(iii) Productivity Ratios: Day/Night, 7-Hour Incubation Period (Figures VIIIA-6 through VIIIA-8)

- Discharge/Intake

Daytime (seven-hour incubation) discharge/intake ratios were always less than one (i.e., discharge values less than

SEVEN-HOUR INCUBATION PRIMARY PRODUCTION RATIOS:* DISCHARGE/INTAKE

JAMES A. FITZPATRICK NUCLEAR POWER PLANT-1976

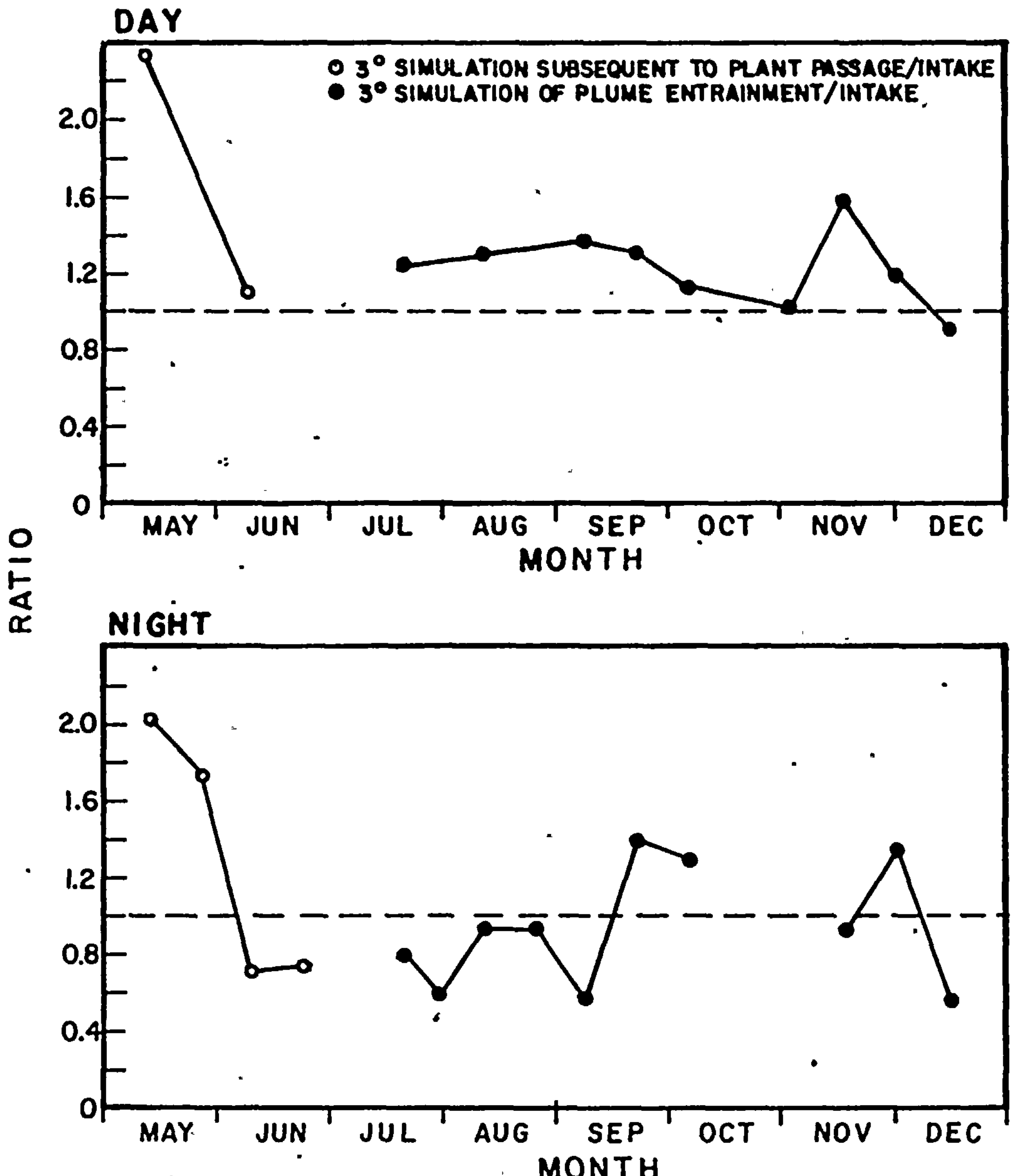


*MEAN OF R-1 and R-2; 1 LIGHT and 1 DARK BOTTLE READINGS ON ALL DATES EXCEPT 14 and 28 APRIL (2 LIGHT and 1 DARK and R-1 ONLY); mg C/m^3/hr.

FIGURE VIIIA-6

SEVEN-HOUR INCUBATION PRIMARY PRODUCTION RATIOS:* 3°SIMULATION / INTAKE

JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

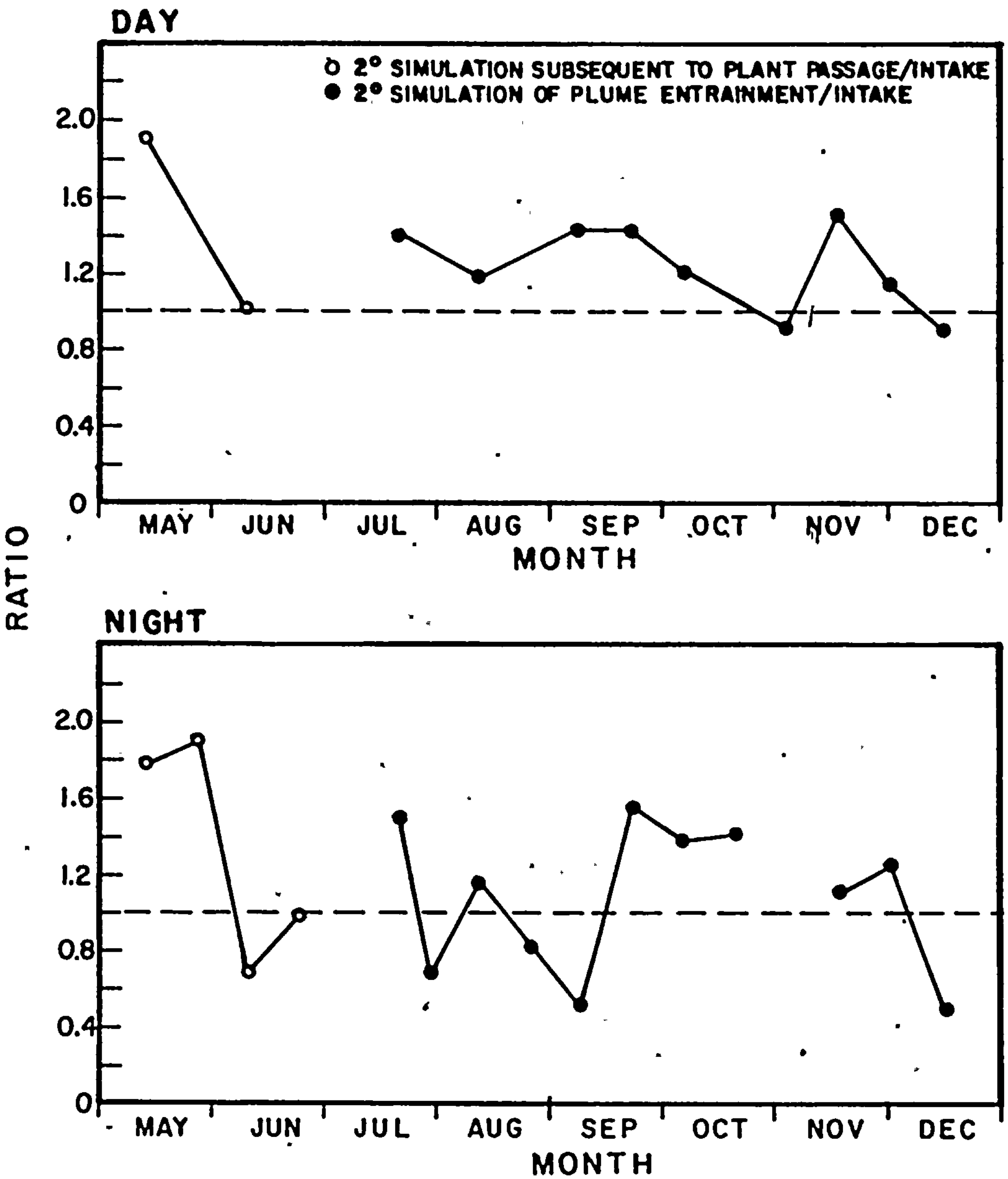


*MEAN OF R-1 and R-2; 1 LIGHT and 1 DARK BOTTLE READINGS PER REPLICATE; mg $C/m^3/hr$.

FIGURE VIIIA-7

SEVEN-HOUR INCUBATION PRIMARY PRODUCTION RATIOS:* 2° SIMULATION / INTAKE

JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976



*MEAN OF R-1 and R-2; 1 LIGHT and 1 DARK BOTTLE READINGS PER REPLICATE; mg C/m³/hr.

FIGURE VIIIA-8

intake values) from 9 June through 3 November. The 20 July ratio of 0.35 indicates marked entrainment-suppressed productivity on this date. Four-hour productivity and immediate chlorophyll a ratios also suggest maximum entrainment effects on this date.

Ratios for samples collected at night demonstrate consistent photosynthetic inhibition from 9 June through 8 September; there was no difference between discharge and intake night productivity on 20 July. Data from earlier and later months were more erratic, with three dates in the 28 April-December sampling period yielding values equal or greater than 1.5, perhaps indicating occasional stimulation at lower ambient temperatures.

- Lake (3 F and 2 F)/Intake (Figure VIIIA-5)

Lake/intake seven-hour productivity ratios within 3 F and 2 F plume isotherms were plotted for four dates from May through October. For seven of eight samples, ratios varied from approximately 1.2 (25 August, 3 F isotherm and 2 and 3 F isotherm on 20 October) to 1.6 (26 May, 2 F isotherm). The exception was the 23 June 3 F lake/intake sample which had an approximate ratio of 0.6, similar to four-hour lake incubation experiment.

- Simulation (3 F and 2 F)/Intake (Figures VIIIA-7 and VIIIA-8)

Daytime 3 F and 2 F simulation/intake ratios were approximately one or greater. Maximum effect of plume entrainment was observed on 17 November when day and night ratios were approximately 1.6 and 1.5, respectively. However, on

3 November there was little difference between simulation and intake productivity for either temperature treatment. Ratios approached or exceeded 2.0 on 12 May but, as previously noted, the instantaneous dilution technique utilized precludes comparability with later dates.

Samples collected at night exhibited erratic fluctuations in productivity ratios after seven hours of incubation. Simulation/intake ratios were again close to 2.0 on 12 May for both temperatures. Otherwise, there was no apparent trend among night ratios or between corresponding day and night results.

(iv) Overview

Consistent suppression of immediate chlorophyll a and both four and seven-hour primary productivity discharge/intake ratios supports the conclusion of plant entrainment-related photosynthetic inhibition from June through September/October. Day samples of 20 July (intake temperature 19.7 C, ΔT 14.2 C) showed the greatest inhibition. Both four and seven-hour incubation data also suggest the possible stimulation of photosynthesis during cooler months.

Both natural (lake) and four-hour simulated plume-entrainment experiments demonstrate that plume-entrained phytoplankton are stimulated from the standpoint of increased primary productivity. The pattern of high plume/intake productivity ratios was similar throughout the survey among all four treatments, suggesting that ambient temperatures and ΔT had no apparent effect on the magnitude of the stimulation.

TABLE VIIIA-5

ZOOPLANKTON OCCURRENCE BY DATE

DISCHARGE AFTBAY, JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

TAXA	28 APR	26 MAY	23 JUN	29 JUL	25 AUG	22 SEP	20 OCT	17 NOV	19 DEC
PROTOZOA									
SARCODINA (LOBOSA)									
Difflugia sp.					X	X			X
SUCTORIA									
Acineta sp.			X	X	X			X	X
Paracineta sp.		X							
Staurophrya elegans *									
Thecacineta sp.	X		X		X			X	X
Tokophrya sp. *									
CILIATA									
Tintinnidae									
Codonella cratera		X		X	X	X	X	X	X
Epistylidae	X			X					
Vorticellidae	X	X	X		X				
ROTIFERA (ASCHELMINTHES)									
Diogononta									
Bdelloidea	X		X		X	X			
Monogononta									
Ploima									
Brachionidae									
Brachionus angularis	X	X	X		X				X
B. caudatus			X						
B. calyciflorus	X	X							
B. havanaensis *									
B. quadridentatus	X								
B. urceolaris *									
Colurella sp. *									
Euchlanis dilatata *									
Euchlanis sp.		X			X				
Kellicottia longispina	X	X	X	X			X	X	X
Keratella crassa			X	X	X	X	X	X	
K. hiemalis	X	X							
K. cochlearis		X	X		X	X	X		
K. earlinae	X	X	X	X	X	X		X	
K. quadrata	X	X	X	X	X	X			X
K. valga *									
Notholca acuminata	X	X							X
N. foliacea									X
N. squamula	X	X							
N. striata *									
Trichotria sp. *									
Lecanidae									
Lecane sp. *									
Notommatidae									
Cephalodella sp.	X		X						
Trichocercidae									
Trichocerca multicrinis			X	X	X	X	X		
T. cylindrica					X				
Gastropidae									
Ascomorpha eucaudis			X						
Chromogaster ovalis *									
Asplanchnidae									
Asplanchna priodonta	X	X	X	X	X		X	X	X

TABLE VIII A-5 (Continued)

ZOOPLANKTON OCCURRENCE BY DATE (Continued)

DISCHARGE AFTBAY, JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

TAXA (continued)	28 APR	26 MAY	23 JUN	29 JUL	25 AUG	22 SEP	20 OCT	17 NOV	19 DEC
ROTIFERA (ASCHELMINTHES) (Continued)									
Monogononta (Continued)									
Synchaetidae									
Ploesoma lenticulare					X	X			
P. hudsoni			X	X					
P. truncatum			X	X	X	X			
Ploesoma sp.									
Polyarthra vulgaris	X	X	X	X	X	X	X	X	X
P. dolichoptera	X	X	X	X		X	X	X	X
P. euryptera					X	X	X		
P. major		X			X	X	X	X	X
P. remata		X	X		X	X			
Polyarthra sp.									
Synchaeta lackowitziana	X	X	X			X			
S. pectinata	X	X						X	X
S. tremula		X							
S. stylata			X	X	X	X	X		
Flosculariacea									
Testudinellidae									
Filinia longiseta	X	X		X	X	X			X
Hexarthridae									
Hexarthra sp.					X				
Conochilidae									
Conochilus unicornis			X	X	X				
Conochiloides sp.					X				
Conothecaceae									
Collotheca mutabilis		X	X		X		X	X	X
COPEPODA (ARTHROPODA)									
Copepod nauplii	X	X	X	X	X	X	X	X	X
CALANOIDA									
Diaptomidae									
Diaptomus spp.								X	
Temoridae									
Eurytemora affinis								X	X
Calanoid - juvenile	X	X	X	X	X	X	X	X	X
CYCLOPOIDA									
Cyclopidae									
Acanthocyclops vernalis									
Diacyclops bicuspidatus thomasi	X	X		X	X	X	X	X	X
Tropocyclops prasinus mexicanus					X	X	X	X	X
Cyclopoid - juvenile	X	X	X	X	X	X	X	X	X
HARPACTICOIDA									
Harpacticoid - juvenile*									
CLADOCERA (ARTHROPODA)									
Chydoridae									
Alona affinis						X			
Chydorus sphaericus	X		X		X	X			
Leydigia quadrangularis	X								
Bosminidae									
Bosmina longirostris		X	X	X	X	X	X	X	X
Eubosmina coregoni							X		
Daphnidae									
Ceriodaphnia lacustris					X	X	X	X	
Daphnia longiremis									
Daphnia retrocurva	X			X	X	X	X	X	X
Daphnia sp.					X				

* Occurrence in viability program samples only

Inconsistent data from seven-hour incubated night collections may indicate either latent recovery or obscured results attributable to carbon recycling. Results of the chlorophyll a analysis for both natural and simulated plume samples indicate little or no plant effect on the viability of phytoplankton.

3. Results and Discussion - Zooplankton

a. Community Composition - Discharge Aftbay

Approximately 70 taxa were identified from the viability discharge aftbay samples (Table VIIIA-5). The majority of the taxa were rotifers, with cladocerans, copepods, and protozoans comprising the balance. Species information was summarized for all species present with at least ten individuals in both replicates and occurring in a minimum of four consecutive viability collections.

b. Mortality of Selected Taxa

(i) Calanoida (Figures VIIIA-9 through VIIIA-11; Appendices VIIIB-2a and VIIIB-3a)

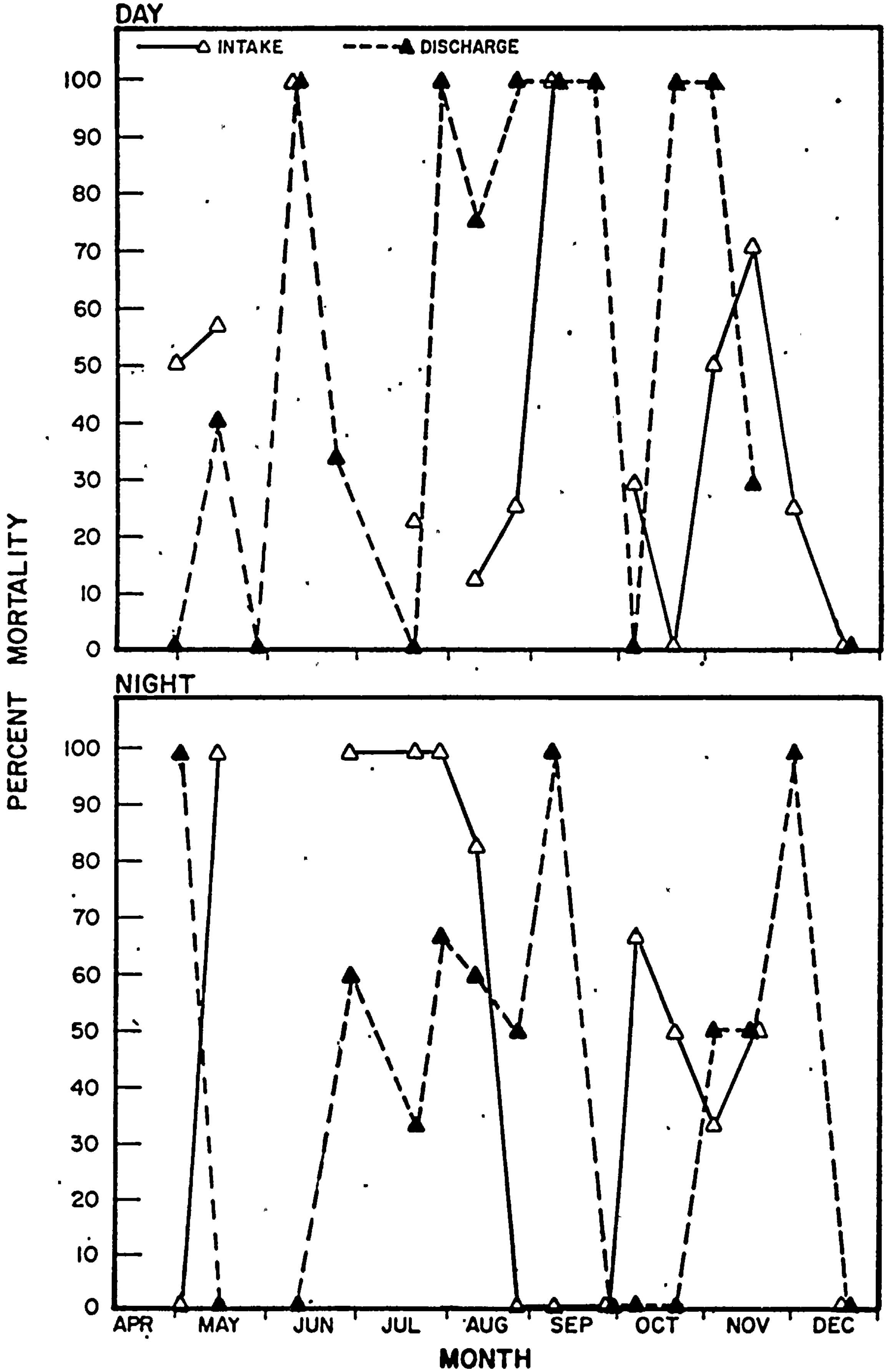
Only seven of all the viability samples collected during the 1976 microzooplankton entrainment study contained more than 10 calanoid copepods, and these seven were widely scattered in time and space. These limitations preclude description and interpretation of the data on calanoid mortality.

(ii) Cyclopoida (Figures VIIIA-12 through VIIIA-14; Appendices VIIIB-2a and VIIIB-3a)

Temporal trends in percent mortality (% dead) of cyclopoid copepods were generally similar between intake and discharge

CALANOIDA (COPEPODA) MORTALITY* IN INTAKE AND DISCHARGE SAMPLES

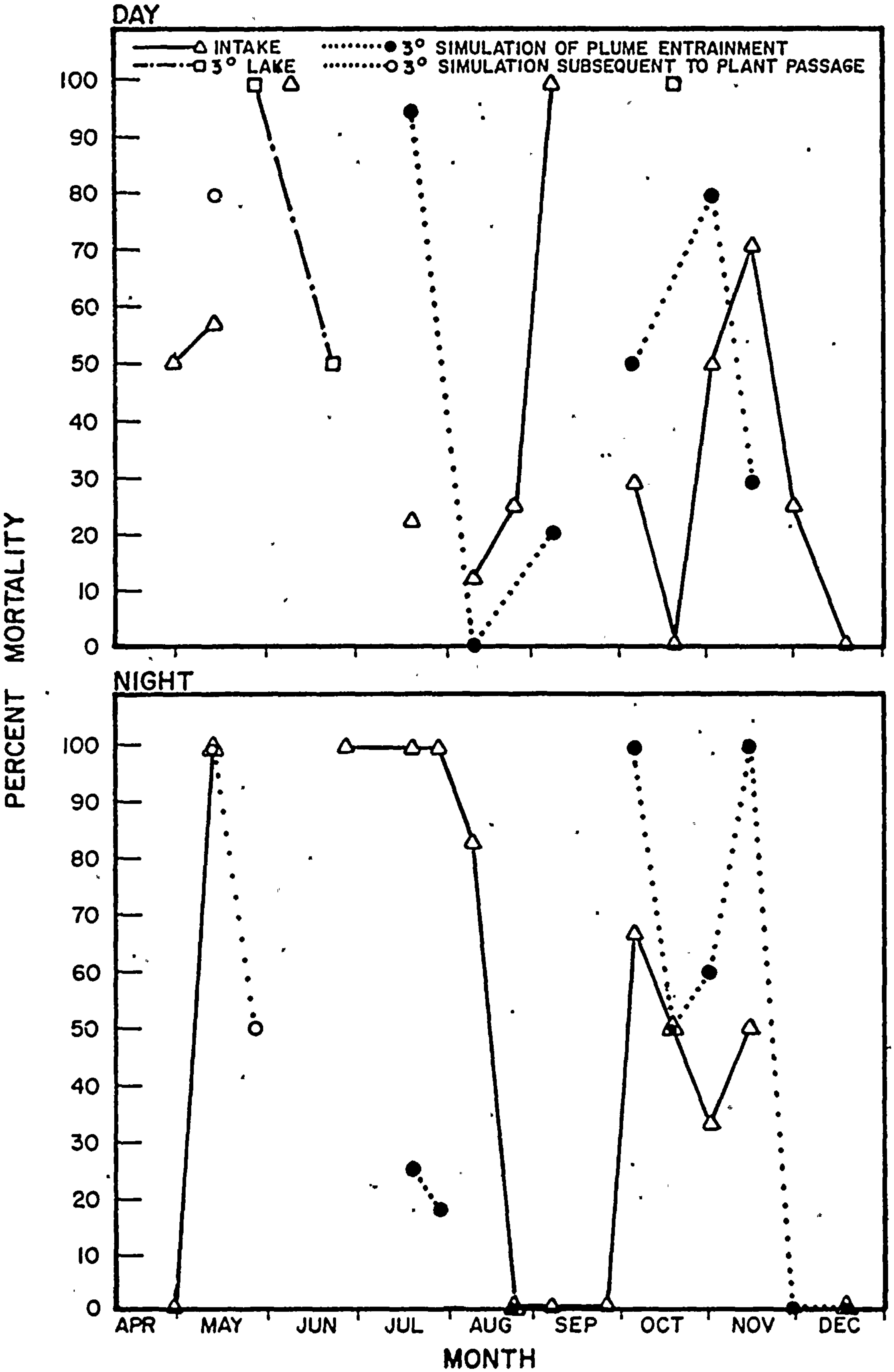
JAMES A. FITZPATRICK NUCLEAR POWER PLANT – 1976



*MEAN OF R-1 and R-2 ; ANALYSIS AFTER 8-HOUR INCUBATION PERIOD, ADULTS AND UNIDENTIFIED JUVENILES

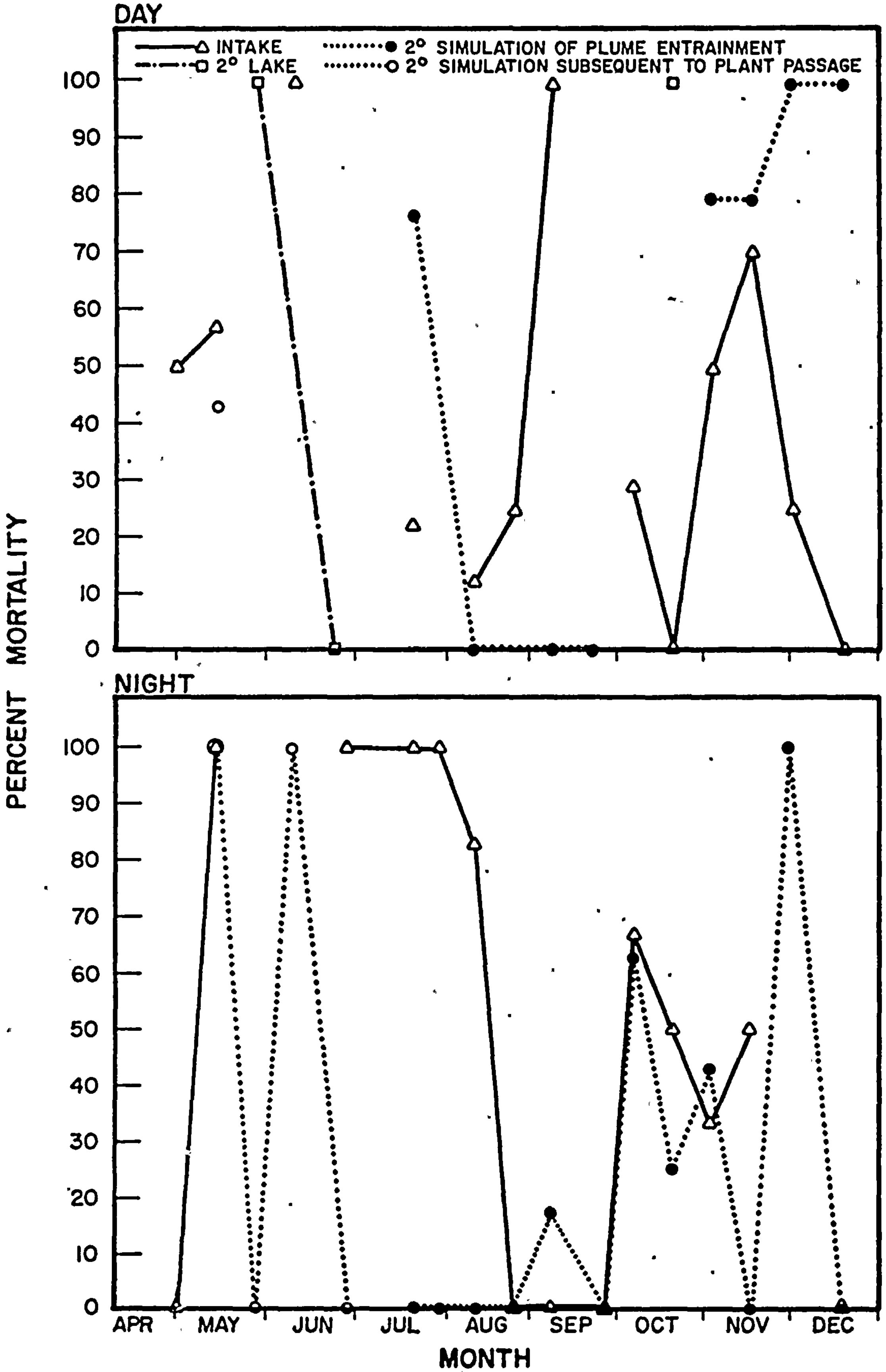
FIGURE VIIIA-10

CALANOIDA (COPEPODA) MORTALITY*
IN INTAKE AND 3° SIMULATION SAMPLES
JAMES A. FITZPATRICK NUCLEAR POWER PLANT – 1976



*MEAN OF R-1 and R-2 ; ANALYSIS AFTER 8-HOUR INCUBATION PERIOD, ADULTS AND UNIDENTIFIED JUVENILES

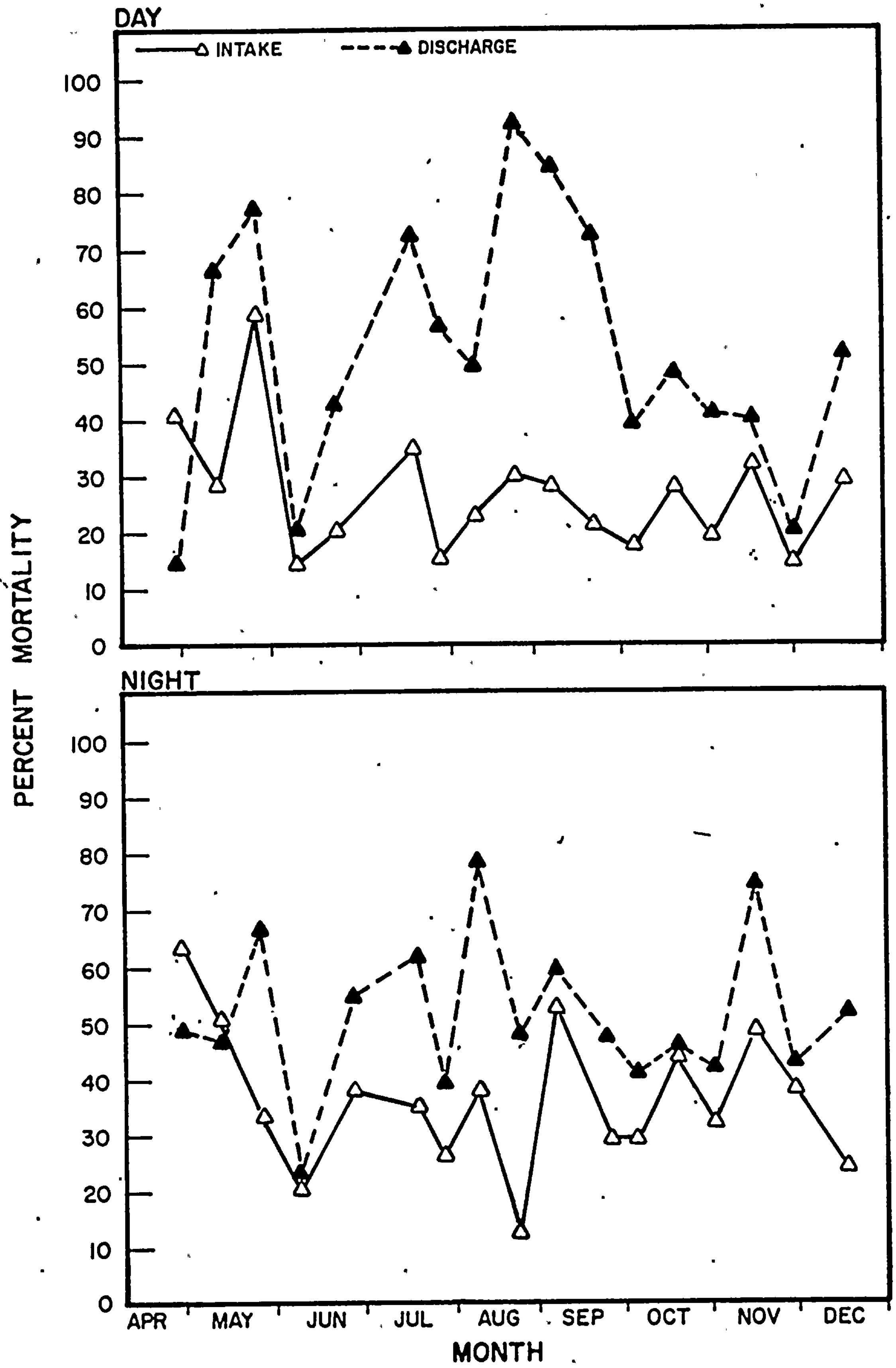
CALANOIDA (COPEPODA) MORTALITY *
IN INTAKE AND 2° SIMULATION SAMPLES
JAMES A. FITZPATRICK NUCLEAR POWER PLANT – 1976



*MEAN OF R-1 and R-2; ANALYSIS AFTER 8-HOUR INCUBATION PERIOD, ADULTS AND UNIDENTIFIED JUVENILES

CYCLOPOIDA (COPEPODA) MORTALITY* IN INTAKE AND DISCHARGE SAMPLES

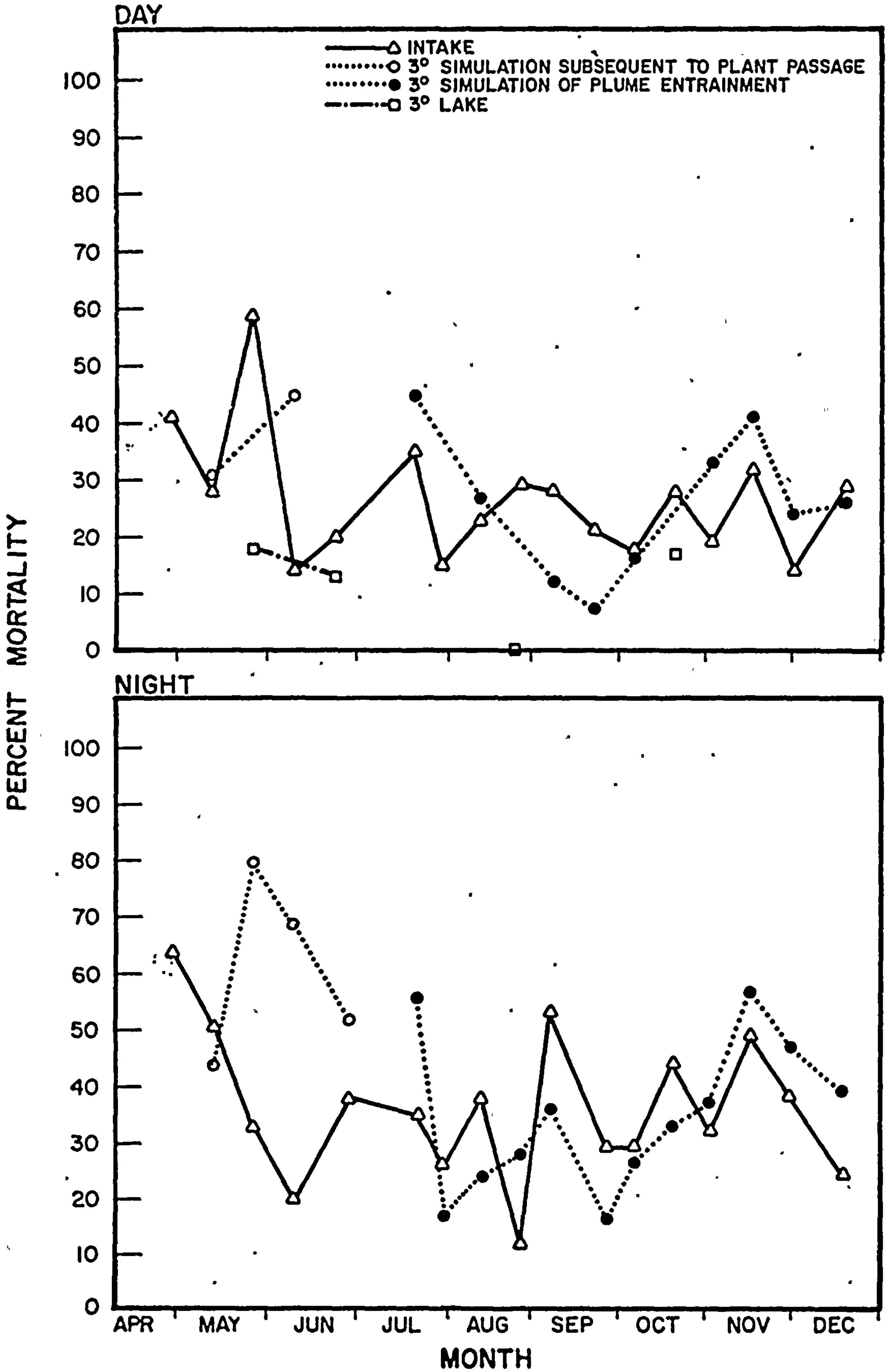
JAMES A. FITZPATRICK NUCLEAR POWER PLANT — 1976



*MEAN OF R-1 and R-2 ; ANALYSIS AFTER 8-HOUR INCUBATION PERIOD , ADULTS AND UNIDENTIFIED JUVENILES

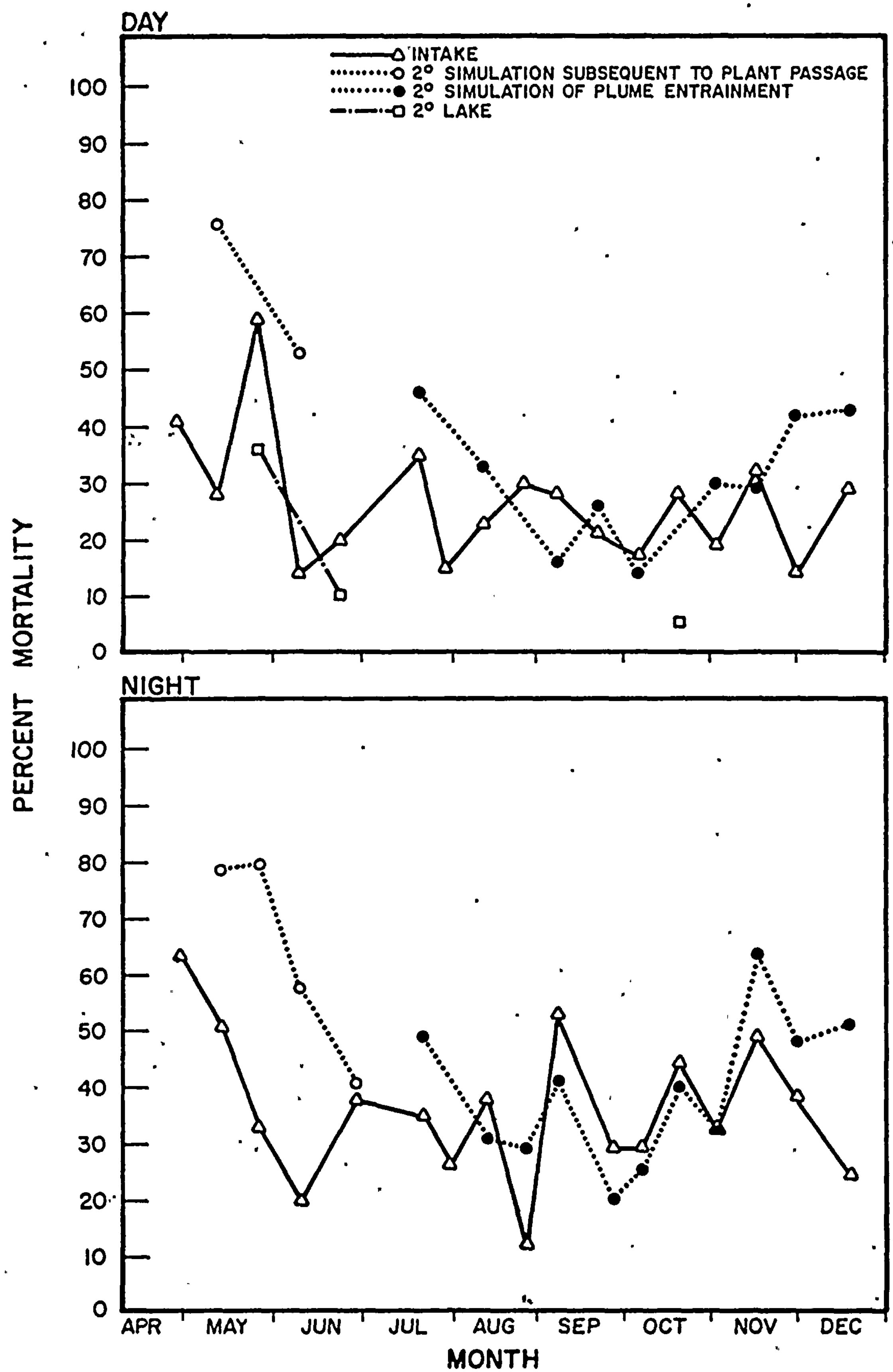
CYCLOPOIDA (COPEPODA) MORTALITY* IN INTAKE AND 3° SIMULATION SAMPLES

JAMES A. FITZPATRICK NUCLEAR POWER PLANT – 1976



*MEAN OF R-1 and R-2; ANALYSIS AFTER 8-HOUR INCUBATION PERIOD, ADULTS AND UNIDENTIFIED JUVENILES

CYCLOPOIDA (COPEPODA) MORTALITY* IN INTAKE AND 2° SIMULATION SAMPLES
JAMES A. FITZPATRICK NUCLEAR POWER PLANT – 1976



* MEAN OF R-1 and R-2; ANALYSIS AFTER 8-HOUR INCUBATION PERIOD, ADULTS AND UNIDENTIFIED JUVENILES

collections and day/night collections. Discharge mortality was greater than intake mortality (Figure VIIIA-12) on 16 of 17 survey dates; the opposite pattern was recorded in late April. The greatest differences between intake and discharge mortality values tended to occur during the warmer months of the year (July, August, Septemeber) for both day and night collections, differences between intake and discharge mortalities were generally greater during the day as compared to night. Overall, both a seasonal and a diurnal component were apparent in cyclopoid entrainment mortality.

The 2 F and 3 F simulation study data (Figures VIIIA-13 and VIIIA-14), show no consistent differences in cyclopoid mortality between control (intake) and stressed (simulation) communities.

Both 2 F and 3 F lake mortality for cyclopoids values were generally lower than simulation, intake, and discharge values (Figures VIIIA-12 through VIIIA-14) which, when combined with the simulation results, indicate no mortality effect due to plume entrainment.

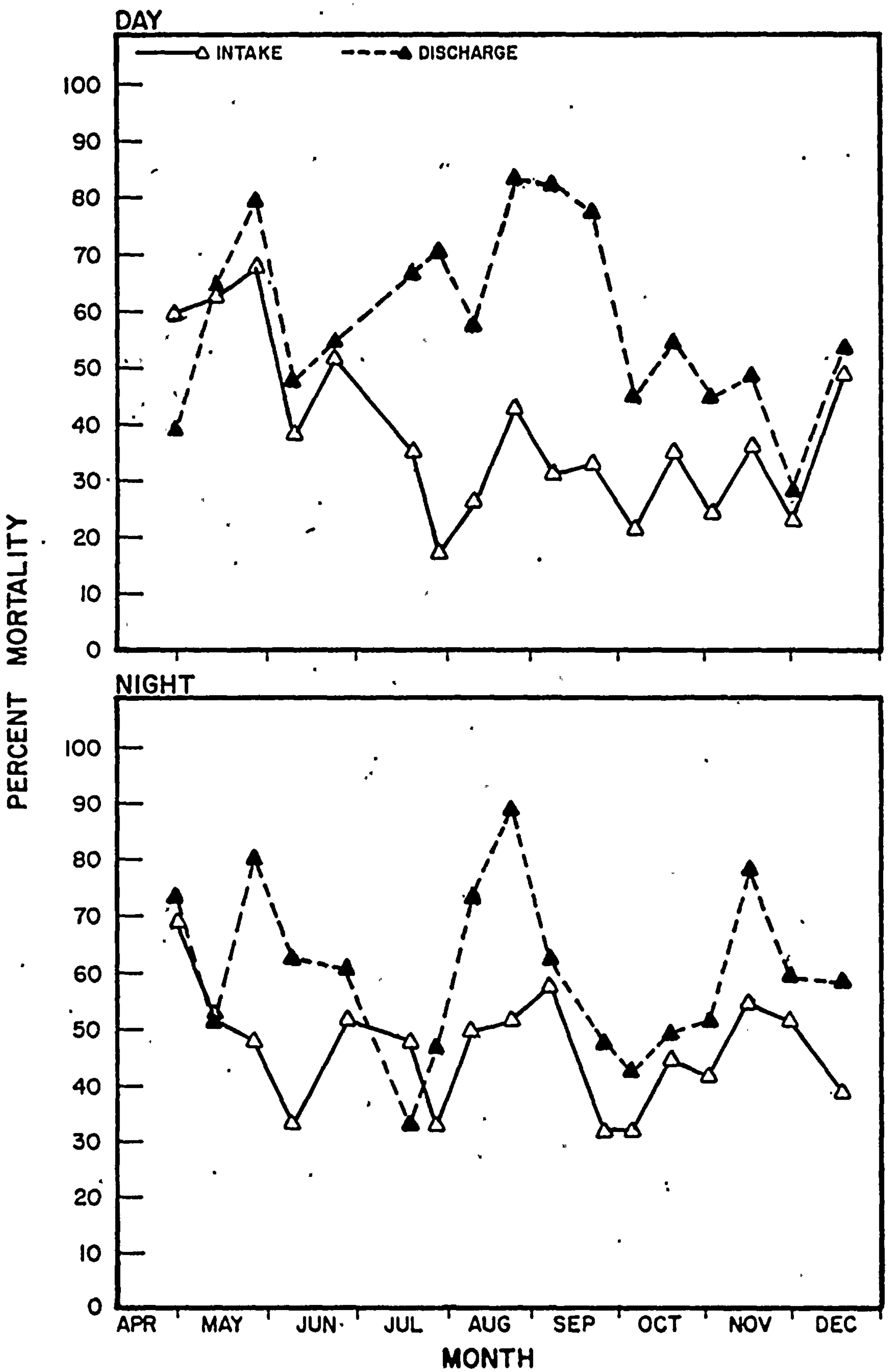
Similar mortality patterns were recorded for Tropocyclops prasinus mexicanus, a dominant cyclopoid copepod, during its September-November period of abundance (Appendices VIIIB-4b and VIIIB-5b).

(iii) Copepoda (Figures VIIIA-15 through VIIIA-17; Appendices IIIB-2a and VIIIB-3a)

The mortality patterns for copepods reflected the previously described temporal patterns of cyclopoids due to the dominance of this group in most collections. For example, copepod mortality values at the discharge generally showed a similar pattern between day and night.

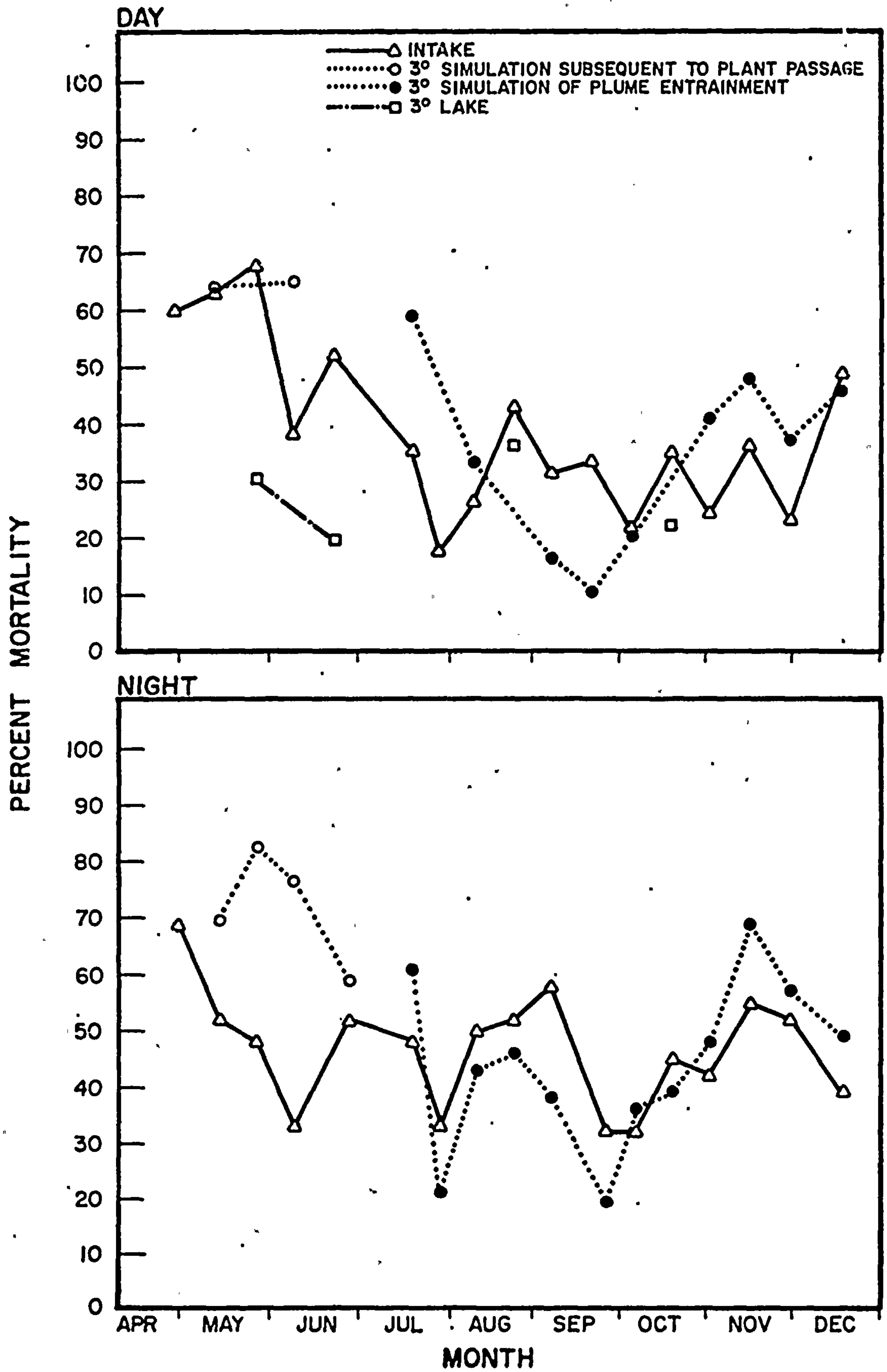
COPEPODA MORTALITY* IN INTAKE AND DISCHARGE SAMPLES

JAMES A. FITZPATRICK NUCLEAR POWER PLANT – 1976



*MEAN OF R-1 and R-2; ADULTS, JUVENILE and NAUPLII COPEPODS; ANALYSIS AFTER 8-HOUR INCUBATION PERIOD

COPEPODA MORTALITY* IN INTAKE AND 3° SIMULATION SAMPLES
JAMES A. FITZPATRICK NUCLEAR POWER PLANT – 1976

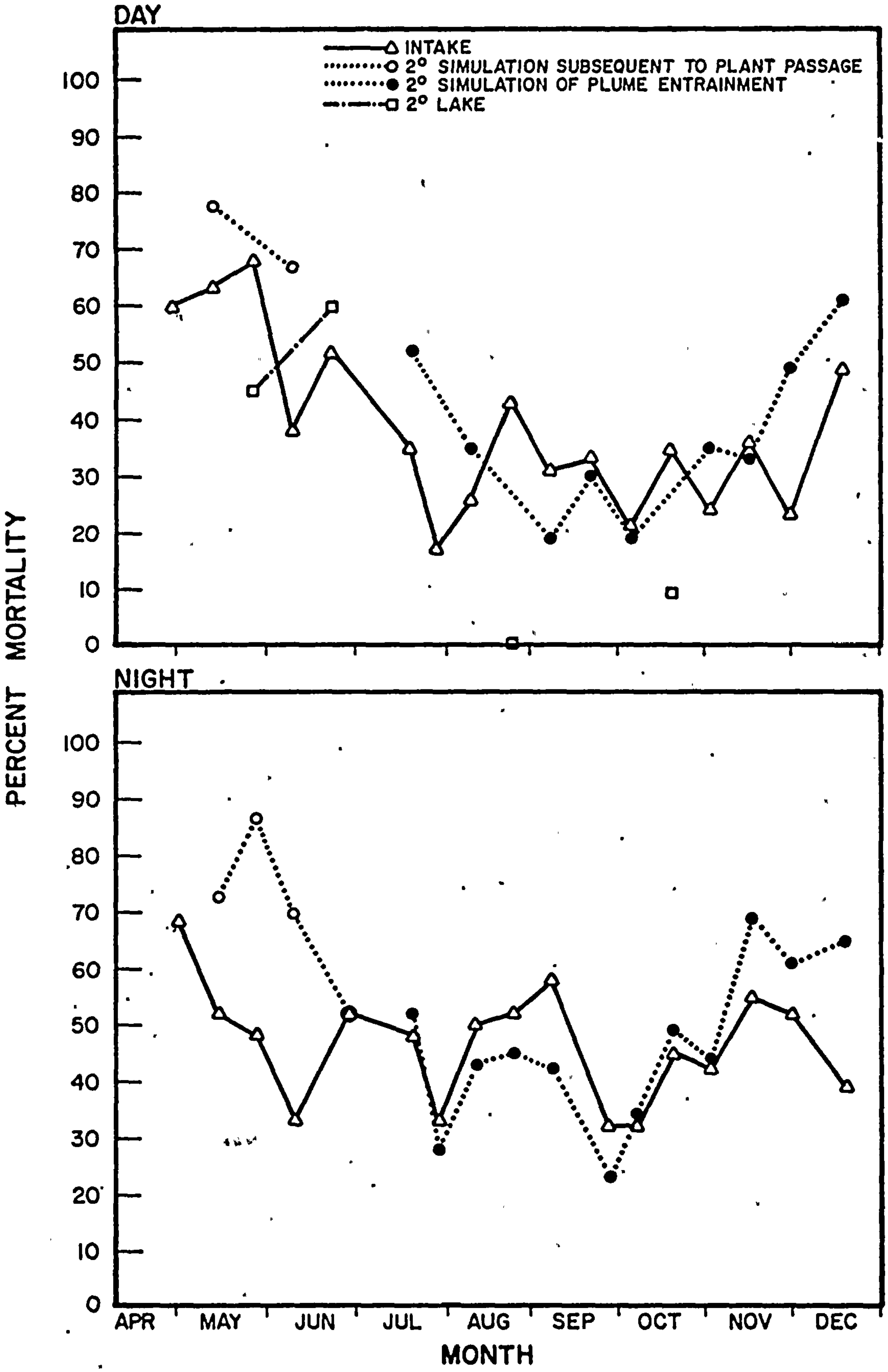


*MEAN OF R-1 and R-2; ADULTS, JUVENILE and NAUPLII COPEPODS; ANAYLSIS AFTER 8-HOUR INCUBATION PERIOD

FIGURE VIIIA-17

COPEPODA MORTALITY* IN INTAKE AND 2° SIMULATION SAMPLES

JAMES A. FITZPATRICK NUCLEAR POWER PLANT – 1976



*MEAN OF R-1 and R-2; ADULTS, JUVENILE and NAUPLII COPEPODS; ANALYSIS AFTER 8-HOUR INCUBATION PERIOD

(iv) Cladocera (Figures VIIIA-18 through VIIIA-20; Appendices VIIIB-2b and VIIIB-3b)

Temporal variations in percent mortality (% dead) of cladocerans were similar between day and night collections taken at the intake and discharge. Discharge mortality was typically greater than intake mortality during both day and night, with greatest differences occurring during the warmer months of the year, a pattern that appeared to be positively correlated with the seasonal pattern in lake water temperature.

The results of the 2 F and 3 F simulation studies (Figure VIIIA-19) showed little or no effect on Cladoceran mortality.

Cladoceran 2 F and 3 F lake mortality values were generally comparable to those at the intake and generally lower than simulation and discharge values. The combined results of the simulation and lake samples indicate no discernible mortality effect due to entrainment into the plume.

Bosmina longirostris (Appendices VIIIB-4a and VIIIB-5a), a dominant cladoceran from June through November (Appendix VIIIB-1), reflected the general cladoceran mortality pattern for in-plant studies. Greatest discharge mortality was observed in August (59-93%), although intake mortality was fairly stable throughout the survey. Relatively few Bosmina were collected for lake viability studies, but their mortality was generally low.

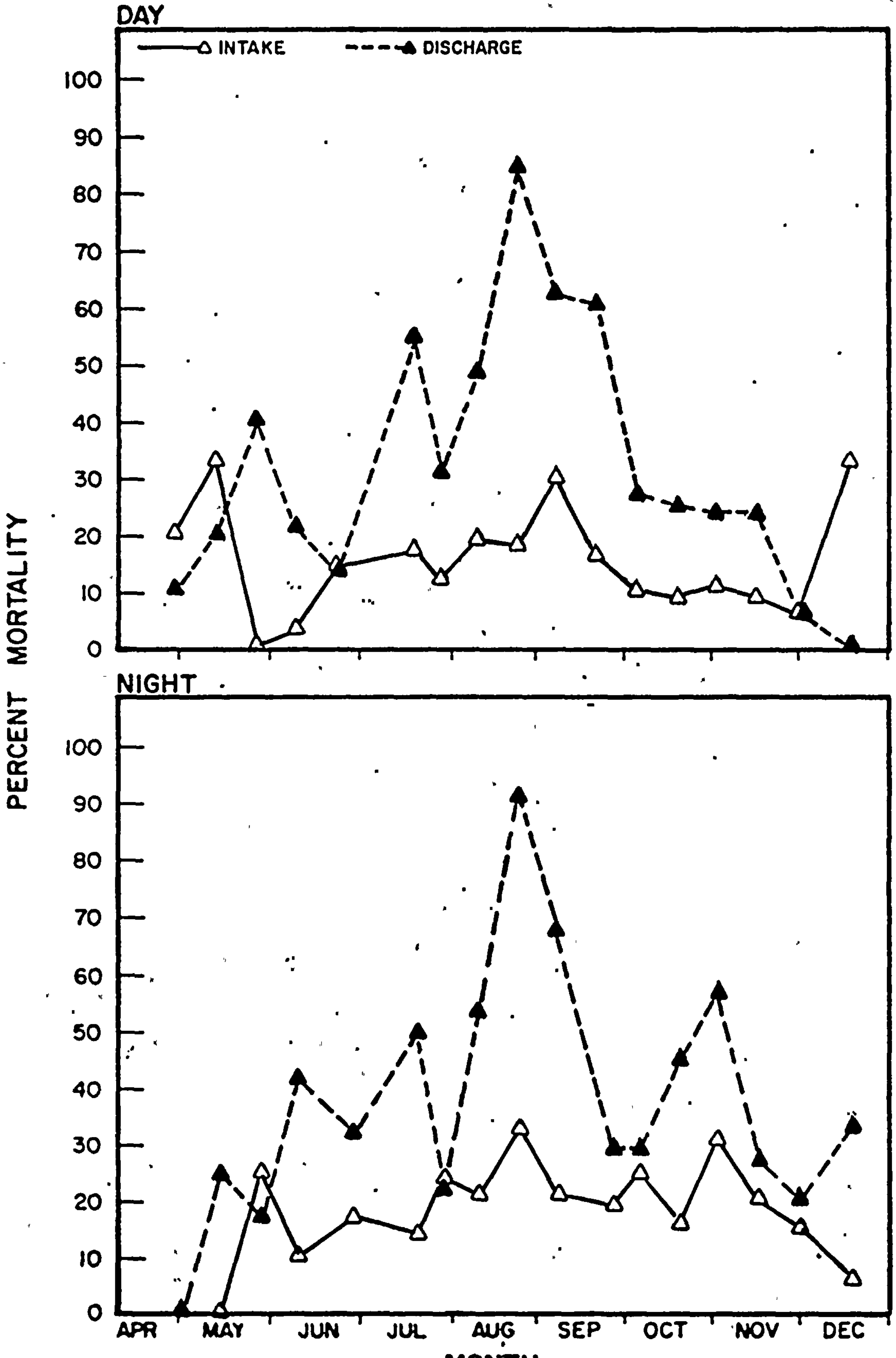
(v) Ciliata (Figures VIIIA-21 through VIIIA-23; Appendices VIII-2c and VIIIB-3c)

In-plant and lake viability samples generally yielded few ciliates. The occasional instances of adequate ciliate

FIGURE VIIIA-18

CLADOCERA MORTALITY* IN INTAKE AND DISCHARGE SAMPLES

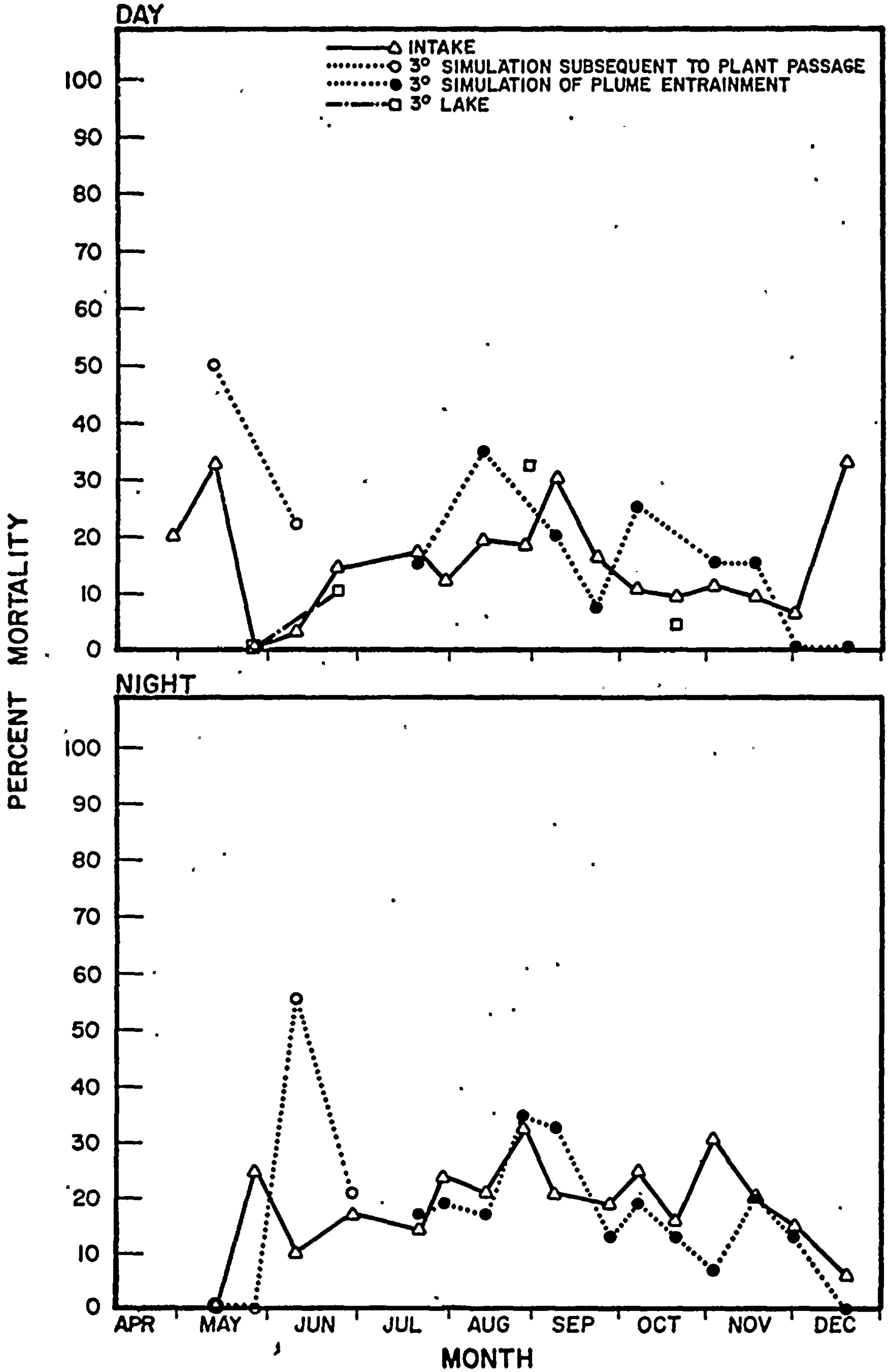
JAMES A. FITZPATRICK NUCLEAR POWER PLANT – 1976



*MEAN OF R-1 and R-2; ANALYSIS AFTER 8-HOUR INCUBATION PERIOD

CLADOCERA MORTALITY * IN INTAKE AND 3° SIMULATION SAMPLES

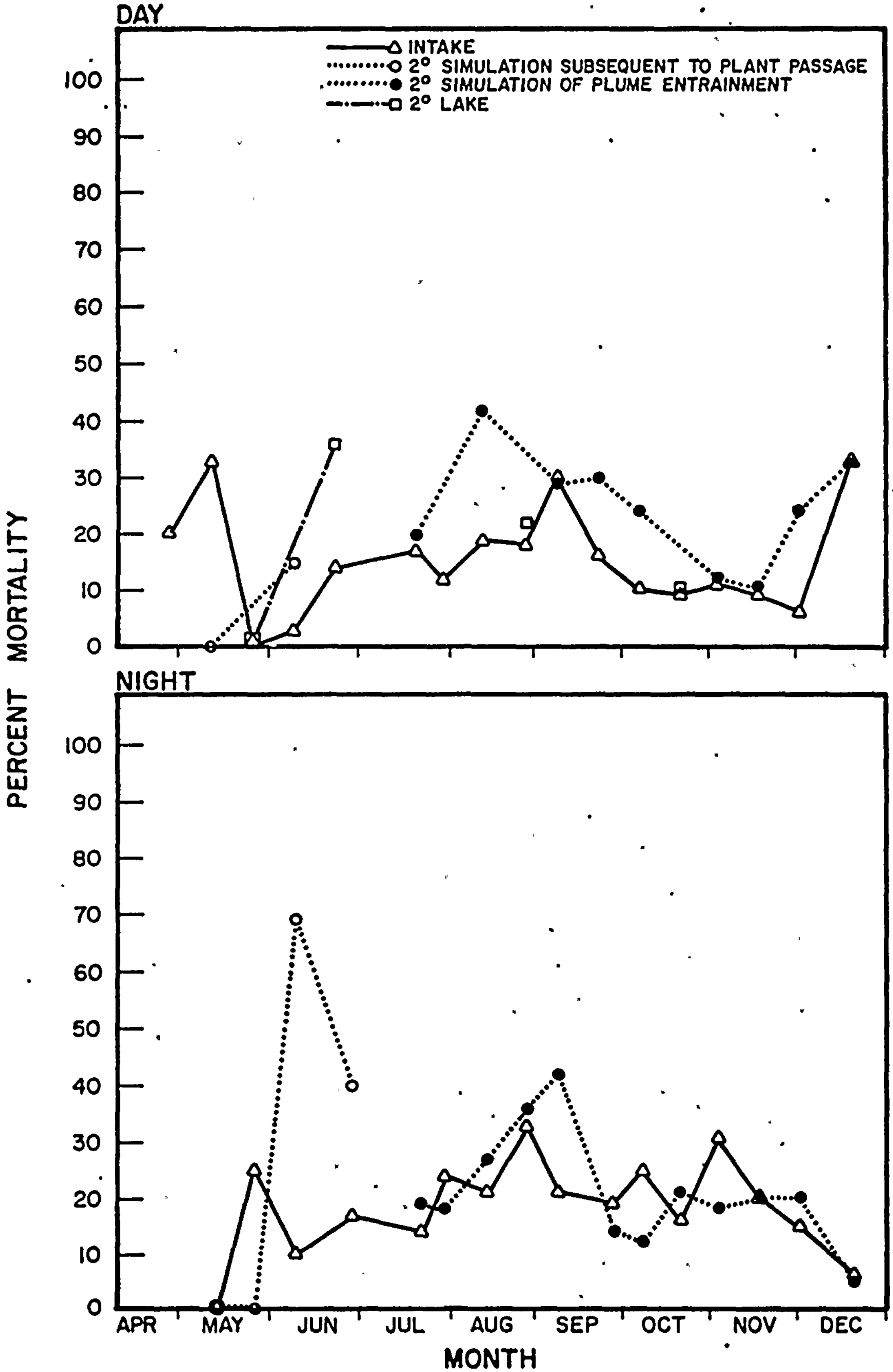
JAMES A. FITZPATRICK NUCLEAR POWER PLANT — 1976



*MEAN OF R-1 and R-2; ANALYSIS AFTER 8-HOUR INCUBATION PERIOD

FIGURE VIIIA-20

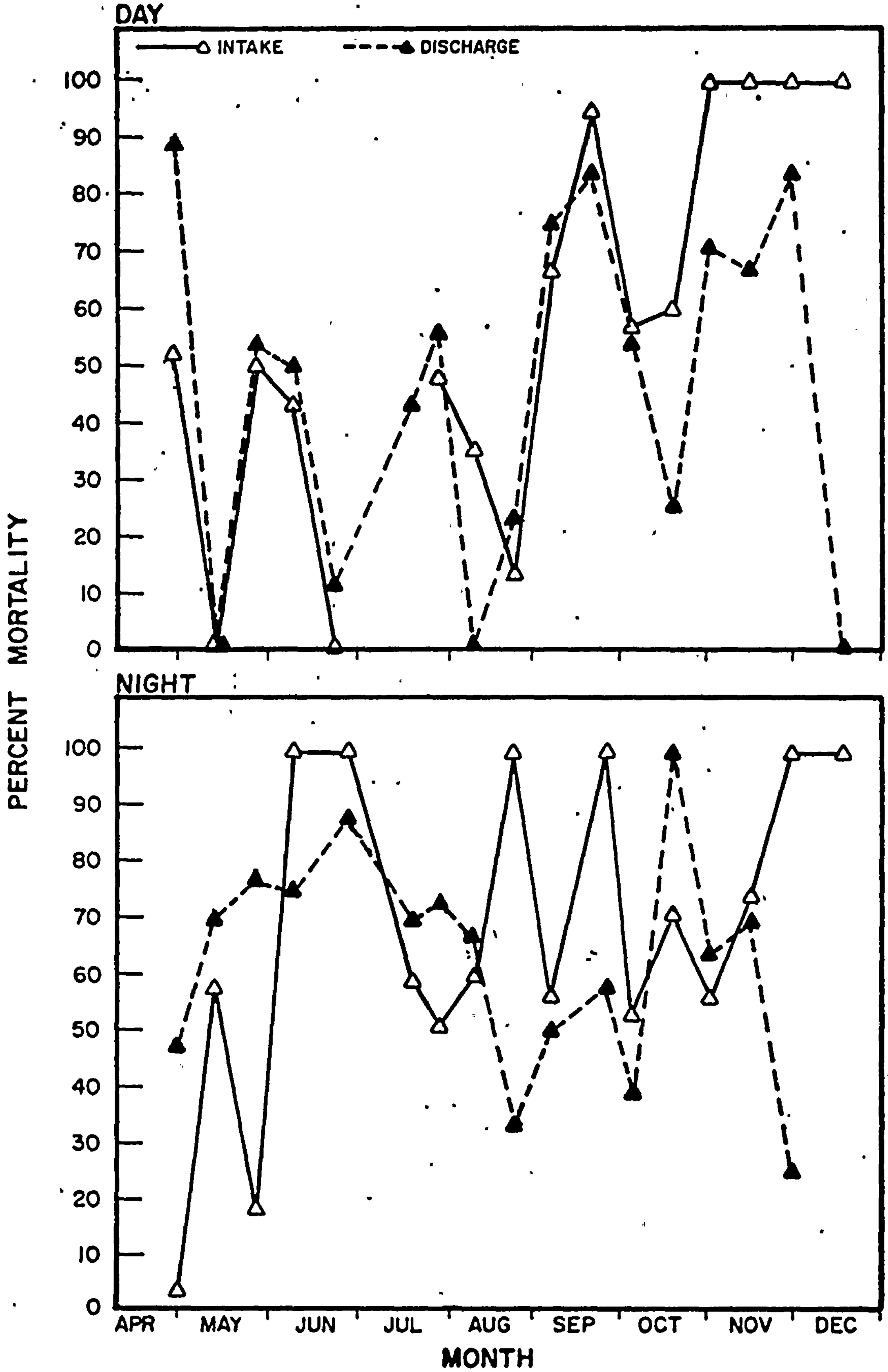
CLADOCERA MORTALITY *
IN INTAKE AND 2° SIMULATION SAMPLES
JAMES A. FITZPATRICK NUCLEAR POWER PLANT — 1976



*MEAN OF R-1 and R-2; ANALYSIS AFTER 8-HOUR INCUBATION PERIOD

CILIATA (PROTOZOA) MORTALITY* IN INTAKE AND DISCHARGE SAMPLES

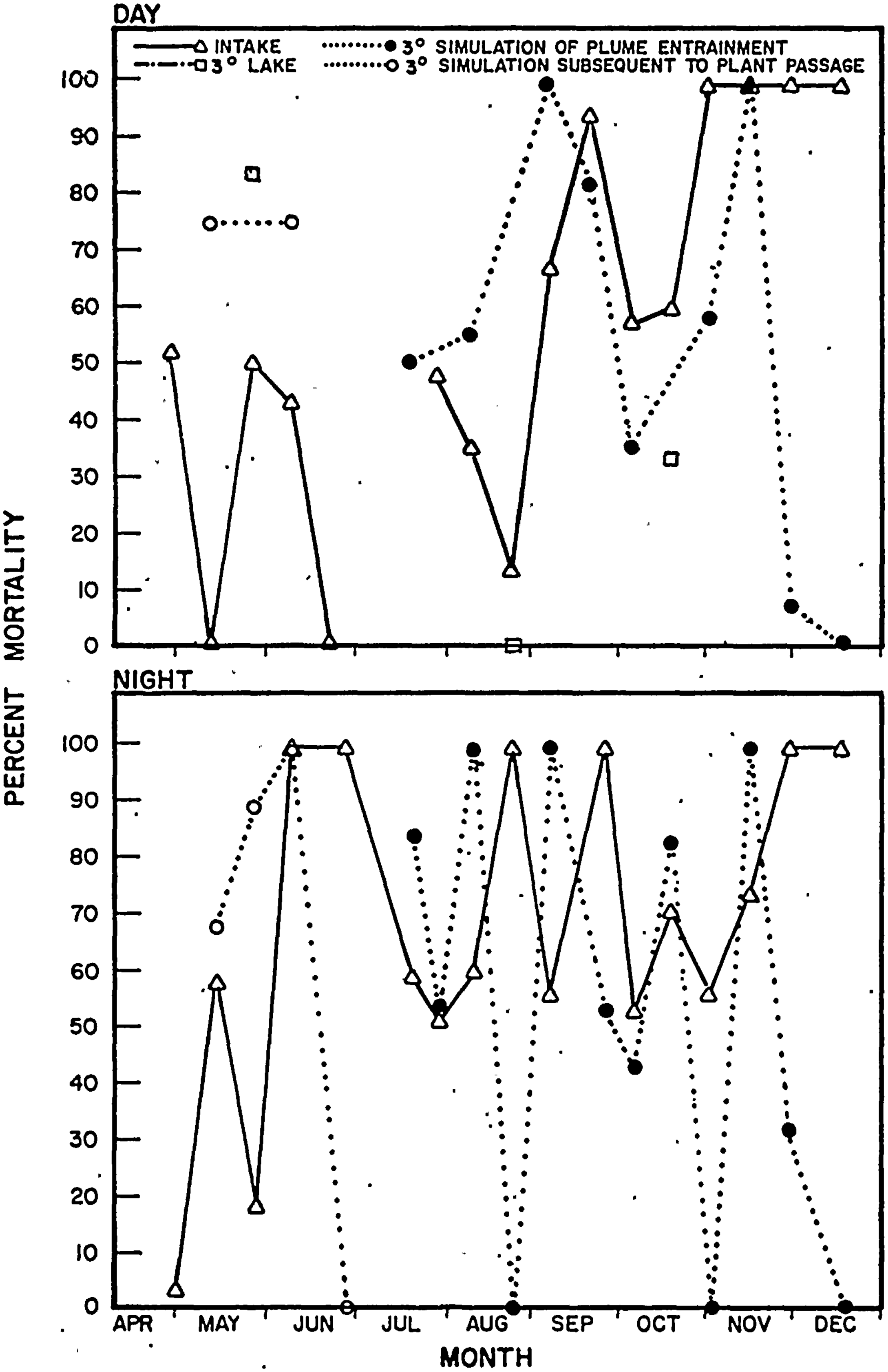
JAMES A. FITZPATRICK NUCLEAR POWER PLANT — 1976



*MEAN OF R-1 and R-2; ANALYSIS AFTER 8-HOUR INCUBATION PERIOD

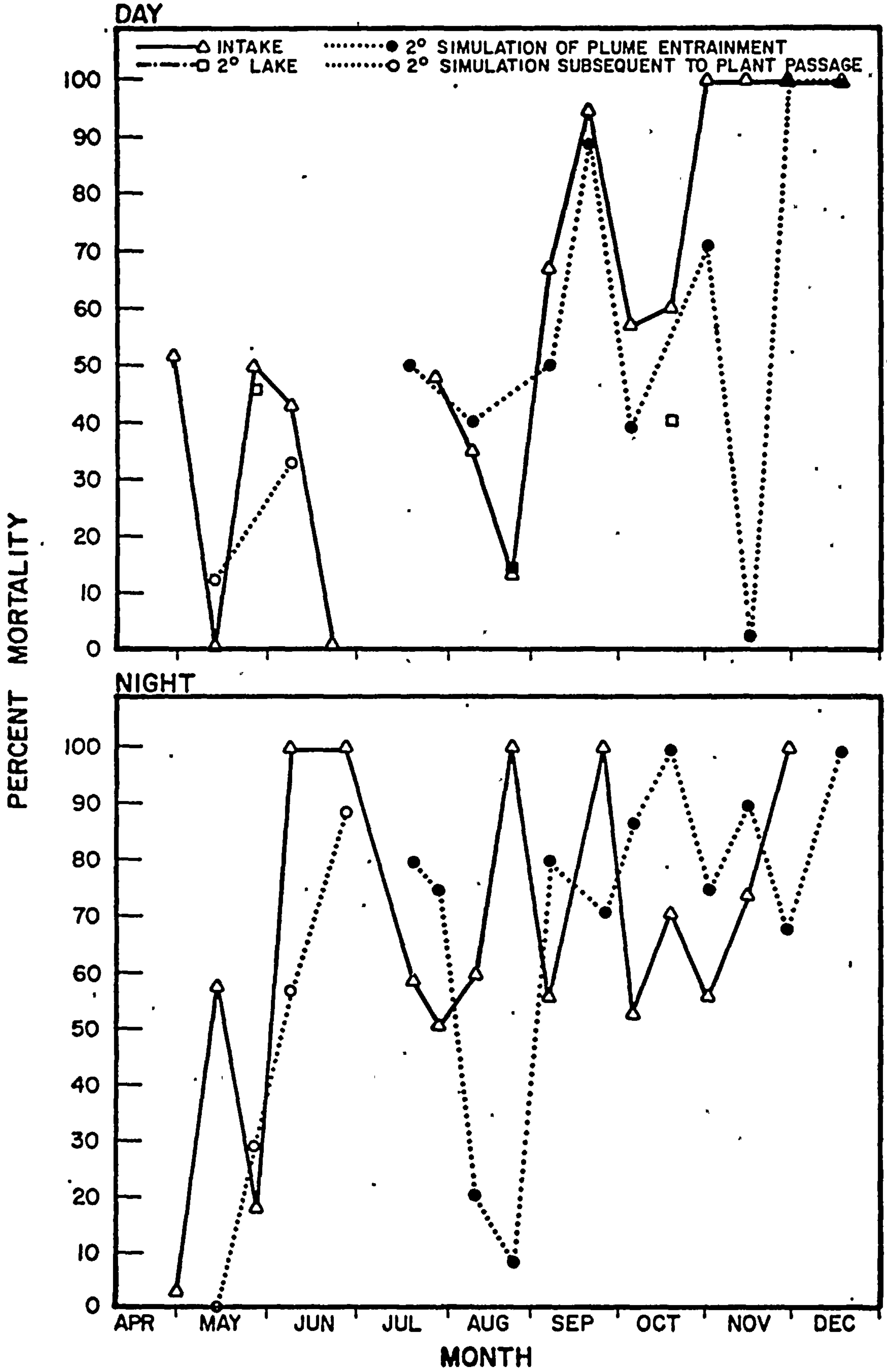
FIGURE VIII-22

CILIATA (PROTOZOA) MORTALITY* IN INTAKE AND 3° SIMULATION SAMPLES
JAMES A. FITZPATRICK NUCLEAR POWER PLANT – 1976



*MEAN OF R-1 and R-2; ANALYSIS AFTER 8-HOUR INCUBATION PERIOD

CILIATA (PROTOZOA) MORTALITY *
IN INTAKE AND 2° SIMULATION SAMPLES
JAMES A. FITZPATRICK NUCLEAR POWER PLANT — 1976



*MEAN OF R-1 and R-2 ; ANALYSIS AFTER 8-HOUR INCUBATION PERIOD

abundance were usually scattered, rendering interpretation difficult.

(vi) Suctoria (Figures VIIIA-24 through VIIIA-26; Appendices VIIIB-2c and VIIIB-3c)

In-plant and lake viability studies never contained suctorians in sufficient densities to warrant data interpretation.

(vii) Total Protozoa (Figures VIIA-27 through VIIIA-29; Appendices VIIIB-2c and VIII-3c)

Combined ciliate and suctorian abundances were too low for extensive interpretation of the data. High discharge mortality (57-73%) in the day and night collections was noted on 29 July, when ciliate protozoans were most abundant.

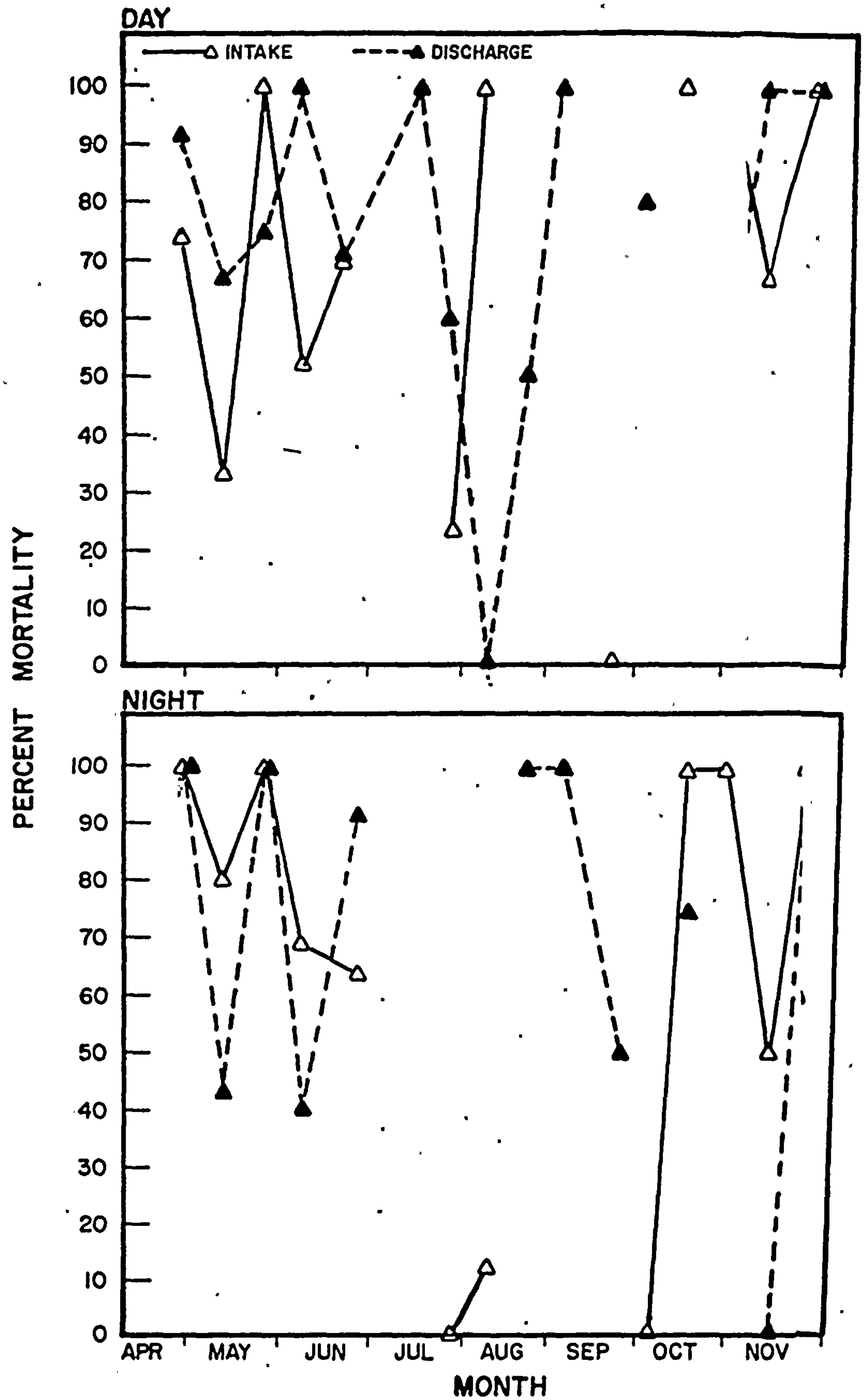
(viii) Rotifera (Figures VIIIA-30 through VIIIA-32; Appendices VIIIB-2d and VIIIB-3d)

Temporal variation in percent mortality (% dead) of rotifers were generally similar between intake and discharge collections and between day and night collections at each location (Figures VIIIA-30). Discharge mortalities generally exceeded those of intake samples. Both intake and discharge mortalities tended to be slightly higher at night, but the magnitude of the difference between plant locations was not markedly altered between corresponding day and night collections, nor was there any apparent seasonal impact on the percentage of plant mortalities. The failure of rotifers to exhibit higher discharge than intake mortalities during warmer months (as noted for copepods and cladocerans) may be related to the change in species composition in the lake rotifer population over time.

FIGURE VIII-24

SUCTORIA (PROTOZOA) MORTATY* IN INTAKE AND DISCHARGE SAPLES

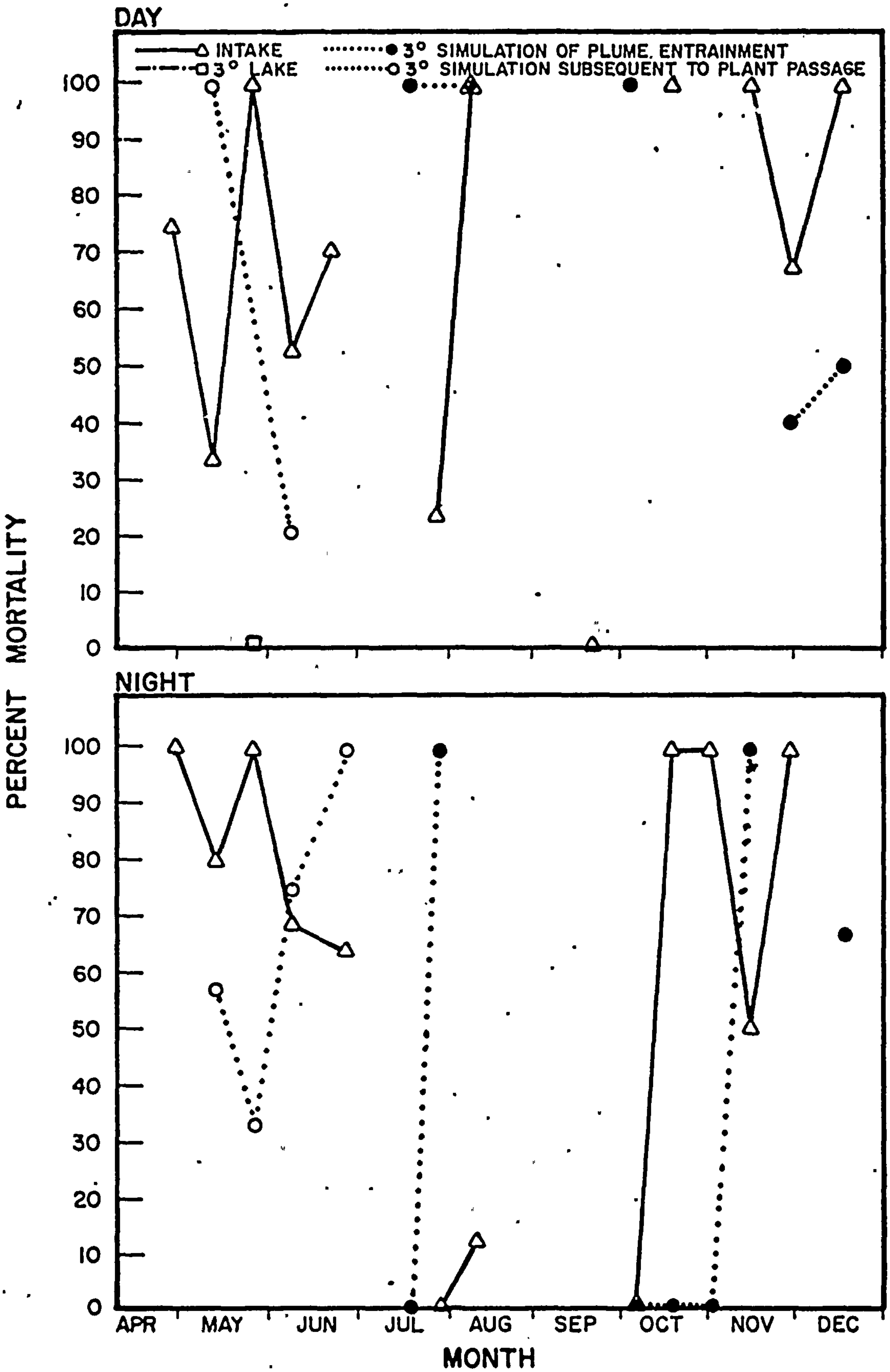
JAMES A. FITZPATRICK NUCLEAR POWER PLA — 1976



*MEAN OF R-1 and R-2; ANALYSIS AFTER 8-HOUR INCUBATIIOD

FIGURE VIIIA-25

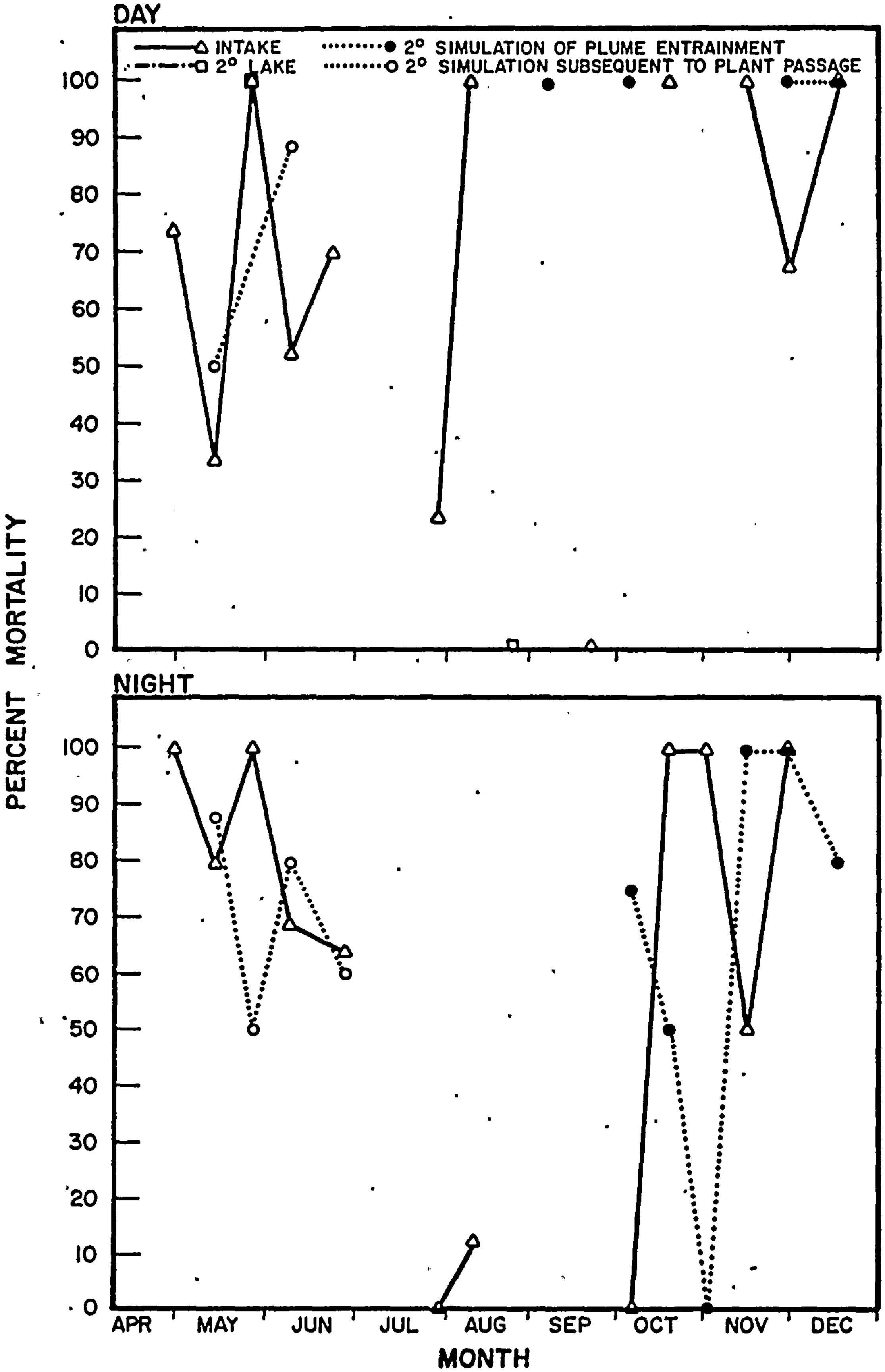
SUCTORIA (PROTOZOA) MORTALITY*
IN INTAKE AND 3° SIMULATION SAMPLES
JAMES A. FITZPATRICK NUCLEAR POWER PLANT – 1976



*MEAN OF R-1 and R-2 ; ANALYSIS AFTER 8-HOUR INCUBATION PERIOD

SUCTORIA (PROTOZOA) MORTALITY * IN INTAKE AND 2° SIMULATION SAMPLES

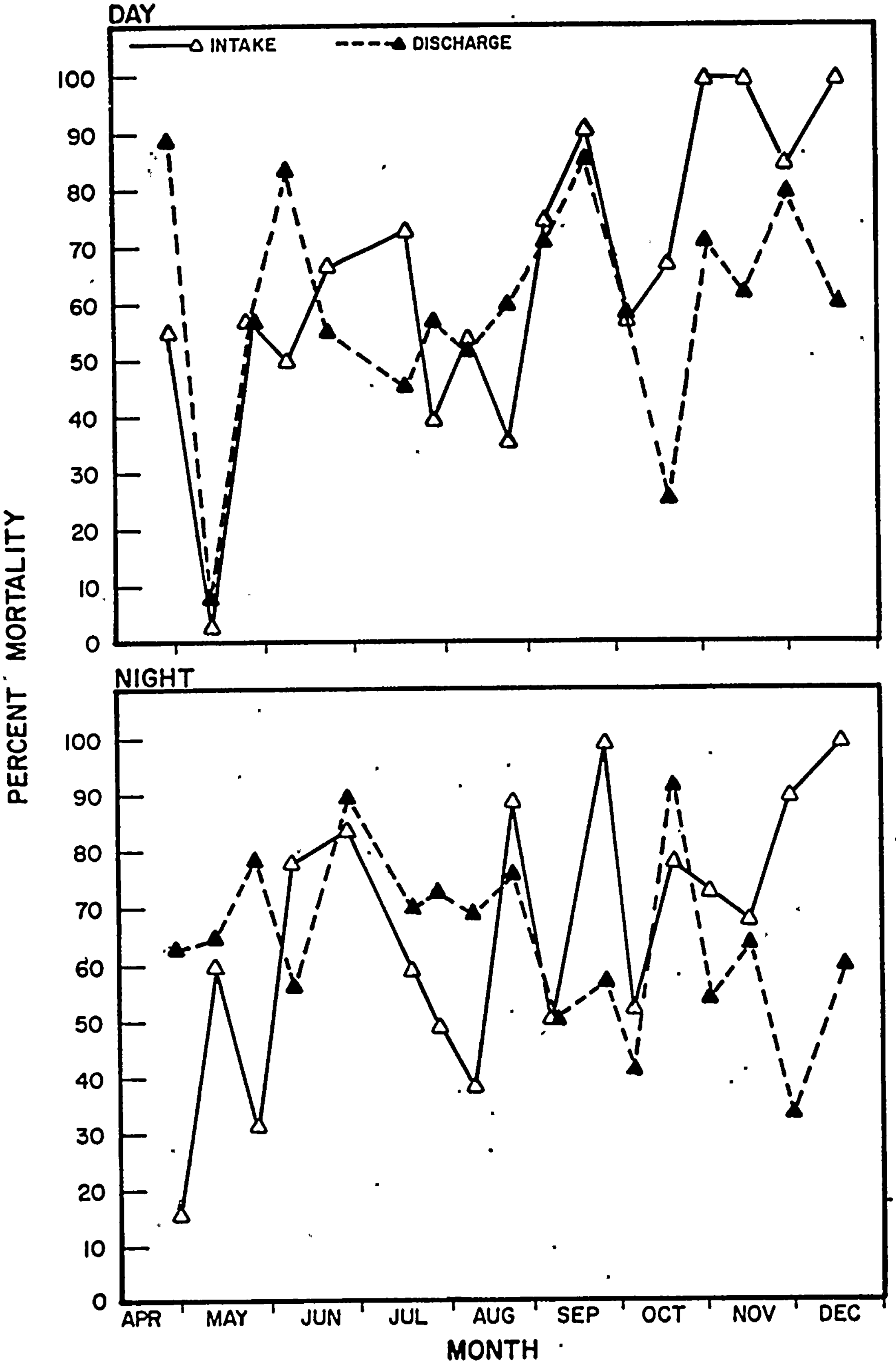
JAMES A. FITZPATRICK NUCLEAR POWER PLANT — 1976



*MEAN OF R-1 and R-2 ; ANALYSIS AFTER 8-HOUR INCUBATION PERIOD

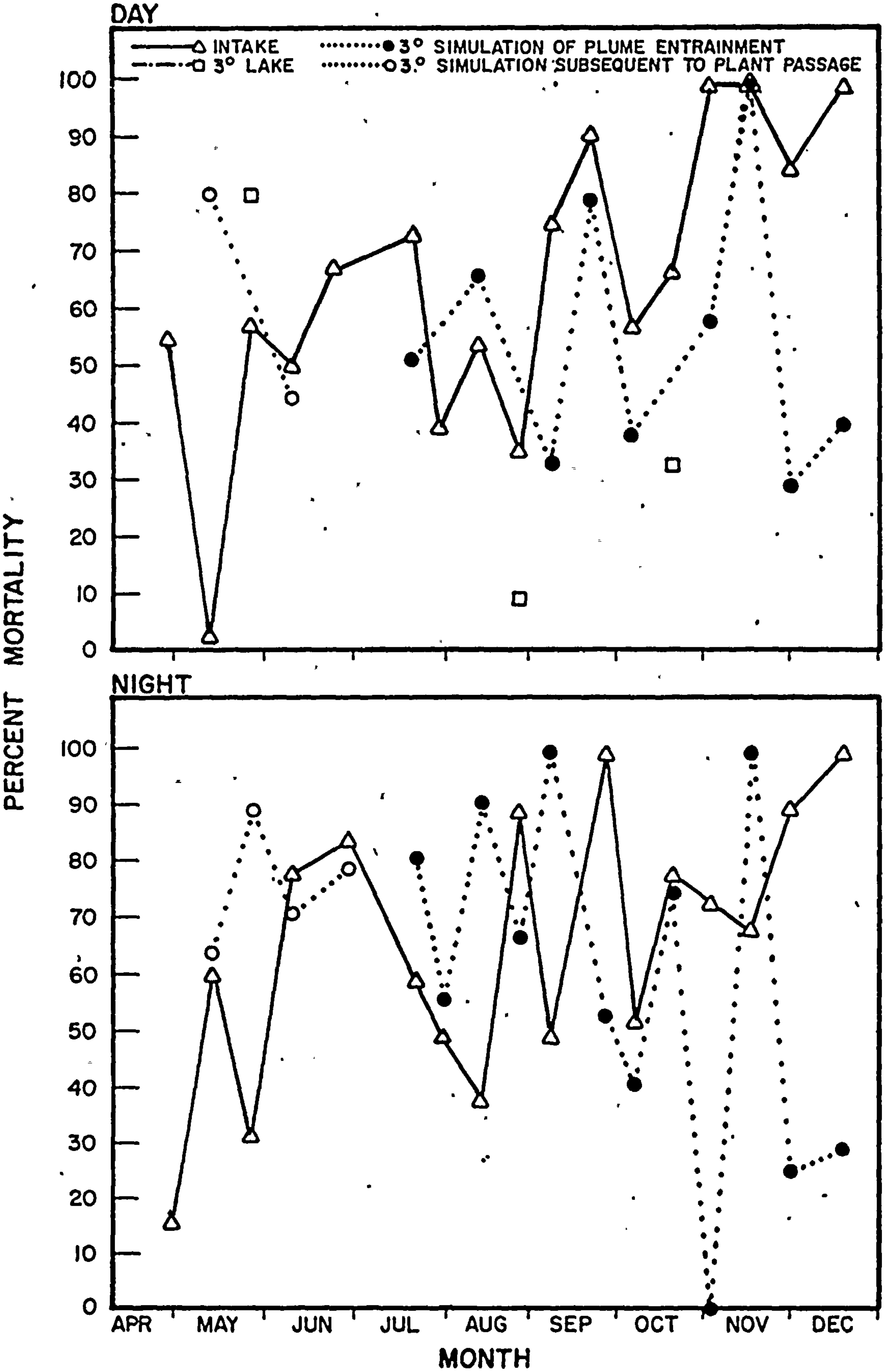
TOTAL PROTOZOA MORTALITY* IN INTAKE AND DISCHARGE SAMPLES

JAMES A. FITZPATRICK NUCLEAR POWER PLANT – 1976



*MEAN OF R-1 and R-2 ; ANALYSIS AFTER 8-HOUR INCUBATION PERIOD

TOTAL PROTOZOA MORTALITY* IN INTAKE AND 3° SIMULATION SAMPLES
JAMES A. FITZPATRICK NUCLEAR POWER PLANT – 1976

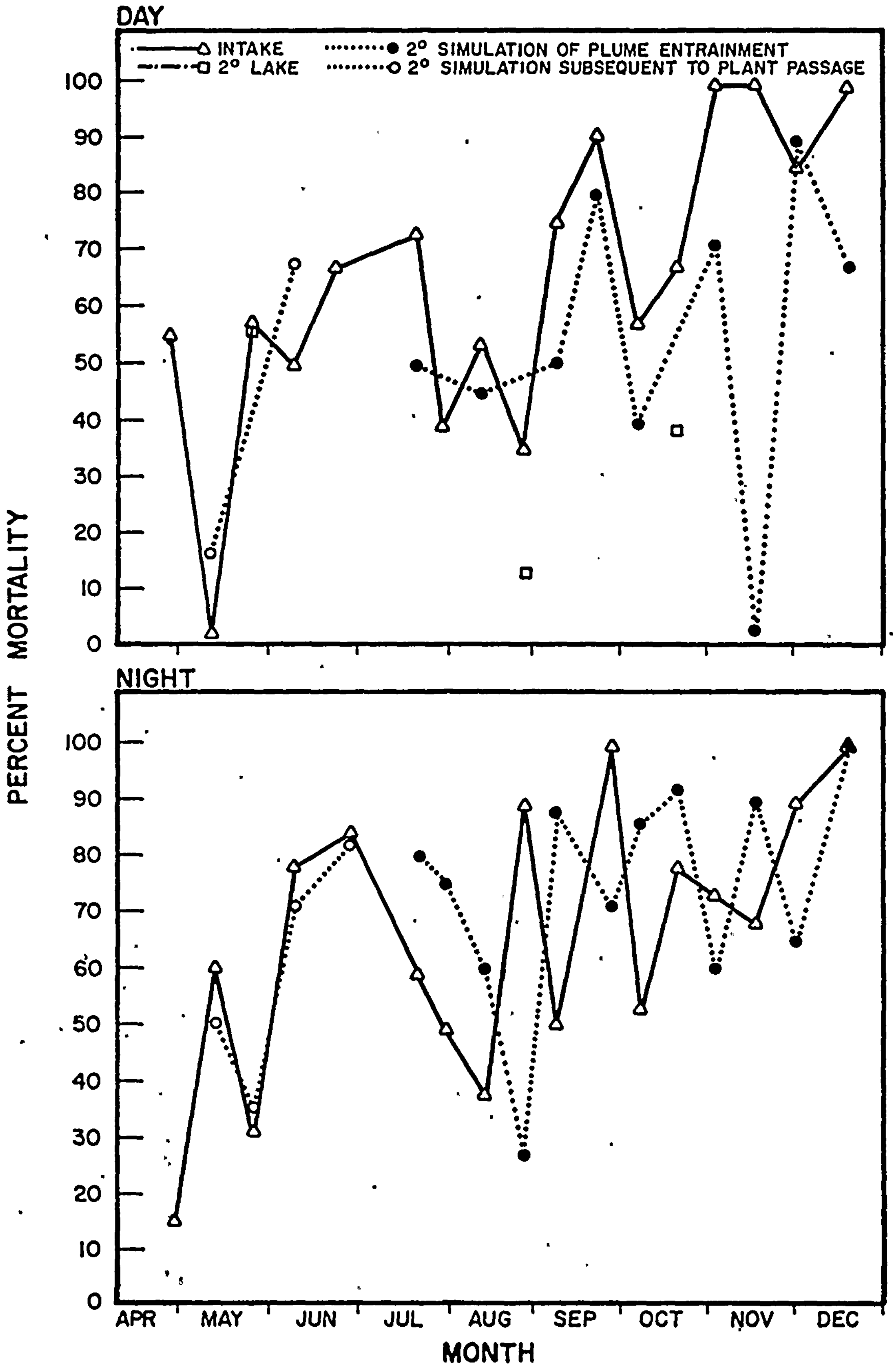


*MEAN OF R-1 and R-2 ; ANALYSIS AFTER 8-HOUR INCUBATION PERIOD

FIGURE VIIIA-29

TOTAL PROTOZOA MORTALITY* IN INTAKE AND 2° SIMULATION SAMPLES

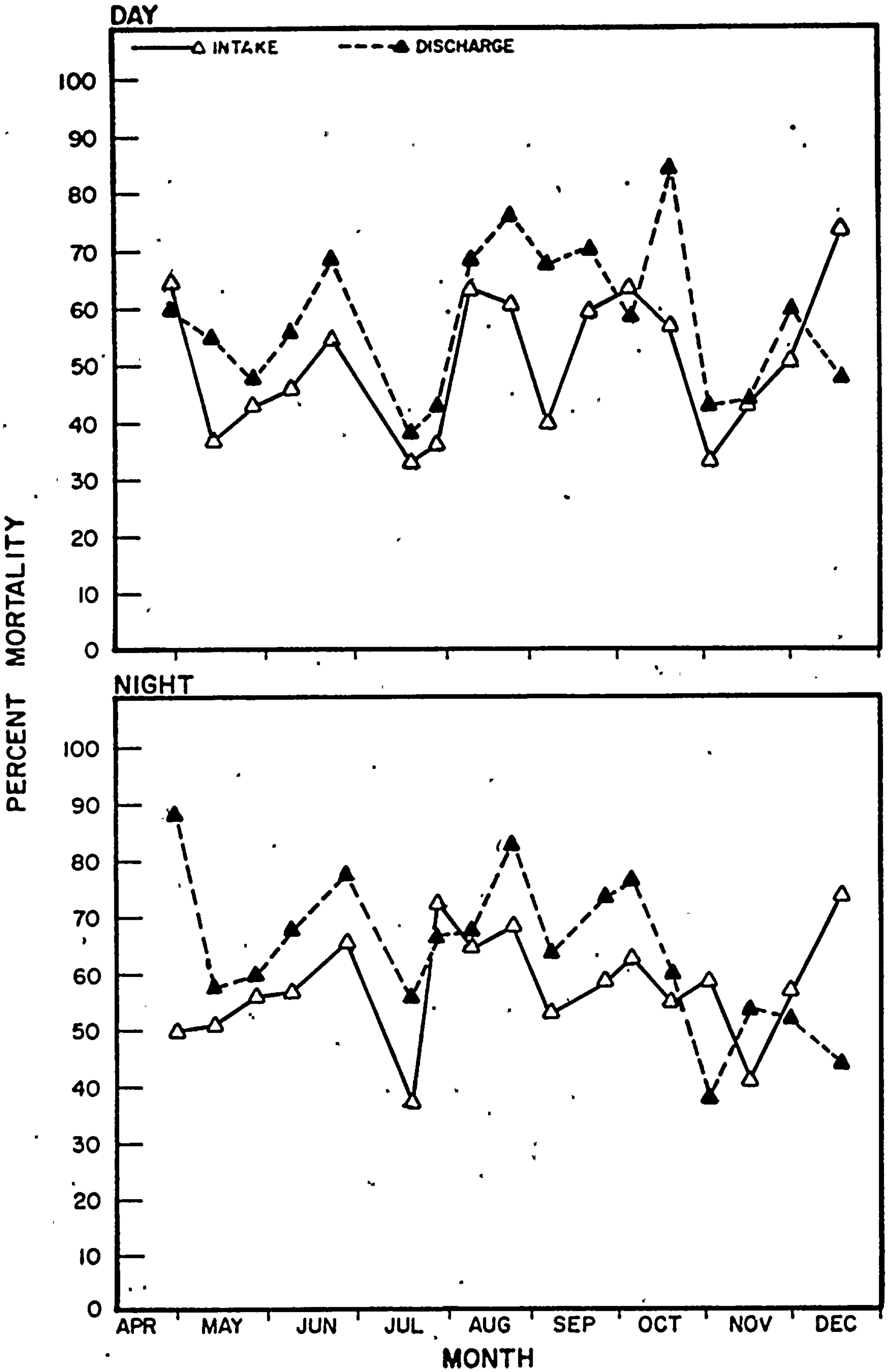
JAMES A. FITZPATRICK NUCLEAR POWER PLANT – 1976



*MEAN OF R-1 and R-2; ANALYSIS AFTER 8-HOUR INCUBATION PERIOD

ROTIFERA MORTALITY* IN INTAKE AND DISCHARGE SAMPLES

JAMES A. FITZPATRICK NUCLEAR POWER PLANT – 1976

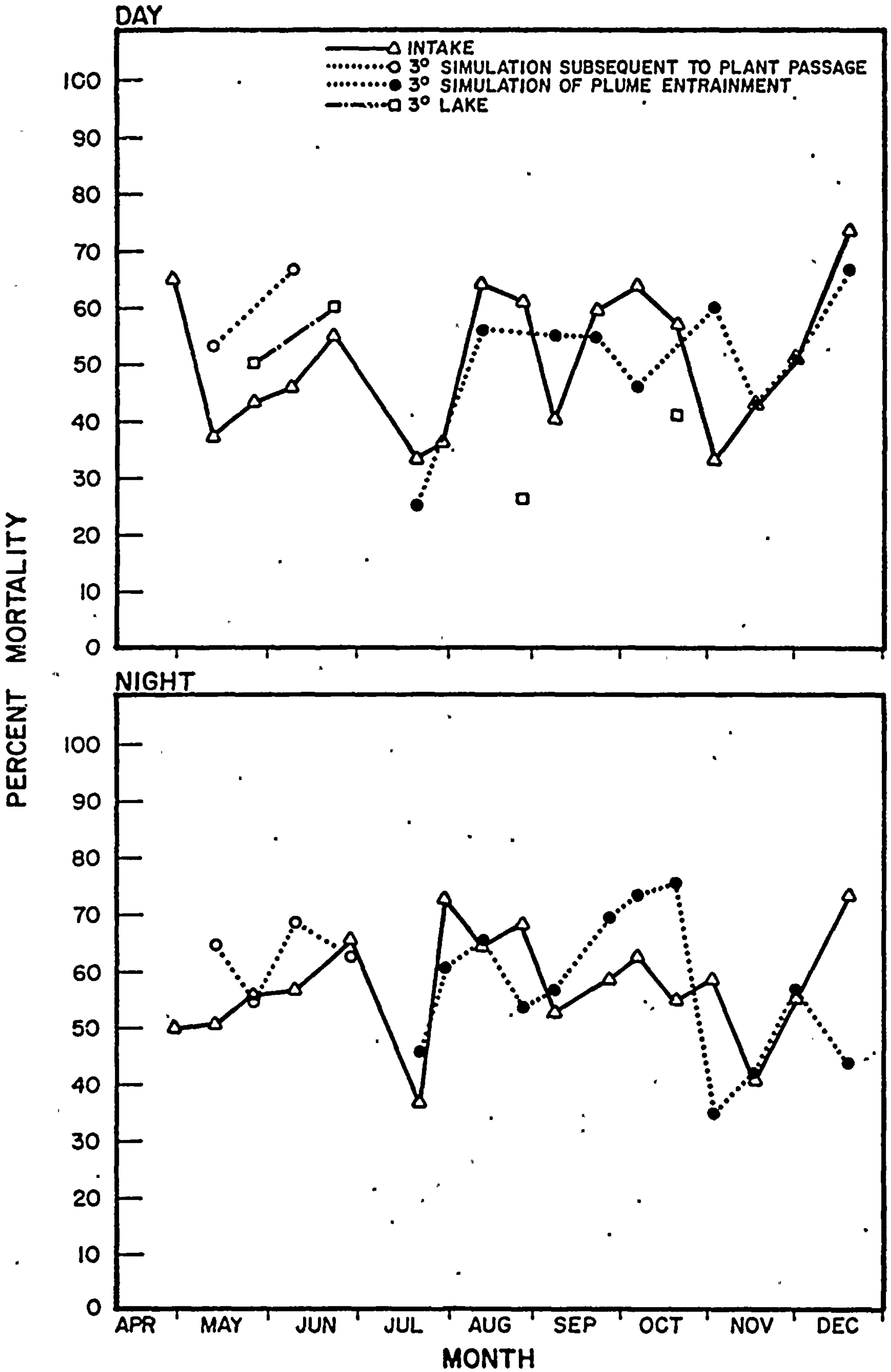


*MEAN OF R-1 and R-2; ANALYSIS AFTER 8-HOUR INCUBATION PERIOD

FIGURE VIIIA-31

ROTIFERA MORTALITY* IN INTAKE AND 3° SIMULATION SAMPLES

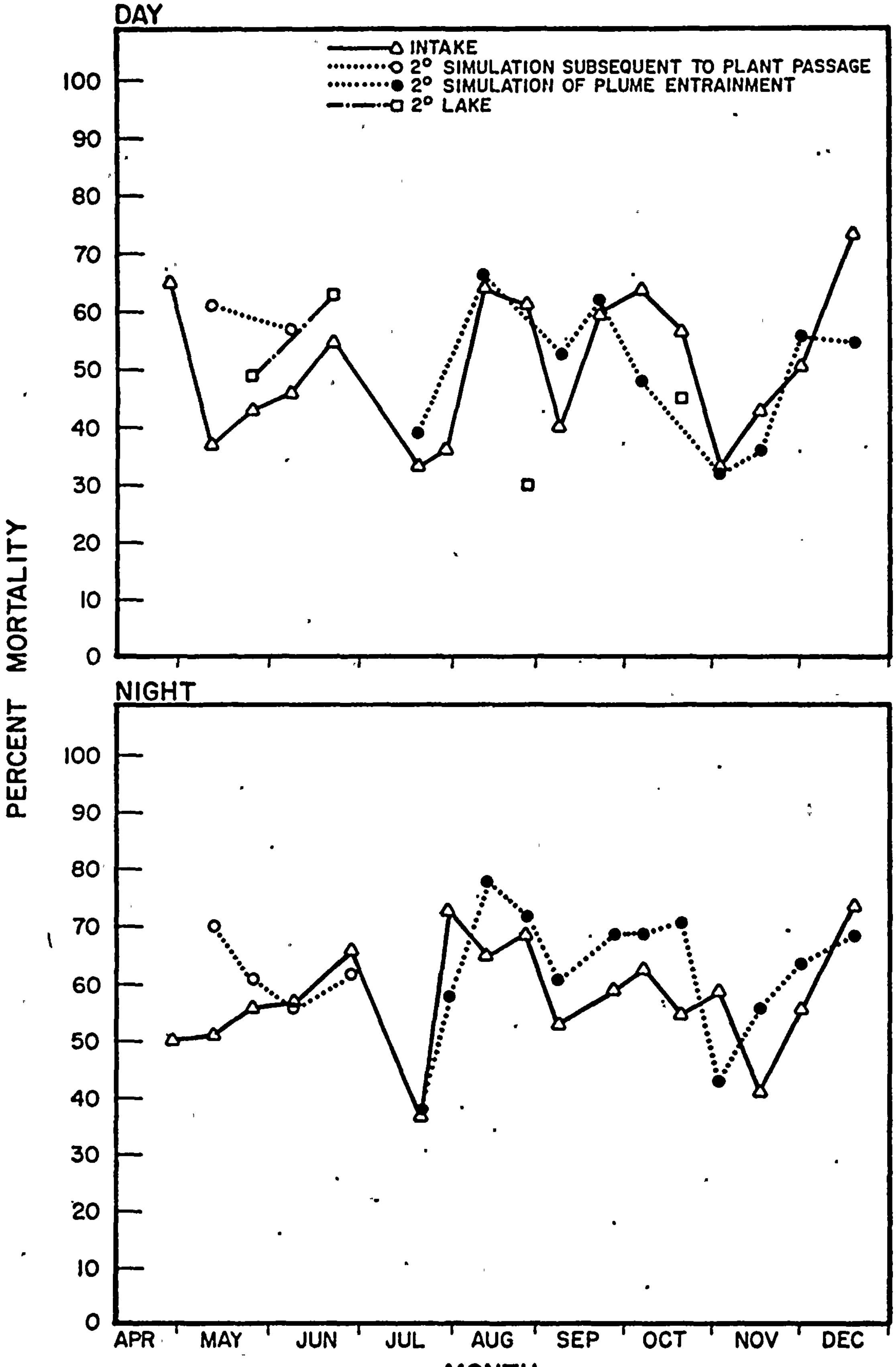
JAMES A. FITZPATRICK NUCLEAR POWER PLANT – 1976



*MEAN OF R-1 and R-2; ANALYSIS AFTER 8-HOUR INCUBATION PERIOD

ROTIFERA MORTALITY* IN INTAKE AND 2° SIMULATION SAMPLES

JAMES A. FITZPATRICK NUCLEAR POWER PLANT — 1976



*MEAN OF R-1 and R-2; ANALYSIS AFTER 8-HOUR INCUBATION PERIOD

Both 3 F and 2 F simulation data (Figures VIIIA-31 and VIIIA-32) displayed similar diurnal effects as the intake and discharge samples (i.e., the percent dead at night generally greater than during the day). From April through June, mortality in day collections at the intake was lower than that of 3 F and 2 F lake and simulation samples; the 3 F lake mortality values were lower than the simulation values recorded during the corresponding month. This is due to the procedure at the time of using plant-passed organisms for the simulation studies.

Rotifer simulation mortalities were generally comparable to intake values from 23,28 June through the remainder of the year, which implies little or no mortality associated with plume entrainment.

<u>Keratella</u> <u>crassa</u> (Appendices VIIIB-4c and VIIIB-5c) was abundant in the collections from 11 August to 8 September. Mortality at the discharge (a range of 22-88% dead) was higher than at the intake (a range of 18-67% dead) for five of six collections during this period; mortalities were equal (22%) for the 11 August night collection. Intake mortalities in the day collection of 22 September was slightly higher than the corresponding discharge mortalities. The results of the day and night 3 F simulation experiments from 11 August through 27 September were variable; mortalities were either greater or less than the corresponding intake values. Percent dead of 2 F in-plant simulations were consistently equal to or higher than that of intake values from 11 August through 27 September. Lake viability collections did not produce sufficient densities of <u>K.</u> <u>crassa</u> to warrant interpretation of data.

Discharge mortalities of Keratella quadrata ranged from 65-92% dead and intake mortalities ranged from 34-74% dead in the 12 May through 9 June collection period, the period of peak abundance for this species. Discharge mortality exceeded intake mortality in five of the six collections (Appendices VIIIB-4c and VIIIB-5c). Simulation experiments (3 F and 2 F) yielded similar results to those at the discharge for this period. Lake 3 F and 2 F isotherm collections on 26 May contained 59 and 65% dead organisms, respectively.

Polyarthra dolichoptera (Appendices VIIIB-4c and VIIIB-5c) was collected in the greatest numbers in the 12 May through 23 June collections. Mortalities were generally higher in intake samples than discharge samples, possibly reflecting collection mortality. Mortalities from lake 3 F and 2 F viability samples taken on 26 May and 23 June, 63 to 95% dead respectively, were similiar to simulation mortalities observed during the same period (71 to 95% dead).

From 11 August through 27 September, Polyarthra major was most abundant in the viability samples. Mortality values ranged from 67 to 100% dead in discharge samples and 73 to 100% dead in intake samples; no trend was observed between intake and discharge samples. Simulation mortalities fell within the range noted for intake and discharge samples. The invariably high percentage of dead animals made interpretation of entrainment-related effects impossible.

Synchaeta lackowitziana (Appendices VIIIB-4c and VIIIB-5c), abundant in the 28 April through 9 June collections, showed greater mortalities at the discharge than at the intake for four consecutive night collections. Night intake and discharge mortalities (71 and 73% dead, respectively, on 28 April) decreased steadily through 9 June, when corresponding

mortalities were 7 and 12%. During the corresponding day collections, the percent dead intake exceeded that at the discharge; simulation mortaliites were generally greater than those of intake samples. Day lake viability samples of 26 May contained 33 and 29% dead organisms at 3 F and 2 F isotherms, respectively; these values were considerably below the 45% intake mortality recorded for the same date.

Discharge mortalities for Synchaeta pectinata (Appendices VIIIB-4c and VIIIB-5c) ranged from 26 to 76% from 28 April through 9 June (day only), the period was collected in most numbers. Corresponding intake mortalities were 16 to 39% except for the 28 April day collection, which showed an anomalously high intake mortality of 80%. Simulation 3 F and 2 F mortalities were greater than those of corresponding intake mortalities. Lake samples of 26 May contained 36 and 19% dead Synchaeta pectinata (2 F and 3 F respectively) compared to 18% dead in the intake.

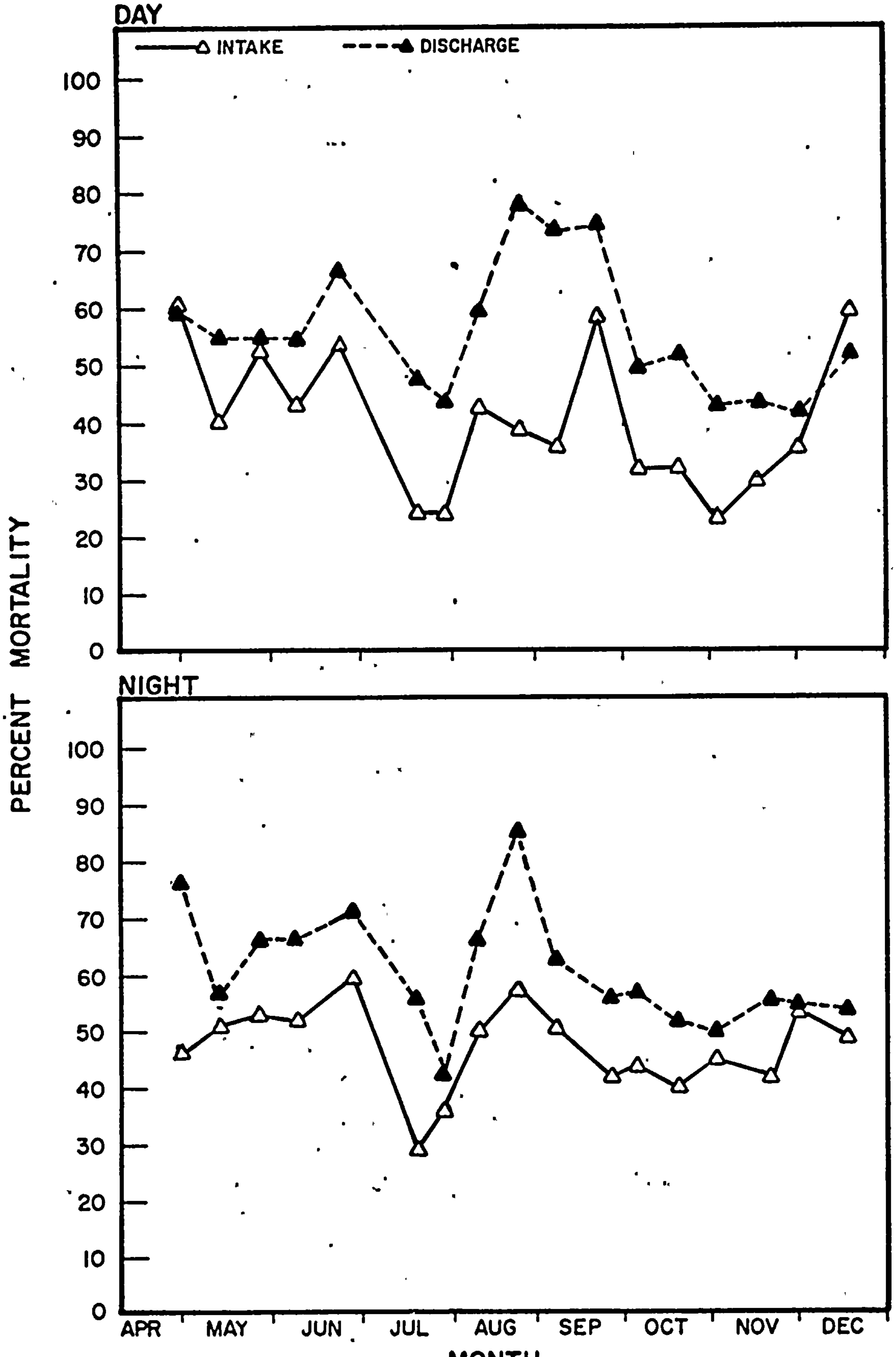
Trichocerca multicrinis (Appendices VIIIB-4c and VIIIB-5c) exhibited 69 to 96% mortality in the discharge samples from 11 August to 27 September, the period of peak abundance in viability samples; the percent dead in the corresponding intake samples was always less, ranging from 44 to 77%. From 11 August through 8 September, simulation mortalities substantially exceeded those of intake samples; on 22, 27 September, simulation and intake mortalities were similar. Low concentrations of Trichocerca multicrinis from lake viability samples precluded meaningful interpretation of the data.

(ix) Total Zooplankton (Figures VIIIA-33 through VIIIA-35; Appendices VIIIB-2e and VIIIB-3e)

Percent dead at the discharge exceeded that of intake on 33 of 36 occasions for all zooplankton combined. The magnitude of

TOTAL ZOOPLANKTON MORTALITY* IN INTAKE AND DISCHARGE SAMPLES

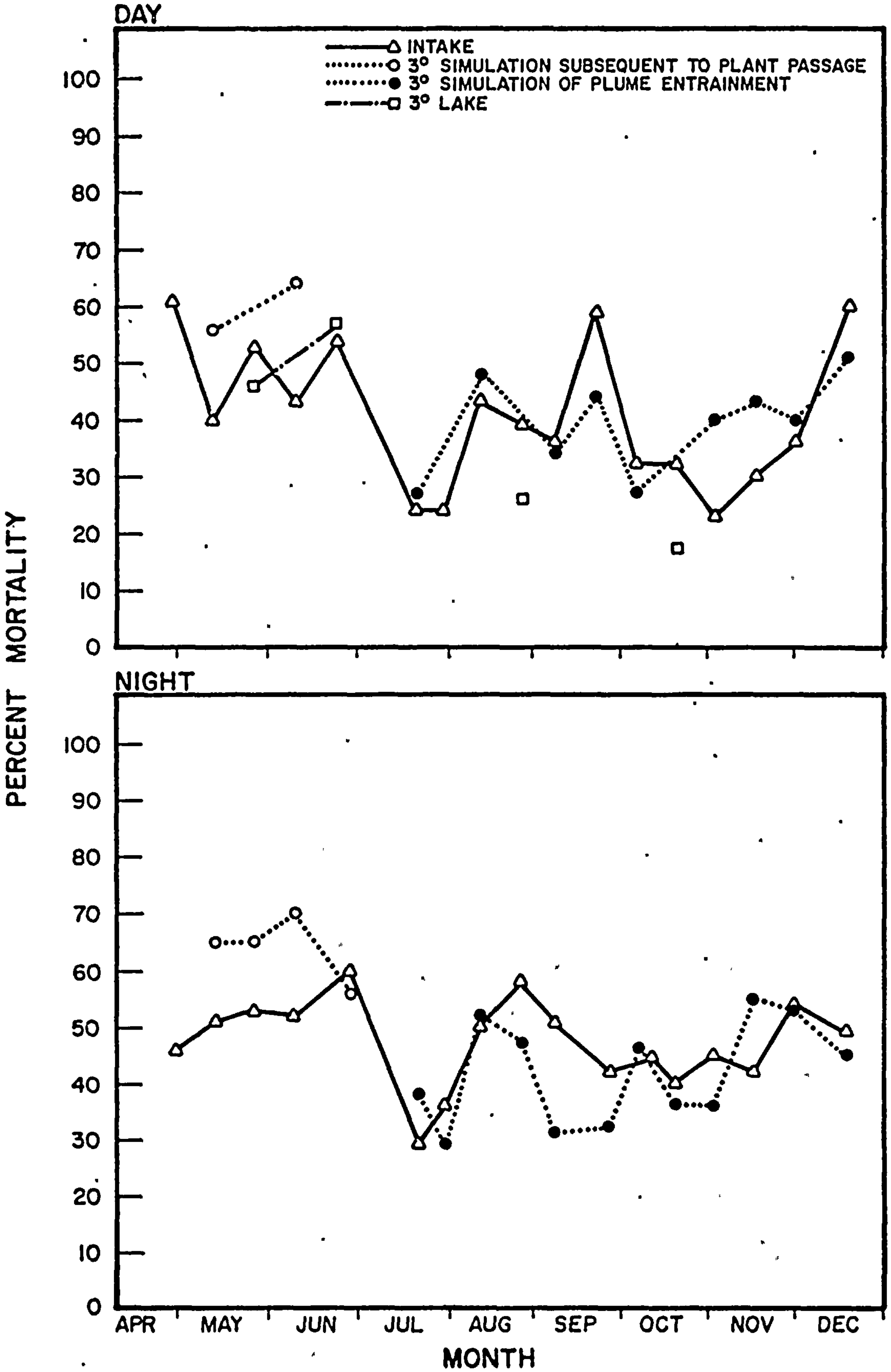
JAMES A. FITZPATRICK NUCLEAR POWER PLANT — 1976



*MEAN OF R-1 and R-2; ANALYSIS AFTER 8-HOUR INCUBATION PERIOD

FIGURE VIIIA-34

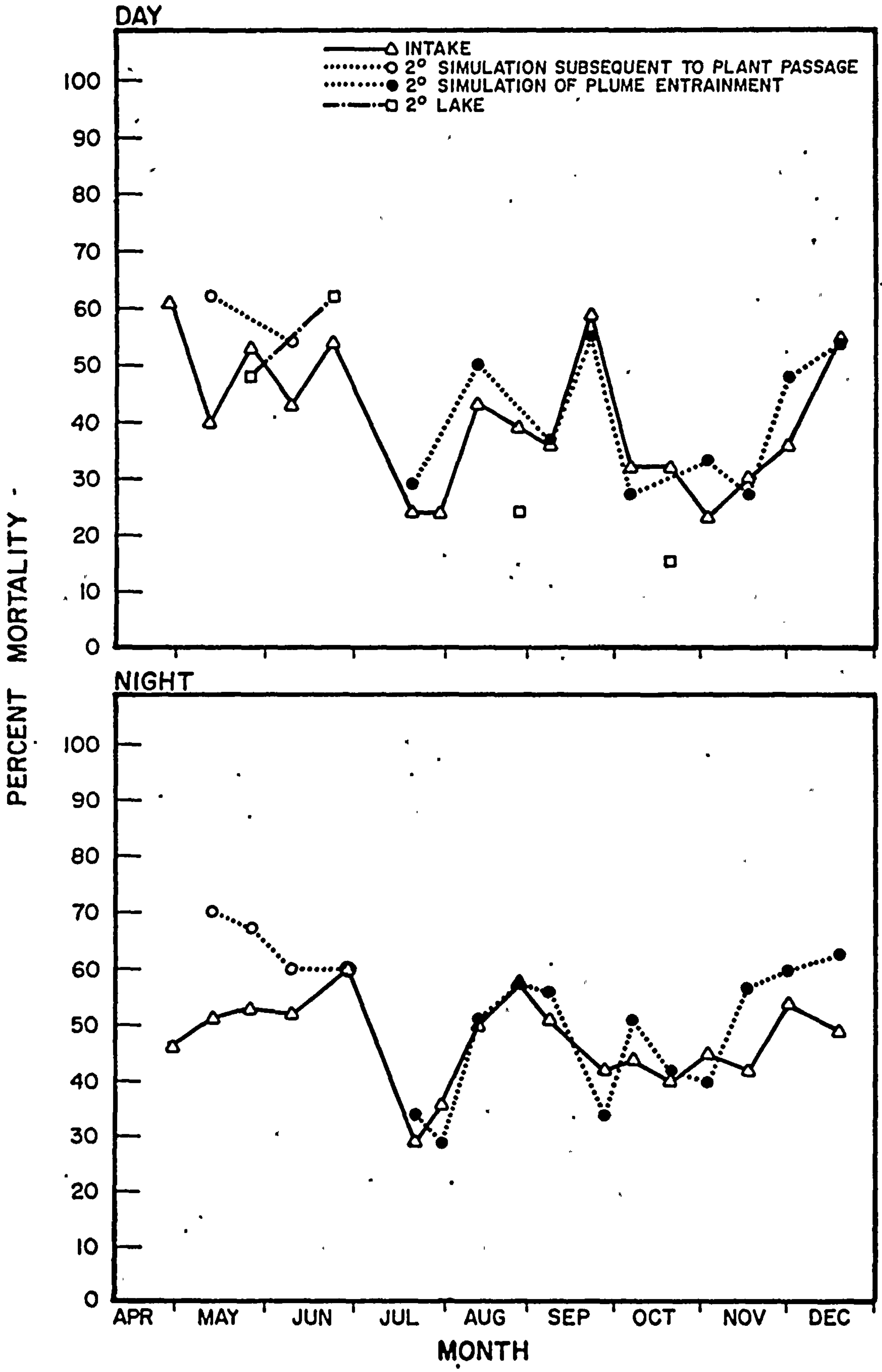
TOTAL ZOOPLANKTON MORTALITY*
IN INTAKE AND 3° SIMULATION SAMPLES
JAMES A. FITZPATRICK NUCLEAR POWER PLANT – 1976



*MEAN OF R-1 and R-2; ANALYSIS AFTER 8-HOUR INCUBATION PERIOD

TOTAL ZOOPLANKTON MORTALITY* IN INTAKE AND 2° SIMULATION SAMPLES

JAMES A. FITZPATRICK NUCLEAR POWER PLANT – 1976



*MEAN OF R-1 and R-2; ANALYSIS AFTER 8-HOUR INCUBATION PERIOD

this difference was greater than 15% on 12 occasions, seven of which fell in July and August, reflecting the seasonal trend of rotifer, cyclopoid, and cladoceran mortalities. From 29 August through 1 December, the magnitude of difference between intake and discharge viability samples was usually greater during the day than night, reflecting the diurnal component of cyclopoid mortality and the fall cyclopoid abundance peak.

From 12 May through 9 June, simulation mortalities resembled discharge values, invariably exceeding the percent dead from the intake. From 23 June through 20 October there was a marked reversal of this trend, with simulation mortality more closely resembling values of the unstressed intake population.

In May and June, discharge samples were diluted with intake water for the simulation experiments. It is therefore logical that May-June simulation mortalities resembled discharge values since the greatest percentage of the organisms were subjected to condenser passage. From 20 July through the survey end, intake samples were serially diluted into filtered discharge water, thereby simulating plume entrainment. The data indicate that the mortality associated with plume entrainment is minimal or nonexistant.

Lake isotherm mortalities for total zooplankton on 26 May and 23 June, were approximately 10% of intake values. On 25 August lake 2 F and 3 F isotherm mortalities were 24 and 26%, respectively, compared to the intake value of 39%. On 20 October, lake values of 15 and 17% mortality were again considerably lower than the intake(32%).

c. Mortality Due to Plant Passage (Table VIIIA-6)

Mortality due to plant passage was computed for five major groups of zooplankton for each of three seasons. Percent survival at the

TABLE VIII.A-6

MORTALITY OF ZOOPLANKTON DUE TO PLANT PASSAGE

JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

TAXA	TIME PERIOD	% LIVE[b] INTAKE	% LIVE[b] DISCHARGE	MORTALITY DUE TO PLANT PASSAGE [c]
CLADOCERA (ARTHROPODA)	APR-JUN	85.28	77.46	9.17
	JUL-SEP	80.55	49.89	38.06
	OCT-DEC	85.64	70.84	17.28
COPEPODA[a] (ARTHROPODA)	APR-JUN	47.21	35.50	24.80
	JUL-SEP	63.82	34.91	45.30
	OCT-DEC	65.06	49.38	24.10
TOTAL PROTOZOA	APR-JUN	53.59	32.17	39.97
	JUL-SEP	42.11	34.67	17.67
	OCT-DEC	33.48	40.29	-20.34
ROTIFERA	APR-JUN	46.81	35.41	24.35
	JUL-SEP	45.59	34.02	25.38
	OCT-DEC	44.57	42.88	3.79
TOTAL ZOOPLANKTON	APR-JUN	48.09	37.90	21.19
	JUL-SEP	60.49	38.26	36.75
	OCT-DEC	63.01	50.33	20.12

[a] Adults, juvenile, nauplii

[b] Number live in R-1 and R-2 divided by the total collected in R-1 and R-2

[c] $\frac{\% \text{ Live}_I - \% \text{ Live}_D}{\% \text{ Live}_I}$; I = Intake sample; D = Discharge sample

intake and discharge locations was calculated by summing the counts of live and total organisms over the period and dividing. The mortality due to plant passage was then computed as the difference between intake and discharge survival divided by the intake survival to remove the effects of sampling mortality.

(i) Copepoda

Entrainment mortality of 45.30% for all adult and juvenile copepods during July-September was the greatest mortality calculated for any taxonomic group. April-June and October-December entrainment mortalities were 24-25%.

(ii) Cladocera

This group, composed largely of Bosmina longirostris, displayed the greatest mortality (38.06%) during the summer months. Calculated April-June and October-December mortalities were 9.17 and 17.28%, respectively.

(iii) Total Protozoa

Ciliates and suctorians were the most abundant protozoans in entrainment collections. These soft-bodied organisms are easily damaged during pump collection, so viability experiments may be subject to large and unquantifiable errors. This problem was exemplified by the negative protozoan mortality estimate for October-December.

(iv) Rotifera

These organisms showed a less defined seasonal mortality effect; April-June and July-September entrainment mortalities were 24.35

and 25.38%, respectively. The very low plant-entrained rotifer mortality of 3.79% during October-December was partially due to the high mortality at the intake on 19 December.

(v) Total Zooplankton

July-September plant-entrained zooplankton mortality of 36.75% largely reflected seasonally increased mortalities of copepods and cladocerans. April-June zooplankton mortality of 21.19% was caused primarily by mortality of rotifers, the dominant organisms during this period. Copepods, which comprised most of the zooplankton population from October through December, clearly influenced the 20.12% total mortality for the time period.

4. RESULTS AND DISCUSSION - GAMMARUS FASCIATUS

a. Distribution

The concentration of Gammarus fasciatus in entrainment samples from January through December is presented in Appendix VIIIC-1.

b. Mortality of Gammarus fasciatus from Day/Night Collections: Intake and Discharge Bays and Simulations.

The results of the entrainment viability program are presented in Appendix VIIIC-2.

5. RESULTS AND DISCUSSION - ICHTHYOPLANKTON

a. Species Inventory

The occurrence of ichthyoplankton in in-plant collections is shown by taxon and date in Table VIIIA-7. A total of 13 taxa three representative important species, (eggs and larvae of alewife and rainbow smelt and larvae of yellow perch), were identified in samples collected at the FitzPatrick plant (Table VIIIA-8), compared to 15 in lake samples. The ichthyoplankton taxa collected in the lake, but not at the plant were: emerald shiner, gizzard shad, Lepomis sp. (unidentified), minnows and carps (unidentified), and threespine

TABLE VIIIA-7

ICHTHYOPLANKTON AND FISH EGGS SPECIES OCCURRENCE BY DATE*

NINE MILE POINT NUCLEAR STATION UNIT 1, JAMES A. FITZPATRICK NUCLEAR POWER PLANT AND VICINITY - FEBRUARY - JUNE 1976

		FEB	MAR	APR					MAY						JUN					
SPECIES	LOCATION	4	17	7	14	21	28	29	5	12	13	19	22	26	2	9	10	16	17	23	30
ALEWIFE ✓	NMP														E	E		E		E	EL
	FITZ									L		L		L				E		EL	EL
	LAKE D															E		EL	L	EL	EL
	N																E	EL		EL	
BURBOT	NMP				L																
	FITZ		E		L		L					L									
	LAKE D			L	L	L		L					L	L							
	N														L						
CARP	NMP																	L			
	FITZ																	L			L
	LAKE D																	L		L	
	N																	L		EL	
EMERALD SHINER	LAKE D																				
	N																	L			
GIZZARD SHAD	NMP																				
JOHNNY DARTER	NMP											L								L	EL
	FITZ											L				EL				L	L
	LAKE D																				
	N																L	L		L	
LAKE HERRING (CISCO)	NMP													E							
	FITZ								E												
	LAKE D							L			E										
LEPOMIS SP. (UID)	LAKE D														L			L			
	N														L		L				
MINNOWS AND CARPS (UID)	LAKE N																			L	
MOTTLED SCULPIN	NMP																	EL		L	L
	FITZ															L		L		L	
	LAKE D																				
	N																L	L		L	
NOTROPIS SP.	FITZ																				L
	LAKE N																	L		L	
RAINBOW SMELT ✓	NMP				E				EL	E		EL		E	EL	EL		L			
	FITZ				L		E		E	EL		L		EL	EL	L		L			
	LAKE D					E		E			EL		EL	EL	L	L		L	L	L	L
	N														EL	L	L	L		L	

✓ Representative important species

TABLE VIIIA-7 (Continued)

ICHTHYOPLANKTON AND FISH EGGS SPECIES OCCURRENCE BY DATE*(Continued)

NINE MILE POINT NUCLEAR STATION UNIT 1, JAMES A. FITZPATRICK NUCLEAR POWER PLANT AND VICINITY - 1976

SPECIES	LOCATION	FEB 4	MAR 17	APR 7	APR 14	APR 21	APR 28	APR 29	MAY 5	MAY 12	MAY 13	MAY 19	MAY 22	MAY 26	JUN 2	JUN 9	JUN 10	JUN 16	JUN 17	JUN 23	JUN 30
THREESPINE STICKLEBACK √	LAKE N																				
TROUT PERCH	NMP																				
	FITZ																				
	LAKE N																				
WALLEYE	NMP								E			E			E	E					
	FITZ						E			E		E		E							
WHITE BASS	FITZ									L											
WHITE PERCH	NMP									E		E		E	EL	E		L		L	
	FITZ								E			E		E	EL	L		L		L	
	LAKE D										E			L	EL	L		EL	L	L	L
	N														L	L	L	EL		L	
YELLOW PERCH √	NMP				L				L	E		L			E						
	FITZ						L			L		L									
	LAKE D							L					L								
	N																				
UID	NMP				E				E			E		E	E	E		E			L
	FITZ	E	E				E			E		EL		E	E	E		EL		E	EL
	LAKE D							EL			E		EL	L	L	EL		L	L	EL	
	N														E		EL	EL		EL	

Ichthyoplankton includes pro-larva, larva, and juvenile life stages

*Dates listed when larvae and/or eggs collected

- D = Day collection
- N = Night collection
- E = Fish eggs
- L = Fish larvae
- UID = Unidentified organism
- √ = Representative important species

- NMP = Nine Mile Point Nuclear Station Unit 1 entrainment program
- FITZ = James A. FitzPatrick Nuclear Power Plant entrainment program
- LAKE = Lake ichthyoplankton collection

TABLE VIIIA-7 (Continued)

ICHTHYOPLANKTON AND FISH EGGS SPECIES OCCURRENCE BY DATE*

NINE MILE POINT NUCLEAR STATION UNIT 1, JAMES A. FITZPATRICK NUCLEAR POWER PLANT AND VICINITY - JULY-DECEMBER 1976

SPECIES	LOCATION	JUL 1	JUL 3	JUL 7	JUL 14	JUL 15	JUL 21	JUL 28	AUG 4	AUG 11	AUG 18	AUG 25	SEP 1	SEP 2	SEP 3	SEP 8	SEP 15	SEP 22	SEP 26	SEP 30	OCT 6	OCT 13	OCT 20	NOV 3	NOV 17	DEC 1
ALEWIFE ✓	NMP		EL	EL	EL		EL	EL	EL	EL	L	L	L			L		L			L		L			
	FITZ			EL	EL		EL	EL	EL	EL	L	L	L			L		L			L		L	L	L	
	LAKE D			EL		EL	EL	EL	EL	EL	EL	L	L			L	L		L	L		L				
	N	EL		EL		EL	EL	EL	EL	EL	L	L		L	L	L	L									
BURBOT	NMP																									
	FITZ																									
	LAKE D																									
	N																									
CARP	NMP							L																		
	FITZ			L				L	L																	
	LAKE D					L		L	L																	
	N	L		EL		L	L	L	L	L		L														
EMERALD SHINER	LAKE D									L	L															
	N																									
GIZZARD SHAD	NMP				E																					
JOHNNY DARTER	NMP			L	L		L	L	L																	
	FITZ			L	L		L	L		L								L								
	LAKE D			L		L																				
	N	L		L		L	L	L	L	L		L		L												
LAKE HERRING (CISCO)	NMP																									
	FITZ																									
	LAKE D																									
LEPOMIS SP. (UID)	LAKE D										L															
	N	L		L		L	L							L												
MINNOWS AND CARPS (UID)	LAKE N																									
MOTTLED SCULPIN	NMP				L																					
	FITZ																									
	LAKE D							L	L																	
	N	L		L		L	L	L	L		L															
NOTROPIS SP.	FITZ																									
	LAKE N	L		L			L																			

TABLE VIIIA-7 (Continued)

ICHTHYOPLANKTON AND FISH EGGS SPECIES OCCURRENCE BY DATE* (Continued)

NINE MILE POINT NUCLEAR STATION UNIT 1, JAMES A. FITZPATRICK NUCLEAR POWER PLANT AND VICINITY - JULY-DECEMBER 1976

SPECIES	LOCATION	JUL							AUG				SEP								OCT			NOV		DEC	
		1	3	7	14	15	21	28	4	11	18	25	1	2	3	8	15	22	26	30	6	13	20	3	17	1	15
RAINBOW SMELT √	NMP			L	L				L	L	L	L															
	FITZ			L	L		L			L	L		L					L								L	L
	LAKE D			L								L															
	N	L		L		L	L	L	L	L	L	L		L	L		L										
THREESPINE STICKLEBACK √	LAKE N							L																			
TROUT-PERCH	NMP							L																			
	FITZ				L																						
	LAKE N					L										L											
WALLEYE	NMP																										
	FITZ																										
WHITE BASS	FITZ																										
WHITE PERCH	NMP		L		L			L	L	L	L																
	FITZ			L	L		L	L	L	L	L							L									
	LAKE D			L		L	L	L	L	L	L	L															
	N	L		L		L	L	L	L	L	L	L		L													
YELLOW PERCH √	NMP																										
	FITZ																										
	LAKE D																										
	N						L																				
UID	NMP		E	EL	L		EL	L	E																		
	FITZ			E	E			E	E	E	E																
	LAKE D			EL		EL	EL	EL	EL	EL	EL	L	L														
	N	EL		EL		EL	E	EL	EL	EL																	

Ichthyoplankton includes pro-larva, larva, and juvenile life stages
*Dates listed when larvae and/or eggs collected
D = Day collection
N = Night collection
E = Fish eggs
L = Fish larvae
UID = Unidentified organism
√ = Representative important species

NMP = Nine Mile Point Nuclear Station Unit 1 entrainment program - day/night collections
FITZ = James A. FitzPatrick Nuclear Power Plant entrainment program - day/night collections
LAKE = Lake ichthyoplankton collection

TABLE VIIIA-8

ICHTHYOPLANKTON AND FISH EGGS SPECIES INVENTORY
FROM REGULAR ENTRAINMENT COLLECTIONS

NINE MILE POINT NUCLEAR STATION UNIT 1 AND JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

SCIENTIFIC NAME*	COMMON NAME	NINE MILE POINT DEVELOPMENTAL STAGE		FITZPATRICK DEVELOPMENTAL STAGE	
		LARVAE	EGGS	LARVAE	EGGS
Family Clupeidae					
Alosa pseudoharengus	Alewife ✓	X	X	X	X
Dorosoma cepedianum	Gizzard shad		X		
Family Salmonidae					
Coregonus artedii	Cisco or Lake herring		X		X
Family Osmeridae					
Osmerus mordax	Rainbow smelt ✓	X	X	X	X
Family Cyprinidae					
Cyprinus carpio	Carp	X		X	
Notropis sp.	UID shiner			X	
Family Percopsidae					
Percopsis omiscomaycus	Trout-perch	X		X	
Family Gadidae					
Lota lota	Burbot	X		X	X
Family Percichthyidae					
Morone americana	White perch	X	X	X	X
M. chrysops	White bass			X	
Family Percidae					
Etheostoma nigrum	Johnny darter	X	X	X	X
Perca flavescens	Yellow perch ✓	X	X	X	
Stizostedion vitreum vitreum	Walleye		X		X
Family Cottidae					
Cottus bairdi	Mottled sculpin	X	X	X	
UID Species		X	X	X	X

*According to A List of Common and Scientific Names of Fishes from the United States and Canada. Amer. Fish. Soc. Spec. Publ. No. 6 3rd ed.

✓ Representative important species

stickleback, a representative important species. There were only two taxa, walleye (eggs only), and white bass (larvae only), found in FitzPatrick collections, but not lake collections. The following representative important species, brown trout, coho salmon, and smallmouth bass were collected neither in the plant nor the lake in the Nine Mile Point vicinity. In general, the periods of ichthyoplankton occurrence in FitzPatrick collections coincided with their presence in lake collections.

b. Temporal Distribution of Selected Species

(i) Alewife: Eggs and Larvae

During 1976, the pattern of alewife egg entrainment at the James A. FitzPatrick Nuclear Power Plant suggested that in-plant concentrations (Appendix VIIID-1b) were generally greater than those in 0.5-NMPE-20-ft bottom collections during daytime hours (Appendix VC-2c), with the opposite trend observed at night. Alewife larvae were generally entrained in higher concentrations than were collected at 0.5-NMPE-20-ft (Appendices VIIID-1a, VC-2a, and VC-2b).

(ii) Other Species

Rainbow smelt egg concentrations were greater in entrainment (Appendix VIIID-b) than in any lake collections (Appendix VC-2c); none were collected in the lake at 0.5 NMPE-20 ft station. Both smelt and yellow perch larvae were collected too infrequently to permit any trend to be discerned (Appendix VIIID-1a).

c. Mortality of Larval Fish from Day/Night Collections: Intake and Discharge Bays, Simulations, 3 F/2 F Lake Zone

The results of the larval mortality studies are presented in Appendix VIIID-2. In all cases the numbers of organisms collected were too small to permit interpretation of the results.

B. NINE MILE POINT NUCLEAR STATION UNIT 1

1. Introduction and Materials and Methods

The basic objectives of the Nine Mile Point plant entrainment program were similar to those of the James A. FitzPatrick plant entrainment program; however, the Nine Mile Point studies involved only ichthyoplankton and pump entrainment effects.

Methods and materials applicable to the Nine Mile Point entrainment studies are summarized in Appendix II. The sampling program is summarized in Table VIII-1.

2. Results and Discussion

a. Species Inventory

The occurrence of ichthyoplankton in Nine Mile Point in-plant collections is shown by taxon and date in Table VIIIA-7. A total of 12 taxa; three representative important species (eggs and larvae of alewife, rainbow smelt, and yellow perch) (Table VIIIA-8) were identified during the 1976 study, compared to 15 identified in lake collections. The taxa identified in the lake, but not the in-plant sites were: emerald shiner, *Lepomis* sp. (species unidentified), minnows and carps, *Notropis* sp., and threespine stickleback, a representative important species. There were only two taxa, gizzard shad (eggs only) and walleye (eggs only), found in Nine Mile Point in-plant collections, but not in lake collections. The representative important species brown trout, coho salmon, and smallmouth bass were also not collected in Nine Mile Point entrainment samples. In general, the periods of occurrence in in-plant samples coincided with periods of occurrence in lake samples.

b. Temporal Distribution of Selected Species (Appendix VIIIE)

(i) Alewife: Eggs and Larvae

Concentrations of alewife eggs (Appendix VIIIE-2) in day entrainment collections at Nine Mile Point Unit 1 were generally greater (exception: 28 July) than the corresponding bottom collections at 0.5-NMPW-20-ft station (Appendix VC-2c): No consistent pattern was observed for night collections; however, lake concentrations did exceed corresponding entrainment collections during the peak abundance period (7 and 15 July). Entrainment concentrations were greatest in the night collections particularly at 0500 hours compared to the day collections. Alewife larvae data are presented in Appendix VIIIE-1a.

(ii) Rainbow smelt: Eggs and Larvae

Rainbow smelt eggs were entrained (Appendix VIIIE-2) more frequently and in higher concentrations than were found in any lake collection, however, concentrations were generally low; the maximum concentration of rainbow smelt eggs in entrainment collections was 827/1000 m^3. Smelt larvae were collected too infrequently to permit comparison between lake (Appendices VC-2a and VC-2b) and entrainment collections (Appendix VIIIE-1).

(iii) White Perch and Yellow Perch

White perch and yellow perch eggs and larvae were rare in entrainment collections (Appendices VIIIE-1 and VIIIE-2). The maximum concentration of white perch eggs was observed on 19 May (1228/1000 m^3) and larvae (20/1000 m^3) on 11 August. Yellow perch egg concentrations reached a peak of 10/1000 m^3 (12 May and 2 June) and larvae a peak of 26/1000 m^3 (19 May).

C. CONCLUSIONS

- PHYTOPLANKTON

Seasonal trends in phytoplankton abundance and percent composition were similar between in-plant and lake collections.

Chlorophyll a ratios, based on discharge and intake values determined from immediate analyses, showed a general trend of degradation of the photosynthetic pigment after condenser passage; this trend was most noticeable in day collections. Productivity ratios, based on day collections incubated for four hours, determined for the 9 June through 22 September sampling period, indicated photosynthetic inhibition, thus confirming the trend observed for chlorophyll a. The possible stimulation of photosynthesis during the cooler months (April and May and in late-November and December) was noted; discharge/ intake productivity ratios, based on four-hour incubation periods, were consistently greater than one.

Productivity data from both 3 and 2 F lake and plume entrainment simulations were compared with corresponding intake productivity values, based on day collections and an incubation period of four hours; this comparison suggests that phytoplankton productivity is stimulated by plume entrainment. Whereas corresponding chlorophyll a ratios (day collections, immediate analysis) suggest that plume entrainment does not result in degradation of chlorophyll a.

- ZOOPLANKTON

Viability data were summarized for calanoids, cyclopoids, all copepods combined, cladocerans, ciliates, suctorians, all

protozoans combined, rotifers, all zooplankton combined, and nine selected species, the latter based on their abundance in the collections.

Temporal trends in percent mortality, for those groups having a sufficient data base for interpretation, indicated that cyclopoids and cladocerans had similar mortalities between day and night collections taken at the intake and discharge locations. Percent mortalities for rotifers, however, was slightly greater in the night collections compared to the corresponding day collections for both intake and discharge locations.

Discharge mortalities generally exceeded those of intake samples for rotifers, cyclopoids, and cladocerans, and particularly during the warmer months for cyclopoids and cladocerans. Little or no mortality associated with plume entrainment was observed from the lake and simulated plume entrainment samples for cyclopoids, cladocerans, and rotifers.

The greatest mortality due to plant passage was observed for copepods, and during the July through September period. Mortality was also high for cladocerans and rotifers during this period. Cladoceran mortality reflected the numerical dominance of Bosmina longirostris in the samples.

- ICHTHYOPLANKTON

Eggs and larvae of alewife and rainbow smelt and larvae of yellow perch, all representative important species, were entrained at both Nine Mile Point Nuclear Station Unit 1 and the James A. FitzPatrick Nuclear Power Plant; eggs of yellow perch were also entrained at the Nine Mile Point plant. Brown trout,

coho salmon, and smallmouth bass, also representative important species, were not collected in entrainment collections at either plant, but adults of these species were present in impingement collections. Notropis sp. (larvae only) and white bass (larvae only) were collected only at the FitzPatrick plant, whereas gizzard shad (eggs only) was collected only at the Nine Mile Point plant.

Concentrations of alewife eggs at both power plants were generally greater in day collections and less in night collections than those in the corresponding bottom lake collections in the vicinity of the respective intake structures. Alewife larvae were generally present in higher concentrations in the FitzPatrick entrainment samples than at the lake sampling station (1-NMPE-20 ft), no consistent trend was observed between Nine Mile Point entrainment collections and the corresponding lake station (0.5-NMPW-20 ft).

Rainbow smelt egg concentrations were greater in FitzPatrick and Nine Mile Point entrainment collections than in any lake collection; no eggs were collected in bottom collections in the vicinity of the FitzPatrick plant intake and smelt eggs were present in only one collection taken in the vicinity of the Nine Mile Point plant intake on a comparable date to entrainment collections.

No conclusive statement could be made regarding the mortality of ichthyoplankton collected at the FitzPatrick plant due to the small sample.

REFERENCES CITED

(none cited)

IX. IMPINGEMENT

A. INTRODUCTION AND MATERIALS AND METHODS

The operation of Nine Mile Point Nuclear Station Unit 1 and James A. FitzPatrick Nuclear Power Plant results in the combined usage of 638,200 gallons per minute of water per day. Withdrawal of this volume of water from Lake Ontario results in the entrapment of floating debris and fish on the trash racks and traveling screens located in the intakes of the plants. Studies conducted during 1976 at the two stations were designed to monitor the species composition and abundance of fishes impinged at each plant.

Impingement monitoring conducted during 1974 and 1975 (LMS 1975, LMS 1976) revealed that alewife, rainbow smelt, and threespine stickleback represent the majority of fish impinged; alewife usually accounted for more than 90% of the impingement catch, rainbow smelt for 2-5%, and threespine stickleback for 1-3%. The 1976 studies were to determine whether or not these annual trends continued.

Studies of fish populations on Lake Ontario were performed concurrently in the Nine Mile Point vicinity to determine their abundance and distribution, the biological characteristics of the lake fish (e.g., age distribution), and the composition of the lake fish community for comparison with that of impinged fish.

A detailed description of the collection and laboratory procedures is presented in Appendix III. The primary differences between the 1975 and 1976 sampling programs are as follows:

- During 1976, only the plant reporting high impingement (>20,000 fish/24-hour period) was continuously sampled until the number of fish impinged dropped below 20,000 fish/24 hour period.

- At the Nine Mile Point plant, Wednesday impingement collections were conducted every hour for a 24-hour period from January through December 1976; the same frequency was followed at the FitzPatrick plant from January through May, after which collections were made according to a day-night cycle from June through December.

- The step of identifying and enumerating invertebrates, begun during the latter part of 1975, was continued during 1976.

- Secondary analysis of fish was conducted in the screen house of the power plants during a part of the 1976 sampling program; fish were not preserved.

- All fish of a species, including damaged and partial fish, were weighed together to determine total biomass per species per collection during part of the 1976 sampling program; fish were not preserved.

- The subsample size for the various parameters monitored in 1976 was different from that used in 1975 (LMS 1976).

- Scale analysis was conducted only on those fish collected in the FitzPatrick impingement collections.

Tables IX-1 and IX-2 summarize the plant operating conditions during impingement collections.

TABLE IX-1

PLANT OPERATING CONDITIONS (ELECTRICAL OUTPUT) DURING IMPINGEMENT COLLECTIONS

NINE MILE POINT NUCLEAR STATION UNIT 1 and JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

DATE	NINE MILE POINT		FITZPATRICK	
	NUMBER OF CIRCULATING WATER PUMPS	MEAN* ELECTRICAL OUTPUT (MWe)	NUMBER OF CIRCULATING WATER PUMPS	MEAN** ELECTRICAL OUTPUT (MWe)
JANUARY 1976				
2-3	2	557.5	3	506.0
5-6	2	580.0	2	572.5
7-8	2	586.0	2	580.0
9-10	2	588.0	2/3[a]	652.5
12-13	2	586.0	3	800.0
14-15	2	561.5	3	800.5
16-17	2	560.0	3/2[b]	236.5[a]
19-20	2	564.0	1	UNIT DOWN
21-22	2	567.5	1	UNIT DOWN
23-24	2	553.0	1	UNIT DOWN
26-27	2	571.5	1	UNIT DOWN
28-29	2	571.0	1	UNIT DOWN
30-31	2	570.0	1	UNIT DOWN
FEBRUARY				
2-3	2	569.5	1	UNIT DOWN
4-5	2	544.0	1	UNIT DOWN
6-7	2	552.0	1	UNIT DOWN
9-10	2	545.0	1	UNIT DOWN
11-12	2	543.0	1	UNIT DOWN
13-14	2	530.0	1	UNIT DOWN
16-17	2	526.5	1	UNIT DOWN
18-19	2	548.5	1	UNIT DOWN
20-21	2	552.0	1	UNIT DOWN
23-24	2	545.0	1	UNIT DOWN
25-26	2	544.0	1	UNIT DOWN
27-28	2	543.5	1	UNIT DOWN
MARCH				
1-2	2	459.0	1	UNIT DOWN
3-4	2	UNIT DOWN	1	UNIT DOWN
5-6	2	271.0	1	UNIT DOWN
8-9	2	486.0	1	UNIT DOWN
10-11	2	528.0	1	UNIT DOWN
12-13	2	544.5	2	UNIT DOWN
15-16	2	531.0	2	UNIT DOWN
17-18	2	528.0	2	UNIT DOWN
19-20	2/1[a]	384.0	2	UNIT DOWN
22-23	2	130.5[a]	2	UNIT DOWN
24-25	2	UNIT DOWN	2	184.0[b]
26-27	2	UNIT DOWN	2	369.5
29-30	2	UNIT DOWN	2	518.5
31-APR 1	2	UNIT DOWN	2	505.0
APRIL				
2-3	2	UNIT DOWN	3	567.5
5-6	2	UNIT DOWN	3	531.5
6-7	2	UNIT DOWN	3	602.5
7-8	2	UNIT DOWN	3	607.5
9-10	2	UNIT DOWN	3	688.5
12-13	2	UNIT DOWN	3	713.5
14-15	2	UNIT DOWN	3	692.0
16-17	2/1[b]	UNIT DOWN	3	700.0
19-20	1/2[c]	118.5[b]	3	700.0
20-21	2	240.5[c]	3	686.5
21-22	2	355.5	3	617.0
23-24	2	387.0	3	677.5
24-25	2	399.5	3	709.5
25-26	2	431.5	3	715.0
26-27	2	479.5	3	720.5
28-29	2	513.0	3	729.5
29-30	2	530.0	3	709.0
30-MAY 1	2	543.5	3	678.5

TABLE IX-1 (Continued)

PLANT OPERATING CONDITIONS (ELECTRICAL OUTPUT) DURING IMPINGEMENT COLLECTIONS (Continued)

NINE MILE POINT NUCLEAR STATION UNIT 1 and JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

DATE	NINE MILE POINT		FITZPATRICK	
	NUMBER OF CIRCULATING WATER PUMPS	MEAN* ELECTRICAL OUTPUT (MWe)	NUMBER OF CIRCULATING WATER PUMPS	MEAN** ELECTRICAL OUTPUT (MWe)
MAY				
3-4	2	546.5	3	735.5
4-5	2	548.0	3	734.5
5-6	2	547.5	3	744.0
6-7	2	550.0	3	749.0
7-8	2	553.0	3	750.5
10-11	2	562.5	3	741.0
12-13	2	569.0	3	526.0[c]
14-15	2	270.0[d]	2	UNIT DOWN[d]
17-18	2	353.5	2/3[c]	572.0
19-20	2	461.5	3	730.0
20-21	2	516.5	3	743.5
21-22	2	556.0	3	736.5
22-23	2	549.0	3	715.5
23-24	2	541.0	3	737.0
24-25	2	559.0	3	775.5
25-26	2	576.5	3	781.0
26-27	2	586.5	3	781.5
28-29	2	588.0	3	777.0
31-JUN 1	2	562.0	3	776.5
JUNE				
2-3	2	576.0	3	771.0
4-5	2	577.0	3	175.5[e]
7-8	2	575.5	2	498.0
9-10	2	578.5	3	728.5
11-12	2	580.0	3	771.5
14-15	2	576.0	3	781.5
16-17	2	584.5	3	778.5
18-19	2	584.0[e]	2	168.5[f]
21-22	2	581.0	3	741.5
23-24	2	275.0[f]	3/2[d]	475.5[g]
25-26	2	523.0	3	744.0
28-29	2	576.5	3	753.0
30-JUL 1	2	578.0	3/2[e]	231.5[h]
JULY				
2-3	2	536.0	3	688.0
5-6	2	479.0	3	769.0
7-8	2	477.0	3	771.0
9-10	2	206.0[g]	3	751.0[i]
12-13	2	UNIT DOWN	3	740.0
14-15	2	219.5[h]	2	UNIT DOWN[j]
16-17	2	376.0	2	56.5[k]
19-20	2	511.5	3	679.0
21-22	2	529.0	3/2[f]	231.0[l]
23-24	2	531.5	2	UNIT DOWN
26-27	2	517.5	2	UNIT DOWN
28-29	2	513.0	2	271.5[m]
30-31	2	512.5	3	665.0
AUGUST				
2-3	2	522.2	3	749.5
4-5	2	525.0	3	747.0
6-7	2	206.2[i]	3	678.5
9-10	2	500.0	3	770.0
11-12	2	528.7	3	777.0
13-14	2	530.5	3	781.0
16-17	2	442.5	3	788.0
18-19	2	217.2[j]	3	791.5
20-21	2	479.6	3	786.5
23-24	2	518.2	3	789.0
25-26	2	519.8[k]	3	787.5
27-28	2	523.0	3	692.5
30-31	2	521.6	3/2[g]	403.5[n]

TABLE IX-1 (Continued)

PLANT OPERATING CONDITIONS (ELECTRICAL OUTPUT) DURING IMPINGEMENT COLLECTIONS (Continued)

NINE MILE POINT NUCLEAR STATION UNIT 1 and JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

DATE	NINE MILE POINT		FITZPATRICK	
	NUMBER OF CIRCULATING WATER PUMPS	MEAN* ELECTRICAL OUTPUT (MWe)	NUMBER OF CIRCULATING WATER PUMPS	MEAN** ELECTRICAL OUTPUT (MWe)
SEPTEMBER				
1-2	2	527.0	3	663.0
3-4	2	532.4	3	776.0
6-7	2	528.2	3	784.0
8-9	2	530.4	3	783.5
10-11	2	531.5 [l]	3	729.0
13-14	2	530.7	3	733.0
15-16	2	522.8 [m]	3	732.0
17-18	2	510.6	3	728.5
20-21	2	519.8	3	731.0
22-23	2	539.2	3	732.5
24-25	2	556.8	3	731.5
27-28	2	557.7	3	733.0
29-30	2	556.5	3	730.0
OCTOBER				
1-2	2	553.9	3	727.0
4-5	2	549.9	3	725.0
6-7	2	551.2	3	727.5
8-9	2	552.7	3/2 [h]	365.0 [o]
11-12	2	550.3	2	UNIT DOWN
13-14	2	550.7	2	48.5 [p]
15-16	2	549.0	2	346.0
18-19	2	534.6	2	475.5
20-21	2	535.8 [n]	2	531.5
22-23	2	451.2	2/3 [i]	583.0
25-26	2	495.8	3	715.5
27-28	2	557.0	3	710.0
29-30	2	572.4	3	634.0
NOVEMBER				
1-2	2	568.6	3	753.0
3-4	2	585.8	3	770.0
5-6	2	584.1	3	665.5
8-9	2	562.6	3	586.5 [q]
10-11	2	UNIT DOWN [o]	2	15.0 [r]
12-13	2	UNIT DOWN	2	UNIT DOWN
15-16	2	318.1 [p]	2	234.5 [s]
17-18	2	553.8	3	692.0
18-19	NO SAMPLE		3/2 [j]	380.5 [t]
19-20	2	585.8	2	12.0 [u]
22-23	2	586.0	2	UNIT DOWN
24-25	2	582.3	2	389.0 [v]
26-27	2	575.8	3	632.5
29-30	2	575.8	3	736.0
DECEMBER				
1-2	2	579.6	3	735.0
3-4	2	576.0	3	702.0
6-7	2	569.4	3	721.0
8-9	2	566.6	3	737.0
10-11	2	527.8	3	719.0
13-14	2	583.5	3	738.0
15-16	2	583.7	3/2 [k]	324.0 [w]
17-18	2	584.2	2	261.5 [x]
20-21	2	583.8	3	703.0
22-23	2	584.4	3	739.0
24-25	2	584.4	3	724.5
27-28	2	582.3	3	739.5
29-30	2	585.8	3	742.0
31-JAN 1 1977	2	582.9	3	725.5

TABLE IX-1 (Continued)

FOOTNOTES: PLANT OPERATING CONDITIONS (ELECTRICAL OUTPUT) DURING IMPINGEMENT COLLECTIONS

*Nine Mile Point Unit #1 "401" Monthly Report (Niagara Mohawk Power Corp., 1976); mean of the daily means for each collection period

**James A. FitzPatrick Nuclear Power Plant "401" Monthly Report (Niagara Mohawk Power Corp., 1976); mean of the daily means for each collection period

NINE MILE NUCLEAR STATIONS UNIT 1

Circulating Water Pumps

[a] Two pumps operating 1000-2100 hrs 19 Mar and 0700-1000 hrs 20 Mar, one pump operating 2100 hrs 19 Mar - 0700 hrs 20 Mar
[b] Two pumps operating 1000 hrs 16 Apr - 0907 17 Apr, one pump operating 0907-1000 hrs 17 Apr
[c] Two pumps operating 1000-1445 hrs 19 Apr and 0730-1000 hrs 20 Apr; one pump operating 1445 hrs 19 Apr - 0730 hrs 20 Apr

Electrical Generation

UNIT DOWN = plant off-line during impingement collection
[a] Unit down 1900 hrs 22 Mar - 1000 hrs 23 Mar
[b] Unit down through 18 Apr, unit down 1600 hrs 19 Apr - 0700 hrs 20 Apr
[c] Unit down 0000-0700 hrs 20 Apr; collection 1000 hrs 20 Apr - 1000 hrs 21 Apr
[d] Unit down 0300-1000 hrs 15 May
[e] Mean electrical output for 18 Jun only
[f] Unit down 1500 hrs 23 Jun - 1000 hrs 24 Jun
[g] Unit down 2209 hrs 9 Jul - 1000 hrs 10 Jul
[h] Unit down 1000-1146 hrs 14 Jul
[i] Unit down 1610 hrs 6 Aug - 1000 hrs 7 Aug
[j] Unit down 1606 hrs 17 Aug - 1700 hrs 18 Aug; collection 1012 hrs 18 Aug - 1012 hrs 19 Aug
[k] Mean electrical output for 25 Aug
[l] Mean electrical output for 10 Sep
[m] Mean electrical output for 16 Sep
[n] Mean electrical output for 20 Oct
[o] Unit down after 1000 hrs 9 Nov collection
[p] Plant on-line for 1000 hrs 15 Nov collection

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

Circulating Water Pumps

[a] Two pumps operating 1000-1506 hrs on 9 Jan; Three pumps operating 1506 hrs 9 Jan - 1000 hrs 10 Jan
[b] Three pumps operating 1000-1500 hrs 16 Jan; Two pumps operating 1500 hrs 16 Jan - 1000 hrs 17 Jan
[c] Two pumps operating 1000 hrs 17 May - 0111 hrs 18 May; Three pumps operating 0111-1000 hrs 18 May
[d] Three pumps operating 0500-1350 hrs 23 Jun; Two pumps operating 1350 hrs 23 Jun - 0500 hrs 24 Jun
[e] Three pumps operating 0500-0652 hrs 30 Jun; Two pumps operating 0652 hrs 30 Jun - 0500 hrs 1 Jul
[f] Three pumps operating 0500-1520 hrs 21 Jul; Two pumps operating 1520 hrs 21 Jul - 0600 hrs 22 Jul
[g] Three pumps operating 1000-1947 hrs 30 Aug; Two pumps operating 1947 hrs 30 Aug - 1000 hrs 31 Aug
[h] Three pumps operating 1000-1828 hrs 8 Oct; Two pumps operating 1828 hrs 8 Oct - 1000 hrs 9 Oct
[i] Two pumps operating 1000 hrs 22 Oct - 0605 hrs 23 Oct; Three pumps operating 0605-1000 hrs 23 Oct
[j] Three pumps operating 1000 hrs 18 Nov - 0053 hrs 19 Nov; Two pumps operating 0053-1000 hrs 19 Nov
[k] Three pumps operating 0700-2150 hrs 15 Dec; Two pumps operating 2150 hrs 15 Dec - 0700 hrs 16 Dec

Electrical Generation

[a] Unit down approximately 1500 hrs 16 Jan - 1000 hrs 17 Jan
[b] Unit down 1000-1700 hrs 24 Mar, mean electrical output for 25 Mar only
[c] Unit down 1200 hrs 13 May, collection 1037 hrs 12 May - 1037 hrs 13 May
[d] Unit down during collection 1037 hrs 14 May - 1037 hrs 15 May
[e] Unit down 1045 hrs 4 Jun - 1020 hrs 5 Jun
[f] Unit down 1120 hrs 18 Jun - 1100 hrs 19 Jun

TABLE IX-1 (Continued)

FOOTNOTES: PLANT OPERATING CONDITIONS (ELECTRICAL OUTPUT) DURING IMPINGEMENT COLLECTIONS (Continued)

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

Electrical Generation (Continued)

[g]Unit down 1430 hrs 23 Jun - 0200 hrs 24 Jun
[h]Unit down 0652 hrs 30 Jun - 0416 1 Jul
[i]Mean electrical output for 10 Jul only
[j]Unit down after 1015hrs 13 Jul collection
[k]Unit down during collection 1015 16 Jul - 1015 17 Jul
[l]Unit down 1900 hrs 21 Jul - 0600 hrs 22 Jul
[m]Unit down 0600-1651 hrs 28 Jul
[n]Unit down 1947 hrs 30 Aug - 1000 hrs 31 Aug
[o]Unit down after 1015 hrs 9 Oct collection
[p]Unit down 0700 hrs 13 Oct - 0700 hrs 14 Oct
[q]Unit down after 1033 9 Nov collection
[r]Unit down during collection 0710 hrs 10 Nov - 0700 hrs 11 Nov
[s]Unit down 1115-1836 hrs 15 Nov
[t]Unit down 0053-0700 hrs 19 Nov
[u]Unit down during collection 1033 hrs 19 Nov - 1033 hrs 20 Nov
[v]Unit on-line (0620 hrs 24 Nov) during collection 0720 hrs 24 Nov - 0700 hrs 25 Nov
[w]Unit down 0045-0700 hrs 16 Dec
[x]Unit down 1035-1804 hrs 17 Dec

TABLE IX-2

PLANT OPERATING CONDITION (ΔT) DURING IMPINGEMENT COLLECTIONS

NINE MILE POINT NUCLEAR STATION UNIT 1 and JAMES A. FITZPATRICK NUCLEAR POWER PLANT - JANUARY - MARCH, 1976

DATE	NMPP[a]	FITZ[b]	DATE	NMPP[a]	FITZ[b]
JAN			FEB		
2	14.8	17.2	17	14.2	2.8[c]
3	14.9	15.6	18	14.6	2.2[c]
5	15.2	16.1	19	14.7	4.4[c]
6	15.6	16.7	20	14.6	4.4[c]
7	15.6	16.7	21	14.4	4.4[c]
8	15.7	16.7	23	14.3	4.4[c]
9	15.6	16.1	24	14.2	3.9[c]
10	15.6	15.0	25	14.2	4.4[c]
12	16.0	17.8	26	14.4	4.4[c]
13	15.7	17.8	27	14.6	3.9[c]
14	14.9	17.8	28	14.3	4.4[c]
15	15.0	17.8			
16	15.3	10.6			
17	15.4	0.6[c]	MAR		
19	16.1	1.1[c]	1	14.3	5.6[c]
20	16.1	2.2[c]	2	9.4	6.1[c]
21	16.1	1.7[c]	3	0.0[c]	5.0[c]
22	16.1	1.1[c]	4	0.1[c]	5.0[c]
23	16.1	3.9[c]	5	7.6	2.2[c]
24	14.3	6.1[c]	6	9.9	1.1[c]
26	15.2	8.3[c]	8	12.6	1.1[c]
27	15.2	7.2[c]	9	13.4	1.1[c]
28	15.2	6.1[c]	10	14.2	1.7[c]
29	15.2	3.9[c]	11	13.4	1.1[c]
30	15.1	2.2[c]	12	14.2	0.6[c]
31	15.2	5.0[c]	13	14.3	0.6[c]
			15	13.9	0.6[c]
FEB			16	13.8	1.1[c]
2	15.1	5.0[c]	17	13.8	0.6[c]
3	15.1	6.7[c]	18	13.8	1.1[c]
4	15.1	7.2[c]	19	14.0	0.6[c]
5	14.2	5.6[c]	20	14.1	1.1[c]
6	14.3	4.4[c]	22	9.2[c]	2.2[c]
7	14.5	4.4[c]	23	0.3[c]	0.6[c]
9	14.4	5.6[c]	24	0.3[c]	3.9[c]
10	14.5	4.4[c]	25	0.2[c]	8.3
11	14.4	3.9[c]	26	0.5[c]	12.2
12	14.5	3.3[c]	27	0.2[c]	15.0
13	14.3	3.3[c]	29	0.7[c]	15.6
14	13.4	2.2[c]	30	0.4[c]	15.0
16	13.9	2.8[c]	31	0.6[c]	15.0

TABLE IX-2 (Continued)

PLANT OPERATING CONDITION (ΔT) DURING IMPINGEMENT COLLECTIONS (Continued)

NINE MILE POINT NUCLEAR STATION UNIT 1 and JAMES A. FITZPATRICK
NUCLEAR POWER PLANT - APRIL - JUNE, 1976

DATE	NMPP[a]	FITZ[b]	DATE	NMPP[a]	FITZ[b]
APR			MAY		
1	0.9[c]	13.3	18	10.7	13.9
2	0.2[c]	13.9	19	12.5	16.1
3	0.2[c]	13.9	20	13.2	16.7
5	0.2[c]	11.1	21	14.6	16.7
6	0.2[c]	13.9	22	15.1	16.7
7	0.2[c]	13.9	23	14.6	15.6
8	0.2[c]	13.9	24	14.7	17.2
9	0.2[c]	15.6	25	15.4	17.8
10	0.5[c]	15.6	26	15.8	17.8
12	0.7[c]	16.1	27	15.9	17.8
13	0.4[c]	16.1	28	15.9	17.8
14	0.4[c]	15.6	29	15.8	17.8
15	0.9[c]	15.6	31	15.1	17.8
16	0.4[c]	15.0			
17	3.0[c]	15.6	JUN		
19	4.5[c]	15.6	1	15.4	15.0
20	5.7[c]	15.6	2	15.6	17.8
21	9.5[c]	15.6	3	15.8	17.8
22	10.4	13.3	4	15.8	8.9[c]
23	10.6	15.0	5	15.6	0.6[c]
24	10.7	15.6	7	15.8	14.4
25	11.8	16.1	8	15.7	15.0
26	12.7	16.7	9	15.9	15.6
27	13.7	16.1	10	16.0	17.2
28	13.8	16.1	11	15.9	17.2
29	13.9	16.7	12	16.0	17.8
30	13.9	16.7	14	15.8	17.8
			15	16.1	17.8
MAY			16	16.4	17.2
1	14.4	15.6	17	16.3	17.2
3	14.1	17.2	18	16.6	3.9[c]
4	14.9	16.7	19	16.7	6.7[c]
5	14.6	16.7	21	16.9	15.6
6	15.1	16.7	22	16.8	17.2
7	14.7	16.7	23	16.8[c]	10.0[c]
8	14.8	17.2	24	15.4[c]	13.3[c]
10	14.8	16.7	25	15.2	16.1
11	14.9	16.7	26	16.6	17.8
12	14.9	16.7	28	17.2	17.2
13	15.1	7.2[c]	29	17.5	17.8
14	14.4	7.2[c]	30	17.2	5.0[c]
15	0.4[c]	7.2[c]			
17	9.3	15.6			

TABLE IX-2 (Continued)

PLANT OPERATING CONDITION (ΔT) DURING IMPINGEMENT COLLECTIONS (Continued)

NINE MILE POINT NUCLEAR STATION UNIT 1 and JAMES A. FITZPATRICK
NUCLEAR POWER PLANT - JULY - 4 OCTOBER, 1976

DATE	NMPP[a]	FITZ[b]
JUL		
1	17.1	8.3[c]
2	16.9	13.9
3	15.0	16.1
5	14.3	17.2
6	13.7	17.2
7	14.3	17.2
8	14.2	17.2
9	13.8[c]	16.7
10	UNIT DOWN	16.7
12	UNIT DOWN	17.2
13	UNIT DOWN	16.1
14	UNIT DOWN	0.0[c]
15	10.9	0.0[c]
16	12.3	0.6[c]
17	12.9	5.0[c]
19	16.5	14.4
20	16.6	15.6
21	16.2	11.1[c]
22	16.4	0.0[c]
23	16.5	7.2[c]
24	16.9	6.7[c]
26	16.6	0.0[c]
27	16.3	0.0[c]
28	16.2	4.4[c]
29	16.1	13.9
30	16.3	12.2
31	15.9	15.0
AUG		
2	13.6	16.1
3	14.4	16.1
4	16.1	16.1
5	16.3	16.1
6	16.6[c]	13.3
7	1.5[c]	15.6
9	15.6	16.7
10	16.3	16.7
11	16.2	16.7
12	16.4	17.2
13	16.6	17.2
14	17.7	17.2
16	17.7	17.2
17	17.1[c]	17.8
18	3.7[c]	17.8
AUG		
19	13.6	17.8
20	14.6	17.8
21	15.7	17.8
23	16.1	17.8
24	16.2	17.8
25	16.1	17.8
26	16.3	17.8
27	16.3	17.8
28	16.8	17.2
30	16.6	17.8[c]
31	16.7	17.2[c]
SEP		
1	16.6	17.2
2	16.7	16.7
3	16.0	17.2
4	16.6	16.7
6	16.4	17.2
7	16.9	17.2
8	16.6	17.8
9	16.4	17.8
10	16.8	16.1
11	16.7	16.1
13	16.9	16.7
14	16.9	16.1
15	16.7	16.7
16	16.7	16.1
17	16.7	16.1
18	15.8	16.1
20	16.5	16.1
21	17.0	16.1
22	16.7	16.7
23	16.8	16.7
24	17.3	16.1
25	17.1	16.7
27	17.2	16.1
28	17.1	16.1
29	17.1	16.1
30	16.9	16.7
OCT		
1	17.2	16.1
2	17.2	16.1
4	17.2	16.1

TABLE IX-2 (Continued)

PLANT OPERATING CONDITION (ΔT) DURING IMPINGEMENT COLLECTIONS (Continued)

NINE MILE POINT NUCLEAR STATION UNIT 1 and JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 5 OCTOBER, 1976 - 1 JANUARY, 1977

DATE	NMPP[a]	FITZ[b]	DATE	NMPP[a]	FITZ[b]
OCT			NOV		
5	16.8	16.7	20	17.1	1.1[c]
6	16.0	16.1	22	17.1	1.1[c]
7	15.8	16.7	23	17.1	0.6[c]
8	16.0	14.4	24	17.1	10.6
9	16.1	4.4[c]	25	16.9	13.9
11	16.5	0.6[c]	26	16.8	13.9
12	16.6	0.6[c]	27	16.6	15.0
13	15.5	0.6[c]	29	17.0	16.7
14	16.1	4.4[c]	30	17.1	17.2
15	16.3	10.6			
16	16.6	11.7	DEC		
18	16.2	13.9	1	17.0	16.7
19	16.3	14.4	2	17.2	16.7
20	16.2	15.6	3	16.9	16.1
21	16.3	15.6	4	16.9	15.6
22	16.4	16.1	6	16.9	16.1
23	11.3	14.4	7	18.1	16.7
25	13.9	15.6	8	17.0	16.7
26	16.0	16.1	9	17.1	16.7
27	16.3	15.6	10	17.2	16.1
28	16.8	13.3	11	14.2	16.7
29	17.1	15.6	13	17.9	17.2
30	17.2	13.3	14	18.6	17.2
			15	17.5	17.2
NOV			16	15.8	3.9[c]
1	16.9	16.1	17	16.2	4.4[c]
2	16.8	17.2	18	16.3	13.3
3	17.1	17.2	20	16.6	15.6
4	16.8	17.2	21	16.3	17.8
5	16.9	16.7	22	16.3	17.8
6	16.9	18.3	23	16.1	17.2
8	16.7	16.1	24	16.2	16.7
9	15.5[c]	9.4[c]	25	16.6	16.7
10	UNIT DOWN	1.1[c]	27	15.6	16.1
11	UNIT DOWN	7.2[c]	28	16.2	16.1
12	UNIT DOWN	7.2[c]	29	16.3	16.1
13	UNIT DOWN	0.6[c]	30	16.3	16.1
15	9.6[c]	3.3[c]	31	16.2	15.6
16	13.3	13.3			
17	15.6	15.0	JAN		
18	16.7	17.2	1	16.1	16.1
19	17.0	17.2[c]	1977		

TABLE IX-2 (Continued)

FOOTNOTES: PLANT OPERATING CONDITIONS (ΔT) DURING IMPINGEMENT COLLECTIONS

[a]Mean Discharge - Mean Intake Temperature (°C) for collection date; from Nine Mile Point Unit #1 "401" Monthly Report (Niagara Mohawk Power Corp., 1976)

[b]Mean Discharge - Mean Intake Temperature (°C) for collection date; from James A. FitzPatrick Nuclear Power Plant "401" Monthly Report (Niagara Mohawk Power Corp., 1976)

[c]Plant off-line for some portion or entire day

UNIT DOWN = Plant off-line; no temperature data available

B. RESULTS AND DISCUSSION - JAMES A. FITZPATRICK NUCLEAR POWER PLANT

1. Species Inventory

A total of 57 fish species were collected from the traveling screens at the James A. FitzPatrick Nuclear Power Plant during 1976. Fifty-four were identified to the species level while three could be identified only to genus. A list of scientific and common names of these species, organized by family, is presented in Table IX-3. No threatened or endangered species were collected during 1976.

Six individuals positively identified as salmonid species were collected, as well as two additional salmonid species which could not be identifed.

2. Temporal (Monthly) Distribution - All Species (Traveling Screen Collections)

A total of 2,504,002 fish were collected from the traveling screens at the James A. FitzPatrick Nuclear Power Plant. Of these, 90.7% were alewives, 5.7% were rainbow smelt, and 2.0% were threespine sticklebacks (Table IX-4).

During the winter (January-March), relatively few fish were impinged. In January the majority of these were alewives, while in February and March the majority were rainbow smelt. The latter species moves into nearshore waters early in the year (Wells 1968), and this is reflected in the impingement catch. Alewives dominated the impingement collections for the remainder of the year, except in December when rainbow smelt were most abundant.

Threespine stickleback was the third most frequently collected fish species, but was second in abundance during June and July.

TABLE IX-3

SPECIES INVENTORY OF FISHES IN IMPINGEMENT COLLECTIONS[a]

JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

SCIENTIFIC NAME[b]	COMMON NAME
Family Petromyzontidae	
Petromyzon marinus	Sea lamprey
Family Lepisosteidae	
Lepisosteus osseus	Longnose gar
Family Amiidae	
Amia calva	Bowfin
Family Anguillidae	
Anguilla rostrata	American eel
Family Clupeidae	
Alosa pseudoharengus	Alewife
Dorosoma cepedianum	Gizzard shad
Family Salmonidae	
Coregonus artedii	Cisco or Lake herring
Oncorhynchus sp.	
Oncorhynchus kisutch	Coho salmon
Salmo gairdnerii	Rainbow trout
S. trutta	Brown trout
Salvelinus sp.	
Salvelinus namaycush	Lake trout
S. namaycush x fontinalis	Splake trout
Family Osmeridae	
Osmerus mordax	Rainbow smelt
Family Umbridae	
Umbra limi	Central madminnow
Family Esocidae	
Esox americanus americanus	Redfin pickerel
E. lucius	Northern pike
Family Cyprinidae	
Carassius auratus	Goldfish
Couesius plumbeus	Lake chub
Cyprinus carpio	Carp
Hybognathus nuchalis	Silvery minnow
Notemigonus crysoleucas	Golden shiner
Notropis atherinoides	Emerald shiner

TABLE IX-3 (Continued)

SPECIES INVENTORY OF FISHES IN IMPINGEMENT COLLECTIONS[a] (Continued)

JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

SCIENTIFIC NAME [b]	COMMON NAME
Family Cyprinidae (continued)	
N. emiliae	Pugnose minnow
N. hudsonius	Spottail shiner
Pimephales notatus	Bluntnose minnow
P. promelas	Fathead minnow
Rhinichthys cataractae	Longnose dace
Semotilus sp.	
Semotilus atromaculatus	Creek chub
S. margarita	Pearl dace
Family Catostomidae	
Catostomus commersoni	White sucker
Hypentelium nigricans	Northern hog sucker
Family Ictaluridae	
Ictalurus nebulosus	Brown bullhead
I. punctatus	Channel catfish
Noturus flavus	Stonecat
N. gyrinus	Tadpole madtom
Family Percopsidae	
Percopsis omiscomaycus	Trout-perch
Family Gadidae	
Lota lota	Burbot
Family Cyprinodontidae	
Fundulus diaphanus	Banded killifish
Family Gasterosteidae	
Culaea inconstans	Brook stickleback
Gasterosteus aculeatus	Threespine stickleback
Family Percichthyidae	
Morone americana	White perch
M. chrysops	White bass
Family Centrarchidae	
Ambloplites rupestris	Rock bass
Lepomis gibbosus	Pumpkinseed
L. macrochirus	Bluegill
Micropterus dolomieui	Smallmouth bass
Pomoxis annularis	White crappie
P. nigromaculatus	Black crappie

TABLE IX-3 (Continued)

SPECIES INVENTORY OF FISHES IN IMPINGEMENT COLLECTIONS[a] (Continued)

JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

SCIENTIFIC NAME[b]	COMMON NAME
Family Percidae	
Etheostoma nigrum	Johnny darter
Perca flavescens	Yellow perch
Percina caprodes	Logperch
Stizostedion vitreum vitreum	Walleye
Family Sciaenidae	
Aplodinotus grunniens	Freshwater drum
Family Cottidae	
Cottus bairdi	Mottled sculpin

[a] Traveling screen (Table IX-5) and trash rack collections

[b] According to A List of Common and Scientific Names of Fishes from the United States and Canada. Amer. Fish. Soc. Spec. Publ. No. 6, 3rd ed.

TABLE IX-4

ABUNDANCE* AND PERCENT COMPOSITION OF FISH IN IMPINGEMENT COLLECTIONS

JAMES A. FITZPATRICK NUCLEAR POWER PLANT - JANUARY - JUNE, 1976

SPECIES	JAN NO.	JAN %	FEB NO.	FEB %	MAR NO.	MAR %	APR NO.	APR %	MAY NO.	MAY %	JUN NO.	JUN %
Alewife	2849	55.62	2	0.37	4743	20.99	382944	92.53	1634284	93.38	112425	85.32
American eel							2	<0.01	22	<0.01	2	<0.01
Black crappie	1	0.02			1	<0.01	1	<0.01	1	<0.01		
Bluegill	1	0.02			1	<0.01	5	<0.01	9	<0.01	1	<0.01
Bluntnose minnow							3	<0.01				
Bowfin												
Brook stickleback					76	0.34	36	0.01	18	<0.01	1	<0.01
Brown bullhead	6	0.12			5	0.02	6	<0.01	1	<0.01		
Brown trout					1	<0.01	1	<0.01			2	<0.01
Burbot												
Carp												
Channel catfish	20	0.39	3	0.56	8	0.04	1	<0.01				
Cisco or Lake herring												
Coho salmon											1	<0.01
Creek chub	2	0.04					2	<0.01				
Cyprinidae							2	<0.01				
Emerald shiner	49	0.96	14	2.60	107	0.47	63	0.02	60	<0.01	7	0.01
Esox sp.												
Fathead minnow					2	0.01	4	<0.01				
Freshwater drum	25	0.49	2	0.37	6	0.03	2	<0.01			1	<0.01
Gizzard shad	356	6.95	189	35.13	4963	21.97	941	0.23	87	<0.01	3	<0.01
Golden shiner	5	0.10	1	0.19	3	0.01	3	<0.01	23	<0.01		
Goldfish	1	0.02			1	<0.01						
Johnny darter	5	0.10	2	0.37	4	0.02	62	0.02	2241	0.13	338	0.27
Lake chub	1	0.02			5	0.02	4	<0.01	18	<0.01	6	<0.01
Lake trout	2	0.04			2	0.01			1	<0.01	1	<0.01
Largemouth bass												
Lepomis sp.											1	<0.01
Logperch							1	<0.01				
Longnose dace	6	0.12	4	0.74	22	0.10	1	<0.01				
Longnose gar	1	0.02										
Mottled sculpin	88	1.72	21	3.90	100	0.44	1072	0.26	1803	0.10	349	0.26
Mudminnow	2	0.04	2	0.37	60	0.27	33	0.01	28	<0.01	3	<0.01
Northern hog sucker												
Northern pike					1	<0.01			1	<0.01		
Pearl dace	1	0.02										
Pimephales sp.									14	<0.01		
Pugnose minnow							4	<0.01				
Pumpkinseed	6	0.12			1	<0.01	9	<0.01	36	<0.01	3	<0.01
Rainbow smelt	1047	20.44	179	33.27	9090	40.23	20417	4.93	78033	4.46	1772	1.34
Rainbow trout												
Rock bass	52	1.02	9	1.67	49	0.22	41	0.01	100	0.01	7	0.01
Salmonidae							1	<0.01	5	<0.01	1	<0.01
Salvelinus sp.									7	<0.01	6	<0.01
Sea lamprey	2	0.04			1	<0.01	6	<0.01	1	<0.01		
Silvery minnow					1	<0.01						
Smallmouth bass	92	1.80	5	0.93	18	0.08	11	<0.01	65	<0.01	5	<0.01
Splake (hybrid lake trout)							3	<0.01				
Spottail shiner	207	4.04	28	5.20	161	0.71	333	0.08	1586	0.09	1014	0.77
Stonecat	1	0.02			2	0.01	7	<0.01	12	<0.01	7	0.01
Tadpole madtom												
Threespine stickleback	9	0.18	9	1.67	1112	4.92	3763	0.91	24643	1.41	14876	11.29
Trout-perch	3	0.06	1	0.19	37	0.16	1569	0.38	3996	0.23	721	0.55
Walleye	1	0.02					1	<0.01				
White bass	87	1.70	58	10.78	1558	6.90	876	0.21	875	0.05	73	0.06
White fish									1	<0.01		
White perch	109	2.13	7	1.30	407	1.80	1430	0.35	1479	0.08	71	0.05
White sucker	4	0.08			1	<0.01	4	<0.01	25	<0.01	15	0.01
Yellow perch	81	1.58	2	0.37	46	0.20	179	0.04	679	0.04	57	0.04
UID							11	<0.01	8	<0.01		
UID chub												
UID sucker												
TOTAL	5122		538		22595		413854		1750162		131769	

*Traveling screen collections ; field counts and identification

TABLE IX-4 (Continued)

ABUNDANCE* AND PERCENT COMPOSITION OF FISH IN IMPINGEMENT COLLECTIONS (Continued)

JAMES A. FITZPATRICK NUCLEAR POWER PLANT - JULY - DECEMBER, 1976

SPECIES	JUL NO.	JUL %	AUG. NO.	AUG. %	SEP NO.	SEP %	OCT NO.	OCT %	NOV NO.	NOV %	DEC NO.	DEC %	TOTAL NO.	TOTAL %
Alewife	58477	86.96	1438	66.64	2032	71.88	1681	49.12	68070*	77.42	1329	8.11	2270274	90.67
American eel	6	0.01	4	0.19	8	0.28	4	0.12	2	<0.01	1	<0.01	51	<0.01
Black crappie					1	0.04			1	<0.01	1	<0.01	6	<0.01
Bluegill					1	0.04	3	0.09	1	<0.01			22	<0.01
Bluntnose minnow													3	<0.01
Bowfin					1	0.04	1	0.03	3	<0.01			5	<0.01
Brook stickleback													131	<0.01
Brown bullhead			2	0.09	5	0.18	38	1.11	22	0.02	17	0.10	102	<0.01
Brown trout			1	0.05			1	0.03			2	0.01	8	<0.01
Burbot	1	<0.01	2	0.09			2	0.06			10	0.06	15	<0.01
Carp									3	<0.01	1	<0.01	4	<0.01
Channel catfish									23	0.03	3	0.02	58	<0.01
Cisco or Lake herring											1	<0.01	1	<0.01
Coho salmon	1	<0.01											2	<0.01
Creek chub													4	<0.01
Cyprinidae									1	<0.01			3	<0.01
Emerald shiner	1	<0.01	5	0.23	4	0.14	47	1.37	5	0.01	90	0.55	452	0.02
Esox sp.	3	<0.01											3	<0.01
Fathead minnow													6	<0.01
Freshwater drum									2	<0.01	1	<0.01	39	<0.01
Gizzard shad	2	<0.01	2	0.09	1	0.04	247	7.22	580	0.66	392	2.39	7763	0.31
Golden shiner			1	0.05	1	0.04	1	0.03	1	<0.01	1	<0.01	40	<0.01
Goldfish											1	<0.01	3	<0.01
Johnny darter	664	0.99	119	5.51	100	3.54	9	0.26	2	<0.01	6	0.04	3552	0.14
Lake chub	7	0.01	5	0.23	2	0.07	1	0.03	1	<0.01			50	<0.01
Lake trout							1	0.03	1	<0.01			8	<0.01
Largemouth bass					1	0.04							1	<0.01
Lepomis sp.	4	0.01											5	<0.01
Logperch	1	<0.01											2	<0.01
Longnose dace	2	<0.01									1	<0.01	36	<0.01
Longnose gar													1	<0.01
Mottled sculpin	154	0.23	30	1.39	87	3.08	33	0.96	89	0.10	167	1.02	3993	0.16
Mudminnow	1	<0.01							3	<0.01			132	0.01
Northern hog sucker	1	<0.01	1	0.05									2	<0.01
Northern pike			2	0.09							3	0.02	7	<0.01
Pearl dace													1	<0.01
Pimephales sp.													14	<0.01
Pugnose minnow													4	<0.01
Pumpkinseed	1	<0.01	4	0.19	5	0.18	6	0.18	11	0.01	8	0.05	90	<0.01
Rainbow smelt	226	0.34	170	7.88	82	2.90	1032	30.16	17797	20.24	13394	81.78	143239	5.72
Rainbow trout					1	0.04							1	<0.01
Rock bass	19	0.03	27	1.25	41	1.45	30	0.88	36	0.04	94	0.57	505	0.02
Salmonidae	6	0.01	6	0.23									19	<0.01
Salvelinus sp.	10	0.01	2	0.09					1	<0.01			26	<0.01
Sea lamprey	1	<0.01							1	<0.01	7	0.04	19	<0.01
Silvery minnow													1	<0.01
Smallmouth bass	5	0.01	1	0.05	9	0.32	4	0.12	6	0.01	19	0.12	240	0.01
Splake (hybrid lake trout)			1	0.05					6	0.01	10	0.06	20	<0.01
Spottail shiner	1901	2.83	168	7.73	73	2.58	24	0.70	18	0.02	30	0.18	5543	0.22
Stonecat	15	0.02	2	0.09	5	0.18	9	0.26	3	<0.01	15	0.09	78	<0.01
Tadpole madtom							1	0.03					1	<0.01
Threespine stickleback	5004	7.44	2	0.09			7	0.20	47	0.05	210	1.28	49682	1.98
Trout-perch	489	0.73	36	1.67	7	0.25	6	0.18	4	<0.01	2	0.01	6871	0.27
Walleye													2	<0.01
White bass	10	0.01			1	0.04	13	0.38	928	1.06	276	1.69	4755	0.19
White fish													1	<0.01
White perch	65	0.10	20	0.93	160	5.66	106	3.10	97	0.11	73	0.45	4024	0.16
White sucker	40	0.06	20	0.93	41	1.45	20	0.58	3	<0.01	2	0.01	175	0.01
Yellow perch	105	0.16	84	3.89	158	5.59	95	2.78	160	0.18	212	1.29	1859	0.07
UID	2	<0.01											21	<0.01
UID chub	24	0.04	2	0.09									26	<0.01
UID sucker	1	<0.01	1	0.05									2	<0.01
TOTAL	67249		2158		2827		3422		87928		16378		2504002	

*Traveling screen collections; field counts and identification

Revised

3. Length Frequency by Month of Selected Species

a. Alewife

The monthly length frequency distribution for alewife collected from the traveling screens at the James A. FitzPatrick Nuclear Power Plant during 1976 is presented in Figure IX-1. From January to March, the length frequency distribution was unimodal; when viewed in relation to age data (see Section IXB-5 below), this suggests that the alewives impinged during January-March were age III or older.

During April, the length frequency distribution was bimodal, indicating the presence of two-year-old fish in addition to three-year-olds. A small number of yearlings were also collected from January through April (excluding February). In May, a larger percentage of yearlings were collected than during other months and fish age II or older made up the remainder of the catch.

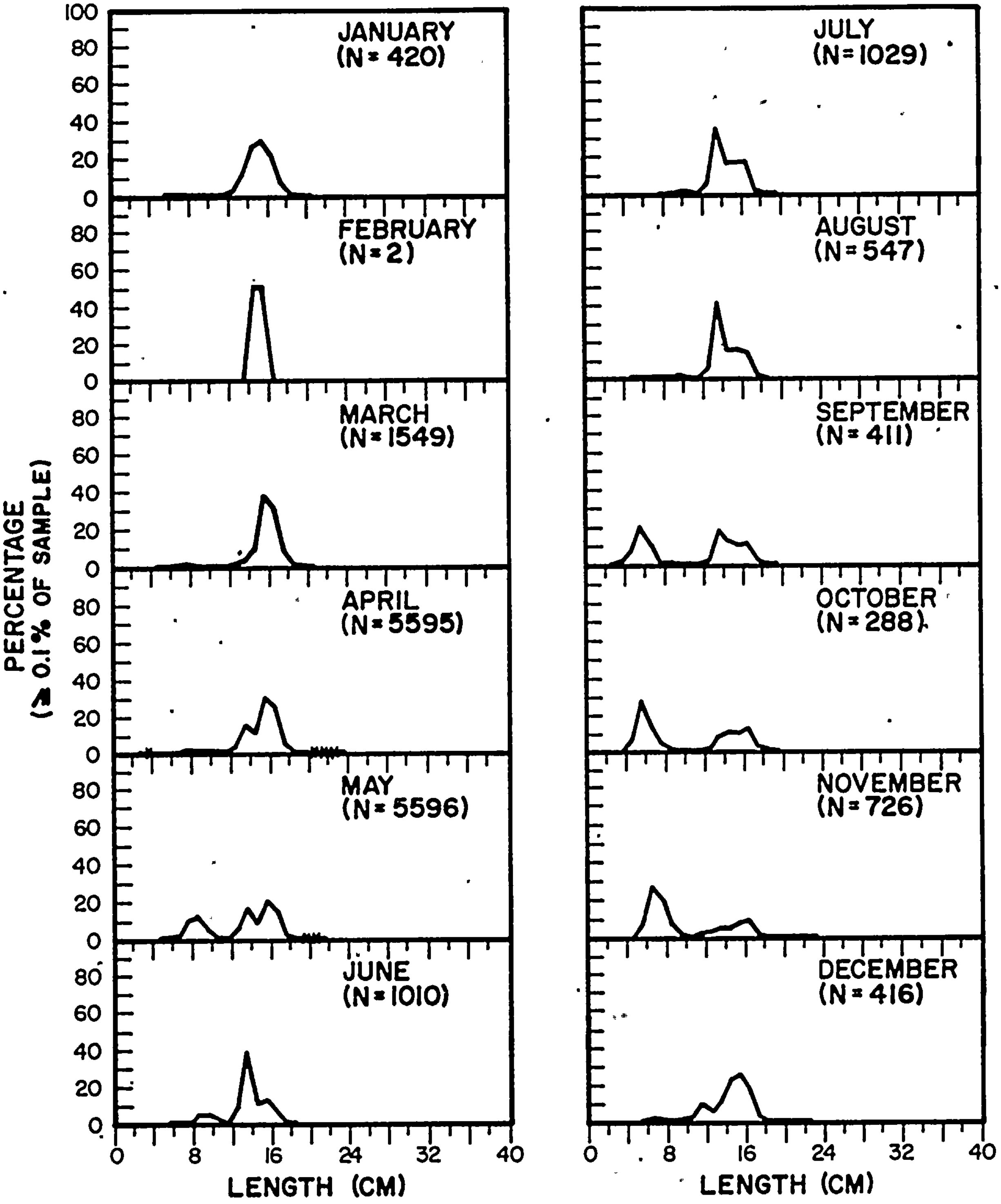
From June to August, the majority of alewives appeared to be age II with a lower percentage of age III and IV fish compared to earlier months. The recruitment of young-of-the-year fish occurred during September, October, and November.

b. Rainbow Smelt

The monthly length frequency distribution for rainbow smelt collected from the traveling screens at the FitzPatrick plant during 1976 are presented in Figure IX-2. Yearling rainbow smelt (4-7 cm) dominated the smelt collections from January to June, although during May and June, larger (older) individuals

LENGTH FREQUENCY DISTRIBUTION FOR ALEWIFE

JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

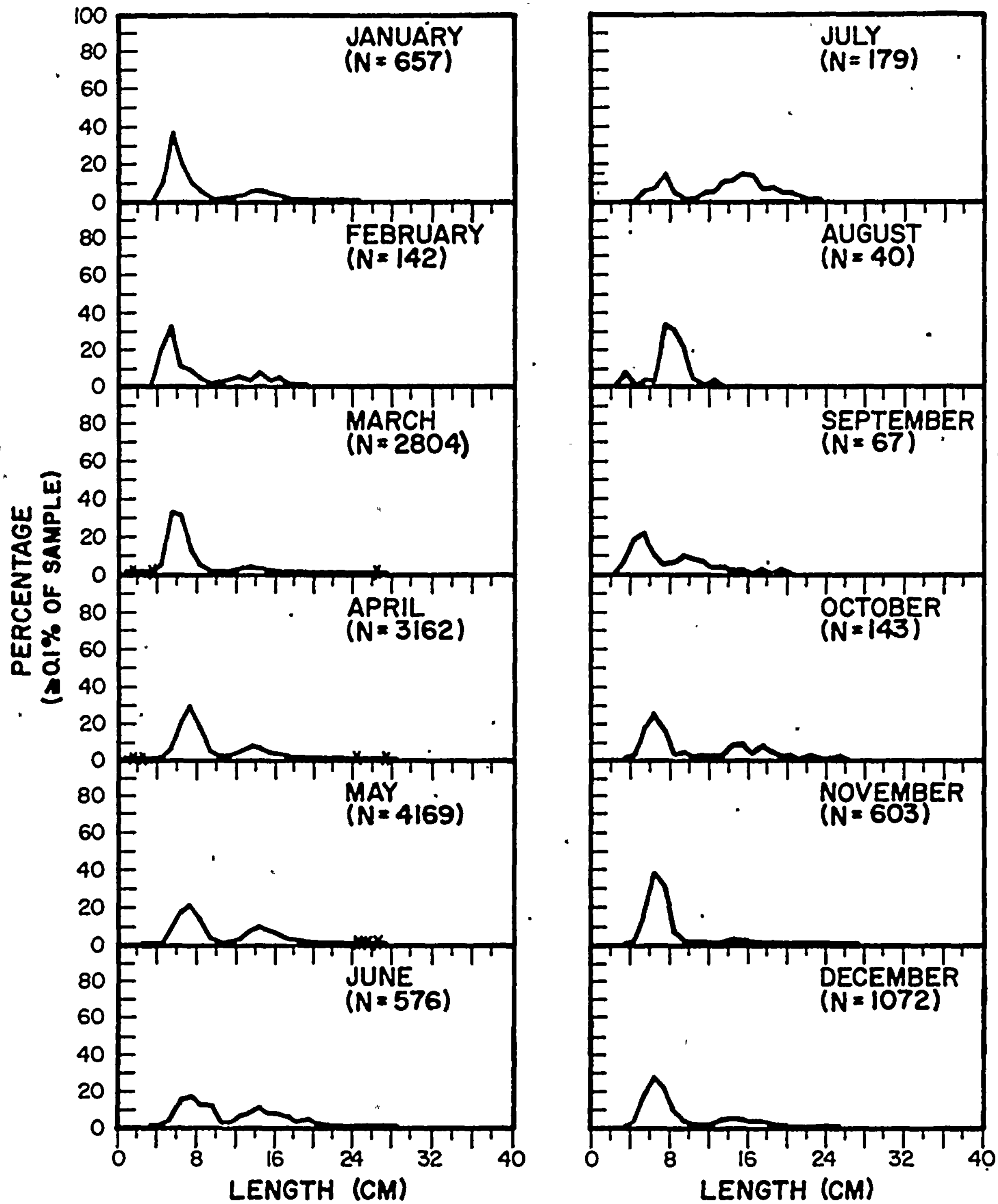


N = TOTAL NUMBER OF FISH ANALYZED FROM TRAVELING SCREEN COLLECTIONS ON SCHEDULED IMPINGEMENT DAYS

x = FISH ANALYZED, BUT REPRESENTING <.1% OF SAMPLE ANALYZED

LENGTH FREQUENCY DISTRIBUTION FOR RAINBOW SMELT

JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976



N = TOTAL NUMBER OF FISH ANALYZED FROM TRAVELING SCREEN COLLECTIONS ON SCHEDULED IMPINGEMENT DAYS

X = FISH ANALYZED, BUT REPRESENTING <.1% OF SAMPLE ANALYZED

were collected. Recruitment of young-of-the-year rainbow smelt to impingement collections began in August and continued until December. In general, older rainbow smelt were present in low percentages compared to yearlings throughout the year.

c. White Perch

The monthly length frequency distribution for white perch collected from the traveling screens at the James A. FitzPatrick Nuclear Power Plant during 1976 is presented in Figure IX-3.

During January, the impingement collections contained fish in a range of sizes representing various ages. From February through June, yearling white perch dominated the impingement catch, while recruitment of young-of-the-year into the impingement collections began in September and yearlings dominated the catch from September until November. In December, fish in a wide range of sizes were collected.

d. Yellow Perch

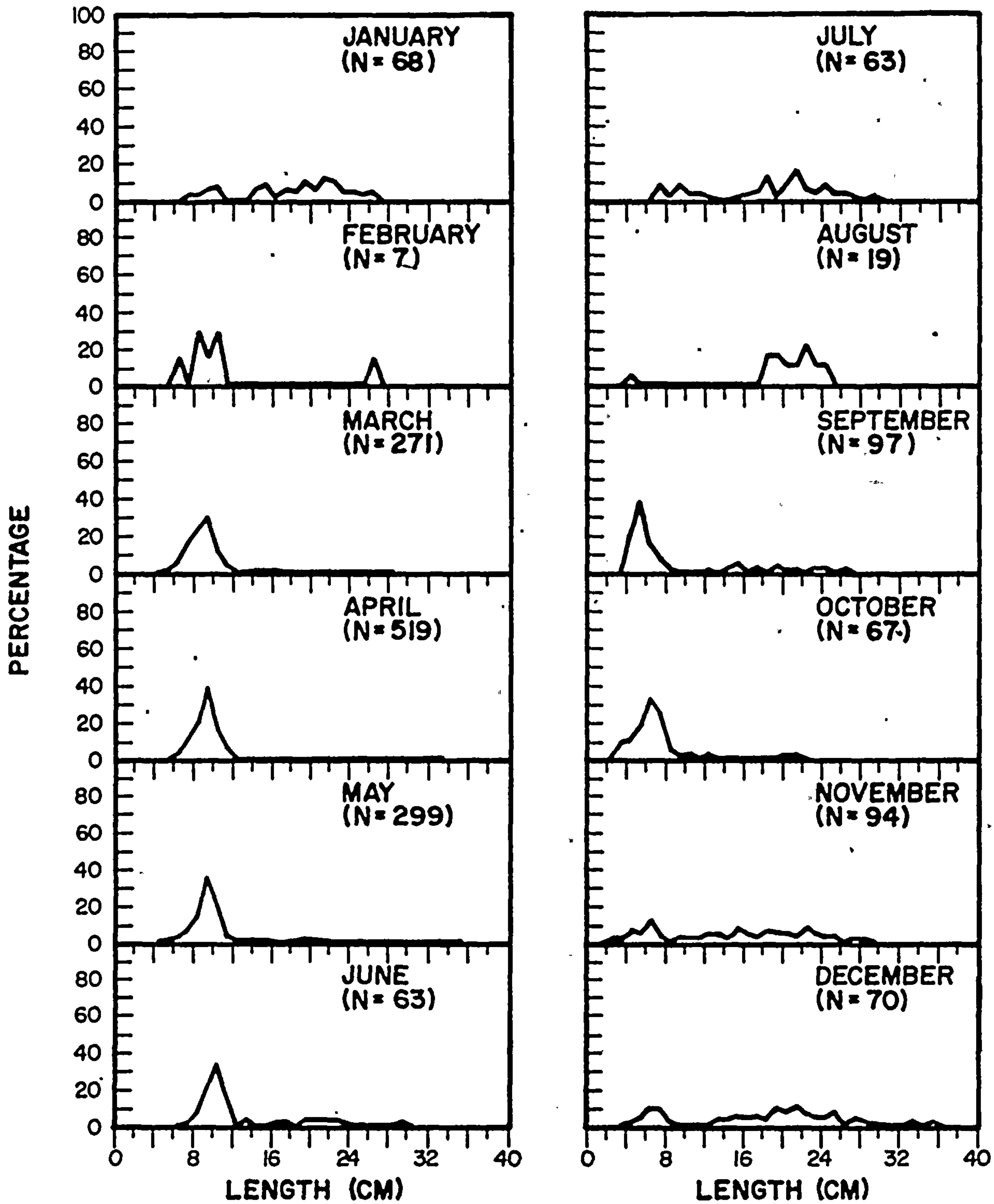
Length frequency data for yellow perch collected from the traveling screens at the James A. FitzPatrick Power Nuclear Plant are presented in Appendix IXB-1c Yearling yellow perch (6-9 cm) dominated the impingement collections from January through July, and from March through August, a small percentage of larger fish were collected. Fish 12-16 cm represented the majority of the impingement collections from September through December.

e. Threespine Stickleback

Length frequency data for threespine stickleback collected from the traveling screens at the James A. FitzPatrick Nuclear Power

LENGTH FREQUENCY DISTRIBUTION FOR WHITE PERCH

JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976



N = TOTAL NUMBER OF FISH ANALYZED FROM TRAVELING SCREEN COLLECTIONS ON SCHEDULED IMPINGEMENT DAYS

Plant are presented in Appendix IXB-1b. Throughout the year, the length frequency distribution was unimodal, with most fish between 5 and 6 cm long.

f. Smallmouth Bass

Length frequency data for smallmouth bass collected from the traveling screens at the FitzPatrick plant (Appendix IXB-1a) indicate no consistent pattern in the length frequency distribution of smallmouth bass due to the small numbers collected.

4. Estimated Impingement Rate

The estimated number of fish impinged at the James A. FitzPatrick Nuclear Power Plant for each month of 1976 is presented in Table IX-5. The estimated number of fish impinged for each species per month was determined by multiplying the mean number of all fish impinged per hour in each month (adjusted for non-operating screens) by the percentage of each species impinged during that month. An estimated 4,313,562 fish were impinged during 1976, 89.9% of which were alewives, 6.0% rainbow smelt, and 2.2% threespine stickleback. This results in a yearly unweighted average of 492.4 fish/hour of which 442.6 fish/hour were alewives, 29.7 fish/hour rainbow smelt, and 23.6 fish/hour threespine stickleback. The remaining species accounted for 10.9 fish/hour.

The highest rate occurred during May when alewives were impinged at an estimated rate of 3578.1 fish/hour. The second highest rate for alewife occurred in April with 857.4 fish/hour.

An estimated 74,206,252 grams (74.2 metric tons) of fish were impinged during 1976 (Table IX-6). The estimated biomass of fish

TABLE IX-5

ABUNDANCE AND PERCENT COMPOSITION OF IMPINGEMENT COLLECTIONS
JAMES A. FITZPATRICK NUCLEAR POWER PLANT - JANUARY - APRIL, 1976

SPECIES	JAN NO.	JAN PCNT	FEB NO.	FEB PCNT	MAR NO.	MAR PCNT	APR NO.	APR PCNT
ALEWIFE	6792	55.6	5	0.4	10504	21.0	637897	92.5
AMERICAN EEL	0	0.0	0	0.0	0	0.0	3	*
BANDED KILLIFISH	0	0.0	0	0.0	0	0.0	0	0.0
BLACK CRAPPIE	2	*	0	0.0	2	*	3	*
BLUEGILL	2	*	0	0.0	2	*	8	*
BLUNTNOSE MINNOW	0	0.0	0	0.0	0	0.0	5	*
BOWFIN	0	0.0	0	0.0	0	0.0	0	0.0
BROOK STICKLEBACK	0	0.0	0	0.0	168	0.3	60	*
BROWN BULLHEAD	14	0.1	0	0.0	11	*	7	*
BROWN TROUT	0	0.0	0	0.0	2	*	2	*
BURBOT	0	0.0	0	0.0	0	0.0	0	0.0
CARP	0	0.0	0	0.0	0	0.0	0	0.0
CENTRAL MUDMINNOW (MUDMINNOW)	5	*	5	0.4	133	0.3	52	*
CHANNEL CATFISH	48	0.4	7	0.5	18	*	2	*
COHO SALMON	0	0.0	0	0.0	0	0.0	0	0.0
CHUB - UID	0	0.0	0	0.0	0	0.0	0	0.0
CREEK CHUB	5	*	0	0.0	0	0.0	2	*
EMERALD SHINER	117	1.0	34	2.6	237	0.5	112	*
FATHEAD MINNOW	0	0.0	0	0.0	4	*	22	*
FRESHWATER DRUM	60	0.5	5	0.4	13	*	3	*
GIZZARD SHAD	849	7.0	456	35.1	10991	22.0	1571	0.2
GOLDEN SHINER	12	0.1	2	0.2	7	*	8	*
GOLDFISH	2	*	0	0.0	2	*	2	*
JOHNNY DARTER	12	0.1	5	0.4	9	*	103	*
LAKE CHUB	2	*	0	0.0	11	*	10	*
LAKE HERRING	0	0.0	0	0.0	0	0.0	0	0.0
LAKE TROUT	5	*	0	0.0	4	*	0	0.0
LOGPERCH	0	0.0	0	0.0	0	0.0	2	*
LONGNOSE DACE	14	0.1	10	0.8	49	0.1	2	*
LONGNOSE GAR	2	*	0	0.0	0	0.0	0	0.0
MINNOWS & CARPS	0	0.0	0	0.0	0	0.0	2	*
MOTTLED SCULPIN	210	1.7	51	3.9	221	0.4	1792	0.3
NORTHERN HOG SUCKER	0	0.0	0	0.0	0	0.0	0	0.0
NORTHERN PIKE	0	0.0	0	0.0	2	*	0	0.0
ONCORHYNCHUS SP (SALMONIDAE)	0	0.0	0	0.0	0	0.0	2	*
PEARL DACE	2	*	0	0.0	0	0.0	0	0.0
PUGNOSE MINNOW	0	0.0	0	0.0	0	0.0	8	*
PUMPKINSEED	14	0.1	0	0.0	2	*	15	*
RAINBOW SMELT	2496	20.4	432	33.2	20131	40.2	34045	4.9
RAINBOW TROUT	0	0.0	0	0.0	0	0.0	0	0.0
REDFIN PICKEREL	0	0.0	0	0.0	2	*	0	0.0
ROCK BASS	124	1.0	22	1.7	109	0.2	68	*
SALVELINUS SP (SALMONIDAE)	0	0.0	0	0.0	0	0.0	0	0.0
SEA LAMPREY	5	*	0	0.0	2	*	10	*
SEMOTILUS SP (CYPRINIDAE)	0	0.0	0	0.0	0	0.0	0	0.0
SILVERY MINNOW	0	0.0	0	0.0	2	*	0	0.0
SMALLMOUTH BASS	219	1.8	12	0.9	40	0.1	18	*
SPLAKE TROUT	0	0.0	0	0.0	0	0.0	5	*
SPOTTAIL SHINER	493	4.0	68	5.2	357	0.7	551	0.1
STONECAT	2	*	0	0.0	4	*	20	*
TADPOLE MADTOM	0	0.0	0	0.0	0	0.0	0	0.0
THREESPINE STICKLEBACK	21	0.2	22	1.7	2463	4.9	6287	0.9
TROUT PERCH	7	0.1	2	0.2	82	0.2	2615	0.4
TROUTS (SALMONIDAE)	0	0.0	0	0.0	0	0.0	0	0.0
UNIDENTIFIED	0	0.0	0	0.0	0	0.0	0	0.0
WALLEYE	2	*	0	0.0	0	0.0	2	*
WHITE BASS	207	1.7	140	10.8	3450	6.9	1458	0.2
WHITE CRAPPIE	0	0.0	0	0.0	0	0.0	0	0.0
WHITE PERCH	260	2.1	17	1.3	901	1.8	2387	0.3
WHITE SUCKER	10	0.1	0	0.0	0	0.0	7	*
YELLOW PERCH	193	1.6	5	0.4	102	0.2	298	*
TOTAL	12208	99.7	1300	100.1	50037	99.8	689466	99.8
TOTAL MONTHLY FLOW SAMPLED (MG)	4147		2070		3982		9349	
TOTAL HOURS SAMPLED	312.08		288.40		335.95		432.23	

* LESS THAN 0.1 PERCENT
(MG) MILLION GALLONS, ALL UNITS COMBINED

TABLE IX-5 (Continued)

ABUNDANCE AND PERCENT COMPOSITION OF IMPINGEMENT COLLECTIONS (CONTINUED)
JAMES A. FITZPATRICK NUCLEAR POWER PLANT - MAY - AUGUST, 1976

SPECIES	MAY NO.	MAY PCNT	JUN NO.	JUN PCNT	JUL NO.	JUL PCNT	AUG NO.	AUG PCNT
ALEWIFE	2662084	93.4	259442	85.3	139445	86.9	3429	66.6
AMERICAN EEL	36	*	5	*	14	*	10	0.2
BANDED KILLIFISH	2	*	0	0.0	0	0.0	0	0.0
BLACK CRAPPIE	2	*	0	0.0	0	0.0	0	0.0
BLUEGILL	11	*	2	*	12	*	0	0.0
BLUNTNOSE MINNOW	0	0.0	0	0.0	0	0.0	0	0.0
BOWFIN	0	0.0	0	0.0	0	0.0	0	0.0
BROOK STICKLEBACK	31	*	2	*	0	0.0	0	0.0
BROWN BULLHEAD	2	*	0	0.0	0	0.0	5	0.1
BROWN TROUT	0	0.0	5	*	0	0.0	5	0.1
BURBOT	0	0.0	0	0.0	2	*	7	0.1
CARP	0	0.0	0	0.0	0	0.0	0	0.0
CENTRAL MUDMINNOW	46	*	7	*	2	*	0	0.0
CHANNEL CATFISH	0	0.0	0	0.0	0	0.0	0	0.0
COHO SALMON	0	0.0	2	*	0	0.0	0	0.0
CHUB - UID	0	0.0	0	0.0	5	*	0	0.0
CREEK CHUB	0	0.0	0	0.0	0	0.0	0	0.0
EMERALD SHINER	108	*	16	*	2	*	12	0.2
FATHEAD MINNOW	24	*	0	0.0	0	0.0	0	0.0
FRESHWATER DRUM	0	0.0	2	*	0	0.0	0	0.0
GIZZARD SHAD	143	*	7	*	5	*	5	0.1
GOLDEN SHINER	41	*	0	0.0	0	0.0	2	*
GOLDFISH	0	0.0	0	0.0	0	0.0	0	0.0
JOHNNY DARTER	3657	0.1	782	0.3	1586	1.0	284	5.5
LAKE CHUB	29	*	14	*	64	*	17	0.3
LAKE HERRING	2	*	0	0.0	0	0.0	0	0.0
LAKE TROUT	0	0.0	0	0.0	0	0.0	0	0.0
LOGPERCH	2	*	0	0.0	2	*	0	0.0
LONGNOSE DACE	0	0.0	0	0.0	5	*	0	0.0
LONGNOSE GAR	0	0.0	0	0.0	0	0.0	0	0.0
MINNOWS & CARPS	0	0.0	0	0.0	0	0.0	2	*
MOTTLED SCULPIN	2942	0.1	805	0.3	367	0.2	72	1.4
NORTHERN HOG SUCKER	0	0.0	2	*	0	0.0	2	*
NORTHERN PIKE	2	*	0	0.0	7	*	5	0.1
ONCORHYNCHUS SP (SALMONIDAE)	0	0.0	0	0.0	0	0.0	0	0.0
PEARL DACE	0	0.0	0	0.0	0	0.0	0	0.0
PUGNOSE MINNOW	0	0.0	2	*	0	0.0	0	0.0
PUMPKINSEED	67	*	9	*	5	*	10	0.2
RAINBOW SMELT	127127	4.5	4098	1.3	544	0.3	405	7.9
RAINBOW TROUT	8	*	0	0.0	2	*	0	0.0
REDFIN PICKEREL	0	0.0	0	0.0	0	0.0	0	0.0
ROCK BASS	165	*	16	*	50	*	64	1.2
SALVELINUS SP (SALMONIDAE)	3	*	5	*	0	0.0	0	0.0
SEA LAMPREY	2	*	0	0.0	2	*	0	0.0
SEMOTILUS SP (CYPRINIDAE)	0	0.0	0	0.0	2	*	0	0.0
SILVERY MINNOW	0	0.0	0	0.0	0	0.0	0	0.0
SMALLMOUTH BASS	108	*	12	*	12	*	2	*
SPLAKE TROUT	10	*	12	*	38	*	12	0.2
SPOTTAIL SHINER	2603	0.1	2365	0.8	4531	2.8	398	7.7
STONECAT	20	*	16	*	36	*	5	0.1
TADPOLE MADTOM	0	0.0	0	0.0	0	0.0	0	0.0
THREESPINE STICKLEBACK	40157	1.4	34408	11.3	11937	7.4	5	0.1
TROUT PERCH	6511	0.2	1666	0.5	1171	0.7	86	1.7
TROUTS	0	0.0	2	*	0	0.0	0	0.0
UNIDENTIFIED	0	0.0	0	0.0	2	*	2	*
WALLEYE	0	0.0	0	0.0	0	0.0	5	0.1
WHITE BASS	1422	*	171	0.1	24	*	0	0.0
WHITE CRAPPIE	2	*	0	0.0	0	0.0	0	0.0
WHITE PERCH	2417	0.1	162	0.1	155	0.1	48	0.9
WHITE SUCKER	41	*	37	*	100	0.1	48	0.9
YELLOW PERCH	1108	*	132	*	250	0.2	200	3.9
TOTAL	2850935	99.9	304206	100.0	160379	99.7	5147	99.6
TOTAL MONTHLY FLOW SAMPLED (MG)	9584		5955		5770		6637	
TOTAL HOURS SAMPLED	456.75		312.00		312.00		312.00	

* LESS THAN 0.1 PERCENT
(MG) MILLION GALLONS, ALL UNITS COMBINED

TABLE IX-5 (Continued)

ABUNDANCE AND PERCENT COMPOSITION OF IMPINGEMENT COLLECTIONS (CONTINUED)
JAMES A. FITZPATRICK NUCLEAR POWER PLANT – SEPTEMBER – DECEMBER, 1976

	SEP		OCT		NOV		DEC		TOTAL	
SPECIES	NO.	PCNT	NO.	PCNT	NO.	PCNT	NO.	PCNT	NO.	PCN
ALEWIFE	4687	71.8	4018	49.1	146305	77.4	2942	8.1	3877550	89.
AMERICAN EEL	21	0.3	10	0.1	4	*	2	*	105	*
BANDED KILLIFISH	0	0.0	0	0.0	0	0.0	0	0.0	2	*
BLACK CRAPPIE	2	*	0	0.0	2	*	0	0.0	13	*
BLUEGILL	2	*	7	0.1	2	*	0	0.0	48	*
BLUNTNOSE MINNOW	0	0.0	0	0.0	0	0.0	0	0.0	5	*
BOWFIN	2	*	2	*	6	*	0	0.0	10	
BROOK STICKLEBACK	0	0.0	0	0.0	0	0.0	0	0.0	261	
BROWN BULLHEAD	12	0.2	91	1.1	49	*	38	0.1	229	
BROWN TROUT	0	0.0	2	*	0	0.0	4	*	20	*
BURBOT	0	0.0	5	0.1	6	*	22	0.1	42	
CARP	0	0.0	0	0.0	0	0.0	2	*	2	*
CENTRAL MUDMINNOW	0	0.0	0	0.0	6	*	0	0.0	256	*
CHANNEL CATFISH	0	0.0	0	0.0	49	*	7	*	131	*
COHO SALMON	0	0.0	0	0.0	0	0.0	0	0.0	2	*
CHUB - UID	0	0.0	0	0.0	0	0.0	0	0.0	5	*
CREEK CHUB	0	0.0	0	0.0	0	0.0	0	0.0	7	*
EMERALD SHINER	23	0.4	112	1.4	11	*	199	0.5	983	*
FATHEAD MINNOW	0	0.0	0	0.0	0	0.0	0	0.0	50	*
FRESHWATER DRUM	0	0.0	0	0.0	4	*	2	*	89	*
GIZZARD SHAD	2	*	590	7.2	1245	0.7	868	2.4	16732	0.
GOLDEN SHINER	2	*	2	*	2	*	2	*	80	*
GOLDFISH	2	*	0	0.0	0	0.0	2	*	10	*
JOHNNY DARTER	231	3.5	22	0.3	4	*	13	*	6708	0.
LAKE CHUB	5	0.1	2	*	2	*	0	0.0	156	*
LAKE HERRING	0	0.0	0	0.0	0	0.0	2	*	4	*
LAKE TROUT	0	0.0	2	*	2	*	0	0.0	13	
LOGPERCH	0	0.0	0	0.0	0	0.0	0	0.0	6	
LONGNOSE DACE	0	0.0	0	0.0	0	0.0	2	*	82	
LONGNOSE GAR	0	0.0	0	0.0	0	0.0	0	0.0	2	
MINNOWS & CARPS	0	0.0	0	0.0	2	*	0	0.0	6	*
MOTTLED SCULPIN	201	3.1	79	1.0	191	0.1	370	1.0	7301	0.
NORTHERN HOG SUCKER	0	0.0	0	0.0	0	0.0	0	0.0	4	*
NORTHERN PIKE	0	0.0	0	0.0	0	0.0	7	*	23	*
ONCORHYNCHUS SP (SALMONIDAE)	0	0.0	0	0.0	0	0.0	0	0.0	2	*
PEARL DACE	0	0.0	0	0.0	0	0.0	0	0.0	2	*
PUGNOSE MINNOW	0	0.0	0	0.0	0	0.0	0	0.0	10	*
PUMPKINSEED	12	0.2	14	0.2	24	*	18	*	190	*
RAINBOW SMELT	189	2.9	2467	30.2	38198	20.2	29651	81.8	259783	6.
RAINBOW TROUT	2	*	0	0.0	0	0.0	0	0.0	12	*
REDFIN PICKEREL	0	0.0	0	0.0	0	0.0	0	0.0	2	*
ROCK BASS	95	1.5	72	0.9	77	*	208	0.6	1070	*
SALVELINUS SP (SALMONIDAE)	0	0.0	0	0.0	2	*	0	0.0	10	*
SEA LAMPREY	0	0.0	0	0.0	2	*	15	*	38	*
SEMOTILUS SP (CYPRINIDAE)	0	0.0	0	0.0	0	0.0	0	0.0	2	*
SILVERY MINNOW	0	0.0	0	0.0	0	0.0	0	0.0	2	*
SMALLMOUTH BASS	23	0.4	10	0.1	13	*	42	0.1	511	*
SPLAKE TROUT	0	0.0	0	0.0	13	*	22	0.1	112	*
SPOTTAIL SHINER	155	2.4	57	0.7	39	*	66	0.2	11683	0.
STONECAT	9	0.1	22	0.3	6	*	33	0.1	173	*
TADPOLE MADTOM	0	0.0	2	*	0	0.0	0	0.0	2	*
THREESPINE STICKLEBACK	0	0.0	17	0.2	101	0.1	465	1.3	95883	2.
TROUT PERCH	16	0.2	14	0.2	9	*	4	*	12183	0.
TROUTS	0	0.0	0	0.0	0	0.0	0	0.0	2	*
UNIDENTIFIED	0	0.0	0	0.0	0	0.0	0	0.0	4	*
WALLEYE	0	0.0	0	0.0	0	0.0	0	0.0	9	*
WHITE BASS	2	*	31	0.4	1992	1.1	611	1.7	9508	0.
WHITE CRAPPIE	0	0.0	0	0.0	0	0.0	0	0.0	2	*
WHITE PERCH	369	5.7	253	3.1	208	0.1	162	0.4	7339	0.
WHITE SUCKER	95	1.5	48	0.6	6	*	4	*	396	*
YELLOW PERCH	365	5.6	227	2.8	346	0.2	469	1.3	3695	0.
TOTAL	6524	99.9	8178	100.1	188928	99.9	36254	99.8	4313562	100.
TOTAL MONTHLY FLOW SAMPLED (MG)	6739		5604		6170		6979		72986	
TOTAL HOURS SAMPLED	312.00		311.27		335.50		336.08		4056.260	

* LESS THAN 0.1 PERCENT
(MG) MILLION GALLONS, ALL UNITS COMBINED

TABLE IX-6

ESTIMATED BIOMASS OF IMPINGEMENT CATCH[a]

JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL TOTAL
Alewife	192213.6	[illegible]151.0	284658.4	14097523.7	47651303.6	4073239.4	2621566.0	59321.7	42651.7	23706.2	570589.5	53838.6	69670763.4
American eel	-	-		3119.1	45151.2	8796.5	16237.2	5495.0	7431.9	9061.0	2253.6	5300.0	102845.5
Banded killifish	-	-	-	-	3.2	-	-	-	-	-	-	-	3.2
Black crappie	19.8	-	9.0	4.5	*	-	-	-	*	-	54.8	-	88.1
Bluegill	7.2	-	5.6	*	18.7	*	37.2	-	200.4	4.9	4.2	-	278.2
Bluntnose minnow	-	-	-	17.5	-	-	-	-	-	-	-	-	17.5
Bowfin	-	-	-	-	-	-	-	-	2840.0	237.0	340.8	-	3417.8
Brook stickleback	-	-	218.4	78.0	49.6	3.6	-	-	-	-	-	-	349.6
Brown bullhead	882.0	-	995.5	687.4	1000.2	-	-	1542.5	3007.2	16052.4	8379.0	3480.8	36027.0
Brown trout	-	-	2156.0	3312.2	-	8492.0	-	9363.0	-	4760.0	-	11510.0	39593.2
Burbot	-	-	-	-	-	-	4551.8	1474.9	-	5040.5	2128.2	541.2	13736.6
Carp	-	-	-	-	-	-	-	-	-	-	-	16400.0	16400.0
Central mudminnow (Mudminnow)	13.5	27.0	678.3	208.0	202.4	63.0	10.8	-	-	-	30.6	-	1233.6
Channel catfish	508.8	51.1	799.2	9.8	-	-	-	-	-	-	142.1	147.7	1658.7
Coho salmon	-	-	-	-	-	*	-	-	-	-	-	-	-
Chub-UID	-	-	-	-	-	-	*	-	-	-	-	-	-
Creek chub	34.5	-	-	6.2	-	-	-	-	-	-	-	-	40.7
Emerald shiner	397.8	44.2	521.4	526.4	583.2	99.2	*	85.2	156.4	795.2	71.5	835.8	4116.3
Fathead minnow	-	-	8.0	61.6	72.0	-	-	-	-	-	-	-	141.6
Freshwater drum	4056.0	79.0	3950.7	111.6	-	62.8	-	-	-	-	57.2	39.8	8357.1
Gizzard shad	157829.1	23803.2	320937.2	47758.4	18933.2	3350.2	1604.0	473.5	5.0	14455.0	150147.0	284530.4	1023826.2
Golden shiner	38.4	8.8	26.6	22.4	102.5	-	-	112.4	39.6	15.8	5.8	29.8	402.1
Goldfish	559.4	-	*	369.4	-	-	-	-	*	-	-	1540.4	2469.2
Johnny darter	19.2	13.5	25.2	329.6	11336.7	1876.8	2696.2	511.2	508.2	52.8	8.0	29.9	17407.3
Lake chub	9.0	-	41.8	289.0	762.7	331.8	1632.0	496.4	270.5	9.4	49.2	-	3891.8
Lake herring	-	-	-	-	1531.0	-	-	-	-	-	-	110.4	1641.4
Lake trout	45.0	-	30.8	-	-	-	-	-	-	373.2	18.2	-	467.2
Logperch	-	-	-	40.8	21.0	-	24.2	-	-	-	-	-	86.0
Longnose dace	50.4	31.0	220.5	7.6	-	-	19.0	-	-	-	-	22.0	350.5
Longnose gar	273.0	-	-	-	-	-	-	-	-	-	-	-	273.0
Minnows and carps	-	-	-	7.4	-	-	-	*	-	-	27.8	-	35.2
Mottled sculpin	735.0	173.4	1547.0	12185.6	12356.4	2898.0	1284.5	288.0	542.7	213.3	496.6	1184.0	33904.5
Northern hog sucker	-	-	-	-	-	19.8	-	153.2	-	-	-	-	173.0
Northern pike	-	-	6129.0	-	*	-	77.7	412.0	-	-	-	821.1	7439.8
<u>Onchorhynchus</u> sp. (Salmonidae)	-	-	-	*	-	-	-	-	-	-	-	-	-

TABLE IX-6 (Continued)

ESTIMATED BIOMASS OF IMPINGEMENT CATCH[a] (Continued)

JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

SPECIES (continued)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL TOTAL
Pearl dace	1.2	-	-	-	-	-	-	-	-	-	-	-	1.2
Pugnose minnow	-	-	-	23.2	-	30.4	-	-	-	-	-	-	53.6
Pumpkinseed	2090.2	-	15.6	642.0	1695.1	642.6	421.5	49.0	699.6	581.0	1804.8	1456.2	10097.6
Rainbow smelt	14227.2	2462.4	74484.7	251933.0	1182281.1	35652.6	6691.2	1377.0	793.8	12828.4	68756.4	94883.2	1746371.0
Rainbow trout	-	-	-	-	860.0	-	1302.0	-	749.4	-	-	-	2911.4
Redfin pickerel	-	-	211.0	-	-	-	-	-	-	-	-	-	211.0
Rock bass	14433.6	140.8	4196.5	3318.4	10362.0	5281.6	11775.0	12684.8	14506.5	8676.0	13667.5	29099.2	128141.9
Salvelinus sp. (Salmonidae)	-	-	-	-	*	43.0	-	-	-	-	18.2	-	61.2
Sea lamprey	100.0	-	101.6	249.7	*	-	89.4	-	-	-	369.4	2946.0	3855.4
Semotilus sp. (Cyprinidae)	-	-	-	-	-	-	80.6	-	-	-	-	-	80.6
Silvery minnow	-	-	4.6	-	-	-	-	-	-	-	-	-	4.6
Smallmouth bass	45026.4	252.0	8076.0	7228.8	1857.6	6172.8	2484.0	1537.2	11359.7	3953.0	3120.0	15115.8	106183.3
Splake trout	-	-	-	59.5	130.0	216.0	4332.0	3584.4	-	-	133.9	290.4	8746.2
Spottail shiner	5176.5	748.0	2356.2	3195.8	19001.9	30745.0	58903.0	4099.4	1953.0	741.0	421.2	825.0	128166.0
Stonecat	138.6	-	304.0	366.0	306.0	1336.0	2379.6	384.5	552.6	1408.0	241.2	2003.1	9419.6
Tadpole madtom	-	-	-	-	-	-	-	-	-	16.0	-	-	16.0
Threespine stickleback	33.6	35.2	4187.1	11316.6	72282.6	58493.6	19099.2	10.0	-	28.9	171.7	837.0	166495.5
Trout perch	63.0	4.2	664.2	38702.0	87247.4	22824.2	15691.4	1118.0	224.0	165.2	34.2	23.2	166761.0
Trouts (Salmonidae)	-	-	-	-	-	*	-	-	-	-	-	-	-
Unidentified	-	-	-	-	-	-	*	*	-	-	-	-	-
Walleye	213.4	-	-	4086.0	-	-	-	49.5	-	-	-	-	4348.9
White bass	8342.1	2366.0	54165.0	21724.2	17632.8	2325.6	470.4	-	*	399.9	13744.8	5254.6	126425.4
White crappie	-	-	-	-	11.2	-	-	-	-	-	-	-	11.2
White perch	36348.0	1620.1	17659.6	36521.1	63325.4	6463.8	18026.5	5673.6	9298.8	1998.7	17492.8	23603.4	238031.8
White sucker	361.0	-	-	979.3	7597.3	27143.2	56820.0	23078.4	43396.0	21172.8	2512.2	1497.6	184557.8
Yellow perch	7970.9	472.0	7211.4	24465.8	46425.2	4897.2	17275.0	14320.0	25039.0	11849.4	10103.2	13835.5	183864.6
TOTAL	492217.4	32482.9	796596.1	14571486.9	49254443.2	4301500.7	2865581.4	147694.8	166226.0	138595.0	867395.6	572032.1	74206252.1

[a]Grams; traveling screens only; estimated biomass = estimated monthly abundance multiplied by monthly mean biomass per species

- = Not applicable, fish of that species not collected

* = Fish collected during the month, but none analyzed

impinged per month was determined by multiplying the mean weight per species for each month by the estimated number of fish impinged during that month from Table IX-5. The mean weight per species per month was determined by dividing the total biomass per species by the total number of fish collected in that month. The monthly total biomass per species was estimated for the January through September period and November at FitzPatrick based on the average weight of those fish analyzed per species; October and December biomass values represent the actual weight of those fish impinged. Alewives accounted for 93.9% of the impinged biomass, rainbow smelt for 2.4%, and gizzard shad for 1.4%. None of the remaining species accounted for more than 1% of the impinged biomass.

5. Age Class Distribution

a. Alewife

During the winter, age was calculated for only four alewives, too small a number to suggest the actual age class distribution of impinged alewives.

From April through June, 73 male and 112 female alewives were randomly selected from the James A. FitzPatrick impingement catch and analyzed for age (Table IX-7). Age III fish accounted for the highest percentages impinged of both sexes, with 52.1% of the males and 54.5% of the females. Male alewife collected with bottom gill nets during the same period showed a different age composition, with age III fish accounting for only 43.7% of alewife collected at experimental sites and 45.2% of those at control sites (Table VII-9).

TABLE IX-7

AGE CLASS DISTRIBUTION OF ALEWIFE FROM IMPINGEMENT COLLECTIONS

JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

I. WINTER (15 JAN - 31 MAR)

AGE CLASS	MALES[a] (N = 2)			FEMALES[b] (N = 2)		
	% FREQUENCY	TOTAL LENGTH (cm)		% FREQUENCY	TOTAL LENGTH (cm)	
		MEAN	RANGE		MEAN	RANGE
I	0	-	-	0	-	-
II	0	-	-	0	-	-
III	50.0	16.40	-	100.0	15.90	15.2 - 16.6
II	0	-	-	0	-	-
V	50.0	15.40	-	0	-	-

[a]Collected 31 Mar
[b]Collected 15 Jan - 25 Mar
- = Not applicable

II. SPRING (11 APR - 31 JUN)

AGE CLASS	MALES[a] (N = 73)			FEMALES[b] (N = 112)		
	% FREQUENCY	TOTAL LENGTH (cm)		% FREQUENCY	TOTAL LENGTH (cm)	
		MEAN	RANGE		MEAN	RANGE
I	0	-	-	0	-	-
II	6.8	14.76	12.5 - 15.7	1.8	13.65	12.5 - 14.8
III	52.1	14.24	12.5 - 16.4	54.5	14.67	12.8 - 17.9
IV	31.5	15.34	13.7 - 16.5	23.2	16.01	13.6 - 17.4
V	9.6	16.21	15.1 - 16.6	18.7	16.50	15.5 - 17.4
VI	0	-	-	1.8	16.75	16.5 - 17.0

[a]Collected 14 Apr - 16 Jun
[b]Collected 11 Apr - 30 Jun
- = Not applicable

III. SUMMER (7 JUL - 8 SEP)

AGE CLASS	MALES[a] (N = 105)			FEMALES[b] (N = 91)		
	% FREQUENCY	TOTAL LENGTH (cm)		% FREQUENCY	TOTAL LENGTH (cm)	
		MEAN	RANGE		MEAN	RANGE
I	1.0	13.60	-	1.1	10.50	-
II	26.7	14.48	12.6 - 16.7	30.8	14.52	12.9 - 16.4
III	50.5	14.44	12.6 - 16.8	27.5	14.69	13.3 - 17.1
IV	19.0	15.85	13.5 - 17.3	33.0	16.38	13.3 - 17.9
V	1.9	15.45	15.0 - 15.9	6.6	16.12	15.7 - 16.5
VI	1.0	17.70	-	1.1	15.80	-

[a]Collected 7 Jul - 8 Sep
[b]Collected 7 Jul - 18 Aug
- = Not applicable

IV. FALL (29 SEP - 22 DEC)

AGE CLASS	MALES[a] (N = 50)			FEMALES[b] (N = 69)		
	% FREQUENCY	TOTAL LENGTH (cm)		% FREQUENCY	TOTAL LENGTH (cm)	
		MEAN	RANGE		MEAN	RANGE
I	12.0	14.40	13.1 - 15.5	2.9	13.05	12.8 - 13.3
II	40.0	14.74	13.3 - 16.7	37.7	15.36	12.5 - 17.2
III	46.0	15.27	13.7 - 17.3	53.6	15.60	13.5 - 17.3
IV	2.0	16.20	-	5.8	16.45	15.3 - 17.4

[a]Collected 29 Sep - 15 Dec
[b]Collected 29 Sep - 22 Dec
- = Not applicable

This difference in age structure between impinged fish and those collected with gill nets during the spring is more pronounced for females than for males. Gillnetted age III females represented only 26.2% of the females collected from the experimental sites and 28.6% of those from the control sites (Table VII-9), whereas impingement collections contained 54.5% three-year-old females (Table IX-7). This may be due to either the inability of the gill nets to collect age III females, the selective collection of younger fish by gill nets, or selective entrapment of age III fish in the FitzPatrick plant's circulating water system.

During the summer, the age class distribution of impinged fish changed only slightly from that observed during the spring.

Female age class distribution showed either fewer older individuals (age III-V) or more younger fish (age II). During the fall, the greatest percentage of male alewife impinged (86%) were age II and III fish, while 91.3% of the females were in these age classes (Table IX-7).

b. Rainbow Smelt

Sufficient numbers of rainbow smelt for the determination of age class distribution were collected only during the spring and fall periods at the James A. FitzPatrick Nuclear Power Plant (Table IX-8). During the spring, 65.0% of the males collected were three-year-olds while 20.4% were four and 3.8% were five-year-olds. The age class distribution for females during this time was more evenly divided, with age III fish accounting for 43.2%, four-year-olds accounting for 28.4%, age V fish accounting for 21.3%, and age VI and VII accounting for 5.1% (Table IX-8).

TABLE IX-8

AGE CLASS DISTRIBUTION OF RAINBOW SMELT FROM IMPINGEMENT COLLECTIONS

JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976

I. WINTER (14 JAN - 18 MAR)

AGE CLASS	MALES[a] (N = 5)			FEMALES[b] (N = 3)		
	% FREQUENCY	TOTAL LENGTH (cm)		% FREQUENCY	TOTAL LENGTH (cm)	
		MEAN	RANGE		MEAN	RANGE
I	20.0	12.8	-	0	-	-
II	60.0	14.0	12.3 - 15.3	33.3	13.0	-
III	20.0	15.2	-	33.3	14.3	-
IV	0	-	-	0	-	-
V	0	-	-	33.3	21.8	-

[a]Collected 17-18 Mar

[b]Collected 14 Jan - 10 Mar

- = Not applicable

II. SPRING (22 APR - 30 JUN)

AGE CLASS	MALES[a] (N = 157)			FEMALES[b] (N = 155)		
	% FREQUENCY	TOTAL LENGTH (cm)		% FREQUENCY	TOTAL LENGTH (cm)	
		MEAN	RANGE		MEAN	RANGE
II	10.2	13.65	11.3 - 16.1	1.9	14.73	13.1 - 17.5
III	65.0	14.65	11.1 - 19.8	43.2	15.17	12.5 - 21.3
IV	20.4	15.60	13.2 - 23.6	28.4	17.24	12.9 - 20.6
V	3.8	18.90	17.3 - 20.5	21.3	20.24	15.2 - 26.5
VI	0.6	17.40	-	3.2	20.58	17.3 - 24.5
VII	0	-	-	1.9	21.60	18.4 - 23.9

[a]Collected 22 Apr - 13 May

[b]Collected 22 Apr - 30 Jun

- = Not applicable

III. FALL (27 OCT - 29 DEC)

AGE CLASS	MALES[a] (N = 26)			FEMALES[b] (N = 42)		
	% FREQUENCY	TOTAL LENGTH (cm)		% FREQUENCY	TOTAL LENGTH (cm)	
		MEAN	RANGE		MEAN	RANGE
I	30.8	15.13	13.7 - 17.0	21.4	14.54	13.1 - 16.0
II	23.1	15.82	14.9 - 17.3	35.7	15.99	14.4 - 17.7
III	34.6	16.71	15.7 - 18.1	31.0	17.62	14.6 - 19.9
IV	11.5	17.43	16.7 - 17.9	11.9	21.36	19.3 - 22.7

[a]Collected 27 Oct - 29 Dec

[b]Collected 27 Oct - 29 Dec

The age class distribution for rainbow smelt in impingement collections (Table IX-8) differed from the distribution of ages for fish from gill net collections (Table VII-10). The gill-netted male rainbow smelt were dominated by age class III which represented 84.9% for experimental sites and 88.0% for control sites (Table VII-10), whereas age III males accounted for only 65% of impingement collections. Gillnetted female rainbow smelt showed a biomodal age class distribution in collections at experimental sites with 59% age III, 9.4% age IV, and 23.9% age V fish. This trend was not observed in the control site data (Table VII-10).

During the fall the percentage of one-year-old rainbow smelt increased to 30.8% for males and 21.4% for females (Table IX-8).

c. Threespine Stickleback

It was not possible to analyze age directly for the threespine stickleback collected from the traveling screens of the James A. FitzPatrick Nuclear Power Plant. Length frequency distribution revealed that the majority of the threespine stickleback analyzed from impingement collections were 5.5 cm long (Figure IX-4), which probably represents fish in age class II. Similar lengths have been reported for two-year-old threespine stickleback by Greenbank and Nelson (1958) and Brian and Power (1973), both from northern North America.

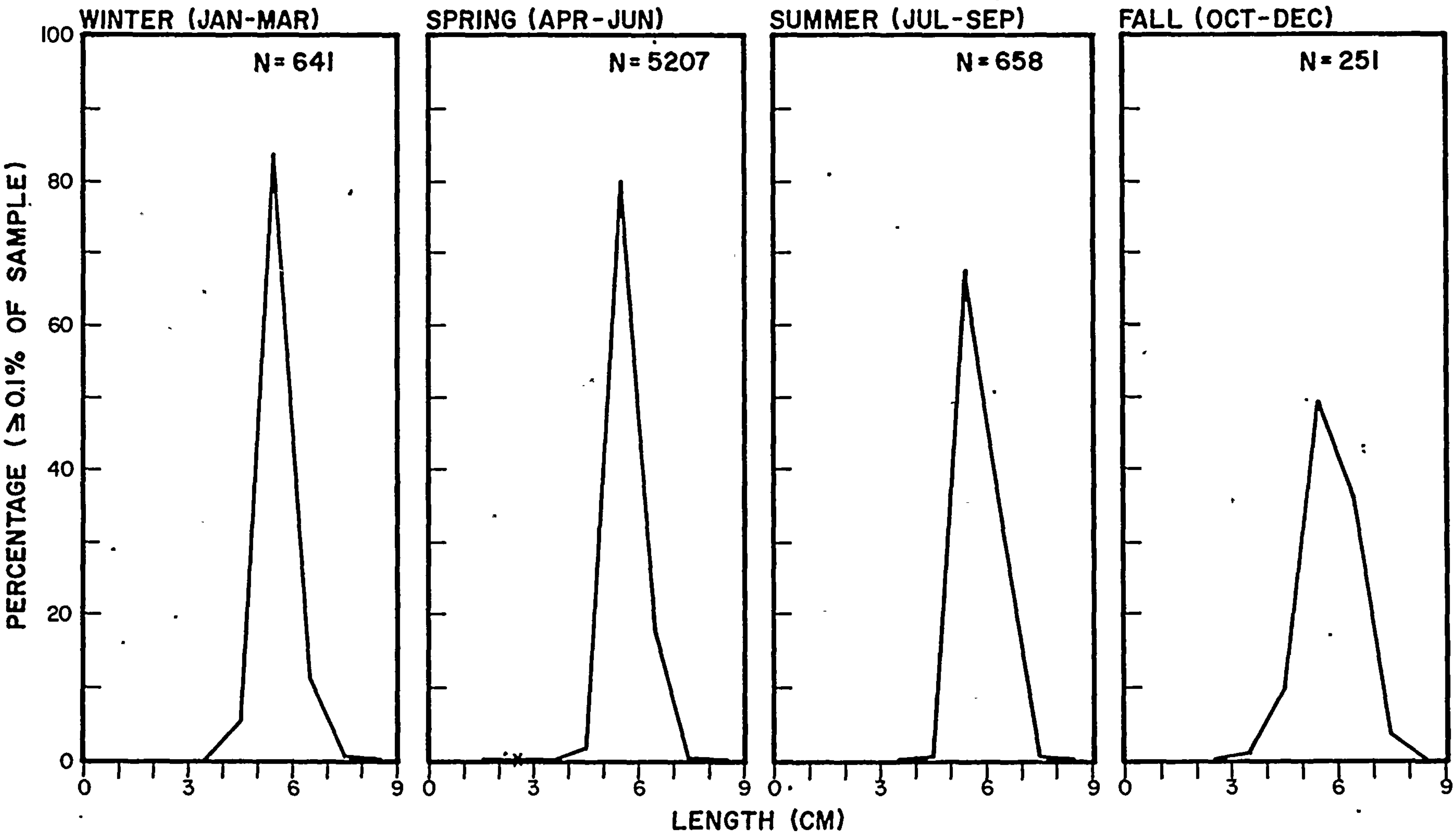
C. RESULTS AND DISCUSSION - NINE MILE POINT NUCLEAR STATION UNIT 1

1. Species Inventory

A total of 47 species (fish identified to the species level) were impinged during 1976 at the Nine Mile Point Nuclear Station (Table

LENGTH FREQUENCY DISTRIBUTION FOR THREESPINE STICKLEBACK

JAMES A. FITZPATRICK NUCLEAR POWER PLANT - 1976



N = TOTAL NUMBER OF FISH ANALYZED FROM TRAVELING SCREEN COLLECTIONS ON SCHEDULED IMPINGEMENT DAYS
X = FISH ANALYZED, BUT REPRESENTING <.1% OF SAMPLE ANALYZED

FIGURE IX-4

IX-9). No threatened or endangered fish species were impinged at Nine Mile Point during 1976. Only one species, rainbow trout, was collected in the trash rack sample and not in the traveling screen collections.

2. Temporal (Monthly) Distribution - All Species (Traveling Screen and Trash Rack Collections)

A total of 2,150,563 fish were collected from the traveling screens of the Nine Mile Point Nuclear Station during 1976. Ninety percent or 1,935,168 were alewives, 3.6% or 77,557 were rainbow smelt, and 4.3% or 93,266 were threespine stickleback (Table IX-10).

Except during February and December, alewives dominated the impingement catch. During February, gizzard shad, rainbow smelt, and white bass were collected in high abundances, while during December only rainbow smelt were collected in greater numbers than alewife (Table IX-10).

Most of the fish (97%) were collected during the late spring and early summer (March-June). The January-February collection contained only 0.5% of the total catch, and 2.2% of the total catch was obtained from the July through December collection.

3. Length Frequency by Month of Selected Species

a. Alewife

During January the majority of alewives collected from the traveling screens of the Nine Mile Point Nuclear Station were between 15 and 17 cm, indicating fish age II or older. This trend continued until May when approximately 10% of the catch

TABLE IX-9

SPECIES INVENTORY OF FISHES IN IMPINGEMENT COLLECTIONS[a]

NINE MILE POINT NUCLEAR STATION UNIT 1 - 1976

SCIENTIFIC NAME[b]	COMMON NAME
Family Petromyzontidae	
Petromyzon marinus	Sea lamprey
Family Anguillidae	
Anguilla rostrata	American eel
Family Clupeidae	
Alosa pseudoharengus	Alewife
Dorosoma cepedianum	Gizzard shad
Family Salmonidae	
Coregonus clupeaformis	Lake whitefish
Oncorhynchus kisutch	Coho salmon
Salmo gairdneri	Rainbow trout[c]
Salmo trutta	Brown trout
Salvelinus sp.	
Salvelinus namaycush	Lake trout
S. namaycush x *fontinalis*	Splake trout
Family Osmeridae	
Osmerus mordax	Rainbow smelt
Family Umbridae	
Umbra limi	Central mudminnow
Family Esocidae	
Esox lucius	Northern pike
Family Cyprinidae	
Carassius auratus	Goldfish
Couesius plumbeus	Lake chub
Cyprinus carpio	Carp
Notemigonus crysoleucas	Golden shiner
Notropis sp.	
Notropis atherinoides	Emerald shiner
N. emiliae	Pugnose minnow
N. hudsonius	Spottail shiner
Pimephales sp.	
Pimephales notatus	Bluntnose minnow
P. promelas	Fathead minnow
Rhinichthys cataractae	Longnose dace
Semotilus atromaculatus	Creek chub
S. margarita	Pearl dace

TABLE IX-9 (Continued)

SPECIES INVENTORY OF FISHES IN IMPINGEMENT COLLECTIONS[a]
(Continued)

NINE MILE POINT NUCLEAR STATION UNIT 1 - 1976

SCIENTIFIC NAME[b]	COMMON NAME
Family Catostomidae	
Catostomus commersoni	White sucker
Family Ictaluridae	
Ictalurus nebulosus	Brown bullhead
I. punctatus	Channel catfish
Noturus flavus	Stonecat
Family Percopsidae	
Percopsis omiscomaycus	Trout-perch
Family Gadidae	
Lota lota	Burbot
Family Gasterosteidae	
Culara inconstans	Brook stickleback
Gasterosteus aculeatus	Threespine stickleback
Family Percichthyidae	
Morone americana	White perch
M. chrysops	White bass
Family Centrarchidae	
Ambloplites rupestris	Rock bass
Lepomis gibbosus	Pumpkinseed
L. macrochirus	Bluegill
Micropterus dolomieui	Smallmouth bass
M. salmoides	Largemouth bass
Pomoxis nigromaculatus	Black crappie
Family Percidae	
Etheostoma nigrum	Johnny darter
Perca flavescens	Yellow perch
Percina caprodes	Logperch
Stizostedion vitreum vitreum	Walleye
Family Sciaenidae	
Aplodinotus grunniens	Freshwater drum
Family Cottidae	
Cottus bairdi	Mottled sculpin

[a] Traveling screen (Table IX-11) and trash rack collections
[b] According to A List of Common and Scientific Names of Fishes from the United States and Canada. Amer. Fish. Soc. Spec. Publ. No. 6, 3rd ed.
[c] Trash rack collection only

TABLE IX-10

MONTHLY ABUNDANCE* AND PERCENT COMPOSITION OF IMPINGEMENT COLLECTIONS

NINE MILE POINT NUCLEAR STATION UNIT 1 - JANUARY - JUNE, 1976

SPECIES	JAN		FEB		MAR		APR		MAY		JUN	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Alewife	1357	31.71	31	0.49	27071	54.99	554432	93.90	1317574	91.48	6674	56.90
American eel	8	0.19	2	0.03	1	<0.01	3	<0.01	3	<0.01	5	0.04
Black crappie	3	0.07	1	0.02					1	<0.01		
Bluegill	5	0.12					4	<0.01	16	<0.01		
Bluntnose minnow							2	<0.01				
Brook stickleback					30	0.06	24	<0.01	1	<0.01		
Brook trout												
Brown bullhead	1	0.02			5	0.01	12	<0.01	3	<0.01		
Brown trout	1	0.02							1	<0.01	5	0.04
Burbot	1	0.02	15	0.24	1	<0.01	1	<0.01				
Carp					1	<0.01					1	0.01
Channel catfish	19	0.44	6	0.09	6	0.01	2	<0.01				
Cisco or Lake herring									1	<0.01		
Coho salmon									1	<0.01		
Creek chub			1	0.02	31	0.06	13	<0.01				
Emerald shiner	44	1.03	138	2.17	244	0.50	106	0.02	34	<0.01		
Fathead minnow							15	<0.01	1	<0.01		
Freshwater drum	17	0.40	19	0.30	9	0.02	1	<0.01	2	<0.01		
Gizzard shad	632	14.77	1903	29.88	6607	13.42	465	0.08	163	0.01		
Goldfish					1	<0.01	4	<0.01				
Golden shiner					4	0.01	7	<0.01	1	<0.01		
Johnny darter			1	0.02			88	0.01	1205	0.08	35	0.30
Lake chub	1	0.02	4	0.06	8	0.02	79	0.01	115	0.01	5	0.04
Lake trout	2	0.05			1	<0.01	15	<0.01	12	<0.01		
Lake whitefish												
Largemouth bass			1	0.02								
Lepomis sp.												
Logperch					1	<0.01	3	<0.01				
Longnose dace	2	0.05	8	0.13	11	0.02	1	<0.01	6	<0.01	1	0.01
Mottled sculpin	311	7.27	449	7.05	228	0.46	1124	0.19	1667	0.12	57	0.49
Mudminnow	2	0.05	1	0.02	23	0.05	12	<0.01	2	<0.01	1	0.01
Mudpuppy												
Northern pike	1	0.02										
Notropis sp.												
Pearl dace					3	0.01	15	<0.01				
Pimephales sp.	1	0.02							1	<0.01		
Pugnose minnow												
Pumpkinseed	4	0.09			2	<0.01	5	<0.01	1	<0.01	2	0.02
Rainbow smelt	1162	27.15	1612	25.31	6300	12.80	19397	3.28	36404	2.53	350	3.00
Rainbow trout												
Rock bass	58	1.36	74	1.16	27	0.05	25	<0.01	67	<0.01	43	0.37
Salvelinus sp.							20	<0.01	3	<0.01		
Sea lamprey	8	0.19	3	0.05	3	0.01	1	<0.01	1	<0.01	6	0.05
Smallmouth bass	9	0.21	23	0.36	5	0.01	4	<0.01	32	<0.01	14	0.12
Splake (hybrid lake trout)	1	0.02	5	0.08	5	0.01	1	<0.01				
Spottail shiner	29	0.68	81	1.27	136	0.28	481	0.08	6366	0.44	388	3.31
Stonecat	10	0.23	15	0.24	2	<0.01	28	<0.01	6	<0.01	26	0.22
Threespine stickleback	86	2.01	505	7.93	3580	7.27	10177	1.72	72587	5.04	3853	32.85
Trout-perch	4	0.09	13	0.20	76	0.15	2247	0.38	2523	0.18	36	0.31
Walleye	3	0.07			2	<0.01			16	<0.01		
White bass	269	6.29	1230	19.32	3827	7.77	831	0.14	393	0.03	13	0.11
White perch	103	2.41	171	2.69	921	1.87	564	0.10	708	0.05	109	0.93
White sucker	3	0.07	10	0.16	5	0.01	5	<0.01	19	<0.01	57	0.49
Yellow perch	123	2.87	46	0.72	49	0.10	264	0.04	405	0.03	42	0.36
UID					1	<0.01	2	<0.01	5	<0.01		
UID Chub											3	0.03
UID Salmonidae									3	<0.01	4	0.03
TOTAL	4280		6368		49227		590480		1440349		11730	

*Traveling screen and trash rack collections; numbers not adjusted for number of traveling screens operating; field counts and identification

TABLE IX-10 (Continued)

MONTHLY ABUNDANCE* AND PERCENT COMPOSITION OF IMPINGED FISH (Continued)

NINE MILE POINT NUCLEAR STATION UNIT 1 - JULY - DECEMBER, 1976

SPECIES	JUL NO.	JUL %	AUG NO.	AUG %	SEP NO.	SEP %	OCT NO.	OCT %	NOV NO.	NOV %	DEC NO.	DEC %	TOTAL NO.	TOTAL %
Alewife	13947	82.33	298	55.70	67	25.38	249	35.67	12307	65.33	1161	10.70	1935168	89.98
American eel	11	0.06	5	0.93	16	6.06			4	0.02	8	0.07	66	<0.01
Black crappie													5	<0.01
Bluegill	1	0.01					2	0.29					28	<0.01
Bluntnose minnow													2	<0.01
Brook stickleback													55	<0.01
Brook trout									2	0.01			2	<0.01
Brown bullhead	2	0.01	3	0.56	2	0.76	13	1.86	6	0.03	2	0.02	49	<0.01
Brown trout	2	0.01	1	0.19									10	<0.01
Burbot	1	0.01			2	0.76	2	0.29	2	0.01	6	0.06	31	<0.01
Carp													2	<0.01
Channel catfish			1	0.19					7	0.04	2	0.02	43	<0.01
Cisco or Lake herring													1	<0.01
Coho salmon													1	<0.01
Creek chub													45	<0.01
Emerald shiner	1	0.01	1	0.19	1	0.38	16	2.29	20	0.11	85	0.78	690	0.03
Fathead minnow													16	<0.01
Freshwater drum							1	0.14			2	0.02	51	<0.01
Gizzard shad			1	0.19			126	18.05	1335	7.09	388	3.57	11620	0.54
Goldfish							1	0.14	1	0.01	1	<0.01	8	<0.01
Golden shiner											1	<0.01	13	<0.01
Johnny darter	49	0.29	8	1.50	15	5.68							1401	0.07
Lake chub	1	0.01									1	<0.01	214	0.01
Lake trout									1	0.01	1	<0.01	32	<0.01
Lake whitefish											1	<0.01	1	<0.01
Largemouth bass													1	<0.01
Lepomis sp.	7	0.04											7	<0.01
Logperch													4	<0.01
Longnose dace													29	<0.01
Mottled sculpin	46	0.27	10	1.87	9	3.41	9	1.29	41	0.22	192	1.77	4143	0.19
Mudminnow											1	<0.01	42	<0.01
Mudpuppy									1	0.01			1	<0.01
Northern pike	1	0.01									1	<0.01	3	<0.01
Notropis sp.											1	<0.01	1	<0.01
Pearl dace													18	<0.01
Pimephales sp.													2	<0.01
Pugnose minnow									1	<0.01			1	<0.01
Pumpkinseed	2	0.01	1	0.19	8	3.03	4	0.57	2	0.01	14	0.13	45	<0.01
Rainbow smelt	37	0.22	15	2.80	5	1.89	79	11.32	3955	21.00	8241	75.92	77557	3.61
Rainbow trout											1	<0.01	1	<0.01
Rock bass	50	0.30	45	8.41	21	7.95	28	4.01	13	0.07	49	0.45	500	0.02
Salvelinus sp.													23	<0.01
Sea lamprey	24	0.14	3	0.56	1	0.38	2	0.29	1	0.01	13	0.12	66	<0.01
Smallmouth bass	11	0.06	22	4.11	5	1.89	4	0:57	3	0.02	4	0.04	136	<0.01
Splake (hybrid lake trout)									9	0.05	5	0.05	26	<0.01
Spottail shiner	104	0.61	12	2.24	9	3.41	6	0.86	11	0.06	26	0.24	7649	0.36
Stonecat	21	0.12	7	1.31			1	0.14	6	0.03	1	<0.01	123	<0.01
Threespine stickleback	2302	13.59	3	0.56			3	0.43	41	0.22	129	1.19	93266	4.34
Trout-perch	20	0.12	2	0.37					7	0.04	6	0.06	4934	0.23
Walleye													21	<0.01
White bass	4	0.02	2	0.37			2	0.29	846	4.49	252	2.32	7669	0.36
White perch	68	0.40	30	5.61	14	5.30	36	5.16	39	0.21	71	0.65	2834	0.13
White sucker	77	0.45	9	1.68	16	6.06	7	1.00	5	0.03	5	0.05	218	0.01
Yellow perch	148	0.87	56	10.47	72	27.27	107	15.33	170	0.90	184	1.70	1666	0.08
UID	1	0.01											9	<0.01
UID Chub													3	<0.01
UID Salmonidae	2	0.01			1	0.38			1	0.01			11	<0.01
TOTAL	16940		535		264		698		18837		10855		2150563	

*Traveling screen and trash rack collections; numbers not adjusted for number of traveling screens operating; field counts and identification

Revised

was fish 7-10 cm and 17% was fish 12-15 cm (Figure IX-5). The recruitment of young-of-the-year alewives into the impingement catch occurred during September and continued through November.

b. Rainbow Smelt

The majority of rainbow smelt (approximately 50%) were 11-18 cm in length, which corresponds to fish of ages I-III (Figure IX-6). Of the remaining fish, 8% were larger than 18 cm and approximately 30% were smaller than 10 cm.

The percentage of smaller fish (<10 cm), which were probably yearlings, increased in February. In March and April the catch was divided roughly in half between yearlings and older fish and from May until August most fish collected were in the size range of yearlings.

Young-of-the-year rainbow smelt were recruited to the impingment catch at Nine Mile Point during November and December (Figure IX-6).

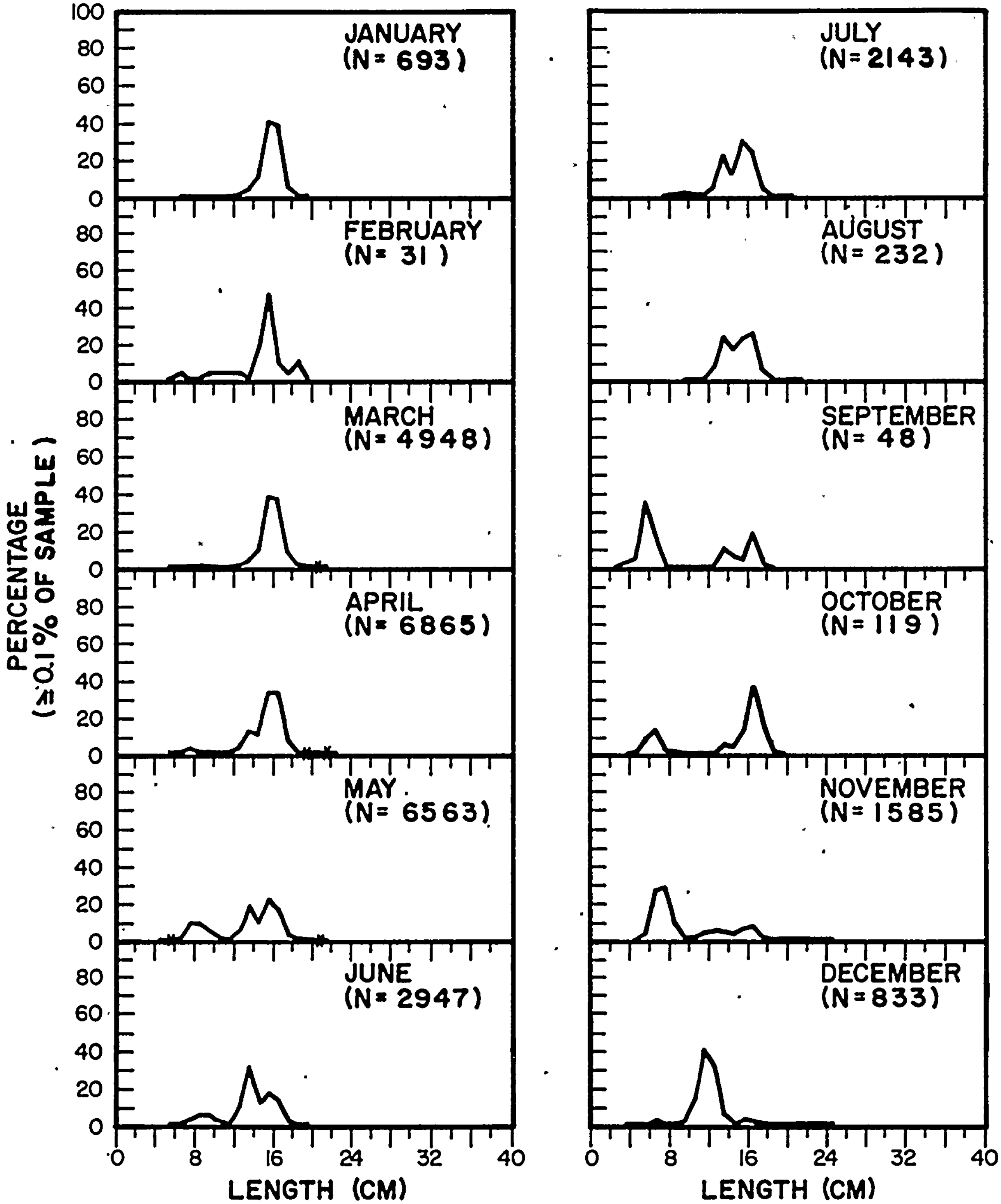
c. White Perch

From January to May 1976, most white perch impinged at the Nine Mile Point Station were yearlings (3-10 cm) (Figure IX-7), but individuals up to 35 cm were also collected. From June through August fish 10-30 cm dominated the impingement catch.

Young-of-the-year white perch were recruited to the impingement catch during September at the Nine Mile Point plant, and this group continued to represent a large percentage of the fish impinged through December.

LENGTH FREQUENCY DISTRIBUTION FOR ALEWIFE

NINE MILE NUCLEAR STATION UNIT 1—1976

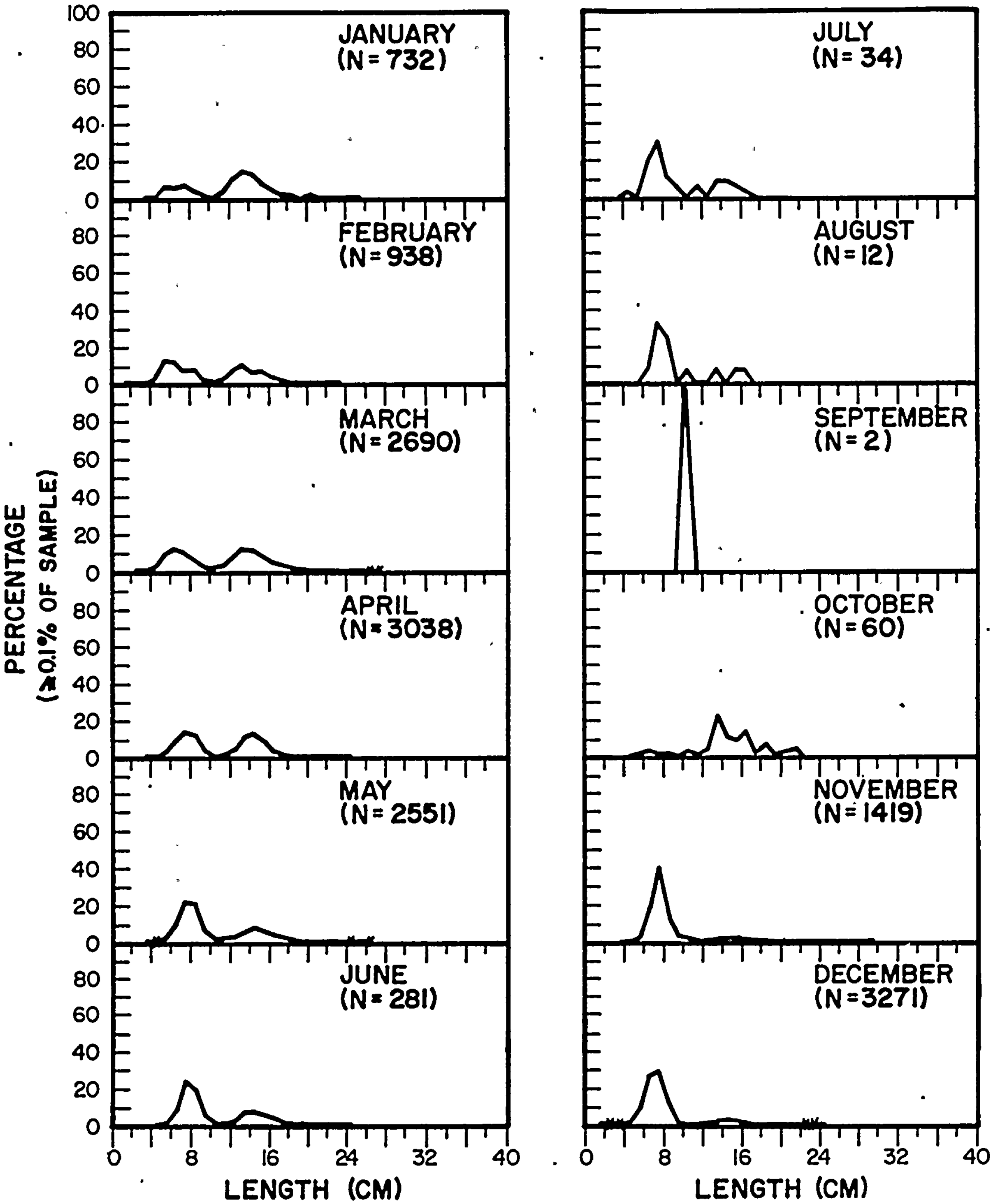


N = TOTAL NUMBER OF FISH ANALYZED FROM TRAVELING SCREEN COLLECTIONS
-- ON SCHUDELED IMPINGEMENT DAYS

X = FISH ANALYZED, BUT REPRESENTING <.1% OF SAMPLE ANALYZED

LENGTH FREQUENCY DISTRIBUTION FOR RAINBOW SMELT

NINE MILE NUCLEAR STATION UNIT 1 — 1976

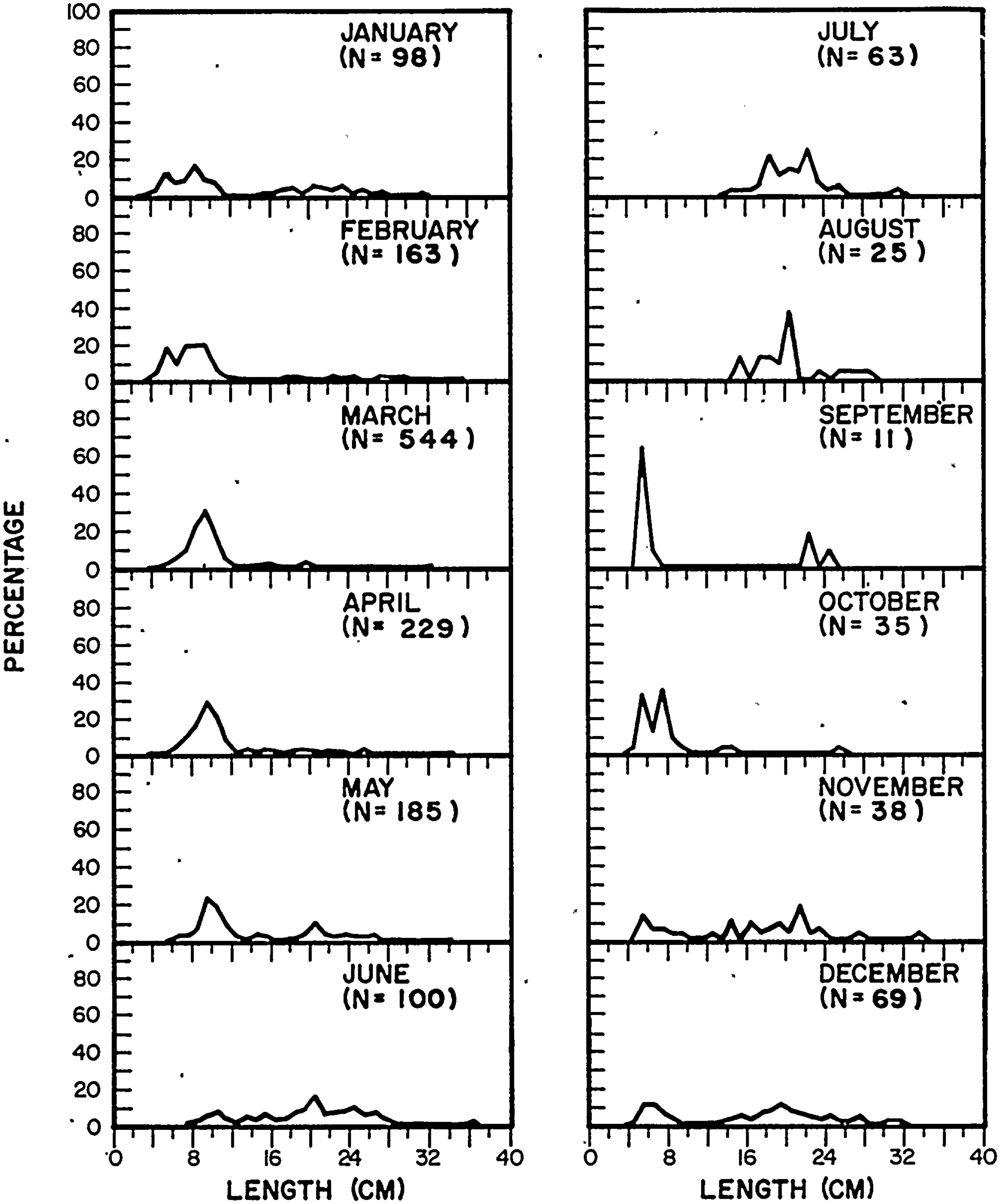


N = TOTAL NUMBER OF FISH ANALYZED FROM TRAVELING SCREEN COLLECTIONS ON SCHEDULED IMPINGEMENT DAYS

X = FISH ANALYZED, BUT REPRESENTING <.1% OF SAMPLE ANALYZED

LENGTH FREQUENCY DISTRIBUTION FOR WHITE PERCH

NINE MILE NUCLEAR STATION UNIT I—1976



N = TOTAL NUMBER OF FISH ANALYZED FROM TRAVELING SCREEN COLLECTIONS ON SCHEDULED IMPINGEMENT DAYS

d. Yellow Perch

Length frequency data for yellow perch collected from the traveling screens at the Nine Mile Point Nuclear Station are presented in Appendix IXC-1c.

During January the length frequency distribution of yellow perch was bimodal, indicating the presence of at least two year classes (yearlings and older fish). The presence of small (young) fish continued until August when most fish collected were 14-28 cm in length.

Young-of-the-year perch were recruited to the impingement catch during both August and September, but were represented by only one fish. From October through December the presence of young-of-the-year fish increased to approximately 25% of the impingement catch. The remainder of the impingement catch was composed of older fish.

e. Smallmouth Bass

Length frequency data for smallmouth bass collected from the traveling screens at the Nine Mile Point plant are presented in Appendix IXC-1a.

The majority of smallmouth bass collected during 1976 were small fish (<14 cm). During January and February, 82.9 and 100%, respectively, of the smallmouth bass collected were smaller than 14 cm. This trend continued until June when only one smallmouth bass was collected.

Recruitment of young-of-the-year bass into the impingement catch was evidenced by only two fish, one in September and one in December.

f. Threespine Stickleback

Length frequency data for threespine stickleback collected from the traveling screens at the Nine Mile Point Nuclear Station are presented in Appendix IXC-1b. The length frequency distribution of threespine stickleback was unimodal throughout the year, with the majority of fish collected being between 5 and 6 cm.

4. Estimated Impingement Rate

The estimated total number of fish impinged by the Nine Mile Point Nuclear Station during 1976 is presented in Table IX-11. The estimated number of fish impinged was calculated similar to that for FitzPatrick (Section B4). An estimated 3,436,085 fish were impinged. The estimated non-weighted yearly impingement rate was 392.3 fish/hour (3,436,087 fish/8760 hours).

Most fish (64.9% of the estimated yearly total) were impinged during May. During April, 27.1% of the estimated yearly total was impinged, and 4% from the June through December period.

The estimated biomass of fish impinged at the Nine Mile Point plant during 1976 is presented in Table IX-12. The estimated biomass of fish impinged was calculated similar to that for FitzPatrick with one exception; the monthly total biomass per species was estimated for only the January through September period. An estimated annual total of 70,255,530.9 grams (70.2 metric tons) of fish were impinged, of which alewives accounted for 92.2%, gizzard shad 2.9%, rainbow smelt 2.0%, and threespine stickleback, white perch, and white bass, approximately 4% each.

Of the estimated yearly fish biomass, 90.5% was impinged at the Nine Mile Point plant during April and May (Table IX-12).

TABLE IX-11

ABUNDANCE AND PERCENT COMPOSITION OF IMPINGEMENT COLLECTIONS
NINE MILE POINT NUCLEAR STATION UNIT 1 - JANUARY-APRIL 1976

SPECIES	JAN NO.	JAN PCNT	FEB NO.	FEB PCNT	MAR NO.	MAR PCNT	APR NO.	APR PCNT
ALEWIFE	3234	32.0	75	0.5	59961	55.0	875307	93.9
AMERICAN EEL	17	0.2	5	*	2	*	5	*
BLACK CRAPPIE	5	*	2	*	0	0.0	0	0.0
BLUEGILL	12	0.1	0	0.0	0	0.0	6	*
BLUNTNOSE MINNOW	0	0.0	0	0.0	0	0.0	2	*
BROOK STICKLEBACK	0	0.0	0	0.0	66	0.1	38	*
BROWN BULLHEAD	2	*	0	0.0	11	*	17	*
BROWN TROUT	2	*	0	0.0	0	0.0	0	0.0
BURBOT	2	*	17	0.1	2	*	2	*
CARP	0	0.0	0	0.0	2	*	0	0.0
CENTRAL MUDMINNOW (MUDMINNOW)	5	*	2	*	51	*	19	*
CHANNEL CATFISH	45	0.4	14	0.1	13	*	3	*
COHO SALMON	0	0.0	0	0.0	0	0.0	0	0.0
CREEK CHUB	0	0.0	2	*	69	0.1	21	*
EMERALD SHINER	103	1.0	314	2.1	540	0.5	145	*
FATHEAD MINNOW	0	0.0	0	0.0	0	0.0	30	*
FRESHWATER DRUM	38	0.4	46	0.3	20	*	2	*
GIZZARD SHAD	1500	14.8	4569	30.7	14634	13.4	736	0.1
GOLDEN SHINER	0	0.0	0	0.0	9	*	13	*
GOLDFISH	0	0.0	0	0.0	2	*	2	*
JOHNNY DARTER	0	0.0	2	*	0	0.0	142	*
LAKE CHUB	2	*	10	0.1	18	*	150	*
LAKE TROUT	5	*	0	0.0	2	*	11	*
LAKE WHITEFISH	0	0.0	0	0.0	0	0.0	0	0.0
LARGEMOUTH BASS	0	0.0	2	*	0	0.0	0	0.0
LOGPERCH	0	0.0	0	0.0	2	*	2	*
LONGNOSE DACE	5	*	19	0.1	24	*	2	*
MOTTLED SCULPIN	718	7.1	979	6.6	505	0.5	1776	0.2
NORTHERN PIKE	2	*	0	0.0	0	0.0	0	0.0
NOTROPIS SP (CYPRINIDAE)	0	0.0	0	0.0	0	0.0	0	0.0
PEARL DACE	0	0.0	0	0.0	7	*	24	*
PIMEPHALES SP	2	*	0	0.0	0	0.0	0	0.0
PUGNOSE MINNOW	0	0.0	0	0.0	0	0.0	0	0.0
PUMPKINSEED	10	0.1	0	0.0	4	*	8	*
RAINBOW SMELT	2741	27.1	3750	25.2	13952	12.8	30644	3.3
ROCK BASS	136	1.3	121	0.8	60	0.1	39	*
SALVELINUS SP (SALMONIDAE)	0	0.0	0	0.0	0	0.0	0	0.0
SEA LAMPREY	17	0.2	7	*	7	*	2	*
SMALLMOUTH BASS	21	0.2	36	0.2	11	*	8	*
SPLAKE TROUT	2	*	12	0.1	11	*	46	*
SPOTTAIL SHINER	67	0.7	196	1.3	301	0.3	761	0.1
STONECAT	21	0.2	7	*	4	*	47	*
THREESPINE STICKLEBACK	205	2.0	1220	8.2	7929	7.3	16077	1.7
TROUT PERCH	10	0.1	31	0.2	168	0.2	3546	0.4
TROUTS (SALMONIDAE)	0	0.0	0	0.0	0	0.0	0	0.0
UNIDENTIFIED	0	0.0	0	0.0	2	*	3	*
WALLEYE	7	0.1	0	0.0	4	*	0	0.0
WHITE BASS	639	6.3	2923	19.6	8477	7.8	1309	0.1
WHITE PERCH	243	2.4	413	2.8	2040	1.9	894	0.1
WHITE SUCKER	7	0.1	14	0.1	11	*	8	*
YELLOW PERCH	293	2.9	101	0.7	109	0.1	417	*
TOTAL	10118	99.7	14889	99.8	109030	100.1	932264	99.9
TOTAL MONTHLY FLOW SAMPLED (MG)	4679		4321		4950		6709	
TOTAL HOURS SAMPLED	311.93		288.07		335.90		456.05	

* LESS THAN 0.1 PERCENT
(MG) MILLION GALLONS

TABLE IX-11 (Continued)

ABUNDANCE AND PERCENT COMPOSITION OF IMPINGEMENT COLLECTIONS
NINE MILE POINT NUCLEAR STATION UNIT 1 - MAY-AUGUST 1976

SPECIES	MAY NO.	MAY PCNT	JUN NO.	JUN PCNT	JUL NO.	JUL PCNT	AUG NO.	AUG PCNT
ALEWIFE	2040879	91.5	15448	57.0	33253	82.3	711	57.0
AMERICAN EEL	5	*	12	*	26	0.1	12	1.0
BLACK CRAPPIE	2	*	0	0.0	0	0.0	0	0.0
BLUEGILL	25	*	0	0.0	2	*	0	0.0
BLUNTNOSE MINNOW	0	0.0	0	0.0	0	0.0	0	0.0
BROOK STICKLEBACK	2	*	0	0.0	0	0.0	0	0.0
BROWN BULLHEAD	3	*	0	0.0	2	*	7	0.6
BROWN TROUT	2	*	12	*	10	*	2	0.2
BURBOT	0	0.0	0	0.0	2	*	0	0.0
CARP	0	0.0	2	*	0	0.0	0	0.0
CENTRAL MUDMINNOW (MUDMINNOW)	3	*	2	*	0	0.0	0	0.0
CHANNEL CATFISH	0	0.0	0	0.0	0	0.0	2	0.2
COHO SALMON	2	*	0	0.0	0	0.0	0	0.0
CREEK CHUB	0	0.0	0	0.0	0	0.0	0	0.0
EMERALD SHINER	54	*	0	0.0	2	*	2	0.2
FATHEAD MINNOW	3	*	0	0.0	0	0.0	0	0.0
FRESHWATER DRUM	3	*	0	0.0	0	0.0	0	0.0
GIZZARD SHAD	252	*	0	0.0	0	0.0	2	0.2
GOLDEN SHINER	2	*	0	0.0	2	*	0	0.0
GOLDFISH	0	0.0	0	0.0	0	0.0	0	0.0
JOHNNY DARTER	1896	0.1	85	0.3	114	0.3	19	1.5
LAKE CHUB	201	*	18	0.1	2	*	0	0.0
LAKE TROUT	9	*	0	0.0	0	0.0	0	0.0
LAKE WHITEFISH	2	*	0	0.0	0	0.0	0	0.0
LARGEMOUTH BASS	0	0.0	0	0.0	0	0.0	0	0.0
LOGPERCH	0	0.0	0	0.0	0	0.0	0	0.0
LONGNOSE DACE	2	*	0	0.0	0	0.0	0	0.0
MOTTLED SCULPIN	2584	0.1	132	0.5	110	0.3	24	1.9
NORTHERN PIKE	0	0.0	0	0.0	2	*	0	0.0
NOTROPIS SP (CYPRINIDAE)	0	0.0	0	0.0	0	0.0	0	0.0
PEARL DACE	0	0.0	2	*	0	0.0	0	0.0
PIMEPHALES SP	0	0.0	0	0.0	0	0.0	0	0.0
PUGNOSE MINNOW	0	0.0	0	0.0	0	0.0	0	0.0
PUMPKINSEED	2	*	5	*	7	*	2	0.2
RAINBOW SMELT	56550	2.5	808	3.0	93	0.2	38	3.0
ROCK BASS	102	*	92	0.3	131	0.3	93	7.5
SALVELINUS SP (SALMONIDAE)	5	*	0	0.0	0	0.0	0	0.0
SEA LAMPREY	2	*	12	*	57	0.1	7	0.6
SMALLMOUTH BASS	50	*	32	0.1	26	0.1	50	4.0
SPLAKE TROUT	5	*	0	0.0	0	0.0	0	0.0
SPOTTAIL SHINER	9870	0.4	900	3.3	265	0.7	29	2.3
STONECAT	12	*	60	0.2	52	0.1	17	1.4
THREESPINE STICKLEBACK	112411	5.0	8892	32.8	5499	13.6	7	0.6
TROUT PERCH	3924	0.2	83	0.3	48	0.1	5	0.4
TROUTS (SALMONIDAE)	2	*	5	*	0	0.0	0	0.0
UNIDENTIFIED	0	0.0	0	0.0	0	0.0	0	0.0
WALLEYE	25	*	0	0.0	0	0.0	0	0.0
WHITE BASS	607	*	30	0.1	12	*	5	0.4
WHITE PERCH	1101	*	242	0.9	160	0.4	64	5.1
WHITE SUCKER	26	*	132	0.5	184	0.5	21	1.7
YELLOW PERCH	627	*	97	0.4	353	0.9	129	10.3
TOTAL	2231252	99.8	27103	99.8	40414	100.0	1248	100.3
TOTAL MONTHLY FLOW SAMPLED (MG)	7205		4680		4680		4678	
TOTAL HOURS SAMPLED	480.32		312.00		311.98		311.85	

* LESS THAN 0.1 PERCENT
(MG) MILLION GALLONS

TABLE IX-11(Continued)

ABUNDANCE AND PERCENT COMPOSITION OF IMPINGEMENT COLLECTIONS
NINE MILE POINT NUCLEAR STATION UNIT 1 - SEPTEMBER-DECEMBER 1976

SPECIES	SEP NO.	SEP PCNT	OCT NO.	OCT PCNT	NOV NO.	NOV PCNT	DEC NO.	DEC PCNT	TOTAL NO.	TOTAL PCNT
ALEWIFE	155	25.6	594	35.7	28401	65.3	2571	10.7	3060589	89.1
AMERICAN EEL	37	6.1	0	0.0	9	*	15	0.1	145	*
BLACK CRAPPIE	0	0.0	0	0.0	0	0.0	0	0.0	9	*
BLUEGILL	0	0.0	5	0.3	0	0.0	0	0.0	53	*
BLUNTNOSE MINNOW	0	0.0	0	0.0	0	0.0	0	0.0	2	*
BROOK STICKLEBACK	0	0.0	0	0.0	0	0.0	0	0.0	106	*
BROWN BULLHEAD	5	0.8	31	1.9	14	*	4	*	96	*
BROWN TROUT	0	0.0	0	0.0	5	*	0	0.0	35	*
BURBOT	5	0.8	5	0.3	5	*	13	0.1	53	*
CARP	0	0.0	0	0.0	0	0.0	0	0.0	4	*
CENTRAL MUDMINNOW (MUDMINNOW)	0	0.0	0	0.0	2	*	2	*	86	*
CHANNEL CATFISH	0	0.0	0	0.0	16	*	4	*	97	*
COHO SALMON	0	0.0	0	0.0	0	0.0	0	0.0	2	*
CREEK CHUB	0	0.0	0	0.0	0	0.0	0	0.0	92	*
EMERALD SHINER	2	0.3	38	2.3	46	0.1	188	0.8	1434	*
FATHEAD MINNOW	0	0.0	0	0.0	0	0.0	0	0.0	33	*
FRESHWATER DRUM	0	0.0	2	0.1	0	0.0	4	*	115	*
GIZZARD SHAD	0	0.0	300	18.0	3081	7.1	859	3.6	25933	0.8
GOLDEN SHINER	0	0.0	0	0.0	0	0.0	2	*	28	*
GOLDFISH	0	0.0	2	0.1	2	*	2	*	10	*
JOHNNY DARTER	35	5.8	0	0.0	0	0.0	0	0.0	2293	0.1
LAKE CHUB	0	0.0	0	0.0	0	0.0	2	*	403	*
LAKE TROUT	0	0.0	0	0.0	2	*	2	*	31	*
LAKE WHITEFISH	0	0.0	0	0.0	0	0.0	2	*	4	*
LARGEMOUTH BASS	0	0.0	0	0.0	0	0.0	0	0.0	2	*
LOGPERCH	0	0.0	0	0.0	0	0.0	0	0.0	4	*
LONGNOSE DACE	0	0.0	0	0.0	0	0.0	0	0.0	52	*
MOTTLED SCULPIN	21	3.5	21	1.3	95	0.2	425	1.8	7390	0.2
NORTHERN PIKE	0	0.0	0	0.0	0	0.0	2	*	6	*
NOTROPIS SP (CYPRINIDAE)	0	0.0	0	0.0	0	0.0	2	*	2	*
PEARL DACE	0	0.0	0	0.0	0	0.0	0	0.0	33	*
PIMEPHALES SP	0	0.0	0	0.0	0	0.0	0	0.0	2	*
PUGNOSE MINNOW	0	0.0	0	0.0	2	*	0	0.0	2	*
PUMPKINSEED	18	3.0	10	0.6	5	*	31	0.1	102	*
RAINBOW SMELT	12	2.0	188	11.3	9127	21.0	18248	75.9	136151	4.0
ROCK BASS	46	7.6	67	4.0	30	0.1	108	0.4	1025	*
SALVELINUS SP (SALMONIDAE)	0	0.0	0	0.0	0	0.0	0	0.0	5	*
SEA LAMPREY	2	0.3	5	0.3	2	*	29	0.1	149	*
SMALLMOUTH BASS	12	2.0	10	0.6	7	*	9	*	272	*
SPLAKE TROUT	0	0.0	0	0.0	21	*	11	*	108	*
SPOTTAIL SHINER	21	3.5	14	0.8	25	0.1	58	0.2	12507	0.4
STONECAT	0	0.0	2	0.1	14	*	2	*	238	*
THREESPINE STICKLEBACK	0	0.0	7	0.4	95	0.2	286	1.2	152628	4.4
TROUT PERCH	0	0.0	0	0.0	16	*	13	0.1	7844	0.2
TROUTS (SALMONIDAE)	0	0.0	0	0.0	2	*	0	0.0	9	*
UNIDENTIFIED	0	0.0	0	0.0	0	0.0	0	0.0	5	*
WALLEYE	0	0.0	0	0.0	0	0.0	0	0.0	36	*
WHITE BASS	0	0.0	5	0.3	1952	4.5	558	2.3	16517	0.5
WHITE PERCH	32	5.3	86	5.2	90	0.2	157	0.7	5522	0.2
WHITE SUCKER	37	6.1	17	1.0	12	*	11	*	480	*
YELLOW PERCH	166	27.4	255	15.3	392	0.9	407	1.7	3346	0.1
TOTAL	606	100.1	1664	99.9	43470	99.7	24027	99.8	3436085	100.0
TOTAL MONTHLY FLOW SAMPLED (MG)	4680		4680		4680		5040		60982	
TOTAL HOURS SAMPLED	312.00		312.00		312.00		336.00		4080.100	

* LESS THAN 0.1 PERCENT
(MG) MILLION GALLONS

TABLE IX-12

ESTIMATED BIOMASS OF IMPINGEMENT CATCH[a]

NINE MILE POINT NUCLEAR POWER PLANT UNIT 1 - 1976

SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL TOTAL
Alewife	90875.4	1710.0	1654923.6	20919837.3	40817580.0	282698.4	688337.1	14646.6	2108.0	13186.8	244248.6	35736.9	64765888.7
American eel	14616.6	1050.5	118.0	1751.0	6602.0	6260.4	18720.0	10500.0	11843.7	-	840.6	3126.0	75428.8
Black crappie	136.5	135.0	-	-	246.8	-	-	-	-	-	-	-	518.3
Bluegill	24.0	-	-	8.4	300.0	-	22.4	-	-	6.0	-	-	360.8
Bluntnose minnow	-	-	-	6.0	-	-	-	-	-	-	-	-	6.0
Brook stickleback	-	-	92.4	53.2	2.4	-	-	-	-	-	-	-	148.0
Brown bullhead	35.6	-	1012.0	2021.3	391.2	-	669.0	1609.3	1078.0	5347.5	795.2	271.6	13230.7
Brown trout	1030.8	-	-	-	1410.8	12903.6	19153.0	*	-	-	284.0	-	34782.2
Burbot	*	19697.9	1329.4	6537.6	-	-	*	-	4652.0	144.5	7273.0	2206.1	41840.5
Carp	-	-	31.8	-	-	30.0	-	-	-	-	-	-	61.8
Central mudminnow (Mudminnow)	59.0	31.4	270.3	104.5	10.8	8.8	-	-	-	-	7.8	14.4	507.0
Channel catfish	468.0	107.8	61.1	67.5	-	-	-	374.8	-	-	190.4	78.4	1348.0
Coho salmon	-	-	-	-	2823.2	-	-	-	-	-	-	-	2823.2
Creek chub	-	86.6	655.5	58.8	-	-	-	-	-	-	-	-	800.9
Emerald shiner	525.3	1413.0	2862.0	783.0	383.4	-	*	14.2	16.8	285.0	289.8	977.6	7550.1
Fathead minnow	-	-	-	90.0	8.4	-	-	-	-	-	-	-	98.4
Freshwater drum	1143.8	2235.6	3056.0	*	79.8	-	-	-	-	22.8	-	2519.6	9057.6
Gizzard shad	267600.0	138897.6	800479.8	41436.8	8190.0	-	-	69.8	-	34290.0	239393.7	489715.9	2020073.6
Golden shiner	-	-	41.4	39.0	6.4	-	15.4	-	-	-	-	14.0	116.2
Goldfish	-	-	296.8	1183.2	-	-	-	-	-	977.8	893.0	981.0	4331.8
Johnny darter	-	3.0	-	511.2	6067.2	229.5	205.2	26.6	59.5	-	-	-	7102.2
Lake chub	33.4	90.0	298.8	1845.0	1608.0	293.4	66.8	-	-	-	-	54.8	4290.2
Lake trout	65.5	-	19.2	104.5	*	-	-	-	-	-	32.0	19.2	240.4
Lake whitefish	-	-	-	-	1548.0	-	-	-	-	-	-	85.8	1633.8
Largemouth bass	-	56.8	-	-	-	-	-	-	-	-	-	-	56.8
Logperch	-	-	42.4	*	-	-	-	-	-	-	-	-	42.4
Longnose dace	16.0	110.2	192.0	8.2	*	-	-	-	-	-	-	-	326.4
Mottled sculpin	3590.0	4503.4	2676.5	8524.8	10594.4	475.2	330.0	79.2	73.5	96.6	361.0	1487.5	32792.1
Northern pike	232.6	-	-	-	-	-	30.2	-	-	-	-	607.8	870.6
Notropis sp. (Cyprinidae)	-	-	-	-	-	-	-	-	-	-	-	7.6	7.6

TABLE IX- 12 (Continued)

ESTIMATED BIOMASS OF IMPINGEMENT CATCH[a] (Continued)

NINE MILE POINT NUCLEAR POWER PLANT UNIT 1 - 1976

SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL TOTAL
Pearl dace	-	-	37.1	110.4	-	78.2	-	-	-	-	-	-	225.7
Pimephales sp.	4.4	-	-	-	-	-	-	-	-	-	-	-	4.4
Pugnose minnow	-	-	-	-	-	-	-	-	-	-	4.6	-	4.6
Pumpkinseed	529.0	-	28.4	346.4	285.8	322.0	242.9	110.2	779.4	783.0	373.0	2631.9	6432.0
Rainbow smelt	38374.0	43875.0	188352.0	392243.2	605085.0	8160.8	539.4	292.6	104.4	3102.0	38333.4	62043.2	1380505.0
Rock bass	16252.0	14616.8	2106.0	3985.8	5793.6	28336.0	22374.8	10127.7	7084.0	5480.6	4491.0	10087.2	130735.5
Salvelinus sp. (Salmonidae)	-	-	-	-	*	-	-	-	-	-	-	-	*
Sea lamprey	5533.5	1289.4	590.8	659.8	428.8	1357.2	10938.3	1703.8	235.8	1046.5	976.4	8114.2	32874.5
Smallmouth bass	9277.8	14641.2	2347.4	2172.0	8085.0	18768.0	7763.6	16830.0	6562.8	3113.0	2499.0	4134.6	96194.4
Splake	15.4	163.2	192.5	565.8	107.5	-	-	-	-	-	279.3	112.2	1435.9
Spottail shiner	616.4	1313.2	2046.8	5327.0	105609.0	11430.0	3180.0	403.1	235.2	141.4	347.5	603.2	131252.8
Stonecat	1457.4	584.5	287.2	2444.0	403.2	3474.0	4430.4	1164.5	-	46.4	522.2	40.4	14854.2
Threespine stickleback	369.0	2196.0	14272.2	30546.3	224822.0	17784.0	11547.9	14.7	-	7.7	161.5	543.4	302264.7
Trout-perch	136.0	238.7	1663.2	61700.4	58467.6	1394.4	739.2	55.0	-	-	137.6	137.8	124669.9
Trouts (Salmonidae)	-	-	-	-	*	*	-	-	-	-	19.6	-	19.6
Unidentified	-	-	*	*	-	-	-	-	-	-	-	-	*
Walleye	438.2	-	2358.8	-	3977.5	-	-	-	-	-	-	-	6774.5
White bass	12268.8	53783.2	154281.4	23300.2	8801.5	510.0	224.4	1201.0	-	563.5	18544.0	6640.2	280118.2
White perch	41771.7	17676.4	45492.0	26104.8	68702.4	36856.6	20288.0	8160.0	1449.6	1247.0	8748.0	16265.2	292761.7
White sucker	782.6	11786.6	4504.5	1840.8	20238.4	55743.6	81548.8	5065.2	13682.6	8127.7	5551.2	9221.3	218093.3
Yellow perch	11427.0	14099.6	13603.2	30524.4	28967.4	7498.1	33287.9	11635.8	15819.8	15427.5	11485.6	16198.6	209974.9
TOTAL	519705.7	346392.6	2900622.5	21566842.6	41997627.5	494612.2	924654.7	84084.1	65785.1	93443.3	587083.0	674677.6	70255530.9

[a] Grams; travelling screens only; estimated biomass = estimated montly abundance multiplied by monthly mean biomass per species

- = Not applicable, fish of that species not collected

* = Fish collected during the month, but none analyzed

D. CONCLUSIONS

- JAMES A. FITZPATRICK NUCLEAR POWER PLANT

A total of 57 fish species were identified in the impingement collections at the James A. FitzPatrick Nuclear Power Plant during 1976. No threatened or endangered species were collected. Of the 2,504,002 fish collected, alewives dominated the collections and rainbow smelt and threespine stickleback were secondary in abundance. Peak alewife impingement occurred during April, May, and June, and peak impingement of threespine stickleback occurred during May, June, and July. Peak impingement of rainbow smelt was observed during the March-May period, although a secondary maximum for this species was observed in November and December.

Length frequency and scale analysis data indicate that the April alewife impingement total was composed of two and three-year-old fish, whereas May collections included a high proportion of yearlings. During June, July, and August the alewife collections were dominated by two-year-olds. Recruitment of young-of-the-year to the fish impingement collections was observed in September, October, and November. Rainbow smelt impingement was dominated by yearlings except in May and June when higher proportions of mature individuals were collected. Young-of-the-year dominated the rainbow smelt collections during the August-September period. Threespine stickleback length frequency data exhibited unimodal distribution with a peak at approximately 5.5 cm.

The estimated total annual impingement by the plant (including days on which sampling was not conducted) is 4.3 million fish. Based on the mean biomass of the individuals impinged, the estimated annual biomass of impinged fish is 74.2 metric tons. Based on biomass,

alewives dominated the annual impingement estimate and rainbow smelt and gizzard shad were secondary in their contributions.

Comparison of the proportion of males and females in impingement collections vs. lake gill net collections for mature (age III) fish indicates that this age group constituted a higher percentage of females in impingement collections than in gill net catches. Rainbow smelt also exhibited differences between gill net and impingement collections, in that proportionally fewer age III males were collected in impingement collections than in the gill net collections.

- NINE MILE POINT NUCLEAR STATION UNIT I

A total of 2,150,563 fish of 47 species were identified in the impingement collections at the Nine Mile Point Nuclear Station during 1976. As with the FitzPatrick plant, the collections were dominated by alewives with rainbow smelt and threespine stickleback being of secondary importance. The length frequency of the dominant species in the impingement collections were similar to those discussed above for the FitzPatrick plant.

The total estimated number of fish impinged by the Nine Mile Point Station in 1976 is 3.4 million fish which weighed an estimated 70.2 metric tons. Based on biomass, alewives dominated the annual impingement and gizzard shad and rainbow smelt were secondary in importance.

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TELEDYNE ISOTOPES

NINE MILE POINT/FITZPATRICK GENERATING STATION

WATER MONITORING PROGRAM

SAMPLES FROM LAKE ONTARIO

SUMMARY REPORT

April 1976 - December 1976

Prepared for

Lawler, Matusky & Skelly, Engineers
415 Route 313
Tappan, New York 10983

Prepared by

Teledyne Isotopes
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Westwood, New Jersey 07675

TABLE OF CONTENTS

I. INTRODUCTION

This report presents the results of the radioanalysis of water samples collected from Lake Ontario in the vicinity of the Power Authority of the State of New York and the Niagara Mohawk Power Corporation (Nine Mile Point/Fitzpatrick) Generating Stations.

Samples were collected monthly from April 1976 or June 1976 through December 1976 from ten locations and analyzed at Teledyne Isotopes, Westwood, New Jersey for:

- Gross alpha and gross beta activity
- Tritium activity by gas counting
- Gamma emitting nuclides by Ge(Li) gamma spectrometry

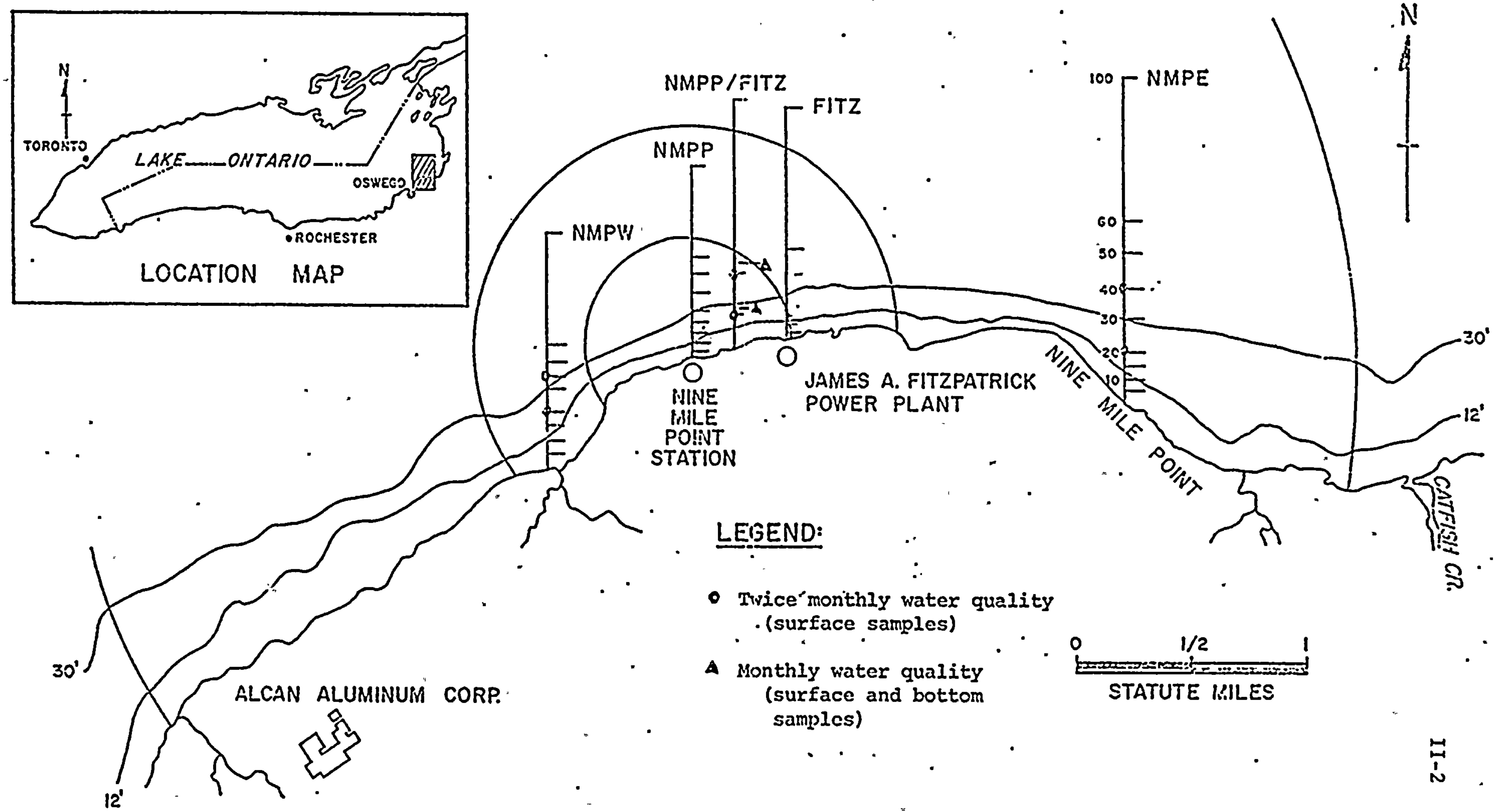
II. RADIOLOGICAL SAMPLING STATIONS AND FREQUENCY OF COLLECTION
NINE MILE POINT VICINITY, LAKE ONTARIO - 1976

TRANSECT	DEPTH CONTOUR(ft)	SAMPLE DEPTH	COLLECTION DATE
TWICE MONTHLY WATER QUALITY PROGRAM			
NMPE	20	Surface	29 APR
NMPE	40	Surface	10 MAY
NMPP/FITZ	20	Surface	8 JUN
NMPP/FITZ	40	Surface	6 JUL
NMPW	20	Surface	2 AUG
NMPW	40	Surface	7 SEP
			4 OCT
			2 NOV
			6 DEC
MONTHLY WATER QUALITY PROGRAM			
NMPP/FITZ	25	Surface	18 JUN
NMPP/FITZ	25	Bottom	19 JUL
NMPP/FITZ	45	Surface	9 AUG
NMPP/FITZ	45	Bottom	13 SEP
			11 OCT
			9 NOV
			8 DEC

On the map the dot (•) closest to the shore at the three LMS transects is at the 20 ft. water depth. The dot farthest from shore is at the 40 ft. water depth.

RADIOLOGICAL SAMPLING STATIONS

NINE MILE POINT VICINITY - 1976



III. SAMPLE RESULTS

Included in this section are summary tables of the radioanalysis performed at each station for:

- gross beta activity
- gross alpha activity
- tritium
- gamma emitters (the 16 gamma emitters routinely monitored in the environs of a nuclear generating station).

The mean ± standard deviation and the range are determined for analysis showing more than two detected measurements. Gross beta and tritium radioanalysis are in this category.

The less than (L.T.) values are tabulated for each of the radionuclides monitored but not detected. If no activity above three times the standard deviation of the background was detected, the results are tabulated as L.T. values. Gamma spectra and most of the gross alpha radioanalysis are in this category.

NINE MILE POINT/FITZPATRICK GENERATING STATION

ENVIRONMENTAL MONITORING 1976

STATION NMP 1

EAST 20' SURFACE

WATER (picocuries/liter)

COLLECTION DATE	GROSS ALPHA	GROSS BETA	TRITIUM	Be-7	K-40	Mn-54	Co-58	Co-60	Zr-95
04/29/76	L.T.3 E 00	3.6+-1.1 E 00	3.1+-0.7 E 02	L.T.1 E 02	L.T.1 E 02	L.T.7 E 00	L.T.1 E 01	L.T.7 E 00	L.T.2 E 01
05/10/76	L.T.2 E 00	3.6+-1.0 E 00	3.3+-0.7 E 02	L.T.8 E 01	L.T.9 E 01	L.T.7 E 00	L.T.9 E 00	L.T.7 E 00	L.T.2 E 01
06/08/76	L.T.3 E 00	3.9+-1.0 E 00	2.3+-0.7 E 02	L.T.8 E 01	L.T.1 E 02	L.T.6 E 00	L.T.7 E 00	L.T.7 E 00	L.T.1 E 01
07/06/76	L.T.2 E 00	4.2+-1.0 E 00	3.7+-0.7 E 02	L.T.8 E 01	L.T.1 E 02	L.T.7 E 00	L.T.7 E 00	L.T.7 E 00	L.T.2 E 01
08/02/76	L.T.2 E 00	3.8+-0.9 E 00	3.7+-0.7 E 02	L.T.9 E 01	L.T.2 E 02	L.T.8 E 00	L.T.9 E 00	L.T.1 E 01	L.T.2 E 01
09/07/76	L.T.4 E 00	3.3+-1.2 E 00	3.7+-0.7 E 02	L.T.5 E 02	L.T.2 E 02	L.T.1 E 01	L.T.3 E 01	L.T.1 E 01	L.T.6 E 01
10/04/76	L.T.2 E 00	3.3+-0.9 E 00	3.6+-0.8 E 02	L.T.8 E 01	L.T.1 E 02	L.T.9 E 00	L.T.9 E 00	L.T.8 E 00	L.T.2 E 01
11/02/76	L.T.2 E 00	3.5+-1.0 E 00	3.9+-0.8 E 02	L.T.6 E 01	L.T.1 E 02	L.T.5 E 00	L.T.6 E 00	L.T.5 E 00	L.T.1 E 01
12/06/76	L.T.3 E 00	3.9+-1.3 E 00	4.1+-0.8 E 02	L.T.7 E 01	L.T.1 E 02	L.T.5 E 00	L.T.6 E 00	L.T.5 E 00	L.T.1 E 01
mean +- std. dev.	-	3.7+-0.3 E 00	3.5+-0.5 E 02	-	-	-	-	-	-
detected / measured	0/9	9/9	9/9	0/9	0/9	0/9	0/9	0/9	0/9
range	-	(3.3-4.2) E 00	(2.3-4.1) E 02	-	-	-	-	-	-

COLLECTION DATE	Ru-103	Ru-106	I-131	Cs-134	Cs-137	Ba-140	Ce-141	Ce-144	Ra-226	Th-228
04/29/76	L.T.1 E 01	L.T.7 E 01	-	L.T.7 E 00	L.T.8 E 00	L.T.1 E 02	L.T.3 E 01	L.T.8 E 01	L.T.2 E 02	L.T.2 E 01
05/10/76	L.T.1 E 01	L.T.7 E 01	L.T.7 E 01	L.T.8 E 00	L.T.8 E 00	L.T.7 E 01	L.T.3 E 01	L.T.7 E 01	L.T.2 E 02	L.T.2 E 01
06/08/76	L.T.1 E 01	L.T.6 E 01	L.T.5 E 01	L.T.7 E 00	L.T.7 E 00	L.T.5 E 01	L.T.2 E 01	L.T.7 E 01	L.T.2 E 02	L.T.1 E 01
07/06/76	L.T.1 E 01	L.T.7 E 01	L.T.5 E 01	L.T.7 E 00	L.T.8 E 00	L.T.6 E 01	L.T.2 E 01	L.T.7 E 01	L.T.2 E 02	L.T.1 E 01
08/02/76	L.T.1 E 01	L.T.8 E 01	L.T.3 E 01	L.T.9 E 00	L.T.9 E 00	L.T.4 E 01	L.T.2 E 01	L.T.7 E 01	L.T.2 E 02	L.T.1 E 01
09/07/76	L.T.9 E 01	L.T.1 E 02	-	L.T.1 E 01	L.T.1 E 01	L.T.2 E 04	L.T.2 E 02	L.T.1 E 02	L.T.2 E 02	L.T.2 E 01
10/04/76	L.T.1 E 01	L.T.7 E 01	L.T.8 E 01	L.T.8 E 00	L.T.9 E 00	L.T.8 E 01	L.T.2 E 01	L.T.5 E 01	L.T.1 E 02	L.T.1 E 01
11/02/76	L.T.9 E 00	L.T.5 E 01	L.T.5 E 01	L.T.6 E 00	L.T.6 E 00	L.T.5 E 01	L.T.2 E 01	L.T.6 E 01	L.T.1 E 02	L.T.1 E 01
12/06/76	L.T.9 E 00	L.T.5 E 01	-	L.T.5 E 00	L.T.5 E 00	L.T.8 E 01	L.T.2 E 01	L.T.5 E 01	L.T.1 E 02	L.T.1 E 01
mean +- std. dev.	-	-	-	-	-	-	-	-	-	-
detected / measured	0/9	0/9	0/6	0/9	0/9	0/9	0/9	0/9	0/9	0/9
range	-	-	-	-	-	-	-	-	-	-

NINE MILE POINT/FITZPATRICK GENERATING STATION

ENVIRONMENTAL MONITORING 1976

STATION NMP 2

EAST 40' SURFACE

WATER (picocuries/liter)

COLLECTION DATE	GROSS ALPHA	GROSS BETA	TRITIUM	Be-7	K-40	Mn-54	Co-58	Co-60	Zr-95
04/29/76	L.T.3 E 00	3.4+-1.0 E 00	3.3+-0.7 E 02	L.T.1 E 02	L.T.2 E 02	L.T.1 E 01	L.T.1 E 01	L.T.9 E 00	L.T.2 E 01
05/10/76	L.T.2 E 00	2.8+-0.9 E 00	3.1+-0.7 E 02	L.T.1 E 02	L.T.2 E 02	L.T.9 E 00	L.T.1 E 01	L.T.9 E 00	L.T.2 E 01
06/08/76	L.T.3 E 00	4.3+-1.0 E 00	3.3+-0.7 E 02	L.T.1 E 02	L.T.2 E 02	L.T.7 E 00	L.T.1 E 01	L.T.8 E 00	L.T.2 E 01
07/06/76	L.T.2 E 00	4.5+-1.0 E 00	3.5+-0.7 E 02	L.T.9 E 01	L.T.2 E 02	L.T.9 E 00	L.T.9 E 00	L.T.1 E 01	L.T.2 E 01
08/02/76	L.T.2 E 00	3.4+-0.9 E 00	4.5+-0.8 E 02	L.T.6 E 01	L.T.1 E 02	L.T.6 E 00	L.T.6 E 00	L.T.7 E 00	L.T.1 E 01
09/07/76	L.T.3 E 00	4.3+-1.2 E 00	3.3+-0.7 E 02	L.T.3 E 02	L.T.1 E 02	L.T.7 E 00	L.T.2 E 01	L.T.7 E 00	L.T.4 E 01
10/04/76	L.T.2 E 00	4.7+-1.0 E 00	3.8+-0.8 E 02	L.T.4 E 02	L.T.8 E 02	L.T.3 E 01	L.T.4 E 01	L.T.4 E 01	L.T.8 E 01
11/02/76	L.T.2 E 00	2.9+-1.0 E 00	4.1+-0.8 E 02	L.T.7 E 01	L.T.7 E 01	L.T.6 E 00	L.T.8 E 00	L.T.6 E 00	L.T.1 E 01
12/06/76	L.T.3 E 00	3.6+-1.3 E 00	3.1+-0.8 E 02	L.T.7 E 01	L.T.1 E 02	L.T.6 E 00	L.T.7 E 00	L.T.7 E 00	L.T.1 E 01
mean +- std. dev.	-	3.8+-0.7 E 00	3.6+-0.5 E 02	-	-	-	-	-	-
detected / measured	0/9	9/9	9/9	0/9	0/9	0/9	0/9	0/9	0/9
range	-	(2.8-4.7) E 00	(3.1-4.5) E 02	-	-	-	-	-	-

COLLECTION DATE	Ru-103	Ru-106	I-131	Cs-134	Cs-137	Ba-140	Ce-141	Ce-144	Ra-226	Th-228
04/29/76	L.T.2 E 01	L.T.9 E 01	-	L.T.9 E 00	L.T.1 E 01	L.T.1 E 02	L.T.3 E 01	L.T.7 E 01	L.T.2 E 02	L.T.1 E 01
05/10/76	L.T.1 E 01	L.T.7 E 01	L.T.7 E 01	L.T.1 E 01	L.T.9 E 00	L.T.8 E 01	L.T.2 E 01	L.T.7 E 01	L.T.2 E 02	L.T.1 E 01
06/08/76	L.T.1 E 01	L.T.8 E 01	L.T.6 E 01	L.T.9 E 00	L.T.9 E 00	L.T.7 E 01	L.T.2 E 01	L.T.7 E 01	L.T.1 E 02	L.T.1 E 01
07/06/76	L.T.1 E 01	L.T.8 E 01	L.T.5 E 01	L.T.9 E 00	L.T.9 E 00	L.T.7 E 01	L.T.2 E 01	L.T.7 E 01	L.T.1 E 02	L.T.1 E 01
08/02/76	L.T.7 E 00	L.T.6 E 01	L.T.2 E 01	L.T.7 E 00	L.T.6 E 00	L.T.3 E 01	L.T.1 E 01	L.T.5 E 01	L.T.1 E 02	L.T.9 E 00
09/07/76	L.T.6 E 01	L.T.7 E 01	-	L.T.8 E 00	L.T.7 E 00	L.T.2 E 04	L.T.2 E 02	L.T.9 E 01	L.T.2 E 02	L.T.1 E 01
10/04/76	L.T.5 E 01	L.T.3 E 02	L.T.4 E 02	L.T.4 E 01	L.T.4 E 01	L.T.4 E 02	L.T.1 E 02	L.T.3 E 02	L.T.7 E 02	L.T.6 E 01
11/02/76	L.T.9 E 00	L.T.6 E 01	L.T.6 E 01	L.T.7 E 00	L.T.7 E 00	L.T.6 E 01	L.T.2 E 01	L.T.5 E 01	L.T.1 E 02	L.T.9 E 00
12/06/76	L.T.1 E 01	L.T.5 E 01	-	L.T.6 E 00	L.T.6 E 00	L.T.9 E 01	L.T.2 E 01	L.T.5 E 01	L.T.1 E 02	L.T.9 E 00
mean +- std. dev.	-	-	-	-	-	-	-	-	-	-
detected / measured	0/9	0/9	0/6	0/9	0/9	0/9	0/9	0/9	0/9	0/9
range	-	-	-	-	-	-	-	-	-	-

NINE MILE POINT/FITZPATRICK GENERATING STATION

ENVIRONMENTAL MONITORING 1976

STATION NMP 3

FITZ 20' SURFACE

WATER (picocuries/liter)

COLLECTION DATE	GROSS ALPHA	GROSS BETA	TRITIUM	Be-7	K-40	Mn-54	Co-58	Co-60	Zr-95
04/29/76	L.T.3 E 00	3.7+-1.0 E 00	4.6+-0.8 E 02	L.T.9 E 01	L.T.2 E 02	L.T.6 E 00	L.T.8 E 00	L.T.7 E 00	L.T.1 E 01
05/10/76	L.T.2 E 00	3.3+-0.9 E 00	2.6+-0.7 E 02	L.T.7 E 01	L.T.2 E 02	L.T.6 E 00	L.T.7 E 00	L.T.6 E 00	L.T.1 E 01
06/08/76	L.T.3 E 00	3.8+-1.0 E 00	2.5+-0.7 E 02	L.T.6 E 01	L.T.2 E 02	L.T.6 E 00	L.T.6 E 00	L.T.6 E 00	L.T.1 E 01
07/06/76	L.T.2 E 00	3.2+-0.9 E 00	3.5+-0.7 E 02	L.T.6 E 01	L.T.1 E 02	L.T.6 E 00	L.T.7 E 00	L.T.6 E 00	L.T.1 E 01
08/02/76	L.T.2 E 00	4.2+-0.4 E 00	5.4+-0.8 E 02	L.T.8 E 01	L.T.1 E 02	L.T.8 E 00	L.T.1 E 01	L.T.1 E 01	L.T.2 E 01
09/07/76	L.T.3 E 00	4.1+-1.1 E 00	3.7+-0.9 E 02	L.T.3 E 02	L.T.2 E 02	L.T.1 E 01	L.T.2 E 01	L.T.8 E 00	L.T.5 E 01
10/04/76	L.T.2 E 00	3.6+-0.9 E 00	4.1+-0.8 E 02	L.T.6 E 01	L.T.7 E 01	L.T.6 E 00	L.T.8 E 00	L.T.6 E 00	L.T.1 E 01
11/02/76	L.T.2 E 00	3.3+-1.0 E 00	4.4+-0.8 E 02	L.T.5 E 01	L.T.1 E 02	L.T.4 E 00	L.T.5 E 00	L.T.5 E 00	L.T.9 E 00
12/06/76	L.T.3 E 00	3.7+-1.3 E 00	3.7+-0.7 E 02	L.T.8 E 01	L.T.1 E 02	L.T.6 E 00	L.T.7 E 00	L.T.6 E 00	L.T.1 E 01
mean+- std. dev.	-	3.7+-0.4 E 00	3.8+-0.9 E 02	-	-	-	-	-	-
detected / measured	0/9	9/9	9/9	0/9	0/9	0/9	0/9	0/9	0/9
range	-	(3.3-4.2) E 00	(2.5-5.4) E 02	-	-	-	-	-	-

COLLECTION DATE	Ru-103	Ru-106	I-131	Cs-134	Cs-137	Ba-140	Ce-141	Ce-144	Ra-226	Th-228
4/29/76	L.T.1 E 01	L.T.6 E 01	-	L.T.7 E 00	L.T.7 E 00	L.T.1 E 02	L.T.2 E 01	L.T.6 E 01	L.T.1 E 02	L.T.1 E 01
05/10/76	L.T.1 E 01	L.T.6 E 01	L.T.5 E 01	L.T.7 E 00	L.T.6 E 00	L.T.6 E 01	L.T.2 E 01	L.T.5 E 01	L.T.1 E 02	L.T.9 E 00
06/08/76	L.T.8 E 00	L.T.5 E 01	L.T.4 E 01	L.T.6 E 00	L.T.6 E 00	L.T.4 E 01	L.T.1 E 01	L.T.4 E 01	L.T.8 E 01	L.T.7 E 00
07/06/76	L.T.8 E 00	L.T.6 E 01	L.T.4 E 01	L.T.7 E 00	L.T.6 E 00	L.T.5 E 01	L.T.2 E 01	L.T.5 E 01	L.T.1 E 02	L.T.9 E 00
08/02/76	L.T.1 E 01	L.T.7 E 01	L.T.2 E 01	L.T.8 E 00	L.T.1 E 01	L.T.4 E 01	L.T.2 E 01	L.T.5 E 01	L.T.1 E 02	L.T.1 E 01
09/07/76	L.T.7 E 01	L.T.9 E 01	-	L.T.9 E 00	L.T.9 E 00	L.T.2 E 04	L.T.2 E 02	L.T.9 E 01	L.T.1 E 02	L.T.1 E 01
10/04/76	L.T.9 E 00	L.T.5 E 01	L.T.7 E 01	L.T.6 E 00	L.T.8 E 00	L.T.7 E 01	L.T.1 E 01	L.T.3 E 01	L.T.7 E 01	L.T.7 E 00
11/02/76	L.T.7 E 00	L.T.4 E 01	L.T.4 E 01	L.T.5 E 00	L.T.5 E 00	L.T.5 E 01	L.T.1 E 01	L.T.4 E 01	L.T.8 E 01	L.T.7 E 00
12/06/76	L.T.1 E 01	L.T.6 E 01	-	L.T.6 E 00	L.T.7 E 00	L.T.9 E 01	L.T.2 E 01	L.T.5 E 01	L.T.1 E 02	L.T.1 E 01
mean +- std. dev.	-	-	-	-	-	-	-	-	-	-
detected / measured	0/9	0/9	0/6	0/9	0/9	0/9	0/9	0/9	0/9	0/9
range	-	-	-	-	-	-	-	-	-	-

NINE MILE POINT/FITZPATRICK GENERATING STATION

ENVIRONMENTAL MONITORING 1976

STATION NMP 4

FITZ 40' SURFACE

WATER (picocuries/liter)

COLLECTION DATE	GROSS ALPHA	GROSS BETA	TRITIUM	Be-7	K-40	Mn-54	Co-58	Co-60	Zr-95
04/29/76	L.T.3 E 00	2.3+-0.9 E 00	4.0+-0.7 E 02	L.T.1 E 02	L.T.1 E 02	L.T.9 E 00	L.T.1 E 01	L.T.4 E 01	L.T.2 E 01
05/10/76	L.T.2 E 00	3.4+-1.0 E 00	3.3+-0.7 E 02	L.T.8 E 01	L.T.9 E 01	L.T.7 E 00	L.T.7 E 00	L.T.6 E 00	L.T.1 E 01
06/08/76	L.T.3 E 00	3.8+-1.0 E 00	3.6+-0.7 E 02	L.T.8 E 01	L.T.1 E 02	L.T.8 E 00	L.T.8 E 00	L.T.1 E 01	L.T.1 E 01
07/06/76	L.T.2 E 00	3.8+-1.0 E 00	3.5+-0.7 E 02	L.T.9 E 01	L.T.1 E 02	L.T.7 E 00	L.T.8 E 00	L.T.7 E 00	L.T.1 E 01
08/02/76	L.T.2 E 00	3.8+-1.0 E 00	3.7+-0.7 E 02	L.T.6 E 01	L.T.9 E 01	L.T.6 E 00	L.T.7 E 00	L.T.8 E 00	L.T.1 E 01
09/07/76	L.T.3 E 00	4.4+-1.2 E 00	3.7+-0.8 E 02	L.T.3 E 02	L.T.1 E 02	L.T.7 E 00	L.T.2 E 01	L.T.6 E 00	L.T.4 E 01
10/04/76	L.T.2 E 00	3.8+-0.9 E 00	3.5+-0.8 E 02	L.T.6 E 01	L.T.1 E 02	L.T.5 E 00	L.T.7 E 00	L.T.5 E 00	L.T.1 E 01
11/02/76	L.T.2 E 00	3.3+-1.0 E 00	4.0+-0.8 E 02	L.T.6 E 01	L.T.8 E 01	L.T.6 E 00	L.T.7 E 00	L.T.7 E 00	L.T.1 E 01
12/06/76	L.T.3 E 00	3.3+-1.3 E 00	2.9+-0.7 E 02	L.T.7 E 01	L.T.1 E 02	L.T.5 E 00	L.T.6 E 00	L.T.5 E 00	L.T.1 E 01
mean +- std. dev.	-	3.5+-0.6 E 00	3.6+-0.3 E 02	-	-	-	-	-	-
detected / measured	0/9	9/9	9/9	0/9	0/9	0/9	0/9	0/9	0/9
range	-	(2.3+-4.4) E 00	(2.9-4.0) E 02	-	-	-	-	-	-

COLLECTION DATE	Ru-103	Ru-106	I-131	Cs-134	Cs-137	Ba-140	Ce-141	Ce-144	Ra-226	Th-228
04/29/76	L.T.1 E 01	L.T.8 E 01	-	L.T.9 E 00	L.T.9 E 00	L.T.1 E 02	L.T.2 E 01	L.T.6 E 01	L.T.1 E 02	L.T.1 E 01
05/10/76	L.T.1 E 01	L.T.6 E 01	L.T.4 E 01	L.T.7 E 00	L.T.8 E 00	L.T.5 E 01	L.T.2 E 01	L.T.7 E 01	L.T.2 E 02	L.T.1 E 01
06/08/76	L.T.1 E 01	L.T.7 E 01	L.T.5 E 01	L.T.8 E 00	L.T.9 E 00	L.T.6 E 01	L.T.2 E 01	L.T.5 E 01	L.T.1 E 02	L.T.1 E 01
07/06/76	L.T.1 E 01	L.T.7 E 01	L.T.5 E 01	L.T.8 E 00	L.T.8 E 00	L.T.6 E 01	L.T.2 E 01	L.T.8 E 01	L.T.2 E 02	L.T.1 E 01
08/02/76	L.T.8 E 00	L.T.6 E 01	L.T.2 E 01	L.T.7 E 00	L.T.8 E 00	L.T.3 E 01	L.T.9 E 00	L.T.3 E 01	L.T.8 E 01	L.T.7 E 00
09/07/76	L.T.5 E 01	L.T.7 E 01	-	L.T.7 E 00	L.T.6 E 00	L.T.1 E 04	L.T.1 E 02	L.T.6 E 01	L.T.1 E 02	L.T.1 E 01
10/04/76	L.T.9 E 00	L.T.5 E 01	L.T.6 E 01	L.T.6 E 00	L.T.6 E 00	L.T.7 E 01	L.T.2 E 01	L.T.6 E 01	L.T.1 E 02	L.T.1 E 01
11/02/76	L.T.9 E 00	L.T.6 E 01	L.T.5 E 01	L.T.6 E 00	L.T.7 E 00	L.T.5 E 01	L.T.1 E 01	L.T.4 E 01	L.T.9 E 01	L.T.8 E 00
12/06/76	L.T.9 E 00	L.T.5 E 01	-	L.T.5 E 00	L.T.5 E 00	L.T.8 E 01	L.T.2 E 01	L.T.5 E 01	L.T.1 E 02	L.T.1 E 01
mean +- std. dev.	-	-	-	-	-	-	-	-	-	-
detected / measured	0/9	0/9	0/6	0/9	0/9		0/9	0/9	0/9	0/9
range	-	-	-	-	-		-	-	-	-

NINE MILE POINT/FITZPATRICK GENERATING STATION

ENVIRONMENTAL MONITORING 1976

STATION NMP 5

WEST 20' SURFACE

WATER (picccuries/liter)

COLLECTION DATE	GROSS ALPHA	GROSS BETA	TRITIUM	Be-7	K-40	Mn-54	Co-58	Co-60	Zr-95
04/29/76	L.T.3 E 00	3.4+-1.0 E 00	2.6+-0.7 E 02	L.T.8 E 01	L.T.9 E 01	L.T.8 E 00	L.T.8 E 00	L.T.7 E 00	L.T.2 E 01
05/10/76	L.T.3 E 00	3.5+-1.0 E 00	2.7+-0.7 E 02	L.T.9 E 01	L.T.2 E 02	L.T.9 E 00	L.T.1 E 01	L.T.8 E 00	L.T.2 E 01
06/08/76	L.T.3 E 00	2.9+-1.0 E 00	2.7+-0.7 E 02	L.T.7 E 01	L.T.8 E 01	L.T.6 E 00	L.T.7 E 00	L.T.8 E 00	L.T.1 E 01
07/06/76	L.T.2 E 00	4.1+-1.0 E 00	3.8+-0.7 E 02	L.T.9 E 01	L.T.2 E 02	L.T.9 E 00	L.T.1 E 01	L.T.8 E 00	L.T.2 E 01
08/02/76	L.T.2 E 00	3.2+-0.9 E 00	4.5+-0.7 E 02	L.T.6 E 01	L.T.5 E 01	L.T.6 E 00	L.T.6 E 00	L.T.5 E 00	L.T.1 E 01
09/07/76	L.T.3 E 00	5.0+-1.2 E 00	5.8+-0.7 E 02	L.T.3 E 02	L.T.1 E 02	L.T.9 E 00	L.T.2 E 01	L.T.9 E 00	L.T.5 E 01
10/04/76	L.T.2 E 00	4.1+-0.9 E 00	3.6+-0.8 E 02	L.T.1 E 02	L.T.2 E 02	L.T.8 E 00	L.T.9 E 00	L.T.8 E 00	L.T.2 E 01
11/02/76	L.T.2 E 00	3.8+-1.0 E 00	3.7+-0.8 E 02	L.T.5 E 01	L.T.4 E 01	L.T.5 E 00	L.T.6 E 00	L.T.5 E 00	L.T.1 E 01
12/06/76	L.T.4 E 00	4.3+-1.4 E 00	2.4+-0.7 E 02	L.T.8 E 01	L.T.1 E 02	L.T.6 E 00	L.T.7 E 00	L.T.6 E 00	L.T.1 E 01
mean +- std. dev.	-	3.8+-0.6 E 00	3.5+-1.1 E 02	-	-	-	-	-	-
detected / measured	0/9	9/9	9/9	0/9	0/9	0/9	0/9	0/9	0/9
range	-	(2.9-5.0) E 00	(2.4-5.8) E 02	-	-	-	-	-	-

COLLECTION DATE	Ru-103	Ru-106	I-131	Cs-134	Cs-137	Ba-140	Ce-141	Ce-144	Ra-226	Th-228
04/29/76	L.T.1 E 01	L.T.7 E 01	-	L.T.7 E 00	L.T.7 E 00	L.T.1 E 02	L.T.1 E 01	L.T.3 E 01	L.T.8 E 01	L.T.7 E 00
05/10/76	L.T.1 E 01	L.T.8 E 01	L.T.7 E 01	L.T.8 E 00	L.T.8 E 00	L.T.7 E 01	L.T.2 E 01	L.T.7 E 01	L.T.2 E 02	L.T.1 E 01
06/08/76	L.T.8 E 00	L.T.6 E 01	L.T.4 E 01	L.T.7 E 00	L.T.7 E 00	L.T.5 E 00	L.T.1 E 01	L.T.3 E 01	L.T.7 E 01	L.T.7 E 00
07/06/76	L.T.1 E 01	L.T.8 E 01	L.T.6 E 01	L.T.1 E 01	L.T.1 E 01	L.T.7 E 01	L.T.2 E 01	L.T.7 E 01	L.T.2 E 02	L.T.1 E 01
08/02/76	L.T.8 E 00	L.T.1 E 02	L.T.2 E 01	L.T.6 E 00	L.T.6 E 00	L.T.3 E 01	L.T.2 E 01	L.T.6 E 01	L.T.1 E 02	L.T.1 E 01
09/07/76	L.T.6 E 01	L.T.8 E 01	-	L.T.7 E 00	L.T.9 E 00	L.T.2 E 04	L.T.1 E 02	L.T.6 E 01	L.T.1 E 02	L.T.1 E 01
10/04/76	L.T.1 E 01	L.T.8 E 01	L.T.9 E 01	L.T.8 E 00	L.T.8 E 00	L.T.1 E 02	L.T.2 E 01	L.T.7 E 01	L.T.1 E 02	L.T.1 E 01
11/02/76	L.T.6 E 00	L.T.4 E 01	L.T.4 E 01	L.T.5 E 00	L.T.5 E 00	L.T.4 E 01	L.T.8 E 00	L.T.2 E 01	L.T.6 E 01	L.T.5 E 00
12/06/76	L.T.1 E 01	L.T.6 E 01	-	L.T.6 E 00	L.T.6 E 00	L.T.1 E 02	L.T.2 E 01	L.T.5 E 01	L.T.1 E 02	L.T.9 E 00
mean+- std.dev.	-	-	-	-	-	-	-	-	-	-
detected / measured	0/9	0/9	0/6	0/9	0/9	0/9	0/9	0/9	0/9	0/9
range	-	-	-	-	-	-	-	-	-	-

NINE MILE POINT/FITZPATRICK GENERATING STATION

ENVIRONMENTAL MONITORING 1976

STATION NMP 6

WEST 40' SURFACE

WATER (picocuries/liter)

COLLECTION DATE	GROSS ALPHA	GROSS BETA	TRITIUM	Be-7	K-40	Mn-54	Co-58	Co-60	Zr-95
04/29/76	L.T.2 E 00	3.1+-0.9 E 00	4.1+-0.7 E 02	L.T.1 E 02	L.T.9 E 01	L.T.6 E 00	L.T.9 E 00	L.T.6 E 00	L.T.2 E 01
05/10/76	L.T.2 E 00	2.5+-0.9 E 00	2.4+-0.7 E 02	L.T.7 E 01	L.T.1 E 02	L.T.6 E 00	L.T.7 E 00	L.T.6 E 00	L.T.1 E 01
06/08/76	L.T.3 E 00	3.8+-1.0 E 00	3.4+-0.7 E 02	L.T.6 E 01	L.T.1 E 02	L.T.6 E 00	L.T.6 E 00	L.T.6 E 00	L.T.1 E 01
07/06/76	L.T.2 E 00	3.5+-1.0 E 00	3.8+-0.7 E 02	L.T.7 E 01	L.T.1 E 02	L.T.6 E 00	L.T.7 E 00	L.T.6 E 00	L.T.1 E 01
08/02/76	L.T.3 E 00	4.5+-1.0 E 00	4.1+-0.7 E 02	L.T.7 E 01	L.T.2 E 02	L.T.7 E 00	L.T.8 E 00	L.T.7 E 00	L.T.1 E 01
09/07/76	L.T.3 E 00	5.1+-1.2 E 00	3.5+-0.7 E 02	L.T.2 E 02	L.T.8 E 01	L.T.7 E 00	L.T.2 E 01	L.T.6 E 00	L.T.4 E 01
10/04/76	L.T.2 E 00	3.8+-0.9 E 00	4.4+-0.8 E 02	L.T.9 E 01	L.T.1 E 02	L.T.7 E 00	L.T.8 E 00	L.T.7 E 00	L.T.2 E 01
11/02/76	L.T.2 E 00	3.0+-1.0 E 00	4.1+-0.8 E 02	L.T.5 E 01	L.T.8 E 01	L.T.4 E 00	L.T.5 E 00	L.T.4 E 00	L.T.1 E 01
12/06/76	L.T.3 E 00	3.8+-1.3 E 00	2.7+-0.7 E 02	L.T.5 E 01	L.T.1 E 02	L.T.4 E 00	L.T.5 E 00	L.T.4 E 00	L.T.1 E 01
mean +- std. dev.	-	3.7+-0.8 E 00	3.6+-0.7 E 02	-	-	-	-	-	-
detected / measured	0/9	9/9	9/9	0/9	0/9	0/9	0/9	0/9	0/9
range	-	(2.5-5.1) E 00	(2.4-4.4) E 02	-	-	-	-	-	-

COLLECTION DATE	Ru-103	Ru-106	I-131	Cs-134	Cs-137	Ba-140	Ce-141	Ce-144	Ra-226	Th-228
04/29/76	L.T.1 E 01	L.T.7 E 01	-	L.T.7 E 00	L.T.7 E 00	L.T.1 E 02	L.T.3 E 01	L.T.7 E 01	L.T.2 E 02	L.T.1 E 01
05/10/76	L.T.9 E 00	L.T.6 E 01	L.T.5 E 01	L.T.7 E 00	L.T.6 E 00	L.T.6 E 01	L.T.2 E 01	L.T.5 E 01	L.T.1 E 02	L.T.9 E 00
06/08/76	L.T.7 E 00	L.T.5 E 01	L.T.4 E 01	L.T.6 E 00	L.T.6 E 00	L.T.4 E 01	L.T.2 E 01	L.T.6 E 01	L.T.1 E 02	L.T.1 E 01
07/06/76	L.T.9 E 00	L.T.6 E 01	L.T.4 E 01	L.T.7 E 00	L.T.7 E 00	L.T.5 E 01	L.T.2 E 01	L.T.5 E 01	L.T.1 E 02	L.T.1 E 01
08/02/76	L.T.8 E 00	L.T.7 E 01	L.T.2 E 01	L.T.8 E 00	L.T.1 E 01	L.T.4 E 01	L.T.2 E 01	L.T.5 E 01	L.T.1 E 02	L.T.1 E 01
09/07/76	L.T.5 E 01	L.T.7 E 01	-	L.T.7 E 00	L.T.7 E 00	L.T.1 E 04	L.T.9 E 01	L.T.4 E 01	L.T.7 E 01	L.T.7 E 00
10/04/76	L.T.1 E 01	L.T.6 E 01	L.T.1 E 02	L.T.7 E 00	L.T.7 E 00	L.T.8 E 01	L.T.3 E 01	L.T.7 E 01	L.T.2 E 02	L.T.1 E 01
11/02/76	L.T.7 E 00	L.T.4 E 01	L.T.4 E 01	L.T.5 E 00	L.T.5 E 00	L.T.4 E 01	L.T.2 E 01	L.T.5 E 01	L.T.1 E 02	L.T.8 E 00
12/06/76	L.T.7 E 00	L.T.4 E 01	-	L.T.5 E 00	L.T.5 E 00	L.T.6 E 01	L.T.2 E 01	L.T.4 E 01	L.T.1 E 02	L.T.8 E 00
mean +- std. dev.	-	-	-	-	-	-	-	-	-	-
detected / measured	0/9	0/9	0/6	0/9	0/9	0/9	0/9	0/9	0/9	0/9
range	-	-	-	-	-	-	-	-	-	-

NINE MILE POINT/FITZPATRICK GENERATING STATION

ENVIRONMENTAL MONITORING 1976

STATION NMP A

FITZ 25' SURFACE

WATER (picocuries/liter)

COLLECTION DATE	GROSS ALPHA	GROSS BETA	TRITIUM	Be-7	K-40	Mn-54	Co-58	Co-60	Zr-95
06/18/76	L.T.3 E 00	3.1+-0.7 E 00	3.9+-0.7 E 02	L.T.8 E 01	L.T.1 E 02	L.T.7 E 00	L.T.8 E 00	L.T.6 E 00	L.T.1 E 01
07/19/76	L.T.2 E 00	4.2+-1.1 E 00	4.0+-0.7 E 02	L.T.8 E 01	L.T.8 E 01	L.T.7 E 00	L.T.8 E 00	L.T.6 E 00	L.T.1 E 01
08/09/76	L.T.2 E 00	4.2+-1.0 E 00	3.2+-0.7 E 02	L.T.8 E 01	L.T.2 E 02	L.T.9 E 00	L.T.9 E 00	L.T.1 E 01	L.T.2 E 01
09/13/76	L.T.2 E 00	4.5+-1.2 E 00	3.8+-0.8 E 02	L.T.3 E 02	L.T.1 E 02	L.T.8 E 00	L.T.3 E 01	L.T.1 E 01	L.T.5 E 01
10/11/76	L.T.2 E 00	4.2+-1.0 E 00	3.8+-0.8 E 02	L.T.7 E 01	L.T.1 E 02	L.T.6 E 00	L.T.8 E 00	L.T.5 E 00	L.T.1 E 01
11/09/76	L.T.4 E 00	4.3+-1.2 E 00	3.3+-0.7 E 02	L.T.7 E 01	L.T.1 E 02	L.T.5 E 00	L.T.6 E 00	L.T.5 E 00	L.T.1 E 01
12/08/76	L.T.3 E 00	3.5+-1.3 E 00	3.3+-0.7 E 02	L.T.8 E 01	L.T.1 E 02	L.T.6 E 00	L.T.7 E 00	L.T.6 E 00	L.T.1 E 01
mean +- std. dev.	-	4.0+-0.5 E 00	3.6+-0.3 E 02	-	-	-	-	-	-
detected / measured	0/7	7/7	7/7	0/7	0/7	0/7	0/7	0/7	0/7
range	-	(3.1-4.5) E 00	(3.2-4.0) E 02	-	-	-	-	-	-

COLLECTION DATE	Ru-103	Ru-106	I-131	Cs-134	Cs-137	Ba-140	Ce-141	Ce-144	Ra-226	Th-228
06/18/76	L.T.1 E 01	L.T.6 E 01	L.T.7 E 01	L.T.7 E 00	L.T.7 E 00	L.T.7 E 01	L.T.3 E 01	L.T.7 E 01	L.T.2 E 02	L.T.1 E 01
07/19/76	L.T.1 E 01	L.T.7 E 01	L.T.5 E 01	L.T.8 E 00	L.T.8 E 00	L.T.6 E 01	L.T.2 E 01	L.T.7 E 01	L.T.2 E 02	L.T.1 E 01
08/09/76	L.T.9 E 00	L.T.8 E 01	L.T.2 E 01	L.T.1 E 01	L.T.9 E 00	L.T.3 E 01	L.T.2 E 01	L.T.6 E 01	L.T.2 E 02	L.T.1 E 01
09/13/76	L.T.7 E 01	L.T.8 E 01	-	L.T.9 E 00	L.T.1 E 01	L.T.1 E 04	L.T.1 E 02	L.T.7 E 01	L.T.1 E 02	L.T.1 E 01
10/11/76	L.T.1 E 01	L.T.6 E 01	L.T.7 E 01	L.T.6 E 00	L.T.6 E 00	L.T.8 E 01	L.T.2 E 01	L.T.6 E 01	L.T.1 E 02	L.T.1 E 01
11/09/76	L.T.9 E 00	L.T.5 E 01	L.T.5 E 01	L.T.6 E 00	L.T.6 E 00	L.T.6 E 01	L.T.2 E 01	L.T.6 E 01	L.T.1 E 02	L.T.1 E 01
12/08/76	L.T.1 E 01	L.T.6 E 01	-	L.T.6 E 00	L.T.7 E 00	L.T.8 E 01	L.T.2 E 01	L.T.5 E 01	L.T.1 E 02	L.T.1 E 01
mean+- std. dev.	-	-	-	-	-	-	-	-	-	-
detected / measured	0/7	0/7	0/5	0/7	0/7	0/7	0/7	0/7	0/7	0/7
range	-	-	-	-	-	-	-	-	-	-

NINE MILE POINT/FITZPATRICK GENERATING STATION

ENVIRONMENTAL MONITORING 1976

STATION NMP B

FITZ 25' BOTTOM

WATER (picocuries/liter)

COLLECTION DATE	GROSS ALPHA	GROSS BETA	TRITIUM	Be-7	K-40	Mn-54	Co-58	Co-60	Zr-95
06/18/76	L.T.3 E 00	2.7+-0.9 E 00	4.2+-0.7 E 02	L.T.1 E 02	L.T.2 E 02	L.T.8 E 00	L.T.1 E 01	L.T.9 E 00	L.T.2 E 01
07/19/76	L.T.2 E 00	3.6+-1.0 E 00	3.2+-0.7 E 02	L.T.7 E 01	L.T.2 E 02	L.T.6 E 00	L.T.6 E 00	L.T.7 E 00	L.T.1 E 01
08/09/76	L.T.2 E 00	4.4+-1.0 E 00	4.5+-0.8 E 02	L.T.6 E 01	L.T.2 E 02	L.T.6 E 00	L.T.5 E 00	L.T.5 E 00	L.T.1 E 01
09/13/76	L.T.3 E 00	4.5+-1.4 E 00	3.4+-0.7 E 02	L.T.3 E 02	L.T.9 E 01	L.T.7 E 00	L.T.2 E 01	L.T.8 E 00	L.T.4 E 01
10/11/76	L.T.2 E 00	5.9+-1.1 E 00	3.7+-0.8 E 02	L.T.1 E 02	L.T.2 E 02	L.T.9 E 00	L.T.1 E 01	L.T.9 E 00	L.T.2 E 01
11/09/76	L.T.4 E 00	4.9+-1.2 E 00	2.8+-0.8 E 02	L.T.8 E 01	L.T.2 E 02	L.T.6 E 00	L.T.8 E 00	L.T.7 E 00	L.T.1 E 01
12/08/76	L.T.4 E 00	5.0+-1.4 E 00	2.2+-0.7 E 02	L.T.1 E 02	L.T.2 E 02	L.T.8 E 00	L.T.9 E 00	L.T.7 E 00	L.T.2 E 01
mean +- std. dev.		4.4+-1.0 E 00	3.4+-0.8 E 02	-	-	-	-	-	-
detected / measured	0/7	7/7	7/7	0/7	0/7	0/7	0/7	0/7	0/7
range		(2.7-5.9) E 00	(2.2-4.5) E 02	-	-	-	-	-	-

COLLECTION DATE	Ru-103	Ru-106	I-131	Cs-134	Cs-137	Ba-140	Ce-141	Ce-144	Ra-226	Th-228
06/18/76	L.T.1 E 01	L.T.8 E 01	L.T.8 E 01	L.T.9 E 00	L.T.9 E 00	L.T.8 E 01	L.T.2 E 01	L.T.7 E 01	L.T.1 E 02	L.T.1 E 01
07/19/76	L.T.9 E 00	L.T.5 E 01	L.T.4 E 01	L.T.7 E 00	L.T.7 E 00	L.T.5 E 01	L.T.2 E 01	L.T.5 E 01	L.T.1 E 02	L.T.9 E 00
08/09/76	L.T.6 E 00	L.T.5 E 01	L.T.1 E 01	L.T.6 E 00	L.T.6 E 00	L.T.2 E 01	L.T.1 E 01	L.T.5 E 01	L.T.1 E 02	L.T.9 E 00
09/13/76	L.T.5 E 01	L.T.7 E 01	-	L.T.7 E 00	L.T.8 E 00	L.T.1 E 04	L.T.8 E 01	L.T.4 E 01	L.T.8 E 01	L.T.8 E 00
10/11/76	L.T.1 E 01	L.T.9 E 01	L.T.1 E 02	L.T.9 E 00	L.T.1 E 01	L.T.1 E 02	L.T.3 E 01	L.T.7 E 01	L.T.2 E 02	L.T.1 E 01
11/09/76	L.T.1 E 01	L.T.6 E 01	L.T.6 E 01	L.T.8 E 00	L.T.7 E 00	L.T.6 E 01	L.T.2 E 01	L.T.5 E 01	L.T.1 E 02	L.T.1 E 01
12/08/76	L.T.1 E 01	L.T.7 E 01	-	L.T.8 E 00	L.T.8 E 00	L.T.1 E 02	L.T.3 E 01	L.T.8 E 01	L.T.2 E 02	L.T.1 E 01
mean +- std. dev.	-	-	-	-	-	-	-	-	-	-
detected / measured	0/7	0/7	0/5	0/7	0/7	0/7	0/7	0/7	0/7	0/7
range	-	-	-	-	-	-	-	-	-	-

NINE MILE POINT/FITZPATRICK GENERATING STATION

ENVIRONMENTAL MONITORING 1976

STATION NMP C

FITZ 45' SURFACE

WATER (picocuries/liter)

COLLECTION DATE	GROSS ALPHA	GROSS BETA	TRITIUM	Be-7	K-40	Mn-54	Co-58	Co-60	Zr-95
06/18/76	L.T.3 E 00	2.3+-0.9 E 00	4.1+-0.7 E 02	L.T.7 E 01	L.T.1 E 02	L.T.6 E 00	L.T.7 E 00	L.T.6 E 00	L.T.1 E 01
07/19/76	L.T.2 E 00	4.2+-1.0 E 00	3.1+-0.7 E 02	L.T.8 E 01	L.T.1 E 02	L.T.8 E 00	L.T.9 E 00	L.T.1 E 01	L.T.2 E 01
08/09/76	L.T.2 E 00	3.4+-1.0 E 00	3.6+-0.7 E 02	L.T.7 E 01	L.T.1 E 02	L.T.7 E 00	L.T.9 E 00	L.T.1 E 01	L.T.2 E 01
09/13/76	L.T.3 E 00	3.9+-1.2 E 00	3.3+-0.7 E 02	L.T.3 E 02	L.T.2 E 02	L.T.9 E 00	L.T.2 E 01	L.T.7 E 00	L.T.4 E 01
10/11/76	L.T.2 E 00	3.8+-0.9 E 00	2.9+-0.7 E 02	L.T.7 E 01	L.T.1 E 02	L.T.6 E 00	L.T.7 E 00	L.T.5 E 00	L.T.1 E 01
11/09/76	L.T.4 E 00	4.8+-1.2 E 00	5.6+-0.8 E 02	L.T.6 E 01	L.T.1 E 02	L.T.4 E 00	L.T.5 E 00	L.T.4 E 00	L.T.1 E 01
12/08/76	L.T.3 E 00	3.0+-1.3 E 00	2.7+-0.8 E 02	L.T.1 E 02	L.T.2 E 02	L.T.9 E 00	L.T.1 E 01	L.T.1 E 01	L.T.2 E 01
mean+- std. dev.	-	3.6+-0.8 E 00	3.6+-1.0 E 02	-	-	-	-	-	-
detected / measured	0/7	7/7	7/7	0/7	0/7	0/7	0/7	0/7	0/7
range	-	(2.3-4.8) E 00	(2.7-5.6) E 02	-	-	-	-	-	-

COLLECTION DATE	Ru-103	Ru-106	I-131	Cs-134	Cs-137	Ba-140	Ce-141	Ce-144	Ra-226	Th-228
06/18/76	L.T.9 E 00	L.T.6 E 01	L.T.6 E 01	L.T.6 E 00	L.T.6 E 00	L.T.6 E 01	L.T.2 E 01	L.T.5 E 01	L.T.1 E 02	L.T.9 E 00
07/19/76	L.T.1 E 01	L.T.6 E 01	L.T.5 E 01	L.T.8 E 00	L.T.9 E 00	L.T.6 E 01	L.T.2 E 01	L.T.5 E 01	L.T.1 E 02	L.T.1 E 01
08/09/76	L.T.8 E 00	L.T.8 E 01	L.T.1 E 01	L.T.8 E 00	L.T.9 E 00	L.T.3 E 01	L.T.1 E 01	L.T.5 E 01	L.T.1 E 02	L.T.1 E 01
09/13/76	L.T.5 E 01	L.T.8 E 01	-	L.T.8 E 00	L.T.7 E 00	L.T.1 E 04	L.T.2 E 02	L.T.9 E 01	L.T.2 E 02	L.T.2 E 01
10/11/76	L.T.9 E 00	L.T.5 E 01	L.T.7 E 01	L.T.6 E 00	L.T.6 E 00	L.T.7 E 01	L.T.2 E 01	L.T.6 E 01	L.T.1 E 02	L.T.1 E 01
11/09/76	L.T.7 E 00	L.T.4 E 01	L.T.5 E 01	L.T.5 E 00	L.T.5 E 00	L.T.4 E 01	L.T.1 E 01	L.T.4 E 01	L.T.8 E 01	L.T.7 E 00
12/18/76	L.T.2 E 01	L.T.8 E 01	-	L.T.9 E 00	L.T.1 E 01	L.T.1 E 02	L.T.3 E 01	L.T.8 E 01	L.T.2 E 02	L.T.1 E 01
mean +- std. dev.	-	-	-	-	-	-	-	-	-	-
detected / measured	0/7	0/7	0/5	0/7	0/7	0/7	0/7	0/7	0/7	0/7
range	-	-	-	-	-	-	-	-	-	-

NINE MILE POINT/FITZPATRICK GENERATING STATION

ENVIRONMENTAL MONITORING 1976

STATION NMP D

FITZ 45' BOTTOM

WATER (picocuries/liter)

COLLECTION DATE	GROSS ALPHA	GROSS BETA	TRITIUM	Be-7	K-40	Mn-54	Co-58	Co-60	Zr-95
06/18/76	L.T.2 E 00	2.7+-0.9 E 00	4.4+-0.7 E 02	L.T.8 E 01	L.T.1 E 02	L.T.8 E 00	L.T.9 E 00	L.T.7 E 00	L.T.2 E 01
07/19/76	L.T.2 E 00	8.3+-1.3 E 00	3.3+-0.7 E 02	L.T.7 E 01	L.T.1 E 02	L.T.7 E 00	L.T.8 E 00	L.T.6 E 00	L.T.1 E 01
08/09/76	L.T.2 E 00	4.5+-1.0 E 00	2.9+-0.7 E 02	L.T.5 E 01	L.T.8 E 01	L.T.7 E 00	L.T.7 E 00	L.T.8 E 00	L.T.1 E 01
09/13/76	L.T.1 E 00	L.T.2 E 00	3.3+-0.7 E 02	L.T.5 E 01	L.T.8 E 01	L.T.2 E 00	L.T.4 E 00	L.T.1 E 00	L.T.8 E 00
10/11/76	L.T.3 E 00	4.8+-1.0 E 00	3.1+-0.7 E 02	L.T.1 E 02	L.T.2 E 02	L.T.7 E 00	L.T.1 E 01	L.T.8 E 00	L.T.2 E 01
11/09/76	L.T 4 E 00	3.8+-1.1 E 00	4.1+-0.8 E 02	L.T.6 E 01	L.T.8 E 01	L.T.6 E 00	L.T.7 E 00	L.T.6 E 00	L.T.1 E 01
12/08/76	L.T.5 E 00	4.6+-1.5 E 00	2.2+-0.8 E 02	L.T.8 E 01	L.T.2 E 02	L.T.6 E 00	L.T.8 E 00	L.T.6 E 00	L.T.1 E 01
mean +- std.dev.	-	4.8+-1.9 E 00	3.3+-0.7 E 02	-	-	-	-	-	-
detected measured	0/7	6/7	7/7	0/7	0/7	0/7	0/7	0/7	0/7
range	-	(2.7-8.3) E 00	(2.2-4.4) E 02	-	-	-	-	-	-

COLLECTION DATE.	Ru-103	Ru-106	I-131	Cs-134	Cs-137	Ba-140	Ce-141	Ce-144	Ra-226	Th-228
06/18/76	L.T.1 E 01	L.T.7 E 01	L.T.7 E 01	L.T.8 E 00	L.T.9 E 00	L.T.7 E 01	L.T.2 E 01	L.T.5 E 01	L.T.1 E 02	L.T.1 E 01
07/19/76	L.T.9 E 00	L.T.5 E 01	L.T.3 E 01	L.T.7 E 00	L.T.7 E 00	L.T.4 E 01	L.T.1 E 01	L.T.3 E 01	L.T.7 E 01	L.T.7 E 00
08/09/76	L.T.7 E 00	L.T.5 E 01	L.T.1 E 01	L.T.6 E 00	L.T.8 E 00	L.T.2 E 01	L.T.8 E 00	L.T.3 E 01	L.T.8 E 01	L.T.7 E 00
09/13/76	L.T.1 E 01	L.T.2 E 01	-	L.T.2 E 00	L.T.1 E 00	L.T.2 E 03	L.T.2 E 01	L.T.9 E 00	L.T.2 E 01	L.T.2 E 00
10/11/76	L.T.1 E 01	L.T.9 E 01	L.T.1 E 02	L.T.9 E 00	L.T.8 E 00	L.T.1 E 02	L.T.2 E 01	L.T.7 E 01	L.T.2 E 02	L.T.1 E 01
11/09/76	L.T.9 E 00	L.T.5 E 01	L.T.5 E 01	L.T.6 E 00	L.T.7 E 00	L.T.6 E 01	L.T.1 E 01	L.T.4 E 01	L.T.9 E 01	L.T.8 E 00
12/08/76	L.T.1 E 01	L.T.6 E 01	-	L.T.7 E 00	L.T.7 E 00	L.T.1 E 02	L.T.2 E 01	L.T.5 E 01	L.T.1 E 02	L.T.1 E 01
mean +- std. dev.	-	-	-	-	-	-	-	-	-	-
detected measured	0/7	0/7	0/5	0/7	0/7	0/7	0/7	0/7	0/7	0/7
range	-	-	-	-	-	-	-	-	-	-

IV. DISCUSSION OF RESULTS

The results of the radioanalysis of the water samples from the ten locations on Lake Ontario are presented in Section III of this report. Gross beta and tritium activity were detected for all of the stations monitored except the September 13, 1976 collection at FITZ-45 ft. station, bottom sample, and the mean ± standard deviation of the monthly collections are entered on the accompanying Trends Plots.

A. Gross Beta

Average gross beta activity at the Nine Mile Point - Lake Ontario monitoring stations continued in the range monitored since 1973. The mean range during 1976 varied from 3.5 ± 0.6 to 4.8 ± 1.9 picocuries/liter of water. In 1975 the mean range varied from 3.4 to 5.0 picocuries/liter indicating no change in the content of beta emitters over the years.

These results compare to the published measurements of 3 to 5 picocuries/liter issued in the 1975 quarterly Environmental Radiation Bulletins, Numbers 75-1 through 75-4 for the Oswega City Hall Tap (Lake Ontario). Copies of this report were obtained from the New York State Department of Environmental Conservation.

B. Gross Alpha

Measurements of gross alpha activity were below the limits of detection of the monitoring procedure. The highest limit of detection was L.T. 5 picocuries/liter. The majority of the measurements of limits of detection were L.T. 2 or L.T. 3 picocuries/liter, a function of the weight of dissolved and/or suspended material in the water sample. Normally we expect to detect alpha emitters in the sediment/silt of the lake with negligible dissolved salts of the heavy metals in the water.

C. Tritium

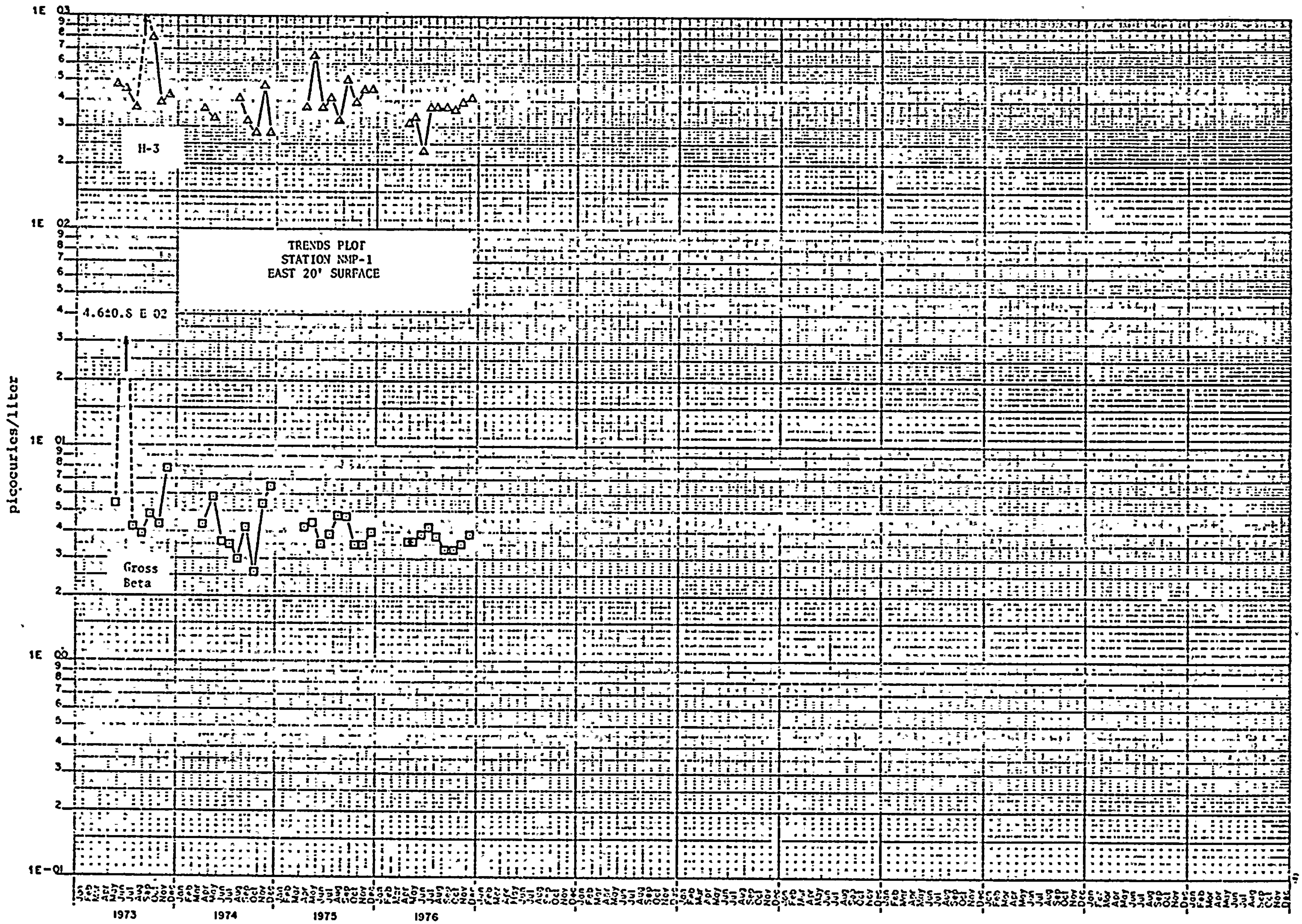
During 1976 the mean tritium levels at each monitoring station varied from 330 ± 70 to 380 ± 90 picocuries/liter. The range of each monthly measurement varied from a minimum of 220 to a maximum of 580 picocuries/liter. During 1975 the minimum was 240 and the maximum 750 picocuries/liter. No significant change in tritium activity has been measured since 1974 in the water samples monitored for this program. Published data for the July - September 1976 quarter list the tritium activity at Oswego-Lake Ontario as 300± 200 picocuries/liter (a range of 100 to 500 picocuries/liter). This data was taken from Report 7 (January 1977) published in Environmental Radiation Data and issued by the US EPA Office of Radiation Programs.

D. Gamma Emitters

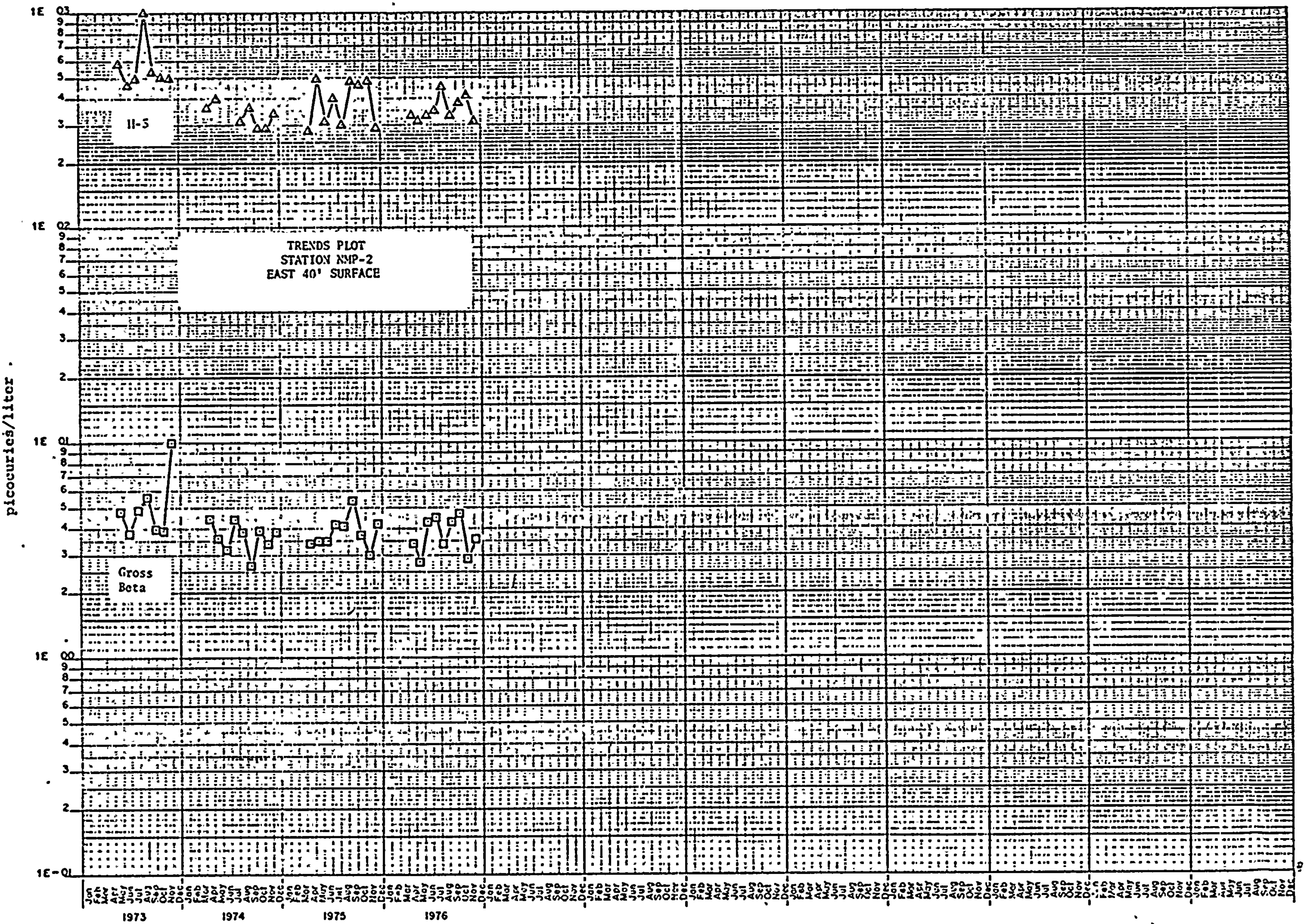
No gamma emitters above the limits of detection were found in the water samples analyzed by Ge(Li) gamma spectrometry. A computer controlled search was made to detect the nuclides listed in Section III. The L.T. designation indicates that no measureable activity was found above the background and background error of the detection system. The L.T. values tabulated in Section III were determined by a computer controlled search and calculation program for each analysis. Nominal values of detection limits are listed in Appendix "B" and are usually higher than the actual values calculated in Section III.

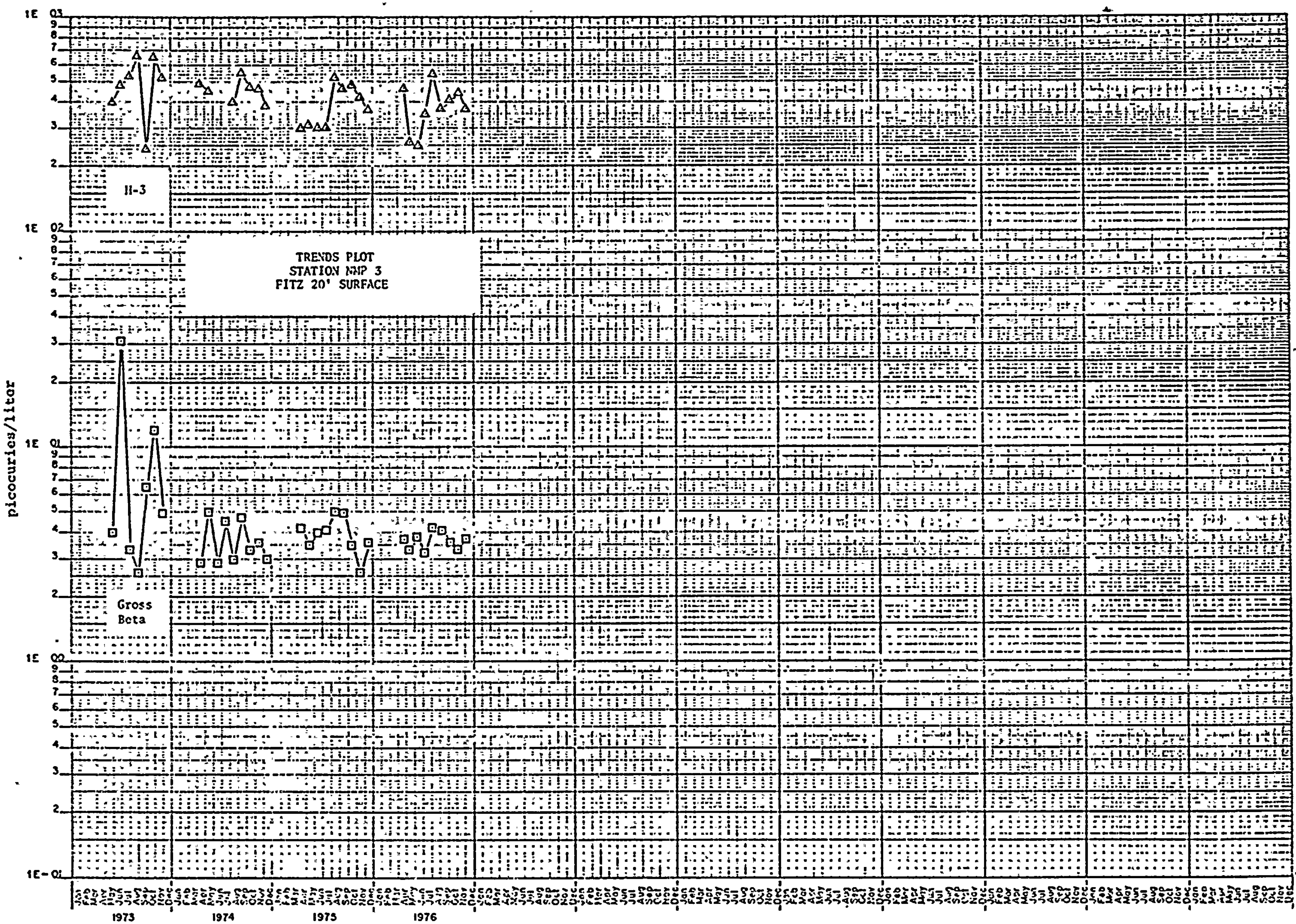
CONCLUSION

From the radioanalysis for gross beta, gross alpha, tritium and gamma emitters in the water samples from Lake Ontario in the vicinity of the Nine Mile Point/Fitzpatrick Power Generating Station, we conclude that no detectable levels above the natural background of the nuclides listed in Section III (Summary of Data) were found.

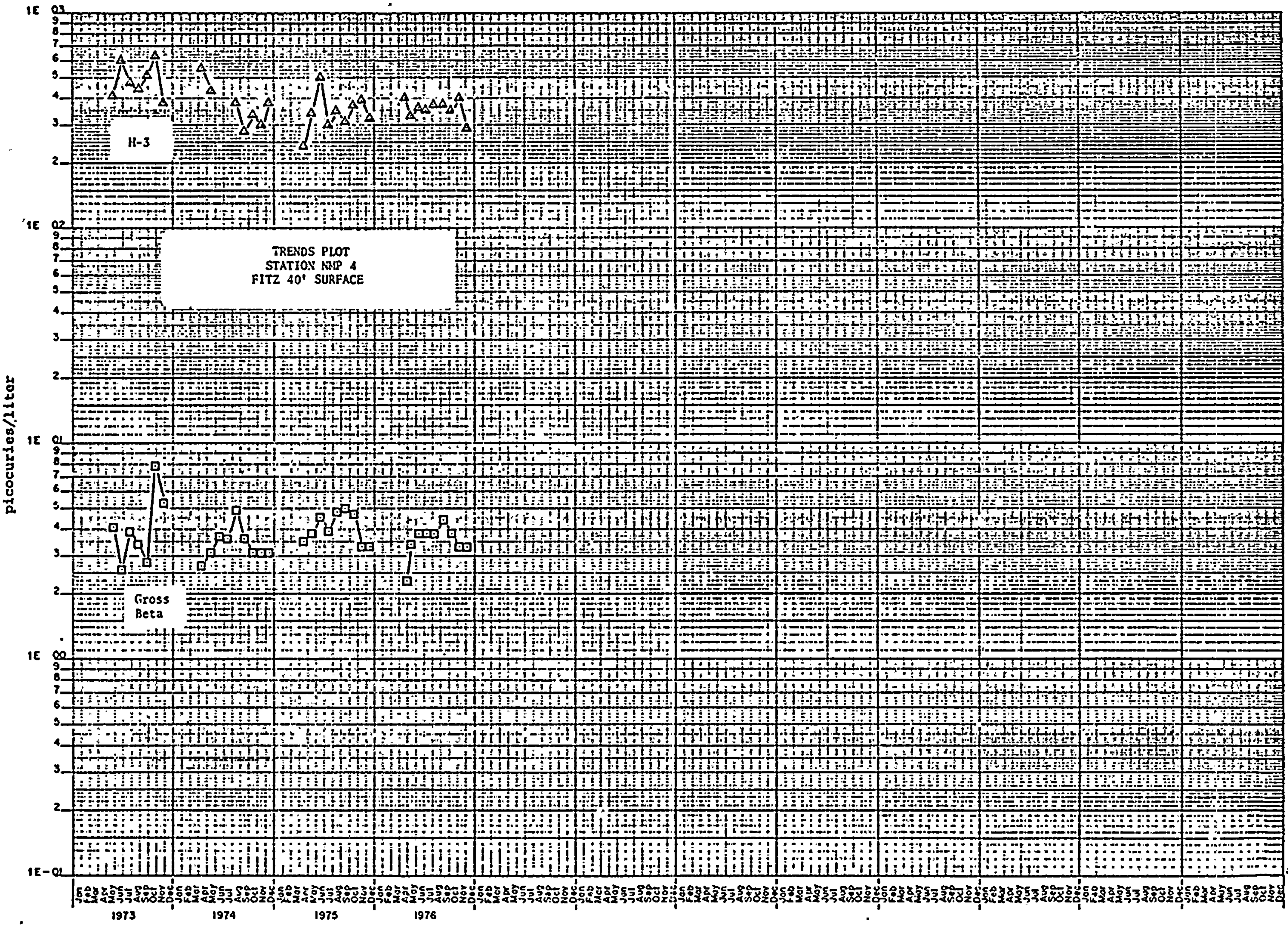


TRENDS PLOT
STATION NMP-1
EAST 20' SURFACE
H-3
Gross Beta
4.6±0.5 E 02
picocuries/liter
1973
1974
1975
1976

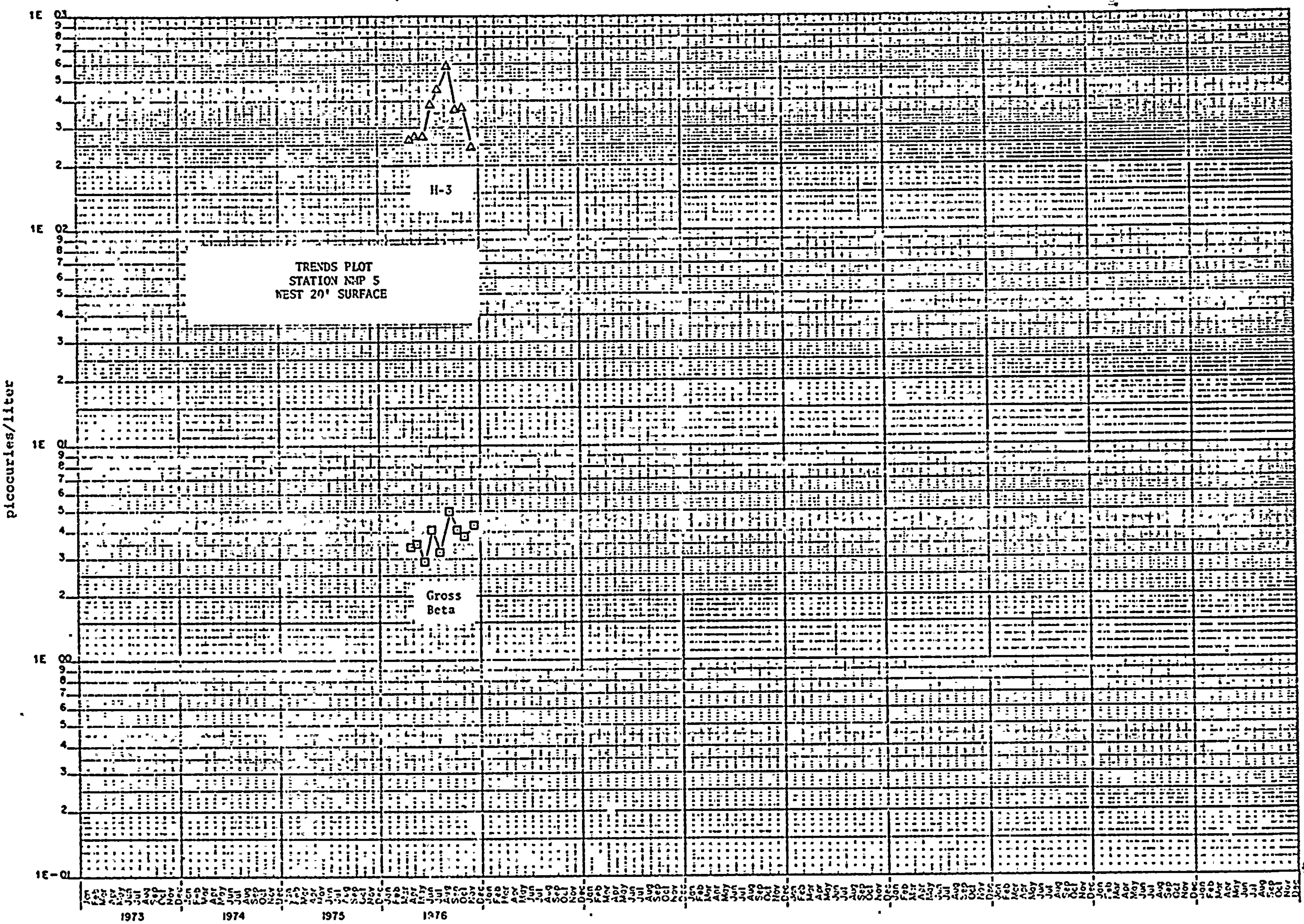

TRENDS PLOT
STATION NMP-2
EAST 40' SURFACE
H-3
Gross
Beta
picocuries/liter
1973
1974
1975
1976

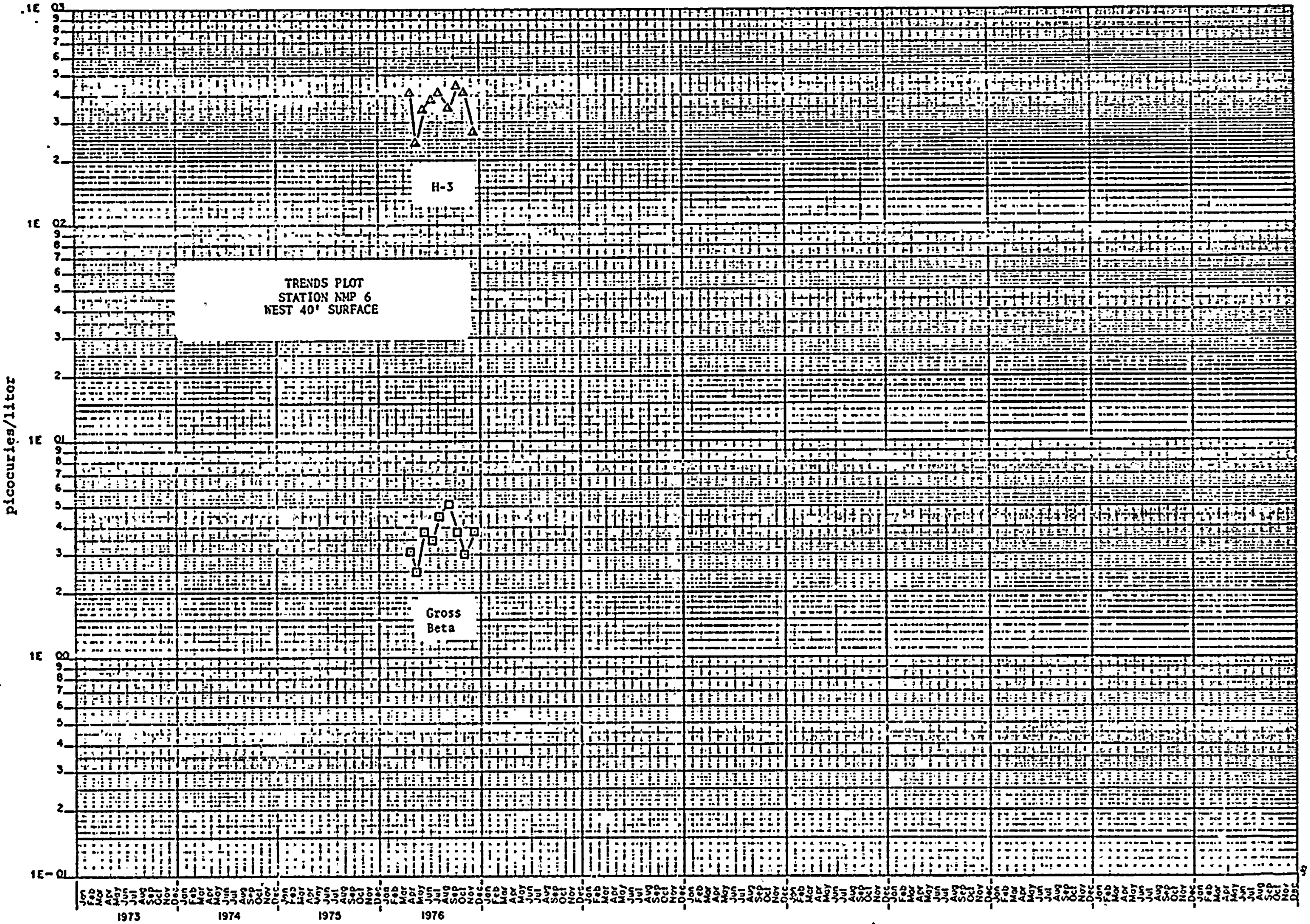


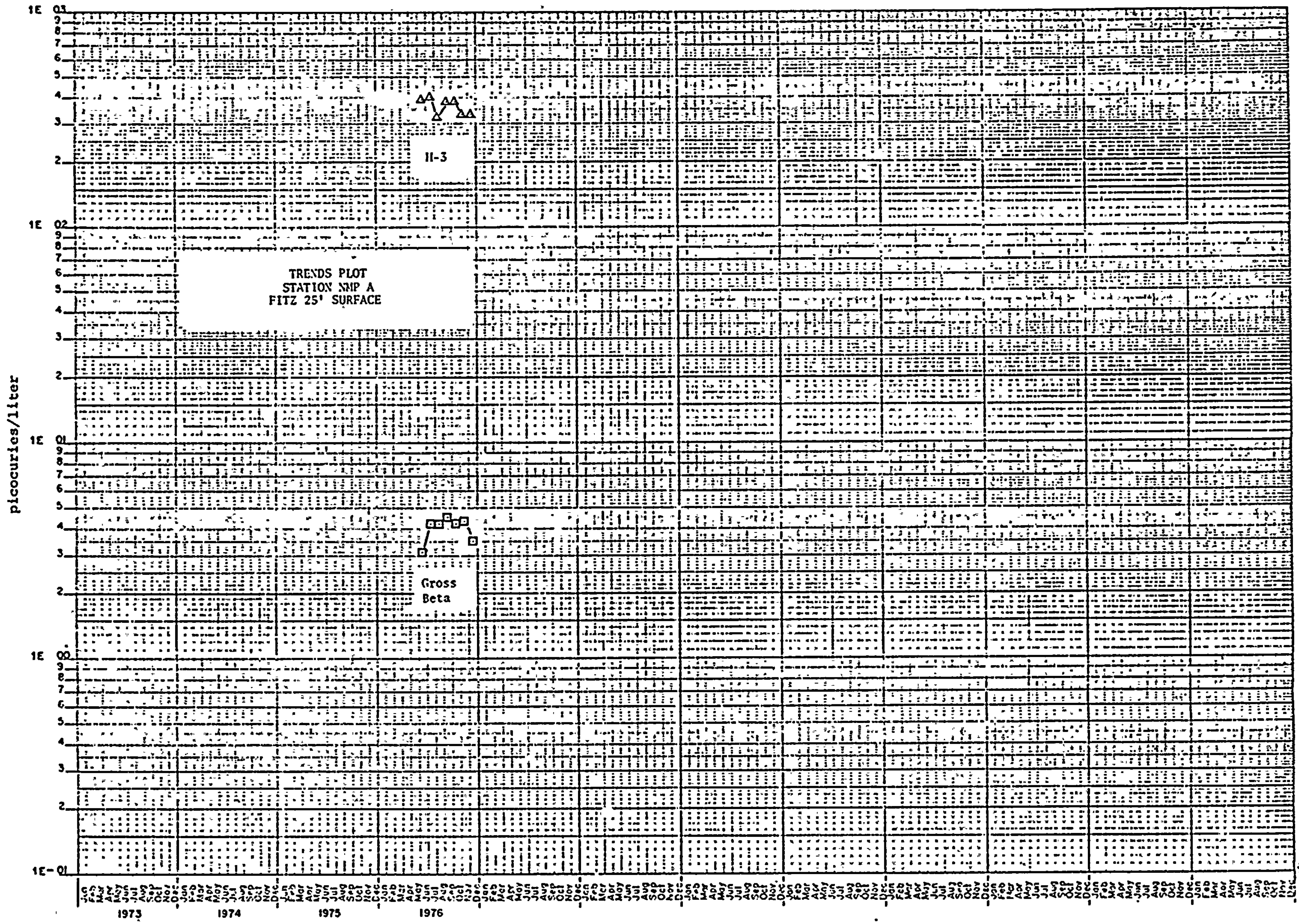
TRENDS PLOT
STATION NMP 3
FITZ 20' SURFACE
H-3
Gross
Beta
picocuries/liter
1973
1974
1975
1976

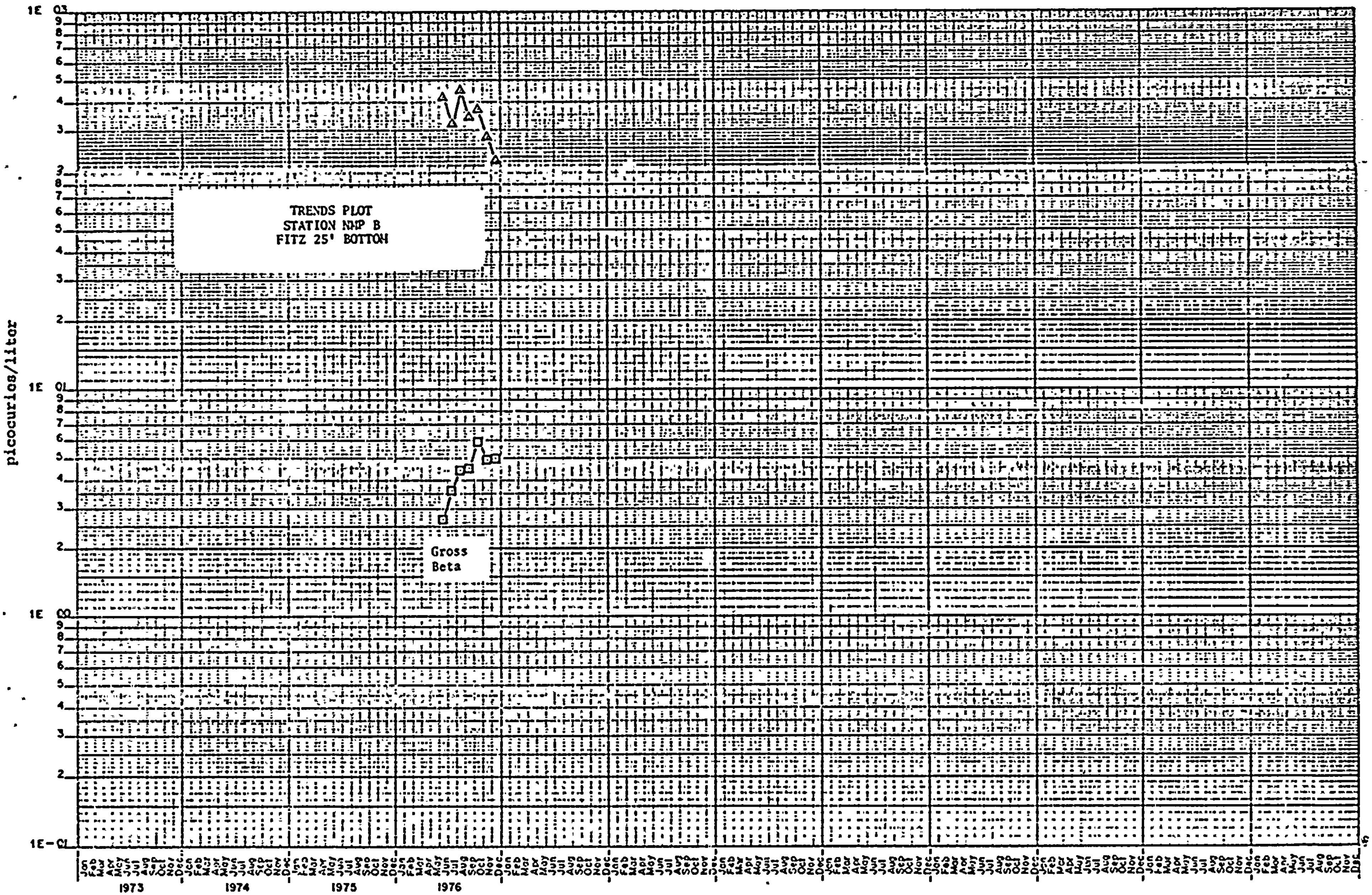


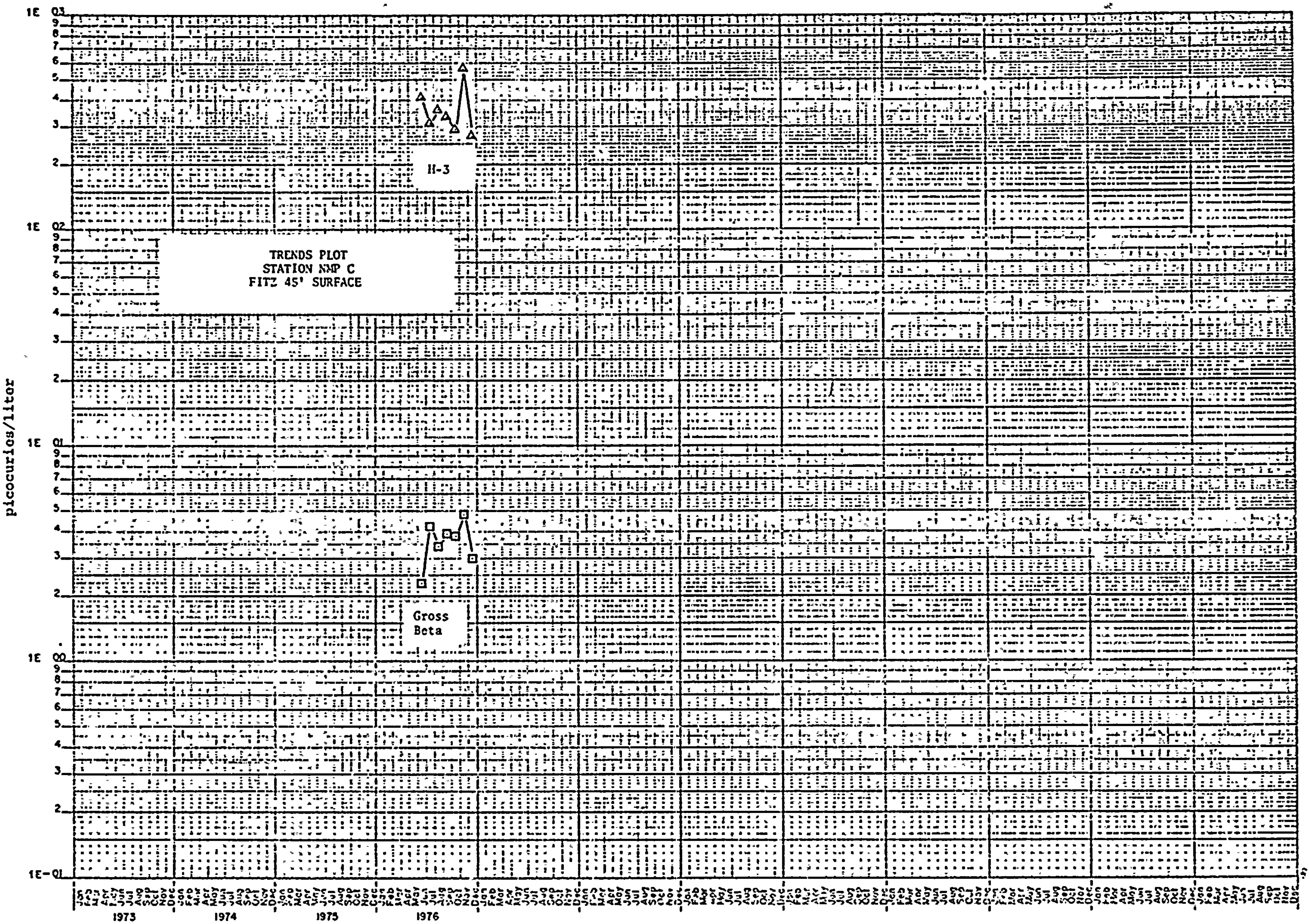
TRENDS PLOT
STATION NMP 4
FITZ 40' SURFACE
H-3
Gross Beta
picocuries/liter
1E 03
1E 02
1E 01
1E 00
1E-01
1973
1974
1975
1976

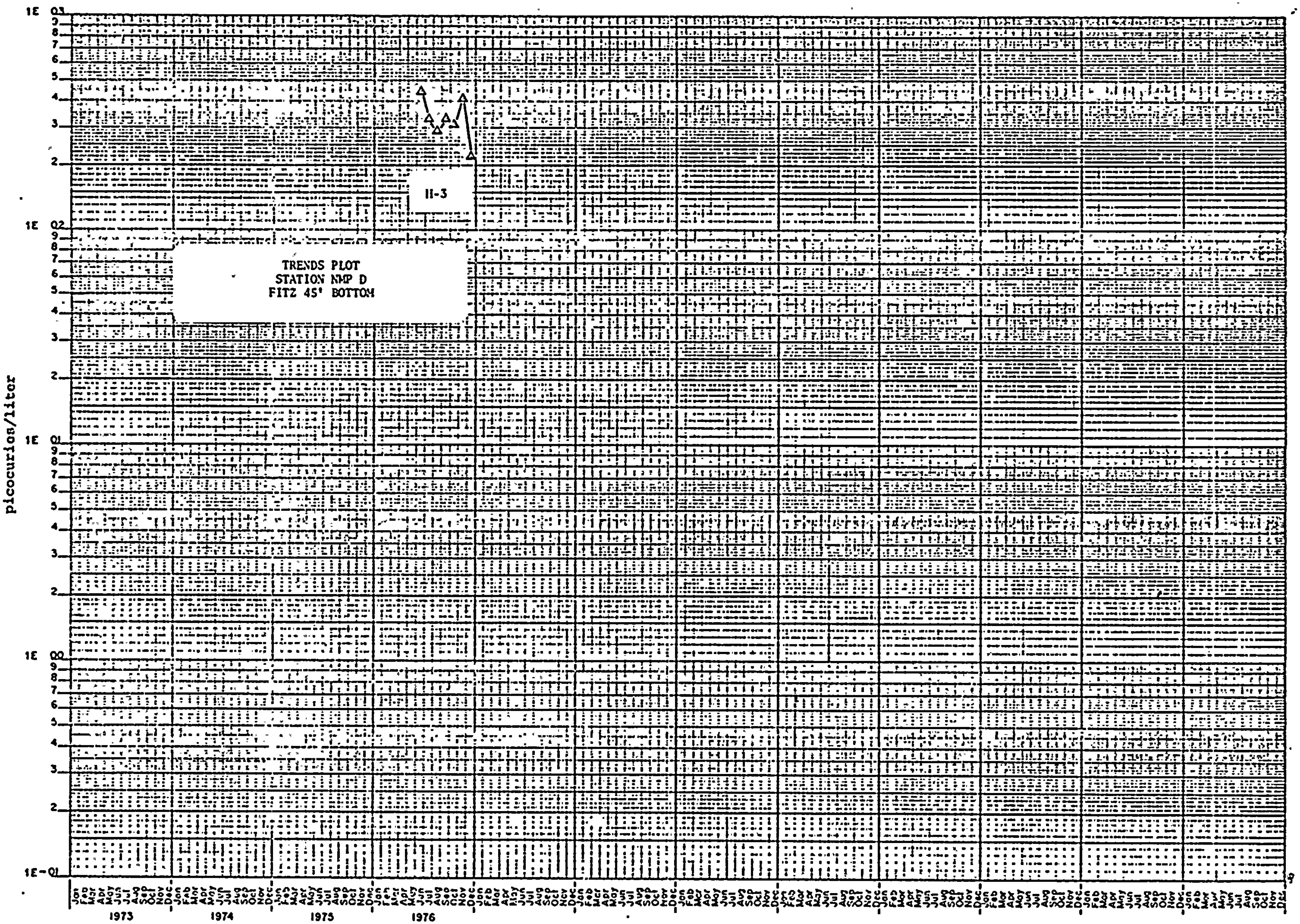

TRENDS PLOT
STATION NHP 5
WEST 20' SURFACE
H-3
Gross
Beta
picocuries/liter
1E 03
1E 02
1E 01
1E 00
1E-01
1973
1974
1975
1976


TRENDS PLOT
STATION NMP 6
WEST 40' SURFACE
H-3
Gross Beta
picocuries/liter
1E 03
1E 02
1E 01
1E 00
1E-01
1973
1974
1975
1976


TRENDS PLOT
STATION NMP A
FITZ 25' SURFACE
H-3
Gross Beta
picocuries/liter
1E 03
1E 02
1E 01
1E 00
1E-01
1973
1974
1975
1976


TRENDS PLOT
STATION NMP B
FITZ 25' BOTTOM
Gross Beta
picocuries/liter
1973
1974
1975
1976


TRENDS PLOT
STATION NMP C
FITZ 45' SURFACE
H-3
Gross Beta
picocuries/liter
1E 03
1E 02
1E 01
1E 00
1E-01
1973
1974
1975
1976


TRENDS PLOT
STATION NMP D
FITZ 45' BOTTOM
II-3
picocuries/liter
1E 03
1E 02
1E 01
1E 00
1E-01
1973
1974
1975
1976

APPENDIX A

ANALYTICAL PROCEDURES

RIVER OR LAKE WATER

Gross Beta/Gross Alpha

1. To 1 liter of sample, add 1 mℓ of nitric acid and evaporate to 1 - 2 mℓs volume.

2. Transfer to a 2 inch diameter stainless steel planchet and evaporate to dryness under an infrared heating lamp. Determine the weight of residue and submit for radioassay.

3. Count for 50 minutes in a Beckman-Sharp Wide Beta II counter for gross beta, then for gross alpha.

Tritium

An aliquot of sample is converted to hydrogen gas by reduction in a hot zinc furnace, mixed with methane counting gas, and radioassayed utilizing an internal low-level gas proportional counter. Very low levels of activity can be detected due to the sophistication of the counting equipment, the electronics, and the shielding.

Gamma Isotopic Analysis

One liter of sample is transferred to a 1 liter Marinelli wraparound counting beaker and counted for 8 hours on a high resolution gamma spectrometer. Specific gamma isotopes are indicated by peaks at discrete energies. The activity of each isotope is determined by computer-aided integration of the area under each peak.

APPENDIX B

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS

ANALYSIS	HALF-LIFE	LOWER LIMIT OF DETECTION (LLD) a by Radiochemical Methods					
		Water (pCi/ℓ)	Airborne Particulate or Gas (pCi/m^3)	Fish, Meat or Poultry (pCi/kg, wet)	Milk (pCi/ℓ)	Vegetation (pCi/kg, wet)	Soil (pCi/kg, dry)
SAMPLE REQUIRED		1 liter	300 Cu. M	400 Gm Wet	1 liter	400 Gm Wet	50 Gm Dry
Gross β }e,f,h	N.A.	0.9	0.004	50	2	60	1300
Gross α }e,f,h	N.A.	0.3	0.002	-	-	-	-
SAMPLE REQUIRED		1 liter	1200 Cu. M	400 Gm Wet.	1 liter	400 Gm Wet	50 Gm Dry
Sr^{89} (b) (h)	53 d	4	0.004	30 (g)	4	30	400
Sr^{90} (h)	28 y	0.8	0.0007	5 (g)	0.8	5	80
Cs^{137} (h)	30 y	2	0.001	-	2	-	20
SAMPLE REQUIRED		2 to 3 ℓ	300 Cu. M	400 Gm Wet	2 to 3 ℓ	400 Gm Wet	-
I^{131} (i)	81 d	0.4 0.5 (c)	0.003	-	0.4 0.5 (c)	80	-
SAMPLE REQUIRED		0.3 liter	-	400 Gm Wet	0.3 liter	400 Gm Wet	50 Gm Dry
elem Ca	N.A.	0.02 gm/ℓ	-	40 gm/kg wet	0.02 gm/ℓ	40 gm/kg wet	
elem K	N.A.	2 mg/ℓ	-	100 mg/kg wet	2 mg	100 mg/kg wet	
H^3	12.5 Y	90	-	-	90	-	-

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS

ANALYSIS	HALF-LIFE	LOWER LIMIT OF DETECTION (LLD)[a,b,d] Ge(Li) Gamma Spectrometry Analysis					
		Water (pCi/ℓ)	Airborne Particulate or Gas (pCi/m^3)	Fish, Meat or Poultry (pCi/kg, wet)	Milk (pCi/ℓ)	Vegetation (pCi/kg, wet)	Soil (pCi/kg, dry)
SAMPLE REQUIRED		1 liter	1200 Cu. M.	400 Gm	1 liter	400 Gm	400 Gm
Be^{7}	53 d	80	0.02	200	80	200	200
K^{40}	1.3 E 09 y	200	0.04	500	200	500	500
Cr^{51}	27.8 d	80	0.07	200	80	200	200
Mn^{54}	290 d	8	0.002	20	8	20	20
Co^{58}	71 d	8	0.002	20	8	20	20
Fe^{59}	45 d	10	0.003	40	10	40	40
Co^{60}	5.3 y	8	0.002	20	8	20	20
Zn^{65}	245 d	20	0.005	30	20	30	30
Zr^{95}	65 d	10	0.003	40	10	40	40
Ru^{103}	40 d	8	0.002	20	8	20	20
Ru^{106}	368 d	80	0.02	200	80	200	200
I^{131}	8.1 d	10	0.002	30	10	30	30
Cs^{134}	2.1 y	9	0.002	20	9	20	20
Cs^{137}	30 y	9	0.002	20	9	20	20
$Bs\text{-}La^{140}$	12.8d/40 hr	15	0.005	30/40	15	80/40	40
Ce^{141}	33 d	20	0.003	40	20	40	40
Ce^{144}	284 d	80	0.02	200	80	200	200
Ra^{226}	1602 y	60	0.009	100	60	100	100
Th^{228}	1.9 y	10	0.009	20	10	20	20

Notes:

(a) The nominal lower limit of detection (LLD) is defined in HASL 300, pp D-08-01, -02, -03 at the 95% confidence level.

(b) The nominal LLD is at the counting time and must be corrected to the midcollection time.

(c) The LLD levels for I-131 in milk and water are decay corrected to the midcollection time. The midcollection to counting time must be <8 days to insure conformity to L.T. 0.5 pCi/liter (σm = 4) at the 97.7% confidence level or L.T. 0.4 pCi/liter (σm = 3.3) at the 95% confidence level. See (a) above for 95% confidence level referral.

(d) The LLD for radionuclides analyzed by Ge(Li) gamma spectrometry will vary according to the number of nuclides in the environmental sample and consequently the background continuum and Compton scattering.

(e) Not applicable - indicated by (N.A.) Activities calculated as of the counting date.

(f) This is the LLD for a weightless mount. Dissolved or suspended materials in the sample increase the self-absorption in the mount resulting in an increase of the LLD.

(g) Flesh only required for analysis. The ash weight percent of fish is ∿3%.

(h) Sample required is for analysis of bracketed nuclides.

(i) The midcollection to counting time of short-lived nuclides must be less than one half-life for the LLD to apply.