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SURFACE DISTRIBUTION OF TOTAL CHLOROPHYLL A  
IN LAKES ONTARIO AND ERIE, 1970

by

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## INTRODUCTION

The seasonal cycle of phytoplankton in Lake Ontario has been studied by Tucker (Bay of Quinte region, 1948), Schenk and Thompson (1965), Matheson and Anderson (1966), McCombie (Bay of Quinte, 1967), Michalski (1968), and Munawar and Nauwerck (1971). Matheson and Anderson (1966) used chlorophyll a + b as an index of total phytoplankton in Hamilton Harbour, but the other authors used either algal cell numbers or volumes.

The distribution of chlorophyll over the entire lake was described by Nicholson (1970) and Chau et al (1970). Highest chlorophyll concentrations occurred inshore (less than 20 m depth) in the western end of the lake from Toronto to the Niagara River and along the southern shore east of Rochester, New York. These studies were confined from June to November, 1967, and May to September 1969, respectively, so winter and spring algal distribution was not discussed. No comprehensive studies have been made on chlorophyll distribution in Lake Erie, except Michalski (1968) found ratios of algae (A.S.U./ml) between the Western, Central, and Eastern basins of 3.4:1.5:1 and Davis (1968), in terms of chlorophyll a of 3.2:1.5:1.

An investigation was made to determine the relative distribution of surface chlorophyll a in Lakes Ontario and Erie with particular emphasis upon temporal and spatial distribution of this pigment.

## METHODS

For the surface chlorophyll a studies, continuous fluorometric measurements of surface waters was performed by the method of Lorenzen (1966). The lake water was pumped via a hole in the side of the ... (contn'd page 2)

M.V. Martin Karlsen 3.5 m below the water surface and approximately in the center of the ship's side. During the early cruises, the pumped lake water was passed through a heated water bath to prevent condensation upon the fluorometer cuvette.

Once each four hours, a water sample was collected from the fluorometer outlet and filtered for spectrophotometric analysis of chlorophylls (see section by Glooschenko and Moore for method used). The fluorometer reading was recorded at the same time and thus provided a calibration between the fluorometer reading and chlorophyll a. Such a calibration was not corrected for chlorophyll degradation products such as pheophytin or pheophorbide.

On selected monitor stations, water was collected from 1 and 5 meter depths, mixed in equal amounts together, and chlorophyll determined spectrophotometrically. These results were compared to those values found by fluorometry of the pumped water sample. In general, the results obtained by pumping were lower by a mean factor of 0.86 on all Lake Ontario cruises. On each cruise, the chlorophyll values determined by fluorometry were divided by the mean ratio for the cruise of chlorophyll by fluorometry to chlorophyll a by spectrophotometric determination of integrated 1 + 5 m water samples to correct for this discrepancy.

## RESULTS AND DISCUSSION

### Lake Ontario

This paper will be confined to a general discussion of total surface chlorophyll distribution as the accompanying paper by Glooschenko and Moore discusses the chlorophyll-pheopigment cycle in more detail.

During early February cruise, chlorophyll was evenly distributed over the lake with the exception of peaks near the mouth of the Niagara River and along the southeastern shore (Fig. 1). From March to the end of May, highest total chlorophyll a development started along the shore with slightly higher development on the north shore. This was undoubtedly related to formation of the thermal bar and subsequent higher temperature and nutrients on the shoreward side of it. In late June, a rather complex distribution of chlorophyll was noted. The low chlorophyll values along the northern shore of the lake are probably due to upwelling of colder water in the region which occurred at that time in addition to nutrient depletion causing termination of the spring bloom which occurs in that region of the lake.

In late July and August similar features were noted in the distribution of chlorophyll in the lake. Highest chlorophyll values occurred in inshore waters especially in the western portion of the lake, and towards the St. Lawrence River. The maximum of chlorophyll in the western end of the lake was particularly pronounced in late September and October. After October when the fall overturn took place, chlorophyll distribution was rather uniform in the lake except for slightly higher values in inshore waters.

The annual average, chlorophyll (total) values are summarized in figure 2. Note that the highest values are found in the southwest corner between Hamilton, Ontario, and the mouth of the Niagara River, and on the south shore east of Rochester, N.Y. Chlorophyll data is summarized in table 1.

#### Lake Erie

Distribution maps of total surface chlorophyll in Lake Erie

are presented in figure 3. During the first Erie cruise in early April, high concentrations of chlorophyll were already present in the lake, especially along the southern shore and in the western basin centered around Pelee Island. By early May, chlorophyll values had decreased and a fairly even distribution of this pigment was noted. These decreased concentrations were also noted in early June and coincided with the end of the spring bloom which apparently had begun under the ice before the April cruise.

By early July, lowest values of the field season were observed in the Central and Eastern basins, but the Western basin had at least tripled in chlorophyll concentration compared to the previous cruise in early June. In early August, slight increases of chlorophyll were noted in the Central and Eastern basins, but in the Western basin, a decrease occurred. In late August, high values again were noted in the Western basin spreading into the Western edge of the central basin. Also then, chlorophyll was higher along the southern shore. In September and late October, the high chlorophyll values were noted further eastward to the mid-Central basin. By the end of November and in mid-December, chlorophyll values were slightly reduced but still quite high, especially along the southern shore.

The annual average total chlorophyll concentrations are shown in figure 5. The Western basin contained the highest values, about twice that of the Central basin and triple that of the Eastern basin. Contours of total chlorophyll showed a north-south trend eastwards to Pt. Aux Pins - Cleveland. East of that, the contours showed a west-east trend with approximately twice the chlorophyll on the southern shore as on the northern shore. The data is summarized in table 2.

Comparison of Lake Erie Basins

Average chlorophyll a values per cruise for the east, central, and west basins of Lake Erie, together with the basin ratios, are presented in Table 3. The western basin was notably higher in total chlorophyll a than the other two basins except for early May and June when all basins had approximately the same values of this pigment.

The greatest difference between the western basin and other basins was during July and late August, perhaps related to the development of blue-green algal bloom in the western basin during the summer. The annual mean ratio between the three basins of 1:1.3:2.1 (E:C:W) was lower than that mentioned by Michalski (1968), in terms of the western basin number, but Michalski used volume units rather than pigment values.

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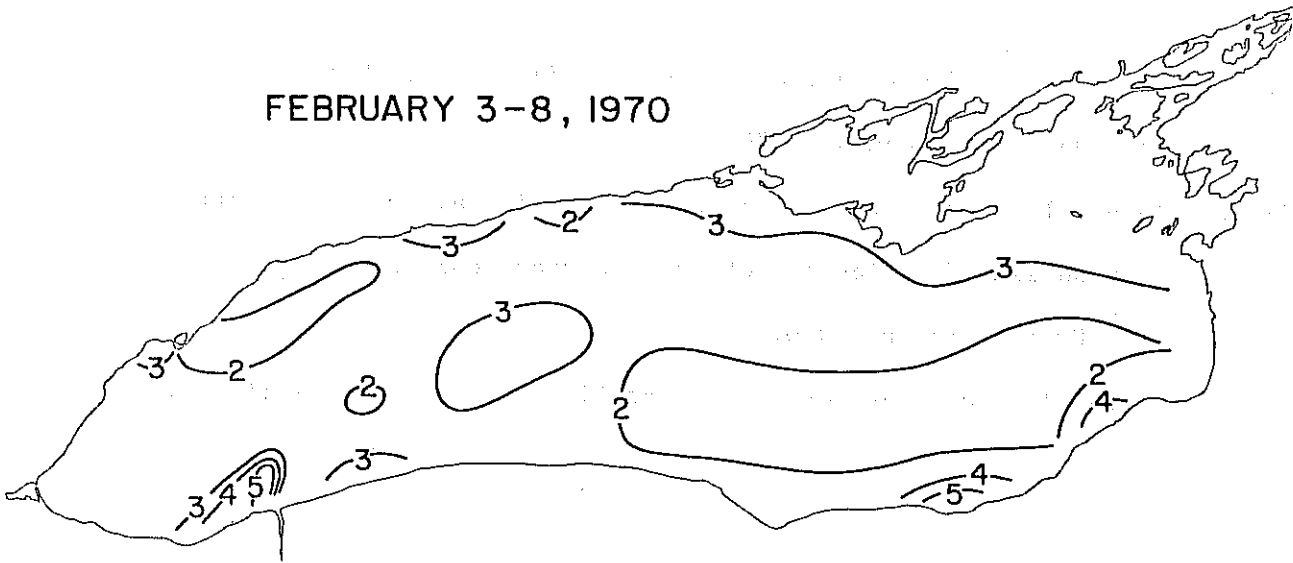
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Figure Captions

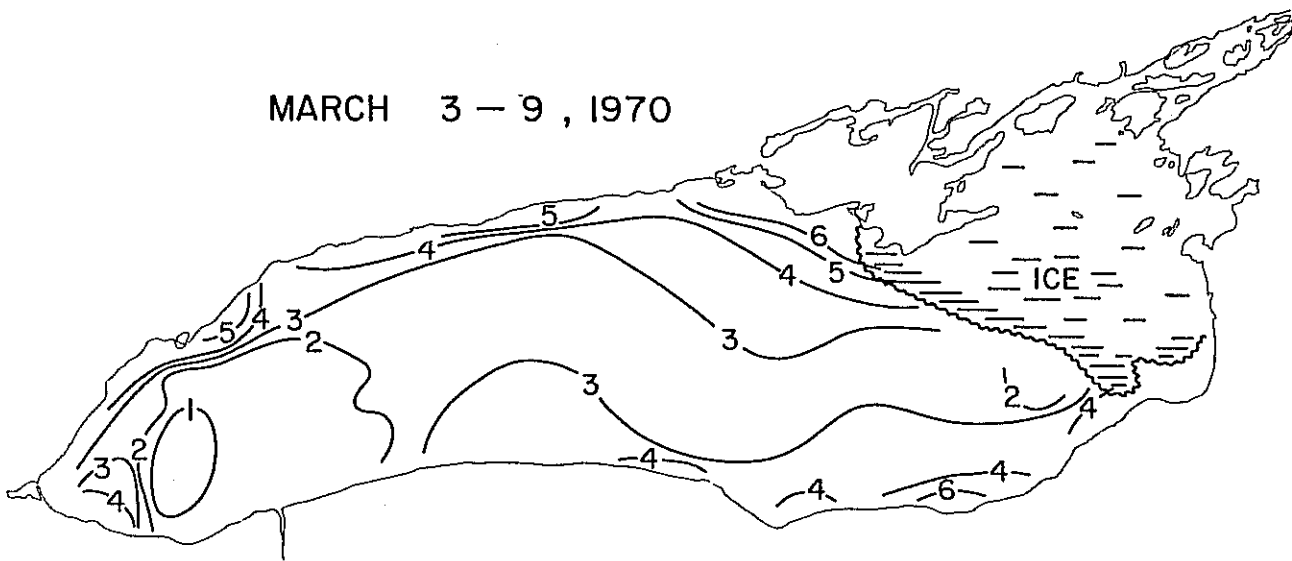
- Fig. 1. Maps showing distribution of total surface chlorophyll a in Lake Ontario by month, 1970.
- Fig. 2. Annual 1970 average total chlorophyll a in Lake Ontario (surface).
- Fig. 3. Maps showing distribution of total surface chlorophyll a in Lake Erie by month, 1970.
- Fig. 4. Annual 1970 average total chlorophyll a in Lake Erie (surface).

TOTAL CHLOROPHYLL a, mg/m<sup>3</sup>

FEBRUARY 3-8, 1970

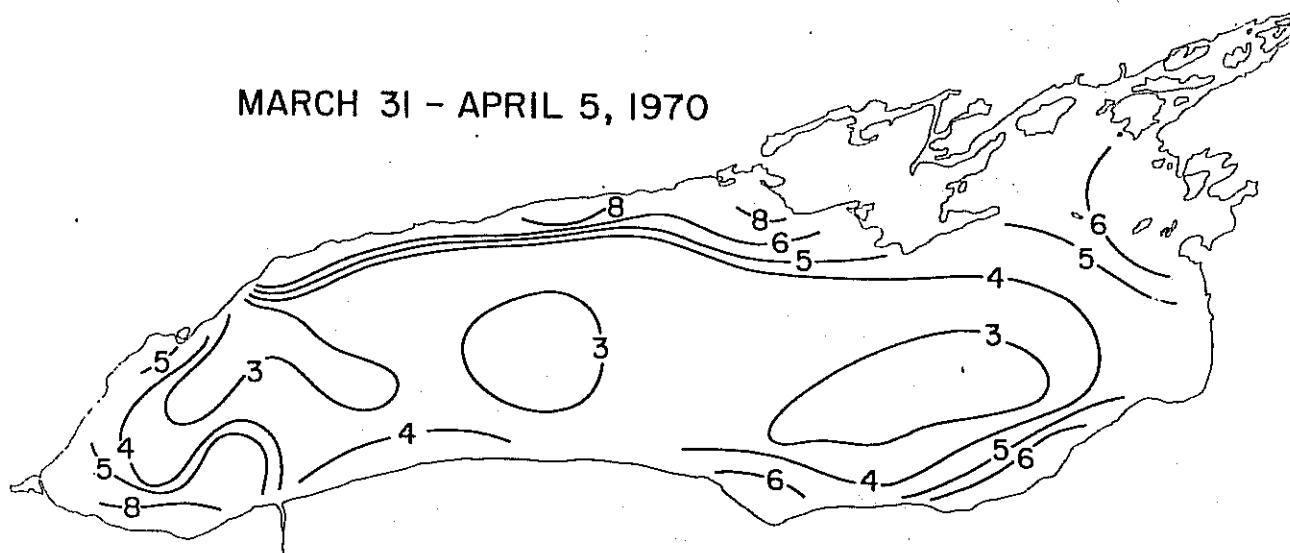


MARCH 3-9, 1970

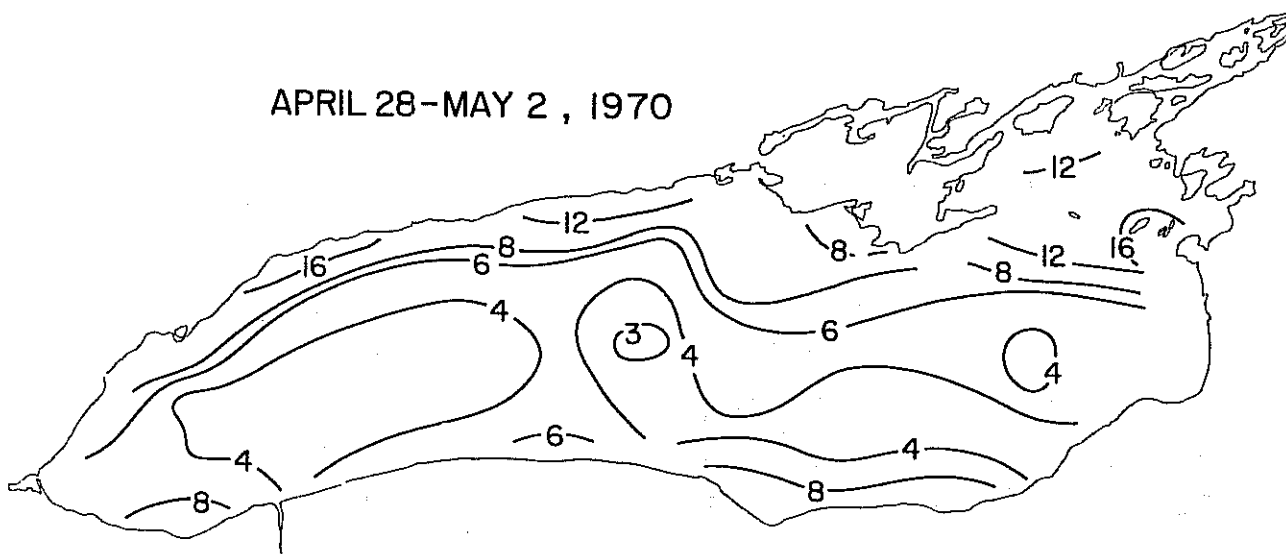


TOTAL CHLOROPHYLL a, mg/m<sup>3</sup>

MARCH 31 - APRIL 5, 1970

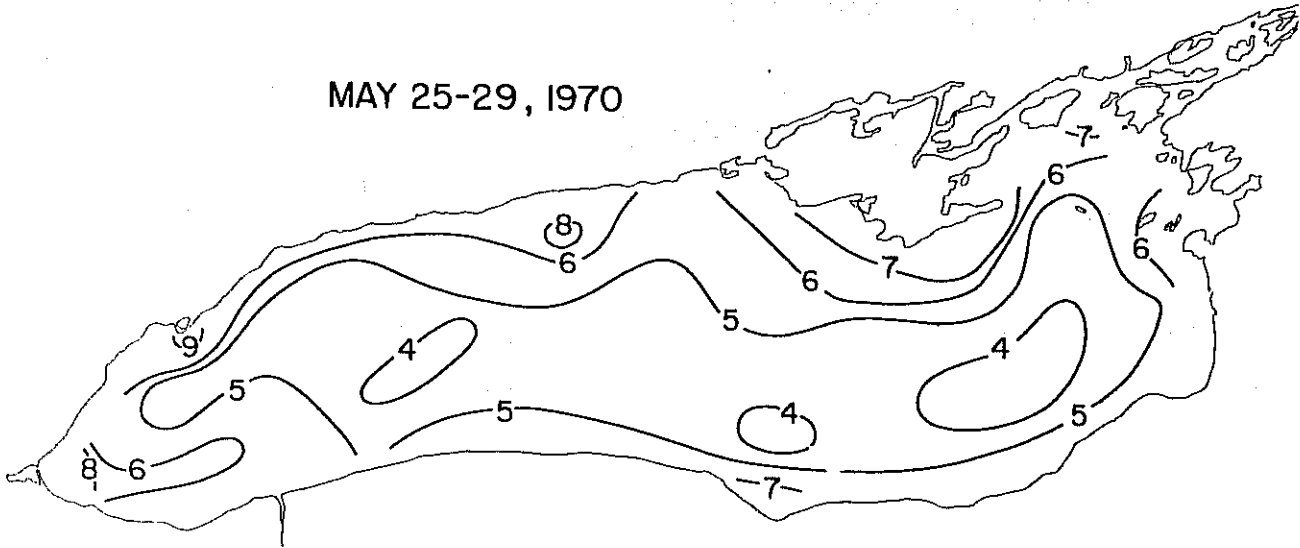


APRIL 28 - MAY 2, 1970

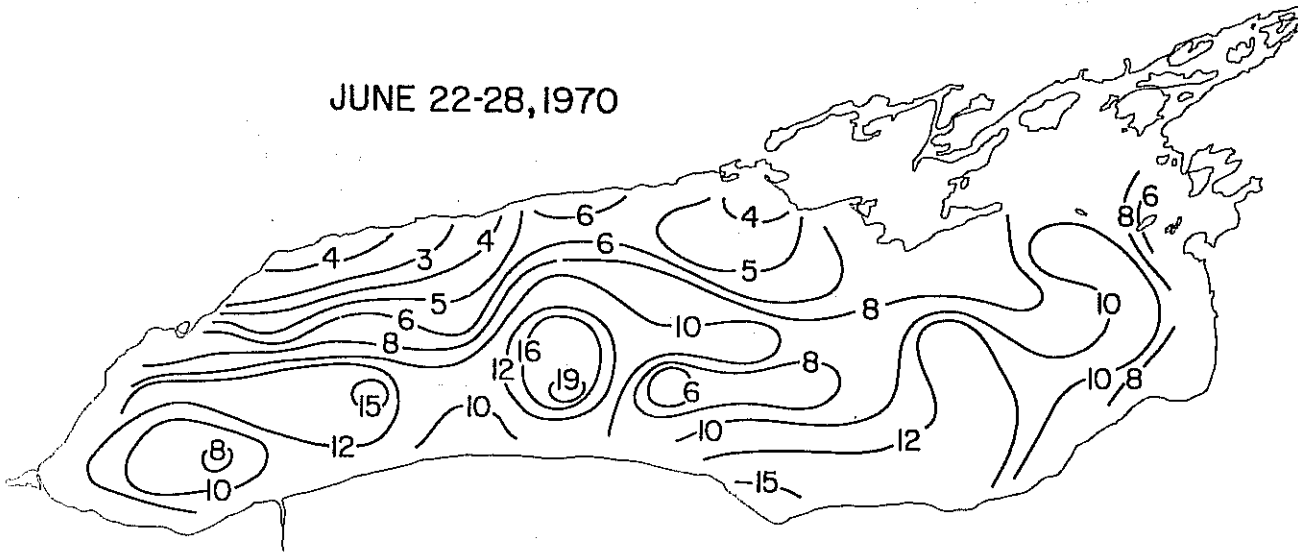


TOTAL CHLOROPHYLL  $a$ ,  $\text{mg}/\text{m}^3$

MAY 25-29, 1970

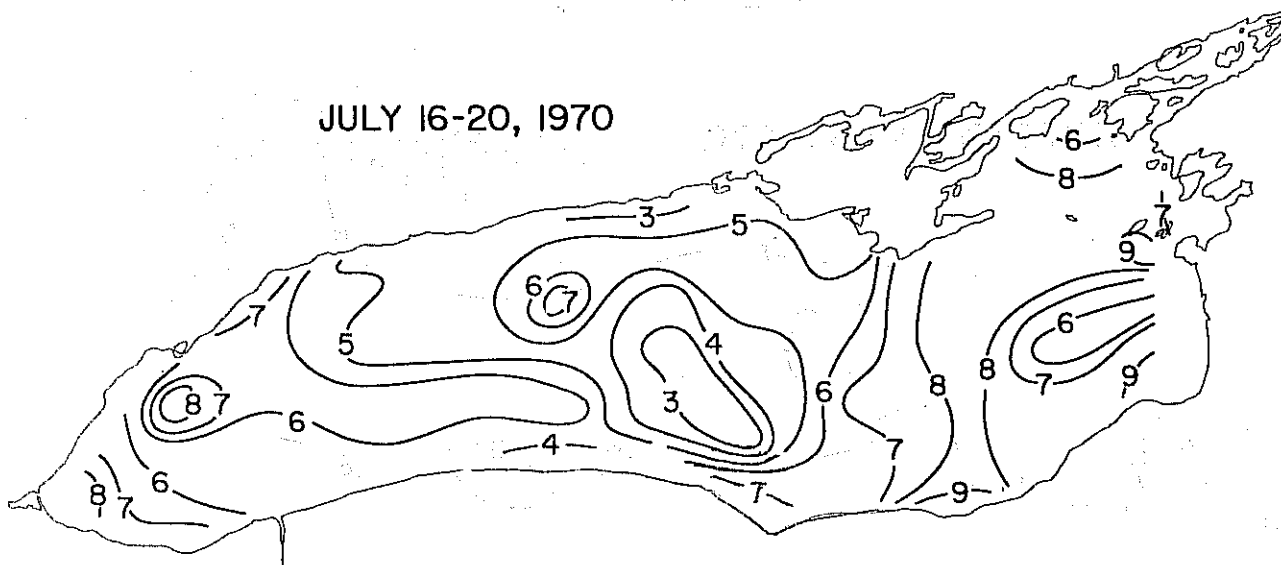


JUNE 22-28, 1970

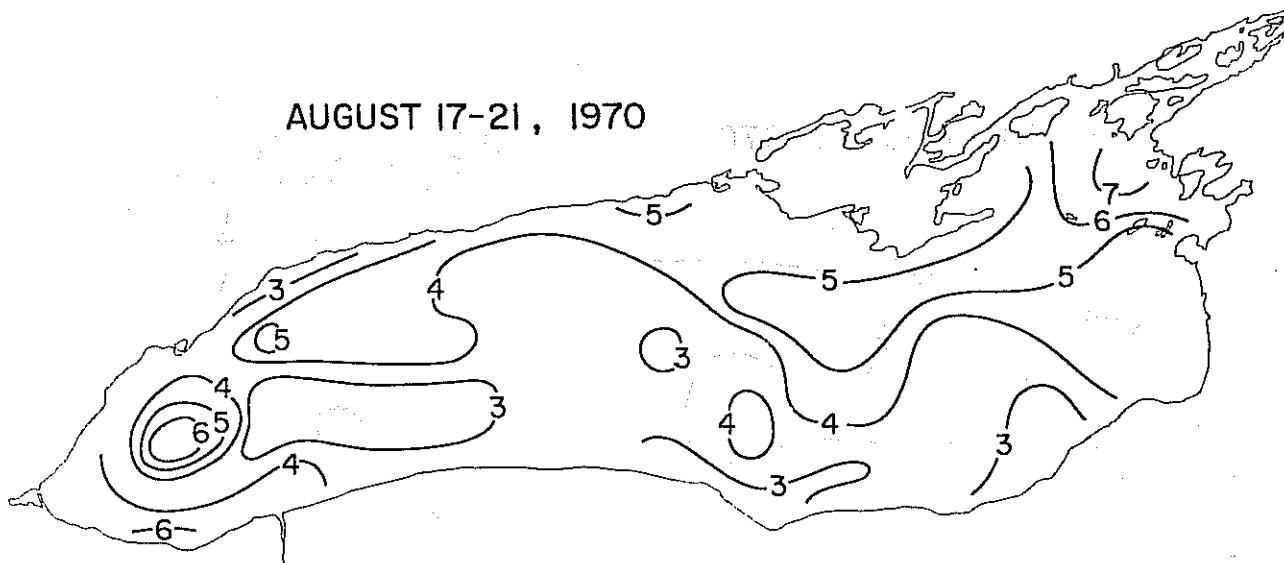


TOTAL CHLOROPHYLL  $a$ ,  $\text{mg}/\text{m}^3$

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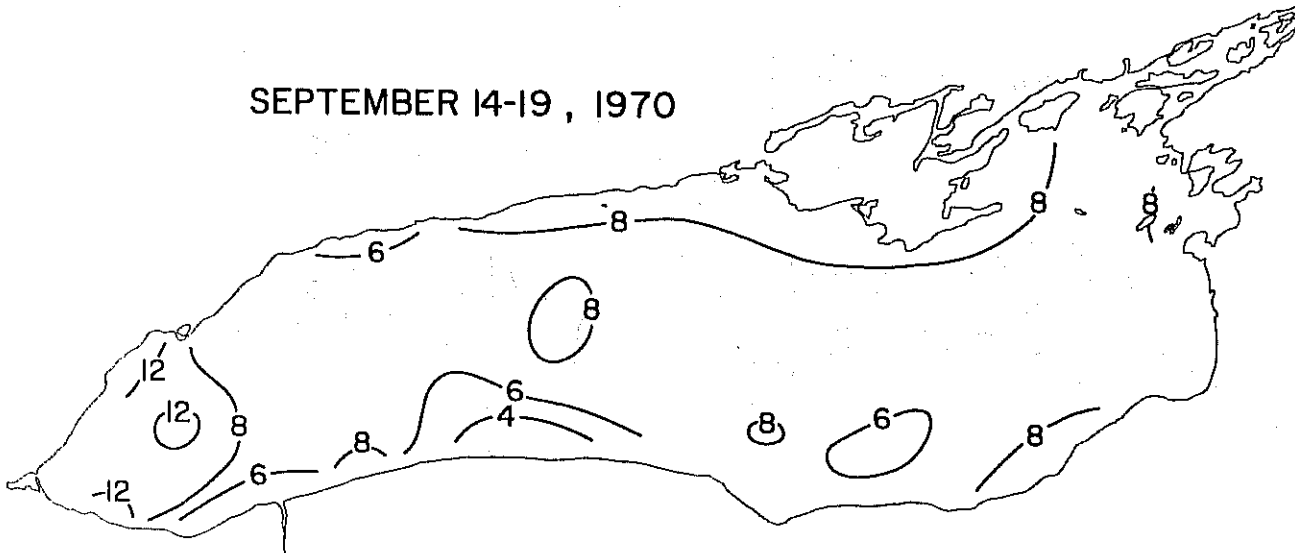


AUGUST 17-21, 1970

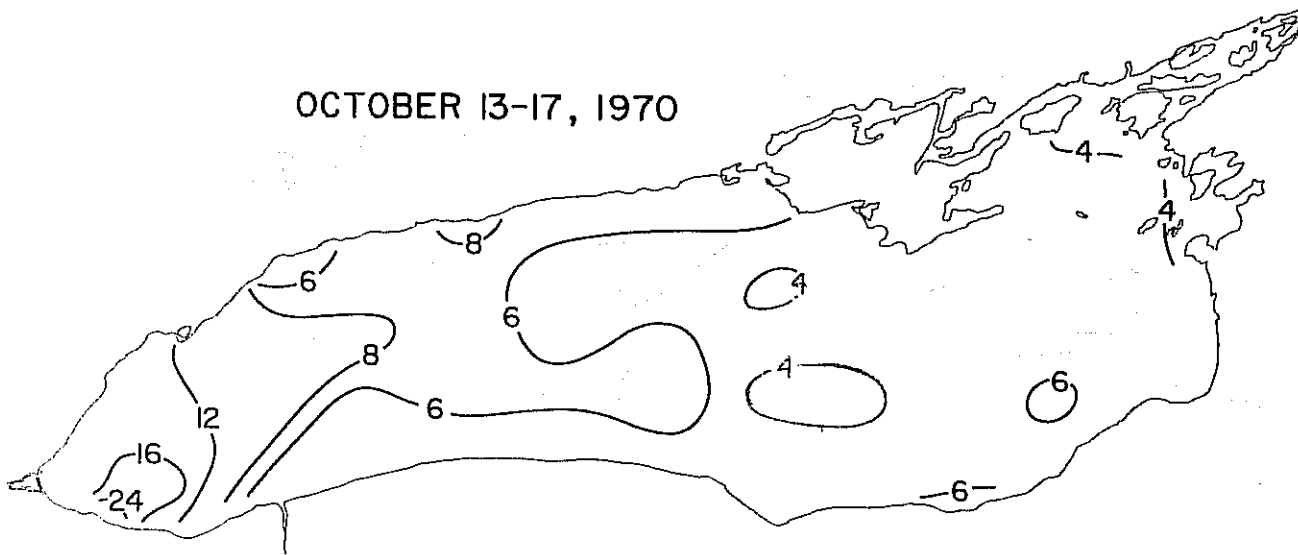


TOTAL CHLOROPHYLL  $a$ ,  $\text{mg}/\text{m}^3$

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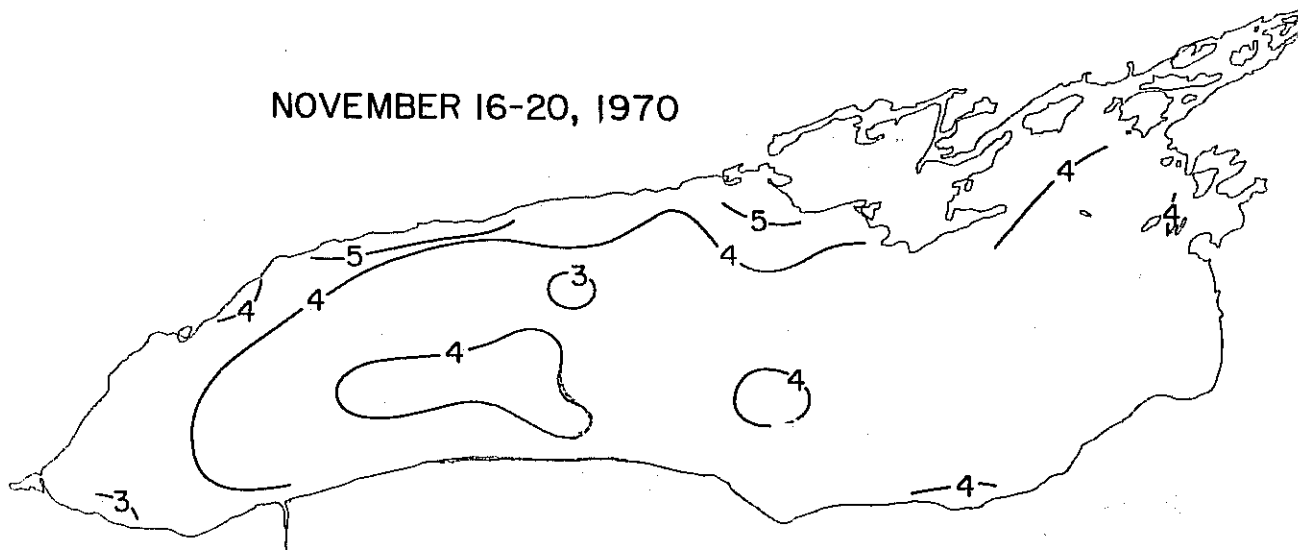


OCTOBER 13-17, 1970

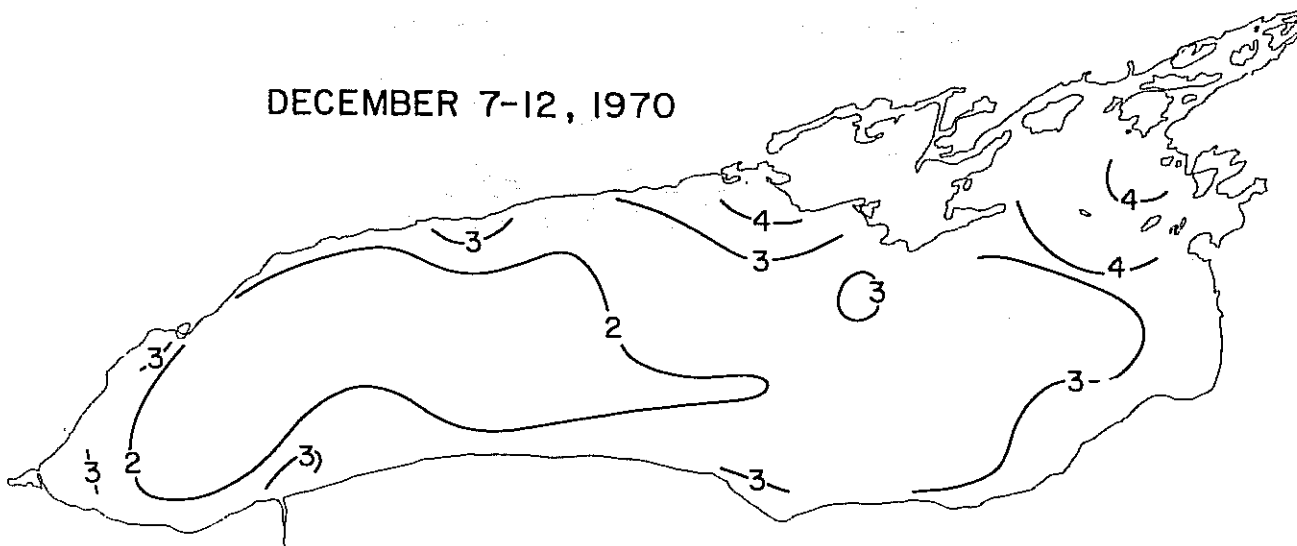


TOTAL CHLOROPHYLL  $a$ ,  $\text{mg}/\text{m}^3$

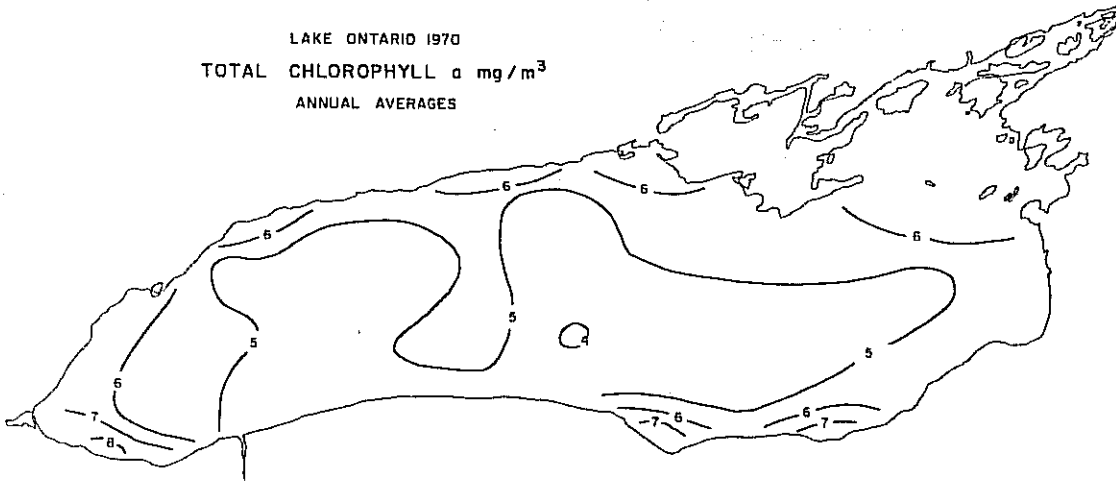
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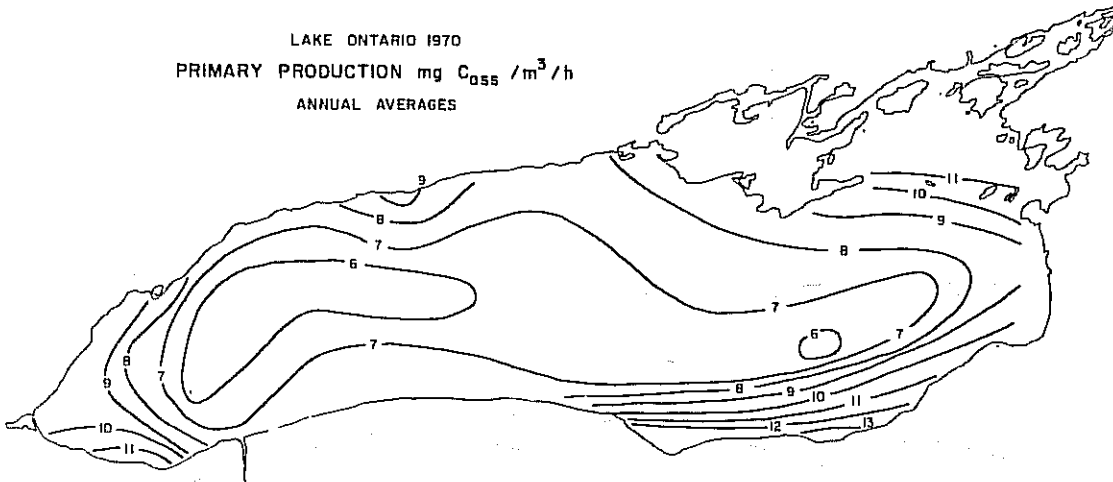
DECEMBER 7-12, 1970



LAKE ONTARIO 1970  
TOTAL CHLOROPHYLL  $a$   $\text{mg}/\text{m}^3$   
ANNUAL AVERAGES



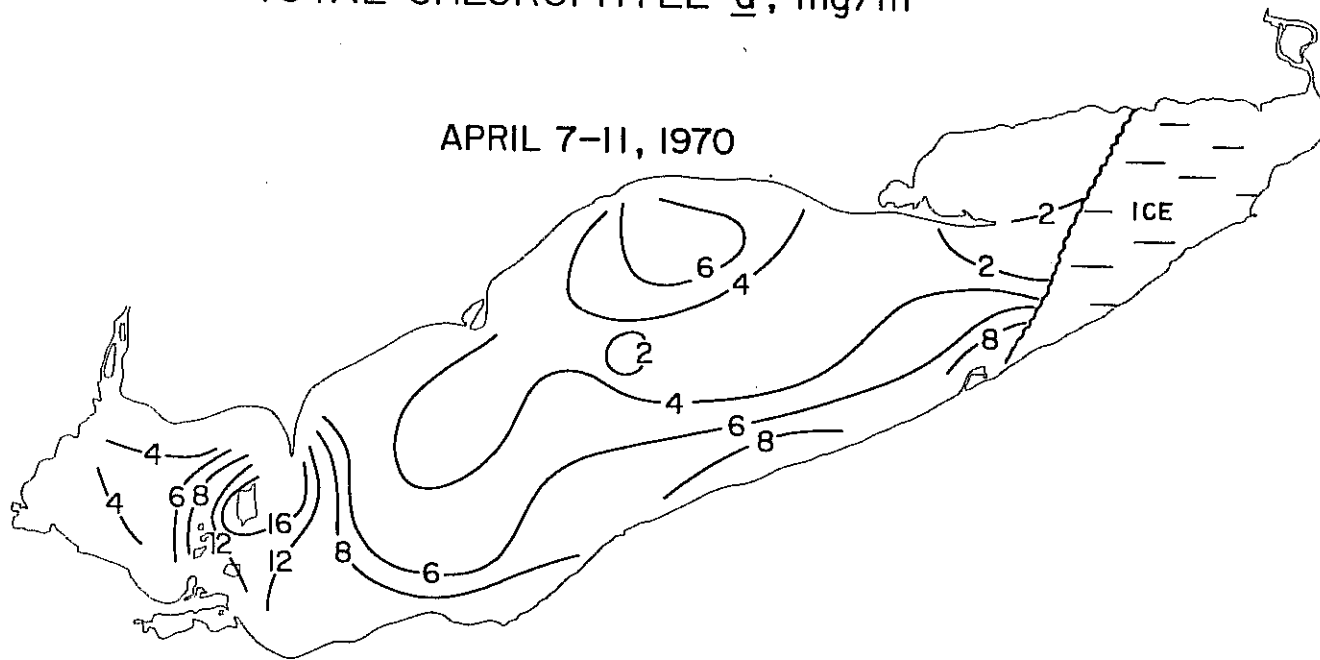
LAKE ONTARIO 1970  
PRIMARY PRODUCTION  $\text{mg } C_{\text{org}}/\text{m}^3/\text{h}$   
ANNUAL AVERAGES



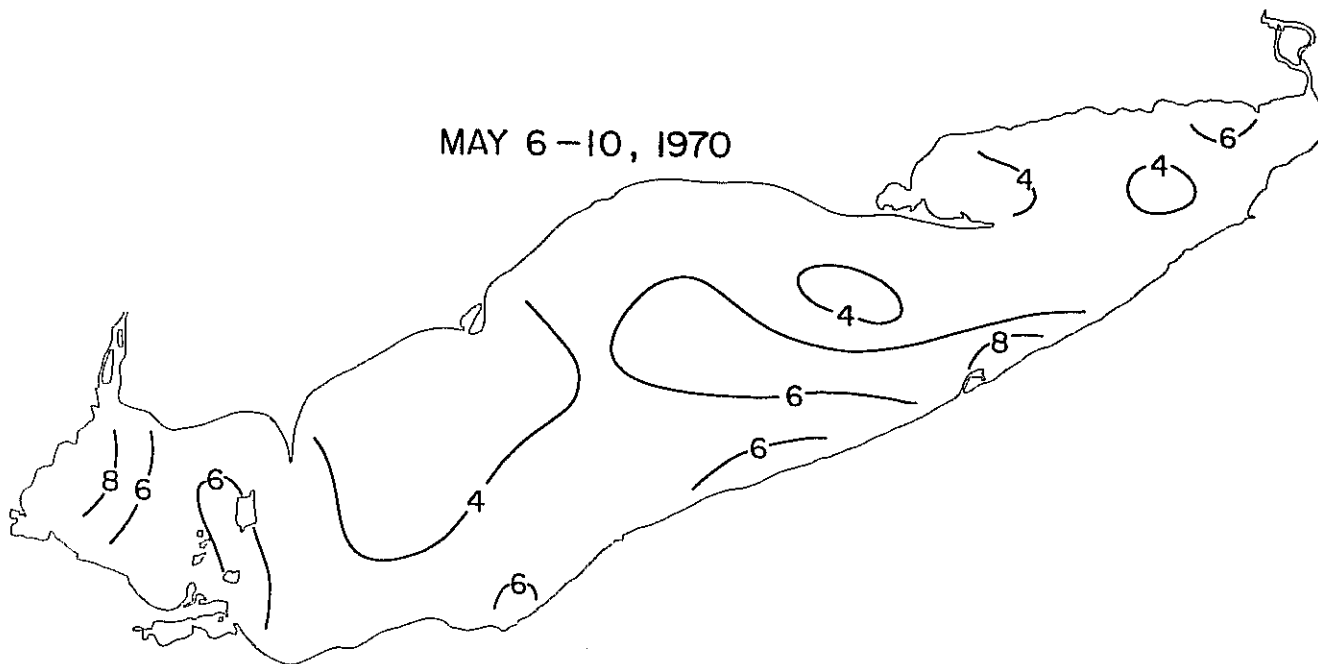


TOTAL CHLOROPHYLL  $a$ ,  $\text{mg}/\text{m}^3$

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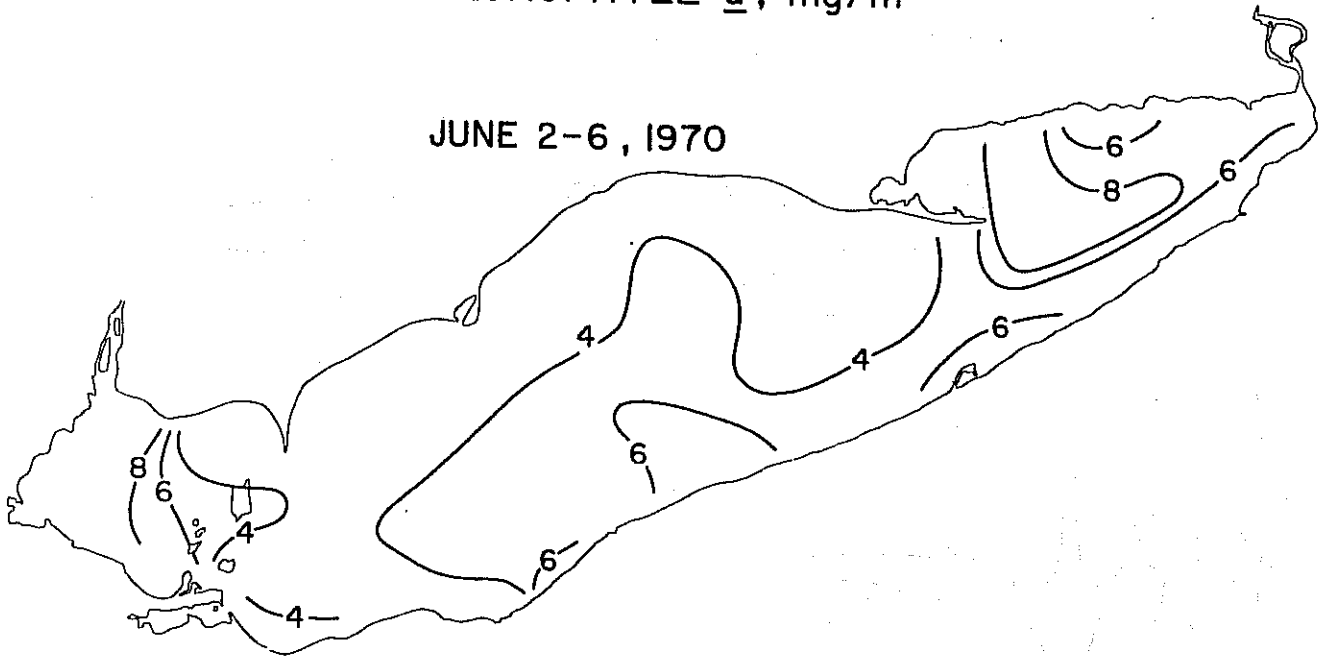


MAY 6-10, 1970

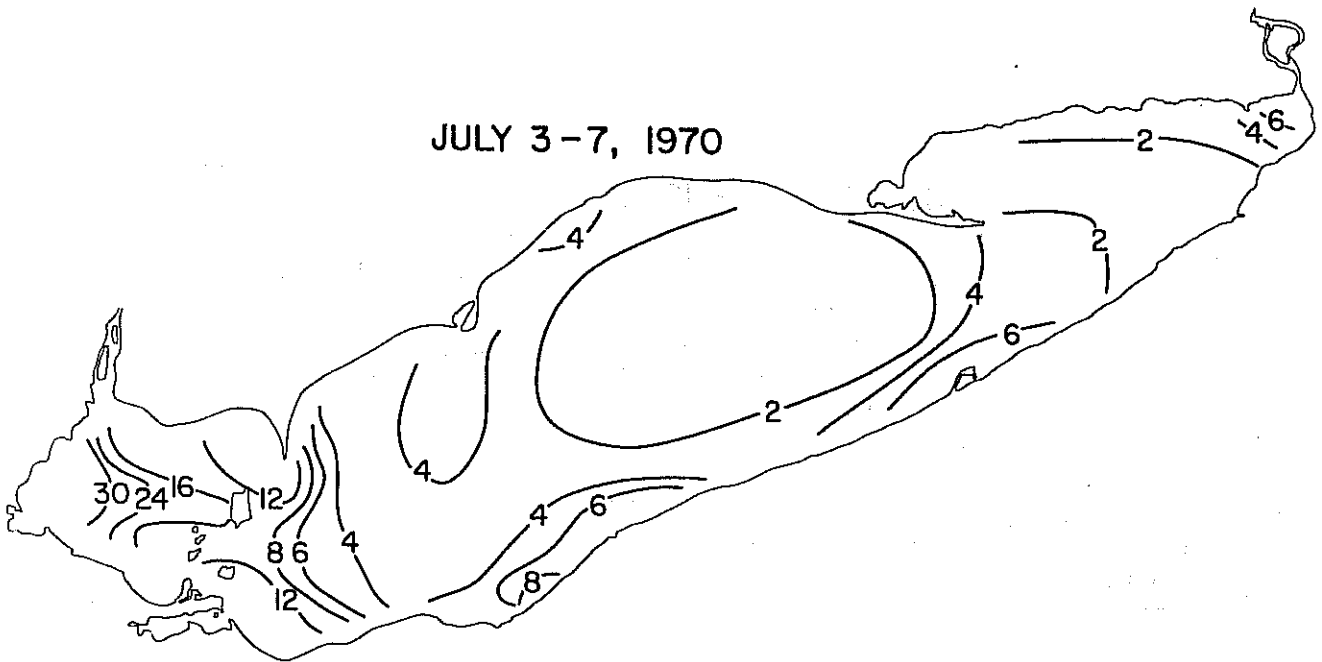


TOTAL CHLOROPHYLL a, mg/m<sup>3</sup>

JUNE 2-6, 1970

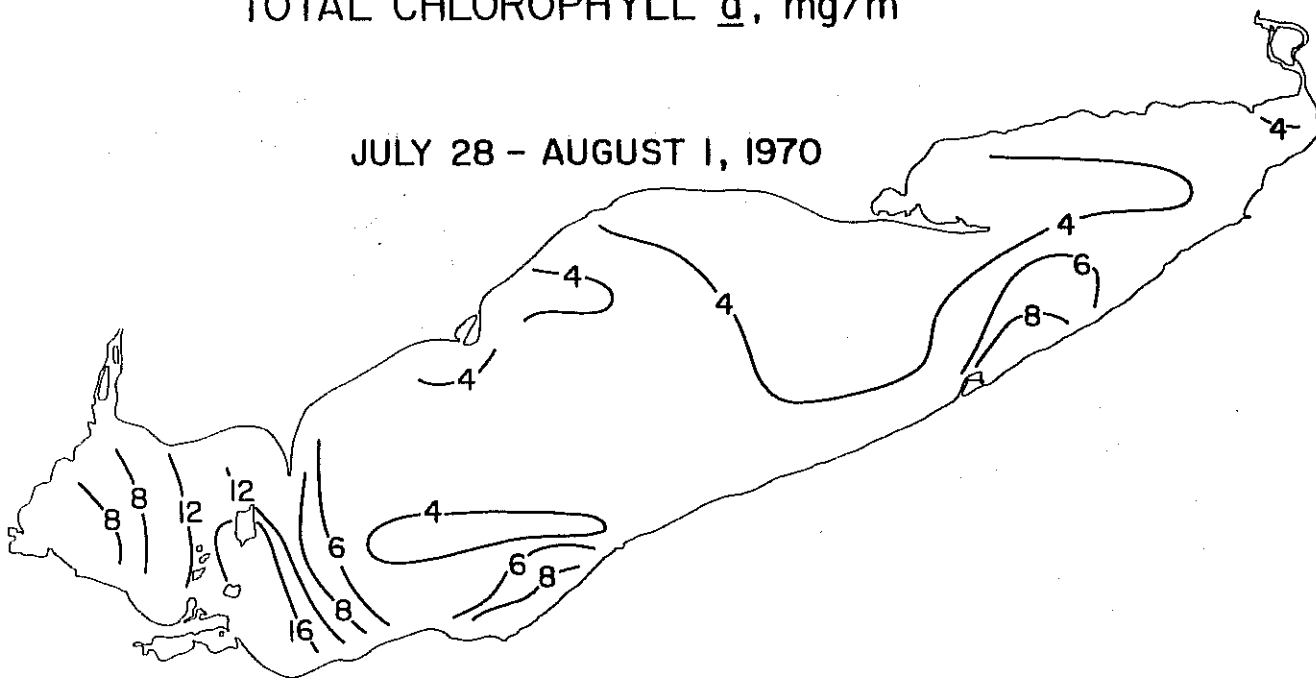


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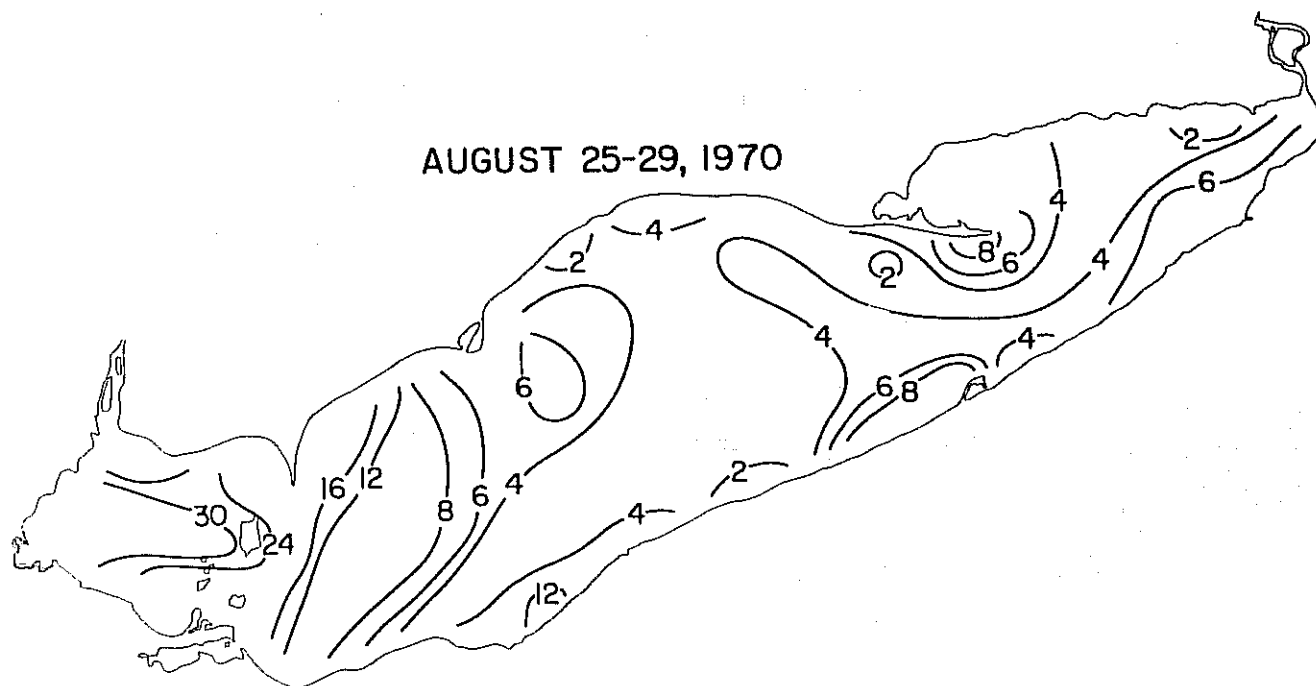


TOTAL CHLOROPHYLL a, mg/m<sup>3</sup>

JULY 28 - AUGUST 1, 1970

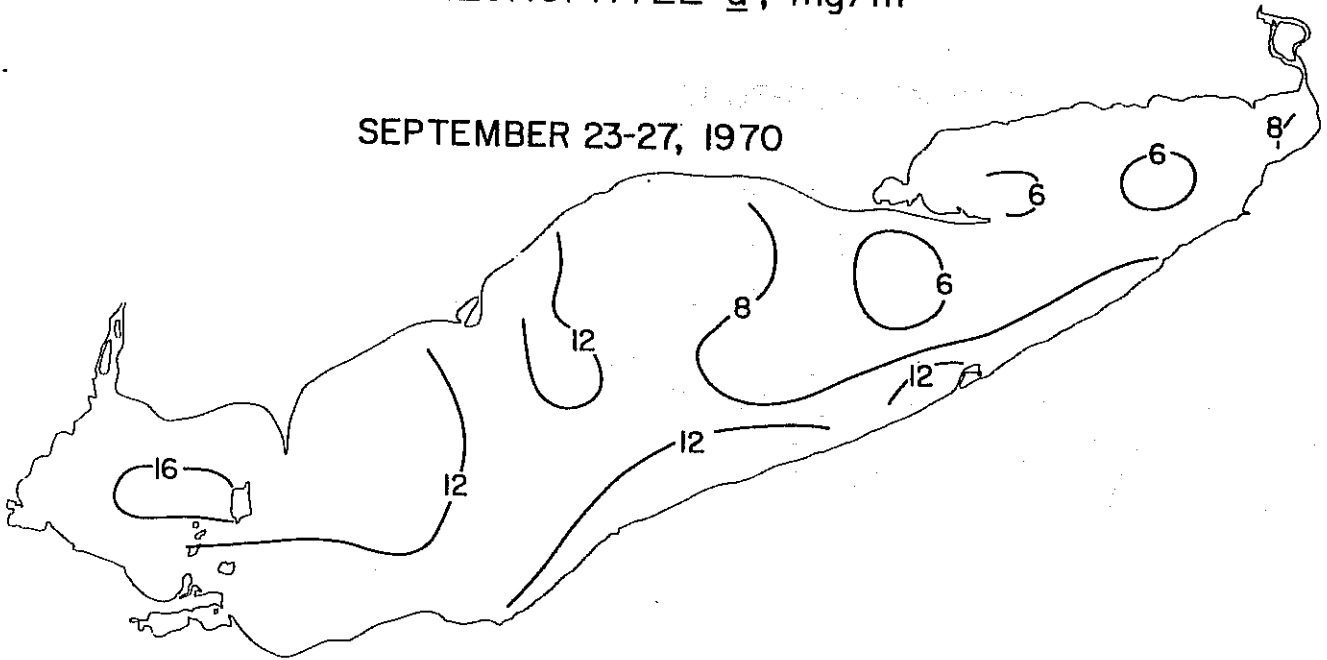


AUGUST 25-29, 1970

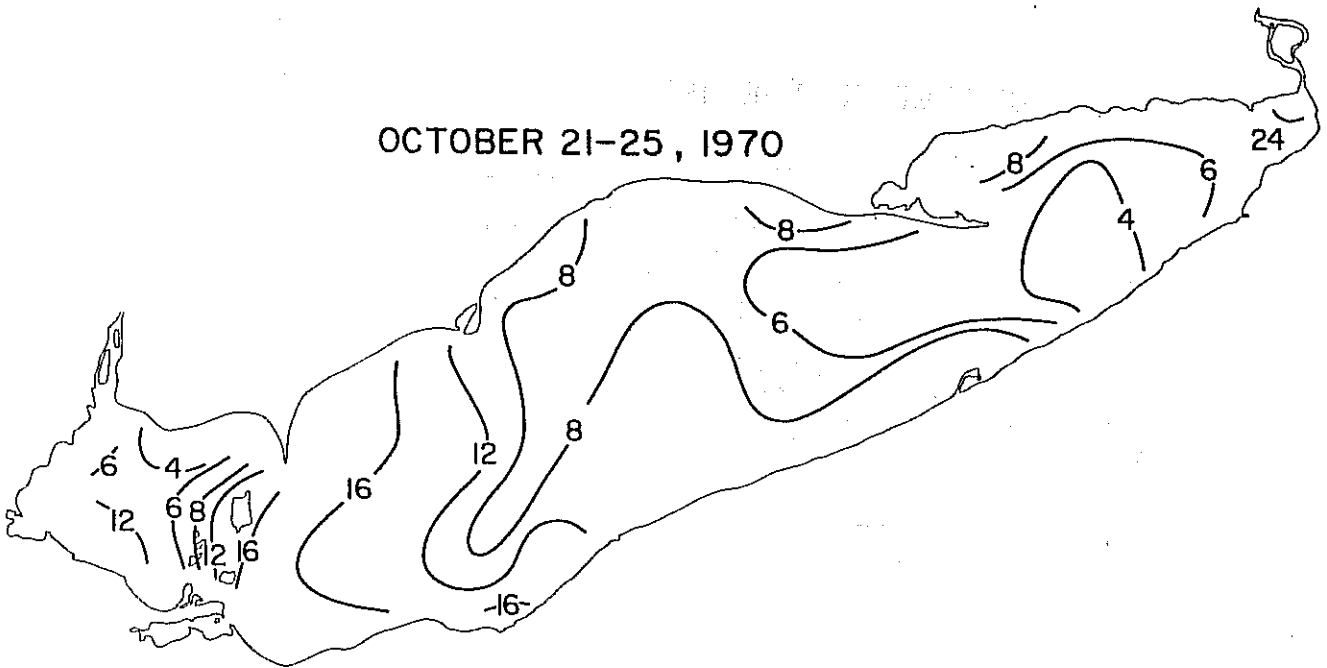


TOTAL CHLOROPHYLL a, mg/m<sup>3</sup>

SEPTEMBER 23-27, 1970

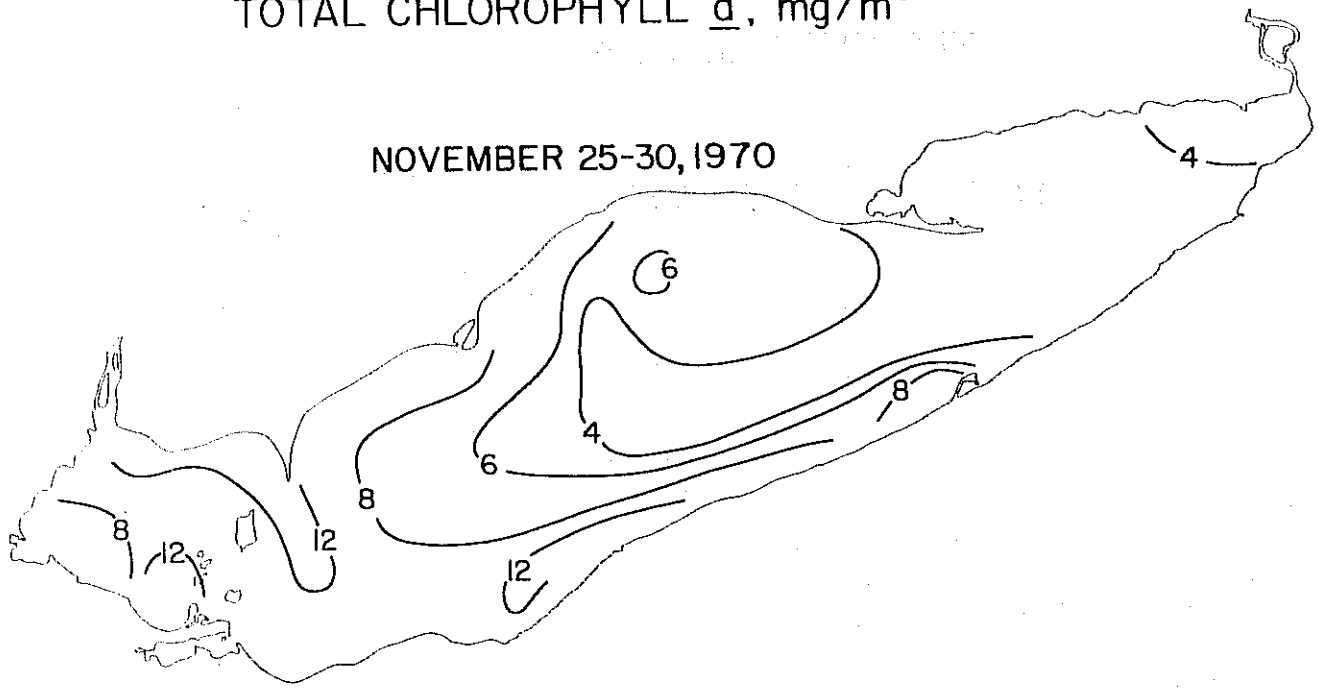


OCTOBER 21-25, 1970

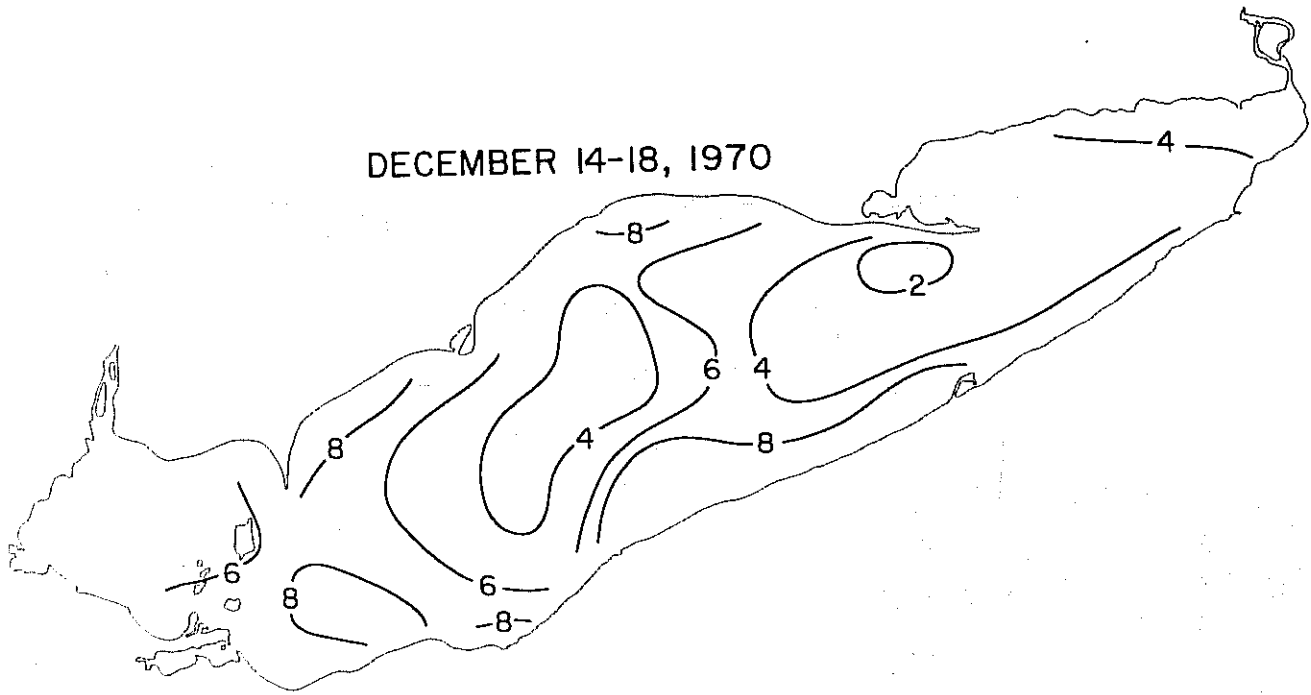


TOTAL CHLOROPHYLL a, mg/m<sup>3</sup>

NOVEMBER 25-30, 1970



DECEMBER 14-18, 1970



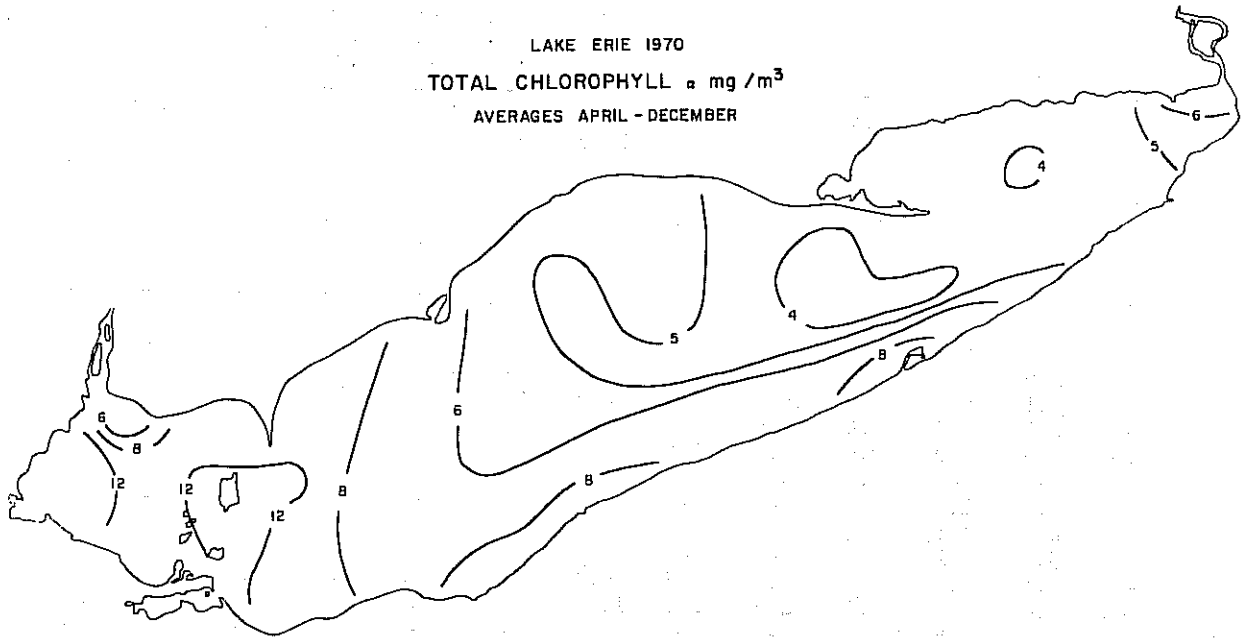


TABLE 1

Station Values of Surface Chlorophyll a (mg/m<sup>3</sup>) for Lake Ontario, 1970.

Cruise Station	01	02	03	05	06	07	08	09	12	13	14	15	16
01	-	2.6	2.9	5.9	5.2	8.4	12.0	8.4	5.7	9.9	15.1	4.2	3.1
02	-	2.8	4.1	-	-	-	-	-	-	-	-	-	-
03	1.3	2.5	5.1	8.9	6.3	5.4	12.8	7.5	5.4	13.0	25.4	2.5	2.5
04	-	2.7	-	-	-	-	-	-	-	-	-	-	-
05	-	2.8	3.4	-	-	-	-	-	-	-	-	-	-
06	-	2.7	2.6	4.1	7.1	4.8	12.7	6.5	3.4	8.6	14.8	4.1	2.3
07	-	2.7	4.0	-	-	-	-	-	-	-	-	-	-
08	-	2.7	-	-	-	-	-	-	-	-	-	-	-
09	-	3.0	3.1	5.5	8.8	8.3	5.4	4.6	1.1	12.5	15.2	4.9	3.0
10	-	2.2	1.3	-	-	-	-	-	-	-	-	-	-
11	-	2.2	2.0	2.9	3.9	4.7	12.9	8.8	5.0	10.9	12.8	4.2	1.5
12	-	2.4	0.8	3.6	4.2	4.8	10.6	5.3	7.5	12.5	12.9	4.4	1.2
13	-	2.3	0.2	-	-	-	-	-	-	-	-	-	-
14	-	2.0	0.1	3.4	4.6	6.4	9.8	6.4	3.2	8.1	17.8	4.2	1.7
15	3.0	2.8	1.2	9.6	17.7	5.5	12.0	7.8	6.0	6.1	14.8	4.7	2.5
16	-	1.9	-	-	-	-	-	-	-	-	-	-	-
17	-	1.9	-	-	-	-	-	-	-	-	-	-	-
18	1.3	2.0	1.5	5.8	4.0	6.4	8.5	5.2	3.0	8.5	11.1	3.3	1.6
19	-	2.1	-	-	-	-	-	-	-	-	-	-	-
20	-	2.1	-	-	-	-	-	-	-	-	-	-	-
21	-	2.1	-	-	-	-	-	-	-	-	-	-	-
22	0.5	1.8	4.2	4.4	15.2	9.0	6.3	6.3	3.9	7.1	7.5	4.6	1.5
23	-	1.9	5.2	-	-	-	-	-	-	-	-	-	-
24	-	1.9	-	-	-	-	-	-	-	-	-	-	-
25	-	2.1	6.4	2.9	15.6	7.3	2.9	7.4	3.0	7.9	8.4	3.9	2.0
26	-	2.0	3.7	9.4	19.5	6.7	4.1	7.6	1.9	7.8	4.6	4.4	2.3
27	1.0	1.9	2.0	2.9	2.8	4.5	4.2	6.2	5.3	6.7	8.0	4.0	1.1
27A	-	-	-	3.1	3.6	4.9	14.8	6.0	2.5	7.4	10.2	3.7	1.5
28	1.2	2.1	1.6	-	-	-	-	-	-	-	-	-	-
29	-	4.9	1.1	-	-	-	-	-	-	-	-	-	-
30	-	5.3	1.1	-	-	-	-	-	-	-	-	-	-
31	-	2.1	1.8	3.9	3.8	5.8	10.7	5.0	4.4	3.0	4.2	4.0	3.5
32	-	3.0	1.6	4.1	4.3	4.8	11.8	5.6	3.3	9.4	5.2	3.1	2.4
33	-	2.5	1.8	-	-	-	-	-	-	-	-	-	-
34	-	1.9	2.1	2.8	3.4	3.9	15.1	6.9	2.5	7.7	5.5	4.3	2.1
35	-	2.2	1.8	-	-	-	-	-	-	-	-	-	-
36	0.8	2.1	2.9	3.3	3.9	4.5	7.2	4.3	4.7	7.8	8.3	3.7	1.7
37	-	2.1	2.6	-	-	-	-	-	-	-	-	-	-
38	-	1.2	3.3	3.4	5.5	5.0	2.2	5.6	4.6	7.6	6.7	4.0	1.2
39	-	2.3	10.0	6.8	17.7	6.1	4.2	4.2	3.0	4.0	6.6	5.1	2.4
40	-	3.6	5.1	6.0	9.9	7.3	2.6	4.0	4.1	8.1	8.0	5.2	3.7
41	-	3.1	3.4	-	-	-	-	-	-	-	-	-	-
42	-	2.3	2.1	-	-	-	-	-	-	-	-	-	-
42A	-	-	-	3.4	4.0	5.2	4.9	4.0	3.5	6.7	7.3	3.7	1.7
43	0.8	3.1	2.1	3.0	3.1	3.9	5.6	4.4	5.5	7.8	7.0	3.9	1.7
43A	-	-	-	3.2	3.5	4.7	10.6	6.4	2.7	5.6	7.8	4.0	1.7
44	-	2.9	3.8	-	-	-	-	-	-	-	-	-	-
45	-	2.9	3.4	4.1	4.8	5.7	8.5	5.5	3.1	3.8	4.7	3.2	2.0
46	-	2.3	3.2	3.4	7.0	5.6	11.1	4.6	3.8	2.6	4.2	4.0	2.1
46A	-	-	-	2.8	4.6	4.5	19.4	6.5	3.3	6.9	6.6	3.9	1.6
47	-	2.3	3.5	-	-	-	-	-	-	-	-	-	-
48	1.0	3.6	2.9	3.0	4.1	4.6	17.2	4.9	3.1	8.2	5.4	4.0	1.7
48A	-	-	-	3.0	4.7	5.4	10.4	7.4	3.7	8.3	5.4	2.9	1.6
49	-	2.2	2.5	3.2	10.9	8.2	5.9	5.6	3.9	7.1	6.0	4.1	2.2
50	-	1.9	5.8	9.2	14.6	7.3	6.9	3.0	4.4	10.2	6.6	4.0	2.6
51	-	3.3	4.2	6.4	14.0	5.4	5.4	2.6	5.4	10.2	6.6	4.0	3.7
52	-	2.1	4.1	-	-	-	-	-	-	-	-	-	-
53	-	2.1	3.4	3.3	5.5	5.7	4.3	5.3	4.8	7.6	5.8	3.5	2.6
53A	-	-	-	3.3	3.9	4.6	8.6	3.1	3.5	6.8	5.4	3.5	2.1
54	-	2.1	3.1	-	-	-	-	-	-	-	-	-	-
55	-	2.2	2.6	-	-	-	-	-	-	-	-	-	-
56	1.0	2.1	2.5	3.3	2.9	3.5	10.5	3.0	2.6	6.5	6.3	3.6	2.4

TABLE 1 continued

Cruise Station	01	02	03	05	06	07	08	09	12	13	14	15	16
56A	-	-	-	3.4	3.3	4.4	3.9	3.1	3.3	6.1	6.3	3.2	2.0
57	-	1.6	2.4	-	-	-	-	-	-	-	-	-	-
58	-	1.6	2.4	-	-	-	-	-	-	-	-	-	-
59	-	1.7	2.2	3.0	3.7	4.6	9.4	5.0	2.9	6.1	6.0	3.1	2.9
60	-	2.2	4.7	-	-	-	-	-	-	-	-	-	-
61	-	2.6	3.2	8.7	17.7	7.8	15.0	7.9	3.0	7.5	5.8	3.2	3.2
62	-	2.4	5.3	-	-	-	-	-	-	-	-	-	-
63	-	2.1	3.2	-	-	-	-	-	-	-	-	-	-
64	-	1.4	2.5	3.0	3.9	3.5	11.1	2.9	4.4	8.0	4.2	3.9	2.3
64A	-	-	-	3.1	5.2	4.4	7.4	4.0	4.0	7.1	3.6	4.2	2.0
65	0.3	2.1	3.4	3.3	4.7	5.1	10.8	4.6	3.3	7.9	5.1	3.7	2.3
65A	-	-	-	3.4	8.5	5.4	5.6	5.9	5.3	7.0	3.5	3.9	2.8
66	-	2.7	4.2	-	-	-	-	-	-	-	-	-	-
67	-	3.8	6.7	8.1	9.3	6.9	3.4	5.0	4.6	8.4	6.2	5.6	4.6
68	-	2.8	4.7	-	-	-	-	-	-	-	-	-	-
69	-	2.9	6.1	5.4	10.4	7.1	6.5	4.0	4.1	8.6	4.5	4.0	2.9
69A	-	-	-	3.6	7.6	6.3	7.3	5.6	5.3	6.5	4.3	3.6	3.1
70	0.6	2.3	2.6	3.4	4.3	4.6	9.2	6.1	5.9	7.0	5.4	3.4	2.1
70A	-	-	-	2.9	3.2	4.9	9.8	7.2	4.4	6.5	3.5	3.7	2.6
71	-	1.4	3.2	-	-	-	-	-	-	-	-	-	-
72	-	-	3.2	3.1	3.1	4.6	12.8	6.6	2.8	4.6	4.3	3.1	2.4
72	-	2.2	3.5	4.4	8.6	6.4	13.6	6.4	3.5	6.9	4.5	3.1	2.4
73	-	5.5	8.0	6.2	12.4	5.6	13.2	9.9	3.1	7.7	6.3	4.3	3.7
74	-	2.4	3.2	-	-	-	-	-	-	-	-	-	-
75	-	1.7	3.4	-	-	-	-	-	-	-	-	-	-
76	-	1.6	2.7	2.5	3.2	3.6	12.0	8.0	3.9	6.1	4.5	3.0	2.2
77	-	1.8	2.7	-	-	-	-	-	-	-	-	-	-
78	0.7	2.1	2.6	2.7	5.4	4.7	12.8	8.4	3.4	6.3	4.8	2.5	2.7
79	-	2.8	-	-	-	-	-	-	-	-	-	-	-
80	-	3.5	-	4.0	6.7	7.8	7.7	8.6	5.3	7.9	4.9	3.4	2.7
81	-	3.7	-	-	-	-	-	-	-	-	-	-	-
82	-	3.1	-	4.7	12.2	4.5	11.8	8.2	5.6	7.6	4.5	3.7	4.1
83	1.4	1.5	-	3.6	3.0	3.6	8.8	5.4	3.9	6.5	5.8	3.3	2.1
83A	-	-	-	3.0	4.5	3.9	11.8	7.5	2.8	7.7	6.1	3.5	3.3
84	-	1.8	3.3	-	-	-	-	-	-	-	-	-	-
85	-	3.1	3.8	6.4	3.8	6.0	6.6	7.5	2.8	9.9	4.3	3.7	3.4
86	-	4.4	5.3	-	-	-	-	-	-	-	-	-	-
87	-	3.0	4.3	4.9	5.6	6.0	8.1	9.6	4.3	7.4	5.1	3.6	3.0
88	-	1.9	-	-	-	-	-	-	-	-	-	-	-
89	-	2.8	-	4.9	6.0	4.5	11.0	5.5	4.1	7.7	4.6	3.5	3.0
90	-	3.1	-	-	-	-	-	-	-	-	-	-	-
91	-	-	-	6.5	17.1	6.3	5.2	9.7	4.2	8.0	4.1	3.7	4.3
92	-	-	-	-	15.6	6.9	-	4.7	6.8	8.9	3.8	4.4	4.3
93	-	-	-	6.6	12.8	5.3	8.5	8.1	7.1	7.8	4.9	3.7	3.8
94	-	-	-	5.5	11.2	7.1	-	5.4	6.1	6.2	3.6	4.5	4.5
95	-	-	-	5.8	12.2	6.9	8.0	8.4	4.8	8.7	5.5	4.2	4.3

TABLE 2

Station Values of Surface Chlorophyll a (mg/m<sup>3</sup>) for Lake Erie, 1970.

Cruise Station	01	02	03	05	06	07	09	10	11	12
01	-	6.6	6.6	2.1	5.2	1.9	6.8	6.3	5.6	4.9
02	3.0	4.4	5.1	3.6	4.6	2.7	6.7	6.2	3.4	4.9
03	2.6	4.9	6.9	1.7	3.1	3.1	6.6	3.5	2.3	3.0
04	1.0	4.5	8.0	2.7	7.9	2.2	6.7	3.4	2.7	2.2
05	9.8	9.1	7.2	7.7	11.4	3.9	9.6	8.1	4.2	7.6
06	2.5	4.6	2.5	1.7	2.4	0.6	5.0	5.6	4.0	0.8
07	3.3	6.4	2.5	0.8	3.9	3.2	7.4	6.7	3.7	3.9
08	9.3	6.3	6.5	3.0	4.1	1.8	14.7	10.2	10.5	9.8
09	3.3	8.6	5.6	1.0	4.6	3.4	8.1	9.8	4.9	6.2
10	6.7	5.9	5.2	1.3	4.7	3.3	9.6	6.8	6.7	5.8
11	3.9	5.5	3.2	4.7	5.1	1.0	11.8	8.1	7.4	7.5
12	2.6	4.1	2.4	2.5	2.9	3.3	13.7	9.3	9.2	7.3
13	3.3	3.8	3.6	3.8	4.5	6.2	12.3	6.5	7.6	5.3
14	5.1	3.7	4.1	1.6	5.0	7.0	13.6	7.8	4.6	3.4
15	7.9	5.4	4.5	5.3	9.7	2.5	11.8	14.0	13.2	4.4
16	9.4	5.6	6.2	8.2	10.0	23.3	13.7	14.6	11.2	7.5
17	9.4	5.9	4.0	9.0	9.0	21.1	11.8	14.2	10.7	7.9
18	8.8	6.0	3.4	5.6	13.4	6.4	13.7	16.5	11.5	10.1
19	9.9	6.4	3.8	6.9	6.3	6.9	9.6	14.6	13.8	7.2
20	6.0	4.6	4.3	3.8	5.2	3.3	11.1	10.2	9.4	6.1
21	8.0	5.6	3.2	3.6	5.1	2.5	11.8	15.8	10.0	8.1
22	4.6	3.2	4.0	3.8	3.7	11.4	13.2	14.7	8.2	6.8
23	18.0	5.7	3.9	13.6	9.3	17.9	14.9	19.7	13.8	7.0
24	3.1	5.9	2.7	11.1	12.6	27.1	15.2	2.8	10.3	4.9
25	2.3	6.0	10.3	5.2	5.1	3.0	5.4	4.1	12.3	4.3
26	4.3	9.6	10.9	35.8	9.6	30.2	15.6	7.5	10.9	5.3
27	3.1	7.1	9.9	28.4	5.6	31.8	15.7	12.9	6.5	4.2
28	7.7	4.2	6.4	9.9	9.3	20.8	12.8	4.7	13.4	5.1
29	16.6	7.0	5.3	17.5	18.1	39.3	22.4	12.8	9.9	5.8
30	12.1	6.3	2.8	13.6	18.3	22.3	9.6	17.4	10.2	7.9
31	11.1	5.4	5.2	14.4	16.3	9.6	10.5	21.6	11.1	6.5
32	9.7	4.7	2.4	4.5	6.3	8.9	10.4	15.2	13.4	9.5
33	4.8	3.5	3.7	2.2	4.8	22.3	14.0	21.8	9.4	10.1
34	4.6	3.2	3.6	4.8	3.9	5.8	11.3	11.9	8.5	6.9
35	3.6	3.0	3.5	4.3	4.8	10.1	14.9	14.6	6.5	5.2
36	5.6	4.3	4.9	3.3	5.2	3.7	9.7	7.1	6.9	3.5
37	6.9	4.7	5.5	7.0	4.0	5.7	15.0	10.5	12.3	9.4
38	5.8	5.0	6.8	1.5	4.1	3.3	10.1	9.2	3.6	8.1
39	0.0	6.1	-	1.0	4.1	4.0	11.3	8.1	3.4	2.9
40	4.8	4.4	2.8	1.4	3.9	5.1	10.5	6.1	3.5	2.1
41	6.1	4.5	3.8	3.3	3.5	5.5	10.6	7.2	5.7	8.3
42	6.3	5.6	2.7	1.4	3.5	4.8	11.3	6.2	4.0	5.9
43	4.0	5.9	3.0	1.7	2.6	3.7	7.3	8.4	4.5	5.4
44	2.5	3.7	3.7	1.9	2.4	4.4	7.7	4.9	5.4	3.7
45	6.7	5.2	5.1	4.6	4.7	8.0	11.3	10.2	7.9	10.6
46	-	6.6	6.2	9.6	4.5	9.4	14.3	14.6	13.3	14.6
47	4.3	4.1	3.9	1.1	2.8	4.4	5.8	4.3	2.6	2.5
48	1.7	4.9	4.9	5.3	2.8	10.4	6.9	5.3	2.5	2.0
49	2.6	3.8	11.3	1.4	3.5	6.0	5.2	5.6	2.5	2.9
50	3.1	3.4	4.0	1.5	2.5	5.6	7.1	9.9	3.1	3.0
51	2.8	4.3	8.5	1.9	4.1	5.2	6.7	8.4	2.5	2.4
52	-	4.6	5.0	1.9	5.2	6.0	9.2	3.4	2.5	7.3
53	-	3.5	9.5	1.6	3.0	6.1	5.3	5.2	2.9	3.6
54	-	5.1	-	1.7	5.4	6.0	7.1	6.5	3.4	2.8
55	-	5.4	5.4	4.5	4.8	7.1	8.1	6.9	5.0	4.8
56	-	5.9	7.3	6.4	3.2	4.5	7.1	24.3	4.3	3.9

Table 3

Average total surface chlorophyll a values  
for Lake Erie basins by cruise with basin  
ratios, 1970

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<u>Cruise Date</u>	Average surface chlorophyll <u>a</u> $\mu\text{g/L}$ , by basin			Ratio <u>E:C:W</u>
	East	Central	West	
7 - 11 April	3.4	5.5	8.8	1-1.6-2.6
6 - 10 May	5.1	5.0	6.2	1-1-1.2
2 - 6 June	6.7	4.1	6.0	1-0.6-0.9
3 - 7 July	3.4	3.5	15.4	1-1-4.3
28 July - 1 August	4.6	5.0	11.1	1-1.1-2.3
25 - 29 August	5.3	6.5	21.1	1-1.2-3.9
23 - 27 September	7.5	11.3	13.3	1-1.5-1.8
21 - 25 October	7.6	10.4	11.9	1-1.4-1.6
25-30 November	3.9	7.6	11.2	1-2-2.9
14 - 18 December	4.5	6.3	6.1	1-1.4-1.4
Yearly average	5.2	6.5	11.1	1-1.3-2.1