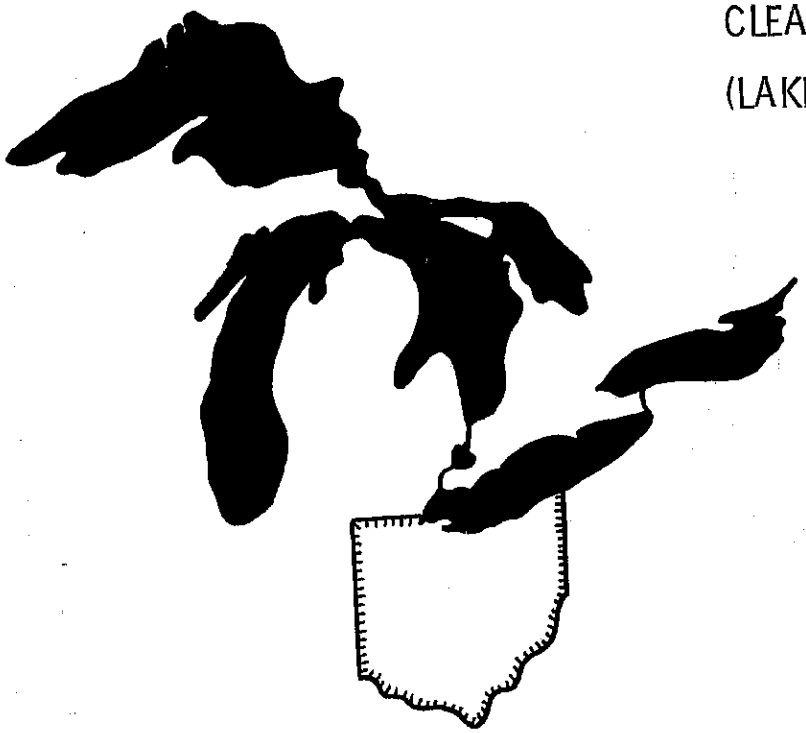

CLEAR TECHNICAL REPORT NO. 242

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LAKE ERIE INTENSIVE STUDY: NEARSHORE BENTHIC MACROINVERTEBRATES-- DETROIT RIVER TO HURON, OHIO

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INTRODUCTION

Review of of Historical Studies

Early studies of bottom organisms in the Great Lakes were placed into two distinct groups by Wright (1955). These studies consisted almost entirely of general qualitative reports like that of Cutler (1929) who investigated conditions of pollution along the shore at the east end of Lake Erie. The specific industry discharging contaminants was identified but he did not report the number of benthic organisms found. In addition, there were many reports that focused on a special group of organisms such as the paper on the leeches of Ohio of by Miller (1929). Lists of these early specific reports can be found in papers by Osborn (1930) and Wright (1955).

The western basin was studied during the period of 1929-1930 by Wright and Tidd (Wright 1955; Wright and Tidd 1933). They reported that the bottom fauna was domainted by Hexagenia and that its importance declined at river mouths, harbors and on harder substrates. Wright set up an arbitrary standard for determining degrees of polllution, based on the abundance of oligochaetes and Hexagenia. Clean conditions were indicated by more than 100 Hexagenia/m^2 and less than 100 Tubificidae/m^2. One hundred to 999 Tubificidae/m^2 represented light pollution, 1000 to 5000 moderate pollution, and more than 5000/m^2 heavy pollution. Using these criteria they stated that most of the western basin was unpolluted except for the mouths of the Detroit, Raisin and Maumee Rivers.

While Wright and Tidd were studying the western basin, Fish (1929, 1960) carried out a biological and limnological survey of the central and eastern basins.

The early work of Krecker (1924, and in Langlois 1954) and Krecker and Lankaster (1933) and others suggested that the littoral zone is inhabited by a different and more varied fauna than that of deeper waters. The presence of swift-water animal communities on wave-beaten shores resembling those of different stream stages was noted by Krecker (1924).

In 1937, Shelford and Boesel (1942) studied the region of Gibraltar Island to a depth of 6 m. They identified three community types according to the dominant species present. They found the Goneobasis-Hydropsyche community on areas swept clear of sand and silt by wave action and currents, the Pleurocera-Lampsilis community on sandy bottoms and the Hexagenia-Oecetis community of mud bottom areas also containing many chironomid larvae, molluscs, amphipods, and oligochaetes.

In a 1952 study of the bottom fauna of ten Ohio shoreline river mouths, Brown (1953) utilized his data of Tubificid populations and Wright's index to assess the pollution status of these various streams. Other data on changes of the bottom fauna followed (Britt 1955a, 1955b and Beeton 1961).

Wood (1963) sampling in 1951-1952 found a fauna that consisted of 34 percent Hexagenia and 25 percent molluscs. He found oligochaetes but did not include them in his population estimates.

Britt showed the dramatic effects that a short period of thermal stratification and low oxygen in the western basin could have on the benthic macroinvertebrate population. In August and September of 1953, high temperatures and calm weather resulted in oxygen depletion of the bottom waters. Bottom collections revealed 465 dead Hexagenia nymphs/m^2. Later collections yielded an average of 44 live nymphs/m^2, indicating a greatly reduced population. In the following years the population was found to be large again (Britt 1973) with an occasional indication of unfavorable conditions.

In a series of papers Beeton (1960, 1961, 1965, 1966) compared data from spans of up to sixty years showing the changes that have occurred to the biota of Lake Erie and to the rate of eutrophication. He reported an increase in major ions as much as 10 ppm, an increase of mean annual water temperatures, 1.1^{o}C warmer in recent years, and also a large area of oxygen depletion. The commercial fishery which once depended on the blue pike (Stizostedion vitreum glaucum) and the cisco (Coregonus artedii) now found these species that needed cold water and a high dissolved oxygen content scarce. Beeton also reported major changes in the bottom fauna. The once abundant Hexagenia population (Britt 1955) had decreased severely and the more pollution-tolerant tubificids had increased from 12/m^2 in 1929 to 551/m^2 in 1957 and 612/m^2 in 1958. Midge larvae had also increased from 56/m^2 in 1929 to 299/m^2.

Changes in the crustacean zooplankton of the island area of the western basin between 1938 and 1959 were shown by Bradshaw (1964).

As evidence for the eutrophication of Lake Erie, Davis (1964), supplied with 25 years of phytoplankton records from the Cleveland Division of Water and Heat showed a constant increase in the average quantity of phytoplankton along with other qualitative changes. An unpublished 1964 investigation of benthos indicated mostly pollution-tolerant forms over most of the central basin (Davis 1966).

At two stations in the Put-in-Bay region Smith (1966) found 15 species of Oligochaetes with the genus Limnodrilus being the most abundant. He found a greater density of oligochaetes and a lesser diversity at his station of 10 meters depth than at his station of two meters depth.

The area of the western basin that was covered by Wright and Tidd in 1929-1930 was resurveyed in 1961 by Carr and Hiltunen (1965). They compared their results with those of Wright and found that the area of pollution, based on the abundance of oligochaeta increased from 263 km^2 in 1930 to 1020 km^2 in 1961. The most important changes in the fauna were: ninefold increase in Oligochaeta; fourfold increase in Chironomidae; twofold increase in Sphaeriidae; sixfold increase in Gastropoda, and a reduction of Hexagenia to less than 1 percent of former abundance. Numbers of Oligochaetes were highest

near the mouths of the Detroit, Raisin, and Maumee rivers. Other papers spawned from the 1961 study showed that Limnodrilus species made up 90 percent of the Oligochaeta found (Hiltunen 1969) and gave evidence of the increasing frequency of oxygen depletion during thermal stratification in the western basin (Carr 1962; Carr, Applegate, and Keller 1965).

The 1967 study of Veal and Osmond (1968) had findings similar to those of Carr and Hiltunen (1965). Veal and Osmond (1968) studied the western basin and the northern shore zones of the central and eastern basins. They found great densities of oligochaetes in the western basin and reported that Hexagenia occurred in their collections from the eastern basin but was absent from the western and central basins. They also categorized the worm fauna into three associations that were basin-dependent.

In a study that overlapped that of Veal and Osmond's study of the nearshore zone of Canada (1968), Barton and Hynes reported on the distribution and seasonal variations of macrobenthic populations in the wave-zone of Lake Erie (1976, 1978a, 1978b).

Brinkhurst (1965) questioned Wright's validity for using an arbitrary standard for determining degrees of pollution and stated that there is no universal indicator species of worm. However, Britt et al. (1973) felt the standard was useful for comparison of benthic conditions.

Brinkhurst, Hamilton, and Herrington (1968) found that eighteen oligochaete species of Lake Erie are divisible into three associations corresponding to the three basins. This was also expressed by Veal and Osmund (1968) and Cook and Johnson (1974). Brinkhurst et al. (1968) also provided calculations of the trophic conditions of each area of the Great Lakes to aid in comparisons of various bodies of water.

The Federal Water Pollution Control Administration (1968) found thirty-four benthic species during their lake surveys on 1963, 1964, 1967, and 1968.

Using data collected in 1961 from 40 stations in western Lake Erie, Hiltunen (1969) found that five species of Limnodrilus were most abundant comprising 90 percent of all Oligochaetes at 33 of the 40 stations. Numbers of Limnodrilus were large near the mouths of the Detroit, Raisin, and Maumee rivers and decreased progressively lakeward. A pollution-intolerant species, Stylodrilus heringianus, was not found in the western end of the lake but is common in the eastern end.

Cook and Johnson (1974) made a review of the literature on the benthic macroinvertebrates of the Great Lakes and found much evidence for the idea of decreased eutrophication of Lake Erie as one moves east. Using the data of Brinkhurst et al. (1968), Veal and Osmond (1968) and others, they demonstrated the shift through three associations from west to east. In the western basin, they describe the highly eutrophic Limnodrilus spp. association along with Valuata sincera, several sphaeriids, the chironomids Procladius bellus, Coelotanypus concinnus, Cryptochironomus sp., and Chironomus plumosus. Other

species join the community further out in the western basin (Aulodrilus spp., Potamothrix spp., Branchiura sowerbyi, Peloscolex multisetosus, and P. ferox) and can be considered mesotrophic. Peloscolex ferox was the most abundant species of the central basin while Stylodrilus heringianus was dominant in the deep basins of all the lakes, and Tubifex tubifex were the main oligochaetes of the eastern basin. Many other species whether pollution-tolerant and found in the western basin, or pollution-intolerant and found in the eastern basin were given.

A comparison of various bio-indexing systems as applied to benthic organisms was carried out by Berganty (1977). He found Goodnight and Whitley's (1961) index of percent Tubificidae to be a gross test of water quality as it took into account only one major taxonomic group and did not show a marked difference between stations along the Buffalo River that had varying water qualities.

Methods

Macrobenthic organisms were collected by the use of a 23 x 23 cm Ponar dredge. The samples were sieved through a number 30 USGS standard sieve (0.91 mm openings) using the boat's hose and lake water. The material retained by the sieve was transferred to plastic jars and preserved with 10 percent formalin and then transported to the laboratory for identification.

At the laboratory a solution of Rose Bengal and ethyl alcohol was added to each sample to stain the animal organic matter pink, to provide contrast with the substrate. The staining process was allowed to continued for at least 24 hours before the organisms were picked from the sample. To insure that all organisms were counted and that skewed results do not occur in favor of dominant species, all benthos were removed from the sample. Each sample was rinsed in a sieve and then poured into a white enamel pan. The sediment substrate was flushed with water several times and the water poured into a fine mesh sieve number 40 USGS. This process was repeated several times until visual observation indicated the absence of organisms from the sediment. A careful check of the substrate insured a recovery of 95 to 100 percent of benthos in each sample. This method proved efficient for the smaller benthos, which constitute a larger percentage of total organisms. The benthos were placed in numbered vials of 70 percent ethanol for later identification.

The contents of each vial were examined with the use of a dissecting microscope at magnifications from 15-30X. This stage of analysis was used to separate immature and mature oligochaetes and for the analysis of larger benthos (i.e., amphipods, oligochaetes, leeches, etc.). Representative specimens of chironomid genera were wet mounted for examination of the head capsule. This is a recommended method where large numbers of midges are to be identified. The clearing of head capsules is not usually necessary for identification to the generic level because of morphological features specific to each of the existing genera. At this point any unidentified species were retained for further examination and the remaining organisms were stored.

Adult oligochaetes were placed in an ascending alcohol series to prepare them for permanent slides. The specimens were run through a series of 70 percent ethanol for 24 hours, 95 percent ethanol for two hours, 100 percent ethanol for two hours and xylene for 12 hours after which they could be mounted in Permount. Each slide was labelled with station number and allowed to dry for 48 hours. Identification was made using a compound microscope with special attention given to the taxonomic features of setae size and shape, and size and shape of penis sheath and head.

RESULTS AND DISCUSSION

Quality Control

Replicate samples were taken at 121 stations during the study. Two replicate samples were taken at each quality control station except at seven stations where three samples were taken. Table 1 lists the data and statistical analysis of the quality control comparisons. Total number of organisms ranged from 28,516/m^2 at station 205 to 0/m^2 found at several stations. Total number of organisms differed greatly between most of the replicate samples and similarities ranged from 2.0 percent to 100.0 percent excluding those stations at which one replicate sample contained no organisms (0.0 percent similarity). The average percent similarity for total organisms during the entire study was 45.3 percent. Number of taxa ranged from 12 to 0 and similarity between replicate samples ranged from 100.0 percent to 12.5 percent. Combining the replicate samples produced, a total taxa range of up to thirteen taxa. Percent similarities of taxa shared between the replicate samples, percent Oligochaetes and percent similarity of Oligochaete content between replicate samples, all ranges ran the entire length of possible percentiles.

Krieger (1981) also found a great variation between replicate samples in his nearshore study of the central basin and repeated the importance of replicate samples for determining precise densities and taxonomic compositions. He also reviewed the findings of Brinkhurst (1967) who suggested at least four replicate samples were sufficient to reveal the correct rank order of the most abundant Oligochaete species and Mason (1976) who determined that 40 replicate grabs may be needed to correctly estimate the number of individuals within $\pm$20 percent. Krieger (1981) also states that seasonal variation in the recruitment of new cohorts, growth of earlier cohorts, insect emergences, and mortality may be responsible for increasing the difference between stations that were sampled at different times of the year.

Area and Station Comparisons

Twenty-six species of benthic macroinvertebrates were found in the western basin nearshore zone in 1978 and 1979 (Table 2).

During the spring cruise of 1978 the mean density of total benthic organisms at each station ranged from 0.0/m^2 at four stations (126, 215, 216, 226) to 3551.3/m^2 at station 205 and 2863.7/m^2 at station 206. For the summer 1978 cruise, the range ran from 0.0/m^2 at three stations (112, 119, and 125)

to up to 2709.9/m^2 at station 206 for total mean density. A range of 0.0/m^2 for five stations (104, 118, 126, 225 and 228) up to 8244.8/m^2 for station 125 was found for total mean density of benthos during the summer 1979 cruise.

Major Taxonomic Group Summary

Oligochaeta. Oligochaetes were found to cover the entire range of the nearshore sampling area except at those stations where either no sample could be taken or no organisms were found in the sample. However, two stations did include chironomids and not oligochaetes, those being 126 and 214 (Appendix A, Figure 1).

The percentage of oligochaetes in a sample was the basis of a system of pollution classification by Goodnight and Whitley (1961). Tables 3, 4, and 5 show the percentage of oligochaetes at each station according to their classifications.

The spring cruise of 1978 found 32 stations that were made up of over 80 percent oligochates (polluted). There were 13 stations with 60 percent to 80 percent oligochaetes (doubtful) and 10 stations with less than 60 percent oligochaetes (good condition) (Figure 2). The summer cruise of 1978 had a much different overall look using the index, due to the marked increase in the numbers of the cladoceran Leptadora kindtii and various chironomids. Only 12 stations had over 80 percent oligochaetes (polluted), 11 stations with 60 percent to 80 percent oligochaetes (doubtful) and 37 stations were considered in good condition (less than 60 percent) (Figure 3). Sampling in 1979 (Figure 4) produced results more like that of the first cruise of 1978 within the index. Polluted stations numbered 27, doubtful stations numbered 18, and stations with good conditions numbered 15. However stations were variable between samplings and many fell into different categories when compared on different cruises.

Another pollution standard index also based on the fact that high oligochaete density and large oligochaete contributions to the total benthic fauna are indicators of organic pollution was established in a 1955 paper by Wright (Krieger 1981). Heavy pollution was indicated by more than 5,000 tubificid per meter squared. Moderate pollution was 5000/m^2 to 1000/m^2. Light pollution was indicated by 100-999 tubificids/m^2. Clean conditions were represented by less than 100 tubificids/m^2 and more than 100 Hexagenia nymphs/m^2. Since no Hexagenia were found during this study, the "clean" category cannot be properly used but was included for those cases in which less than 100 tubificids were found. Tables 6, 7 and 8 show the stations classified using Wright's (1955) index for each cruise.

Three stations fell into the 10,000 tubificids/m^2 category from the spring 1978 cruise (stations 105, 106 and 244) (Figure 5). These occur at the Maumee Channel and at the mouth of the Huron River. Station 206 was also classified in the 10,000/m^2 tubificids category during the summer 1978 cruise (Figure 6). No station fell into this range during the summer 1979 cruise (Figure 7). Again, this index, like the preceeding one, did not

consistently keep stations within a specific category and many changes were seen between cruises.

The oligochaete density made up an overwhelming majority of organisms collected. Immature tubificids without hair setae were found at almost every station and made up the majority of samples found. Limnodrilus cervix, L. claparedianus and Branchyura sowerbyi were the adults found most frequently during the study. Other less common taxa also found were immatures with hair setae, Limnodrilus cervix-claparedianus intermediate, L. hoffmeisteri, L. maumeensis, L. profundicola, L. udekemianus, Peloscolex sp., Potamothrix moldaviensis, and Ophidonais serpentina (Figures 8-34).

Chironomidae. Midgefly larvae were the second most abundant group of macroinvertebrates. They were just as widespread over the sampling area as the Oligochaetes and occurred at all stations except 103, 111, 202, 215, 222, 243 and 248 (Figure 35).

Chironomus sp. and Procladius sp. made up the bulk of the Chironomid population found and were widespread throughout the sampling area (Figures 36-46). Chironomus pupae and Procladius pupae were found at less than 25 percent of the stations and during the spring 1978 cruise only the pupae of Procladius were found at station 231 in Sandusky Bay. Other species were found less regularly and in much smaller proportions and included Tanytarus sp., Cryptochironomus sp., Polypedium sp. and Chaoborus albipes (Figures). Krieger (1981) stated that Chironomus sp. and Procladius sp. are considered to be among the midgefly larvae most tolerant to polluted water by many including Brinkhurst et al. (1968), Carr and Hiltunen (1965), and Britt et al. (1973).

Cladocera. The Cladoceran Leptodora kindtii was the third most abundant category in the study. L. kindtii was found at stations covering the entire study area both onshore and in open lake studies. The stations where it did not occur were 101, 111, 116, 117, 122, 123, 214, 216, 230 and 241 (Figure 56). It made up a majority of the population at many stations and its density ranged up to 1891/m^2 at station 226. During the spring 1978 cruise, it was only found at five stations (105, 108, 110, 125, 239) (Figure 57) and its density only reached a high point of 567/m^2. During the other two cruises, however, it was found throughout the study area (Figures 58 and 59).

The groups left remaining make up a small part of the overall benthic population.

Gastropoda. Snails were absent from the entire study except for one incident of the genus Physa that occurred at station 113 near the mouth of the Raisin River (Figure 60).

Amphipods. Gammarus fasciatus was the only species of amphipod present in the study. Its density never reached above 75/m^2 except at station 205 during the summer 1978 cruise, where it reached a peak density of 3404/m^2. Gammarus fasciatus was mostly found east of Locust Point except for a few

stations (205, 114). Gammarus fasciatus was found only at station 217 during the summer 1979 cruise (Figures 61-64).

Isopods. Isopods of the genus Asellus were found only at stations 237 during the summer 1978 cruise and 239 during the summer 1979 cruise. Both of these stations lie off the mouth of Sandusky Bay (Figures 65-67).

Hirudinea. Two species of leeches were found during the study. Helobdella stagnalis and H. elongata were found only occasionally in Maumee Bay and near Sandusky Bay (Figures 68-74) at stations 125, 203, 206, 207, 225, 227, 235.

Ephemeropterans. The Caenis genus of mayflies is one that is widely distributed in ponds, slow streams or backwaters (Pennak 1978). In this nearshore study it was found only at two stations: 203 at the mouth of the Maumee River and at 216 off of Locust Point, with densities of $38/m^2$ and $19/m^2$ respectively (Figures 75-77).

Pelecypoda. Mussels were noticeably absent in all phases of this study with only one individual being found during the entire study. The mussel of the genus Proptera was found at station 233 within Sandusky Bay (Figure 78). The method of collecting samples could be responsible for not collecting more mussels.

There were 21 stations in the western basin nearshore where no organisms were found in at least one of the replicate samples (Figure 79).

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TABLES

TABLE 1

VARIATION BETWEEN REPLICATE MACROINVERTEBRATE GRAB SAMPLES
PERCENTAGE SIMILARITIES (S) REPRESENT THE
SMALLER NUMBER DIVIDED BY THE LARGER, X 100

Station	Julian Date	Year	Total Organisms (#/m²)	Similarity (%)	No. of Taxa	Similarity	Total Taxa	Taxa Shared	% Taxa Shared	% Oligochaetes	Similarity (%)
101	117	78	38	11.2	1	100.0	1	1	100.0	100.0	100.0
101	117	78	340		1					100.0	
104	114	78	321	53.0	3	66.7	3	2	66.7	23.5	35.2
104	114	78	170		2					66.7	
105	114	78	1626	30.5	8	88.9	10	7	70.0	91.9	78.3
105	114	78	5333		9					72.0	
106	114	78	3234	85.4	4	80.0	6	3	50.0	99.4	99.8
106	114	78	2761		5					99.3	
108	114	78	1078	38.8	3	60.0	5	3	60.0	98.2	91.4
108	114	78	2780		5					89.8	
109	114	78	1664	77.2	4	75.0	4	3	75.0	70.4	92.2
109	114	78	2156		3					64.9	
110	114	78	38	13.4	1	33.3	3	1	33.3	100.0	20.0
110	114	78	284		3					20.0	
112	115	78	1570	60.3	3	100.0	4	2	50.0	88.0	72.7
112	115	78	946		3					64.0	
113	115	78	1229	81.5	6	100.0	8	4	50.0	75.4	90.1
113	115	78	1002		6					67.9	
114	115	78	132	43.2	2	50.0	2	1	50.0	85.7	85.7
114	115	78	57		1					100.0	
115	115	78	529	71.5	1	33.3	3	1	33.3	100.0	95.0
115	115	78	378		3					95.0	
116	115	78	19	11.2	1	50.0	2	1	50.0	100.0	88.9
116	115	78	170		2					88.9	
117	115	78	606	62.9	5	60.0	5	3	60.0	78.1	99.6
117	115	78	964		3					78.4	
118	115	78	132	53.7	1	50.0	2	1	50.0	100.0	76.9
118	115	78	246		2					76.9	
119	115	78	756	39.6	4	57.1	8	3	37.5	77.5	95.4
119	115	78	1910		7					81.2	
120	115	78	208	12.8	2	66.7	3	2	66.7	90.9	95.9
120	115	78	1626		3					87.2	
121	115	78	359	25.0	3	100.0	4	2	50.0	94.7	86.2
121	115	78	1437		3					81.6	
123	115	78	246	69.1	2	66.7	3	2	66.7	76.9	86.7
123	115	78	170		3					66.7	
124	117	78	1645	82.8	3	33.3	9	3	33.3	79.3	92.5
124	117	78	1986		9					85.7	
125	117	78	5030	79.7	4	100.0	5	3	60.0	94.7	98.6
125	117	78	4009		4					93.4	
126	117	78	0								
126	117	78	0								
127	118	78	378	60.1	1	50.0	2	1	50.0	100.0	91.7
127	118	78	227		2					91.7	
202	117	78	1494	78.4	2	50.0	2	1	50.0	100.0	100.0
202	117	78	1172		1					100.0	
203	117	78	529	41.8	5	80.0	6	3	50.0	85.7	87.0
203	117	78	1266		4					98.5	
204	117	78	454	49.0	1	50.0	2	1	50.0	100.0	40.8
204	117	78	927		2					40.8	

TABLE 1 CONT.

VARIATION BETWEEN REPLICATE MACROINVERTEBRATE GRAB SAMPLES
PERCENTAGE SIMILARITIES (S) REPRESENT THE
SMALLER NUMBER DIVIDED BY THE LARGER, X 100

Station	Julian Date	Year	Total Organisms (#/m²)	Similarity (%)	No. of Taxa	Similarity	Total Taxa	Taxa Shared	% Taxa Shared	% Oligochaetes	Similarity (%)
205	117	78	24848	87.1	6	66.7	9	6	66.7	80.4	100.0
205	117	78	28516		9					80.4	
206	117	78	23713	93.2	8	100.0	9	7	77.8	96.6	91.5
206	117	78	22106		8					88.4	
211	117	78	2326	67.5	4	75.0	4	3	75.0	79.7	92.0
211	117	78	1570		3					86.7	
213	117	78	4179	68.2	3	50.0	6	3	50.0	84.2	96.4
213	117	78	6127		6					87.3	
218	106	78	264	14.4	5	40.0	5	2	40.0	35.7	71.4
218	106	78	38		2					50.0	
219	106	78	548	13.0	3	66.7	3	2	66.7	41.4	60.4
219	106	78	76		2					25.0	
220	106	78	284	73.2	3	100.0	5	1	20.0	73.3	0.0
220	106	78	208		3					0.0	
222	105	78	0	0.0	0	0.0	1	0	0.0	0.0	0.0
222	105	78	19		1					100.0	
223	104	78	397	42.8	3	33.3	3	1	33.3	85.7	85.7
223	104	78	170		1					100.0	
224	104	78	492	60.5	2	50.0	4	2	50.0	38.5	84.7
224	104	78	813		4					32.6	
225	104	78	6467	90.5	4	100.0	4	4	100.0	73.1	85.3
225	104	78	7148		4					85.7	
227	107	78	1645	48.3	4	80.0	6	3	50.0	57.8	89.0
227	107	78	794		5					76.2	
228	107	78	1021	48.6	6	83.3	7	4	57.1	46.3	71.3
228	107	78	2099		5					64.9	
229	112	78	189	41.6	2	66.7	3	2	66.7	80.0	93.8
229	112	78	454		3					75.0	
231	112	78	1607	50.6	5	60.0	5	3	60.0	83.5	99.8
231	112	78	813		3					83.7	
235	112	78	1815	50.5	4	66.7	6	4	66.7	93.8	91.5
235	112	78	3593		6					85.8	
236	109	78	5597	60.5	5	83.3	6	5	83.3	85.1	93.2
236	109	78	3385		6					79.3	
238	109	78	1570	56.9	5	71.4	8	4	50.0	74.7	86.6
238	109	78	2761		7					86.3	
239	109	78	1853	57.2	5	80.0	5	4	80.0	35.7	100.0
239	109	78	1059		4					35.7	
240	109	78	4765	98.0	6	66.7	6	4	66.7	68.3	80.7
240	109	78	4671		4					55.1	80.7
242	110	78	964	98.1	3	75.0	4	3	75.0	56.9	69.4
242	110	78	946		4					82.0	
244	110	78	7772	72.3	8	87.5	8	7	87.5	96.8	96.0
244	110	78	5616		7					92.9	
245	110	78	113	0.0	1	0.0	1	0	0.0	100.0	0.0
245	110	78	0		0					0.0	
246	110	78	3168	78.4	5	100.0	7	3	42.9	77.2	96.7
246	110	78	4028		5					79.8	
247	110	78	57	0.0	1	0.0	1	0	0.0	100.0	0.0
247	110	78	0		0					0.0	
249	110	78	189	16.7	3	100.0	3	3	100.0	60.0	72.0
249	110	78	1135		3					83.3	

TABLE 1 CONT.

VARIATION BETWEEN REPLICATE MACROINVERTEBRATE GRAB SAMPLES
PERCENTAGE SIMILARITIES (S) REPRESENT THE
SMALLER NUMBER DIVIDED BY THE LARGER, X 100

Station	Julian Date	Year	Total Organisms (#/m²)	Similarity (%)	No. of Taxa	Similarity	Total Taxa	Taxa Shared	% Taxa Shared	% Oligochaetes	Similarity (%)
250	110	78	8131		5					84.7	
250	110	78	0	0.0	0	0.0	5	0	0.0	0.0	0.0
*101	177	78	170		5					55.6	
101	177	78	38	22.4	1	20.0	5	1	20.0	100.0	55.6
101	177	78	132	77.6	2	40.0	6	1	16.7	100.0	55.6
102	177	78	662		6					34.3	
102	177	78	227	34.3	3	50.0	6	3	50.0	25.0	72.9
104	178	78	681		3					91.7	
104	178	78	908	75.0	1	33.3	3	1	33.3	100.0	91.7
106	178	78	265		2					92.9	
106	178	78	1154	23.0	5	40.0	5	2	40.0	42.6	45.8
108	178	78	700		3					45.9	
108	178	78	321	45.9	3	100.0	4	2	50.0	88.2	52.0
109	178	78	3404		8					91.7	
109	178	78	3782	90.0	4	50.0	9	3	33.3	86.0	93.8
110	178	78	0		0					0.0	
110	178	78	19	0.0	1	0.0	1	0	0.0	100.0	0.0
112	178	78	0								
112	178	78	0								
113	178	78	19		1					0.0	
113	178	78	19	100.0	1	100.0	1	1	100.0	0.0	
114	178	78	529		3					39.3	
114	178	78	1437	36.8	6	50.0	6	3	50.0	35.5	90.3
115	178	78	2458	67.0	7	87.5	9	5	55.6	86.9	62.3
115	178	78	2363	64.4	7	87.5	10	5	50.0	70.4	76.8
*115	178	78	3669		8					54.1	
116	178	78	38		1					100.0	
116	178	78	227	16.7	1	100.0	1	1	100.0	100.0	100.0
117	179	78	2288		8					57.9	
117	179	78	1002	43.8	6	75.0	9	5	55.6	58.5	99.0
118	178	78	662		6					85.7	
118	178	78	624	94.3	3	50.0	6	3	50.0	21.2	24.7
119	178	78	0								
119	178	78	0								
120	178	78	113	67.1	1	12.5	8	1	12.5	100.0	43.8
120	178	78	0	0.0	0	0.0	0	0	0.0		
*120	178	78	1683		8					43.8	
121	178	78	38		2					50.0	
121	178	78	1343	2.8	5	40.0	5	2	40.0	38.0	76.0
124	178	78	0		0					0.0	
124	178	78	76	0.0	3	0.0	3	0	0.0	25.0	0.0
125	178	78	0								
125	178	78	0								
202	181	78	5162		7					91.6	
202	181	78	4330	83.9	8	87.5	8	7	87.5	88.2	96.3
203	181	78	1456		6					98.7	
203	181	78	2855	51.0	7	85.7	9	4	44.4	96.0	97.3
204	181	78	1399	30.8	6	75.0	9	5	55.6	79.7	83.2
*204	180	78	4538		8					95.8	
204	181	78	662	14.5	5	62.5	8	5	62.5	91.4	95.4
205	181	78	6543	74.4	9	100.0	13	5	38.5	66.5	86.9
*205	181	78	8793		9					57.8	
205	181	78	5635	64.1	7	77.8	11	5	45.5	76.2	75.9

TABLE 1 CONT.

VARIATION BETWEEN REPLICATE MACROINVERTEBRATE GRAB SAMPLES
PERCENTAGE SIMILARITIES (S) REPRESENT THE
SMALLER NUMBER DIVIDED BY THE LARGER, X 100

Station	Julian Date	Year	Total Organisms (#/m²)	Similarity (%)	No. of Taxa	Similarity	Total Taxa	Taxa Shared	% Taxa Shared	% Oligochaetes	Similarity (%)
206	181	78	17530		7					97.2	
206	181	78	18664	93.9	7	100.0	8	6	75.0	94.7	97.4
207	181	78	3007		8					49.7	
207	181	78	1872	62.3	5	62.5	8	5	62.5	20.2	40.6
208	181	78	492		3					92.3	
208	181	78	1551	31.7	4	75.0	5	2	40.0	96.3	95.8
210	181	78	1059		4					64.3	
210	181	78	567	53.5	4	100.0	5	3	60.0	53.3	82.9
211	181	78	2553		7					37.8	
211	181	78	5314	48.0	10	70.0	11	6	54.5	41.6	90.9
212	181	78	1135	70.6	8	62.5	9	4	44.4	30.0	82.3
212	181	78	908	56.5	3	60.0	5	3	60.0	10.4	42.1
*212	181	78	1607		5					24.7	
213	181	78	4728		6					80.8	
213	181	78	1645	34.8	6	100.0	8	4	50.0	32.2	39.9
216	188	78	511		4					40.7	
216	188	78	719	71.1	4	100.0	6	2	33.3	94.7	43.0
218	188	78	19		1					0.0	
218	188	78	567	3.4	5	20.0	5	1	20.0	30.0	0.0
219	188	78	113		3					33.3	
219	188	78	1097	10.3	3	100.0	4	2	50.0	39.7	83.9
220	188	78	19		1					0.0	
220	188	78	189	10.1	5	20.0	5	1	20.0	10.0	0.0
222	188	78	113		1					00.0	
222	188	78	76	67.3	1	100.0	1	1	100.0	00.0	
223	188	78	0		0					0.0	
223	188	78	57	0.0	2	0.0	2	0	0.0	33.3	0.0
224	188	78	340		4					66.7	
224	188	78	870	39.1	5	80.0	7	2	28.6	93.5	71.3
225	188	78	2023		6					88.8	
225	188	78	208	10.3	3	50.0	6	3	50.0	81.8	92.1
226	189	78	435		2					95.7	
226	189	78	2175	20.0	5	40.0	6	1	16.7	4.3	4.5
227	188	78	964		5					60.8	
227	188	78	208	21.6	2	40.0	5	2	40.0	63.6	95.6
228	188	78	0		0					0.0	
228	188	78	189	0.0	5	0.0	5	0	0.0	30.0	
229	191	78	321		4					35.3	
229	191	78	2250	14.3	8	50.0	8	4	50.0	79.0	44.7
230	191	78	794		7					40.5	
230	191	78	2004	39.6	6	85.7	9	4	44.4	56.6	71.6
231	191	78	397		4					71.4	
231	191	78	2534	15.7	6	66.7	6	4	66.7	77.6	92.0
232	191	78	954		6					47.1	
232	191	78	2420	39.8	5	83.3	6	5	83.3	57.8	81.5
233	191	78	927		8					26.5	
233	191	78	378	40.8	4	50.0	9	3	33.3	20.0	75.5
234	191	78	2836		8					46.0	
234	191	78	2931	96.8	9	88.9	9	8	88.9	45.2	98.3
235	191	78	3423		8					42.5	
235	191	78	2855	83.4	7	87.5	8	7	87.5	41.7	98.1
236	188	78	6051		7					77.2	
236	188	78	2099	34.7	7	100.0	8	6	75.0	51.3	79.4

TABLE 1 CONT.

VARIATION BETWEEN REPLICATE MACROINVERTEBRATE GRAB SAMPLES
PERCENTAGE SIMILARITIES (S) REPRESENT THE
SMALLER NUMBER DIVIDED BY THE LARGER, X 100

Station	Julian Date	Year	Total Organisms (#/m²)	Similarity (%)	No. of Taxa	Similarity	Total Taxa	Taxa Shared	% Taxa Shared	% Oligochaetes	Similarity (%)
237	191	78	510		7					29.6	
237	191	78	1399	36.5	5	71.4	8	4	50.0	14.9	50.3
238	191	78	6259		10					60.7	
238	191	78	5938	94.9	12	83.3	13	9	69.2	54.8	90.3
239	191	78	4387		8					48.7	
239	191	78	5711	76.8	4	50.0	8	4	50.0	58.9	82.7
240	191	78	2420		5					46.1	
240	191	78	1002	41.4	5	100.0	6	4	66.7	45.3	98.3
242	191	78	652		5					60.0	
242	191	78	1834	36.1	5	100.0	6	4	66.7	27.8	46.3
244	192	78	1796		7					95.8	
244	192	78	4765	37.7	9	77.8	9	7	37.7	67.3	91.1
245	191	78	5654		9					66.9	
245	191	78	1551	27.4	8	88.9	11	6	54.5	43.9	65.6
246	191	78	2250		6					64.7	
246	191	78	3461	65.0	7	85.7	8	5	62.5	54.6	84.4
247	191	78	4387		8					53.9	
247	191	78	3555	81.0	5	62.5	9	4	44.4	36.2	67.2
248	192	78	0		0					0.0	
248	192	78	19	0.0	1	0.0	1	0	0.0	0.0	0.0
249	191	78	492		8					23.1	
249	191	78	719	68.4	7	87.5	9	6	66.7	44.7	51.7
250	191	78	38		1					100.0	
250	191	78	1891	2.0	4	25.0	4	1	25.0	11.0	11.0
103	206	79	95		2					60.0	
103	206	79	38	40.0	1	50.0	2	1	50.0	100.0	60.0
114	206	79	908		3					60.4	
114	206	79	1021	88.9	6	50.0	6	3	50.0	63.0	95.9
115	206	79	1097		5					72.4	
115	206	79	813	74.1	4	80.0	5	4	80.0	67.4	93.1
207	209	79	4936		7					88.1	
207	209	79	700	14.2	3	42.9	7	3	42.9	73.0	82.9
*224	212	79	700		3					86.5	
224	212	79	340	48.6	3	100.0	4	2	50.0	61.1	70.6
224	212	79	19	2.7	1	33.3	3	1	33.3	100.0	61.1
226	212	79	0		0					0.0	
226	212	79	19	0.0	1	0.0	1	0	0.0	100.0	0.0
234	212	79	586		4					90.3	
234	212	79	775	75.6	3	75.0	4	3	75.0	80.5	89.1
238	215	79	889		3					44.7	
238	215	79	208	23.4	3	100.0	5	2	40.0	81.8	54.6

TABLE 2

TAXONOMIC CATEGORIES OF MACROINVERTEBRATES
COLLECTED IN 1978 AND 1979

OLIGOCHAETA
- Immature (hair)
- Immature (no hair)
- *Branchiura sowerbyi*
- *Limnodrilus cervix*
- *Limnodrilus claparedianus*
- *Limnodrilus cervix-claparedianus* intermediate
- *Limnodrilus hoffmeisteri*
- *Limnodrilus maumeensis*
- *Limnodrilus profundicola*
- *Limnodrilus udekemianus*
- *Peloscolex* sp.
- *Potamothrix moldaviensis*
- *Ophidonais serpentina*

HIRUDINEA
- *Helobdella stagnalis*
- *Helobdella elongata*

AMPHIPODA
- *Gammarus fasciatus*

ISOPODA
- *Asellus* sp.

CLADOCERA
- *Leptodora kindti*

DIPTERA (CHIRONOMIDAE)
- *Chaoborus albipes*
- *Chironomus* sp.
- *Chironomus* pupae
- *Cryptochironomus* sp.
- *Polypedilum* sp.
- *Procladius* sp.
- *Procladius* pupae
- *Tanytarsus* sp.

EPHEMEROPTERA
- *Caenis* sp.

GASTROPODA
- *Physa* sp.

PELECYPODA
- *Proptera* sp.

TABLE 3

PERCENTAGE OF OLIGOCHAETES PER STATION FOR THE SPRING 1978 WESTERN BASIN NEARSHORE CRUISE

STATION-DATE-YEAR	SAMPLE 1	SAMPLE 2	SAMPLE 3	AVERAGE
101-117-78	100.0	100.0		100.0
104-114-78	23.5	66.7		45.1
105-114-78	91.9	72.1		82.0
106-114-78	99.4	99.3		99.4
108-114-78	98.2	89.8		94.0
109-114-78	70.4	64.9		67.7
111-114-78	100.0	20.0		60.0
112-115-78	88.0	84.0		86.0
113-115-78	75.4	67.9		71.7
114-115-78	85.7	100.0		92.8
115-115-78	100.0	95.0		97.5
116-115-78	100.0	88.9		94.5
117-115-78	77.4	78.4		77.9
118-115-78	100.0	76.9		88.5
119-115-78	77.5	81.2		79.4
120-115-78	90.9	87.2		89.1
121-115-78	94.7	81.6		88.2
123-115-78	76.9	66.7		71.8
124-117-78	79.3	85.7		82.5
125-117-78	94.7	93.4		94.1
127-117-78	100.0	91.7		95.9
202-117-78	100.0	100.0		100.0
203-117-78	85.7	98.5		92.1
204-117-78	100.0	40.8		70.4
205-117-78	80.4	80.4		80.4
206-117-78	96.6	88.4		92.5
211-117-78	79.7	86.8		83.3
213-117-78	84.2	87.4		85.8
214-106-78	0.0	0.0		0.0
217-106-78	88.0			88.0
218-106-78	41.7	50.0		45.6
219-106-78	41.4	25.0		33.2
220-106-78	73.3	0.0		36.2
221-105-78	85.0			85.0
222-105-78	100.0	100.0		100.0
223-104-78	85.7	100.0		92.6
224-104-78	38.5	32.6		35.3
225-104-78	71.8	85.1		78.5
227-107-78	67.8	76.2		72.0
228-107-78	46.3	64.9		55.6
229-112-78	80.0	75.0		77.5
231-112-78	83.5	83.7		83.6
235-112-78	93.8	86.2		90.0
236-109-78	85.1	29.3		57.2
238-109-78	74.7	86.3		80.5
239-109-78	35.7	35.7		35.7
240-109-78	68.2	55.1		61.7
241-110-78	56.9			56.9
242-110-78	82.0			82.0
244-110-78	96.8	97.4		97.1
245-110-78	100.0			100.0
246-110-78	77.2			77.2
247-110-78	100.0			100.0
249-110-78	60.0	83.3		71.7
250-110-78	84.6			84.6

TABLE 4

PERCENTAGE OF OLIGOCHAETES PER STATION FOR THE SUMMER 1978 WESTERN BASIN NEARSHORE CRUISE

STATION-DATE-YEAR	SAMPLE 1	SAMPLE 2	SAMPLE 3	AVERAGE
101-177-78	100.0	100.0		100.0
101-178-78	62.5	100.0		81.3
102-177-78	25.0	100.0		62.5
104-178-78	96.0	81.8	100.0	92.6
105-178-78	63.4			63.4
106-178-78	92.9	42.6		67.8
108-178-78	41.2	88.2		64.7
109-178-78	91.7	86.0		88.9
110-178-78	100.0	100.0		100.0
113-178-78	0.0	0.0		0.0
114-178-78	39.3	35.5		37.4
115-178-78	86.9	70.4	56.1	71.1
116-178-78	100.0	100.0		100.0
117-179-78	57.8	58.5		58.2
118-178-78	85.7	21.2		53.5
120-178-78	100.0	43.8		71.9
121-178-78	50.0	38.0		44.0
124-178-78	25.0			25.0
126-178-78	0.0	0.0		0.0
201-188-78	15.0			15.0
203-181-78	98.7	96.0		97.4
204-181-78	95.8	77.9	91.4	88.3
205-181-78	68.4	57.9	85.7	70.7
206-181-78	97.0	94.7		95.9
207-181-78	51.5	20.2		35.9
208-181-78	92.3	96.3		94.3
210-181-78	64.3	53.3		58.8
211-181-78	37.8	41.6		39.7
212-181-78	30.0	10.4	24.7	21.7
213-181-78	80.8	32.2		56.5
216-188-78	40.7	94.7		67.7
218-188-78	0.0	30.0		15.0
219-188-78	33.3	39.7		36.5
220-188-78	0.0	18.2		9.1
222-188-78	0.0	0.0		0.0
223-188-78	0.0	33.3		16.6
224-188-78	66.7	93.8		80.3
225-188-78	88.7	81.8		85.3
226-189-78	95.6	4.4		50.0
227-188-78	60.8	63.6		62.2
228-188-78	30.0			30.0
229-191-78	35.3	79.0		57.2
230-191-78	40.5	56.6		48.6
231-191-78	71.4	77.6		74.5
232-191-78	47.1	57.8		52.5
233-191-78	27.1	20.0		23.6
234-191-78	46.0	45.2		45.6
235-191-78	42.5	41.7		42.1
236-188-78	77.2	60.7		69.0
237-191-78	29.6	14.9		22.3
238-191-78	70.5	53.3		61.9
239-191-78	48.7	59.3		78.4
240-191-78	46.1	45.3		68.8
242-191-78	60.0	25.2		42.6
244-192-78	90.1	87.4		88.7
245-191-78	66.9	43.9		55.4
246-191-78	64.7	54.6		92.0
247-191-78	53.3	36.2		44.8
248-192-78	0.0	0.0		0.0
249-191-78	23.1	44.7		33.9
250-191-78	100.0	11.8		55.9

TABLE 5

PERCENTAGE OF OLIGOCHAETES PER STATION FOR THE SPRING 1979 WESTERN BASIN NEARSHORE CRUISE

STATION-DATE-YEAR	SAMPLE 1	SAMPLE 2	SAMPLE 3	AVERAGE
101-206-79	100.0	100.0		100.0
103-206-79	60.0	100.0	80.0	80.0
105-206-79	41.4			41.4
106-206-79	86.1			86.1
108-206-79	64.7			64.7
109-206-79	77.3			77.3
110-206-79	57.1			57.1
111-206-79	100.0			100.0
112-206-79	16.2			16.2
113-206-79	22.2			22.2
114-206-79	60.4	63.0		61.7
115-206-79	72.4	67.4		69.9
116-206-79	96.3			96.3
117-206-79	92.7			92.7
119-206-79	24.2			24.2
120-206-79	68.0			68.0
122-206-79	87.5			87.5
123-206-79	100.0			100.0
124-206-79	73.6			73.6
125-206-79	88.5			88.5
126-206-79	0.0	0.0		0.0
127-206-79	83.9			83.9
201-209-79	50.0			50.0
202-209-79	95.0			95.0
203-209-79	73.9			73.9
204-209-79	43.2			43.2
205-209-79	67.4			67.4
206-209-79	79.6			79.6
207-209-79	88.1	73.0		80.6
208-209-79	94.1			94.1
213-209-79	78.0			78.0
217-212-79	88.9			88.9
218-212-79	48.5			48.5
219-212-79	58.9			58.9
220-212-79	64.3			64.3
221-212-79	62.8			62.8
223-212-79	50.0			50.0
224-212-79	86.5	61.1	100.0	82.5
226-212-79	100.0			100.0
227-212-79	71.0			71.0
229-212-79	89.7			89.7
230-212-79	78.2			78.2
232-212-79	72.1			72.1
233-212-79	100.0			100.0
234-212-79	90.3	80.5		85.4
235-212-79	78.2			78.2
236-212-79	78.2			78.2
237-215-79	100.0			100.0
238-215-79	44.7			44.7
239-215-79	81.8	46.1		63.6
240-215-79	100.0			100.0
241-215-79	100.0			100.0
242-215-79	89.3			89.3
244-215-79	42.9			42.9
245-215-79	90.0			90.0
246-215-79	92.6			92.6
247-215-79	83.2			83.2
249-215-79	100.0			100.0
250-215-79	95.0			95.0

TABLE 6

STATION BREAKDOWN OF POLLUTION ZONES
UTILIZING OLIGOCHAETA DATA (per m^2) FROM THE
SPRING 1978 WESTERN BASIN NEARSHORE CRUISE

CLEAN <100	LIGHT 100-1000	MODERATE 1001-5000	HEAVY 5001-10,000	HEAVY >10,000
104-114-78	101-117-78	105-114-78	225-104-78	205-117-78
110-114-78	112-115-78	106-114-78	250-110-78	206-117-78
114-115-78	113-115-78	108-114-78		244-110-78
116-115-78	115-115-78	109-114-78		
218-106-78	117-115-78	119-115-78		
247-110-78	118-115-78	124-117-78		
	120-115-78	125-117-78		
	121-115-78	202-117-78		
	123-115-78	211-117-78		
	127-118-78	213-117-78		
	203-117-78	217-106-78		
	204-117-78	231-112-78		
	219-106-78	235-112-78		
	220-106-78	236-109-78		
	221-105-78	238-109-78		
	223-104-78	240-109-78		
	224-104-78	246-110-78		
	227-107-78			
	228-107-78			
	229-112-78			
	239-109-78			
	241-110-78			
	242-110-78			
	245-110-78			
	249-110-78			

TABLE 7

STATION BREAKDOWN OF POLLUTION ZONES
UTILIZING OLIGOCHAETA DATA (per m^2) FROM THE
SUMMER 1978 WESTERN BASIN NEARSHORE CRUISE

CLEAN <100	LIGHT 100-1000	MODERATE 1001-5000	HEAVY 5001-10,000	HEAVY >10,000
101-177-78	102-177-78	109-178-78	205-181-78	206-181-78
110-114-78	104-178-78	115-178-78		
124-178-78	105-178-78	203-181-78		
201-188-78	106-178-78	204-181-78		
220-188-78	108-178-78	211-181-78		
223-188-78	114-178-78	213-181-78		
228-188-78	116-178-78	231-191-78		
	117-179-78	234-191-78		
	118-179-78	235-191-78		
	120-178-78	236-188-78		
	121-178-78	238-191-78		
	207-181-78	239-191-78		
	208-181-78	244-192-78		
	210-181-78	245-191-78		
	212-181-78	246-191-78		
	216-188-78	247-191-78		
	218-188-78			
	219-188-78			
	224-188-78			
	225-188-78			
	226-188-78			
	227-188-78			
	229-191-78			
	230-191-78			
	232-191-78			
	233-191-78			
	237-191-78			
	240-191-78			
	242-191-78			
	249-191-78			
	250-191-78			

TABLE 8

STATION BREAKDOWN OF POLLUTION ZONES
UTILIZING OLIGOCHAETA DATA (per m^2) FROM THE
SUMMER 1979 WESTERN BASIN NEARSHORE CRUISE

CLEAN <100	LIGHT 100-1000	MODERATE 1001-5000	HEAVY 5001-10,000	HEAVY >10,000
103-206-79	101-206-79	105-206-79	125-206-79	
111-206-79	108-206-79	106-206-79		
123-206-79	110-206-79	109-206-79		
221-212-79	112-206-79	117-206-79		
223-212-79	113-206-79	124-206-79		
226-212-79	114-206-79	127-206-79		
237-215-79	115-206-79	206-209-79		
240-215-79	116-206-79	207-209-79		
241-215-79	119-206-79	217-212-79		
244-215-79	120-206-79	218-212-79		
	122-206-79	220-212-79		
	201-209-79	230-212-79		
	202-209-79	232-212-79		
	203-209-79	236-212-79		
	204-209-79	246-215-79		
	205-209-79	247-215-79		
	208-209-79	249-215-79		
	209-209-79			
	213-209-79			
	219-212-79			
	224-212-79			
	227-212-79			
	229-212-79			
	233-212-79			
	234-212-79			
	235-212-79			
	238-215-79			
	239-215-79			
	242-215-79			
	245-215-79			
	250-215-79			

TABLE 9

MEAN DENSITY OF TOTAL BENTHOS AT EACH STATION (No./m^2) FOR THE WESTERN BASIN NEARSHORE CRUISES

SPRING CRUISE	
STATION-DATE-YEAR	TOTAL DENSITY
101-117-78	189.1
104-114-78	245.8
105-114-78	3479.4
106-114-78	2997.2
108-114-78	1928.8
109-114-78	1909.9
110-114-78	160.7
112-115-78	1257.5
113-115-78	1115.7
114-115-78	94.6
115-115-78	453.8
116-115-78	94.6
117-115-78	784.8
118-115-78	189.1
119-115-78	1333.2
120-115-78	917.1
121-115-78	898.2
123-115-78	208.0
124-117-78	1815.4
125-117-78	4519.5
126-117-78	0.0
127-118-78	302.6
202-117-78	1333.2
203-117-78	898.2
204-117-78	690.2
205-117-78	26682.0
206-117-78	22909.5
211-117-78	1947.7
213-117-78	5153.0
214-106-78	160.7
215-105-78	0.0
216-105-78	0.0
217-106-78	1654.6
218-106-78	151.3
219-106-78	312.0
220-106-78	245.8
221-105-78	378.2
222-105-78	18.9
223-104-78	283.7
224-104-78	652.4
225-104-78	6807.6
226-105-78	0.0
227-107-78	1219.7
228-107-78	1560.1
229-112-78	321.5
231-112-78	1210.2
235-112-78	2704.1
236-109-78	4491.1
238-109-78	2165.2
239-109-78	1456.1
240-109-78	2359.0
242-110-78	477.5
244-110-78	3347.0
245-110-78	56.7
246-110-78	3592.9
247-110-78	28.4
249-110-78	661.9
250-110-78	4065.7

TABLE 9 CONT.

MEAN DENSITY OF TOTAL BENTHOS AT EACH STATION
(No./m^2) FOR THE WESTERN BASIN NEARSHORE CRUISES

SUMMER CRUISE	
STATION-DATE-YEAR	TOTAL DENSITY
101-177-78	179.6
101-178-78	37.8
102-177-78	444.4
104-178-78	794.2
105-178-78	387.7
106-178-78	709.1
108-178-78	510.6
109-178-78	3782.0
110-178-78	18.9
112-178-78	0.0
113-178-78	18.9
114-178-78	983.3
115-178-78	4245.3
116-178-78	132.4
117-179-78	1645.2
118-178-78	642.9
119-178-78	0.0
120-178-78	56.7
121-178-78	690.2
124-178-78	37.8
125-178-78	0.0
126-178-78	66.2
201-178-78	189.1
203-181-78	2155.7
204-180-78	1834.3
204-181-78	2165.2
205-181-78	10485.6
206-181-78	18096.9
207-181-78	2439.4
208-181-78	1021.1
210-181-78	813.1
211-181-78	3933.3
212-181-78	1824.8
213-181-78	3186.3
216-188-78	614.6
218-188-78	293.1
219-188-78	605.1
220-188-78	104.0
222-188-78	94.6
223-188-78	37.8
224-188-78	605.1
225-188-78	1115.7
226-189-78	1304.8
227-188-78	586.2
228-188-78	94.6
229-191-78	1285.9
230-191-78	1399.3
231-191-78	1465.5
232-191-78	1692.4
233-191-78	652.4
234-191-78	2883.8
235-191-78	3139.1
236-188-78	4075.1
237-191-78	955.0
238-191-78	6098.5
239-191-78	5049.0
240-191-78	1711.4
242-191-78	1248.1
244-192-78	3280.9
245-191-78	3602.4
246-191-78	2855.4
247-191-78	3971.1
248-192-78	18.9
249-191-78	605.1
250-191-78	964.4

TABLE 9 CONT.

MEAN DENSITY OF TOTAL BENTHOS AT EACH STATION (No./m^2) FOR THE WESTERN BASIN NEARSHORE CRUISES

SUMMER CRUISE	
STATION-DATE-YEAR	TOTAL DENSITY
101-206-79	208.0
103-206-79	66.2
104-206-79	0.0
105-206-79	2420.5
106-206-79	3120.2
108-206-79	321.5
109-206-79	4670.8
110-206-79	264.7
111-206-79	75.6
112-206-79	1399.3
113-206-79	680.8
114-206-79	482.2
115-206-79	477.5
116-206-79	510.6
117-206-79	2325.9
118-206-79	0.0
119-206-79	1172.4
120-206-79	945.5
121-206-79	0.0
122-206-79	170.2
123-206-79	56.7
124-206-79	4803.1
125-206-79	8244.8
126-206-79	605.1
127-206-79	1645.2
201-209-79	907.7
202-209-79	378.2
203-209-79	869.9
204-209-79	1796.5
205-209-79	869.9
206-209-79	5843.2
207-209-79	2817.6
208-209-79	643.9
209-209-79	775.3
213-209-79	851.0
217-212-79	3819.8
218-212-79	2023.4
219-212-79	264.7
220-212-79	2136.8
221-212-79	113.5
223-212-79	66.2
224-212-79	529.5
225-212-79	0.0
226-212-79	18.9
227-212-79	1172.4
228-212-79	0.0
229-212-79	548.4
230-212-79	4084.6
232-212-79	1966.6
233-212-79	170.2
234-212-79	680.8
235-212-79	1040.0
236-212-79	2779.8
237-215-79	18.9
238-215-79	548.4
239-215-79	397.1
240-215-79	2061.2
241-215-79	37.8
242-215-79	529.5
244-215-79	132.4
245-215-79	756.4
246-215-79	4576.2
247-215-79	1796.5
249-215-79	1059.0
250-215-79	378.2

FIGURES

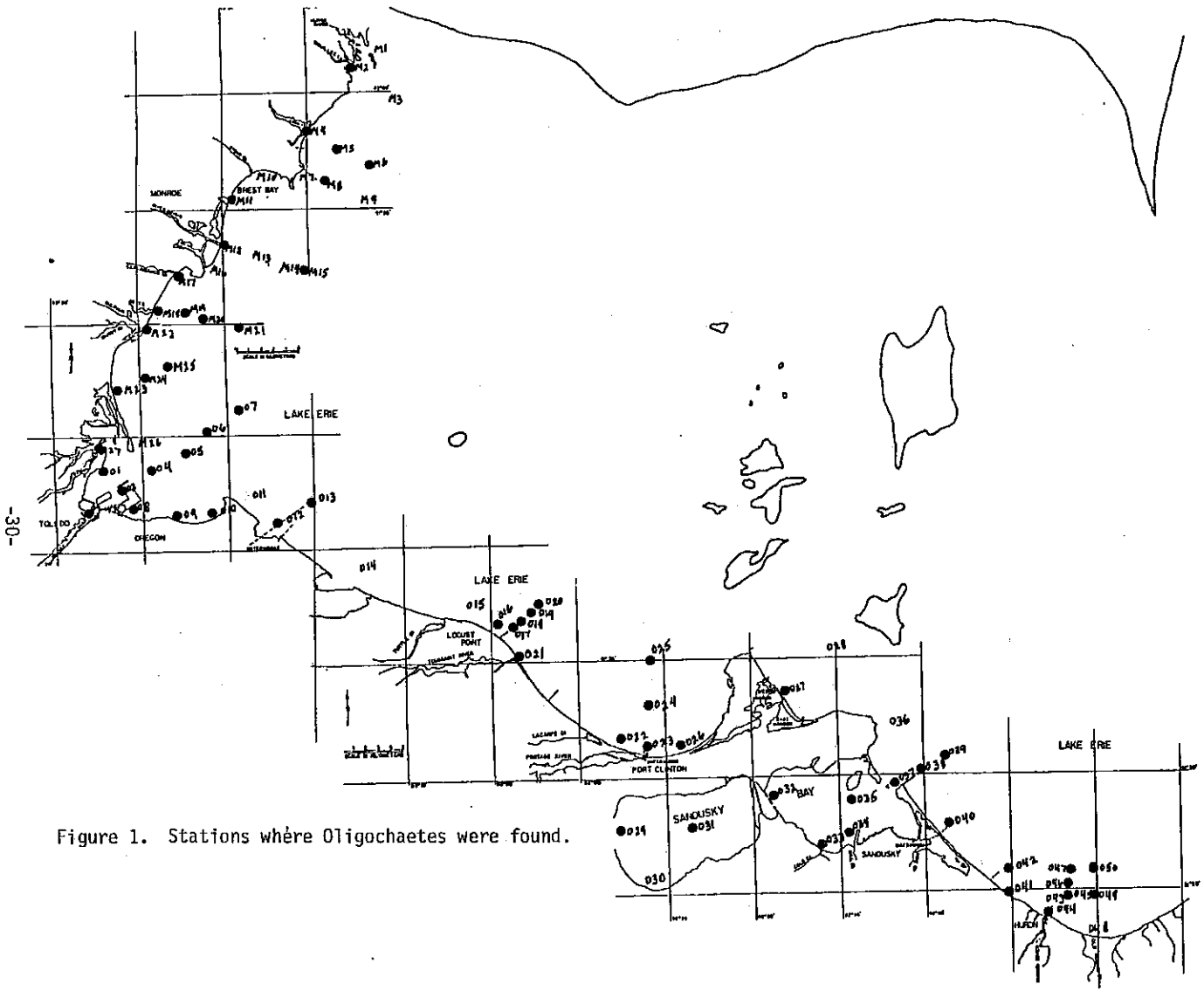


Figure 1. Stations where Oligochaetes were found.

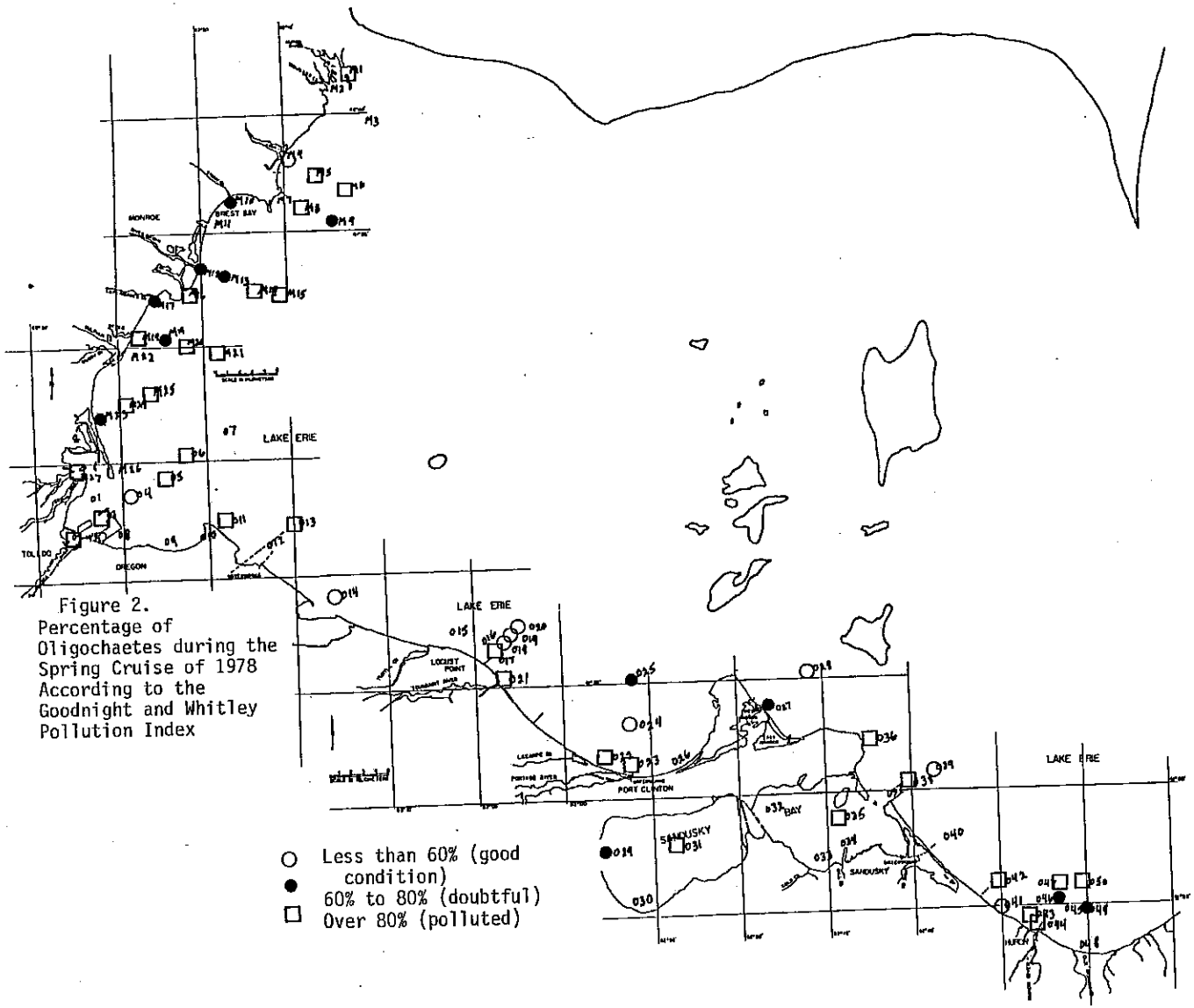


Figure 2.
Percentage of Oligochaetes during the Spring Cruise of 1978 According to the Goodnight and Whitley Pollution Index

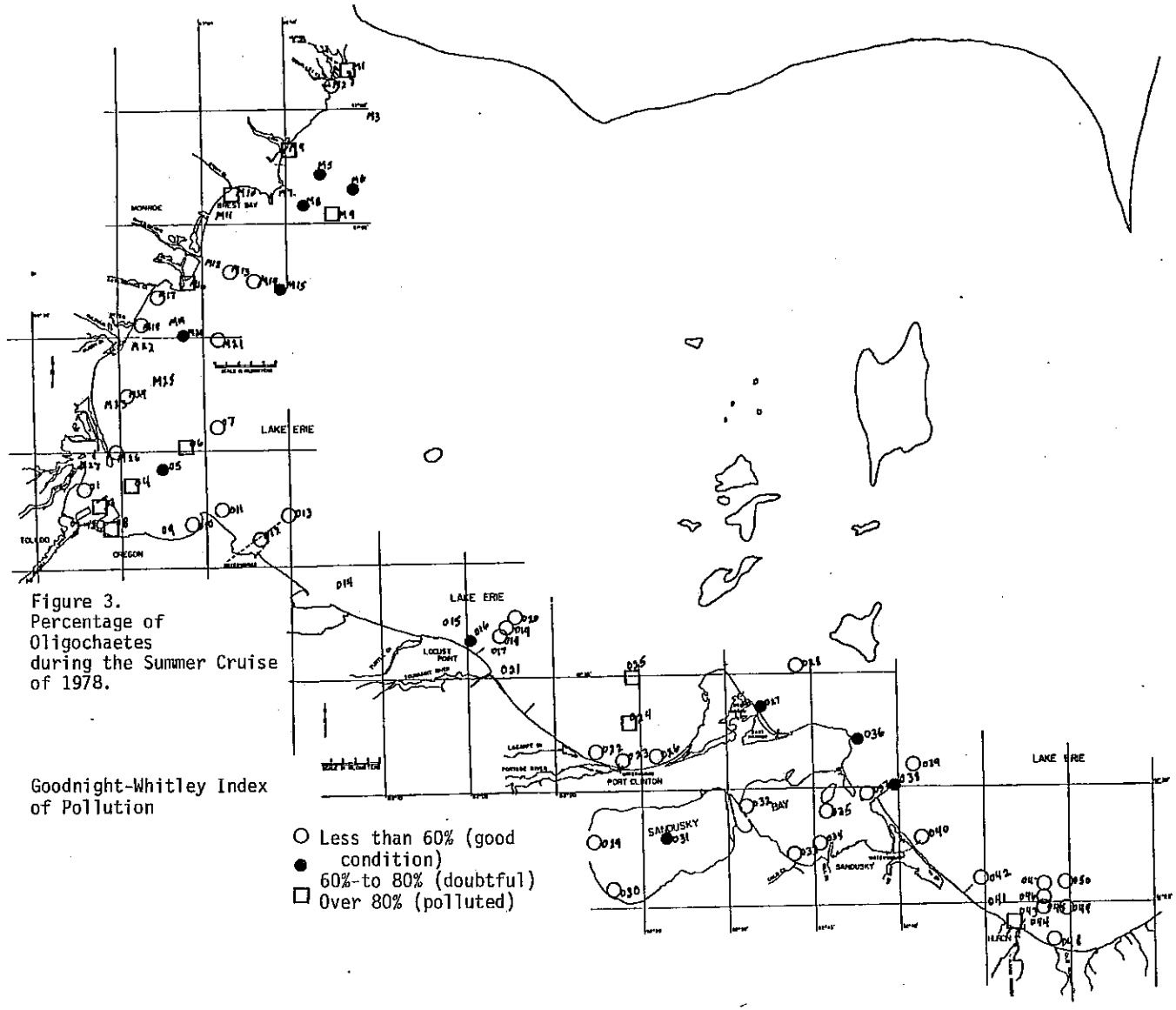


Figure 3.
Percentage of Oligochaetes during the Summer Cruise of 1978.

Goodnight-Whitley Index of Pollution

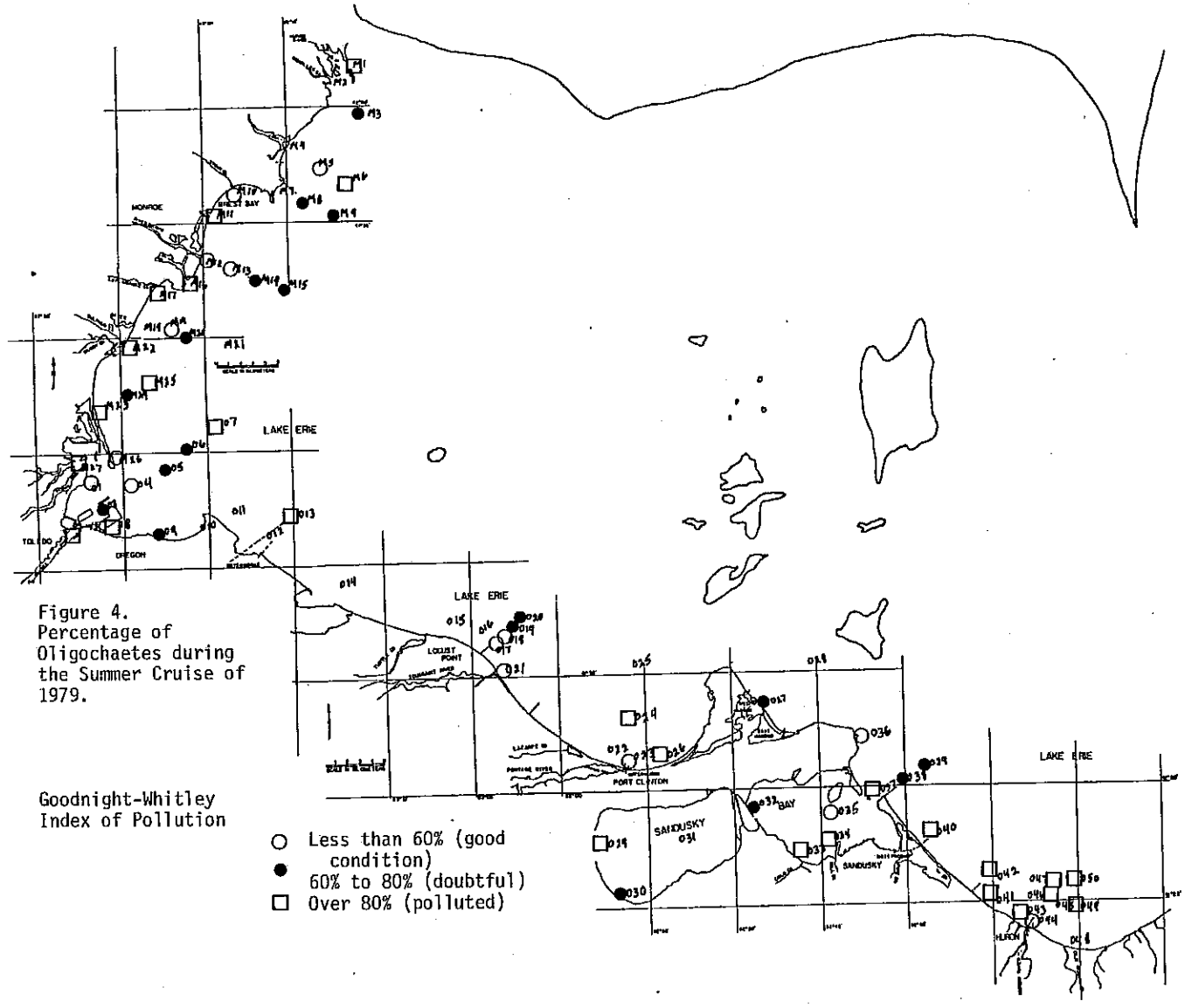


Figure 4.
Percentage of Oligochaetes during the Summer Cruise of 1979.

Goodnight-Whitley Index of Pollution

○ Less than 60% (good condition)
● 60% to 80% (doubtful)
□ Over 80% (polluted)

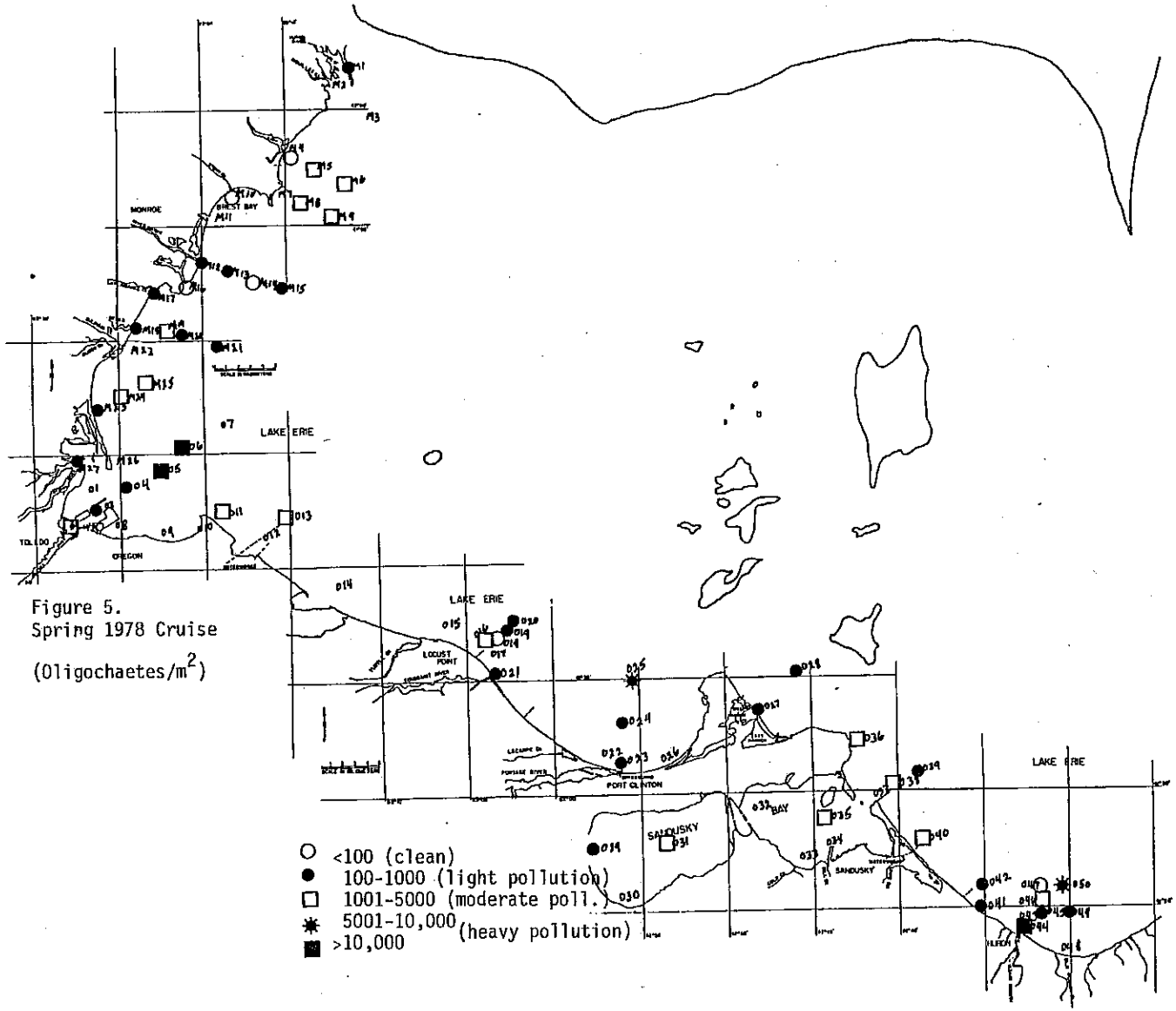


Figure 5.
Spring 1978 Cruise

(Oligochaetes/m^2)

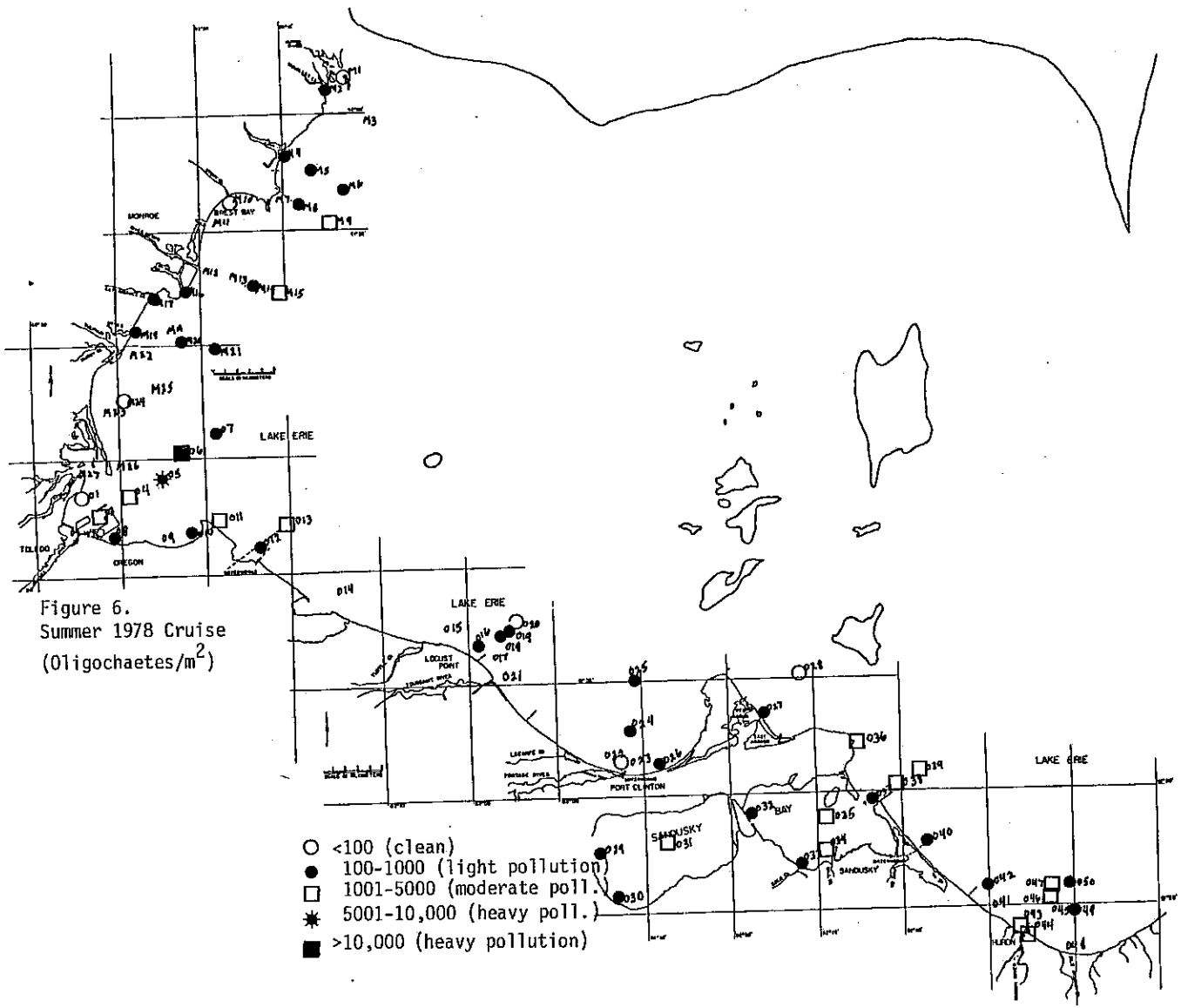


Figure 6.
Summer 1978 Cruise
(Oligochaetes/m^2)

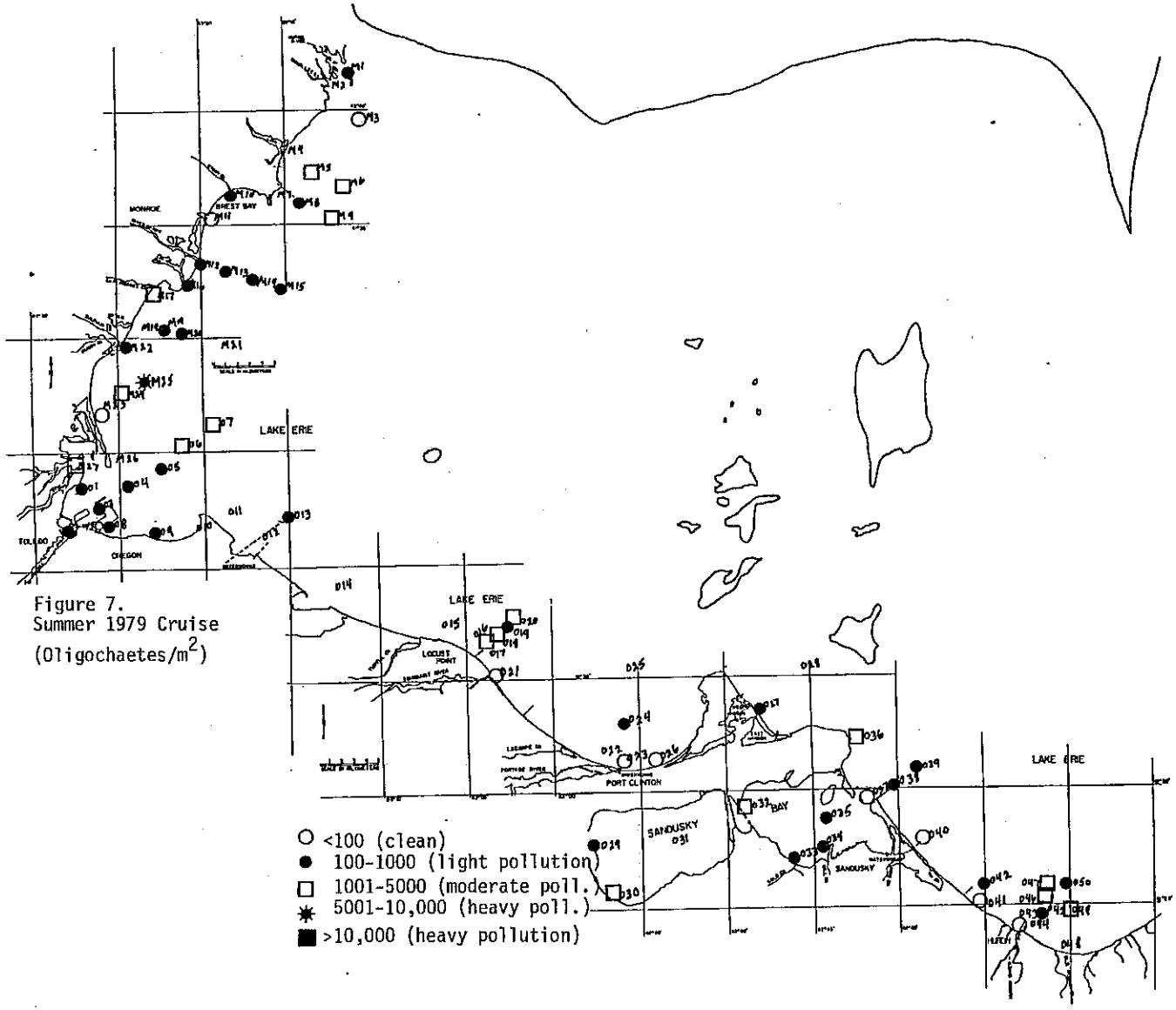


Figure 7.
Summer 1979 Cruise
(Oligochaetes/m^2)

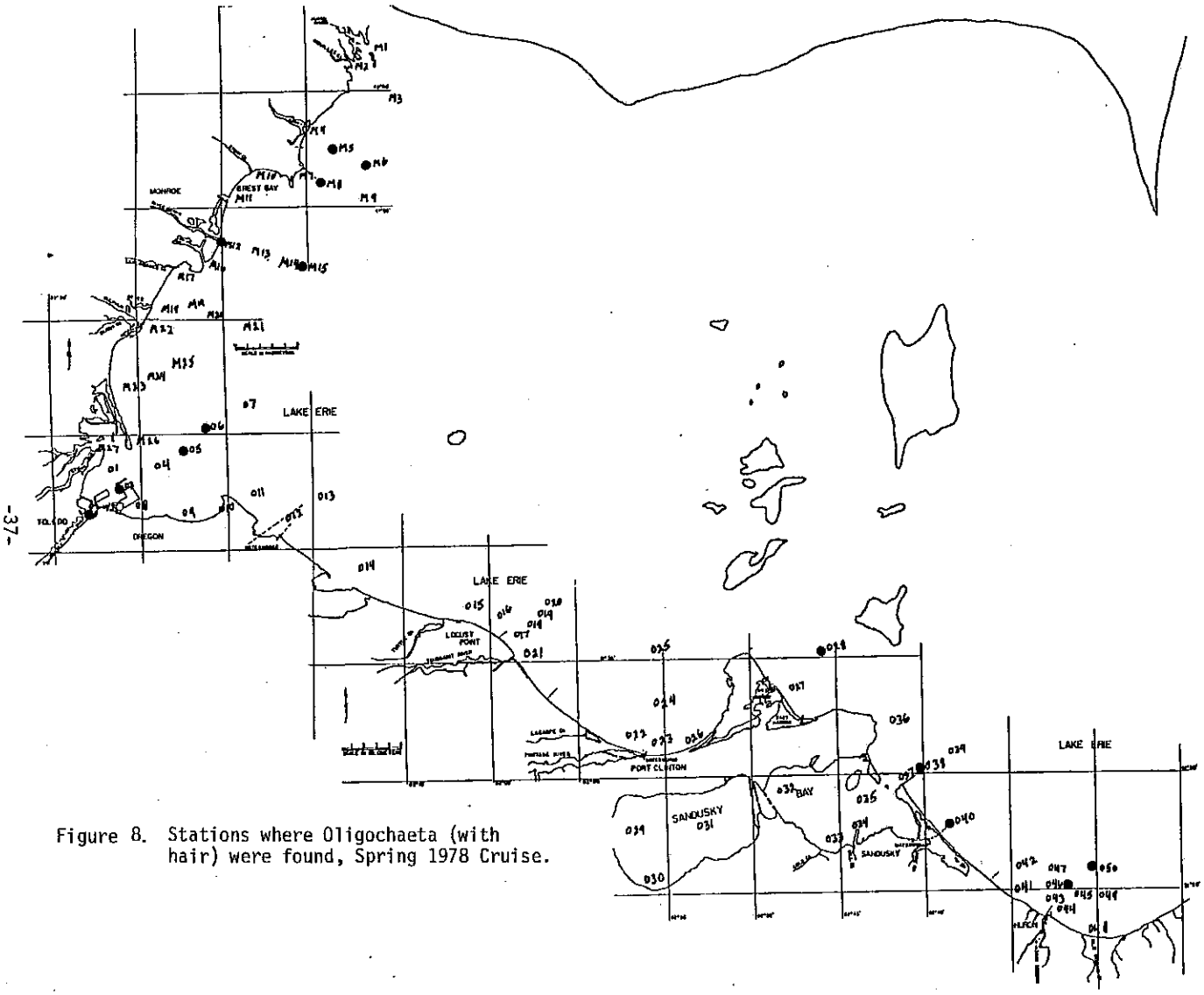


Figure 8. Stations where Oligochaeta (with hair) were found, Spring 1978 Cruise.

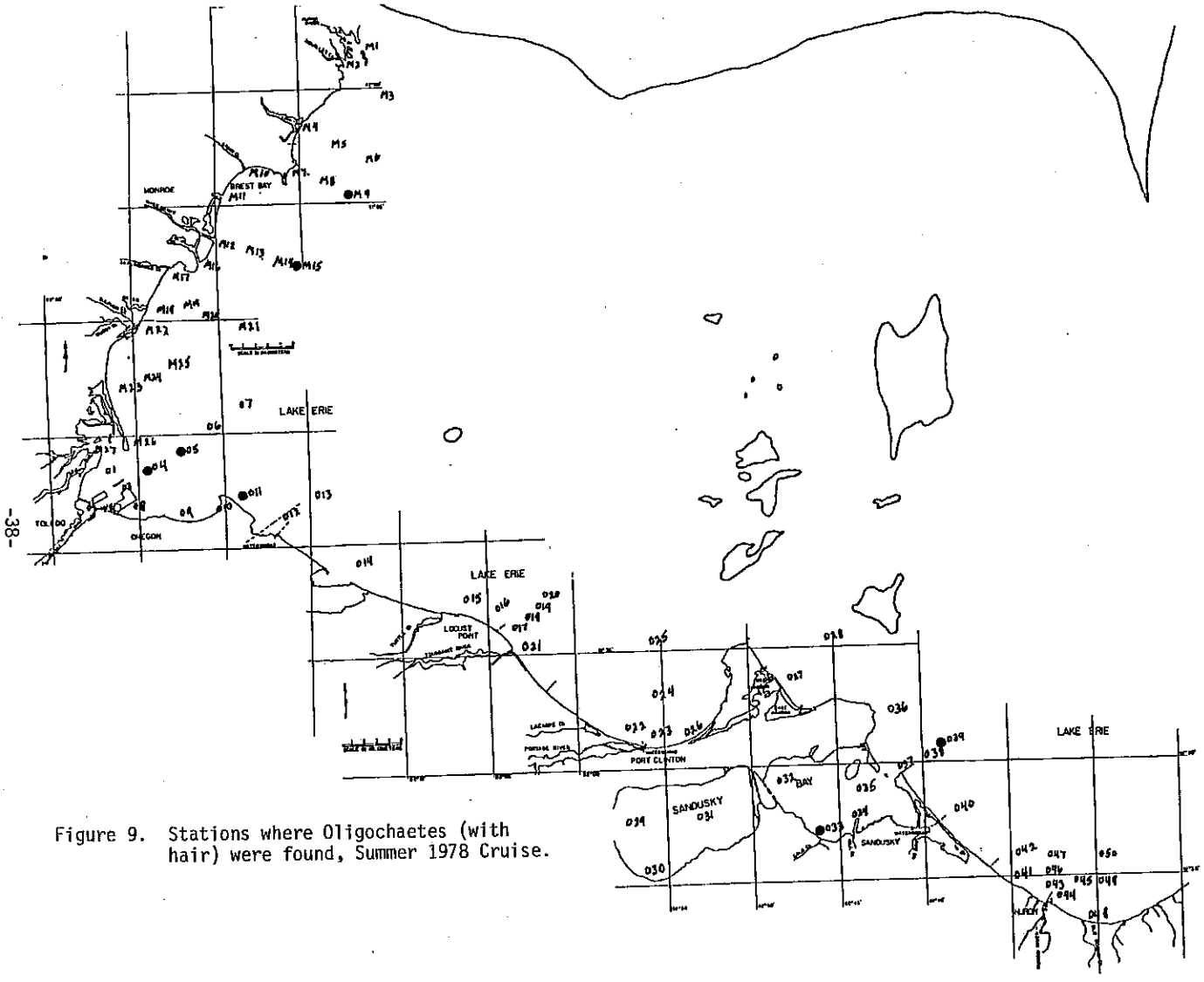


Figure 9. Stations where Oligochaetes (with hair) were found, Summer 1978 Cruise.

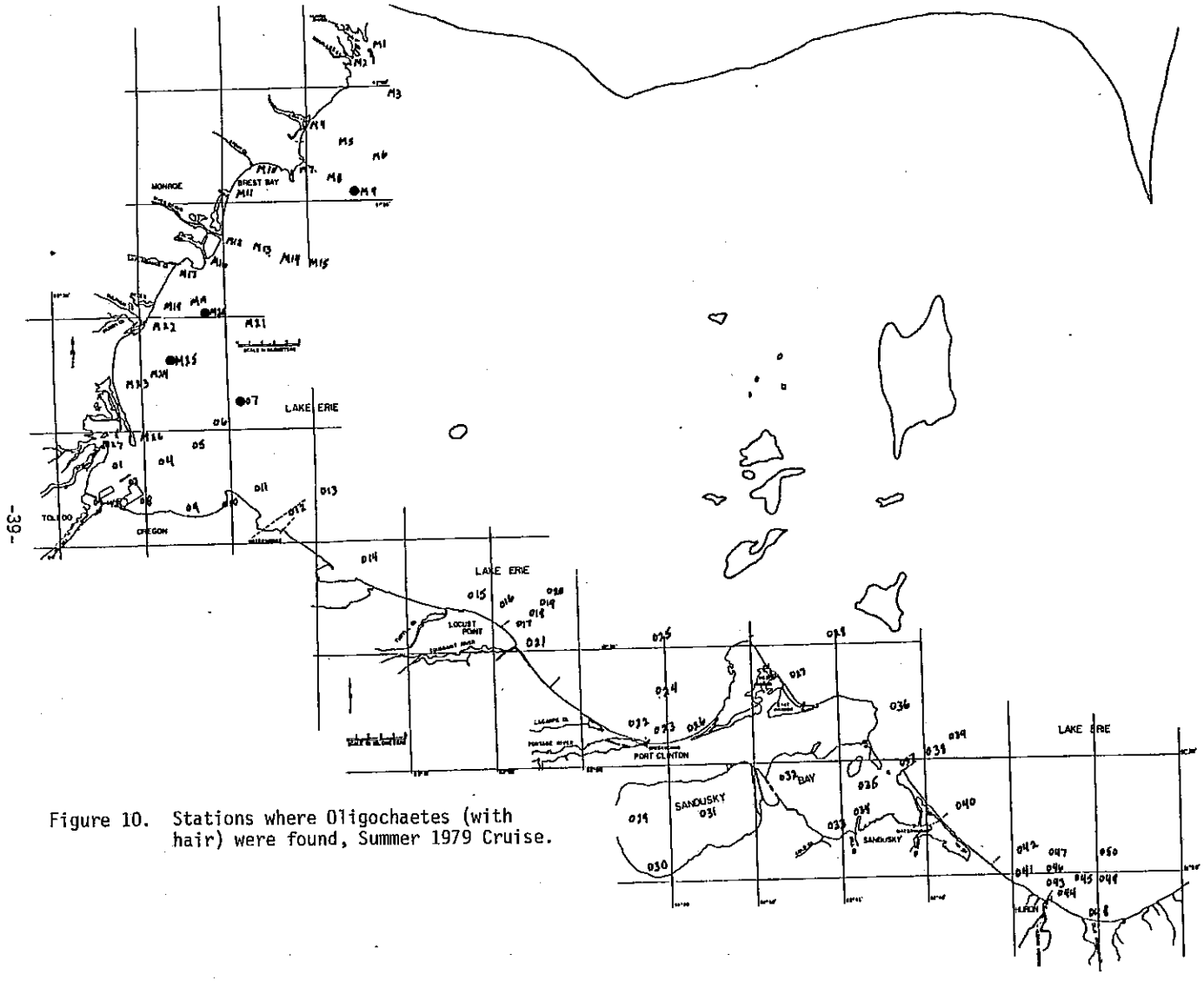


Figure 10. Stations where Oligochaetes (with hair) were found, Summer 1979 Cruise.

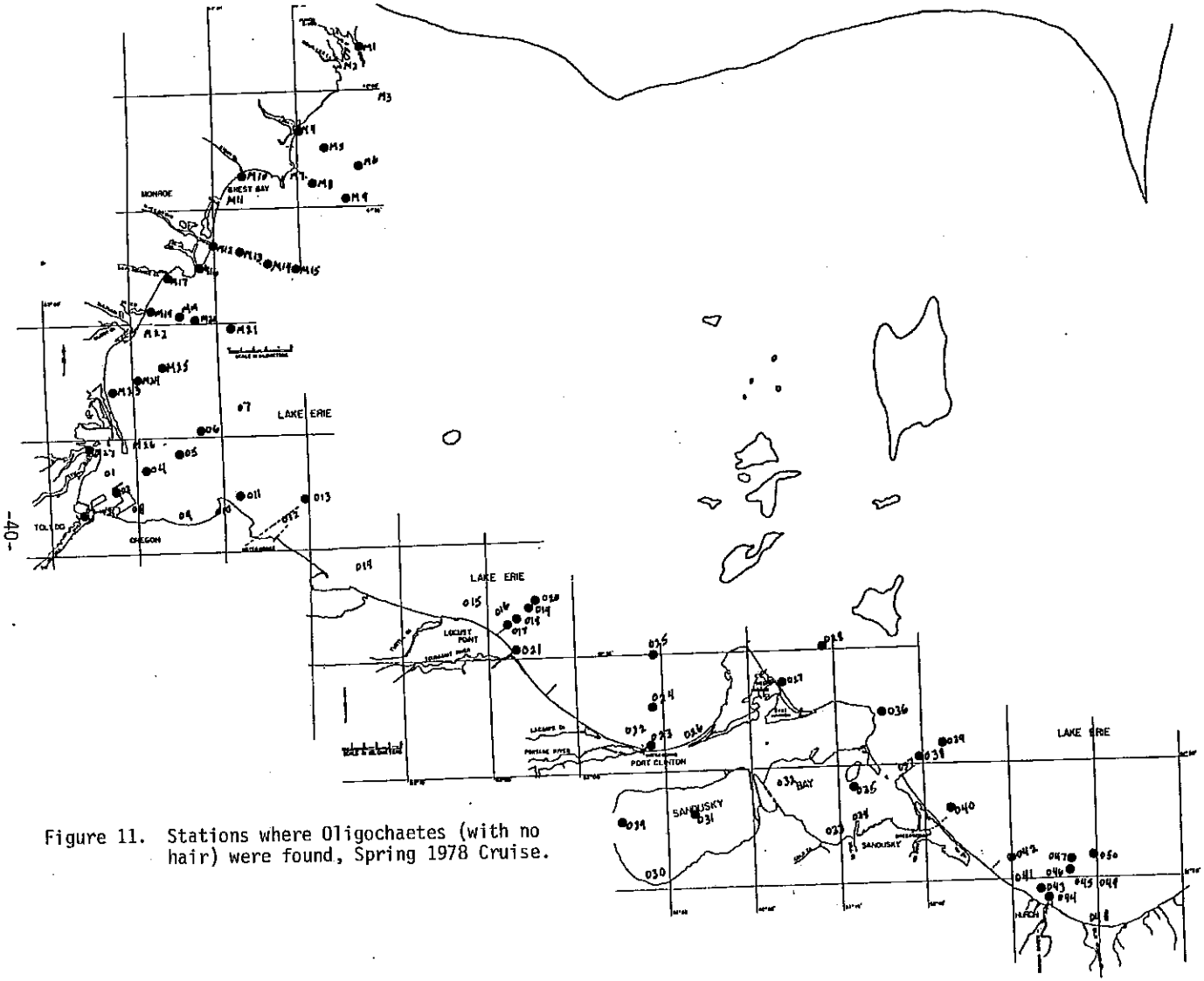


Figure 11. Stations where Oligochaetes (with no hair) were found, Spring 1978 Cruise.

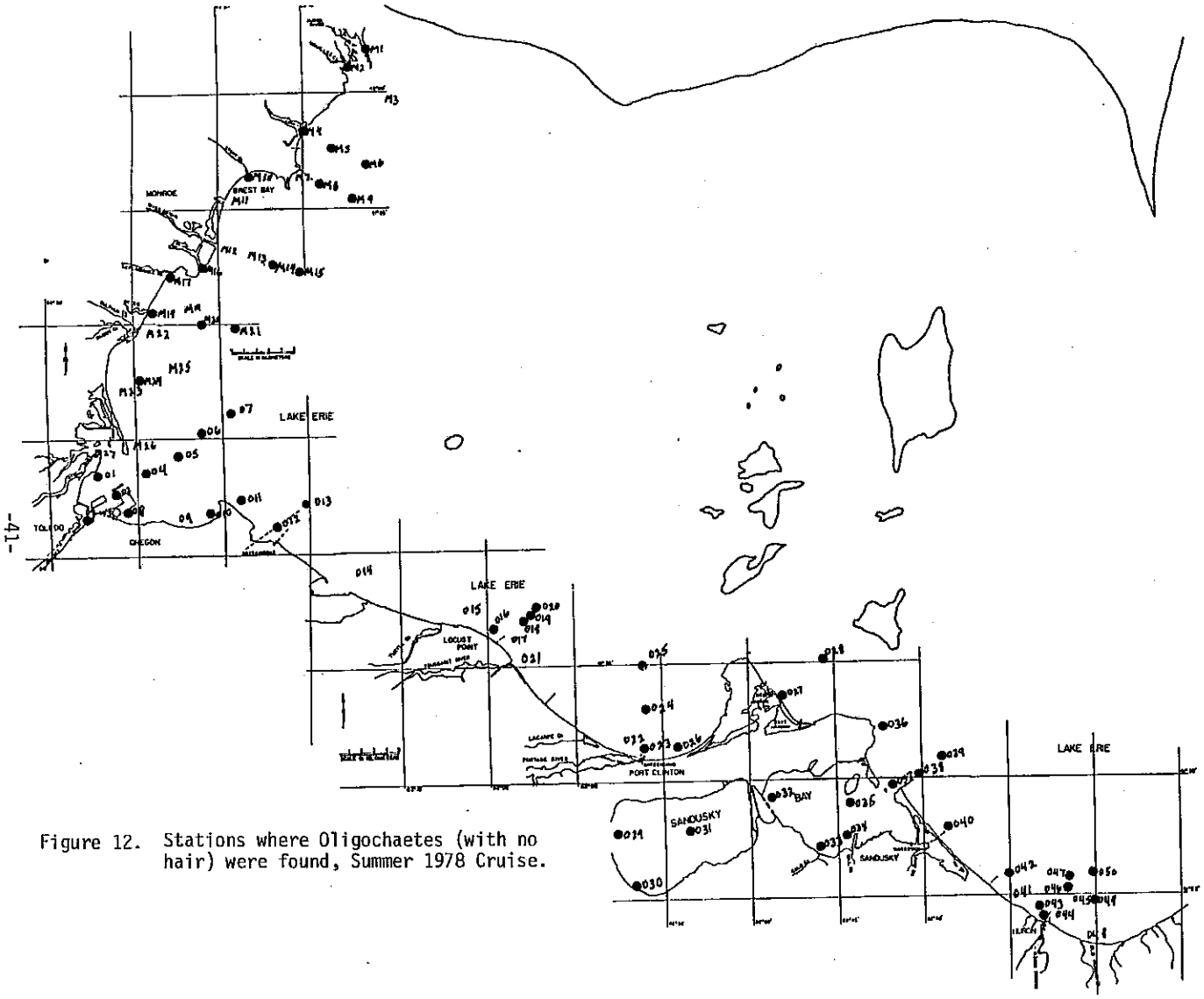


Figure 12. Stations where Oligochaetes (with no hair) were found, Summer 1978 Cruise.

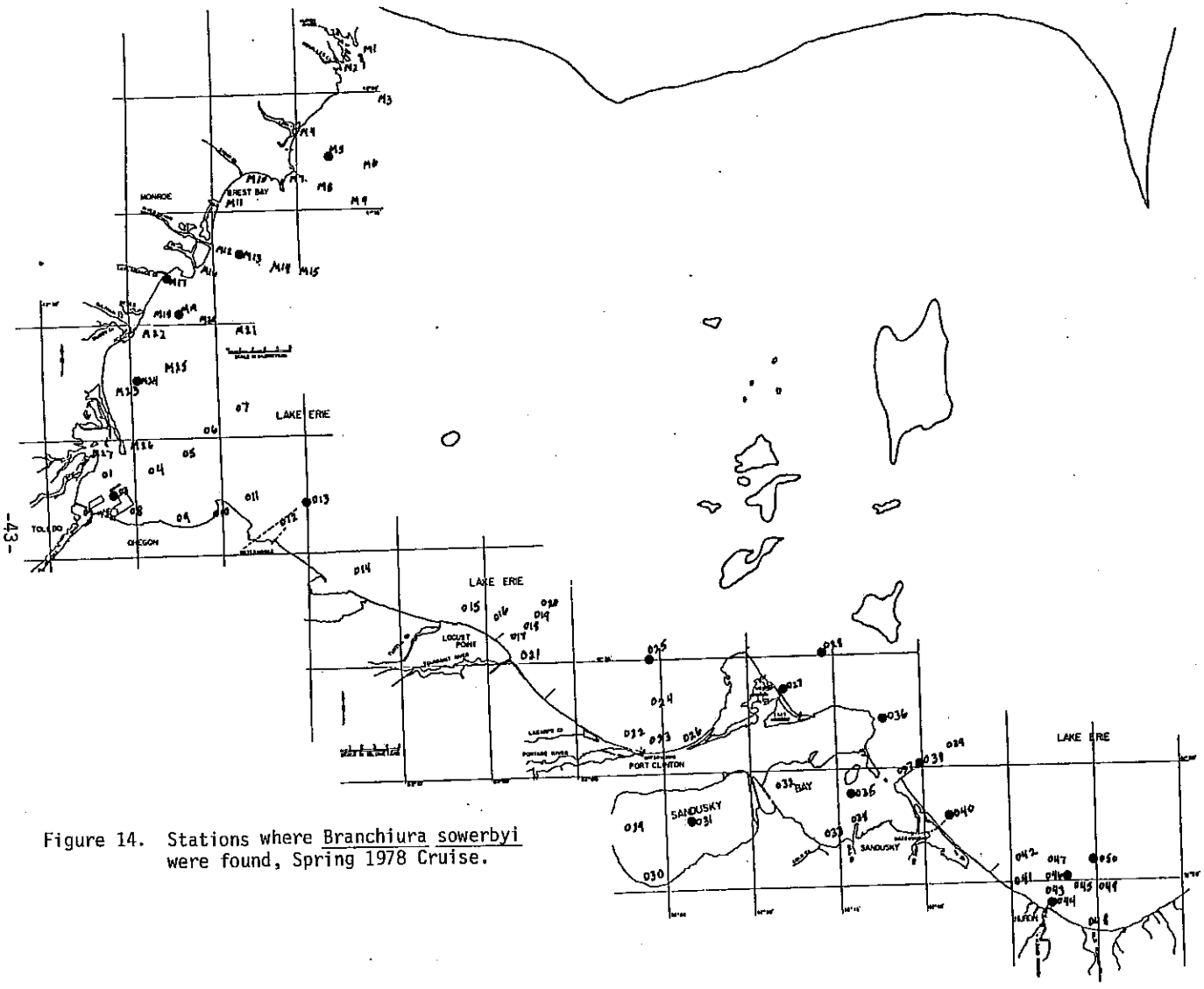


Figure 14. Stations where Branchiura sowerbyi were found, Spring 1978 Cruise.

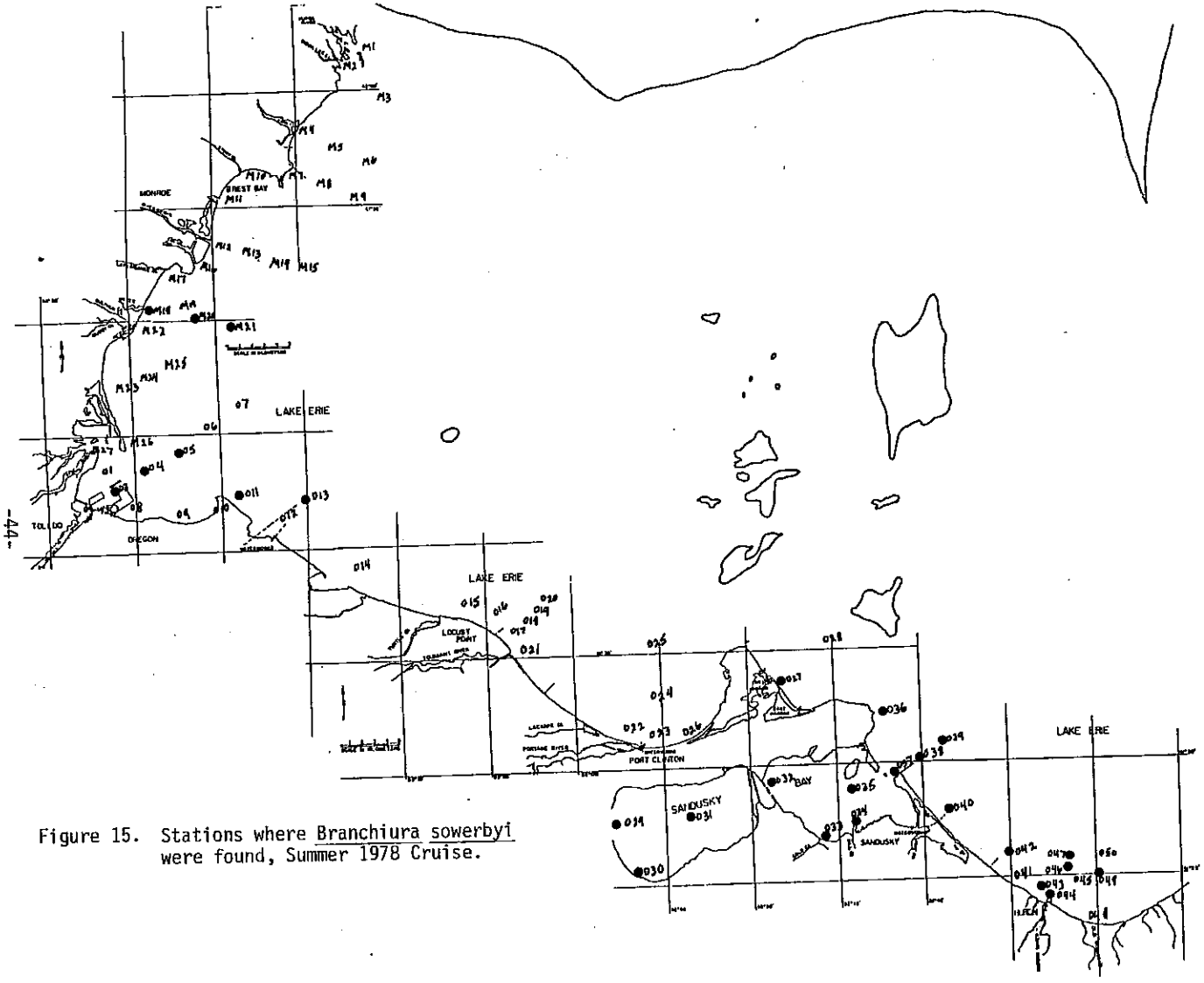


Figure 15. Stations where Branchiura sowerbyi were found, Summer 1978 Cruise.

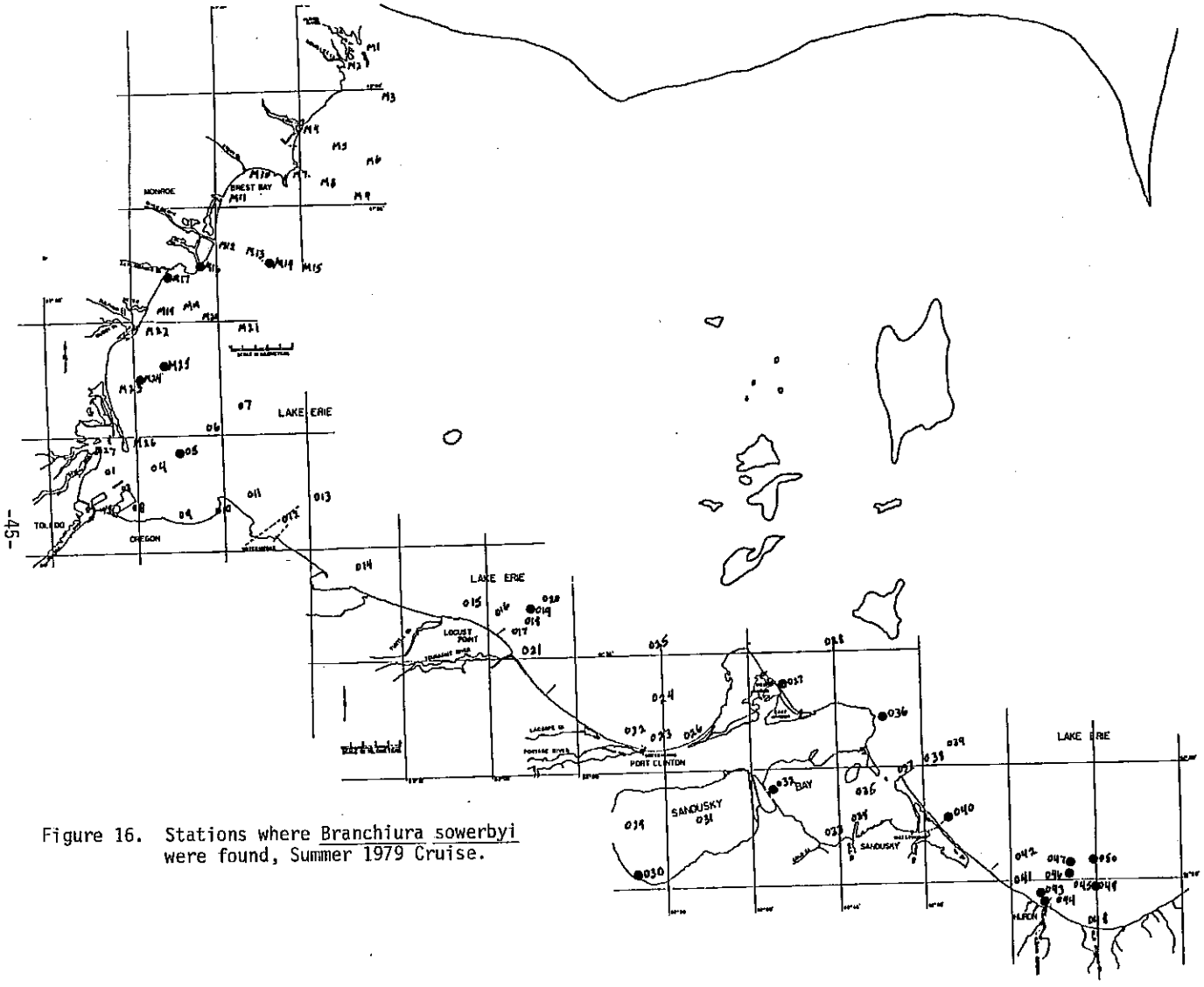


Figure 16. Stations where Branchiura sowerbyi were found, Summer 1979 Cruise.

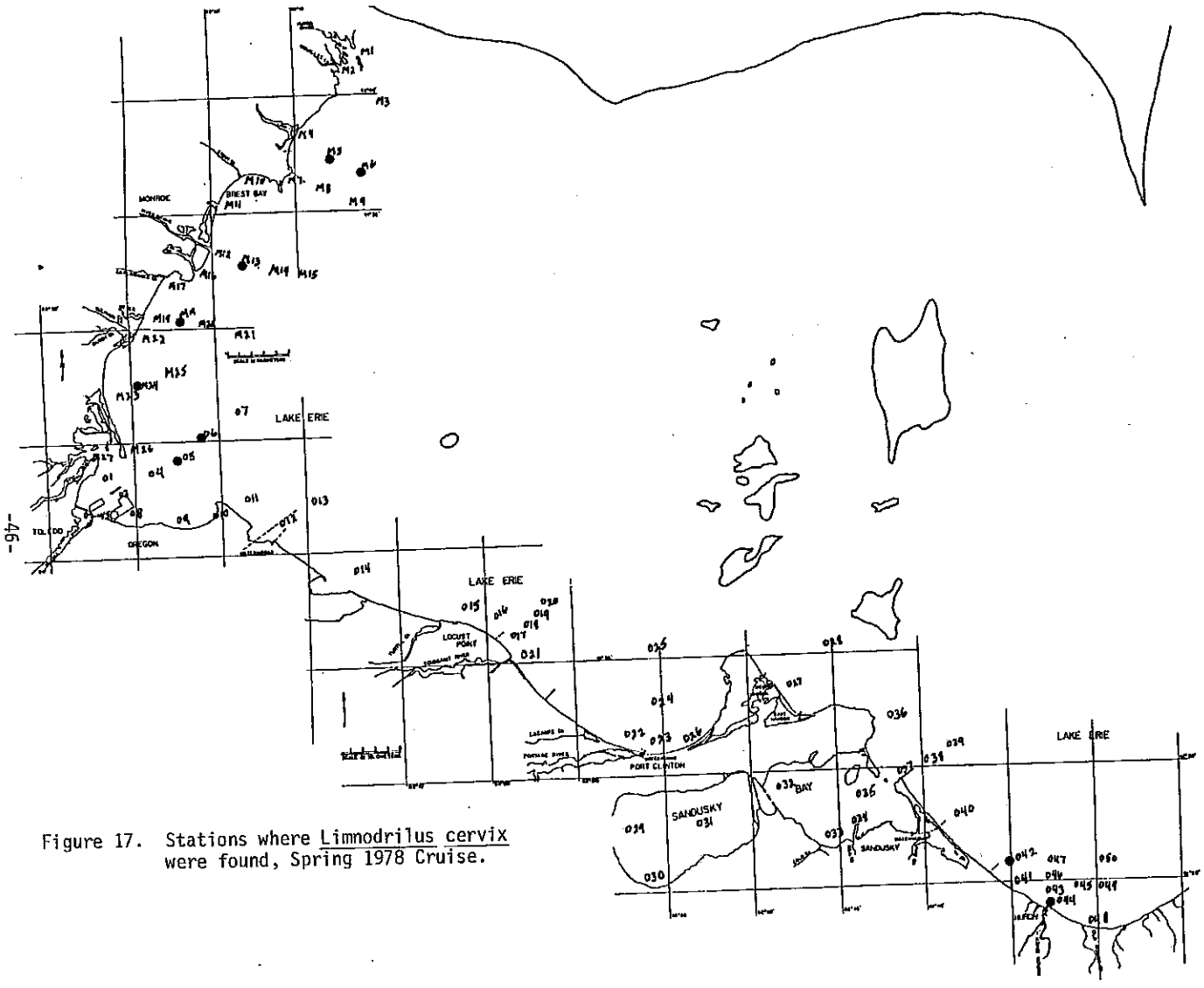


Figure 17. Stations where Limnodrilus cervix were found, Spring 1978 Cruise.

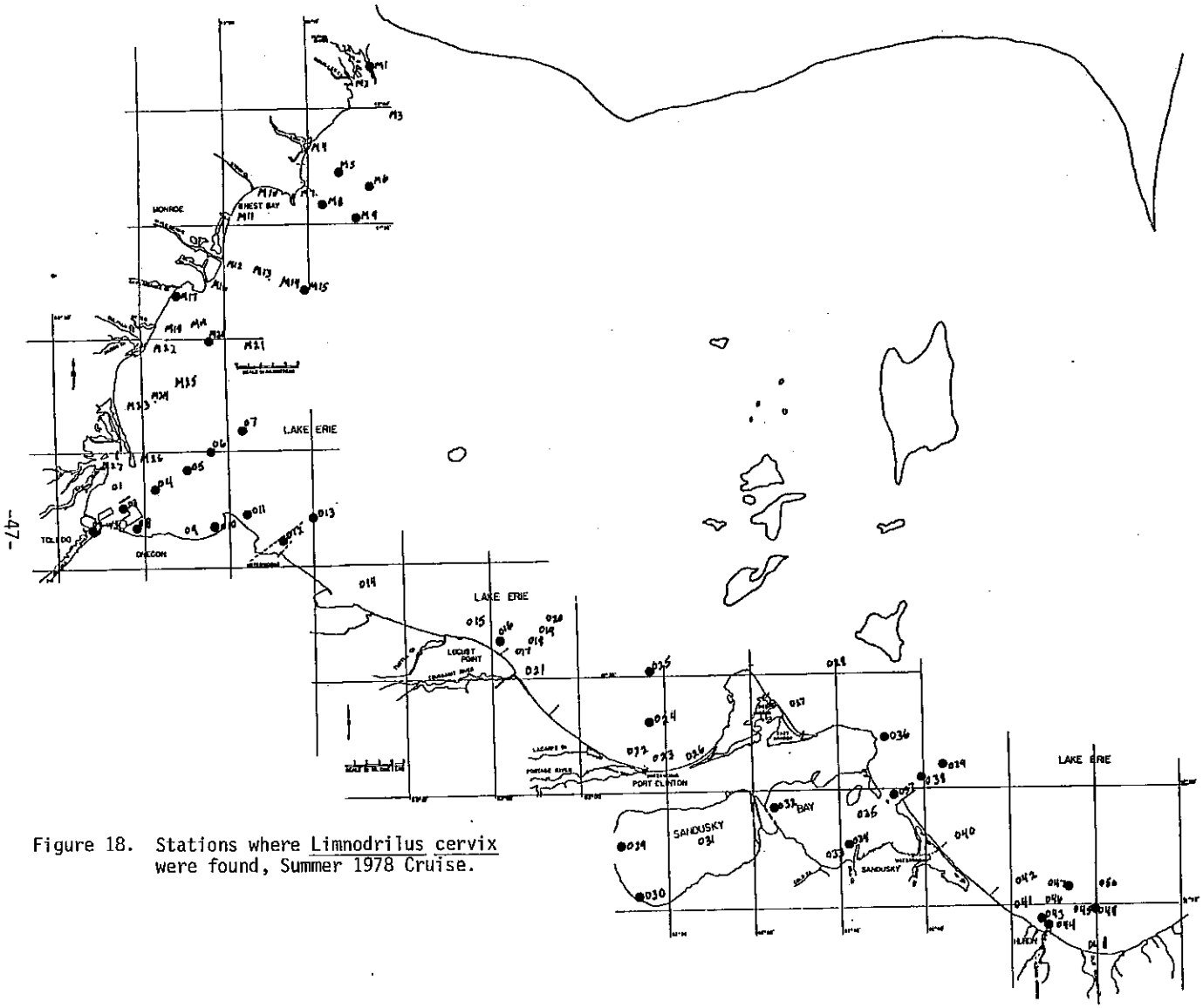


Figure 18. Stations where Limnodrilus cervix were found, Summer 1978 Cruise.

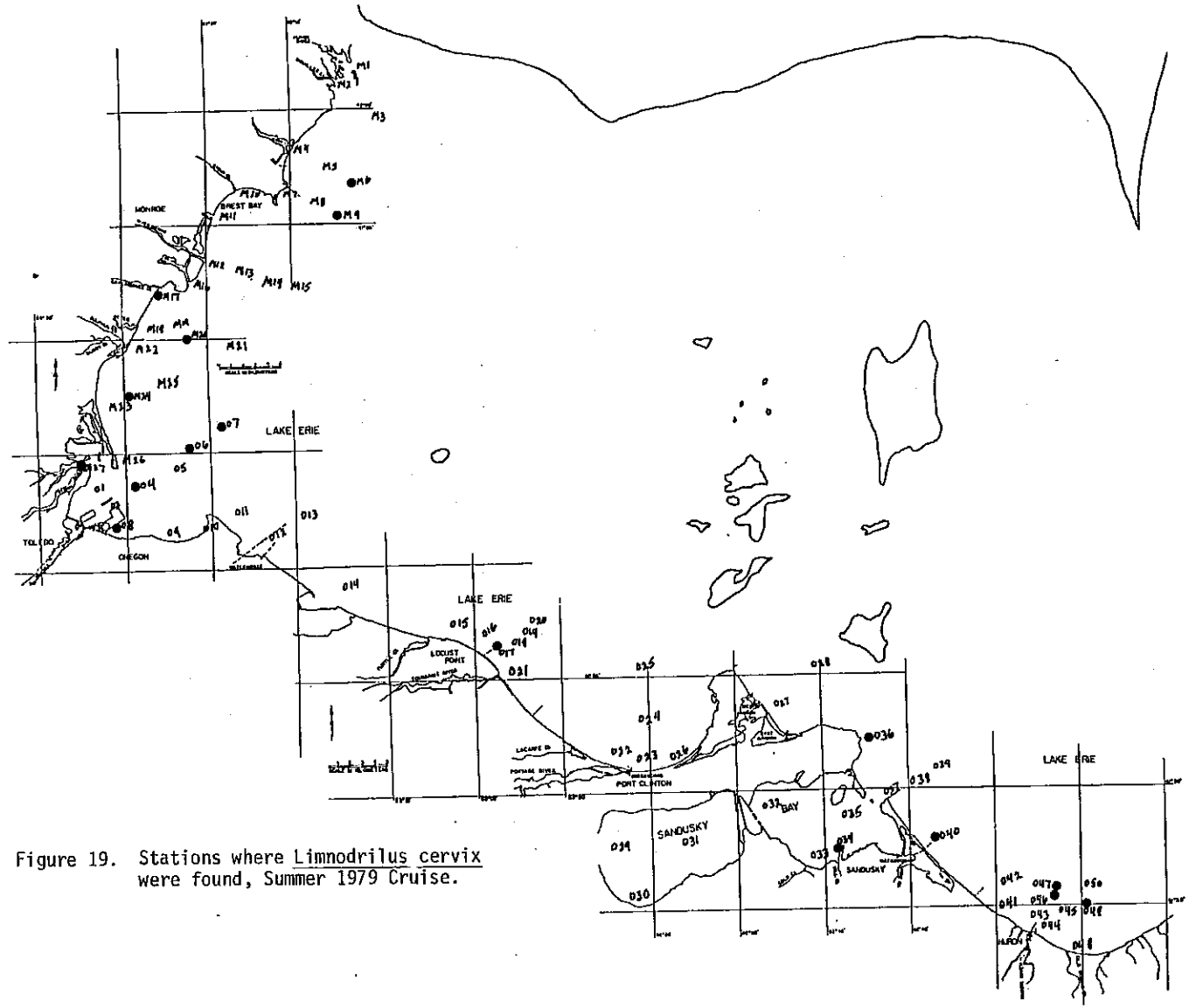


Figure 19. Stations where Limnodrilus cervix were found, Summer 1979 Cruise.

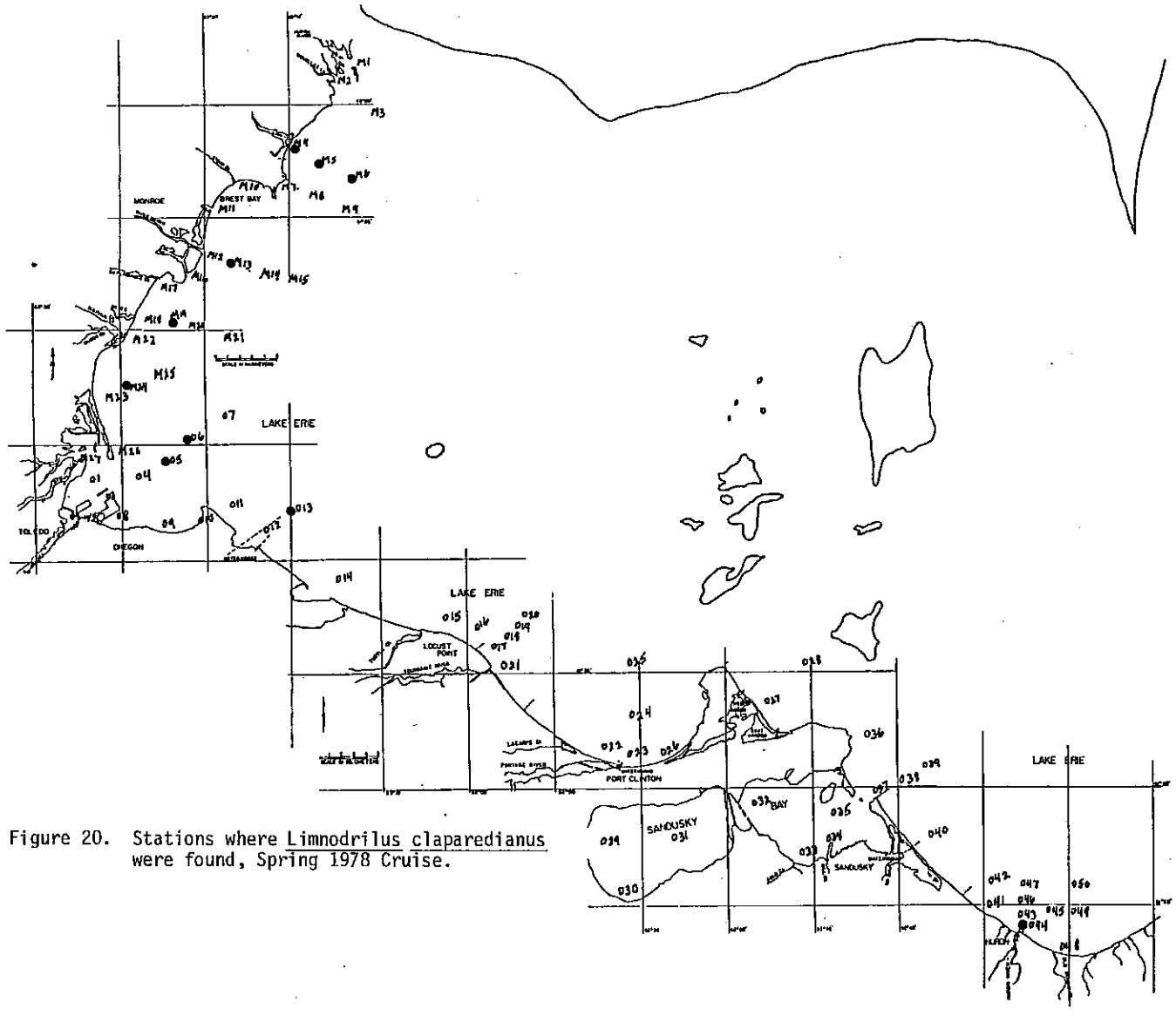


Figure 20. Stations where Limnodrilus claparedianus were found, Spring 1978 Cruise.

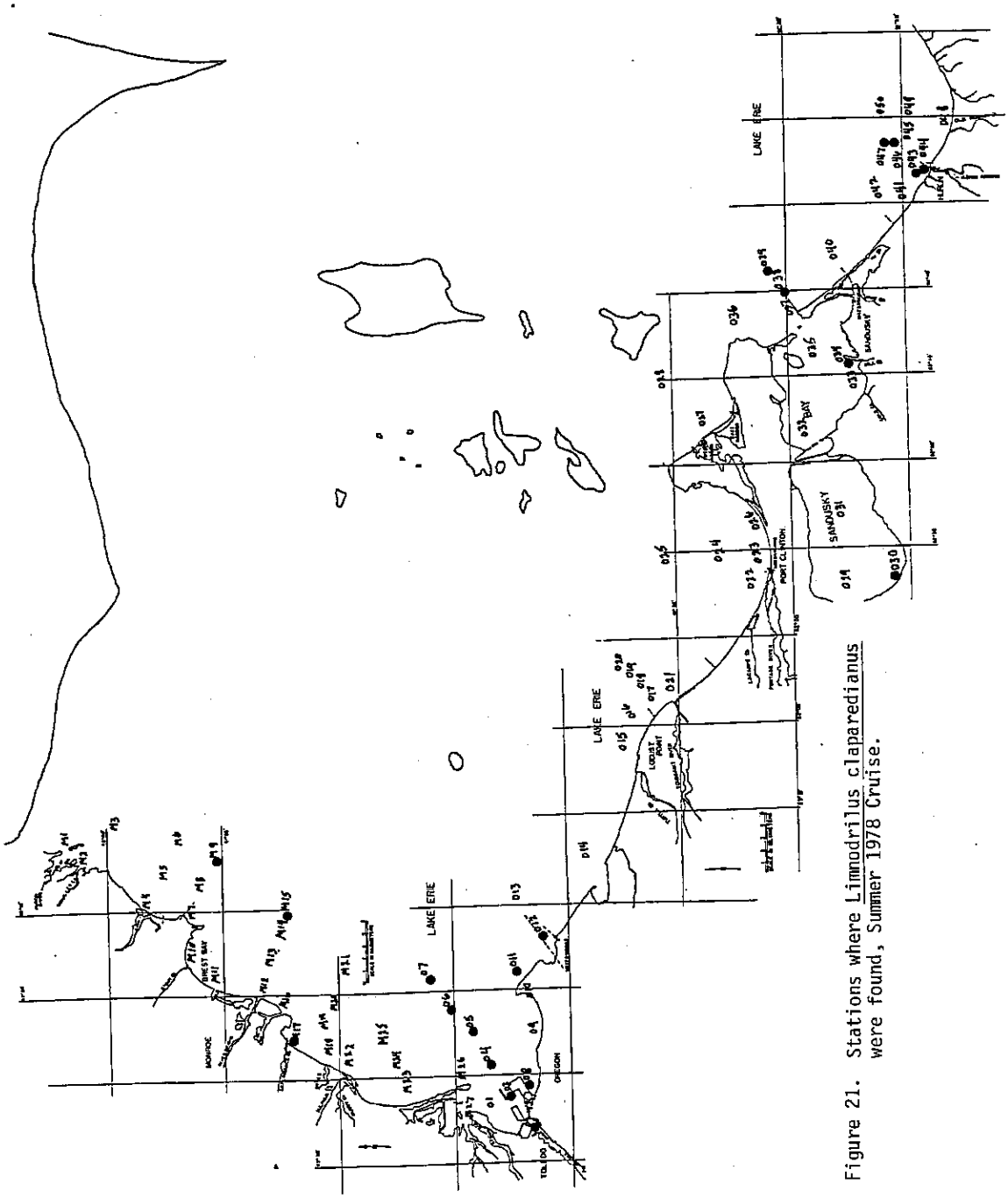


Figure 21. Stations where Limnodrilus claparedianus were found, Summer 1978 Cruise.

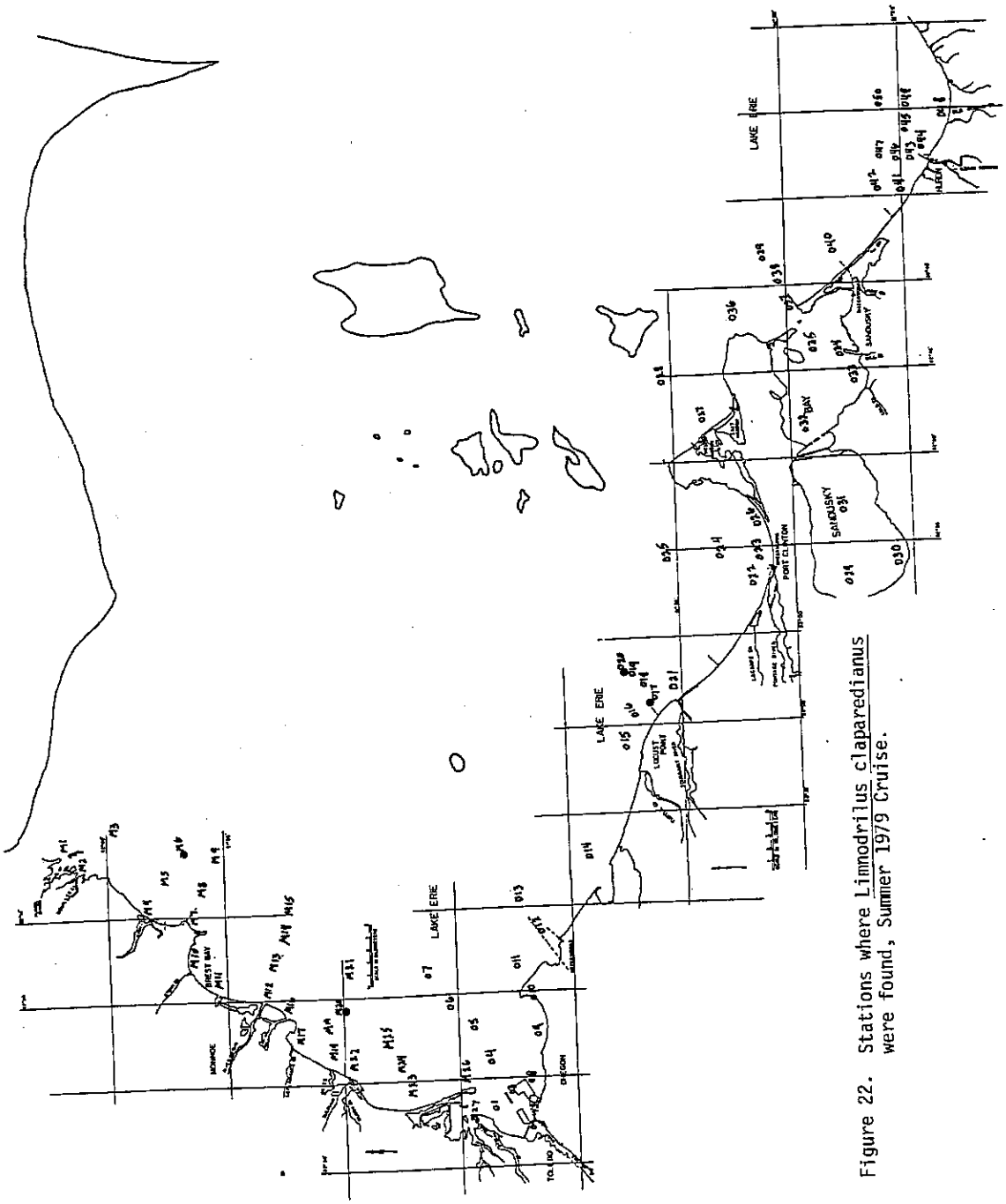


Figure 22. Stations where Limnodrilus claparedianus were found, Summer 1979 Cruise.

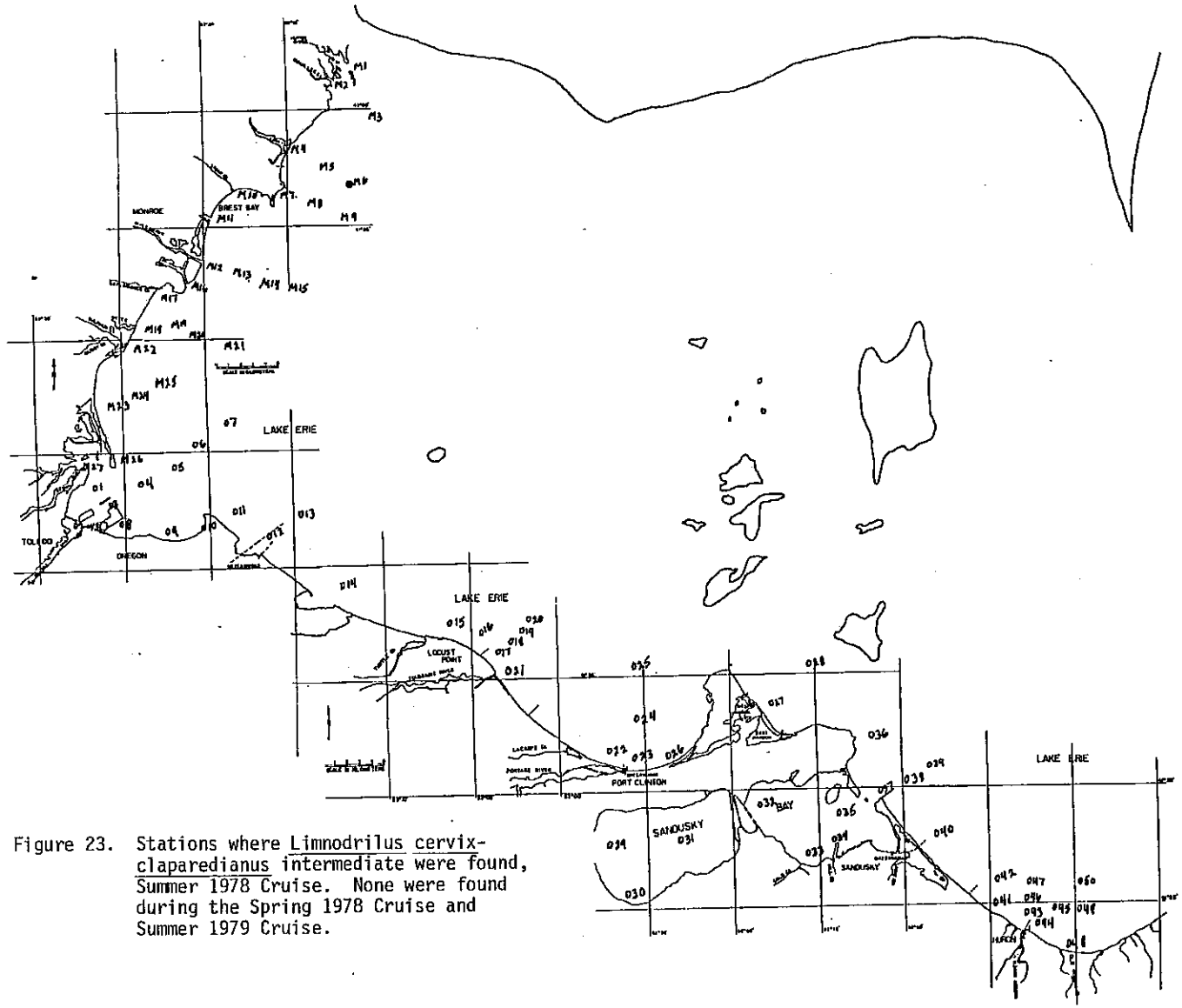


Figure 23. Stations where Limnodrilus cervix-claparedianus intermediate were found, Summer 1978 Cruise. None were found during the Spring 1978 Cruise and Summer 1979 Cruise.

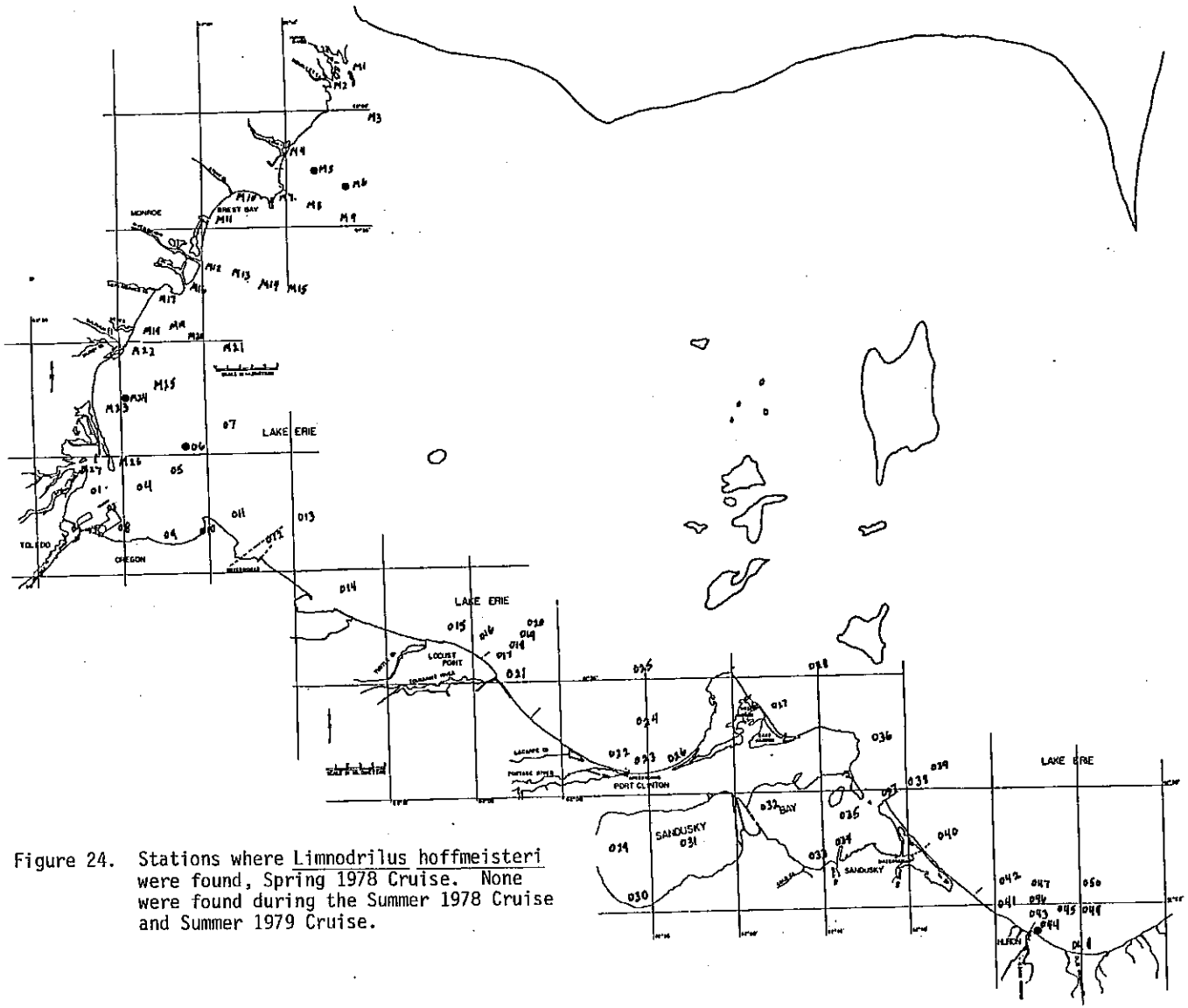


Figure 24. Stations where Limnodrilus hoffmeisteri were found, Spring 1978 Cruise. None were found during the Summer 1978 Cruise and Summer 1979 Cruise.

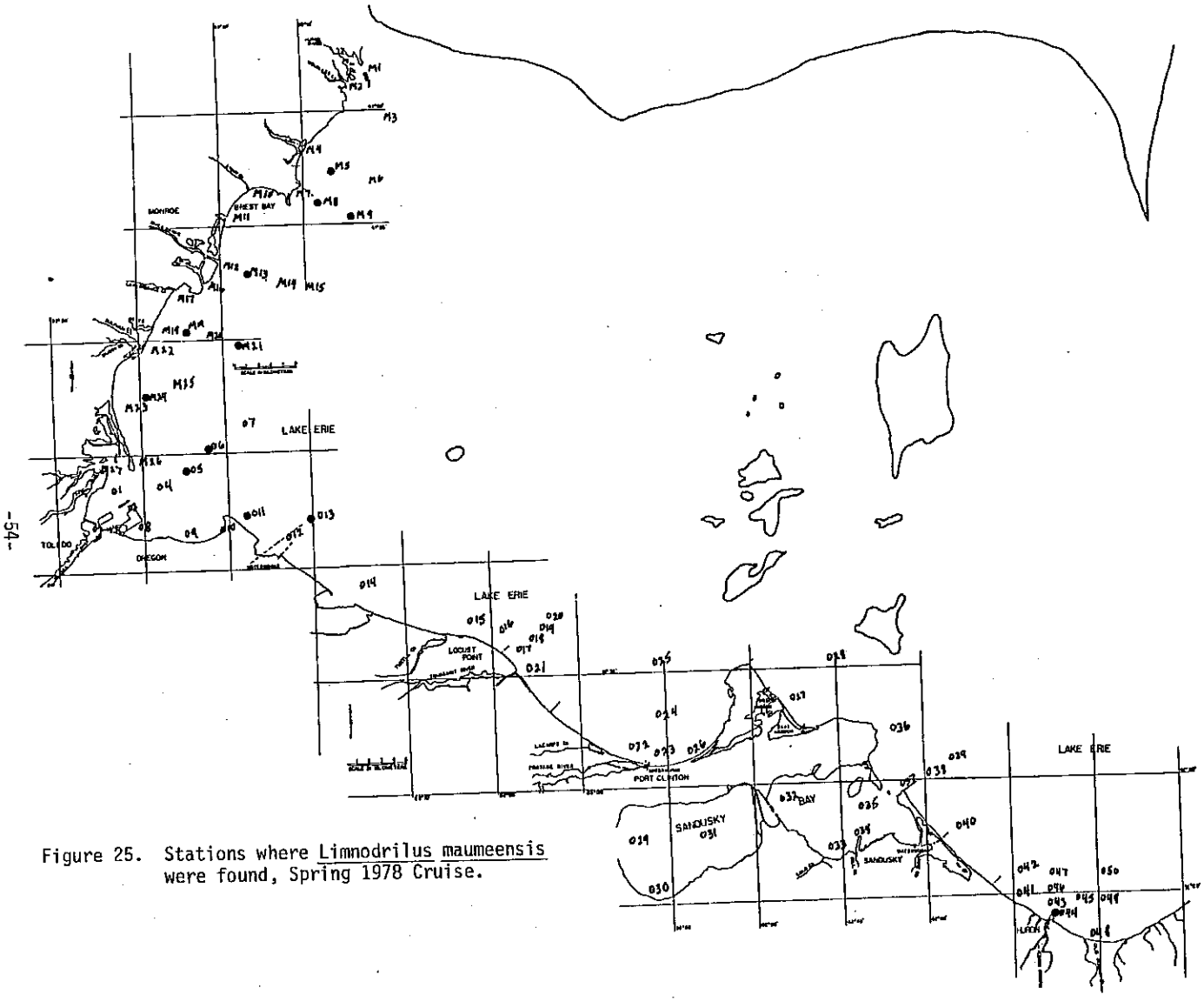


Figure 25. Stations where Limnodrilus maumeensis were found, Spring 1978 Cruise.

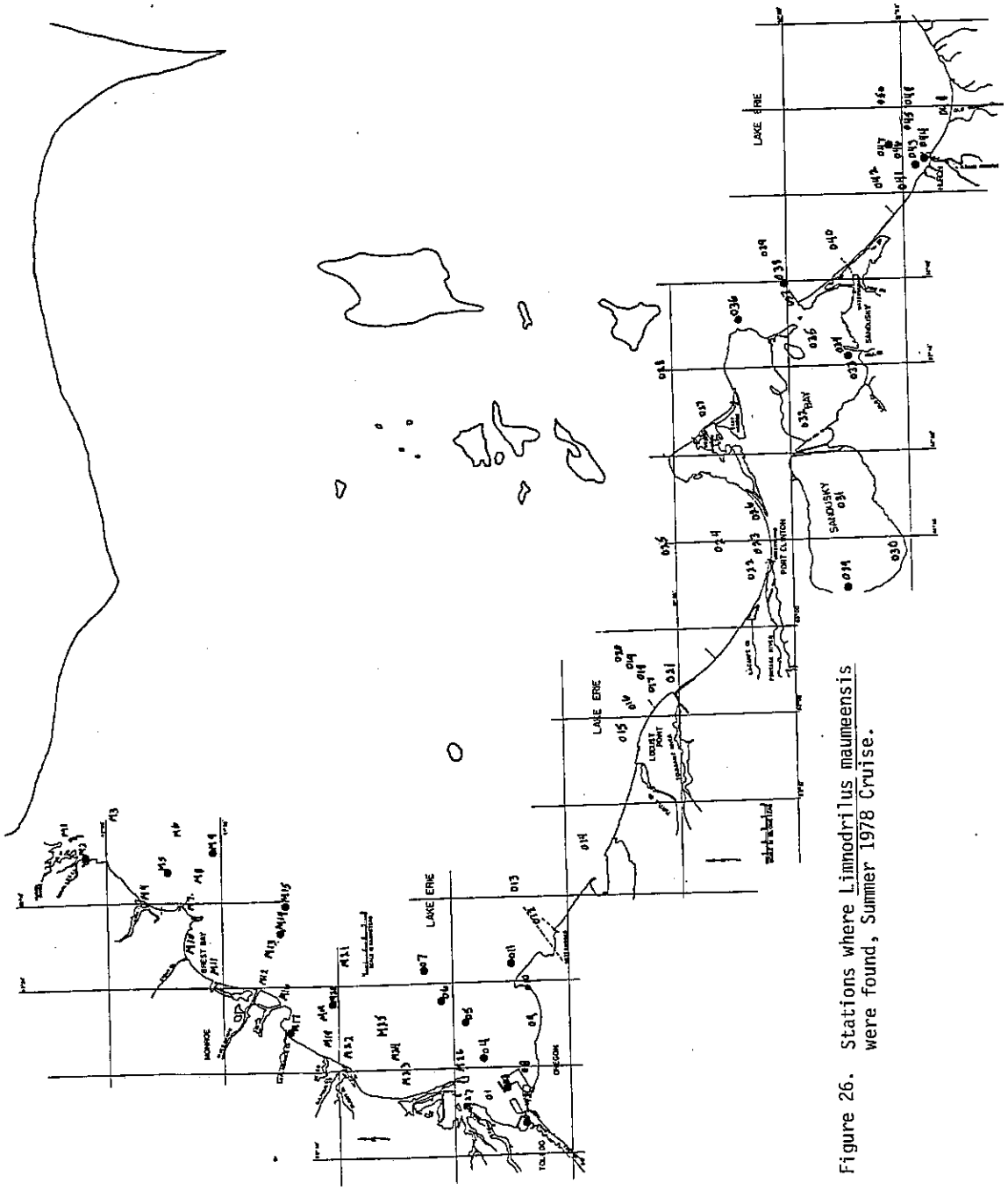


Figure 26. Stations where Limnodrilus maumeensis were found, Summer 1978 Cruise.

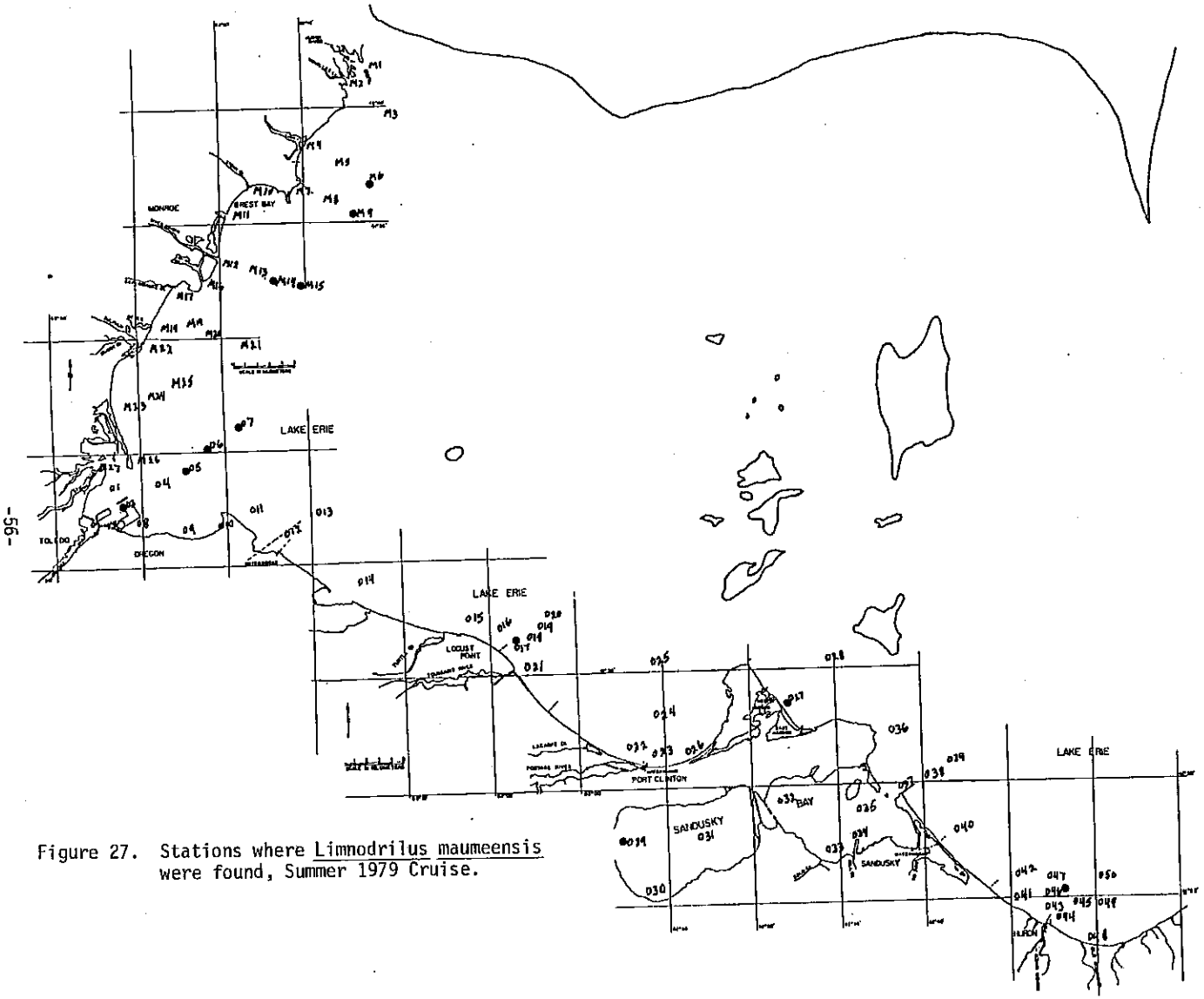


Figure 27. Stations where Limnodrilus maumeensis were found, Summer 1979 Cruise.

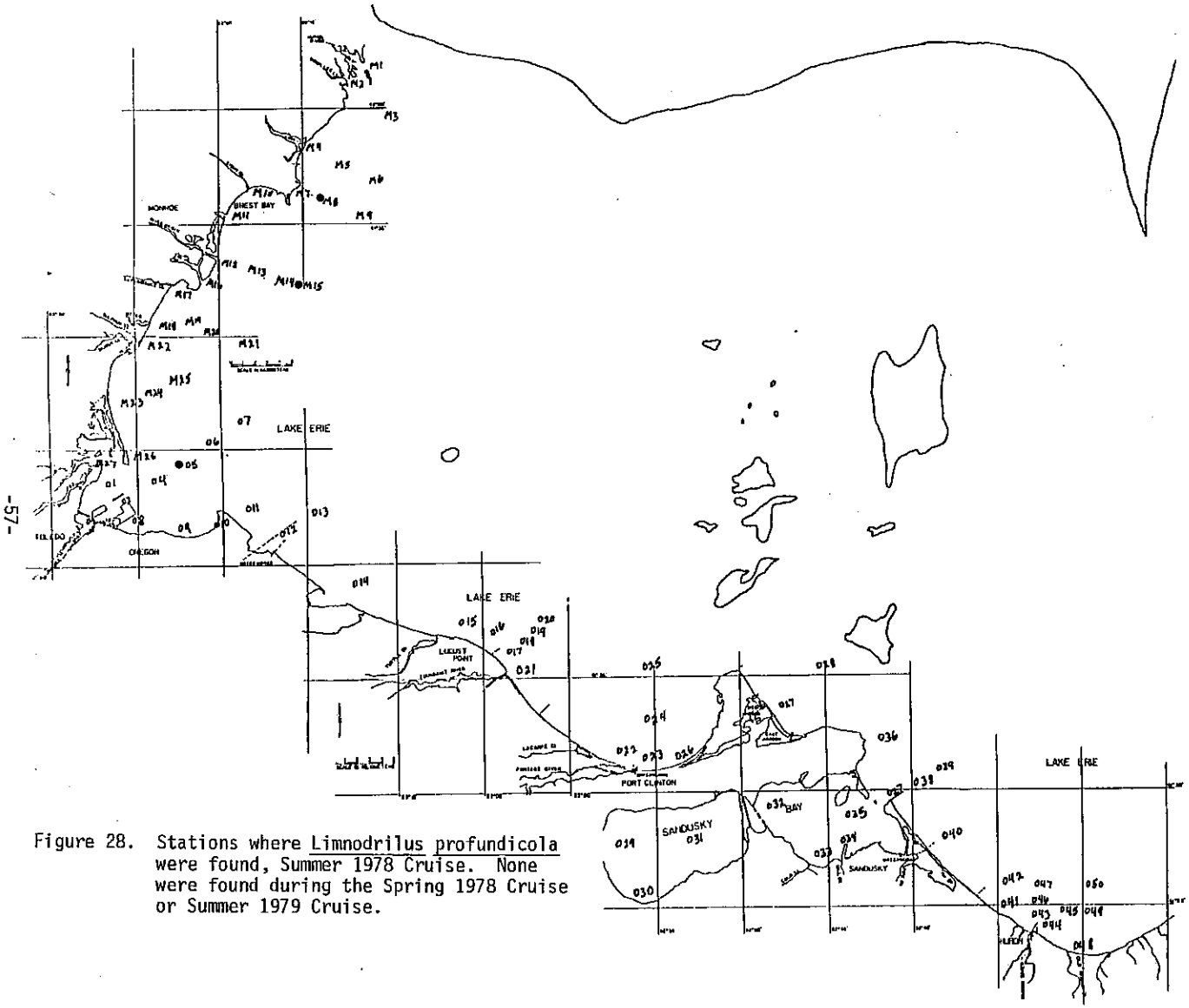


Figure 28. Stations where Limnodrilus profundicola were found, Summer 1978 Cruise. None were found during the Spring 1978 Cruise or Summer 1979 Cruise.

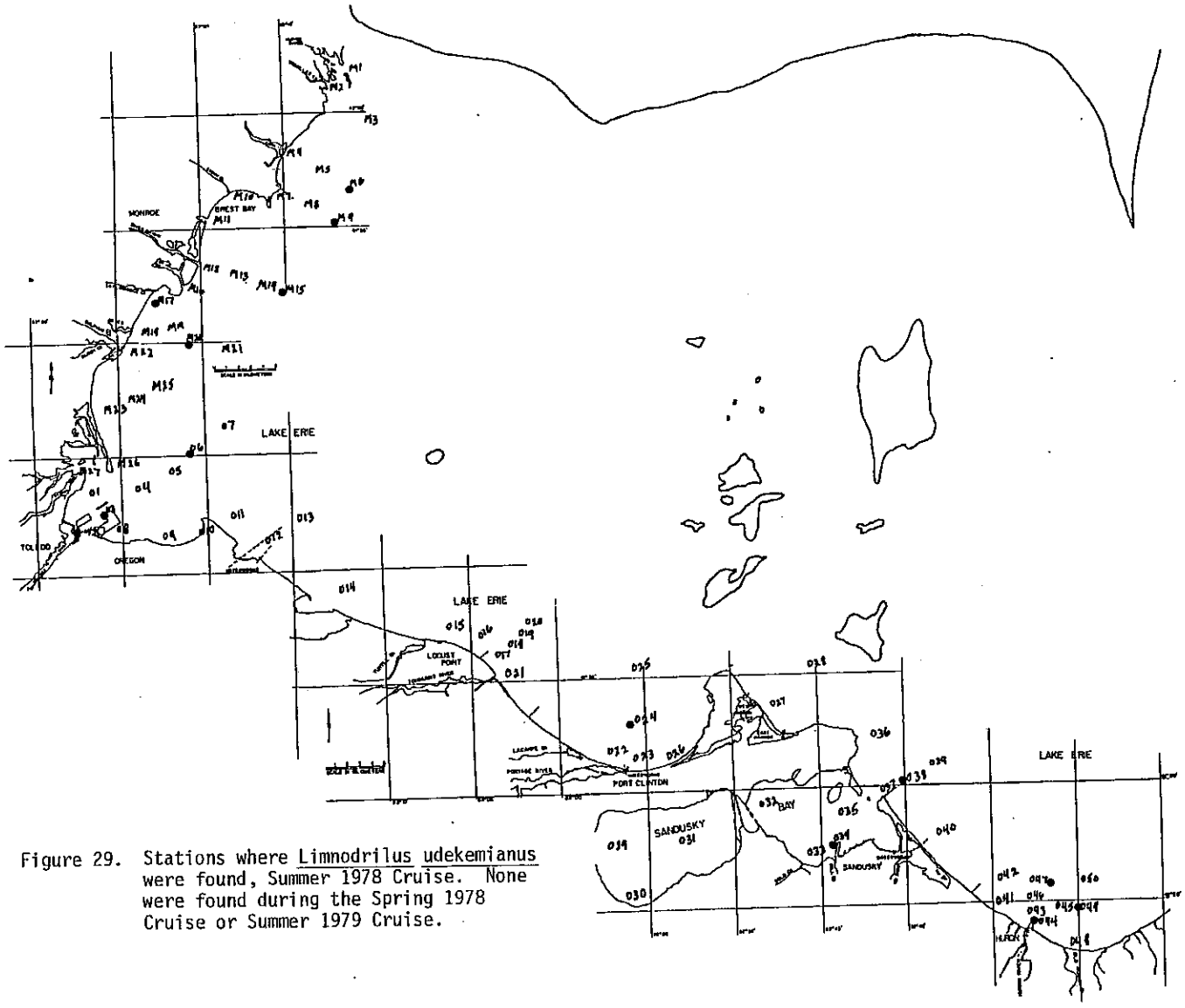


Figure 29. Stations where Limnodrilus udekemianus were found, Summer 1978 Cruise. None were found during the Spring 1978 Cruise or Summer 1979 Cruise.

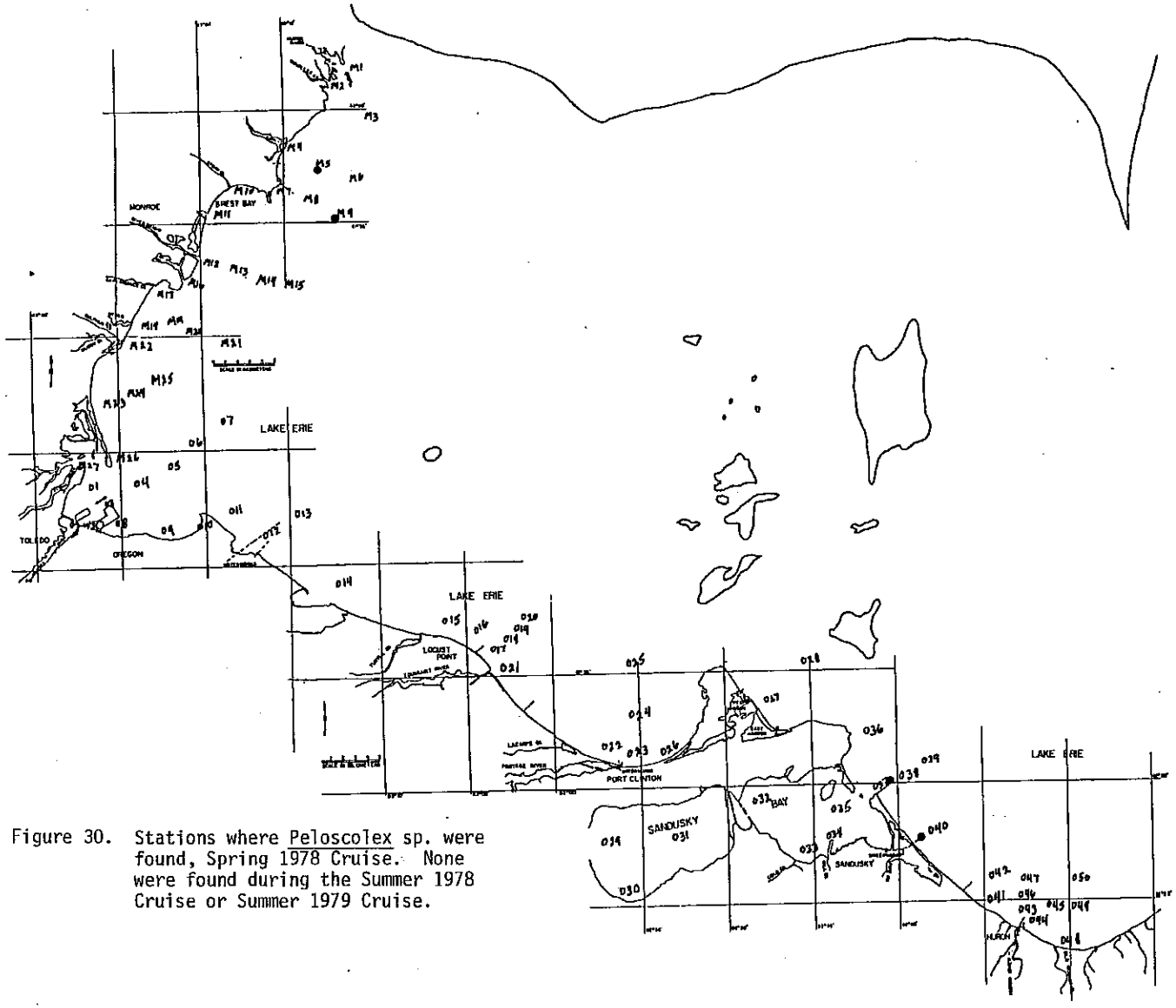


Figure 30. Stations where Peloscolex sp. were found, Spring 1978 Cruise. None were found during the Summer 1978 Cruise or Summer 1979 Cruise.

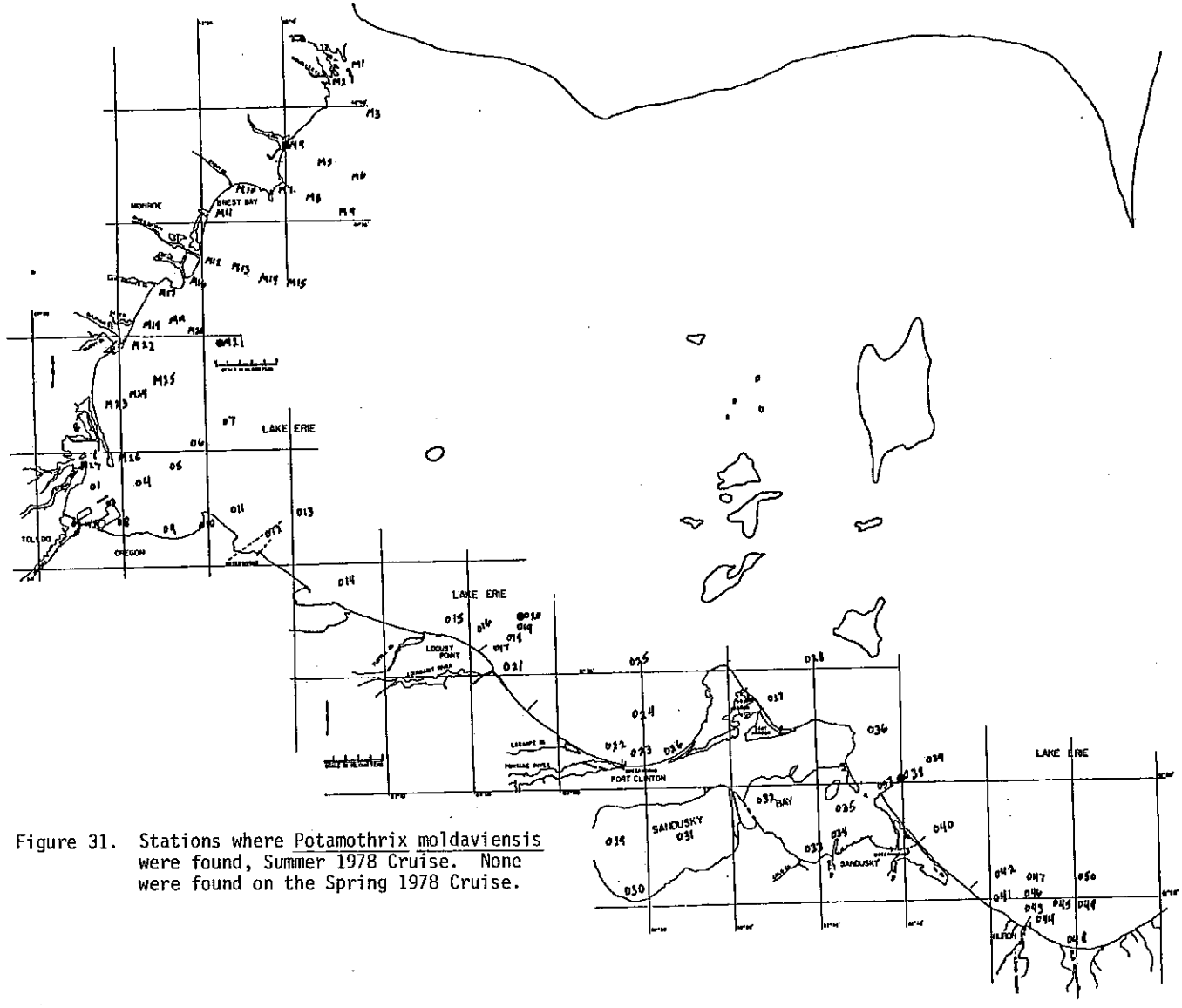


Figure 31. Stations where Potamothrix moldaviensis were found, Summer 1978 Cruise. None were found on the Spring 1978 Cruise.

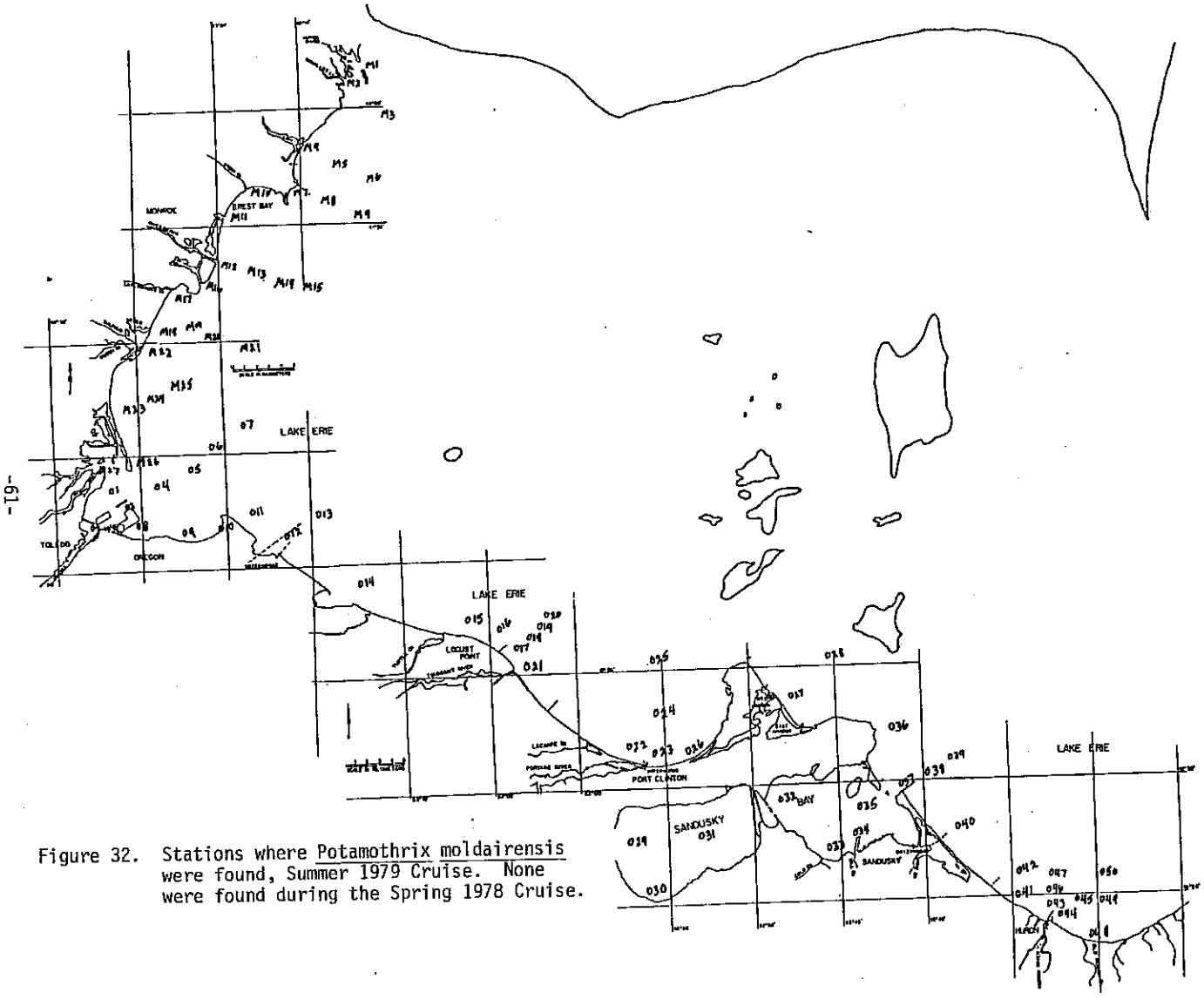


Figure 32. Stations where Potamothrix moldairensis were found, Summer 1979 Cruise. None were found during the Spring 1978 Cruise.

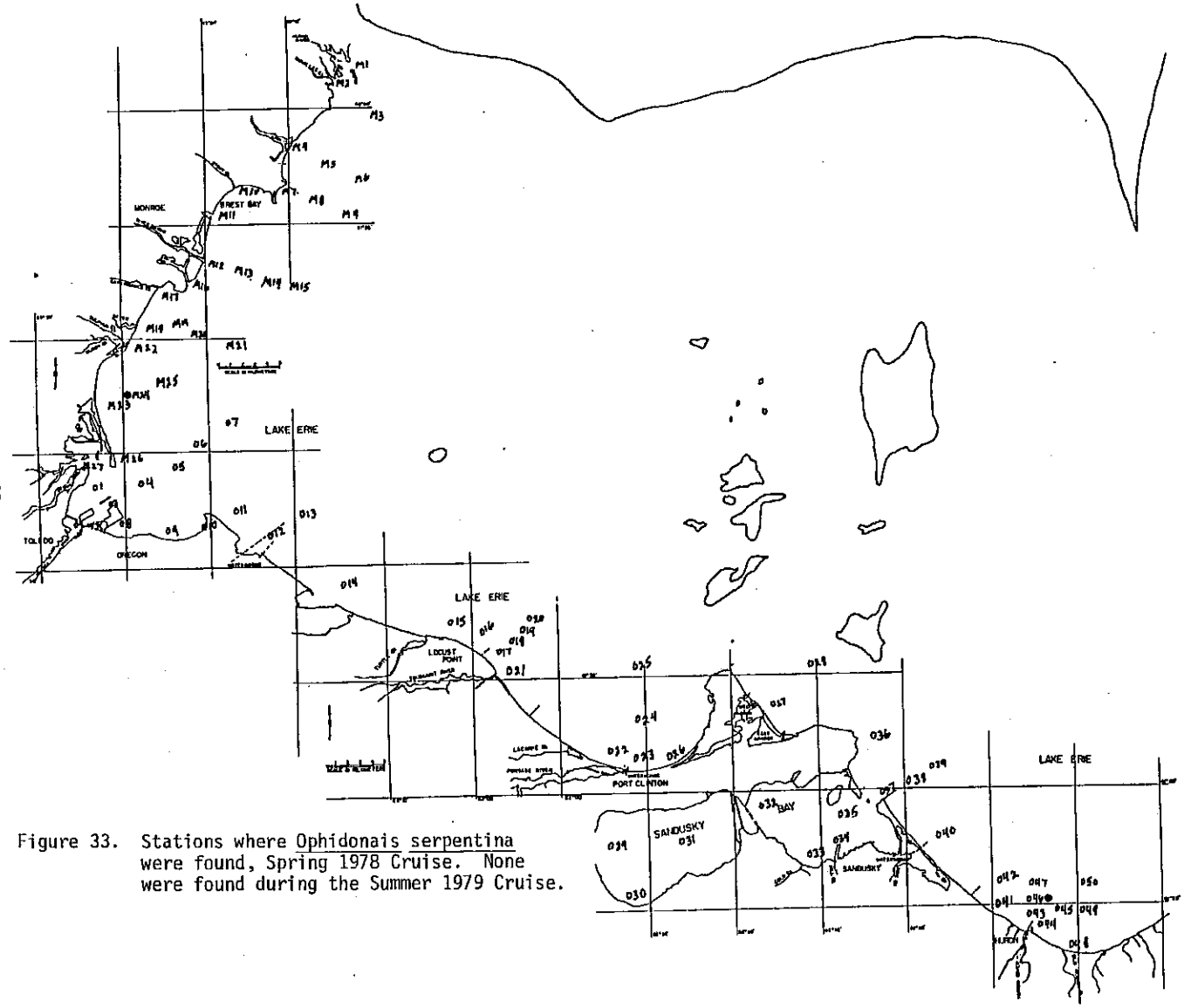


Figure 33. Stations where Ophidonais serpentina were found, Spring 1978 Cruise. None were found during the Summer 1979 Cruise.

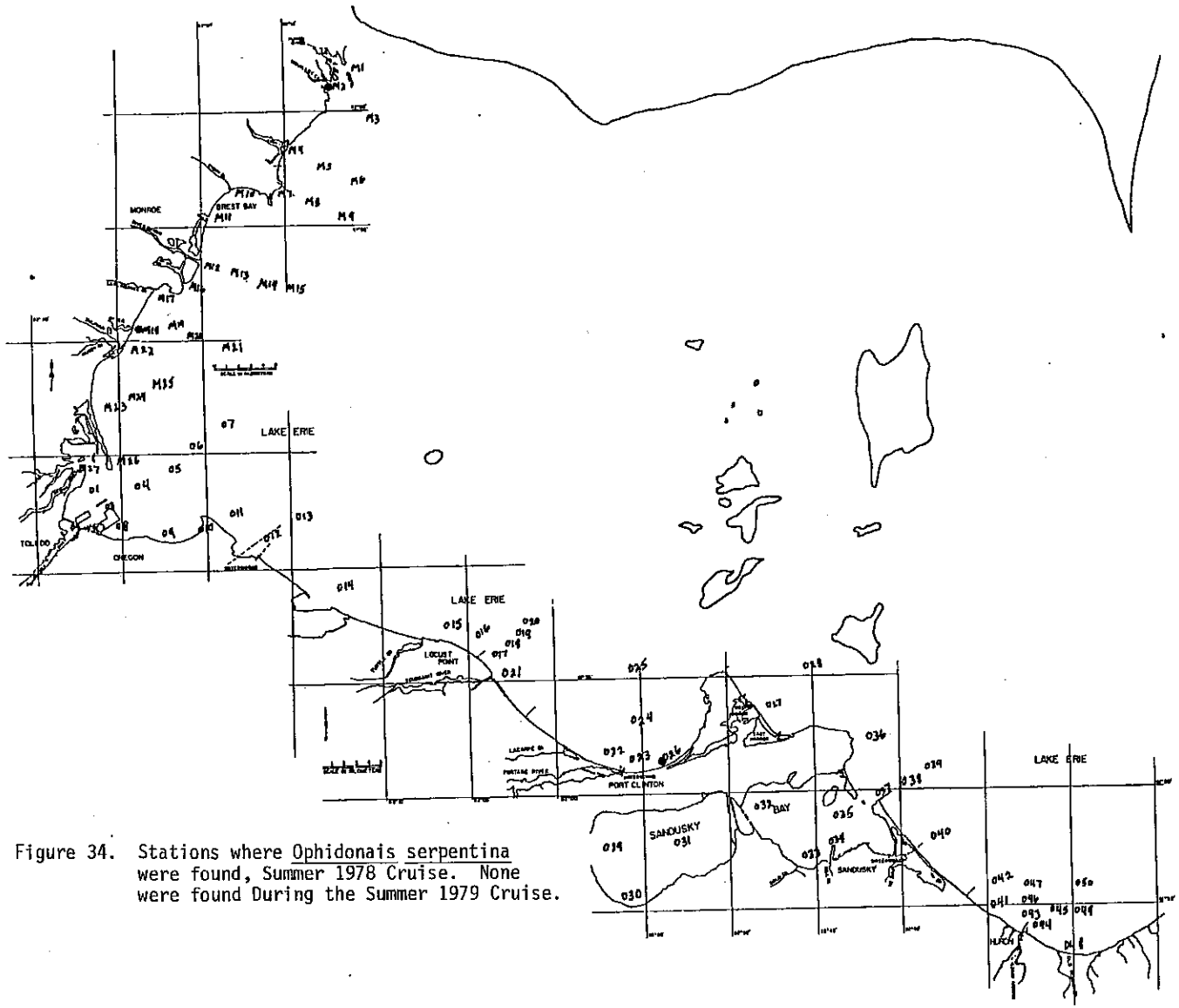


Figure 34. Stations where Ophidonais serpentina were found, Summer 1978 Cruise. None were found During the Summer 1979 Cruise.

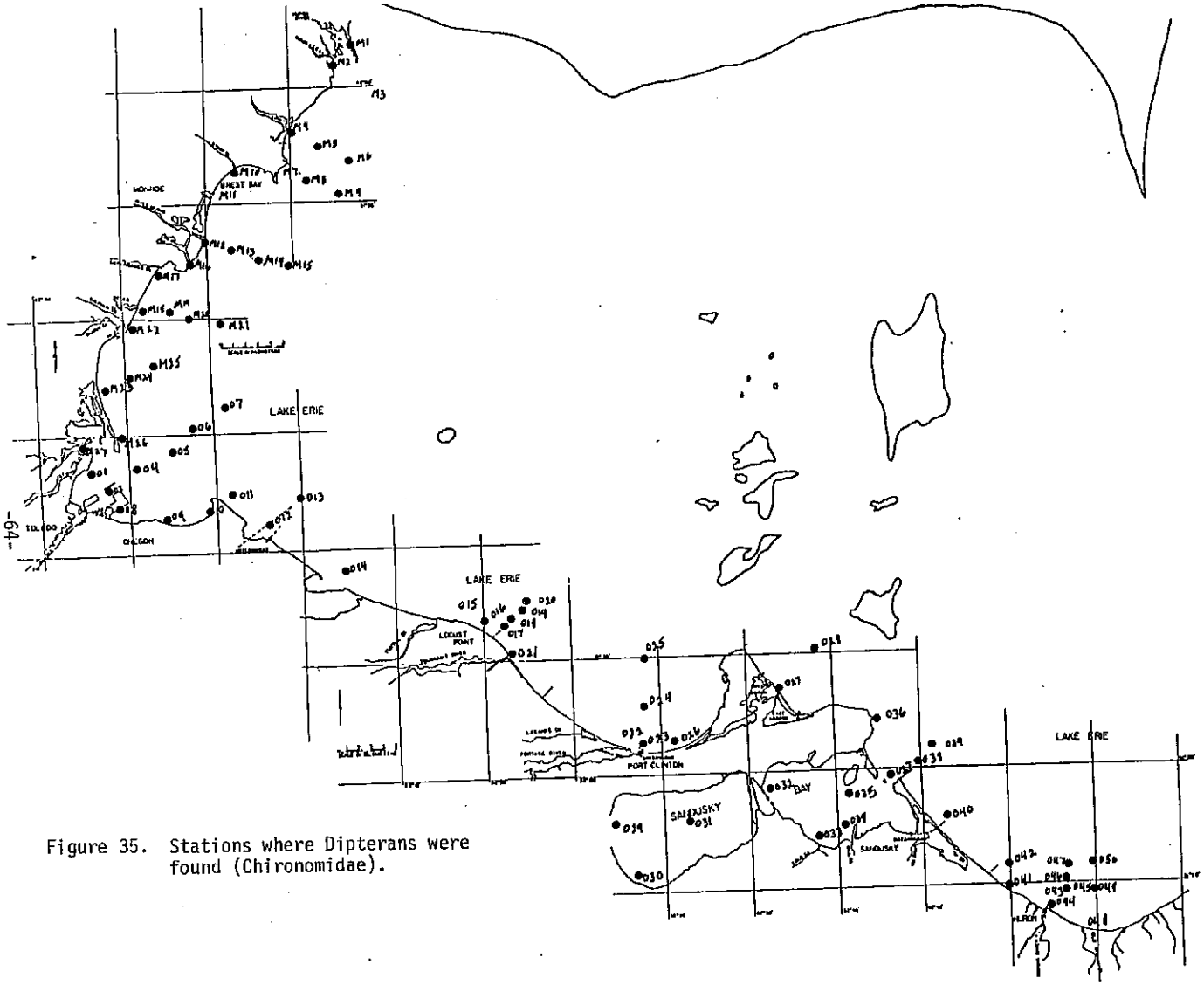


Figure 35. Stations where Dipterans were found (Chironomidae).

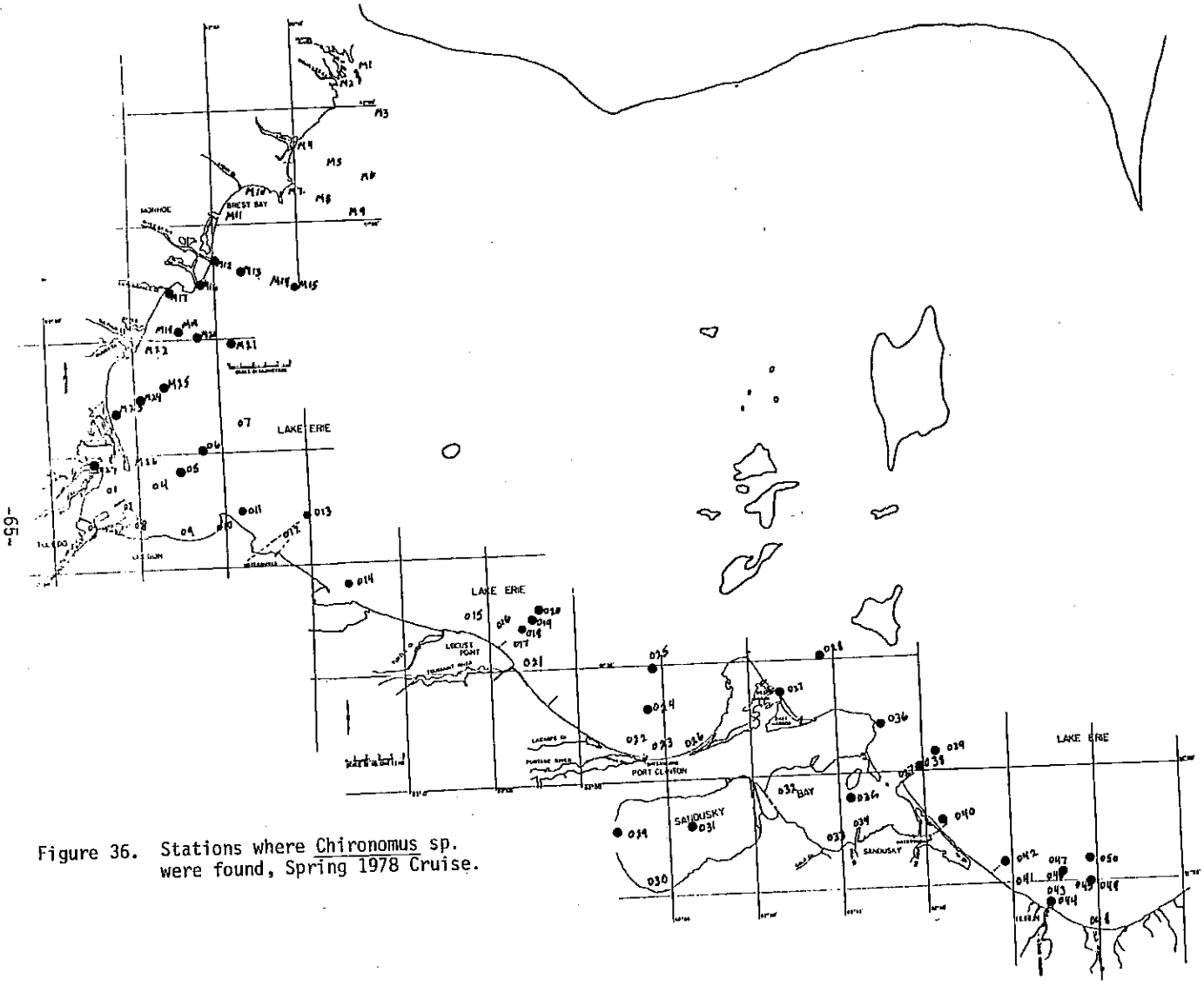


Figure 36. Stations where Chironomus sp. were found, Spring 1978 Cruise.

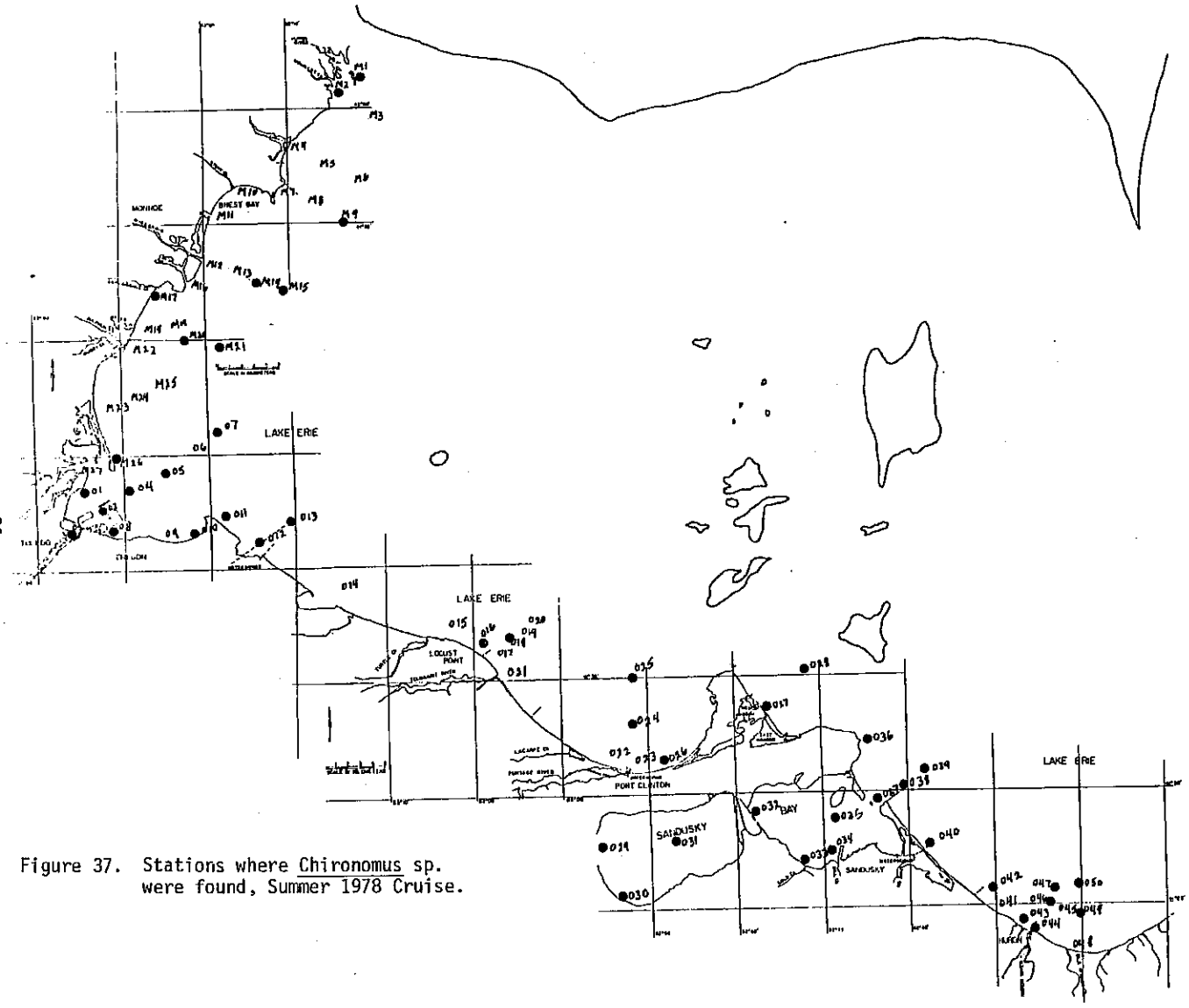


Figure 37. Stations where Chironomus sp. were found, Summer 1978 Cruise.

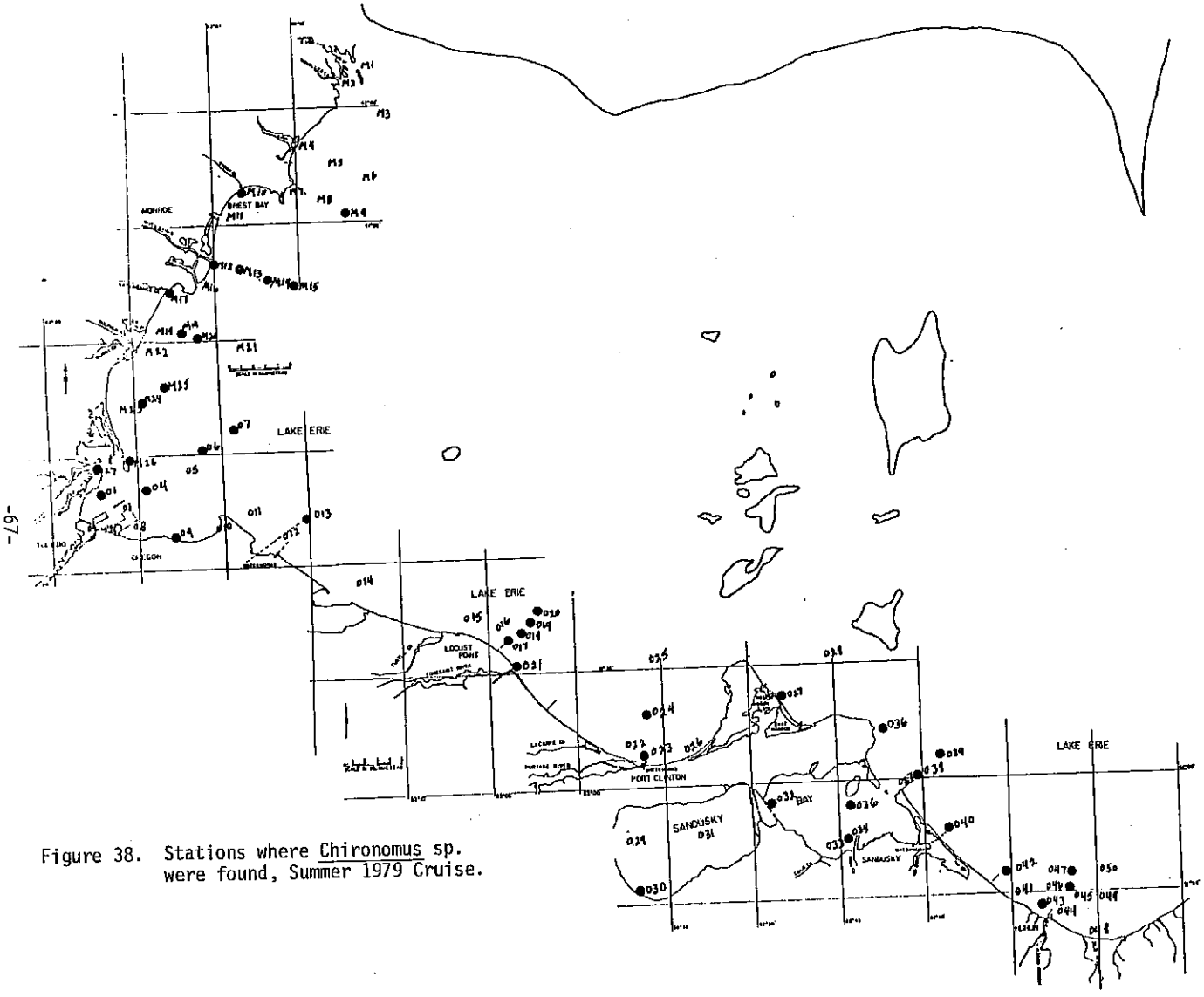


Figure 38. Stations where Chironomus sp. were found, Summer 1979 Cruise.

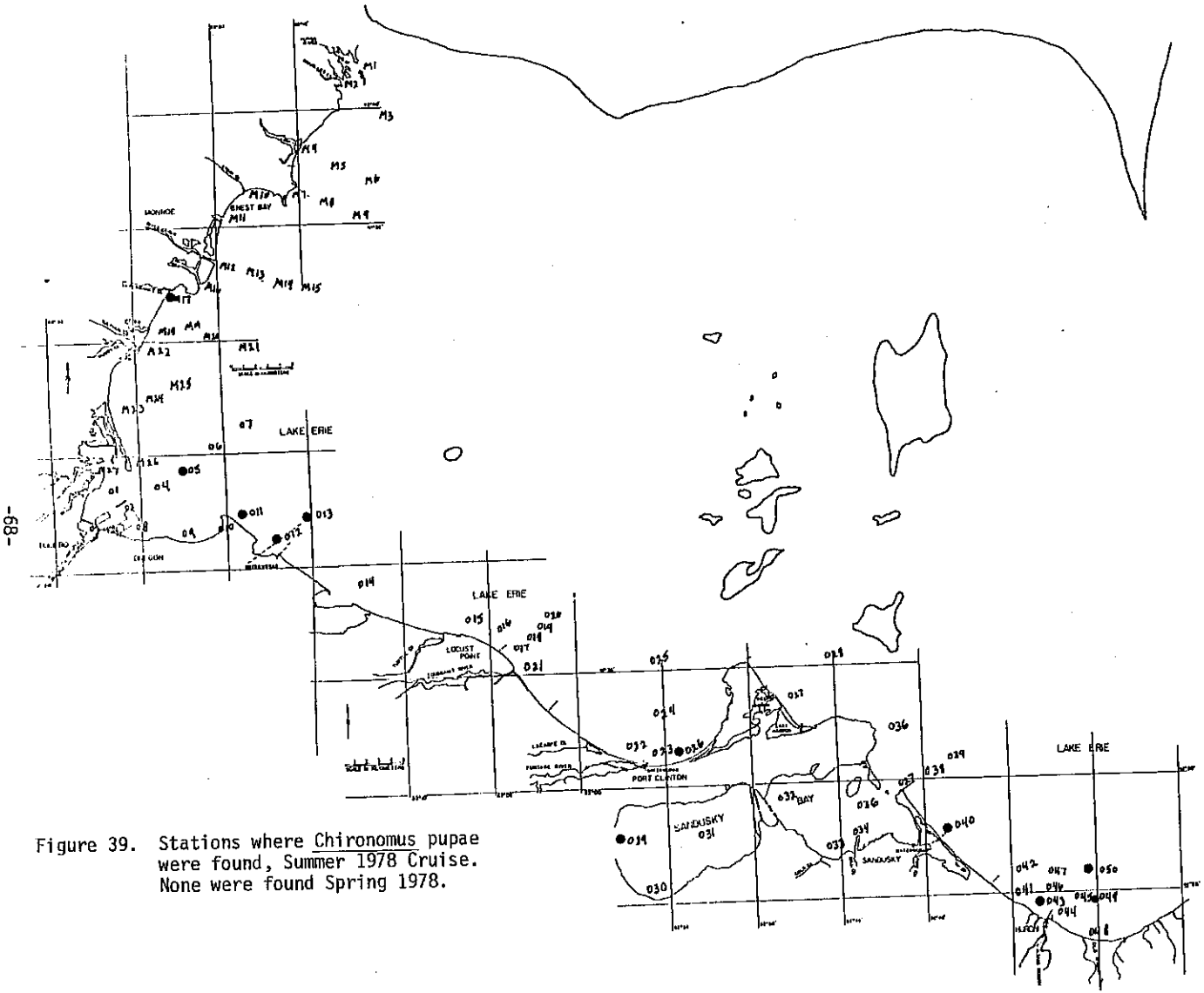


Figure 39. Stations where Chironomus pupae were found, Summer 1978 Cruise. None were found Spring 1978.

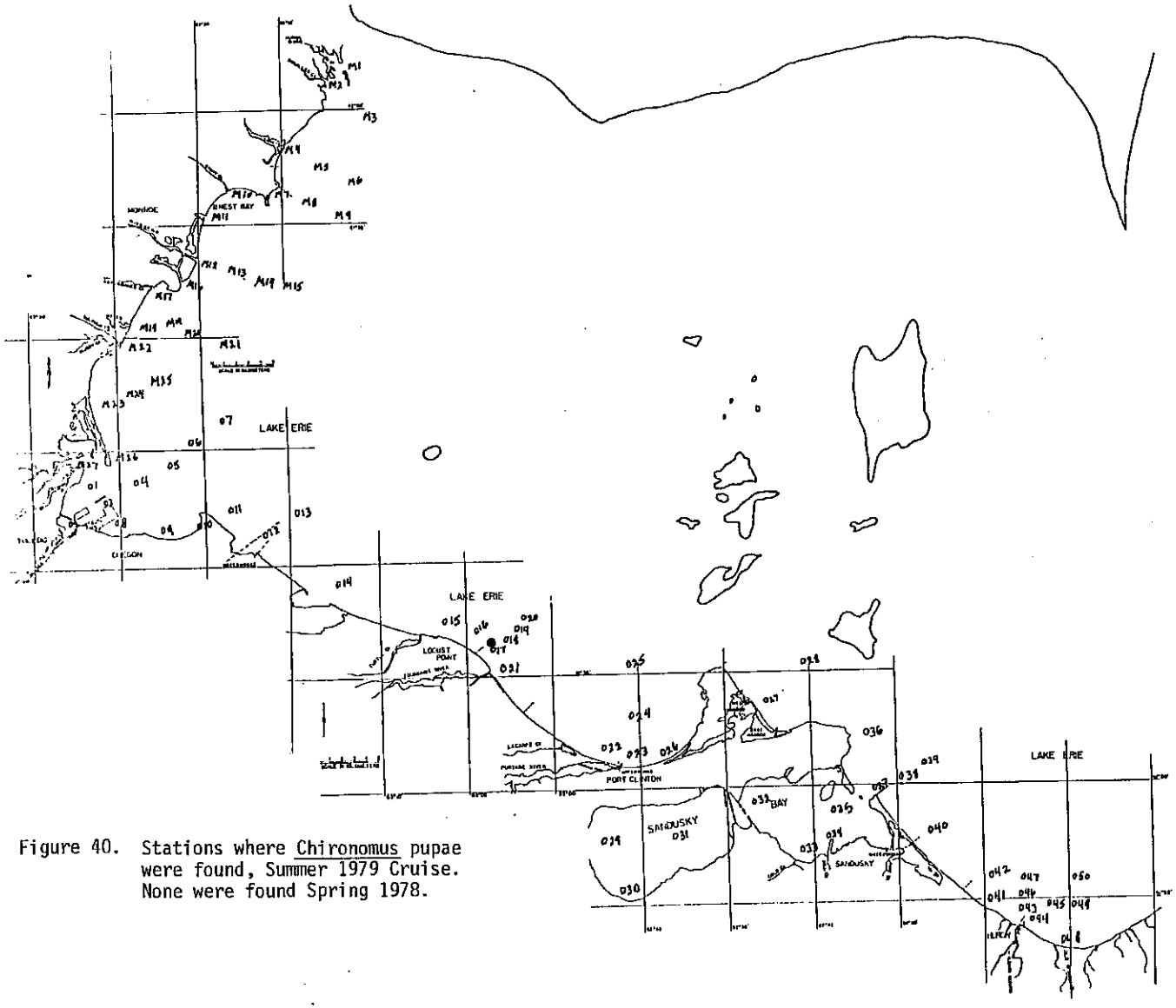


Figure 40. Stations where Chironomus pupae were found, Summer 1979 Cruise. None were found Spring 1978.

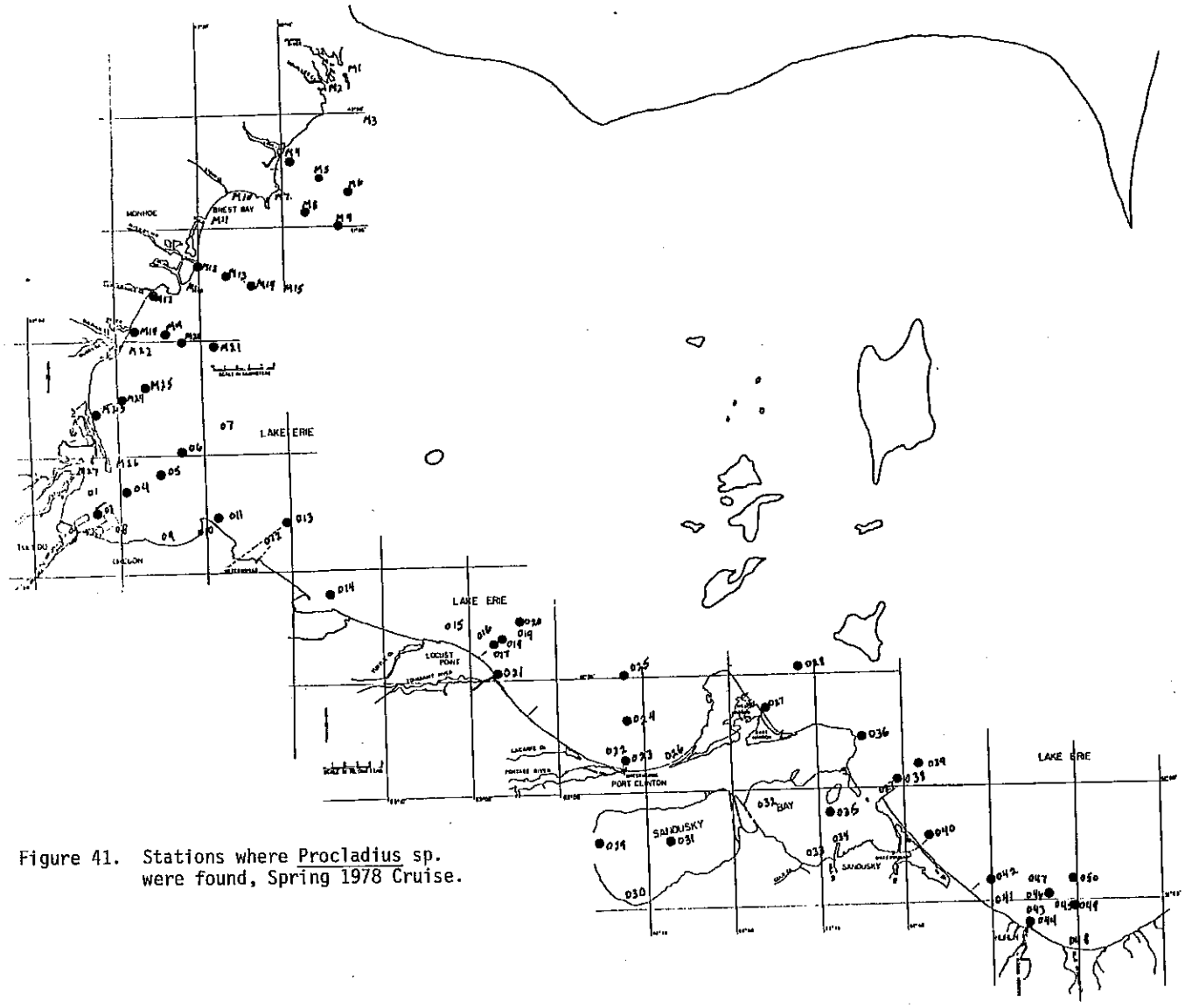


Figure 41. Stations where Procladius sp. were found, Spring 1978 Cruise.

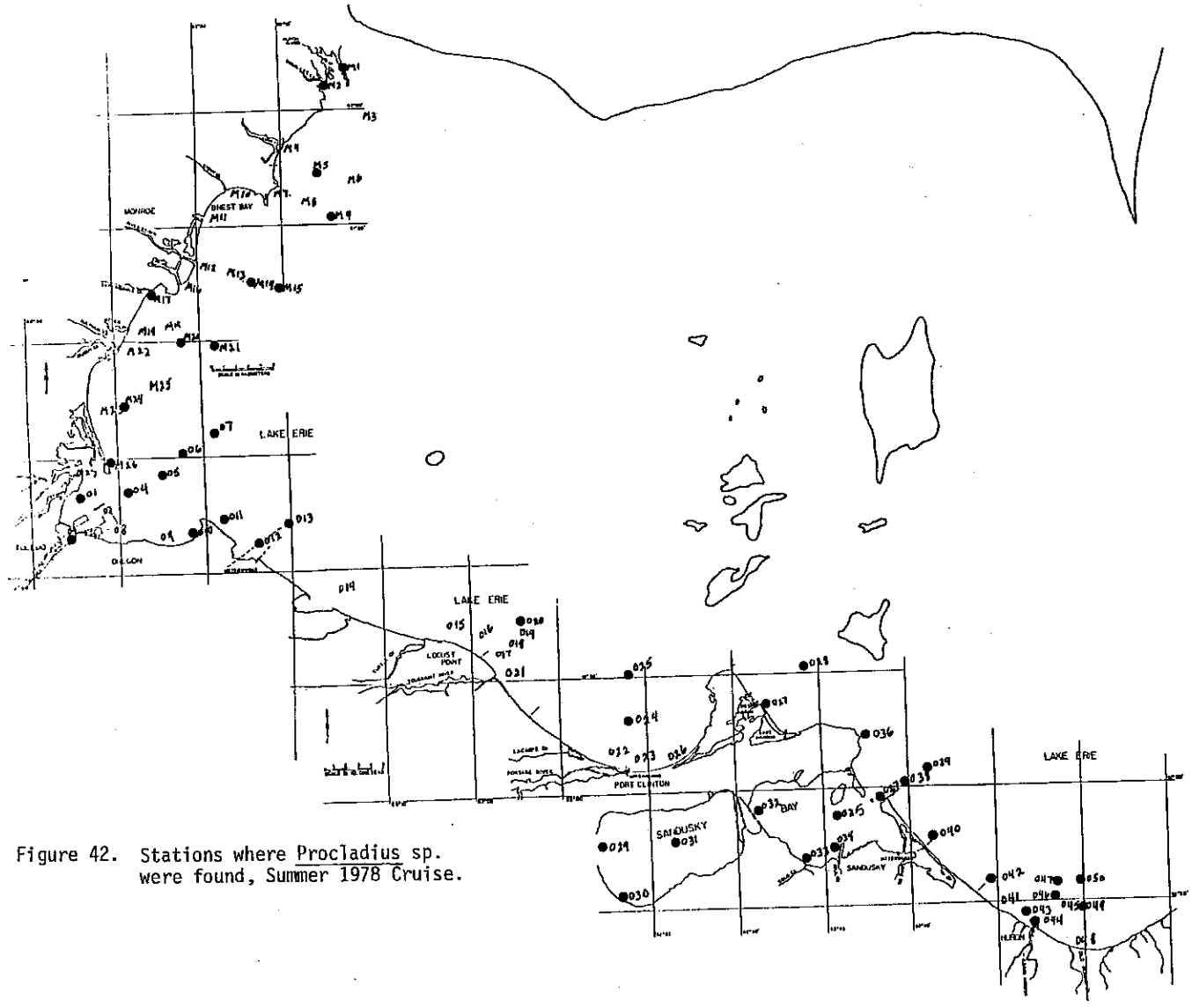


Figure 42. Stations where Procladius sp. were found, Summer 1978 Cruise.

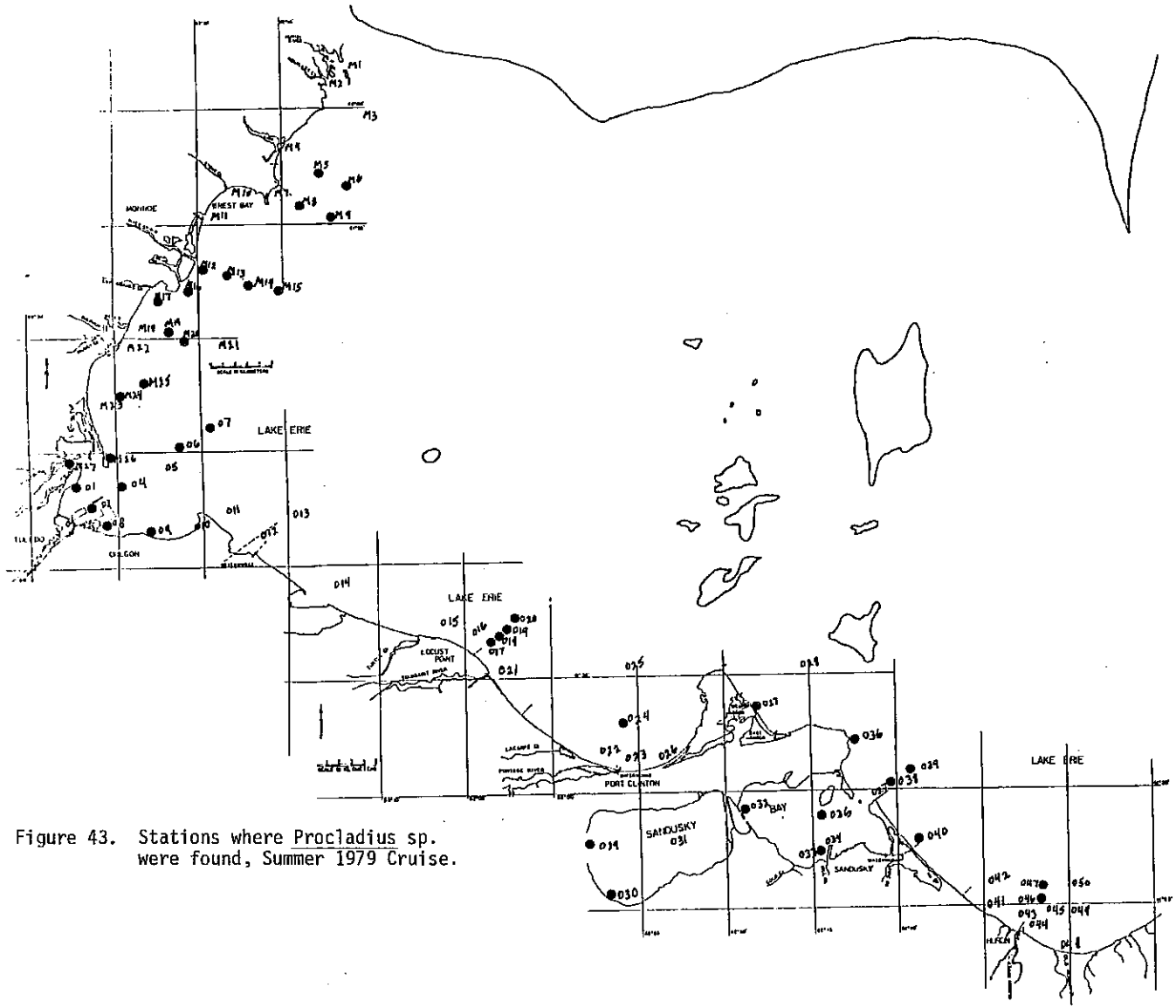


Figure 43. Stations where Procladius sp. were found, Summer 1979 Cruise.

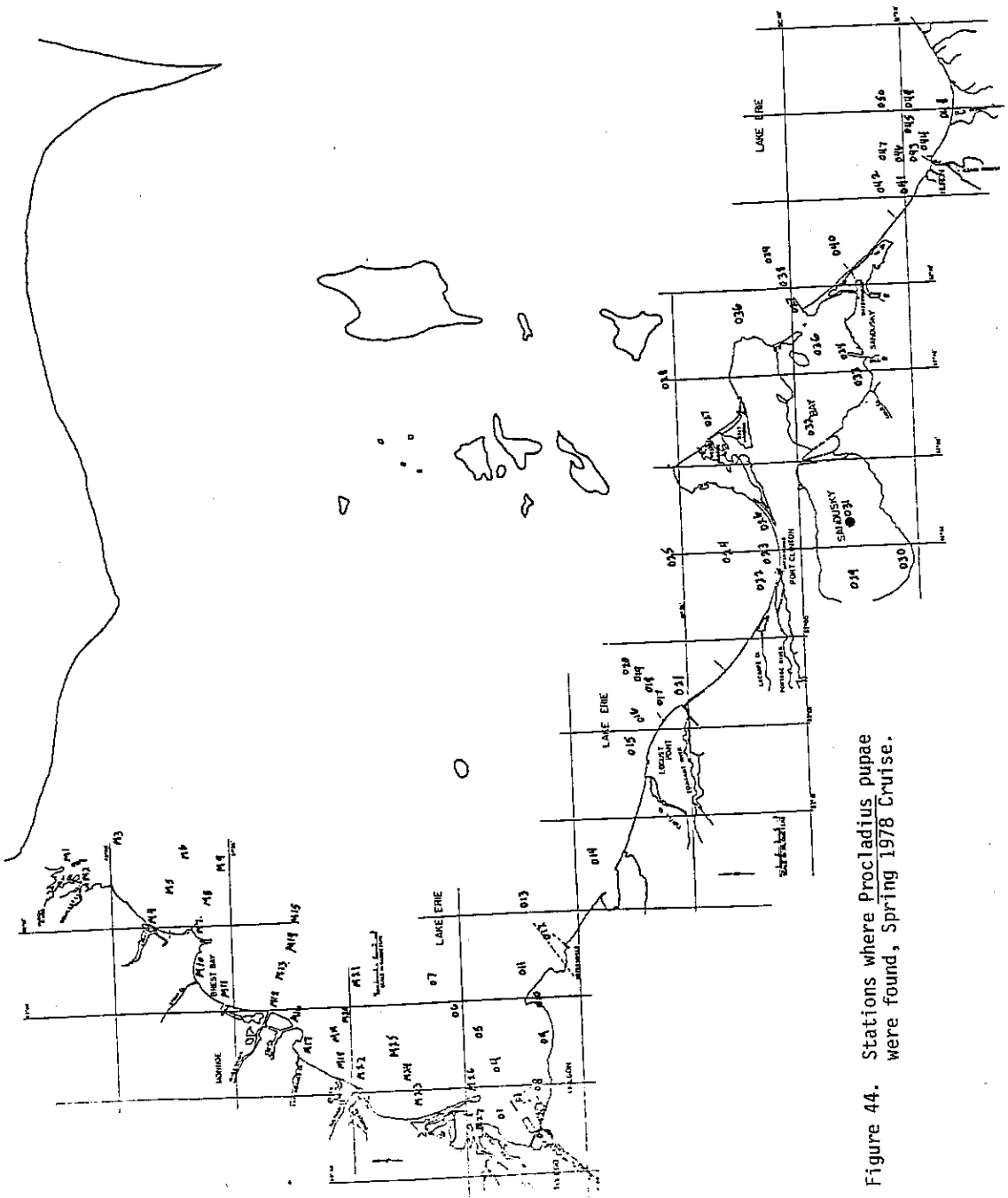


Figure 44. Stations where Procladius pupae were found, Spring 1978 Cruise.

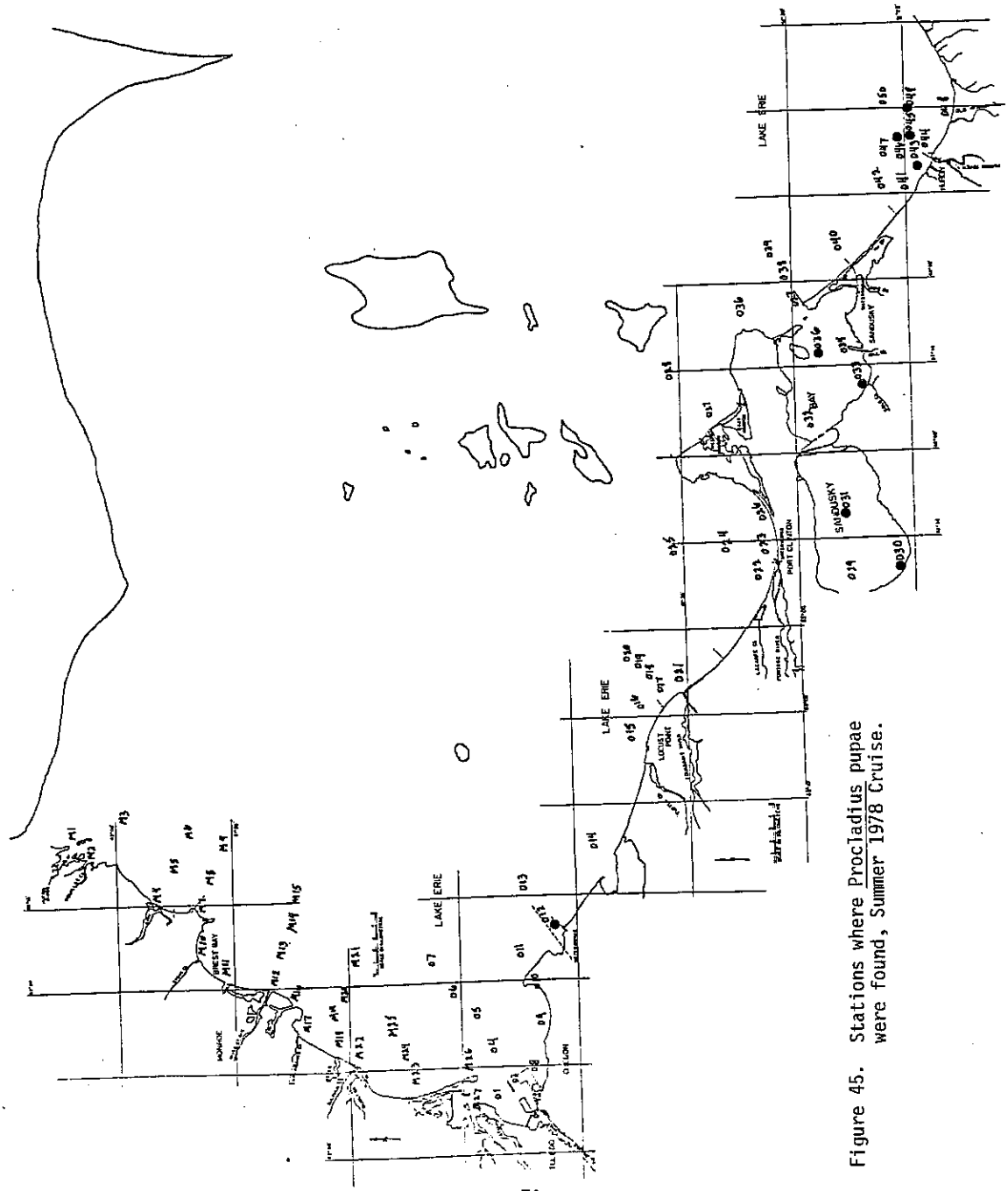


Figure 45. Stations where Procladius pupae were found, Summer 1978 Cruise.

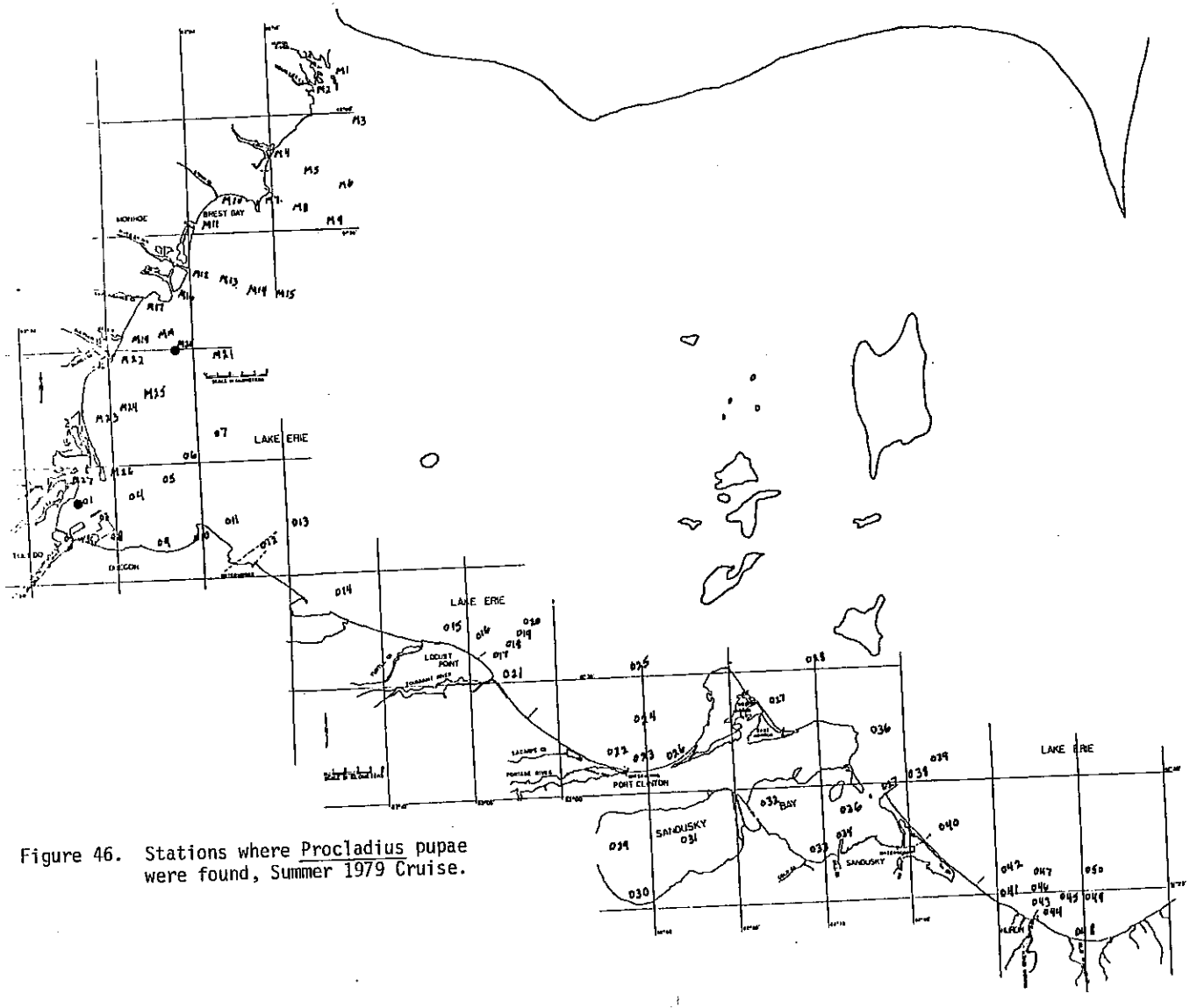


Figure 46. Stations where Procladius pupae were found, Summer 1979 Cruise.

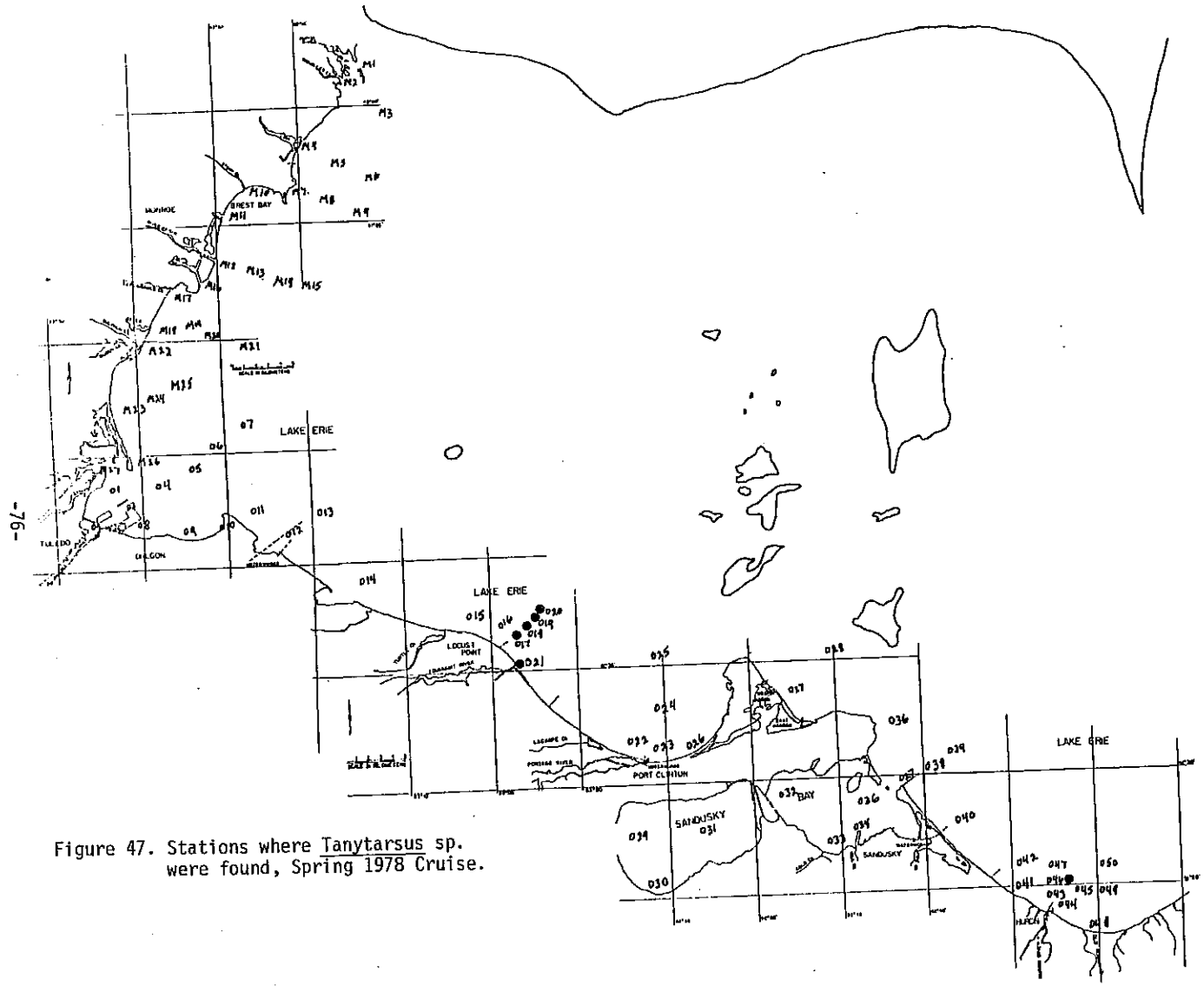


Figure 47. Stations where Tanytarsus sp. were found, Spring 1978 Cruise.

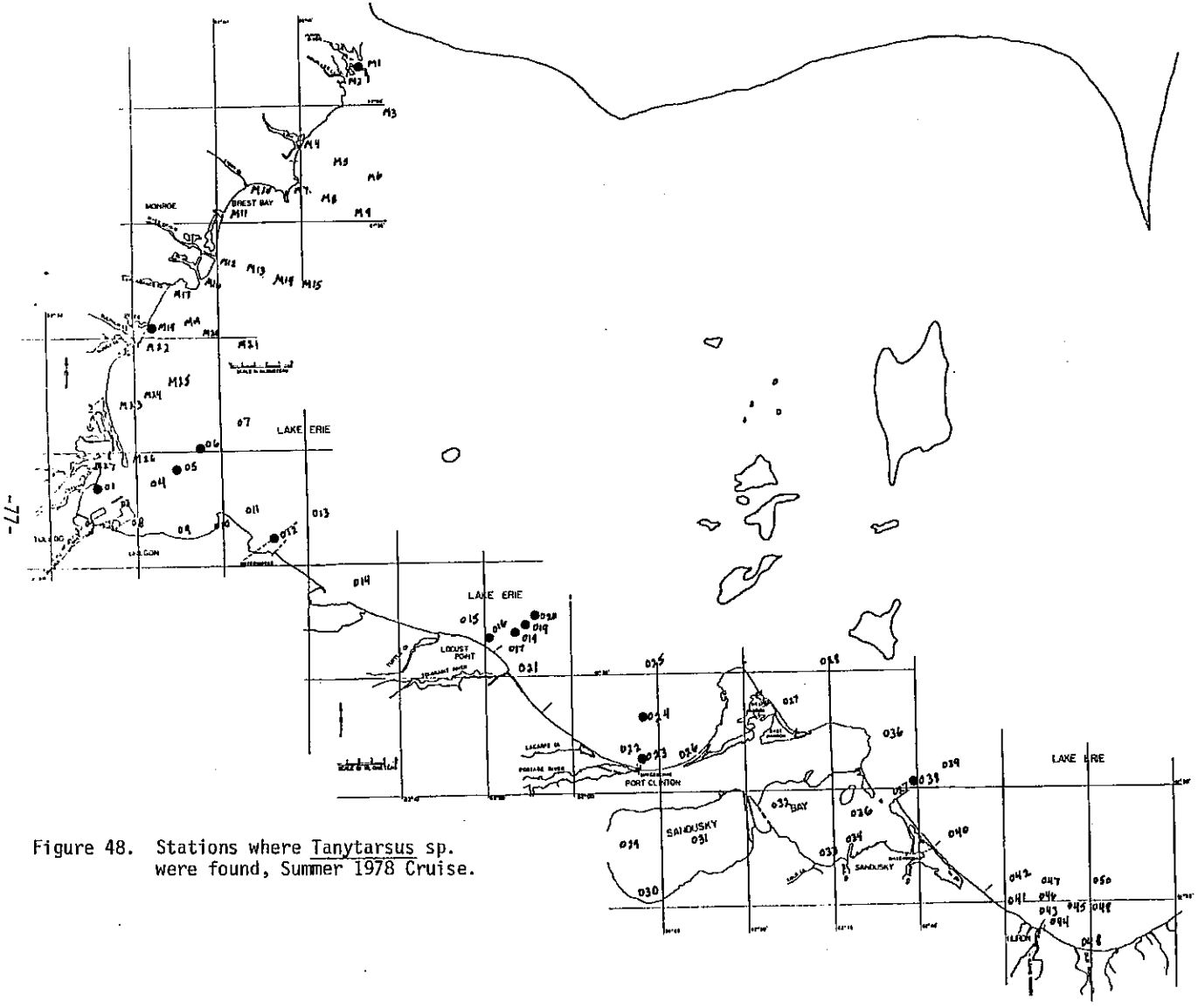


Figure 48. Stations where Tanytarsus sp. were found, Summer 1978 Cruise.

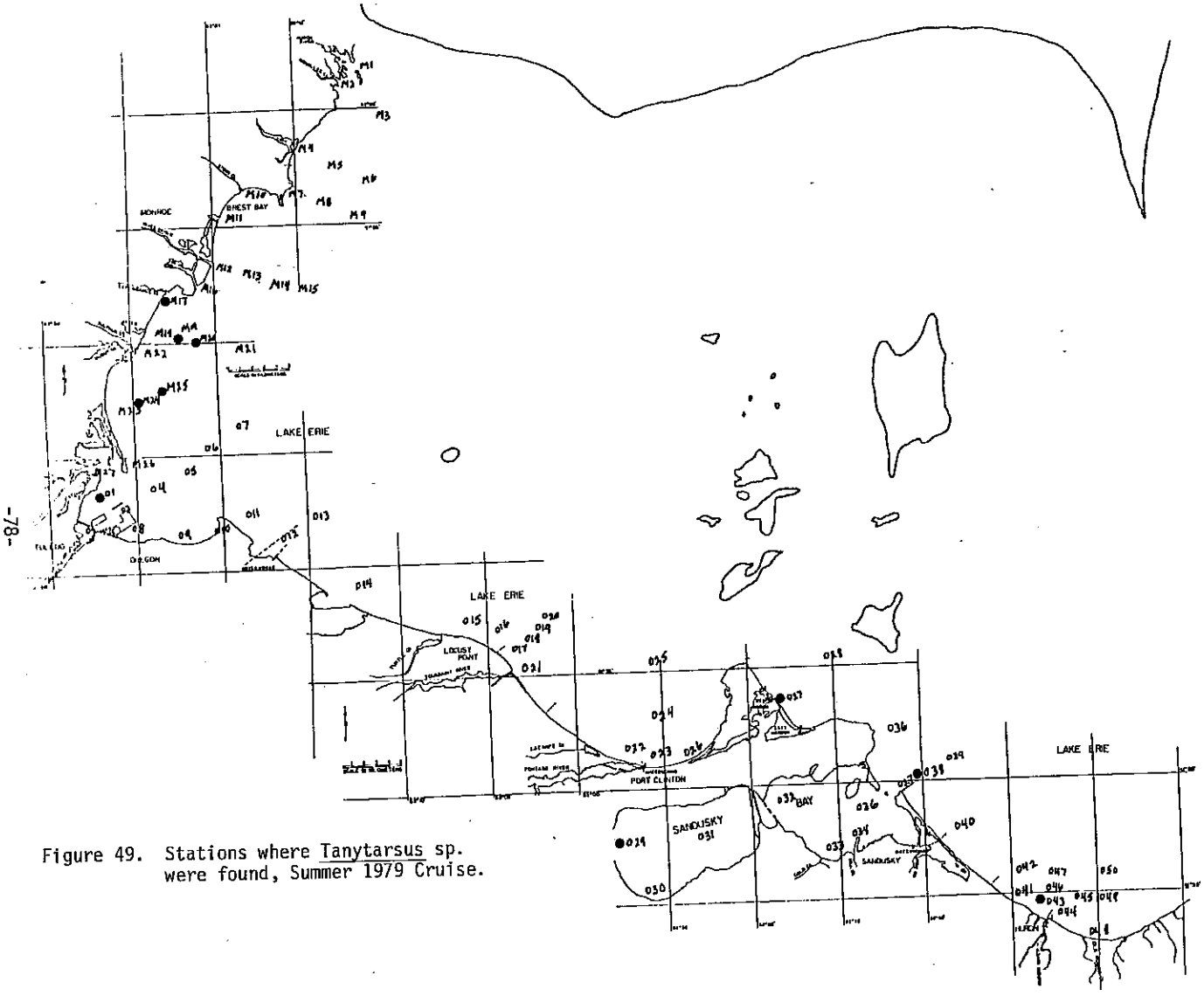


Figure 49. Stations where Tanytarsus sp. were found, Summer 1979 Cruise.

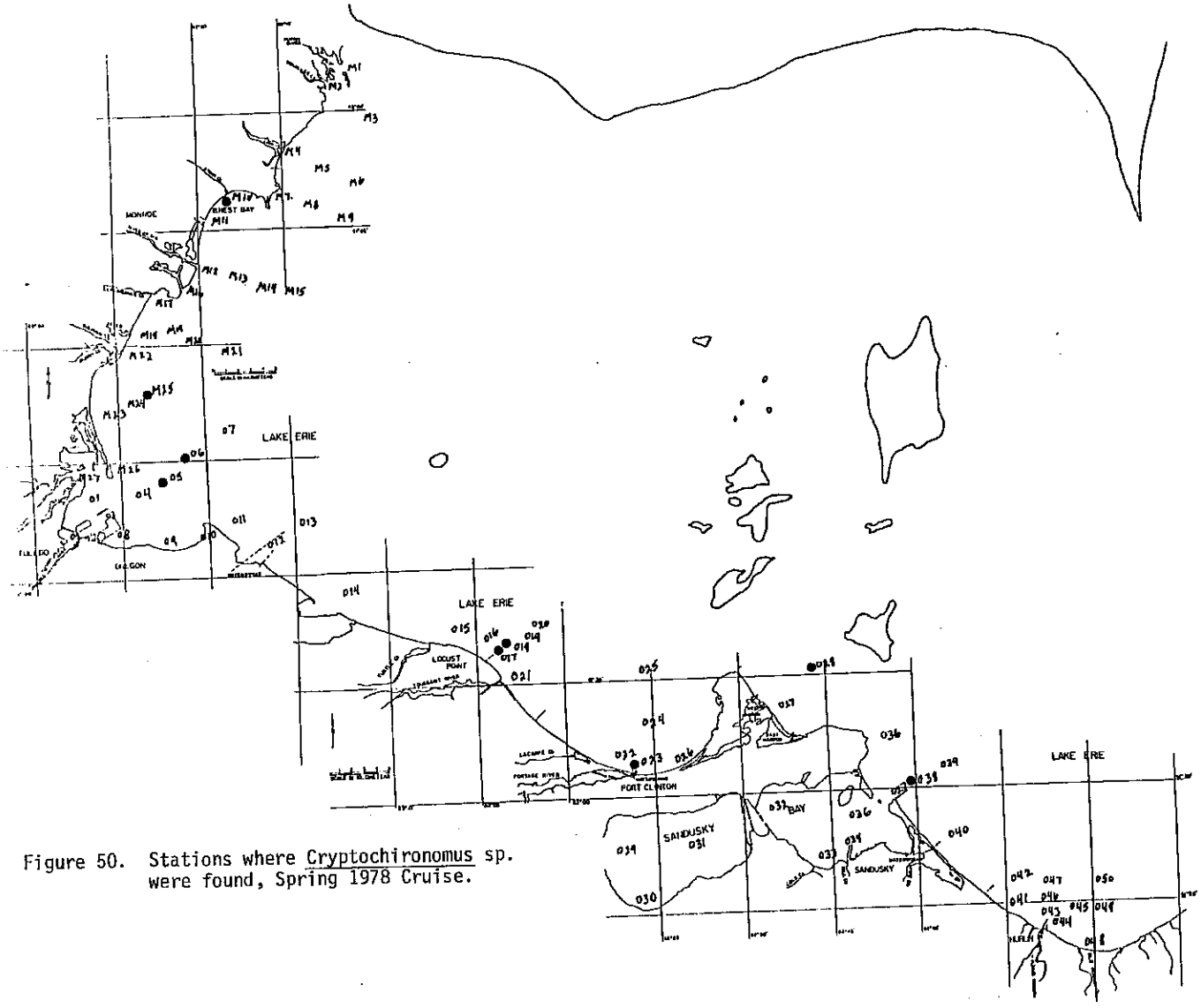


Figure 50. Stations where Cryptochironomus sp. were found, Spring 1978 Cruise.

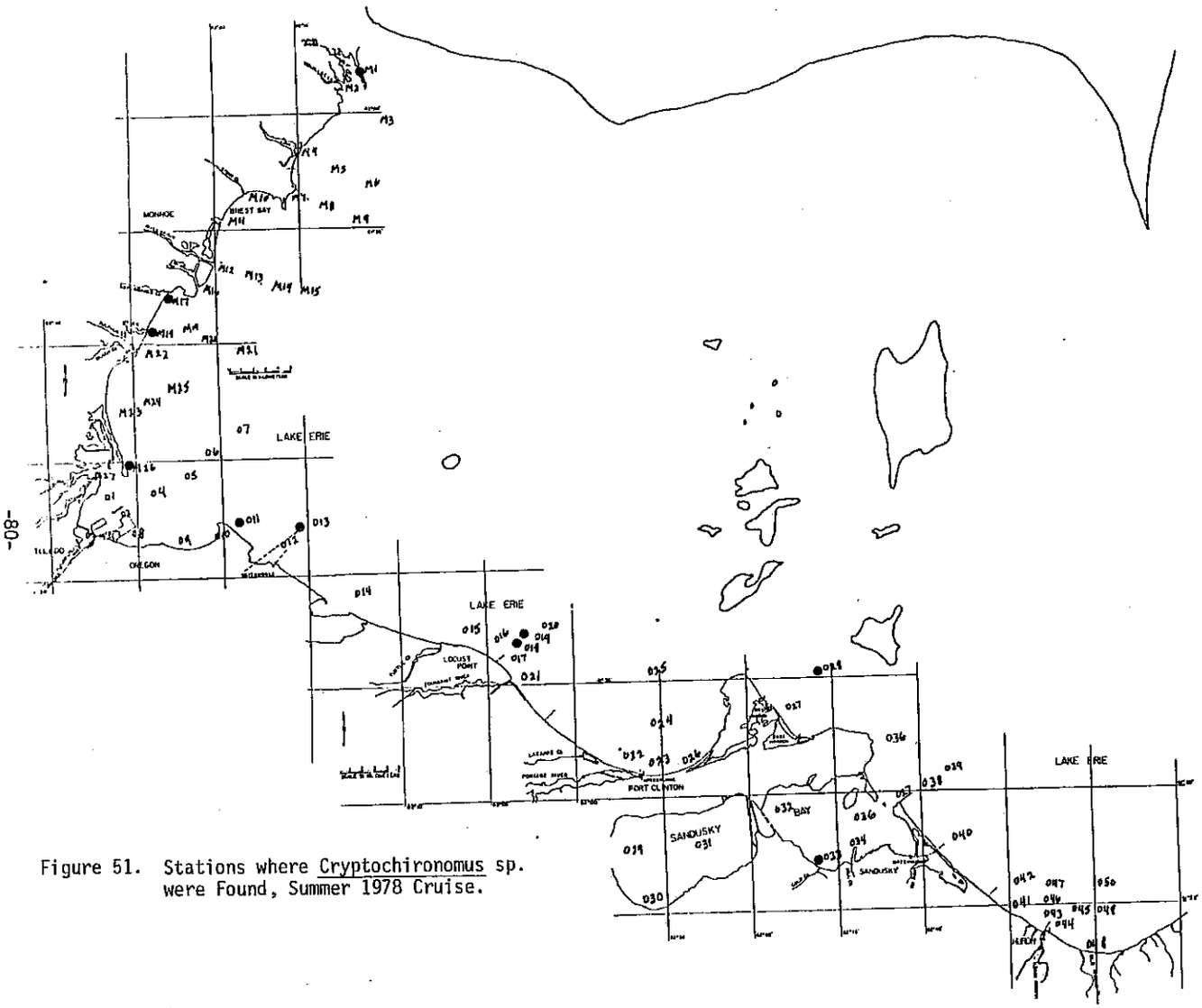


Figure 51. Stations where Cryptochironomus sp. were Found, Summer 1978 Cruise.

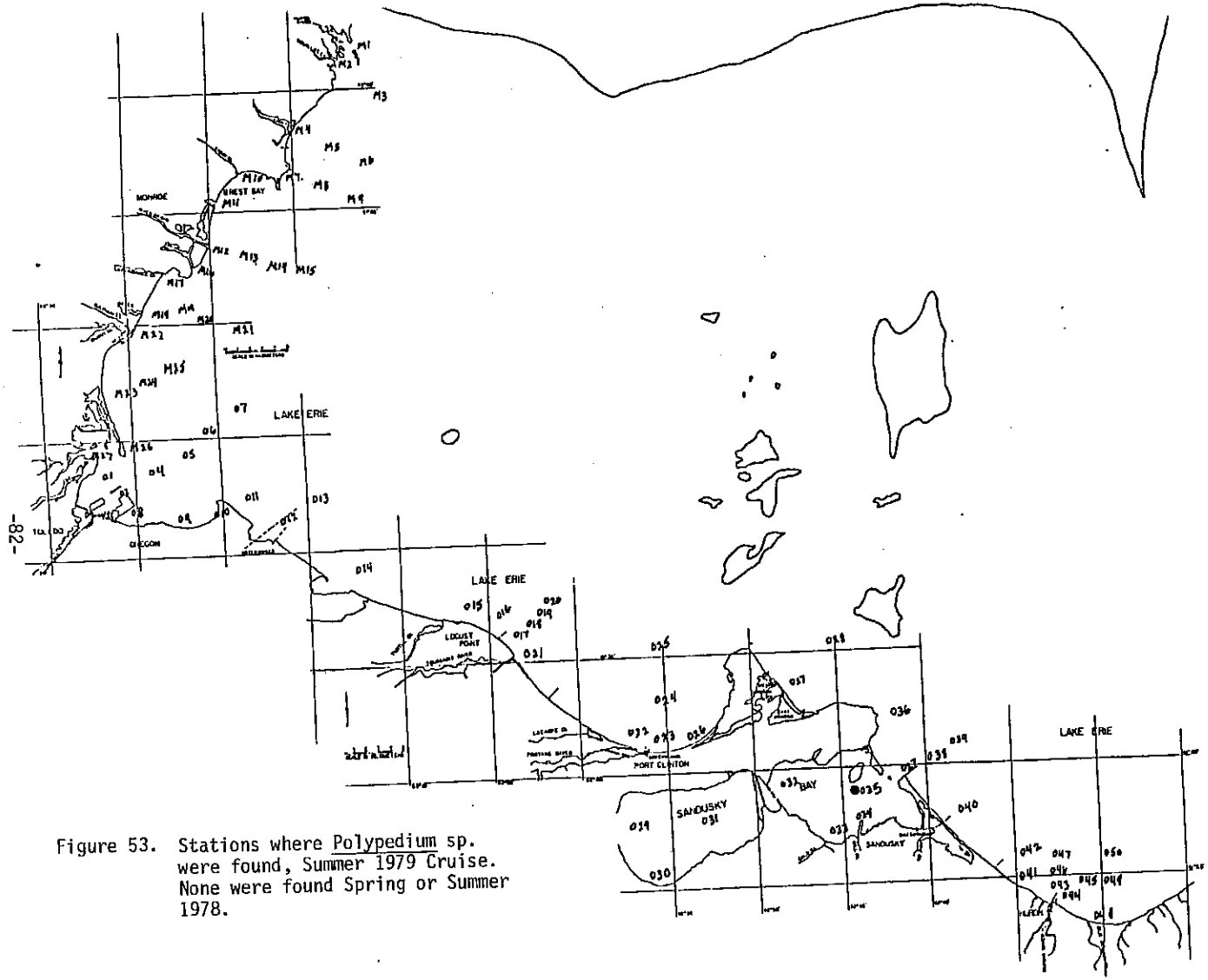


Figure 53. Stations where Polypedium sp. were found, Summer 1979 Cruise. None were found Spring or Summer 1978.

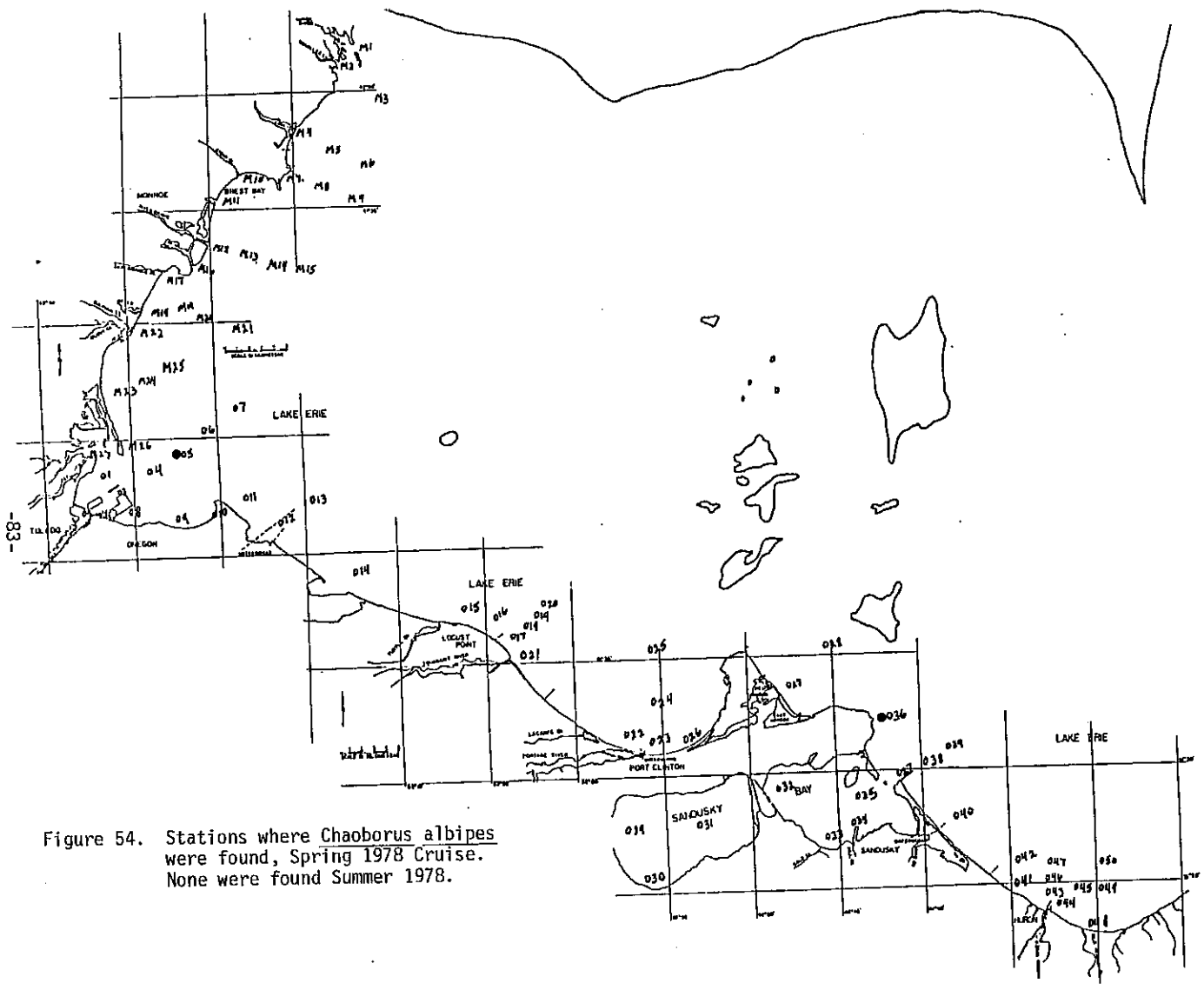


Figure 54. Stations where Chaoborus albipes were found, Spring 1978 Cruise. None were found Summer 1978.

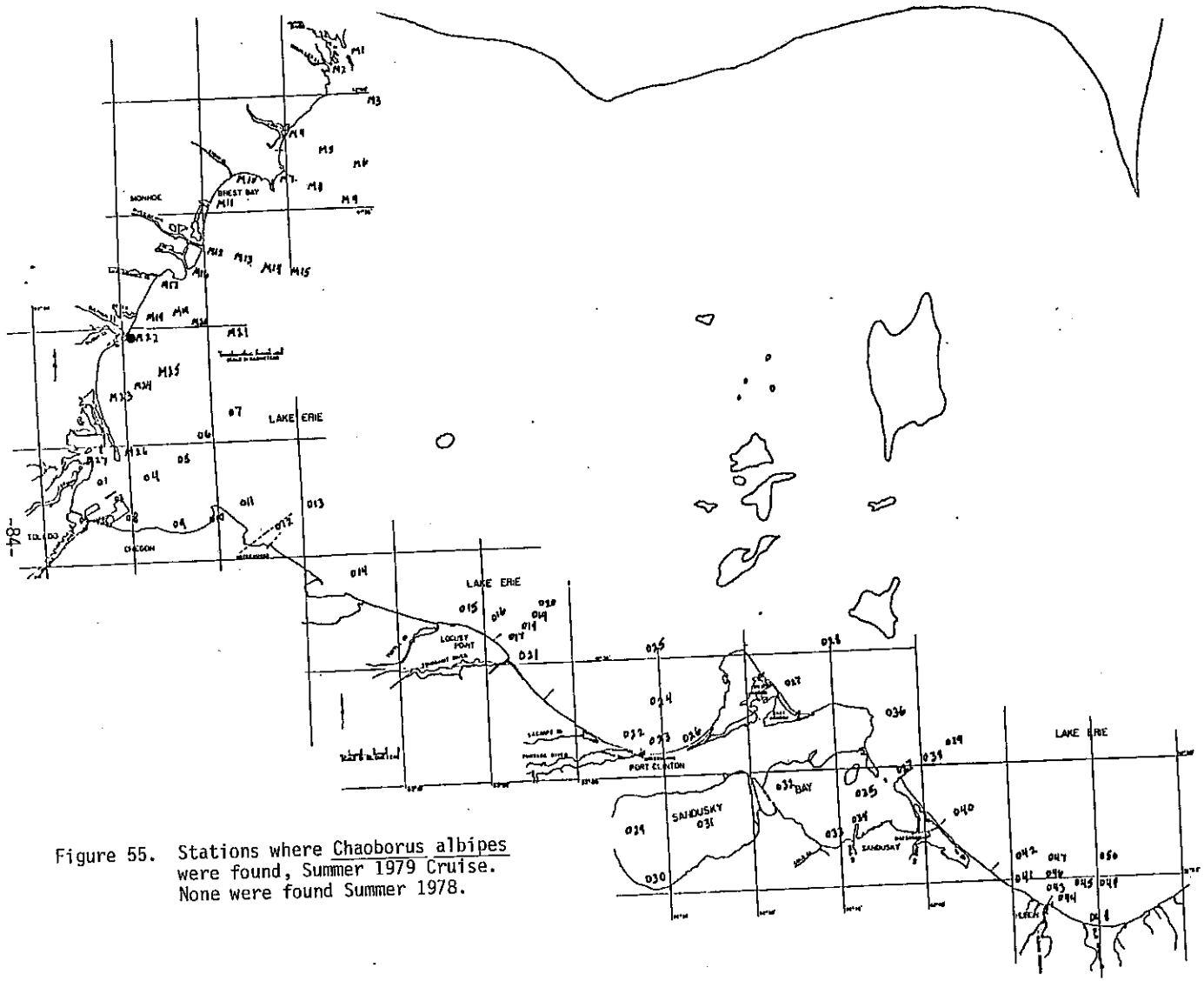


Figure 55. Stations where Chaoborus albipes were found, Summer 1979 Cruise. None were found Summer 1978.

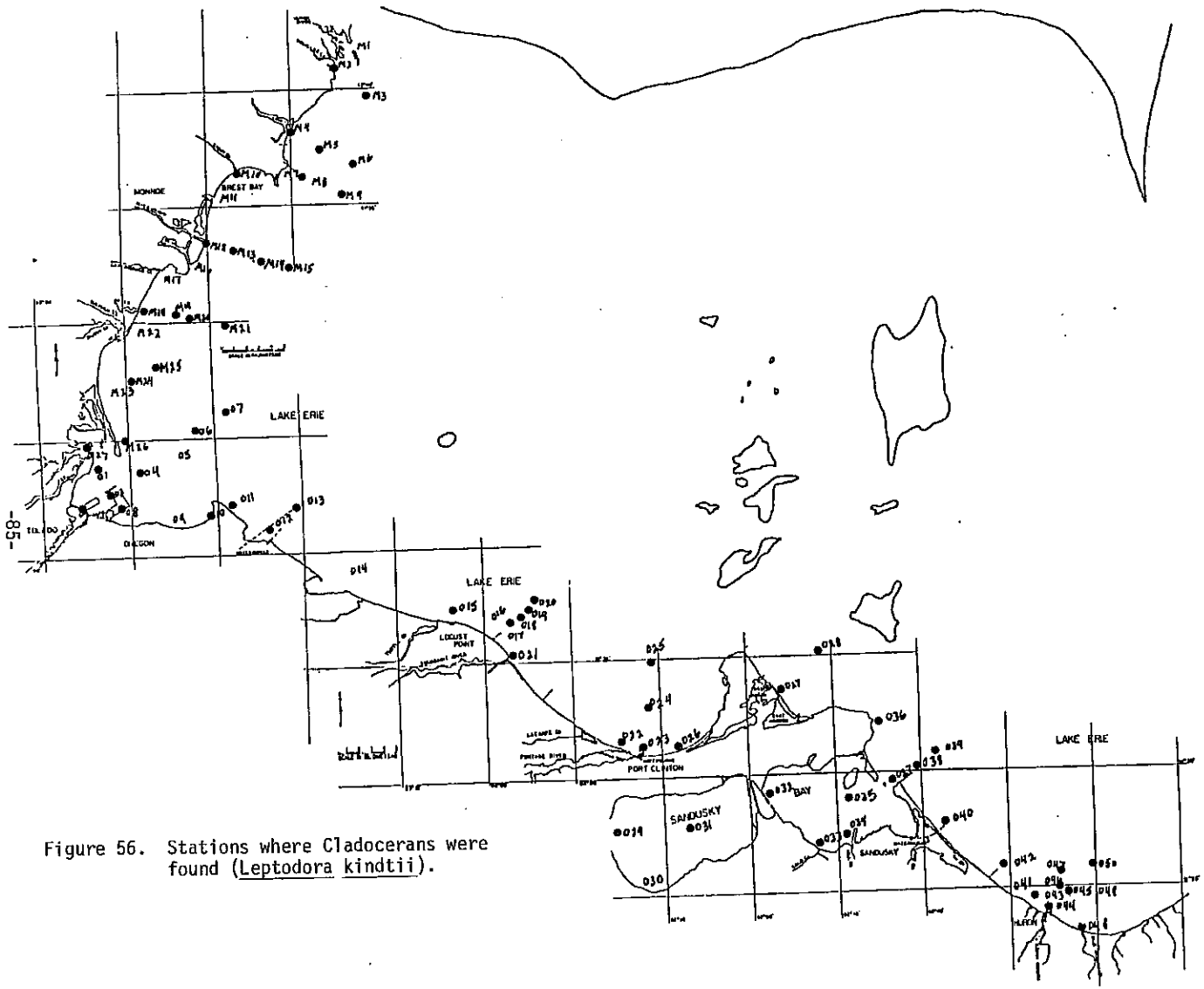


Figure 56. Stations where Cladocerans were found (Leptodora kindtii).

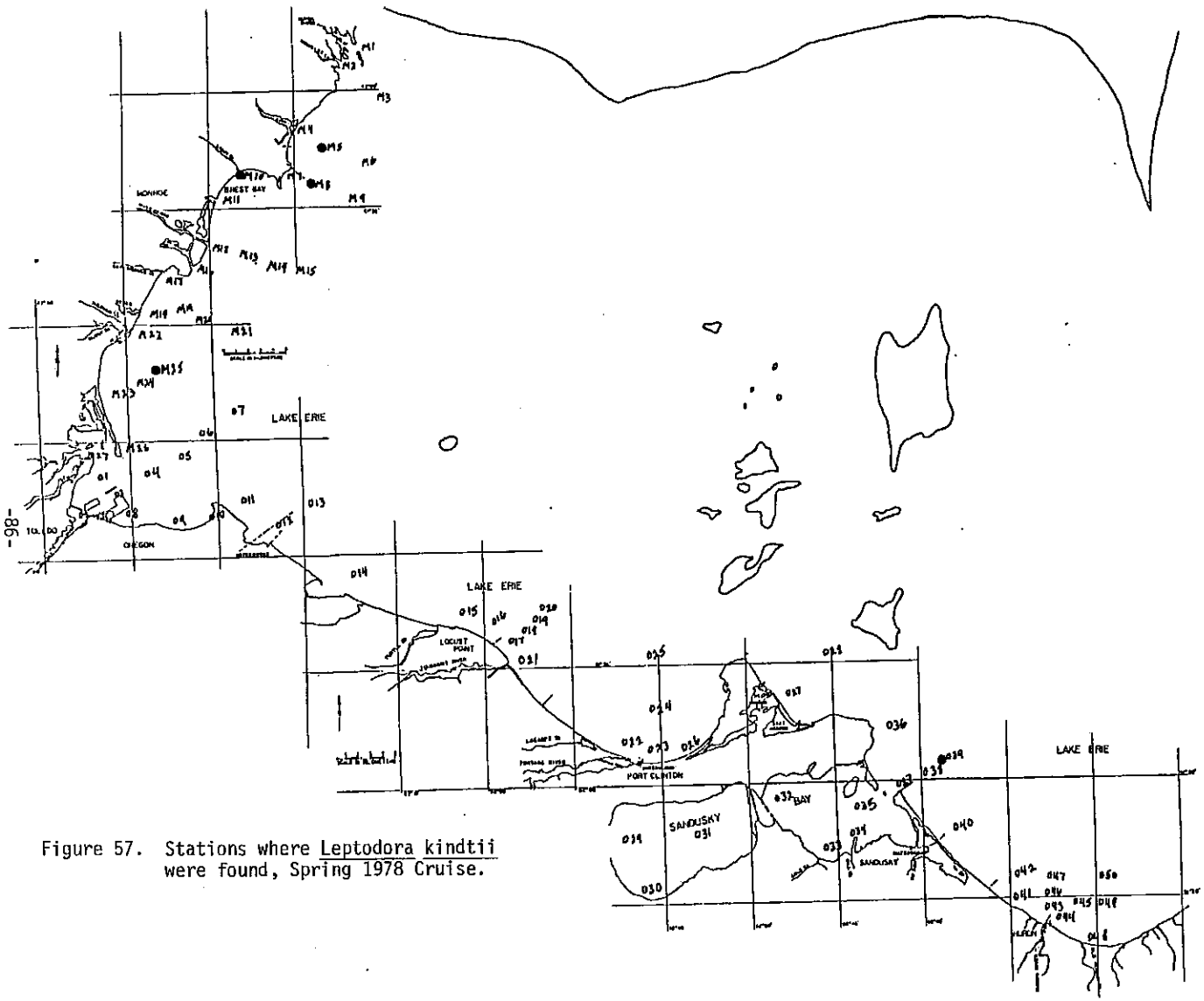


Figure 57. Stations where Leptodora kindtii were found, Spring 1978 Cruise.

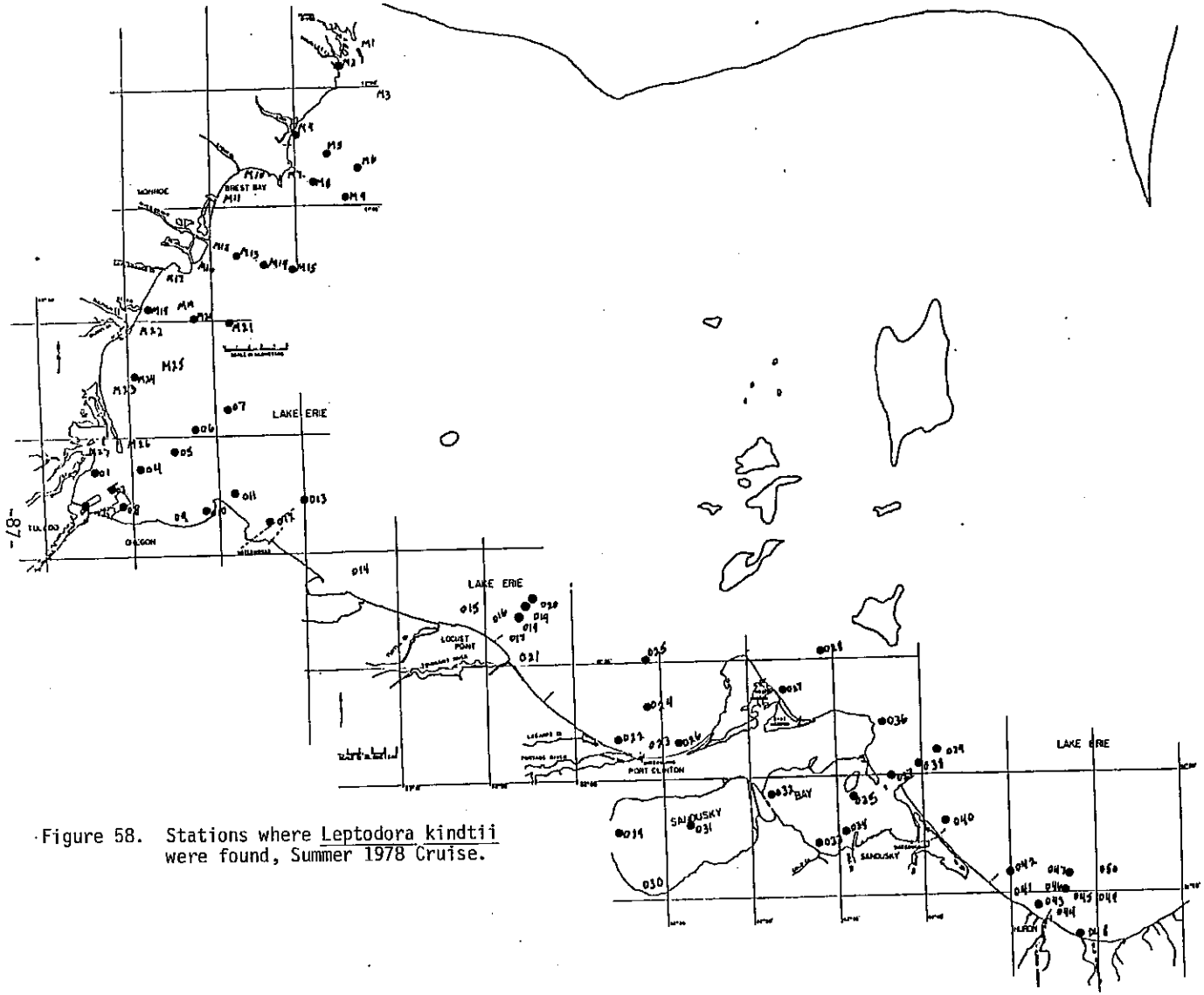


Figure 58. Stations where Leptodora kindtii were found, Summer 1978 Cruise.

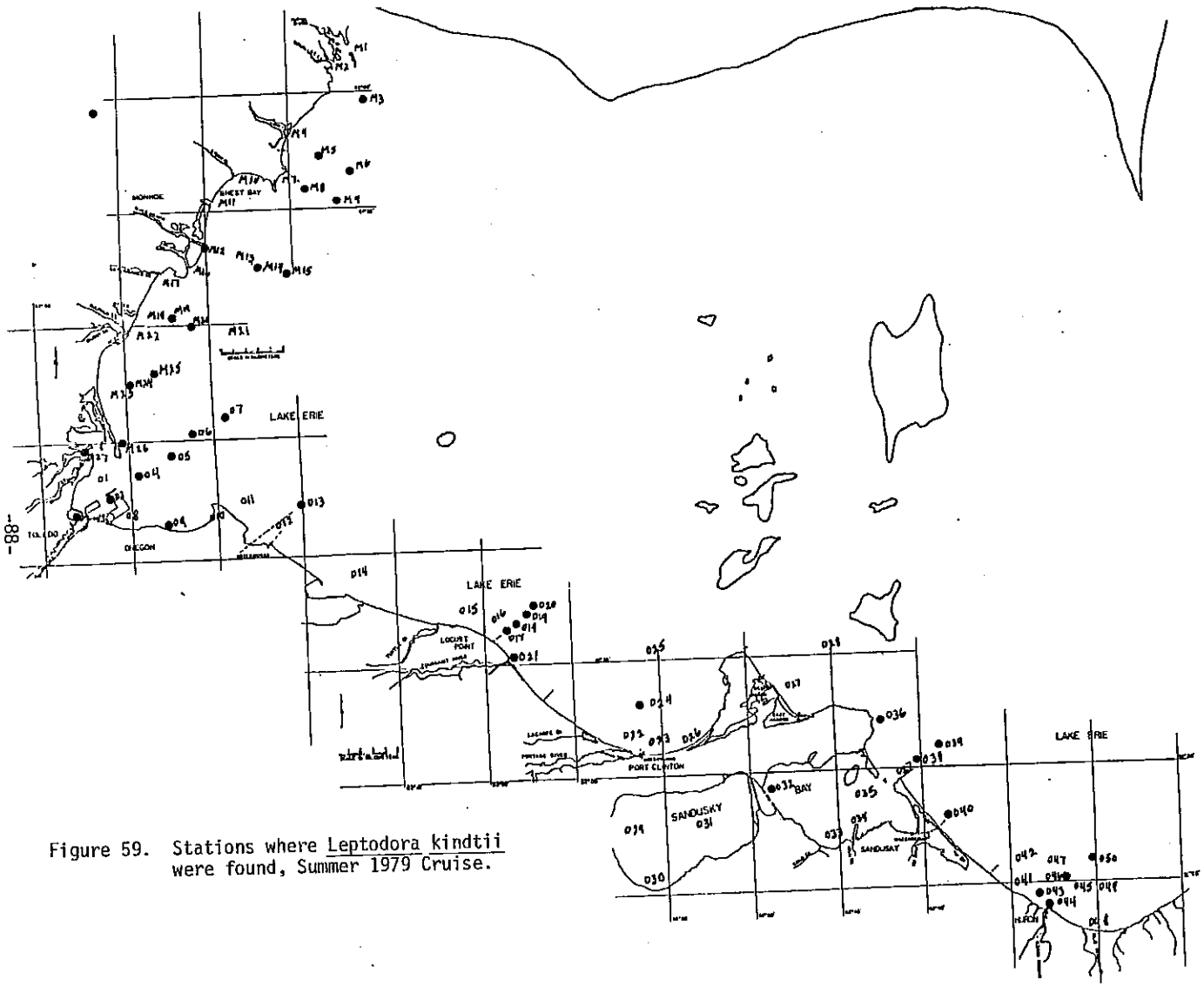


Figure 59. Stations where Leptodora kindtii were found, Summer 1979 Cruise.

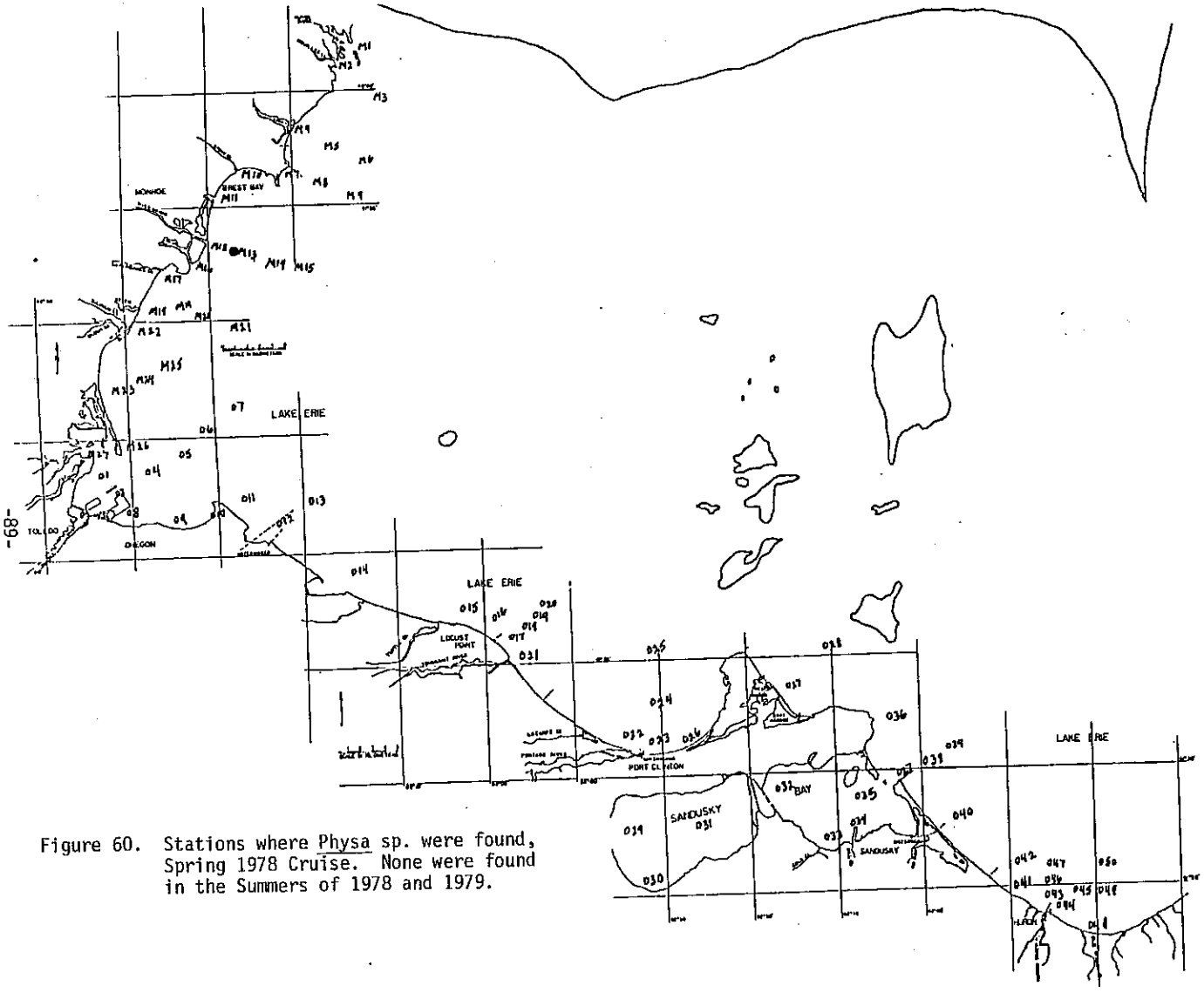


Figure 60. Stations where Physa sp. were found, Spring 1978 Cruise. None were found in the Summers of 1978 and 1979.

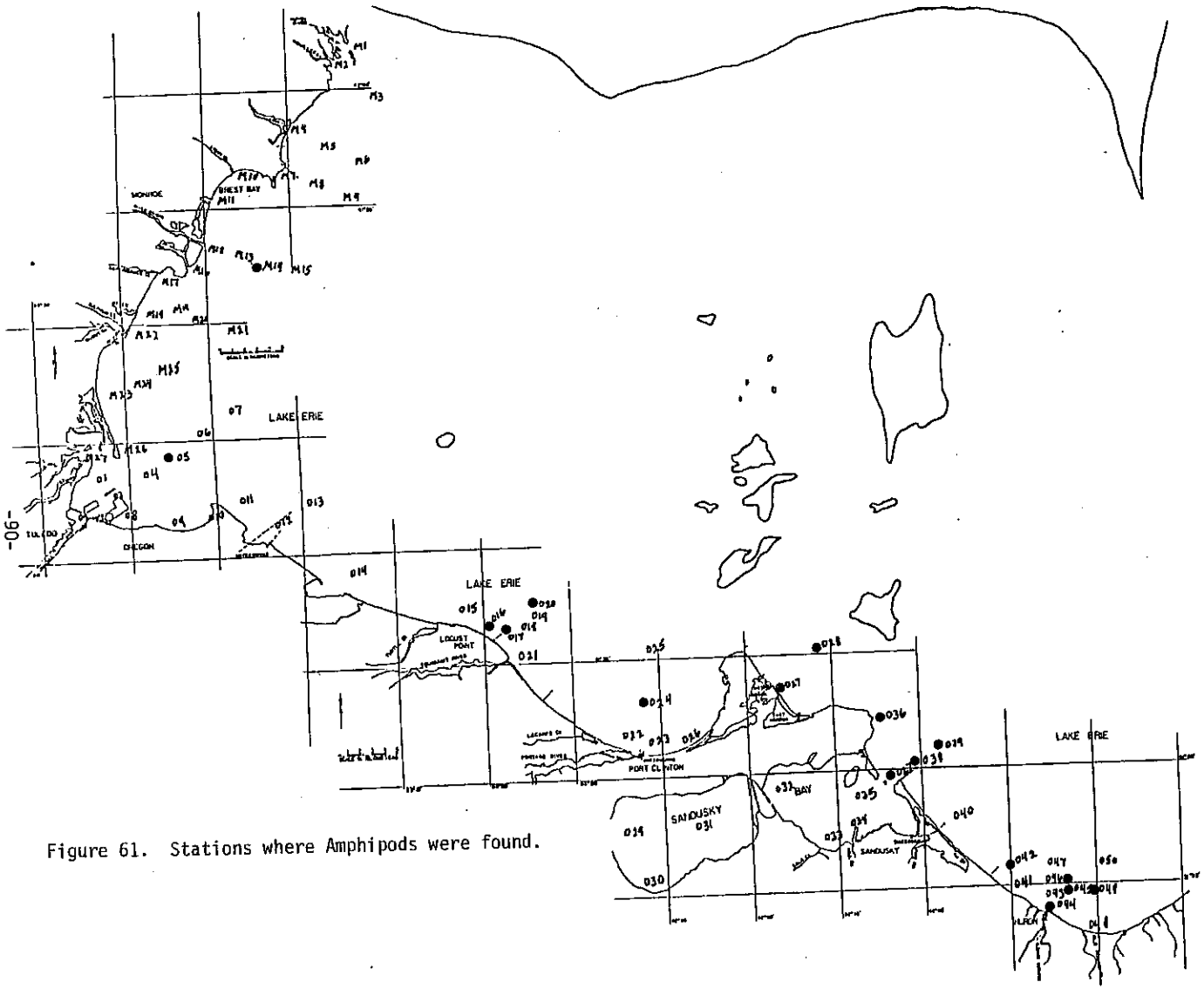


Figure 61. Stations where Amphipods were found.

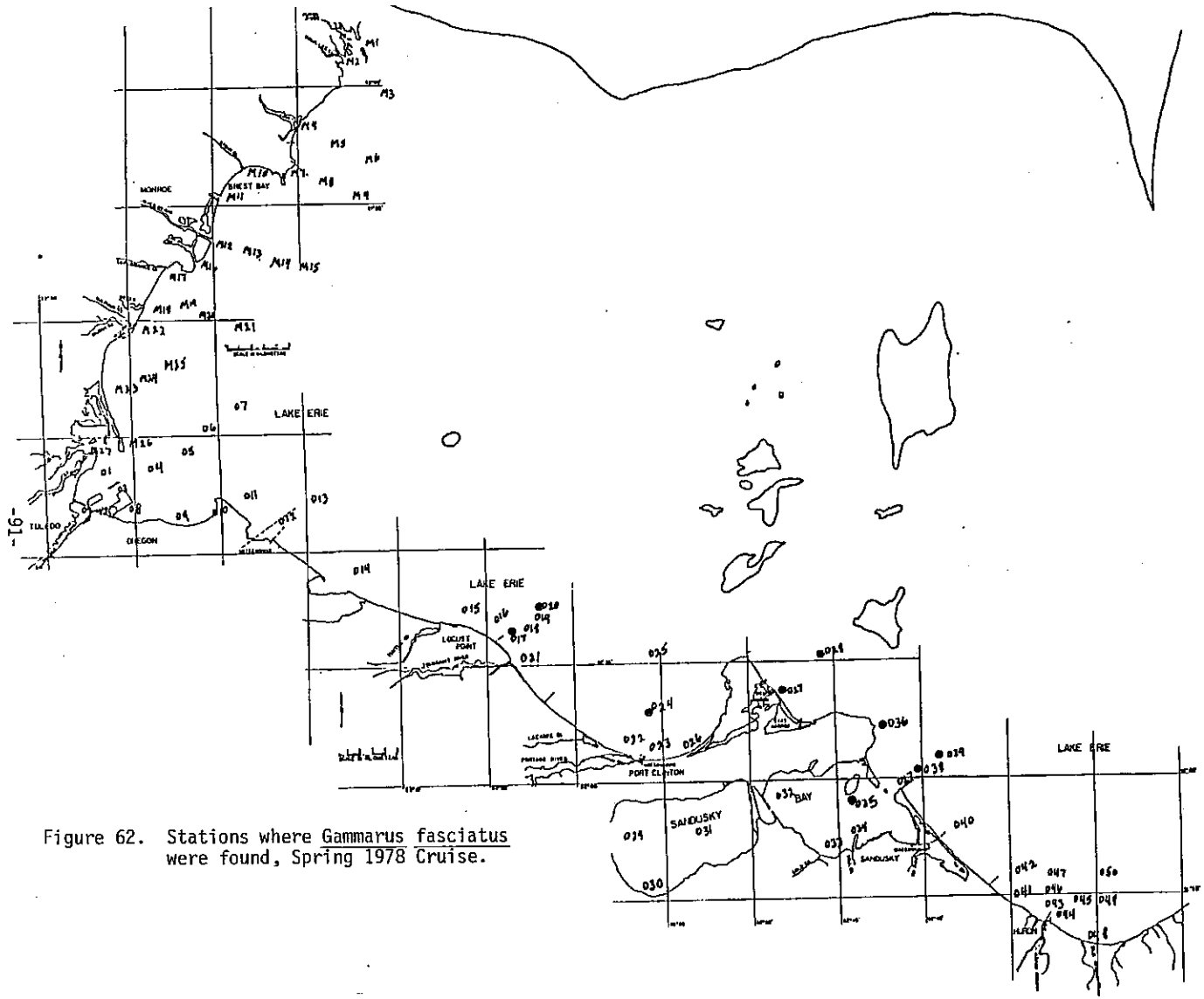


Figure 62. Stations where Gammarus fasciatus were found, Spring 1978 Cruise.

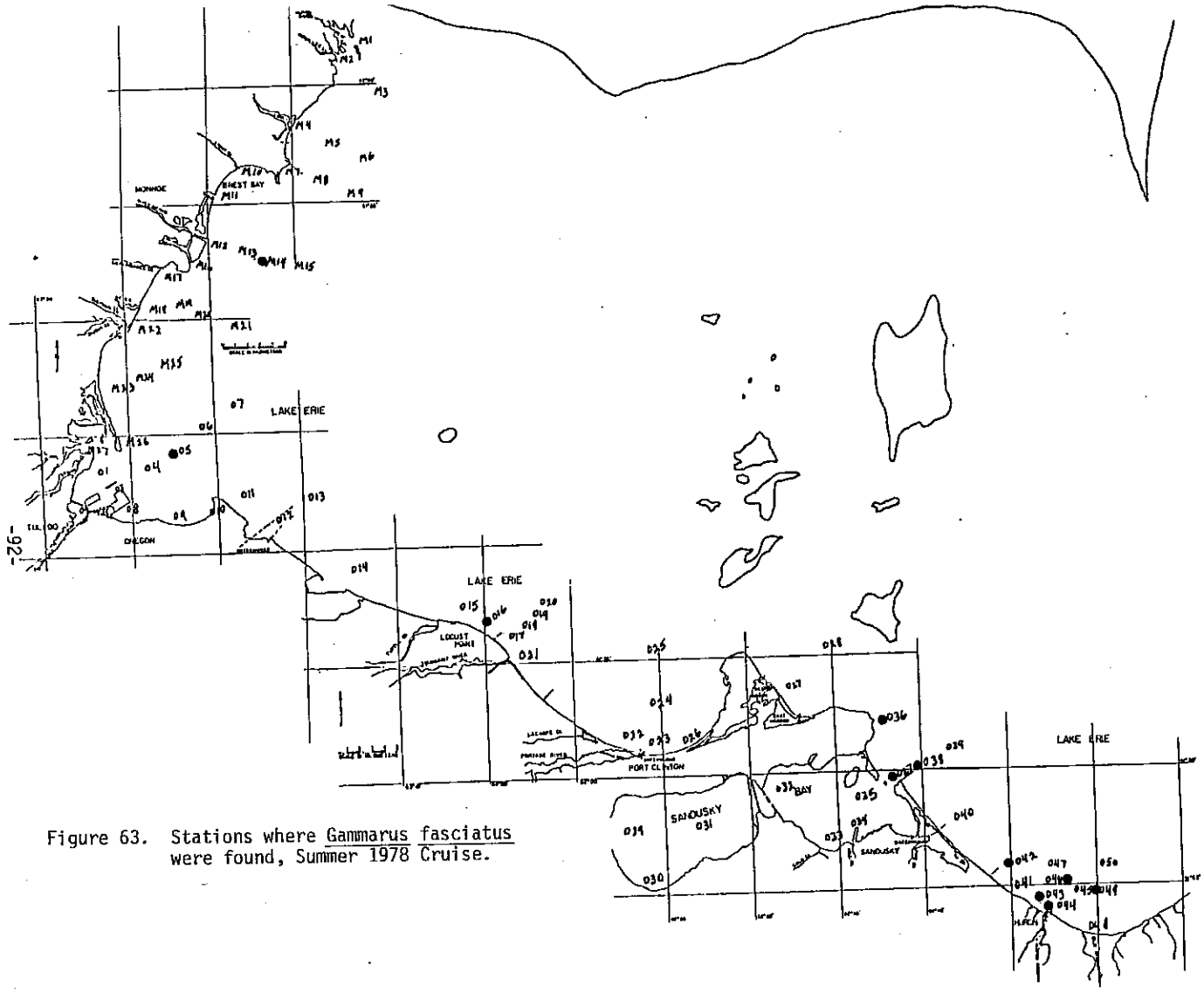


Figure 63. Stations where Gammarus fasciatus were found, Summer 1978 Cruise.

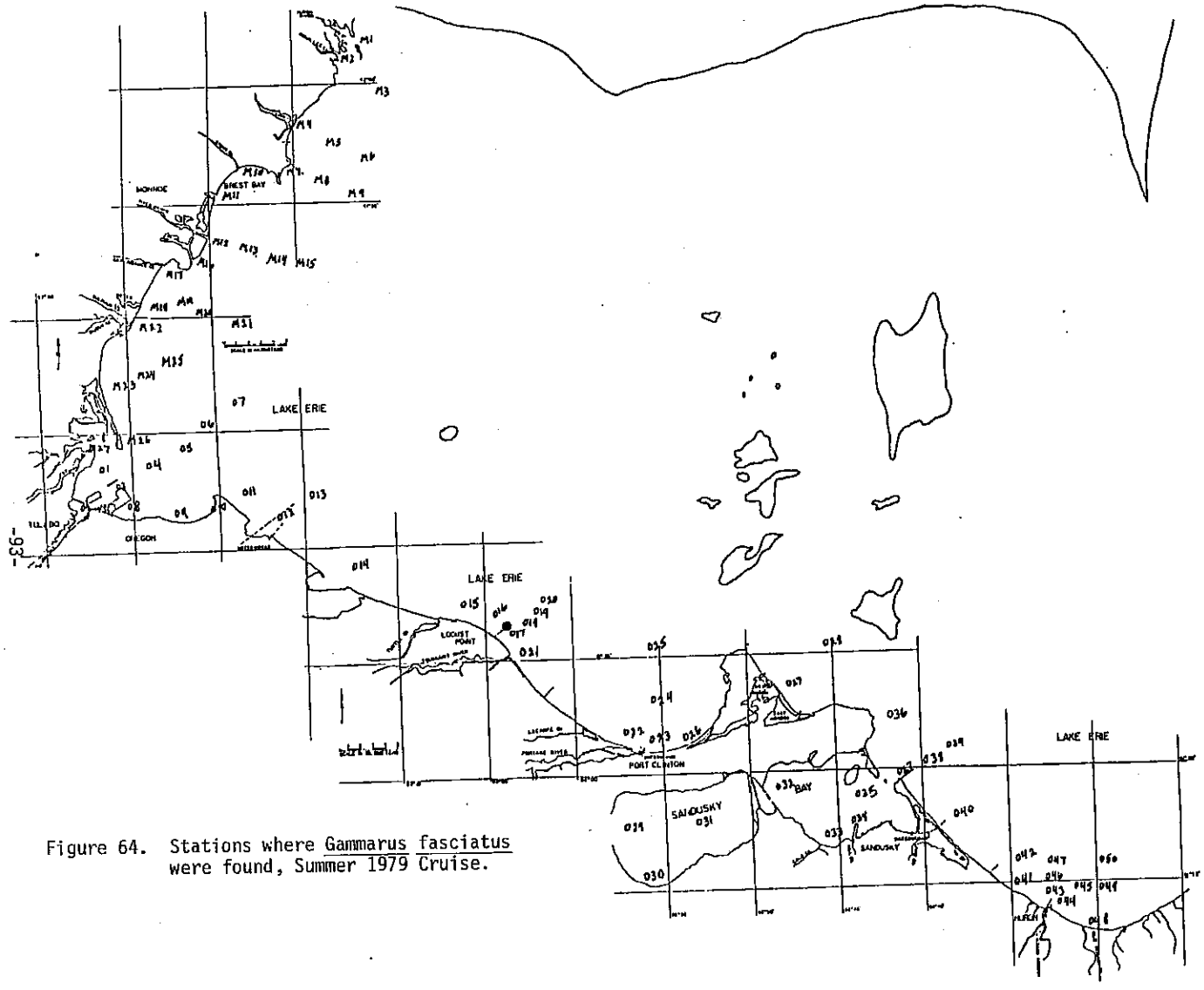


Figure 64. Stations where Gammarus fasciatus were found, Summer 1979 Cruise.

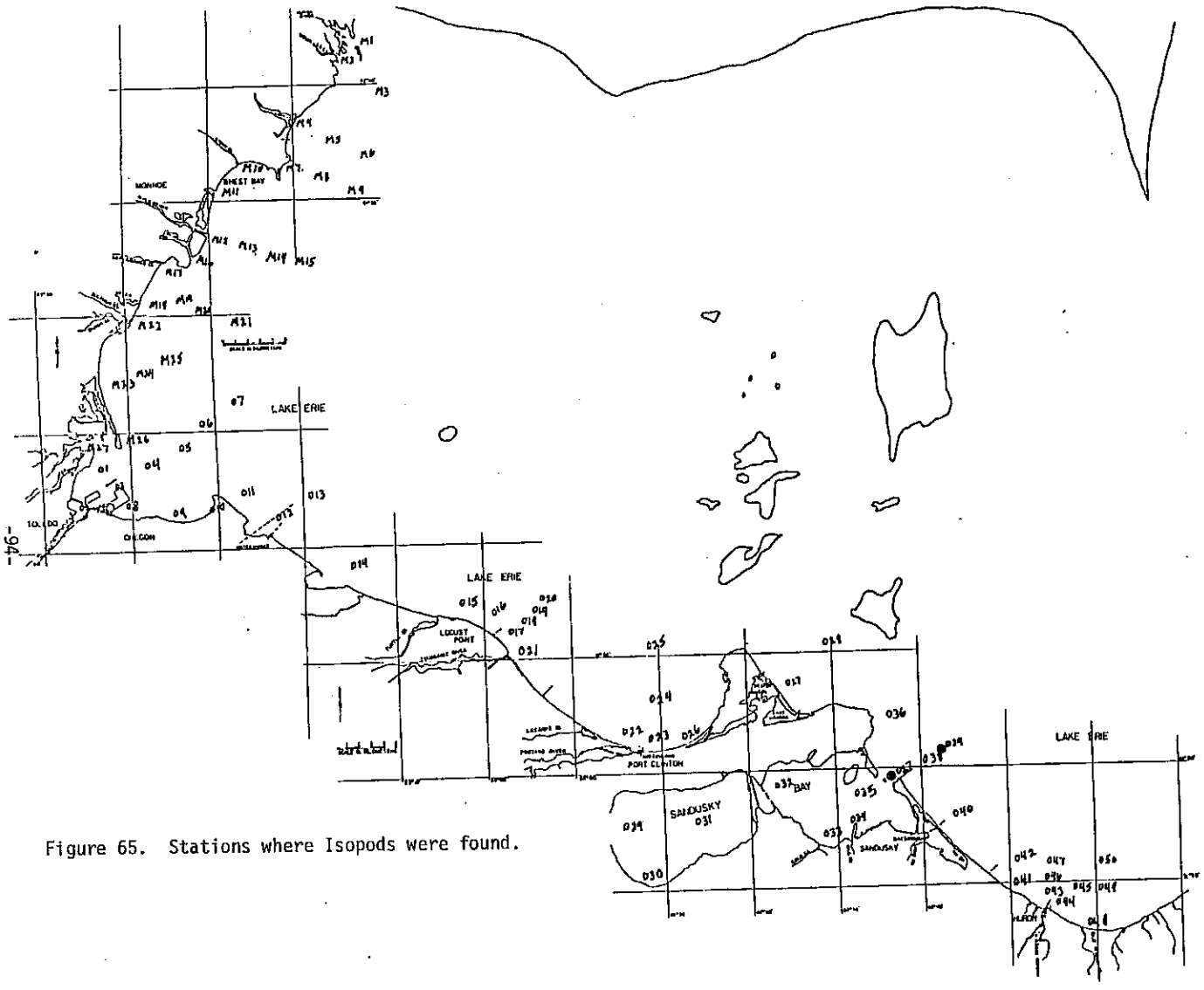


Figure 65. Stations where Isopods were found.

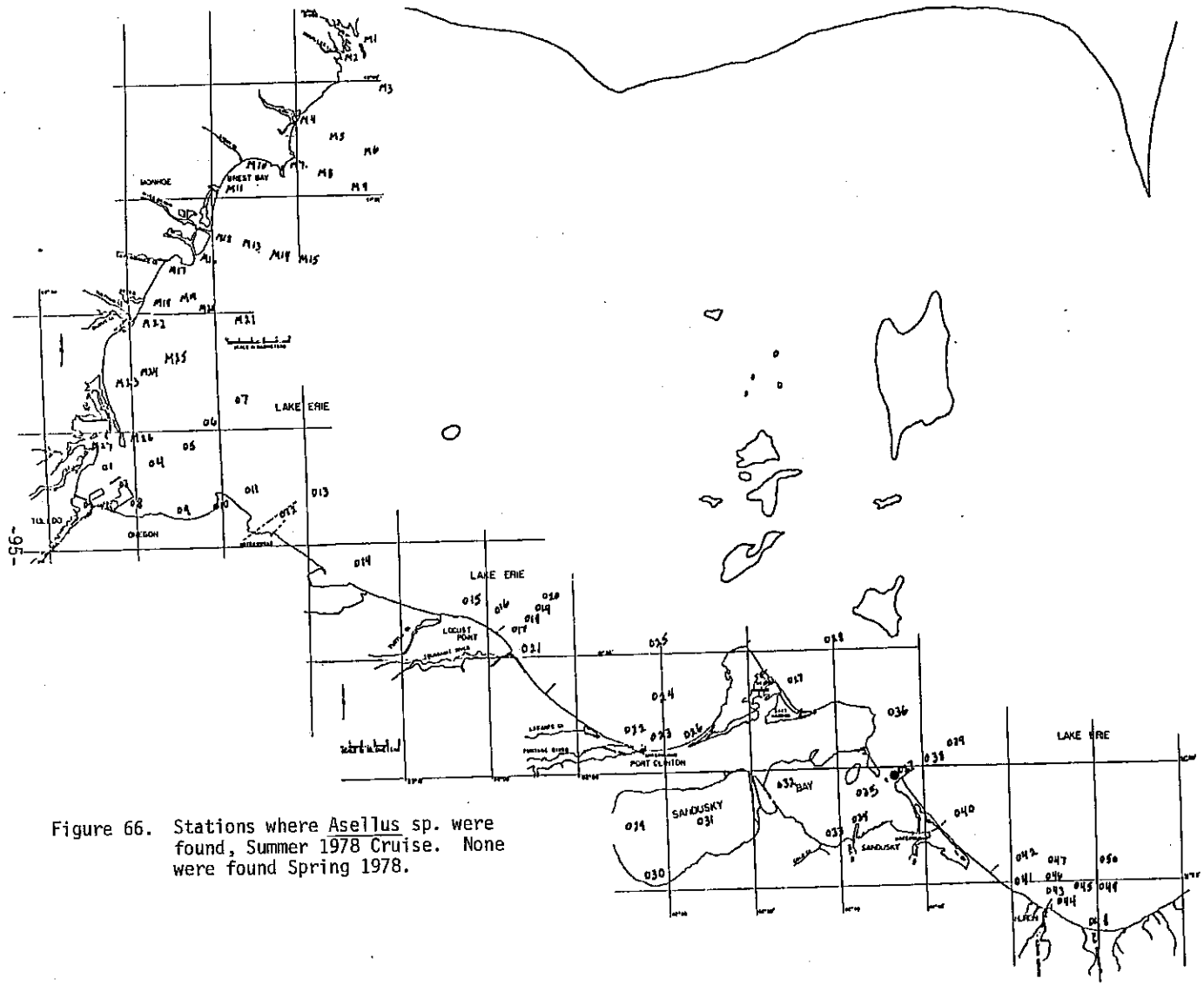


Figure 66. Stations where Asellus sp. were found, Summer 1978 Cruise. None were found Spring 1978.

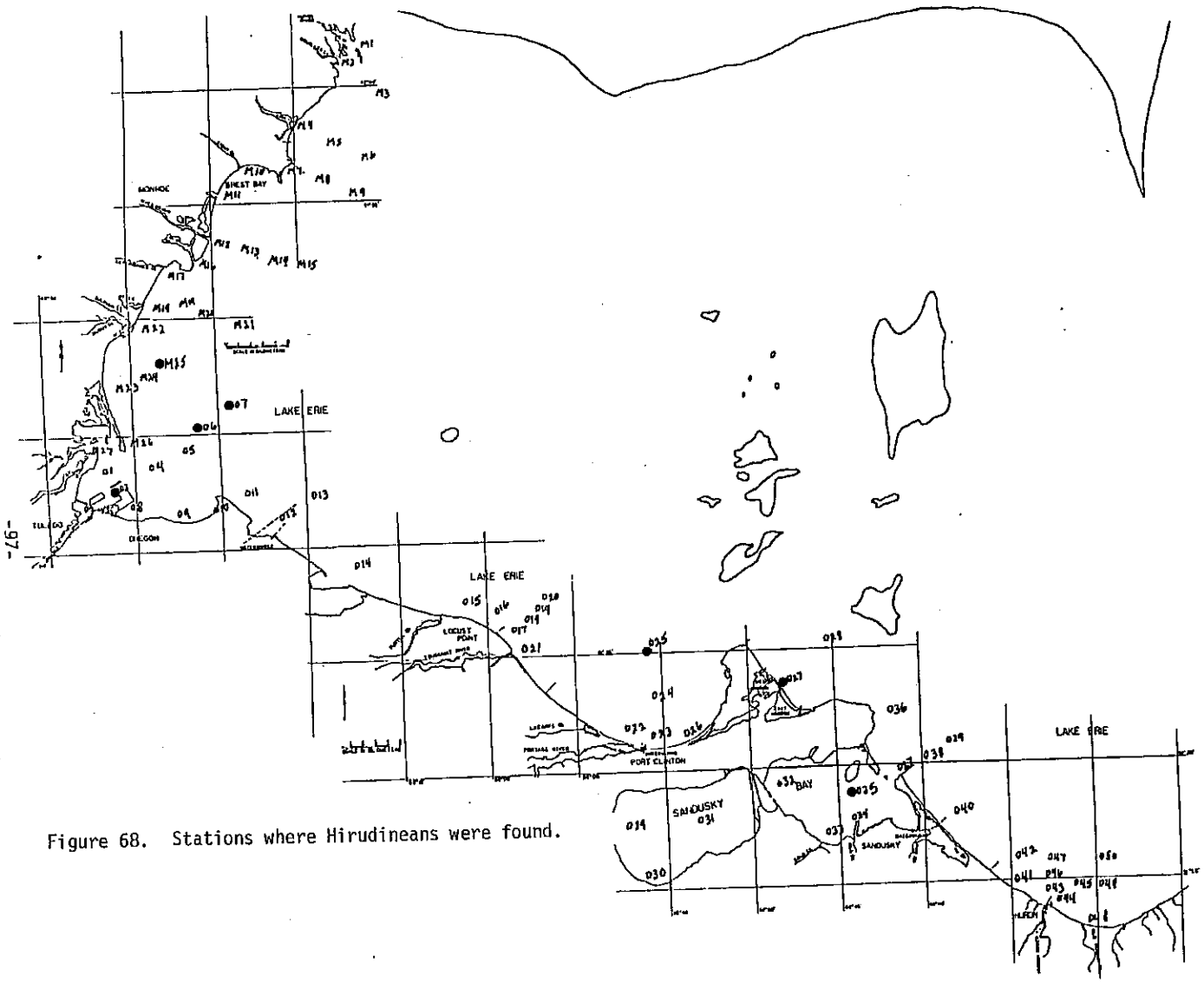


Figure 68. Stations where Hirudineans were found.

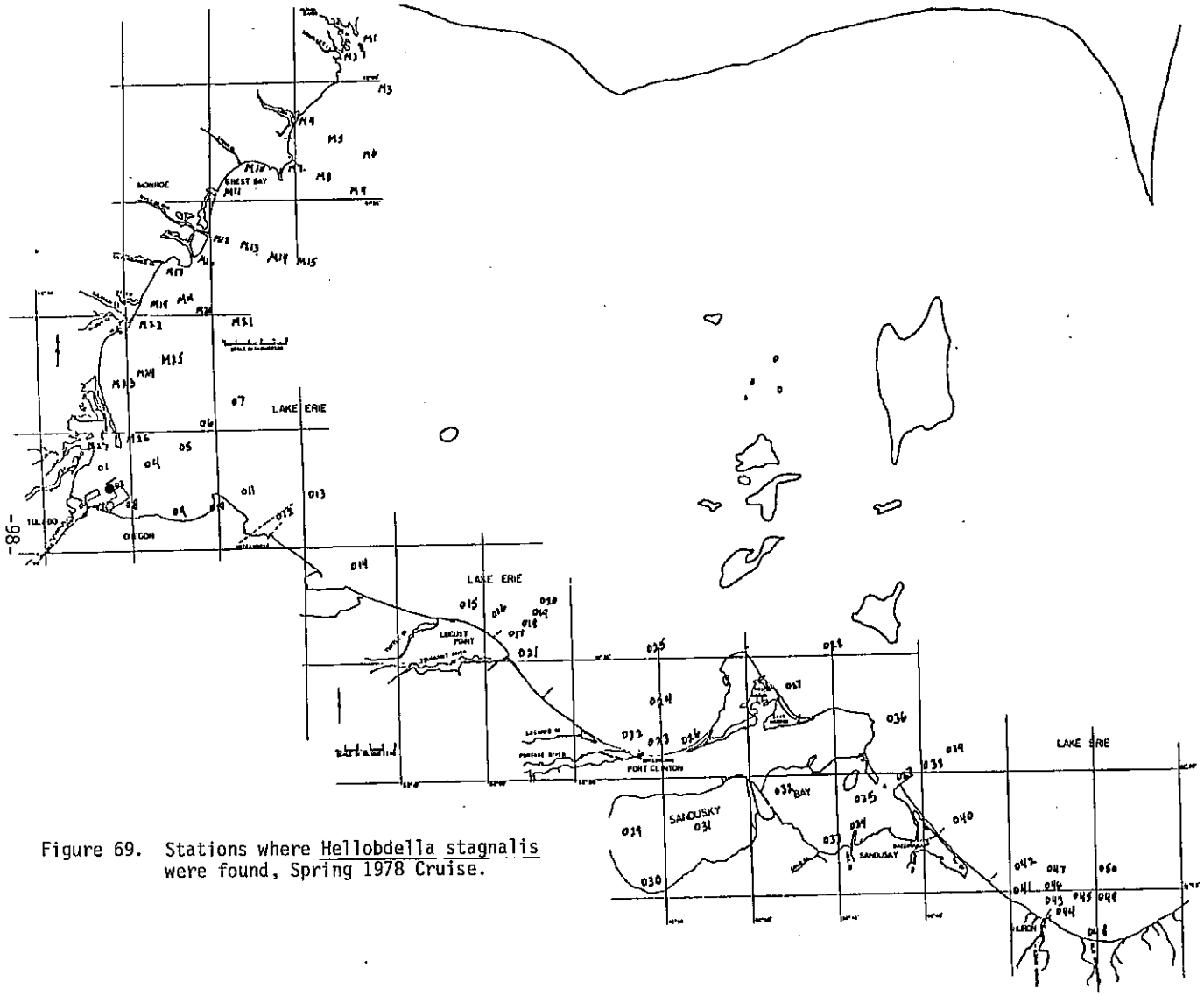


Figure 69. Stations where Hellobdella stagnalis were found, Spring 1978 Cruise.

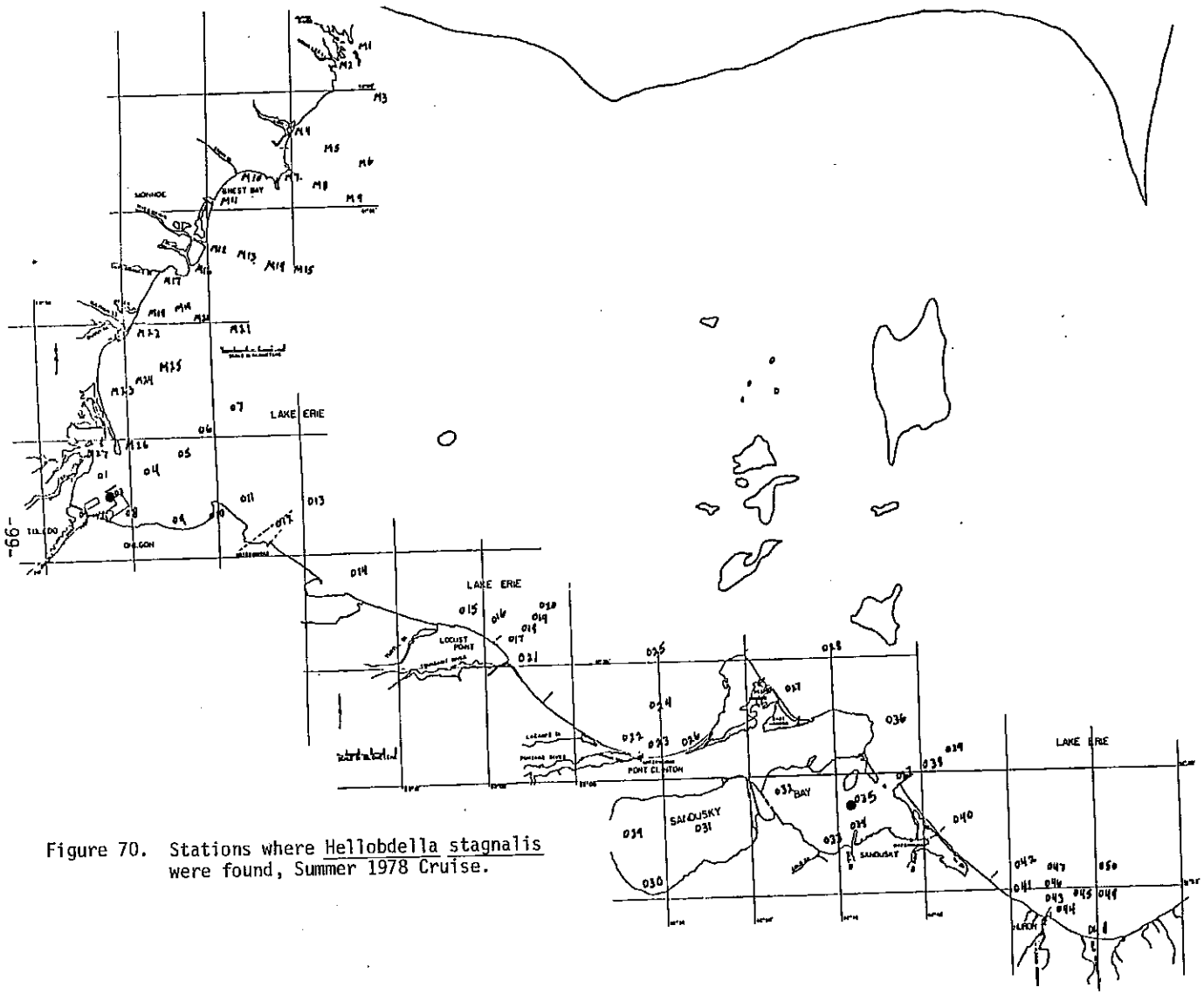


Figure 70. Stations where Hellobdella stagnalis were found, Summer 1978 Cruise.

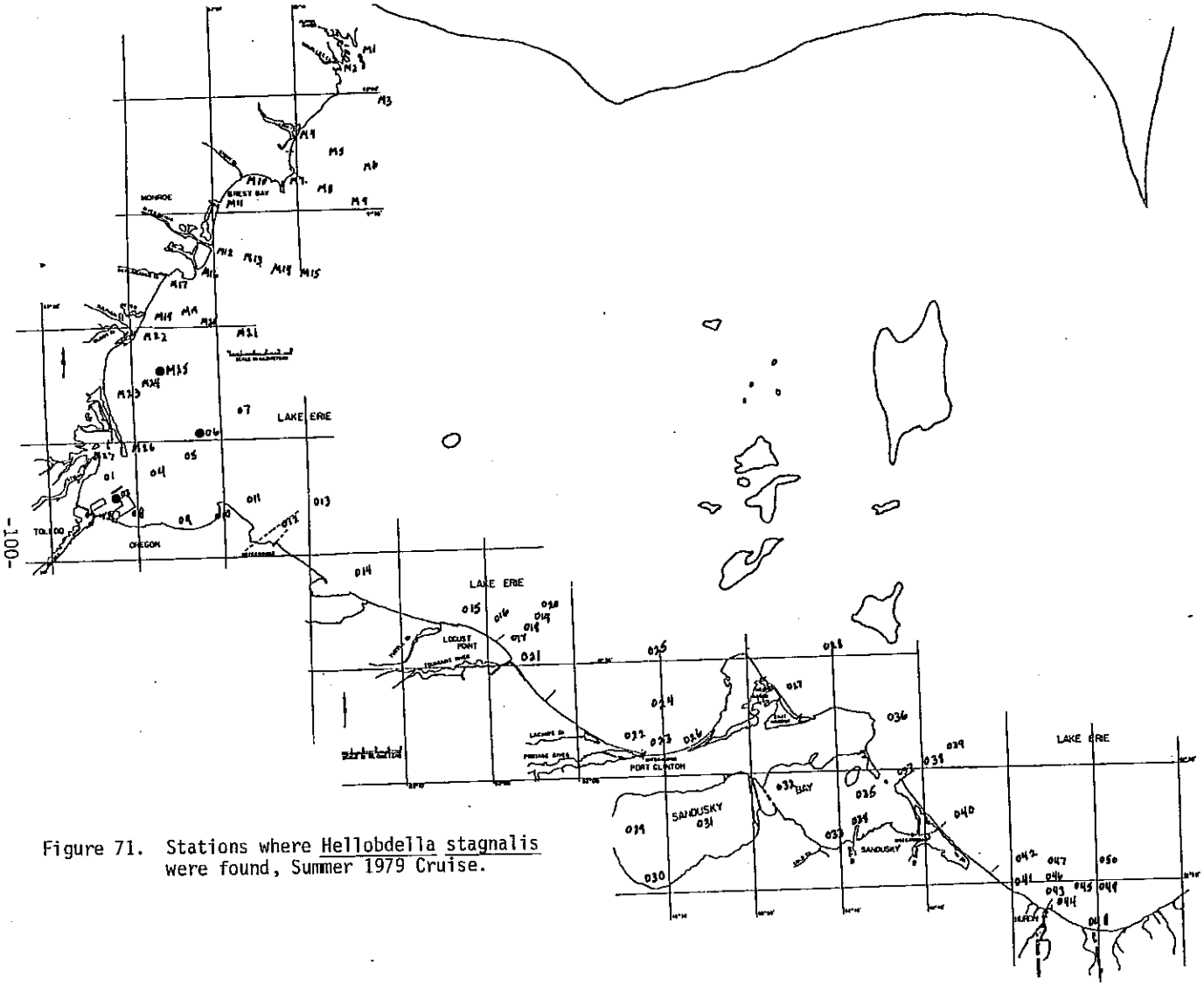


Figure 71. Stations where Hellobdella stagnalis were found, Summer 1979 Cruise.

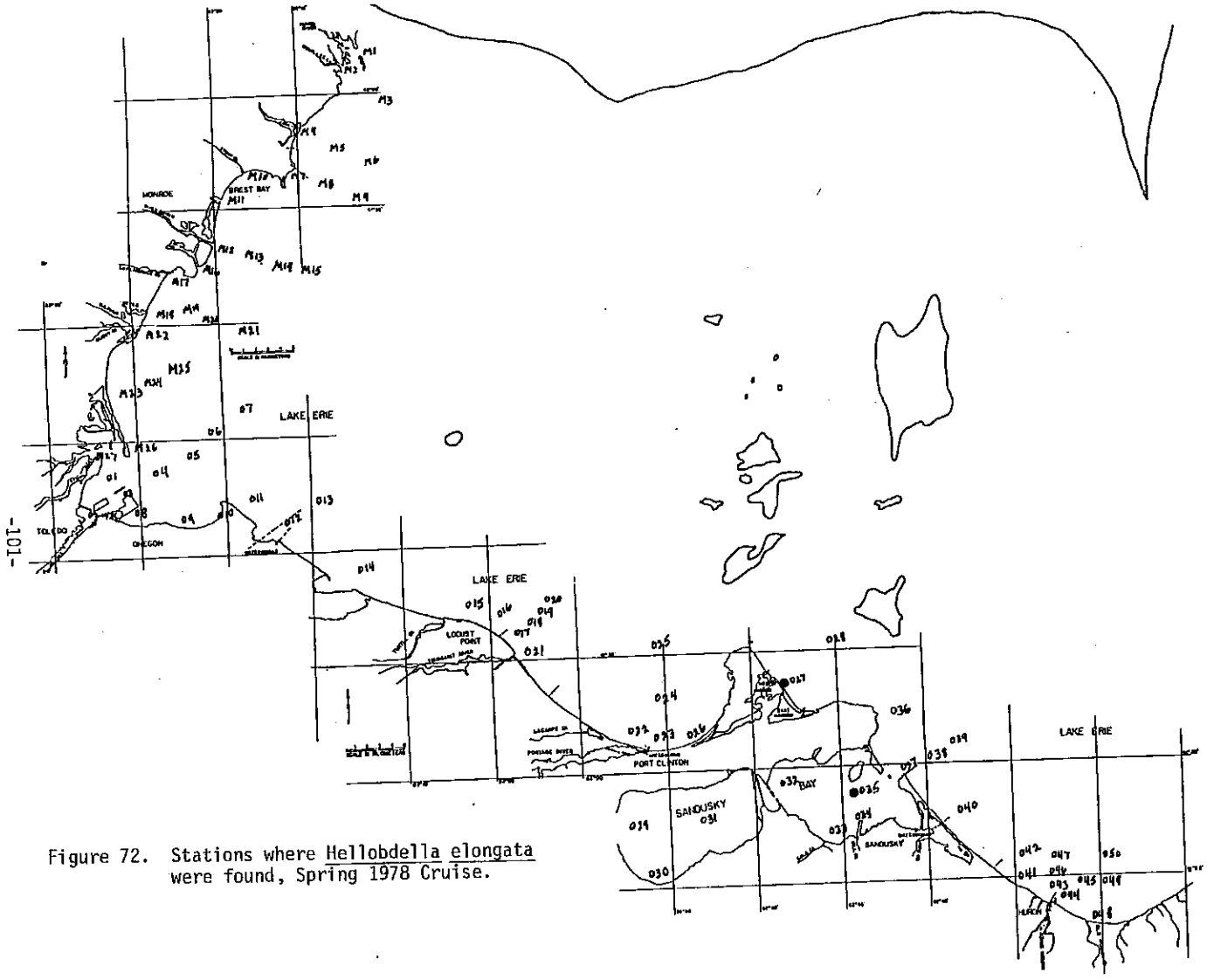


Figure 72. Stations where Hellobdella elongata were found, Spring 1978 Cruise.

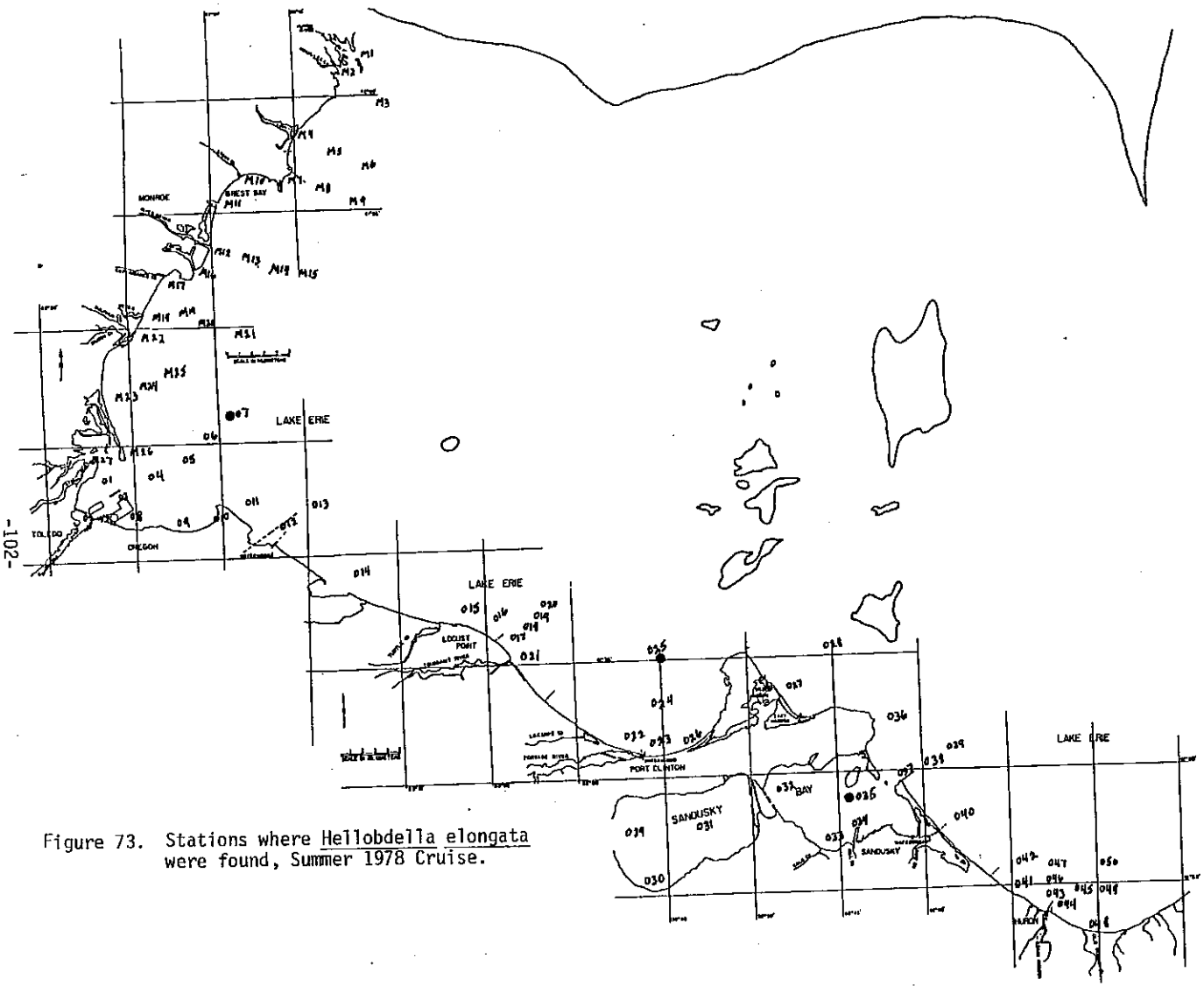


Figure 73. Stations where Hellobdella elongata were found, Summer 1978 Cruise.

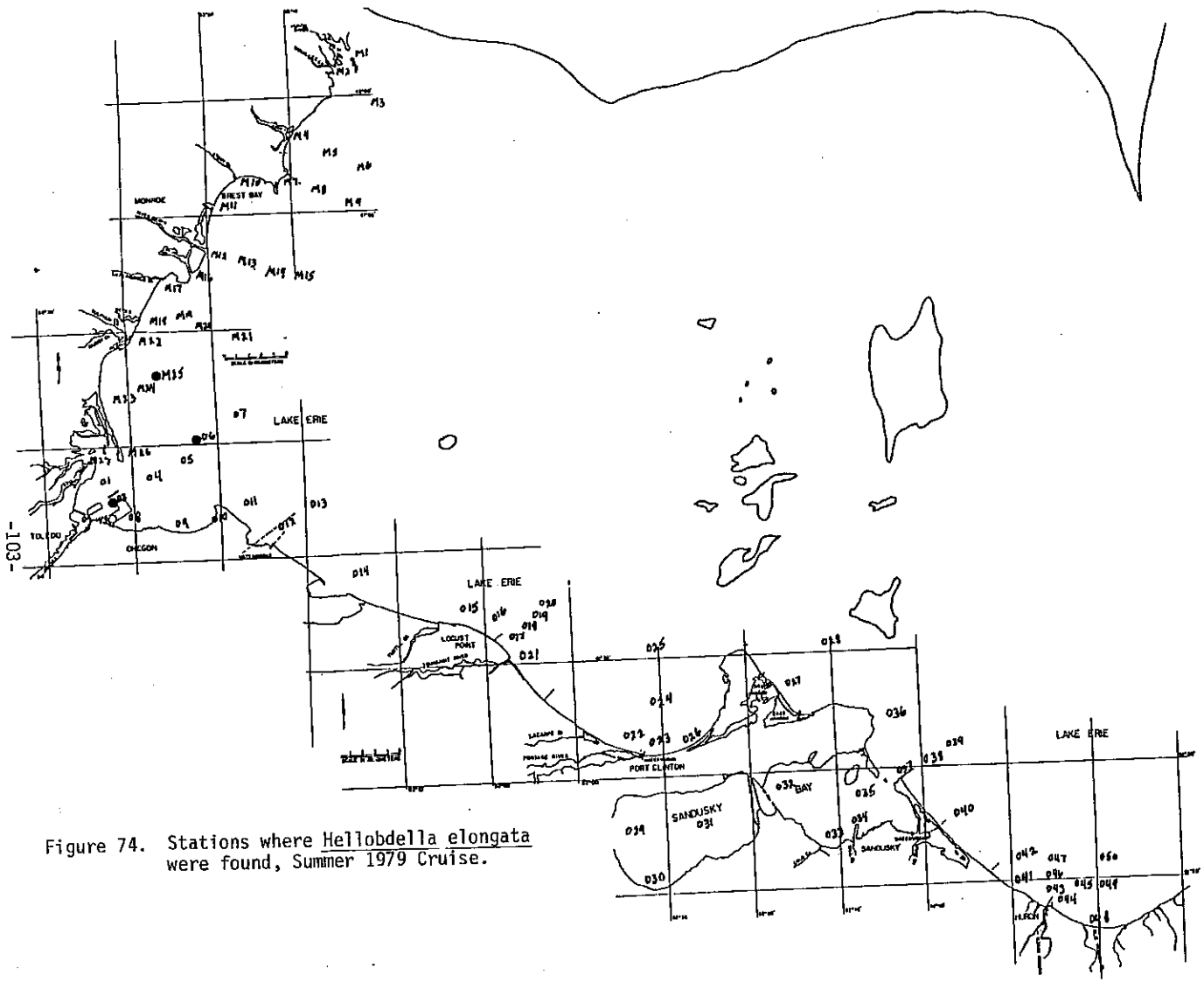


Figure 74. Stations where Hellobdella elongata were found, Summer 1979 Cruise.

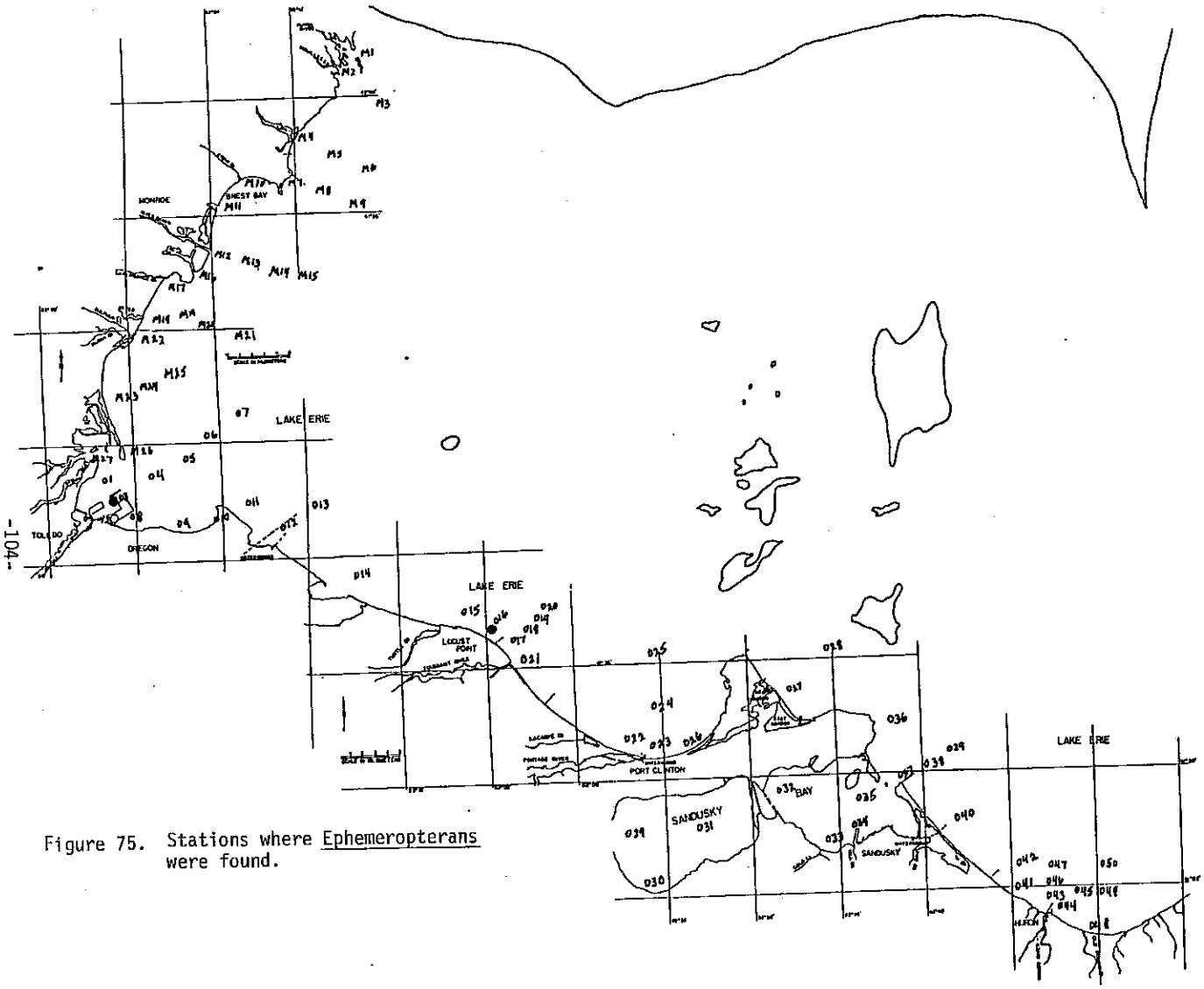


Figure 75. Stations where Ephemeropterans were found.

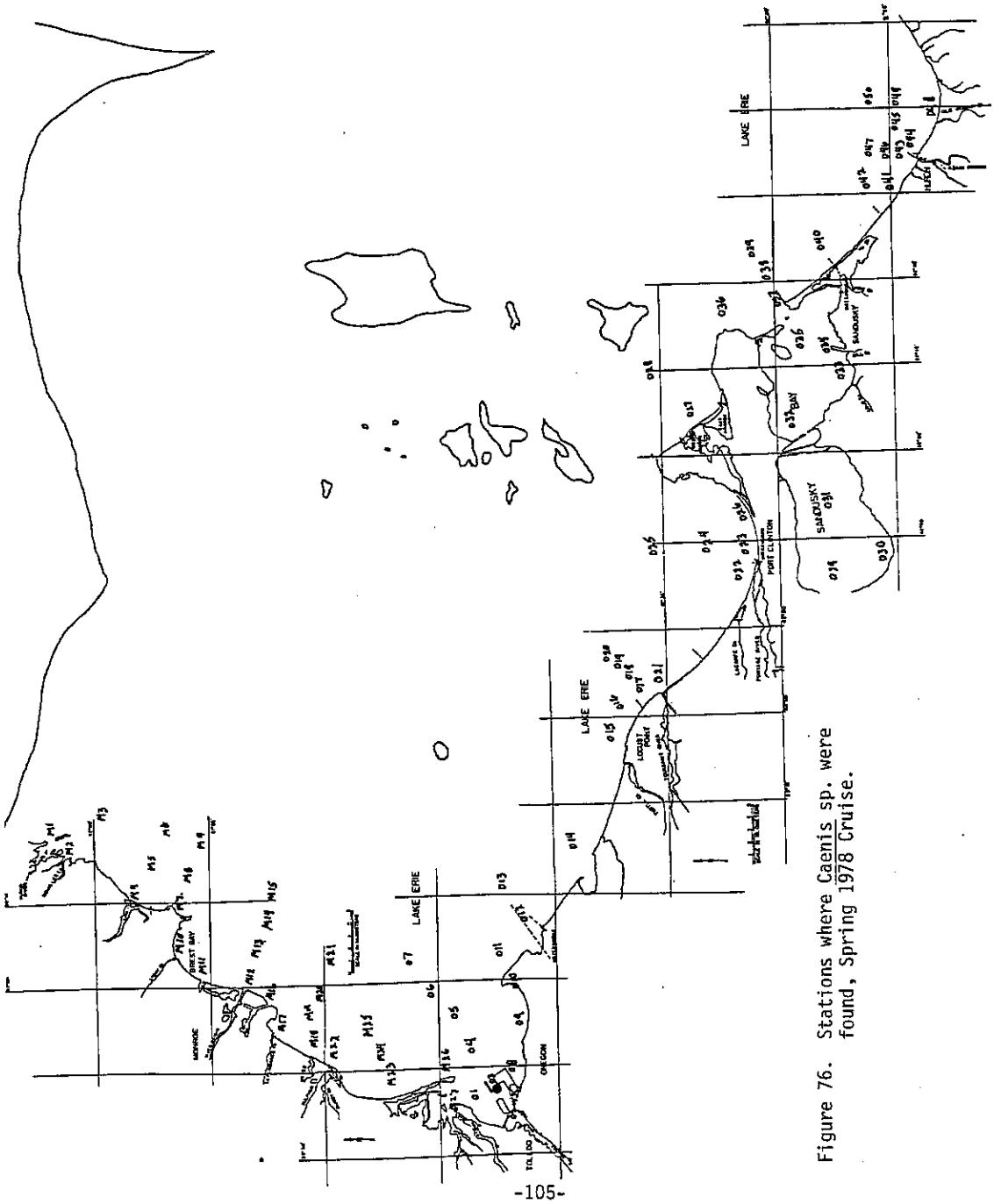


Figure 76. Stations where Caenis sp. were found, Spring 1978 Cruise.

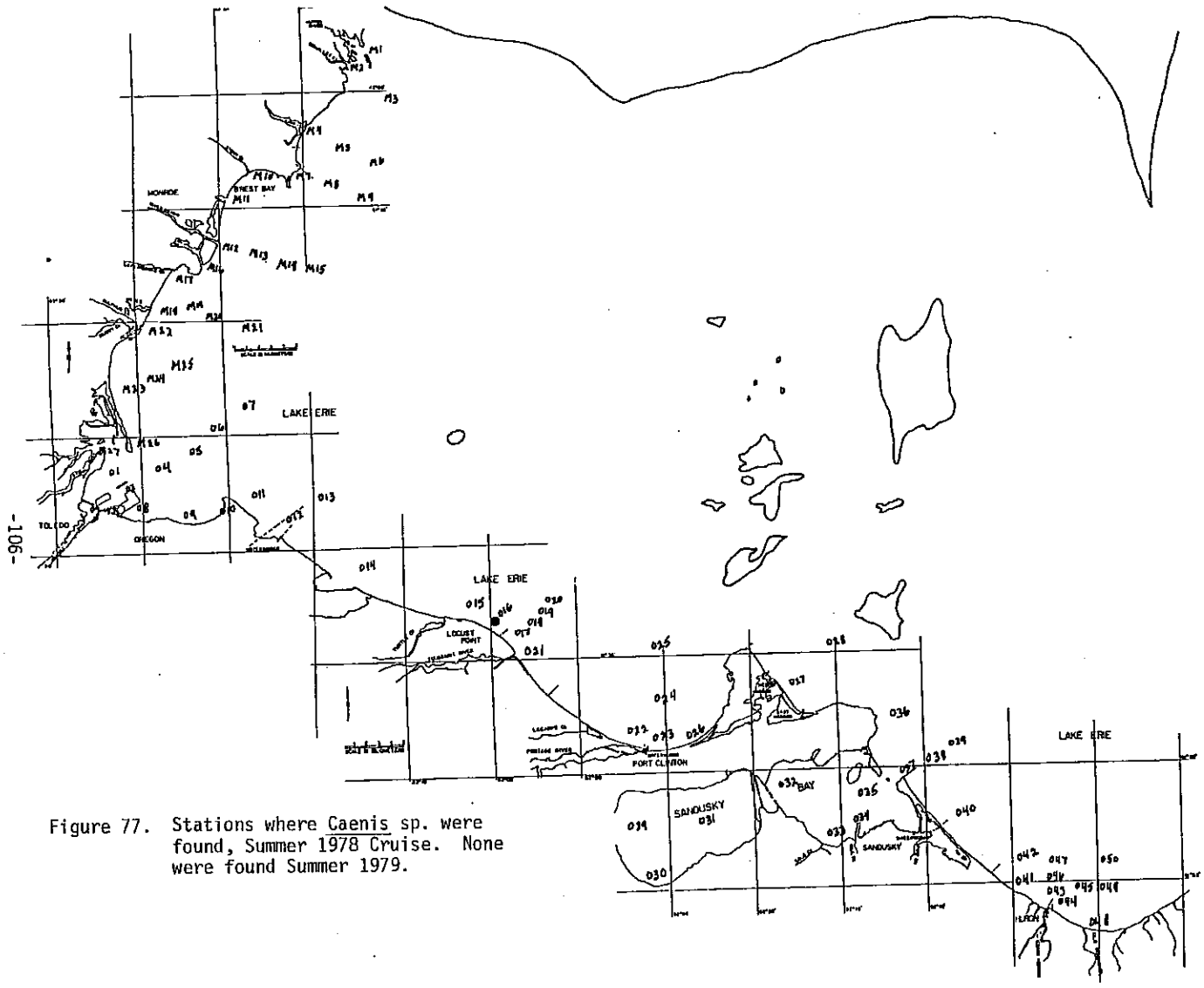


Figure 77. Stations where Caenis sp. were found, Summer 1978 Cruise. None were found Summer 1979.

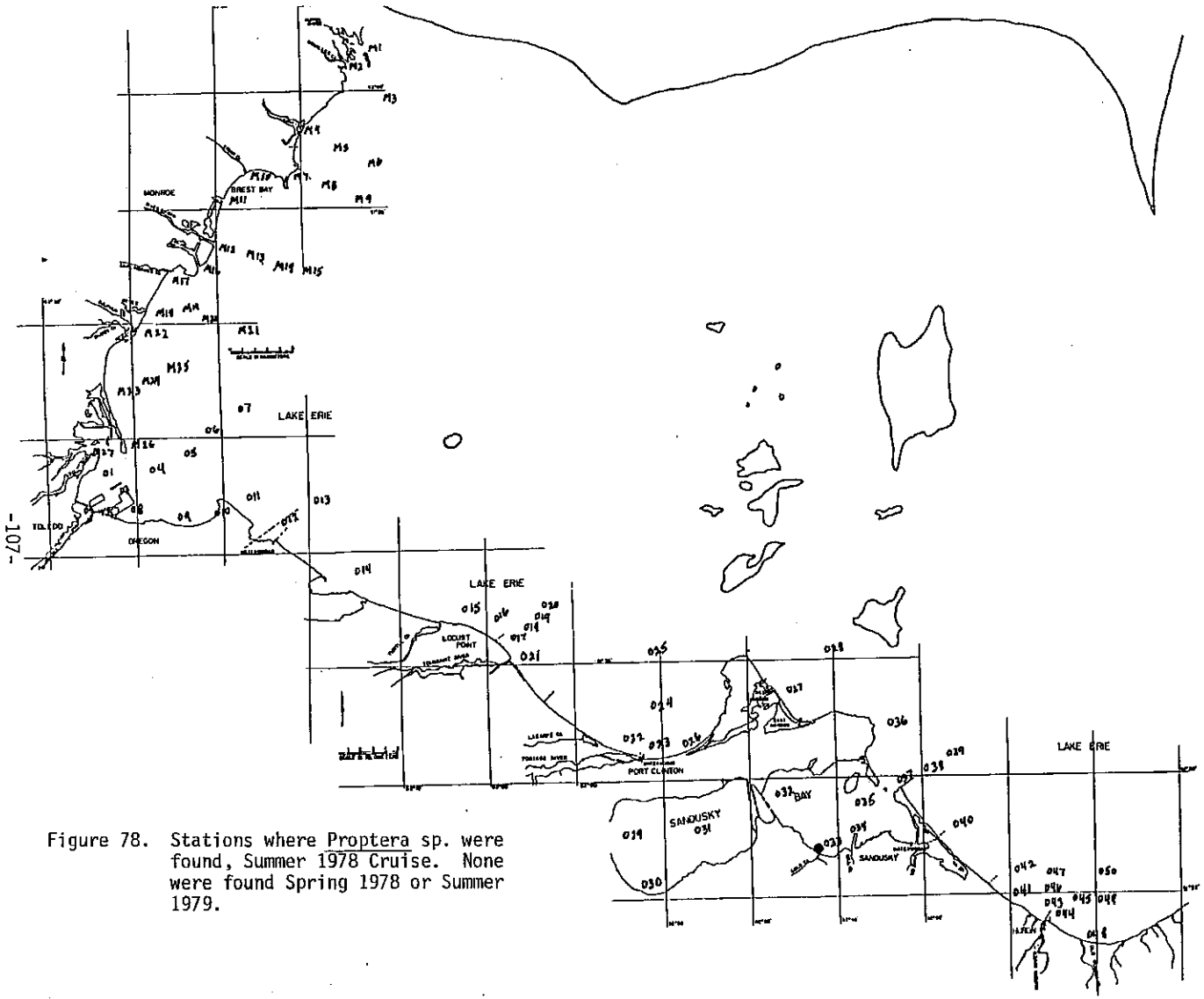


Figure 78. Stations where Proptera sp. were found, Summer 1978 Cruise. None were found Spring 1978 or Summer 1979.

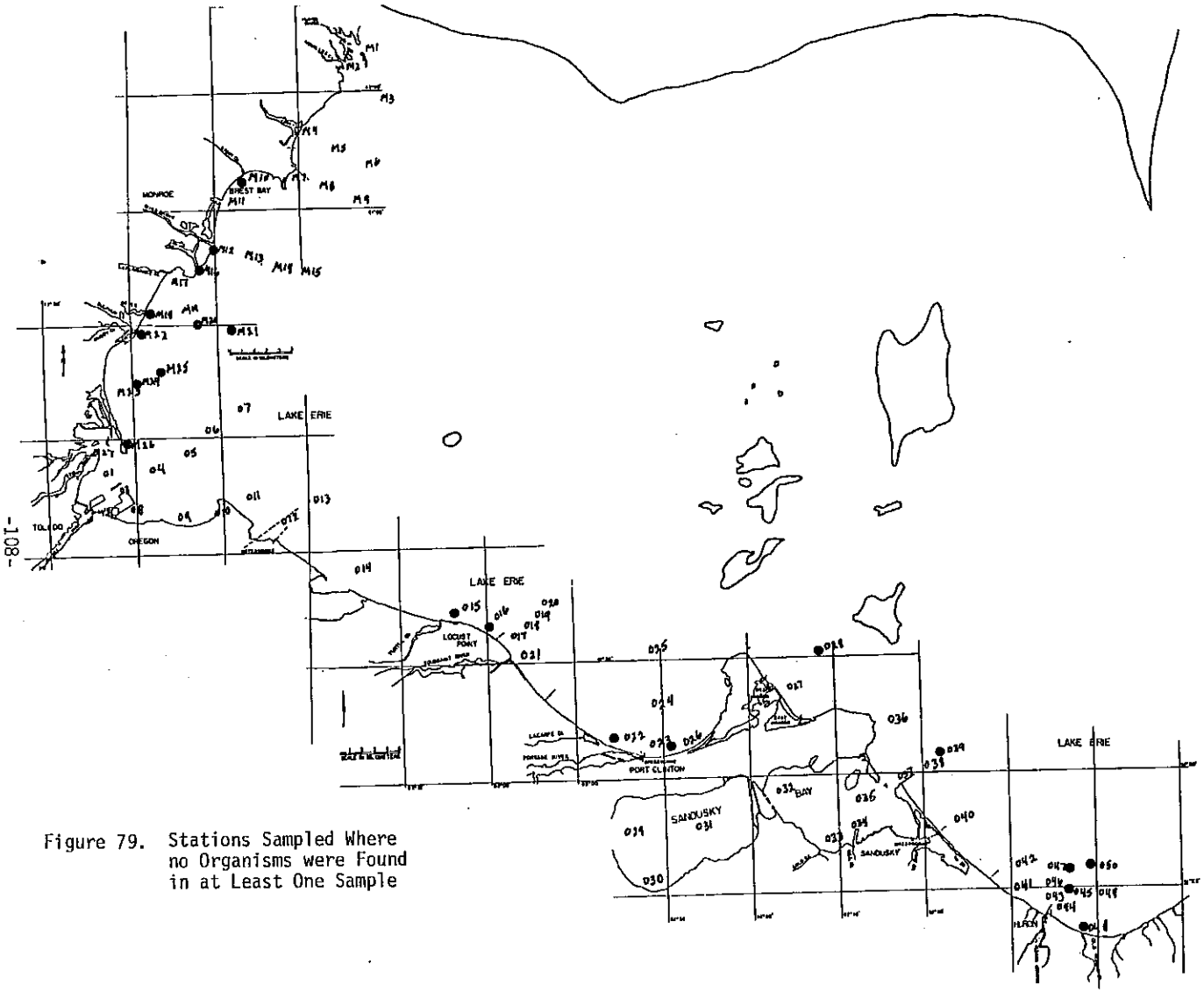
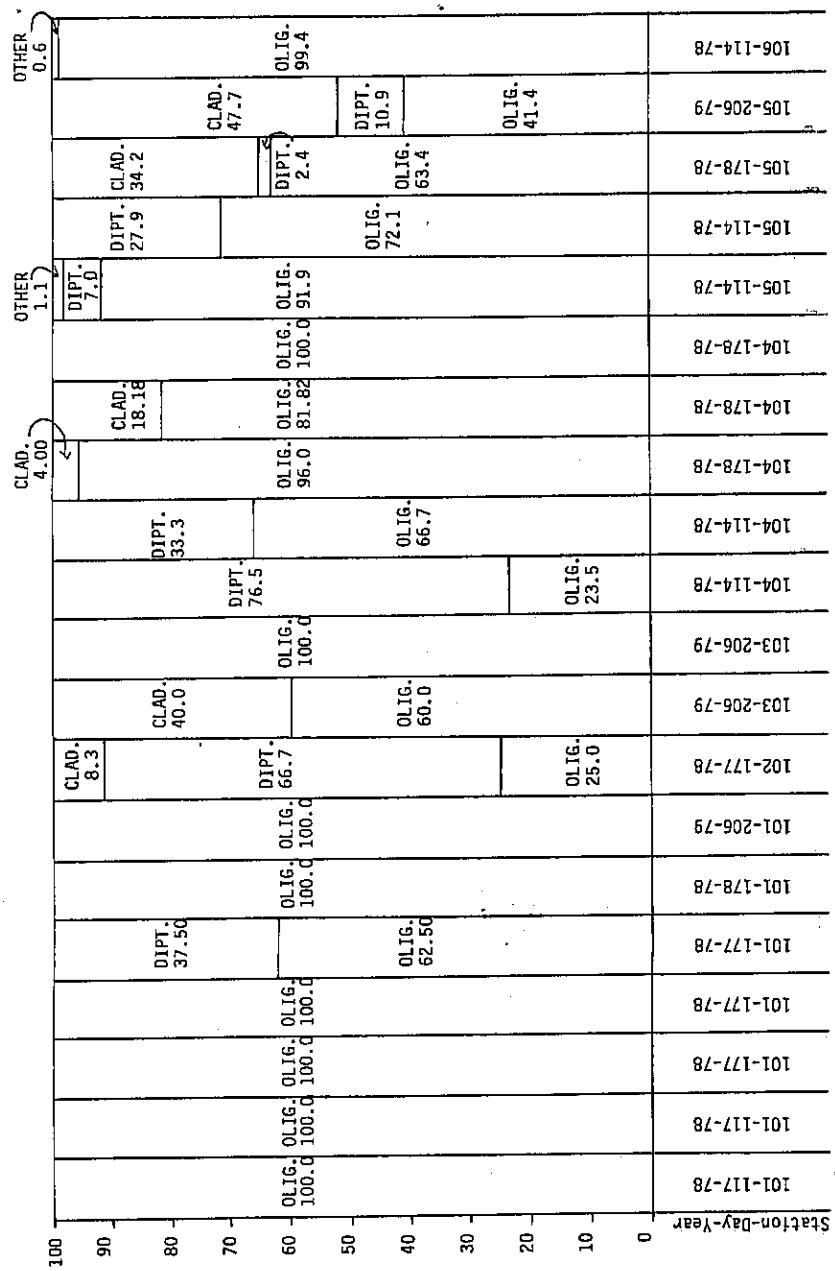


Figure 79. Stations Sampled Where no Organisms were Found in at Least One Sample

APPENDIX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105-178-78
105-114-78
105-114-78
104-178-78
104-178-78
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104-114-78
103-206-79
103-206-79
102-177-78
101-206-79
101-178-78
101-177-78
101-177-78
101-177-78
101-117-78
101-117-78
OTHER 0.6
OLIG. 99.4
CLAD. 47.7
DIPT. 10.9
OLIG. 41.4
CLAD. 34.2
DIPT. 2.4
OLIG. 63.4
DIPT. 27.9
OLIG. 72.1
OTHER 1.1
DIPT. 7.0
OLIG. 91.9
OLIG. 100.0
CLAD. 18.18
OLIG. 81.82
CLAD. 4.00
OLIG. 96.0
DIPT. 33.3
OLIG. 66.7
DIPT. 76.5
OLIG. 23.5
OLIG. 100.0
CLAD. 40.0
OLIG. 60.0
CLAD. 8.3
DIPT. 66.7
OLIG. 25.0
OLIG. 100.0
OLIG. 100.0
DIPT. 37.50
OLIG. 62.50
OLIG. 100.0
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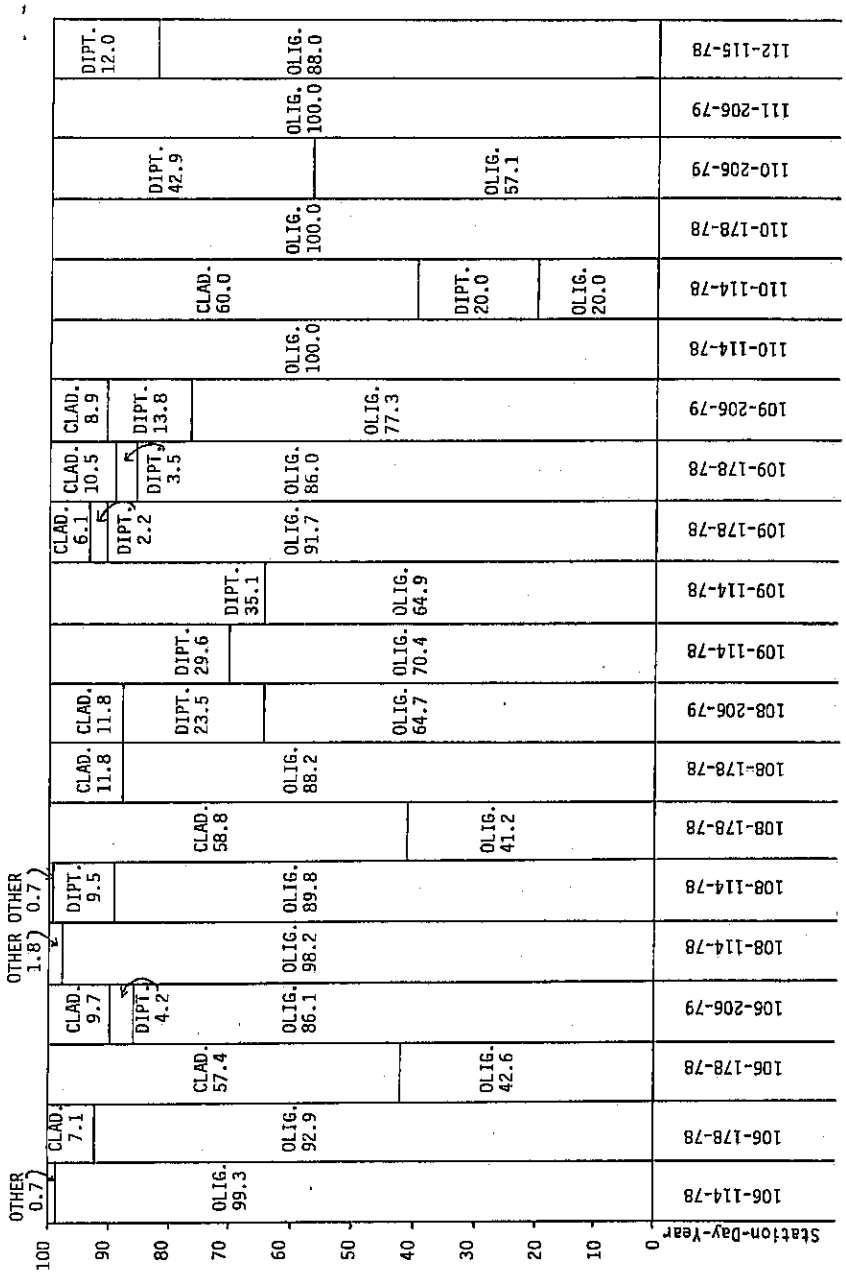
30
20
10
0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CLAD. 7.1
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CLAD. 57.4
OLIG. 42.6
106-206-79
CLAD. 9.7
DIPT. 4.2
OLIG. 86.1
108-114-78
OTHER 1.8
OLIG. 98.2
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DIPT. 9.5
OLIG. 89.8
108-178-78
CLAD. 58.8
OLIG. 41.2
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CLAD. 11.8
OLIG. 88.2
108-206-79
CLAD. 11.8
DIPT. 23.5
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DIPT. 29.6
OLIG. 70.4
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DIPT. 35.1
OLIG. 64.9
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DIPT. 2.2
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DIPT. 3.5
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DIPT. 13.8
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DIPT. 20.0
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OLIG. 100.0
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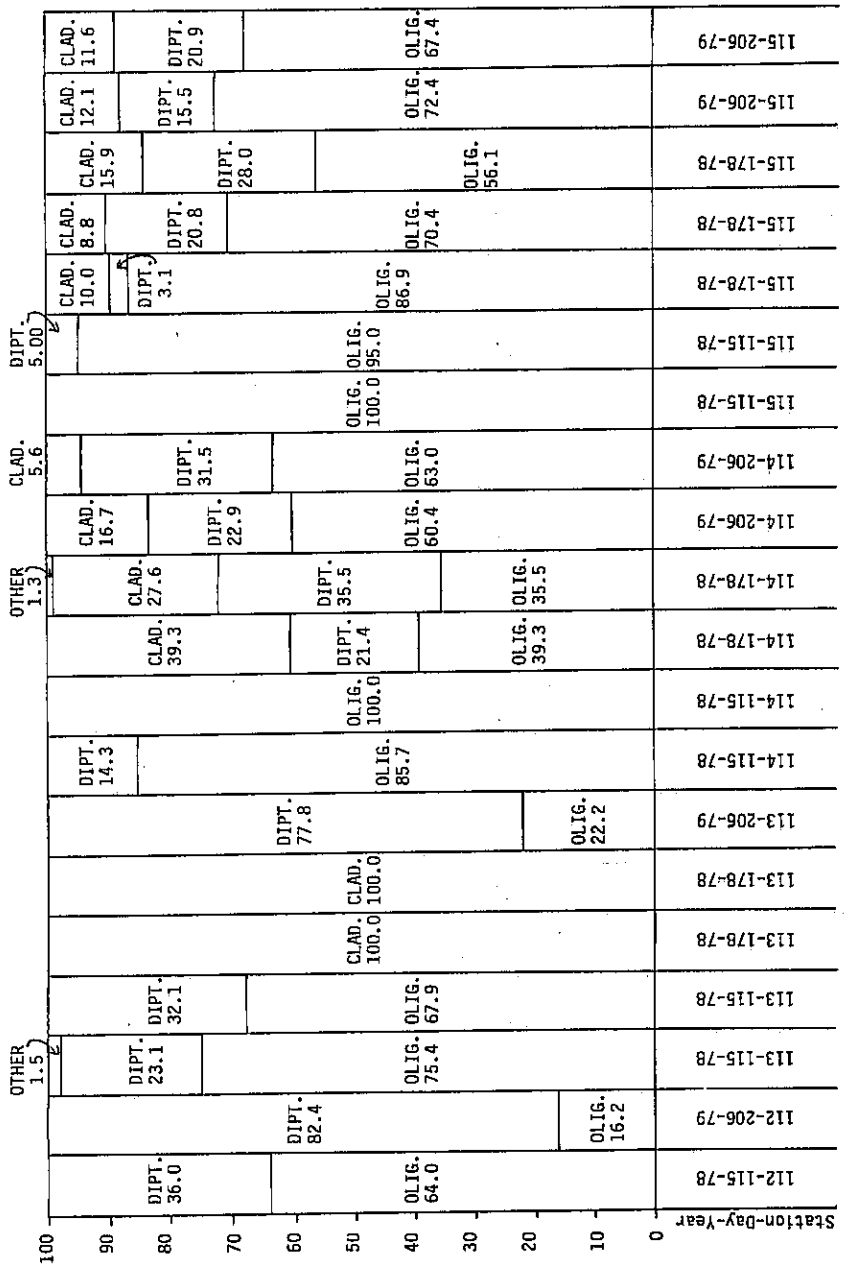
DIPT. 42.9
OLIG. 57.1
111-206-79
OLIG. 100.0
112-115-78
DIPT. 12.0
OLIG. 88.0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115-178-78
115-206-79
DIPT. 36.0
OLIG. 64.0
DIPT. 82.4
OLIG. 16.2
OTHER 1.5
DIPT. 23.1
OLIG. 75.4
DIPT. 32.1
OLIG. 67.9
CLAD. 100.0
CLAD. 100.0
DIPT. 77.8
OLIG. 22.2
DIPT. 14.3
OLIG. 85.7
OLIG. 100.0
CLAD. 39.3
DIPT. 21.4
OLIG. 39.3
OTHER 1.3
CLAD. 27.6
DIPT. 35.5
OLIG. 35.5
CLAD. 16.7
DIPT. 22.9
OLIG. 60.4
CLAD. 5.6
DIPT. 31.5
OLIG. 63.0
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DIPT. 5.00
OLIG. 95.0
CLAD. 10.0
DIPT. 3.1
OLIG. 86.9
CLAD. 8.8
DIPT. 20.8
OLIG. 70.4
CLAD. 15.9
DIPT. 28.0
OLIG. 56.1
CLAD. 12.1
DIPT. 15.5
OLIG. 72.4
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DIPT. 20.9
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70
60
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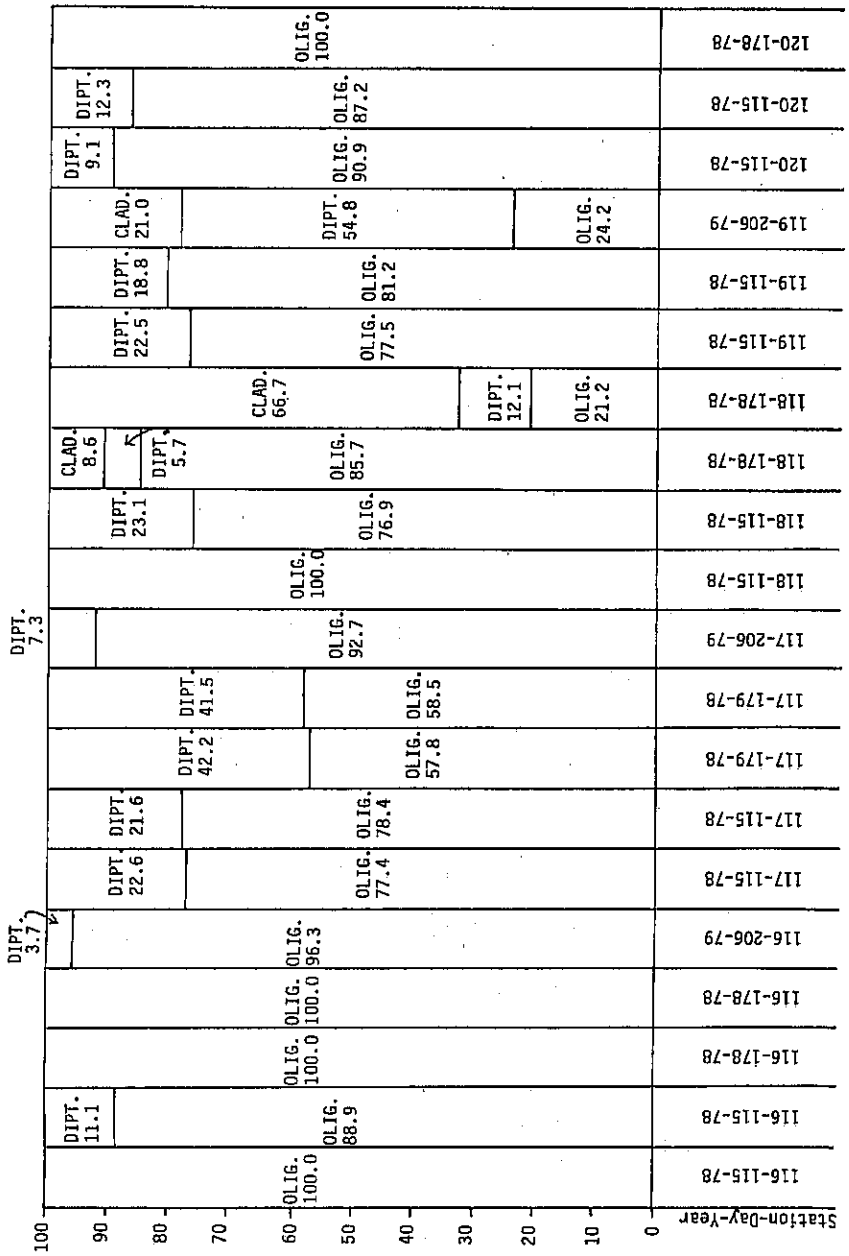
30
20
10
0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OLIG. 88.9
OLIG. 100.0
OLIG. 100.0
DIPT. 3.7
OLIG. 96.3
DIPT. 22.6
OLIG. 77.4
DIPT. 21.6
OLIG. 78.4
DIPT. 42.2
OLIG. 57.8
DIPT. 41.5
OLIG. 58.5
DIPT. 7.3
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DIPT. 23.1
OLIG. 76.9
CLAD. 8.6
DIPT. 5.7
OLIG. 85.7
CLAD. 66.7
DIPT. 12.1
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DIPT. 22.5
OLIG. 77.5
DIPT. 18.8
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OLIG. 90.9
DIPT. 12.3
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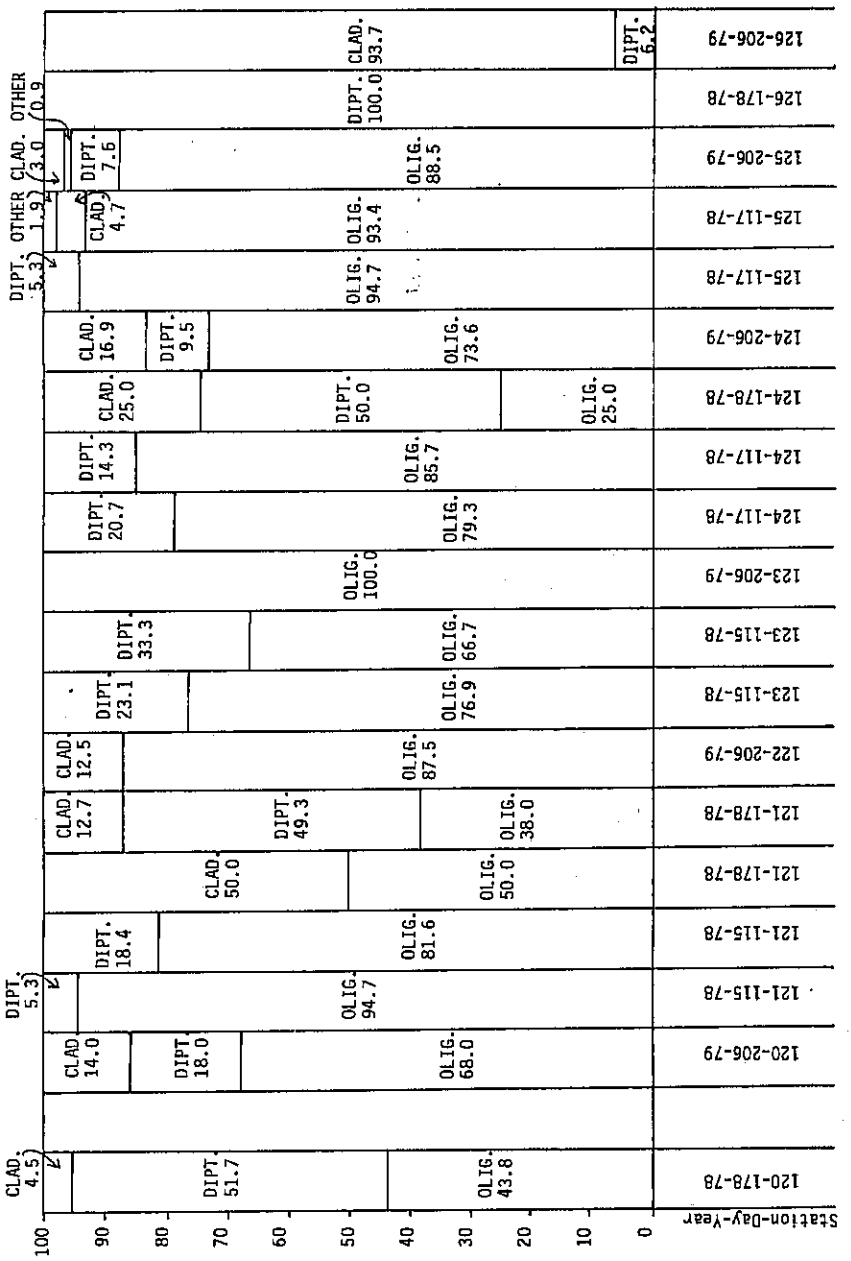
OLIG. 100.0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30
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DIPT. 51.7
OLIG. 43.8
120-206-79
CLAD 14.0
DIPT. 18.0
OLIG. 68.0
121-115-78
DIPT. 5.3
OLIG. 94.7
121-115-78
DIPT. 18.4
OLIG. 81.6
121-178-78
CLAD. 50.0
OLIG. 50.0
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CLAD. 12.7
DIPT. 49.3
OLIG. 38.0
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CLAD. 12.5
OLIG. 87.5
123-115-78
DIPT. 23.1
OLIG. 76.9
123-115-78
DIPT. 33.3
OLIG. 66.7
123-206-79
OLIG. 100.0
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DIPT 20.7
OLIG. 79.3
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DIPT. 14.3
OLIG. 85.7
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CLAD. 4.7
OLIG. 93.4
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DIPT. 7.6
OLIG. 88.5
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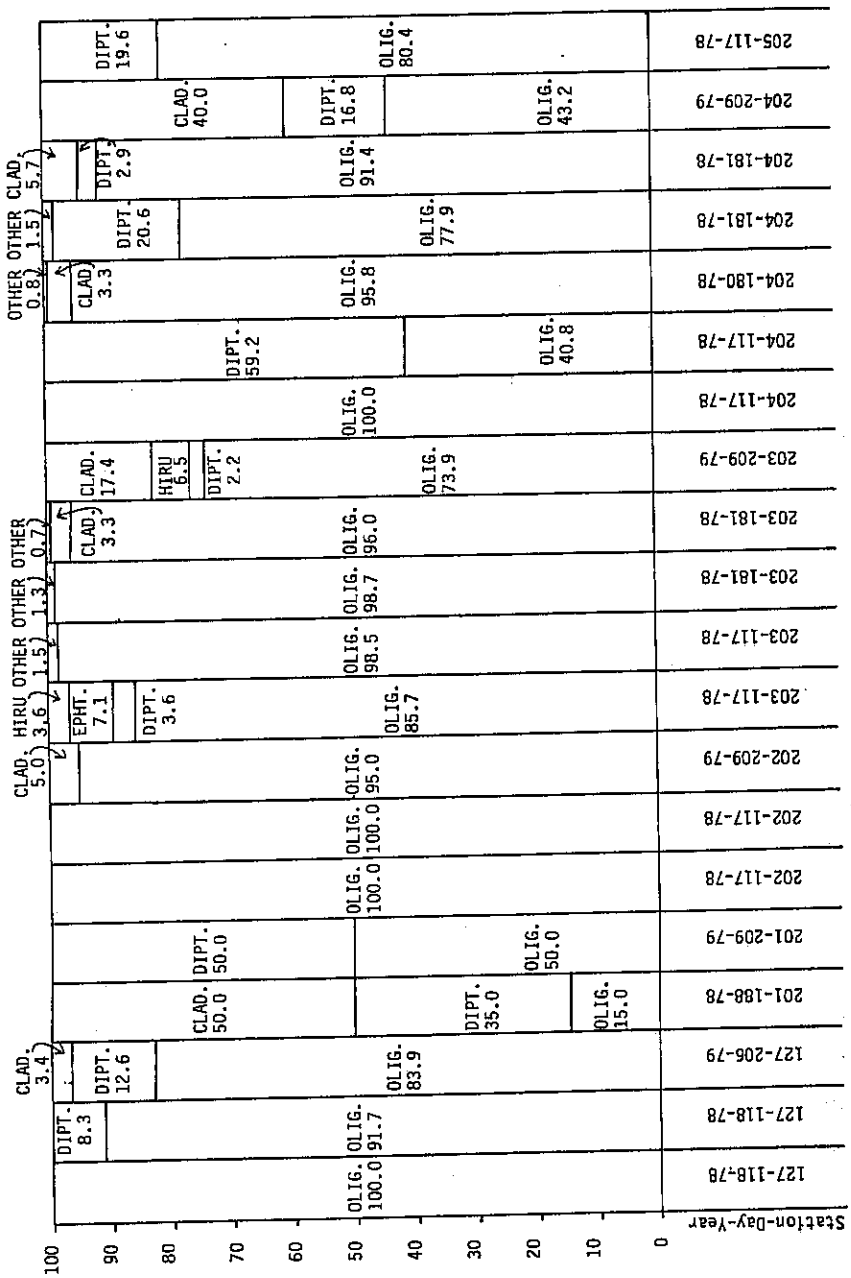
OTHER 0.9
DIPT. 100.0
126-206-79
CLAD. 93.7
DIPT. 6.2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DIPT. 8.3
OLIG. 83.9
OLIG. 91.7
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DIPT. 50.0
DIPT. 35.0
OLIG. 50.0
OLIG. 15.0
OLIG. 100.0
OLIG. 100.0
OLIG. 100.0
CLAD. 5.0
OLIG. 95.0
HIRU 3.6
EPHT. 7.1
DIPT. 3.6
OLIG. 85.7
OTHER 1.5
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OTHER 1.3
OLIG. 98.7
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CLAD. 17.4
HIRU 6.5
DIPT. 2.2
OLIG. 73.9
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DIPT. 59.2
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CLAD. 1.5
DIPT. 20.6
OLIG. 77.9
CLAD. 5.7
DIPT. 2.9
OLIG. 91.4
CLAD. 40.0
DIPT. 16.8
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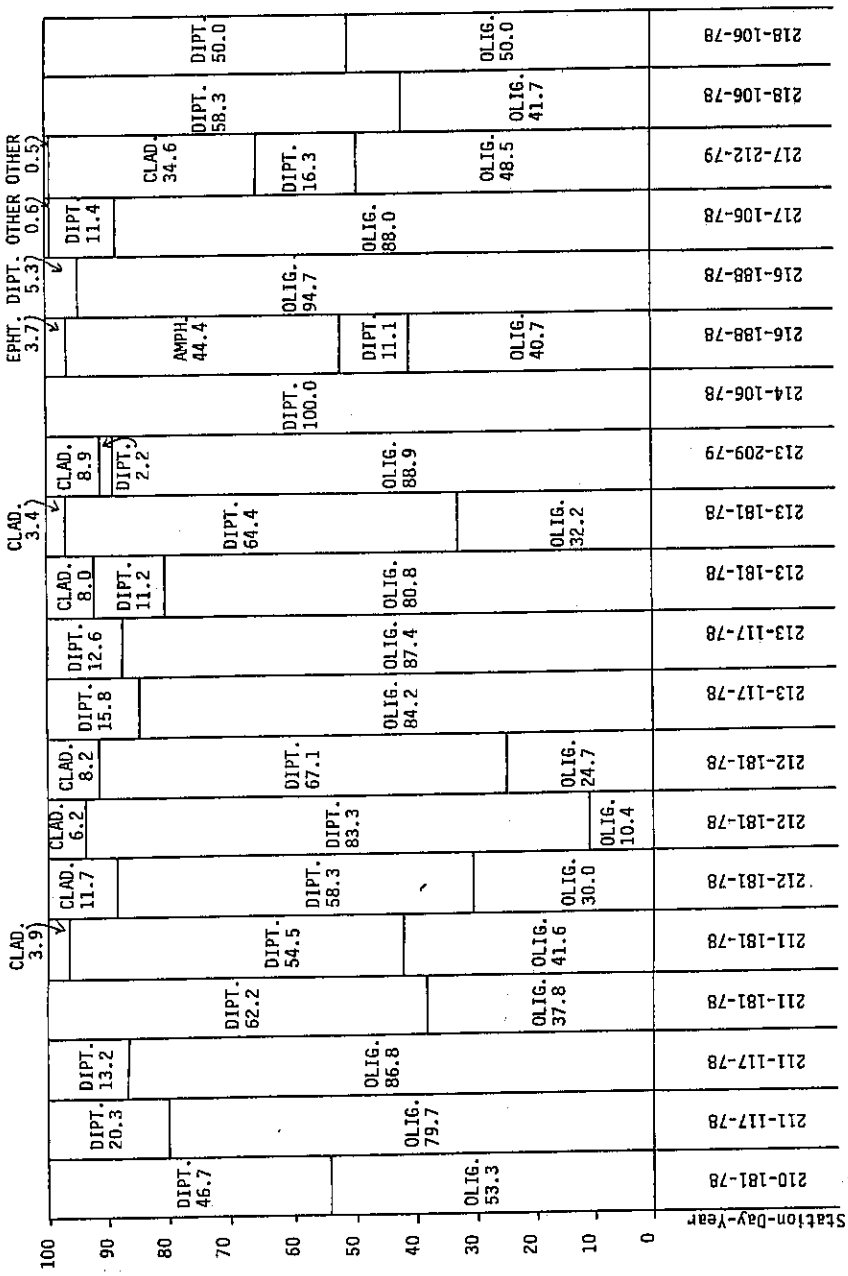
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DIPT. 50.0
OLIG. 50.0
DIPT. 58.3
OLIG. 41.7
CLAD. 34.6
DIPT. 16.3
OLIG. 48.5
OTHER 0.5)
DIPT 11.4
OLIG. 88.0
OTHER 0.6)
OLIG. 94.7
DIPT. 5.3)
AMPH 44.4
DIPT. 11.1
OLIG. 40.7
EPHT. 3.7)
DIPT. 100.0
CLAD. 8.9
DIPT. 2.2
OLIG. 88.9
DIPT. 64.4
OLIG. 32.2
CLAD. 3.4)
CLAD. 8.0
DIPT. 11.2
OLIG. 80.8
DIPT. 12.6
OLIG. 87.4
DIPT. 15.8
OLIG. 84.2
CLAD. 8.2
DIPT. 67.1
OLIG. 24.7
CLAD. 6.2
DIPT. 83.3
OLIG. 10.4
CLAD. 11.7
DIPT. 58.3
OLIG. 30.0
CLAD. 3.9)
DIPT. 54.5
OLIG. 41.6
DIPT. 62.2
OLIG. 37.8
DIPT. 13.2
OLIG. 86.8
DIPT. 20.3
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10
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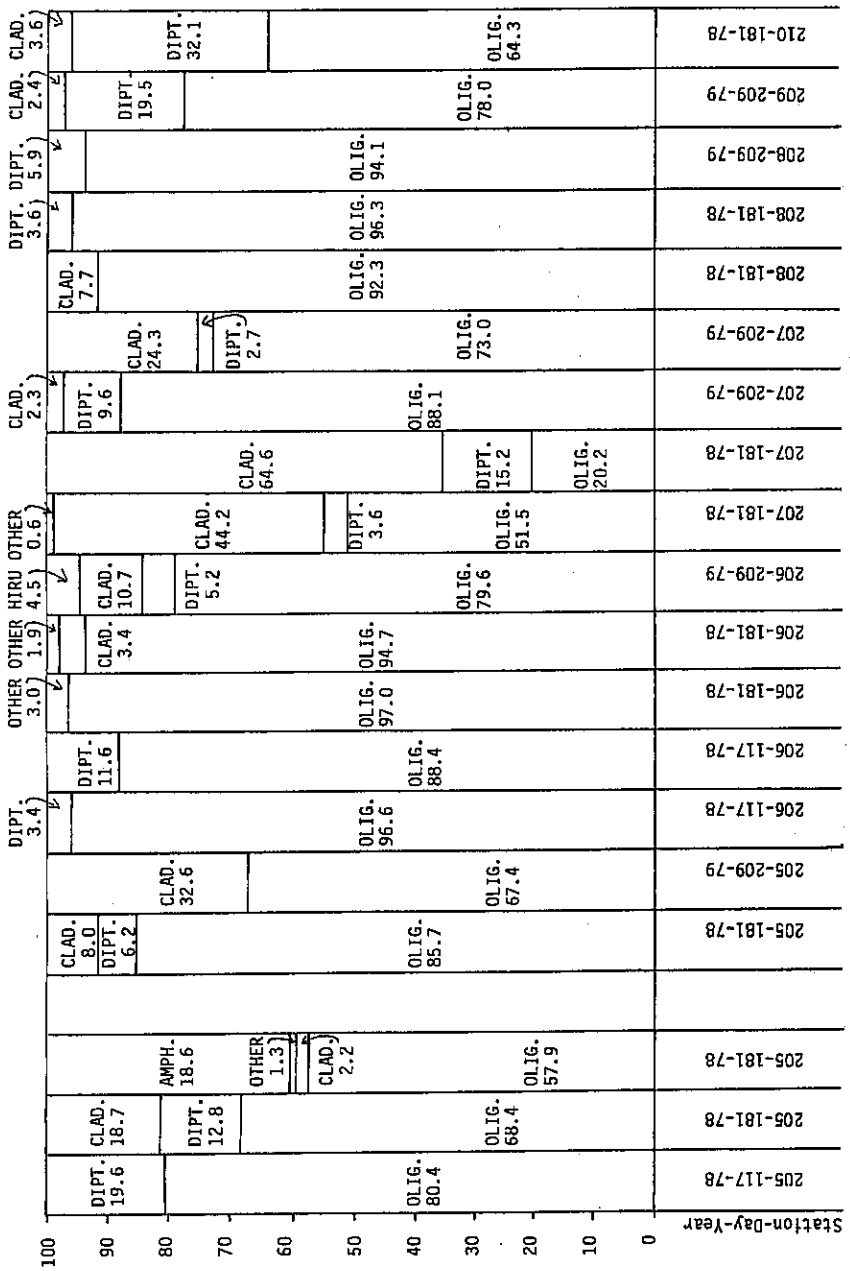
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210-181-78
DIPT. 19.6
OLIG. 80.4
CLAD. 18.7
DIPT. 12.8
OLIG. 68.4
AMPH. 18.6
OTHER 1.3
CLAD. 2.2
OLIG. 57.9
CLAD. 8.0
DIPT. 6.2
OLIG. 85.7
CLAD. 32.6
OLIG. 67.4
DIPT. 3.4
OLIG. 96.6
DIPT. 11.6
OLIG. 88.4
OTHER 3.0
OLIG. 97.0
OTHER 1.9
CLAD. 3.4
OLIG. 94.7
HIRU 4.5
CLAD. 10.7
DIPT. 5.2
OLIG. 79.6
OTHER 0.6
CLAD. 44.2
DIPT. 3.6
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CLAD. 64.6
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OLIG. 20.2
CLAD. 2.3
DIPT. 9.6
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CLAD. 7.7
OLIG. 92.3
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OLIG. 96.3
DIPT. 5.9
OLIG. 94.1
CLAD. 2.4
DIPT. 19.5
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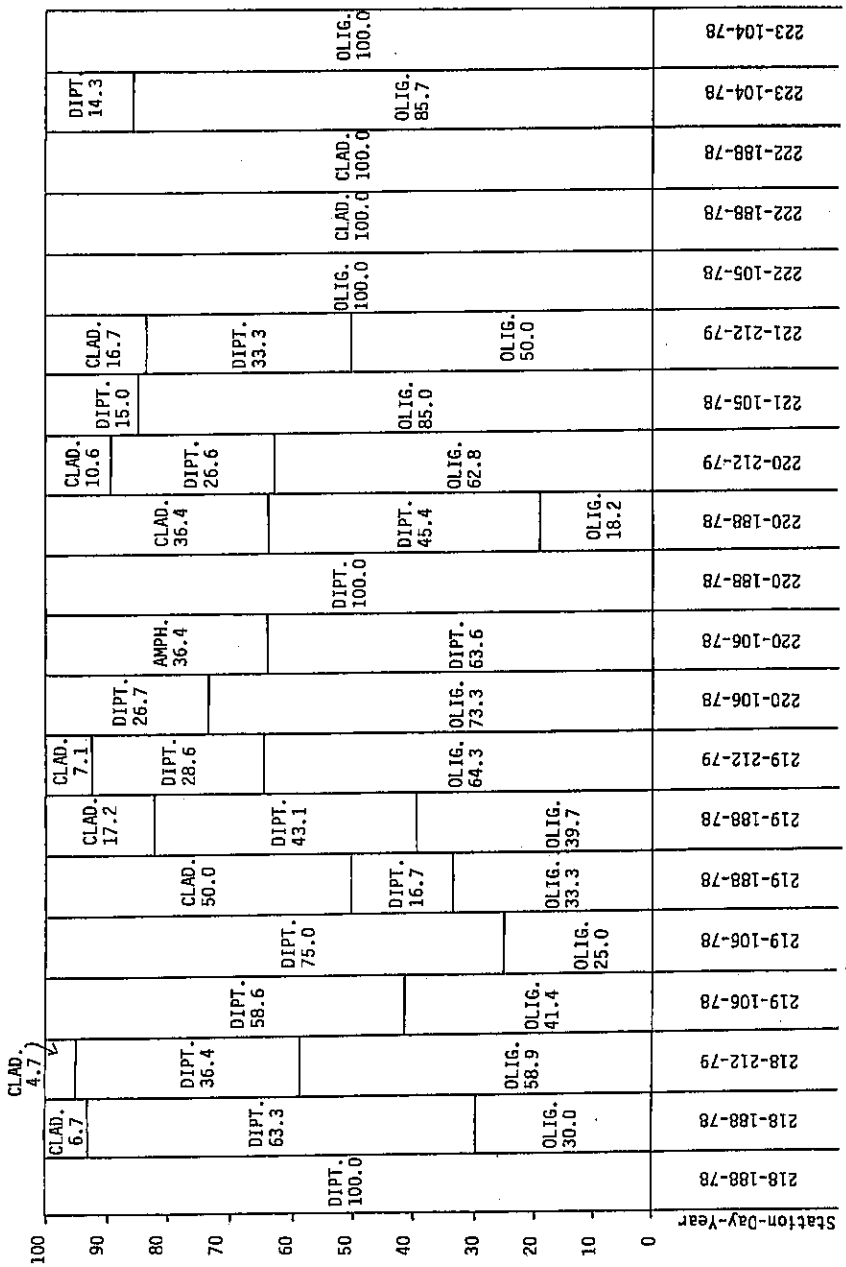
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OLIG. 30.0
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CLAD. 4.7
DIPT. 36.4
OLIG. 58.9
219-106-78
DIPT. 58.6
OLIG. 41.4
219-106-78
DIPT. 75.0
OLIG. 25.0
219-188-78
CLAD. 50.0
DIPT. 16.7
OLIG. 33.3
219-188-78
CLAD. 17.2
DIPT. 43.1
OLIG. 39.7
219-212-79
CLAD. 7.1
DIPT. 28.6
OLIG. 64.3
220-106-78
DIPT. 26.7
OLIG. 73.3
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AMPH. 36.4
DIPT. 63.6
220-188-78
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CLAD. 36.4
DIPT. 45.4
OLIG. 18.2
220-212-79
CLAD. 10.6
DIPT. 26.6
OLIG. 62.8
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OLIG. 85.0
221-212-79
CLAD. 16.7
DIPT. 33.3
OLIG. 50.0
222-105-78
OLIG. 100.0
222-188-78
CLAD. 100.0
222-188-78
CLAD. 100.0
223-104-78
DIPT 14.3
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223-104-78
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10
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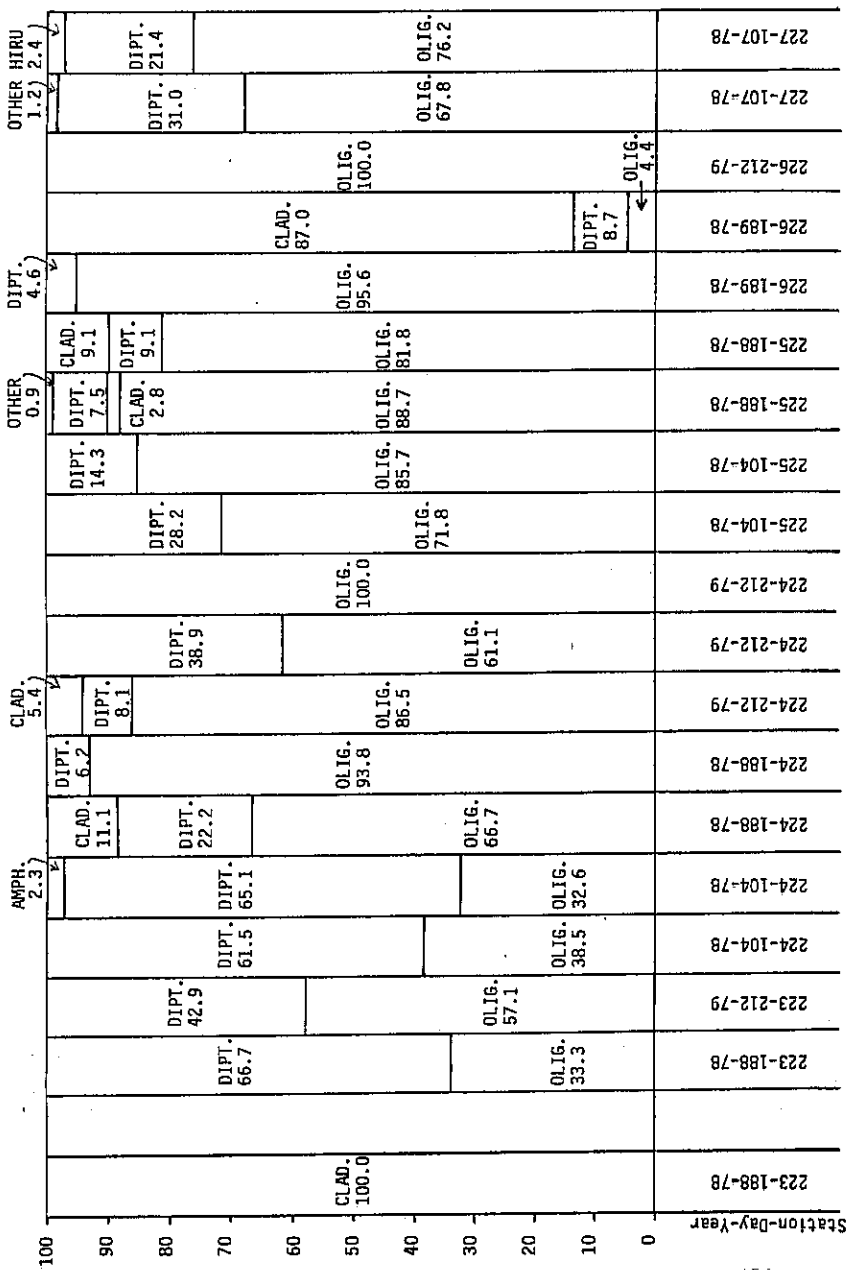
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224-104-78
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224-188-78
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224-212-79
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224-212-79
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226-189-78
226-189-78
226-212-79
227-107-78
227-107-78
CLAD. 100.0
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DIPT. 42.9
OLIG. 57.1
DIPT. 61.5
OLIG. 38.5
AMPH. 2.3
DIPT. 65.1
OLIG. 32.6
CLAD. 11.1
DIPT. 22.2
OLIG. 66.7
DIPT. 6.2
OLIG. 93.8
CLAD. 5.4
DIPT. 8.1
OLIG. 86.5
DIPT. 38.9
OLIG. 61.1
OLIG. 100.0
DIPT. 28.2
OLIG. 71.8
DIPT. 14.3
OLIG. 85.7
OTHER 0.9
DIPT. 7.5
CLAD. 2.8
OLIG. 88.7
CLAD. 9.1
DIPT. 9.1
OLIG. 81.8
DIPT. 4.6
OLIG. 95.6
CLAD. 87.0
DIPT. 8.7
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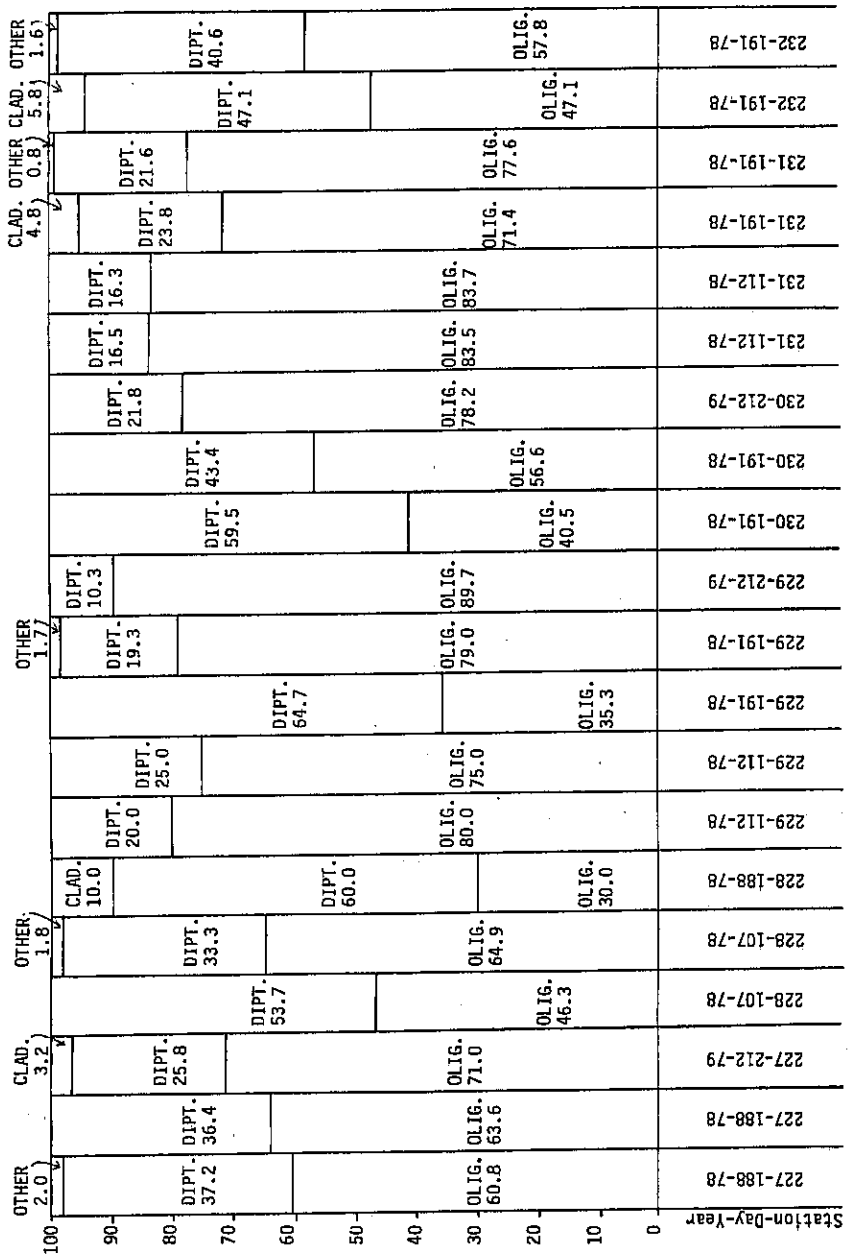
OLIG. 76.2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232-191-78
232-191-78
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CLAD. 3.2
OTHER 1.8
CLAD. 10.0
OTHER 1.7
CLAD. 4.8
OTHER 0.8
CLAD. 5.8
OTHER 1.6
DIPT. 37.2
OLIG. 60.8
DIPT. 36.4
OLIG. 63.6
DIPT. 25.8
OLIG. 71.0
DIPT. 53.7
OLIG. 46.3
DIPT. 33.3
OLIG. 64.9
DIPT. 60.0
OLIG. 30.0
DIPT. 20.0
OLIG. 80.0
DIPT. 25.0
OLIG. 75.0
DIPT. 64.7
OLIG. 35.3
DIPT. 19.3
OLIG. 79.0
DIPT. 10.3
OLIG. 89.7
DIPT. 59.5
OLIG. 40.5
DIPT. 43.4
OLIG. 56.6
DIPT. 21.8
OLIG. 78.2
DIPT. 16.5
OLIG. 83.5
DIPT. 16.3
OLIG. 83.7
DIPT. 23.8
OLIG. 71.4
DIPT. 21.6
OLIG. 77.6
DIPT. 47.1
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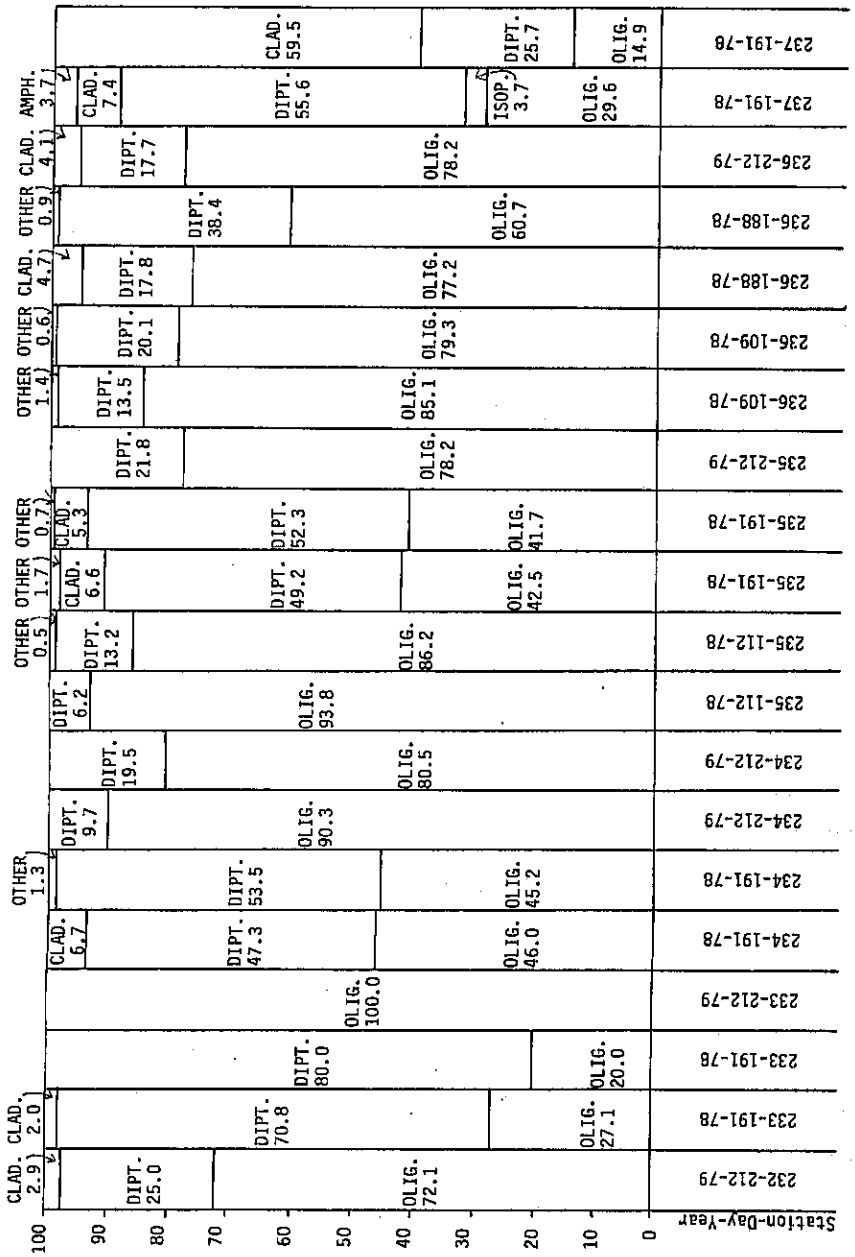
Station-Day-Year
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CLAD. 2.9
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233-191-78
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DIPT. 70.8
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233-191-78
DIPT. 80.0
OLIG. 20.0
233-212-79
OLIG. 100.0
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CLAD. 6.7
DIPT. 47.3
OLIG. 46.0
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OTHER 1.3
DIPT. 53.5
OLIG. 45.2
234-212-79
DIPT. 9.7
OLIG. 90.3
234-212-79
DIPT. 19.5
OLIG. 80.5
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OLIG. 93.8
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OTHER 0.5
DIPT. 13.2
OLIG. 86.2
235-191-78
OTHER 1.7
CLAD. 6.6
DIPT. 49.2
OLIG. 42.5
235-191-78
OTHER 0.7
CLAD. 5.3
DIPT. 52.3
OLIG. 41.7
235-212-79
DIPT. 21.8
OLIG. 78.2
236-109-78
OTHER 1.4
DIPT. 13.5
OLIG. 85.1
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OTHER 0.6
DIPT. 20.1
OLIG. 79.3
236-188-78
CLAD. 4.7
DIPT. 17.8
OLIG. 77.2
236-188-78
OTHER 0.9
DIPT. 38.4
OLIG. 60.7
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DIPT. 17.7
OLIG. 78.2
237-191-78
AMPH. 3.7
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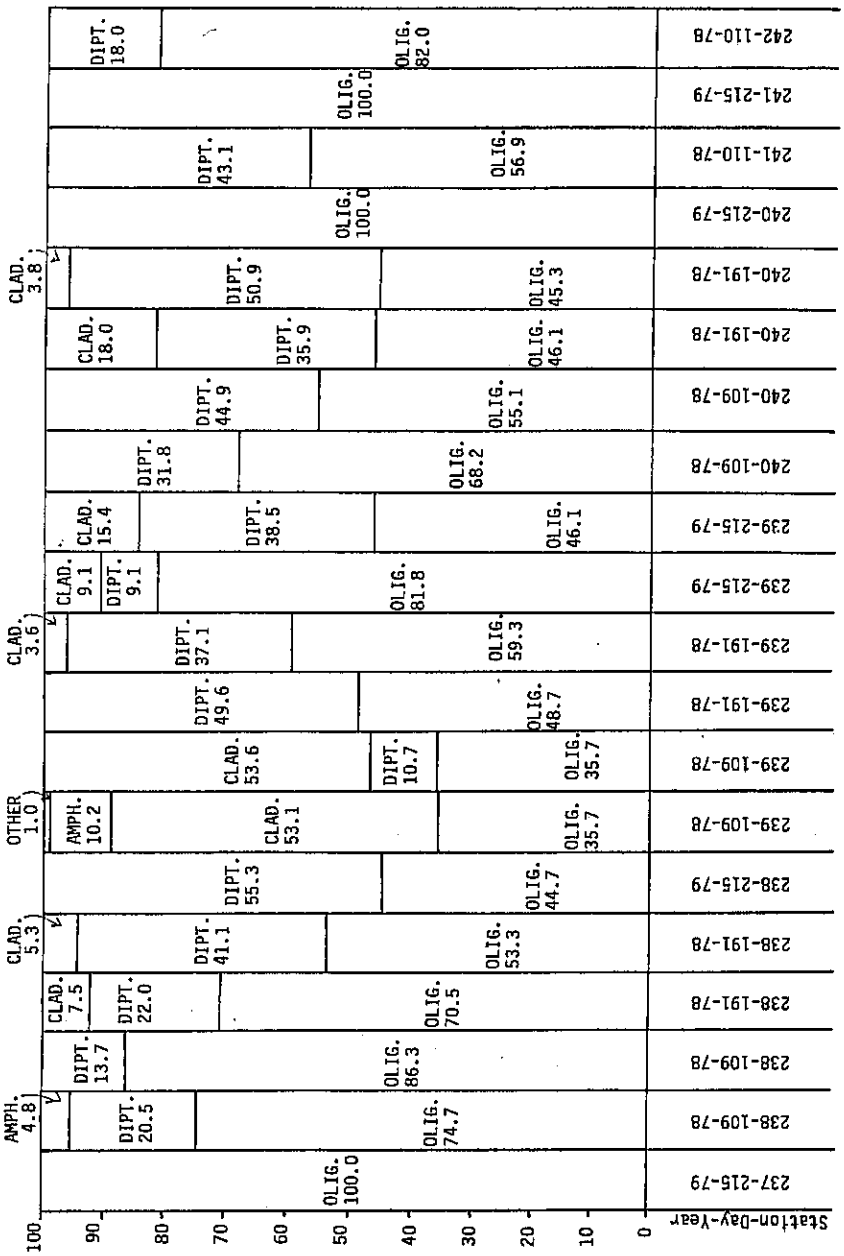
OLIG. 14.9


Station-Day-Year
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240-215-79
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242-110-78
AMPH. 4.8
CLAD. 5.3
OTHER 1.0
CLAD. 3.6
CLAD. 3.8
DIPT. 20.5
OLIG. 100.0
DIPT. 13.7
OLIG. 86.3
CLAD. 7.5
DIPT. 22.0
OLIG. 74.7
DIPT. 41.1
OLIG. 70.5
DIPT. 55.3
OLIG. 53.3
AMPH. 10.2
CLAD. 53.1
OLIG. 44.7
CLAD. 53.6
DIPT. 10.7
OLIG. 35.7
DIPT. 49.6
OLIG. 35.7
DIPT. 37.1
OLIG. 48.7
CLAD. 9.1
DIPT. 9.1
OLIG. 59.3
CLAD. 15.4
DIPT. 38.5
OLIG. 81.8
DIPT. 31.8
OLIG. 46.1
DIPT. 44.9
OLIG. 68.2
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DIPT. 50.9
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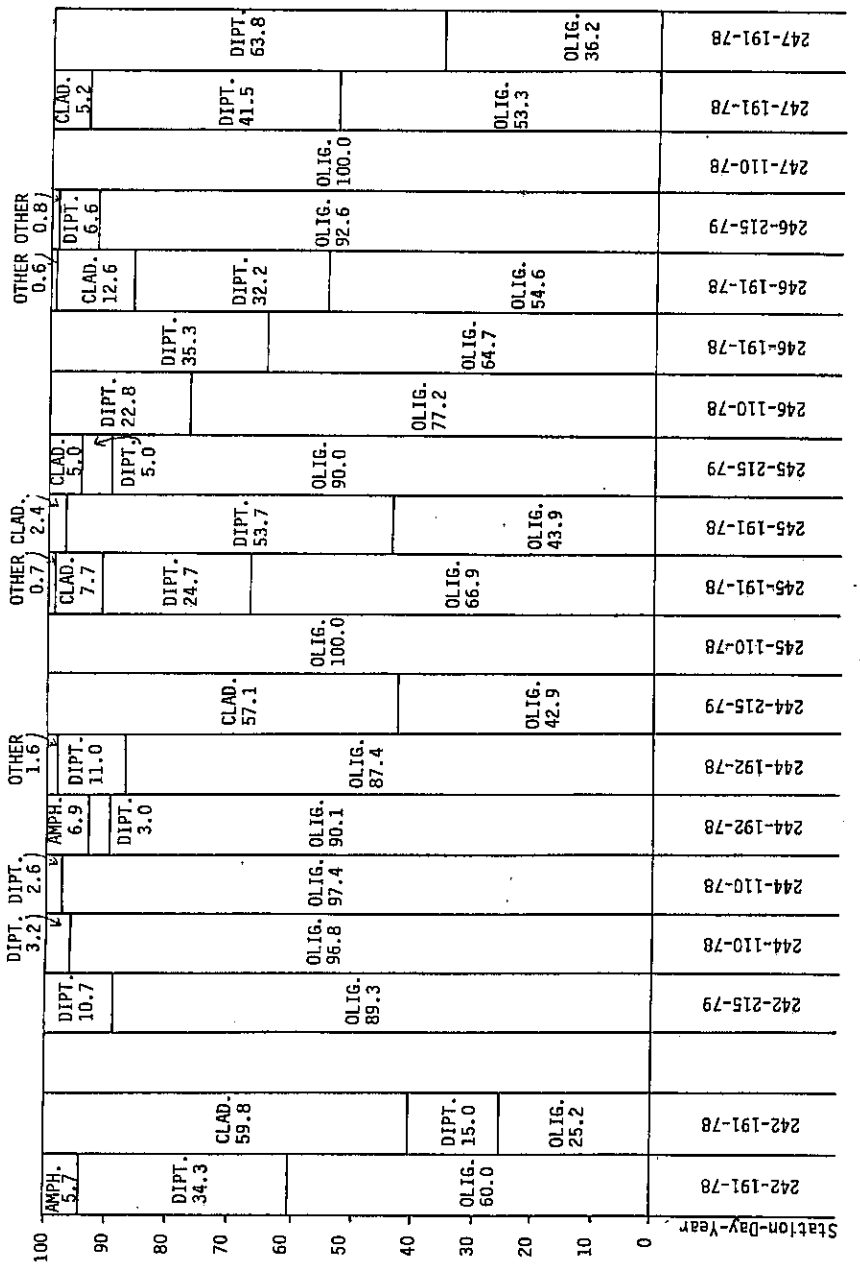
OLIG. 82.0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DIPT. 10.7
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DIPT. 2.6
OLIG. 97.4
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DIPT. 3.0
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DIPT. 11.0
OLIG. 87.4
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CLAD. 57.1
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OLIG. 100.0
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CLAD. 7.7
DIPT. 24.7
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OTHER CLAD. 2.4
DIPT. 53.7
OLIG. 43.9
245-215-79
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DIPT. 5.0
OLIG. 90.0
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DIPT. 22.8
OLIG. 77.2
246-191-78
DIPT. 35.3
OLIG. 64.7
246-191-78
OTHER 0.6
CLAD. 12.6
DIPT. 32.2
OLIG. 54.6
246-215-79
OTHER 0.8
DIPT. 6.6
OLIG. 92.6
247-110-78
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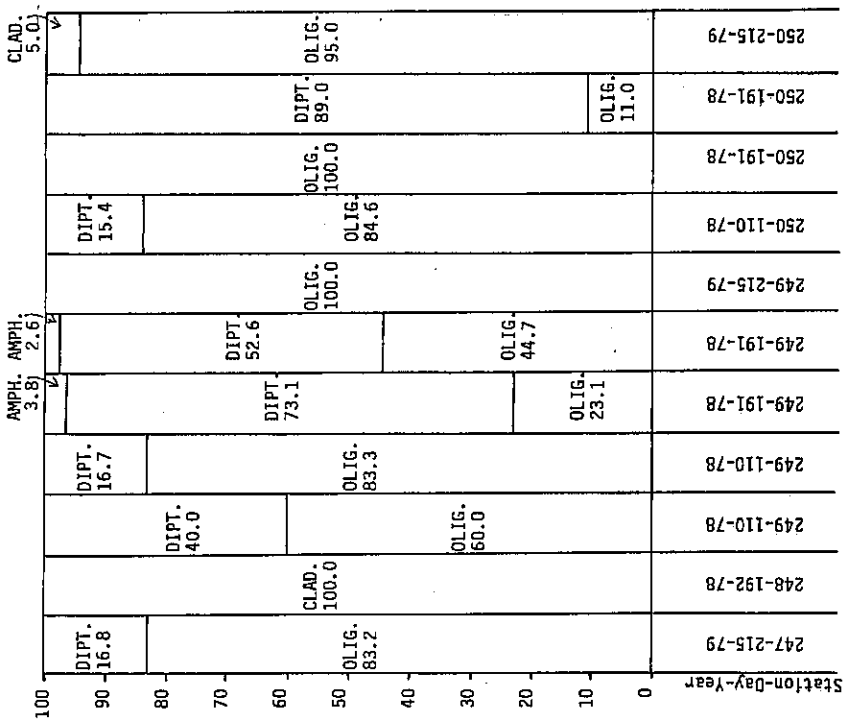
OLIG. 36.2


Station-Day-Year
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250-215-79
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DIPT. 16.7
OLIG. 83.3
AMPH. 3.8
DIPT. 73.1
OLIG. 23.1
AMPH. 2.6
DIPT. 52.6
OLIG. 44.7
OLIG. 100.0
DIPT. 15.4
OLIG. 84.6
OLIG. 100.0
DIPT. 89.0
OLIG. 11.0
CLAD. 5.0
OLIG. 95.0
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80
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20
10
0