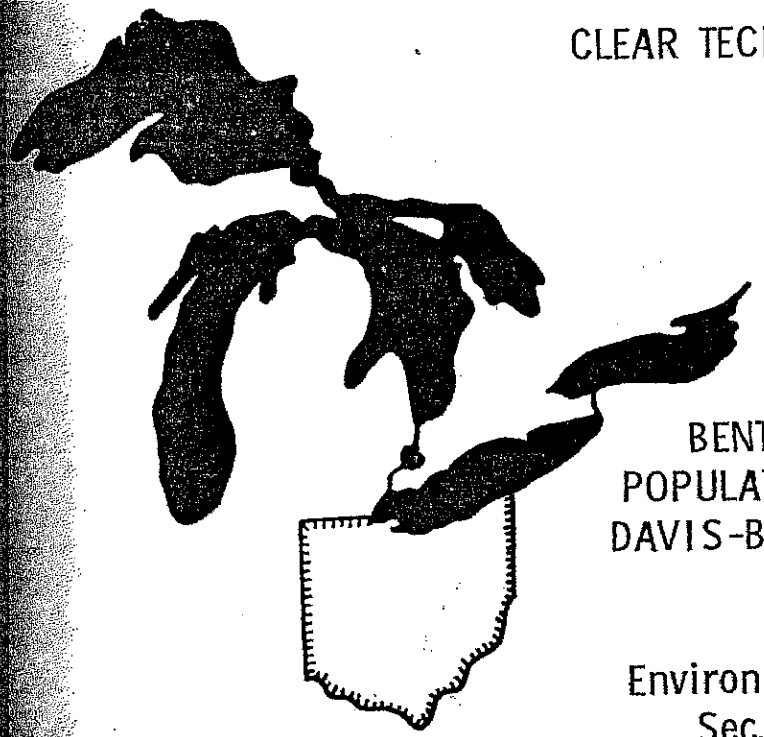
CLEAR TECHNICAL REPORT NO. 107



BENTHIC MACROINVERTEBRATE POPULATIONS IN LAKE ERIE NEAR THE DAVIS-BESSE NUCLEAR POWER STATION DURING 1978

Environmental Technical Specifications
Sec. 3.1.2.a.2 Benthic Studies

Prepared by

Jeffrey M. Reutter

Prepared for

Toledo Edison Company
Toledo, Ohio

THE OHIO STATE UNIVERSITY

CENTER FOR LAKE ERIE AREA RESEARCH

COLUMBUS, OHIO

February 1979

3.1.2.a.2 Benthic Studies

Procedures

Benthic macroinvertebrates were collected approximately once every 60 days from May through November (Table 1). Three replicates using a Ponar dredge (Area = 0.052 m^2) were collected at Stations 1, 3, 8, 9, 13, 14, 15, 17, 18, and 26 on each date (Figure 1). Samples were sieved on the boat through a U.S. #40 soil sieve, preserved in 10% formalin and returned to the laboratory for identification and enumeration. Individuals were identified as far as practicable (usually to genus; to species when possible). Results were reported as number of organisms per m^2 and computed by multiplying the number of each species in each replicate grab sample by 19.1.

Results

Benthic macroinvertebrates collected May through November 1978 were grouped in 25 taxa, generally to the genus or species level within 4 phyla (Table 2). Two taxa were in Coelenterata, 10 in Annelida, 12 in Arthropoda, and 1 in Mollusca.

Total populations ranged from 559/m^2 in May to 2,043/m^2 in November with an annual mean of 1,108/m^2. These populations were dominated by Annelids which made up 54.0 percent of the total benthos population and Arthropods which made up 45.9 percent of the total benthos population. Annelids were the dominant form during each of the four collections. Immature oligochaetes (no hair setae) was always the dominant Annelid taxon, while Arthropoda was dominated by Leptodora kindtii in May and July and Tanytarsus sp. in September and November. Annelid populations ranged from 302/m^2 in May to 1,788/m^2 in November. Arthropod populations ranged from 169/m^2 in July to 275/m^2 in September. All raw data were keypunched and maintained on file at the offices of the Center for Lake Erie Area Research in Columbus, Ohio.

Analysis

Benthic macroinvertebrate populations collected at Locust Point during 1978 were typical for populations along the south shore of western Lake Erie and similar to those observed during preceding years (Figure 2). Species composition, mainly immature oligochaetes and chironomids, was also similar to that observed from 1972-1977 (Reutter, 1978).

It is becoming more apparent each year that substrate is the controlling factor of benthic macroinvertebrate populations at Locust Point. Reutter and Herdendorf (1977) observed that densities increased with distance from shore except over the intake and discharge pipelines. This trend of increasing population with distance from shore is probably due to reduced wave effect as the water gets deeper and, therefore, a more stable substrate. Densities over the pipelines would be reduced due to an exposed substrate of hard-pan clay. Today a thin layer of sand, gravel, snail shells, and silt exists on top of the hard-pan clay. Currents and wave action move this layer around so that it is

TABLE 1

MONTHLY MEAN BENTHIC MACROINVERTEBRATE POPULATIONS *
FROM SAMPLING STATIONS AT LOCUST POINT LAKE ERIE - 1978

Station \ Date	May 11	July 26	Sept. 26	Nov. 1	Grand Mean
1	184.6	222.8	76.4	57.3	135.3
3	955.0	19.1	382.0	4081.1	1359.3
8	89.1	553.9	617.6	1706.3	741.7
9	1903.6	1279.7	4399.4	1719.0	2325.4
13	668.5	649.4	1012.3	1833.6	1041.0
14	178.3	1407.0	2132.8	3781.8	1875.0
15	356.5	108.2	744.9	70.0	319.9
17	299.2	579.4	261.0	273.8	353.4
18	350.2	2260.2	935.9	5844.6	2347.7
26	604.8	292.9	337.4	1069.6	576.2
Grand Mean	559.0	737.3	1090.0	2043.7	1107.5

* Data presented as number of organisms per m^2 and computed from 3 grabs with a Ponar dredge (A=0.052 m^2) at each station on the dates indicated.

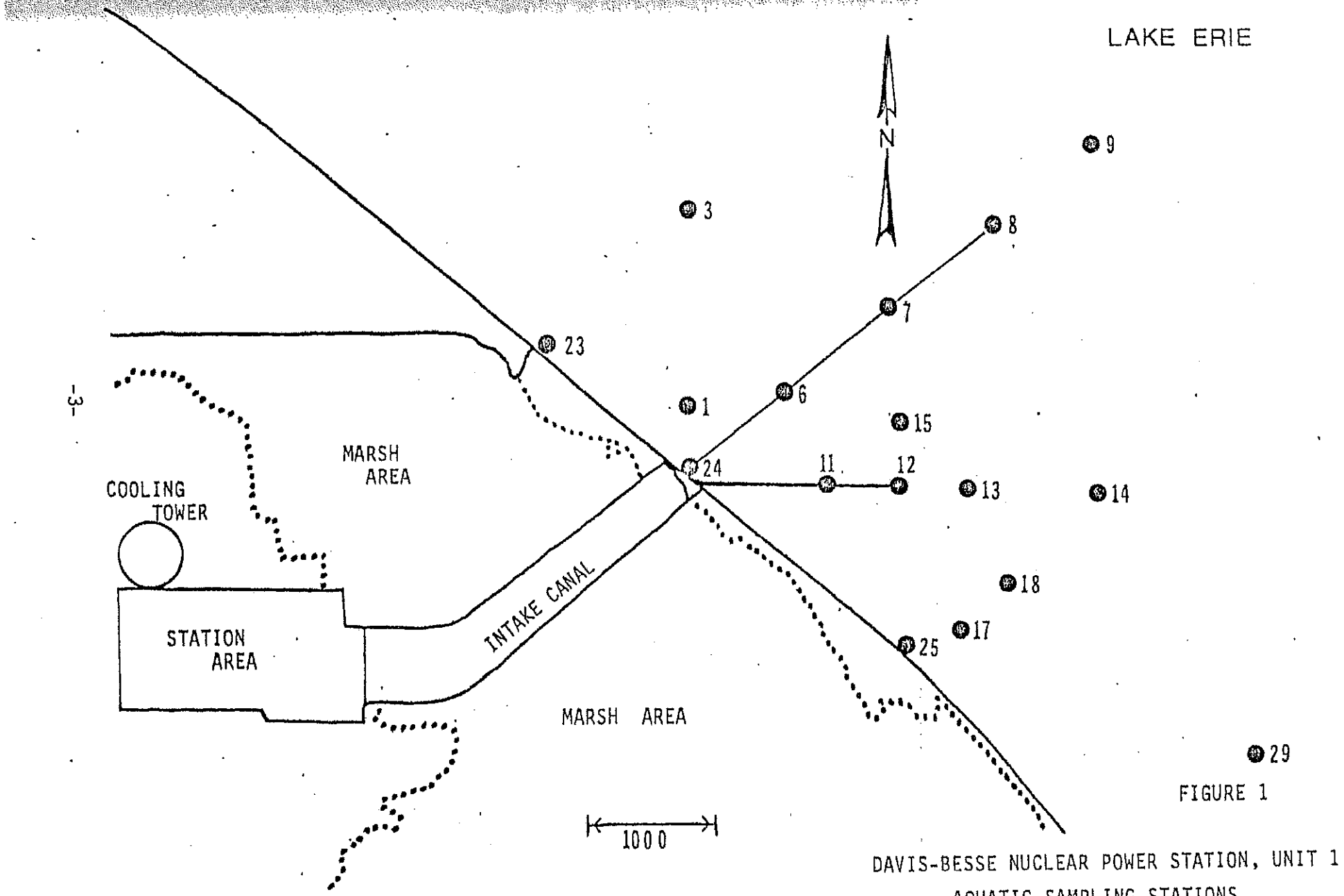


FIGURE 1

DAVIS-BESSE NUCLEAR POWER STATION, UNIT 1
AQUATIC SAMPLING STATIONS

TABLE 2

MONTHLY MEAN POPULATIONS* OF INDIVIDUAL

BENTHIC MACROINVERTEBRATE TAXA AT LOCUST POINT - 1978

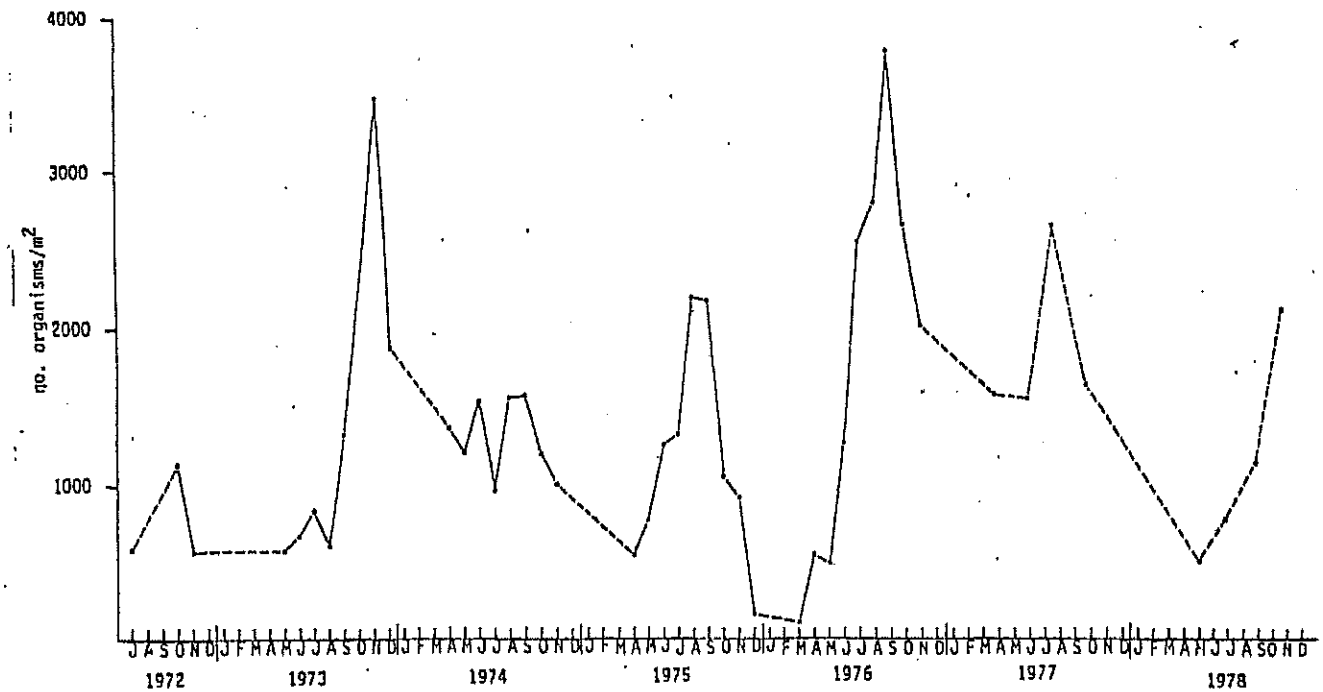
TAXA \ Date	May 11	July 26	Sept. 26	Nov. 1	Grand Mean
COELENTERATA					
Hydra sp. (single polyp)	0.6	1.9	0.6	8.9	3.0
Hydra sp. (budding polyp)		2.5		7.6	2.7
Subtotal	0.6	4.4	0.6	16.5	5.7
ANNELIDA					
Hirudinea					
Helobdella elongata		1.3	1.3		0.7
H. stagnalis		0.6	1.9	0.6	0.8
Oligochaeta					
Immatures (hair setae)	2.5		0.6	3.8	1.8
Immatures (no hair setae)	257.9	528.4	794.6	1695.4	819.1
Branchuira sowerbyi		4.5	5.1	23.6	8.5
Limnodrilus cervix	0.6	5.1			1.5
L. claparedeanus		1.3	0.6	5.1	1.8
L. maumeensis	0.6	3.2	0.6	7.0	2.9
Ophidonais serpentina	35.0	12.7	7.6	52.2	26.9
Potamothrix moldaviensis	5.1	6.4	0.6		3.1
Subtotal	301.8	563.5	813.0	1787.8	866.5
ARTHROPODA					
Cladocera					
Leptodora kindtii	149.0	58.6	18.5	24.2	62.6

MONTHLY MEAN POPULATIONS* OF INDIVIDUAL
BENTHIC MACROINVERTEBRATE TAXA AT LOCUST POINT - 1978

TAXA \ Date	May 11	July 26	Sept. 26	Nov. 1	Grand Mean
ARTHROPODA					
Amphipoda					
Gammarus fasciatus	10.2	29.3	1.9	7.6	12.3
Hyallela azteca	0.6				0.2
Chironomidae					
Chironomus sp.	1.9	4.5	12.7	13.4	8.1
Cryptochironomus sp.	5.1	4.5	17.8	35.7	15.8
Glyptotendipies sp.	1.3				0.3
Polypedilum sp.	0.6	1.9			0.7
Procladius sp.	15.3	45.8	57.9	31.8	37.7
Tanytarsus sp.	70.7	22.9	160.4	126.1	95.0
Tanytarsus pupae		1.3	5.1		1.7
Ephemeroptera					
Ephemeridae			0.6		0.2
Caenis sp.	1.9	0.6		0.6	0.8
Subtotal	256.6	169.4	275.0	239.4	235.1
MOLLUSCA					
Pelecypoda					
Amblema sp.			1.3		0.3
TOTAL	559.0	737.3	1090.0	2043.7	1107.5

* Data presented as number of organisms/m^2 and computed from 3 grabs with a Ponar dredge ($A=0.052\ m^2$) at each of 10 sampling stations on the dates indicated.

FIGURE 2. MONTHLY MEAN BENTHIC MACROINVERTEBRATE POPULATIONS FOR LAKE ERIE AT LOCUST POINT, 1972 - 1978.



difficult to determine exactly what substrate will be found at any one station on a particular day. Since the density of benthic macroinvertebrates generally is directly related to the quantity of suitable substrate, densities at a given station can vary radically with time, and trends become difficult to determine. For example, the annual mean density at Station 8, 742/m^2, is greater than that found at its control, Station 26 (576/m^2), but less than that found at control Station 3, 1,359/m^2, which is closer to shore (Table 1). However, Station 3 exhibited the lowest density observed during 1978, 19/m^2 in July, and Station 1, the closest to shore, had the lowest annual mean density, 135/m^2.

In summary, benthic macroinvertebrate populations found at Locust Point during 1978 must be considered typical for those of the nearshore waters of the Western Basin of Lake Erie. Furthermore, no adverse impact due to plant operation was observed.

LITERATURE CITED

Reutter, J.M. 1978. Benthic macroinvertebrate populations in Lake Erie Near the Davis-Besse Nuclear Power Station During 1977. The Ohio State Univ., CLEAR Tech. Rept. No. 89. 6pp.

Reutter, J.M. and C.E. Herdendorf. 1977. Pre-operational aquatic ecology monitoring program for the Davis-Besse Nuclear Power Station, Unit I. The Ohio State Univ., CLEAR, Columbus, Ohio. 205 pp.