PEACH BOTTOM ATOMIC POWER STATION

Postoperational Report No. 12
on the
Ecology of Conowingo Pond
for the Period of
January 1979-June 1979

Prepared For

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August 1979

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1.0 INTRODUCTION

This document is the twelfth semi-annual postoperational report on the ecology of Conowingo Pond in relation to the operation of Peach Bottom Atomic Power Station Units No. 2 and 3. Data collected from January through June 1967 to 1973 (preoperational) are compared with those collected from 1974 to 1979 (postoperational) for the same time period. Units No. 2 and 3 operated at varying power loads in this postoperational period (Figure 1-1).

Temperature increases due to Peach Bottom thermal discharge (temperature at discharge structure minus temperature at intake structure) are summarized on a monthly basis (monthly mean and hourly maximum) for the entire postoperational period (Table 1-1). The impact of Peach Bottom thermal discharge in Conowingo Pond, as determined for location (S13) at Pennsylvania/Maryland stateline and including adjustment for natural variation, is summarized on a monthly basis (monthly mean and hourly maximum for the incremental temperature increases above ambient) for the entire postoperational period (Table 1-2).

The phytoplankton and zooplankton communities and selected species of benthos and fishes which have been addressed were selected by the United States Environmental Protection Agency as "representative, important species" for Conowingo Pond as part of the 316(a) demonstration submitted in July 1975 (Philadelphia Electric Company 1975a). Beginning with the fifth semi-annual report and in subsequent reports variations in abundance and biology of these communities and species are addressed.

TABLE 1-1

Monthly summary of PBAPS operation, 1974-1979. Temperature increase (Delta T) of circulating water to Conowingo Pond as measured by paired hourly thermograph water temperature readings[c]. Discharge structure (S32) minus PBAPS intake (S30) - °C.

	Hourly Delta T - Plant discharge minus plant intake temperature - In °C											
	1974[a]		1975[b]		1976[b]		1977[b]		1978[b]		1979[b]	
Month	Mean	Max	Mean	Max	Mean	Max	Mean	Max	Mean	Max	Mean	Max
Jan	-	-	5.61	9.6	6.80	9.8	7.27	12.5	11.67	18.7	11.35	18.4
Feb	-	-	5.67	9.9	8.57	12.5	8.20	16.1	12.18	16.0	12.70	15.1
Mar	1.25	5.1	8.84	9.7	7.40	11.3	5.54	10.4	12.50	16.2	11.20	14.7
Apr	2.32	4.1	8.14	10.2	7.24	11.5	4.68	8.8	ND	ND	9.30	12.4
May	2.34	6.3	4.42	6.1	3.76	9.7	6.67	12.7	6.03	9.3	6.53	10.3
Jun	2.14	5.9	3.34	6.7	6.37	9.2	5.95	11.4	6.13	9.3	5.85	8.7
Jul	2.38	4.2	4.10	6.6	6.67	10.3	4.35	9.0	5.67	9.4		
Aug	ND	ND	3.98	6.3	6.94	10.0	4.36	7.3	6.03	7.2		
Sep	3.84	5.0	4.30	6.2	8.28	11.0	2.05	4.6	ND	ND		
Oct	4.01	8.4	6.55	8.2	1.43	3.2	7.88	10.3	5.61	9.0		
Nov	5.88	9.9	3.80	5.1	8.33	12.2	6.93	10.7	7.34	9.8		
Dec	ND	ND	6.48	8.0	9.73	14.2	7.27	12.7	11.58	14.0		

FOOTNOTES:

ND = No Data
UA = Unavailable
a = Reported in (Philadelphia Electric Company 1974) monthly reports (Nos. 9-35) to NRC and PA. DER in graphic form
b = Reported in (Philadelphia Electric Company 1974) monthly reports (36-72) to NRC and PA. DER in tabular form
c = Total number of paired hourly readings equal 37445

TABLE 1-2

Monthly summary of PBAPS thermal impact to Conowingo Pond - 1974 to 1979. Temperature increase (Delta T) as measured by paired hourly thermograph surface water temperatures (°C)g. Pennsylvania/Maryland stateline (S13) minus location one mile upriver of PBAPS intake (S2) - °C after adjustment for natural variation.

	PRE-OP 1972 and 1973[a]		Delta T (Stateline (S13) minus location one mile upriver of PBAPS Intake (S2)) in °C											
	Monthly Mean	Mean Hourly	1974[b]		1975		1976[c]		1977[c]		1978[c]		1979[c]	
Month	Delta T	CL	Mon. Mean[d]	Hr. Max[e]	Mon. Mean[d]	Hr. Max[e,c]	Mon. Mean[d]	Hr. Max[e]	Mon. Mean[d]	Hr. Max[e]	Mon. Mean[d]	Hr. Max[e]	Mon. Mean[d]	Hr. Max[e]
Jan	-.112[f]	0.6[f]	-	-	0.90	3.2*	1.13	2.9*	1.24	3.2*	0.71	3.9*	0.51	4.0
Feb	.034[f]	0.6[f]	-	-	0.70	4.1*	0.68	2.3	1.20	2.9*	0.72	3.7*	1.81	4.2
Mar	-.062[f]	1.9[f]	0.08	0.0	1.19	2.3	0.71	0.6	0.17	0.0	ND	ND	ND	ND
Apr	.252	1.4	0.11	0.7	1.49	3.1*	0.0	0.9	0.33	1.0	0.03	0.0	0.52	1.2
May	.265	1.4	0.50	1.3	1.0	2.3	0.35	1.3	0.49	1.1	0.0	1.5	0.10	0.9
Jun	.489	2.2	0.41	1.2	0.23	0.3	0.19	0.3	0.96	1.1	0.12	2.4	0.61	0.9
Jul	.452	2.5	0.46	1.7	ND	ND	1.09	0.9	0.35	0.1	1.59	2.7		
Aug	.690	2.8	0.66	0.1	0.21	1.0	ND	ND	0.37	0.0	1.15	0.9		
Sep	.413	2.1	0.92	1.1	0.32	0.8	2.07	2.7*	3.84	2.3	0.99	1.1		
Oct	.264	1.6	1.62	3.7*	0.55	1.1	1.00	2.3	1.08	1.6	0.91	0.8		
Nov	.051	1.4	1.93	3.0*	0.11	0.0	0.99	1.8	0.77	1.3	1.61	2.1		
Dec	-.211	0.8	1.30	2.8*	0.91	2.8*	1.67	3.8*	0.0	1.9	1.53	3.7*		

LEGEND & FOOTNOTES:

ND = No Data, UA = Unavailable
$\overline{\Delta T}$ = Monthly mean of hourly delta Ts (S13-S2)
ΔT = Hourly delta T (S13-S2)
$\overline{CL}$ = Monthly Mean hourly Confidence Limits (99%)
CL = Hourly Confidence Limit (99%) for that month
a = Results reported in Philadelphia Electric Company 1975b
b = Results reported in Philadelphia Electric Company 1975c
c = Results reported in Philadelphia Electric Company, 197? Monthly reports to NRC and PA. DER
d $\overline{\Delta T}$ (postop) - $\overline{\Delta T}$ (preop) = mean
e ΔT (postop) - $\overline{CL}$ (preop) = max
f = Includes 1974 data (Jan. 1 to Mar. 14) - PBAPS did not generate power
g = Total number of paired hourly readings equal 39857
* If max equals or exceeds 2.8°C then the following is used to assess magnitude of variation above ambient:
Max = ΔT (postop) - CL (preop)

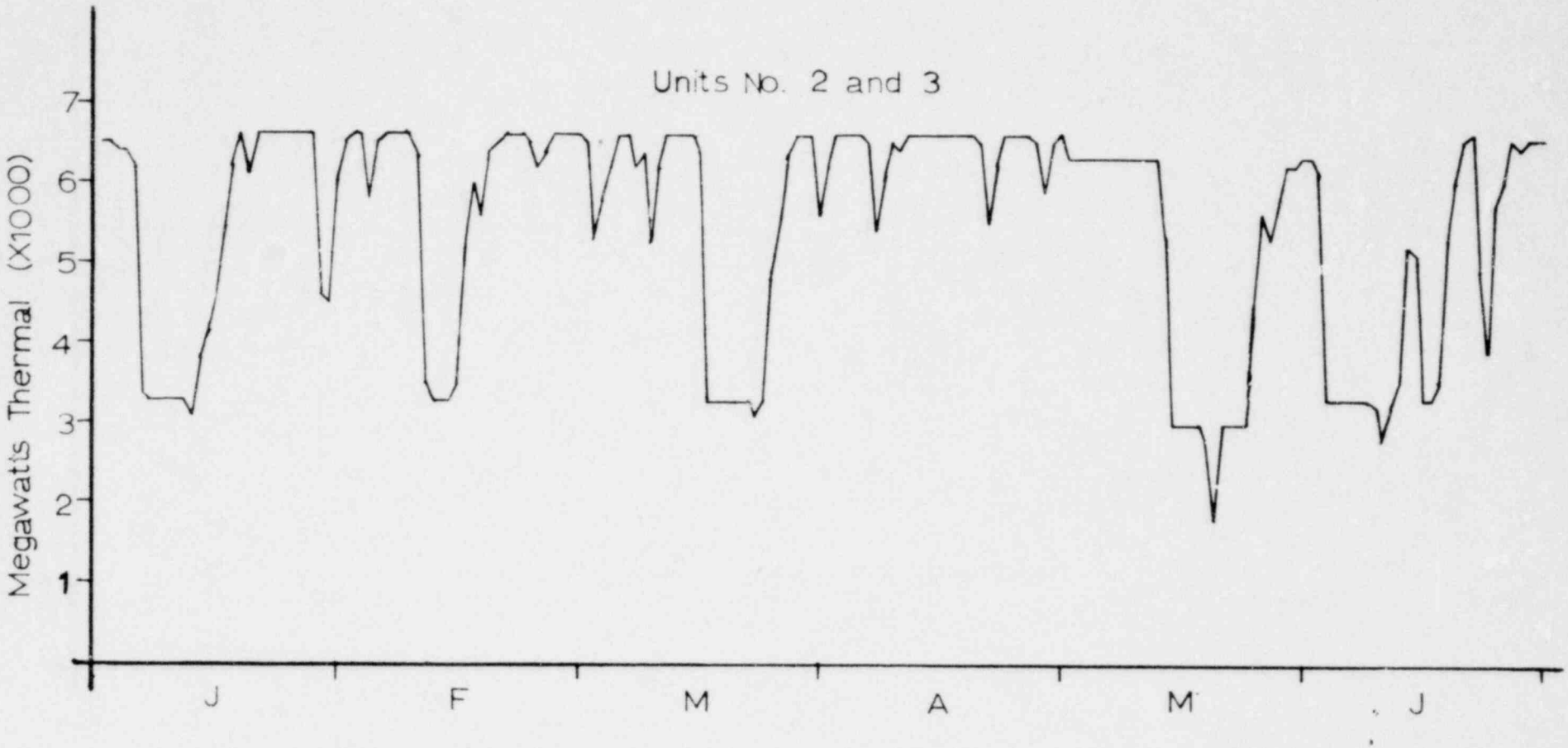

FIGURE 1-1

Monthly summary of operations of the Peach Bottom Atomic Power Station Units No. 2 and 3, January-June 1979. Full power = 6,600 megawatts thermal.

LITERATURE CITED

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Philadelphia Electric Company. 1975b. Peach Bottom Atomic Power Station analysis of ambient water temperatures in Conowingo Pond Station 13 versus Station 18. Philadelphia Electric Company, Philadelphia, Pennsylvania. 160 pp.

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1.1 SUMMARY OF ECOLOGICAL STUDY

1.1.1 Limnology

1.1.1.1 Physicochemistry

No thermal stratification or dissolved oxygen stagnation occurred in Conowingo Pond as a whole in either the preoperational or postoperational periods. However, oxygen concentrations below 40 feet at the south end of the Pond were lower in June 1979 than in other months; a phenomenon also observed in the preoperational period. The percent saturation of dissolved oxygen was similar in each period. The depth of light penetration, determined by Secchi disk measurements varied between months and between periods. This variation is inversely related to the average daily river flow and suspended solids load.

Except for suspended solids, which were higher at the bottom, the concentrations of other parameters were homogeneously distributed or varied slightly with depth in both periods. Although the postoperational monthly mean values of most parameters differed from those of the preoperational period, the range of variation was within that observed in the preoperational period. No significant differences in concentrations of the various physicochemical parameters between stations occurred in the Pond in the postoperational period.

1.1.1.2 Plant Pigments

As in the preoperational period, no distinct stratification of chlorophyll *a* or phaeopigments was observed in the

postoperational period. The monthly mean concentrations of chlorophyll a and phaeopigments were higher in May and June in both periods. In most months the postoperational mean values of chlorophyll a and phaeopigments differed from those in the preoperational period due to natural variations.

1.1.1.3 Zooplankton

Nauplii were the dominant zooplankters in March through June 1979. Other abundant zooplankters were Daphnia spp., Bosmina longirostris, cyclopoid copepodids, Diaphanosoma leuchtenbergianum and Cyclops vernalis. Densities of these taxa and total zooplankton were within the range of variation observed in the preoperational period.

1.1.1.4 Benthos

A total of 37 taxa or life stages was collected from Conowingo Pond in 1979. As in the preoperational period, the six common taxa (Limnodrilus hoffmeisteri, Procladius sp. (complex), Chironomus decorus, Coelotanypus concinnus, Chaoborus punctipennis and Ilyodrilus templetoni comprised over 95% by number of the benthic fauna in 1979. Although the densities of these taxa varied between stations and months, the overall postoperational densities of Procladius sp. (complex), L. hoffmeisteri and C. attenuatus were more than twice those of the preoperational period. Mean species diversity values were similar in the two periods.

1.1.2 Fisheries

1.1.2.1 Species Composition and Abundance

Some 26 species and two hybrids were caught at trap net stations. The white crappie, channel catfish, brown bullhead, carp and pumpkinseed were most common. Fluctuations in abundance were noted between months and stations for these fishes. The postoperational catches of the common fishes were within the range observed in the preoperational period.

Twenty-three species were collected from March through June 1979 at trawl transect stations. The common fishes in descending order of abundance were channel catfish, spottail shiner, carp, comely shiner and white crappie. Only the catch of white crappie was below that of the preoperational years. The species rankings in 1979 were not significantly different from those of other years and the average correlation coefficient for 1979 species rank was within the confidence limits of the preoperational period.

Number of species taken in Trawl Zones 405, 406 and 408 from March through June were 15, 20 and 20, respectively. Channel catfish and spottail shiner were most commonly taken in Zones 405 and 406. In Zone 408 the most common species in descending order of abundance were spottail shiner, channel catfish, white crappie, carp, comely shiner and tessellated darter. In general the catches in all zones were similar to those of other postoperational and preoperational years, except for the higher catches of spottail shiner, channel catfish, white crappie and

largemouth bass. There were no significant differences in species ranks between 1979 and other years in Zones 406 and 408.

A total of 8,269 fish of 32 species was collected at seine stations from January through June 1979. The common fishes were spotfin shiner, largemouth bass, bluntnose minnow, creek chub, comely shiner and common shiner. Abundance of each species varied between stations and months. The annual average catch per effort of all but two species was within the range observed in the preoperational years. Catches of bluntnose minnow and largemouth bass were more than twice as high as those from preoperational years. Monthly diversity values and percent similarity values were similar to those of preoperational years. No significant changes in species composition occurred between 1979 and the preoperational period.

Larvae of 34 species were identified from ichthyoplankton tows in 1978. The most common were larvae of quillback and comely shiner which comprised 41% of the transect and 58% of the inshore catch, respectively. Other common species included gizzard shad, carp, channel catfish and tessellated darter. The catch of larval white crappie was considerably lower than in the preoperational period. The densities of channel catfish larvae at a station in the thermal plume were not adversely affected by the heated discharge. The postoperational spawning temperatures of the "representative, important" fishes were similar to those in the preoperational period. The temporal and spatial distributions established in the preoperational period remained essentially unchanged in the postoperational period.

1.1.2.2 Biology of Fishes

A total of 284 walleye collected in 1966 through 1977 was aged. Most walleye were less than age IV although fish up to age IX were sampled. Annual variations in age composition were due to year class fluctuations. The rate of weight increase relative to length was significantly less ($P < 0.01$) in the postoperational period. However, empirical and calculated weights and condition factors for 10 mm length groups were not markedly different between the two periods. Mean length at ages I through IV were greater in the postoperational period, but only at age II was length significantly ($P < 0.01$) greater. Annual incremental growth of ages I through III were not significantly different ($P > 0.01$) between the two periods.

Growth of walleye in Conowingo Pond compares favorably with growth of walleye from other areas in North America. Growth of walleye in Conowingo Pond was greater than that in nearby Muddy Run Pumped Storage Pond in the preoperational period but was less in the postoperational period.

The operation of the Peach Bottom Atomic Power Station had no detectable effect on the growth of walleye in Conowingo Pond. The improved growth of walleye in the postoperational years resulted primarily from the increased forage due to the establishment of gizzard shad. With this presentation, studies on age and growth of walleye have been terminated because the intent of the Environmental Technical Specifications Appendix B has been fulfilled.

A total of 2,418 channel catfish collected in 1973 through 1978 was aged. Although specimens as old as XVIII years of age were collected most were less than X. Annual variations in age composition were due to year class fluctuations. Back calculated lengths varied depending upon the method of calculation. However, consistent significant differences ($P < 0.01$)) were not apparent in the growth pattern between the preoperational and postoperational period. Little variation was associated with status. Status (preoperational-postoperational) was also not an important source of variation when the data on length-weight relationships were examined. Thus, no discernible effects from the operation of the Peach Bottom Atomic Power Station on the growth of channel catfish were observed. With this presentation the studies on age and growth of channel catfish have been terminated because the intent of the Environmental Technical Specifications Appendix B has been fulfilled.

A total of 25,533 white crappie was tagged in Conowingo Pond from 1966 through 1978 at various locations. Of these, 3,247 (12.7%) were recaptured by anglers and field crew. Recapture locations indicate that white crappie move seasonally within the Pond. White crappie move downstream in fall and overwinter in the lower third of the Pond, primarily in Conowingo Creek and Broad Creek. Movement of white crappie in spring was less directional; approximately equal numbers of recaptures were made in upstream and downstream areas from the point of tagging. These movement patterns are such that white crappie do not

concentrate in the vicinity of Peach Bottom Atomic Power Station in any season.

Of the 6,343 channel catfish tagged in Conowingo Pond from 1966 through 1978, 462 (7.3%) were recaptured by anglers and field crew. Recapture locations indicate that channel catfish do not move as extensively as white crappie in Conowingo Pond; 60% did not move at all, 27% moved less than two miles. Channel catfish do not seem to concentrate in any area of the Pond. Because neither species concentrates in the vicinity of the intake structure of Peach Bottom Atomic Power Station, impingement and entrainment risks are minimized. With this presentation, the intent of the Environmental Technical Specifications Appendix B has been fulfilled and movement studies of white crappie and channel catfish have been terminated.

2.0 LIMNOLOGY OF CONOWINGO POND

2.1 METHODS

The description and location of stations sampled in Conowingo Pond are given in Table 2.1-1 and Figure 2.1-1. Ice conditions on the Pond prevented sampling in January, February and the first half of March 1979. The parameters sampled at each station are given in Table 2.1-2.

Water for physicochemical and plant pigment analyses was collected with a Van Dorn sampler twice monthly from the surface and bottom depths at five stations in Conowingo Pond. One sample each was taken twice from Holtwood and Conowingo dams. The parameters measured and the methods of analysis used in the laboratory are given in Table 2.1-3.

Duplicate zooplankton samples were collected twice monthly with a Clarke-Bumpus sampler fitted with a #20 mesh nylon net at eleven stations in Conowingo Pond. The sampler was towed in a circular oblique path from a maximum depth of 20 ft. A calibrated flow meter attached to the sampler was used to determine the volume of water strained. Duplicate samples were collected twice monthly at Holtwood and Conowingo dams by filtering a known volume of water through a #20 mesh net and bucket. In the laboratory, samples were diluted or concentrated to a volume that yielded an estimated 200 to 300 animals per milliliter. One 1-ml subsample was placed on a Sedgewick Rafter counting chamber and examined. All zooplankters were counted when fewer than 150 to 200 animals per sample were present.

Samples of benthos were taken twice monthly with an 81 $in.^2$ grab. In 1967 through 1970, samples were wet-sieved through a #20 U.S. Standard sieve, a #50 sieve was used in 1971 and 1972 and a #30 sieve in 1973 and thereafter. The organisms were identified and counted. Biomass of the benthic organisms was determined. Specimens of each taxon were dried at 40 C in an oven and weighed to the nearest 0.001 mg. The weights of each taxon were summed to obtain the total benthic biomass.

TABLE 2.1-1

List of limnological stations and locations in Conowingo Pond.

Station	Location	Depth at Station (ft)
630	Holtwood Hydro Station outlet pipe for circulating water pump 17-B	
601	Mid-pond off mouth of Fishing Creek	14
602	Point off Dorsey Road (west shore) north of Peach Bottom Atomic Power Station	12
603	Mid-pond just below double towers off Mt. Johnson Island	15
604	Point on east shore south of Mt. Johnson Island	12
605	Point just below south end of discharge canal Peach Bottom Atomic Power Station	13
606	Mid-pond off mouth of Peters Creek	12
607	Point just above mouth of Peters Creek off east shore	10
608	West shore just north of Williams Tunnel	24
609	Between west shore and mid-pond off Michael Run	26
610	Mid-pond off Broad Creek	38
611	Mid-pond off Hopkins Cove	70
640	Conowingo Hydro Station outlet pipe for Unit 1	

TABLE 2.1-2

Parameters sampled at stations in Conowingo Pond for limnological studies, January-June 1979. Stations were sampled twice monthly.

	Air and Water Temperature	Dissolved Oxygen	Secchi	Water Chemistry	Plant Pigments	Zooplankton	Benthos
*630	X			X	X	X	
601	X	X	X	X	X	X	X
602	X	X	X			X	X
603	X	X	X			X	X
604	X	X	X	X	X	X	X
605	X	X	X	X	X	X	X
606	X	X	X			X	X
607	X	X	X	X	X	X	X
608	X	X	X			X	X
609	X	X	X			X	X
610	X	X	X			X	X
611	X	X	X	X	X	X	X
*640	X			X	X	X	

* Water quality parameters from bottom samples could not be measured due to ice cover on the Pond. Parameters were analyzed from water samples taken at outlet pipes at Holtwood and Conowingo Hydro Stations and are listed as surface samples in Tables 2.2-1 to 2.2-3 and 2.2-5 to 2.2-20.

TABLE 2.1-3

Physicochemical and plant pigment parameters and reference(s) for analysis of water in Conowingo Pond.

Parameter	Method	Reference(s)
Water Temperature	Thermistor, hand held thermometer	EPA (1974)
Dissolved Oxygen	Membrane electrode Azide modification-Winkler method (Hach proprietary reagents)	EPA (1974) APHA (1975)
Light Penetration	Secchi disk transparency	Wetzel (1975)
Hydrogen ion (pH)	Electrometrically	EPA (1974) APHA (1975)
Specific Conductance	Conductivity meter, wheatstone bridge type cell @ 20 C	EPA (1974)
CO_3, HCO_3	Potentiometric titration	EPA (1974) APHA (1975)
Na	Atomic absorption	EPA (1974)
K	Atomic absorption	EPA (1974)
Ca	Atomic absorption	APHA (1975) EPA (1974)
Mg	Atomic absorption	EPA (1974) APHA (1975)
Cl	Mercuric chloride (Autoanalyzer)	EPA (1974)
SO_4	Chloranilate (Autoanalyzer)	EPA (1974)
NO_2	Diazotization (Autoanalyzer)	EPA (1974)
NO_3	Diazotization (Autoanalyzer)	EPA (1974)
Fe (filterable)	Atomic absorption	EPA (1974)
SiO_3-Si (reactive)	Stannous chloride	Golterman (1970)
PO_4 (total)	Persulfate digestion; single reagent	EPA (1974)
Total Suspended Solids	Filter, oven dried 103 to 105 C	EPA (1974) APHA (1975)
Plant Pigments	Spectrophotometrically	Strickland and Parsons (1972)

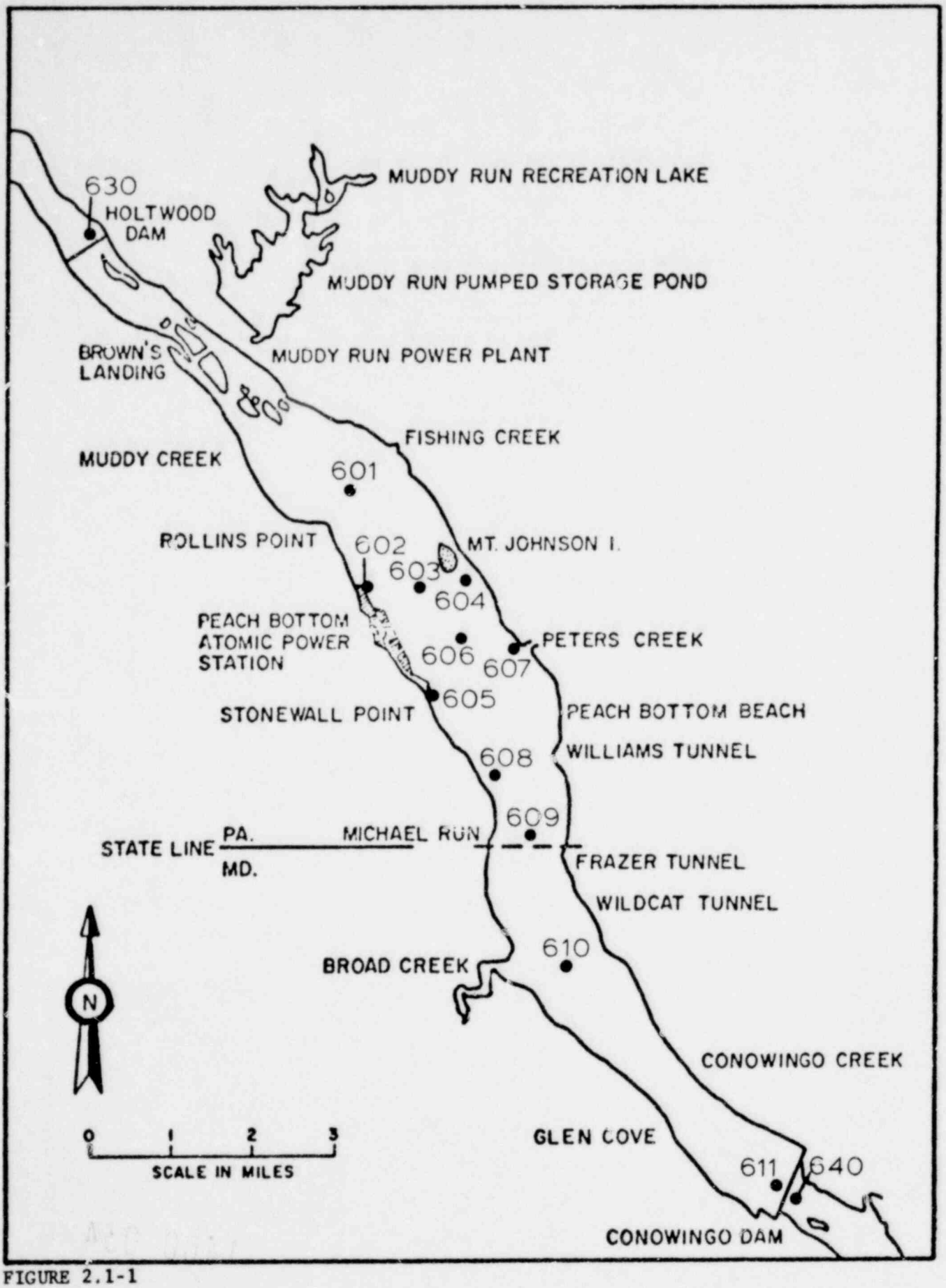

FIGURE 2.1-1

Distribution of limnological stations in Conowingo Pond.

2.2 RESULTS

2.2.1 Physicochemical

Monthly mean temperatures between the surface and bottom differed by 1.3 F or less in the preoperational period and 1.7 F or less in the postoperational period (Table 2.2-1). The postoperational mean values were higher (1.0 to 8.0 F) than those in the preoperational period in most months. Seasonally, mean temperatures were highest in June and lowest in January in both periods. Comprehensive daily temperature data that were collected in the Pond are reported elsewhere by Philadelphia Electric Company.

No dissolved oxygen stagnation occurred in the Pond as a whole in either the preoperational or postoperational periods (Table 2.2-2). However, oxygen concentrations in June in both periods were lower below a depth of approximately 40 feet in the lower portion of the Pond near Conowingo Dam. Monthly mean oxygen values between the surface and bottom differed by 0.7 ppm or less in both the preoperational and postoperational periods. However mean values at the surface and bottom in 1979 were lower (0.7 ppm at surface in March, May and June; 2.2 ppm at bottom in April) than those observed in the preoperational period. Seasonally, mean oxygen values were lower in June and higher in winter months in both periods. The monthly mean concentrations of dissolved oxygen in both periods were greater than 5.0 ppm, which is the water quality criteria (minimum monthly value) established by the Pennsylvania Department of Environmental Resources (1971) for the lower Susquehanna River.

The depth of light penetration, as determined by Secchi disk measurements, varied between months in each period and between periods (Table 2.2-3). This variation is inversely related to the average daily river flow and suspended solids load (Ichthyological Associates, Inc., P.B.A.P.S. Postoperational Reports No. 4 and 5, 1975, 1976). Comparison of the monthly mean river flow in both periods is given in Table 2.2-4.

Except for values of suspended solids, which generally were higher at the bottom, concentrations of other parameters were either homogenously distributed or varied slightly with depth in both periods (Tables 2.2-5 to 2.2-20). Monthly mean concentrations of the various parameters generally followed a similar trend in both periods. Concentrations of nitrate, filterable iron, reactive silica, total phosphate and suspended solids generally were higher in January through March in both periods. Values for most other parameters generally were higher in January and/or June. The differences in the concentrations of most parameters between the two periods are due to variation in river flow. Concentrations of the various parameters are significantly related to river flow in Conowingo Pond (I.A., P.B.A.P.S. Postoperational Reports No. 4 and 5, 1975-1976). Although the 1979 postoperational mean values of most parameters differed from the preoperational values, the magnitude of variation observed in the postoperational period generally was within the range of that observed in the preoperational period. Consequently, the differences between the two periods are considered natural variation.

TABLE 2.2-1

COMPARISON OF THE MONTHLY MINIMUM, MAXIMUM AND MEAN WATER TEMPERATURE (F) FROM JANUARY-JUNE DURING PRECPERATIONAL (1967-1973) AND POSTOPERATIONAL (1979) PERIODS IN CONDENSER POND. N REPRESENTS NUMBER OF DETERMINATIONS.

MONTH		JAN	FEB	MAR	APR	MAY	JUN	JAN-JUN
				1967-1973				
SURFACE	N	43	29	32	56	65	164	389
	MIN	32.5	33.8	37.0	39.5	56.0	61.0	32.5
	MAX	43.5	41.0	51.0	65.0	65.1	82.0	82.0
	MEAN	35.4	37.1	43.7	51.5	60.5	74.0	59.0
BOTTOM	N	33	21	26	48	55	156	339
	MIN	32.8	33.8	36.0	39.5	56.0	61.0	32.8
	MAX	42.7	40.0	44.2	61.5	64.0	78.5	78.5
	MEAN	34.4	36.6	42.4	50.3	59.4	72.7	59.1
				1979				
SURFACE	N	4	4	21	35	37	26	127
	MIN	33.0	34.0	39.0	49.5	62.0	72.0	33.0
	MAX	34.0	40.0	58.0	70.0	76.0	83.5	83.5
	MEAN	33.5	36.7	44.7	56.1	68.5	75.4	60.5
BOTTOM	N			16	32	33	22	103
	MIN	-	-	41.0	49.5	62.0	72.0	41.0
	MAX	-	-	58.0	66.0	76.0	81.0	81.0
	MEAN	-	-	44.6	54.4	66.9	74.6	61.2

TABLE 2.2-2

COMPARISON OF THE MONTHLY MINIMUM, MAXIMUM AND MEAN DISSOLVED OXYGEN CONCENTRATIONS (PPM) FROM JANUARY-JUNE DURING PREOPERATIONAL (1967-1973) AND POSTOPERATIONAL (1979) PERIODS IN CONOWINGO POND. N REPRESENTS NUMBER OF DETERMINATIONS.

MONTH		JAN	FEB	MAR	APR	MAY	JUN	JAN-JUN
				1967-1973				
SURFACE	N	22	15	25	46	40	83	231
	MIN	14.7	11.2	12.2	10.3	7.5	4.9	4.9
	MAX	16.0	16.8	14.2	14.4	13.4	14.0	16.8
	MEAN	15.4	15.4	13.4	12.9	11.2	8.2	11.4
BOTTOM	N	21	15	25	46	40	85	233
	MIN	13.1	11.5	12.2	11.1	7.7	1.6	1.6
	MAX	16.6	17.5	14.9	14.7	13.8	13.0	17.5
	MEAN	15.6	15.6	13.6	13.1	11.7	8.1	11.5
				1979				
SURFACE	N	-	-	16	32	22	22	92
	MIN	-	-	12.0	10.2	7.7	4.8	4.8
	MAX	-	-	13.8	11.9	12.6	9.4	13.8
	MEAN	-	-	12.7	11.0	10.5	7.5	10.4
BOTTOM	N	-	-	16	32	22	22	92
	MIN	-	-	12.2	9.6	3.4	1.9	1.9
	MAX	-	-	13.2	11.6	11.1	9.3	13.2
	MEAN	-	-	12.7	10.9	9.8	6.9	10.0

TABLE 2.2-3

COMPARISON OF THE MONTHLY, MINIMUM, MAXIMUM, AND MEAN DEPTH OF LIGHT PENETRATION (IN.) FROM JANUARY-JUNE DURING PREOPERATIONAL (1967-1973) POSTOPERATIONAL (1979) PERIODS IN CONOWINGO POND. N REPRESENTS NUMBER OF DETERMINATIONS.

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JAN-JUN
			1967-1973				
N	33	22	26	46	55	123	305
MIN	33	3	9	12	7	1	1
MAX	70	67	65	43	40	120	120
MEAN	53	31	32	26	27	30	32
			1979				
N	-	-	16	32	33	22	103
MIN	-	-	24	24	29	22	22
MAX	-	-	31	49	84	100	100
MEAN	-	-	27	35	42	39	37

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TABLE 2.2-4

Comparison of the monthly and annual mean river flow (x 1000 cfs) at Holtwood Dam, January 1967-June 1979. Data supplied by Pennsylvania Power and Light Company.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean
1967	20.5	30.8	82.6	64.4	66.0	19.2	15.4	21.3	10.6	27.2	44.2	48.4	37.6
1968	18.3	40.2	56.9	34.7	49.6	54.1	18.9	6.5	14.0	7.0	43.9	34.3	31.5
1969	23.0	28.6	28.7	39.6	34.5	20.4	15.8	18.9	6.7	5.2	27.3	32.3	25.1
1970	19.1	69.5	52.4	136.9	42.5	21.2	21.1	10.9	8.7	18.1	58.5	42.6	41.8
1971	27.7	74.5	103.8	62.7	45.4	15.3	7.6	14.5	11.1	11.1	18.5	59.7	37.7
1972	46.9	31.8	113.1	91.1	72.3	178.0	58.2	12.8	7.5	7.5	55.5	105.5	65.0
1973	51.3	62.8	64.9	80.8	60.5	37.3	21.9	14.6	16.1	13.8	27.0	89.8	45.1
Min.	18.3	28.6	28.7	34.7	34.5	15.3	7.6	6.5	6.7	5.2	18.5	32.3	25.1
Mean	29.5	48	71.8	75.7	53.0	49.4	22.7	14.2	10.7	12.8	39.3	58.9	40.5
Max.	51.3	64	113.1	136.9	72.3	178.0	58.2	21.3	16.1	27.2	58.5	105.5	65.0
1974	72.7	47.6	61.4	92.4	39.7	19.4	21.4	10.6	21.2	11.8	23.0	53.5	39.6
1975	54.4	84.9	81.9	49.9	58.2	43.5	20.2	10.0	83.4	66.7	42.0	37.2	52.7
1976	49.2	100.8	63.8	43.2	34.2	38.0	24.6	20.4	12.5	80.9	36.5	25.1	43.9
1977	11.5	24.7	125.9	85.7	28.8	11.7	18.4	12.9	34.0	73.1	71.4	87.7	49.0
1978	85.2	37.9	118.0	93.8	81.5	27.1							
1979	100.5	45.8	143.9	65.1	43.4	26.1							

TABLE 2.2-5

COMPARISON OF THE MONTHLY MINIMUM AND MAXIMUM PH VALUES FROM JANUARY-JUNE DURING PREOPERATIONAL (1971-1973) AND POSTOPERATIONAL (1979) PERIODS IN CONDUINCO POND. N REPPESENTS NUMBER OF DETERMINATIONS.

	MONTH	JAN	FEB	MAR	APR	MAY	JUN	JAN-JUN
				(1971-1973)				
SURFACE	N	38	27	33	44	45	41	228
	MIN	6.9	6.8	6.8	6.4	7.1	6.5	6.4
	MAX	9.9	7.5	7.8	7.7	8.2	8.9	9.9
BOTTOM	N	12	5	10	18	21	18	84
	MIN	7.0	6.8	6.9	6.4	7.2	6.7	6.4
	MAX	7.3	6.9	7.4	7.4	7.7	7.6	7.7
				1979				
SURFACE	N	4	4	9	13	14	14	58
	MIN	7.1	7.3	7.4	7.5	7.5	7.[illegible]	7.2
	MAX	7.4	7.5	7.5	7.9	9.0	8.1	9.0
BOTTOM	N	-	-	5	10	10	10	35
	MIN	-	-	7.4	7.5	7.2	7.3	7.2
	MAX	-	-	7.5	7.8	8.6	8.1	8.6

TABLE 2.2-6

COMPARISON OF THE MONTHLY MINIMUM, MAXIMUM AND MEAN CONDUCTIVITY VALUES (UMHOS/CM AT 20 C) FROM JANUARY-JUNE DURING PREOPERATIONAL (1971-1973) AND POSTOPERATIONAL (1979) PERIODS IN CONOWINGO POND. N REPRESENTS NUMBER OF DETERMINATIONS.

	MONTH	JAN	FEB	MAR	APR	MAY	JUN	JAN-JUN
				(1971-1973)				
SURFACE	N	38	27	33	44	45	41	228
	MIN	154	107	112	116	126	98	98
	MAX	246	279	291	200	197	272	291
	MEAN	201	187	178	158	157	164	172
BOTTOM	N	12	5	10	18	21	18	84
	MIN	157	112	148	116	124	97	97
	MAX	242	127	289	196	175	202	289
	MEAN	213	121	216	156	153	147	167
				1979				
SURFACE	N	4	4	9	13	14	14	58
	MIN	123	158	124	131	176	171	123
	MAX	199	226	156	156	205	228	228
	MEAN	157	194	143	147	188	195	172
BOTTOM	N	-	-	5	10	10	10	35
	MIN	-	-	143	133	177	172	133
	MAX	-	-	149	158	199	218	218
	MEAN	-	-	146	147	188	195	172

TABLE 2.2-7

COMPARISON OF THE MONTHLY MINIMUM, MAXIMUM AND MEAN BICARBONATE CONCENTRATIONS (PPM) FROM JANUARY-JUNE DURING PREOPERATIONAL (1971-1973) AND POSTOPERATIONAL (1979) PERIODS IN CONOWINGO POND. N REPRESENTS NUMBER OF DETERMINATIONS.

	MONTH	JAN	FEB	MAR	APR	MAY	JUN	JAN-JUN
				(1971-1973)				
SURFACE	N	38	27	33	44	45	41	228
	MIN	15.1	21.6	18.5	26.8	27.3	22.6	15.1
	MAX	51.6	53.2	62.2	59.3	58.3	67.2	67.2
	MEAN	36.8	34.8	36.2	34.1	35.8	41.1	36.7
BOTTOM	N	12	5	10	18	21	18	84
	MIN	24.2	21.1	26.2	28.1	26.9	25.0	21.1
	MAX	51.4	25.7	58.6	42.0	39.2	52.3	58.6
	MEAN	37.5	23.9	42.3	33.7	33.7	36.2	35.2
				1979				
SURFACE	N	4	4	9	13	14	14	58
	MIN	20.5	30.0	24.8	28.7	41.0	39.5	20.5
	MAX	33.2	55.5	31.6	35.4	48.2	53.5	55.5
	MEAN	29.2	40.8	27.5	33.8	44.2	44.7	38.1
BOTTOM	N	-	-	5	10	10	10	35
	MIN	-	-	25.0	28.7	41.0	40.4	25.0
	MAX	-	-	28.8	36.1	48.2	51.8	51.8
	MEAN	-	-	27.5	33.9	44.0	44.7	39.0

TABLE 2.2-8

COMPARISON OF THE MONTHLY MINIMUM, MAXIMUM AND MEAN CARBONATE CONCENTRATIONS (PPM) FROM JANUARY-JUNE DURING PREOPERATIONAL (1971-1973) AND POSTOPERATIONAL (1979) PERIODS IN CONOWINGO POND. N REPRESENTS NUMBER OF DETERMINATIONS.

	MONTH	JAN	FEB	MAR	APR	MAY	JUN	JAN-JUN
				(1971-1973)				
SURFACE	N	38	27	33	44	45	41	228
	MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	MAX	11.0	0.0	0.0	0.0	0.0	4.3	11.0
	MEAN	0.6	0.0	0.0	0.0	0.0	0.1	0.1
BOTTOM	N	12	5	10	18	21	18	84
	MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	MAX	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	MEAN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				1979				
SURFACE	N	4	4	9	13	14	14	58
	MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	MAX	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	MEAN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BOTTOM	N	-	-	5	10	10	10	35
	MIN	-	-	0.0	0.0	0.0	0.0	0.0
	MAX	-	-	0.0	0.0	0.0	0.0	0.0
	MEAN	-	-	0.0	0.0	0.0	0.0	0.0

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TABLE 2.2-9

COMPARISON OF THE MONTHLY MINIMUM, MAXIMUM AND MEAN SODIUM CONCENTRATIONS (PPM) FROM JANUARY-JUNE DURING PREOPERATIONAL (1971-1973) AND POSTOPERATIONAL (1979) PERIODS IN CONOWINGO POND. N REPRESENTS NUMBER OF DETERMINATIONS.

	MONTH	JAN	FEB	MAR	APR	MAY	JUN	JAN-JUN
				(1971-1973)				
SURFACE	N	38	27	33	44	45	41	228
	MIN	5.28	4.42	4.10	4.52	4.63	2.33	2.33
	MAX	10.84	14.46	9.34	7.62	8.26	18.95	18.95
	MEAN	7.70	8.22	6.15	5.68	5.55	5.76	6.37
BOTTOM	N	12	5	10	18	21	18	84
	MIN	7.30	4.42	4.31	4.74	4.64	3.24	3.24
	MAX	8.91	5.28	8.37	6.56	5.92	7.73	8.91
	MEAN	8.09	5.06	6.27	5.64	5.23	5.42	5.88
				1979				
SURFACE	N	4	4	9	13	14	14	58
	MIN	2.90	2.20	3.90	4.10	6.10	6.50	2.20
	MAX	6.40	9.20	5.20	4.90	6.50	8.80	9.20
	MEAN	4.43	5.30	4.32	4.57	6.27	7.55	5.70
BOTTOM	N	-	-	5	10	10	10	35
	MIN	-	-	4.10	4.00	5.60	6.70	2.20
	MAX	-	-	4.60	5.10	6.50	8.20	9.20
	MEAN	-	-	4.46	4.45	6.13	7.46	5.70

TABLE 2.2-10

COMPARISON OF THE MONTHLY MINIMUM, MAXIMUM AND MEAN POTASSIUM CONCENTRATIONS (PPM) FROM JANUARY-JUNE DURING PREOPERATIONAL (1971-1973) AND POSTOPERATIONAL (1979) PERIODS IN CONOWINGO POND. N REPRESENTS NUMBER OF DETERMINATIONS.

	MONTH	JAN	FEB	MAR	APR	MAY	JUN	JAN-JUN
				(1971-1973)				
SURFACE	N	38	27	33	44	45	41	228
	MIN	1.14	1.19	0.90	0.46	1.20	0.98	0.46
	MAX	2.07	1.95	1.93	4.18	1.74	3.20	4.18
	MEAN	1.55	1.48	1.38	1.41	1.41	1.62	1.48
BOTTOM	N	12	5	10	18	21	18	84
	MIN	1.19	1.22	1.16	0.78	1.17	1.07	0.78
	MAX	1.64	1.31	1.64	1.61	1.68	2.53	2.53
	MEAN	1.44	1.27	1.39	1.27	1.39	1.41	1.37
				1979				
SURFACE	N	4	4	9	13	14	14	58
	MIN	1.77	1.40	1.20	1.00	1.10	0.90	0.90
	MAX	2.40	1.53	1.50	1.20	1.50	1.30	2.40
	MEAN	2.09	1.45	1.34	1.11	1.29	1.09	1.28
BOTTOM	N	-	-	5	10	10	10	35
	MIN	-	-	1.30	1.00	1.10	1.00	1.00
	MAX	-	-	1.40	1.20	1.40	1.20	1.40
	MEAN	-	-	1.34	1.10	1.27	1.10	1.18

TABLE 2.2-11

COMPARISON OF THE MONTHLY MINIMUM, MAXIMUM AND MEAN CALCIUM CONCENTRATIONS (PPM) FROM JANUARY-JUNE DURING PREOPERATIONAL (1971-1973) AND POSTOPERATIONAL (1979) PERIODS IN CONOWINGO POND. N REPRESENTS NUMBER OF DETERMINATIONS.

	MONTH	JAN	FEB	MAR	APR	MAY	JUN	JAN-JUN
				(1971-1973)				
SURFACE	N	38	27	33	44	45	41	228
	MIN	15.6	12.5	10.0	8.4	8.4	8.4	8.4
	MAX	34.8	32.0	32.8	26.0	64.0	28.8	64.0
	MEAN	25.0	21.6	21.1	17.1	20.3	21.4	20.9
BOTTOM	N	12	5	10	18	21	18	84
	MIN	15.6	11.5	16.0	13.8	15.3	17.8	11.5
	MAX	30.5	15.0	33.8	25.5	60.0	27.8	60.0
	MEAN	24.8	14.0	24.8	19.1	23.8	23.4	22.4
				1979				
SURFACE	N	4	4	9	13	14	14	58
	MIN	12.1	18.5	14.0	10.3	13.7	20.1	10.3
	MAX	20.7	29.1	18.9	18.9	22.1	28.4	29.1
	MEAN	17.3	23.4	16.9	14.2	17.7	23.8	18.6
BOTTOM	N	-	-	5	10	10	10	35
	MIN	-	-	16.1	10.7	13.6	20.1	10.7
	MAX	-	-	22.0	19.4	21.0	27.5	27.5
	MEAN	-	-	18.4	14.2	17.4	23.5	18.4

TABLE 2.2-12

COMPARISON OF THE MONTHLY MINIMUM, MAXIMUM AND MEAN MAGNESIUM CONCENTRATIONS (PPM) FROM JANUARY-JUNE DURING PREOPERATIONAL (1971-1973) AND POSTOPERATIONAL (1979) PERIODS IN CONOWINGO POND. N REPRESENTS NUMBER OF DETERMINATIONS.

	MONTH	JAN	FEB	MAR	APR	MAY	JUN	JAN-JUN
				(1971-1973)				
SURFACE	N	38	27	33	44	45	41	228
	MIN	0.0	0.0	0.0	2.0	2.1	2.5	0.0
	MAX	9.6	10.4	12.1	12.1	16.0	18.8	18.8
	MEAN	4.7	5.3	6.7	5.2	6.2	6.8	5.8
BOTTOM	N	12	5	10	18	21	18	84
	MIN	0.8	3.8	4.7	3.4	3.2	4.5	0.8
	MAX	9.1	4.1	9.1	10.0	17.2	7.1	17.2
	MEAN	5.2	4.0	7.0	5.3	7.2	5.5	5.9
				1979				
SURFACE	N	4	4	9	13	14	14	58
	MIN	3.8	6.2	4.4	4.6	6.30	5.8	3.8
	MAX	6.4	10.1	5.6	5.9	7.80	8.7	10.1
	MEAN	5.2	7.9	5.2	5.4	7.21	7.2	6.4
BOTTOM	N	-	-	5	10	10	10	35
	MIN	-	-	5.3	4.3	6.4	5.9	4.3
	MAX	-	-	5.7	5.8	7.7	8.4	8.4
	MEAN	-	-	5.4	5.3	7.0	7.2	6.4

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TABLE 2.2-13

COMPARISON OF THE MONTHLY MINIMUM, MAXIMUM AND MEAN CHLORIDE CONCENTRATIONS (PPM) JANUARY-JUNE DURING PREOPERATIONAL (1971-1973) AND POSTOPERATIONAL (1979) PERIODS IN CONOWINGO POND. N REPRESENTS NUMBER OF DETERMINATIONS.

	MONTH	JAN	FEB	MAR	APR	MAY	JUN	JAN-JUN
				(1971-1973)				
SURFACE	N	38	27	33	44	45	41	228
	MIN	6.9	6.2	5.1	4.8	4.4	3.7	3.7
	MAX	15.2	20.5	13.8	10.6	9.4	13.1	20.5
	MEAN	10.5	10.7	9.6	7.0	7.1	7.9	8.6
BOTTOM	N	12	5	10	18	21	18	84
	MIN	8.3	5.8	6.2	5.0	5.7	4.1	4.1
	MAX	11.7	7.1	13.1	9.4	8.5	11.7	13.1
	MEAN	10.4	6.7	9.6	6.4	6.9	7.1	7.7
				1979				
SUPFACE	N	4	4	9	13	14	14	58
	MIN	7.4	9.1	6.6	6.2	8.7	8.1	6.2
	MAX	19.7	15.4	10.6	8.0	10.9	12.1	19.7
	MEAN	12.7	11.7	8.6	7.4	9.9	9.6	9.4
BOTTOM	N	-	-	5	10	10	10	35
	MIN	-	-	8.1	6.2	9.2	8.5	6.2
	MAX	-	-	10.6	8.0	10.5	11.3	11.3
	MEAN	-	-	9.0	7.4	9.9	9.5	9.0

1400 050

TABLE 2.2-14

COMPARISON OF THE MONTHLY MINIMUM, MAXIMUM AND MEAN SULFATE CONCENTRATIONS (PPM) JANUARY-JUNE DURING PREOPERATIONAL (1971-1973) AND POSTOPERATIONAL (1979) PERIODS IN CONOVINCO POND. N REPRESENTS NUMBER OF DETERMINATIONS.

	MONTH	JAN	FEB	MAR	APR	MAY	JUN	JAN-JUN
				(1971-1973)				
SURFACE	N	38	27	33	44	45	41	228
	MIN	16.7	25.1	15.4	18.2	6.3	34.1	6.3
	MAX	66.3	74.3	76.4	58.2	50.9	76.8	76.8
	MEAN	44.6	42.7	45.0	36.9	37.2	47.6	42.0
BOTTOM	N	12	5	10	18	21	18	84
	MIN	30.4	26.1	40.6	35.2	17.8	35.4	17.8
	MAX	63.6	31.0	78.3	52.6	46.2	50.7	78.3
	MEAN	45.4	28.9	59.2	41.2	37.6	43.4	42.8
				1979				
	MONTH	JAN	FEB	MAR	APR	MAY	JUN	JAN-JUN
SURFACE	N	4	4	9	13	14	14	58
	MIN	29.0	33.9	27.2	31.3	38.2	38.6	27.2
	MAX	34.2	62.3	45.0	36.4	48.7	61.9	62.3
	MEAN	31.3	46.7	39.5	33.5	42.0	48.4	40.6
BOTTOM	N	-	-	5	10	10	10	35
	MIN	-	-	39.8	31.3	38.2	38.6	31.3
	MAX	-	-	43.7	34.9	47.5	57.1	57.1
	MEAN	-	-	42.4	33.1	42.0	47.8	41.2

1400 051

TABLE 2.2-15

COMPARISON OF THE MONTHLY MINIMUM, MAXIMUM AND MEAN NITRITE CONCENTRATIONS (PPM) JANUARY-JUNE DURING PREOPERATIONAL (1971-1973) AND POSTOPERATIONAL (1979) PERIODS IN CONOWINGO POND. N REPRESENTS NUMBER OF DETERMINATIONS.

	MONTH	JAN	FEB	MAR	APR	MAY	JUN	JAN-JUN
				(1971-1973)				
SURFACE	N	30	21	26	34	36	37	184
	MIN	0.01	0.02	0.02	0.02	0.01	0.00	0.00
	MAX	0.22	0.36	0.12	0.07	0.10	0.20	0.36
	MEAN	0.05	0.13	0.05	0.04	0.04	0.05	0.06
BOTTOM	N	12	5	10	18	18	18	81
	MIN	0.02	0.14	0.04	0.02	0.01	0.02	0.01
	MAX	0.19	0.28	0.09	0.08	0.06	0.15	0.28
	MEAN	0.06	0.20	0.06	0.04	0.03	0.07	0.06
				1979				
SURFACE	N	4	4	9	13	14	14	58
	MIN	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	MAX	0.06	0.06	0.03	0.03	0.07	0.10	0.10
	MEAN	0.04	0.05	0.03	0.03	0.05	0.08	0.05
BOTTOM	N	-	-	5	10	10	10	35
	MIN	-	-	0.03	0.03	0.03	0.03	0.03
	MAX	-	-	0.03	0.03	0.07	0.10	0.10
	MEAN	-	-	0.03	0.03	0.05	0.08	0.05

1400 052

TABLE 2.2-16

COMPARISON OF THE MONTHLY MINIMUM, MAXIMUM AND MEAN NITRATE CONCENTRATIONS (PPM) JANUARY-JUNE DURING PREOPERATIONAL (1971-1973) AND POSTOPERATIONAL (1979) PERIODS IN CONOWINGO POND. N REPRESENTS NUMBER OF DETERMINATIONS.

	MONTH	JAN	FEB	MAR	APR	MAY	JUN	JAN-JUN
				(1971-1973)				
SURFACE	N	38	27	33	44	45	41	228
	MIN	4.24	4.65	2.85	1.21	1.18	2.80	1.18
	MAX	12.40	16.10	11.70	15.60	11.10	10.50	16.10
	MEAN	7.14	8.17	6.25	5.58	5.49	5.05	6.13
BOTTOM	N	12	5	10	18	21	18	84
	MIN	4.46	4.55	3.70	3.47	3.24	2.12	2.12
	MAX	10.54	5.12	5.87	6.57	9.30	8.06	10.54
	MEAN	6.92	4.87	4.75	4.71	5.10	4.64	5.12
				1979				
SURFACE	N	4	4	9	13	14	14	58
	MIN	0.00	4.12	3.28	2.22	0.62	1.33	0.00
	MAX	6.16	7.40	4.21	3.32	1.82	2.88	7.40
	MEAN	4.08	5.71	3.71	2.73	1.42	2.26	2.75
BOTTOM	N	-	-	5	10	10	10	35
	MIN	-	-	3.50	2.35	1.06	1.73	1.06
	MAX	-	-	4.03	3.19	1.82	2.70	4.03
	MEAN	-	-	3.78	2.80	1.45	2.20	2.38

1400 053

TABLE 2.2-17

COMPARISON OF THE MONTHLY MINIMUM, MAXIMUM AND MEAN FILTERABLE IRON CONCENTRATIONS (PPM) JANUARY-JUNE DURING PREOPERATIONAL (1971-1973) AND POSTOPERATIONAL (1979) PERIODS IN CONOWINGO POND. N REPRESENTS NUMBER OF DETERMINATIONS.

	MONTH	JAN	FEB	MAR	APR	MAY	JUN	JAN-JUN
				(1971-1973)				
SURFACE	N	38	27	33	44	45	41	238
	MIN	0.04	0.04	0.07	0.05	0.04	0.04	0.04
	MAX	2.36	0.13	0.56	0.35	0.25	0.16	2.36
	MEAN	0.30	0.09	0.15	0.13	0.09	0.06	0.14
BOTTOM	N	12	5	10	18	21	18	84
	MIN	0.06	0.08	0.09	0.04	0.04	0.04	0.04
	MAX	0.16	0.11	0.18	0.25	0.31	0.14	0.31
	MEAN	0.10	0.10	0.13	0.13	0.08	0.06	0.10
				1979				
SURFACE	N	4	4	9	13	14	14	58
	MIN	0.00	0.00	0.11	0.13	0.00	0.10	0.00
	MAX	0.82	0.00	0.79	0.24	0.00	0.17	0.82
	MEAN	0.39	0.00	0.53	0.18	0.00	0.12	0.18
BOTTOM	N	-	-	5	10	10	10	35
	MIN	-	-	0.57	0.11	0.00	0.10	0.00
	MAX	-	-	0.86	0.21	0.00	0.17	0.86
	MEAN	-	-	0.68	0.16	0.00	0.13	0.18

1400 054

TABLE 2.2-18

COMPARISON OF THE MONTHLY MINIMUM, MAXIMUM AND MEAN REACTIVE SILICA CONCENTRATIONS (PPM) JANUARY-JUNE DURING PREOPERATIONAL (1971-1973) AND POSTOPERATIONAL (1979) PERIODS IN CONOWINGO POND. N REPRESENTS NUMBER OF DETERMINATIONS.

	MONTH	JAN	FEB	MAR	APR	MAY	JUN	JAN-JUN
				(1971-1973)				
SURFACE	N	38	27	33	44	45	41	228
	MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	3.24	2.88	2.49	2.44	2.63	1.80	3.24
	MEAN	1.12	1.45	1.23	0.79	1.20	0.70	1.05
BOTTOM	N	12	5	10	18	21	18	84
	MIN	0.02	2.36	0.99	0.13	0.00	0.14	0.00
	MAX	2.80	2.59	2.53	2.07	1.66	2.03	2.80
	MEAN	1.25	2.44	1.65	1.05	1.20	0.89	1.23
				1979				
SURFACE	N	4	4	9	13	14	14	58
	MIN	1.72	1.04	2.81	1.51	0.01	0.51	0.01
	MAX	2.55	2.97	3.78	2.00	0.49	1.41	3.78
	MEAN	2.08	1.97	3.07	1.73	0.25	0.92	1.43
BOTTOM	N	-	-	5	10	10	10	35
	MIN	-	-	2.48	1.44	0.09	0.60	0.09
	MAX	-	-	3.18	2.00	0.45	1.48	3.18
	MEAN	-	-	2.85	1.71	0.26	0.94	1.24

1400 055

TABLE 2.2-19

COMPARISON OF THE MONTHLY MINIMUM, MAXIMUM AND MEAN TOTAL PHOSPHATE CONCENTRATIONS (PPM) FROM JANUARY-JUNE DURING PREOPERATIONAL (1971-1973) AND POSTOPERATIONAL (1979) PERIODS IN CONOWINGO POND. N REPRESENTS NUMBER OF DETERMINATIONS.

	MONTH	JAN	FEB	MAR	APR	MAY	JUN	JAN-JUN
				(1971-1973)				
SURFACE	N	30	21	26	34	36	37	184
	MIN	0.00	0.05	0.01	0.02	0.03	0.00	0.00
	MAX	0.66	0.76	0.65	0.45	0.52	0.57	0.76
	MEAN	0.14	0.26	0.16	0.15	0.14	0.11	0.15
BOTTOM	N	12	5	10	18	18	18	81
	MIN	0.00	0.30	0.08	0.06	0.06	0.00	0.00
	MAX	0.93	0.56	0.35	0.33	0.32	0.53	0.93
	MEAN	0.16	0.43	0.12	0.17	0.16	0.15	0.17
				1979				
SURFACE	N	4	4	9	13	14	14	58
	MIN	0.21	0.12	0.09	0.00	0.12	0.06	0.00
	MAX	0.58	0.21	0.52	0.18	0.51	0.55	0.58
	MEAN	0.36	0.17	0.24	0.10	0.23	0.22	0.20
BOTTOM	N	-	-	5	10	10	10	35
	MIN	-	-	0.09	0.03	0.15	0.09	0.03
	MAX	-	-	0.18	0.24	0.25	0.49	0.49
	MEAN	-	-	0.14	0.13	0.19	0.22	0.17

1400 056

TABLE 2.2-20

COMPARISON OF THE MONTHLY MINIMUM, MAXIMUM AND MEAN TOTAL SUSPENDED SOLIDS (PPM) FROM JANUARY-JUNE DURING PREOPERATIONAL (1971-1973) AND POSTOPERATIONAL (1979) PERIODS IN CONOWINGO POND. N REPRESENTS NUMBER OF DETERMINATIONS.

	MONTH	JAN	FEB	MAR	APR	MAY	JUN	JAN-JUN
				(1971-1973)				
SURFACE	N	30	21	26	34	36	39	186
	MIN	2.0	1.2	1.8	2.4	0.0	2.0	0.0
	MAX	129.6	469.0	169.6	131.6	73.6	177.6	469.0
	MEAN	16.8	96.8	27.0	18.0	19.4	26.8	30.1
BOTTOM	N	12	5	10	18	18	18	81
	MIN	2.6	132.0	8.4	3.4	0.0	18.2	0.0
	MAX	13.6	272.0	79.2	32.2	75.6	83.6	272.0
	MEAN	6.3	216.6	28.1	15.5	25.6	38.4	35.4
				1979				
SURFACE	N	4	4	9	13	14	14	58
	MIN	24.0	3.0	11.0	8.0	4.0	2.0	2.0
	MAX	69.0	9.0	28.0	22.0	21.0	29.0	69.0
	MEAN	47.0	5.2	18.6	12.2	11.7	11.5	14.8
BOTTOM	N	-	-	5	10	10	10	35
	MIN	-	-	12.0	13.0	12.0	7.0	7.0
	MAX	-	-	25.0	34.0	45.0	30.0	45.0
	MEAN	-	-	15.8	20.1	18.7	17.1	18.2

2.3 PLANT PIGMENTS

2.3.1 Chlorophyll a

As in the preoperational period, no distinct vertical stratification of chlorophyll a (total and active) was noted in this postoperational period (Table 2.3-1). Concentrations of both at the surface and bottom were high in May and June in both periods. The overall mean values (Jan-Jun) indicated that the postoperational concentrations of total and active chlorophyll a were higher than those in the preoperational period. In most months the postoperational mean value differed from that in the preoperational period. However, the postoperational values generally were within the range of variation observed in the preoperational period. In addition, the fluctuations in the concentrations of chlorophyll a are significantly correlated with variation in river flow (I.A., P.B.A.P.S. Postoperational Reports No. 4 and 5, 1975, 1976).

2.3.2 Phaeopigments

The seasonal distribution of phaeopigments in Conowingo Pond was similar in the preoperational and postoperational periods. Monthly mean values were high in June and low in January through March in both periods (Table 2.3-2). No consistent trend in monthly mean concentrations between the surface and bottom was observed in either period. In most months, the postoperational values at the surface and bottom differed from those observed in the preoperational period. However, the postoperational values generally were within the range of variation observed in the preoperational period. In addition, the fluctuation in the

concentrations of phaeopigments is significantly correlated with variations in river flow (I.A., P.B.A.P.S. Postoperational Reports No. 4 and 5, 1975, 1976). In view of the above, the differences between the two periods are attributed to natural variation.

TABLE 2.3-1

COMPARISON OF THE MONTHLY MINIMUM, MAXIMUM AND MEAN TOTAL AND ACTIVE CHLOROPHYLL A CONCENTRATIONS (MG/M3) FROM JANUARY-JUNE DURING PREOPERATIONAL (1971-1973) AND POSTOPERATIONAL (1979) PERIODS IN CONOWINGO POND. N REPRESENTS NUMBER OF DETERMINATIONS.

	MONTH	JAN	FEB	MAR	APR	MAY	JUN	JAN-JUNE
				CHLOROPHYLL A TOTAL				
				1971-1973				
SURFACE	N	36	20	31	44	45	41	217
	MIN	0.00	0.00	0.35	0.66	1.04	4.48	0.00
	MAX	10.82	1.74	7.06	50.21	117.29	96.84	117.29
	MEAN	1.56	0.92	2.18	5.23	17.29	26.14	10.24
BOTTOM	N	12	5	10	18	21	18	84
	MIN	0.00	1.00	0.96	0.00	3.40	8.14	0.00
	MAX	1.70	2.35	2.87	11.79	25.55	47.24	47.24
	MEAN	0.62	1.75	1.89	3.51	14.36	23.25	9.74
				1979				
SURFACE	N	2	4	9	13	14	14	56
	MIN	2.57	0.00	0.00	0.35	5.92	2.78	0.00
	MAX	5.39	2.04	0.70	16.33	41.04	50.21	50.21
	MEAN	3.98	0.76	0.23	5.24	27.00	19.68	13.12
BOTTOM	N	-	-	5	10	10	10	35
	MIN	-	-	0.00	0.00	6.26	3.75	0.00
	MAX	-	-	0.70	6.74	35.99	41.14	41.14
	MEAN	-	-	0.42	3.12	26.82	20.71	14.53
				CHLOROPHYLL A ACTIVE				
				1971-1973				
SURFACE	N	36	20	31	44	45	41	217
	MIN	0.00	0.00	0.00	0.00	0.80	3.20	0.00
	MAX	9.61	2.40	14.42	9.61	43.25	51.26	51.26
	MEAN	1.58	0.84	2.38	2.46	11.41	15.75	6.52
BOTTOM	N	12	5	10	18	21	18	84
	MIN	0.00	0.00	0.00	0.00	1.60	2.40	0.00
	MAX	2.40	1.60	4.01	8.01	22.43	40.85	40.85
	MEAN	0.60	0.80	0.56	2.58	10.83	15.22	6.72
				1979				
SURFACE	N	2	4	9	13	14	14	56
	MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	5.39	1.00	0.70	11.20	36.72	36.02	36.72
	MEAN	2.70	0.26	0.23	2.73	22.26	10.81	9.05
BOTTOM	N	-	-	5	10	10	10	35
	MIN	-	-	0.00	0.00	1.62	0.00	0.00
	MAX	-	-	0.70	6.42	34.07	31.29	34.07
	MEAN	-	-	0.42	2.62	18.45	9.31	8.74

TABLE 2.3-2

COMPARISON OF THE MONTHLY MINIMUM, MAXIMUM, AND MEAN PHAEOPIGMENT CONCENTRATIONS (MG/M3) FROM JANUARY-JUNE DURING PREOPERATIONAL (1971-1973) AND POSTOPERATIONAL (1979) PERIODS IN CONOWINGO POND. N REPRESENTS NUMBER OF DETERMINATIONS.

	MONTH	JAN	FEB	MAR	APR	MAY	JUN	JAN-JUN
				PHAEOPIGMENTS				
				1971-1973				
SURFACE	N	36	20	31	44	45	41	217
	MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	2.56	1.68	8.01	51.90	73.37	55.75	73.37
	MEAN	0.39	0.39	1.05	4.12	7.56	14.32	5.36
BOTTOM	N	12	5	10	18	21	18	84
	MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MAX	2.80	3.20	3.92	7.21	21.15	32.60	32.60
	MEAN	0.56	1.44	2.55	2.15	5.57	13.41	5.19
				1979				
SURFACE	N	2	4	9	13	14	14	56
	MIN	0.00	0.00	0.00	0.00	0.56	0.00	0.00
	MAX	3.12	2.00	0.00	8.17	10.73	21.24	21.24
	MEAN	1.56	0.50	0.00	2.58	5.18	8.87	4.20
BOTTOM	N	-	-	5	10	10	10	35
	MIN	-	-	0.00	0.00	0.00	0.08	0.00
	MAX	-	-	0.00	3.52	25.87	37.83	37.83
	MEAN	-	-	0.00	0.63	7.80	11.40	5.67

1400 061

2.4 Zooplankton

2.4.1 Results

Twenty-eight taxa of Cladocedra and Copepoda were identified from 77 samples taken from the Pond in March through June 1979. Numerically, nauplii were the dominant zooplankters followed by Daphnia spp., Bosmina longirostris, Cyclopoid copepodids, Diaphanosoma leuchtenbergianum, and Cyclops vernalis (Table 2.4-1).

Total zooplankton density from March through June 1979 varied between months and stations (Table 2.4-2). Densities generally increased from March through June as water temperature increased and river flow decreased (Table 2.4-3). This trend was similar to that observed in the preoperational period (I.A., P.B.A.P.S. Preoperational Report, 1974).

The monthly densities of zooplankton in 1979 were compared with those in the preoperational period (Table 2.4-4). The mean postoperational densities were similar to the preoperational densities. Postoperational mean zooplankton densities at stations in the Pond were also similar to those observed in the preoperational period (Table 2.4-5). Overall, the postoperational densities were within the range of variation of those observed in the preoperational years (Table 2.4-6).

The mean densities of the abundant taxa in the two periods were also compared (Table 2.4-7 and Table 2.4-8). The mean postoperational densities of most of the abundant taxa were

similar to those in the preoperational period. The overall seasonal distribution and abundance of the common taxa between stations and between periods was similar to that indicated above for total zooplankton.

TABLE 2.4-1

MEAN DENSITIES (NUMBER PER LITER) OF VARIOUS ZOOPLANKTERS IN CONOWINGO POND, MAR-JUN 1979.

	21 MAR	3 APR	25 APR	8 MAY	21 MAY	12 JUN	26 JUN	MEAN
CLADOCERA								
L. KINDTII	-	-	-	-	-	-	0.11	0.02
D. LEUCHTENBERGIANUM	-	-	**	**	0.05	0.53	4.77	0.76
DAPHNIA SPP.	-	**	**	0.02	0.93	0.64	19.65	3.04
MOINA SPP.	-	-	-	-	0.06	-	-	0.01
B. LONGIROSTRIS	0.01	0.01	0.02	0.14	15.62	0.93	2.09	2.69
I. SPINIFER	**	**	**	**	0.01	0.01	**	**
I. SORDIDUS	**	-	-	-	**	-	0.01	**
M. LATICORNIS	**	**	-	-	-	**	0.01	**
M. ROSEA	**	-	-	-	-	-	-	**
ALONA SPP.	-	**	-	**	**	0.02	0.07	0.01
B. AFFINIS	-	-	**	-	-	-	-	**
L. LEYDIGI	**	**	**	-	-	-	-	**
C. SPHAERICUS	**	**	**	0.02	0.08	0.01	-	0.02
C. RECTIROSTRIS	-	**	-	-	-	-	-	**
D. ROSTRATA ROSTRATA	-	**	-	-	**	0.10	0.06	0.02
TOTAL CLADOCERA	0.01	0.02	0.02	0.18	16.76	2.25	26.77	6.57
COPEPODA								
NAUPLII	0.17	0.32	0.75	1.56	5.14	2.09	55.78	9.40
CYCLOPOID COPEPODIDS	0.04	0.02	0.03	0.40	1.76	0.77	7.49	1.50
C. VERNALIS	**	-	-	-	0.08	0.12	1.14	0.19
C. BICUSPIDATUS THOMASI	**	**	**	0.01	0.06	0.02	0.03	0.02
C. CRASICAUDIS BRACYERCUS	-	**	-	-	-	-	-	**
M. EDAX	-	-	-	**	-	-	0.09	0.01
E. AGILIS	**	**	**	0.01	0.03	-	-	0.01
E. SPERATUS	**	-	-	-	-	-	-	**
T. PRASINUS	**	-	-	-	-	-	-	**
P. FIMBRIATUS POPPEI	-	-	**	**	-	**	-	**
CALANOID COPEPODIDS	**	-	**	**	0.31	0.12	0.85	0.18
DIAPTOMUS SPP.	**	-	-	**	-	0.02	0.28	0.04
HARPACTICOIDA	**	**	**	-	-	**	0.01	**
TOTAL COPEPODA	0.22	0.35	0.79	1.98	7.38	3.14	65.68	11.36
TOTAL ZOOPLANKTON	0.22	0.36	0.81	2.16	24.14	5.38	92.44	17.93

** LESS THAN 0.01

1400 064

TABLE 2.4-2

MEAN ZOOPLANKTON DENSITIES (NUMBER PER LITER) AT LOCATIONS 601-611 IN CONOWINGO POND, MAR-JUN 1979.

STATION	601	602	603	604	605	606	607	608	609	610	611	MEAN
21 MAR	0.20	0.26	0.25	0.20	0.24	0.20	0.28	0.19	0.18	0.23	0.23	0.22
03 APR	0.60	0.25	0.26	0.28	0.21	0.26	0.32	0.41	0.34	0.67	0.42	0.36
25 APR	0.77	1.12	0.91	0.72	0.64	0.82	1.06	0.41	0.66	0.76	1.03	0.81
08 MAY	1.36	2.48	1.16	1.97	1.64	2.37	1.75	1.96	2.31	2.15	4.62	2.16
21 MAY	2.38	3.74	3.52	9.09	14.16	8.32	11.18	3.83	6.78	17.38	186.12	24.14
12 JUN	0.66	0.59	4.67	4.05	1.74	9.76	10.18	1.91	2.18	3.58	20.91	5.38
26 JUN	39.46	12.63	35.91	92.48	15.61	59.16	87.06	78.37	92.19	142.37	361.65	92.44
MEAN	6.49	3.01	6.67	15.40	4.89	11.41	15.97	12.44	14.95	23.88	82.14	17.93

TABLE 2.4-3

WATER TEMPERATURE (F), DAILY RIVER FLOW (X 1000 CFS) AND ZOOPLANKTON DENSITY (NO./LITER) DURING MAR-JUN 1979.

DATE	WATER TEMP (F)	RIVER FLOW (X 1000 CFS)	AVERAGE TOTAL ZOOPLANKTON DENSITY
21 MAR	43.7	61.3	0.22
03 APR	50.0	66.2	0.36
25 APR	58.3	38.7	0.81
08 MAY	62.6	34.6	2.16
21 MAY	68.0	21.0	24.14
12 JUN	73.2	26.2	5.38
26 JUN	72.7	12.4	92.44

TABLE 2.4-4

COMPARISON OF MONTHLY MINIMUM, MAXIMUM AND MEAN DENSITIES (NUMBER PER LITER) OF TOTAL ZOOPLANKTON FROM JANUARY-JUNE DURING PREOPERATIONAL (1967-1973) AND POSTOPERATIONAL (1979) PERIODS IN CONOWINGO POND.

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JAN-JUN
				1967-1973			
N	22	22	26	47	55	136	308
MIN	0.05	0.02	0.03	0.05	0.10	0.02	0.02
MAX	0.19	0.15	0.35	0.62	4.35	324.23	324.23
MEAN	0.09	0.08	0.11	0.23	0.61	32.91	14.70
				1979			
N	-	-	11	22	22	22	77
MIN	-	-	0.18	0.21	1.16	0.59	0.18
MAX	-	-	0.28	1.12	186.12	361.65	361.65
MEAN	-	-	0.22	0.59	13.15	48.91	17.93

1400 065

TABLE 2.4-5

COMPARISON OF MONTHLY MINIMUM, MAXIMUM AND MEAN DENSITIES (NUMBER PER LITER) OF TOTAL ZOOPLANKTON FROM JANUARY-JUNE AT STATIONS 601-611 DURING PREOPERATIONAL (1967-1973) AND POSTOPERATIONAL (1979) PERIODS IN CONOWINGO POND.

STATION	601	602	603	604	605	606	607	608	609	610	611	601-611
						1967-1973						
N	29	28	29	27	29	29	31	26	28	27	25	308
MIN	0.03	0.03	0.02	0.03	0.05	0.02	0.04	0.03	0.05	0.06	0.04	0.02
MAX	118.10	287.40	324.33	188.74	121.31	156.90	144.13	187.82	98.26	182.95	114.90	324.33
MEAN	9.10	15.50	15.66	12.56	13.14	13.01	20.91	12.44	9.61	23.78	15.80	14.70
						1979						
N	7	7	7	7	7	7	7	7	7	7	7	77
MIN	0.20	0.25	0.25	0.20	0.21	0.20	0.28	0.19	0.18	0.23	0.23	0.18
MAX	39.46	12.63	35.91	92.48	15.61	59.16	87.06	78.37	92.19	142.37	361.65	361.65
MEAN	6.49	3.01	6.67	15.40	4.89	11.41	15.97	12.44	14.95	23.88	82.14	17.93

TABLE 2.4-6

Mean densities of total zooplankton (no./liter) at Stations 601-611 in Conowingo Pond, January-June 1967-1979.

Station	601	602	603	604	605	606	607	608	609	610	611	Mean
1967	76.4	187.6	196.2	139.0	108.9	108.2	92.4	133.2	-	-	-	130.2
N	2	2	2	2	2	2	2	2	-	-	-	16
1968	0.4	0.8	0.4	0.4	-	-	-	-	6.7	7.6	15.4	4.8
N	2	1	2	2	-	-	-	-	2	2	2	13
1969	30.8	19.1	16.2	-	42.5	46.7	69.0	13.9	71.8	71.4	-	46.7
N	2	2	2	-	2	4	1	2	2	2	-	19
1970	7.4	3.3	4.7	8.8	8.7	8.8	27.2	7.2	15.7	82.5	63.1	20.8
N	4	4	4	4	6	6	6	4	4	4	4	50
1971	1.0	0.4	0.5	1.3	0.4	0.4	0.8	0.3	0.2	1.0	1.1	0.6
N	1	1	1	1	1	1	1	1	2	1	1	12
1972	1.4	0.2	0.3	0.3	0.5	0.3	0.5	0.3	1.2	4.7	4.9	1.3
N	8	8	8	8	8	8	8	8	8	8	8	88
1973	0.7	0.4	0.7	2.1	2.2	1.2	2.0	1.2	3.9	11.5	7.2	3.0
N	10	10	10	10	10	10	10	10	10	10	10	110
1974	18.2	24.9	31.3	26.6	18.4	22.2	39.2	24.9	30.5	47.7	71.0	32.3
N	9	9	9	9	9	9	9	9	9	9	9	99
1975	0.9	0.7	1.8	7.6	2.2	1.6	6.6	1.3	2.4	3.3	10.9	3.6
N	8	8	8	8	8	8	8	8	8	8	8	88
1976	1.3	1.4	1.8	2.2	1.6	2.5	3.1	2.0	2.6	3.3	21.4	3.9
N	8	8	8	8	8	8	8	8	8	8	8	88
1977	24.6	16.3	29.4	63.0	38.6	60.5	47.3	40.2	93.2	76.9	66.9	50.6
N	8	8	8	8	8	8	8	8	8	8	8	88
1978	1.6	2.3	5.2	20.9	5.0	17.3	7.0	7.5	11.3	25.2	14.3	10.7
N	6	6	6	6	6	6	6	6	6	6	6	66
1979	6.5	3.0	6.7	15.4	4.9	11.4	16.0	12.4	14.9	23.9	82.1	17.9
N	7	7	7	7	7	7	7	7	7	7	7	77

TABLE 2.4-7

COMPARISON OF THE MONTHLY MINIMUM, MAXIMUM AND MEAN DENSITIES OF COMMON TAXA FROM JANUARY-JUNE DURING PREOPERATIONAL (1967-1973) AND POST-OPERATIONAL (1979) PERIODS IN CONOWINGO POND.

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JAN-JUN
			NAUPLII				
1967-1973							
N	22	22	26	47	55	136	308
MIN	0.03	0.01	0.01	0.01	0.05	0.02	0.01
MAX	0.16	0.09	0.31	0.47	1.02	160.13	160.13
MEAN	0.06	0.04	0.07	0.14	0.25	10.83	4.86
1979							
N	-	-	11	22	22	22	77
MIN	-	-	0.14	0.17	0.92	0.35	0.14
MAX	-	-	0.23	1.08	23.78	172.54	172.54
MEAN	-	-	0.17	0.53	3.35	28.94	9.40
			CYCLOPOID COPEPODIDS				
1967-1973							
N	22	22	26	47	55	136	308
MIN	**	0.01	**	**	0.01	0.03	**
MAX	0.03	0.05	0.05	0.16	0.23	58.06	58.06
MEAN	0.01	0.02	0.02	0.03	0.07	5.09	2.27
1979							
N	-	-	11	22	22	22	77
MIN	-	-	0.02	0.01	0.11	0.10	0.01
MAX	-	-	0.05	0.09	10.69	30.98	30.98
MEAN	-	-	0.04	0.03	1.08	4.13	1.50
			C. VERNALIS				
1967-1973							
N	22	22	26	47	55	136	308
MIN	0.00	0.00	**	0.00	**	**	0.00
MAX	0.00	0.00	**	0.06	0.01	41.79	41.79
MEAN	**	0.00	**	**	**	1.21	0.53
1979							
N	-	-	11	22	22	22	77
MIN	-	-	0	0	0.00	0.00	0.00
MAX	-	-	**	0	0.69	5.88	5.88
MEAN	-	-	**	0	0.04	0.63	0.19

TABLE 2.4-7

Continued.

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JAN-JUN
			DAPHNIA SPP.				
1967-1973							
N	22	22	26	47	55	136	309
MIN	0.00	0.00	**	0.00	**	**	0.00
MAX	**	**	**	0.01	0.17	93.11	93.11
MEAN	**	**	**	**	0.01	4.46	1.97
1979							
N	-	-	11	22	22	22	77
MIN	-	-	0	0	0.00	0.00	0.00
MAX	-	-	0	0.01	8.96	136.75	136.75
MEAN	-	-	0	**	0.48	10.14	3.04
			B. LONGIROSTRIS				
1967-1973							
N	22	22	26	47	55	136	308
MIN	**	**	**	**	**	**	**
MAX	0.03	0.01	0.02	0.31	2.58	42.73	42.73
MEAN	0.01	0.01	**	0.03	0.23	3.28	1.50
1979							
N	-	-	11	22	22	22	77
MIN	-	-	0	0	0.04	0.02	0.00
MAX	-	-	0.01	0.08	136.49	7.55	136.49
MEAN	-	-	0.01	0.01	7.88	1.51	2.69
			D. LEUCHTENBERGIANUM				
1967-1973							
N	22	22	26	47	55	136	308
MIN	**	**	**	**	**	**	**
MAX	0.03	0.01	0.02	**	0.01	19.20	42.73
MEAN	0.01	0.01	**	**	**	2.14	1.50
1979							
N	-	-	11	22	22	22	77
MIN	-	-	0	0.00	0.00	0.00	0.00
MAX	-	-	0	0.01	0.35	18.18	18.18
MEAN	-	-	0	**	0.02	2.65	0.76

** Less than 0.01

1400 069

TABLE 2.4-8

COMPARISON OF THE MINIMUM, MAXIMUM AND MEAN DENSITIES OF COMMON TAXA FROM JANUARY-JUNE AT STATIONS 601-611 DURING PREOPERATIONAL (1967-1973) AND POSTOPERATIONAL PERIODS (1979) IN CONOWINGO POND.

STATION	601	602	603	604	605	606	607	608	609	610	611	601-611
						NAUPLII						
1967-1973												
N	29	28	29	27	29	29	31	26	28	27	25	308
MIN	0.02	0.01	0.02	0.02	0.01	0.01	0.01	0.02	0.02	0.03	0.02	0.01
MAX	32.90	55.97	160.13	59.30	52.41	60.78	85.83	52.78	76.99	56.57	31.62	160.13
MEAN	3.52	4.33	7.55	4.45	4.63	4.39	7.99	3.71	4.19	5.26	2.23	4.86
1979												
N	7	7	7	7	7	7	7	7	7	7	7	77
MIN	0.16	0.20	0.20	0.16	0.17	0.16	0.21	0.15	0.14	0.17	0.14	0.14
MAX	28.70	4.69	25.54	52.24	10.98	42.02	48.56	58.59	83.02	86.72	172.54	172.54
MEAN	4.78	1.60	4.52	8.75	2.18	7.48	8.71	9.08	12.79	14.22	29.29	9.40
						CYCLOPOID COPEPODIDS						
1967-1973												
N	29	28	29	27	29	29	31	26	28	27	25	308
MIN	0.01	**	0.01	**	0.01	**	0.01	0.01	0.01	0.01	**	**
MAX	16.50	17.47	58.06	13.88	27.92	26.12	47.07	16.69	16.23	29.12	14.07	58.06
MEAN	1.67	1.70	3.18	1.63	2.58	2.31	4.10	2.21	1.25	2.34	1.68	2.37
1979												
N	7	7	7	7	7	7	7	7	7	7	7	77
MIN	0.02	0.02	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.04	0.02	0.01
MAX	5.38	2.44	4.88	3.77	2.10	7.36	3.39	4.85	4.21	13.01	30.98	30.98
MEAN	0.89	0.51	0.87	0.92	0.45	1.55	0.98	0.87	0.81	2.22	6.44	1.50
						C. VERNALIS						
1967-1973												
N	29	28	29	27	29	29	31	26	28	27	25	308
MIN	**	**	**	0.01	**	0.00	**	0.06	**	**	0.00	0.00
MAX	8.92	9.53	41.79	11.10	7.29	4.85	4.72	7.37	1.51	8.83	4.92	41.79
MEAN	0.48	0.48	1.64	0.53	0.40	0.36	0.57	0.37	0.12	0.56	0.29	0.53
1979												
N	7	7	7	7	7	7	7	7	7	7	7	77
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**	0.00
MAX	1.30	0.17	0.39	1.03	0.39	0.31	1.13	0.62	0.11	1.21	5.88	5.88
MEAN	0.19	0.02	0.07	0.15	0.06	0.05	0.20	0.09	0.02	0.23	1.04	0.19

TABLE 2.4-8

Continued.

STATION	601	602	603	604	605	606	607	608	609	610	611	601-611
DAPHNIA SPP.												
1967-1973												
N	29	28	29	27	29	29	31	26	28	27	25	308
MIN	0.00	**	**	**	**	0.00	**	0.00	**	0.00	0.00	0.00
MAX	1.40	2.05	2.00	3.86	4.07	2.00	51.85	6.50	29.22	93.11	44.42	93.11
MEAN	.29	0.18	0.28	0.56	0.27	0.35	2.86	0.38	1.78	10.06	5.29	1.97
1979												
N	7	7	7	7	7	7	7	7	7	7	7	77
MIN	0.01	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MAX	1.36	0.28	2.32	12.80	0.22	2.41	22.58	8.96	3.67	24.81	136.75	136.75
MEAN	0.20	0.04	0.43	1.93	0.06	0.42	3.42	1.30	0.56	3.63	21.40	3.04
B. LONGIROSTRIS												
1967-1973												
N	29	28	29	27	29	29	31	26	28	27	25	308
MIN	**	**	**	**	**	**	**	**	**	**	**	**
MAX	5.15	15.59	14.42	12.42	34.51	12.08	51.85	28.30	29.48	42.73	35.15	42.73
MEAN	0.62	0.67	0.59	0.93	1.46	0.80	2.17	1.38	1.37	2.85	3.90	1.50
1979												
N	7	7	7	7	7	7	7	7	7	7	7	77
MIN	0.00	0.00	0.00	0.00	0.00	**	0.01	0.00	0.00	0.01	0.00	0.00
MAX	0.65	0.50	1.22	2.06	12.20	4.59	4.05	1.52	2.57	7.23	136.49	136.49
MEAN	0.12	0.13	0.27	0.57	1.92	0.93	0.84	0.42	0.58	2.09	21.71	2.69
D. LEUCHTENBERGIANUM												
1967-1973												
N	29	28	29	27	29	29	31	26	28	27	25	308
MIN	0.01	**	**	0.01	**	**	0.01	**	**	**	**	0.00
MAX	8.82	8.47	1.19	13.48	15.07	15.43	19.20	3.88	6.58	13.24	18.56	19.20
MEAN	0.44	0.56	0.12	0.68	1.27	0.94	1.59	0.31	0.66	2.07	1.84	0.95
1979												
N	7	7	7	7	7	7	7	7	7	7	7	77
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MAX	1.48	4.52	2.01	18.18	0.68	4.64	9.26	3.11	0.32	7.23	1.75	18.18
MEAN	0.21	0.65	0.37	2.71	0.12	0.76	1.51	0.45	0.08	1.09	0.45	0.76

** Less than 0.01

2.5 BENTHOS

2.5.1 Methods of Analysis

The methods of analysis to describe the benthic community in Conowingo Pond are similar to those presented earlier (I.A., P.B.A.P.S. Preoperational Report, 1974). Comparisons were made of the monthly mean density and biomass data of the common taxa of the preoperational (1967-1973) and the 1979 postoperational periods. Monthly mean species diversity and percent similarity between stations were examined for both periods. A phylogenetic listing of the taxa collected in Conowingo Pond, 1967-1979 is given in Table 2.5-1.

2.5.2 Results

2.5.2.1 Species Composition

A total of 37 taxa or life stages was collected from Conowingo Pond in 1979 (Tables 2.5-2 and 2.5-3). As in the preoperational period, midges and tubificids comprised about one-half of the number of taxa collected but accounted for over 98% by number and 91% by weight of the total benthic fauna. The common taxa in order of decreasing abundance were Limnodrilus hoffmeisteri, Chironomus decorus and Procladius sp. (complex). Although Coelotanypus concinnus, Chaoborus punctipennis and Ilyodrilus templetoni were sparsely represented in this postoperational period (1979), their mean density and biomass data were compared with that from the preoperational period since these species have often been abundant in the benthic fauna of Conowingo Pond.

2.5.2.2 Faunal Diversity

Monthly mean diversity values were calculated for the benthic organisms collected during the preoperational and postoperational periods (Table 2.5-4). Except for April, the postoperational mean diversity values were similar or slightly higher than those observed in the preoperational period. The overall mean diversity indicated that the benthic fauna remained stable in the postoperational period.

2.5.2.3 Distribution and Abundance

The abundance of the six common taxa (as percentage of total number collected) varied between months and stations in the postoperational period (Tables 2.5-2 and 2.5-3). Procladius sp. (complex), L. hoffmeisteri and C. decorus comprised 93.7% by number and 89.7% by weight of the total benthic fauna. The other common taxa were sparsely represented in the postoperational period averaging less than one organism per 81 sq. in.

Since the densities of the six common taxa comprised the bulk of the benthic fauna, the monthly mean density of these organisms in the preoperational and postoperational periods were compared (Table 2.5-5). Although changes in sieve size in 1971 and 1975 (see Section 2.1) does affect comparisons of density and biomass between preoperational and postoperational periods, no substantial changes in the following basic conclusions were found. Densities of Procladius sp. (complex), L. hoffmeisteri and C. decorus in the postoperational period were more than twice those of the preoperational period. Postoperational densities of

C. punctipennis and C. concinnus were slightly less than those in the preoperational period whereas those of I. templetoni were slightly greater. Hexagenia limbata, although uncommon, is designated as a "representative, important species" (letter dated 2 January 1975 from H. R. Preston, U.S. Environmental Protection Agency addressed to W. E. Rosengarten, Jr., Environmental Engineering Section, Philadelphia Electric Company) for Conowingo Pond and thus its preoperational and postoperational data are provided herein.

The monthly postoperational biomass (mean dry weight) of the common benthic organisms was also compared to that in the preoperational period (Table 2.5-6). The overall biomass of Procladius sp. (complex) was slightly higher in the postoperational period. Overall, the biomass of L. hoffmeisteri, C. decorus and H. limbata was more than twice as high as that observed in the preoperational period. The overall biomass of I. templetoni, C. punctipennis and C. concinnus was lower in the postoperational period.

Comparison of mean density of the six common taxa at Stations 601-611 during the preoperational and postoperational periods is shown in Table 2.5-7. The densities of L. hoffmeisteri, Procladius sp. (complex) and C. decorus were higher at most stations in the postoperational period. C. punctipennis was collected only at Station 611 in the postoperational period. C. concinnus was absent or low in abundance at all stations in the postoperational period. The density of I. templetoni at most

stations fluctuated during both periods. H. limbata was found infrequently in the Pond in both periods.

Comparison of mean biomass by station for the six common taxa between the preoperational and postoperational periods is given in Table 2.5-8. The biomass of Procladius sp. (complex), L. hoffmeisteri and C. decorus increased at most stations in the postoperational period. The variations in biomass of the other taxa between the two periods were similar to the trends noted above for densities.

Most stations were not subjected to the thermal influence of the operation of Peach Bottom Atomic Power Station. However, Station 605, located in the discharge, was subject to scouring of the bottom and increases in water temperature. Of the six common taxa, only L. hoffmeisteri and C. decorus were collected at Station 605 (Table 2.5-3).

2.5.2.4 Faunal Similarity

Percent similarity (PS_c) indices between the control and other stations were calculated for January through June, 1967-1979 (Table 2.5-9). In 1979 all PS_c values were in the intermediate to high affinity range (>50% similarity). Station 605, located in the discharge, showed an intermediate similarity to control Station 601 in 1978. These values indicate that the benthic fauna remained similar in the postoperational period.

2.5.2.5 Biomass

The total biomass of benthic organisms varied slightly between months in this period (Table 2.5-10). The 1979

postoperational biomass was highest in June (32.791 mg) but was within the range observed in the preoperational period. The highest biomass (43.016 mg) was noted in December 1969 and the lowest (2.831 mg) in August 1972. The low value was most likely the result of excessive flooding which accompanied Tropical Storm Agnes in June 1972 (I.A., P.B.A.P.S. Preoperational Report, 1974). A comparison of the monthly total benthic biomass between the two periods did not reveal any consistent trends.

TABLE 2.5-1

List of benthic organisms collected in Conowingo Pond, 1967-1979.

Platyhelminthes
- Planariidae
  - Dugesia sp.
- Plagiostomidae
  - Hydrolimax grisea

Nematoda

Bryozoa
- Plumatellidae
  - Plumatella sp. (Statoblasts observed)
- Lophopodidae
  - Lophopodella carteri (Statoblasts observed)
  - Pectinatella magnifica (Statoblasts observed)

Mollusca
- Pelecypoda
  - Sphaeriidae
    - Pisidium sp.
    - Sphaerium sp.
  - Unionidae
    - Anodonta imbecillus
    - A. cataracta
    - Elliptio complanata
- Gastropoda
  - Lymnaeidae
    - Stagnicola sp.
  - Physidae
    - Physa sp.
  - Ancylidae

Annelida
- Oligochaeta
  - Tubificidae
    - Branchiura sowerbyi
    - Limnodrilus hoffmeisteri
    - Ilyodrilus templetoni
    - Pelescolex mutisetosus
- Polychaeta
- Hirudinea

Arthropoda
- Crustacea
  - Isopoda
    - Asellus militaris
  - Amphipoda
    - Gammaridae
      - Gammarus fasciatus
    - Talitridae
      - Hyalella azteca
- Arachmoidea
  - Hydracarina

continued

TABLE 2.5-1

Continued.

Insecta
- Plecoptera
  - Nemouridae
    - Taeniopteryx sp.
- Ephemeroptera
  - Baetidae
    - Baetis sp.
  - Ephemeridae
    - Hexagenia limbata
  - Caenidae
    - Caenis sp.
  - Heptageniidae
  - Ephemerellidae
- Odonata
  - Libelluilidae
  - Gomphidae
    - Gomphus sp.
- Hemiptera
  - Mesoveliidae
    - Mesovelia mulsanti
- Megaloptera
  - Sialidae
    - Sialis sp.
- Tricoptera
  - Leptoceridae
    - Oecetis sp.
  - Psychomyiidae
    - Neureclipsis sp.
  - Hydropsychidae
    - Cheumatopsyche sp.
    - Hydropsyche sp.
  - Polycentropodidae
    - Cyrnellus sp.
- Lepidoptera
  - Pyralididae
- Coleoptera
  - Elmidae
  - Dytiscidae
  - Hydrophilidae
    - Berosus sp.
- Diptera
  - Chaoboridae
    - Chaoborus pupae
    - C. punctipennis
  - Ceratopogonidae
  - Chironomidae
    - Pupae
    - Procladius sp. (complex)
    - P. riparius
    - P. culiciformis
    - P. rubellus
    - Anatopynia sp. (1)
    - Tanytarsus sp. (1)
    - Chironomus sp.
    - C. decorus
    - C. (Dicrotendipes) sp.
    - Tribelos sp.

continued

TABLE 2.5-1

Continued.

	Crytochironomus fulvus
	Paracladopelma sp.
	Harnischia sp.
	H. nr nais
	H. amachaerus
	Pentaneura sp. E
	Ablabesmyia sp.
	Polypedilum halterale
	Polypedilum sp. 1
	P. fallax
	Coelotanypus concinnus
	Limnochironomus sp. (1)
	L. fumigus
	L. modestus
	Calopsectra sp. 5
	Glytotendipes sp.
	Orthocladius sp.
	Microtendipes sp.
	Psectrocladius sp.
	Trichocladius sp.
	Microchironomus sp.
	Pseudochironomus sp.
	Cricotopus sp.
	Stenochironomus sp.
Anthomyiidae	
Sciaridae	
Simuliidae	
	Simulium sp.
Tipulidae	

TABLE 2.5-2

MEAN NUMBER & MEAN DRY WEIGHT (MG) PER 81 SQ. IN. & PERCENTAGE COMPOSITION BY TOTAL NUMBER & TOTAL WEIGHT FOR BENTHIC ORGANISMS COLLECTED AT STATIONS 601-611 IN CONOWINGO POND, MAR-JUN 1979. DASHES INDICATE NO SAMPLE COLLECTED. SIX MOST COMMON TAXA LISTED FIRST - REMAINDER LISTED PHYLOGENETICALLY.

MONTH NO. SAMPLES	JAN 0	FEB 0	MAR 11	APR 22	MAY 22	JUN 22	TOTAL 77
PROCLADIUS SP.(COMPLEX)							
MEAN NO.	-	-	13.45	16.18	12.77	22.55	16.64
MEAN WGT.	-	-	0.380	0.762	1.017	1.489	0.988
% NO.	-	-	18.6	20.6	24.5	13.3	17.3
% WGT.	-	-	1.5	2.7	6.2	4.5	3.8
LIMNODRILUS HOFFMEISTERI							
MEAN NO.	-	-	38.18	45.55	24.00	91.14	51.36
MEAN WGT.	-	-	10.216	13.972	8.254	16.181	12.433
% NO.	-	-	52.9	57.9	46.1	53.9	53.[illegible]
% WGT.	-	-	39.4	48.7	50.7	49.3	4[illegible].0
CHIRONOMUS DECORUS							
MEAN NO.	-	-	14.73	13.41	12.23	44.05	22.01
MEAN WGT.	-	-	14.054	11.857	3.850	11.681	9.833
% NO.	-	-	20.4	17.0	23.5	26.1	22.9
% WGT.	-	-	54.2	41.3	23.7	35.6	37.9
ILYODRILUS TEMPLETONI	-	-					
MEAN NO.	-	-	1.73	1.09	0.23	3.18	1.53
MEAN WGT.	-	-	0.083	0.067	0.027	0.143	0.080
% NO.	-	-	2.4	1.4	0.4	1.9	1.6
% WGT.			0.3	0.2	0.2	0.4	0.3
COELOTANYPUS CONCINNUS	-	-					
MEAN NO.	-	-	0.55	0.05	0	0.05	0.10
MEAN WGT.	-	-	0.056	0.005	0	0.016	0.014
% NO.	-	-	0.8	0.1	0	TR	0.1
% WGT.			0.2	TR	0	TR	0.1
CHAOBORUS PUNCTIPENNIS	-	-					
MEAN NO.	-	-	0.27	0.09	0.05	0	0.08
MEAN WGT.	-	-	0.029	0.009	0.005	0	0.008
% NO.	-	-	0.4	0.1	0.1	0	0.1
% WGT.			0.1	TR	TR	0	TR
NEMATODA	-	-					
MEAN NO.	-	-	0.27	0.09	0	1.86	0.60
MEAN WGT.	-	-	0.018	0.009	0	0.116	0.038
% NO.	-	-	0.4	0.1	0	1.1	0.6
% WGT.			0.1	TR	0	0.4	0.1
SPHAERIUM SP.	-	-					
MEAN NO.	-	-	0.36	0.05	0.05	0.09	0.10
MEAN WGT.	-	-	0.228	0.019	0.016	0.528	0.193
% NO.	-	-	0.5	0.1	0.1	0.1	0.1
% WGT.			0.9	0.1	0.1	1.6	0.7

1400 080

TABLE 2.5-2

CONTINUED

MONTH NO. SAMPLES	JAN 0	FEB 0	MAR 11	APR 22	MAY 22	JUN 22	TOTAL 77
GASTROPODA							
MEAN NO.	-	-	0	0.09	0	0	0.03
MEAN WGT.	-	-	0	1.574	0	0	0.450
% NO.	-	-	0	0.1	0	0	TR
% WGT.	-	-	0	5.5	0	0	1.7
ANCYLIDAE							
MEAN NO.	-	-	0	0.05	0	0	0.01
MEAN WGT.	-	-	0	0.010	0	0	0.003
% NO.	-	-	0	0.1	0	0	TR
% WGT.	-	-	0	TR	0	0	TR
BRANCHIURA SOWERBYI							
MEAN NO.	-	-	0	0	0.09	0.09	0.05
MEAN WGT.	-	-	0	0	0.135	0.018	0.044
% NO.	-	-	0	0	0.2	0.1	0.1
% WGT.	-	-	0	0	0.8	0.1	0.2
GAMMARUS FASCIATUS							
MEAN NO.	-	-	0.09	0	0	0.50	0.16
MEAN WGT.	-	-	0.022	0	0	0.051	0.018
% NO.	-	-	0.1	0	0	0.3	0.2
% WGT.	-	-	0.1	0	0	0.2	0.1
HEXAGENIA LIMBATA							
MEAN NO.	-	-	0.09	0	0.18	0.14	0.10
MEAN WGT.	-	-	0.311	0	2.606	1.979	1.354
% NO.	-	-	0.1	0	0.3	0.1	0.1
% WGT.	-	-	1.2	0	16.0	6.0	5.2
SIALIS SP.							
MEAN NO.	-	-	0	0	0	0.05	0.01
MEAN WGT.	-	-	0	0	0	0.001	**
% NO.	-	-	0	0	0	TR	TR
% WGT.	-	-	0	0	0	TR	TR
CHEUMATOPSYCHE SP.							
MEAN NO.	-	-	0.09	0.05	0	0	0.03
MEAN WGT.	-	-	0.008	0.009	0	0	0.004
% NO.	-	-	0.1	0.1	0	0	TR
% WGT.	-	-	TR	TR	0	0	TR
ELMIDAE							
MEAN NO.	-	-	0.36	0.14	0.14	0.05	0.14
MEAN WGT.	-	-	0.076	0.034	0.029	0.048	0.043
% NO.	-	-	0.5	0.2	0.3	TR	0.1
% WGT.	-	-	0.3	0.1	0.2	0.1	0.2

1400 081

TABLE 2.5-2

CONTINUED

MONTH NO. SAMPLES	JAN 0	FEB 0	MAR 11	APR 22	MAY 22	JUN 22	TOTAL 77
HYDROPHILIDAE							
MEAN NO.	-	-	0	0.09	0.05	0	0.04
MEAN WGT.	-	-	0	0.026	**	0	0.008
% NO.	-	-	0	0.1	0.1	0	TR
% WGT.	-	-	0	0.1	TR	0	TR
CHAOBORUS PUPAE							
MEAN NO.	-	-	0	0	0	0.05	0.01
MEAN WGT.	-	-	0	0	0	0.002	**
% NO.	-	-	0	0	0	TR	TR
% WGT.	-	-	0	0	0	TR	TR
CERATOPOGONIDAE							
MEAN NO.	-		0	0.09	0.05	0	0.04
MEAN WGT.	-	-	0	0.003	0.001	0	0.001
% NO.	-	-	0	0.1	0.1	0	TR
% WGT.	-	-	0	TR	TR	0	TR
CHIRONOMID PUPAE							
MEAN NO.	-	-	0.18	0.14	0.41	1.09	0.49
MEAN WGT.	-	-	0.041	0.109	0.188	0.248	0.162
% NO.	-	-	0.3	0.2	0.8	0.6	0.5
% WGT.	-	-	0.2	0.4	1.2	0.8	0.6
TANYTARSUS SP.							
MEAN NO.	-	-	0	0	0	0.36	0.10
MEAN WGT.	-	-	0	0	0	0.006	0.002
% NO.	-	-	0	0	0	0.2	0.1
% WGT.	-	-	0	0	0	TR	TR
CHIRONOMUS SP.							
MEAN NO.	-	-	0.09	0	0	0	0.01
MEAN WGT.	-	-	0.009	0	0	0	0.001
% NO.	-	-	0.1	0	0	0	TR
% WGT.	-	-	TR	0	0	0	TR
DICROTENDIPES SP.							
MEAN NO.	-	-	0.18	0.18	0	0.59	0.25
MEAN WGT.	-	-	0.051	0.009	0	0.092	0.036
% NO.	-	-	0.3	0.2	0	0.3	0.3
% WGT.	-	-	0.2	TR	0	0.3	0.1
TRIBELOS SP.							
MEAN NO.	-	-	0.09	0.09	0	0.09	0.06
MEAN WGT.	-	-	0.017	0.014	0	0.005	0.008
% NO.	-	-	0.1	0.1	0	0.1	0.1
% WGT.	-	-	0.1	TR	0	TR	TR

TABLE 2.5-2

CONTINUED

MONTH NO. SAMPLES	JAN 0	FEB 0	MAR 11	APR 22	MAY 22	JUN 22	TOTAL 77
CRYPTOCHIRONOMUS FULVUS							
MEAN NO.	-	-	0.27	0.41	0	0.36	0.26
MEAN WGT.	-	-	0.113	0.144	0	0.081	0.080
% NO.	-	-	0.4	0.5	0	0.2	0.3
% WGT.	-	-	0.4	0.5	0	0.2	0.3
HARNISCHIA AMACHAERUS							
MEAN NO.	-	-	0	0	0	0.05	0.01
MEAN WGT.	-	-	0	0	0	0.022	0.006
% NO.	-	-	0	0	0	TR	TR
% WGT.	-	-	0	0	0	0.1	TR
ABLABESMYIA SP.							
MEAN NO.	-	-	0.09	0.14	0.05	0.09	0.09
MEAN WGT.	-	-	0.024	0.012	0.003	0.005	0.009
% NO.	-	-	0.1	0.2	0.1	0.1	0.1
% WGT.	-	-	0.1	TR	TR	TR	TR
POLYPEDILUM HALTERALE							
MEAN NO.	-	-	0	0.09	0.50	1.45	0.58
MEAN WGT.	-	-	0	0.005	0.041	0.049	0.027
% NO.	-	-	0	0.1	1.0	0.9	0.6
% WGT.	-	-	0	TR	0.3	0.2	0.1
POLYPEDILUM SP.#1							
MEAN NO.	-	-	0.09	0.09	0	0	0.04
MEAN WGT.	-	-	0.018	0.009	0	0	0.005
% NO.	-	-	0.1	0.1	0	0	TR
% WGT.	-	-	0.1	TR	0	0	TR
ORTHOCLADIUS SP.							
MEAN NO.	-	-	0.91	0.41	0.77	0	0.47
MEAN WGT.	-	-	0.140	0.011	0.054	0	0.039
% NO.	-	-	1.3	0.5	1.5	0	0.5
% WGT.	-	-	0.5	TR	0.3	0	0.1
PSECTROCLADIUS SP.							
MEAN NO.	-	-	0	0	0	0.36	0.10
MEAN WGT.	-	-	0	0	0	0.002	**
% NO.	-	-	0	0	0	0.2	0.1
% WGT.	-	-	0	0	0	TR	TR
CRICOPTOPUS SP.							
MEAN NO.	-	-	0	0	0.09	0	0.03
MEAN WGT.	-	-	0	0	0.007	0	0.002
% NO.	-	-	0	0	0.2	0	TR
% WGT.	-	-	0	0	TR	0	TR

TABLE 2.5-2

CONTINUED

MONTH NO. SAMPLES	JAN 0	FEB 0	MAR 11	APR 22	MAY 22	JUN 22	TOTAL 77
STENOCHIRONOMUS SP.							
MEAN NO.	-	-	0	0	0.05	0	0.01
MEAN WGT.	-	-	0	0	0.022	0	0.006
% NO.	-	-	0	0	0.1	0	TR
% WGT.	-	-	0	0	0.1	0	TR
MICROCHIRONOMUS SP.							
MEAN NO.	-	-	0	0	0.23	0.73	0.27
MEAN WGT.	-	-	0	0	0.007	0.018	0.007
% NO.	-	-	0	0	0.4	0.4	0.3
% WGT.	-	-	0	0	TR	0.1	TR
PSEUDOCHIRONOMUS							
MEAN NO.	-	-	0.09	0	0	0.05	0.03
MEAN WGT.	-	-	0.044	0	0	0.008	0.009
% NO.	-	-	0.1	0	0	TR	TR
% WGT.	-	-	0.2	0	0	TR	TR
TIPULIDAE							
MEAN NO.	-	-	0	0.14	0.09	0	0.06
MEAN WGT.	-	-	0	0.026	0.002	0	0.008
% NO.	-	-	0	0.2	0.2	0	0.1
% WGT.	-	-	0	0.1	TR	0	TR
SCIARIDAE							
MEAN NO.	-	-	0	0	0.05	0	0.01
MEAN WGT.	-	-	0	0	0.003	0	**
% NO.	-	-	0	0	0.1	0	TR
% WGT.	-	-	0	0	TR	0	TR
MEAN NO.	-	-	72.18	78.68	52.05	169.00	95.95
MEAN WGT.	-	-	25.945	28.695	16.267	32.791	25.921
% NO.	-	-	100.0	100.0	100.0	100.0	100.0
% WGT.	-	-	100.0	100.0	100.0	100.0	100.0

TR - < 0.1
** - < 0.001

1400 084

TABLE 2.5-3

MEAN NUMBER & MEAN DRY WEIGHT (MG) PER 81 SQ. IN. & PERCENTAGE COMPOSITION BY TOTAL NUMBER & TOTAL WEIGHT FOR BENTHIC ORGANISMS COLLECTED AT STATIONS 601-611 IN CONOWINGO POND, MAR-JUN 1979. DASHES INDICATE NO WEIGHT MEASUREMENTS MADE. SIX MOST COMMON TAXA LISTED FIRST - REMAINDER LISTED PHYLOGENETICALLY.

STATION NO. SAMPLES	601 7	602 7	603 7	604 7	605 7	606 7	607 7	608 7	609 7	610 7	611 7	TOTAL 77
PROCLADIUS SP.(COMPLEX)												
MEAN NO.	4.29	22.57	2.86	4.14	0	9.14	15.14	21.00	18.14	22.29	63.43	16.64
MEAN WGT.	0.433	1.318	0.265	0.353	0	0.740	0.558	1.382	1.019	1.790	3.422	0.988
% NO.	4.4	18.1	4.8	6.2	0	9.1	12.1	22.2	17.8	23.5	39.5	17.3
% WGT.	1.6	3.3	1.5	1.8	0	3.9	2.5	4.2	4.3	6.5	6.1	3.8
LIMNODRILUS HOFFMEISTERI												
MEAN NO.	59.00	59.29	30.71	39.14	15.57	64.29	76.57	43.00	53.57	40.57	83.29	51.36
MEAN WGT.	12.228	11.254	7.128	8.335	2.854	9.650	10.813	9.285	11.295	7.332	46.587	12.433
% NO.	59.9	47.5	51.9	58.5	53.2	64.2	67.3	45.4	52.7	42.7	51.9	53.5
% WGT.	46.4	28.1	40.8	43.0	44.4	51.3	48.1	28.0	47.9	34.6	82.8	48.0
CHIRONOMUS DECORUS												
MEAN NO.	32.14	37.57	22.14	19.57	0.71	24.86	24.86	23.86	26.71	27.43	2.29	22.01
MEAN WGT.	13.316	23.158	9.516	5.289	0.388	8.070	10.402	15.811	10.751	11.079	0.382	9.833
% NO.	32.7	30.1	37.4	29.3	2.4	24.8	19.9	25.2	26.3	28.9	1.4	22.9
% WGT.	50.6	57.8	54.5	27.3	6.0	42.9	46.3	47.7	45.6	52.3	0.7	37.9
ILYODRILUS TEMPLETONI												
MEAN NO.	0.29	1.86	0	0.57	0	0.14	2.14	3.57	1.00	1.43	5.86	1.53
MEAN WGT.	0.007	0.041	0	0.006	0	0.026	0.124	0.129	0.059	0.143	0.350	0.080
% NO.	0.3	1.5	0	0.9	0	0.1	1.7	3.8	1.0	1.5	3.6	1.6
% WGT.	TR	0.1	0	TR	0	0.1	0.6	0.4	0.3	0.7	0.6	0.3
COELOTANYPUS CONCINNUS												
MEAN NO.	0	0.14	0	0.14	0	0	0.71	0.14	0	0	0	0.10
MEAN WGT.	0	0.015	0	0.049	0	0	0.071	0.017	0	0	0	0.014
% NO.	0	0.1	0	0.2	0	0	0.6	0.2	0	0	0	0.1
% WGT.	0	TR	0	0.3	0	0	0.3	0.1	0	0	0	0.1
CHAOBORUS PUNCTIPENNIS												
MEAN NO.	0	0	0	0	0	0	0	0	0	0	0.86	0.08
MEAN WGT.	0	0	0	0	0	0	0	0	0	0	0.090	0.008
% NO.	0	0	0	0	0	0	0	0	0	0	0.5	0.1
% WGT.	0	0	0	0	0	0	0	0	0	0	0.2	TR
NEMATODA												
MEAN NO.	0.43	1.00	0.14	0.57	0.71	0.29	1.29	0.71	0.71	0.71	0	0.60
MEAN WGT.	0.019	0.083	0.035	0.017	0.016	0.030	0.054	0.049	0.030	0.088	0	0.038
% NO.	0.4	0.8	0.2	0.9	2.4	0.3	1.0	0.8	0.7	0.8	0	0.6
% WGT.	0.1	0.2	0.2	0.1	0.3	0.2	0.2	0.1	0.1	0.4	0	0.1
SPHAERIUM SP.												
MEAN NO.	0.14	0	0.29	0	0.71	0	0	0	0	0	0	0.10
MEAN WGT.	0.051	0	0.188	0	1.888	0	0	0	0	0	0	0.193
% NO.	0.1	0	0.5	0	2.4	0	0	0	0	0	0	0.1
% WGT.	0.2	0	1.1	0	29.-	0	0	0	0	0	0	0.7

TABLE 2.5-3

CONTINUED

STATION NO. SAMPLES	601 7	602 7	603 7	604 7	605 7	606 7	607 7	608 7	609 7	610 7	611 7	TOTAL 77
GASTROPODA												
MEAN NO.	0	0	0	0	0	0	0	0	0	0	0.29	0.03
MEAN WGT.	0	0	0	0	0	0	0	0	0	0	4.947	0.650
% NO.	0	0	0	0	0	0	0	0	0	0	0.2	TR
% WGT.	0	0	0	0	0	0	0	0	0	0	8.9	1.7
ANCYLIDAE												
MEAN NO.	0	0	0.14	0	0	0	0	0	0	0	0	0.01
MEAN WGT.	0	0	0.030	0	0	0	0	0	0	0	0	0.003
% NO.	0	0	0.2	0	0	0	0	0	0	0	0	TR
% WGT.	0	0	0.2	0	0	0	0	0	0	0	0	TR
BRANCHIURA SOWERBYI												
MEAN NO.	0	0	0	0	0.57	0	0	0	0	0	0	0.05
MEAN WGT.	0	0	0	0	0.479	0	0	0	0	0	0	0.044
% NO.	0	0	0	0	2.0	0	0	0	0	0	0	0.1
% WGT.	0	0	0	0	7.5	0	0	0	0	0	0	0.2
GAMMARUS FASCIATUS												
MEAN NO.	0	0.29	0	0	1.14	0	0	0	0	0.29	0	0.16
MEAN WGT.	0	0.036	0	0	0.114	0	0	0	0	0.045	0	0.018
% NO.	0	0.2	0	0	3.9	0	0	0	0	0.3	0	0.2
% WGT.	0	0.1	0	0	1.8	0	0	0	0	0.2	0	0.1
HEXAGENIA LIMBATA												
MEAN NO.	0.14	0.29	0	0.14	0	0	0	0.29	0	0.29	0	0.10
MEAN WGT.	0.021	3.446	0	4.688	0	0	0	6.239	0	0.505	0	1.354
% NO.	0.1	0.2	0	0.2	0	0	0	0.3	0	0.3	0	0.1
% WGT.	0.1	8.6	0	24.2	0	0	0	18.8	0	2.4	0	5.2
SIALIS SP.												
MEAN NO.	0	0	0.14	0	0	0	0	0	0	0	0	0.01
MEAN WGT.	0	0	0.005	0	0	0	0	0	0	0	0	**
% NO.	0	0	0.2	0	0	0	0	0	0	0	0	TR
% WGT.	0	0	TR	0	0	0	0	0	0	0	0	TR
CHEUMATOPSYCHE SP.												
MEAN NO.	0	0.14	0	0	0	0	0	0.14	0	0	0	0.03
MEAN WGT.	0	0.027	0	0	0	0	0	0.012	0	0	0	0.004
% NO.	0	0.1	0	0	0	0	0	0.2	0	0	0	TR
% WGT.	0	0.1	0	0	0	0	0	TR	0	0	0	TR
ELMIDAE												
MEAN NO.	0	0	0	0.14	0.14	0	0	0.29	0	0.14	0.86	0.14
MEAN WGT.	0	0	0	0.151	0.036	0	0	0.083	0	0.036	0.161	0.043
% NO.	0	0	0	0.2	0.5	0	0	0.3	0	0.2	0.5	0.1
% WGT.	0	0	0	0.8	0.6	0	0	0.3	0	0.2	0.3	0.2

TABLE 2.5-3

CONTINUED

STATION NO. SAMPLES	601 7	602 7	603 7	604 7	605 7	606 7	607 7	608 7	609 7	610 7	611 7	TOTAL 77
HYDROPHILIDAE												
MEAN NO.	0	0	0.14	0	0	0	0	0	0	0	0.29	0.04
MEAN WGT.	0	0	0.041	0	0	0	0	0	0	0	0.044	0.008
% NO.	0	0	0.2	0	0	0	0	0	0	0	0.2	TR
% WGT.	0	0	0.2	0	0	0	0	0	0	0	0.1	TR
CHAOBORUS PUPAE												
MEAN NO.	0.14	0	0	0	0	0	0	0	0	0	0	0.01
MEAN WGT.	0.006	0	0	0	0	0	0	0	0	0	0	**
% NO.	0.1	0	0	0	0	0	0	0	0	0	0	TR
% WGT.	TR	0	0	0	0	0	0	0	0	0	0	TR
CERATOPOGONIDAE												
MEAN NO.	0	0	0	0	0.14	0	0	0	0	0.29	0	0.04
MEAN WGT.	0	0	0	0	0.005	0	0	0	0	0.010	0	0.001
% NO.	0	0	0	0	0.5	0	0	0	0	0.3	0	TR
% WGT.	0	0	0	0	0.1	0	0	0	0	TR	0	TR
CHIRONOMID PUPAE												
MEAN NO.	0.43	0.57	0.14	1.00	0.29	0.29	0.86	0.14	0.57	1.00	0.14	0.49
MEAN WGT.	0.089	0.242	0.006	0.320	0.009	0.081	0.188	0.024	0.278	0.508	0.033	0.162
% NO.	0.4	0.5	0.2	1.5	1.0	0.3	0.7	0.2	0.6	1.1	0.1	0.5
% WGT.	0.3	0.6	TR	1.7	0.1	0.4	0.8	0.1	1.2	2.4	0.1	0.6
TANYTARSUS SP.												
MEAN NO.	0	0	0	0	1.14	0	0	0	0	0	0	0.10
MEAN WGT.	0	0	0	0	0.018	0	0	0	0	0	0	0.002
% NO.	0	0	0	0	3.9	0	0	0	0	0	0	0.1
% WGT.	0	0	0	0	0.3	0	0	0	0	0	0	TR
CHIRONOMUS SP.												
MEAN NO.	0	0	0	0	0	0	0.14	0	0	0	0	0.01
MEAN WGT.	0	0	0	0	0	0	0.014	0	0	0	0	0.001
% NO.	0	0	0	0	0	0	0.1	0	0	0	0	TR
% WGT.	0	0	0	0	0	0	0.1	0	0	0	0	TR
DICROTENDIPES SP.												
MEAN NO.	0.14	0.14	0.14	0	1.86	0	0	0	0	0	0.43	0.25
MEAN WGT.	0.009	0.040	0.016	0	0.290	0	0	0	0	0	0.043	0.036
% NO.	0.1	0.1	0.2	0	6.3	0	0	0	0	0	0.3	0.3
% WGT.	TR	0.1	0.1	0	4.5	0	0	0	0	0	0.1	0.1
TRIBELOS SP.												
MEAN NO.	0	0	0.14	0	0.57	0	0	0	0	0	0	0.06
MEAN WGT.	0	0	0.003	0	0.083	0	0	0	0	0	0	0.008
% NO.	0	0	0.2	0	2.0	0	0	0	0	0	0	0.1
% WGT.	0	0	TR	0	1.3	0	0	0	0	0	0	TR

TABLE 2.5-3

CONTINUED

STATION NO. SAMPLES	601 7	602 7	603 7	604 7	605 7	606 7	607 7	608 7	609 7	610 7	611 7	TOTAL 77
CRYPTOCHIRONOMUS FULVUS												
MEAN NO.	0.71	0.43	0.14	0.29	0	0	0.14	0.29	0.57	0.14	0.14	0.28
MEAN WGT.	0.076	0.353	0.011	0.112	0	0	0.067	0.091	0.143	0.031	0.001	0.050
% NO.	0.7	0.3	0.2	0.4	0	0	0.1	0.3	0.6	0.2	0.1	0.3
% WGT.	0.3	0.9	0.1	0.6	0	0	0.3	0.3	0.6	0.1	TR	0.3
HARNISCHIA AMACHAERUS												
MEAN NO.	0.14	0	0	0	0	0	0	0	0	0	0	0.01
MEAN WGT.	0.069	0	0	0	0	0	0	0	0	0	0	0.006
% NO.	0.1	0	0	0	0	0	0	0	0	0	0	TR
% WGT.	0.3	0	0	0	0	0	0	0	0	0	0	TR
ABLABESMYIA SP.												
MEAN NO.	0	0.14	0	0	0.29	0	0	0.14	0	0	0.43	0.09
MEAN WGT.	0	0.038	0	0	0.020	0	0	0.006	0	0	0.037	0.009
% NO.	0	0.1	0	0	1.0	0	0	0.2	0	0	0.3	0.1
% WGT.	0	0.1	0	0	0.3	0	0	TR	0	0	0.1	TR
POLYPEDILUM HALTERALE												
MEAN NO.	0.29	0.14	0.86	0.43	1.86	0.57	2.00	0	0.14	0.14	0	0.58
MEAN WGT.	0.007	0.001	0.060	0.030	0.013	0.050	0.122	0	0.010	0.008	0	0.027
% NO.	0.3	0.1	1.4	0.6	6.3	0.6	1.6	0	0.1	0.2	0	0.6
% WGT.	TR	TR	0.3	0.2	0.2	0.3	0.5	0	TR	TR	0	0.1
POLYPEDILUM SP.B1												
MEAN NO.	0	0	0.29	0	0.14	0	0	0	0	0	0	0.04
MEAN WGT.	0	0	0.028	0	0.028	0	0	0	0	0	0	0.005
% NO.	0	0	0.5	0	0.5	0	0	0	0	0	0	TR
% WGT.	0	0	0.2	0	0.4	0	0	0	0	0	0	TR
ORTHOCLADIUS SP.												
MEAN NO.	0	0.14	0.14	0	2.14	0.14	0.29	0.29	0.29	0	1.71	0.47
MEAN WGT.	0	0.001	0.021	0	0.150	0.096	0.022	0.018	0.015	0	0.105	0.039
% NO.	0	0.1	0.2	0	7.3	0.1	0.2	0.3	0.3	0	1.1	0.5
% WGT.	0	TR	0.1	0	2.3	0.5	0.1	0.1	0.1	0	0.2	0.1
PSECTROCLADIUS SP.												
MEAN NO.	0	0	0	0	1.14	0	0	0	0	0	0	0.10
MEAN WGT.	0	0	0	0	0.006	0	0	0	0	0	0	**
% NO.	0	0	0	0	3.9	0	0	0	0	0	0	0.1
% WGT.	0	0	0	0	0.1	0	0	0	0	0	0	TR
CRICOTOPUS SP.												
MEAN NO.	0	0	0	0	0	0.29	0	0	0	0	0	0.03
MEAN WGT.	0	0	0	0	0	0.021	0	0	0	0	0	0.002
% NO.	0	0	0	0	0	0.3	0	0	0	0	0	TR
% WGT.	0	0	0	0	0	0.1	0	0	0	0	0	TR

TABLE 2.5-3

CONTINUED

STATION NO. SAMPLES	601 7	602 7	603 7	604 7	605 7	606 7	607 7	608 7	609 7	610 7	611 7	TOTAL 77
STENOCHIRONOMUS SP.												
MEAN NO.	0	0	0	0	0	0	0	0	0	0	0.14	0.01
MEAN WGT.	0	0	0	0	0	0	0	0	0	0	0.069	0.006
% NO.	0	0	0	0	0	0	0	0	0	0	0.1	TR
% WGT.	0	0	0	0	0	0	0	0	0	0	0.1	TR
MICROCHIRONOMUS SP.												
MEAN NO.	0.14	0	0.29	0.71	0	0	0.71	0.86	0	0.29	0	0.27
MEAN WGT.	0.004	0	0.006	0.018	0	0	0.026	0.021	0	0.003	0	0.007
% NO.	0.1	0	0.5	1.1	0	0	0.6	0.9	0	0.3	0	0.3
% WGT.	TR	0	TR	0.1	0	0	0.1	0.1	0	TR	0	TR
PSEUDOCHIRONOMUS												
MEAN NO.	0	0	0.14	0	0.14	0	0	0	0	0	0	0.03
MEAN WGT.	0	0	0.069	0	0.026	0	0	0	0	0	0	0.009
% NO.	0	0	0.2	0	0.5	0	0	0	0	0	0	TR
% WGT.	0	0	0.4	0	0.4	0	0	0	0	0	0	TR
TIPULIDAE												
MEAN NO.	0	0	0.29	0	0	0.14	0	0	0	0	0.29	0.06
MEAN WGT.	0	0	0.041	0	0	0.041	0	0	0	0	0.007	0.008
% NO.	0	0	0.5	0	0	0.1	0	0	0	0	0.2	0.1
% WGT.	0	0	0.2	0	0	0.2	0	0	0	0	TR	TR
SCIARIDAE												
MEAN NO.	0	0	0	0	0	0	0	0	0	0	0.14	0.01
MEAN WGT.	0	0	0	0	0	0	0	0	0	0	0.010	**
% NO.	0	0	0	0	0	0	0	0	0	0	0.1	TR
% WGT.	0	0	0	0	0	0	0	0	0	0	TR	TR
TOTAL												
MEAN NO.	98.43	124.71	59.14	66.86	29.29	100.14	124.86	94.	1' 1.71	95.00	160.57	95.95
MEAN WGT.	26.334	40.053	17.470	19.367	6.424	18.804	22.462	33.1[illegible]7	23.599	21.167	56.288	25.921
% NO.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
% WGT.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TR - < 0.1
** - < 0.001

TABLE 2.5-4

Comparison of the monthly minimum, maximum and mean diversity values for benthic organisms by number during the preoperational (1967-1973) and postoperational (1979) periods in Conowingo Pond. N represents the sample size. Dashes indicate no sample collected.

Month	Jan	Feb	Mar	Apr	May	Jun	Jan-Jun
1967-1973							
N	33	10	23	54	63	121	304
Min.	0	0	0	0	0	0	0
Max.	2.51	2.17	2.38	2.67	2.60	2.60	2.67
Mean	1.60	1.33	1.32	1.36	1.30	1.09	1.26
1979							
N	-	-	11	22	22	22	77
Min.	-	-	0.71	0	0.52	1.11	0
Max.	-	-	2.52	1.98	1.92	2.30	2.52
Mean	-	-	1.57	1.15	1.33	1.62	1.40

TABLE 2.5-5

COMPARISON OF THE MONTHLY MINIMUM, MAXIMUM AND MEAN NUMBER PER 81 SQ. IN. OF THE COMMON BENTHIC ORGANISMS DURING PREOPERATIONAL (1967-1973) AND POSTOPERATIONAL (1979) PERIODS IN CONOWINGO POND. N REPRESENTS THE SAMPLE SIZE. DASHES INDICATE NO SAMPLE TAKEN.

MONTH	JAN	FEB	MAR	APR	MAY	JUN	MEAN
1967-1973			PROCLADIUS SP.(COMPLEX)				
N	35	11	23	55	62	123	306
MIN	0	0	0	0	0	0	0
MAX	59	20	73	144	44	54	144
MEAN	10.17	4.73	16.61	9.58	9.23	7.10	9.03
1979							
N	-	-	11	22	22	22	77
MIN	-	-	0	0	0	0	0
MAX	-	-	79	191	90	80	191
MEAN	-	-	13.46	16.18	12.77	22.55	16.64
1967-1973			LIMNODRILUS HOFFMEISTERI				
N	35	11	23	55	62	123	306
MIN	0	0	0	0	0	0	0
MAX	59	17	33	92	97	115	115
MEAN	7.11	2.64	5.35	8.33	16.45	26.24	16.69
1979							
N	-	-	11	22	22	22	77
MIN	-	-	1	1	4	13	1
MAX	-	-	100	122	54	205	205
MEAN	-	-	38.18	45.55	24.00	91.14	51.36
1967-1973			CHIRONOMUS DECORUS				
N	35	11	23	55	62	123	306
MIN	0	0	0	0	0	0	0
MAX	19	14	53	37	21	29	53
MEAN	3.06	5.73	11.48	3.47	1.44	2.48	3.33
1979							
N	-	-	11	22	22	22	77
MIN	-	-	1	0	0	0	0
MAX	-	-	38	45	56	106	106
MEAN	-	-	14.73	13.41	12.23	44.05	22.01

1400 091

TABLE 2.5-5

MONTH	JAN	FEB	MAR	APR	MAY	JUN	MEAN
1967-1973			ILYODRILUS TEMPLETONI				
N	35	11	23	55	62	123	306
MIN	0	0	0	0	0	0	0
MAX	29	0	5	11	12	31	31
MEAN	4.09	0	0.52	1.07	1.15	1.30	1.45
1979							
N	-	-	11	22	22	22	77
MIN	-	-	0	0	0	0	0
MAX	-	-	10	5	4	17	17
MEAN	-	-	1.73	1.09	0.23	3.18	1.53
1967-1973			COELOTANYPUS CONCINNUS				
N	35	11	23	55	62	123	306
MIN	0	0	0	0	0	0	0
MAX	14	7	14	16	9	34	34
MEAN	2.97	0.73	1.70	2.11	1.63	2.77	2.32
1979							
N	-	-	11	22	22	22	77
MIN	-	-	0	0	0	0	0
MAX	-	-	5	1	0	1	5
MEAN	-	-	0.55	0.05	0	0.05	0.10
1967-1973			CHAOBORUS PUNCTIPENNIS				
N	35	11	23	55	62	123	306
MIN	0	0	0	0	0	0	0
MAX	23	8	16	13	10	3	23
MEAN	4.46	1.82	2.09	0.64	0.40	0.07	0.96
1979							
N	-	-	11	22	22	22	77
MIN	-	-	0	0	0	0	0
MAX	-	-	3	2	1	0	3
MEAN	-	-	0.27	0.09	0.05	0	0.08
1967-1973			HEXAGENIA LIMBATA				
N	35	11	23	55	62	123	306
MIN	0	0	0	0	0	0	0
MAX	0	0	0	10	3	3	10
MEAN	0	0	0	0.18	0.08	0.04	0.07
1979							
N	-	-	11	22	22	22	77
MIN	-	-	0	0	0	0	0
MAX	-	-	1	0	1	1	1
MEAN	-	-	0.09	0	0.18	0.14	0.10

TABLE 2.5-6

COMPARISON OF THE MONTHLY MINIMUM, MAXIMUM, AND MEAN DRY WEIGHT (MG) PER 81 SQ. IN. OF THE COMMON BENTHIC ORGANISMS DURING PREOPERATIONAL (1967-1973) AND POSTOPERATIONAL (1979) PERIODS IN IN CONOWINGO POND. N REPRESENTS THE SAMPLE SIZE. DASHES INDICATE NO SAMPLE TAKEN.

MONTH	JAN	FEB	MAR	APR	MAY	JUN	MEAN
1967-1973			PROCLADIUS SP.(COMPLEX)				
N	35	10	23	54	62	122	306
MIN	0	0	0	0	0	0	0
MAX	7.070	2.133	3.263	5.805	9.400	4.955	9.400
MEAN	0.877	0.616	0.987	0.604	1.170	0.676	0.808
1979							
N	-	-	11	22	22	22	77
MIN	-	-	0	0	0	0	0
MAX	-	-	1.730	9.005	5.370	4.073	9.005
MEAN	-	-	0.380	0.762	1.017	1.489	0.988
1967-1973			LIMNODRILUS HOFFMEISTERI				
N	35	11	23	55	62	123	306
MIN	0	0	0	0	0	0	0
MAX	24.025	29.170	19.077	28.500	30.071	43.000	43.000
MEAN	4.433	3.755	3.176	4.525	6.841	8.322	6.425
1979							
N	-	-	11	22	22	22	77
MIN	-	-	0.073	0.070	1.425	2.045	0.070
MAX	-	-	37.825	80.410	48.113	44.813	80.410
MEAN	-	-	10.216	13.972	8.254	16.181	12.433
1967-1973			CHIRONOMUS DECORUS				
N	35	11	23	55	62	123	306
MIN	0	0	0	0	0	0	0
MAX	20.792	17.530	48.445	16.584	22.980	6.645	48.445
MEAN	2.863	5.029	7.787	2.043	1.308	0.543	1.944
1979							
N	-	-	11	22	22	22	77
MIN	-	-	0.403	0	0	0	0
MAX	-	-	41.005	47.369	17.255	31.693	47.368
MEAN	-	-	14.054	11.857	3.850	11.681	9.833

1400 093

TABLE 2.5-6

Continued.

MONTH	JAN	FEB	MAR	APR	MAY	JUN	MEAN
1967-1973			ILYODRILUS TEMPLETONI				
N	35	11	23	55	62	123	306
MIN	0	0	0	0	0	0	0
MAX	3.736	0	1.163	2.632	2.036	2.538	3.736
MEAN	0.692	0	0.086	0.245	0.157	0.097	0.201
1979							
N	-	-	11	22	22	22	77
MIN	-	-	0	0	0	0	0
MAX	-	-	0.510	0.305	0.525	0.798	0.798
MEAN	-	-	0.088	0.067	0.027	0.143	0.080
1967-1973			COELOTANYPUS CONCINNUS				
N	35	10	23	55	62	123	306
MIN	0	0	0	0	0	0	0
MAX	3.195	2.705	3.170	5.265	3.503	3.230	5.265
MEAN	0.767	0.276	0.384	0.496	0.478	0.453	0.495
1979							
N	-	-	11	22	22	22	77
MIN	-	-	0	0	0	0	0
MAX	-	-	0.498	0.105	0	0.345	0.498
MEAN	-	-	0.056	0.005	0	0.016	0.014
1967-1973			CHAOBORUS PUNCTIPENNIS				
N	35	11	23	55	62	123	306
MIN	0	0	0	0	0	0	0
MAX	3.093	1.457	1.730	1.347	1.385	0.315	3.093
MEAN	0.659	0.326	0.262	0.068	0.052	0.010	0.133
1979							
N	-	-	11	22	22	22	77
MIN	-	-	0	0	0	0	0
MAX	-	-	0.320	0.208	0.103	0	0.320
MEAN	-	-	0.029	0.009	0.005	0	0.008
1967-1973			HEXAGENIA LIMBATA				
N	35	11	23	55	62	123	306
MIN	0	0	0	0	0	0	0
MAX	0	0	0	8.993	13.455	36.823	36.823
MEAN	0	0	0	0.164	0.362	0.481	0.296
1979							
N	-	-	11	22	22	22	77
MIN	-	-	0	0	0	0	0
MAX	-	-	3.423	0	32.815	42.448	42.448
MEAN	-	-	0.311	0	2.606	1.979	1.354

1400 094

TABLE 2.5-7

COMPARISON OF THE MINIMUM, MAXIMUM AND MEAN NUMBER PER 81 SQ. IN. OF THE COMMON BENTHIC ORGANI DURING PREOPERATIONAL (1967-1973) AND POSTOPERATIONAL (1979) PERIODS AT STATIONS IN CONWINGO POND. N REPRESENTS SAMPLE SIZE.

STATION	601	602	603	604	605	606	607	608	609	610	611	601-611
1967-1973					PROCLADIUS SP.(COMPLEX)							
N	30	30	27	29	29	30	31	29	24	24	23	306
MIN	0	0	0	0	0	0	0	0	1	1	0	0
MAX	20	37	8	46	48	59	34	25	48	44	144	144
MEAN	2.67	6.70	1.59	10.14	9.07	7.73	9.19	5.17	12.17	15.42	24.00	9.03
1979												
N	7	7	7	7	7	7	7	7	7	7	7	77
MIN	0	6	0	0	0	0	0	5	0	3	20	0
MAX	25	35	12	22	0	35	79	28	60	80	191	191
MEAN	4.29	22.57	2.86	4.14	0	9.14	15.14	21.00	19.14	22.29	63.43	16.64
1967-1973					LIMNODRILUS HOFFMEISTERI							
N	30	30	27	29	29	30	31	29	24	24	23	306
MIN	0	0	0	0	0	0	0	0	0	0	1	0
MAX	52	59	70	92	60	87	98	115	82	71	97	115
MEAN	11.43	16.47	12.44	15.66	9.59	19.67	16.00	19.83	18.29	12.33	35.04	16.69
1979												
N	7	7	7	7	7	7	7	7	7	7	7	77
MIN	4	17	2	24	1	2	27	13	12	2	23	1
MAX	187	166	82	71	48	205	199	90	134	118	122	205
MEAN	59.00	59.29	30.71	39.14	15.57	64.29	76.57	43.00	53.57	40.57	83.29	51.36
1967-1973					CHIRONOMUS DECORUS							
N	30	30	27	29	29	30	31	29	24	24	23	306
MIN	0	0	0	0	0	0	0	0	0	0	0	0
MAX	29	22	23	53	8	28	37	28	19	18	4	53
MEAN	4.13	3.23	1.82	5.83	1.21	3.27	6.00	3.66	3.67	2.54	0.26	3.33
1979												
N	7	7	7	7	7	7	7	7	7	7	7	77
MIN	1	2	6	2	0	1	6	3	0	1	0	0
MAX	74	106	43	56	2	81	48	72	54	86	8	106
MEAN	32.14	37.57	22.14	19.57	0.71	24.86	24.86	23.86	26.71	27.43	2.29	22.01

TABLE 2.5-7

Continued.

STATION	601	602	603	604	605	606	607	608	609	610	611	601-611
1967-1973					ILYODRILUS TEMPLETONI							
N	30	30	27	29	29	30	31	29	24	24	23	306
MIN	0	0	0	0	0	0	0	0	0	0	0	0
MAX	6	5	3	5	3	23	12	29	11	7	31	31
MEAN	0.73	1.00	0.44	0.55	0.35	2.17	1.97	1.90	1.42	1.71	4.30	1.45
1979												
N	7	7	7	7	7	7	7	7	7	7	7	77
MIN	0	0	0	0	0	0	0	0	0	0	0	0
MAX	1	6	0	2	0	1	5	17	4	7	12	17
MEAN	0.29	1.86	0	0.57	0	0.14	2.14	3.57	1.00	1.43	5.86	1.53
1967-1973					COELOTANYPUS CONCINNUS							
N	30	30	27	29	29	30	31	29	24	24	23	306
MIN	0	0	0	0	0	0	0	0	0	0	0	0
MAX	11	22	5	11	21	30	14	8	11	34	8	34
MEAN	1.57	3.43	0.56	1.69	3.31	4.60	2.48	1.38	1.71	3.71	0.61	2.32
1979												
N	7	7	7	7	7	7	7	7	7	7	7	77
MIN	0	0	0	0	0	0	0	0	0	0	0	0
MAX	0	1	0	1	0	0	5	1	0	0	0	5
MEAN	0	0.14	0	0.14	0	0	0.71	0.14	0	0	0	0.10
1967-1973					CHAOBORUS PUNCTIPENNIS							
N	30	30	27	29	29	30	31	29	24	24	23	306
MIN	0	0	0	0	0	0	0	0	0	0	0	0
MAX	4	0	1	4	11	3	10	2	6	16	23	23
MEAN	0.17	0	0.11	0.38	1.00	0.13	1.23	0.10	0.83	2.58	5.13	0.96
1979												
N	7	7	7	7	7	7	7	7	7	7	7	77
MIN	0	0	0	0	0	0	0	0	0	0	0	0
MAX	0	0	0	0	0	0	0	0	0	0	3	3
MEAN	0	0	0	0	0	0	0	0	0	0	0.86	0.08
1967-1973					HEXAGENIA LIMBATA							
N	30	30	27	29	29	30	31	29	24	24	23	306
MIN	0	0	0	0	0	0	0	0	0	0	0	0
MAX	0	0	3	1	10	1	1	0	0	0	0	10
MEAN	0	0	0.11	0.07	0.45	0.03	0.03	0	0	0	0	0.07
1979												
N	7	7	7	7	7	7	7	7	7	7	7	77
MIN	0	0	0	0	0	0	0	0	0	0	0	0
MAX	1	1	0	1	0	0	0	1	0	1	0	1
MEAN	0.14	0.29	0	0.14	0	0	0	0.29	0	0.29	0	0.10

TABLE 2.5-8

COMPARISON OF THE MINIMUM, MAXIMUM AND MEAN DRY WEIGHT (MG) PER 81 SQ. IN. OF THE COMMON BENTHIC ORGANISMS DURING THE JANUARY-JUNE PREOPERATIONAL (1967-1973) AND POSTOPERATIONAL (1979) PERIODS AT STATIONS IN CONOWINGO POND. N REPRESENTS THE SAMPLE SIZE.

STATION	601	602	603	604	605	606	607	608	609	610	611	601-611
1967-1973					PROCLADIUS SP.(COMPLEX)							
N	30	30	27	29	29	30	31	29	24	24	23	306
MIN	0	0	0	0	0	0	0	0	0.082	0.154	0	0
MAX	2.405	3.170	1.398	7.070	3.080	4.955	3.440	2.107	8.435	3.313	9.600	9.600
MEAN	0.281	0.530	0.204	0.974	0.810	0.688	0.793	0.673	1.329	1.293	1.903	0.808
1979												
N	7	7	7	7	7	7	7	7	7	7	7	77
MIN	0	0.575	0	0	0	0	0	0.113	0	0.203	0.755	0
MAX	2.905	2.053	1.280	1.810	0	2.878	1.730	3.138	3.095	4.073	9.005	9.005
MEAN	0.433	1.318	0.265	0.353	0	0.720	0.588	1.382	1.019	1.380	3.422	0.988
1967-1973					LIMNODRILUS HOFFMEISTERI							
N	30	30	27	29	29	30	31	29	24	24	23	306
MIN	0	0	0	0	0	0	0	0	0	0	0.998	0
MAX	12.955	25.785	23.306	20.792	22.560	19.662	27.638	25.990	32.760	19.762	43.000	43.000
MEAN	3.399	5.761	2.822	4.800	4.094	6.393	5.959	7.512	8.927	6.322	17.256	6.425
1979												
N	7	7	7	7	7	7	7	7	7	7	7	77
MIN	1.030	5.745	0.335	4.298	0.070	0.073	4.298	4.303	2.183	1.415	12.500	0.070
MAX	33.410	16.830	26.483	11.755	6.673	25.878	19.713	17.295	23.903	24.888	80.410	80.410
MEAN	12.228	11.254	7.128	8.335	2.854	9.650	10.813	9.285	11.295	7.332	46.587	12.433
1967-1973					CHIRONOMUS DECORUS							
N	30	30	27	29	29	30	31	29	24	24	23	306
MIN	0	0	0	0	0	0	0	0	0	0	0	0
MAX	10.457	13.313	11.780	48.445	6.500	17.875	22.980	9.548	9.780	9.065	1.322	48.445
MEAN	1.942	1.482	0.772	4.555	0.839	1.851	4.151	1.673	2.004	1.351	0.072	1.944
1979												
N	7	7	7	7	7	7	7	7	7	7	7	77
MIN	0.193	0.060	0.603	1.848	0	0.558	2.623	3.125	0	0.170	0	0
MAX	29.533	47.368	25.445	9.060	2.130	24.605	20.155	29.469	25.703	31.693	1.170	47.368
MEAN	13.316	23.158	9.516	5.289	0.388	8.070	10.402	15.811	10.751	11.079	0.382	9.833

TABLE 2.5-8

Continued.

STATION	601	602	603	604	605	606	607	608	609	610	611	601-611
						ILYODRILUS TEMPLETONI						
1967-1973												
N	30	30	27	29	29	30	31	29	24	24	23	306
MIN	0	0	0	0	0	0	0	0	0	0	0	0
MAX	0.449	0.769	0.770	0.332	1.757	2.923	3.736	2.465	2.632	1.818	2.575	3.736
MEAN	0.055	0.092	0.076	0.043	0.094	0.297	0.365	0.209	0.246	0.288	0.516	0.201
1979												
N	7	7	7	7	7	7	7	7	7	7	7	77
MIN	0	0	0	0	0	0	0	0	0	0	0	0
MAX	0.038	0.193	0	0.023	0	0.180	0.380	0.580	0.305	0.798	0.573	0.798
MEAN	0.007	0.041	0	0.006	0	0.026	0.124	0.129	0.059	0.143	0.350	0.080
						COELOTANYPUS CONCINNUS						
1967-1973												
N	30	30	27	29	29	30	31	29	24	24	23	306
MIN	0	0	0	0	0	0	0	0	0	0	0	0
MAX	1.793	5.265	1.835	2.875	2.000	2.8[illegible]	3.195	2.440	1.620	3.230	2.463	5.265
MEAN	0.369	0.721	0.132	0.350	0.633	0.7[illegible]	.656	0.304	0.378	0.940	0.151	0.495
1979												
N	7	7	7	7	7	7	7	7	7	7	7	77
MIN	0	0	0	0	0	0	0	0	0	0	0	0
MAX	0	0.105	0	0.345	0	0	0.498	0.120	0	0	0	0.498
MEAN	0	0.015	0	0.049	0	0	0.071	0.017	0	0	0	0.014
						CHAOBORUS PUNCTIPENNIS						
1967-1973												
N	30	30	27	29	29	30	31	29	24	24	23	306
MIN	0	0	0	0	0	0	0	0	0	0	0	0
MAX	0.585	0	0.137	0.648	1.480	0.415	1.722	0.295	1.180	1.730	3.093	3.093
MEAN	0.028	0	0.010	0.063	0.133	0.020	0.187	0.016	0.141	0.343	0.674	0.133
1979												
N	7	7	7	7	7	7	7	7	7	7	7	77
MIN	0	0	0	0	0	0	0	0	0	0	0	0
MAX	0	0	0	0	0	0	0	0	0	0	0.320	0.320
MEAN	0	0	0	0	0	0	0	0	0	0	0.090	0.008
						HEXAGENIA LIMBATA						
1967-1973												
N	30	30	27	29	29	30	31	29	24	24	23	306
MIN	0	0	0	0	0	0	0	0	0	0	0	0
MAX	0	0	13.455	10.205	36.823	12.190	8.870	0	0	0	0	36.823
MEAN	0	0	0.498	0.355	1.580	0.406	0.286	0	0	0	0	0.296
1979												
N	7	7	7	7	7	7	7	7	7	7	7	77
MIN	0	0	0	0	0	0	0	0	0	0	0	0
MAX	0.145	20.698	0	32.815	0	0	0	42.448	0	2.595	0	42.448
MEAN	0.021	3.446	0	4.688	0	0	0	6.239	0	0.505	0	1.354

TABLE 2.5-9

Index of percent similarity of species composition between control Station 601 and Stations 602-611 in the preoperational (1967-1973) and postoperational (1974-1979) periods in Conowingo Pond, January-June. Dashes indicate station not sampled.

	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
602	91	76	84	79	49	74	84	58	75	87	83	92	84
603	61	71	70	74	86	77	84	58	80	88	96	89	90
604	74	83	72	71	62	83	59	86	77	87	89	86	94
605	81	69	73	45	38	76	45	53	48	55	90	72	57
606	83	82	87	75	86	70	88	67	79	80	93	91	90
607	88	72	77	87	55	77	51	81	71	91	76	83	86
608	91	72	72	66	75	80	72	89	79	76	71	72	76
609	-	71	75	72	37	77	56	83	78	74	77	83	85
610	-	66	-	65	37	66	44	90	75	46	55	69	78
611	-	-	-	61	60	78	36	66	52	37	48	68	58

TABLE 2.5-10

Comparison of the monthly mean biomass (mg dry weight) per 81 in. at stations during preoperational (1967-1973) and postoperational (1974-1979) periods in Conowingo Pond. Dashes indicate no sample collected.

Month	Jan	Feb	Mar	Apr	May	Jun	Mean
1967	-	-	-	-	-	11.901	11.901
1968	-	-	-	9.277	8.066	7.095	7.777
1969	-	-	-	-	-	27.488	27.488
1970	-	-	39.472	9.773	-	14.382	14.686
1971	-	-	-	-	32.110	-	32.110
1972	9.089	-	-	8.566	11.325	11.722	10.151
1973	15.010	13.000	12.733	13.742	5.504	3.250	9.847
1974	15.944	-	15.614	19.110	16.819	21.083	17.911
1975	36.865	37.109	19.681	23.278	28.919	26.407	26.128
1976	-	5.097	4.500	5.271	6.502	14.062	7.562
1977	-	-	18.577	25.109	14.557	20.108	19.588
1978	-	-	-	12.497	12.881	13.498	12.958
1979	-	-	25.945	28.695	16.267	32.791	25.921

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3.0 DISTRIBUTION AND ABUNDANCE OF FISHES

3.1 METHODS

Methods of sampling in the fisheries program in Conowingo Pond in January through June 1979 were the same as those given in the preoperational report (I.A., P.B.A.P.S. Preoperational Report, 1974a). However, replicate sampling of trap net and trawl zone stations was eliminated, beginning in 1978, as they are not required by Technical Specifications and Bases for the operation of Peach Bottom Atomic Power Station. The description and locations of trap net, trawl zone, trawl transect, seine and ichthyoplankton stations sampled are given in Tables 3.1-1 to 3.1-6 and Figures 3.1-1 to 3.1-7. All stations except ichthyoplankton stations were sampled twice a month during this reporting period, weather conditions and equipment permitting. Ichthyoplankton stations were sampled weekly from May through August and the data reported herein is from the 1978 sampling year. A comparison of the monthly effort for each gear in 1966 through 1979 (through 1978 for plankton meter nets) is given in Tables 3.1-7 to 3.1-9.

The trap net has a 3 x 6 ft trap with 3 x 50 ft lead consisting of 1/2 in. square mesh of #126 knotless nylon. Trap nets are set for about 17 to 26 hr with the lead perpendicular to the shoreline. A 16-ft semi-balloon trawl with 1/4 in. mesh liner in the cod end was used to sample the trawl zone and transect stations. The trawl was hauled for 10 min in an

upstream direction (north). Seines measuring 10 x 4 and 15 x 4 ft with 1/4 in. mesh were used. Size of seine sites and bottom conditions vary considerably and the effort was based on complete coverage of the seinable area rather than a specified number of hauls at each station. Volume of water strained was measured for plankton net tows of 10 min. duration.

Common names of fishes are used in the text of this report. A list of common and scientific names of fishes taken in Conowingo Pond is given in Table 3.1-10.

The catch per effort data in the tables presented in Section 3 of this and preoperational and postoperational reports one through four (I.A., P.B.A.P.S. Preoperational Report and Postoperational Reports No. 1-4, 1974a, b; 1975a, b, c) are the overall weighted average(s) and not the sums. The total(s) represent the total number of fish collected in a month or at a station divided by the total effort expended in that month or at that station. Consequently, the catch per effort data in the tables are not additive either horizontally or vertically, unless the effort expended is equal.

3.1.1 Introduction of Fishes into Conowingo Pond

Several species have been introduced into Conowingo Pond since the inception of studies relative to the operation of the Peach Bottom Station. The introductions have been associated with past seasonal operation of the Conowingo Dam Fish Collection Facility which began in 1972. A total of 37,156 specimens of

1400 102

was introduced to the Pond via the operation of the Conowingo Dam Fish Collection Facility (RMC, P.B.A.P.S. Postoperational Report No. 11, 1979). Most were anadromous: 27,307 blueback herring, 3,352 alewife, 331 American shad, 9 hickory shad and 1,111 striped bass. The catadromous American eel was introduced in 1976, white perch and gizzard shad were introduced in 1972 during testing of the fish transport tank. No fish introductions in association with the operation of the Conowingo Dam Fish Collection Facility have been made in this reporting period.

The Pennsylvania Fish Commission has continued its stocking of striped bass x white bass hybrids (Morone saxatilis x M. chrysops). This program, initiated in 1977, was intended to establish a game fish population in Conowingo Pond that would utilize and control the gizzard shad population (RMC, P.B.A.P.S. Postoperational Reports No. 9-11, 1978a, 1978b, and 1979). During this reporting period, 50,000 fingerling (25-50 mm) striped bass x white bass hybrids were stocked. Although stocked in 1977 and 1978, tiger muskies (Esox masquinongy x E. lucius)were not stocked in Conowingo Pond in 1979.

Both hybrids have been observed in angler catches and at the Conowingo Dam Fish Collection Facility. Tiger muskie of legal size (762 mm) were caught by anglers in the Broad Creek area this spring. Striped bass hybrids from the 1977 stocking have also reached legal size; one as large as 432 mm in length and weighing almost 1.4 kg was caught by rod and reel. However, catch data from the Conowingo Dam Fish Collection Facility indicate that many of the stocked hybrids did not remain in Conowingo Pond. A

total of 115 tiger muskie and 273 striped bass x white bass hybrids were collected at the facility during this reporting period.

TABLE 3.1-1

Location of trap net stations in Conowingo Pond.

Station	Location	Depth(ft)
104	Offshore from Peach Bottom Atomic Power Station Unit No. 1	13
106	Approximately 200 yards downriver from the mouth of Peters Creek	5
107	At the mouth of Broad Creek	14
108	Approximately 50 yards upriver from the mouth of Conowingo Creek	20
109	North shore of Hopkins Cove	12
110	Off Burkins Run (Stonewall Point)	5
136	In Broad Creek	12
138	In Conowingo Creek	11
141	Approximately 400 yards upriver from the mouth of Peters Creek	17
142	Approximately 600 yards upriver from the mouth of Peters Creek	13

TABLE 3.1-2

Location of Trawl Zones 401-410 in Conowingo Pond. Trawl Zones are sampled as listed in Table 3.1-3.

Zone	Location
401	From a point off the mouth of Muddy Creek to a point off Rollins Point
402	From a point just downriver from Sicily Island to a point off the mouth of Fishing Creek
403	From a point off Rollins Point to a point just downriver from Mt. Johnson Island
404	From a point off the mouth of Fishing Creek to a point just downriver from Mt. Johnson Island
405	Off the Peach Bottom Atomic Power Station, from a point just downriver from Mt. Johnson Island to a point off Stonewall Point
406	From a point just downriver from Mt. Johnson Island to a point off the mouth of Peters Creek
407	From a point off Stonewall Point to a point off the mouth of Michael Run
408	From a point off the mouth of Peters Creek to a point approximately 800 yards downriver from Williams Tunnel
409	From a point off the mouth of Michael Run to a point off the mouth of Broad Creek
410	From a point approximately 800 yards downriver from Williams Tunnel to a point approximately 800 yards downriver from Wildcat Tunnel

TABLE 3.1-3

Location of Stations 451 to 456 in Trawl Zone 405, Stations 461 to 466 in Trawl Zone 406 and Stations 481 to 486 in Trawl Zone 408 in Conowingo Pond. Trawls made at nearshore stations are indicated by odd numbers and offshore stations by even numbers.

Station	Location	Depth(ft)
	Zone 405	
451 452	From a point off Stonewall Point to the Peach Bottom Atomic Power Station Discharge	16 20
453 454	From a point approximately 50 yards upriver from the Peach Bottom Atomic Power Station Discharge to a point off Peach Bottom Atomic Power Station Unit No. 1	20 17
455 456	From a point off Peach Bottom Atomic Power Station Unit No. 1 to a point just upriver from Peach Bottom Atomic Power Station Units No. 2 and 3	23 20
	Zone 406	
461 462	From a point approximately 50 yards upriver from the mouth of Peters Creek	25 26
463 464	From a point approximately 500 yards upriver from the mouth of Peters Creek	14 18
465 466	From a point approximately 700 yards upriver from the mouth of Peters Creek	30 28
	Zone 408	
481 482	From a point approximately 300 yards downriver from Peach Bottom Beach to a point off Peach Bottom Beach	17 12
483 484	From a point off Peach Bottom Beach to a point approximately 200 yards downriver from the mouth of Peters Creek	7 10
485 486	From a point approximately 200 yards downriver from the mouth of Peters Creek to a point off the mouth of Peters Creek	7 12

TABLE 3.1-4

Location of trawl transect stations in Conowingo Pond.

Transect	Location	Depth(ft)
Transect 1		
312	Mid-pond between Fishing Creek and Rollins Point	16
313	Off Fishing Creek	13
Transect 2		
321	Off Peach Bottom Atomic Power Station	22
322	Mid-pond between Mt. Johnson Island and the Peach Bottom Atomic Power Station	20
323	Just downriver from Mt. Johnson Island	18
Transect 3		
331	Off Michael Run	13
332	Mid-pond between Michael Run and Williams Tunnel	15
333	Off Williams Tunnel	35
Transect 4		
341	Off Broad Creek	34
342	Mid-pond off Broad Creek	35
343	Off Wildcat Tunnel	35
Transect 7		
371	Off Burkins Run (Stonewall Point)	12
372	Mid-pond off Burkins Run	15
373	Off the mouth of Peters Creek	11

TABLE 3.1-5

Location of seine stations in Conowingo Pond.

Station	Location
201	Approximately 200 yards upriver from the mouth of Fishing Creek
202	Southeast shore of Sicily Island
203	West shore of Big Chestnut Island
206	At the mouth of Wissler Run
207*	In Peach Bottom Atomic Power Station Discharge Canal approximately 600 yards downriver from Unit No. 1
208	Peach Bottom Beach
209	Broad Creek at the boat launch
210	Conowingo Creek at the boat launch
211	North shore of Hopkins Cove
212	Fishing Creek at first road bridge upstream from mouth
213	Peters Creek at third road bridge upstream from mouth
214	Beach at mouth of Burkins Run (Stonewall Point)

* This station cannot always be sampled when the Peach Bottom Station is in operation.

TABLE 3.1-6

Location of meter net stations in Conowingo Pond. Locations are the same as those for trawl transects except the stations are given different numbers.

Station	Location	Depth (ft)
570*	Rollins Point	17
560	Mid-pond between Fishing Creek and Rollins Point	15
561	Fishing Creek	14
562	Off Peach Bottom Atomic Power Station	16
563	Mid-pond between and below Mt. Johnson Island and Peach Bottom Atomic Power Station	19
575*	250 yards below Mt. Johnson Island	14
576	700 yards below Mt. Johnson Island starting under power line	19
564	Burkins Run	22
565	Mid-pond between Burkins Run and RMC Field Station	16
566	RMC Field Station	12
567	Coopers Rock Point	25
568	Mid-pond between Coopers Rock Point and Chester County water intake	16
569	Chester County water intake	11

*Sampled only at surface

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TABLE 3.1-7

Comparison of the sampling effort from January-June by a 16 ft semi-balloon trawl (number of 10-min hauls) and 10- and 15 x 4 ft seine (number of collections) during preoperational (1967-1973) and postoperational (1974-1979) periods in Conowingo Pond. Dashes indicate sampling could not be conducted.

Month	Jan	Feb	Mar	Apr	May	Jun	Total
				Trawl Transect			
1967	-	-	-	-	-	7	7
1968	-	-	-	15	12	44	71
1969	-	-	-	10	15	26	51
1970	-	-	-	-	13	32	45
1971	-	-	-	-	-	38	38
1972	13	-	-	13	39	13	78
1973	13	-	26	7	13	27	86
1974	14	-	14	28	28	28	112
1975	14	28	28	42	28	28	168
1976	-	14	42	14	28	28	126
1977	-	-	28	28	28	28	112
1978	-	-	-	28	14	28	70
1979	-	-	14	28	26	28	96
				Trawl Zone 405			
1967	-	-	2	-	8	8	18
1968	-	-	-	-	5	12	17
1969	-	-	-	-	9	12	21
1970	-	-	-	6	6	17	29
1971	-	-	-	-	18	24	42
1972	24	-	-	24	19	24	91
1973	-	12	24	12	24	24	96
1974	12	-	24	24	24	24	108
1975	24	24	24	24	24	24	144
1976	-	12	24	24	24	36	120
1977	-	-	24	24	24	24	96
1978	-	-	-	12	12	12	36
1979	-	-	6	12	12	12	42
				Trawl Zone 406			
1973	-	-	12	-	-	24	36
1974	7	-	12	36	24	20	99
1975	12	24	24	36	18	24	138
1976	-	12	36	24	24	24	120
1977	-	-	24	24	24	24	96
1978	-	-	-	12	12	12	36
1979	-	-	6	12	12	12	42
				Trawl Zone 408			
1967	-	-	2	2	6	1	11
1968	-	-	-	-	2	12	14
1969	-	-	-	-	2	12	14
1970	-	-	-	6	6	18	30
1971	-	-	-	-	14	21	35
1972	12	12	-	23	18	24	89
1973	-	12	24	12	24	24	96
1974	12	-	24	24	24	24	108
1975	24	12	24	24	24	36	144
1976	-	12	24	24	24	24	108
1977	-	-	24	24	24	24	96
1978	-	-	-	12	12	12	36
1979	-	-	6	12	12	12	42
				Seine			
1967	1	-	4	2	9	10	26
1968	-	-	-	-	6	27	33
1969	-	-	-	2	5	16	23
1970	-	-	-	-	5	40	45
1971	-	-	-	-	15	23	38
1972	19	8	15	32	35	23	132
1973	-	-	33	17	24	24	98
1974	9	-	22	23	24	24	102
1975	16	17	20	24	24	36	137
1976	10	16	24	24	24	24	122
1977	4	7	16	24	24	24	99
1978	6	-	11	24	24	24	89
1979	7	2	18	24	24	24	99

Table 3.1-8

Comparison of the sampling effort from January through June by 3 x 6 ft trap net (number of trap net days) during the preoperational (1967-1973) and postoperational (1974-1979) periods in Conowingo Pond. Dashes indicate sampling could not be conducted.

Month	Jan	Feb	Mar	Apr	May	Jun	Total
1967	6.38	-	10.92	4.42	31.54	23.54	76.80
1968	-	-	-	23.95	25.00	31.62	80.57
1969	-	-	15.29	29.45	14.29	33.62	92.65
1970	-	-	7.79	8.00	39.04	46.20	101.03
1971	2.04	1.91	-	7.91	34.33	40.12	86.31
1972	33.08	19.54	57.83	41.96	43.38	44.13	239.92
1973	-	22.83	39.46	46.50	68.96	47.46	225.21
1974	12.38	-	47.20	70.33	46.75	45.83	222.49
1975	22.25	30.54	53.21	89.38	46.71	47.08	289.17
1976	-	21.04	80.67	23.33	59.71	43.38	228.12
1977	-	-	32.66	28.67	39.84	40.63	141.80
1978	-	-	0.84	19.06	18.66	18.92	57.48
1979	-	-	9.54	27.46	19.55	19.41	75.96

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TABLE 3.1-9

Comparison of the sampling effort from April through August by plankton meter net (number of tows) at transect stations during the preoperational (1967-1973) and postoperational (1974-1978) periods in Conowingo Pond. Dashes indicate sampling was not conducted.

Month	Apr	May	Jun	Jul	Aug
1969	-	55	127	188	20
1970	-	26	135	173	115
1971	-	44	151	147	129
1972	40	75	92	60	60
1973	-	103	189	192	144
1974	-	192	192	144	168
1975	-	191	116	240	144
1976	-	192	206	192	96
1977	-	50	190	178	94
1978	91	48	187	95	137

TABLE 3.1-10

List of scientific and common names of fishes collected in Conowingo Pond and connecting waters (according to Bailey, et al., 1970).

Scientific Name	Common Name
Family - Amiidae	Bowfins
Amia calva	Bowfin
Family - Clupeidae	Herrings
Alosa aestivalis	Blueback herring
Alosa pseudoharengus	Alewife
Alosa sapidissima	American shad
Dorosoma cepedianum	Gizzard shad
Family - Salmonidae	Trouts
Salmo gairdneri	Rainbow trout
Salmo trutta	Brown trout
Salvelinus fontinalis	Brook trout
Family - Esocidae	Pikes
Esox niger	Chain pickerel
Esox lucius	Northern pike
Esox masquinongy	Muskellunge
E. masquinongy x *E. lucius*	Tiger muskie
Family - Cyprinidae	Minnows and Carps
Campostoma anomalum	Stoneroller
Carassius auratus	Goldfish
Clinostomus funduloides	Rosyside dace
Cyprinus carpio	Carp
Ericymba buccata	Silverjaw minnow
Exoglossum maxillingua	Cutlips minnow
Nocomis micropogon	River chub
Notemigonus crysoleucas	Golden shiner
Notropis amoenus	Comely shiner
Notropis analostanus	Satinfin shiner
Notropis cornutus	Common shiner
Notropis hudsonius	Spottail shiner
Notropis procne	Swallowtail shiner
Notropis rubellus	Rosyface shiner
Notropis spilopterus	Spotfin shiner
Pimephales notatus	Bluntnose minnow
Pimephales promelas	Fathead minnow
Rhinichthys atratulus	Blacknose dace
Rhinichthys cataractae	Longnose dace
Semotilus atromaculatus	Creek chub
Semotilus corporalis	Fallfish
Family - Catostomidae	Suckers
Carpiodes cyprinus	Quillback
Catostomus commersoni	White sucker
Erimyzon oblongus	Creek chubsucker
Hypentelium nigricans	Northern hog sucker
Moxostoma macrolepidotum	Shorthead redhorse
Family - Ictaluridae	Freshwater catfishes
Ictalurus catus	White catfish
Ictalurus natalis	Yellow bullhead
Ictalurus nebulosus	Brown bullhead
Ictalurus punctatus	Channel catfish
Noturus insignis	Margined madtom
Family - Anguillidae	Freshwater eels
Anguilla rostrata	American eel
Family - Cyprinodontidae	Killifishes
Fundulus diaphanus	Banded killifish
Fundulus heteroclitus	Mummichog
Family - Centrarchidae	Sunfishes
Ambloplites rupestris	Rock bass
Lepomis auritus	Redbreast sunfish
Lepomis cyanellus	Green sunfish
Lepomis gibbosus	Pumpkinseed
Lepomis macrochirus	Bluegill
Micropterus dolomieui	Smallmouth bass
Micropterus salmoides	Largemouth bass
Pomoxis annularis	White crappie
Pomoxis nigromaculatus	Black crappie
Family - Percichthyidae	Temperate basses
Morone americana	White perch
M. saxatilis x *M. chrysops*	Striped bass x white bass hybrid
Family - Percidae	Perches
Etheostoma olmstedi	Tessellated darter
Etheostoma zonale	Banded darter
Perca flavescens	Yellow perch
Percina caprodes	Logperch
Percina peltata	Shield darter
Stizostedion vitreum	Walleye

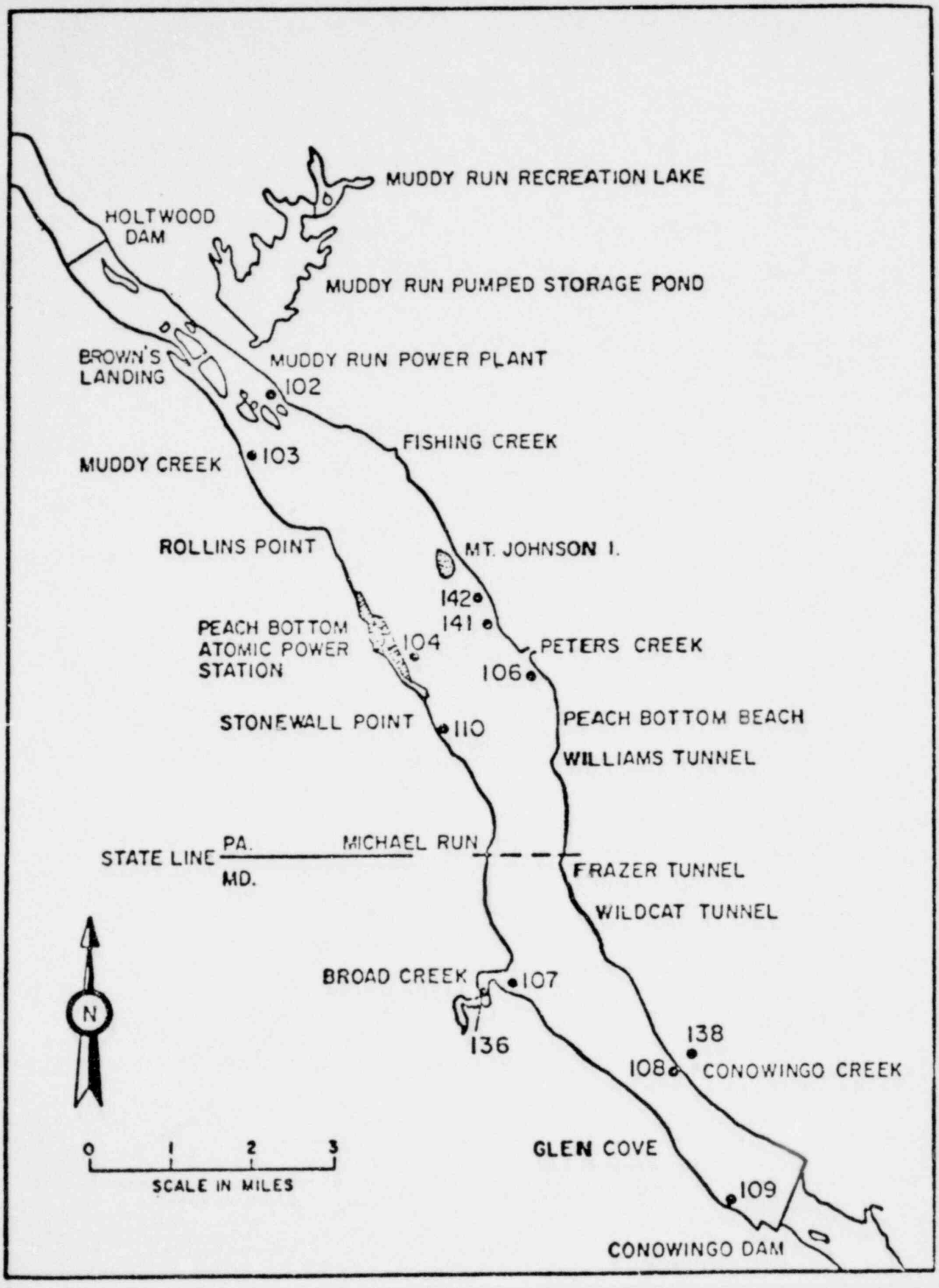

FIGURE 3.1-1 MAP OF CONOWINGO POND SHOWING THE LOCATION OF TRAP NET STATIONS.

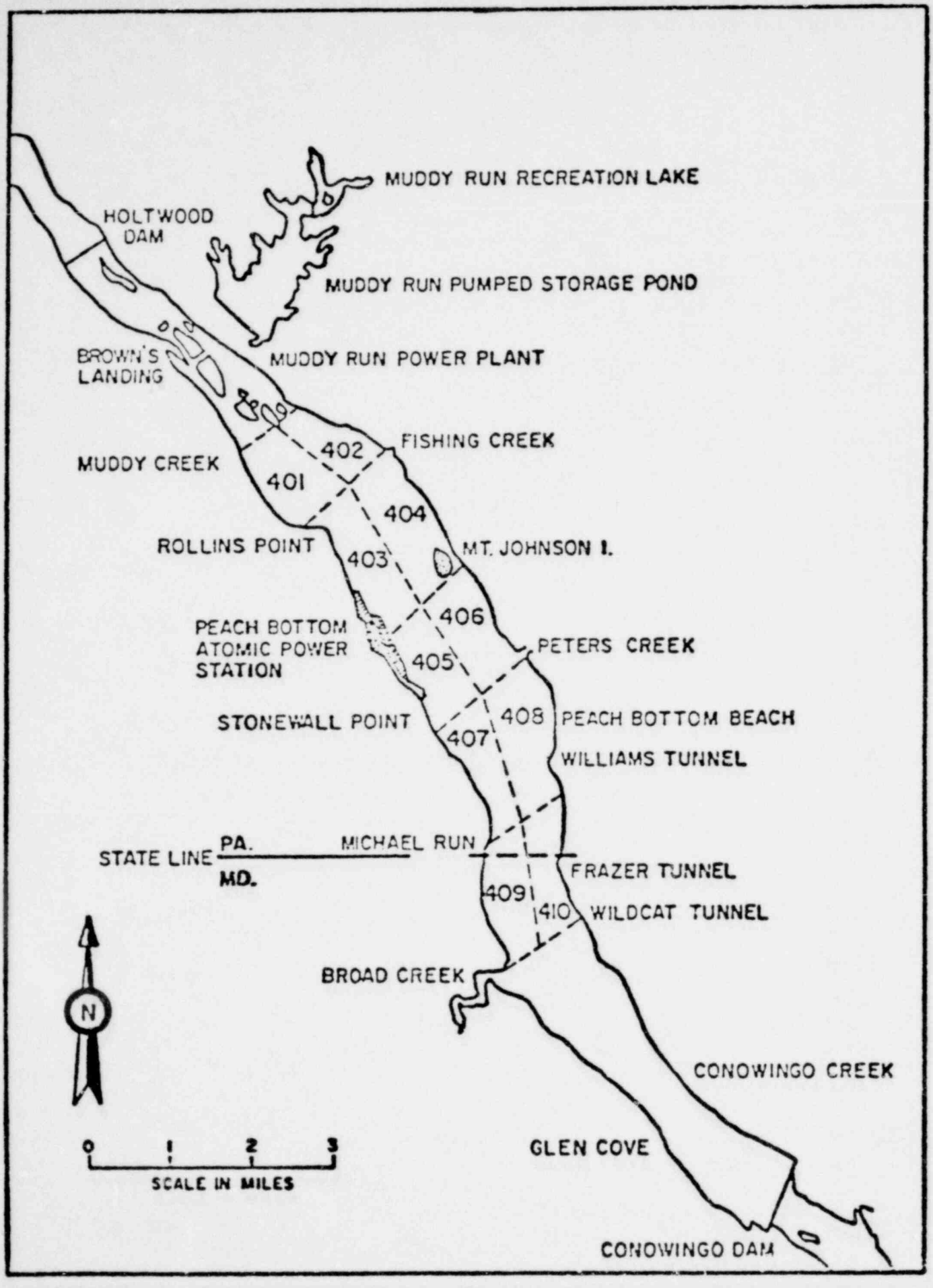

FIGURE 3.1-2 MAP OF CONOWINGO POND SHOWING THE LOCATION OF TRAWL ZONES 401-410. TRAWL ZONES ARE SAMPLED AS SHOWN ON FIGURE 3.1-3.

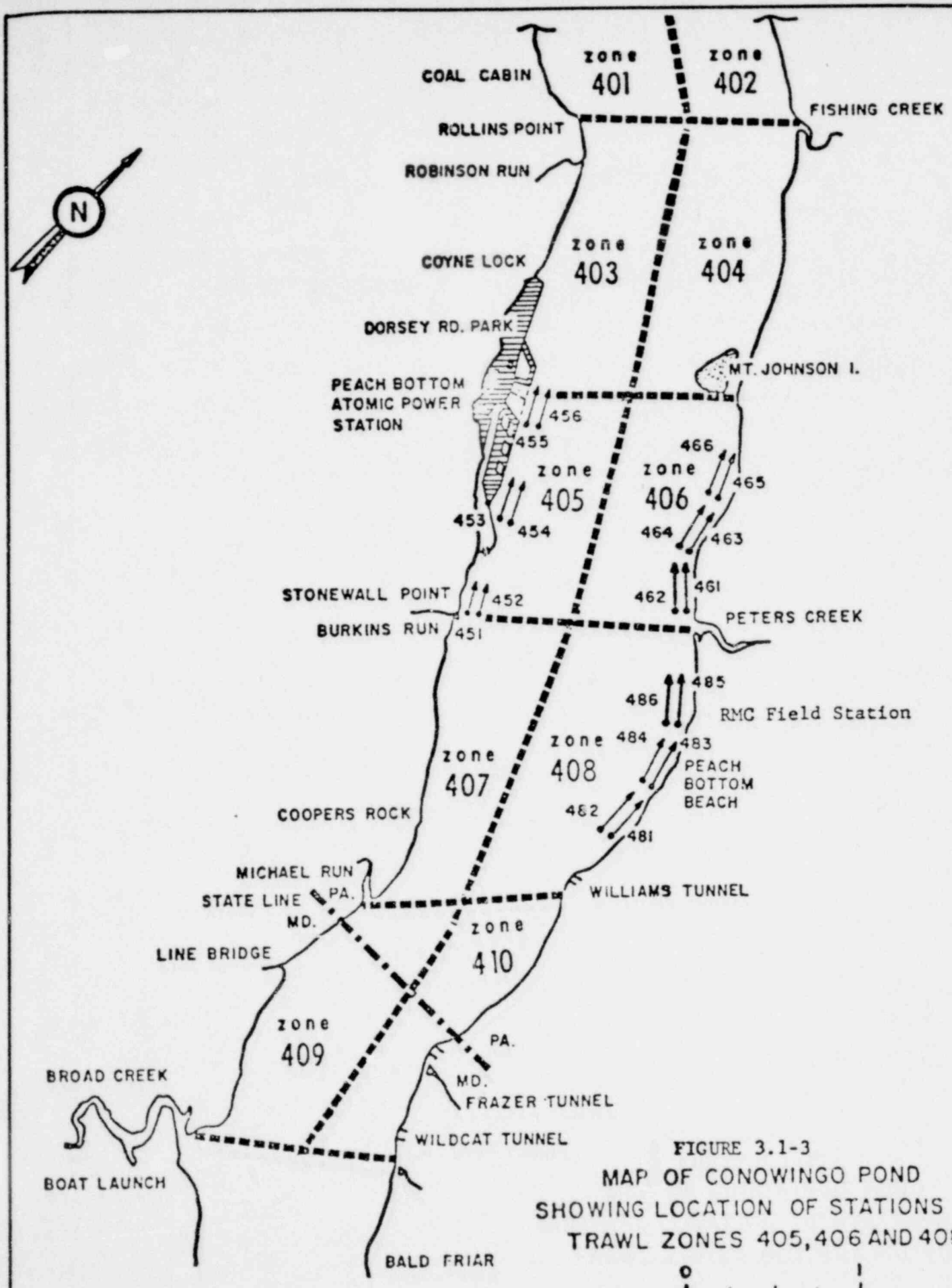

FIGURE 3.1-3
MAP OF CONOWINGO POND
SHOWING LOCATION OF STATIONS IN
TRAWL ZONES 405, 406 AND 408

1400 117

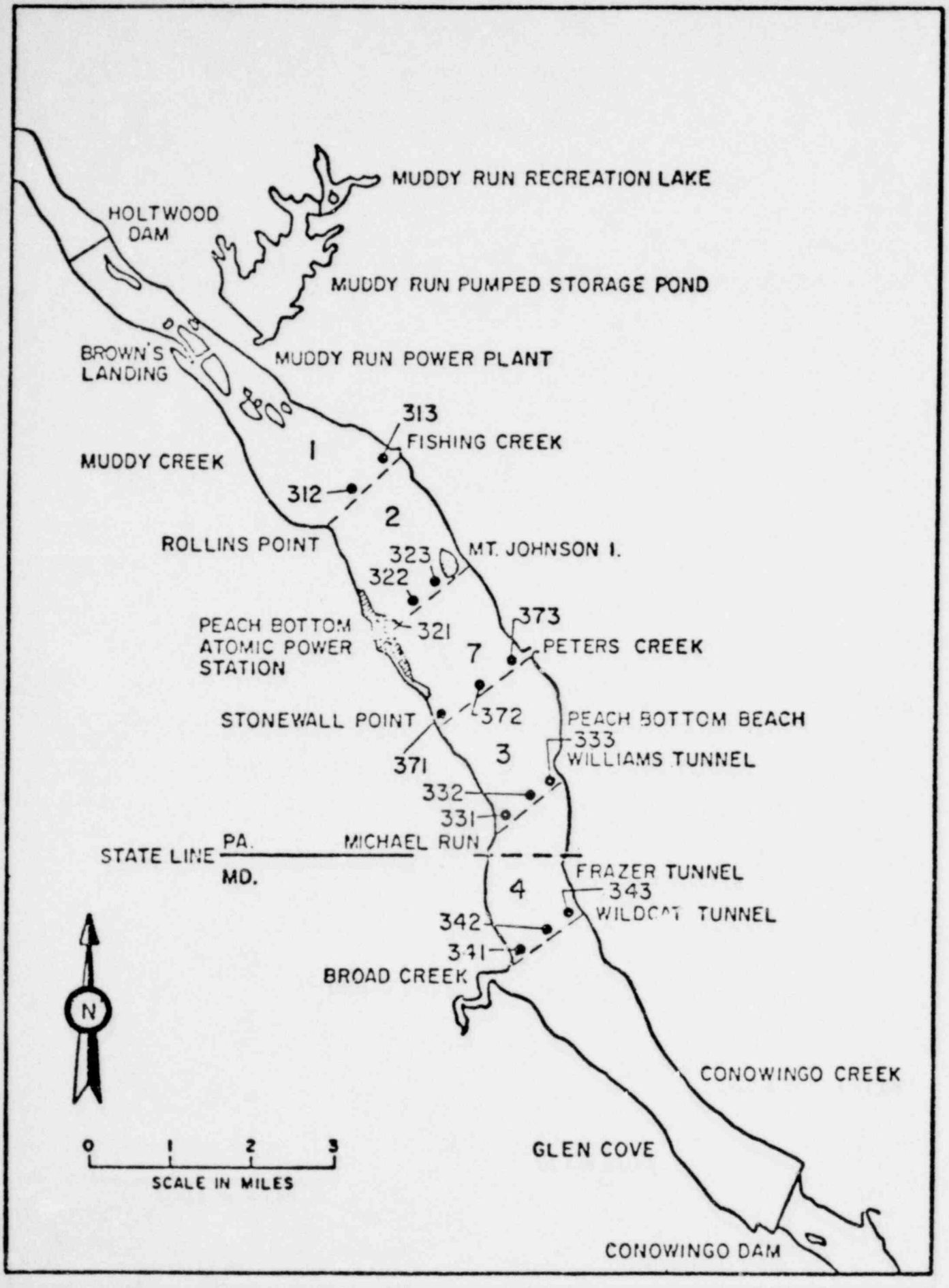

FIGURE 3.1-4 MAP OF CONOWINGO POND SHOWING THE LOCATION OF STATIONS ON TRAWL TRANSECTS 1-4, AND 7 (DASHED LINES)

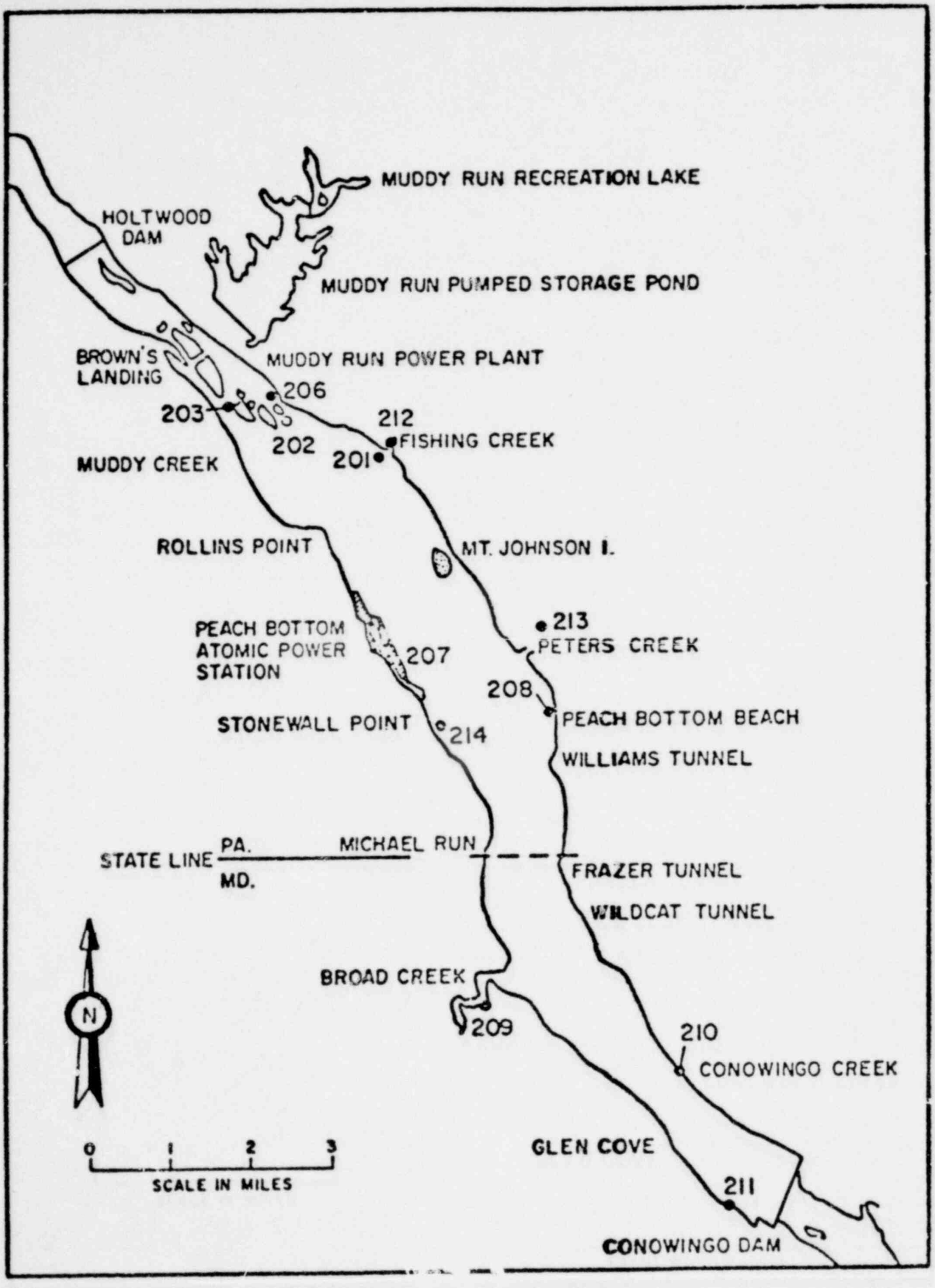

FIGURE 3.1-5 MAP OF CONOWINGO POND SHOWING THE LOCATION OF SEINE STATIONS.

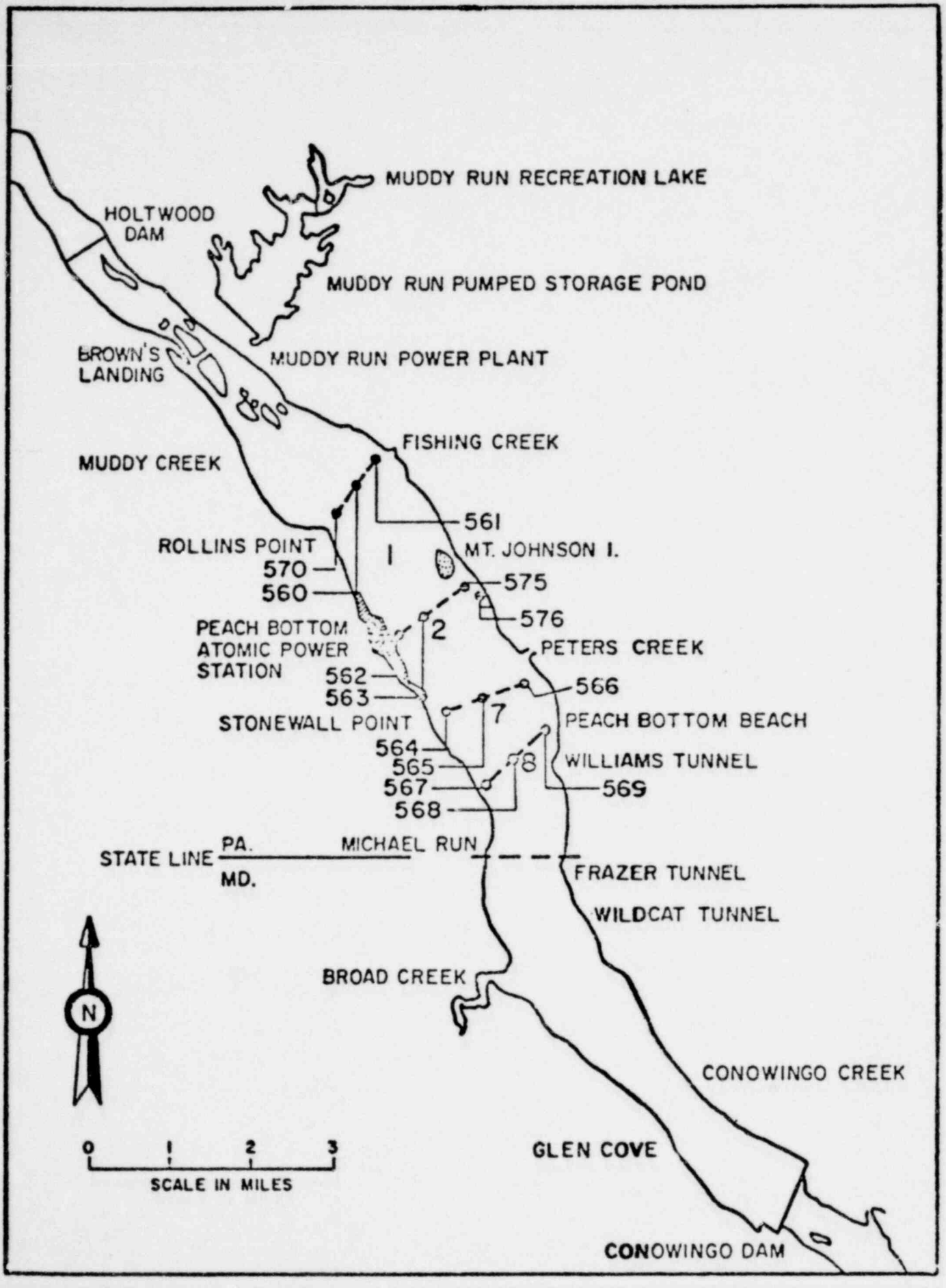

FIGURE 3.1-6 MAP OF CONOWINGO POND SHOWING THE LOCATION OF PLANKTON NET STATIONS ON TRANSECTS 1,2,7 AND 8 (DASHED LINES)

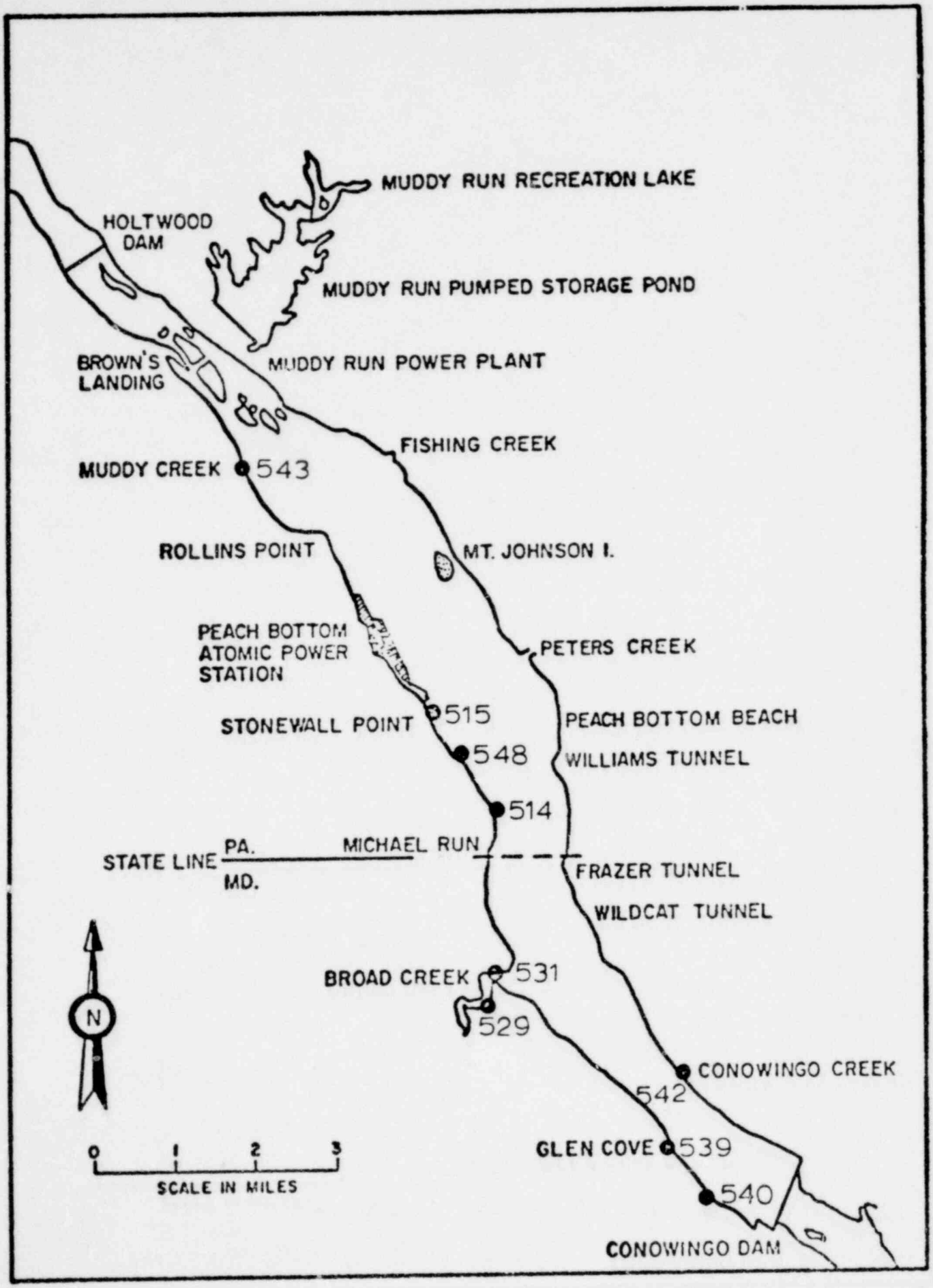

FIGURE 3.1-7

Map of Conowingo Pond showing the distribution of plankton net inshore stations sampled

3.2 TRAP NET CATCHES

A total of 26 species and two hybrids were caught during the period March through June 1979 (Tables 3.2-1 and 3.2-2). Samples could not be taken in January, February and early March 1979 because the Pond was frozen. The number of species ranged from 15 in March to 22 in May and from 18 at Station 109 to 19 at Station 106. At Station 110, located in the thermal plume, 18 species were collected. The common fishes in order of decreasing numerical abundance were white crappie, channel catfish, brown bullhead, carp and pumpkinseed. The white crappie and channel catfish ranked first and second, respectively, in abundance in all months and at all stations except Station 110, where channel catfish ranked first. The low abundance of white crappie at Station 110, located below the discharge of Peach Bottom Atomic Power Station, was probably due to avoidance of high water velocity. The striped bass x white bass hybrid and tiger muskie, introduced in spring and summer of 1977, were captured but in low numbers. Game fishes such as largemouth bass, smallmouth bass and walleye were also captured in low numbers.

Comparison of the monthly catch per effort data for the preoperational (1967-1973) and postoperational (1974-1979) periods for the common fishes was made to determine if changes occurred in their abundance (Table 3.2-3). The mean catches of the common fishes were within the range of variation observed in previous years. It appears that the abundance of fishes is related to factors other than Peach Bottom Atomic Power Station

operation. The mortality of white crappie, channel catfish and other fishes due to impingement and entrainment is negligible. Also, no mortalities were observed in the Pond associated with plant operation such as during shutdown or start-up. Thus, no effects were discernible on the population of fishes due to the operation of Peach Bottom Atomic Power Station in this sampling period or in the past.

Trap net catches vary due to fluctuations in year class strength of fishes, i.e., the recruitment rate is variable between years (I.A., P.B.A.P.S. Postoperational Report No. 3, 1975b). This is supported by the length frequency distribution of the two most common species, white crappie and channel catfish (Table 3.2-4 and 3.2-5). The length frequency data from January-June 1967 through 1979 have been standardized by adjusting for fishing effort and sample size. The data on the young crappie ($\leq$140 mm) and channel catfish ($\leq$120 mm) have been separated and shown in Table 3.2-6 to highlight the variable recruitment which occurred in these populations since 1966. The proportion and catch per effort of young crappie for this reporting period was within the range of variation observed previously. The data for the channel catfish illustrate the same phenomena except for smaller fluctuations between years.

TABLE 3.2-1

CATCH PER EFFORT (NUMBER PER 24 HOURS) FOR FISHES COLLECTED AT TRAP NET STATIONS IN CONOWINGO POND, MAR-JUN 1979.

LOCATION	104	106	107	108	109	110	136	138	141	142	TOTAL
NO. COLLECTIONS	7	7	7	7	7	7	7	7	7	7	70
NO. SPECIES	15	19	13	13	8	18	14	11	16	15	26
NO. HOURS	197	191	187	183	185	191	188	184	186	137	1824
NO. TRAP DAYS	8.20	7.94	7.78	7.62	7.68	7.92	7.80	7.63	7.72	5.67	75.96
SPECIES											MEAN
BOWFIN	-	0.13	-	-	-	-	-	-	-	-	0.01
AMERICAN EEL	0.12	-	-	-	-	-	-	-	0.13	-	0.03
GIZZARD SHAD	-	0.13	-	-	-	-	-	-	-	-	0.01
TIGER MUSKIE	-	0.13	-	-	-	-	-	-	-	-	0.01
CARP	0.61	0.88	0.13	4.20	0.13	5.43	2.44	1.31	1.42	2.29	1.87
GOLDEN SHINER	0.12	2.14	0.26	0.26	-	0.13	0.13	1.83	0.13	0.53	0.55
QUILLBACK	-	-	-	-	-	1.14	-	-	-	-	0.12
WHITE SUCKER	0.12	0.38	0.13	0.13	0.13	0.13	0.13	0.26	0.26	0.35	0.20
SHORTHEAD REDHORSE	-	0.13	-	-	-	0.38	-	-	0.13	-	0.07
WHITE CATFISH	0.37	0.88	0.26	0.13	-	0.13	0.51	-	0.13	0.35	0.28
YELLOW BULLHEAD	0.98	0.25	0.26	0.13	1.04	1.77	0.13	0.66	0.78	0.53	0.66
BROWN BULLHEAD	1.59	3.40	1.03	2.62	0.39	1.77	8.08	2.88	1.42	2.47	2.57
CHANNEL CATFISH	3.66	8.31	2.44	2.10	0.39	39.65	5.00	4.46	6.74	4.06	7.85
MARGINED MADTOM	-	-	0.13	-	-	-	-	-	-	-	0.01
STRIPED BASS HYBRID	-	1.13	-	-	-	0.25	-	-	-	-	0.14
ROCK BASS	0.24	-	-	0.26	-	0.38	0.13	-	0.52	0.71	0.21
REDBREAST SUNFISH	0.24	0.38	0.13	0.39	-	0.13	0.51	0.26	-	0.35	0.24
GREEN SUNFISH	-	0.13	-	-	-	0.13	-	-	-	0.18	0.04
PUMPKINSEED	1.22	3.02	0.39	0.92	1.82	0.88	3.08	1.57	0.52	1.41	1.49
BLUEGILL	0.12	0.63	0.39	0.39	1.04	1.89	3.59	4.98	-	0.18	1.34
SMALLMOUTH BASS	-	-	-	-	-	-	-	-	0.13	-	0.01
LARGEMOUTH BASS	-	-	-	-	-	0.25	-	-	-	-	0.03
WHITE CRAPPIE	5.00	13.48	5.53	47.64	2.21	0.63	31.03	31.98	11.40	12.35	16.06
BLACK CRAPPIE	0.37	0.25	-	0.26	-	0.38	0.13	0.26	0.26	0.35	0.22
YELLOW PERCH	-	0.13	0.13	-	-	-	0.26	-	0.52	0.35	0.13
WALLEYE	0.12	-	-	-	-	-	-	-	0.26	-	0.04
TOTAL	14.88	35.91	11.21	59.43	7.15	55.45	55.15	50.45	24.75	26.46	34.19

TABLE 3.2-2

MONTHLY CATCH PER EFFORT (NUMBER PER 24 HOURS) FOR FISHES COLLECTED AT TRAP NET STATIONS IN CONOWINGO POND, MAR-JUN 1979.

MONTH	MAR	APR	MAY	JUN	TOTAL
NO. COLLECTIONS	10	20	20	20	70
NO. SPECIES	15	18	22	19	26
NO. HOURS	229	660	470	466	1824
NO. TRAP DAYS	9.54	27.46	19.55	19.41	75.96
SPECIES					MEAN
BOWFIN	-	-	0.05	-	0.01
AMERICAN EEL	-	-	-	0.10	0.03
GIZZARD SHAD	-	-	0.05	-	0.01
TIGER MUSKIE	-	-	0.05	-	0.01
CARP	2.62	1.13	1.89	2.52	1.87
GOLDEN SHINER	0.31	0.58	0.82	0.36	0.55
QUILLBACK	-	-	-	0.46	0.12
WHITE SUCKER	-	0.22	0.36	0.10	0.20
SHORTHEAD REDHORSE	0.21	0.07	-	0.05	0.07
WHITE CATFISH	0.31	0.15	0.46	0.26	0.28
YELLOW BULLHEAD	1.15	0.58	0.61	0.57	0.66
BROWN BULLHEAD	2.94	2.48	3.07	2.01	2.57
CHANNEL CATFISH	19.71	6.63	8.18	3.40	7.85
MARGINED MADTOM	-	-	-	0.05	0.01
STRIPED BASS HYBRID	0.42	0.22	0.05	-	0.14
ROCK BASS	0.31	0.15	0.31	0.15	0.21
REDBREAST SUNFISH	-	0.18	0.61	0.05	0.24
GREEN SUNFISH	-	0.04	0.10	-	0.04
PUMPKINSEED	0.21	1.27	2.51	1.39	1.49
BLUEGILL	1.36	1.31	1.69	1.03	1.34
SMALLMOUTH BASS	-	-	0.05	-	0.01
LARGEMOUTH BASS	-	-	0.05	0.05	0.03
WHITE CRAPPIE	22.64	13.33	9.97	22.82	16.06
BLACK CRAPPIE	0.84	0.15	0.10	0.15	0.22
YELLOW PERCH	0.42	0.15	0.05	0.05	0.13
WALLEYE	0.10	0.04	0.05	-	0.04
TOTAL	53.55	28.68	31.08	35.57	34.19

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TABLE 3.2-3

Comparison of the monthly catch per effort (number per 24 hr) of fishes collected at trap net stations from January-June during preoperational (1967-1973) and postoperational (1974-1979) periods in Conowingo Pond. Data shown for years when species collected.

	Jan	Feb	Mar	Apr	May	Jun	Mean
				*White crappie			
1967	98.11	-	41.70	75.96	78.02	29.82	59.62
1968	-	-	-	49.01	66.92	74.79	66.33
1969	-	-	23.67	78.03	41.14	30.33	48.00
1970	-	-	221.56	261.00	243.26	101.29	178.06
1971	2.94	2.09	-	134.89	143.40	144.41	136.62
1972	38.69	329.48	79.11	93.64	77.85	61.16	92.94
1973	-	39.47	25.85	35.31	28.15	39.00	32.66
1974	31.20	-	14.53	15.54	15.53	12.79	15.89
1975	42.34	45.84	32.49	28.75	49.97	44.92	38.35
1976	-	13.16	12.17	7.54	14.25	15.58	12.98
1977	-	-	9.19	11.20	18.17	8.00	11.78
1978	-	-	0.00	8.34	7.88	4.39	6.77
1979	-	-	22.64	13.33	9.97	22.82	16.06
				*Channel catfish			
1967	1.41	-	4.67	9.29	8.49	12.02	11.69
1968	-	-	-	2.58	1.12	2.37	2.05
1969	-	-	2.48	13.41	3.28	4.46	6.79
1970	-	-	13.22	3.00	11.57	11.43	10.96
1971	0.98	0.00	-	4.42	4.57	12.66	8.13
1972	1.66	0.77	9.36	20.92	2.33	3.35	7.24
1973	-	8.15	2.81	2.82	4.00	7.84	4.78
1974	0.49	-	0.53	2.76	3.36	2.03	2.14
1975	0.13	0.72	9.08	5.07	10.51	6.88	6.14
1976	-	7.46	4.41	4.93	3.42	3.62	4.34
1977	-	-	14.18	6.17	2.69	2.56	6.00
1978	-	-	0.00	9.18	1.50	2.22	4.26
1979	-	-	19.71	6.63	8.18	3.40	7.85
				*Bluegill			
1967	1.09	-	0.64	0.22	0.31	1.74	0.86
1968	-	-	-	0.70	0.16	1.17	0.72
1969	-	-	2.22	2.81	2.44	7.88	4.50
1970	-	-	1.28	0.87	4.53	8.16	5.65
1971	0.00	0.00	-	2.27	2.18	3.11	2.52
1972	2.36	0.51	1.42	3.31	3.27	1.81	2.21
1973	-	0.18	0.10	0.71	0.41	0.55	0.42
1974	1.04	-	0.80	0.72	1.48	3.40	1.43
1975	2.16	0.92	0.84	0.70	1.99	1.93	1.27
1976	-	0.24	0.73	2.27	0.62	1.36	0.93
1977	-	-	0.46	1.46	2.03	1.62	1.44
1978	-	-	0.00	0.89	1.07	3.44	1.77
1979	-	-	1.36	1.31	1.69	1.03	1.34
				Brown bullhead			
1967	0.15	-	2.01	1.13	1.36	2.63	1.73
1968	-	-	-	1.29	2.08	0.88	1.38
1969	-	-	0.52	1.96	3.72	1.13	1.54
1970	-	-	5.51	2.50	1.81	3.67	3.01
1971	0.00	0.00	-	2.90	2.09	5.38	3.60
1972	0.12	0.20	1.71	2.45	1.57	1.86	1.50
1973	-	1.88	0.86	2.00	2.89	2.09	2.08
1974	0.00	-	0.57	1.05	2.78	0.92	1.20
1975	0.04	0.23	1.15	1.60	1.97	1.64	1.32
1976	-	0.14	0.94	0.56	1.41	3.64	1.46
1977	-	-	1.71	1.88	2.84	1.21	1.92
1978	-	-	0.00	3.25	2.09	1.90	2.38
1979	-	-	2.94	2.48	3.07	2.01	2.57

continued

TABLE 3.2-3

Continued.

	Jan	Feb	Mar	Apr	May	Jun	Mean
				Pumpkinseed			
1967	0.47	-	0.45	1.81	1.45	5.81	2.59
1968	-	-	-	0.91	1.28	0.60	0.90
1969	-	-	0.58	1.56	3.28	4.19	2.62
1970	-	-	0.00	1.12	8.58	7.31	6.75
1971	0.98	0.00	-	1.76	1.86	3.06	2.35
1972	0.85	0.00	0.31	1.14	6.36	1.77	1.87
1973	-	0.00	0.13	0.43	0.33	0.53	0.32
1974	0.30	-	0.19	0.16	0.77	3.10	0.87
1975	0.00	0.06	0.34	1.22	3.17	2.40	1.35
1976	-	0.00	0.47	0.90	1.07	3.23	1.15
1977	-	-	0.58	0.70	2.74	2.81	1.85
1978	-	-	0.00	1.63	1.66	3.65	2.28
1979	-	-	0.21	1.27	2.51	1.39	1.49
				*Gizzard shad			
1973	-	0.00	0.00	0.00	0.00	0.08	0.02
1974	0.00	-	0.00	0.00	0.02	0.00	**
1975	0.00	0.13	0.06	0.42	1.71	0.08	0.45
1976	-	0.00	0.04	0.04	0.07	0.07	0.05
1977	-	-	0.24	0.00	0.00	0.00	0.06
1978	-	-	0.00	0.00	0.00	0.00	0.00
1979	-	-	0.00	0.00	0.05	0.00	0.01
				*Smallmouth bass			
1975	0.00	0.00	0.08	0.01	0.02	0.02	0.02
1976	-	0.00	0.00	0.00	0.02	0.07	0.02
1977	-	-	0.03	0.00	0.00	0.00	0.01
1978	-	-	0.00	0.05	0.00	0.00	0.02
1979	-	-	0.00	0.00	0.05	0.00	0.01
				*Largemouth bass			
1967	0.00	-	0.09	0.00	0.00	0.08	0.04
1969	-	-	0.00	0.03	0.00	0.00	0.01
1971	0.00	0.00	-	0.00	0.00	0.02	0.01
1972	0.09	0.00	0.02	0.02	0.00	0.00	0.02
1974	0.00	-	0.00	0.02	0.04	0.00	0.02
1975	0.00	0.03	0.02	0.02	0.00	0.08	0.03
1976	-	0.00	0.04	0.00	0.00	0.00	0.01
1977	-	-	0.00	0.03	0.00	0.00	0.01
1978	-	-	0.00	0.00	0.00	0.11	0.03
1979	-	-	0.00	0.00	0.05	0.05	0.03
				*Walleye			
1967	0.00	-	0.18	0.00	0.03	0.12	0.06
1968	-	-	-	0.08	0.04	0.06	0.06
1969	-	-	0.00	0.03	0.00	0.00	0.01
1970	-	-	0.00	0.00	0.00	0.02	0.01
1972	0.00	0.00	0.03	0.00	0.00	0.29	0.06
1973	-	0.39	0.13	0.13	0.04	0.02	0.11
1974	0.00	-	0.00	0.00	0.00	0.02	**
1975	0.00	0.00	0.02	0.00	0.00	0.04	0.01
1976	-	0.00	0.04	0.04	0.03	0.00	0.03
1977	-	-	0.15	0.03	0.08	0.02	0.07
1978	-	-	0.00	0.00	0.05	0.00	0.02
1979	-	-	0.10	0.04	0.05	0.00	0.04

* Designated by U.S. Environmental Protection Agency (1975) as "representative, important species"

** Less than 0.01

TABLE 3.2-4

Comparison of the length frequency distribution (adjusted for effort and sample size) of white crappie collected from January-June at trap net stations during the preoperational (1967-1973) and postoperational (1974-1979) periods in Conowingo Pond. Catch per 24-hr frequencies multiplied by 100.

Year	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
No. Trap Days	76.80	80.57	92.65	101.03	86.31	519.95	225.21	222.49	289.17	229.13	141.80	57.48	75.96
Fork Length (mm)													
41-50	-	1	-	-	-	0.4	-	-	-	-	-	-	-
51-60	-	-	-	-	-	-	-	-	-	-	-	-	-
61-70	-	-	-	-	-	0.4	-	0.4	-	-	-	-	-
71-80	1	-	2	1	1	2	-	4	0.3	1	-	17	-
81-90	30	2	70	2	-	17	-	8	15	2	3	70	12
91-100	263	1	219	117	-	122	3	47	59	3	24	68	167
101-110	820	10	445	1192	-	343	6	133	176	4	83	16	270
111-120	1237	11	445	3232	9	540	6	139	455	17	56	3	348
121-130	1103	5	368	4086	3	584	9	116	761	17	46	9	238
131-140	599	22	277	3445	36	462	36	68	837	57	42	5	101
141-150	177	271	206	2325	440	219	195	28	529	103	23	-	34
151-160	26	999	93	930	2014	53	575	13	142	183	32	7	29
161-170	27	1651	62	263	3794	80	925	25	28	233	59	14	34
171-180	56	1807	109	266	3582	253	738	76	31	244	90	19	79
181-190	189	1059	278	493	2277	457	451	209	66	133	121	21	83
191-200	195	473	505	472	948	475	156	367	101	93	130	40	43
201-210	177	132	684	340	327	366	88	281	121	68	140	45	53
211-220	307	65	550	174	103	195	49	122	133	36	122	43	21
221-230	313	52	324	111	50	80	16	32	127	24	93	30	17
231-240	259	32	126	105	30	22	6	15	104	9	35	31	9
241-250	120	24	27	88	21	7	3	1	74	12	23	33	9
251-260	31	11	8	81	8	3	0.4	0.4	47	10	22	19	10
261-270	12	2	1	49	10	3	-	0.1	21	10	8	42	10
271-280	12	1	3	18	6	2	-	-	3	15	5	45	12
281-290	4	-	-	11	5	1	2	0.4	1	13	7	30	8
291-300	1	-	-	4	-	0.4	0.4	0.4	0.3	9	4	40	8
301-310	1	-	-	1	-	1	2	-	1	3	4	19	3
311-320	-	2	-	1	-	-	-	1	0.3	0.4	2	3	4
321-330	-	-	-	1	-	0.4	-	-	-	-	2	3	3
331-340	-	-	-	-	-	0.4	-	-	-	-	1	2	-
341-350	-	-	-	-	-	-	-	-	-	-	-	-	-
351-360	-	-	-	-	-	-	-	-	-	-	-	-	-
361-370	-	-	-	-	-	-	-	-	-	-	-	2	-
371-380	-	-	-	-	-	0.4	-	-	-	-	-	-	-
Total	5960	6633	4803	17808	13664	4288.4	3266.8	1686.7	3147.9	1299.4	1177	676	1605

TABLE 3.2-5

Comparison of the length frequency distribution (adjusted for effort and sample size) of channel catfish collected from January-June at trap net stations during the preoperational (1967-1973) and postoperational (1974-1979) periods in Conowingo Pond. Catch per 24-hr frequencies multiplied by 100.

Year	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
No. Trap Days	76.80	80.57	92.65	101.03	86.31	519.95	225.21	222.49	289.17	228.13	141.80	57.48	75.96
Fork Length (mm)													
41-50	-	-	-	-	-	0.2	-	1	0.3	2	23	-	-
51-60	3	1	-	5	-	3	4	3	7	14	102	-	3
61-70	3	1	-	7	1	6	4	3	12	13	38	-	-
71-80	-	1	1	14	4	4	1	3	15	11	7	5	9
81-90	-	5	6	3	5	3	3	3	20	17	7	2	4
91-100	-	5	9	18	2	4	3	1	23	10	5	5	3
101-110	-	1	25	29	6	20	8	3	40	21	11	35	18
111-120	-	2	50	27	9	26	23	5	69	48	39	43	18
121-130	7	4	47	22	35	20	48	6	44	49	37	56	41
131-140	26	6	19	8	104	16	59	5	33	43	65	63	90
141-150	20	17	30	17	151	17	47	5	39	29	37	70	91
151-160	12	14	25	34	89	23	29	12	46	36	50	52	97
161-170	43	17	40	41	27	28	32	18	33	32	25	28	80
171-180	43	6	27	38	31	23	40	18	28	19	26	12	66
181-190	59	10	29	22	24	13	29	30	22	13	22	10	49
191-200	59	4	26	29	22	12	28	32	18	20	16	9	37
201-210	81	10	19	25	19	16	24	18	31	13	22	9	33
211-220	141	11	26	43	36	22	29	19	23	12	16	5	16
221-230	215	15	21	81	72	22	22	17	29	9	13	3	28
231-240	193	20	45	109	48	21	13	9	17	5	13	2	21
241-250	118	17	53	120	55	12	7	4	15	6	6	5	14
251-260	65	9	56	127	20	9	5	3	12	6	6	2	17
261-270	42	4	37	89	12	4	3	2	9	2	5	2	12
271-280	8	7	31	59	12	3	4	1	8	1	1	2	5
281-290	12	1	14	36	12	2	3	2	5	2	-	2	4
291-300	4	2	6	23	7	1	1	-	3	1	3	3	8
301-310	3	5	9	19	2	0.4	1	-	2	0.4	0.7	2	4
311-320	-	-	3	15	-	0.4	1	-	1	0.4	1	-	5
321-330	-	5	1	13	1	-	1	0.4	1	0.4	-	-	3

continued

TABLE 3.2-5

Continued.

Year	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
No. Trap Days	76.80	80.57	92.65	101.03	86.31	519.95	225.21	222.49	289.17	228.13	141.80	57.48	75.96
Fork Length (mm)													
331-340	3	1	1	8	-	0.4	-	1	1	-	-	-	3
341-350	-	-	2	6	-	0.4	-	0.4	1	0.4	-	-	4
351-360	10	-	1	2	-	0.2	1	-	1	-	-	-	1
361-370	-	-	4	3	2	-	1	-	0.3	-	0.7	-	-
371-380	-	-	1	-	1	-	1	0.4	1	-	0.7	-	-
381-390	3	1	4	2	-	-	-	1	1	-	-	-	-
391-400	-	-	-	-	1	-	-	0.4	0.3	-	-	-	-
401-410	-	-	2	2	1	-	0.4	-	2	-	-	-	-
411-420	-	-	-	-	-	-	-	-	1	-	-	-	1
421-430	-	-	3	-	-	-	-	-	-	-	-	-	-
431-440	3	-	-	-	-	0.2	-	-	0.3	-	-	-	-
441-450	3	-	-	-	-	-	-	-	-	-	0.7	-	-
451-460	-	-	-	-	-	-	-	0.4	1	-	-	-	-
461-470	-	-	1	-	-	-	-	-	-	-	-	-	-
471-480	-	-	-	1	-	-	-	-	-	-	-	-	-
481-490	-	-	2	-	-	-	-	0.4	-	-	-	-	-
491-500	-	-	1	-	-	-	-	-	-	-	-	-	-
501-510	-	-	-	-	-	-	-	-	-	0.4	-	-	-
Total	**1179**	**202**	**677**	**1097**	**812**	**322.2**	**475.4**	**227.4**	**615.2**	**436**	**598.8**	**427**	**785**

TABLE 3.2-6

Percentage and catch per effort (number per 24-hr x 100) for the white crappie ($\leq$ 140 mm) and channel catfish ($\leq$ 120 mm) collected from January-June at trap net stations during the preoperational (1967-1973) and postoperational (1974-1979) periods in Conowingo Pond.

Year	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
No. Trap Days	76.80	80.57	92.65	101.03	86.31	519.95	225.21	222.49	289.17	228.13	141.8	57.48	75.96
						White crappie							
Percent	68.0	0.8	38.0	67.8	0.4	48.3	1.8	30.5	89.9	7.8	15.6	27.8	70.8
C/E x 100	4053	52	1826	12075	49	2070	60	515	2832	101	180	188	1136
						Channel catfish							
Percent	0.5	7.9	13.4	9.4	3.3	19.9	9.6	9.7	30.3	31.2	44.9	21.1	7.0
C/E x 100	6	16	91	103	27	66	46	22	186	136	229	90	55

3.3 TRAWL TRANSECT CATCHES

Twenty-three species were collected at transect stations in Conowingo Pond from March through June 1979 (Tables 3.3-1 and 3.3-2). Species number ranged from 3 at Station 371 to 14 at Station 343. The monthly species abundance ranged from 8 in March to 15 in April, May, and June (Table 3.3-2). The most common species in descending order of abundance were channel catfish, spottail shiner, carp, comely shiner and white crappie. The variations in catch with respect to month and station were primarily due to differences in abundance of these species, especially channel catfish.

Monthly catch per effort comparisons of preoperational and postoperational periods for the common and "RIS" were included for the January to June sampling period (Table 3.3-3). A large amount of monthly fluctuation occurred in the catches as in previous years. Except for white crappie all of the 1979 catches for the six month period were either within or greater than the range of preoperational years. The catch of white crappie was higher than in recent years (since 1975) but was still less than that of preoperational years.

For purposes of comparing relationships between preoperational and postoperational periods individually and collectively, the entire matrix of Spearman correlation coefficients for all years was examined (Table 3.3-4). Each group of r's was tested by means of chi-square (Snedecor and Cochran 1967) as to whether the sample correlations within each

group were taken from the same population. In the event of a true hypothesis the sample correlations could be combined to provide a better estimate of common ρ (average of r's) for their respective group than could be afforded by individual correlations. Because of non-significant chi-square values (Table 3.3-5), the preoperational group of r's were considered homogeneous i.e., from the same population. The same conditions of non-significant X^2 values and homogeneity were true for each postoperational year versus the preoperational years and for all preoperational years versus all postoperational years. For each homogeneous group, sample correlations were combined into an estimate of common ρ and the 95% confidence interval was established on the preoperational ρ (Table 3.3-5). As in all other postoperational years except 1976, the estimate of common ρ for the present postoperational comparison (1979 vs 1967-1973) was within the 95% confidence limit for the preoperational period. The ρ for the postoperational year 1976, as noted previously (Radiation Management Corporation, P.B.A.P.S. Postoperational Report No. 11, 1979) was below the preoperational confidence limits. This condition was not attributed to the operation of the Peach Bottom Atomic Power Station, but rather to other variables including natural fluctuations of year class strength, effects of Tropical Storm Agnes and variations in species composition including the introduction of gizzard shad into the Pond in 1972.

TABLE 3.3-1

CATCH PER EFFORT (NUMBER PER 10-MIN HAUL) FOR FISHES COLLECTED BY A 16 FT SEMI-BALLOON TRAWL AT STATIONS ON TRAWL TRANSECTS 1-4 AND 7 IN CONOWINGO POND, MAR-JUN 1979.

LOCATION	312	313	321	322	323	331	332	333	341	342	343	371	372	373	TOTAL
NO. COLLECTIONS	6	6	7	7	7	7	7	7	7	7	7	7	7	7	96
NO. SPECIES	5	5	4	5	12	10	6	11	10	6	14	3	5	9	23
SPECIES															MEAN
GIZZARD SHAD	-	-	-	-	-	-	-	-	4.43	-	-	-	-	-	0.32
CARP	1.17	0.17	-	-	0.29	0.71	1.14	1.57	7.43	3.00	6.29	-	0.86	0.29	1.66
COMELY SHINER	-	-	-	0.14	0.14	13.00	-	-	-	-	-	-	-	-	0.97
SPOTTAIL SHINER	2.50	3.50	-	1.71	14.00	4.71	2.00	0.14	-	0.29	1.29	2.86	2.71	9.71	3.25
BLUNTNOSE MINNOW	-	-	-	-	0.29	-	-	-	-	-	-	-	-	0.14	0.03
QUILLBACK	-	-	-	-	-	-	-	-	0.29	-	0.14	-	-	-	0.03
WHITE SUCKER	-	-	-	-	-	-	-	0.14	-	-	-	-	-	-	0.01
SHORTHEAD REDHORSE	-	-	-	-	0.43	-	-	-	0.14	-	0.29	-	-	-	0.06
WHITE CATFISH	-	-	-	-	-	-	-	0.57	0.29	0.14	0.29	-	-	-	0.09
YELLOW BULLHEAD	-	-	-	-	-	-	-	-	-	-	0.57	-	-	-	0.04
BROWN BULLHEAD	-	-	-	-	-	0.14	-	0.86	1.43	0.29	0.86	-	-	-	0.26
CHANNEL CATFISH	20.67	0.17	4.57	10.14	3.29	92.29	86.29	65.29	29.43	196.71	103.14	1.29	8.86	1.00	45.22
STRIPED BASS HYBRID	-	-	-	-	-	-	-	-	-	-	-	-	-	0.14	0.01
ROCK BASS	-	-	0.14	-	-	-	-	-	-	-	-	-	-	-	0.01
REDBREAST SUNFISH	-	-	-	-	-	-	-	0.14	-	-	-	-	-	-	0.01
PUMPKINSEED	-	-	-	-	0.14	0.43	-	0.14	-	-	0.14	-	-	0.86	0.13
SMALLMOUTH BASS	-	-	-	-	0.29	-	-	-	-	-	-	-	-	-	0.02
WHITE CRAPPIE	0.17	-	0.14	-	0.43	1.00	0.43	0.57	6.14	0.29	2.71	-	-	0.29	0.89
BLACK CRAPPIE	-	-	-	-	-	0.14	-	-	-	-	0.14	-	-	-	0.02
TESSELLATED DARTER	-	0.67	0.29	0.14	1.29	0.57	1.29	0.29	0.14	-	2.43	0.14	0.14	2.14	0.69
YELLOW PERCH	0.17	-	-	0.14	0.14	0.43	0.14	0.29	2.71	-	1.00	-	0.43	0.14	0.41
LOGPERCH	-	0.33	-	-	-	-	-	-	-	-	-	-	-	-	0.02
WALLEYE	-	-	-	-	0.14	-	-	-	-	-	0.14	-	-	-	0.02
TOTAL	24.68	4.84	5.14	12.27	20.87	113.42	91.29	70.00	52.43	200.72	119.43	4.29	13.00	14.71	54.17

TABLE 3.3-2

MONTHLY CATCH PER EFFORT (NUMBER PER 10-MIN HAUL) FOR FISHES COLLECTED BY A 16 FT SEMI-BALLOON TRAWL AT TRAWL TRANSECTS IN CONOWINGO POND, MAR-JUN 1979.

MONTH	MAR	APR	MAY	JUN	TOTAL
NO. COLLECTIONS	14	28	26	28	96
NO. SPECIES	8	15	15	15	23
SPECIES					MEAN
GIZZARD SHAD	1.79	0.18	0.04	-	0.32
CARP	0.57	2.46	1.62	1.43	1.66
COMELY SHINER	-	3.32	-	-	0.97
SPOTTAIL SHINER	1.29	4.36	3.65	2.75	3.25
BLUNTNOSE MINNOW	0.07	-	-	0.07	0.03
QUILLBACK	-	0.11	-	-	0.03
WHITE SUCKER	-	-	0.04	-	0.01
SHORTHEAD REDHORSE	-	0.07	0.12	0.04	0.06
WHITE CATFISH	-	0.07	0.08	0.18	0.09
YELLOW BULLHEAD	-	-	-	0.14	0.04
BROWN BULLHEAD	-	0.11	0.35	0.46	0.26
CHANNEL CATFISH	15.86	36.14	35.19	78.29	45.22
STRIPED BASS HYBRID	-	-	0.04	-	0.01
ROCK BASS	-	-	-	0.04	0.01
REDBREAST SUNFISH	-	-	0.04	-	0.01
PUMPKINSEED	-	0.04	0.27	0.14	0.13
SMALLMOUTH BASS	-	-	-	0.07	0.02
WHITE CRAPPIE	-	1.54	0.96	0.61	0.89
BLACK CRAPPIE	-	0.04	0.04	-	0.02
TESSELLATED DARTER	1.57	1.14	0.35	0.11	0.69
YELLOW PERCH	0.29	0.54	0.23	0.50	0.41
LOGPERCH	-	0.07	-	-	0.02
WALLEYE	0.07	-	-	0.04	0.02
TOTAL	21.51	50.19	43.02	84.87	54.17

1400 135

TABLE 3.3-3

Comparison of the monthly catch per effort (number per 10 min haul) of fishes collected by a 16 ft semi-balloon trawl at transect stations during the preoperational (1967-1973) and postoperational (1974-1979) periods in Conowingo Pond. Data shown only for years when species collected.

Month	Jan	Feb	Mar	Apr	May	Jun	Mean
				*White crappie			
1967	-	-	-	-	-	9.43	9.43
1968	-	-	-	9.33	8.00	4.82	6.31
1969	-	-	-	0.50	6.20	9.58	6.80
1970	-	-	-	-	180.92	25.59	70.47
1971	-	-	-	-	-	5.89	5.89
1972	4.54	-	-	1.85	19.56	22.15	14.54
1973	4.03	-	0.04	0.00	2.85	0.15	1.10
1974	0.00	-	0.00	0.14	0.18	0.07	0.10
1975	0.00	0.00	0.07	1.07	1.78	2.36	0.97
1976	-	0.00	0.00	0.00	0.39	0.00	0.09
1977	-	-	0.00	0.00	0.14	1.43	0.39
1978	-	-	-	0.07	0.57	0.11	0.19
1979	-	-	0.00	1.54	0.94	0.61	0.89
				*Channel catfish			
1967	-	-	-	-	-	36.00	36.00
1968	-	-	-	10.87	24.75	44.05	33.77
1969	-	-	-	41.60	66.40	46.46	51.37
1970	-	-	-	-	92.08	120.38	112.20
1971	-	-	-	-	-	89.92	89.92
1972	1.46	-	-	62.23	51.08	32.08	41.50
1973	1.69	-	1.04	40.00	37.08	4.85	10.95
1974	6.64	-	1.28	12.93	5.54	1.21	5.91
1975	0.07	13.89	5.78	3.33	61.89	13.11	16.62
1976	-	2.14	0.90	1.71	5.25	17.36	5.75
1977	-	-	22.82	11.64	12.36	19.36	16.54
1978	-	-	-	17.89	2.36	5.57	9.86
1979	-	-	15.86	36.14	35.19	78.29	45.22
				*Bluegill			
1967	-	-	-	-	-	0.14	0.14
1968	-	-	-	0.00	0.00	0.05	0.03
1969	-	-	-	0.20	0.53	1.77	1.10
1970	-	-	-	-	2.85	0.16	0.93
1971	-	-	-	-	-	0.05	0.05
1972	0.00	-	-	0.08	0.03	0.46	0.10
1974	0.00	-	0.00	0.00	0.11	0.00	0.03
1977	-	-	0.00	0.00	0.00	0.04	0.01
				Tessellated darter			
1968	-	-	-	0.27	0.17	0.45	0.37
1969	-	-	-	2.20	1.00	0.62	1.04
1970	-	-	-	-	0.77	0.69	0.71
1971	-	-	-	-	-	0.16	0.16
1972	0.23		-	0.08	0.54	0.00	0.32
1973	0.08	-	0.31	0.29	0.08	0.04	0.15
1974	1.57	-	1.00	0.39	0.00	0.36	0.51
1975	0.00	0.75	0.43	0.40	0.43	0.46	0.45
1976	-	0.00	0.14	0.00	.00	2.54	0.61
1977	-	-	0.86	0.14	0.04	0.18	0.30
1978	-	-	-	0.18	0.00	0.00	0.70
1979	-	-	1.57	1.14	0.35	0.11	0.69

continued

TABLE 3.3-3

Continued.

Month	Jan	Feb	Mar	Apr	May	Jun	Mean
				Pumpkinseed			
1967	-	-	-	-	-	0.43	0.43
1968	-	-	-	0.33	0.33	0.00	0.13
1969	-	-	-	0.00	0.87	1.77	1.16
1970	-	-	-	-	2.31	0.94	1.33
1971	-	-	-	-	-	0.24	0.24
1972	0.15	-	-	0.31	0.13	0.54	0.23
1973	0.00	-	0.00	0.00	0.08	0.00	0.01
1974	0.00	-	0.00	0.14	0.11	0.04	0.07
1975	0.00	0.00	0.00	0.00	0.25	0.04	0.05
1976	-	0.00	0.00	0.00	0.00	0.04	0.01
1977	-	-	0.00	0.14	0.11	0.04	0.07
1978	-	-	-	0.00	0.00	0.18	0.07
1979	-	-	0.00	0.04	0.27	0.14	0.13
				Spottail shiner			
1968	-	-	-	0.20	0.00	0.09	0.10
1969	-	-	-	1.00	1.93	0.58	1.06
1970	-	-	-	-	5.31	1.38	2.51
1971	-	-	-	-	-	0.26	0.26
1972	0.69	-	-	0.23	0.87	0.08	0.60
1973	0.08	-	0.04	0.00	0.00	0.00	0.02
1974	0.64	-	0.64	0.07	0.00	0.04	0.19
1975	0.00	0.46	0.46	1.64	1.04	0.50	0.82
1976	-	0.00	0.05	0.21	0.00	0.18	0.08
1977	-	-	0.11	0.00	0.00	0.07	0.04
1978	-	-	-	0.14	0.07	0.00	0.07
1979	-	-	1.29	4.36	3.65	2.75	3.25
				*Gizzard shad			
1975	0.00	0.71	0.07	0.07	0.00	0.00	0.15
1977	-	-	0.00	0.00	0.00	4.54	1.13
1979	-	-	1.79	0.18	0.04	0.00	0.32
				*Smallmouth bass			
1967	-	-	-	-	-	0.14	0.14
1968	-	-	-	0.00	0.00	0.02	0.01
1969	-	-	-	0.00	0.00	0.42	0.22
1970	-	-	-	-	0.00	0.16	0.11
1975	0.00	0.00	0.00	0.00	0.04	0.11	0.02
1979	-	-	0.00	0.00	0.00	0.07	0.02
				*Largemouth bass			
1970	-	-	-	-	0.08	0.03	0.04
1971	-	-	-	-	-	0.03	0.03
1975	0.00	0.00	0.00	0.00	0.07	0.00	0.01
1977	-	-	0.00	0.00	0.04	0.00	0.01
				*Walleye			
1967	-	-	-	-	-	0.14	0.14
1968	-	-	-	0.00	0.00	0.02	0.01
1969	-	-	-	0.00	0.00	0.08	0.04
1970	-	-	-	-	0.00	0.06	0.04
1971	-	-	-	-	-	0.03	0.03
1975	0.00	0.00	0.00	0.00	0.00	0.04	**
1976	-	0.00	0.00	0.00	0.00	0.18	0.04
1979	-	-	0.07	0.00	0.00	0.04	0.02

* Designated by U.S. Environmental Protection Agency (1975) as "representative, important species".

** < 0.01

1400 137

TABLE 3.3-4

Spearman rank correlation coefficients for comparison of species ranking of fishes collected from January through June by a 16 ft semi-balloon trawl at Trawl Transects in Conowingo Pond between the preoperational (1967-1973) and postoperational (1974-1979) periods. Triangle = preoperational; Rectangles = postoperational comparisons.

		1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
1979	N	24	27	27	28	25	24	23	25	28	25	28	23
	r	.24^{NS}	.45*	.43*	.39*	.54	.54	.75	.59	.72	.56	.62	.69
	z̄	.24	.48	.46	.41	.60	.60	.97	.68	.91	.63	.72	.85
1978	N	18	20	22	23	18	16	14	16	23	18	22	
	r	.46*	.65	.57	.50	.50	.70	.73	.66	.61	.49*	.69	
	z̄	.50	.78	.65	.55	.55	.87	.93	.79	.71	.54	.85	
1977	N	24	24	25	25	23	21	21	21	27	25		
	r	.36^{NS}	.59	.47*	.37^{NS}	.47*	.69	.74	.58	.63	.27^{NS}		
	z̄	.38	.68	.51	.39	.51	.85	.95	.66	.74	.28		
1976	N	21	22	23	22	21	19	16	19	24			
	r	.00^{NS}	.33^{NS}	.33^{NS}	.36*	.29^{NS}	.35^{NS}	58*	.41*	.49			
	z̄	.00	.34	.34	.38	.30	.36	.66	.44	.54			
1975	N	24	25	26	25	25	25	22	22				
	r	.26^{NS}	.61	.56	.51	.48	.50	.83	.59				
	z̄	.27	.71	.63	.56	.52	.55	1.19	.68				
1974	N	17	18	21	21	17	13	13					
	r	.27^{NS}	.73	.72	.74	.73	.89	.80					
	z̄	.28	.93	.91	.95	.93	1.42	1.10					
1973	N	15	17	20	20	14	12						
	r	.38^{NS}	.88	.75	.69	.89	.87						
	z̄	.40	1.38	.97	.85	1.42	1.33						
1972	N	15	18	21	22	16							
	r	.40^{NS}	.78	.77	.72	.84							
	z̄	.42	1.04	1.02	.91	1.22							
1971	N	18	20	22	22								
	r	.37^{NS}	.66	.65	.63								
	z̄	.39	.79	.78	.74								
1970	N	23	23	23									
	r	.44*	.72	.81									
	z̄	.47	.91	1.13									
1969	N	22	21										
	r	.52	.84										
	z̄	.58	1.22										
1968	N	19											
	r	.47*											
	z̄	.51											

All correlations significant at 99% level unless otherwise indicated

* - Significant at 95% level
NS - Not significant at 95% level

1400 138

TABLE 3.3-5

Statistics for confidence intervals c the preoperational (1967-1973) Spearman rank correlation coefficients (r_s) for trawl transects in Conowingo Pond. Correlations were calculated on the species ranks from January-June.

	X^2	df	Average Weighted Z	Estimate of Common ρ	Confidence Limits (P = 0.95)
Preoperational (1967-1973)	31.11	20	0.86	0.70	$0.403 \leq Z \leq 1.327$ $0.380 \leq \rho \leq 0.869$
Postoperational (1974)	8.54	6	0.90	0.72	
(1975)	9.33	6	0.62	0.55	
(1976)	3.45	6	0.32	0.31	
(1977)	5.78	6	0.60	0.53	
(1978)	2.40	6	0.67	0.58	
(1979)	6.39	6	0.53	0.48	
Total (1974-1979)	55.68	41	0.60	0.54	

* Not within the 95% confidence limits of the preoperational period.

1400 139

3.4 TRAWL ZONES

Total number of species taken in Trawl Zones 405, 406 and 408 from March through June were 15, 20, and 20, respectively (Tables 3.4-1 to 3.4-3). Number of species fluctuated monthly. In both Zones 405 and 406 channel catfish and spottail shiner were most commonly taken. White crappie was also common in Zone 406. Six species were common in Zone 408 and included spottail shiner, channel catfish, white crappie, carp, comely shiner and tessellated darter in decreasing order of abundance.

Monthly catch per effort comparisons of the common and "representative, important species" (RIS) are given for each zone for the preoperational (1966-1973) and postoperational (1974-1979) periods (Tables 3.4-4 to 3.4-6). Most species in Zones 405 and 408 were caught in numbers that were within their range of previous years, for both the preoperational and postoperational periods. However, four species (spottail shiner, channel catfish, white crappie and largemouth bass) were caught in greater abundance than in recent years. In Zone 406 the catches of channel catfish, spottail shiner, smallmouth and largemouth bass were above those of previous years (1973-1978). Catches of other species were within the range of previous years.

A comparison of the length frequency distribution of white crappie and channel catfish taken from January through June (Tables 3.4-7 to 3.4-11) in the preoperational (1966-1973) and postoperational (1974-1979) periods shows that the fluctuations in total catch are primarily due to the differential recruitment

and abundance of year classes (I.A., P.B.A.P.S. Postoperational Report No. 3, 1975b). Not enough white crappie (2 fish) were taken from Zone 405 to depict the strength of the 1978 year class (Table 3.4-7). However, in Zones 406 and 408, 42% and 44% of the catch, respectively, were yearlings ($\leq$ 110 mm), indicating a moderate year class was produced in the 1978 spawning season (Tables 3.4-9 and 3.4-10). Yearling channel catfish ($\leq$ 100 mm) comprised 69% of the total catch in Zone 405, 40% in Zone 406 and 20% in Zone 408. These data demonstrate a moderate 1978 year class (Tables 3.4-8, 3.4-9 and 3.4-11).

The entire matrix of spearman correlation coefficients for each zone (Tables 3.4-12 and 3.4-13) was examined for purposes of comparing relationships between preoperational and postoperational years. The same analyses were utilized as described for trawl transects in Section 3.3. In Zones 405 and 408 the chi-square value involving the total postoperational period compared to the preoperational period (1974-1979 vs 1966-1973) was non-significant as was the chi-square value for the postoperational year 1979 versus the preoperational period (Table 3.4-14). Thus, all sample correlations within each of these groups were considered to be from their respective group populations. An estimate of a common ρ was determined for each homogeneous group by the combination of their sample correlations, and confidence limits (95%) were placed around the preoperational ρ from Zones 405 and 408. The ρ for the postoperational year 1979 was within the 95% confidence limit of the preoperational period for both Zones 405 and 408, indicating

that there were no significant ($P > 0.05$) changes in species ranks between 1979 and the preoperational period.

TABLE 3.4-1

MONTHLY CATCH PER EFFORT (NUMBER PER 10-MIN HAUL) FOR FISHES COLLECTED BY A 16 FT SEMI-BALLOON TRAWL IN TRAWL ZONE 405 IN CONOWINGO POND, MAR-JUN 1979.

MONTH	MAR	APR	MAY	JUN	TOTAL
NO. COLLECTIONS	6	12	12	12	42
NO. SPECIES	4	7	8	9	15
SPECIES					MEAN
CARP	-	0.50	1.00	1.42	0.83
COMELY SHINER	0.17	-	-	-	0.02
SPOTTAIL SHINER	0.67	1.92	1.58	0.17	1.14
ROSYFACE SHINER	-	-	0.08	-	0.02
BLUNTNOSE MINNOW	-	-	0.08	-	0.02
LONGNOSE DACE	-	-	-	0.08	0.02
WHITE CATFISH	-	0.17	-	0.58	0.21
YELLOW BULLHEAD	-	-	-	0.08	0.02
BROWN BULLHEAD	-	-	0.08	0.25	0.10
CHANNEL CATFISH	1.17	8.00	55.25	107.58	48.98
SMALLMOUTH BASS	-	-	0.08	-	0.02
WHITE CRAPPIE	-	0.17	-	-	0.05
TESSELLATED DARTER	0.83	0.58	0.17	0.17	0.38
YELLOW PERCH	-	-	-	0.08	0.02
WALLEYE	-	0.08	-	-	0.02
TOTAL	2.84	11.42	58.32	110.41	51.85

1400 143

TABLE 3.4-2

MONTHLY CATCH PER EFFORT (NUMBER PER 10-MIN HAUL) FOR FISHES COLLECTED BY A 16 FT SEMI-BALLOON TRAWL IN TRAWL ZONE 406 IN CONOWINGO POND, MAR-JUN 1979.

MONTH	MAR	APR	MAY	JUN	TOTAL
NO. COLLECTIONS	6	12	12	12	42
NO. SPECIES	5	5	12	19	20
SPECIES					MEAN
GIZZARD SHAD	-	-	-	0.08	0.02
CARP	0.17	0.08	0.75	0.83	0.50
GOLDEN SHINER	0.17	-	-	0.25	0.10
COMELY SHINER	-	0.08	0.08	-	0.05
SPOTTAIL SHINER	3.67	5.00	5.75	6.58	5.48
BLUNTNOSE MINNOW	-	-	0.25	0.42	0.19
WHITE SUCKER	-	-	-	0.50	0.14
SHORTHEAD REDHORSE	-	-	-	0.33	0.10
WHITE CATFISH	-	-	-	0.08	0.02
YELLOW BULLHEAD	-	-	-	0.08	0.02
BROWN BULLHEAD	-	-	-	0.17	0.05
CHANNEL CATFISH	0.50	1.17	3.00	42.67	13.45
PUMPKINSEED	-	-	0.25	0.42	0.19
SMALLMOUTH BASS	-	-	0.08	0.25	0.10
LARGEMOUTH BASS	-	-	0.17	0.08	0.07
WHITE CRAPPIE	-	-	0.50	3.42	1.12
BLACK CRAPPIE	-	-	0.08	0.08	0.05
TESSELLATED DARTER	1.33	1.00	0.33	0.42	0.69
YELLOW PERCH	-	-	0.58	0.50	0.31
WALLEYE	-	-	-	0.08	0.02
TOTAL	5.84	7.33	11.82	57.24	22.67

1400 144

TABLE 3.4-3

MONTHLY CATCH PER EFFORT (NUMBER PER 10-MIN HAUL) FOR FISHES COLLECTED BY A 16 FT SEMI-BALLOON TRAWL IN TRAWL ZONE 408 IN CONOWINGO POND, MAR-JUN 1979.

MONTH	MAR	APR	MAY	JUN	TOTAL
NO. COLLECTIONS	6	12	12	12	42
NO. SPECIES	9	11	17	14	20
SPECIES					MEAN
CARP	0.17	1.25	4.67	1.92	2.26
GOLDEN SHINER	-	0.25	-	-	0.07
COMELY SHINER	0.33	5.17	1.17	-	1.86
SPOTTAIL SHINER	12.17	18.75	5.92	2.67	9.55
SPOTFIN SHINER	-	-	0.17	-	0.05
BLUNTNOSE MINNOW	-	-	0.17	0.17	0.10
WHITE SUCKER	-	-	0.25	0.08	0.10
SHORTHEAD REDHORSE	-	-	0.08	-	0.02
BROWN BULLHEAD	0.17	0.08	0.08	0.50	0.21
CHANNEL CATFISH	1.67	2.92	8.58	17.50	8.52
PUMPKINSEED	-	0.67	1.42	1.00	0.88
BLUEGILL	-	-	0.33	0.08	0.12
SMALLMOUTH BASS	-	-	-	0.08	0.02
LARGEMOUTH BASS	-	0.08	0.17	0.08	0.10
WHITE CRAPPIE	4.33	9.00	5.00	12.58	8.21
BLACK CRAPPIE	-	-	0.08	0.08	0.05
TESSELLATED DARTER	3.17	2.58	0.17	0.08	1.26
YELLOW PERCH	1.00	0.42	0.33	2.00	0.93
LOGPERCH	0.17	-	-	-	0.02
WALLEYE	-	-	0.08	-	0.02
TOTAL	23.18	41.17	28.67	38.82	34.35

1400 145

TABLE 3.4-4

Comparison of the monthly catch per effort (number per 10 min haul) for fishes collected by a 16 ft semi-balloon trawl from January-June in Trawl Zone 405 during the preoperational (1967-1973) and postoperational (1974-1979) periods in Conowingo Pond. Data given only for years in which species collected.

Month	Jan	Feb	Mar	Apr	May	Jun	Mean
				*White crappie			
1967	-	-	1.00	-	20.00	37.75	25.78
1968	-	-	0.00	-	20.60	12.25	14.70
1969	-	-	-	-	5.33	41.00	25.71
1970	-	-	-	175.00	25.83	24.71	54.17
1971	-	-	-	-	8.22	3.58	5.57
1972	0.17	-	-	41.33	185.00	16.96	54.04
1973	-	0.00	0.00	0.75	0.04	0.04	0.11
1974	0.00	-	0.00	0.00	0.04	0.00	0.01
1975	0.29	0.00	0.12	0.08	0.00	0.08	0.10
1976	-	0.00	0.00	0.00	0.12	0.00	0.02
1979	-	-	0.00	0.17	0.00	0.00	0.05
				*Channel catfish			
1967	-	-	97.50	-	37.13	52.83	50.83
1968	-	-	0.00	-	26.60	32.41	30.70
1969	-	-	-	-	95.67	49.17	69.10
1970	-	-	-	192.17	41.00	294.24	213.37
1971	-	-	-	-	65.50	85.20	76.76
1972	0.33	-	-	11.21	75.42	35.88	28.25
1973	-	0.00	0.04	4.75	9.88	0.88	3.29
1974	1.00	-	2.17	11.42	16.12	4.04	7.61
1975	2.50	0.33	2.92	5.17	45.21	97.08	22.20
1976	-	0.00	0.88	4.96	1.00	13.50	5.42
1977	-	-	9.30	3.25	1.17	67.01	20.17
1978	-	-	-	0.42	0.25	0.00	0.22
1979	-	-	1.17	8.00	55.22	107.58	48.98
				*Bluegill			
1967	-	-	0.00	-	0.00	0.13	0.05
1968	-	-	0.00	-	1.20	0.08	0.41
1969	-	-	-	-	0.56	2.75	1.81
1970	-	-	-	0.50	0.17	0.06	0.17
1971	-	-	-	-	0.66	0.16	0.38
1972	0.04	-	-	0.04	1.42	0.04	0.33
				Pumpkinseed			
1967	-	-	0.00	-	0.13	0.88	0.44
1968	-	-	0.00	-	0.40	1.00	0.82
1969	-	-	-	-	1.44	2.33	1.95
1970	-	-	-	2.00	0.17	0.24	0.57
1971	-	-	-	-	0.38	0.37	0.38
1972	0.00	-	-	0.13	1.53	0.53	0.46
1974	0.00	-	0.00	0.00	0.00	0.04	0.01
1975	0.00	0.04	0.00	0.00	0.00	0.00	0.01
1976	-	0.00	0.00	0.08	0.00	0.00	0.02

continued

TABLE 3.4-4

Continued.

Month	Jan	Feb	Mar	Apr	May	Jun	Mean
				Tesselated darter			
1967	-	-	0.00	-	0.50	0.00	0.22
1968	-	-	0.00	-	0.60	0.16	0.29
1969	-	-	-	-	1.00	1.25	1.14
1970	-	-	-	1.83	0.00	0.59	0.70
1971	-	-	-	-	0.66	0.08	0.33
1972	0.29	-	-	0.46	0.63	0.04	0.34
1973	-	0.00	0.00	0.08	0.00	0.00	0.01
1974	0.75	-	1.00	0.42	0.04	0.12	0.44
1975	0.54	0.12	0.42	0.37	0.42	0.29	0.36
1976	-	0.00	0.00	0.12	0.00	0.67	0.22
1977	-	-	0.13	0.00	0.00	0.13	0.06
1979	-	-	0.83	0.58	0.17	0.17	0.38
				Spottail shiner			
1967	-	-	0.00	-	1.38	0.00	0.61
1968	-	-	-	-	0.20	0.00	0.06
1969	-	-	-	-	2.44	0.58	1.38
1970	-	-	-	3.83	0.83	2.29	2.23
1971	-	-	-	-	1.16	0.00	0.50
1972	0.46	-	-	1.83	0.95	0.00	0.80
1973	-	0.00	0.00	0.08	0.00	0.00	0.01
1974	0.17	0.00	0.04	0.00	0.00	0.00	0.03
1975	0.04	0.42	1.21	0.54	0.17	0.04	0.40
1976	-	0.00	0.00	0.08	0.00	0.00	0.02
1977	-	-	0.00	0.00	0.04	0.00	0.01
1979	-	-	0.67	1.92	1.58	0.17	1.14
				*Gizzard shad			
1975	0.25	0.00	0.00	0.00	0.00	0.00	0.04
1977	-	-	0.00	0.00	0.00	0.13	0.03
				*Smallmouth bass			
1967	-	-	0.00	-	0.00	0.13	0.06
1969	-	-	-	-	0.00	0.33	0.19
1979	-	-	0.00	0.00	0.08	0.00	0.02
				*Largemouth bass			
1967	-	-	0.00	-	0.00	0.13	0.06
1968	-	-	-	-	0.00	0.08	0.06
1970	-	-	-	0.00	0.00	0.06	0.03
1971	-	-	-	-	0.06	0.00	0.02
1972	0.00	-	-	0.00	0.05	0.00	0.01
1978	-	-	-	0.00	0.08	0.00	0.03
				*Walleye			
1967	-	-	0.00	-	0.25	0.00	0.11
1968	-	-	-	-	0.00	0.08	0.06
1969	-	-	-	-	0.11	0.00	0.05
1970	-	-	-	0.17	0.00	0.12	0.10
1971	-	-	-	-	0.00	0.04	0.02
1972	0.00	-	-	0.00	0.00	0.04	0.01
1976	-	0.00	0.00	0.00	0.00	0.06	0.02
1977	-	-	0.00	0.00	0.00	0.04	0.01
1979	-	-	0.00	0.08	0.00	0.00	0.02

* Designated by U.S. Environmental Protection Agency (1975) as "representative, important species"

TABLE 3.4-5

Comparison of the monthly catch per effort (number per 10 min haul) for fishes collected by a 16 ft semi-balloon trawl from January-June in Trawl Zone 400 during the preoperational (1973) and postoperational (1974-1979) periods in Conowingo Pond. Data given only for years in which species collected.

Month	Jan	Feb	Mar	Apr	May	Jun	Mean
				*White crappie			
1973	-	-	0.08	-	-	3.33	2.25
1974	0.14	-	0.00	0.39	0.54	0.90	0.46
1975	0.00	0.00	0.00	1.72	3.44	2.92	1.40
1976	-	0.00	0.00	0.04	0.67	0.25	0.19
1977	-	-	0.00	0.13	0.33	2.04	0.63
1979	-	-	0.00	0.00	0.50	3.42	1.12
				*Channel catfish			
1973	-	-	0.83	-	-	10.63	7.36
1974	3.86	-	1.25	19.36	12.33	3.60	11.18
1975	0.83	0.04	0.67	1.28	4.61	47.75	9.43
1976	-	1.08	1.61	3.29	2.88	6.42	3.11
1977	-	-	24.42	1.00	3.50	10.33	9.81
1978	-	-	-	0.50	0.92	4.58	2.00
1979	-	-	0.50	1.17	3.00	42.67	13.45
				*Bluegill			
1973	-	-	0.00	-	-	0.08	0.06
1974	0.00	-	0.00	0.03	0.08	0.25	0.08
1975	0.08	0.00	0.00	0.00	0.28	0.38	0.48
1976	-	0.00	0.00	0.04	0.04	0.04	0.02
1977	-	-	0.00	0.00	0.13	0.33	0.11
				Pumpkinseed			
1973	-	-	0.00	-	-	0.13	0.08
1974	0.00	-	0.00	0.17	0.17	0.40	0.18
1975	0.00	0.00	0.00	0.28	2.22	0.67	0.48
1976	-	0.00	0.03	0.42	0.42	0.17	0.21
1977	-	-	0.00	0.42	0.46	0.33	0.30
1978	-	-	-	0.00	0.08	0.33	0.14
1979	-	-	0.00	0.00	0.25	0.42	0.19
				Tessellated darter			
1973	-	-	1.00	-	-	-	0.33
1974	2.28	-	1.25	2.86	0.54	2.75	2.04
1975	0.00	0.00	0.54	1.86	0.44	0.12	0.66
1976	-	0.25	0.33	0.67	0.08	1.58	0.59
1977	-	-	2.21	0.38	0.17	2.92	1.42
1978	-	-	-	0.67	0.25	0.00	0.31
1979	-	-	1.33	1.00	0.33	0.42	0.69
				Spottail shiner			
1973	-	-	0.08	-	-	0.00	0.03
1974	1.57	0.00	0.25	0.30	0.04	0.25	0.31
1975	0.00	0.08	0.21	3.94	2.67	0.38	1.49
1976	-	0.08	0.11	0.46	0.00	0.04	0.14
1977	-	-	0.63	0.54	0.00	0.25	0.35
1978	-	-	-	0.25	2.00	0.00	0.75
1979	-	-	3.67	5.00	5.75	6.58	5.48
				Gizzard shad			
1977	-	-	0.00	0.00	0.00	11.17	2.79
1979	-	-	0.00	0.00	0.00	0.08	0.02
				*Smallmouth bass			
1973	-	-	0.00	-	-	0.04	0.03
1975	0.00	0.00	0.00	0.00	0.22	0.12	0.05
1976	-	0.00	0.00	0.00	0.04	0.08	0.02
1979	-	-	0.00	0.00	0.08	0.25	0.10
				*Largemouth bass			
1974	0.00	-	0.00	0.00	0.00	0.05	0.01
1975	0.00	0.00	0.00	0.00	0.22	0.08	0.04
1979	-	-	0.00	0.00	0.17	0.08	0.07
				*Walleye			
1975	0.00	0.00	0.00	0.00	0.00	0.12	0.02
1977	-	-	0.04	-	-	-	0.01
1979	-	-	0.00	0.00	0.00	0.08	0.02

*Designated by U.S. Environmental Protection Agency (1975) as "representative, important species".

TABLE 3.4-6

Comparison of the monthly catch per effort (number per 10 min haul) for fishes collected by a 16 ft semi-balloon trawl from January-June in Trawl Zone 903 during the preoperational (1967-1973) and postoperational (1974-1979) periods in Conowingo Pond. Data given only for years in which species collected.

Month	Jan	Feb	Mar	Apr	May	Jun	Mean
				*White crappie			
1967	-	-	43.50	7.00	150.33	15.00	92.54
1968	-	-	-	-	63.00	56.00	58.78
1969	-	-	-	-	31.50	33.92	33.57
1970	-	-	-	17.67	124.00	59.39	63.97
1971	-	-	-	-	33.21	19.47	24.97
1972	0.17	0.25	-	4.04	79.44	55.08	32.05
1973	-	0.00	0.17	8.92	7.00	2.96	3.66
1974	1.58	-	0.12	0.12	2.42	1.83	1.18
1975	3.21	0.00	0.04	1.00	11.38	10.67	5.27
1976	-	0.00	0.12	0.79	2.00	0.71	0.80
1977	-	-	0.00	0.63	0.83	0.29	0.44
1978	-	-	-	0.00	0.33	0.17	0.17
1979	-	-	4.33	9.00	5.00	12.58	8.21
				*Channel catfish			
1967	-	-	114.50	2.00	14.33	55.00	34.00
1968	-	-	-	-	25.50	28.41	28.00
1969	-	-	-	-	24.00	5.67	8.28
1970	-	-	-	88.33	17.17	16.78	31.17
1971	-	-	-	-	19.71	47.80	36.57
1972	0.42	0.67	-	4.91	59.28	113.88	44.11
1973	-	1.92	23.75	7.50	23.12	19.17	17.69
1974	1.25	-	14.21	43.96	28.79	15.75	22.96
1975	2.21	36.42	20.42	1.21	17.29	25.44	16.25
1976	-	15.67	26.75	3.67	4.54	2.42	10.05
1977	-	-	8.21	11.29	1.83	22.13	10.86
1978	-	-	-	1.83	1.58	9.25	4.22
1979	-	-	1.67	2.92	8.58	17.50	8.52
				*Bluegill			
1967	-	-	0.00	0.00	1.17	1.00	0.73
1968	-	-	-	-	1.00	1.91	1.78
1969	-	-	-	-	5.50	7.25	7.00
1970	-	-	-	0.50	0.83	0.94	0.83
1971	-	-	-	-	0.28	0.57	0.46
1972	0.08	0.00	-	0.13	0.06	0.04	0.07
1974	0.00	-	0.00	0.04	0.17	0.21	0.09
1975	0.00	0.00	0.00	0.00	0.00	0.47	0.12
1976	-	0.00	0.00	0.00	0.08	0.08	0.04
1977	-	-	0.00	0.04	0.33	0.00	0.09
1978	-	-	-	0.08	0.00	0.33	0.14
1979	-	-	0.00	0.00	0.33	0.08	0.12
				Pumpkinseed			
1967	-	-	0.00	0.00	2.83	6.00	2.09
1968	-	-	-	-	1.50	2.75	2.57
1969	-	-	-	-	5.00	7.00	6.71
1970	-	-	-	0.00	1.00	2.39	1.63
1971	-	-	-	-	2.21	0.90	1.43
1972	0.00	0.00	-	0.26	0.17	0.58	0.26
1973	-	0.00	0.00	0.42	0.08	0.08	0.09
1974	0.00	-	0.04	0.00	0.46	0.46	0.21
1975	0.50	0.00	0.00	0.04	1.04	1.72	0.69
1976	-	0.00	0.00	0.29	0.12	0.33	0.17
1977	-	-	0.04	0.29	0.79	0.25	0.34
1978	-	-	-	0.08	1.08	0.92	0.69
1979	-	-	0.00	0.67	1.42	1.00	0.88
				Tessellated darter			
1967	-	-	0.00	0.00	1.00	0.00	0.54
1968	-	-	-	-	2.00	0.50	0.71
1969	-	-	-	-	0.50	0.50	0.50
1970	-	-	-	5.00	0.00	0.39	1.23
1971	-	-	-	-	0.92	0.04	0.40
1972	0.00	0.08	-	1.96	0.28	0.13	0.61
1973	-	0.50	0.29	0.17	0.00	0.96	0.40
1974	3.75	-	1.92	2.04	0.17	0.25	1.39
1975	2.62	0.83	1.42	0.92	1.00	0.22	1.12
1976	-	1.00	1.00	0.21	0.04	0.12	0.42
1977	-	-	1.67	0.42	0.08	0.21	0.59
1978	-	-	-	2.33	0.42	0.08	0.94
1979	-	-	3.17	2.58	0.17	0.08	1.26

continued

TABLE 3.4-6

Continued.

Month	Jan	Feb	Mar	Apr	May	Jun	Mean
				Spottail shiner			
1967	-	-	1.50	0.00	1.83	1.00	1.36
1968	-	-	-	-	0.00	0.40	0.43
1969	-	-	-	-	1.00	1.83	1.71
1970	-	-	-	56.67	1.17	1.89	12.70
1971	-	-	-	-	1.71	0.04	0.71
1972	0.08	0.08	-	5.26	2.22	0.08	1.84
1973	-	0.08	0.17	0.00	0.00	0.00	0.05
1974	2.17	0.00	0.92	0.67	0.42	0.17	0.72
1975	1.21	0.00	1.88	1.42	6.96	0.69	2.08
1976	-	0.58	0.17	0.50	0.38	0.00	0.30
1977	-	-	0.17	0.79	0.13	0.00	0.27
1978	-	-	-	2.00	1.67	0.25	1.31
1979	-	-	12.17	18.75	5.92	2.67	9.55
				*Gizzard shad			
1975	0.12	0.00	0.00	0.00	0.00	0.00	0.02
1976	-	0.00	0.00	0.00	0.00	0.25	0.06
1977	-	-	0.00	0.00	0.00	1.29	0.32
				*Smallmouth bass			
1968	-	-	-	-	0.00	0.08	0.07
1969	-	-	-	-	0.00	0.42	0.36
1975	0.00	0.00	0.00	0.04	0.00	0.11	0.03
1976	-	0.00	0.00	0.00	0.04	0.00	0.01
1979	-	-	0.00	0.00	0.00	0.08	0.02
				*Largemouth bass			
1967	-	-	0.00	0.00	0.50	0.00	0.27
1968	-	-	-	-	0.00	0.08	0.07
1969	-	-	-	-	0.00	0.42	0.36
1970	-	-	-	0.00	0.17	0.17	0.13
1971	-	-	-	-	0.00	0.10	0.06
1974	0.00	-	0.00	0.00	0.00	0.08	0.02
1975	0.00	0.00	0.00	0.00	0.13	0.14	0.06
1976	-	0.00	0.00	0.04	0.00	0.00	0.01
1978	-	-	-	0.00	0.08	0.00	0.03
1979	-	-	0.00	0.08	0.17	0.08	0.10
				*Walleye			
1968	-	-	-	-	0.00	0.08	0.07
1969	-	-	-	-	0.00	0.08	0.07
1973	-	0.00	0.04	0.00	0.00	0.00	0.01
1974	0.00	-	0.00	0.00	0.00	0.08	0.02
1975	0.00	0.00	0.04	0.00	0.00	0.06	0.02
1977	-	-	0.04	0.00	0.00	0.00	0.01
1978	-	-	-	0.00	0.08	0.17	0.08
1979	-	-	0.00	0.00	0.08	0.00	0.02

* Designated by U.S. Environmental Protection Agency (1975) as "representative, important species".

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TABLE 3.4-7

Comparison of the length frequency distribution of white crappie collected by a 16 ft semi-balloon trawl from January-June in Zone 405 during the preoperational (1967-1973) and postoperational (1974-1979) periods in Conowingo Pond.

Year	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
No. Collections	21	17	19	29	24	48	48	54	72	60	48	56	42
Fork Length (mm)													
11-20	-	-	-	-	-	-	-	-	-	-	-	-	-
21-30	-	-	4	-	-	-	-	-	-	-	-	-	-
31-40	-	-	37	-	-	-	-	-	-	-	-	-	-
41-50	-	-	-	-	-	-	-	-	-	-	-	-	-
51-60	-	-	-	-	-	-	-	-	-	-	-	-	-
61-70	-	-	-	-	-	-	-	-	-	-	-	-	-
71-80	-	-	-	2	-	1	-	-	-	-	-	-	-
81-90	2	-	5	6	-	6	-	-	-	-	-	-	-
91-100	15	1	8	29	2	64	-	-	-	-	-	-	-
101-110	72	-	9	257	-	176	-	-	2	-	-	-	1
111-120	139	-	21	582	1	211	-	-	1	-	-	-	-
121-130	121	1	32	463	1	136	-	-	1	-	-	-	1
131-140	77	10	21	189	4	38	1	-	-	-	-	-	-
141-150	12	41	9	57	20	9	-	-	-	-	-	-	-
151-160	2	72	1	9	31	2	1	-	-	-	-	-	-
161-170	1	65	1	9	46	4	4	-	-	-	-	-	-
171-180	-	32	1	4	18	16	2	-	-	-	-	-	-
181-190	2	11	3	7	8	18	1	-	-	-	-	-	-
191-200	4	5	6	3	4	14	-	-	-	-	-	-	-
201-210	2	2	3	2	2	9	-	1	-	-	-	-	-
211-220	8	2	3	2	-	3	-	-	-	-	-	-	-
221-230	2	6	1	1	-	2	-	-	2	-	-	-	-
231-240	3	2	-	1	1	-	-	-	1	-	-	-	-
241-250	-	-	-	2	-	-	-	-	-	-	-	-	-
251-260	-	-	-	-	1	-	-	-	-	-	-	-	-
261-270	-	-	-	-	-	-	-	-	-	1	-	-	-
271-280	-	-	-	-	-	-	-	-	-	1	-	-	-
No. Measured	462	250	165	1625	139	709	9	1	7	2	0	0	2
Total Sample	464	250	540*	1625	142	3238*	9	1	7	2	0	0	2

* Most unmeasured specimens were ≤ 140 mm

TABLE 3.4-8

Comparison of the length frequency distribution of channel catfish collected by a 16 ft semi-balloon trawl from January-June in Zone 405 during the preoperational (1967-1973) and postoperational (1974-1979) periods in Conowingo Pond.

Year	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
No. Collections	21	17	19	29	24	48	48	54	72	60	48	36	42
Fork Length (cm)													
11-20	-	-	1	1	-	-	-	-	-	4	-	-	-
21-30	-	-	23	1	-	-	-	-	-	4	6	-	-
31-40	-	-	14	-	-	-	-	1	2	2	5	-	-
41-50	-	2	2	4	-	15	-	19	4	2	3	-	5
51-60	2	18	1	94	15	207	5	28	29	14	13	-	84
61-70	3	22	6	218	57	251	6	34	90	36	96	-	197
71-80	4	29	28	374	110	157	3	58	204	88	170	-	305
81-90	3	40	87	467	175	97	1	56	264	32	123	-	205
91-100	5	12	129	485	139	31	-	53	283	10	71	-	63
101-110	-	2	121	304	44	8	7	23	141	10	21	-	64
111-120	1	2	99	142	52	18	30	9	48	25	21	2	97
121-130	9	12	83	39	145	26	51	38	23	20	64	1	58
131-140	7	54	34	27	291	66	31	42	43	13	48	1	50
141-150	4	72	46	71	238	66	5	47	68	1	62	-	32
151-160	10	54	36	97	62	57	3	49	57	9	14	-	32
161-170	38	18	52	72	23	59	13	25	24	8	5	-	12
171-180	84	22	24	36	25	25	3	13	23	5	4	3	13
181-190	57	32	14	19	18	13	3	18	24	4	-	-	7
191-200	41	19	10	14	12	8	-	13	11	5	-	1	5
201-210	57	22	6	9	7	7	1	2	14	1	1	-	3
211-220	42	23	9	14	4	5	-	1	11	3	-	-	2
221-230	33	9	7	12	5	6	-	3	5	-	-	-	-
231-240	11	10	3	8	2	6	-	1	3	3	-	-	2
241-250	5	4	2	8	2	2	-	-	-	-	-	-	-
251-260	-	2	-	4	-	1	-	1	2	-	-	-	-
261-270	-	-	-	4	1	1	-	-	-	-	-	-	-
271-280	1	-	1	-	1	-	-	-	-	-	-	-	-
281-290	-	1	-	1	-	-	-	-	-	-	-	-	-
291-300	-	1	-	-	-	-	-	-	-	-	-	-	-
301-310	-	-	-	-	-	-	-	-	-	-	-	-	-
311-320	-	-	-	-	-	-	-	-	-	-	-	-	-
321-330	-	-	-	-	1	-	-	-	-	-	-	-	-
331-340	-	1	-	-	-	-	-	-	-	-	-	-	-
No. Measured	417	483	838	2525	1429	1132	162	534	1373	299	727	8	1236
Total Sample	914	823	1220	6401	1701	1669	162	534	2032	299	1092	8	2057

TABLE 3.4-9

Comparison of the length frequency distribution of white crappie and channel catfish collected by a 16-ft semi-balloon trawl from January-June in Zone 406 from 1973-1979 in Conowingo Pond.

	White crappie							Channel catfish						
Year	1973	1974	1975	1976	1977	1978	1979	1973	1974	1975	1976	1977	1978	1979
No. Collections	36	54	72	60	48	36	42	36	54	72	60	48	36	42
Fork Length (mm)														
11-20	-	2	1	-	6	-	-	-		-	-	-	-	-
21-30	-	1	-	-	25	-	-	-	1	-	-	-	-	-
31-40	-	-	1	-	8	-	-	-	6	-	-	1	-	-
41-50	-	-	-	-	-	-	-	-	27	3	-	18	-	2
51-60	-	-	-	-	-	-	-	-	40	2	1	40	3	9
61-70	-	-	-	-	-	-	-	-	51	15	1	35	9	32
71-80	-	-	1	-	1	-	-	2	58	47	1	11	17	38
81-90	-	-	-	-	1	-	-	-	68	93	1	5	5	31
91-100	-	2	3	-	-	-	3	-	65	134	3	7	3	12
101-110	-	-	7	-	3	-	17	-	25	103	3	12	2	9
111-120	-	3	16	-	2	-	15	1	13	35	5	28	2	22
121-130	1	1	34	-	-	-	7	3	17	8	10	62	1	19
131-140	1	1	25	-	-	-	3	4	26	24	15	66	1	24
141-150	6	1	19	1	-	-	1	5	23	38	12	53	4	20
151-160	10	-	6	3	-	-	-	6	49	46	17	30	7	26
161-170	15	-	1	5	-	-	-	13	51	26	22	24	5	21
171-180	10	1	1	3	-	-	-	12	34	14	14	20	6	18
181-190	2	2	-	2	-	-	-	8	36	12	9	21	-	13
191-200	1	5	-	-	-	-	-	10	25	22	10	8	2	4
201-210	-	6	1	2	-	-	-	2	9	17	10	2	3	6
211-220	-	2	1	-	1	-	1	4	1	14	5	7	-	2
221-230	-	2	-	-	-	-	-	-	3	6	6	4	1	1
231-240	-	-	1	-	-	-	-	-	-	5	5	-	1	1
241-250	-	-	-	-	-	-	-	-	-	1	-	1	-	-
251-260	-	-	-	-	-	-	-	-	1	1	-	-	-	-
261-270	-	-	-	-	-	-	-	-	-	-	-	-	-	1
271-280	-	-	-	-	-	-	-	-	-	-	-	-	-	-
281-290	-	-	-	-	-	-	-	-	-	-	1	-	-	-
291-300	-	-	-	-	-	-	-	-	-	-	-	-	-	-
301-310	-	-	-	-	-	-	-	-	-	-	-	-	-	-
311-320	-	-	-	-	-	-	-	-	-	-	1	-	-	-
321-330	-	-	-	-	-	-	-	-	-	-	-	-	-	-
331-340	-	-	-	-	-	-	-	-	-	-	2	-	-	-
No. Measured	46	29	118	16	47	0	47	70	629	666	154	455	72	311
Total Sample	46	29	118	16	47	0	47	70	629	876	154	457	72	565

TABLE 3.4-10

Comparison of the length frequency distribution of white crappie collected by a 16 ft semi-balloon trawl from January-June in Zone 408 during the preoperational (1967-1973) and postoperational (1974-1979) periods in Conowingo Pond.

Year	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
No. Collections	11	14	14	29	20	48	48	54	72	54	48	36	42
Fork Length (mm)													
11-20	-	-	-	-	-	-	-	-	-	-	1	-	-
21-30	-	-	1	2	-	-	-	-	-	-	2	-	-
31-40	-	-	-	2	-	-	-	-	1	-	-	-	-
41-50	-	-	-	-	-	-	-	-	-	-	-	-	-
51-60	-	-	-	-	-	-	-	-	-	-	-	-	-
61-70	-	-	-	-	-	-	-	-	-	1	-	-	-
71-80	-	-	-	2	-	-	-	-	1	-	1	-	1
81-90	1	1	3	3	-	8	-	-	3	-	3	2	4
91-100	22	8	23	55	2	74	1	3	[illegible]	-	1	-	45
101-110	34	10	51	297	2	235	3	13	24	-	3	4	102
111-120	74	4	107	619	1	384	5	10	86	-	1	-	119
121-130	25	4	101	482	2	294	3	12	145	1	2	-	59
131-140	18	1	62	273	7	97	6	4	111	2	1	-	2
141-150	5	96	15	117	29	10	24	-	43	6	-	-	1
151-160	-	245	4	31	88	7	46	-	13	14	-	-	-
161-170	-	233	1	6	132	5	59	2	2	6	-	-	-
171-180	2	127	1	2	120	19	26	1	-	11	-	-	2
181-190	8	46	3	4	53	34	8	2	-	4	-	-	-
191-200	7	14	5	4	18	28	3	5	-	4	-	-	-
201-210	6	2	6	7	3	18	2	1	5	1	4	-	5
211-220	18	-	4	4	3	10	-	2	1	-	-	-	1
221-230	21	2	4	4	-	1	2	-	2	-	1	-	1
231-240	15	1	-	-	-	1	-	-	4	-	1	-	-
241-250	11	-	-	1	-	1	-	-	-	-	-	-	1
251-260	1	-	-	2	-	-	-	-	1	-	-	-	-
261-270	1	-	-	-	-	-	-	-	-	1	-	-	-
271-280	-	-	-	-	1	-	-	-	-	1	-	-	-
281-290	1	-	-	2	-	-	-	-	-	-	-	-	1
331-340	-	-	-	-	-	-	-	-	-	-	-	-	1
No. Measured	270	812	391	1919	461	1226	188	61	453	52	21	6	345
Total Sample	1018*	823	470	1919	462	1462*	188	61	453	52	21	6	345

* Most unmeasured specimens were $\leq$ 140 mm

TABLE 3.4-11

Comparison of the length frequency distribution of channel catfish collected by a 16 ft semi-balloon trawl from January-June in Zone 408 during the preoperational (1967-1973) and postoperational (1974-1979) periods in Conowingo Pond.

Year	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
No. Collections	11	14	14	29	20	48	48	54	72	54	48	36	42
Fork Length (mm)													
21-30	-	-	-	-	-	-	-	-	-	-	-	-	-
31-40	-	-	-	-	-	-	-	3	1	-	1	-	-
41-50	-	-	-	3	-	16	1	17	2	21	15	-	5
51-60	8	2	-	15	1	129	9	33	7	79	46	7	3
61-70	4	3	-	43	-	263	23	41	52	69	33	9	15
71-80	5	16	1	77	1	308	35	93	71	26	64	24	25
81-90	2	27	8	129	12	163	42	177	105	2	68	15	11
91-100	1	18	9	167	24	51	4	205	125	14	47	15	11
101-110	-	4	7	130	5	14	8	53	120	41	29	20	20
111-120	4	2	3	29	10	15	49	7	78	100	25	20	42
121-130	6	7	3	25	26	27	170	46	43	77	58	11	53
131-140	3	44	3	19	114	65	149	56	48	24	61	4	39
141-150	6	86	3	31	130	62	78	41	91	16	36	7	30
151-160	5	55	11	49	77	55	67	80	103	25	21	3	27
161-170	14	17	12	60	19	77	98	97	74	20	21	4	14
171-180	74	16	10	40	11	61	83	47	58	21	6	3	10
181-190	57	25	9	16	19	20	46	33	64	20	9	3	10
191-200	20	19	9	29	7	7	15	20	51	15	4	-	4
201-210	26	14	4	23	6	7	17	20	38	21	4	1	5
211-220	24	12	1	14	4	7	12	12	28	14	7	3	5
221-230	22	11	4	10	5	6	4	2	17	5	1	2	7
231-240	12	5	3	4	3	6	3	2	6	3	1	-	3
241-250	8	2	-	6	1	4	4	1	1	-	1	-	-
251-260	2	1	-	7	-	2	2	1	3	-	-	-	-
261-270	3	-	-	4	1	2	-	1	-	-	-	-	1
271-280	-	1	-	2	-	1	2	-	-	-	-	1	-
281-290	-	-	-	2	-	2	1	-	-	-	-	-	-
291-300	-	-	-	-	-	-	-	-	-	-	-	-	-
301-310	-	-	-	-	-	-	-	1	-	-	-	-	-
311-320	-	-	-	-	-	1	-	-	-	-	-	-	-
No. Measured	306	387	100	934	476	1371	922	1089	1186	613	561	152	340
Total Sample	373*	392*	116*	934	476	2153*	922	1089	1186	613	561	152	358

* Most unmeasured specimens were ≤ 120 mm

TABLE 3.4-12

Spearman rank correlation coefficients for comparison of species ranking of fishes collected from January through June by a 16 ft semi-balloon trawl in Zones 405 and 406 in Conowingo Pond between the preoperational (1967-1973) and postoperational (1974-1979) periods. Triangle = preoperational; Rectangles = postoperational comparisons.

		Zone 405												Zone 406					
		1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1973	1974	1975	1976	1977	1978
1979	N	21	21	19	24	23	20	16	18	19	18	17	17	21	22	24	23	25	20
	r	.47*	.20^{NS}	.32^{NS}	.34^{NS}	.37^{NS}	.35^{NS}	.66	.46*	.52*	.47*	.32^{NS}	.07^{NS}	.45*	.65	.73	.56	.58	.68
	s	.51	.20	.33	.35	.39	.36	.79	.50	.58	.51	.33	.07	.48	.78	.93	.63	.66	.83
1978	N	16	16	18	19	19	15	9	11	15	10	9		15	15	22	18	22	
	r	.05^{NS}	.05^{NS}	-.07^{NS}	.04^{NS}	.02^{NS}	.09^{NS}	.23^{NS}	.14^{NS}	.05^{NS}	.65*	.27^{NS}		.15^{NS}	.49^{NS}	.47*	.38^{NS}	.51	
	s	.05	.05	-.07	.04	.02	.09	.23	.14	.05	.78	.28		.15	.54	.51	.40	.56	
1977	N	16	16	18	19	20	15	9	11	15	12			24	23	25	24		
	r	.19^{NS}	-.02^{NS}	-.01^{NS}	.23^{NS}	.11^{NS}	.25^{NS}	.37^{NS}	.66*	.46^{NS}	.46^{NS}			.48*	.70	.60	.57		
	s	.19	-.02	-.01	.23	.11	.26	.39	.79	.50	.50			.52	.87	.69	.65		
1976	N	17	17	18	20	20	16	12	13	16				17	18	23			
	r	.56*	.31^{NS}	.39^{NS}	.51*	.52*	.55*	.48^{NS}	.35*	.44*				.73	.76	.86			
	s	.63	.32	.41	.56	.58	.62	.52	.62	.47				.93	1.00	1.29			
1975	N	20	19	19	20	21	18	14	15					23	22				
	r	.45*	.26^{NS}	.33^{NS}	.51*	.48*	.43*	.66	.54*					.64	.80				
	s	.48	.27	.34	.56	.52	.46	.79	.60					.76	1.10				
1974	N	16	16	18	20	19	15	9						16					
	r	.57*	.36^{NS}	.42^{NS}	.54	.54	.62	.58^{NS}						.71					
	s	.65	.38	.45	.60	.60	.72	.66						.89					
1973	N	15	15	17	19	19	14												
	r	.72	.49*	.50*	.66	.57	.74												
	s	.91	.54	.55	.79	.65	.95												
1972	N	16	15	18	20	20													
	r	.80	.73	.75	.80	.72													
	s	1.10	.93	.97	1.10	.91													
1971	N	21	21	21	23														
	r	.67	.64	.74	.63														
	s	.81	.76	.95	.74														
1970	N	21	21	21															
	r	.76	.73	.71															
	s	1.00	.93	.89															
1969	N	18	19																
	r	.77	.72																
	s	1.02	.91																
1968	N	17																	
	r	.65																	
	s	.79																	

All correlations significant at 99% level unless otherwise indicated
* - Significant at 95% level
NS - Not significant at 95% level

TABLE 3.4-13

Spearman rank correlation coefficients for comparison of species ranking of fishes collected from January through June by a 16 ft semi-balloon trawl in Zone 408 in Conowingo Pond between the preoperational (1967-1973) and postoperational (1974-1979) periods. Triangle = preoperational; Rectangles = postoperational comparisons.

Zone 408

		1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
1979	N	21	23	21	21	22	22	23	21	25	24	22	21
	r	.67	.51	.66	.76	.71	.69	.43*	.75	.78	.60	.60	.72
	β	.81	.56	.79	1.00	.89	.85	.46	.97	1.04	.69	.69	.91
1978	N	18	22	19	19	20	18	20	19	24	23	22	
	r	.52*	.50*	.53*	.64	.59	.73	.51*	.56	.76	.54	.57	
	β	.58	.55	.59	.76	.68	.93	.56	.63	1.00	.60	.65	
1977	N	20	24	23	22	23	21	20	22	25	25		
	r	.58	.58	.55	.68	.69	.72	.57	.59	.73	.72		
	β	.66	.66	.62	.83	.85	.91	.65	.68	.93	.91		
1976	N	20	24	22	22	22	21	24	22	26			
	r	.72	.65	.65	.74	.73	.73	.48*	.66	.74			
	β	.91	.78	.78	.95	.93	.93	.52	.79	.95			
1975	N	24	27	25	26	26	24	26	25				
	r	.70	.67	.84	.80	.68	.71	.47	.75				
	β	.87	.81	1.22	1.10	.83	.89	.51	.97				
1974	N	17	21	18	20	19	17	21					
	r	.68	.56	.54*	.65	.62	.70	.48*					
	β	.83	.63	.60	.78	.72	.87	.52					
1973	N	17	22	21	20	18	19						
	r	.69	.45*	.35NS	.60	.68	60						
	β	.85	.48	.36	.69	.83	.69						
1972	N	15	21	17	18	17							
	r	.78	.60	.67	.74	.80							
	β	1.02	.69	.81	.95	1.10							
1971	N	15	21	19	18								
	r	.90	.78	.70	.87								
	β	1.50	1.04	.87	1.33								
1970	N	17	20	19									
	r	.87	.73	.83									
	β	1.33	.93	1.19									
1969	N	17	20										
	r	.75	.67										
	β	.97	.81										
1968	N	20											
	r	.74											
	β	.95											

All correlations significant at 99% level unless otherwise indicated

* - Significant at 95% level
NS - Not significant at 95% level

TABLE 3.4-14

Statistics for confidence intervals on the preoperational (1967-1973) Spearman rank correlation coefficients (r_s) for trawl Zones 405 and 408 in Conowingo Pond. Correlations were calculated on the species ranks from January-June.

	χ^2	df	Average Weighted Z	Estimate of Common ρ	Confidence Limits (P = 0.95)
Zone 405					
Preoperational (1967-1973)	7.02	20	0.87	0.70	$0.405 \leq Z \leq 1.329$ $0.380 \leq \rho \leq 0.869$
Postoperational (1974)	1.12	6	0.57	0.52	
(1975)	2.22	6	0.48	0.45	
(1976)	1.13	6	0.52	0.48	
(1977)	1.14	6	0.15*	0.15*	
(1978)	0.21	6	0.06*	0.06*	
(1979)	3.06	6	0.40	0.38	
Combined (1974-1979)	29.19	41	0.37*	0.35*	
Zone 408					
Preoperational (1967-1973)	8.35	20	0.95	0.74	$0.490 \leq Z \leq 1.414$ $0.454 \leq \rho \leq 0.888$
Postoperational (1974)	1.57	6	0.70	0.60	
(1975)	6.96	6	0.89	0.71	
(1976)	2.87	6	0.82	0.68	
(1977)	1.58	6	0.74	0.63	
(1978)	1.83	6	0.66	0.58	
(1979)	4.13	6	0.76	0.64	
Combined (1974-1979)	23.58	41	0.77	0.65	

* Not within the 95% confidence interval of the preoperational period

3.5 SEINE CATCHES

A total of 8,269 fish of 32 species was collected from January through June 1979 (Tables 3.5-1 to 3.5-2). The common fishes in order of decreasing abundance were the spotfin shiner, largemouth bass, bluntnose minnow, creek chub, comely shiner and common shiner. Abundance of each species varied between stations and months. The spotfin shiner was common at all stations and accounted for over 75% of the total catch of all stations combined.

The monthly catch per effort of the "representative, important species" and that of several other species commonly taken by seine was compared with preoperational data to determine if any changes occurred in their abundance in this postoperational period (Table 3.5-3). The overall catches of all but two fishes from January through June were within the range observed during the preoperational period. Catches of bluntnose minnow and largemouth bass were more than twice as high as those from preoperational years.

The number of species collected and total catch per effort at Station 207 (located in the discharge canal) and at Station 214 (located in the thermal plume) were examined to determine the occurrence and abundance of fishes in the heated discharge. The water temperatures at Station 207 ranged from 9 to 18 F higher than those at Stations 201-203 and 206 where no delta T occurred or is expected to occur. Water temperatures at Station 214 ranged from 2 to 12 F higher than those at stations upstream of

Peach Bottom Atomic Power Station. The catch per effort at Station 214 (57.71 fish per collection) was below the average catch per effort of all stations (83.53) and ranked sixth among all stations. Over ninty-one percent of the catch at Station 214 consisted of spotfin shiner, indicating that this species was attracted to the warmer water. The catch per effort at Station 207 (6.50 fish per collection) ranked eleventh among all stations. The number of species collected at Stations 214 (6) and 207 (6) were within the range observed at other stations (4 to 21).

Monthly species diversity indices from January through June (Table 3.5-4) ranged from 0.45 in January to 2.14 in June. The diversity values of all months except May were within the range of variation observed since 1966. The diversity value for May was slightly higher than that for the preoperational years. Diversity values at seine stations ranged from 0.39 and 0.44 at Stations 202 and 208 to 2.24 and 1.57 at Stations 213 and 201, respectively. The low diversity at Stations 202 and 208 resulted from the dominance of a single species, spotfin shiner, which comprised over 93% of the catch. In contrast, the higher diversity at Stations 213 and 201 was due to spotfin shiner comprising less than 60% of the catch. The diversity values at Station 214 (0.57) and 207 (0.83) were either within or above the range of diversity values at stations unaffected by thermal effluent from Peach Bottom Atomic Power Station (0.39-0.56).

Faunal similarity among stations was determined by the index of percent similarity, PS_c (Table 3.5-5). Except for Station

211, all stations showed greater than 50% similarity. Station 211 had the lowest (16%) faunal similarity to other stations due to the large proportion of largemouth bass (79.8%) in the catch. Station 214 (79%) and 207 (76%), located in the thermal plume and discharge canal, respectively, had high faunal similarity to other stations which indicates that species composition at these stations was similar to that at stations not directly affected by the thermal discharge.

Spearman rank correlation coefficients (r_s) were calculated to determine if any significant changes have occurred in the rank of species (Table 3.5-6). Species ranks in 1966 and 1969 were significantly different ($P < 0.05$) from those in 1979. However, the small number of collections taken in those years (1966-9, 1969-23, 1979-99) is the primary cause of the differences in species ranks; the analysis does not indicate any significant shifts in species composition among years.

TABLE 3.5-1

MONTHLY CATCH PER EFFORT (NUMBER PER COLLECTION) FOR FISHES COLLECTED BY 10 X 4 FT SEINE IN CONOWINGO POND, JANUARY-JUNE 1979.

MONTH	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
NO. COLLECTIONS	7	2	18	24	24	24	99
NO. SPECIES	2	2	16	21	25	25	32
SPECIES							MEAN
GIZZARD SHAD	-	-	-	-	0.04	-	0.01
STONEROLLER	-	-	-	0.04	0.29	0.25	0.14
ROSYSIDE DACE	-	-	0.22	0.63	0.92	0.08	0.43
CUTLIPS MINNOW	-	-	0.06	0.79	0.33	-	0.28
RIVER CHUB	-	-	-	0.13	-	0.04	0.04
GOLDEN SHINER	-	-	-	0.04	0.21	-	0.06
COMELY SHINER	-	-	4.72	2.08	0.38	-	1.45
COMMON SHINER	-	-	1.33	1.42	2.63	0.75	1.40
SPOTTAIL SHINER	-	-	0.39	0.50	0.54	2.38	0.90
SWALLOWTAIL SHINER	-	-	0.28	0.83	0.08	0.17	0.31
ROSYFACE SHINER	-	-	0.50	0.13	0.21	0.13	0.20
SPOTFIN SHINER	2.71	11.50	97.11	105.38	59.38	21.17	63.15
BLUNTNOSE MINNOW	-	1.50	9.44	7.88	2.54	0.88	4.48
BLACKNOSE DACE	0.29	-	1.67	2.96	0.75	0.50	1.34
LONGNOSE DACE	-	-	-	0.08	-	0.17	0.06
CREEK CHUB	-	-	0.61	2.58	3.79	1.50	2.02
FALLFISH	-	-	-	0.04	0.38	0.04	0.11
QUILLBACK	-	-	-	-	-	0.21	0.05
WHITE SUCKER	-	-	-	0.29	0.42	0.46	0.28
NORTHERN HOG SUCKER	-	-	0.06	0.04	0.04	0.29	0.10
CHANNEL CATFISH	-	-	0.11	-	-	-	0.02
MUMMICHOG	-	-	-	-	0.04	-	0.01
STRIPED BASS HYBRID	-	-	-	-	-	0.04	0.01
REDBREAST SUNFISH	-	-	0.06	-	0.17	0.08	0.07
GREEN SUNFISH	-	-	0.06	-	-	-	0.01
PUMPKINSEED	-	-	-	-	0.29	0.58	0.21
BLUEGILL	-	-	-	0.08	0.25	0.54	0.21
SMALLMOUTH BASS	-	-	-	-	0.13	0.04	0.04
LARGEMOUTH BASS	-	-	-	0.04	0.04	23.88	5.81
TESSELLATED DARTER	-	-	0.39	0.21	0.21	0.33	0.25
YELLOW PERCH	-	-	-	-	-	0.04	0.01
LOGPERCH	-	-	-	-	0.13	0.17	0.07
TOTAL	3.00	13.00	117.01	126.17	74.19	54.72	83.53

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TABLE 3.3-2

CATCH PER EFFORT (NUMBER PER COLLECTION) FOR FISHES COLLECTED BY 10 X 4 FT SEINE AT STATIONS 201-203, 206-214 IN CONOWINGO POND, JANUARY-JUNE 1979.

LOCATION	201	202	203	206	207	208	209	210	211	212	213	214	TOTAL
NO. COLLECTIONS	7	7	7	8	12	8	8	8	7	10	10	7	99
NO. SPECIES	4	6	6	12	6	5	20	11	10	18	21	6	32
SPECIES													MEAN
GIZZARD SHAD	0.14	-	-	-	-	-	-	-	-	-	-	-	0.01
STONEROLLER	-	-	-	-	-	-	-	-	-	-	1.40	-	0.14
ROSYSIDE DACE	-	-	-	-	-	-	0.63	-	-	0.10	3.70	-	0.43
CUTLIPS MINNOW	-	-	-	-	-	-	-	-	-	2.70	0.10	-	0.28
RIVER CHUB	-	-	-	-	-	-	0.13	-	-	-	0.30	-	0.04
GOLDEN SHINER	-	-	-	0.25	-	-	0.13	-	-	0.30	-	-	0.06
COMELY SHINER	0.57	-	-	0.50	-	0.38	1.00	-	0.14	7.10	4.20	1.57	1.45
COMMON SHINER	-	0.14	-	0.25	-	-	2.00	0.50	-	6.70	3.90	1.43	1.40
SPOTTAIL SHINER	0.14	-	3.00	1.25	-	0.13	3.50	-	3.14	0.50	0.10	-	0.90
SWALLOWTAIL SHINER	-	0.29	-	-	-	-	0.75	0.25	-	1.70	0.10	0.43	0.31
ROSYFACE SHINER	-	-	-	0.13	-	-	0.25	0.13	-	0.70	0.90	-	0.20
SPOTFIN SHINER	1.00	16.71	39.43	62.38	5.67	18.63	273.00	28.38	13.86	162.20	63.50	53.00	63.15
BLUNTNOSE MINNOW	-	-	0.43	0.25	0.25	-	18.88	1.50	0.86	21.70	4.20	1.14	4.48
BLACKNOSE DACE	-	0.14	0.14	0.25	-	0.63	0.50	0.13	0.14	6.70	5.10	-	1.34
LONGNOSE DACE	-	-	-	-	-	-	-	-	-	0.10	0.50	-	0.06
CREEK CHUB	-	-	-	-	-	-	2.38	-	-	2.00	16.10	-	2.02
FALLFISH	-	-	-	-	-	-	0.75	-	-	0.20	0.30	-	0.11
QUILLBACK	-	-	-	-	-	-	0.63	-	-	-	-	-	0.05
WHITE SUCKER	-	-	0.29	-	-	-	-	-	-	0.50	2.10	-	0.28
NORTHERN HOG SUCKER	-	-	-	-	-	-	0.13	-	-	0.10	0.80	-	0.10
CHANNEL CATFISH	-	-	-	-	0.17	-	-	-	-	-	-	-	0.02
MUMMICHOG	-	-	-	-	-	-	0.13	-	-	-	-	-	0.01
STRIPED BASS HYBRID	-	0.14	-	-	-	-	-	-	-	-	-	-	0.01
REDBREAST SUNFISH	-	-	-	-	0.25	-	-	0.13	0.43	-	-	-	0.07
GREEN SUNFISH	-	-	-	-	-	-	-	-	0.14	-	-	-	0.01
PUMPKINSEED	-	-	-	0.13	0.08	-	0.88	1.00	0.57	-	-	-	0.21
BLUEGILL	-	-	-	-	0.08	-	1.75	0.50	-	-	0.20	-	0.21
SMALLMOUTH BASS	-	-	-	0.25	-	-	-	-	-	-	0.10	0.14	0.04
LARGEMOUTH BASS	-	-	-	-	-	-	2.50	0.13	79.14	-	-	-	5.81
TESSELLATED DARTER	-	0.14	-	0.38	-	0.13	0.13	0.25	0.71	1.10	0.10	-	0.25
YELLOW PERCH	-	-	0.14	-	-	-	-	-	-	-	-	-	0.01
LOGPERCH	-	-	-	0.13	-	-	-	-	-	0.30	0.30	-	0.07
TOTAL	1.85	17.56	43.43	66.15	6.50	19.90	310.05	32.90	99.13	214.70	108.00	57.71	83.53

TABLE 3.5-3

Comparison of the monthly catch per effort (number per collection) of fishes collected by a 10- and 15 x 4 ft seine in January-June during the preoperational (1967-1973) and postoperational (1974-1979) periods in Conowingo Pond. Data given only for years in which species were collected.

Month	Jan	Feb	Mar	Apr	May	Jun	Mean
			*Spotfin shiner				
1967	0.00	-	20.75	39.00	35.00	68.60	45.08
1968	-	-	-	-	36.83	35.96	36.12
1969	-	-	-	69.00	86.80	11.50	32.70
1970	-	-	-	-	72.20	75.87	75.47
1971	-	-	-	-	95.40	85.43	89.37
1972	13.63	11.87	6.13	25.97	48.08	25.04	26.79
1973	-	-	59.24	102.47	36.17	14.29	50.08
1974	16.00	-	98.68	102.00	82.25	54.71	77.92
1975	43.38	9.18	2.50	49.17	44.96	45.44	37.92
1976	23.60	35.19	71.42	71.33	68.62	26.71	53.38
1977	4.75	21.57	27.44	45.67	40.42	19.21	31.68
1978	16.67	-	10.36	14.79	30.71	29.96	22.75
1979	2.71	11.50	97.11	105.38	59.38	21.17	63.15
			*Bluntnose minnow				
1967	0.00	-	1.75	10.00	1.50	1.30	2.08
1968	-	-	-	-	0.33	0.63	0.58
1969	-	-	-	1.50	1.00	0.00	0.35
1970	-	-	-	-	1.60	0.67	0.78
1971	-	-	-	-	2.27	0.35	1.10
1972	0.26	0.25	0.07	1.37	2.11	0.39	1.02
1973	-	-	1.85	1.41	2.92	0.42	1.68
1974	0.11	-	0.59	2.39	3.04	0.79	1.58
1975	7.88	1.35	2.90	4.42	2.46	0.86	2.94
1976	2.60	0.94	2.67	2.67	0.42	0.75	1.61
1977	0.00	0.43	0.56	0.38	1.08	1.79	0.91
1978	0.50	-	0.36	2.04	1.54	3.33	1.94
1979	0.00	1.50	9.44	7.88	2.54	0.88	4.48
			Pumpkinseed				
1967	0.00	-	0.25	0.00	0.00	0.20	0.12
1968	-	-	-	-	0.17	0.59	0.52
1969	-	-	-	0.00	0.20	1.31	0.96
1970	-	-	-	-	1.80	1.72	1.73
1971	-	-	-	-	0.13	1.78	1.13
1972	0.16	0.00	0.07	0.16	0.57	1.09	0.41
1973	-	-	0.00	0.23	0.17	0.00	0.08
1974	0.33	-	0.09	0.65	0.42	0.92	0.51
1975	0.00	0.00	0.05	0.17	0.92	0.58	0.35
1976	0.00	0.00	0.00	0.00	0.21	0.12	0.06
1977	0.00	0.00	0.00	0.00	0.33	0.42	0.18
1978	0.50	-	0.09	0.21	0.21	0.38	0.26
1979	0.00	0.00	0.00	0.00	0.29	0.58	0.21

continued

TABLE 3.5-3

Continued.

Month	Jan	Feb	Mar	Apr	May	Jun	Mean
				*Bluegill			
1967	0.00	-	0.00	0.00	0.00	0.30	0.12
1968	-	-	-	-	0.17	0.59	0.52
1969	-	-	-	1.50	2.00	2.06	2.00
1970	-	-	-	-	0.40	0.32	0.33
1971	-	-	-	-	0.07	0.26	0.18
1972	0.58	0.12	1.20	1.25	0.37	1.39	0.87
1973	-	-	0.18	0.00	0.08	0.00	0.08
1974	0.00	-	0.68	0.48	0.75	0.08	0.45
1975	0.00	1.06	0.40	0.25	1.38	1.11	0.77
1976	0.10	0.12	0.00	0.08	0.25	0.08	0.11
1977	0.00	0.00	0.13	0.00	0.17	0.21	0.11
1978	0.00	-	0.45	0.00	0.08	0.08	0.10
1979	0.00	0.00	0.00	0.08	0.25	0.54	0.21
				Spottail shiner			
1967	0.00	-	0.00	2.50	0.37	0.10	0.36
1968	-	-	-	-	1.17	0.04	0.24
1969	-	-	-	0.00	0.80	2.56	1.96
1970	-	-	-	-	0.00	2.57	2.29
1971	-	-	-	-	0.27	0.30	0.29
1972	0.10	0.00	0.33	0.75	1.14	0.65	0.65
1973	-	-	0.00	0.06	0.00	0.92	0.23
1974	0.00	-	0.36	0.39	0.04	7.29	1.89
1975	0.00	0.76	0.05	0.21	0.00	4.75	1.39
1976	0.40	0.00	0.04	0.00	0.12	1.96	0.45
1977	0.00	0.00	0.38	0.13	0.08	0.38	0.20
1978	0.00	-	0.36	0.13	0.13	1.46	0.51
1979	0.00	0.00	0.39	0.50	0.54	2.38	0.90
				*Gizzard shad			
1975	0.00	0.00	0.00	0.00	0.00	0.25	0.06
1977	0.00	0.00	0.00	0.00	0.00	4.54	1.10
1978	0.00	-	0.00	0.00	0.00	0.00	0.00
1979	0.00	0.00	0.00	0.00	0.04	0.00	0.01
				Tessellated darter			
1967	0.00	-	1.50	1.00	0.12	0.00	0.36
1968	-	-	-	-	0.00	0.63	0.52
1969	-	-	-	0.00	0.20	8.00	5.61
1970	-	-	-	-	0.00	1.02	0.91
1971	-	-	-	-	0.33	0.04	0.16
1972	1.89	0.75	0.40	1.41	1.11	0.30	1.05
1973	-	-	0.24	0.65	0.08	0.58	0.36
1974	0.77	-	0.77	0.87	0.42	6.38	2.03
1975	0.38	1.35	0.60	1.00	1.29	0.67	0.88
1976	0.40	0.06	0.17	0.00	0.17	0.42	0.19
1977	0.00	0.14	0.06	0.00	0.33	6.25	1.62
1978	0.17	-	0.64	0.63	0.25	0.21	0.38
1979	0.00	0.00	0.39	0.21	0.21	0.33	0.25

continued

TABLE 3.5-3

Continued.

Month	Jan	Feb	Mar	Apr	May	Jun	Mean
			*Channel catfish				
1967	0.00	-	0.00	1.00	1.12	1.60	1.08
1968	-	-	-	-	0.20	0.04	0.06
1971	-	-	-	-	0.20	0.13	0.16
1972	0.00	0.12	0.07	0.09	0.12	0.17	0.10
1973	-	-	0.00	0.00	0.04	0.00	0.01
1974	0.00	-	0.00	0.04	0.00	0.00	0.01
1975	0.00	0.00	0.00	0.00	0.00	0.03	0.01
1976	0.10	0.00	0.21	0.04	0.00	0.00	0.06
1977	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1978	0.00	-	0.00	0.00	0.00	0.04	0.02
1979	0.00	0.00	0.11	0.00	0.00	0.00	0.02
			*Smallmouth bass				
1967	0.00	-	0.00	0.00	0.38	0.00	0.12
1968	-	-	-	-	0.20	0.11	0.12
1969	-	-	-	0.00	0.00	7.62	5.30
1970	-	-	-	-	0.00	0.45	0.40
1971	-	-	-	-	0.07	0.09	0.08
1972	0.00	0.00	0.00	0.00	0.06	0.04	0.02
1974	0.00	-	0.00	0.00	0.04	0.58	0.15
1975	0.00	0.00	0.00	0.00	0.08	0.11	0.04
1976	0.00	0.00	0.00	0.00	0.00	0.04	0.01
1977	0.00	0.00	0.06	0.00	0.04	0.33	0.10
1978	0.00	-	0.00	0.00	0.04	0.63	0.18
1979	0.00	0.00	0.00	0.00	0.13	0.04	0.04
			*Largemouth bass				
1967	0.00	-	0.00	0.00	0.25	0.00	0.08
1968	-	-	-	-	0.20	0.30	0.28
1969	-	-	-	0.50	0.20	3.06	2.22
1970	-	-	-	-	0.00	0.30	0.27
1971	-	-	-	-	0.00	0.35	0.21
1972	0.00	0.00	0.00	0.03	0.06	0.22	0.06
1973	-	-	0.03	0.00	0.00	0.00	0.01
1974	0.00	-	0.00	0.04	0.00	0.71	0.18
1975	0.00	0.00	0.00	0.00	0.17	0.56	0.18
1976	0.00	0.06	0.00	0.04	0.00	0.04	0.02
1977	0.00	0.00	0.00	0.00	0.00	2.25	0.55
1978	0.00	-	0.00	0.04	0.08	0.17	0.08
1979	0.00	0.00	0.00	0.04	0.04	23.88	5.81
			*White crappie				
1967	0.00	-	0.25	0.50	0.25	0.00	0.16
1968	-	-	-	-	0.00	1.44	1.22
1969	-	-	-	0.00	0.00	0.69	0.48
1970	-	-	-	-	0.20	0.02	0.04
1971	-	-	-	-	0.00	0.83	0.50
1972	0.00	0.00	0.20	1.44	0.24	4.70	1.25
1973	-	-	0.03	0.06	0.00	0.00	0.02
1974	0.00	-	0.00	0.09	0.00	0.00	0.02
1975	0.06	2.94	0.75	0.00	0.00	0.03	0.49
1976	0.40	0.06	0.04	0.04	0.00	0.00	0.06
1977	0.00	0.00	0.31	0.00	0.00	1.25	0.35
1978	0.00	-	0.73	0.00	0.00	0.00	0.09
1979	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			*Walleye				
1972	0.00	0.00	0.00	0.00	0.03	0.04	0.02

* Designated by U.S. Environmental Protection Agency (1975) as "representative, important species"

1400 166

TABLE 3.5-4

Comparison of the monthly species diversity indices for fishes collected at seine stations in January-June during the preoperational (1967-1973) and postoperational (1974-1979) periods in Conowingo Pond. A dash indicates that no samples were taken.

Month	Jan	Feb	Mar	Apr	May	Jun
1967	1.00	-	-	1.56	0.86	0.43
1968	-	-	-	-	0.52	1.36
1969	-	-	-	0.36	0.40	2.91
1970	-	-	-	-	0.43	1.01
1971	-	-	-	-	0.64	0.82
1972	1.50	1.22	2.34	2.10	1.08	2.18
1973	-	-	0.69	0.54	1.07	1.88
1974	0.94	-	0.43	0.72	0.87	2.25
1975	0.85	2.01	1.20	0.94	1.20	1.56
1976	1.26	0.63	0.53	0.51	0.50	2.12
1977	0.29	0.71	1.83	0.56	1.95	3.46
1978	0.83	-	2.40	2.07	1.59	2.38
1979	0.45	0.52	1.06	1.13	1.41	2.14

TABLE 3.5-5

Index of percentage similarity of species composition between seine stations in Conowingo Pond, January-June 1979.

Station	201	202	203	206	207	208	209	210	211	212	213
214	57	93	92	94	89	94	91	91	15	83	66
213	58	61	61	61	63	64	66	65	15	74	
212	57	78	77	79	79	81	84	84	16		
211	17	15	18	17	16	16	17	17			
210	54	89	88	88	93	87	93				
209	55	89	90	91	91	89					
208	56	95	92	96	87						
207	54	87	88	88							
206	57	96	93								
203	61	91									
202	54										

1400 167

TABLE 3.5-6

Spearman rank correlation coefficients for comparison of species ranking of fishes collected from January-June by 10- and 15 x 4 ft seine in Conowingo Pond between the preoperational (1966-1973) and postoperational (1974-1979) periods. Triangle = preoperational; rectangle = postoperational comparisons.

		1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
1979	N	36	35	35	36	35	38	40	36	36	39	36	39	41
	r	.07NS	.39*	.53	.17NS	.49	.53	.53	.56	.67	.67	.53	.63	.75
	a	.09	.41	.59	.17	.54	.59	.59	.63	.81	.81	.59	.74	.97
1978	N	37	38	38	38	41	38	42	39	38	40	39	45	
	r	.38*	.39*	.74	.39*	.59	.75	.66	.64	.75	.67	.68	.74	
	a	.40	.41	.95	.41	.68	.97	.79	.76	.97	.81	.83	.95	
1977	N	39	39	38	39	33	42	43	39	41	39	41		
	r	.33*	.34*	.63	.44	.47	.67	.61	.66	.67	.74	.63		
	a	.34	.35	.74	.47	.51	.81	.71	.79	.81	.95	.74		
1976	N	30	33	33	34	34	35	36	32	35	37			
	r	.31NS	.35*	.37*	.18NS	.39*	.73	.55	.76	.69	.62			
	a	.32	.37	.39	.18	.41	.93	.62	1.00	.85	.73			
1975	N		37	37	38	38	38	41	35	37				
	r	.20NS	.51	.61	.34*	.56	.62	.72	.59	.67				
	a	.20	.56	.71	.35	.63	.73	.91	.68	.81				
1974	N	31	32	33	34	35	34	39	34					
	r	.24NS	.37*	.52	.35*	.59	.66	.61	.69					
	a	.25	.39	.58	.37	.68	.79	.71	.85					
1973	N	30	32	32	32	32	33	38						
	r	.26NS	.29NS	.29NS	.17NS	.33NS	.63	.61						
	a	.27	.30	.30	.17	.34	.74	.71						
1972	N	37	39	38	39	40	40							
	r	.29NS	.52	.77	.38*	.46	.65							
	a	.30	.58	1.02	.40	.50	.78							
1971	N	29	32	30	33	35								
	r	.43*	.16NS	.68	.34*	.44								
	a	.46	.16	.83	.35	.47								
1970	N	29	29	31	32									
	r	.21NS	.36*	.36*	.45									
	a	.21	.38	.38	.49									
1969	N	23	28	29										
	r	.22NS	.24NS	.25NS										
	a	.22	.25	.26										
1968	N	25	28											
	r	.23NS	.49											
	a	.23	.54											
1967	N	21												
	r	.50*												
	a	.55												

All correlations significant at 99% level unless otherwise indicated
* - Significant at the 95% level
NS - Not significant at the 95% level

3.6 ICHTHYOPLANKTON

Larvae of 34 species were identified from ichthyoplankton tows in 1978 (Table 3.6-1 and 3.6-2). The most common were larvae of quillback and comely shiner which comprised 41% of the transect and 58% of the inshore catch, respectively. Other common species included gizzard shad, carp, channel catfish and tessellated darter. With the exception of quillback and gizzard shad, the overall abundance of other species was within the range of variation noted in the preoperational period (RMC, P.B.A.P.S. Postoperational Report No. 9, 1978a).

Spearman rank correlation coefficients (r_s) were calculated for transect catches to determine if the species ranks had changed between 1978 and the various preoperational and postoperational years (Table 3.6-3). All correlations were significant and indicated no overall changes in the species rankings between years. Therefore, species composition of larvae was not affected by operation of Peach Bottom Atomic Power Station.

As in earlier years, catches of common ichthyoplankters varied with date and location in 1978 (Tables 3.6-4 to 3.6-7). The location and time of the highest densities of the common ichthyoplankters were similar to that noted previously (RMC, P.B.A.P.S. Postoperational Report No. 9, 1978a).

The time of spawning observed at inshore and transect stations was similar. However, gizzard shad, and comely shiner tended to spawn slightly later in the main Pond than at the inshore stations. White crappie spawned over a short period

of time at inshore areas, while spawning was more protracted in the main Pond. Carp, quillback, channel catfish and tessellated darter were common components of the catch at offshore stations while gizzard shad, comely shiner, white sucker, sunfishes and log perch were taken mainly at inshore stations. These temporal and spatial distributions of larvae show the same general pattern as noted previously (I.A., P.B.A.P.S. Preoperational Report, 1974a).

To detect changes in the abundance of the common ichthyoplankters at Stations 564 and 567 (located on the periphery of the thermal plume) in Conowingo Pond, the catch per effort at these two stations was divided by the mean catch per effort at all other transect stations (Table 3.6-8). The preoperational and postoperational ratios were then compared. The ratios indicate that the abundance of channel catfish larvae increased at the plume periphery in postoperational years. Larvae of bluegill and pumpkinseed were rarely collected at Stations 564 and 567 from 1974 through 1978 since larvae of these two species, less than 14 mm in length, are difficult to separate; they are combined under the category "sunfishes". The ratios indicate that the abundance of sunfishes has increased at Station 564 and decreased at Station 567 which resulted in a slight increase in sunfish abundance in the plume periphery in the postoperational years.

The overall densities of white crappie larvae decreased dramatically in the postoperational years, however the greatest reductions occurred in those areas unaffected by the Peach Bottom

Atomic Power Station; i.e. - creeks and coves in the southern section of the Pond (I.A., P.B.A.P.S. Postoperational Report No. 7, 1977). These areas are the principal spawning grounds of the white crappie and (since 1972) the gizzard shad. Thus, the observed decreases have apparently resulted from the effects of Tropical Storm Agnes and from competition with the recently introduced gizzard shad, rather than from operation of Peach Bottom Atomic Power Station.

TABLE 3.6-1

Yearly comparison of the mean densities (no. per 1000 m^3) of ichthyoplankters (< 25 mm) at transect stations, 1969-1978.

Year	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
No. Samples	390	449	471	327	628	695	691	686	512	558
No. Species	27	24	18	15	28	27	26	28	19	32
Species										
Herring	-	-	-	-	-	-	-	0.02	-	0.01
Gizzard shad	-	-	-	0.01	1.16	0.23	162.41	243.30	105.85	23.75
Minnows	1.38	1.1[illegible]	0.22	0.60	0.40	0.72	1.70	1.10	0.51	2.38
Stoneroller	-	-	-	-	-	-	-	-	-	0.01
Carp	14.22	9.90	8.60	21.77	17.88	8.69	13.57	53.32	31.51	63.07
Golden shiner	0.04	0.04	0.15	-	0.01	*	0.01	0.02	0.07	0.52
Comely shiner	-	0.04	0.01	0.07	0.01	0.01	0.05	0.03	0.24	0.19
Common shiner	-	-	-	-	-	-	-	-	0.08	0.02
Spottail shiner	0.15	0.22	-	-	0.04	0.01	0.03	0.02	-	0.42
Swallowtail shiner	0.04	0.04	-	-	-	-	-	-	-	-
Rosyface shiner	0.04	-	-	-	0.01	-	0.02	-	-	-
Spotfin shiner	0.41	0.30	0.34	0.11	0.07	1.10	0.43	0.48	0.06	0.35
Bluntnose minnow	0.04	-	-	-	0.01	0.04	0.06	*	0.02	0.10
Fallfish	-	-	-	0.01	-	-	-	-	-	-
Blacknose dace	-	-	-	-	-	-	-	*	-	0.14
Longnose dace	-	-	-	-	-	-	-	*	-	0.03
Creek chub	-	-	-	-	-	-	-	-	0.04	0.01
Suckers	0.03	0.04	-	0.01	0.02	-	0.01	0.04	-	0.07
Quillback	9.42	17.98	4.10	59.83	26.54	13.84	19.12	41.51	3.39	89.09
White sucker	0.07	0.07	0.04	0.43	1.49	0.24	0.21	0.15	-	0.64
Hog sucker	-	-	-	-	-	-	-	0.01	-	0.02
Shorthead redhorse	-	-	-	-	-	-	-	-	-	0.02
White catfish	0.19	0.01	-	-	0.04	0.03	-	0.04	-	0.01
Yellow bullhead	0.15	0.04	-	-	0.04	0.07	0.11	0.10	0.01	0.19
Brown bullhead	0.07	-	-	-	0.01	0.01	0.01	-	-	0.01
Channel catfish	24.16	9.72	2.35	0.01	6.98	6.25	18.21	10.08	3.66	9.89
Rock bass	0.11	0.07	-	0.04	0.01	0.02	0.02	0.29	0.01	0.11
Sunfishes	4.73	1.71	12.62	-	1.83	1.08	1.96	2.08	2.15	1.20
Redbreast sunfish	0.19	0.01	0.04	-	0.01	0.02	0.06	0.50	0.01	0.04
Green sunfish	0.01	0.01	-	-	-	0.01	*	0.01	-	-
Pumpkinseed	0.74	0.15	1.97	0.62	0.04	0.08	0.03	0.01	0.03	0.06
Bluegill	11.32	1.45	7.71	0.11	0.11	0.33	0.12	0.01	-	0.18
Smallmouth bass	0.45	0.07	0.04	-	0.01	0.02	0.01	0.23	-	0.21
Largemouth bass	0.01	0.04	0.04	-	0.01	*	-	*	-	0.01
White crappie	7.33	0.89	5.29	0.33	0.45	0.83	0.18	0.51	0.71	0.93
Black crappie	0.04	0.01	-	-	0.04	1.00	-	-	-	-
Perches	0.05	0.11	0.01	0.23	0.07	0.07	0.19	0.01	-	0.05
Tessellated darter	66.08	26.51	19.84	7.64	2.05	51.85	11.48	5.72	4.89	10.93
Banded darter	-	-	-	-	-	-	-	-	-	0.14
Yellow perch	-	0.01	-	-	0.01	0.05	0.05	0.02	-	0.07
Log perch	0.01	-	0.01	-	0.01	0.06	0.64	0.08	0.02	0.95
Shield darter	0.41	0.52	0.19	0.29	0.49	0.84	2.80	3.91	0.04	5.00
Walleye	0.01	-	0.30	0.14	0.11	0.03	0.27	0.04	-	0.03
Banded/shield darter	-	-	-	-	-	-	-	-	-	0.16
Unidentifiable	2.71	2.46	0.75	4.83	1.88	0.22	3.15	4.57	0.84	4.29
Total	144.63	73.12	64.57	97.04	60.38	86.75	236.92	368.26	154.11	215.26

TABLE 3.6-2

Yearly comparison of the mean densities (no. per 1000 m^3) of ichthyoplankters (< 25 mm) at inshore stations, 1969-1978.

Year	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
No. Samples	103	74	175	316	192	192	288	268	320	306
No. Species	17	12	15	15	14	14	12	16	14	14
Species										
Gizzard shad	-	-	-	12.62	5.00	9.99	3092.15	1725.15	297.19	70.95
Northern pike	-	-	0.17	-	-	-	-	-	-	-
Minnows	2.55	2.76	0.24	0.73	0.19	0.56	1.12	0.36	0.07	2.52
Carp	3.44	3.83	1.31	1.50	2.96	9.40	2.91	10.59	1.52	3.23
Golden shiner	0.35	0.96	0.39	0.50	0.19	0.90	0.12	0.17	0.26	0.99
Comely shiner	0.26	1.13	-	-	0.74	9.09	9.28	4.60	3.92	223.61
Common shiner	-	-	-	-	-	-	-	-	0.46	0.08
Spottail shiner	-	-	-	0.04	-	-	-	0.35	-	-
Rosyface shiner	0.09	0.13	-	0.04	0.19	-	-	0.09	-	-
Spotfin shiner	1.66	0.65	0.09	-	0.74	4.22	0.32	0.87	-	0.13
Suckers	-	0.06	0.02	0.05	-	-	0.14	0.21	-	-
Quillback	94.76	17.79	8.90	10.80	5.37	2.85	2.60	28.26	1.23	19.47
White sucker	0.04	-	0.13	0.33	0.74	1.03	0.40	1.47	1.95	10.53
White catfish	-	-	-	0.17	-	-	-	-	-	-
Sunfishes	50.58	322.39	22.11	22.92	32.57	26.96	24.19	44.73	7.71	27.29
Redbreast sunfish	-	-	-	-	-	0.11	-	0.30	-	-
Pumpkinseed	0.26	-	11.08	-	-	-	-	-	-	-
Bluegill	1.66	0.17	31.92	-	-	-	-	-	-	-
Smallmouth bass	0.09	-	-	-	-	-	-	0.31	-	-
White crappie	15.79	53.11	41.38	44.19	7.77	25.86	2.66	0.59	3.63	0.12
Perches	-	0.06	-	0.16	0.29	-	0.20	-	0.06	0.07
Tessellated darter	0.04	0.09	0.04	0.17	0.37	-	-	-	-	-
Banded darter	-	-	-	-	-	-	-	-	-	0.14
Yellow perch	0.31	-	1.18	0.17	-	0.41	-	0.12	0.05	2.55
Log perch	0.13	0.17	0.61	0.17	0.19	3.18	1.16	0.73	0.25	16.29
Shield darter	0.31	0.21	0.04	0.33	0.37	0.77	2.69	0.80	0.25	0.24
Walleye	0.04	-	0.39	0.33	1.30	0.09	0.99	-	0.06	1.66
Banded/shield darter	-	-	-	-	-	-	-	-	-	0.26
Unidentifiable	5.87	18.56	1.20	1.93	0.10	0.34	5.84	6.66	1.00	5.44
Total	178.23	422.10	121.21	97.51	59.06	95.76	3146.77	1826.36	319.43	385.08

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TABLE 3.6-3

Spearman rank correlation coefficient for comparison of the species rankings of ichthyoplankters between 1978 and 1969-1977 at transect stations in Conowingo Pond.

		Postoperation				Preoperation			
		1977	1976	1975	1974	1973	1971	1970	1969
	N	32	33	34	33	34	32	35	36
1978	r	.680	.803	.799	.762	.638	.598	.618	.494
	t	5.085	7.504	7.503	6.560	4.683	4.083	4.517	3.310

All correlations significant at 99% level

TABLE 3.6-4

MEAN DENSITIES (NO. PER 1000 M) OF ICHTHYOPLANKTERS (<25MM) AT TRANSECT STATIONS, APRIL THROUGH AUGUST, 1978.

LOCATION	560	561	562	563	564	565	566	567	568	569	570	575	576
NO. SAMPLES	43	45	42	47	48	48	48	48	48	48	22	24	47
SPECIES													
HERRINGS	-	-	-	-	-	-	-	-	-	-	0.15	-	-
GIZZARD SHAD	1.15	2.04	17.97	1.82	69.39	2.38	64.63	21.86	13.97	53.78	59.45	10.82	39.96
MINNOWS	1.90	2.43	1.61	1.84	5.70	1.29	1.37	1.32	4.35	0.58	5.63	1.38	0.86
STONEROLLER	-	0.09	-	-	-	-	-	-	-	-	-	-	-
CARP	76.17	142.61	41.97	44.93	37.78	44.31	55.60	39.09	66.54	49.06	68.75	33.24	67.90
GOLDEN SHINER	-	-	-	-	-	-	0.08	-	-	5.86	-	-	0.09
COMELY SHINER	-	0.18	-	0.14	-	0.08	0.38	0.42	0.23	0.07	0.35	0.21	0.42
COMMON SHINER	-	-	-	-	-	-	-	-	0.08	-	-	-	0.15
SPOTTAIL SHINER	0.08	1.41	-	-	-	0.14	0.42	0.09	-	2.10	-	-	0.20
SPOTFIN SHINER	0.16	2.10	0.18	0.35	0.21	0.13	0.31	0.04	0.15	0.16	0.82	0.15	0.26
BLUNTNOSE MINNOW	-	0.33	0.21	-	-	-	0.37	-	-	0.36	-	-	-
BLACKNOSE DACE	0.08	-	-	-	0.45	-	0.30	0.30	-	0.13	0.26	0.21	0.15
LONGNOSE DACE	-	-	-	-	0.07	0.07	0.16	-	-	-	-	-	-
CREEK CHUB	-	-	-	-	-	-	0.07	-	-	-	-	-	-
SUCKERS	-	-	0.99	-	-	-	-	-	-	-	-	-	-
QUILLBACK	142.58	197.87	79.62	56.76	51.12	43.26	58.53	87.27	48.46	58.94	198.41	155.90	58.71
WHITE SUCKER	1.00	1.04	0.15	0.28	0.07	0.72	0.82	0.31	0.24	0.34	2.91	0.86	0.60
NORTHERN HOG SUCKER	-	-	0.25	-	-	-	-	-	-	-	-	-	-
SHORTHEAD REDHORSE	-	-	-	-	-	-	0.19	-	-	-	-	-	0.08
WHITE CATFISH	-	0.08	-	-	-	-	-	-	-	-	-	-	-
YELLOW BULLHEAD	0.28	0.57	0.19	0.39	0.08	0.16	-	-	-	-	0.32	0.34	0.22
BROWN BULLHEAD	0.08	-	-	-	-	-	-	-	-	-	-	-	0.07
CHANNEL CATFISH	13.13	15.75	4.63	8.50	7.36	9.50	0.22	37.30	3.94	1.86	1.68	4.07	4.09
ROCK BASS	0.09	0.23	-	0.15	0.15	0.14	0.26	-	-	0.09	0.16	-	0.23
SUNFISHES	1.02	1.37	0.49	0.67	0.36	0.57	2.70	0.06	1.10	3.54	1.36	1.21	1.00
REDBREAST SUNFISH	-	0.23	-	0.08	0.07	-	0.07	-	0.07	-	-	-	-
PUMPKINSEED	-	-	-	-	0.07	-	0.32	-	-	0.19	-	-	0.14
BLUEGILL	0.16	0.51	-	-	-	-	0.16	0.08	0.07	0.34	-	0.13	0.07
SMALLMOUTH BASS	0.17	0.23	0.23	-	0.21	0.14	-	-	-	0.06	0.58	-	1.21
LARGEMOUTH BASS	0.07	-	-	-	-	-	-	-	-	-	-	0.11	-
WHITE CRAPPIE	0.75	2.17	0.88	0.46	0.63	0.67	1.64	0.42	0.93	0.80	0.94	0.66	1.21
PERCHES	0.16	0.14	0.19	0.07	-	0.07	-	-	-	-	-	-	-
TESSELLATED DARTER	28.35	35.82	6.17	2.69	1.55	6.09	6.91	1.83	2.14	5.67	6.02	9.97	22.58
BANDED DARTER	0.08	0.15	-	-	-	-	0.28	-	-	0.12	-	0.64	0.71
YELLOW PERCH	-	0.08	0.34	-	0.05	-	-	-	0.15	0.12	-	-	0.09
LOGPERCH	0.33	1.26	-	0.32	0.07	0.21	2.90	0.41	0.14	2.47	0.14	0.48	2.27
SHIELD DARTER	3.76	8.55	1.86	2.63	6.74	3.89	8.24	2.74	4.18	4.49	3.58	3.32	5.59
WALLEYE	-	0.08	-	-	-	-	-	-	0.07	-	-	-	0.15
BANDED/SHIELD DARTER	-	0.08	-	-	-	-	-	-	-	0.52	-	0.77	0.92
UNIDENTIFIABLE	5.20	5.96	8.16	1.49	2.27	2.80	11.17	5.17	3.47	2.05	5.37	2.70	1.59
TOTAL	274.79	423.37	166.10	123.57	164.41	116.61	198.10	198.70	150.28	193.74	356.88	227.14	211.52

TABLE 3.6-5

MEAN DENSITIES (NO. PER 1000 M) OF ICHTHYOPLANKTERS (<25MM) AT INSHORE STATIONS, APRIL THROUGH AUGUST, 1978.

LOCATION NO. SAMPLES SPECIES	BELOW DISCHARGE 102	BROAD CREEK 68	CONOWINGO CREEK 34	GLEN COVE 34	HOPKINS COVE 34	MUDDY CREEK 34
GIZZARD SHAD	11.56	291.17	62.32	44.73	8.78	0.98
MINNOWS	1.01	3.88	1.60	4.48	2.33	3.83
CARP	6.87	0.79	4.08	0.64	1.19	7.17
GOLDEN SHINER	-	-	-	3.82	0.63	-
COMELY SHINER	0.18	24.84	15.84	1997.61	27.41	12.84
COMMON SHINER	0.23	-	-	-	-	-
SPOTFIN SHINER	0.17	-	-	0.66	-	-
QUILLBACK	10.07	6.51	6.32	41.69	108.20	4.89
WHITE SUCKER	1.69	-	1.15	1.88	-	82.53
SUNFISHES	0.86	30.49	52.25	123.00	27.20	1.12
WHITE CRAPPIE	0.15	-	-	0.64	-	-
PERCHES	-	0.30	-	-	0.53	-
BANDED DARTER	-	-	-	-	0.63	0.64
YELLOW PERCH	0.40	6.88	0.55	5.20	1.66	-
LOGPERCH	0.31	22.49	33.12	48.91	1.05	-
SHIELD DARTER	-	-	0.60	1.04	0.53	-
WALLEYE	1.77	2.04	-	4.85	-	-
BANDED/SHIELD DARTER	-	0.60	0.58	0.52	-	-
UNIDENTIFIABLE	1.24	11.15	0.95	21.93	4.07	-
TOTAL	36.51	401.12	179.36	2301.60	184.20	114.01

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TABLE 3.6-6

WEEKLY MEAN DENSITIES (NO. PER 1000 M) OF ICHTHYOPLANKTERS (<25MM) AT TRANSECT STATIONS, APRIL THROUGH AUGUST, 1978.

WEEK OF	04/16	04/23	05/28	06/04	06/11	06/18	06/25	07/16	07/23	07/30	08/06	08/13
NO. SAMPLES	43	48	48	48	48	48	43	47	48	48	41	48
SPECIES												
HERRINGS	-	-	0.07	-	-	-	-	-	-	-	-	-
BLUEBACK HERRING	-	-	-	-	-	-	-	-	-	-	-	-
GIZZARD SHAD	-	-	4.69	35.88	25.82	105.43	56.49	38.08	13.51	4.53	0.58	-
MINNOWS	-	0.06	3.34	2.20	3.85	3.20	13.71	0.23	0.44	0.18	0.17	-
STONEROLLER	-	-	-	-	0.08	-	-	-	-	-	-	-
CARP	-	-	13.14	177.93	437.73	33.86	27.88	0.10	0.13	-	-	-
GOLDEN SHINER	-	-	-	-	0.08	0.08	6.45	0.09	-	-	-	-
COMELY SHINER	-	-	-	0.46	0.29	0.63	0.39	0.15	-	0.19	0.10	-
COMMON SHINER	-	-	-	-	0.15	0.08	-	-	-	-	-	-
SPOTTAIL SHINER	-	-	-	-	0.16	1.46	3.04	-	-	-	-	-
ROSYFACE SHINER	-	-	-	-	-	-	-	-	-	-	-	-
SPOTFIN SHINER	-	-	-	-	0.30	0.26	0.99	0.49	1.20	0.40	0.27	0.56
BLUNTNOSE MINNOW	-	-	-	-	-	-	0.26	0.37	0.46	0.17	-	-
BLACKNOSE DACE	-	-	-	-	0.15	1.29	0.17	-	0.04	-	-	-
LONGNOSE DACE	-	-	-	-	-	0.16	0.16	-	-	-	-	-
CREEK CHUB	-	-	-	-	-	0.07	-	-	-	-	-	-
SUCKERS	-	-	-	0.35	0.35	0.16	-	-	-	-	-	-
QUILLBACK	-	0.07	486.77	356.74	153.98	13.03	2.08	-	-	-	-	-
WHITE SUCKER	-	-	0.85	1.58	2.77	1.53	0.44	-	-	-	-	-
NORTHERN HOG SUCKER	-	-	-	-	0.22	-	-	-	-	-	-	-
SHORTHEAD REDHORSE	-	-	-	-	0.26	-	-	-	-	-	-	-
WHITE CATFISH	-	-	-	-	-	-	0.08	-	-	-	-	-
YELLOW BULLHEAD	-	-	-	-	-	1.34	0.75	0.09	-	-	-	-
BROWN BULLHEAD	-	-	-	-	-	0.07	0.07	-	-	-	-	-
CHANNEL CATFISH	-	-	0.08	7.73	12.63	6.95	48.36	10.10	8.11	8.44	1.51	7.46
ROCK BASS	-	-	-	-	0.88	0.15	0.40	-	-	-	-	-
SUNFISHES	-	-	0.08	0.17	1.76	0.92	4.74	3.29	1.67	1.09	0.63	0.14
REDBREAST SUNFISH	-	-	-	-	-	-	0.57	-	-	-	-	-
PUMPKINSEED	-	-	-	-	-	-	-	-	0.16	0.13	0.17	0.29
BLUEGILL	-	-	-	-	-	-	0.07	-	0.70	0.08	0.40	0.23
SMALLMOUTH BASS	-	-	-	1.04	0.64	0.07	0.76	-	-	-	-	-
LARGEMOUTH BASS	-	-	-	-	-	0.05	0.07	-	-	-	-	-
WHITE CRAPPIE	-	-	0.43	2.39	2.73	1.18	2.17	2.07	0.26	-	-	-
PERCHES	-	-	0.17	0.13	0.15	-	0.14	-	-	-	-	-
TESSELLATED DARTER	-	0.06	2.01	9.45	18.60	27.32	67.00	2.51	0.98	0.07	0.10	-
BANDED DARTER	-	-	-	-	-	0.07	1.65	-	-	0.08	-	-
YELLOW PERCH	0.07	0.42	0.17	0.14	-	-	-	-	-	-	-	-
LOGPERCH	-	-	1.54	2.80	4.13	0.95	1.24	-	-	-	-	-
SHIELD DARTER	-	-	4.74	8.95	10.92	14.66	16.69	0.20	0.21	-	-	-
WALLEYE	-	0.07	-	0.23	-	-	-	-	-	-	-	-
BANDED/SHIELD DARTER	-	-	-	-	-	0.36	1.70	-	-	-	-	-
UNIDENTIFIABLE	-	0.13	10.67	26.14	11.75	0.54	1.66	-	0.28	-	0.17	-
TOTAL	0.07	0.82	528.73	634.31	690.39	215.86	260.19	57.76	28.16	15.36	4.11	8.67

TABLE 3.6-7

WEEKLY MEAN DENSITIES (NO. PER 1000 M) OF ICHTHYOPLANKTERS (<25MM) AT INSHORE STATIONS, APRIL THROUGH AUGUST, 1978.

WEEK OF	04/23	04/30	05/07	05/14	05/21	05/28	06/04	06/11	06/18	06/25	07/02	07/09	07/16	07/23	07/30	08/06	08/13
NO. SAMPLES	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
SPECIES																	
GIZZARD SHAD	-	-	-	3.41	-	494.79	169.40	354.20	237.58	47.29	44.17	8.19	20.41	6.68	-	-	-
MINNOWS	-	-	-	14.20	-	1.09	14.79	-	5.22	3.36	1.53	2.26	-	-	1.03	-	-
CARP	-	-	-	1.00	1.04	13.11	13.42	23.84	6.96	4.01	3.22	-	-	-	-	-	-
GOLDEN SHINER	-	-	-	-	-	-	1.19	6.03	1.18	-	-	-	-	-	-	-	-
COMELY SHINER	-	-	-	-	-	-	148.53	1181.44	2499.19	65.73	34.54	14.18	6.02	-	-	23.30	1.12
COMMON SHINER	-	-	-	-	-	-	-	-	-	1.29	-	-	-	-	-	-	-
SPOTFIN SHINER	-	-	-	-	-	-	-	0.97	-	-	-	1.25	-	-	-	-	-
QUILLBACK	-	-	-	26.50	10.63	42.88	187.62	0.97	89.59	26.72	1.06	-	-	-	-	-	-
WHITE SUCKER	-	-	-	4.03	2.17	-	1.20	20.28	143.53	-	-	-	-	-	-	-	-
SUNFISHES	-	-	-	-	1.04	-	2.26	7.12	6.71	18.43	90.16	10.85	133.55	137.27	77.34	17.28	2.57
WHITE CRAPPIE	-	-	-	-	-	-	0.86	1.21	-	-	-	-	-	-	-	-	-
PERCHES	-	-	-	2.13	-	-	-	-	-	-	-	-	-	-	-	-	-
BANDED DARTER	-	-	-	-	-	-	1.20	-	-	-	-	1.20	-	-	-	-	-
YELLOW PERCH	3.12	3.42	6.28	27.23	2.22	-	-	-	-	-	-	-	-	-	-	-	-
LOGPERCH	-	2.32	-	237.87	-	2.36	1.07	-	-	-	-	-	-	-	-	-	-
SHIELD DARTER	-	-	-	2.96	-	-	-	1.14	-	-	-	-	-	-	-	-	-
WALLEYE	-	-	-	23.46	3.65	-	-	-	-	-	-	-	-	-	-	-	-
BANDED/SHIELD DARTER	-	-	-	3.25	-	1.09	-	-	-	-	-	-	-	-	-	-	-
UNIDENTIFIABLE	-	-	-	2.98	-	7.16	25.05	34.95	16.49	-	5.73	-	-	7.68	-	-	-
TOTAL	3.12	5.74	6.28	349.02	20.55	562.49	566.59	1632.13	3006.44	166.83	180.42	37.92	159.98	151.63	78.37	40.58	3.68

TABLE 3.6-8

Ratios of the catch per effort of the common larval fishes at Stations 564 and 567 at the periphery of the thermal plume in relationship to the average catch per effort at all transect stations in Conowingo Pond, 1969-1978. A ratio less than one indicates a less than average catch and a ratio more than one indicates a greater than average catch.

Year	1969-1973 Mean	1969-1973 Range	1974	1975	1976	1977	1978
Carp							
564	0.90	0.51-1.13	0.54	0.68	1.12	0.52	0.58
567	0.78	0.36-1.69	0.79	0.37	1.96	1.34	0.59
Quillback							
564	0.74	0.70-0.79	1.07	1.48	1.09	0.24	0.51
567	0.67	0.37-1.15	0.32	0.31	0.54	0.47	0.99
Channel catfish							
564	2.39	0.85-4.29	2.05	1.54	2.79	3.79	1.22
567	2.67	0.0 -4.30	2.31	1.75	3.27	7.37	5.79
Pumpkinseed							
564	1.43	0.0 -5.67	0.00	0.00	0.00	0.00	1.07
567	0.21	0.0 -0.67	0.00	0.00	0.00	0.00	0.00
Bluegill							
564	0.40	0.0 -1.00	0.20	0.00	0.00	0.00	0.00
567	0.03	0.0 -0.11	0.00	0.00	0.00	0.00	0.53
White crappie							
564	1.94	0.55-3.98	0.48	0.00	0.36	0.10	0.62
567	1.48	0.44-2.45	0.44	0.33	0.50	0.48	0.42
Sunfishes							
564	0.24	0.0 -0.67	0.87	0.49	1.07	0.19	0.23
567	0.45	0.0 -1.44	0.58	0.29	0.55	0.06	0.06
Tessellated darter							
564	1.02	0.61-1.33	0.44	1.00	0.31	0.57	0.13
567	0.67	0.13-1.09	0.39	0.28	0.14	0.18	0.13

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4.0 Biology of Fishes

4.4 Age and Growth

4.4.1 Walleye

An age and growth study was conducted on the walleye to determine if operation of Peach Bottom Atomic Power Station has had any impact upon this highly valued game species. Some aspects of its age and growth in the preoperational period were presented earlier (I.A., P.B.A.P.S. Preoperational Report, 1974). This report completes the age and growth study of walleye in Conowingo Pond and fulfills the intent of the Environmental Technical Specifications.

4.4.1.1 Methods

Walleye were collected in Conowingo Pond from 1966 through 1978 by electroshocker, seine, trawl, trap net, rod and reel and plankton net. Electroshocking was the most effective method for capturing adult walleye but this method was used only in 1966-1967 and 1975-1977. Data were classified according to preoperational (1966-1973) and postoperational (1974-1978) periods.

Walleye were measured to the nearest mm fork length and weighed to the nearest 0.1 g. Scales were taken from an area adjacent to the tip of the depressed pectoral fin and just below the lateral line. Scale impressions were made on cellulose acetate slides and read using a Bausch and Lomb Tri-simplex micro-projector at 24 magnifications. Annuli were identified by the criteria of Lagler (1966). The scale radius and distance to each annulus were measured from the focus to the anterior margin

of each scale and annulus. Ages were advanced one year on January 1 (Hile 1948). All data were stored by computer and most analyses were aided by use of a database management system. Length-scale relationships were calculated by regression of the mean length of fishes (1 mm groups) on the corresponding mean scale radius. The resultant equation was $L = a \times S + c$ where L = empirical fish length, S = scale radius, a = slope and c = intercept.

The length at each annulus (L') was calculated by substituting the intercept value (c) into the formula: $L' = c + \frac{S'}{S}(L-C)$ where L' = fish length at a given annulus, L = empirical fish length, S' = annulus distance, S = scale radius and C = the intercept value in the length-scale radius equation. Differences in calculated growth were analyzed by analysis of variance.

The general parabola, $W = cL^n$, in the following logarithmic form was fitted to the mean weights per one mm length interval to determine the length-weight relationship: $\text{Log } W = \text{Log } c + n \text{ Log } L$ where W = body weight in g, L = fork length in mm, and c and n are empirically determined constants. Because of small sample size (Tables 4.4-1 and 4.4-2), length-weight regression analysis was limited to weight data from fish 141 to 450 mm fork length. An analysis of covariance was used to determine if mean weights, adjusted for the covariate length, were significantly different ($P < 0.01$) between status (preoperational and postoperational). Yearly variations could not be meaningfully evaluated because of

either insufficient data on weights or the absence of comparable weight data for fish of similar lengths.

The coefficient of condition (K) was calculated from the following expression: $K = \frac{10 \times W}{L^3}$ where W = body weight in g and L = fork length in mm.

4.4.1.2 Results

4.4.1.2.1 Age Composition

Most walleye collected from Conowingo Pond were less than age IV although fish up to age IX were sampled (Table 4.4-3). Ages 0-III comprised the highest percentage of all age groups. Although the aged sample was limited (284 fish), the data indicated that the walleye population was comprised of strong and weak year classes. The following year classes dominated the collections between 1966 and 1977: 1965, 1969, 1971 and 1975.

There was no evidence that the age composition of the walleye population in Conowingo Pond was affected by the operation of the Peach Bottom Atomic Power Station. This is further supported by the small number of walleye collected during entrainment and impingement studies conducted at the Station between 1974 and 1977.

4.4.1.2.2 Length-weight

The length-weight regression for the preoperational (1966-1973) and postoperational (1974-1977) periods were Log W = -5.5287 + 3.2058 Log L and Log W = -5.0659 + 3.0314 Log L, respectively. The respective r^2 values were 0.95 and 0.98. The rate of weight increase relative to length was significantly less ($P < 0.01$) in the postoperational period (3.0324 postoperational,

3.2058 preoperational); however, some of the difference may have been due to sampling methods (Table 4.4-4). Weights were taken primarily from preserved fish in 1967 through 1969 and from fresh specimens thereafter. Preserved fish tend to shrink in length which would result in a higher weight to length ratio. Although the rate of weight increase was higher for fish from the preoperational period, the empirical and calculated weights and condition factors for 10 mm length groups were not markedly different between the two periods (Table 4.4-5). The overall mean condition factor was slightly greater during the preoperational period (0.95 preoperational, 1.03 postoperational).

4.4.1.2.3 Growth

Age and growth of the walleye during the preoperational period was reported in the preoperationl report (I.A.,P.B.A.P.S. Preoperational Report, 1974). Because a check near the focus had been erroneously interpreted as the first annulus on many scales the lengths reported at the various ages were incorrect (too low). This mis-interpretation was corrected and the informtion presented herein is based on the corrected data.

The length-scale radius regression was $L = 3.2867S + 45.5266$. Scale samples from fish collected in 1966 and 1967 and from fish greater than 500 mm were eliminated from the length-scale radius computations. The scale samples taken in 1966 and 1967 were not removed from the same area of the fish used in subsequent years, and were thus not comparable. The sample size of fish larger than 500 mm (10) was inadequate. Visual inspection of the data

indicated that the length-scale radius relationship was linear. However, correlation (r^2 = 0.90) was lower than that found for other scaled species in Conowingo Pond.

Back calculated lengths of walleye from the preoperational and postoperational periods were compared. Mean lengths of ages I through V for the preoperational period was 214, 300, 361, 394, and 456 mm, respectively. In the postoperational period length was 222, 333, 396, 405, 422, and 473 mm, at ages I through VI (Table 4.4-6 and Figure 4.4-1). Lengths at ages I-III were tested for differences between periods (Table 4.4-7). Only at age II was length significantly ($P < .01$) different (greater). Because of small sample size statistical comparison of other age groups was not performed.

Annual incremental growth of walleye collected in both periods was also examined. The incremental growth of age groups I through V was 214, 86, 56, 25, and 10 mm for the preoperational period and 222, 100, 74, 34, and 28 mm for the postoperational period (Table 4.4-8). Although incremental lengths were greater in the postoperational period at all ages, statistical comparison, limited to age groups I through III, indicated that incremental growth was not significantly ($P > 0.01$) different for the two periods (Table 4.4-9).

Yearly growth of age I and age II fish was examined for both periods (Figure 4.4-2). The comparisons were limited to back calculated lengths of ten or more fish per year. Poorest growth of age I fish (212 mm) was in 1971 and the best growth was in 1974 (243 mm). Growth of age I fish in the postoperational

period was similar to that in the preoperational period. Although the yearly data was limited for age II fish, no change in growth was detected after Peach Bottom Atomic Power Station commenced operation.

4.4.1.3 Discussion

Growth of walleye in Conowingo Pond compares favorably with growth of walleye from other areas in North America (Table 4.4-10). Growth in Conowingo Pond was greater than that of walleye from more northerly waters and similar to or less than that of fish from southern areas.

Growth of walleye in Conowingo Pond was also compared to that of walleye in the adjoining Muddy Run Pumped Storage Pond (Table 4.4-9; Figures 4.4-1 and 4.4-2). Walleye in Conowingo Pond were generally larger than those in Muddy Run during most of the preoperational period, but were generally smaller in the postoperational years.

The better growth of walleye in Muddy Run Pond in the postoperatinal period was attributed to increased forage due to the establishment of a large population of gizzard shad. Although gizzard shad also became abundant in Conowingo Pond during this period, increased vulnerability to predation in Muddy Run enabled walleye to better utilize this increased forage. Young gizzard shad grew faster in Conowingo Pond and were thus vulnerable to predation for a shorter period of time than those in Muddy Run Pond. Additionally, large daily water level drawdowns (up to 9 m) in Muddy Run Pond concentrated prey and predators and forced prey species from shoreline cover. Swenson

(1977) felt that vegetation in Shagawa Lake reduced the availability of food for walleye by providing cover for prey which concentrated in it.

The operation of the Peach Bottom Atomic Power Station had no detectable effect on the growth of walleye in Conowingo Pond. The improved growth of walleye in the postoperational years resulted primarily from the increased forage due to the establishment of gizzard shad.

4.4.2 Channel catfish

The growth in length and length-weight relationship of the channel catfish in Conowingo Pond were studied during the preoperational (1966-1973) and postoperational (1974-1978) periods. The present report completes these studies on the channel catfish. Although basic statistics based on 236 specimens collected in 1967 and 1968 were provided in an earlier report, no attempt could be made at that time to isolate the effects of the power station. In this report statistical comparisons are given for a much larger sample size (N = 2418).

The analysis, as shown in the following sections of this report, revealed that no significant differences attributable to the operation of Peach Bottom Atomic Power Station occurred in either the growth rate or the length-weight relationships of the channel catfish. Consequently, these studies have been terminated because the intent of the Environmental Technical Specifications Appendix B for the Peach Bottom Atomic Power Station Units No. 2 and 3 was fulfilled.

4.4.2.1 Methods

Channel catfish were collected by several gears from various sections of Conowingo Pond. However, most specimens used for age and growth study were collected by trap net. Specimens were also collected from the thermal plume in 1974 through 1978. Specimens were weighed to the nearest 0.1 gm and fork length measured to the nearest mm. Dorsal spines were removed and preserved in the field.

In the laboratory, spines were first softened in 5% hydrochloric acid to decalcify, then three to five thin transverse sections were cut at the base of the spine. The sections were immediately wet mounted and read at 48X using a Bausch and Lomb Tri-Simplex projector. Total spine radius and distances to annuli were measured from the focus. Ages were assigned independently by two biologists and if an agreement could not be reached those spines were excluded in data analysis.

Growth in length was determined by back calculation and from empirical lengths obtained during the nongrowing season (October-June). Back calculations were performed using the direct proportion method and logarithmic relationship between the fork length and spine radius. The logarithmic relationship was:

$$\text{Log}_e FL = 0.109 + 1.271 \text{ Log}_e R \qquad R^2 = 0.792$$

Although the logarithmic relationship provided a slightly better fit much variance exists in the data. Because of small sample size of fish less than 140 mm true relationship in this range cannot be distinctly discerned.

Length-weight relationships of the form, $W = aL^b$ were derived using the individual weights and lengths for fish collected during different years and periods. A high correlation and close agreement of the calculated and observed weights indicated that the logarithmic expression adequately described this relationship.

4.4.2.2 Results

4.4.2.2.1 Age Composition

A total of 2,418 channel catfish collected from Conowingo Pond in 1972 through 1978 was aged (Table 4.4-11). The oldest fish collected was XVIII years old. However, aging of fish older than VIII years proved difficult because of closeness of annual rings. Few older than X years were collected. Age composition of the population varied among years and was due to fluctuations in year class strength.

4.4.2.2.2 Growth

Lengths attained by channel catfish at each age group in each year were calculated using the direct proportion and logarithmic relationship of fish length-spine radius methods and empirical data (Tables 4.4-11 to 4.4-13 and Figure 4.4-3). The lengths computed by direct proportion method were closer to empirical lengths for ages up to VIII and thereafter the logarithmic relationship provided a better approximation to the empirical lengths. However, the differences particularly at age V and older were not large.

Depending upon the method of back calculation the lengths at various ages differed between the preoperational and postoperational periods (Tables 4.4-12 and 4.4-13). The back calculated lengths using the direct proportion relationship tended to be higher at younger ages ($\leq$ III) during the preoperational than in the postoperational period. A reversed trend was observed when lengths were calculated using the

logarithmic relationship. However, the length increments showed a similar trend of higher growth in postoperational period by both methods (Tables 4.4-14 and 4.4-15 and Figure 4.4-4).

Differences between the preoperational and postoperational length increments for both methods were statistically analyzed (Tables 4.4-16 and 4.4-17). Because of an inconsistent trend in absolute lengths growth increments were used for this analysis. Although the growth increments were higher in the postoperational period using either method of back calculation, statistical analyses showed discrepant results. Significant ($P < 0.01$) differences were evident only for ages IV, V and VII. Even in these cases the sum of squares due to status (preoperational-postoperational) contributed less than 5% of the total sum of squares. The entire model explained less than 7% of the total variation for any age group tested. Because no independent variable(s) could be ascertained at present to predict absolute growth increments, the observed variation explained by "status" is more attributable to natural year to year variation than to Peach Bottom Atomic Power Station.

4.4.2.2.3 Length-weight Relationship

Weight data was taken from more than 8,000 channel catfish between 1966 and 1979 (Table 4.4-18 and 4.4-19). The overall length-weight relationship for these channel catfish was:

$$\text{Log } W = 2.978 \text{ Log } L - 4.906$$

This equation explained about 98% of the variation (R^2) in weight. Thus, length of the fish is a good predictor of weight.

The length-weight relationships for both the preoperational (1967-1973) and postoperational (1974-1978) periods revealed similar trends. The data for the two periods were compared by analysis of covariance using the General Linear Model procedure given in Barr et al (1976) (Table 4.4-20). The comparison of interest was to determine if the random variations in adjusted weights between status (preoperational-postoperational) were greater than those among years. Thus, the status differences were tested by keeping the year within status mean squares in the denominator for the F-test. This F-test indicated that the preoperational and postoperational periods were similar and that status contributed less than 0.1% of the total variation. Since status was not a source of significant variation, it is concluded that the effects of Peach Bottom Atomic Power Station were not detectable in the length-weight relationships for the catfish population.

TABLE 4.4-1

YEARLY SUMMARY OF AVERAGE WEIGHT (G) PER 10 MM LENGTH GROUP
FOR WALLEYE COLLECTED FROM CONOWINGO DURING THE PREOPERATIONAL PERIOD.

	1966		1967		1968		1969		1970		1971		1972		1973	
LENGTH	NO.	AVG WEIGHT	NO.	AVG WEIGHT	NO.	AVG WEIGHT	NO.	AVG WEIGHT	NO.	AVG WEIGHT	NO.	AVG WEIGHT	NO.	AVG WEIGHT	NO.	AVG WEIGHT
141-150	-	-	-	-	-	-	-	-	-	-	-	-	1	30.1	-	-
151-160	-	-	1	42.6	-	-	-	-	-	-	-	-	-	-	-	-
171-180	-	-	-	-	-	-	-	-	-	-	-	-	1	44.1	-	-
181-190	-	-	1	69.5	-	-	-	-	-	-	-	-	-	-	-	-
191-200	-	-	-	-	1	85.0	-	-	-	-	1	56.8	-	-	-	-
201-210	-	-	-	-	-	-	-	-	-	-	-	-	3	71.3	-	-
211-220	1	81.9	-	-	-	-	-	-	-	-	2	77.8	4	91.2	-	-
221-230	-	-	-	-	-	-	-	-	-	-	-	-	2	97.9	-	-
231-240	2	118.7	-	-	-	-	-	-	-	-	-	-	7	105.7	1	119.1
241-250	-	-	-	-	-	-	-	-	-	-	-	-	1	96.5	2	154.9
251-260	-	-	-	-	-	-	-	-	-	-	-	-	3	138.6	-	-
261-270	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	159.9
271-280	2	217.7	-	-	-	-	-	-	-	-	-	-	1	207.1	3	196.2
281-290	-	-	1	242.1	-	-	-	-	1	222.7	-	-	1	296.7	3	230.5
291-300	-	-	1	242.0	1	270.0	-	-	-	-	-	-	2	282.4	-	-
301-310	-	-	3	278.6	-	-	-	-	-	-	-	-	-	-	1	272.0
311-320	-	-	-	-	-	-	-	-	-	-	-	-	2	282.4	1	340.6
321-330	-	-	1	391.2	1	424.5	-	-	-	-	-	-	1	328.1	-	-
331-340	-	-	-	-	-	-	-	-	-	-	-	-	2	272.4	-	-
341-350	-	-	2	441.2	-	-	-	-	-	-	-	-	1	508.1	1	419.7
351-360	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	447.0
361-370	-	-	-	-	-	-	1	482.0	-	-	-	-	-	-	-	-
371-380	-	-	1	621.2	-	-	-	-	-	-	-	-	1	447.0	-	-
381-390	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	365.6
391-400	-	-	-	-	-	-	-	-	-	-	1	596.0	-	-	-	-
401-410	-	-	-	-	1	1134.0	-	-	1	708.8	-	-	-	-	-	-
441-450	-	-	-	-	1	793.8	-	-	-	-	-	-	-	-	-	-
TOTAL	5		11		5		1		2		4		33		15	

TABLE 4.4-2

YEARLY SUMMARY OF AVERAGE WEIGHT (G) PER 10 MM LENGTH GROUP
FOR WALLEYE COLLECTED FROM CONOWINGO DURING THE POSTOPERATIONAL PERIOD.

	1974		1975		1976		1977	
LENGTH	NO.	AVG WEIGHT	NO.	AVG WEIGHT	NO.	AVG WEIGHT	NO.	AVG WEIGHT
141-150	-	-	-	-	2	34.8	-	-
151-160	-	-	-	-	-	-	1	52.8
171-180	-	-	-	-	-	-	1	49.2
181-190	-	-	1	74.0	1	60.9	-	-
191-200	-	-	1	80.4	1	82.4	2	69.7
201-210	-	-	1	86.8	1	87.7	2	91.0
211-220	-	-	3	90.9	3	100.9	-	-
221-230	-	-	2	111.9	3	110.1	4	122.7
231-240	-	-	-	-	4	145.2	2	142.3
241-250	1	148.1	1	163.0	2	131.7	2	177.7
251-260	-	-	1	144.0	-	-	1	195.0
271-280	-	-	-	-	1	202.9	-	-
281-290	1	244.5	1	213.5	-	-	1	298.8
291-300	-	-	-	-	1	235.3	1	306.1
301-310	-	-	1	246.9	1	275.0	-	-
311-320	-	-	-	-	1	318.2	1	325.0
321-330	-	-	-	-	2	319.3	1	378.4
331-340	-	-	2	387.1	1	249.5	1	444.4
341-350	-	-	2	431.8	-	-	-	-
361-370	-	-	1	510.5	-	-	1	630.2
371-380	-	-	1	556.3	1	555.1	-	-
381-390	-	-	1	545.0	2	639.7	-	-
391-400	-	-	1	723.0	-	-	-	-
401-410	1	709.2	-	-	-	-	-	-
421-430	-	-	-	-	1	882.2	-	-
441-450	-	-	1	942.7	1	923.5	-	-
TOTAL	3		21		29		21	

1400 195

TABLE 4.4-3

AGE COMPOSITION (%) OF WALLEYE COLLECTED FROM CONOWINGO POND, 1966-1977.

YEAR OF COLLECTION	NO. AGED	AGE GROUP 0	1	2	3	4	5	6	7	8	9
1966	9	-	88.9	11.2	-	-	-	-	-	-	-
1967	43	9.4	-	67.5	7.0	7.0	2.4	-	-	7.0	-
1968	20	5.0	25.0	5.0	25.0	10.0	5.0	15.0	5.0	5.0	-
1969	10	70.0	-	20.0	10.0	-	-	-	-	-	-
1970	10	10.0	30.0	20.0	20.0	10.0	10.0	-	-	-	-
1971	14	57.2	14.3	21.5	-	-	-	-	-	-	7.2
1972	33	3.1	78.8	9.1	9.1	-	-	-	-	-	-
1973	25	-	4.0	80.0	12.0	4.0	-	-	-	-	-
1974	3	33.4	-	33.4	-	33.4	-	-	-	-	-
1975	23	39.2	34.8	4.4	8.7	8.7	4.4	-	-	-	-
1976	35	40.0	25.8	25.8	-	2.9	-	2.9	-	2.9	-
1977	59	22.1	56.0	11.9	8.5	1.7	-	-	-	-	-
TOTAL	284										

TABLE 4.4-4

Results of analysis of covariance of length-weight data on walleye collected during the preoperational (1966-1973) and postoperational (1974-1977) periods in Conowingo Pond. Dependent variable is $\log_{10}$ weight.

Source	df	SS	MS	F
$\log_{10}$ length	1	16.864	16.864	4216.00**
Status	1	0.060	0.060	15.00**
Error	147	0.619	0.004	
Corrected Total	149			

**Significant at P = 0.01

TABLE 4.4-5

WEIGHT COMPARISONS OF WALLEYE COLLECTED FROM CONOWINGO POND DURING THE PREOPERATIONAL(1966-1973) AND POSTOPERATIONAL(1974-1977) PERIODS.

	PREOPERATIONAL(1966-1973)					POSTOPERATIONAL(1974-1977)				
FORK LENGTH (MM)	NO.	(1) MEAN EMP. LNGH	MEAN EMP. WT	(2) MEAN CALC WT	(3) MEAN KFAC	NO.	MEAN EMP. LNGH	MEAN EMP. WT	MEAN CALC WT	MEAN KFAC
141-150	1	145	30.1	30.6	0.99	2	144	34.8	30.0	1.17
151-160	1	160	42.6	41.3	1.04	1	151	32.8	34.6	0.95
171-180	1	178	44.1	57.0	0.78	1	172	49.2	51.4	0.97
181-190	1	182	69.5	61.0	1.15	2	186	67.5	65.8	1.04
191-200	2	192	70.9	71.8	1.01	4	197	75.5	77.9	0.98
201-210	3	205	71.3	87.6	0.83	4	206	89.1	89.5	1.02
211-220	7	215	86.0	101.8	0.86	6	214	95.9	100.2	0.97
221-230	2	227	97.9	119.2	0.84	9	225	116.1	116.4	1.01
231-240	10	234	109.6	131.4	0.85	6	234	144.2	132.2	1.11
241-250	3	248	135.4	155.8	0.89	6	246	155.0	153.1	1.03
251-260	3	254	138.6	169.0	0.84	2	259	169.5	177.7	0.98
261-270	1	262	159.9	184.1	0.89	-	-	-	-	-
271-280	6	276	205.2	215.6	0.98	1	273	202.9	208.5	1.00
281-290	6	285	242.2	238.0	1.04	3	288	252.3	246.1	1.06
291-300	4	295	269.2	263.8	1.05	2	296	270.7	266.5	1.05
301-310	4	303	277.0	287.4	0.99	2	303	261.0	286.0	0.94
311-320	3	314	301.8	319.7	0.97	2	318	321.6	332.8	1.00
321-330	3	322	381.3	346.1	1.13	3	326	339.0	357.1	0.98
331-340	2	334	272.4	384.3	0.73	4	338	367.0	398.4	0.95
341-350	4	346	452.6	427.7	1.09	2	345	431.8	425.9	1.05
351-360	1	355	447.0	462.2	1.00	-	-	-	-	-
361-370	1	363	482.0	494.5	1.01	2	366	570.4	509.3	1.16
371-380	2	377	534.1	554.8	0.99	2	377	555.7	554.7	1.04
381-390	1	382	365.6	577.3	0.66	3	385	608.1	592.7	1.06
391-400	1	396	596.0	643.8	0.96	1	391	723.0	619.5	1.21
401-410	2	409	921.4	712.7	1.35	1	403	709.2	678.9	1.08
421-430	-	-	-	-	-	1	423	882.2	786.3	1.17
441-450	1	449	793.8	942.1	0.88	2	444	933.1	910.8	1.07
OVERALL MEANS	76	276	240.6	251.0	0.95	74	271	256.4	252.8	1.03

1. EMP. = EMPIRICAL OR ACTUAL.
2. CALC WT. = PREOP: (10 ** -5.5287) * (LENGTH**3.2058)
   POSTOP: (10 ** -5.0659) * (LENGTH**3.0314).
3. KFAC= CONDITION FACTOR:(WEIGHT*100000 / LENGTH**3).

1400 198

TABLE 4.4-6

Calculated length attained by walleye during the preoperational (1963-1973) and postoperational (1974-1976) periods in Conowingo Pond.

Year of Growth	Length attained at the end of growing season					
	1	2	3	4	5	6
1963	212(4)					
1964	227(6)	304(4)				
1965	224(43)	334(6)	350(4)			
1966	180(3)	320(35)	397(5)	365(4)		
1967	177(9)	233(3)	371(6)	462(2)	510(1)	
1968	157(2)	277(4)	355(2)	392(1)	-(0)	-(0)
1969	216(10)	230(2)	350(2)	420(1)	402(1)	-(0)
1970	230(11)	280(7)	-(0)	-(0)	-(0)	-(0)
1971	212(48)	321(9)	328(4)	-(0)	-(0)	-(0)
1972	210(5)	275(22)	362(6)	355(1)	-(0)	-(0)
1973	234(2)	306(4)	352(2)	391(3)	-(0)	-(0)
1974	243(23)	335(2)	389(3)	392(2)	422(2)	-(0)
1975	213(16)	328(15)	399(1)	423(1)	-(0)	473(1)
1976	213(32)	344(7)	399(5)	414(1)	-(0)	-(0)
Preoperational Period (1963-1973)						
Total	143	96	31	12	2	-
Mean	214.5	299.9	361.3	393.6	456.0	-
SD	34.7	47.4	59.4	80.9	-	-
SE	2.9	4.8	10.7	23.4	-	-
Postoperational Period (1974-1976)						
Total	71	24	9	4	2	1
Mean	222.4	333.0	395.5	405.1	421.8	473.0
SD	30.0	26.4	52.5	24.8	-	-
SE	3.6	5.4	17.5	12.4	-	-

TABLE 4.4-7

Results of analysis of variance of mean length between status (preoperational-postoperational) for ages I-III of walleye in Conowingo Pond.

Source	df	SS	MS	F
		AGE I		
Status	1	3106.05	3106.05	2.81NS
Error	213	235825.05	1107.16	
Corrected total	214	238931.10		
		AGE II		
Status	1	21024.41	21024.41	10.79**
Error	118	229905.64	1948.35	
Corrected total	119	250930.05		
		AGE III		
Status	1	10491.13	10491.13	2.76NS
Error	39	148212.96	3800.33	
Corrected total	40	158704.09		

** Significant at P = 0.01

NS Not significant at P = 0.05

1400 200

TABLE 4.4-8

Calculated incremental growth attained by walleye during the preoperational (1963-1973) and postoperational (1974-1976) periods in Conowingo Pond.

Year of Growth	Length attained at the end of growing season					
	1	2	3	4	5	6
1963	212(4)					
1964	227(6)	92(4)				
1965	224(43)	106(6)	46(4)			
1966	180(3)	94(35)	64(5)	16(4)		
1967	177(9)	53(3)	38(6)	27(2)	10(1)	
1968	157(2)	103(4)	96(2)	35(1)	-(0)	-(0)
1969	216(10)	74(2)	65(2)	52(1)	10(1)	-(0)
1970	230(11)	81(7)	-(0)	-(0)	-(0)	-(0)
1971	212(48)	91(9)	70(4)	-(0)	-(0)	-(0)
1972	210(5)	68(22)	43(6)	24(1)	-(0)	-(0)
1973	234(2)	89(4)	72(2)	26(3)	-(0)	-(0)
1974	243(23)	101(2)	71(3)	40(2)	28(2)	-(0)
1975	213(16)	87(15)	62(1)	41(1)	-(0)	24(1)
1976	213(32)	130(7)	78(5)	15(1)	-(0)	-(0)
Preoperational Period (1963-1973)						
Total	143	96	31	12	2	-
Mean	214.5	86.0	56.1	25.3	10.0	-
SD	34.7	32.9	26.6	14.8	-	-
SE	2.9	3.4	4.8	4.3	-	-
Postoperational Period (1974-1976)						
Total	71	24	9	4	2	1
Mean	222.4	100.5	74.2	34.1	28.0	24.0
SD	30.0	28.8	33.6	13.5	-	-
SE	3.6	5.9	11.1	6.7	-	-

TABLE 4.4-9

Results of analysis of variance of growth increments between status (preoperational-postoperational) for ages I-III of walleye in Conowingo Pond.

Source	df	SS	MS	F
		AGE I		
Status	1	3106.05	3106.05	2.81NS
Error	213	235825.05	1107.16	
Corrected total	214	238931.10		
		AGE II		
Status	1	4246.13	4246.13	4.12*
Error	118	121669.81	1031.10	
Corrected total	119	125915.94		
		AGE III		
Status	1	3932.94	3932.94	2.54NS
Error	39	60472.05	1550.57	
Corrected total	40	64404.99		

* Significant at P = 0.05
NS Not significant at P = 0.05

1400 202

TABLE 4.4-10

Comparison of mean total length attained by walleye in various waters of North America.

Source	Place	Age 1	2	3	4	5	6	7	8	9	10
Kennedy (1949)	Lake Manitoba, Canada	-	-	290	330	378	411	434	455	500	505
Rawson (1956)	Lac La Ronge, Saskatchewan	198	233	282	327	378	424	467	508		
Deason (1933)	Lake Erie	107	213	287	376	457	528				
Eschmeyer (1950)	Lake Gogebic, Michigan	112	236	300	353	386	414	429	439		
Eddy and Carlander (1939)	Minnesota Lakes	117	218	305	381	460	521	582	640	678	
Carlander (1945)	Lake of the Woods, Minnesota	163	236	292	343	378	424	465	505	549	577
Forney (1965)	Oneida Lake, New York										
	Male	155	234	295	340	366	388	404			
	Female	160	241	307	358	394	424	447			
Rose (1950)	Spirit Lake, Iowa	183	282	366	445	505	564	602	632		
Nelson and Walburg (1977)	Missouri River Reservoirs, South Dakota										
	Lewis Clark	167	273	356	421	480	547	584	640		
	Francis Case	130	274	374	417	480	540	579	599	621	
	Sharpe	140	258	346	409	469	512	562	599	654	
	Oahe	163	285	349	399	439	474	513	569	617	
Stroud (1949)	Norris Reservoir, Tennessee	262	417	475	505	528	533	561	632		
Roseberry (1950)	Claytor Lake, Virginia	206	353	467	574	647	695	757	818		
Hepworth and Closs (1976)	Lake Powell, Utah-Arizona	302	423	492	604	778					
Present study[1]	Conowingo Pond, Pennsylvania-Maryland										
	Preoperational period	228	319	383	418	483					
	Postoperational period	235	353	420	429	447	501				
	Muddy Run Pond, Pennsylvania										
	Preoperational period	217	295	358	408	466	511	542	586		
	Postoperational period	242	366	439	443	475	507	573			

[1] Total length calculated by multiplying fork length by 1.06

TABLE 4.4-11

Mean empirical lengths attained by channel catfish collected during the non-growing season (October-June) in Conowingo Pond, 1972-1978.

Year of Growth	Length Attained at the End of Growing Season													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1972	- (0)	130 (2)	147 (4)	150 (11)	165 (7)	163 (2)	300 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	410 (1)	
1973	77 (5)	113 (9)	152 (30)	190 (41)	191 (49)	205 (32)	211 (24)	255 (11)	264 (3)	327 (5)	291 (2)	455 (1)	- (0)	
1974	98 (15)	128 (89)	151 (54)	190 (77)	214(150)	231(206)	246(184)	269 (84)	298 (32)	328 (30)	375 (13)	388 (5)	432 (4)	430 (2)
1975	86 (9)	117 (46)	150 (36)	184 (65)	207 (67)	225 (57)	241 (47)	263 (34)	272 (13)	301 (7)	397 (5)	428 (3)	468 (1)	- (0)
1976	- (0)	121 (9)	136 (20)	177 (22)	209 (39)	224 (25)	239 (19)	304 (16)	291 (25)	349 (9)	303 (7)	392 (8)	401 (5)	452 (4)
1977	- (0)	126 (8)	156 (20)	178 (16)	205 (10)	271 (2)	257 (3)	280 (4)	353 (3)	300 (2)	453 (1)	503 (1)	- (0)	- (0)
1978	- (0)	- (0)	- (0)	155 (6)	192 (5)	218 (2)	202 (6)	244 (3)	312 (4)	271 (2)	376 (2)	412 (1)	- (0)	393 (1)

TABLE 4.4-12

Lengths of channel catfish, calculated by the direct proportion method[1] during the preoperational (1963-1973) and postoperational (1974-1977) periods in Conowingo Pond.

Year of Growth	Length Attained at End of Growing Season													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1963	87 (22)													
1964	85 (34)	133 (22)												
1965	85 (61)	140 (34)	169 (22)											
1966	75 (93)	135 (61)	179 (34)	194 (22)										
1967	74(183)	122 (93)	172 (61)	205 (34)	214 (22)									
1968	71(345)	118(183)	158 (93)	198 (61)	227 (34)	238 (22)								
1969	71(426)	118(345)	156(183)	186 (93)	221 (61)	251 (34)	257 (22)							
1970	70(371)	121(426)	154(345)	180(183)	208 (93)	241 (61)	276 (34)	283 (22)						
1971	66(312)	122(371)	160(426)	180(345)	201(183)	226 (93)	260 (61)	296 (34)	302 (22)					
1972	63(275)	116(312)	158(371)	185(426)	200(345)	219(183)	244 (93)	280 (61)	321 (34)	327 (22)				
1973	64(296)	113(275)	152(310)	183(365)	206(410)	220(336)	237(181)	262 (92)	304 (60)	339 (33)	347 (22)			
1974	65(132)	119(160)	156(175)	189(198)	211(265)	231(324)	246(249)	275(106)	297 (59)	342 (40)	378 (23)	393 (12)		
1975	54(101)	112 (95)	151(105)	184(127)	213(107)	229 (88)	255 (81)	272 (64)	306 (23)	307 (21)	379 (14)	397 (9)	415 (5)	
1976	68 (10)	114 (33)	145 (38)	179 (36)	203 (31)	219 (15)	246 (20)	277 (11)	327 (8)	355 (1)	350 (2)	361 (1)	- (0)	385 (1)
1977	- (0)	118 (6)	151 (25)	176 (26)	199 (18)	215 (12)	241 (6)	276 (7)	271 (3)	367 (3)	383 (1)	503 (1)	379 (1)	- (0)
Preoperational Period (1963-1973)														
Total No.	2418	2122	1845	1529	1148	729	391	209	116	55	22	0	0	0
Mean	69.4	119.5	157.7	184.0	205.1	224.3	246.9	275.3	308.2	334.2	346.7	-	-	-
SD	19.0	33.7	34.0	33.8	35.9	40.5	51.1	61.1	64.0	69.0	79.4	-	-	-
SE	0.4	0.7	0.8	0.9	1.1	1.5	2.6	4.2	5.9	9.3	16.[illegible]	-	-	-
Postoperational Period (1974-1977)														
Total No.	243	294	343	387	421	439	356	188	93	65	40	23	6	1
Mean	60.9	115.9	152.9	185.5	210.6	230.0	248.3	274.4	301.0	332.1	377.2	397.8	409.1	385
SD	16.1	22.3	24.6	27.5	28.3	33.1	35.8	44.4	58.2	67.9	67.9	77.0	101.7	-
SE	1.0	1.3	1.3	1.4	1.4	1.6	1.9	3.2	6.0	8.4	10.7	16.0	41.5	-

1. Backcalculated by linear ratio: BL = (AR/SR)*FL
BL = backcalculated lengths; AR = annulus radius; SR = spine radius; FL = measured fork length.

TABLE 4.4-13

Lengths of channel catfish, calculated using a logarithmic relationship[1] during the preoperational (1963-1973) and postoperational (1974-1977) periods in Conowingo Pond.

Year of Growth	Length Attained at the End of Growing Season													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1963	59 (22)													
1964	57 (34)	101 (22)												
1965	59 (61)	108 (34)	136 (22)											
1966	52 (93)	106 (61)	147 (34)	162 (22)										
1967	53(183)	97 (93)	144 (61)	175 (34)	183 (22)									
1968	51(345)	96(183)	134 (93)	172 (61)	198 (34)	209 (22)								
1969	52(426)	98(345)	135(183)	165 (93)	198 (61)	225 (34)	231 (22)							
1970	52(371)	102(426)	137(345)	163(183)	189 (93)	221 (61)	254 (34)	261 (22)						
1971	49(312)	105(371)	145(426)	165(345)	187(183)	211 (93)	243 (61)	278 (34)	283 (22)					
1972	48(275)	101(312)	146(371)	174(426)	189(345)	208(183)	232 (93)	268 (61)	307 (34)	312 (22)				
1973	53(296)	102(275)	142(310)	175(365)	199(410)	212(336)	230(181)	255 (92)	295 (60)	330 (33)	337 (22)			
1974	54(132)	110(160)	148(175)	182(198)	207(265)	228(324)	243(249)	272(106)	292 (59)	338 (40)	374 (23)	386 (12)		
1975	44(101)	103 (95)	144(105)	179(127)	208(107)	225 (88)	251 (81)	268 (64)	303 (23)	303 (21)	375 (14)	392 (9)	408 (5)	
1976	58 (10)	106 (33)	138 (38)	174 (36)	198 (31)	214 (15)	241 (20)	271 (11)	321 (8)	340 (1)	342 (2)	352 (1)	- (0)	385 (1)
1977	- (0)	117 (6)	150 (25)	174 (26)	197 (18)	210 (12)	238 (6)	272 (7)	265 (3)	364 (3)	376 (1)	503 (1)	375 (1)	- (0)
Preoperational Period (1963-1973)														
Total No.	2418	2122	1845	1529	1148	729	391	209	116	55	22	9	0	0
Mean	51.5	101.1	141.6	170.1	192.7	212.5	234.7	262.8	296.3	323.2	337.1	-	-	-
SD	16.4	32.9	33.6	33.2	34.6	38.3	48.4	58.8	62.3	68.0	78.2	-	-	-
SE	0.3	0.7	0.8	0.8	1.0	1.4	2.4	4.1	5.8	9.2	16.7	-	-	-
Postoperational Period (1974-1977)														
Total No.	243	294	343	387	421	439	356	188	93	65	40	23	6	1
Mean	50.1	107.3	145.7	179.8	206.3	226.3	244.8	270.6	296.5	328.0	372.6	39.0	402.7	385.0
SD	17.1	24.7	25.4	28.3	29.3	33.2	35.4	43.9	57.8	66.5	67.7	77.8	98.6	-
SE	1.1	1.4	1.4	1.4	1.4	1.6	1.9	3.2	6.0	8.2	10.7	16.2	40.3	-

1. Backcalculated by exponential ratio: $BL = (AR/SR)^{1.27} * FL$.
BL = backcalculated length; AR = annulus radius; SR = spine radius; FL = measured fork length.

TABLE 4.4-14

Incremental growth of channel catfish, calculated by the direct proportion method[1], during the preoperational (1963-1973) and postoperational (1974-1977) periods in Conowingo Pond.

Year of Growth	Length Added During Growing Season													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1963	87 (22)													
1964	85 (34)	46 (22)												
1965	85 (61)	54 (34)	36 (22)											
1966	75 (93)	50 (61)	40 (34)	25 (22)										
1967	74(183)	47 (93)	37 (61)	26 (34)	20 (22)									
1968	71(345)	44(183)	36 (93)	25 (61)	21 (34)	24 (22)								
1969	71(426)	47(345)	38(183)	28 (93)	23 (61)	24 (34)	19 (22)							
1970	70(371)	50(426)	36(345)	25(183)	22 (93)	20 (61)	25 (34)	26 (22)						
1971	66(312)	52(371)	40(426)	25(345)	21(183)	19 (93)	19 (61)	21 (34)	19 (22)					
1972	63(275)	50(312)	37(371)	24(426)	20(345)	18(183)	17 (93)	20 (61)	25 (34)	25 (22)				
1973	64(296)	50(275)	36(310)	25(365)	20(410)	19(336)	17(181)	19 (92)	21 (60)	22 (33)	20 (22)			
1974	65(132)	57(160)	38(175)	30(198)	23(265)	21(324)	22(249)	23(106)	22 (59)	24 (40)	25 (23)	25 (12)		
1975	54(101)	50 (95)	36(105)	28(127)	25(107)	21 (88)	23 (81)	23 (64)	26 (23)	23 (21)	24 (14)	23 (9)	31 (5)	
1976	68 (10)	60 (33)	35 (38)	29 (36)	24 (31)	19 (15)	23 (20)	23 (11)	23 (8)	34 (1)	24 (2)	28 (1)	- (0)	24 (1)
1977	- (0)	60 (6)	39 (25)	29 (26)	24 (18)	28 (12)	21 (6)	26 (7)	24 (3)	29 (3)	29 (1)	61 (1)	18 (1)	- (0)
						Preoperational Period (1963-1973)								
Total No.	2418	2122	1845	1529	1148	729	391	209	116	55	22	0	0	0
Mean	69.4	49.4	37.3	25.1	20.6	19.3	18.3	20.4	21.7	23.2	20.2	-	-	-
SD	19.0	24.6	19.5	12.8	10.4	10.0	9.5	11.5	11.1	10.8	11.1	-	-	-
SE	0.4	0.5	0.4	0.3	0.3	0.4	0.5	0.8	1.0	1.5	2.4	-	-	-
						Postoperational Period (1974-1977)								
Total No.	243	294	343	387	421	439	356	188	93	65	40	23	6	1
Mean	66.9	55.2	37.3	29.4	23.8	21.2	22.1	23.2	22.9	23.8	24.8	25.8	28.9	24.1
SD	16.1	19.8	17.0	13.0	11.1	10.7	11.1	13.1	13.3	11.1	12.6	12.4	12.8	-
SE	1.0	1.2	0.9	0.7	0.5	0.5	0.6	1.0	1.4	1.4	2.0	2.6	5.2	-

1. Yearly increase in length as backcalculated by linear ratio: BL = (AR/SR)*FL.
BL = backcalculated length; AR = annulus radius; SR = spine radius: FL = measured fork length.

TABLE 4.4-15

Incremental growth of channel catfish, calculated using a logarithmic relationship[1], during the preoperational (1963-1973) and postoperational (1974-1977) periods in Conowingo Pond.

Year of Growth	Length Added During Growing Season													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1963	59 (22)													
1964	57 (34)	42 (22)												
1965	59 (61)	50 (34)	35 (22)											
1966	52 (93)	48 (61)	40 (34)	26 (22)										
1967	53(183)	45 (93)	38 (61)	27 (34)	21 (22)									
1968	51(345)	43(183)	37 (93)	28 (61)	23 (34)	27 (22)								
1969	52(426)	47(345)	40(183)	31 (93)	26 (61)	27 (34)	22 (22)							
1970	52(371)	50(426)	39(345)	28(183)	25 (93)	23 (61)	28 (34)	29 (22)						
1971	49(312)	53(371)	43(426)	29(345)	24(183)	22 (93)	22 (61)	24 (34)	22 (22)					
1972	48(275)	52(312)	41(371)	28(426)	23(345)	21(183)	21 (93)	24 (61)	29 (34)	30 (22)				
1973	53(296)	53(275)	41(310)	30(365)	24(410)	23(336)	21(181)	23 (92)	26 (60)	27 (33)	25 (22)			
1974	54(132)	62(160)	44(175)	36(198)	29(265)	26(324)	27(249)	29(106)	27 (59)	29 (40)	31 (23)	30 (12)		
1975	44(101)	54 (95)	42(105)	34(127)	30(107)	26 (88)	28 (81)	28 (64)	32 (23)	28 (21)	30 (14)	29 (9)	38 (5)	
1976	58 (10)	65 (33)	41 (38)	35 (36)	29 (31)	24 (15)	29 (20)	29 (11)	29 (8)	40 (1)	29 (2)	34 (1)	- (0)	30 (1)
1977	- (0)	68 (6)	47 (25)	36 (26)	29 (18)	35 (12)	27 (6)	32 (7)	29 (3)	36 (3)	35 (1)	76 (1)	23 (1)	- (0)
						Preoperational Period (1963-1973)								
Total No.	2418	2122	1845	1529	1148	729	391	209	116	55	22	0	0	0
Mean	51.5	49.8	40.6	28.7	24.0	22.9	21.8	24.3	26.2	28.1	24.6	-	-	-
SD	16.4	26.0	20.7	14.2	11.9	11.6	11.0	13.5	13.0	13.0	13.2	-	-	-
SE	0.3	0.6	0.5	0.4	0.4	0.4	0.6	0.9	1.2	1.8	2.8	-	-	-
						Postoperational Period (1974-1977)								
Total No.	243	294	343	387	421	439	356	188	93	65	40	23	6	1
Mean	50.1	59.8	43.2	35.3	29.1	26.1	27.3	28.7	28.3	29.5	30.7	32.0	35.7	30.3
SD	17.1	22.2	19.1	15.4	13.4	13.0	13.5	16.1	16.4	13.5	15.3	15.3	15.6	-
SE	1.1	1.3	1.0	0.8	0.7	0.6	0.7	1.2	1.7	1.7	2.4	3.2	6.4	-

1. Yearly increase in length as backcalculated by exponential ratio: $BL = (AR/SR)^{1.27} * FL$.
BL = backcalculated length; AR = annulus radius; SR = spine radius; FL = measured fork length.

TABLE 4.4-16

Results of analysis of variance of growth increments (calculated by logarithmic method) between status (preoperational-postoperational) and years (status) for ages I-VIII of channel catfish in Conowingo Pond.

Source	df	SS	MS	F[1]
		AGE I		
Status	1	437.90	437.90	0.31NS
Year (status)	12	17123.27	1426.94	5.34**
Error	2647	707795.13	267.40	
Corrected total	2660	725356.30		
		AGE II		
Status	1	26016.59	26016.59	10.44**
Year (status)	12	29913.11	2492.76	3.87**
Error	2402	1545794.45	643.54	
Corrected total	2415	1601724.15		
		AGE III		
Status	1	1903.09	1903.09	2.66NS
Year (status)	11	7875.71	715.97	1.71NS
Error	2175	909205.57	418.02	
Corrected total	2187	918984.38		
		AGE IV		
Status	1	13406.66	13406.66	68.96**
Year (status)	10	1944.11	194.41	0.93NS
Error	1904	398323.48	209.20	
Corrected total	1915	413674.24		
		AGE V		
Status	1	7823.59	7823.59	80.60**
Year (status)	9	873.55	97.06	0.64NS
Error	1558	236697.16	151.92	
Corrected total	1568	245394.30		
		AGE VI		
Status	1	2843.63	2843.63	9.02*
Year (status)	8	2522.37	315.30	2.17*
Error	1158	168120.00	145.18	
Corrected total	1167	173486.01		
		AGE VII		
Status	1	5590.62	5590.62	21.71**
Year (status)	7	1802.87	257.55	1.73NS
Error	738	110050.47	149.12	
Corrected total	746	117443.97		
		AGE VIII		
Status	1	1917.73	1917.73	14.08**
Year (status)	6	817.16	136.19	0.62NS
Error	389	85056.89	218.66	
Corrected total	396	87791.78		

1. $F_{status} = MS_{status}/MS_{year\ (status)}$
   $F_{year\ (status)} = MS_{year\ (status)}/MS_{error}$

* Significant at $P \leq 0.05$
** Significant at $P \leq 0.01$

1400 209

TABLE 4.4-17

Results of analysis of variance of growth increments (calculated by direct proportion method) between status (preoperational-postoperational) and years (status) for ages I-VIII of channel catfish in Conowingo Pond.

Source	df	SS	MS	F[1]
		AGE I		
Status	1	16045.32	16045.32	2.80NS
Year (status)	12	68754.28	5729.52	17.55**
Error	2647	863976.54	326.40	
Corrected total	2660	948776.15		
		AGE II		
Status	1	8698.35	8698.35	6.74*
Year (status)	12	15490.76	1290.90	2.23**
Error	2402	1387671.64	577.72	
Corrected total	2415	1411860.75		
		AGE III		
Status	1	0.04	0.04	0.00NS
Year (status)	11	4392.15	399.27	1.09NS
Error	2175	795415.87	365.71	
Corrected total	2187	799808.07		
		AGE IV		
Status	1	5700.80	5700.80	31.28**
Year (status)	10	1822.42	182.24	1.11NS
Error	1904	312114.33	163.92	
Corrected total	1915	319637.55		
		AGE V		
Status	1	3208.62	3208.62	28.80**
Year (status)	9	1002.70	111.41	0.99NS
Error	1558	175511.83	112.65	
Corrected total	1568	179723.14		
		AGE VI		
Status	1	951.00	951.00	3.08NS
Year (status)	8	2472.56	309.07	2.99**
Error	1158	119839.73	103.49	
Corrected total	1167	123263.29		
		AGE VII		
Status	1	2665.76	2665.76	10.35*
Year (status)	7	1803.55	257.65	2.47*
Error	738	76949.01	104.27	
Corrected total	746	81418.32		
		AGE VIII		
Status	1	814.14	814.14	5.72NS
Year (status)	6	853.68	142.28	0.94NS
Error	389	59004.30	151.68	
Corrected total	396	60672.12		

1 $F_{status} = MS_{status}/MS_{year\ (status)}$

$F_{Year\ (status)} = MS_{year\ (status)}/MS_{error}$

* Significant at $P \leq 0.05$
** Significant at $P \leq 0.01$

1400 210

TABLE 4.4-18

YEARLY SUMMARY OF AVERAGE WEIGHT (G) PER 10 MM LENGTH GROUP
FOR CHANNEL CATFISH COLLECTED FROM CONOWINGO DURING THE PREOPERATIONAL PERIOD.

	1966		1967		1968		1969		1971		1972		1973	
LENGTH	NO.	AVG WEIGHT	NO.	AVG WEIGHT	NO.	AVG WEIGHT	NO.	AVG WEIGHT	NO.	AVG WEIGHT	NO.	AVG WEIGHT	NO.	AVG WEIGHT
51-60	-	-	-	-	-	-	-	-	-	-	12	2.5	2	2.5
61-70	-	-	-	-	-	-	-	-	3	3.6	13	3.2	6	3.5
71-80	-	-	-	-	-	-	-	-	1	4.6	9	5.0	5	5.7
81-90	-	-	-	-	-	-	-	-	-	-	6	7.6	3	9.6
91-100	1	11.0	-	-	-	-	-	-	7	9.1	11	10.8	2	11.6
101-110	1	14.6	-	-	-	-	1	18.0	13	12.0	47	13.2	9	15.0
111-12[illegible]	-	-	-	-	-	-	2	21.0	5	14.9	52	17.4	13	20.1
121-[illegible]0	1	22.0	-	-	-	-	1	22.0	6	21.9	32	20.7	18	23.2
131-[illegible]40	-	-	-	-	-	-	-	-	2	27.1	28	28.3	41	28.3
14[illegible]-150	-	-	-	-	-	-	2	40.0	8	33.2	38	33.8	48	35.1
1[illegible]-160	-	-	-	-	-	-	-	-	8	43.8	25	40.0	33	40.0
[illegible]1-170	-	-	-	-	-	-	1	50.0	1	51.0	36	47.2	35	48.8
171-180	-	-	-	-	-	-	1	64.0	1	71.6	38	57.1	47	59.5
181-190	-	-	-	-	-	-	1	68.0	1	66.4	15	67.2	29	68.5
191-200	-	-	-	-	-	-	1	82.0	1	70.8	27	78.5	35	81.9
201-210	-	-	1	97.1	-	-	-	-	4	97.3	37	94.4	35	104.2
211-220	-	-	-	-	-	-	2	103.0	10	112.0	53	106.2	43	108.6
221-230	-	-	-	-	-	-	-	-	9	127.9	51	122.4	30	123.1
231-240	1	150.0	-	-	-	-	2	142.0	15	143.1	58	139.1	22	146.4
241-250	4	179.8	-	-	-	-	-	-	8	161.7	32	159.4	12	173.2
251-260	2	184.0	-	-	-	-	1	169.8	1	187.4	33	179.1	10	175.9
261-270	1	240.0	-	-	1	226.4	2	198.1	4	220.8	15	209.1	6	224.2
271-280	2	242.0	-	-	-	-	2	226.4	2	213.9	11	251.6	6	228.3
281-290	1	266.0	1	311.3	-	-	2	254.7	2	249.7	4	243.9	3	283.7
291-300	-	-	-	-	-	-	2	325.5	-	-	10	310.4	5	301.8
301-310	-	-	1	311.3	1	396.2	1	283.0	2	340.2	5	332.0	5	343.8
311-320	1	364.0	1	481.9	-	-	1	339.6	-	-	3	368.6	-	-
321-330	-	-	-	-	1	460.0	-	-	1	404.2	1	438.1	3	417.6
331-340	1	411.0	1	524.3	-	-	-	-	-	-	3	493.4	3	497.8
341-350	1	516.0	1	605.1	-	-	1	538.5	-	-	3	509.3	3	519.9
351-360	-	-	2	651.7	1	530.0	-	-	-	-	-	-	-	-
361-370	-	-	4	-	-	-	-	-	-	-	5	638.8	2	628.6
371-380	1	558.0	3	831.2	-	-	1	623.4	-	-	2	636.6	1	478.0
381-390	-	-	2	906.8	-	-	-	-	-	-	2	722.1	-	-
391-400	1	878.1	1	1190.2	-	-	1	736.6	-	-	1	778.1	-	-
401-410	2	978.0	1	1246.8	-	-	1	821.5	-	-	-	-	2	1049.0
411-420	-	-	-	-	-	-	-	-	-	-	1	987.8	-	-
421-430	-	-	-	-	1	907.2	-	-	1	1360.8	1	1097.8	-	-
431-440	-	-	1	1360.8	-	-	-	-	-	-	1	951.8	-	-
441-450	-	-	-	-	-	-	-	-	-	-	1	1251.6	-	-
451-460	-	-	1	1728.7	-	-	-	-	-	-	-	-	1	1428.3
461-470	-	-	-	-	-	-	-	-	-	-	2	1440.8	-	-
471-480	1	1587.2	-	-	1	1558.9	1	1558.9	-	-	-	-	1	1529.1
481-490	1	1530.6	-	-	1	1587.2	-	-	-	-	1	1276.0	1	1330.2
491-500	-	-	1	1927.6	-	-	-	-	-	-	-	-	-	-
501-510	1	1700.4	-	-	-	-	-	-	-	-	1	1604.0	-	-
511-520	-	-	-	-	1	1814.4	-	-	-	-	-	-	-	-
521-530	-	-	-	-	-	-	1	2296.3	-	-	-	-	-	-
531-540	-	-	-	-	-	-	-	-	1	2040.8	-	-	-	-
541-550	-	-	1	2324.6	-	-	-	-	-	-	-	-	-	-
561-570	2	3401.6	-	-	-	-	-	-	-	-	-	-	-	-
601-610	-	-	-	-	-	-	1	3146.1	-	-	-	-	-	-
620+	-	-	-	-	-	-	-	-	1	4308.8	-	-	-	-
TOTAL	26		19		8		32		118		726		520	

1400 211

TABLE 4.4-19

YEARLY SUMMARY OF AVERAGE WEIGHT (G) PER 10 MM LENGTH GROUP
FOR CHANNEL CATFISH COLLECTED FROM CONOWINGO DURING THE POSTOPERATIONAL PERIOD.

	1974		1975		1976		1977		1978		1979	
LENGTH	NO.	AVG WEIGHT	NO.	AVG WEIGHT	NO.	AVG WEIGHT	NO.	AVG WEIGHT	NO.	AVG WEIGHT	NO.	AVG WEIGHT
21-30	-	-	-	-	2	0.4	-	-	-	-	-	-
31-40	-	-	-	-	11	0.7	-	-	-	-	-	-
41-50	2	1.9	2	1.7	14	1.3	13	1.4	-	-	-	-
51-60	5	2.1	17	2.5	54	2.5	52	1.9	-	-	-	-
61-70	21	4.0	15	3.5	70	4.1	21	3.1	-	-	-	-
71-80	23	5.7	23	5.7	61	5.9	31	5.3	2	5.9	-	-
81-90	45	7.6	23	8.6	49	8.6	29	8.0	-	-	-	-
91-100	56	10.8	40	11.4	74	10.6	47	10.2	1	10.0	-	-
101-110	53	13.8	68	13.8	99	14.0	62	13.7	13	13.6	-	-
111-120	71	17.5	96	16.5	175	17.4	69	17.6	15	16.7	-	-
121-130	72	22.8	99	21.4	192	22.4	85	22.4	17	20.1	-	-
131-140	84	28.8	74	26.4	133	27.7	90	27.5	21	24.8	1	25.2
141-150	104	35.2	72	32.9	112	32.8	72	34.8	28	31.5	1	33.2
151-160	93	42.5	90	40.5	140	39.3	67	40.4	24	38.9	-	-
161-170	83	52.1	86	47.5	115	44.9	43	48.6	18	46.4	1	47.3
171-180	54	60.6	57	59.0	90	53.3	35	58.9	17	52.4	2	53.3
181-190	70	71.8	62	68.2	77	64.8	29	67.6	13	62.7	2	122.8
191-200	79	83.3	88	80.5	90	74.2	36	78.3	18	82.8	2	75.4
201-210	68	96.4	133	96.8	87	88.2	30	95.8	16	90.7	1	81.6
211-220	83	111.5	148	110.2	99	103.2	43	111.9	11	101.6	1	116.8
221-230	61	128.3	157	129.0	67	121.5	35	128.1	6	127.5	4	121.1
231-240	64	143.1	148	146.5	67	140.4	56	150.5	5	123.2	3	138.8
241-250	36	161.1	93	168.0	53	157.4	45	169.6	10	162.2	2	149.5
251-260	22	180.6	69	191.9	57	181.1	25	193.3	4	179.5	4	157.1
261-270	15	204.6	69	213.2	31	223.9	23	218.8	4	198.3	3	177.6
271-280	18	226.0	39	241.4	25	235.7	16	244.0	4	219.3	2	247.4
281-290	19	265.1	25	274.8	24	259.9	21	275.6	4	270.1	1	217.4
291-300	8	295.8	27	306.1	20	295.7	9	306.1	2	336.8	1	256.4
301-310	8	347.2	19	338.5	12	311.0	9	348.6	5	324.9	2	335.2
311-320	1	331.0	18	376.5	13	401.7	13	397.2	-	-	3	312.5
321-330	6	432.3	9	449.1	12	438.0	6	416.4	-	-	1	387.6
331-340	2	431.6	16	453.0	11	456.2	1	485.1	3	421.3	1	500.0
341-350	3	561.4	11	527.6	9	512.4	2	493.0	2	436.8	1	536.8
351-360	3	559.0	7	554.4	6	616.0	-	-	-	-	1	654.8
361-370	1	599.5	2	640.5	6	664.8	7	617.3	1	562.4	-	-
371-380	5	625.0	9	659.9	2	674.7	3	680.4	-	-	-	-
381-390	4	772.1	6	770.2	-	-	5	724.5	2	679.3	-	-
391-400	1	721.2	4	851.3	2	863.6	1	881.2	1	596.8	-	-
401-410	2	915.7	9	985.1	4	869.1	-	-	-	-	-	-
411-420	2	1101.0	6	1035.5	4	966.1	2	923.6	1	836.7	-	-
421-430	1	1190.6	2	1060.8	2	1053.5	2	1020.9	-	-	-	-
431-440	-	-	5	1069.1	2	1295.7	-	-	-	-	-	-
441-450	-	-	2	1103.1	2	1198.9	-	-	-	-	-	-
451-460	1	1256.0	2	1385.5	-	-	2	1239.9	-	-	-	-
461-470	-	-	1	1426.2	3	1427.9	-	-	-	-	-	-
471-480	1	1800.0	1	1478.8	-	-	1	1286.4	-	-	-	-
481-490	1	1587.0	1	2082.0	2	1758.2	-	-	-	-	-	-
491-500	-	-	-	-	3	1879.9	-	-	-	-	-	-
501-510	-	-	1	1742.5	3	1706.7	-	-	1	1524.6	-	-
511-520	1	1950.0	1	2000.0	-	-	-	-	-	-	-	-
521-530	-	-	-	-	1	2171.5	-	-	-	-	-	-
531-540	-	-	-	-	1	2250.0	-	-	-	-	-	-
551-560	-	-	-	-	1	2825.0	-	-	-	-	-	-
561-570	-	-	-	-	1	3425.0	-	-	-	-	-	-
581-590	-	-	-	-	1	2875.0	-	-	-	-	-	-
591-600	-	-	1	2980.0	-	-	-	-	-	-	-	-
TOTAL	1352		1953		2190		1138		269		40	

1400 212

TABLE 4.4-20

Results of analysis of covariance of length-weight data on channel catfish collected during the preoperational (1966-1973) and post-operational (1974-1979) periods in Conowingo Pond. Dependent variable is $\log_{10}$ weight.

Source	df	SS	MS	F[1]
$\log_{10}$ length	1	2031.303	2031.303	
Status	1	0.004	0.004	0.05NS
Year (status)	11	0.959	0.087	21.75**
Error	8168	36.528	0.004	
Corrected total	8181	2068.795		

1 $F_{status}=MS_{status}/MS_{year\ (status)}$

$F_{year\ (status)}=MS_{year/status}/MS_{error}$

1400 213

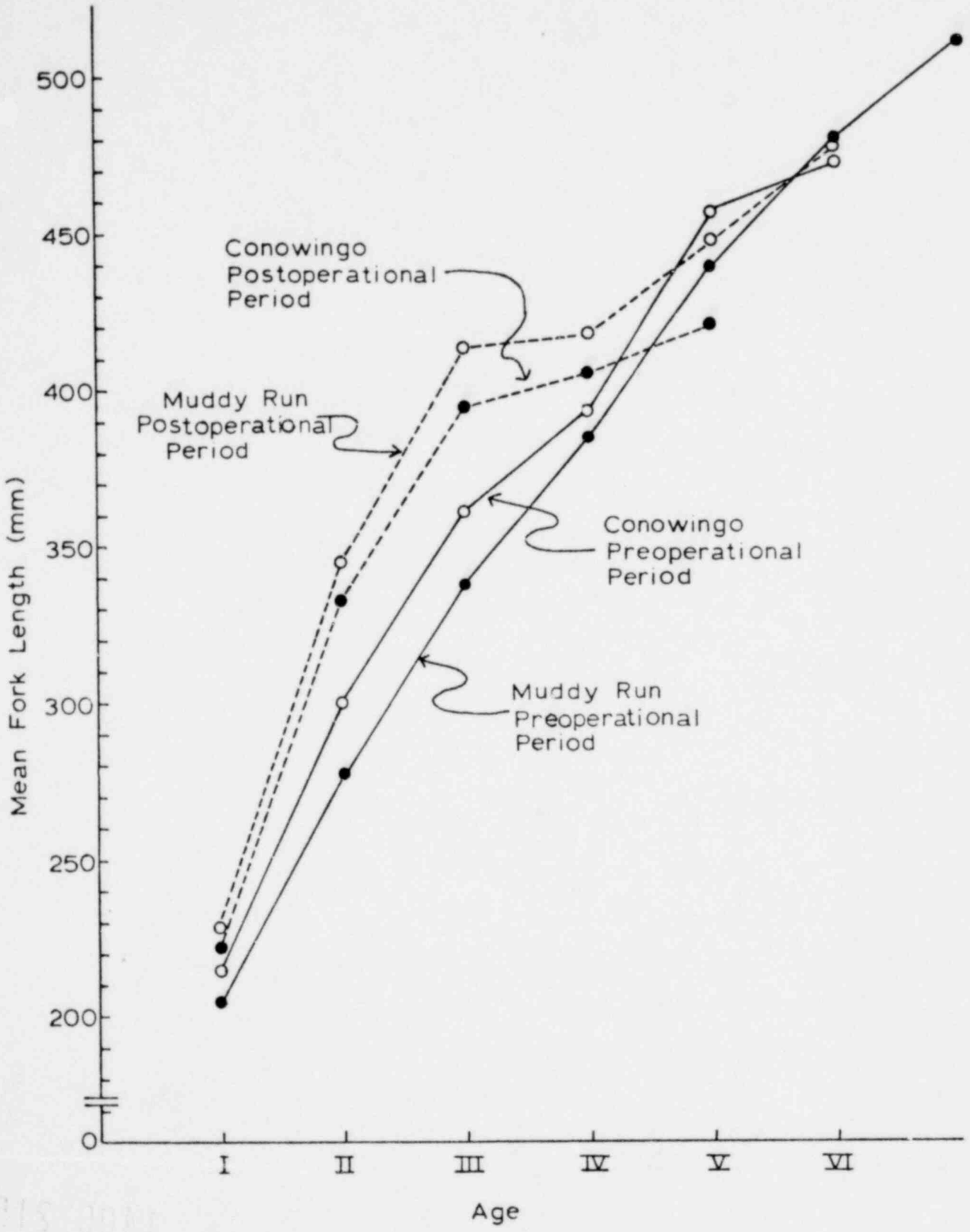
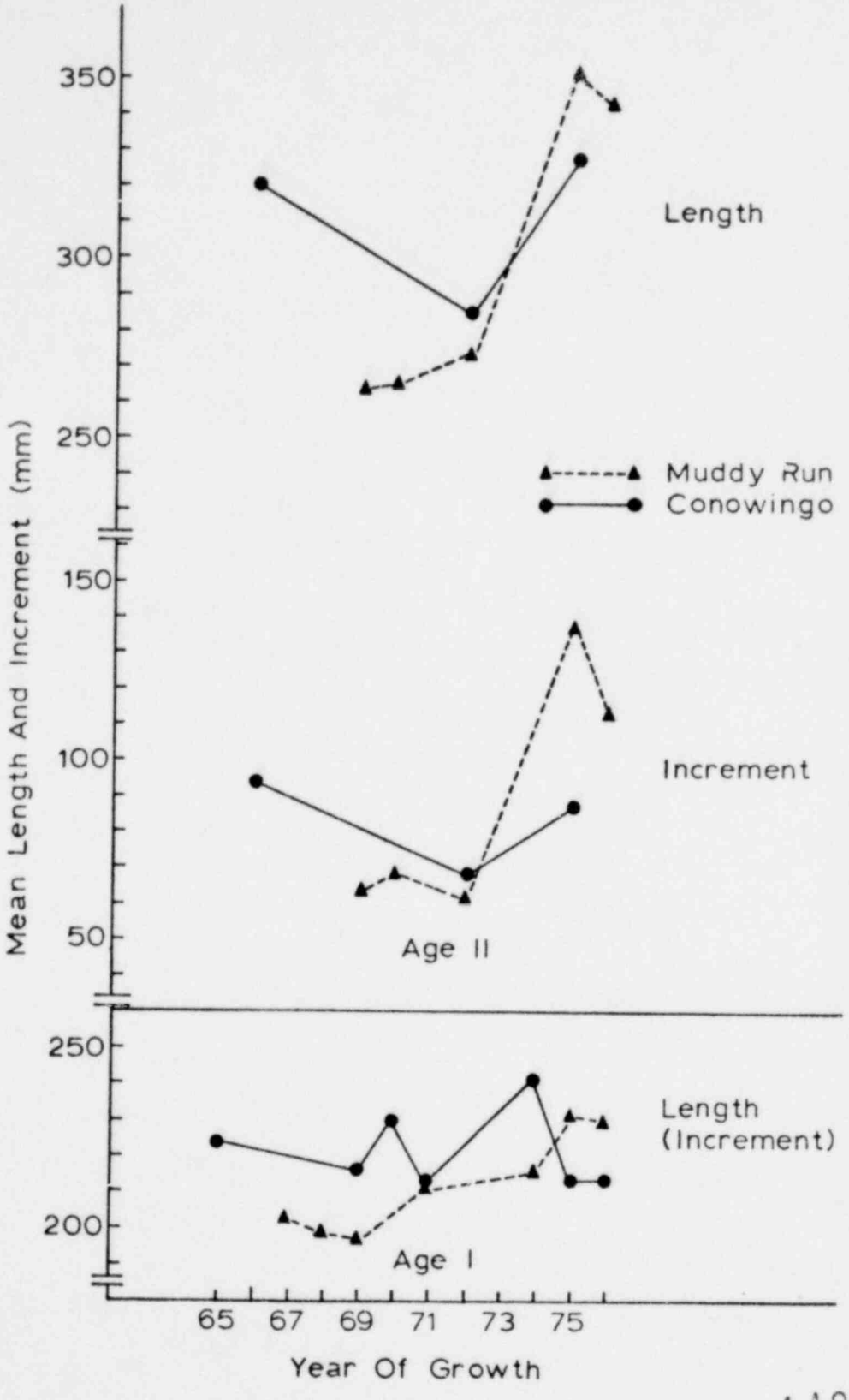


FIGURE 4.4-1

Growth comparisons between the preoperational and postoperational periods of walleye collected in Conowingo and Muddy Run ponds.



1400 215

FIGURE 4.4-2

Comparison of annual growth attained by one and two year old walleye in Conowingo and Muddy Run ponds in the preoperational (1965-1973) and postoperational (1974-1976) periods.

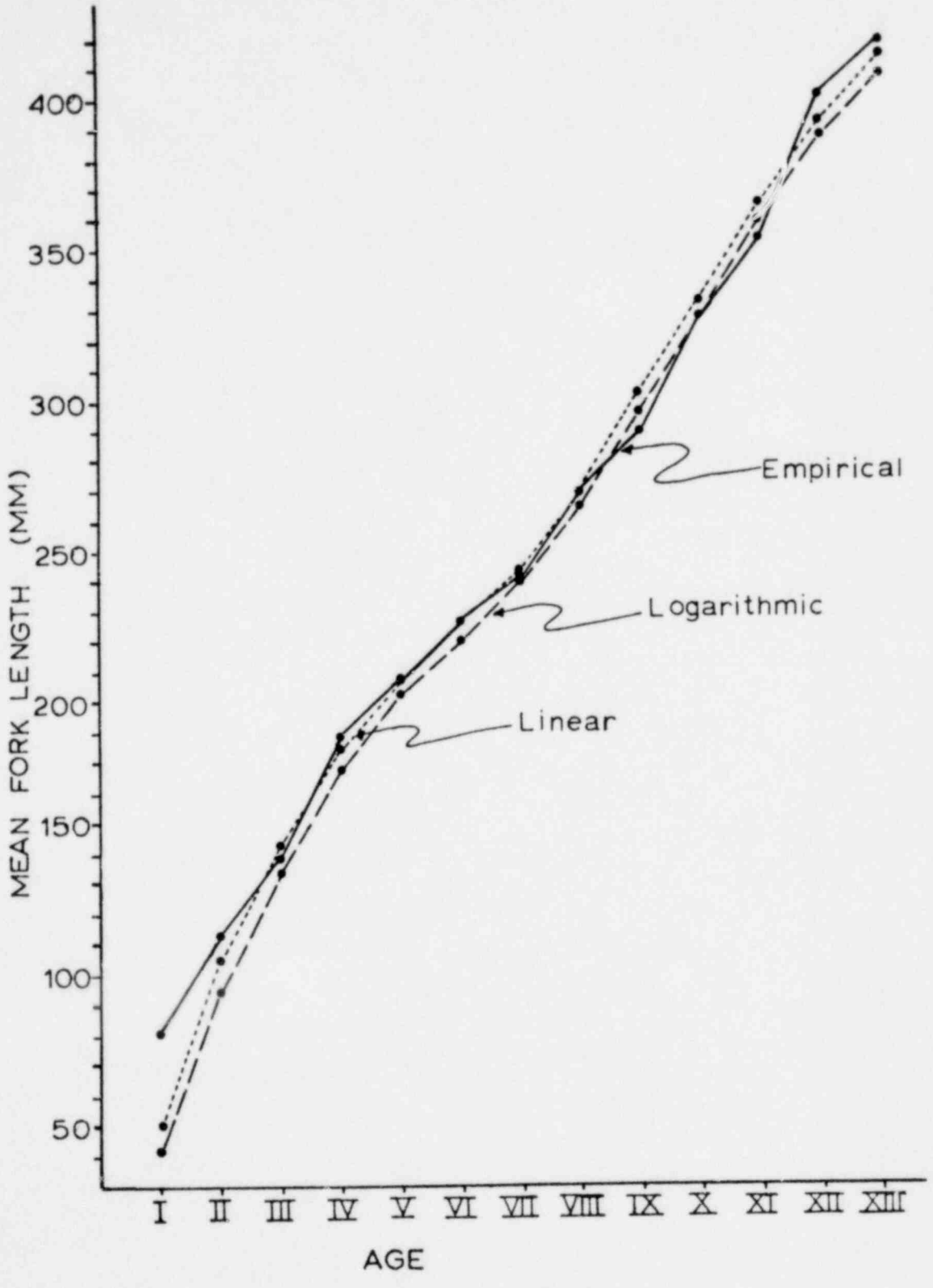


FIGURE 4.4-3

Comparison of the empirical length (nongrowing season) and computed lengths by linear and logarithmic relationships for channel catfish collected from Conowingo Pond, 1973-1976.

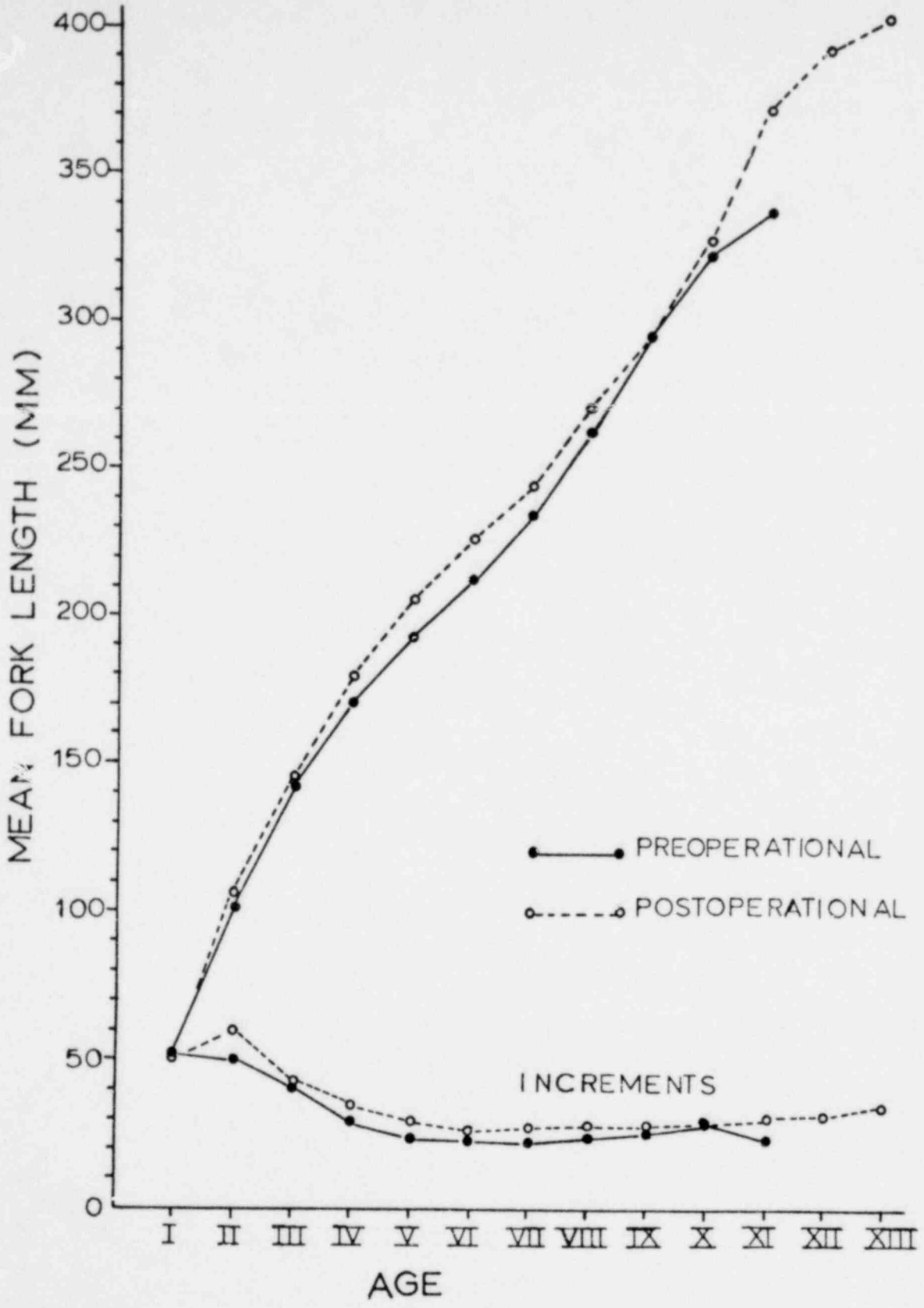


FIGURE 4.4-4

Comparison of calculated lengths (logarithmic relationship) of channel catfish during the preoperational (1963-1973) and postoperational (1974-1977) periods in Conowingo Pond.

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4.8 MOVEMENT OF FISHES

The movement pattern of white crappie and channel catfish has been studied since 1966. The movement pattern of white crappie tagged in the thermal plume was reported in an earlier report (RMC, Postoperational Report No. 9, 1978). This report summarizes the information collected on movement patterns of common fishes in Conowingo Pond during the preoperational (1967-1973) and postoperational (1974-1978) periods. This report completes a study on the movement of white crappie and channel catfish and fulfills the intent of the Environmental Technical Specification Appendix B. Consequently, these studies have been terminated.

4.8.1 Methods

Tagging of fishes (mostly white crappie and channel catfish) was initiated in 1966 and continued through 1978. Fishes used for tagging were collected mostly in trap nets throughout the Pond and tagged with either vinyl Floy T anchor or modified carlin dangler tags, or Floy dart tag or disc tags at the base of the dorsal fin between the interneural spines. The number of tags and type used for each species is shown in Tables 4.8-1 and 4.8-2. Initially, fishes were tagged throughout the year. However, in later years tagging was conducted only in spring and fall because of high handling mortality among tagged fish in summer months. This procedure also yielded a better return rate of tagged fish. For example, of the 6,655 white crappie tagged in summer, only 1.5% were recaptured while of those tagged in

spring (6,596) or fall (6,820) a recapture rate of over 16% was observed.

Direction and minimum distance from tagging site to recapture location was determined for each fish. For purposes of determining the distance moved by each fish, Conowingo Pond was divided into 15 zones, each one mile long (Figure 4.8-1). Distance moved was estimated as the distance traveled between the tagging and recapture zone. Further, the Pond was divided into upper (tag zones 108-115) and lower (tag zones 101-107) reservoir. Because earlier studies had indicated that little movement occurs across the Pond, directional movement was recorded as upstream, downstream or no movement. The fish is considered to have shown movement if it moved more than one mile in any direction. Fish categorized as showing no movement were recaptured in the tagging zone. The tag recapture data were separated into seasons: spring (March-May), summer (June-August), fall (September-November) and winter (December-February). Crew tag returns and angler recaptures have been combined to show a net movement pattern.

4.8.2 Results

4.8.2.1 White crappie

A total of 25,533 white crappie was tagged in Conowingo Pond from 1966 through 1978 at various locations (Table 4.8-3). Of these, 3,247 (12.7%) were recaptured by anglers and field crew. Complete information as to the location and date of recapture was obtained for 3,166 (12.4%) tag returns. Recapture rates varied

among years. The low recapture rate of fish tagged in 1967, particularly in summer, may have resulted from a high mortality of tagged fish during handling. Most recaptures (68%) were angler tag returns and suggests a more extensive coverage of the area than by field crews.

Recapture locations, as with all tagging studies, are dependent on fishing pressure. Winter and spring anglers who accounted for over 60% of the returns generally fished in the lower third of the Pond, primarily in Conowingo Creek and Broad Creek (Ta. 4.8-4). Little or no fishing occurred in winter in the upper Pond. Fishing pressure in summer and fall was more diffused throughout the Pond.

Recapture locations indicate that the white crappie move seasonally within the Pond (Table 4.8-5). Of the 3,166 recaptures whose locations and distances moved could be estimated, 1,636 were returned from areas at least one mile away from the original site of tagging. White crappie move downstream in fall; of the 702 recaptures made of fish that moved in fall, 605 (86.2%) had traveled downstream. About 75% of these fish traveled downstream more than two miles. An approximately equal number of recaptures of fish tagged in spring were made in both directions from the point of tagging. A relatively large proportion of those which did not show movement were captured in winter at the point of tagging. Specimens which moved traveled as much as 10 miles or more in either direction. The movement patterns are such that white crappie do not concentrate in the vicinity of Peach Bottom Atomic Power Station in any season.

Thus, this behavioral pattern along with the location and design of the intake structure minimizes the risk of impingement and entrainment.

4.8.2.2 Channel catfish

A total of 6,343 channel catfish was tagged from 1966 through 1978 at various locations (Table 4.8-6). Of these, 462 (7.3%) were recaptured by anglers and crew. Recapture rates of anglers were slightly less than those of the field crews, perhaps reflecting the paucity of anglers fishing for channel catfish in Conowingo Pond.

Most of the recaptures of channel catfish were obtained in spring through fall and from locations off the Peach Bottom Dock, in the thermal plume and in the upper Pond (Table 4.8-7). Recapture locations indicate that channel catfish do not move as extensively as white crappie in Conowingo Pond (Table 4.8-8). Of the 442 recaptures whose locations and distances traveled could be determined, 267 (60%) did not move and 118 (27%) were recaptured within two miles. Of those that showed any movement, most moved downstream from the tagging location. Unlike the movement patterns of white crappie, channel catfish do not seem to concentrate in any area. There was no indication that channel catfish concentrate in the vicinity of the Peach Bottom Atomic Power Station intake structure. Thus, the impingement and entrainment risks are insignificant.

TABLE 4.8-1

NUMBER OF WHITE CRAPPIE TAGGED WITH VARIOUS TAG TYPES IN CONOWINGO POND, 1966-1978.

TAG TYPE	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	TOTAL
ORANGE NUMB. FLOY ANCHOR	-	-	-	88	1921	1756	1615	148	735	2838	1284	595	10990
GREEN NUMB. CARLIN DANGLER	23	5493	1901	1338	406	-	-	-	-	-	-	-	9161
YELLOW NUMB. FLOY DART	-	35	-	-	-	-	-	-	-	-	-	-	35
GREEN NUMB. DISC TAG	-	1234	-	-	-	-	-	-	-	-	-	-	1234
WHITE UNNUMB.(FD-67)	-	-	-	-	-	-	-	-	577	-	-	-	577
BLUE UNNUMB.(FD-67F)	-	-	-	-	-	-	-	2936	-	-	-	-	2936
RED UNNUMB.(FD-67F)	-	-	-	547	-	-	-	-	-	-	-	-	547
GREEN UNNUMB.(FD-67F)	-	-	-	63	-	-	-	-	-	-	-	-	63
TOTAL	23	6762	1901	2036	2327	1756	1615	3084	1312	2838	1284	595	25533

TABLE 4.8-2

NUMBER OF CHANNEL CATFISH TAGGED WITH VARIOUS TAG TYPES IN CONOWINGO POND, 1966-1978.

TAG TYPE	1966	1967	1969	1970	1971	1974	1975	1976	TOTAL
ORANGE NUMB. FLOY ANCHOR	-	-	687	692	314	330	212	257	2487
GREEN NUMB. CARLIN DANGLER	-	347	4	-	-	-	-	-	351
YELLOW NUMB. FLOY DART	783	2566	-	-	-	-	-	-	3349
RED UNNUMB.(FD-67F)	-	-	105	-	-	-	-	-	105
GREEN UNNUMB.(FD-67F)	-	-	51	-	-	-	-	-	51
TOTAL	783	2913	842	692	314	330	212	257	6343

TABLE 4.8-3

NUMBER OF WHITE CRAPPIE TAGGED IN VARIOUS SEASONS AND RECAPTURED IN CONOWINGO POND, 1966-1978.

YEAR	SPRING NO. TAGGED	RECAP	SUMMER NO. TAGGED	RECAP	FALL NO. TAGGED	RECAP	WINTER NO. TAGGED	RECAP	TOTAL NO. TAGGED	TOTAL RECAP
1966	-	-	-	-	23	1	-	-	23	1
1967	715	246	5524	60	523	0	-	-	6762	306
1968	1647	248	254	7	-	-	-	-	1901	255
1969	1216	220	241	14	579	28	-	-	2036	262
1970	291	13	-	-	1471	102	-	-	1762	115
1971	257	37	402	11	1020	93	565	58	2244	199
1972	1289	165	145	2	111	22	147	16	1692	205
1973	-	-	-	-	148	51	2936	355	3084	386
1974	-	-	69	3	285	89	677	121	1031	213
1975	311	120	20	0	1719	556	764	237	2814	913
1976	476	96	-	-	751	156	355	86	1582	338
1977	394	12	-	-	190	37	7	4	591	53
1978	-	-	-	-	-	-	11	1	11	1
TOTAL	6596	1157	6655	97	6820	1135	5462	858	25533	3247

TABLE 4.8-4

NUMBER OF WHITE CRAPPIE RECAPTURED IN VARIOUS SEASONS AND AREAS IN CONOWINGO POND, 1966-1978.

AREA	SPRING	SUMMER	FALL	WINTER	TOTAL
BROAD CR	126	45	35	153	359
CANAL	3	-	2	1	6
CONOWINGO CR	315	93	128	495	1031
FULTON	40	11	30	79	160
PB DOCK	119	95	32	39	285
THERMAL PLUME	130	50	122	212	514
UPPER RES	97	92	25	11	225
OTHER AREAS	268	181	77	106	632
TOTAL	1098	567	451	1096	3212*

*This total number of recaptures differs from that in Table 4.8-3 because those for which no location or season data were available were not included.

TABLE 4.8-5

FREQUENCY OF MILES MOVED BY WHITE CRAPPIE THAT WERE TAGGED IN VARIOUS SEASONS IN CONOWINGO POND, 1966-1978.

DIRECTION MOVED	MILES TRAVELED	SPRING	SUMMER	FALL	WINTER	TOTAL
NO MOVE	<1.0	451	61	416	602	1530
UPSTREAM	1.0-2.0	184	8	69	49	310
	2.1-3.0	45	5	8	17	75
	3.1-4.0	22	-	6	15	43
	4.1-5.0	25	-	2	5	32
	5.1-6.0	23	-	5	19	47
	6.1-7.0	15	-	5	17	37
	7.1-8.0	10	-	1	16	27
	8.1-9.0	6	-	-	2	8
	9.1-10.0	1	-	1	1	3
	>10.0	7	-	-	2	9
DOWNSTREAM	1.0-2.0	170	10	122	38	340
	2.1-3.0	29	-	110	12	151
	3.1-4.0	30	1	106	25	162
	4.1-5.0	29	5	123	12	169
	5.1-6.0	13	1	41	8	63
	6.1-7.0	18	1	81	1	101
	7.1-8.0	10	2	13	4	29
	8.1-9.0	9	1	2	1	13
	9.1-10.0	2	-	1	-	3
	>10.0	7	1	6	-	14
TOTAL		1106	96	1118	846	3166*

*This total number of recaptures differs from that in Table 4.8-3 because those for which no location or season data were available were not included.

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TABLE 4.8-6

NUMBER OF CHANNEL CATFISH TAGGED IN VARIOUS SEASONS AND RECAPTURED IN CONOWINGO POND, 1966-1978.

YEAR	SPRING NO. TAGGED	RECAP	SUMMER NO. TAGGED	RECAP	FALL NO. TAGGED	RECAP	WINTER NO. TAGGED	RECAP	TOTAL NO. TAGGED	TOTAL RECAP
1966	-	-	-	-	783	46	-	-	783	46
1967	610	23	2229	105	75	3	-	-	2915	131
1969	311	22	281	29	250	60	-	-	842	111
1970	-	-	596	80	96	3	-	-	692	83
1971	-	-	-	-	314	26	-	-	314	26
1974	-	-	146	9	178	25	-	-	324	34
1975	170	11	16	0	26	0	6	0	218	11
1976	-	-	-	-	257	20	-	-	257	20
TOTAL	1091	56	3267	223	1979	183	6	0	6343	462

TABLE 4.8-7

NUMBER OF CHANNEL CATFISH RECAPTURED IN VARIOUS SEASONS AND AREAS IN CONOWINGO POND, 1966-1978.

AREA	SPRING	SUMMER	FALL	WINTER	TOTAL
BROAD CR	2	7	3	-	13
CANAL	1	3	-	-	4
CONOWINGO CR	1	4	4	-	9
PR ROCK	20	79	43	2	144
THERMAL PLUME	30	37	38	4	109
UPPER RES	31	23	5	1	60
OTHER AREAS	25	53	36	-	114
TOTAL	110	207	129	7	453*

*This total number of recaptures differs from that in Table 4.8-6 because those for which no location or season data were available were not included.

TABLE 4.8-8

FREQUENCY OF MILES MOVED BY CHANNEL CATFISH THAT WERE TAGGED IN VARIOUS SEASONS IN CONOWINGO POND, 1966-1978.

DIRECTION MOVED	MILES TRAVELED	SPRING	SUMMER	FALL	TOTAL
NO MOVE	<1.0	23	132	115	270
UPSTREAM	1.0-2.0	4	13	16	33
	2.1-3.0	2	2	2	6
	3.1-4.0	2	3	1	6
	4.1-5.0	-	1	1	2
	5.1-6.0	-	1	1	2
	>10.0	-	1	-	1
DOWNSTREAM	1.0-2.0	12	50	24	86
	2.1-3.0	1	1	2	4
	3.1-4.0	1	1	6	8
	4.1-5.0	1	2	4	7
	5.1-6.0	-	2	-	2
	6.1-7.0	2	2	3	7
	7.1-8.0	1	1	-	2
	8.1-9.0	5	1	1	7
	9.1-10.0	-	-	1	1
	>10.0	-	-	2	2
TOTAL		54	213	179	446

*This total number of recaptures differs from that in Table 4.8-6 because those for which no location or season data were available were not included.

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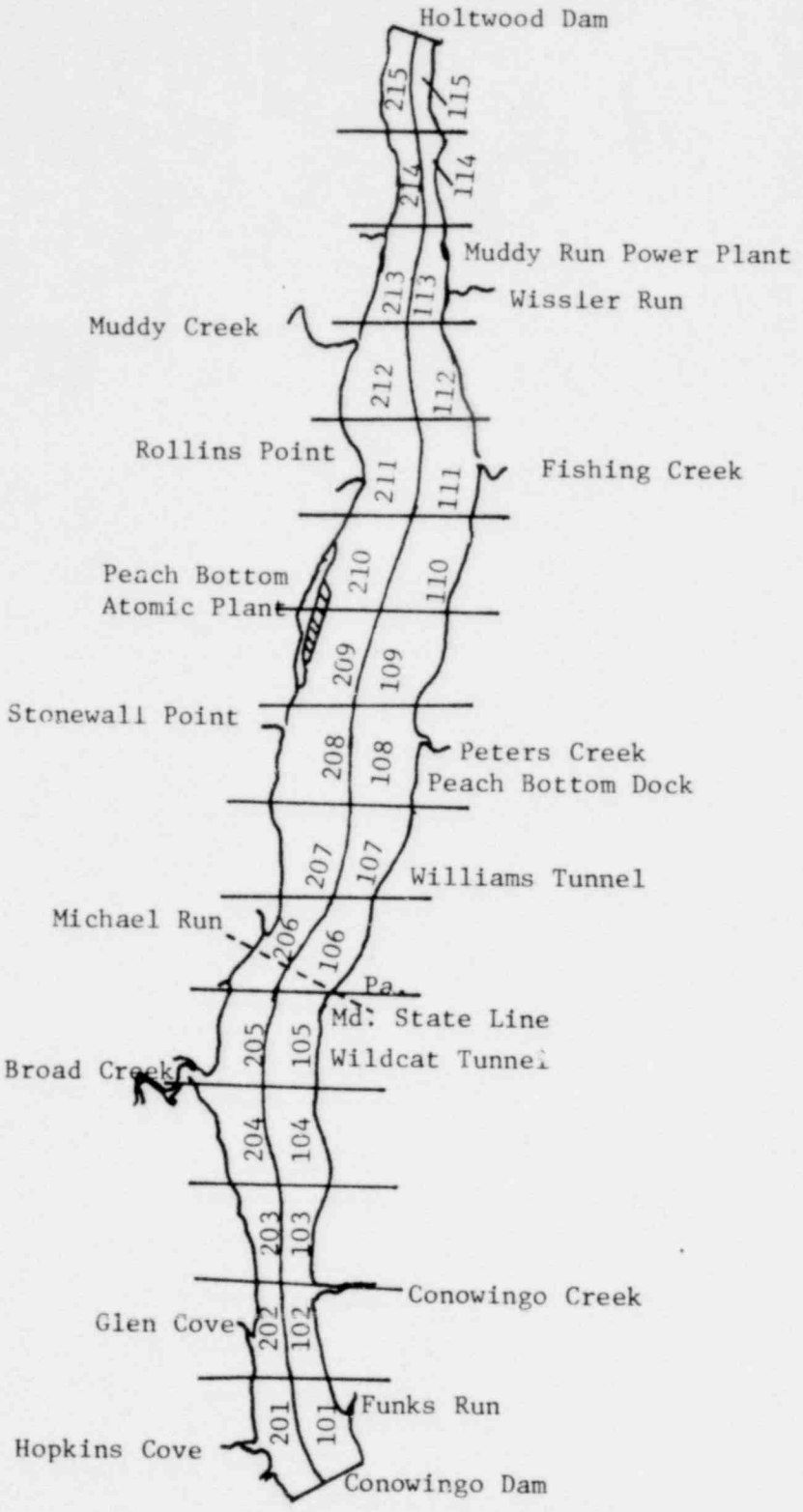

Figure 4.8-1

Tag-recapture zones in Conowingo Pond, 1966-1978.

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