SUMMARY OF THE OPERATION OF THE CONOWINGO DAM FISH COLLECTION FACILITY DURING THE SPRING OF 1976

by

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FISH FACILITY OPERATION REPORT 5

August 1976

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of tagged shad at Shures Landing (4) a creel census conducted below Conowingo Dam (5) statistics on the catch of the American shad, and (6) a comparison of data obtained in 1976 with that of 1972 through 1975.

Attraction Velocity

A standard attraction velocity of approximately 6.5-7.0 fps was used from 5-24 April. This was achieved by setting both weir gates 6.0 ft below tailrace and operating Station Service Units 1 and 2 (approximately 400 cfs each) at 35% and 75% gate opening. However, the gate setting on one station service unit is always dependent on plant demand, thus gate opening of this unit may vary from 30-50% which results in slight variation in attraction velocity at the weirs.

An experimental schedule of attraction velocities and flow (volume of water through the facility) was initiated on 24 April and continued through 30 June. Four test conditions of attraction velocity and flow were used in a schedule of eight test periods (Table 1). Each day was divided into two test periods and a set of test conditions was run in each period. Test periods were used consecutively throughout the test season.

Tests using each of two positions of the crowder gates were also conducted to determine if there were differences in catch. The intermediate gate position (12 in. opening) was used on one lift and the full-open position was used on the next.

Operation of Conowingo Hydro-electric Station in the spring is, in part, modified by the occurrence of anadromous fish runs. As part of an agreement with the State of Maryland, to prevent fish mortality in the tailrace due to oxygen deficiences, a generator was operated continuously between 22 April and 10 June (Dietz, 1976). Either one or more of Units 1 through 7 (approximately 5,000 cfs each) were used. The selection of which one to operate was made by a biologist conducting a surveillance and depended upon the relative abundance and distribution of fishes (primarily blueback herring, alewife, and white perch) in the tailrace. In 1976, Unit No. 2 was operated to provide oxygenated

fishes in the lift was made from a count of fish in the subsample. All catches were counted or subsampled except when large numbers of herring were available for transport. Where mortalities due to an oxygen deficiency were likely, large catches were estimated visually and released to the river immediately.

Length, weight, sex and scale samples were taken from blueback herring, alewife, white perch, and gizzard shad. Scale samples were also taken from American shad caught by anglers along the west shore of the tailrace.

Fishes, other than American shad, were tagged on 10 June to determine numbers of fishes that may be captured more than one time. A total of 373 fish of 12 species were tagged with floy anchor tags and released into the tailrace from the sorting tank. Numbers of tagged fish in the catch were then recorded from 11 through 30 June. The tags of recaptured fish were partially clipped so that multiple recaptures could be identified.

Common names of fishes are used throughout the text and tables. A list of common and scientific names of fishes collected in the Conowingo Dam Fish Collection Facility from 1972 to 1976 is given in Table 2.

Creel Census

A creel census was conducted below Conowingo Dam to determine: (1) if the distribution of shad changes in the tailrace with the phases of operation of Conowingo Hydro-electric Station and (2) if a relationship existed between the anglers catch and the collection of shad in the fish facility.

The number and distribution of boats and anglers fishing from the west shore were counted. The catch of the shore anglers was counted once an hour daily from approximately 0400 to 1200 hrs between 21 April and 30 June. Changes in the distribution of boats was determined by a count

Juvenile American eel were collected in greater numbers in 1976 than in previous years. It comprised 17.2% of the 1976 catch. The greatest numbers were taken between 7 and 27 June when water temperatures ranged from 68 to 80 F.

American Shad Catch

A total of 91 American shad was collected between 21 April and 19 June. Twenty-two shad died prior to release. One was tagged and released at Conowingo Creek. The remaining 68 fish were tagged and released at Shures Landing. No recaptures of tagged shad were made in the collection facility in 1976. Two tags were returned by anglers. Both fish were tagged on 18 May. One was caught along the west shore of the tailrace on 20 May and the other was caught in the Susquehanna Flats area of the Chesapeake Bay on 29 May. The sex ratio of 71 shad examined in 1976 was 0.78 males to 1.00 females (Table 4). Most females were green while all males examined were ripe. Ripe females were not observed in the catch.

Conditions of operation associated with the collection of shad are given in Table 5. Data from the lift preceeding and the lift following one(s) which contained shad is included to show which variables may have changed. The largest number of shad (31) were collected when Unit 1 through 11 were shut-down (Table 6). Seven shad were taken with all units operating. The effect of operating Unit No. 1 at a reduced gate is not obvious. Results of the velocity, volume and crowder gate position tests are presented in Tables 7, 8 and 9. Data from a clean out lift and the first lift with the crowder gates open are not included in the analysis. The function of the clean out lift was to remove fishes that gained access to the holding channel, primarily through the closed crowder gates, between hours of operation. The first lift with a

Fish Transplantation

A total of 90 alewife, 6,622 blueback herring and 2,384 American eel was transported from the Conowingo Dam Fish Collection Facility to Conowingo Pond (Table 13). The goal of transporting 50,000 herring was not met due to an unusually small herring run and the time consuming process of sorting herring from catches with large numbers of white perch.

Monitoring studies in Conowingo Pond by Ichthyological Associates, Inc., have provided evidence of successful alewife reproduction above Conowingo Dam. Seven young (27-76 mm FL) were taken. The first was taken by 16 ft trawl off Peach Bottom Beach (Lancaster County) on 15 June. Two were collected by trawl on 8 July, 50 yds above the mouth of Peters Creek. Two were found on the traveling screens of the Peach Bottom Atomic Power Station on 20 July and an additional two on 27 July.

No striped bass were transported above Conowingo Dam. A total of four juvenile striped bass (71-245 mm FL) were observed in the fish collection facility in two days of operation in July. Creel census data provided by plant personnel showed that a few striped bass (8-21 inches) were taken almost daily by anglers off the stoplog gallery between 2 and 30 July. No catches were reported on 6, 15, 18 and 25 July. The largest daily catches reported were 25 striped bass on 7 July and 25-30 fish on 23 July.

Tagging Program

Twenty-one fish were recaptured between 11 and 30 June (Table 15). Most (19) were gizzard shad. One redbreast sunfish and one tagged channel catfish were also taken. One gizzard shad was recaptured twice. Multiple recapture of gizzard shad were 8.0% (20 of 251 tagged fish) which indicates that a portion of the catch is recycled through the facility in daily operation.

In 1973-1976, 72.0% of the shad were taken in the facility when no large units were operating (Table 6). Anglers fishing from shore took 35.2% of their catch under similar conditions (Table 16). Shore angler effort below Conowingo Dam has decreased steadily since 1973. The catch of American shad per fisherman hour ranged from 0.007 to 0.010 in 1973, 1974 and 1975 (Table 23). The 1976 catch per fisherman hour increased to 0.041. The greatest angling pressure normally occurs on weekend days. Weekend angling effort comprised 43 to 52% of the total angling effort from 1973 through 1976.

Of the shad taken in the facility from 1973-1976, 47.9% were males and 52.0% were females (Table 4). Almost all males were ripe. Approximately 75% of all females were green, 8% ripe and 17% were spent.

Age composition of adult shad caught in the collection facility and by anglers is similar, i.e., most shad taken were four year old fish (Table 12). The presence of three year old fish in 1975 and four year old fish in 1976 indicates that some survival occurred in 1972 when Tropical Storm Agnes caused severe flooding of the Susquehanna River in late June.

Daily river flows and water temperatures, for April-June, 1972-1976 (Table 24), has been included to aid those who might attempt further analysis of the facilities' past operation.

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Table 1. Schedule of test velocities and volumes for the Conowingo Dam Fish Collection Facility, 24 April-30 June 1976.

Period No.	Test Conditions	Service Unit Setting No. 1	Service Unit Setting No. 2	Entrance Weir Setting: Depth Below Tailrace	Entrance Weir Setting: Velocity ft/sec (± 0.5)
1	HV-HF	35%	75%	4.2 ft	7.5
2	LV-LF	35%	35%	5.7 ft	4.0
3	LV-HF	35%	75%	9.8 ft	3.5
4	HV-LF	35%	35%	2.4 ft	6.5
5	HV-LF	35%	35%	2.4 ft	6.5
6	LV-HF	35%	75%	9.8 ft	3.5
7	LV-LF	35%	35%	5.7 ft	4.0
8	HV-HF	35%	75%	4.2 ft	7.5
A*	HV-XLF	35%	0%	1.2 ft	7.5
B*	LV-XLF	35%	0%	2.9 ft	4.0

* Alternate between A and B operation when too many generating units are off and tailrace is too low for standard setting.

HV - High Velocity
LV - Low Velocity
HF - High Flow
LF - Low Flow
XLF - Extra Low Flow

Table 3. Numbers of fishes taken in the Conowingo Dam Fish Collection Facility, 5 April - 30 June 1976.

Dates	5-9 Apr	12-15 Apr	19-25 Apr	26 Apr-2 May	3-9 May	10-16 May	17-23 May	24-30 May	31 May-6 Jun	7-13 Jun	14-20 Jun	21-27 Jun	28-30 Jun	Totals
No. Lifts	13	11	80	90	73	85	78	81	75	76	77	74	26	839
Fishing Time (hr)	9.0	5.7	12.8	24.3	26.3	29.4	32.6	33.6	32.7	32.9	32.4	30.7	11.5	313.9
Water Temperature (F)	50-51	50-51	53-68	59-69	57-62.5	60-64	64-66.5	63.5-65.5	65-67.5	67.5-72	73-78	74-80	75-76	
Lampreys														
Sea lamprey	-	-	-	25	4	-	-	-	-	-	-	-	-	29
Freshwater eels														
American eel	1	-	131	536	46	139	1578	754	1842	38096	126373	16483	1056	187035
Herrings														
Blueback herring	-	-	26878	5	133	600	780	315	551	3529	6679	28	5	39503
Alewife	-	3	195	2	12	18	1	4	-	-	-	-	-	235
American shad	-	-	8	1	-	9	12	8	9	30	14	-	-	91
Atlantic menhaden	-	-	-	-	-	-	-	1	12	8	556	-	-	577
Gizzard shad	406	221	94576	31249	31293	111642	43540	13709	20329	21123	23651	13138	633	405510
Trouts														
Rainbow trout	-	1	-	-	-	4	-	1	12	36	6	-	-	60
Brown trout	5	4	8	15	3	38	19	46	52	181	122	1	-	494
Pikes														
Muskellunge	-	1	4	-	-	-	2	1	2	1	3	-	-	14
Minnows and Carps														
Goldfish	-	-	-	-	-	4	-	-	-	-	4	-	-	8
Carp	-	-	324	794	180	448	1179	782	530	1500	1469	2222	24	9452
Golden shiner	-	-	132	74	91	218	171	175	175	491	233	108	-	1868
Comely shiner	-	-	-	-	-	40	-	-	-	700	101	-	-	841
Spottail shiner	-	-	664	1023	56	-	-	-	-	-	-	-	-	1743
Spotfin shiner	1	-	8	-	64	30	159	360	1001	27693	29992	489	59	59856
Suckers														
Quillback	-	-	1406	52	-	205	2579	1392	2074	1878	358	271	2	10217
White sucker	2	2	136	57	9	97	56	23	23	44	8	-	-	457
Northern hog sucker	-	1	-	4	-	-	-	-	-	-	-	-	-	5
Shorthead redhorse	-	-	226	39	63	673	227	23	20	4	-	-	-	1275
Freshwater Catfishes														
White catfish	1	-	-	26	4	15	270	130	156	374	524	559	3	2062
Yellow bullhead	-	-	-	-	-	-	-	-	-	-	10	-	-	10
Brown bullhead	-	-	47	7	4	54	131	76	31	68	74	84	4	580
Channel catfish	29	8	7523	3077	1147	1811	5589	2422	11830	5911	6492	44274	1602	91715

continued

Table 4. Sex ratio and spawning conditions of American shad, *Alosa sapidissima*, collected in the Conowingo Dam Fish Collection Facility, 1972-1976.

Year	Male		Female				Undetermined	Total
	Ripe	Spent	Green	Ripe	Spent	Undetermined		
1972	-	-	-	-	-	-	293	293
%	-	-	-	-	-	-	100.0	
1973	34	1	22	1	12	0	7	77
%	44.2	1.3	28.6	1.3	15.6	0	9.1	
1974	48	0	41	9	6	12	12	128
%	37.5	0	32.0	7.0	4.7	9.4	9.4	
1975	49	0	30	0	4	0	1	84
%	58.3	0	35.7	0	4.8	0	1.2	
1976	31	0	0	0	0	40	20	91
%	34.1	0	0	0	0	44.0	22.0	
Total	162	1	93	10	22	52	333	673
	24.1	0.1	13.8	1.5	3.3	7.7	49.5	

Males = 163 (47.9%)
Females = 177 (52.0%)

Table 5. Continued.

Date	14 May			15 May			15 May					16 May						
Lift Number	8	9	10	4	5	6	10	11	12	14	15	1	2	3	4	5	6	7
Parameters *																		
Shad Taken	0	1	0	0	1	0	0	1	0	0	1	1	0	0	1	0	1	0
Total Fish	1200	565	556	660	537	2160	4192	4425	1696	3616	4561	1346	4544	98	525	312	1569	2496
Rel. Loc.	-	2	-	-	2	-	-	2	-	-	2	2	-	-	2	-	2	-
Lift Time	0920	1005	1050	0625	0707	0749	0940	0957	1015	1057	1130	0450	0504	0525	0601	0619	0700	0742
Min. Fished	30	30	30	30	30	30	5	5	5	5	2	0	5	5	10	15	30	30
Air Temp.	66.5	68.0	67.0	65.0	66.0	68.0	77.0	76.0	76.0	78.0	79.0	67.5	67.5	66.0	66.0	68.0	69.0	69.0
Water Temp.	62.0	62.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0
Weather	3	3	3	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3
At. Pressure	30.16	30.16	30.16	30.07	30.07	30.07	30.06	30.06	30.06	30.06	30.06	30.02	30.02	30.02	30.02	30.02	30.02	30.02
Small Gen. On	6	6	6	2	2	4	4	4	4	4	4	2	2	2	2	2	2	3
Large Gen. On	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 1	2	2	2	2	2	3	3	3	3	3	3	2	2	2	2	2	2	2
Unit 2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Spill Gates Open	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
River Flow	20.4	20.4	20.4	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1	26.6	26.6	26.6	26.6	26.6	26.6	26.6
% Gate S.U.1	45	45	45	35	35	35	35	35	35	35	35	45	45	45	45	45	45	45
% Gate S.U.2	75	75	35	35	35	35	75	75	75	75	75	0	75	75	75	75	75	75
Vel. Hld. Chan.	1.6	1.6	1.6	1.3	1.3	1.3	1.5	1.5	1.5	1.5	1.5	-	2.0	2.0	2.0	2.0	2.0	999
Vel. Weir 1	3.7	3.7	3.7	4.2	4.2	4.2	7.7	7.7	7.7	7.7	7.7	-	7.7	7.7	7.7	7.7	7.7	999
Vel. Weir 2	3.6	3.6	3.6	3.8	3.8	3.8	7.5	7.5	7.5	7.5	7.5	-	7.5	7.5	7.5	7.5	7.5	999
Weir Gates Open	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Ft. Below TR																		
Weir 1	10.8	10.8	10.8	5.7	5.7	5.7	4.2	4.2	4.2	4.2	4.2	-	4.7	4.7	4.7	4.7	4.7	999
Weir 2	10.8	10.8	10.8	5.7	5.7	5.7	4.2	4.2	4.2	4.2	4.2	-	4.7	4.7	4.7	4.7	4.7	999
Tailrace Elev.	20.1	20.2	20.2	14.8	14.8	16.0	16.1	16.1	16.1	16.1	16.1	-	14.8	14.8	14.8	14.8	14.8	999
Hld. Chan. Elev.	20.1	20.6	20.6	15.0	15.1	16.2	17.7	17.7	17.7	17.7	17.7	-	15.5	16.1	16.1	16.1	16.1	999
Crowder Position	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Cr. Gate Position	2	1	2	2	1	2	2	1	2	2	1	-	2	1	2	1	2	1

continued

Table 5. Continued.

Date	25 May			27 May			28 May						29 May			30 May		
Lift Number	5	6	7	9	10	11	3	4	5	6	11	12	5	6	7	6	7	8
Parameters *																		
Shad Taken	0	1	0	0	1	0	0	1	1	0	0	1	0	2	0	0	1	0
Total Fish	72	106	67	396	1337	186	462	653	209	116	260	145	292	170	808	269	1025	3744
Rel. Loc.	-	2	-	-	-	-	-	2	2	-	-	2	-	2	-	-	2	-
Lift Time	0705	0750	0830	0955	1035	1110	0535	0615	0655	0740	1105	1145	0655	0736	0818	0750	0832	0913
Min. Fished	30	30	30	30	30	20	20	30	30	30	30	30	30	30	30	30	30	30
Air Temp.	58.0	59.0	61.0	65.0	67.0	69.0	52.0	55.0	57.0	61.0	73.0	73.5	62.0	64.0	65.5	63.5	64.5	65.0
Water Temp.	65.0	65.0	65.0	63.5	63.5	63.5	65.0	65.0	65.0	65.0	65.0	65.0	65.5	65.5	65.5	65.5	65.5	65.5
Weather	2	1	2	1	1	1	1	1	1	1	1	1	3	3	3	3	3	3
At. Pressure	29.83	29.83	29.83	30.22	30.22	30.22	30.26	30.26	30.26	30.26	30.26	30.26	30.15	30.15	30.15	29.86	29.88	29.88
Small Gen. On	4	7	7	7	7	7	1	3	3	4	7	7	4	4	4	1	1	2
Large Gen. On	3	4	4	4	4	4	0	0	0	4	4	4	1	1	1	0	0	0
Unit 1	3	3	3	3	3	3	2	2	2	2	1	1	3	3	3	2	2	3
Unit 2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Spill Gates Open	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
River Flow	40.0	40.0	40.0	36.5	36.5	36.5	34.1	34.1	34.1	34.1	34.1	34.1	31.6	31.6	31.6	34.8	34.8	34.8
% Gate S.U.1	0	0	0	0	0	40	35	35	35	35	35	35	35	35	35	35	35	35
% Gate S.U.2	35	35	35	75	75	75	35	35	35	35	75	75	75	75	75	0	0	35
Vel. Hld. Chan.	1.2	1.2	1.2	0.6	0.6	2.0	1.3	1.3	1.3	1.3	1.5	1.5	2.0	2.0	2.0	1.5	1.5	1.5
Vel. Weir 1	7.7	7.7	7.7	4.2	4.2	7.7	4.2	4.2	4.2	4.2	7.7	7.7	7.7	7.7	7.7	3.8	3.8	6.7
Vel. Weir 2	7.5	7.5	7.5	3.8	3.8	7.7	3.8	3.8	3.8	3.8	7.5	7.5	7.5	7.5	7.5	3.8	3.8	6.7
Weir Gates Open	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Ft. Below TR																		
Weir 1	1.2	1.2	1.2	5.7	5.7	4.7	5.7	5.7	5.7	5.7	4.2	4.2	4.2	4.2	4.2	2.9	2.9	2.4
Weir 2	1.2	1.2	1.2	5.7	5.7	4.7	5.7	5.7	5.7	5.7	4.2	4.2	4.2	4.2	4.2	2.9	2.9	2.4
Tailrace Elev.	18.6	20.3	20.6	20.5	20.6	20.6	14.0	15.1	15.5	999	20.7	20.7	16.8	17.1	17.1	13.9	13.9	14.5
Hld. Chan. Elev.	19.3	20.9	21.1	21.0	21.0	21.0	14.0	15.4	15.7	999	21.9	21.9	18.3	18.5	18.5	13.9	13.9	15.8
Crowder Position	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Cr. Gate Position	1	2	1	2	1	2	1	2	1	2	1	2	2	1	2	2	1	2

continued

Table 5. Continued.

Date	6 Jun			8 Jun			8 Jun					9 Jun						
Lift Number	8	9	10	3	4	5	6	7	9	10	11	4	5	6	7	8	9	10
Parameters *																		
Shad Taken	0	1	0	0	1	2	1	0	0	1	0	0	2	0	0	1	1	0
Total Fish	1920	4065	910	790	180	1452	791	930	1190	1057	725	925	6077	1561	1175	1501	171	204
Rel. Loc.	-	2	-	-	2	2	2	-	-	2	-	-	2	-	-	2	2	-
Lift Time	0913	0955	1038	0540	0620	0700	0745	0830	1000	1045	1140	0545	0730	0815	0900	1020	1105	1140
Min. Fished	30	30	30	30	30	30	30	30	30	30	40	30	30	30	30	30	30	25
Air Temp.	66.0	71.0	69.5	60.0	61.0	63.5	68.0	70.0	70.0	77.0	79.0	67.0	71.0	77.0	78.0	82.0	83.0	84.5
Water Temp.	67.5	67.5	67.5	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0
Weather	2	2	2	6	6	6	2	2	3	3	3	1	1	1	1	1	1	1
At. Pressure	30.24	30.24	30.21	29.97	30.00	30.00	30.02	30.02	30.02	30.02	30.02	29.96	29.96	29.97	29.97	29.97	29.97	29.99
Small Gen. On	4	4	4	1	1	4	4	4	4	4	4	1	1	4	4	4	4	4
Large Gen. On	0	0	1	0	0	0	1	1	2	2	2	0	0	0	0	2	2	2
Unit 1	3	3	3	2	2	3	3	3	3	3	3	2	2	2	2	2	2	2
Unit 2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Spill Gates Open	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
River Flow	34.9	34.9	34.9	26.4	26.4	26.4	26.4	26.4	26.4	26.4	26.4	25.1	25.1	25.1	25.1	25.1	25.1	25.1
% Gate S.U.1	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
% Gate S.U.2	35	35	35	35	35	35	35	35	75	75	75	35	35	35	75	75	75	75
Vel. Hld. Chan.	0.6	0.6	0.6	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.3	1.3	1.3	1.5	1.5	1.5	1.5
Vel. Weir 1	4.2	4.2	4.2	6.7	6.7	6.7	6.7	6.7	3.7	3.7	3.7	4.2	4.2	4.2	7.7	7.7	7.7	7.7
Vel. Weir 2	3.8	3.8	3.8	6.7	6.7	6.7	6.7	6.7	3.6	3.6	3.6	3.8	3.8	3.8	7.5	7.5	7.5	7.5
Weir Gates Open	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Ft. Below TR																		
Weir 1	5.7	5.7	5.7	2.4	2.4	2.4	2.4	2.4	9.8	9.8	9.8	5.7	5.7	5.7	4.2	4.2	4.2	4.2
Weir 2	5.7	5.7	5.7	2.4	2.4	2.4	2.4	2.4	9.8	9.8	9.8	5.7	5.7	5.7	4.2	4.2	4.2	4.2
Tailrace Elev.	999	16.0	17.0	14.0	14.0	15.7	16.9	16.9	17.6	17.6	17.6	14.0	14.0	16.1	999	18.1	18.1	18.1
Hld. Chan. Elev.	999	16.2	17.2	14.7	14.7	16.4	17.9	17.9	18.0	18.0	18.0	14.1	14.1	16.3	999	19.6	19.6	19.6
Crowder Position	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Cr. Gate Position	1	2	1	2	1	2	1	2	2	1	2	1	2	1	2	1	2	1

continued

Table 5. Continued.

Date	14 Jun						15 Jun					16 Jun			17 Jun			
Lift Number	2	3	4	5	6	7	6	7	8	9	10	4	5	6	5	6	7	8
Parameters *																		
Shad Taken	0	2	0	0	1	0	0	1	0	1	0	0	1	0	0	3	1	0
Total Fish	5664	8802	4960	3232	4401	1540	1210	517	6951	1411	2720	9164	4897	3870	1384	1127	497	3360
Rel. Loc.	-	2	-	-	2	-	-	2	-	-	-	-	2	-	-	2	2	-
Lift Time	0500	0545	0630	0715	0800	0845	0800	0845	0930	1015	1100	0625	0705	0755	0715	0800	0845	0930
Min. Fished	10	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Air Temp.	63.0	65.0	65.0	67.0	67.0	69.5	73.0	76.0	79.0	82.0	83.5	74.5	76.0	77.0	71.5	72.0	73.0	75.5
Water Temp.	73.0	73.0	73.0	73.0	73.0	73.0	74.5	74.5	74.5	74.5	74.5	75.0	75.0	75.0	76.0	76.0	76.0	76.0
Weather	3	3	3	3	3	3	3	3	3	3	3	2	2	2	3	3	3	3
At. Pressure	30.26	30.26	30.26	30.26	30.26	30.26	30.13	30.13	30.13	30.13	30.13	29.95	29.95	29.95	30.00	30.00	30.00	30.00
Small Gen. On	0	0	0	0	0	4	0	0	0	4	4	0	0	0	0	0	0	0
Large Gen. On	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
Unit 1	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2
Unit 2	2	2	2	2	2	1	2	2	2	1	1	2	2	2	2	2	2	2
Spill Gates Open	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
River Flow	19.6	19.6	19.6	19.6	19.6	19.6	19.1	19.1	19.1	19.1	19.1	17.8	17.8	17.8	18.2	18.2	18.2	18.2
% Gate S.U.1	35	35	35	35	35	35	0	0	0	0	0	0	0	0	0	0	0	0
% Gate S.U.2	0	0	0	0	0	0	35	35	75	75	75	35	35	35	35	35	35	75
Vel. Hld. Chan.	1.5	1.5	1.5	1.5	1.5	1.5	1.2	1.2	0.6	0.6	0.6	1.5	1.5	1.5	1.2	1.2	1.2	0.6
Vel. Weir 1	3.8	3.8	3.8	3.8	3.8	3.8	7.7	7.7	4.2	4.2	4.2	3.8	3.8	3.8	7.7	7.7	7.7	4.2
Vel. Weir 2	3.8	3.8	3.8	3.8	3.8	3.8	7.5	7.5	3.8	3.8	3.8	3.8	3.8	3.8	7.5	7.5	7.5	3.8
Weir Gates Open	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Ft. Below TR																		
Weir 1	2.9	2.9	2.9	2.9	2.9	2.9	1.2	1.2	5.7	5.7	5.7	2.9	2.9	2.9	1.2	1.2	1.2	5.7
Weir 2	2.9	2.9	2.9	2.9	2.9	2.9	1.2	1.2	5.7	5.7	5.7	2.9	2.9	2.9	1.2	1.2	1.2	5.7
Tailrace Elev.	12.2	12.2	12.2	12.2	12.2	15.7	13.3	13.3	13.3	999	17.0	11.9	11.9	11.9	12.0	12.0	12.0	12.0
Hld. Chan. Elev.	12.5	12.5	12.5	12.5	12.5	15.9	15.0	15.0	999	999	17.5	12.3	12.3	12.3	12.8	12.8	12.8	12.7
Crowder Position	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Cr. Gate Position	1	2	1	2	1	2	1	2	1	2	1	1	2	1	1	2	1	2

continued

TABLE 5. Continued.

* PARAMETER	ABBREVIATION	CODE
Date	Date	-
Lift Number	Lift Number	-
Number of shad in lift	Shad Taken	-
Total number of fish in lift	Total Fish	-
Location shad were released	Rel. Loc.	1. Above dam 2. Returned to tailrace
Time of Lift	Lift Time	EST
Fishing Time (minutes)	Min. Fished	-
Air Temperature	Air Temp.	°F
Water Temperature	Water Temp.	°F
Weather	Weather	1. Clear 2. Partly cloudy 31. Overcast 4. Light rain 5. Heavy rain 6. Fog
Barometric pressure	At. Pressure	inches
Number of small generators operating**	Small Gen. on	9. Varying
Number of large generators operating***	Large Gen. on	9. Varying
Generating status of Unit 1	Unit 1	1. On 2. Off 3. Reduced
Generating status of Unit 2	Unit 2	1. On 2. Off
Number of spill gates open	Spill gates open	-
Natural river flow	River Flow	cfs x 1000
Gate opening (%) of station service Unit 1	% Gate S.U.1	-
Gate opening (%) of station service Unit 2	% Gate S.U.2	-
Water Velocity in holding Channel (ft/sec)	Vel. Hld. Chan.	999. Varying
Attraction velocity at Entrance #1 (ft/sec)	Vel. Weir 1	999. Varying
Attraction velocity at Entrance #2 (ft/sec)	Vel. Weir 2	999. Varying
Number of weir gates open	Weir gates open	1. #1, 2. #2, 3. Both
Setting of each weir gate	Ft. Below TR	-
Setting of Weir #1	Weir 1	999. Varying
Setting of Weir #2	Weir 2	999. Varying
Tailrace Elevation	Tailrace Elev.	999. Varying
Holding Channel Elevation	Hld. Chan. Elev.	999. Varying
Crowder Fishing Position	Crowder Position	1. Full, 2. Reduced
Crowder Gate Position	Cr. Gate Position	1. Full Open, 2. Intermediate Open

** 5,000 cfs unit
*** 10,000 cfs unit

Table 7. Comparison of numbers of eight selected species taken in the Conowingo Dam Fish Collection Facility at intermediate and full positions of the crowder gates, 5 April-30 June 1976.

Date	5 Apr		9 Apr		12 Apr		15 Apr		19 Apr		20 Apr		21 Apr		22 Apr	
No. Lifts*	1	2	4	3	4	3	1	1	4	4	2	2	4	4	5	6
Fishing Time (hr)	1.0	1.0	2.0	1.5	2.2	1.5	0.5	0.5	2.3	2.0	0.3	0.3	0.5	0.5	0.7	1.2
Gate Setting	INT	FULL	INT	FULL	INT	FULL	INT	FULL	INT	FULL	INT	FULL	INT	FULL	INT	FULL
Species																
Blueback herring	-	-	-	-	-	-	-	-	-	-	550	125	4710	1545	4896	3258
Alewife	-	-	-	-	-	1	2	-	73	50	20	30	12	-	-	-
American shad	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-
Gizzard shad	1	1	288	144	152	51	5	11	1157	857	2200	880	3088	4596	9744	5958
Carp	-	-	-	-	-	-	-	-	-	-	-	-	8	12	-	-
Quillback	-	-	-	-	-	-	-	-	55	325	-	-	12	44	-	8
Channel catfish	2	17	-	-	-		-	-	-	-	-	-	-	10	-	52
White perch	-	-	-	-	-	-	-	-	4	30	3200	215	134	24	1674	2060
Total	3	18	288	144	152	52	7	11	1289	1262	5970	1250	7968	6231	16314	11336

Date	23 Apr		24 Apr		25 Apr		26 Apr		27 Apr		28 Apr		29 Apr		30 Apr	
No. Lifts*	6	7	7	6	6	5	6	7	6	5	6	5	5	5	6	6
Fishing Time (hr)	1.4	1.6	1.0	0.7	0.6	0.4	0.8	0.8	1.5	1.4	2.1	1.8	1.8	1.8	1.5	1.5
Gate Setting	INT	FULL	INT	FULL	INT	FULL	INT	FULL	INT	FULL	INT	FULL	INT	FULL	INT	FULL
Species																
Blueback herring	-	5	45	-	2407	4629	-	-	-	-	-	-	5	-	-	-
Alewife	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
American shad	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-
Gizzard shad	4896	15565	9000	4672	3495	3467	5170	3252	1600	782	3206	791	879	411	2347	1462
Carp	32	5	65	51	16	130	115	312	36	106	4	58	1	19	10	26
Quillback	32	-	500	430	-	-	-	-	4	48	-	-	-	-	-	-
Channel catfish	3364	814	259	437	24	29	220	257	44	46	81	83	78	42	24	26
White perch	5196	8560	1272	526	4630	2270	9152	6653	5055	766	999	919	226	88	591	1106
Total	13520	24949	11141	6116	10574	10526	14657	10474	6739	1748	4290	1851	1189	560	2972	2620

continued

INT - Intermediate gate setting (12 in. opening)
FULL - Full open gate setting

* The clean out lift and the first lift with the crowder gates open are not included

Table 7. Continued.

Date	17 May		18 May		19 May		20 May		21 May		22 May		23 May		24 May	
No. Lifts*	5	5	5	5	5	4	5	4	5	4	4	4	4	5	4	5
Fishing Time (hr)	2.3	2.5	2.3	2.2	2.7	1.7	2.8	2.0	2.3	2.0	2.0	2.0	2.0	2.7	2.0	2.8
Gate Setting	INT	FULL	INT	FULL	INT	FULL	INT	FULL	INT	FULL	INT	FULL	INT	FULL	INT	FULL
Species																
Blueback herring	16	36	8	4	-	-	356	64	5	24	8	2	-	7	-	-
Alewife	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	1
American shad	1	-	4	4	-	-	-	-	-	1	-	-	1	1	-	-
Gizzard shad	6094	1975	2880	2836	8907	2252	3454	716	1976	1594	754	996	3370	1050	204	435
Carp	44	20	109	327	33	36	8	7	458	48	1	32	-	28	3	13
Quillback	-	5	22	489	14	97	57	78	601	744	22	225	32	170	9	375
Channel catfish	318	91	109	88	1107	508	25	29	46	112	21	18	26	33	29	60
White perch	730	341	124	242	132	105	2544	25	216	403	255	60	1201	276	142	1056
Total	7203	2468	3256	3990	10193	2998	6444	919	3303	2926	1061	1333	4630	1565	388	1940

Date	25 May		26 May		27 May		28 May		29 May		30 May		31 May		1 Jun	
No. Lifts*	5	5	5	4	5	5	5	5	5	5	4	5	3	4	4	5
Fishing Time (hr)	2.3	2.5	2.7	1.8	2.3	2.3	2.5	2.3	2.3	2.3	2.0	2.7	1.5	2.0	2.0	2.7
Gate Setting	INT	FULL	INT	FULL	INT	FULL	INT	FULL	INT	FULL	INT	FULL	INT	FULL	INT	FULL
Species																
Blueback herring	-	-	12	6	5	-	96	89	1	6	3	9	-	5	20	10
Alewife	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-
American shad	1	-	-	-	-	1	2	1	-	2	-	1	-	-	2	2
Gizzard shad	533	514	844	586	1003	1413	813	680	1425	984	1638	606	499	749	1093	971
Carp	25	349	304	16	9	36	5	10	-	9	-	1	5	-	32	316
Quillback	-	337	147	192	-	196	6	57	-	17	-	56	-	-	20	1172
Channel catfish	68	137	45	83	81	99	59	33	47	79	10	94	57	113	86	93
White perch	280	425	549	102	896	590	220	377	1807	1275	2716	1154	1678	1582	669	1026
Total	907	1762	1901	986	1994	2335	1201	1247	3280	2372	4367	1922	2239	2449	1922	3590

INT - Intermediate gate setting (12 in. opening)
FULL - Full open gate setting
* The clean out lift and the first lift with the crowder gates open are not included

Table 7. Continued.

Date	18 Jun		19 Jun		20 Jun		21 Jun		22 Jun		23 Jun		24 Jun		25 Jun	
No. Lifts*	5	4	5	4	5	4	5	4	5	4	5	4	4	4	4	4
Fishing Time (hr)	2.4	2.1	2.4	2.0	2.5	2.0	2.4	2.0	2.4	2.0	2.2	1.8	2.0	2.0	2.0	2.0
Gate Setting	INT	FULL	INT	FULL	INT	FULL	INT	FULL	INT	FULL	INT	FULL	INT	FULL	INT	FULL
Species																
Blueback herring	422	183	20	28	288	884	4	11	-	-	-	-	-	8	-	-
Alewife	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
American shad	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Gizzard shad	1267	488	408	184	360	226	112	325	261	376	1674	669	1719	1848	1972	600
Carp	46	20	16	4	10	-	23	12	25	29	825	274	256	381	208	140
Quillback	-	10	8	-	-	-	16	67	5	38	-	16	32	37	-	60
Channel catfish	191	73	200	160	46	32	107	122	1692	1674	5151	1812	2869	2908	2630	2695
White perch	174	169	64	129	364	568	42	55	213	93	-	-	-	8	-	-
Total	2102	943	716	506	1068	1710	304	592	2196	2210	7650	2771	4876	5190	4810	3495

Date	26 Jun		27 Jun		28 Jun		29 Jun		30 Jun		SEASON TOTALS			
No. Lifts *	4	4	5	4	4	3	3	3	4	3				
Fishing Time (hr)	2.0	2.2	2.5	2.0	2.0	1.5	1.5	1.5	2.0	1.5	155.2	Fish/ Hour	Fish/ Hour	145.7
Gate Setting	INT	FULL	INT	FULL	INT	FULL	INT	FULL	INT	FULL	INT	INT	FULL	FULL
Species														
Blueback herring	-	-	-	-	1	-	2	-	1	-	19719	127.0	89.9	13098
Alewife	-	-	-	-	-	-	-	-	-	-	134	0.9	0.6	91
American shad	-	-	-	-	-	-	-	-	-	-	51	0.3	0.2	36
Gizzard shad	577	400	460	250	99	220	83	54	48	51	192338	1239.3	1038.2	151263
Carp	-	-	1	3	3	10	1	1	4	4	4144	26.7	33.7	4916
Quillback	-	-	-	-	-	-	-	-	2	-	1794	11.6	57.3	8353
Channel catfish	548	350	402	314	631	232	114	77	198	94	27956	180.1	126.2	18390
White perch	-	-	-	-	11	2	4	5	22	5	110283	710.6	671.5	97842
Total	1125	750	863	567	745	464	204	137	275	154	356419	2296.5	2017.6	293991

INT - Intermediate gate setting (12 in. opening)
FULL - Full open gate setting

* The clean out lift and the first lift with the crowder gates open are not included

Table 8. Continued.

Date	12 May		13 May			14 May		15 May		16 May		17 May		18 May			19 May	
No. Lifts *	5	4	3	4	3	5	4	6	7	6	6	4	6	2	4	4	5	4
Fishing Time (hr)	2.2	2.0	1.2	1.5	1.5	2.2	2.1	2.2	0.7	1.8	2.2	1.8	3.0	0.7	2.0	1.8	2.1	2.3
Velocity + Volume	HV-HF	LV-LF	HV-XLF	LV-HF	HV-LF	HV-LF	HV-HF	LV-LF	HV-HF	HV-HF	LV-LF	LV-XLF	HV-XLF	HV-XLF	LV-HF	HV-LF	HV-LF	LV-HF
Species																		
Blueback herring	-	-	-	-	-	5	26	4	-	-	-	52	-	-	12	-	-	-
Alewife	-	5	-	-	-	-	13	-	-	-	-	-	-	-	-	-	-	-
American shad	-	-	-	-	-	-	1	1	2	2	-	-	1	1	7	-	-	-
Gizzard shad	10152	2564	2408	14272	4784	3757	3175	5381	25952	7066	9184	2140	5929	498	3147	2071	8575	2584
Carp	-	37	-	-	52	-	5	4	-	-	256	24	40	-	36	400	17	52
Quillback	-	-	-	-	44	-	-	-	-	-	160	4	1	-	20	491	30	81
Channel catfish	12	69	5	32	8	2	41	-	-	6	8	92	317	25	115	57	87	1528
White perch	1076	26780	836	128	100	1650	587	1161	-	50	1752	488	583	93	128	143	144	93
Total	11240	29455	3249	14432	4988	5414	3848	6551	25954	7124	11360	2800	6871	617	3465	3164	8853	4338

Date	20 May		21 May		22 May		23 May		24 May		25 May		26 May		27 May		
No. Lifts	5	4	5	4	5	3	5	4	5	4	5	5	5	4	5	3	2
Fishing Time (hr)	2.5	2.3	2.5	1.8	2.5	1.5	2.5	2.2	2.5	2.3	2.5	2.2	2.5	2.1	2.5	1.5	0.7
Velocity + Volume	LV-LF	HV-LF	HV-XLF	LV-LF	LV-XLF	HV-LF	HV-XLF	LV-LF	LV-XLF	HV-LF	HV-XLF	LV-LF	LV-XLF	HV-LF	HV-XLF	LV-LF	HV-HF
Species																	
Blueback herring	420	-	13	16	10	-	2	5	-	-	-	-	14	4	5	-	-
Alewife	-	-	1	-	-	-	-	-	1	1	-	-	1	-	-	-	-
American shad	-	-	-	1	-	-	-	2	-	-	1	-	-	-	-	1	-
Gizzard shad	3818	352	429	3141	850	900	936	3484	391	248	157	890	169	1261	1022	1126	268
Carp	2	13	1	505	3	30	3	25	3	13	-	374	-	320	1	32	12
Quillback	-	135	-	1345	12	235	-	202	-	384	-	337	-	339	-	132	64
Channel catfish	28	26	52	106	29	10	22	37	74	15	69	136	59	69	94	68	18
White perch	2564	5	275	344	301	14	339	1138	1189	9	375	330	567	84	828	598	60
Total	6832	531	771	5458	1205	1189	1302	4893	1658	670	602	2067	810	2077	1950	1957	422

continued

HV - High Velocity
LV - Low Velocity
HF - High Flow
LF - Low Flow
XLF - Extra Low Flow

* The clean out lift and the first lift with the crowder gates open are not included

Table 8. Continued.

Date	13 Jun			14 Jun		15 Jun		16 Jun		17 Jun		18 Jun		19 Jun		20 Jun	
No. Lifts	1	3	5	6	3	5	4	4	5	5	4	4	5	5	4	5	4
Fishing Time (hr)	0.5	1.5	2.7	3.0	1.4	2.5	1.9	2.0	2.5	2.5	1.9	2.1	2.4	2.5	1.9	2.2	2.2
Velocity + Volume	LV-XLF	LV-LF	HV-XLF	LV-XLF	HV-LF	HV-XLF	LV-LF	LV-XLF	HV-LF	HV-XLF	LV-LF	LV-XLF	HV-LF	HV-HF	LV-XLF	LV-XLF	HV-LF
Species																	
Blueback herring	20	548	912	2196	-	8	490	594	12	116	1252	588	17	40	8	1143	29
Alewife	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
American shad	-	2	3	3	-	1	1	1	-	4	-	1	1	1	-	-	-
Gizzard shad	80	668	930	3732	2228	602	7360	320	1908	504	1972	510	1245	580	12	19	567
Carp	-	32	4	218	706	-	55	10	208	4	108	25	41	16	4	10	-
Quillback	-	-	-	192	96	-	-	-	-	20	32	10	-	8	-	-	-
Channel catfish	-	8	59	352	32	202	35	54	76	140	36	75	189	240	120	40	38
White perch	3080	22600	4355	10286	32	4475	1040	1800	962	1284	2360	320	23	8	185	758	174
Total	3180	23858	6263	16979	3094	5288	8981	2779	3166	2072	5760	1529	1516	893	329	1970	808

Date	21 Jun		22 Jun			23 Jun		24 Jun		25 Jun		26 Jun			27 Jun	
No. Lifts	4	5	4	1	4	5	4	4	4	4	4	1	4	3	5	4
Fishing Time (hr)	2.0	2.4	2.0	0.5	1.9	2.1	2.0	2.0	2.0	2.0	2.0	0.5	2.0	1.7	2.5	2.0
Velocity + Volume	HV-LF	LV-XLF	HV-XLF	LV-LF	LV-XLF	HV-HF	LV-HF	LV-HF	HV-HF	HV-HF	LV-LF	HV-XLF	LV-HF	HV-LF	HV-LF	LV-HF
Species																
Blueback herring	12	3	-	-	-	-	-	8	-	-	-	-	-	-	-	-
Alewife	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
American shad	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gizzard shad	423	14	277	50	310	2098	245	895	2672	1650	922	10	594	373	431	279
Carp	10	25	4	5	45	28	1071	5	632	200	148	-	-	-	-	4
Quillback	79	4	8	-	35	-	16	5	64	10	50	-	-	-	-	-
Channel catfish	59	170	196	620	2550	4426	2537	2977	2800	2780	2545	54	434	410	117	599
White perch	43	54	226	10	70	-	-	8	-	-	-	-	-	-	-	-
Total	626	270	711	685	3010	6552	3869	3898	6168	4640	3665	64	1028	783	548	882

continued

HV - High Velocity
LV - Low Velocity
HF - High Flow
LF - Low Flow
XLF - Extra Low Flow

* The clean out lift and the first lift with the crowder gates open are not included

Table 9. Catch per hour for eight selected species taken in the Conowingo Dam Fish Collection Facility under various conditions of velocity and flow, 24 April-30 June 1976.

Blueback herring					Alewife					American shad					Gizzard shad				
	Flow					Flow					Flow					Flow			
Velocity	HF	LF	XLF	Total	Velocity	HF	LF	XLF	Total	Velocity	HF	LF	XLF	Total	Velocity	HF	LF	XLF	Total
HV	2.6	9.4	33.3	45.3	HV	-	0.05	0.03	0.08	HV	0.4	0.3	0.3	1.0	HV	1802.5	1102.0	593.6	3498.1
LV	3.1	164.1	157.3	324.5	LV	0.6	0.1	0.1	0.8	LV	0.2	0.3	0.1	0.6	LV	1096.3	1066.0	496.3	2658.6
Total	5.7	173.5	190.6	369.8	Total	0.6	0.15	0.13	0.88	Total	0.6	0.6	0.4	1.6	Total	2898.8	2168.0	1089.9	6156.7

Carp					Quillback					Channel catfish					White perch				
	Flow					Flow					Flow					Flow			
Velocity	HF	LF	XLF	Total	Velocity	HF	LF	XLF	Total	Velocity	HF	LF	XLF	Total	Velocity	HF	LF	XLF	Total
HV	33.2	35.7	4.3	73.2	HV	65.2	38.1	0.9	104.2	HV	275.4	32.1	55.6	363.1	HV	100.4	311.5	476.0	887.9
LV	65.4	33.0	14.2	112.6	LV	14.9	54.5	6.3	75.7	LV	283.8	166.5	100.7	551.0	LV	549.7	1616.6	721.3	2887.6
Total	98.6	68.7	18.5	185.8	Total	80.1	92.6	7.2	179.9	Total	559.2	198.6	156.3	914.1	Total	650.1	1928.1	1197.3	3775.5

HV - High Velocity
LV - Low Velocity
HF - High Flow
LF - Low Flow
XLF - Extra Low Flow

Table 11. Comparison of the numbers of American shad, *Alosa sapidissima*, taken in the Conowingo Dam Fish Collection Facility with water temperature, 1972-1976.

Temperature	1972		1973		1974		1975		1976		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
56	0	-	0	-	6	4.7	0	-	0	-	6	0.9
58	0	-	2	2.6	3	2.3	-	-	0	-	5	0.7
59	2	0.7	0	-	0	-	0	-	4	4.4	6	0.9
60	2	0.7	1	1.3	0	-	0	-	0	-	3	0.4
61	0	-	0	-	3	2.3	0	-	2	2.2	5	0.7
62	2	0.7	3	3.9	0	-	0	-	2	2.2	7	1.0
63	0	-	1	1.3	0	-	0	-	3	3.3	4	0.6
64	1	0.3	3	3.9	0	-	0	-	5	5.5	9	1.3
65	0	-	1	1.3	0	-	0	-	8	8.8	9	1.3
66	0	-	0	-	1	0.8	0	-	16	17.6	17	2.5
67	4	1.4	4	5.2	0	-	1	1.2	3	3.3	12	1.8
68	17	5.8	0	-	1	0.8	0	-	17	18.7	35	5.2
69	24	8.2	10	13.0	2	1.6	2	2.3	0	-	38	5.6
70	116	39.6	17	22.1	88	68.8	7	8.3	0	-	228	33.9
71	57	19.5	0	-	17	13.3	0	-	12	13.2	86	12.8
72	3	1.0	0	-	0	-	6	7.1	5	5.5	14	2.1
73	0	-	7	9.1	0	-	2	2.3	3	3.3	12	1.8
74	65	27.2	1	1.3	2	1.6	47	56.0	2	2.2	117	17.4
75	0	-	22	28.6	0	-	16	19.0	1	1.1	39	5.8
76	0	-	0	-	4	3.1	3	3.5	8	8.8	15	2.2
77	0	-	1	1.3	1	0.8	0	-	0	-	2	0.3
79	0	-	4	5.2	0	-	0	-	0	-	4	0.6
Total	293		77		128		84		91		673	

Table 13. Daily numbers of alewife, *Alosa pseudoharengus*, blueback herring, *Alosa aestivalis*, and American eels, *Anguilla rostrata*, transported from the Conowingo Dam Fish Collection Facility to Conowingo Pond, 19 April - 30 June 1976.

Date	Alewife	Blueback herring	American eel
April 19	66	0	0
20	24	2362	0
21	0	2422	0
22	0	805	0
25	0	1033	0
June 25	0	0	265
26	0	0	805
27	0	0	395
28	0	0	367
29	0	0	308
30	0	0	244
Total	90	6622	2384

Total Fish = 9096

$N = \frac{(251+1)(38604+1)}{251+1}$ → # caught 6/11 – 30/76

N = 486,423 Gizzard shad

Table 15. Fishes tagged at the Conowingo Dam Fish Collection Facility on 10 June and recaptured from 11-30 June 1976.

Species	No. Fish in 7 lifts	No. Fish Tagged	% Tagged	No. Fish Recaptured 11-30 June
Blueback herring	26	11	42	0
Gizzard shad	1904 (2249 = # in 3 years)	251	13	19
Brown trout	10	3	33	0
Carp	132	5	4	0
Quillback	940	66	6	0
White sucker	8	2	25	0
Channel catfish	114	7	6	1
White perch	2052	10	0.5	0
Redbreast sunfish	34	2	6	1
Green sunfish	5	1	20	0
Smallmouth bass	32	1	3	0
Walleye	96	14	15	0
Total	5353	373	7	21

est. pop. 486,423

Table 17. Status of generation of Conowingo Hydro-electric Station in relation to shore angler catch of American shad, *Alosa sapidissima* for 1973-1976. No angler survey in 1972.

No. Units Operating		Status of	Status of	No. of Shad Caught					% of Catch				
Small*	Large**	Unit No. 1	Unit No. 2	1973	1974	1975	1976	Total	1973	1974	1975	1976	Total
1	0	OFF	ON	10	14	22	51	97	7.0	27.5	53.7	31.1	24.4
2	0	OFF	ON	0	2	3	3	8	-	3.9	7.3	1.8	2.0
3	0	OFF	ON	0	2	2	8	12	-	3.9	4.9	4.9	3.0
4	0	OFF	ON	0	5	1	1	7	-	9.8	2.4	0.6	1.8
4	0	Reduced	ON	0	0	0	14	14	-	-	-	8.5	3.5
4	0	ON	ON	0	0	0	2	2	-	-	-	1.2	0.5
4	1	OFF	ON	1	0	0	7	8	0.7	-	-	4.3	2.0
4	1	Reduced	ON	0	0	0	1	1	-	-	-	0.6	0.2
4	2	OFF	ON	2	0	0	1	3	1.4	-	-	0.6	0.8
4	2	ON	ON	0	0	0	3	3	-	-	-	1.8	0.8
4	2	ON	OFF	0	0	0	4	4	-	-	-	2.4	1.0
3	3	ON	ON	1	0	0	0	1	0.7	-	-	-	0.2
4	3	OFF	ON	1	1	0	6	8	0.7	2.0	-	3.6	2.0
4	3	ON	ON	0	0	0	7	7	-	-	-	4.3	1.8
4	4	OFF	ON	0	9	0	2	11	-	17.6	-	1.2	2.8
4	4	ON	ON	1	0	0	10	11	0.7	-	-	6.1	2.8
5	4	OFF	ON	1	6	2	0	9	0.7	11.8	4.9	-	2.3
5	4	ON	ON	1	0	0	2	3	0.7	-	-	1.2	0.8
5	3	Reduced	ON	0	0	0	6	6	-	-	-	3.6	1.5
5	1	Reduced	ON	0	0	0	1	1	-	-	-	0.6	0.2
6	4	OFF	ON	1	3	3	6	13	0.7	5.9	7.3	3.6	3.3
6	4	ON	ON	0	0	0	16	16	-	-	-	9.8	4.0
7	3	ON	ON	2	0	0	0	2	1.4	-	-	-	0.5
7	4	ON	ON	92	9	8	4	113	64.8	17.6	19.5	2.4	28.4
7	4	Reduced	ON	0	0	0	9	9	-	-	-	5.5	2.3
Changing			Changing	5	0	0	0	5	3.5	-	-	-	1.2
Undetermined				24	0	0	0	24	16.9	-	-	-	6.0
Total				142	51	41	164	398					

* 5,000 cfs unit
** 10,000 cfs unit

Table 19. Numbers of fishes taken in the Conowingo Dam Fish Collection Facility, 1972-1976.

Year	1972			1973			1974			1975			1976			1972-1976		
Total No. Lifts	934			1645			929			514			839			4861		
Total Fishing Time (hr)	363.1			662.6			289.1			199.4			313.9			1828.1		
	Total Fish	%	Fish/ 100 hr	Total Fish	%	Fish/ 100 hr	Total Fish	%	Fish/ 100 hr	Total Fish	%	Fish/ 100 hr	Total Fish	%	Fish/ 100 hr	Total Fish	%	Fish/ 100 hr
Species																		
Lampreys																		
Sea lamprey	1	*	**	2	*	**	0	-	-	2	*	1	29	*	9	34	*	2
Freshwater eels																		
American eel	932	0.27	257	2248	0.16	339	126543	7.47	43771	64375	7.04	32284	187035	13.21	59584	381133	6.58	20849
Herrings																		
Blueback herring	76867	22.21	21170	354388	24.91	53484	333986	19.71	115526	69932	7.64	35071	39503	2.79	12585	874676	15.10	47846
Hickory shad	369	0.11	102	738	0.05	111	219	0.01	76	20	*	10	0	-	-	1346	0.02	74
Alewife	12218	3.53	3365	143880	10.11	21714	17052	1.01	5898	4311	0.47	2162	235	0.02	75	177696	3.07	9720
American shad	293	0.08	81	77	*	12	128	0.01	44	84	0.01	42	91	0.01	29	673	0.01	37
Atlantic menhaden	0	-	-	0	-	-	113	0.01	39	0	-	-	577	0.04	184	690	0.01	38
Gizzard shad	37191	10.74	10243	60103	4.22	9071	122491	7.23	42370	139156	15.21	69787	405510	28.64	129184	764451	13.19	41817
Trouts																		
Lake herring	0	-	-	1	*	**	0	-	-	0	-	-	0	-	-	1	*	**
Rainbow trout	36	0.01	10	68	*	10	21	*	7	22	*	11	60	*	19	207	*	11
Brown trout	147	0.04	40	300	0.02	45	625	0.04	216	219	0.02	110	494	0.03	157	1785	0.03	98
Brook trout	1	*	**	3	*	**	4	*	1	1	*	**	0	-	-	9	*	**
Pikes																		
Chain pickerel	0	-	-	1	*	**	10	*	3	0	-	-	0	-	-	11	*	**
Northern pike	0	-	-	2	*	**	2	*	**	0	-	-	0	-	-	4	*	**
Muskellunge	19	*	5	105	0.01	16	9	*	3	7	*	4	14	*	4	154	*	8
Minnows and carp																		
Goldfish	0	-	-	27	*	4	2	*	**	9	*	5	8	*	3	46	*	3
Carp	5478	1.58	1509	19473	1.37	2939	36766	2.17	12717	15114	1.65	7580	9452	0.67	3011	86283	1.49	4720
Golden shiner	180	0.05	50	832	0.06	126	516	0.03	178	751	0.08	377	1868	0.13	595	4147	0.07	227
Comely shiner	8	*	2	255	0.02	38	3870	0.23	1339	2079	0.23	1043	841	0.06	268	7053	0.12	386
Spottail shiner	34	0.01	9	137	0.01	21	2331	0.14	806	408	0.04	205	1743	0.12	555	4653	0.08	255
Rosyface shiner	0	-	-	0	-	-	0	-	-	1	*	**	0	-	-	1	*	**
Spotfin shiner	113	0.03	31	40	*	6	3585	0.21	1240	1091	0.12	547	59856	4.23	19068	64685	1.12	3538
Longnose dace	0	-	-	0	-	-	1	*	**	0	-	-	0	-	-	1	*	**

continued

Table 20. Comparison of the number of American shad, *Alosa sapidissima*, taken in the Conowingo Dam Fish Collection Facility with time of day, 1972-1976.

Time of Day	1972		1973		1974		1975		1976		Total**	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0400-0459	0	-	6	7.8	0	-	2	2.4	1	1.1	9	1.5
0500-0559	10	3.4	25	32.5	11	8.6	11*	13.3	7	7.7	64	10.6
0600-0659	113	38.6	22	28.6	24	18.8	42	50.6	12	13.2	213	35.3
0700-0759	66	22.6	6	7.8	20	15.6	9	10.8	33	36.3	134	22.2
0800-0859	64	21.8	2	2.6	17	13.3	9	10.8	19	20.9	111	18.4
0900-0959	5	1.7		3.9	8	6.3	8	9.6	4	4.4	28	4.6
1000-1059	2	0.7	2	2.6	7	5.5	2	2.4	10	11.0	23	3.8
1100-1159	1	0.3	2	2.6	13	10.2			5	5.5	21	3.5
1200-1259	3	1.0	2	2.6	7	5.5						
1300-1359	7	2.4	1	1.3	6	4.7						
1400-1459	4	1.4	0	-	5	3.9						
1500-1559	0	-	2	2.6	2	1.6						
1600-1659	3	1.0	2	2.6	2	1.6						
1700-1759	9	3.1	2	2.6	4	3.1						
1800-1859	6	2.0	0	-	2	1.6						
Total	293		77		128		83		91		603	

* Does not include 1 American shad collected dead
** Includes data from 0400-1159 hours only

Table 22. Comparison of the percentage of American shad, *Alosa sapidissima*, taken by shore anglers just downstream of the Conowingo Dam Fish Collection Facility with water temperature 1973-1976. No angler survey conducted in 1972.

Temperature	1973		1974		1975		1976		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
56	0	-	0	-	1	2.4	0	-	1	0.3
57	1	0.7	1	2.0	2	4.8	0	-	4	1.0
58	4	2.8	3	5.9	1	2.4	0	-	8	2.0
59	10	7.0	3	5.9	0	-	4	2.4	17	4.3
60	8	5.6	7	13.7	0	-	6	3.7	21	5.3
61	33	23.2	8	15.7	0	-	1	0.6	42	10.5
62	27	19.0	14	27.5	0	-	12	7.3	53	13.3
63	56	39.4	3	5.9	0	-	5	3.0	64	16.1
64	3	2.1	0	-	0	-	27	16.5	30	7.5
65	0	-	0	-	2	4.8	10	6.1	12	3.0
66	0	-	0	-	6	14.6	45	27.4	51	12.8
67	0	-	0	-	1	2.4	0	-	1	0.3
68	0	-	1	2.0	2	4.8	54	32.9	57	14.3
69	0	-	1	2.0	0	-	0	-	1	0.3
70	0	-	10	19.6	0	-	0	-	10	2.5
72	0	-	0	-	12	29.3	0	-	12	3.0
74	0	-	0	-	14	36.6	0	-	14	3.5
Total	142		51		41		164		398	

Table 23. Continued.

Hours of Creel Census

Date	1973 0400-2000 Angler Hours	1973 No. Shad caught	1974 0400-1100 Angler Hours	1974 No. Shad caught	1975 0400-1100 Angler Hours	1975 No. Shad caught	1976 0400-1200 Angler Hours	1976 No. Shad caught
1 Jun	139	0	167	0	57	0	3	0
2 Jun	418	3	80	0	43	0	2	0
3 Jun	426	0	40	0	30	0	19	0
4 Jun	81	0	60	1	56	0	9	0
5 Jun	155	0	28	0	29	0	54	0
6 Jun	87	0	17	0	24	0	33	0
7 Jun	119	0	31	0	170	0	1	0
8 Jun	217	0	138	0	118	0	15	0
9 Jun	321	0	158	0	11	0	5	0
10 Jun	328	0	14	0	32	0	4	0
11 Jun	86	0	22	0	45	0	11	0
12 Jun	-	-	19	0	5	0	16	0
13 Jun	-	-	28	0	31	0	4	0
14 Jun	110	0	45	0	-	-	1	0
15 Jun	69	0	121	0	-	-	19	0
16 Jun	-	-	138	0	-	-	9	0
17 Jun	-	-	17	0	-	-	4	0
18 Jun	-	-	28	0	-	-	4	0
19 Jun	-	-	11	0	-	-	2	0
20 Jun	-	-	16	0	-	-	6	0
21 Jun	-	-	44	0	-	-	9	0
22 Jun	-	-	92	0	-	-	9	0
23 Jun	-	-	82	0	-	-	10	0
24 Jun	-	-	3	0	-	-	3	0
25 Jun	-	-	23	0	-	-	11	0
26 Jun	-	-	11	0	-	-	2	0
27 Jun	-	-	17	0	-	-	0	0
28 Jun	-	-	14	0	-	-	0	0
29 Jun	-	-	45	0	-	-	0	0
30 Jun	-	-	196	0	-	-	0	0
Total	20495	142	7675	51	4096	41	4024	164
Average Per Day	409.9	2.8	105.1	0.7	95.3	0.95	56.7	2.3
Catch Per Angler Hour		.007		.007		.010		.041

Table 24. Continued.

Date	1972 Temp (F)	1972 Flow (1000 cfs)	1973 Temp (F)	1973 Flow (1000 cfs)	1974 Temp (F)	1974 Flow (1000 cfs)	1975 Temp (F)	1975 Flow (1000 cfs)	1976 Temp (F)	1976 Flow (1000 cfs)
May 14	58.0	97.0	63.0	64.2	59.0	63.6	63.0	58.7	62.0	20.4
15	59.0	81.4	63.0	60.1	63.0	88.7	64.0	55.5	63.0	22.1
16	60.0	74.2	60.0	54.7	64.0	86.6	65.0	64.9	64.0	26.6
17	62.0	76.9	60.0	48.9	65.0	70.8	66.0	64.5	64.0	25.2
18	63.0	74.9	60.0	50.1	65.0	57.8	67.0	66.1	66.0	26.6
19	65.0	75.6	59.0	48.5	66.0	49.8	68.0	61.5	66.5	32.3
20	64.0	72.5	59.0	52.3	67.0	43.2	68.0	55.6	65.0	40.1
21	66.0	68.3	58.0	52.1	68.0	41.7	68.0	49.7	66.0	37.2
22	66.0	64.5	57.0	59.0	70.0	37.9	69.0	44.5	66.0	42.5
23	66.0	59.7	60.0	69.3	71.0	37.7	70.0	41.4	65.5	49.9
24	67.0	54.4	59.0	75.8	70.0	32.4	72.0	38.5	65.0	48.8
25	68.0	47.6	59.0	73.9	70.0	29.5	73.0	38.5	65.0	40.0
26	67.0	44.2	58.0	68.8	70.0	27.8	74.0	36.3	65.0	39.3
27	68.0	37.9	57.0	65.3	70.0	27.3	74.0	36.2	63.5	36.5
28	68.0	34.6	56.0	72.3	70.0	25.7	75.0	32.5	65.0	34.1
29	69.0	30.6	58.0	86.6	70.0	23.1	75.0	32.1	65.5	31.6
30	70.0	27.2	59.0	78.9	71.0	22.2	75.0	28.8	65.5	34.8
31	70.0	30.5	-	75.4	70.0	21.7	74.0	29.3	65.0	35.8
Jun 1	70.0	47.5	63.0	66.2	70.0	22.3	74.0	35.4	65.0	37.1
2	70.0	53.2	64.0	57.0	70.0	23.6	75.0	28.2	65.5	41.4
3	71.0	53.5	65.0	52.5	69.0	22.8	76.0	26.7	66.0	40.0
4	71.0	52.4	66.0	45.5	69.0	24.8	75.0	25.4	66.0	38.0
5	71.0	50.7	67.0	43.9	70.0	20.9	76.0	26.1	67.0	36.0
6	70.0	43.3	69.0	42.5	70.0	19.4	76.0	34.4	67.5	34.9
7	71.0	42.3	70.0	44.5	70.0	17.0	75.0	54.2	67.5	29.5
8	70.0	41.8	70.0	53.8	70.0	16.7	74.0	92.6	68.0	26.4
9	70.0	39.7	74.0	50.2	70.0	15.8	71.0	91.8	68.0	25.1
10	72.0	33.4	75.0	45.8	71.0	11.4	68.0	67.9	68.5	25.2
11	70.0	31.5	77.0	40.9	72.0	14.5	67.0	53.1	70.5	26.5
12	70.0	28.7	-	34.8	72.0	13.1	68.0	50.2	71.0	25.5
13	70.0	28.6	-	33.5	72.0	12.4	68.0	52.0	72.0	24.5
14	70.0	29.2	79.0	29.3	73.0	12.8	-	52.8	73.0	19.6
15	70.0	25.2	79.0	27.1	73.0	11.7	-	55.9	74.5	19.1
16	71.0	27.3	79.0	29.1	73.0	13.4	-	49.6	75.0	17.8
17	71.0	30.0	79.0	30.2	74.0	14.8	-	45.6	76.0	18.2
18	71.0	36.2	77.0	28.0	74.0	22.3	-	45.3	75.5	18.5
19	72.0	40.2	76.0	25.4	76.0	24.8	-	43.2	76.5	19.0
20	74.0	44.0	75.0	23.8	76.0	28.8	-	37.6	78.0	21.0
21	74.0	47.3	75.0	22.5	76.0	22.1	-	33.8	78.0	25.1
22	-	409.0	75.0	25.1	76.0	19.5	-	30.8	79.0	54.0
23	-	868.4	75.0	26.5	76.0	20.0	-	25.6	80.0	118.6
24	-	969.4	73.0	29.4	77.0	19.3	-	24.4	79.5	92.4
25	-	801.4	73.0	27.0	75.0	19.7	-	21.6	77.0	64.6
26	-	559.3	73.0	25.0	75.0	18.8	-	21.8	75.0	51.1
27	-	365.6	74.0	26.4	75.0	16.8	-	26.1	74.0	40.3
28	-	235.6	75.0	24.4	74.0	20.3	-	38.8	76.0	35.5
29	-	198.5	75.0	33.9	74.0	21.5	-	41.2	76.0	30.9
30	-	100.8	77.0	37.9	74.0	23.2	-	36.0	75.0	29.0