

SUMMARY OF THE OPERATION OF THE  
CONOWINGO DAM FISH COLLECTION FACILITY  
DURING THE SPRING OF 1981

by

RMC-Ecological Division  
Muddy Run Ecological Laboratory  
P. O. Box 10  
Drumore, Pennsylvania 17518

Prepared For  
Philadelphia Electric Company

RADIATION MANAGEMENT CORPORATION  
3508 Market Street  
Philadelphia, Pennsylvania 19104

FISH FACILITY OPERATION REPORT 10  
JANUARY 1982

## TABLE OF CONTENTS

	Page
INTRODUCTION. . . . .	1
METHODS . . . . .	1
RESULTS AND DISCUSSION. . . . .	5
LITERATURE CITED. . . . .	10

## LIST OF TABLES

Table	Page
1     Flow schedule used to obtain attraction velocities at Conowingo Dam Fish Collection Facility from 7 April to 23 April 1981. Flows similar to those used in 1977 - 1980. . . . .	11
2     List of scientific and common names of fishes collected in the Conowingo Dam Fish Collection Facility, 1981 . . . . .	12
3     Estimated numbers of fish taken at the Conowingo Dam Fish Collection Facility, 7 April to 15 June 1981. . . . .	14
4     Capture-recapture data on American shad tagged at the Conowingo Dam Fish Collection Facility, 1981. . . . .	19
5     Flow schedule and range of observed attraction velocities used at the Conowingo Dam Fish Collection Facility, 1977 to 1981. Velocity measurements taken with Marsh-McBirney and Endeco current meter. . . . .	20

## LIST OF FIGURES

Figure	Page
1     Schematic drawing of Conowingo Dam Fish Collection Facility (from Kotkas and Robbins, 1976). . . . .	21
2     River flow and water temperature 7 April-15 June 1981. . . . .	22
3     Catch of American shad at the Conowingo Dam Fish Collection Facility, 7 April-15 June 1981. . . . .	23

## INTRODUCTION

The Conowingo Dam Fish Collection Facility (hereafter Fish Trap) has been operated since 1972 as part of a cooperative state, private, and federal effort to restore American shad to the Susquehanna River. Early goals of trap operation were to determine the number of American shad that could be collected from the Fish Trap location and to transport as many shad as possible upriver. The current goal is to monitor anadromous fish populations below Conowingo Dam. Operation of the fish trap is under the guidance of the Susquehanna River Anadromous Fish Restoration Cooperative and has been funded by Philadelphia Electric Company.

Objectives of the 1981 operation were to monitor (1) relative abundance of Alosa species in the Conowingo Dam tailrace, (2) species composition of fish in Conowingo Dam tailrace, and (3) obtain life history information from selected anadromous fish species and resident species.

## METHODS

Conowingo Dam is located on the Susquehanna River approximately 10 mi upriver of the confluence with Chesapeake Bay. The fish trap (Figure 1) is located at the base of the Dam on the west side of the tailrace adjacent to the power house. Attraction water for the trap is provided by two small turbines (House Units). Discharge from the trap is controlled by flow from these turbines and by

adjustable weir gates. Trap design has been described by Kotkas and Robbins (1976) and in the Operation and Maintenance Manual (Anon, 1972).

Trap operation commenced on 7 April 1981. However, prior to the operation of the facility, starting on 25 March, daily conversations with personnel at a retail fish market (Owen's Fish House) were made to determine if commercial fishermen were catching anadromous fishes in the river. Few fished due to low abundance of anadromous fishes. Starting 1 April 1981 daily trips were taken to the lower river to determine if the dip net fishery for river herring had begun. On 3 April the first dip netter was interviewed at Deer Creek. It was his second trip of the 1981 season. His catch for approximately 3 hrs of fishing that day was 6 alewife. The fish trap was operated initially for two days (7 and 8 April) in an effort to determine if alosids were present in the tailrace. Normal operation (every third day) began on 8 April and continued through 15 June. Additionally the trap was operated following any day when 5 or more American shad were collected.

The trap was usually fished one half hour before sunrise to noon. Additional operation occurred if possible, whenever one or more shad were taken between 1100-1200 hr. On those days operation continued until no shad were

collected for one hour or when the presence of other fishes, particularly carp, made it impossible to handle shad.

Trap operation was similar to that described in the Operation and Maintenance Manual (Anon, 1972). Fishing time (i.e., time crowder gates were open ranged from 1 to 60 minutes) depending upon abundance of fishes; the more fish, the shorter the time. Fishing time of 30 minutes was most frequently used. An intermediate crowder gate position (12-in. opening) was used throughout the season. The crowder doors were usually closed for 5 minutes between fishing periods, depending upon abundance of fishes and the time required to process the catches.

Based on an agreement with the State of Maryland, Susquehanna Electric Company continuously released at least 5,000 cfs from Conowingo Dam from 15 April through 6 July. When the fish trap operated, this flow was discharged via Unit No. 2 turbine adjacent to the trap in an effort to attract fish to the west side of the tailrace.

Attraction velocity and flow from 7 April to 23 April were similar to those maintained in the 1977 to 1980 seasons. This was accomplished by duplicating the same house unit and weir gate settings (Table 1) used in those seasons. However, starting 26 April, weir gate settings and valve settings were changed. The following valve settings were used: valve one at full open; valve 2 at 80% open and

valve 3 half open. Weir gate elevation was changed to 6.9 ft below tailwater elevation. These changes resulted in the following: approximately a 1-ft differential in the holding channel elevation and tailrace elevation, a velocity of 1 ft/sec in the holding area, an increase of 1.8 ft that each weir gate was open from 5.1 ft below tailwater elevation to 6.9 ft below tailwater elevation and a less turbulent flow of water through the holding and trapping areas and a water velocity of 6 ft/sec over the weir gates.

Morpholine was scheduled for release from the fish trap during a 24-hour period every sixth day starting 8 April 1981. However, on 20 April equipment malfunction prevented scheduled release until 17 May. This chemical was used by the Pennsylvania Fish Commission to imprint larval shad reared at their Van Dyke Hatchery (Thompsontown, Pa) and stocked in Susquehanna River tributaries. It was hoped that adults resulting from these introductions would be attracted to the fish trap by morpholine release.

Fishes were processed as described by McGhan (1977) and sorted in a 1.8 x 3.7 x 1.2 m tank supplied with running river water. Fishes were counted or subsampled and released to the tailrace. When mortalities due to overcrowding in the holding facility were likely, the number of fish of each species was estimated and the catch was released.

American shad were dip netted from the sorting tank into a circular 6 -ft diameter tank supplied continuously with river water. Healthy, actively swimming fish were either tagged with Floy anchor tags or fin clipped (left pelvic fin). All shad were observed prior to release to determine their condition, and healthy individuals were released into the tailrace via a water filled pipe. Length, weight, sex, and spawning condition were determined. Scale samples of the captured American shad were taken when possible.

Length, weight, sex and scale samples were also taken from blueback herring, alewife, striped bass, and striped bass x white bass hybrid. Common names of fishes (Bailey et al. 1970) are used throughout the text and tables. A list of common and scientific names is given in Table 2.

River flow and water temperature during trap operation are summarized in Figure 2. Daily river flows ranged from 16,400 to 89,600 cfs. Flow fluctuated among days but generally decreased from April through June. Temperature ranged from 55.4 to 75.5F and generally increased through the season.

## RESULTS AND DISCUSSION

In 37 days of fish trap operation 1,353,313 fish representing 12 families and 49 species were caught in 490 lifts with a total fishing time of 178 hours (Table 3). Predominate species were gizzard shad , white perch ,

channel catfish , carp and American eel . Alosids , (alewife, blueback herring, American shad, and hickory shad) comprised a small portion of the total catch.

The total catch of blueback herring and alewife was 618 and 129 fish, respectively. Most blueback herring were collected on 12 April. One hickory shad was collected on 23 April.

A total of 328 American shad was collected (Table 3, Figure 3). Seven of these had been previously captured and marked at the trap. Two American shad were collected on 28 May and 2 June that were tagged by the State of Maryland. We should caution using these data for estimating the efficiency of the trap because of the known behavior of the American shad after handling and tagging.

Most American shad (300) were captured at the fish trap from 26 May to 7 June. Water temperature was 66.5 F on 26 May and generally increased to a high of 73.0 F on 4 June. On 31 May and 1 June a total of 51 and 55 American shad were collected, respectively. These fish were not transported to upstream areas upon the advice of Susquehanna Anadromous Fish Advisory Committee. Also, a large percentage of these fish were partially spent and/or spent as was the case with most shad collected during this period.

Observations were made on the behavior and catch of American shad relative to the presence of carp (5 to 20 lbs).



When a large number of carp occupied the area at the face of the dam catches of American shad tapered off as did the catches of other fishes. On one occasion 3 American shad were observed in the holding channel of the trap during a period when carp were just starting to occupy this area and entered the trap in large numbers (+500). After lifting and sorting the catch, no American shad were found. It was also noted that mortality of American shad was higher when carp were abundant in the sample than at other times throughout the season. On these occasions trap operations had to be discontinued to protect the American shad.

A total of 284 American shad was floy tagged at the fish trap. Twelve were recaptured (Table 4); seven were recaptured at the trap and one of those was recaptured twice. One return came from an angler fishing the west shore of the tailrace. The remaining 5 were returned from commercial fishermen who collected the fish from locations outside the tailrace.

Maintenance of proper attraction velocity has been a major concern since the fish lift began operating in 1972. Starting in 1977 the intent was to maintain an average attraction velocity of 6 fps at the facility. However, some recent velocity measurements in 1981 indicate that this velocity may not have been maintained in all previous years. In 1977 to 1980 the attraction velocities were measured with

a calibrated General Oceanic Model 2030 digital flow meter. However, this meter was calibrated at velocities much lower than those created at the fish trap and was used from 1972 to 1976 during velocity studies. In 1980, discussions with USFWS engineer Jim Dalley concerning attraction velocities at the facility created further doubt regarding reliability of the velocity measurements obtained by the General Oceanics meter.

Therefore, on 23 and 26 April 1981 three different flow and/or current meters were used to determine the actual attraction velocities and provide an additional check on the flow meters. General Oceanics Model 2030 digital meter, Marsh-McBirney Model 201 portable water current meter and Endeco Type 110 remote reading current meter was tested. Measurements of velocities from the Marsh-McBirney and Endeco current meters were similar (Table 5). However, the velocity measurements from the General Oceanic meter were 5 to 6 fps lower than those obtained using the other two meters. Based on these measurements the mode of operation at the fish trap was changed to obtain the desired 6fps attraction velocity given in the Methods Section of this report. It seems that the new mode of operation, implemented on 26 April 1981, resulted in the daily total catch increasing by at least a factor of two. It is also interesting to note that with the American shad population

at or near an all time low in the Susquehanna River, the fish trap collected a larger number of American shad in 1981 than in other years. In 1982, additional velocity measurements will be taken to provide further support for the above observations and to maintain the desired attraction velocity.

#### LITERATURE CITED

- Anonymous. 1972. Conowingo Dam Fish Collection Facility Operation and Maintenance Manual. Prepared for Philadelphia Electric Company, 24 p.
- Bailey, R. M., J. E. Fitch, E. S. Herald, E. A. Lachner, C. C. Lindsey, C. R. Robins and W. B. Scott. 1970. A list of common and scientific names of fishes from the United States and Canada (third edition). Amer. Fish. Soc. Spec. Publ. No. 6:150 p.
- Kotkas, E. and T. W. Robbins. 1976. Studies of the American shad, Alosa sapidissima, in the lower Susquehanna River below Conowingo Dam (Maryland), 1972-1976. Paper presented at the 1976 Atlantic Estuarine Research Society Fall Meeting, Cape May, New Jersey, October 14-16, 1976.
- McGhan, G. L. 1977. Summary of the operation of the Conowingo Dam Fish Collection Facility during the spring of 1977. Ichthyological Associates, Inc., Drumore, Pa., Fish Facility Operation Report 6, prepared for Philadelphia Electric Company, 69 p.
- McGhan, G. L. 1978. Summary of the operation of the Conowingo Dam Fish Collection Facility during the spring of 1978. RMC Ecological Division, Drumore, Pa., Fish Facility Operation Report 7, prepared for Philadelphia Electric Company, 37 p.
- Radiation Management Corporation. 1979. Summary of the Operation of the Conowingo Dam Fish Collection Facility during the spring of 1979. RMC-Muddy Run Ecological Laboratory, Drumore, Pa., Fish Facility Operation Report 8, prepared for Philadelphia Electric Company, 28 p.
- Radiation Management Corporation. 1980. Summary of the Operation of the Conowingo Dam Fish Collection Facility during the spring of 1980. RMC-Muddy Run Ecological Laboratory, Drumore, Pa., Fish Facility Operation Report 9, prepared for Philadelphia Electric Company, 15 p.

TABLE 1

Flow schedule used to obtain attraction velocities at the Conowingo Dam Fish Collection Facility from 7 April to 23 April 1981. Flows similar to those used in 1977 to 1980 (see text for explanation).

Condition	Service Unit Gate Setting		Flows cfs	Entrance Weir Depth Below Tailrace	Setting Velocity (ft/sec)
	No. 1	No. 2			
High Flow	35%	75%	265	5.1	6.0
Low Flow	35%	35%	150	3.1	6.0
Low Low Flow	35%	0%	75	1.7	6.0

TABLE 2. List of scientific and common names of fishes collected in the Conowingo Dam Fish Collection Facility, 1981, (according to Baily, et al., 1970).

Scientific Name	Common Name
Family - Petromyzontidae	Lampreys
<u>Petromyzon marinus</u>	Sea lamprey
Family - Anguillidae	Freshwater eels
<u>Anquilla rostrata</u>	American eel
Family - Clupeidae	Herrings
<u>Alosa aestivalis</u>	Blueback herring
<u>Alosa mediocris</u>	Hickory shad
<u>Alosa pseudoharengus</u>	Alewife
<u>Alosa sapidissima</u>	American shad
<u>Brevoortia tyrannus</u>	Atlantic menhaden
<u>Dorosoma cepedianum</u>	Gizzard shad
Family - Salmonidae	Trouts
<u>Salmo gairdneri</u>	Rainbow trout
<u>Salmo trutta</u>	Brown trout
<u>Salvelinus fontinalis</u>	Brook trout
<u>S. fontinalis</u> x	
<u>S. namaycush</u>	Splake
Family - Esocidae	Pikes
<u>Esox niger</u>	Chain pickerel
<u>Esox lucius</u>	Northern pike
<u>Esox masquinongy</u>	Muskellunge
<u>E. masquinongy</u> x	
<u>E. lucius</u>	Tiger muskie
Family - Cyprinidae	Minnows and carps
<u>Carassius auratus</u>	Goldfish
<u>Cyprinus carpio</u>	Carp
<u>Notemimonus crysoleucas</u>	Golden shiner
<u>Notropis amoenus</u>	Comely shiner
<u>Notropis hudsonius</u>	Spottail shiner
<u>Notropis procne</u>	Swallowtail shiner
<u>Notropis spilopterus</u>	Spotfin shiner

continued

TABLE 2. Continued.

Scientific Name	Common Name
Family - Catostomidae	Suckers
<u>Carpionodes cyprinus</u>	Quillback
<u>Catostomus commersoni</u>	White sucker
<u>Erimyzon oblongus</u>	Creek chubsucker
<u>Hypentelium nigricans</u>	Northern hogsucker
<u>Moxostoma macrolepidotum</u>	Shorthead redhorse
Family - Ictaluridae	Freshwater catfishes
<u>Ictalurus catus</u>	White catfish
<u>Ictalurus natalis</u>	Yellow bullhead
<u>Ictalurus nebulosus</u>	Brown bullhead
<u>Ictalurus punctatus</u>	Channel catfish
Family - Belontiidae	Needlefishes
<u>Strongylura marina</u>	Atlantic needlefish
Family - Percichthyidae	Temperate basses
<u>Morone americana</u>	White perch
<u>Morone saxatilis</u>	Striped bass
<u>M. saxatilis</u> x	
<u>M. chrysops</u>	Striped bass x
	White bass
Family - Centrarchidae	Sunfishes
<u>Ambloplites rupestris</u>	Rock bass
<u>Lepomis auritus</u>	Redbreast sunfish
<u>Lepomis cyanellus</u>	Green sunfish
<u>Lepomis gibbosus</u>	Pumpkinseed
<u>Lepomis macrochirus</u>	Bluegill
<u>Micropterus dolomieu</u>	Smallmouth bass
<u>Micropterus salmoides</u>	Largemouth bass
<u>Pomoxis annularis</u>	White crappie
<u>Pomoxis nigromaculatus</u>	Black crappie
Family - Percidae	Perches
<u>Etheostoma olmstedii</u>	Tessellated darter
<u>Perca flavescens</u>	Yellow perch
<u>Stizostedion vitreum</u>	Walleye
<u>Percina caprodes</u>	Log perch
<u>Percina peltata</u>	Shield darter

TABLE 3

CONOWINGO DAM FISH COLLECTION FACILITY - 1981 DAILY CATCH SUMMARY (see text for explanation of changed mode of fish trap operation).

DATE	04/07/81	04/08/81	04/11/81	04/12/81	04/14/81	04/17/81	04/20/81	04/23/81
NO. LIFTS	9	10	4	11	12	10	13	14
FIRST LIFT	605	630	545	535	527	520	520	520
LAST LIFT	1200	1200	735	1200	1200	1200	1200	1200
OPERATING TIME	5.42	5.50	1.83	6.42	6.55	6.67	6.67	6.67
FISHING TIME(HR)	3.33	3.75	0.75	4.25	3.95	4.75	4.58	3.93
AVE RIVER FLOW	26.7	25.8	24.5	24.8	40.9	62.8	45.8	33.4
AVE WATER TEMP.	56.0	55.5	58.0	59.0	58.0	55.4	56.5	57.0
MORPHOLINE USED?	NO	YES	NO	NO	YES	NO	YES	NO
AMERICAN EEL	39	201	25	-	19	7	12	11
BLUEBACK HERPING	-	8	10	218	4	-	-	2
HICKORY SHAD	-	-	-	-	-	-	-	1
ALBATEL	1	1	2	2	1	1	15	9
AMERICAN SHAD	-	1	-	1	1	-	2	-
GIZZARD SHAD	190	994	1139	5077	3218	2107	6427	7183
ATLANTIC MENHADEN	-	-	-	-	-	-	-	-
RAINBOW TROUT	-	1	1	-	-	-	-	-
BROWN TROUT	2	1	-	1	2	-	7	2
BROOK TROUT	-	-	-	-	-	-	-	-
SHOKE	-	-	-	-	-	-	-	-
CHAIN PICKEREL	-	-	-	-	-	-	-	-
MUSKELLUNGE	-	-	-	-	-	-	-	-
GOLDFISH	-	-	-	-	-	-	-	-
CARP	1	-	-	20	9	8	36	6
GOLDEN SHINER	1	-	1	1	-	-	-	-
COMELY SHINER	-	-	-	-	-	-	-	-
SPOTTAIL SHINER	-	-	-	10	12	-	9	-
SMALLMOUTH SHINER	-	-	-	-	-	-	-	-
SPOTFIN SHINER	-	-	-	-	-	-	-	-
QUILLBACK	-	-	-	-	-	-	-	-
WHITE SUCKER	50	92	11	38	25	11	36	17
CREEK CHUBSUCKER	-	-	-	-	-	-	-	-
NORTHERN HOG SUCKER	-	-	-	-	-	-	-	-
SHORTHEAD REDHORSE	4	8	-	1	5	16	262	180
WHITE CATFISH	-	-	-	-	-	-	-	-
YELLOW BULLHEAD	-	-	-	-	-	-	-	-
BROWN BULLHEAD	-	-	-	-	-	-	-	-
CHANNEL CATFISH	79	56	33	43	24	84	183	96
WHITE PERCH	1	51	360	251	878	520	580	6252
STRIPED BASS	-	-	-	-	-	-	-	-
ROCK BASS	2	1	-	-	-	-	-	-
REDBREAST SUNFISH	-	-	-	-	-	-	1	-
GREEN SUNFISH	-	-	-	-	-	-	-	-
PUMPKINSEED	-	2	-	10	-	-	1	-
BLUEGILL	-	-	2	-	6	5	-	-
SMALLMOUTH BASS	-	5	4	19	-	-	12	7
LARGEMOUTH BASS	2	-	1	-	-	-	-	-
WHITE CRAPPIE	2	-	8	-	-	2	6	10
BLACK CRAPPIE	2	-	1	2	1	-	-	-
TESSELATED DARTER	-	-	-	-	-	-	2	-
YELLOW PERCH	16	18	75	18	31	10	3	-
LOGPERCH	-	-	-	-	-	-	-	-
SHIELD DARTER	-	-	-	-	1	-	-	-
WALLEYE	20	19	2	16	21	7	25	15
ATLANTIC NEEDLEFISH	-	-	-	-	-	-	-	-
SEA LAMPREY	-	-	-	2	-	2	1	3
STRIPED BASS X WHITE BASS	1	1	-	-	-	1	5	14
TIGER MUSKIE	-	3	-	4	1	-	1	1
HYBRIDS	-	-	-	-	-	-	-	-
*****	*****	*****	*****	*****	*****	*****	*****	*****
	413	1463	1675	5734	4259	2781	7626	13809

(5)



TABLE 3

Continued.

DATE	04/26/81	04/29/81	05/02/81	05/05/81	05/08/81	05/11/81	05/13/81	05/14/81
NO. LIFTS	18	14	12	13	23	13	2	13
FIRST LIFT	505	515	458	450	450	510	950	520
LAST LIFT	1155	1200	1200	1200	1200	1210	1035	1140
OPERATING TIME	6.83	6.75	7.03	7.17	7.17	7.00	0.75	6.33
FISHING TIME(HR)	3.13	4.50	5.08	4.35	3.17	4.42	0.50	4.08
AVE RIVER FLOW	31.0	35.0	89.6	49.0	34.5	25.3	40.1	74.6
AVE WATER TEMP.	57.0	59.0	59.0	58.0	59.0	61.0	61.0	62.0
MORPHOLINE USED?	NO	NO	NO	NO	NO	NO	NO	NO
AMERICAN EEL	13	-	16	10	22	1	15	1
BLUEBACK HERRING	1	-	3	2	6	-	-	3
HICKORY SHAD	-	-	-	-	-	-	-	-
ALEWIFE	2	6	56	2	18	-	-	2
AMERICAN SHAD	-	-	-	-	-	-	-	3
GIZZARD SHAD	32740	21351	17341	32244	60450	30714	18100	58000
ATLANTIC MENHADEN	-	-	-	-	-	-	-	-
PAINOW TROUT	-	2	1	1	-	1	-	200
BROWN TROUT	6	3	3	5	4	4	-	2
BROOK TROUT	-	1	-	-	1	-	-	-
TROUT	-	-	-	-	-	-	-	-
CHAIN PICKEREL	-	-	-	-	-	-	-	-
MUSKELLUNGE	-	-	-	-	-	-	-	-
GOLDFISH	-	-	-	1	-	-	-	-
CARP	1	1	310	16	11	9	-	42
GOLDEN SHINER	-	1	-	2	-	-	-	-
COMELY SHINER	-	-	-	-	-	-	-	-
SPOTTAIL SHINER	-	-	-	-	-	-	-	-
SMALLMOUTH SHINER	-	-	-	-	-	-	-	-
SPOTFIN SHINER	-	-	-	-	-	-	-	-
OJILLBACK	-	-	-	-	1	-	-	77
WHITE SUCKER	50	163	66	40	50	16	-	43
CREEK CHUBSUCKER	-	-	-	-	-	-	-	-
NORTHERN HOG SUCKER	-	1	-	-	-	-	-	-
SHORTHEAD REDHORSE	78	450	1326	241	272	602	55	353
WHITE CATFISH	-	-	-	-	-	16	-	-
YELLOW BULLHEAD	-	-	-	-	-	-	-	-
BROWN BULLHEAD	-	-	-	-	6	6	-	6
CHANNEL CATFISH	84	143	1775	268	195	235	125	700
WHITE PERCH	6377	8920	4645	998	6245	9754	1500	2250
STRIPED BASS	-	-	-	-	-	-	-	1
ROCK BASS	-	1	1	-	3	58	15	6
REDBREAST SUNFISH	-	-	-	-	1	-	15	1
GREEN SUNFISH	-	-	-	-	-	-	-	-
PUMPKINSEED	-	-	1	-	2	6	15	-
BLUEGILL	2	-	5	1	4	11	15	-
SMALLMOUTH BASS	3	29	37	3	49	21	1	22
LARGemouth BASS	-	1	-	2	-	-	-	-
WHITE CRAPPIE	13	3	3	5	10	3	2	6
BLACK CRAPPIE	2	-	-	-	2	2	-	-
TESSELLATED DARTER	-	-	-	-	-	-	-	-
YELLOW PERCH	1	11	-	1	2	16	-	1
LOGPERCH	-	-	-	-	-	-	-	-
SHIELD DARTER	-	-	-	-	-	-	-	-
WALLEYE	9	14	14	14	37	51	7	46
ATLANTIC NEEDLEFISH	-	-	-	-	-	-	-	-
SEA LAMPREY	3	-	3	2	4	9	-	7
STRIPED BASS X WHITE BASS	2	-	2	-	3	-	-	2
TIGER MUSKIE	1	1	1	-	-	-	-	2
HYBRIDS	-	-	-	-	-	-	-	-
*****	*****	*****	*****	*****	*****	*****	*****	*****
	39388	31102	25609	33858	67398	41535	19865	61776

TABLE 3

Continued.

DATE	05/17/81	05/20/81	05/23/81	05/26/81	05/27/81	05/28/81	05/29/81	05/30/81
NO. LIFTS	14	14	14	14	13	17	10	15
FIRST LIFT	430	420	415	415	415	415	415	412
LAST LIFT	1200	1240	1200	1130	1045	1305	1000	1330
OPERATING TIME	7.50	8.33	7.75	7.25	6.50	8.83	5.75	9.30
FISHING TIME (HR)	3.75	5.42	5.08	5.33	4.17	5.67	3.75	5.83
AVE RIVER FLOW	63.8	50.7	32.3	21.8	20.3	18.1	20.8	20.6
AVE WATER TEMP.	62.0	62.0	62.3	66.5	64.5	68.9	71.0	71.0
MORPHOLINE USED?	YES	NO	NO	NO	NO	NO	YES	NO
AMERICAN EEL	7	17	24	42	130	390	155	300
BLUEBACK HERRING	-	1	17	13	3	15	3	28
HICKORY SHAD	-	-	-	-	-	-	-	-
ALEWIFE	-	4	1	1	2	2	-	-
AMERICAN SHAD	2	1	2	13	36	28	8	23
GIZZARD SHAD	105150	48966	62568	24404	37913	55928	48248	100100
ATLANTIC MENHADEN	-	-	-	-	-	-	-	-
RAINBOW TROUT	1	-	1	-	2	-	-	-
BROWN TROUT	6	9	7	3	8	5	22	8
BROOK TROUT	-	-	1	-	-	-	-	-
TROUT	-	-	-	2	-	-	-	-
CHAIN PICKEREL	-	-	-	-	-	-	-	-
MUSKELLUNGE	1	-	-	-	-	-	-	-
GOLDFISH	-	-	-	-	-	-	-	-
CARP	351	92	319	479	1403	1799	415	175
GOLDEN SHINER	4	1	1	5	3	4	13	18
COMELY SHINER	-	1	-	-	-	-	-	-
SPOTTAIL SHINER	-	-	-	-	-	-	-	-
SMALLTAIL SHINER	-	-	-	-	-	-	-	-
SPOTFIN SHINER	-	-	-	-	5	20	-	-
GULLBACK	61	2	-	100	1320	360	171	15
WHITE SUCKER	140	25	10	14	45	150	73	87
CREEK CHUBSUCKER	-	-	-	-	-	-	-	-
NORTHERN HOG SUCKER	-	-	-	-	-	-	-	-
SHORTHEAD REDHORSE	315	118	126	264	645	475	185	179
WHITE CATFISH	11	112	58	28	21	5	31	5
YELLOW BULLHEAD	1	4	3	-	2	-	-	-
BROWN BULLHEAD	2	7	26	11	45	65	5	5
CHANNEL CATFISH	910	991	695	1349	1120	5048	4638	4018
WHITE PERCH	1025	1217	7720	9536	1102	2455	2444	1832
STRIPED BASS	-	1	2	3	1	2	6	7
ROCK BASS	49	11	19	7	27	20	26	28
REDBREAST SUNFISH	23	10	24	37	26	15	21	45
GREEN SUNFISH	-	-	-	1	-	-	-	-
PUMPKINSEED	20	-	-	13	5	10	1	24
BLUEGILL	29	14	9	21	65	75	59	53
SMALLMOUTH BASS	24	7	62	109	54	158	68	56
LARGEMOUTH BASS	-	-	1	-	-	1	-	-
WHITE CRAPPIE	2	1	11	2	8	2	4	9
BLACK CRAPPIE	-	-	-	-	-	-	-	-
TESSELLATED DARTER	-	-	-	-	-	-	-	-
YELLOW PERCH	14	3	6	18	7	10	22	21
LOGPERCH	-	-	1	-	-	-	-	-
SHIELD DARTER	-	-	-	-	-	-	-	-
MALLEYE	28	31	58	76	66	183	159	145
ATLANTIC NEEDLEFISH	-	-	-	-	1	1	-	-
SEA LAMPREY	13	2	3	-	-	-	-	1
STRIPED BASS X WHITE BASS	-	-	-	-	-	-	-	-
TIGER MUSKIE	-	-	21	7	1	-	2	-
HYBRIDS	-	-	1	-	2	-	-	-
=====	108189	51648	71797	36558	44068	67226	56779	107182

TABLE 3

Continued.

DATE	05/31/81	06/01/81	06/02/81	06/03/81	06/04/81	06/05/81	06/06/81	06/07/81
NO. LIFTS	23	14	14	14	19	13	21	14
FIRST LIFT	401	404	405	409	415	409	415	420
LAST LIFT	1655	1123	1315	1114	1958	1111	1915	1300
OPERATING TIME	12.90	7.32	9.17	7.08	15.72	7.03	15.00	8.67
FISHING TIME (HR)	9.67	5.67	2.75	5.75	7.50	5.75	8.33	6.75
AVE RIVER FLOW	23.2	18.8	17.5	17.7	16.4	19.1	23.8	27.6
AVE WATER TEMP.	72.0	71.0	72.0	72.0	73.0	73.0	73.0	73.0
MORPHOLINE USED?	NO	NO	NO	NO	YES	NO	NO	YES
AMERICAN EEL	1175	906	4729	525	2258	40	120	27
BLUEBACK HERRING	34	11	39	45	8	17	40	27
HICKORY SHAD	-	-	-	-	-	-	-	-
ALBIE	1	-	-	-	-	-	-	-
AMERICAN SHAD	51	55	11	18	12	21	18	5
GIZZARD SHAD	72144	14330	38408	16566	38668	7792	41712	19894
ATLANTIC MENHADEN	-	-	-	10	-	-	-	1
RAINBOW TROUT	3	-	-	-	-	-	4	-
BROWN TROUT	37	10	1	24	7	2	4	4
BROOK TROUT	-	-	-	-	-	-	-	-
TROUT	-	-	-	-	-	-	-	-
CHAIN PICKEREL	1	-	-	-	-	-	-	-
MUSKELLUNGE	-	-	-	-	-	-	-	-
GOLDFISH	-	-	-	-	-	-	-	-
CARP	2097	663	746	1201	1751	799	2138	160
GOLDEN SHINER	4	1	-	9	21	32	5	18
COMELY SHINER	150	125	-	-	-	-	5	-
SPOTTAIL SHINER	-	-	-	-	-	-	-	-
SMALLTAIL SHINER	-	-	-	-	-	-	2	1
SPOTFIN SHINER	120	75	-	-	-	-	-	4
GULLBACK	295	261	200	371	5	128	45	-
WHITE SUCKER	44	2	35	20	9	-	11	-
CREEK CHUBSUCKER	-	-	-	-	-	-	4	-
NORTHERN HOG SUCKER	-	-	-	-	-	-	-	-
SHORTHEAD PEOHORSE	175	132	45	-	16	-	-	-
WHITE CATFISH	22	220	232	275	404	151	88	17
YELLOW BULLHEAD	-	-	16	-	-	-	-	5
BROWN BULLHEAD	9	19	85	20	15	68	6	21
CHANNEL CATFISH	1819	3852	4419	2619	5569	3164	1429	588
WHITE PERCH	1452	702	544	734	725	210	514	407
STRIPED BASS	19	33	73	113	120	317	310	331
ROCK BASS	21	7	8	-	6	18	10	-
POPBREAST SUNFISH	116	25	54	22	60	64	82	73
GREEN SUNFISH	-	-	-	-	-	-	-	2
PUMPKINSEED	47	-	5	2	2	18	5	22
BLUEGILL	67	54	34	27	74	72	75	66
SMALLMOUTH BASS	48	26	1	-	-	11	3	33
LARGEMOUTH BASS	1	-	1	1	1	-	-	-
WHITE CRAPPIE	15	2	6	12	18	10	-	13
BLACK CRAPPIE	2	-	-	1	-	2	-	1
TESSELLATED DARTER	-	-	-	-	-	-	-	-
YELLOW PERCH	132	46	8	45	17	42	16	68
LOGPERCH	-	-	-	-	-	-	-	-
SHIELD DARTER	-	-	-	-	-	-	-	-
WALLEYE	146	127	306	99	139	79	204	116
ATLANTIC NEEDLEFISH	-	-	-	-	-	-	-	-
SEA LAMPREY	-	-	-	-	-	-	-	-
STRIPED BASS X WHITE BASS	1	-	1	2	1	1	-	-
TIGER MUSKIE	3	-	-	1	1	-	1	-
HYBRIDS	2	-	-	-	-	-	-	-
	80253	21684	50007	22762	49907	13058	46851	21904

108  
180  
298

TABLE 3

Continued.

DATE	06/08/81	06/10/81	06/11/81	06/13/81	06/15/81	TOTALS
NO. LIFTS	9	11	13	14	9	490
FIRST LIFT	415	415	404	405	420	
LAST LIFT	1155	1103	1128	1149	1030	
OPERATING TIME	7.67	6.80	7.40	7.73	6.17	275.13
FISHING TIME(HR)	6.25	5.28	5.25	6.25	5.25	177.97
AVE RIVER FLOW	26.3	20.1	19.8	25.6	23.1	
AVE WATER TEMP.	73.4	75.0	75.0	75.5	74.0	
MORPHOLINE USED?	NO	YES	NO	NO	YES	
<hr/>						
AMERICAN EEL	-	12	18	39	23	11,329
BLUEBACK HERRING	5	45	10	-	-	618
HICKORY SHAD	-	-	-	-	-	1
ALEWIFE	-	-	-	-	-	129
AMERICAN SHAD	4	5	3	3	1	328
GIZZARD SHAD	17844	21230	39156	31264	17102	1,156,662
ATLANTIC MENHADEN	-	-	3	-	28	42
RAINBOW TROUT	-	1	-	-	-	219
BROWN TROUT	4	-	-	4	-	207
BROOK TROUT	-	-	-	-	-	3
TROUT	-	-	-	-	-	2
CHAIN PICKEREL	-	-	-	-	-	1
MUSKELLUNGE	-	-	-	-	-	1
GOLDFISH	-	-	-	-	-	1
CARP	937	384	616	35	1283	18,313
GOLDEN SHINER	-	-	10	-	-	155
COMMON SHINER	-	-	-	-	-	281
SPOTTAIL SHINER	-	-	-	-	-	31
SMALLMOUTH SHINER	-	-	-	-	-	3
SPOTFIN SHINER	300	-	-	-	-	524
QUILLBACK	25	135	20	-	30	3,622
WHITE SUCKER	13	6	-	2	-	1,394
CATFISH	-	-	-	-	-	4
NORTHERN HOG SUCKER	-	-	-	-	-	1
SHORTHEAD REDHORSE	-	-	5	-	-	6,533
WHITE CATFISH	135	105	46	151	66	2,199
YELLOW BULLHEAD	5	-	-	-	-	36
BROWN BULLHEAD	10	10	4	45	35	531
CHANNEL CATFISH	1820	1174	1359	2781	2043	55,528
WHITE PERCH	192	349	392	164	65	83,363
STRIPED BASS	230	291	567	389	461	3,277
ROCK BASS	-	9	5	8	15	381
REDBREAST SUNFISH	25	58	49	66	94	1,007
GREEN SUNFISH	1	20	-	-	5	29
PUMPKINSEED	18	23	13	21	20	306
BLUEGILL	63	58	104	186	43	1,299
SMALLMOUTH BASS	6	-	-	1	1	880
LARGEMOUTH BASS	-	-	1	-	-	13
WHITE CRAPPIE	5	2	25	3	8	231
BLACK CRAPPIE	-	-	-	-	2	20
TESSSELLATED DARTER	-	-	-	-	-	2
YELLOW PERCH	85	18	29	164	33	1,007
LOGPERCH	-	-	-	-	-	1
SHIELD DARTER	-	-	-	-	-	1
WALLEYE	55	114	99	33	64	2,644
ATLANTIC NEEDLEFISH	-	-	-	-	-	2
<hr/>						
SEA LAMPREY	-	-	-	-	-	55
STRIPED BASS X WHITE BASS	-	-	-	1	1	39
TIGER MUSKIE	1	-	-	-	-	53
HYBRIDS	-	-	-	-	-	5
=====	=====	=====	=====	=====	=====	=====
	21783	24049	42534	35360	21423	1,353,313

328  
256

TABLE 4

Capture-recapture data on American shad tagged at the Conowingo Dam Fish Collection Facility, 1981.

Date Tagged	Date Recaptured	Tagging Location	Recapture Location	Gear Type
5-27-81	5-31-81	Cono. Dam	Cono. Dam	FL
5-27-81	5-10-81	Cono. Dam	Cono. Dam	FL
5-27-81	6-7-81	Cono. Dam	Cono. Tailrace	HL
5-28-81*	6-4-81	Cono. Dam	Cono. Dam	FL
5-28-81*	6-11-81	Cono. Dam	Cono. Dam	FL
5-31-81	6-7-81	Cono. Dam	Cono. Dam	FL
5-31-81	6-10-81	Cono. Dam	Cono. Dam	FL
6-1-81	7-17-81	Cono. Dam	Cono. Dam	FL
6-2-81	6-15-81	Cono. Dam	Sus. Flats (Sandy Point)	GN
6-2-81	6-15-81	Cono. Dam	Sus. Flats (Sandy Point)	GN
6-4-81	6-15-81	Cono. Dam	Sus. River (Spencer Island)	GN
6-5-81	6-23-81	Cono. Dam	Sus. River (Spencer Island)	GN
6-7-81	6-18-81	Cono. Dam	N.E. River (Mouth)	GN

---

Gear Type Abbreviation

FL = Fish Lift  
 HL = Hook & Line  
 GN = Gill Net

\* Recaptured Twice

TABLE 5

Flow schedule and range of observed attraction velocities used at the Conowingo Dam Fish Collection Facility, 1977 to 1981. Velocity measurements taken with Marsh-McBirney and Endeco current meters.

Condition	Service Unit Gate Setting		Flows cfs	Entrance Weir Depth Below Tailrace	Range of Observed Velocity(ft/sec)
	No. 1	No. 2			
High Flow	35%	75%	265	5.1	11.0 to 12.0
Low Flow	35%	35%	150	3.1	10.5 to 11.5
High Flow	35%	75%	265	6.9	5.5 to 6.5
Low Flow	35%	35%	150	5.1	5.5 to 6.5

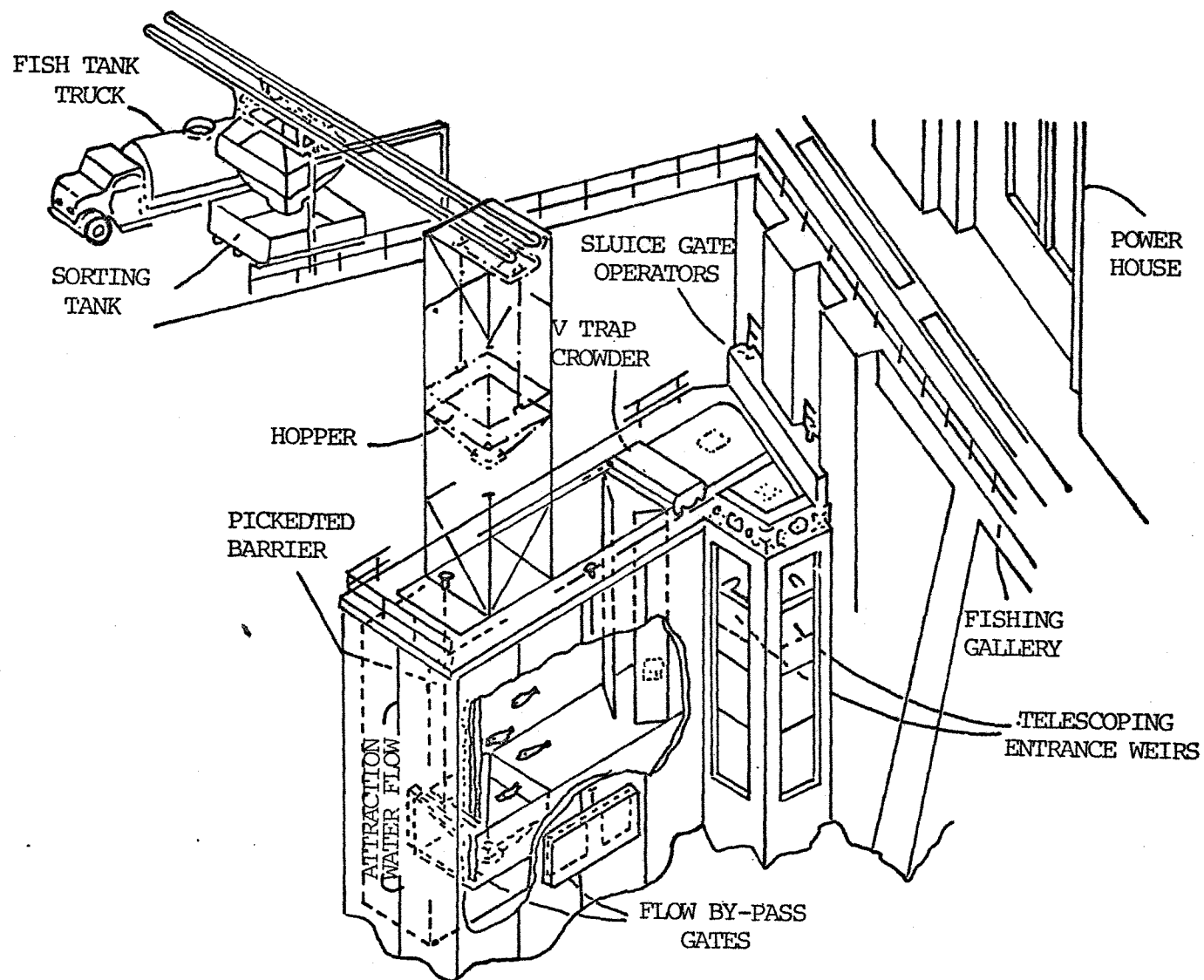


FIGURE 1

Schematic drawing of Conowingo Dam Fish Collection Facility, Anonymous (1972).

River flow (F) and water temperature (T) 7 April to 15 June 1981.





River flow (F) and water temperature (T) / April to 15 June 1981.

5.14

N = No  
Y = Yes