

SUMMARY

From the data presently available it appears that striped bass fingerlings can be successfully reared in troughs. Trough culture allows the biologist to control the following factors:

1. The diet and amount of feed used can be controlled.
2. Mortality can be held to a minimum by exclusion of predators.
3. Diseases and parasites can be effectively controlled before epidemic or epizootic proportions are reached.
4. Larger numbers of fish can be reared in less space.
5. Fish become adjusted to handling and mortality from shock is reduced in subsequent transportation.

At present fathead minnows appear to be the best natural food for fingerling striped bass. The major limiting factor in pond culture appears to be keeping a quantity of suitable size forage fish present.

LITERATURE CITED

- Tatum, B. L., J. D. Bayless, E. G. McCoy, and W. B. Smith. 1965. Preliminary experiments in the artificial propagation of striped bass, *Roccus saxatilis*. Presented at 19th Ann. Conf. Southeast. Assoc. Game and Fish Comm., Tulsa, Okla. (In press).

PROGRESS REPORT OF VIRGINIA'S TROUT FEE-FISHING PROGRAM

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Background

The first opportunity to launch into a fee-fishing program came in 1962 when the General Assembly of Virginia authorized the Commission of Game and Inland Fisheries to establish not more than three such streams. After having viewed similar operations in the State of Missouri, Robert G. Martin, Chief of the Fish Division, made initial preparations for the opening of Virginia's first fee-fishing stream in 1964. Big Tumbling Creek located in the southwestern part of the state was selected and opened on May 2 of that year. Since 1964, trout anglers have had fee-fishing available from the first Saturday in April through Labor Day each year hence. To date, only one stream has been operated in this manner.

Description of Stream

Big Tumbling Creek is a large stream ranging in width from twenty to forty feet along the 3.5 miles being utilized for the fee-fishing program. A good perennial water flow stems from sandstone soils with a small amount of shale parent material in one tributary. Two of the three tributaries of the stream are noted for wild trout production. The stream bed is made of shelving rock and round boulders creating pools and rapid falls essential for trout cover. Through one section of the stream approximately 5,500 feet in length, water cascades down 600 feet before reaching more moderate slopes. Elevations of the stream reach 3,000 feet above sea level and graduate down to 2,300 feet at the lower end. Approximately 1.7 miles of the stream is situated on private lands where perpetual public fishing rights have been obtained. The remaining 1.8 miles upstream is located on the state-owned Clinch Mountain Wildlife Management Area.

Regulations and License Requirements

Special regulations were formulated for the fee-fishing program. Unlike other trout streams in Virginia, a one-dollar fishing permit is required of all anglers regardless of age. The creel limit is set at five trout per fisherman; however, uninjured trout may be released from the hook, creating somewhat of a fish-for-fun atmosphere. All persons from age 16 through age 69 must also have a valid state, county, non-resident, or three-day trip license. The daily permit is in lieu of the trout license required on other trout streams of the state. This is the only trout stream in the state where a three-day trip license is valid (see Table I and II). Fishing hours are based on eastern standard time and vary through the season with extremes from 5:00 A.M. opening to 7:30 P.M. closing. Fishermen are required to report their daily catch at a checking station.

TABLE I. DATA COMPARISON

	1964	1965	1966
Number of days in season	156	157	157
Number of fishermen	17,887	22,314	22,632
Number of trout stocked	51,948	71,205	71,206
Preseason stocking (Included in above figure)	2,500	4,676	4,550
Number of trout caught	44,453	55,756	55,500
Percent recovery	86%	78%	78%
Catch ratio (Trout per fisherman)	2.56	2.50	2.45
Stocking rate (Trout per fisherman)	2.98	3.19	3.14
Average number of fishermen per week	756	970	1,010
Number of fishermen on holidays			
Memorial Day	281	311	181
Independence Day	226	249	289
Labor Day	132	162	231
Average number of fishermen by day of week			
Saturday	229	278	277
Sunday	200	284	272
Monday	48	71	73
Tuesday	77	86	95
Wednesday	86	102	100
Thursday	66	92	88
Friday	65	73	95
Number of camping permits sold	147	323	399
Number of campers	551	1,016	1,216
Gross receipts of Concessionaire	Not Open	\$8,492	\$9,309
Number of 3-day fishing licenses sold	N/A	N/A	546

1966

FISHERMAN SURVEY

Table II

Dates	Type of Sample	Number of Previous Trips						Type Fishing License Used						Origin of Fishermen		
		0	1	2-5	6-10	11+	Total	State	County	Non-Res.	3-Day	Under 16	Over 70	Total	Va. Res.	Non Res.
April 18-30	Weekdays 100%	305	132	352	162	36	987	815	49	13	8	108	993	961	23	984
May 2-12	Weekdays 100%	123	67	178	119	144	631	545	12	0	15	50	622	614	16	630
June 6-10	Weekdays 100%	84	25	84	49	73	315	211	12	5	16	69	313	297	17	314
June 11	Saturday 10%	0	3	7	5	1	16	11	0	1	1	3	16	14	2	16
July 5-8	weekdays 100%	123	44	87	52	128	434	291	6	22	50	65	434	365	69	434
July 10	Sunday 10%	0	2	7	1	7	17	13	0	3	0	1	17	14	3	17
August 1-5	Weekdays 100%	135	35	80	62	125	437	288	3	9	47	75	422	430	13	443
August 13	Saturday 10%	0	5	4	4	6	19	10	3	3	1	2	19	15	4	19
Percentage		27	11	28	16	18	100	77	3	2	5	13	100	95	5	100

Facilities

The stream was made accessible by an all-weather road prior to the concept of its use for fee-fishing. Being operated in conjunction with a wildlife management area, personnel and equipment are available for any needs of the fee-fishing operation. Holding ponds were constructed of concrete block and measuring 10 feet by 65 feet. This structure has a capacity of about 5,000 trout at water temperatures not exceeding 65°. With the holding pond located adjacent to the stream, a gabion dam was constructed to divert water through a six-inch pipe to the pond. The state-operated trout hatchery at Marion makes deliveries to the holding pond. Trout are transported to the stream by means of a pickup truck equipped with a 275-gallon metal tank with recirculating pump. Where buckets cannot be carried from the truck to the stream, wire cables span the distance between the road and stream using a pulley and special reel equipment to carry the buckets. A check station building (8' x 20') serves as a concession and place where permits are sold. This building has been in use since July 1, 1965.

Personnel

The field operation of the fee-fishing program is conducted by one salaried fisheries manager, assisted by a minimum of two laborers. Further assistance is furnished by personnel employed on the wildlife management area. Although not a part of the state's personnel organization, the concessionaire serves as salesman for fishing permits, camping permits and three-day trip licenses as well as creel clerk. The operation is supervised by the writer with over-all supervision coming from the Chief of the Fish Division.

Concessionaire

No concession was available in 1964. During that year, state personnel, hired on an hourly status, operated a check station in a small house trailer, where daily permits were sold and creel census was taken. The same system was followed until July 1, 1965, at which time the concessionaire, under contract, occupied the permanent building. The concessionaire has use of the building rent free with water and electricity furnished, and in return performs those functions required by the state. Fishing bait and tackle, along with those items normally available at small food stands are sold to the public. The concession is required to be open one-half hour prior to legal fishing hours and remain open until the close of fishing hours each day. Gross sales, exclusive of permits and licenses, are shown on Table I. All funds from the sale of permits and licenses are remitted to the proper agency.

Trout Stocking Procedures

Trout are stocked every day, except Sunday, after legal fishing hours. The rate of stocking is a minimum of three trout per angler based on the predicted number of fishermen for the following day. The daily stocking schedule for 1966 was prepared in advance of the season, with only minor revisions during the progress of the season. The stream is divided into three sections, each receiving trout twice a week, and more often during heavy fishing pressure. Stocking data may be reviewed on Table I.

Records, Reports and Deposits

The concessionaire is required to maintain a daily record of fishing permit sales by serial number. This record is checked every two weeks by the biologist in charge, at which time the concessionaire remits, by check, to the credit of the Treasurer of Virginia and deposit is made at a nearby bank. The fisheries manager submits weekly reports to the Chief of the Fish Division and biologist showing number of permits sold, number of trout stocked, number of trout caught, and catch ratio for each day of the week. The fisheries manager also makes daily recordings of certain weather and water data discussed elsewhere in this report.

Camping Facilities

Although not directly a part of the fee-fishing activity, a twenty-unit campground on the wildlife management area began operation July 1, 1964. Funds for the construction of the facilities was provided by the Virginia Division of Parks while game commission personnel performed the work. With trout fishing being the primary attraction at present, the operation dates for the campground are arranged so as to cater to fishermen with an opening date of April 1, and closing date of September 15 each year. The concessionaire sells daily camping permits, as an incidental function, for the Division of Parks with all funds being remitted to that agency. The charge is one dollar and fifty cents for a maximum of six persons at one camp site. The Division of Parks transfers these funds to the Game Commission for the operation and maintenance of the facility. Comparative data is shown in Table I.

Law Enforcement

Special emphasis is placed on stream patrol by the Game Warden force during the operating season. A part of this function is performed in uniform, while at times, Game Wardens patrol the stream in disguise. The following tabulation of case convictions represents the effectiveness of the law enforcement activity since first opening in 1964.

<u>Violation</u>	<u>No. Cases</u>
Fishing by illegal methods	100
Exceeding creel limit	50
Improper license	21
Fishing at unlawful hours	16
Fishing without fishing license	12
Fishing without fishing permit	12
Feeding fish	10
Fishing permit unsigned	10
Fishing on borrowed license	1
Loaning fishing license	1
Total	233

Cost of Operation

In 1966 the production cost of one catchable size trout was 26 cents. The amount realized by the state in permit sales for each trout released is 31.7 cents. The remaining 5.7 cents, after deduction for cost of production, would amount to a total surplus of \$4,058.74 to be used for other operation costs. Although the program is not active year around, the entire salary for the fisheries manager is charged against the project, with a small remaining amount being used for part-time labor.

Considering all other essential costs incurred by this program, it is evident that the receipts from the sales of the one dollar fishing permit does not pay for the total cost of operation. This was not the intention of the program. In 1964 the receipts per trout stocked was 33.4 cents, and in 1965 the receipts amounted to 31.3 cents per trout released.

Data Comparison (Table I)

Comparative data is shown in Table I for the three years of operation. Present conclusions from these data would indicate the program as becoming stabilized with definite patterns having been established. The creel census is the least valid of all data since it represents voluntary information.

1966 Fisherman Survey (Table II)

Fisheries Research Biologist, R. W. Wollitz, devised the fisherman survey which was conducted by the concessionaire and a special creel clerk during the periods indicated. This table represents the results of the actual number of fishermen polled and is not intended to represent the total fishing pressure.

1964

Data Based on Weekly Averages

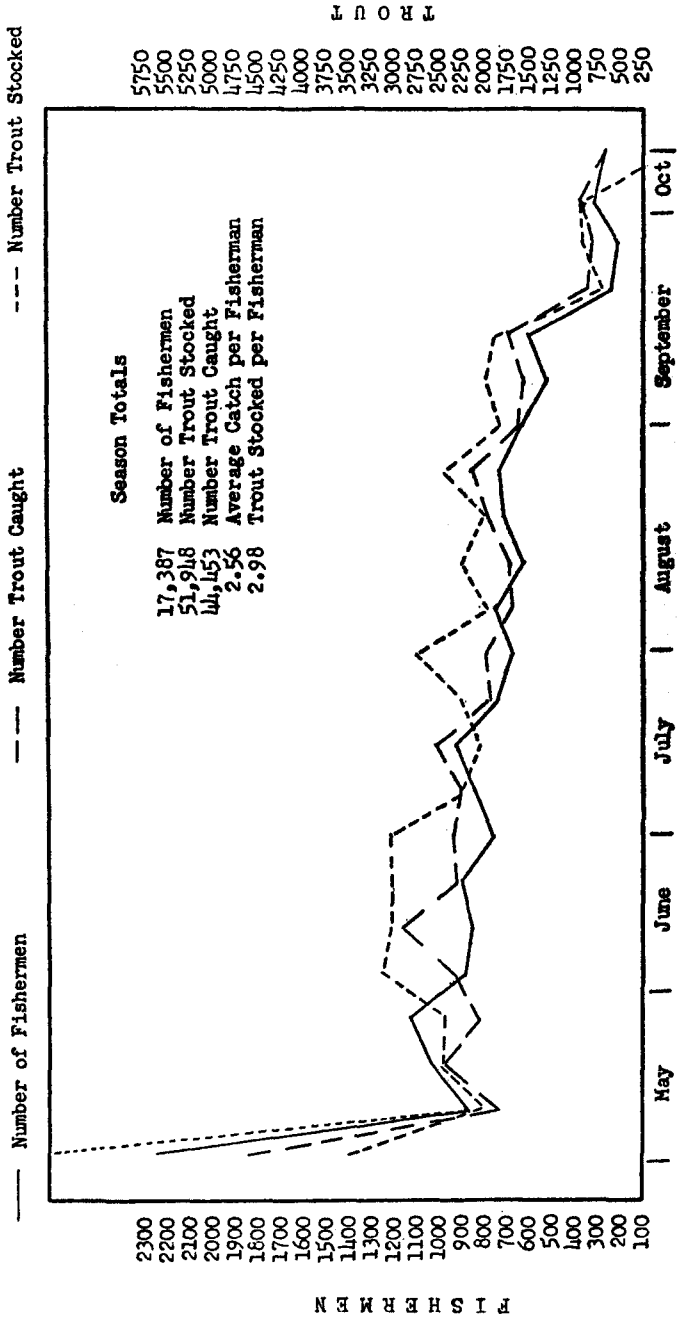


Figure I 1964

1965

Data Based on Weekly Averages

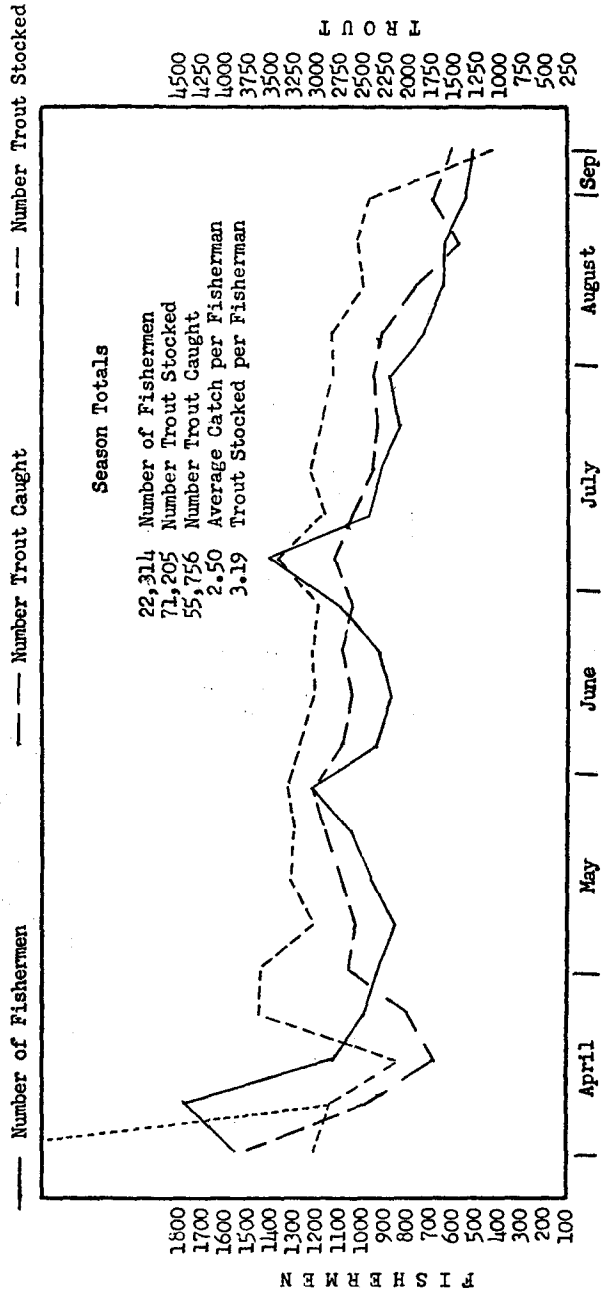


Figure II

These are graphic representations of the number of fishermen, number of trout stocked, and the number of trout caught for each season. The graph is designed to represent 2.5 trout per fisherman, which is the intended seasonal average. The line indicated by small dash, extending high on the chart, represents the preseason stocking. In 1964 it is evident that the predicted rate of stocking was more erratic than for the succeeding seasons. In 1965 and 1966 the fishing pressure

1966

Data Based on Weekly Averages

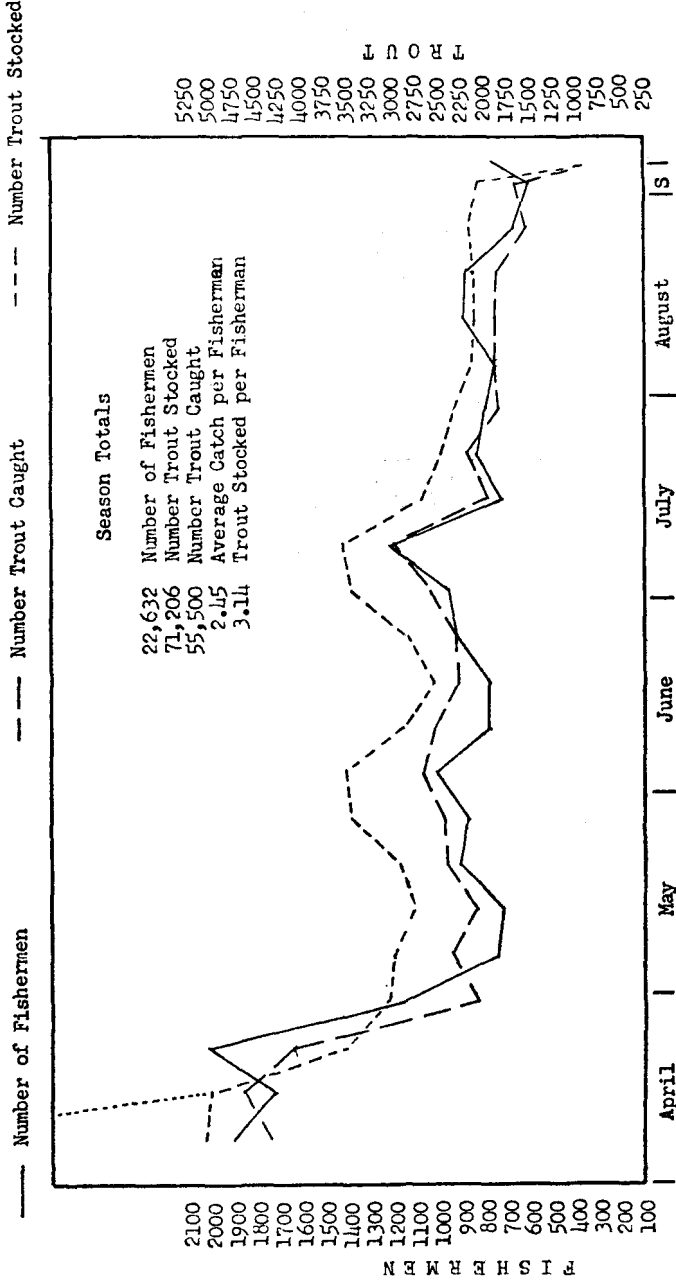


Figure III

Analysis of Figure IV

1966

Data Based on Weekly Averages

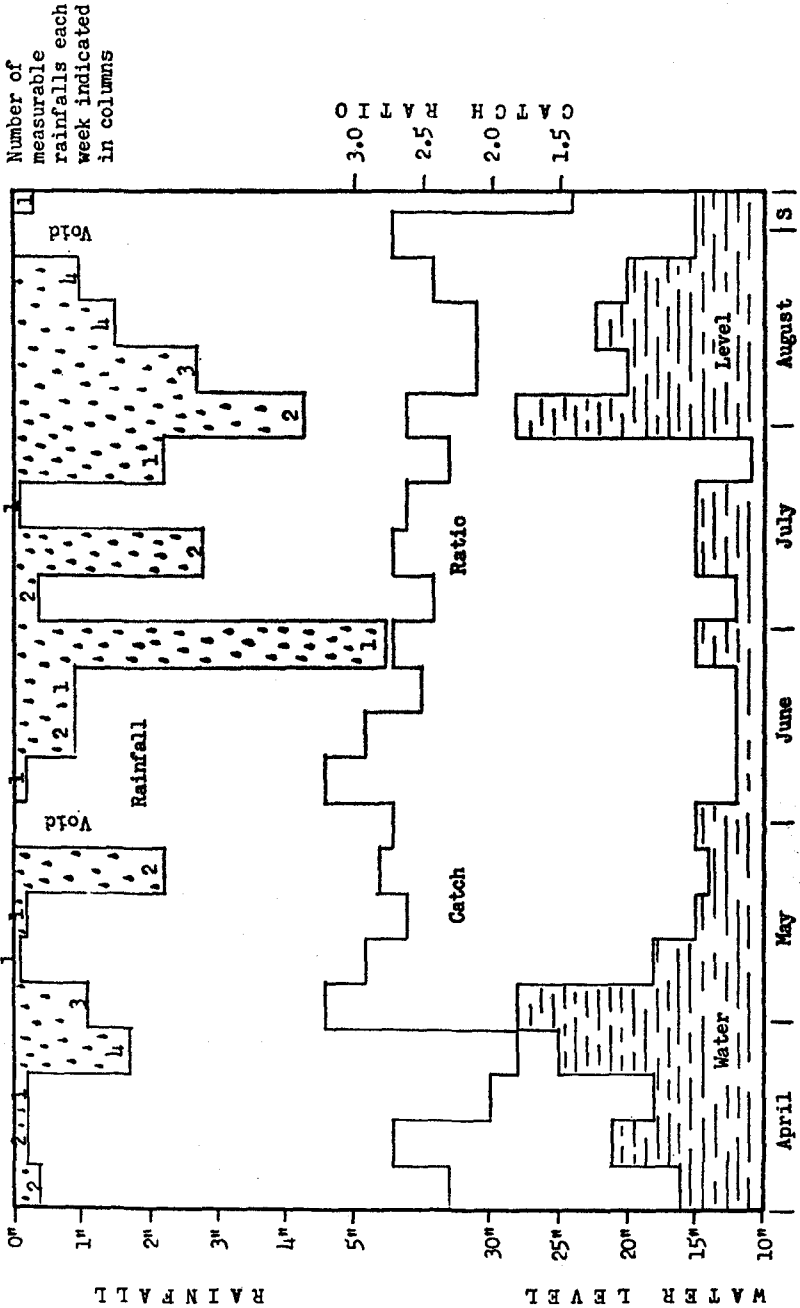


Figure IV

During the 1966 season, daily measurements were made for water level and rainfall. Figure IV represents these data in relation to catch ratio. There appears to be some possible correlation between these weather factors and catch ratio. Fishing, in general, was better following rains, but at times, dryness of the soil blotted much of the rainfall,

Analysis of Figure V

1966

Data Based on Weekly Averages

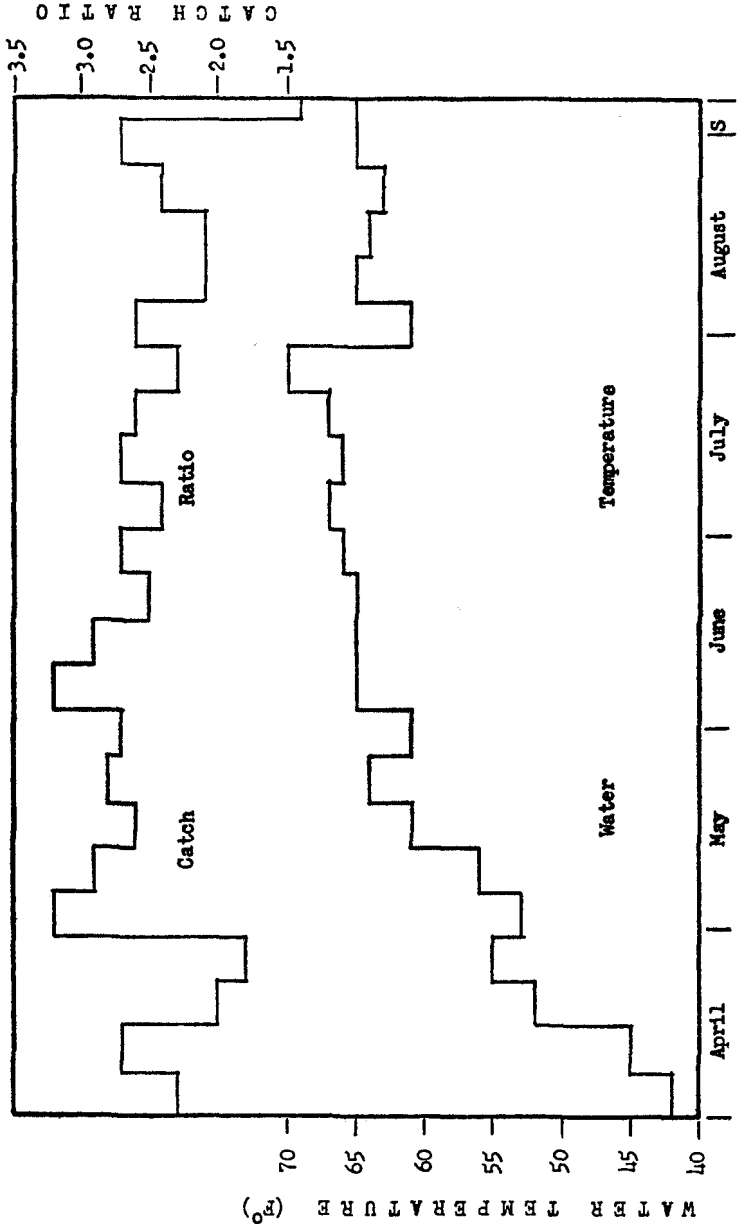


Figure V

causing little change in water level. All data was collected at the lower end of the stream and not all rains were general over the entire drainage. Observations indicated that a water level of 18 inches, at the point measurements were taken, is the most ideal level. Eighteen inches was, in fact, the average for the season. A water gauging station was erected on the stream in July 1966 by the U. S. Geological Survey. Data collected at this station indicates a depth of 1.24 feet closely represents the 18-inch level measured elsewhere. At this level, stream flow was

calculated to be 25 cubic feet per second. Total rainfall for the season was 28.9 inches, with an average weekly rainfall of 1.3 inches. Two weeks were void of rain. A lake has been proposed for the headwaters of Big Tumbling Creek to be designed for both flow and flood control.

In addition to the data previously discussed, daily readings were made of the air and water temperature. Rising water level had slight effect on the lowering of water temperature, but these temperatures were more nearly affected by air temperature. With water being the medium for trout habitat, this data is graphically illustrated to show possible correlation with catch ratio. Periods of high fishing pressure appear to overpower all other factors which influence catch ratio, but during normal fishing activity, water temperature does have a decided effect on catch, indicating a higher rate of catch with a lowering of water temperature.

Conclusions

Fee-fishing for trout in Virginia is an accepted program by the angling public. The trend of increasing fishing pressure each successive year would indicate a need for an expansion of this type program to other parts of the state.

The selection of a stream with the desired characteristics is of utmost importance. Holding facilities for trout should be no obstacle, and the stream may be located some distance from the hatchery source. Rainbow trout are well suited for this type program.

Normal revenues from the sale of fishing licenses will not support this program in Virginia. The one-dollar daily fee is a reasonable assessment and will pay a major portion of the expense. The three-day trip license is a savings for non-residents and a convenience to unprepared residents.

The joint operation of the fee-fishing program and camping facilities requires the services of one full-time, and a minimum of two part-time employees. The function of the concessionaire in selling permits and making a creel census is a saving of manpower for the state and is an inducement to commodity sales for the concession. The concessionaire realized 38 cents per fisherman in 1965 and 41 cents per fisherman in 1966.

The practice of stocking trout daily is necessary for equitable distribution in relation to fishing pressure, and is the prime factor for the inducement of the angler to make return trips.

The system of records and reports are sufficient for control of operations.

The temptation for violation of fishing regulations is somewhat greater in this type operation. Trout are more visible during periods of low water level becoming more vulnerable to illegal practices. More intensive law enforcement is necessary. Enforcement techniques being used are effective.

Fishing pressures in excess of 1,000 fishermen per week on this given stream adversely affects the catch ratio. Seventy-eight percent of the trout released are recovered legally, and the average angler is fifty percent successful in obtaining the creel limit.