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THE FOURTEENTH ANNUAL CREEL CENSUS
AND PROGRESS REPORT,
PIGEON RIVER TROUT RESEARCH STATION, 1962

By William C. Latta

The Pigeon River Trout Research Station, 13 miles east of Vanderbilt in Otsego County, was established in 1949 on the site of the former Pigeon River Forest Headquarters. The experimental waters of the station include seven small limestone sinks or lakes (Ford, Section 4, Hemlock, Lost, West Lost, North Twin and South Twin) and, at the time of the station's establishment, included 4.8 miles of the Pigeon River. This portion of the Pigeon River was divided into four experimental sections (A, B, C and D), each approximately 1.2 miles long (Fig. 1). In 1953, a fifth experimental section (E), of about equal length, was added at the upstream end of the controlled area, increasing the length of the experimental area to about 6 miles. The physical features of the experimental stream sections are presented in Table 1.

Since 1949, fishing on the experimental waters has been by permit. Each angler is required to obtain a free, one-day permit



MICHIGAN DEPARTMENT OF CONSERVATION
FISH DIVISION
PIGEON RIVER TROUT RESEARCH AREA
OTSEGO AND CHEBOYGAN COUNTIES

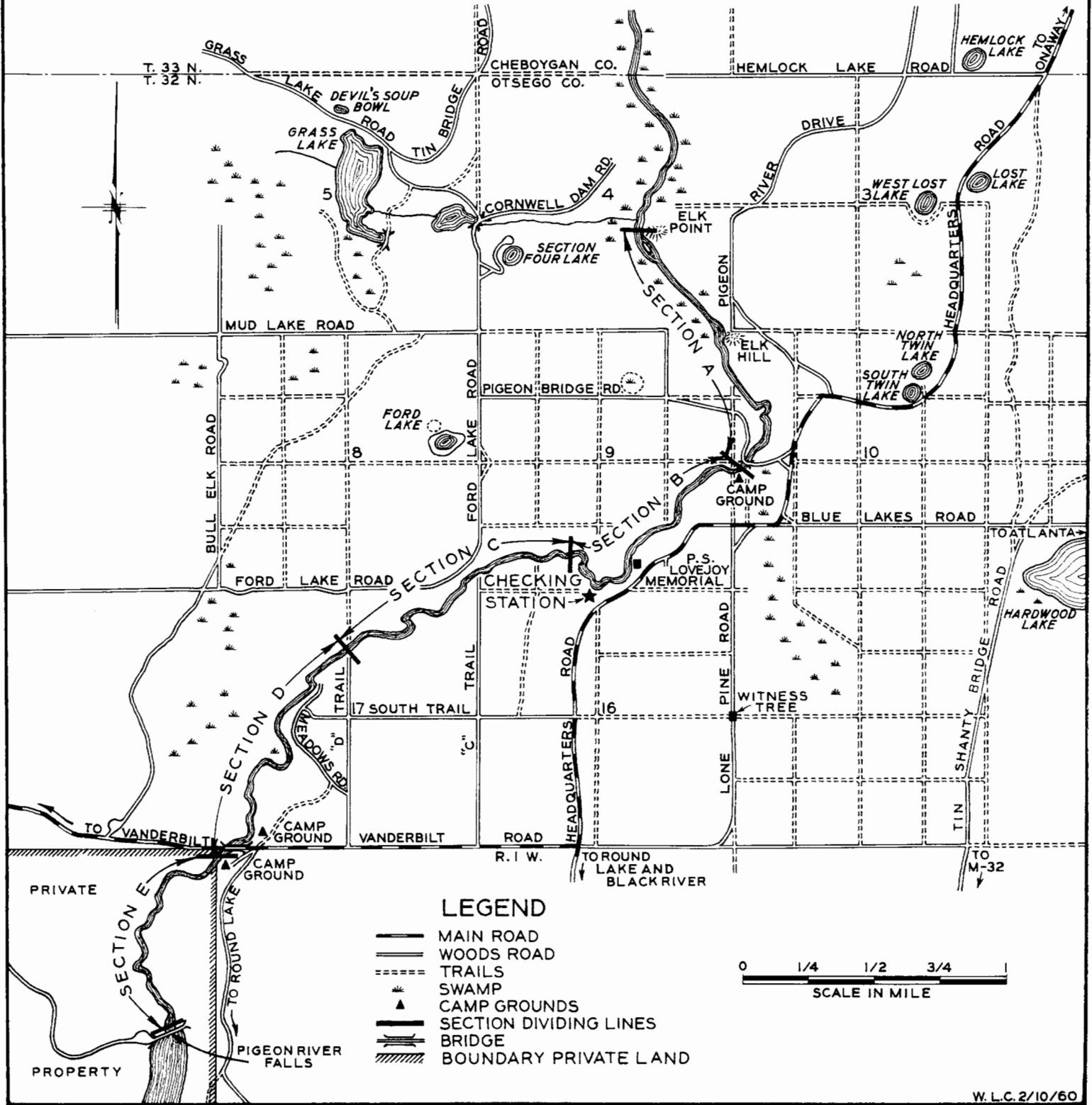


Figure 1

THE PIGEON RIVER TROUT RESEARCH AREA

This research and experimental area is located in the northeastern corner of Otsego County and in a small portion of Cheboygan County in the Pigeon River State Forest. Here six miles of the Pigeon River and seven trout lakes have been designated as experimental waters for studies on brook, brown, and rainbow trout. This program, as is also true with other functions of the Fish Division, is financed solely from the sale of fishing licenses and trout stamps. Its success depends to a large extent on the cooperation of the fishing public in supplying the information needed to maintain and improve trout fishing.

The Pigeon River in this experimental area is divided into five convenient fishing sections as indicated on the reverse side of this sheet. Seven trout lakes of unusual character are included in the trout research program. These lakes are believed to have been formed geologically through the solution of underlying limestone by ground water, and a settling of the surface layer of sand and gravel, producing cone-shaped pot holes, some with nearly vertical banks 50 to 60 feet high.

In order to obtain a complete record of the fishing in this area, each fisherman is required to register daily at the checking station, obtain a free permit to fish in any lake or portion of the stream and report back to the checking station before fishing in another lake or stream section or before leaving the area. Some experimental changes in the usual regulations governing trout fishing in Michigan are made from time to time in order to learn how necessary such restrictions are and whether changes may improve the angling quality. The special regulations are stated on the fishing permit.

In addition to the information on fishing success collected from anglers using the area, periodic estimates are made of the size of the trout populations and the rates of growth and mortality of the fish are determined. All of these factors—fishing success, total catch, population size, growth, mortality and any others that are pertinent—are used in the evaluation of research projects.

Research projects include the evaluation of various changes in the fishing regulations, the correct stocking programs for the lakes and stream, and the effects of stream improvement, as well as studies of the basic biology of trout.

The research station also provides a base for studies on waters outside of the experimental area.

Table 1. --Morphometry of experimental stream sections,
Pigeon River Trout Research Station¹

Section	Length (miles)	Average width (feet)	Area (acres)
A	1.31	45	7.16
B	1.19	41	5.90
C	1.13	40	5.39
D	1.18	40	5.65
E	1.17	40	5.67

¹Data for Sections A, B, C and D from Cooper, 1952.
Length of Section E from Bacon, Shetter and Cooper,
1958. Width of Section E was measured July 28, 1961.

29.77201

before proceeding to his selected water, whether experimental section of the stream or particular lake, and is also required to report on his trip and to allow examination of his catch by station personnel. On any day, he may fish in as many sections of the river or in as many lakes as he desires, so long as he reports back to the checking station after fishing in each separate water.

The creel census is used to evaluate experimental methods of trout management, such as special regulations, methods of planting, manipulation of the environment, as well as providing information concerning the basic biology of trout. The compulsory permit system assured a complete, or nearly complete, census and information was secured which could not be obtained otherwise. Previous annual creel census reports have appeared in the Institute report series.¹↓

No trout have been planted in the experimental sections of the stream since 1957; the data for the stream fishing are for wild trout only. Trout do not reproduce in the lakes, so for lakes all data are derived from plants of hatchery trout.

During 1962, the station was under the supervision of the author. The rest of the permanent staff included Gerald F. Myers, Harold H. Brado and Doyle E. Edson. Donald F. Thomas and Kiyoshi G. Fukano assisted during the pre-season population estimate. Mr. Fukano also helped with the creel census during the first two days of the fishing season.

¹↓ For report numbers, refer to "Literature cited."

Floyd E. Simonis helped during the postseason population estimate. Supervisory assistance was provided by Gerald P. Cooper and David S. Shetter.

Since July 1, 1960, the station has been under the Federal Aid in Fish Restoration Act. The name of the project (F-27-R-1) is: Development and Evaluation of Trout Management Techniques. The primary purposes in previous reports were to record creel census data which might have significant bearing on trout fisheries in other Michigan waters and, from pre- and postseason population estimates, ascertain the degree of exploitation by anglers. The present report includes data on creel census and exploitation rates and also indicates progress on all jobs considered under the Federal Aid Project.

Job No. 1.--Station clerical work, record keeping, and library maintenance.

The routine clerical work included bookkeeping on supplies purchased, utilities, time and attendance, and so forth. Daily weather readings were taken; weekly and monthly reports were submitted to the U. S. Weather Bureau. A stream gauge was checked weekly for the U. S. Geological Survey. Progress was made on assembling and maintaining station library.

Job No. 2.--Complete creel census of six miles of stream

Special fishing regulations have been in effect since the establishment of the research station. They have been, or will be, evaluated in

separate reports but to aid in interpretation of the creel census results, the regulations are summarized in Table 2.

Catch statistics for 1962 for the stream sections are presented in Table 3.² The catch of 954 trout was slightly better than the 941 recorded in 1961 and approached the average catch (since 1953) of about 1,000 fish per year. Section E, with the normal fishing regulations, produced the most fish, 396 of the 954 trout caught. Sections C and D, with the higher size limit and flies-only regulation, produced the fewest fish, 60 and 65 trout, respectively. Total number of fishing trips increased from 1,543 in 1961, to 1,776 in 1962, and total hours fished increased from 4,196.5 to 4,692.0. The average number of trout caught per hour decreased from 0.23 trout in 1961 to 0.2 trout in 1962.

Fishing success during weekly periods is given in Table 4; it was best the first three weeks of the season and poorest the first two weeks in August.

Annual totals of fishing pressure and fishing success for the experimental waters of the Pigeon River since 1949 are given in Table 5. Fishing pressure (hours fished) and number of fishing trips increased in 1962 to continue an upward trend, after a steady decline from 1954 to 1959. Fishing success in 1962, as measured by percentage of successful fishing trips and average number of trout caught per trip, was lower

² In Table 3 and subsequent tables, catch per hour per trip was determined by taking a simple average of the catch per hour for each fishing trip.

Table 2.--Experimental regulations, in waters of the Pigeon River Trout
Research Station, 1949-1962

Years	Water and regulation ¹							
	Stream sections						Lakes	
	A, B		C, D		E ²			
	Creel Mini- limit mum (trout legal per length day) (inches)	Creel Mini- limit mum (trout legal per length day) (inches)	Creel Mini- limit mum (trout legal per length day) (inches)	Creel Mini- limit mum (trout legal per length day) (inches)	Creel Mini- limit mum (trout legal per length day) (inches)	Creel Mini- limit mum (trout legal per length day) (inches)	Creel Mini- limit mum (trout legal per length day) (inches)	
1949-50	5	7	15	7	..	..	5	7
1951-52	5	7	2	9	..	..	5	7
1953-54	5	7	2	9	10	7	5	7
1955-62	5	7	5	9	10	7	5	7

¹ Lure was restricted to artificial flies only in Section C and D in 1958-62 and in Ford Lake in 1955-62. The use of minnows as bait was prohibited in the lakes (state-wide regulation on all designated trout lakes).

² Section E was added in 1953.

Table 3.--Results of creel census on experimental stream sections,
Pigeon River Trout Research Station, 1962

Stream sections	Fishing trips		Total hours fished	Average number of trout caught per hour per trip
	Number	Percentage successful		
A	434	24.7	1,083.0	0.18
B	480	25.2	1,110.0	0.21
C	246	17.1	692.5	0.09
D	248	16.5	684.5	0.09
E	368	38.3	1,122.0	0.35
Total	1,776	25.4	4,692.0	0.20

Stream sections	Anglers' catch					
	Brook trout		Brown trout		Total	
	Number	Weight (pounds)	Number	Weight (pounds)	Number	Weight (pounds)
A	160	36.07	30	18.98	190	55.05
B	211	44.20	30	19.35	243 ¹	63.84 ¹
C	41	14.98	19	16.18	60	31.16
D	51	19.38	14	13.45	65	32.83
E	355	86.38	41	24.44	396	110.82
Total	818	201.01	134	92.40	954 ¹	293.70 ¹

¹ Two rainbow trout weighing 0.12 and 0.17 pound, respectively, were added to the totals.

Table 4.--Fishing success, and total weight of anglers' catch during weekly periods, Pigeon River, 1962

Dates	Fishing trips		Trout caught						Hours fished	Average number of trout caught per hour per trip
	Num-ber	Percent- age success- ful	Brook		Brown		Total			
			Num-ber	Weight (pounds)	Num-ber	Weight (pounds)	Num-ber	Weight (pounds)		
April 28-May 4	103	42.7	114	30.33	9	7.48	123	37.81	247.5	0.47
May 5 - May 11	78	47.4	92	21.71	5	1.51	97	23.22	229.0	0.43
May 12-May 18	75	49.3	87	19.76	3	1.00	90	20.76	226.5	0.42
May 19-May 25	65	27.7	32	6.70	6	5.75	38	12.45	195.0	0.19
May 26-June 1	119	26.9	70	16.61	6	4.58	77↓	21.31↓	293.0	0.22
June 2-June 8	59	42.4	46	13.26	9	4.94	55	18.20	170.5	0.31
June 9-June 15	88	29.5	78	18.54	2	1.36	80	19.90	235.0	0.33
June 16-June 22	121	24.8	44	12.06	7	6.82	51	18.88	359.5	0.15
June 23-June 29	124	31.5	51	14.86	25	23.04	77↓	38.07↓	354.0	0.24
June 30-July 6	151	20.5	29	7.00	18	11.82	47	18.82	371.5	0.14
July 7-July 13	137	12.4	19	4.65	2	3.25	21	7.90	355.0	0.05
July 14-July 20	107	18.7	22	3.61	9	6.10	31	9.71	266.5	0.12
July 21-July 27	85	29.4	38	9.82	12	2.38	50	12.20	214.0	0.22
July 28-Aug. 3	75	16.0	23	4.85	2	1.42	25	6.27	188.5	0.10
Aug. 4-Aug. 10	71	9.9	8	1.93	2	2.34	10	4.27	173.0	0.05
Aug. 11-Aug. 17	37	5.4	0	0.00	3	2.36	3	2.36	94.5	0.04
Aug. 18-Aug. 24	114	17.5	26	5.88	4	3.85	30	9.73	305.0	0.10
Aug. 25-Aug. 31	88	15.9	24	6.32	2	0.31	26	6.63	224.5	0.10
Sept. 1-Sept. 7	59	18.6	10	2.37	6	1.42	16	3.79	141.5	0.10
Sept. 8-Sept. 9	20	25.0	5	0.75	2	0.67	7	1.42	48.0	0.12
Total	1,776	25.4	818	201.01	134	92.40	954↓	293.70↓	4,692.0	0.20

↓ Two rainbow trout, one weighing 0.12 pound, caught during the fifth week, and another weighing 0.17 pound, caught during the ninth week, were added to the totals.

Table 5. --Results of creel census in experimental waters of the Pigeon River,
1949-62

Year ¹	Fishing trips		Trout caught				Hours fished	Average number of fish caught per hour per trip
	Number	Percentage successful	Brook	Brown	Rain-bow	Total		
1949	2,233	26.2	793	198	57	1,048	6,817	0.15
1950	2,160	27.3	917	255	18	1,190	6,195	0.18
1951	2,846	15.4	453	228	10	691	7,076	0.10
1952	1,450	24.5	464	127	47	638	3,957	0.16
1953	1,943	24.9	742	203	88	1,033	5,689	0.23
1954	2,427	32.8	1,435	437	66	1,938	6,584	0.30
1955	2,039	25.3	959	250	33	1,242	5,775	0.20
1956	1,979	24.8	869	266	15	1,150	5,527	0.19
1957	1,699	23.2	721	120	17	858	4,490	0.18
1958	1,599	25.8	894	116	11	1,021	4,205	0.22
1959	1,206	14.8	289	52	1	342	2,760	0.11
1960	1,236	29.2	692	220	3	915	3,197	0.27
1961	1,543	27.3	784	157	..	941	4,196	0.23
1962	1,776	25.4	818	134	2	954	4,692	0.20

¹ Section E was added to the experimental waters in 1953.

than in 1961, but about average for the years 1953-61 (average successful trips was 25.3 percent and average catch per hour was 0.21 trout).

Most of the anglers fishing the Pigeon River came from Wayne County, with local residents from Otsego County placing second (Table 6). Of the 83 counties in Michigan, 49 were represented by at least one angler; 17 other states were represented. Most of the nonresident anglers came from Ohio.

Job No. 3.--Complete creel census
of seven trout lakes.

Catch statistics for the lakes are presented in Table 7. The fishery consists entirely of hatchery brook trout planted as fingerlings (average total length 5.5 inches) in the fall, with the exception of Section 4 Lake. The planting rate approximates 100 fingerlings per acre per year. Section 4 Lake received about 1,000 brook trout fry per acre (a total of 3,000 fry for the lake) each spring through 1961. In 1962, Section 4 Lake was used in an experiment to measure the food consumption of the American Merganser (Latta and Sharkey, 1963). The brook trout population was prey for the predatory merganser. In July, 1962, after the merganser experiment, Section 4 Lake was planted with 400 brook trout (longer than 7 inches) as part of an experiment being conducted by Dr. R. O. Anderson of the Wolf Lake State Fish Hatchery to test the comparative survival of two strains (Michigan and Pennsylvania) and inter-strain crosses of brook trout. Because of this mid-season plant

Table 6. --Residence of anglers who fished the experimental sections of the Pigeon River in 1962

County	Number of fishing trips	County	Number of fishing trips	County or state	Number of fishing trips
Wayne	359	Iosco	10	Livingston	1
Otsego	162	Arenac	9	Mecosta	1
Oakland	148	Kalamazoo	9	Wexford	1
Washtenaw	111	Presque Isle	9	Michigan	
Ingham	102	St. Clair	9	(total)	1,534
Bay	84	Monroe	8	Ohio	135
Genesee	79	Ionia	7	Indiana	56
Kent	51	Antrim	6	New York	9
Saginaw	47	Hillsdale	6	Pennsylvania	7
Macomb	38	Montmorency	6	Virginia	6
Branch	26	Calhoun	5	West Virginia	6
Cheboygan	26	Emmet	5	Illinois	5
Midland	26	Montcalm	5	New Jersey	5
Muskegon	26	Ogemaw	4	California	2
Jackson	22	Clinton	3	Maine	2
Shiawassee	19	Van Buren	3	Missouri	2
Charlevoix	15	Berrien	2	Wisconsin	2
Gratiot	15	Eaton	2	Florida	1
Tuscola	14	Grand Traverse	2	Kansas	1
Alpena	13	Ottawa	2	Massachusetts	1
Roscommon	12	Clare	1	Minnesota	1
Barry	11	Isabella	1	Tennessee	1
Gladwin	10	Leelanau	1	Total	1,776

Table 7. --Results of creel census on lakes of the Pigeon River Trout
 Research Station, 1962
 (only brook trout were caught)

Lake	Fishing trips		Trout caught		Hours fished	Average number of fish caught per hour per trip
	Num- ber	Percent- age success- ful	Num- ber	Pounds		
Ford	198	39.4	207	60.78	500.5	0.37
Section 4	187	53.5	308	67.87	514.0	0.57
Hemlock	251	42.2	259	76.56	887.0	0.26
Lost	172	27.3	90	15.92	441.0	0.18
West Lost	274	22.6	152	57.78	689.5	0.18
North Twin	288	30.2	181	68.64	824.5	0.18
South Twin	191	17.3	62	20.62	415.0	0.12
Total	1,561	32.9	1,259	368.17	4,271.5	0.26

of legal-size trout, the fishing quality in Section 4 Lake, as measured in percentage of successful trips and average catch per hour, was higher than in any other lake. Fishing success for all the lakes combined, as measured by the average number of fish caught per hour per trip, was 0.26 trout, the same as in 1961. Total fishing trips and hours fished decreased from 1,864 trips and 5,316.5 hours in 1961, to 1,561 trips and 4,271.5 hours in 1962.

On Ford Lake, under a flies-only regulation, the catch per hour has decreased from 1.15 trout in 1959, to 0.82 trout in 1960, to 0.54 trout in 1961, to 0.37 trout in 1962.

Residence of anglers who fished the lakes in 1962 is given in Table 8. Muskegon County contributed the most anglers; Otsego County was second. Fifty-three counties of Michigan and six states contributed at least one angler.

Data from the river and the lakes are combined in Tables 9 and 10.

On the stream, anglers who used worms were more successful, in terms of percentage of successful trips and catch per hour per trip, than those who used flies (Table 9). In terms of total catch, the anglers using worms caught 369 trout, while the anglers using flies caught 359 trout. Flies were used most frequently with worms next in order. In the lakes, worms were used most frequently and accounted for most of the catch.

Table 8. --Residence of anglers who fished Pigeon River lakes in 1962

County	Number of fishing trips	County	Number of fishing trips	County or state	Number of fishing trips
Muskegon	174	Clare	12	Crawford	2
Otsego	150	Emmet	12	Lapeer	2
Ingham	121	Lenawee	8	Mecosta	2
Genesee	105	Antrim	7	Monroe	2
Wayne	104	Macomb	7	Ottawa	2
Saginaw	68	Huron	6	Tuscola	2
Oakland	66	Oceana	6	Van Buren	2
Cheboygan	65	Eaton	5	Barry	1
Washtenaw	60	Newaygo	5	Mason	1
Gratiot	57	Ogemaw	5	Montmorency	1
Kent	57	St. Joseph	5	Oscoda	1
Bay	52	Berrien	4	Michigan	
Charlevoix	40	Calhoun	4	(total)	1,490
Jackson	38	Hillsdale	4	Ohio	40
Presque Isle	38	Ionia	4	West Virginia	19
Midland	35	Manistee	4	Indiana	8
Shiawassee	34	Montcalm	4	Florida	2
Alpena	31	Clinton	3	New York	1
Isabella	23	Lake	3	Virginia	1
Kalamazoo	21	Roscommon	3	Total	1,561
Arenac	20	Branch	2		

Table 9.--Fishing success according to lure used, Pigeon River Trout Research Station, 1962

Lure	Fishing trips		Number of trout caught			Hours fished	Average number of trout caught per hour per trip
	Number	Percentage successful	Brook	Brown	Total		
<u>STREAM</u>							
Worms	517	31.9	345	23	369 ⁴	1,328.0	0.26
Worms and spinner	130	21.5	65	3	68	334.5	0.18
Flies	828	22.7	269	90	359	2,225.5	0.17
Minnows	5	80.0	4	...	4	14.5	0.28
Insects	10	...	...	...	...	9.5	...
Artificial ¹	96	20.8	27	5	33 ⁴	206.5	0.14
Natural ²	1	...	...	...	...	1.5	...
Other ³	187	25.1	108	13	121	567.0	0.20
Unknown	2	...	...	...	...	5.0	...
Total for stream	1,776	25.5	818	134	954	4,692.0	0.20
<u>LAKES</u>							
Worms	783	30.3	563	...	...	2,109.0	0.23
Worms and spinner	240	42.5	279	...	...	681.0	0.37
Flies	27	14.8	4	...	...	42.0	0.06
Insects	14	71.4	35	...	...	37.0	0.85
Artificial ¹	36	22.2	10	...	...	62.0	0.10
Natural ²	2	...	...	...	...	2.0	...
Other ³	261	28.4	161	...	...	838.0	0.16
Ford Lake (flies only)	198	39.4	207	...	...	500.5	0.37
Total for lakes	1,561	32.9	1,259	...	...	4,271.5	0.26

¹ Artificial lures other than flies.

² Natural baits other than worms, minnows or insects.

³ Other refers to a combination of the above lures, two or more lures used successively on same trip or a lure other than listed above.

⁴ Total includes one rainbow trout.

Table 10.--Number of anglers of different classes who fished in
experimental waters of the Pigeon River in 1962
(Percentages in parentheses)

Residence	Licensed males	Licensed females	Wives	Minor males	Minor females	Total
<u>STREAM</u>						
Resident	1,149	11	109	205	60	1,534 (86.4)
Nonresident	171	15	...	41	15	242 (13.6)
Total	1,320 (74.3)	26 (1.5)	109 (6.1)	246 (13.9)	75 (4.2)	1,776
<u>LAKES</u>						
Resident	959	22	186	260	63	1,490 (95.5)
Nonresident	47	4	...	15	5	71 (4.5)
Total	1,006 (64.4)	26 (1.7)	186 (11.9)	275 (17.6)	68 (4.4)	1,561

Number of fishing trips made to the experimental waters by licensed and non-licensed anglers, i. e., wives and minors, are given in Table 10. Licensed anglers accounted for 75.8 percent of the fishing on the stream; 66.1 percent of the fishing on the lakes. Michigan residents did 86.4 percent of the stream fishing and 95.5 percent of the lake fishing.

Job No. 4. --Estimate number of trout in stream during spring and fall.

The mark-and-recapture (Petersen) method was used to estimate the number of trout present in each experimental section of the river. Two trips were made through each section using a direct-current shocker to take samples of trout (one trip to mark trout, and the second to recapture, with an interval of a week between trips). The number of fish in each 1-inch group of each species for each section was calculated.

In order to compute the pounds of trout in the population estimates, the average weight of each 1-inch group of each species was found (based on the calculated weight at each 0.1 inch). The length-weight relationships of Pigeon River trout as described by Cooper and Benson (1951) was the basis of the calculations.

Results of the 1962 spring estimates, by stream section, species, and 1-inch groups of trout (fish 12 inches long and longer were grouped in the table but not in the estimates), are presented in Table 11. The total population for the 6 miles of river was 10,143 trout (8,866 brook and 1,277 brown trout) or 18.57 pounds of trout per acre.

Table 11. --Estimated numbers and weight of trout of different species and lengths in the experimental sections of the Pigeon River in the spring of 1962 (before opening of the trout fishing season)

Stream section	Inch groups ¹ ✓	Brook trout		Brown trout		Total	
		Number	Weight (pounds)	Number	Weight (pounds)	Number	Weight (pounds)
A	2	8	0.05	...	...	8	0.05
	3	240	3.60	61	0.98	301	4.58
	4	367	11.74	114	3.88	481	15.62
	5	107	6.21	18	1.08	125	7.29
	6	43	4.13	...	...	43	4.13
	7	52	7.59	...	...	52	7.59
	8	33	6.96	8	1.74	41	8.70
	9	12	3.52	6	1.81	18	5.33
	10	2	0.79	3	1.22	5	2.01
	11	2	1.03	2	1.07	4	2.10
	12+	...	...	46	56.09	46	56.09
	Total		866	45.62	258	67.87	1,124	113.49
Pounds per acre			6.37		9.48		15.85
B	2	21	0.13	7	0.04	28	0.17
	3	533	8.00	133	2.13	666	10.13
	4	356	11.39	84	2.86	440	14.25
	5	100	5.80	13	0.78	113	6.58
	6	20	1.92	...	...	20	1.92
	7	43	6.28	...	...	43	6.28
	8	37	7.81	6	1.30	43	9.11
	9	10	2.93	4	1.21	14	4.14
	10	5	1.97	2	0.81	7	2.78
	11	...	...	4	2.13	4	2.13
	12+	...	...	15	17.41	15	17.41
	Total		1,125	46.23	268	28.67	1,393	74.90
Pounds per acre			7.84		4.86		12.70
C	2	45	0.27	2	0.01	47	0.28
	3	1,216	18.24	112	1.79	1,328	20.03
	4	1,005	32.16	226	7.68	1,231	39.84
	5	197	11.43	35	2.10	232	13.53
	6	132	12.67	5	0.49	137	13.16
	7	81	11.83	...	...	81	11.83
	8	48	10.13	13	2.82	61	12.95
	9	10	2.93	13	3.93	23	6.86
	10	1	0.39	5	2.04	6	2.43
	11	2	1.03	7	3.73	9	4.76
	12+	...	...	21	20.49	21	20.49
	Total		2,737	101.08	439	45.08	3,176	146.16
Pounds per acre			18.75		8.36		27.11

(continued)

Table 11.--continued

Stream section	Inch groups ¹	Brook trout		Brown trout		Total	
		Number	Weight (pounds)	Number	Weight (pounds)	Number	Weight (pounds)
D	2	42	0.25	2	0.01	44	0.26
	3	1,072	16.08	18	0.29	1,090	16.37
	4	809	25.89	56	1.90	865	27.79
	5	195	11.31	24	1.44	219	12.75
	6	81	7.78	2	0.20	83	7.98
	7	53	7.74	...	...	53	7.74
	8	30	6.33	17	3.69	47	10.02
	9	6	1.76	22	6.64	28	8.40
	10	1	0.39	...	...	1	0.39
	11	...	...	7	3.73	7	3.73
	12+	2	1.32	25	32.62	27	33.94
	Total		2,291	78.85	173	50.52	2,464	129.37
Pounds per acre			13.96		8.94		22.90
E	2	42	0.25	2	0.01	44	0.26
	3	703	10.54	21	0.34	724	10.88
	4	803	25.70	62	2.11	865	27.81
	5	141	8.18	36	2.16	177	10.34
	6	68	6.53	...	...	68	6.53
	7	58	8.47	...	...	58	8.47
	8	27	5.70	...	...	27	5.70
	9	2	0.59	2	0.60	4	1.19
	10	2	0.79	2	0.81	4	1.60
	11	1	0.52	1	0.53	2	1.05
	12+	...	...	13	15.06	13	15.06
	Total		1,847	67.27	139	21.62	1,986	88.89
Pounds per acre			11.86		3.81		15.67
All sections	2	158	0.95	13	0.07	171	1.02
	3	3,764	56.46	345	5.53	4,109	61.99
	4	3,340	106.88	542	18.43	3,882	125.31
	5	740	42.93	126	7.56	866	50.49
	6	344	33.03	7	0.69	351	33.72
	7	287	41.91	...	...	287	41.91
	8	175	36.93	44	9.55	219	46.48
	9	40	11.73	47	14.19	87	25.92
	10	11	4.33	12	4.88	23	9.21
	11	5	2.58	21	11.19	26	13.77
	12+	2	1.32	120	141.67	122	142.99
	Total		8,866	339.05	1,277	213.76	10,143	552.81
Pounds per acre			11.39		7.18		18.57

¹ Length groups range from 2.0-2.9 inches, 3.0-3.9, 4.0-4.9 inches, etc.

Results of the 1962 fall population estimates are presented in Table 12. The total population was 23,436 trout (20,556 brook and 2,880 brown trout) or 35.63 pounds per acre.

Job No. 5. --Estimate number of trout in two lakes during spring and fall.

April and October population estimates of the number of brook trout in each year class in Ford and Hemlock lakes, and the catches, are presented in Table 13. Samples of trout for the estimates were taken by fishing with flies, shocking with a direct-current shocker at night with underwater lights, and creel census. The Bailey modification of the Petersen formula for mark-and-recapture estimates was used (Ricker, 1958). Confidence limits (95 percent) were calculated from Clopper and Pearson's (1934) chart.

Job No. 6. --Calculate growth and mortality rates for the trout from the stream.

Age composition of the anglers' catch in 1962 and average total length and weight of each age group for each experimental section of the Pigeon River are given in Table 14. As in past years, two-year-olds predominated in the catch.

Annual expectations of death (total mortality, rate of exploitation and natural mortality) for brook and brown trout in the experimental sections of the Pigeon River, from the fall of 1961 to the fall of 1962 are given in Table 15.

The age distributions of the spring and fall population estimates were determined from scale collections (15 scale samples were taken

Table 12.--Estimated numbers and weight of trout of different species and lengths in the experimental sections of the Pigeon River in the fall of 1962 (after close of the trout fishing season)

Stream section	Inch groups√	Brook trout		Brown trout		Total	
		Number	Weight (pounds)	Number	Weight (pounds)	Number	Weight (pounds)
A	2	329	1.97	21	0.13	350	2.10
	3	811	12.16	265	4.24	1,076	16.40
	4	98	3.14	189	6.43	287	9.57
	5	141	8.18	8	0.48	149	8.66
	6	179	17.18	93	9.11	272	26.29
	7	48	7.01	50	7.50	98	14.51
	8	15	3.16	16	3.47	31	6.63
	9	11	3.22	6	1.81	17	5.03
	10	6	2.36	7	2.85	13	5.21
	11	2	1.03	9	4.80	11	5.83
	12+	1	0.83	21	27.39	22	28.22
	Total		1,641	60.24	685	68.21	2,326	128.45
Pounds per acre			8.41		9.53		17.94
B	2	733	4.40	33	0.20	766	4.60
	3	2,081	31.22	273	4.37	2,354	35.59
	4	303	9.70	164	5.58	467	15.28
	5	273	15.83	10	0.60	283	16.43
	6	192	18.43	54	5.29	246	23.72
	7	47	6.86	67	10.05	114	16.91
	8	8	1.69	26	5.64	34	7.33
	9	3	0.88	4	1.21	7	2.09
	10	1	0.39	2	0.81	3	1.20
	11	...	...	7	3.73	7	3.73
	12+	2	1.32	21	28.17	23	29.49
	Total		3,643	90.72	661	65.65	4,304	156.37
Pounds per acre			15.38		11.13		26.51
C	2	749	4.49	22	0.13	771	4.62
	3	3,609	54.14	327	5.23	3,936	59.37
	4	523	16.74	191	6.49	714	23.23
	5	689	39.96	15	0.90	704	40.86
	6	458	43.97	72	7.06	530	51.03
	7	162	23.65	111	16.65	273	40.30
	8	36	7.60	26	5.64	62	13.24
	9	22	6.45	4	1.21	26	7.66
	10	5	1.97	4	1.63	9	3.60
	11	4	2.06	6	3.20	10	5.26
	12+	1	0.66	24	43.01	25	43.67
	Total		6,258	201.69	802	91.15	7,060	292.84
Pounds per acre			37.42		16.91		54.33

(continued)

Table 12.--continued

Stream section	Inch groups ¹ ↓	Brook trout		Brown trout		Total	
		Number	Weight (pounds)	Number	Weight (pounds)	Number	Weight (pounds)
D	2	487	2.92	5	0.03	492	2.95
	3	2,707	40.60	160	2.56	2,867	43.16
	4	549	17.57	41	1.39	590	18.96
	5	607	35.21	1	0.06	608	35.27
	6	496	47.62	19	1.86	515	49.48
	7	166	24.24	59	8.85	225	33.09
	8	57	12.03	19	4.12	76	16.15
	9	18	5.27	1	0.30	19	5.57
	10	14	5.52	3	1.22	17	6.74
	11	5	2.58	4	2.13	9	4.71
	12+	4	2.64	33	59.68	37	62.32
	Total		5,110	196.20	345	82.20	5,455	278.40
Pounds per acre			34.73		14.55		49.28
E	2	300	1.80	1	0.01	301	1.81
	3	2,084	31.26	64	1.02	2,148	32.28
	4	575	18.40	168	5.71	743	24.11
	5	412	23.90	7	0.42	419	24.32
	6	391	37.54	3	0.29	394	37.83
	7	93	13.58	45	6.75	138	20.33
	8	22	4.64	65	14.10	87	18.74
	9	13	3.81	16	4.83	29	8.64
	10	5	1.97	2	0.81	7	2.78
	11	5	2.58	2	1.07	7	3.65
	12+	4	2.81	14	27.24	18	30.05
	Total		3,904	142.29	387	62.25	4,291	204.54
Pounds per acre			25.10		10.98		36.08
All sections	2	2,598	15.58	82	0.50	2,680	16.08
	3	11,292	169.38	1,089	17.42	12,381	186.80
	4	2,048	65.55	753	25.60	2,801	91.15
	5	2,122	123.08	41	2.46	2,163	125.54
	6	1,716	164.74	241	23.61	1,957	188.35
	7	516	75.34	332	49.80	848	125.14
	8	138	29.12	152	32.97	290	62.09
	9	67	19.63	31	9.36	98	28.99
	10	31	12.21	18	7.32	49	19.53
	11	16	8.25	28	14.93	44	23.18
	12+	12	8.26	113	185.49	125	193.75
	Total		20,556	691.14	2,880	369.46	23,436	1,060.60
Pounds per acre			23.22		12.41		35.63

¹↓ Length groups range from 2.0-2.9 inches, 3.0-3.9, 4.0-4.9 inches, etc.

Table 13. --Catches, and spring and fall population estimates of brook trout in Ford and Hemlock lakes, 1962

[The 95-percent confidence limits for population estimates are given in parentheses]

Year class	Population estimates and catches ¹					
	Ford Lake			Hemlock Lake		
	N ₁	C	N ₂	N ₁	C	N ₂
1959	1 ²	9	4	1 ³	5	...

1960	256 (170-585)	124	28 (22-56)	126 (89-218)	86	20 ...
1961	854 (681-1,119)	75	483 (418-595)	453 (391-553)	176	238 (174-402)
Totals	1,111	208	515	580	267	258

¹ N₁ = April population estimate, C = catch, N₂ = October population estimate.

² Minimum estimate; number of fish handled. N₁ assumed to be 13.

³ Minimum estimate; number of fish handled. N₁ assumed to be 5.

Table 14. -- Age composition of the anglers' catch and average length and weight of age groups for each experimental section, Pigeon River, 1962

Stream section	Species	Age group	Number	Average total length (inches)	Average weight (pounds)
A	Brook ¹ ✓	I	40	7.5	0.15
		II	112	8.6	0.25
		III	6	9.6	0.35
	Brown	I	11	7.7	0.16
		II	11	10.4	0.41
		III	5	14.7	1.26
		IV	2	16.8	1.92
		V	1	18.7	2.56
	B	Brook ¹ ✓ ² ✓	I	52	7.4	0.15
II			142	8.4	0.22
III			15	9.3	0.31
Brown		I	9	7.8	0.16
		II	14	10.6	0.44
		III	4	13.9	1.00
		IV	3	18.5	2.58
C	Brook	II	26	9.6	0.32
		III	14	10.3	0.43
		IV	1	10.5	0.53
	Brown	II	12	10.9	0.47
		III	4	14.6	1.22
		IV	3	17.1	1.88
D	Brook	II	34	9.6	0.33
		III	17	10.7	0.48
	Brown ¹ ✓	II	8	11.5	0.58
		III	2	13.5	0.91
		IV	3	17.4	2.22
	E	Brook ¹ ✓	I	74	7.4	0.15
II			226	8.5	0.23
III			51	10.1	0.41
IV			2	14.6	1.30
Brown ¹ ✓		I	17	7.6	0.16
		II	15	10.7	0.46
		III	4	15.2	1.35
		IV	5	16.8	1.89

¹✓ Age was not determined for two brook trout from Section A, two brook trout from Section B, one brown trout from Section D, and two brook trout and one brown trout from Section E.

²✓ Two rainbow trout age I and II, length 7.3 and 7.9 inches, and weight 0.12 and 0.17 pound were caught in Section B.

Table 15. --Annual expectations of death for brook and brown trout in the experimental sections of the Pigeon River, fall, 1961 to fall, 1962

Section	Total mortality, winter, 1961-62		Total mortality, summer, 1962		Rate of exploitation, summer, 1962		Natural mortality, summer, 1962	
	Age group		Age group		Age group		Age group	
	I	II+	I	II+	I	II+	I	II+
BROOK TROUT								
A	0.15	0.53	0.46	... ¹	0.06	... ¹	0.40	... ¹
B	0.67	0.69	0.38	... ¹	0.05	... ¹	0.33	... ¹
C	0.51	0.77	0.35	0.78	... ²	0.15	... ²	0.63
D	0.48	0.86	0.30	0.40	... ²	0.30	... ²	0.10
E	0.35	0.78	0.24	... ¹	0.05	... ¹	0.19	... ¹
BROWN TROUT								
A	0.76	0.12	0.11	0.45	0.06	0.29	0.05	0.16
B	0.71	0.78	0.33	... ¹	0.04	... ¹	0.29	... ¹
C	0.57	0.69	0.40	0.41	... ²	0.31	... ²	0.10
D	0.34	0.23	... ¹	0.46	... ²	0.19	... ²	0.27
E	0.38	0.83	... ¹	... ¹	... ¹	... ¹	... ¹	... ¹

¹ No estimate made because of lack of agreement between size of population and/or catch.

² Under 9-inch minimum size regulation no fish from age group I are caught.

for each inch group of each species) taken at the time of the estimates. In general, there was poor agreement between the estimates and the number of fish in the catch for in many instances it appeared that more fish were caught during the 1962 season than were estimated to be present at the start of the season. Some of the possible reasons for these discrepancies, e. g., movement between sections, recruitment from outside the experimental area, inaccurate estimates of population size, particularly in the spring because of high water and other physical difficulties, have been or will be checked and, if possible, correction factors will be added in the future.

Job No. 7. --Calculate growth and mortality rates for the trout from two lakes.

Average length and weight for each year class of brook trout in the anglers' catch from Ford and Hemlock lakes are given in Table 16.

Annual expectations of death (mortality rates) for brook trout in Ford and Hemlock lakes, April to October, 1962, are presented in Table 17. These figures are based on estimates of population size calculated for Job 5 and creel census for Job 3 (Table 13). Rate of exploitation of the two-year-olds was 48 and 68 percent while for the one-year-olds, just entering the catch, it was 9 percent in Ford Lake and 39 percent in Hemlock Lake. Natural mortality for the one-year-olds was greater in Ford Lake (0.34) than in Hemlock Lake (0.08).

The report on the semiannual estimates of natural mortality of hatchery brook trout in Ford and Hemlock lakes was published in Volume 92, Number 1 (January, 1963) of the Transactions of the American Fisheries Society.

Table 16. --Average length and weight for each year class
of brook trout in the anglers' catch from Ford and
Hemlock lakes, 1962

Lake	Year class	Number of fish	Average total length (inches)	Average weight (pounds)
Ford	1959	9	11.1	0.55
	1960	124	9.7	0.34
	1961	74	7.8	0.18
Hemlock	1959	4	13.1	0.94
	1960	87	10.5	0.48
	1961	168	7.8	0.19

Table 17. --Annual expectations of death for brook trout
in Ford and Hemlock lakes, April to October, 1962

Lake	Year class	Total mortality	Rate of exploitation	Natural mortality
Ford	1959	0.69	0.69	0.00
	1960	0.89	0.48	0.41
	1961	0.43	0.09	0.34
Hemlock	1959	1.00	1.00	0.00
	1960	0.84	0.68	0.16
	1961	0.47	0.39	0.08

Job No. 8. --Mark hatchery trout for planting in lakes.

The lakes were stocked with 3,610 marked (adipose and right pectoral fins removed) brook trout in November, 1962. The planted trout were from 5 to 6 inches long.

Job No. 9. --Construction and maintenance of research equipment.

Equipment used was built, modified or repaired as needed.

Job No. 10. --Determine causes of natural mortality of trout in lakes and stream.

In order to determine some of the causes of the natural mortality of brook trout planted in lakes and of wild populations of brook and brown trout in the river the following leads were investigated:

(1) To help evaluate the role of the American Merganser as a predator on trout populations, food consumption was measured in two experiments. In the first experiment, two female mergansers were held captive at the Oden Fish Hatchery and the amount of trout they required per day to maintain body weight was determined. In the second experiment, an estimate was obtained of how much food a merganser will eat under natural conditions. The number of brook trout in Section 4 Lake was estimated, a pinioned female merganser was placed on the lake and left there for 16 days, and then another estimate of the trout population size was made. In the first experiment, the two mergansers

required 9 or 10 ounces of trout per day (or about 30 percent of body weight) to maintain body weight, and in the second experiment the merganser consumed 13 brook trout weighing 1.3 pounds or 59 percent of her body weight per day in a natural environment (Latta and Sharkey, 1963).

(2) The first draft of a manuscript on the relationship of young-of-the-year trout to mature trout and ground water was completed. For the brook trout, there was little indication that the number of potential spawners influenced the number of young-of-the-year trout present in the fall, but much indication that in years of higher ground water level, larger numbers of young-of-the-year brook trout were present in the Pigeon River. Apparently, neither ground water levels nor number of mature trout influenced the number of young-of-the-year brown trout present in the Pigeon River each September.

(3) For part of the fishing season the sex was determined of all trout examined in the creel census (Job No. 2) in order to determine if natural mortality was greater for one sex than the other (Table 18). These are preliminary data and no attempt has been made to analyze them statistically. Apparently, the brook trout in the catch do not vary from a 1:1 ratio of males to females. The faster growing males enter the catch in greater numbers than the slower growing females during the second summer of life (age-group I) but the females enter the catch in greater numbers during the third summer of life (age-group II). The brown trout in the catch appear to vary from the expected 1:1 ratio in favor of the males. However, the numbers are small and no comments will be made at this time.

Table 18. --Number of male and female brook and brown trout in the anglers' catch from each experimental section, Pigeon River, 1962

Section	Age group	Brook trout		Brown trout	
		Male	Female	Male	Female
A	I	27	13	8	1
	II	39	52	6	4
	III	1	4	2	1
	IV	...	...	...	2
	V	...	...	...	1
	Total	67	69	16	9
B	I	35	19	8	1
	II	35	54	7	4
	III	4	9	1	2
	IV	...	...	2	1
	Total	74	82	18	8
C	I	...	...	...	...
	II	12	14	7	4
	III	5	8	1	3
	IV	...	1	...	3
	Total	17	23	8	10
D	I	...	...	...	...
	II	16	15	2	5
	III	6	7	...	2
	IV	2	1
	Total	22	22	4	8
E	I	47	25	14	1
	II	105	90	6	9
	III	11	23	2	2
	IV	...	1	1	2
	Total	163	139	23	14

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