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ATLANTIC SALMON AND TROUT INVESTIGATION

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ATLANTIC SALMON INVESTIGATION

Report No. XIX The Effect of Control of Temperature and Current on the Migration of Brook Trout.

Paul F. Elson.

Trout brook, flowing into lake Ainslie, Cape Breton, has provided in the past an unique fishery for speckled trout. The brook was remarkable both for size of fish and the quantity produced. In the last ten to fifteen years the trout have been greatly diminished in numbers and fewer large trout are taken. While overfishing is undoubtedly responsible in some measure for this state of affairs there has been also another factor involved in producing the present condition of the fishery. For some reason the fish have died in considerable numbers during the summer, particularly in recent years. The present report deals with an attempt to remedy the situation.

Description of the Territory. Trout brook is one of the larger streams flowing into lake Ainslie. It enters the lake on the east side at the southern end of the main basin. The lower end of the stream runs through a flood plain about a mile in length. It arises by two main branches which join two miles up from the mouth of the stream. Of these the northern branch, at the confluence, carries about twice the volume of water as the southern branch. It is also about twice as long. The bed of the northern branch is composed of gravel, stones and boulders and lies in a fairly steep valley. The bed of the southern branch lies to a considerable ex-

tent on solid rock, in a gorge considerably more precipitous than that of the north branch. The pools on the south branch are fewer, smaller, and more devoid of cover provided by boulders and rocks than those of the north branch. From a point 200 yards above the mouth the banks of the stream are heavily wooded with mainly deciduous forest.

At its mouth the stream discharges into a wide bay over a shallow gravel bar. The lake floor slopes down quite gradually and such channel as there is tends to direct the discharge in a direction almost parallel to the lake shore.

The mouth of the stream has been cut so low that to a point about 200 yards upstream it is scarcely more than an inlet in the lake shore. Consequently the current here is very slow. The stream water is discharged into the lake with very little force and in times of normal summer discharge is mixed so completely with the water of the lake as to be almost indistinguishable at a point 100 feet out from the bar crossing the mouth of the stream.

Problem.

Lake Ainslie, which is about twelve miles long by four miles wide at greatest extent, is a relatively shallow body of water. With the exception of a narrow portion at the head of the lake the depth is no greater than thirty feet. As a result there is no thermal stratification to speak of and the temperature of the whole body of water rises quite high during the summer months. This means that trout in the lake are subjected to temperatures that are somewhat higher than seems best for the well-being of speckled trout.

In addition to this adverse temperature effect the trout are subject to a rather heavy parasitism with Argulus, or "lice" as they are locally called. The action of the lice in chafing the skin of the trout lays the fish open to the attacks of Saprolegnia. It is from the effects of this latter that mortality seems to occur.

From previous investigation it seemed evident that the role of high temperature in the above chain of events was to lower the vitality and resistance of the trout to disease.

Most of the angling for trout is done in a large pool inside the mouth of the stream. It was considered that by controlling the discharge the fish might be induced to run into the stream from the lake sooner than they would ordinarily have done. They would thus be made available, in the stream, for angling.

Experiment.

In the summer of 1938 an experiment to remedy, at least in part, the diminution of the fishery was undertaken. A dam was built which permitted the use of artificial freshets, with which it was hoped to hasten the entrance of trout into the brook. It was believed that in the cool water of the stream the fish would be better able to withstand the causes of mortality in the summer months of previous years. Also it was desirable to have the fish in the brook so that they would be available to the anglers.

Construction of the dam was commenced on June 20 and completed on July 8. Delays caused by sections of the dam being washed out on two occasions resulted in postponement of the experiments with artificial freshets until August 1.

Apparatus.

A light dam was constructed across the mouth of the brook (Fig. 3). The outlet was arranged so as to direct the current in a northwesterly direction towards the area in which trout are taken in the early spring fishing. Judging from the accounts of residents and from a map issued in 1882 (Geol. and Nat. Hist. Survey of Canada,1884. Nova Scotia: Sheet No. 13) this was the approximate location of discharge previous to about 1910.

By building the dam to conform to the shape of the gravel bar separating the mouth of the brook from the lake it was possible to place most of the structure in about two feet or less of water. The dam was built by driving posts into the bottom at an angle of thirty degrees from the vertical. East post was supported by a stout prop driven so as to form a sixty degree angle between the tops of the posts, thus bracing firmly against the direction of pressure from within. These posts were placed at intervals of five to eight feet and fastened together with 7-inch spikes. Two series of 2 x 4 stringers were spiked to the inside posts. Inch boards were driven into the bottom and nailed to the stringers to form the face of the dam. By pointing the lower ends of the boards on one side only the boards were driven so as to form a practically water-tight surface. Gravel and rock were then piled at the foot of this board face to give additional strength to the dam and to prevent undermining. After sections of the dam had been washed out on two occasions the importance of this last step was fully realized.

The outlet, or spillway, was placed in what was judged to be very near to the original channel. It was made ten feet wide, with a floor of rough boards, and well braced. Gates were made of 2-inch plank so

that the discharge could be controlled as desired.

Two leads were placed to run from the spillway into the trap. The general scheme of dam and traps is sufficiently shown in Fig. 3. A trap to take any outgoing fish was arranged beside the main trap, as shown, after the main construction was completed. Leads and trap were made of 1½ x 1 inch lath, with a ½-inch space between the laths. The main trap had a board floor to facilitate seining, and a roof with trap-doors to prevent undue disturbance of the fish.

The total lingth of the dam was 555 feet. The height varied from eighteen inches to six feet and was calculated to permit an eighteen inch head. The trap was 10 x 23 feet and the leads were 22 feet long. This allowed the head of the trap to lie in three feet of water.

The discharge through the spillway was measured on August 11, when the height of water in the brook was fourteen inches on the gauge used. It was found, using a chip log, that the average rate of flow at the spillway was two feet per second, with a depth of 9 inches. This gives a discharge of fifteen cubic feet per second, which was the usual rate of discharge throughout the period of the experiment.

Procedure.

The dam, by preventing lake water from entering the lower part of the stream, particularly in times of northerly to westerly winds, resulted in a lowering of the brook temperature at this point by as much as eight degrees below lake temperature. Before the dam was built the water under the bridge, on warm days with a suitable wind, frequently rose to within two or three degrees of the lake temperature. The effect of the dam in this respect was desirable.

The primary purpose of the dam was to test the effectiveness of artificially produced freshets in bringing trout into the stream from the lake.

It was found that to produce an increased discharge, or "freshet", lasting about two hours it was necessary to close the gates of the spillway from two to three hours previous to the time it was desired to start the freshet.

After noting at what time of day, without any artificial inducement, the trout normally entered the trap, freshets were produced at various times in the evening. The trap was tended, as a rule, after most of the freshet had run off. All fish in the trap were liberated inside the dam. Those fish which were sufficiently large were marked with a numbered tag, as described below. Smaller fish were marked by shaving off the adipose fin with a sharp blade. The purpose of this marking was to make possible future identification of fish which had passed through the trap, as opposed to those already in the stream at the time the dam was closed. The total length of all fish taken was also recorded. In addition to comparing the effects of freshets at different times of the night, the effect of one freshet immediately following another was tried. On one occasion trash was dumped into the spillway as the gates were opened to see if this procedure might be of particular value.

Results

Records of the numbers of fish taken in the trap are to be found in tables at the end of this report. Observations were also recorded on water temperature, height of water, air temperature, amount of clouds, force and direction of wind and the catch of trout by angling. These will be found at the end of this report also. A good deal of these data were arranged in the form of graphs, to which reference will be made below.

Temperature analysis of brook discharge.

By the use of a reversing thermometer several surveys were made of bottom temperatures in the lake, with a view to discovering the disposition of the brook water. In making these surveys an outline map of the area was taken along. Stations were located on this map by plotting the intersection of two different lines sighted from the station to suitable points on the shore.

The results of the first survey, made on August 1, are indicated in fig. 4. This was a fairly warm day with very little wind. The survey is important as it shows how the brook water is dissipated almost as soon as it gets into the lake. The water of the brook has reached a temperature of 23°C. by the time it reaches a point where the lake is over five feet deep. The equivalent isotherm for water of the lake bottom is considerably farther out, and at a depth of fifteen to twenty feet, in the direction of the discharge. In the space between, the bottom temperature is an much as a fifth of a degree higher. There is thus a sort of temperature barrier formed for the fish between the cool water of the brook and the cool water of the lake bottom. It must be pointed out that such a barrier will be more readily formed on a warm day, when the temperature of the brook is such that it approaches rather closely the lake temperature. As a result the low temperature of the discharging water is dissipated much more readily.

A survey made on August 15 (Fig. 5) shows the discharge extending somewhat farther along the shore than on August 1. In this case the lake water was somewhat cooler than in the first instance and dissipation of the brook water is less marked.

Surveys made on August 29 and 30 (figs. 6 and 7) indicate that the brook water at this time was discharged far enough into the lake

to give a continuous temperature gradient into the stream. One would suppose this condition more suited to the entrance of trout. Actually, the run of fish seemed to be over by this time.

The salient points from these surveys seem to be: first, that a most important characteristic of the brook water is obscured very soon after it enters the lake and becomes mixed with the lake water, namely, its relatively low temperature; second, that in times of warm summer weather there is no continuous temperature gradient from the bottom of the lake into the brook.

Unfortunately no temperature surveys were made before the construction of the dam. But quite obviously the brook must have had even less influence in the lake in so far as temperature is concerned. For with the slow, widely spread discharge over the whole bar the water must have been well warmed by the time it had passed over the bar.

On September 7 a survey was made to determine whether any indication of brook water could be found after the gates had been closed for three hours. Stations were selected at various depths where the brook water was usually traceable. Though the brook was about five degrees cooler than the lake no indication of brook water was found. At a point about half a mile along the shore, and at a depth of twenty-three feet a difference of three-fifths of a degree between bottom and surface water seemed accountable to the normal difference due to depth. Close to the spillway the difference between normal lake temperature at the surface and bottom temperature was even less. Hence it seems certain that while the discharge is cut off preparatory to an artificial freshet all brook water is dissipated in the lake.

Each freshet must create its own "sphere of influence" for the fish without attaining to that of the previous normal discharge. This is, of course, a weakness in the production of artificial freshets. For there is no area of low temperature to hold fish in place where they would be readily subject to the influence of the artificial freshet to be produced.

Factors involved in migration.

In order to determine the action of artificial freshets in bringing trout into the river it is first necessary to evaluate the other factors which might affect the fish, and which are constantly operative and not subject to control.

Water Temperature.

In figs. 8, 9, and 10 will be found curves indicating the variations in lake temperature, temperature of the water discharged through the spillway and the difference between these two temperatures. Figs. 14, 15 and 16 show the numbers of fish in the trap at the various times it was tended. Both sets of graphs are on a similar time scale for ready comparison.

The effect of lake temperature on fish entering the brook will be considered first. The data available indicate that the numbers of fish entering the river increases when the lake temperature rises above a certain point. This point appears to be somewhere about 21°C. On July 7 and 8 a rise in temperature above 20°C. was accompanied by an increase in the numbers of fish entering the trap (figs. 8 and 14). From July 8 to July 11, also a period of higher lake temperature, the trap was not functioning, so that a comparison for this period is not possible. However it was noted that on July 9 and 10 large numbers

of small trout appeared under the bridge. From July 25 to August 7 the numbers of trout entering the trap show a steady increase. The general curve for trout almost parallels that for temperature during this period, if the effect of artificial freshets is taken into account. Fair numbers of trout entered every day. The lake temperature was constantly above 20°C and for the most part was above 22°C. Between July 29 and August 1 a drop in temperature is accompanied by a fall in the numbers of fish entering. From August 8 to 16 the temperature shows a slow but steady decline. It does not, however, fall below 20°C. In the first part of this period the two curves do not conform, there being a big increase in the numbers of fish despite the falling temperature. This is explainable, however, on the basis that other factors were operating more strongly, as discussed below. From August 16 to September 1 the two curves again show a pronounced similarity. After September 1 the temperature dropped below 20°C and the fish ceased entering almost entirely. Whether this was due to the drop in temperature or to the fact that practically all trout had entered the brook at this time is uncertain. The fact that no fish were observed to enter, subsequently, until the trap was removed on September 8, in spite of heavy freshets on the river, would seem to favour the latter view. However, the relation between numbers of trout entering the brook and temperature of the lake water is well established.

Some experimental evidence has been gathered to support the observation of a critical point in temperature around 20°C. It has been found for trout fry (Salvelinus) that maximum activity in relation to water temperature occurs between 8°C and 15°C. Between 15°C and 25°C the amount of activity rapidly declines and above 25°C an increase

in temperature rapidly becomes lethal. (These data are from some experiments carried on at the University of Toronto by the author in 1938). It is readily understandable, then, that at a point about 21°C. the temperature is such as to result in the fish seeking a lower temperature. The higher the temperature rises above this point the greater would be the stimulus to seek a lower temperature; but at the same time the increasing temperature has an adverse effect on the animal which tends to decrease its activity in seeking the lower temperature.

In order to bring out the relation between lake temperature and the numbers of fish entering the stream the graph shown in fig. 22 was constructed. The points shown were secured by plotting the average numbers of trout per night against the mean of evening and morning lake temperatures. A temperature increment of 0.5°C. was used and the average numbers of fish for all cases in each temperature range were taken. The data used were from the period of July 12 to September 6. The few records taken before this date seem to belong to an earlier run of fish for which data are lacking, so are not considered here. It will be seen from this figure that as the temperature rises above 21°C the numbers of fish entering rises quite rapidly until a temperature in the neighbourhood of 23.3°C is reached. For the data available it appears that above this temperature the numbers of fish decrease with increasing temperature. It is interesting to note that the greatest runs of fish occurred a very few days after a period of rather high lake temperature.

A comparison of brook temperature with number of fish entering the trap fails to show any parallel relation between the two. Any

similarity seems to be only such as might be expected from the fact that the same factor operates to control both brook and lake temperatures, and taking into consideration the demonstrated effect of lake temperature on the numbers of trout. As an example, from August 9 to 14 while the brook temperature drops considerably the number of trout continues to increase. Again from August 21 to 22, and from August 26 to 29 a similar lack of conformity between the two curves is apparent.

That brook temperature does have a direct connection with the inward migration of the fish is, however, clearly demonstrated. The relation appears to be one of difference between temperature of the lake and brook. As examples, on July 15, 16 and 17, while the lake temperature is rather high there is a small difference between lake and brook temperatures. Correspondingly, few fish entered the trap during this period. A slightly different state of affairs is indicated on August 9 to 12. Here there is a considerable difference between lake and brook. The lake temperature is high and the numbers of fish entering is high. From August 13 to 17 there is still a considerable difference in temperatures, but the lake temperature is somewhat lower than in the previous period and the number of fish falls off correspondingly. When the lake remains at a rather uniformly high temperature the number of fish shows a fluctuation which corresponds fairly well with the fluctuations in difference between the two temperatures. This is particularly evident in the interval between August 16 and August 29. August 17-18 and 22-25 are periods of decreased difference and smaller numbers of fish. August 19-22 and 25-29 are periods of greater difference in temperature and greater numbers of fish entering the trap. In fig. 23 are plotted the

average numbers of trout entering the trap under conditions of uniform lake temperature (all cases within a range of 1°C are considered together) against the difference in lake and brook temperatures, (taken to the nearest degree). Cases where less than two fish entered were not considered since one fish alone might have strayed in for some other reason than the operation of the factor being considered. Also instances when there was an onshore wind of force 3 or greater were not considered, since these were times when another factor was quite definitely operative. A limited number of points was available for the curves but while not entirely conclusive they do seem to have some significance. This seems to be (1) a difference of less than about 3°C has little apparent effect; (2) between 23.0°C and 23.9°C as the difference in temperature increases the number of trout entering increases proportionally; (3) between 22.0°C and 22.9°C the numbers of trout increase less rapidly with rising temperature difference than in the 23°C range; (4) between 21.0°C and 21.9°C a difference in temperature has less effect than at the higher temperatures. As lake temperature falls below 22.0°C difference in lake and brook temperature has increasingly less significance. It would seem, for the various temperatures that the lines relating fish to temperature difference should spread out toward the right until as the lake falls to about 20°C difference between lake and brook has practically no significance. As the lake temperature rises above this point, where the fish commence to come in, temperature difference between lake and brook becomes increasingly more important in bringing in large numbers of trout.

Light: Time of day: Greatest numbers of trout were found to enter the trap between the hours of 7 p.m. and 7 a.m. On only two occasions between July 26 and August 29 did the numbers of trout entering between 7 a.m. and 7 p.m. rise as high as 35% of the total number of fish entering from 7 a.m. of one day to 7 a.m. of the next. For the same period the numbers entering by daylight hours, as limited above, amounted seven times to from 10 to 15% of the total fish for the day. Most of the time the proportion of fish entering by daylight was below 8%.

As to the time of night, if such there is, at which the greatest run of fish occurs, the data obtained are insufficient to be of much use. During the period mentioned above, which was the time of steady migration into the stream while the trap was in operation, on only five occasions was the number of fish entering before 11.00 p.m. greater than the number entering between the last evening visit to the trap and 7.00 a.m. the following morning. The idea had been entertained that the hours immediately following sunset were the time of greatest movement of the trout. However the facts available hardly bear out this impression. On fourteen occasions more fish entered after the last evening visit to the trap than before it. On three of these occasions large runs of trout occurred after 10.30 - 11.00 p.m. On August 11 there was a run of trout after 4.30 a.m. which was considerably greater than the run occurring in the dark hours immediately preceding. This indicates a considerable movement after dawn. From observations made on salmon fry in 1937 it appears that movement of fish may occur at considerably higher light intensities in the morning than in the evening.

Whether most movement occurs at times of changing light intensity, as dusk and dawn, or is more or less uniform throughout the night and early morning hours can not be shown from the data collected this year. However two series of observations are of interest in this connection.

When visiting the trap between 8 and 10 p.m. small trout (6-10 inches in length) were frequently to be seen in the shallow water between the beach and the trap. Frequently they were in four inches or less of water. Few, if any, fish were seen in this location at times after 12.00 midnight. This is presumably a reaction to diminishing light intensity coupled with a bottom-seeking reaction and might well be involved in bringing fish into the mouth of the stream.

On occasions when artificial freshets were employed in the early morning hours they seemed to have less effect than in the evening. Again, however, it must be stated that the data do not warrant any very definite conclusions.

Moonlight: The two periods during the experiment when the greatest numbers of fish entered the trap fall just before the time of full moon in July and August. In the first instance, due to a washout and consequent poor functioning of the trap, the data are insufficient to warrant much consideration. It should be stated, however, that on the two mornings following the wash-out large numbers of trout appeared under the bridge. In the second instance while the run occurs just previous to the time of full moon, other factors, of which temperature has already been discussed, appear to be strongly operative. However, between August 7 and August 11

observations were made which indicate that the bright light of full moon, when it was not obscured by clouds, has an inhibitory effect on the movement of trout into the river.

Thus, on the night of August 7-8, the moon was obscured by clouds, at least during the first part of the night. A large run of trout entered the trap. On this night there was also a strong north-west wind which undoubtedly had a favourable effect in bringing in fish. The night of August 8-9 there was a bright moon which was only partially obscured by clouds. The run of fish was not quite so large. On the night of August 9-10 there was a bright moon which was only partially obscured by clouds and on this night the largest run recorded occurred. On the night of August 10-11 the moon was not obscured before 12.00 midnight, or possibly later, and on this night there was a small run of fish compared to the previous three nights. Thus it appears that bright moonlight does have a limiting effect on the migrations of the trout. Reference to Figs. 12 and 18 will give some idea of the effect. Notes on cloud values other than those made at the regular daily observations were kept on these nights.

Clouds: Since strong light is definitely indicated as having an inhibitory effect on the migrations of these trout it might be expected that for such movement as does occur during daylight hours the greatest amount would occur during times of greater cloudiness. This is borne out by the observed facts. From the available data the relationship between amount of clouds in the sky and numbers of fish entering the river seems to be a straight line, the numbers of fish increasing with the amount of cloudiness. This is illustrated in Fig. 24.

In obtaining this graph all cases were taken into account where the trap had been fished at 2.00 p.m. or 3.00 p.m. and previously at about 8.00 a.m. Thus only those fish were considered which had actually entered during the forenoon and early afternoon. On some occasions the production of artificial freshets in the afternoon and evening altered conditions after 3.00 p.m. so all the data for these periods were left out. The day's run of fish was expressed as a percentage of the total number for that day and the preceding night. Thus it could be assumed that the fish had been subject to the same conditions up to the time of entry, except for conditions of light. Cloud values were regarded as being those taken for the day at 1.00 p.m. Cases where the total number of fish for the day and preceding night was less than ten were not considered, since under those conditions the number of fish entering by day, when expressed as a percentage of the total number, tends to be disproportionally high. Further, in order to obtain cases where the temperature conditions were quite uniform, only those cases were used where the lake temperature was above 23.0°C. As previously described the trout entered much more readily when the lake temperature was above this point than at lower temperatures. Since it happened that by admitting cases where the temperature was 22.9°C one point of high cloud values was permitted this latter point was later set as the deadline. It must be emphasized at this point that the action of all the factors encountered in the field, when working together, is very complex. The selection of definite points about which to centre the discussion is necessarily somewhat arbitrary. Quite conceivably a subsequent investigation

might place these points slightly differently. But their selection at this time seems justified by the present data. The points for cloud values 8 and 9 fall in a definitely lower temperature range, mostly well below 22.5°C, and so must be omitted. Below is given, in tabular form, the data from which Fig. 23 is derived.

Effect of Clouds on Number of Trout Entering by Day

Clouds (Beaufort Scale)	Percent of Fish Entering by Day	Average percent per Day
0	5.0	5.0
1	9.1	9.1
2	28.2 0 0	9.4
3	0	0
4	0 5.0 9.8	4.9
5	37.5 7.7 0	15.1
6	20.6	20.6
7	12.5	12.5
8	---	---
9	---	---
10	27.1	27.1

A definite relation between the two factors is shown in Fig. 23. Admittedly the variations of individual cases from the averages are quite large. This is to be expected, especially so when the difficulty of eliminating other complex factors is realized. Also the amount of data is rather small. In all a total of 592 trout entered during the hours considered (7.00 p.m. to 3.00 p.m. of the next day) for the entire period. Of these 52, or 11%, entered between 8.00 a.m. and 3.00 p.m. and from them the relation between amount of clouds and movement of the fish is derived. More complete data would, of course, be desirable, but the relation seems to be definitely indicated.

Wind: In considering the effect of wind on the entrance of trout into the river it is rather difficult to arrive at any very definite conclusions other than that a stiff onshore breeze appears to have a decidedly positive effect in bringing in fish. For Trout Brook this seems to mean a wind from a north-westerly direction and of a force of 3 or over on the Beaufort scale. On the other hand if the wind rises above a force of about 5 the heavy surf would appear to hinder the entrance of an increased number of fish until after the blow was over. This seems to be indicated on August 20, when the wind was estimated at 5, NW in afternoon and evening. A larger run of fish occurred on the subsequent night. On the nights of July 27-28, August 7-8 runs occurred which are larger than can be satisfactorily explained on any other basis than that of an onshore wind. August 7-8, particularly, produced the second largest run of the entire period for which data are available -- 73 trout. A fresh onshore breeze blew all afternoon of August 7, through the night and the next morning. Undoubtedly temperature also had its effect in producing the run, but wind seems to have been definitely involved. The largest run of the season, August 9-10, was on the second night after this wind ceased. Temperature and light conditions were more favourable than on August 7-8. (see Figs. 17,18,19).

Whether the mechanism by which wind works is through a surface onshore drift, or through a bottom return current (wind-formed seiches seemed to be indicated) was not determined. One would expect the latter, however, since presumably the trout, at this season, are largely in the cooler water at the bottom of the lake.

Height of Water: Variations due to rainfall: Before considering artificial freshets in relation to the run of fish it is necessary to see what effect freshets due to rainfall have on the numbers of trout entering the brook. One such freshet had its peak on August 13, with the discharge reaching a low level by August 17. An increase in numbers of fish over the previous two days occurred on August 15, that is two days after the peak of the freshet, but while the discharge was still above normal (see Figs. 12 and 18). An artificial freshet was used on this night; however, in view of other data it is probable this may not account for all the increase in fish. It is suggested, then, that a freshet due to rainfall results in an increase of trout at the mouth of the brook two days later. Now let us consider a freshet having its peak on July 27. There is again a pronounced increase in fish two days later. Another freshet reaches its peak on August 23 and a pronounced increase in numbers of fish occurs on August 25.

If a second freshet occurs before the first has completely run off, that is within two or three days usually, the effect of both seems to be magnified. Thus large runs on July 27 and 28 may be due in part to wind as mentioned above, and in part to the freshet of July 27 following immediately on the decline of one on July 22. Large runs on July 30 and el appear to be related to a freshet on July 30 following that of July 27. Again a larger than usual run on August 26, as well as a still larger run on August 25, seems to be related to a freshet on August 25 following that on August 23. Probably the run of August 25 is large as a result of both freshets acting individually and cumulatively.

It appears, then, that a freshet ordinarily results in an increased run two days after the peak of the freshet. If a second freshet occurs

before the first is run off increased numbers of fish come in on the first two nights following the second freshet.

Artificial Freshets: In order to evaluate the effect of artificial freshets it is necessary to consider the instances where other factors are fairly uniform. During the summer of 1938, due to the variable character of the weather, it was difficult to get days when all other factors were uniform. However, between July 31 and August 8 water temperatures were fairly constant. A freshet having its peak on July 30 was pretty well run off by the night of August 1. Also, as suggested above, its effect should have pretty well passed off by this latter date. Cloudiness (Fig. 12) was quite variable for the period, but on the whole there was more bright sunlight and more uniform weather during this period than at any other time during the summer. On August 3 there was a fresh breeze most of the day which was onshore in the afternoon. Again on August 5 and 6 there was a fresh north-westerly breeze around midday. Except in the last instances these breezes occurred on control days and in no case did they seem to obscure the effectiveness of the freshet. From noon August 7 to noon August 8 a fresh north-westerly breeze blew steadily, which resulted in a very large run of fish on the control night of August 7. Hence the period of August 1-6 is the most satisfactory time during the course of the experiment from which to judge the effect of artificial freshets on the entrance of trout into the brook.

Below are given, in a form facilitating ready comparison, the numbers of fish entering the trap from the lake on the various nights during this period:

Trout Entering Trap

	Aug. 1	Aug. 2	Aug.3	Aug.4	Aug. 5	Aug. 6	Total
Control	16	--	12	--	22	--	50
Freshet	--	38	--	37	--	40	115

Thus, during a period of otherwise fairly uniform conditions, over twice as many fish entered on nights when there was an artificial freshet as on nights when there was no freshet. The above figures present rather a strong case for the value of artificial freshets.

If we consider the data for a somewhat longer period - July 25 to August 31, when the run was practically over - it is necessary to treat it in a slightly different manner. In order to estimate the value of artificial freshets it will be necessary to eliminate all cases where other factors are definitely involved. Due to high water resulting from rainfall the catches of July 25 to July 31, August 15, 25, and 26 will have to be eliminated from consideration. (see section on relation of entrance of trout to rainfall) The catches of August 7, 8, and 22 must be disregarded on account of wind. The catch of August 9, whether due to wind on August 7 and 8 or some other factor, is obviously of some special significance and so can justifiably be left out of the general consideration. This leaves 14 days on which freshets were used and 10 control days. Considering those fish which entered between 7.00 p.m. and 7.00 a.m. of the next day, which is the period when the freshets would show most significance, we find the number of fish for those days with artificial freshets to be 234, for control days to be 126. By taking the average number of fish per day, for the first period, and multiplying it by ten we get a

figure, 167 fish, which can be compared more readily with the 126 fish of the control days. That is to say, on days when an artificial freshet was employed, if special conditions such as wind and rainfall are eliminated but differences in temperature are not taken into account, there are still 30 per cent more fish entering on experimental days than there are on control days. Thus even when considered over a long period during which there may be considerable difference in temperature artificial freshets are still shown to have a pronounced value.

Some attempt was made to determine whether variations in the nature of the freshets, i.e. whether produced in the morning or in the evening, or having two freshets following each other in close succession, would have any effect.

On the nights of August 10 and 12 freshets were produced in the evening and the early morning. The effect on the total run for each day did not seem to be appreciably larger than would have been expected with a single eveing freshet. In fact the intervening night produced a run intermediate in numbers, even though there was no freshet. On the tenth more than half the total number of fish for the evening entered on the evening freshet; on the twelfth the proportion was reversed. The results do not indicate any great value in such procedure, or are, to say the least, inconclusive. On August 14, 16 and 18 the evening freshet was commenced at the usual time, dusk, allowed to run about half an hour, then checked and started again as soon as the water reached the level, or a little higher, at which the gates were first opened. That is two freshets in close succession were produced. On the intervening nights simple freshets were produced. Again no positive results indicating value in such complex procedure were forthcoming.

On August 23 trash, including sticks, grass, muck, etc. was thrown in at the spillway as the discharge was commenced. Traces of this were visible in the water at the spillway during the first 20 minites of discharge. The run was no larger than on the previous and succeeding nights, when simple freshets were used. In fact between the time of opening the gates at 7.20 p.m. and 9.15 p.m. only one small trout entered. By 9.00 a.m. next morning six more fish had entered. Judging from this single instance only, such procedure has no value, and may, indeed, even be detrimental to the entrance of the trout.

Time at which Fish Enter in Relation to Artificial Freshets: As already stated in considering the effect of light on the movements of the trout (page 8) more fish were found to enter after 11.00 p.m. than before that hour, on 14 out of 19 occasions. And, as already stated, on those occasions when freshets were tried both morning and evening no consistent difference in favour of either morning or evening was found. However, if there is a relation one way or another it might be expected to affect the time of entrance of the fish relative to the freshet. As throughout much of the experiment, the data are insufficient to warrant a very detailed analysis of the case. However it may be worth while to offer such figures as are available. Those three occasions, only, will be considered on which artificial freshets are shown to have had a very definite effect on the numbers of fish coming into the trap.

It seems to be definitely indicated that upwards of 30 per cent of the total number of fish for the night entered within 2 hours after the commencement of the freshet. The results of August 4 suggest that most of the fish enter by about 7 hours after the beginning of the

freshet. On some other nights than those mentioned above the fish were watched as they entered the trap. On these occasions there was a fairly steady entrance of fish after about half an hour from the time of opening the gates until two hours later, when the run seemed to slack off somewhat. In order to obtain any precise information it would be necessary to fish the trap through the night at hourly or two-hourly intervals.

Time fish enter in relation to Freshet.

Date of freshet	Time	Hrs. after opening gate	Number of fish	Percent of total for the night
Aug. 2	9.01 p.m.	0	--	--
	11.00 p.m.	2.00	11	29.7
	8.00 a.m.	11.00	26	70.3
Aug. 4	9.00 p.m.	0	--	--
	11.00 p.m.	2.00	15	39.4
	4.00 a.m.	7.00	21	55.3
	9.00 a.m.	12.00	2	5.3
Aug. 6	8.30 p.m.	0	--	--
	10.45 p.m.	2.15	23	57.5
	7.30 a.m.	11.00	17	42.5

Angling Records: The records of trout taken by angling, as kept by the game wardens at the brook, were worked over to see whether the angling catch corresponded in any degree to the numbers of fish entering the stream.

The angling catch is illustrated graphically in Figs. 20 and 21. The points plotted represent the numbers of fish per day per angler. Dotted lines represent no angling on days intervening between points so connected. It will be noticed that the effort was not very uniform through the season. Previous to June 3 most angling was done 100 yards from the mouth of the brook. Subsequent to this date angling was

largely inside the bar separating the lake from the brook. An increase in availability of the fish on June 20 is related to a run of fish into the brook at this time. Another run about July 5 resulted in a similar rise in availability until June 12. Between July 13 and August 29 the availability drops somewhat. This may be related to a rise in the general level of brook temperature, rather than a decrease in the numbers of trout, for it remained rather low until August 30, when the brook temperature dropped somewhat. There is a slight rise in the general curve on August 12 which may correspond to the large run of fish just previous to this time. The correspondence is not very significant, however. On August 30 and 31 there were good catches; there was also a drop in brook temperature about this time.

In order to see whether the catch by angling showed much relation to brook temperature Fig. 25 was constructed. The figures for availability of trout represent fish taken per angler per day. These are compared with the evening temperatures of the brook as abscissae. (On the whole more angling seemed to be done after noon than before noon.) All instances falling within a 1°C range are grouped together and the average of these figures used; e.g. cases where brook temperatures were 15.6°C to 16.5°C were grouped as if at 16.0°C. There are, of course, wide variations from the average value as plotted, particularly at the higher temperatures. This is to be expected as the situation is much more complex than a simple temperature relationship. Nevertheless a relation to temperature does seem to be shown in that availability seems to be, on the whole, better at temperatures between 15°C and 19°C than at higher or lower temperatures. At the extreme

right of the figure occurs a value where the catch was good at a high temperature (21°C on July 26;availability= 8.4) This had to be averaged with only one other instance and the resulting point does not seem to fall at all in line with the other points. No satisfactory explanation for it has been found. Whether or not it invalidates the suggestion made above as to temperature - catch relationship is left to the reader.

Movements of Tagged Trout: It has already been mentioned that large trout (over 28 cm. total length) passing through the trap were marked with numbered tags. Of the 74 fish so tagged 71 were liberated and of these 22 (31%) were reported later. Four of these were taken upstream after the end of August; two were taken in the outgoing trap as sick fish, one of which died and the other, badly fungused, disappeared when left in the trap. Three of the 22 had apparently been out in the lake. One re-entered the trap after 25 days. Another returned from the lake ten days after being tagged. It had deep wounds in shoulder and tail and subsequently died. Another was retaken in the trap 12 hours after it was first recorded. These fish had apparently escaped under the trap before it was securely banked. On one occasion a small school of young fish, trout or smolts, was seen in the trap, but did not remain there long enough to be fished out. Other than this a very few - not more than ten - small stragglers appeared in this trap during the summer. Hence it is concluded that very few of the fish showed any tendency to migrate out into the lake once they had entered the brook; certainly not more than 3 out of 22 (about 14%) of the tagged fish subsequently reported showed any such tendency.

Thirteen of the 22 trout later reported were taken by anglers in the vicinity of the bridge, that is, in the mouth of the brook. Of these 7 were taken within 10 days of the time of tagging; 4 were taken between 11 and 20 days after being tagged; and two were taken from 21 to 30 days after tagging. This would indicate that of those fish under the bridge about 55% are available for only 10 days; they then probably move upstream. About 30% are available for another 10 days, and only 15% remain in the lower part of the brook where they are available to anglers for more than three weeks. If the three fish which returned to the lake are considered along with those taken by anglers the percentages will be altered to 45%, 25%, 12% and 19% returned to the lake. It is the opinion of the investigator that the fish which returned to the lake did so because they were not thrown well clear of the trap when liberated; in such case the liberated fish tended to nose under the trap into the most convenient hiding place, from which they could very easily pass out to the lake again. The fact that no sound fish were taken in the out-going trap indicates that once the trout were well into the stream they actually had very little tendency to go to the lake again.

There was evidence to show that having once entered the stream the movement of the fish was upstream towards the pools, particularly those in the first 2½ miles above the mouth. Little fishing was carried on upstream (it is closed to angling above a point 100 yards up from the bridge), until after the first week in September. After this time four tagged trout were taken upstream. Two of these, taken ½ mile up and on the same day, had come in from the lake 45 days

previously; two others, taken from a pool about one-third of a mile up, and on the same day, had been in 42 and 45 days respectively.

It seems probable that these fish may have remained in these pools for some time. On August 6 a tagged fish was reported as seen in a pool half a mile upstream. On August 9 another was seen in a pool one-third of a mile up. Since tagging was only commenced on July 27 these fish had gone up within 12 days of entering the brook. They were seen in company with other large, unmarked trout, presumably those of an earlier run. On August 10 four tagged fish were seen in a pool one-third of a mile up. One of these bore a small tag, so that it had been tagged not earlier than July 31. On the same date a tagged fish was seen by the author in the pool where the first tagged fish was reported. There was no freshet on the brook between July 31 and August 13, so that at least one of these fish moved up without this stimulus. On August 15 eight tagged fish were seen in the pools of the lower half mile of the stream. One was recorded in a pool less than one quarter of a mile above the point where tagged fish were first recorded. This was the farthest point from the lake at which tagged fish were found. Also it was the last large pool in the stream before a point 2½ miles from the mouth. There were other smaller pools in the intervening stretch. On August 19 large, dark trout, which from scale readings appeared to be from the lake, were taken in every pool of any size below this large pool 2½ miles up. In most of these pools only one large trout was recorded on a given day, but in the upper pool at least four of these large fish were seen at once. In the lower part of the stream large trout were taken from much smaller pools than in the upper stretches. In all the pools in the lower half mile from which tagged trout were recorded schools of these large unmarked fish

were also seen. The evidence seems to indicate that after entering the stream the fish moved up to these pools and spent the time in them. No direct evidence was obtained as to the possibility of their moving up to the head-waters at spawning time. But one resident of the district, who appeared to be more observant than most, reported having seen large trout "on spawning beds" where Gillander Mountain Road crosses the brook, in the late fall. This is about 12 miles from the mouth of the brook. On July 11 a trip was made seven miles upstream, but there was no indication of large trout above the 2½ mile pool.

Colour of Trout as an Indication of Habitat: Those trout which came into the trap from the lake were noticeable for the typical pelagic coloration of the body. The belly of such fish was a bright silver, which almost completely obscured the coloured spots on the sides of the body. The back was a bright, metallic greenish to bluish in colour, through which the marbling typical of Salvelinus showed more or less prominently.

Trout taken in the brook had bellies with a white under-colour which was partially obscured by greyish or orange pigment, or both. The spots were bright and very noticeable and the backs of such fish darkly olive with pronounced black marbling. The fins were also of a bright orange colour with the outside white edge showing clearly, whereas in the lake fish the whole fin was white, rather than just a white band on the edge.

It was observed that fish from the lake which had been in the brook for a while gradually assumed this dark colour. In order to see just how long was required for the lake fish to attain the dark

colour characteristic of brook fish three of the tagged fish were kept in a pen in the brook, adjacent to the trap. Notes on these three specimens will be found in the "Record of Tagged Trout" at the end of the report.

One of these, which was of a bright silvery colour when first taken, showed a noticeably darker pigmentation of the skin after four days. In nine days from time of capture its colour was about midway between that of typical lake and typical brook fish. The fins were quite smoky with an underlying pinkish wash, and white, or light grey edges. By the time 21 days had elapsed the fish was very dark, the belly being grey over an underlying orange tint. It was as dark as any fish taken in the stream during the summer. Another fish kept under observation for 18 days was almost as dark as the first was after 21 days, but showed slightly more orange under-colour. A third fish kept for 11 days was also quite dark and a typical "stream trout" as far as colour was concerned, but showed less of the grey and more orange colour than either of the above two fishes.

Thus it appears that the bright, silvery colour found in the lake gives way to the dark colour of the stream fish in from two to three weeks after the fish leaves the lake. Whether the orange colour of some specimens is simply by way of a transition to the darker grey of others, or due to individual variation, was not determined.

From these observations one would be inclined to think that certain trout which came into the trap and had not quite so bright an appearance as most of the fish may have been in some other stream for a period of time before entering Trout brook. Of course it is possible that the change from dark to silvery may take somewhat longer than the reverse process. So that one could not hazard as to how

long such slightly dark fish had been in moving from one stream to another.

Altering Stream Bed to Improve Water Conditions for Trout:

As has already been indicated water temperature has an important bearing on the physiological condition of the trout. In the discussion of availability of trout to the anglers it was shown that fishing conditions were better in the pool at the mouth when the water temperature was not above 19°C. Therefore anything which would tend to keep down the brook temperature would be a decided advantage. During the first week in August, which was the only period of really warm weather, the brook temperature frequently rose above 19°C, particularly from the late forenoon until evening. This would probably happen much more often in a normally warm summer, when the amount of water in the brook is stated to be much less than was the case in 1938.

The possibility of altering the course of the stream to keep down the water temperature is well illustrated in an experiment carried out at the first rapids above the bridge. Here the water came through a long shallow pool to spill over a gravel slope extending right across the stream and about 100 feet wide. On warm days there was found to be a difference of from 0.5°C to 1.0°C between the temperature of the water above and the temperature of the water below the bar. There was some indication of an old channel running past the bar on the left bank of the river. A dyke of stone was built obliquely across the upper end of the bar so as to direct most of the water into the old channel at the left. There was enough seepage through the stone dyke so that at the extreme right end there was almost as fast a current as before the construction of the dyke. About seven-eighths of the water was directed down the left channel which was well shaded by trees after 11.00 a.m.

In order to test the effectiveness of the new channel in conserving low temperature comparisons were made at 3.00 p.m., the time of highest brook temperature, on subsequent warm days. Temperatures were taken immediately at the lower end of the swiftest current on either side. On the right bank this was 50 feet below the dyke; on the left about 150 feet below the dyke. Since the upper pool was slightly shallower on the right bank temperatures were also taken here. Below are given two typical series of temperatures.

Date	Right Bank		Left Bank	
	Above Dyke	50 Feet Below	Above Dyke	150 Feet Below
Aug. 17	20.4°C	20.8°C	20.4°C	20.4°C
	Temp. in midstream 200 ft. below dyke - 20.5°C			
Aug. 18	20.3°C	20.8°C	20.1°C	20.1°C
	Temp. in midstream 200 ft. below dyke - 20.4°C			

On the left bank there was little or no rise in temperature for from 50 to 150 feet below the dyke, as the water flowed through a channel about two feet deep. Thus it is seen that there was a conservation of the brook temperature by something like 0.5°C caused by directing the water into a shaded channel where it ran swiftly, rather than over a long shallow gravel bar. Incidentally, a much better passageway for trout was provided by the new channel.

From the 200 foot point to the bridge there was a further warming of about 1.0°C. It is estimated that this could be cut in half, or possibly eliminated almost entirely, by the use of suitable baffles which would direct the flow of water under the alders which shade the left bank. There is a deep channel on this side. Under present conditions most of the current seems to be in midstream where the sun's rays strike until about 4.00 p.m.

There are several suitable places in the first half mile of the stream where similar constructions could be used to give a lower brook temperature, particularly on warm days. Also, since there is indication that the trout, especially larger ones, lie in such pools as there are during much of the summer, it would seem sound practice to improve such pools, and also to construct new ones where the force of the stream could be employed to dig them out. There are several excellent opportunities for such work.

Enemies of the Trout: Quite a percentage of trout taken into the trap showed scars which indicated an encounter with some predator. This was particularly the case with the smaller fish, though a few of the real large trout carried wounds evidently made by herons, loons or ospreys. About 6 per cent of the fish over 28 cm. in length were so marked. Complete records of all fish showing scars were not kept, but between 5 and 10 per cent of the smaller trout carried scars made by eels, kingfishers and herons. Eels and kingfishers seemed to be the chief offenders, both species apparently taking an equally severe toll of the young trout in the lake. Trout with scars caused by herons were much less common. Both eels and kingfishers were frequently seen about the bridge. A few herons were seen about the lake shore near the brook, particularly in the early morning and late evening hours, but on the whole their depredations seemed to be carried on further up the stream, and were much more severe in the early part of the summer, very few being seen after the first week in August. Previous to the middle of July herons were to be seen up the brook at almost any time. On one occasion eight herons, a couple of pairs of kingfishers, four golden-eyes, a female

merganser which apparently had young, and a mink were seen within fifteen minutes. As might be expected with such a high predator population the numbers of fry and yearling trout in the brook were small. This was observed to be the condition as far up the brook as there was occasion to go, (about seven miles).

Wounded fish liberated inside the brook were observed to develop heavy infestations of Saprolegnia within three ~~three~~ to five days after entering the brook. This first appeared on the wound but later spread to other parts of the body, particularly head and tail regions.

Practically all trout in the mouth of the brook on June 18 were observed to be infested with Argulus. At this time the "lice", as they are popularly called, were quite small, being less than one-half adult size. Specimens of Argulus were collected from time to time and notes made as to their abundance. From each sample of specimens collected twenty individuals were selected which seemed to be representative of the sample. The lengths of these specimens were measured to the nearest tenth of a millimetre. These observations are given in tabular form below:

Argulus canadensis Collected on Trout at Trout Brook, Lake Ainslie.

Date	Place	Average length of 20 specimens	Range in length
June 20	Bridge	3.9 mm.	2.9 - 4.8 mm.
25	"	5.1 mm.	3.9 - 7.4 mm.
25	½-mile upstream	4.5 mm.	3.4 - 7.0 mm.
28	Bridge	5.9 mm.	4.3 - 8.1 mm.
July 3	"	6.3 mm.	4.4 - 7.8 mm.
10	2½ miles upstream	6.0 mm.	5.3 - 6.9 mm.
12	Trap	7.1 mm.	5.9 - 8.8 mm.
20	"	7.7 mm.	5.7 - 8.7 mm.
25-30	"	8.7 mm.	4.2 - 10.1 mm.
Aug. 1-15	"	8.5 mm.	5.3 - 10.3 mm.

- 5 specimens only.
- 8 specimens only.

By July 1 the infestation of Argulus was very noticeable, practically all fish carrying about 30-40 of the parasites, which were more noticeable than earlier because of their larger size. After this date, however, the numbers of the parasites began to fall off, until by July 15 most of the infected fish carried only from one to five of the parasites apiece and quite a few of the trout were entirely free from the infestation. By the end of July there were very few infected fish entering the trap and these seldom carried more than two or three lice apiece. A few lice continued to be present until after the middle of August. Most of these latter were gravid females, though a few small individuals were present on some of the fish. The peak of the infection, however, seemed to be between the first of July and the middle of the same month, and fell off very rapidly thereafter.

The argulids chafe away the skin and mucus of the trout, particularly about the tail, top of the head and anal fin. Saprolegnia frequently appears on these chafed areas, and if this infection becomes very heavy the trout usually succumbs. After the dam had been closed a week very few fish were seen which were very heavily infested with this fungus and there was no increase in the numbers of dead trout to be seen on the bottom of the pool under the bridge. About the end of June dead trout were appearing in the pool at the rate of about three to ten per day. Less than 100 were seen during the entire summer however, and it is believed that the construction of the dam was in some measure responsible for the improvement of conditions as they were at the end of June.

The dam seemed to have some effect on the course of the Argulus infection. Thus on July 9, when a section of the dam was washed out, considerable numbers of Argulus were found on the lake side of the

boards, but none were found on the brook side. It would seem that they were not able to stem the swift current coming out of the spillway. If this was the case the dam prevented a heavier infection of these fish already within the brook. Again, by keeping out the warmer lake water and thus aiding in maintaining a low brook temperature the dam was instrumental in keeping the trout in better physiological condition so that they were better able to withstand the effects of the parasites which attacked them. It also seems probable that the lower brook temperature resulted in conditions less favourable to the growth of the argulids. This is shown by two cases where infested trout were taken upstream, on June 25 and July 10. The average size of the parasites was considerably smaller than those of parasites of the same time period taken as they were brought in from the lake. This can be seen well from the table above. Thus, in so far as the Argulus infection is concerned the dam had a decidedly beneficial effect for the trout.

The only other species of fish infested with Argulus was Gastrosteus aculeatus.

Miscellaneous: A few observations were made on species of fish other than the speckled trout with which the investigation was especially concerned.

Salmon post-smolts were taken in the trap from July 14 to September 1. The peak of the run occurred between July 21 and August 1. As the season progressed the condition of the post-smolts became steadily poorer, until towards the last they were very thin and weak, and heavily infested with gill parasites. About 80 post-smolts were taken in the trap during the summer.

Lake suckers, Catostomus commersoni, were frequently taken in the trap, almost invariably entering at night, and particularly during the

first part of the night. The suckers were found to enter very frequently on nights of artificial freshets.

Eels entered the trap on only a few occasions, but they were abundant in both lake and brook.

On one occasion a smelt, Osmerus mordax, was taken in the trap; on another occasion one was seen in the mouth of the brook, having apparently passed through the trap ; at another time a dying smelt was picked up out in the lake. Thus their presence in the lake was demonstrated. They do not appear to be very common, however, and are unknown to the natives. Possibly the specimens taken were stragglers, from the lower part of the river, which got lost in the lake at the time of the spawning run. All three specimens were preserved. They were small -- 10 to 12 cm. in length -- and the gonads showed no sign of maturity.

At the conclusion of the experiment the dam was left in position with the hope that it might influence the direction of discharge of the stream by causing a channel to be dug by the water in the position of the spillway, and possibly cause the formation of a bar around the remainder of the mouth, thus reproducing the condition shown on the earlier maps. The dam was reported to have been washed away by severe storms in the late fall; it is not known whether any new channel was formed before the dam went.

SUMMARY

(1) Effects of the Dam: By excluding lake water the dam caused a lowering of the water temperature in the mouth of the brook by as much as eight degrees Centigrade, on warm days with an onshore wind.

The lowering of the water temperature caused increased activity of the trout and improvement in their general condition. Mortality of the trout, which had commenced about the third week in June, ceased a few days after July 3 when the dam was completed.

There was some indication that the dam acted as a mechanical barrier to prevent the argulids from entering the brook from the lake and thus prevented further infestation of those trout already within the brook.

(2) Water Conditions at the Mouth of the Brook: In very warm summer weather, in the late forenoon and afternoon at least, there is a "temperature barrier" for the fish formed between the cooler water at the bottom of the lake and the cold water of the brook. This would prevent the trout from finding the entrance to the brook.

Under even ordinary summer conditions a most important characteristic of the brook water, its relatively low temperature, is lost soon after it enters the lake.

Three hours after the dam was closed preparatory to producing an artificial freshet all indication, as far as temperature was concerned, of brook water in the lake was lost.

(3) Effect of Water Temperature on the Migration of Trout from Lake to Brook: For the period of the experiment it was found that when the lake temperature reached 21°C the trout tended to come into the brook from the lake. As the temperature rose above this point proportionally more fish entered. As the temperature of the lake rose above 23.5°C the numbers of trout entering the brook rapidly fell off, presumably because at such high temperatures their activity rapidly decreases.

At 21°C. a difference of 3°C. between the temperature of lake and brook water is necessary to the entrance of trout. With a greater difference in temperature proportionally more fish entered. At higher lake temperatures a smaller difference between lake and brook temperature will suffice to bring in the fish, and correspondingly, a given difference in temperature is much more effective in bringing in fish at high than at low lake temperatures.

(4) Light: Ninety per cent of the trout entered between 7.00 p.m. and 7.00 a.m. of the following day, that is during the hours of low light intensity. During the period of the experiment more fish entered after midnight than before, but the data are insufficient to determine with any degree of certainty at what time of night the trout are most active.

The numbers of fish entering between 8.00 a.m. and 3.00 p.m. were found to be proportional to the amount of cloudiness of the sky.

(5) Wind: Fresh onshore breezes were followed by an increase in the number of trout coming into the trap. If the wind was of a force greater than 5, on the Beaufort scale, so that a considerable surf was running at the entrance to the trap, the increase in the run of fish was delayed until the night following the cessation of the heavy surf.

(6) Rainfall: When there was a freshet on the brook due to rainfall an increase in the run of trout followed on the second day after the peak of the freshet. If a second freshet followed before the first had completely run off increased numbers of fish came in on the first two nights following the peak of the second freshet.

(7) Artificial Freshets: During a period of six days when weather conditions were quite uniform, on the three experimental nights 115 trout entered; on the three control nights 50 trout entered. Thus, other conditions being equal, over twice as many trout came into the brook on nights of artificial freshet as on nights when there was no artificial freshet.

Upwards of 30 per cent of the trout entered within two hours of the commencement of the freshet, and probably most of the fish entered in the first seven hours.

(8) Angling Results in Relation to Temperature: A consideration of the catch by anglers indicates that angling conditions are best when the brook temperature lies between 15°C. and 19°C.

(9) Temperature Control: A dyke constructed above the first rapids so as to turn the water from over a shallow gravel bar to a shaded channel resulted in a lowering of mid-day temperature 200 feet down stream by 0.5°C.

(10) Movements of Tagged Trout after entering the Brook: No healthy trout appeared in the out-going trap during the summer, indicating a lack of movement in this direction.

Observation of the tagged trout showed that of those fish recaptured by anglers in the vicinity of the bridge 55 per cent were taken within ten days of the time they entered the brook; 30 per cent were taken between 11 and 20 days after first entering the trap; and 15 per cent were taken between 21 and 30 days from the time of coming into the brook. This indicates that most of the fish move up stream within two to three weeks of entering from the lake.

Tagged trout were seen up to one-half a mile upstream within 12 days of the time of tagging. Apparently the trout migrate upstream to the nearest pools and remain in them for most of the summer. Fish entering the brook early go farther up the stream.

(11) Colour Change with Change in Habitat: When trout enter the brook the bright silvery colour characteristic of the fish from the lake gives way to the darker colouring which characterizes the brook fish in two to three weeks' time.

(12) Predators: The chief predators of the trout at Trout Brook are eels, kingfishers, herons, and a few fish-eating ducks. The first two appear to be the worst enemies of the trout. Herons were not very numerous after the first of August.

(13) Parasites: All trout under the bridge were heavily infested with Argulus on June 18. The parasites attach themselves, when small, to the fish and grow to adult size on the host. After July 1 the parasites began to disappear and were quite scarce on newly-run fish by August 1.

The argulids did not show as fast growth in the cool brook water as they did in the lake.

Wounds and skin abrasions caused by predators or Argulus were invariably the scene of infection by the fungus Saprolegnia, which before the construction of the dam frequently resulted in the death of the fish so infected.

Trout River, Inverness Co. N.S.

Record of Air Conditions for June, 1938

Date	Wind 7-8 a.m. F	Wind 7-8 a.m. D	Wind 1-2 p.m. F	Wind 1-2 p.m. D	Wind 7-8 p.m. F	Wind 7-8 p.m. D	Sky 7-8 a.m.	Sky 1-2 p.m.	Sky 7-8 p.m.	Air Temp. 7-8 a.m.	Air Temp. 1-2 p.m.	Air Temp. 7-8 p.m.	Rain 7-8 a.m.	Rain 1-2 p.m.	Rain 7-8 p.m.	Remarks
June 1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16																
17																
18																
19																
20	0	-	-	-	0	-	9	-	6	16.1		15.8				
21	1	SW	4	NNW	0		2	2	1	11.3	18.6	13.9	No			Wind 5 NW in afternoon
22	0		3	W	1	W	2	0	0	10.9	30.3	26.8	Gauge			
23	0		2	WNW	0		8	8	8	22.1	24.6	24.2				
24	1	SW	3	SSW	2	NW	10	7	8	20.9	25.8	21.1				
25	0				1	NW	9	-	9	16.2	-	19.6				
26	3	SSW			4	NW	9	-	10	19.4	-	15.1				Rain in a.m. and
27	1	NW	1	W	0		10	8	9	14.7	17.8	16.7				most of the day
28	0		1	W	0		9	10	10	14.1	15.1	13.9				Drizzling in morning
29	0		1	N	4	NW	9	10	10	15.2	16.1	14.5				Rain at noon
30	3	NNW	4	NNW	0		10	3	3	14.2	19.2	16.0				Drizzle in a.m.

Trout River, Inverness Co., N.S.
Record of Air Conditions for July, 1938

Date	Wind 7-8 a.m. F	D	Wind 1-2 p.m. F	D	Wind 7-8 p.m. F	D	Sky 7-8 a.m.	Sky 1-2 p.m.	Sky 7-8 p.m.	Air Temp. 7-8 a.m.	Air Temp. 1-2 p.m.	Air Temp. 7-8 p.m.	Rain 7-8 a.m.	Rain 1-2 p.m.	Rain 7-8 p.m.	Remarks
July 1	0		1	SW	0		10	5	8	16.3	21.3	16.9				
2	1	SE	0		2	SSW	10	9	9	15.4	17.1	14.5				
3	1	ESE	2	SE	2	SE	9	9	9	16.3	19.6	18.3				
4	1	E	0		0		10	10	10	16.9	21.4	14.9	.06		.04	
5	0		2	E	2	ESE	9	8	7	11.9	16.3	13.1	.015			
6	0		1	S	1	E	2	7	9	15.3	23.3	17.8				
7	2	N	5	N	5	NW	10	8	5	15.7	15.2	14.3	.03			
8	1	E	1	NW	1	E	2	2	2	14.7	20.0	18.9				
9	1	NE	3	SW	2	SW	10	3	5	18.6	27.4	23.1	.01			
10	3	W			2	E	1		9	22.5		22.6				
11	5	NW	6	NW			10	4		17.3	17.5					
12	1	W	0		1	E	9	8	9	14.4	16.2	15.4				
13	1	SE	2	ESE	0		10	9	9	12.7	14.8	17.9	.08		.14	
14	0		1	E	1	E	10	2	0	18.0	27.6	22.7			.005	
15	2	E	3	SW	3	SE	9	8	7	20.9	23.9	22.8			.02	
16	3	SW	4	W	0		4	1	3	20.0	26.4	19.5				
17	0				0		0		4	16.8		22.6				
18	0		2	WSW	0		7	4	10	20.6	25.1	20.2			.19	
19	1	E	4	NW	2	NW	10	7	9	18.8	21.7	20.8	.35	.035		
20	1	E	1	E	0		10	10	7	17.4	20.8	20.1	.18		.035	
21	2	NW	4	N	2	W	10	5	4	20.6	21.9	20.8	.033			
22	0		0		3	NW	10	10	10	18.4	21.8	20.2	.505		.405	Rain all morning
23	2	SW	3	W	1	E	8	8	9	21.1	24.3	22.8	.085			Sunshine in afternoo
24	3	SSW					8			21.2						
25	1	SW	3	WSW	2	SW	8	6	3	22.3	23.6	22.6				
26	3	SSW	3	SW	1	ENE	2	5	4	23.1	27.9	23.6				
27	2	SW	1	SE	3	NW	10	9	10	21.3	22.4	20.2	.29			
28	3	NNW	5	NW	1	E	1	2	2	20.2	21.0	19.1				
29	1	SE	1	SE	2	E	10	3	9	15.2	23.1	15.2				Wind 3,E most of after noon
30	1	E	1	E	0		10	9	8	19.3	22.7	21.2	.465	.515		
31	1	W	3	WSW	0		4	2	3	20.6	25.5	21.4				

Trout River, Inverness Co. N.S.
Record of Air Conditions for August, 1938

Date	Wind 7-8 a.m. F	Wind 7-8 a.m. D	Wind 1-2 p.m. F	Wind 1-2 p.m. D	Wind 7-8 p.m. F	Wind 7-8 p.m. D	Sky 7-8 a.m.	Sky 1-2 p.m.	Sky 7-8 p.m.	Air Temp 7-8 a.m.	Air Temp 1-2 p.m.	Air Temp 7-8 p.m.	Rain 7-8 a.m.	Rain 1-2 p.m.	Rain 7-8 p.m.	Remarks
Aug. 1	0		1	SW	1	SW	0	4	8	20.8	28.4	23.4				
2	2	SE	3	SSE	0		9	8	1	22.4	23.1	20.0				
3	4	SW	4	NW	2	NW	5	4	7	20.5	24.2	20.8				
4	0		0		0		2	5	3	21.7	26.6	22.7				
5	1	SSE	3	WSW	1	E	6	9	8	23.8	25.6	24.5				Hazy in afternoon
6	1	W	3	NW	1	NW	9	4	4	22.6	23.6	19.5				
7	1	SE	2	NW	4	NW	10	2	8	17.7	24.6	21.7				Windy all afternoon
8	3	W	3	WNW	1	E	1	1	7	19.7	22.1	17.0				" "
9	1	E	1	E	0		5	6	6	14.3	20.6	17.2				
10	0		1	SE			10	9		14.7	17.6		.22			Rainy morning
11	1	SE	0		1	SE	8	9	10	13.7	18.9	16.6	.056			
12	2	E	2	E	1	E	10	10	10	17.4	18.2	17.4		.035		.03 Rain in morning
13	1	E	3	WSW	0		9	8	2	14.1	18.1	15.6	.26	.242		
14	0				0		1		2	19.2		18.5				
15	1	SE	1	SW	1	ENE	6	10	7	20.0	25.6	19.4				
16	1	E	3	SW	2	ESE	6	9	8	22.9	25.1	22.9	.05			
17	2	SW	3	SW	1	E	4	4	0	21.3	28.4	21.8				
18	0		2	SE	1	E	8	5	8	20.7	27.3	22.1				(2.00 warm and fine
19	1	E			4	NW	7		8	20.3		22.4	.11			(clouds about 3-4
20	2	SW	5	NW	5+	WNW	8	6	2	18.6	17.8	15.8				Windy from 9 a.m.
21	1	NNW	1	E	1	ESE	5	0	7	14.8	20.8	16.3				on
22	0		1	SE	2	SSW	6	8	5	16.9	26.1	19.9				
23	3	NW	2	WNW	1	SE	3	1	2	19.6	23.2	17.9				
24	0		0		0		9	7	9	17.6	24.1	17.1				
25	1	NE	1	SE	1	SE	9	5	3	18.6	21.1	17.8	.37	.10		
26	0		1	E	1	W	1	8	10	15.2	20.1	17.2			.023	(Wind 3 NW most
27	3	W	2	W	1	E	9	1	3	17.2	19.4	15.4	Drizzly morning			(of morning
28	2	SW	4	N			8	9		19.8	17.9			.275		Windy all after-
																noon and very
29	2	SW	2	WSW	1	E	2	0	1	14.2	20.6	16.7				cool.
30	1	S	1	SW	1	E	2	4	9	15.9	22.4	18.8			.01	
31	2	NNW	4	NW	1	E	9	3	1	17.4	19.3	15.6	.27			Windy 10 a.m.-
																5 p.m.

Trout River, Inverness Co. N.S.
Record of Air Conditions for September 1938

Date	Wind 7-8 a.m. F	D	1-2 p.m. F	D	7-8 p.m. F	D	Sky 7-8 a.m.	1-2 p.m.	7-8 p.m.	Air Temp. 7-8 a.m.	1-2 p.m.	7-8 p.m.	Rain 7-8 a.m.	1-2 p.m.	7-8 p.m.	Remarks
Sept. 1	1	SSE	2	S	3	ESE	8	8	9	17.7	23.3	19.3				Wind rising at 2 p.m. storm brewing
2	3	NW	4	NW	4	NW	10	8	6	16.2	16.9	14.8	.412			Heavy wind all morning. Brook rising.
3	1	E	3	WNW			3	4		8.5	16.8	8.0				Evening cold and clear
4	1	ENE					8			12.6		17.7				
5	3	SW	4	W	3	W	6	3	4	16.4	17.2	14.7	.12			Heavy wind squall 4 a.m. Wind 5 W at 11 a.m. and all p.m. at 4 W.
6	4	WNW	4	WNW	0		6	7	1	12.8	13.1	11.6		.015		Wind all night and all day to 6 p.m.
7	1	SE	2	SW	2	SW	1	5	9	13.1	22.5	15.1				Clear sky all morning
8																Rain last night and all day.

Trout River, Inverness Co., N. S.
Record of Water Conditions ~~for June,~~ 1938

Date	Lake Height (cm.)			Temperature (°C)			Brook (Bridge, June 20-Jly.5; Trap) Height (cm.)			Temperature (°C)			Brook (B2) Hgt."	Temp.°	Remarks
	7-8 a.m.	1-2 p.m.	7-8 p.m.	7-8 a.m.	1-2 p.m.	7-8 p.m.	7-8 a.m.	1-2 p.m.	7-8 p.m.	7-8 a.m.	1-2 p.m.	7-8 p.m.	1-2 p.m.		
June 20				18.1		18.6				11.7		12.4			(B2 Brook
21				17.4	20.9	19.5				10.7	19.1	16.8		15.9	(8.30 a.m. 12°
22				18.7	21.5	20.6				11.4	16.1	20.1		14.8	(10, 12.0°
															(11. 14.
															(12 14.8
23				19.9	21.9	22.3				14.6	18.6	19.5			
24				20.5	23.0	22.4				14.9	20.5	18.6			
25				20.0		20.9				15.0		15.1			
26				20.0		17.3				13.7		13.9			
27				19.3	19.9	19.6				12.1	13.2	13.4			
28				19.0	18.6	19.0				11.7	12.0	12.3			
29				18.7	19.5	17.8				11.2	12.2	11.3			
30				17.4	20.2	20.1				11.3	13.9	13.2			
July															
1				18.2	19.8	19.4				11.2	14.7	14.1			
2				18.9	19.3	18.6				11.6	13.0	12.4			
3				18.6	19.2	18.8				11.9	14.8	15.3		14.4	
4				18.3	19.2	18.5				12.3	14.1	13.2			
5				17.9	18.7	17.0				11.7	12.7	12.4			
6				18.2	18.8	18.9				12.2	15.6	16.0			
7				17.9	20.6	17.4				13.4	14.9	14.3			
8				18.4	23.1	20.4				12.2	18.2	18.3			
9				18.1	21.8	20.3				13.3	16.1	17.6			
10				20.9		20.0				15.4		19.5			B2 taken at 8 a.m.
11				19.1	20.0					16.0	19.0				
12				18.6	19.4	18.8				12.5	13.4	13.3			
13				17.9	19.0	18.9				11.4	12.9	13.9			
14				19.0	20.2	19.0				13.5	16.3	17.6			
15				19.4	22.0	20.9				15.0	17.8	19.8			Gates closed Brook at 9. 30 p.m. 18.2°C.

Trout River, Inverness Co., N.S.
Record of Water Conditions ~~for June~~, 1938

Date	Lake Height (in.) 7-8 a.m.	1-2 p.m.	7-8 p.m.	Lake Temperature (C°) 7-8 a.m.	1-2 p.m.	7-8 p.m.	Brook (~~Bridge, June 20-July 5~~; Trap) Height (in.) 7-8 a.m.	1-2 p.m.	7-8 p.m.	Brook Temperature (C°) 7-8 a.m.	1-2 p.m.	7-8 p.m.	Brook (B2) Hgt. 1-2 p.m.	Temp.° 1-2 p.m.	Remarks
July 16				19.8	23.1	21.1				15.9	21.6	20.3			
17				20.1		22.1				15.4		20.3			
18				21.0	24.2	22.6				16.4	19.2	20.1			
19				21.9	25.7	24.2				15.7	20.9	19.7			
20			18	21.3	21.9	22.2			20	15.2	16.6	16.2			
21	18	17	17¾	21.6	24.2	22.9	19¾	19½	19½	15.9	20.3	18.4	14½	16.7	Brook dark
22	19	18½	19	20.9	21.4	21.5	25½	15½	16	14.9	15.1	14.6	17½	14.4	Brook dark Dam washed out about ½" head between trap and lake
23	19			21.8	23.6	22.3	16			15.0	16.7	18.3	16	14.5	
24	19						16			15.2			15	15.2	B2 at 7 a.m.
25	19	19	19	21.9	24.0	23.2	16	18	18½	17.3	20.3	19.2	14½	18.2	Dam closed at noon
26	19	19	18¾	22.7	25.6	23.5	18	17¾	17¾	17.1	22.6	21.0	14½	21.2	
27		19		22.5	23.1	22.2	18½	19¼	19¼	17.2	17.4	17.4	15	16.8	
28	19			23.5	24.1	23.2	18¼	19	18	16.5	19.8	19.6	14½	18.1	Brook still dark
29	18	18	18	21.0	23.6	21.6	17¼	17	17	15.2	19.8	18.1	14	18.2	
30	18½	19	19½	21.6	22.2	21.9	18½	23¾	27½	18.4	15.9	16.0	16½	15.5	Trap 3 p.m. 24½ 3.45 25¾ 6.30 28 1/8 7.30 27 3/4 extra parts open
31	19½		19¾	22.2	25.6	23.9	23½	22½	21½	16.7	19.9	19.7	15½	19.8	

Trout River, Inverness Co., N.S.
Record of Water conditions ~~Aug-June~~, 1938

Date	Lake Height (in.) 7-8 a.m.	1-2 p.m.	7-8 p.m.	Lake Temperature (°C.) 7-8 a.m.	1-2 p.m.	7-8 p.m.	Brook (~~Bridge, June 20-July 5~~; Trap) Height (in.) 7-8 a.m.	1-2 p.m.	7-8 p.m.	Brook Temperature (°C.) 7-8 a.m.	1-2 p.m.	7-8 p.m.	Brook (B2) Hgt."	Temp.° 1-2 p.m.	Remarks
Aug. 1	19½	19½	19½	22.8	26.2	24.1	20	19¾	19½	16.4	20.9	19.7	14¾	20.2	
2	19			23.2		23.5	19	19	19	17.1	19.6	19.0	14¼	18.6	Art.Fresh. 9 p.m. 24"
3		19¼		22.7	25.5	23.4	18¾	19	18¾	15.8	20.6	19.4	14¼	19.9	B2 14" 17.9° 10.30a.m
4	19	18¾		23.7	24.7	23.4	18½	18½	18½	17.4	21.3	19.6	14¼	19.9	B2 18.6° 11.30 Art. Fresh. 23¾" at 9 p.m.
5	19			23.7	25.0	24.9	18	18	18	17.8	19.3	19.2	14	18.4	
6		18½	18½	23.6	25.6	23.9	18	18	22	16.9	21.1	20.4	14	20.0	Art.Fresh.
7						23.4	18		18½	15.8		18.5			
8				22.9	24.3	23.4	18¼	18¼	23¾	16.6	20.6	19.8	14	19.6	Art. Fresh.
9	17½	17½	17½	22.7	23.7	23.0	18	18¼	18	14.7	17.5	16.9	14	17.0	
10	17¼			22.3	22.5		18¼	18¾	19*	14.1	15.2	16.0	14	14.8	* Art. Freshet at 5 p.m.
11		17	17	21.9	22.6	22.2	27½	18	18	13.6	14.8	15.4	14	14.6	
12	16¾	16¼		21.8	22.3	21.8	18¼	18¾	25	13.7	15.8	16.0	13¾	15.4	Art. Freshet.
13	17¾	17	17	21.1	22.4		24	23¼	23¾	13.1	15.7	15.4	16¼	15.1	
14				22.1			21¼		26¾	14.1		18.2			
15		16½		21.8	22.9	21.9	19	19	24¾	14.2	17.4	17.5	15	16.7	Brook up ½ mile at 2 16.0°
16	16¾		16	22.1	22.8	22.2	18½	18½	24¼	15.8	18.1	18.7	15	16.9	
17	16¼	16¼		21.9	25.2	22.9	18¼	18	24	16.6	21.7	20.9	14	20.4	
18	16	16		22.3	23.2	22.5	17¾	18	23	16.7	21.1	21.1	14	20.1	
19	16			23.4		24.8	18		18	17.4		19.9			
20		18	17	22.6	22.8	20.2	17¾	18	18	16.3	18.9	17.0	13¾	18.5	
21	15½	15½	15½	21.2	25.4	22.1	17	17¼	17½	13.8	17.4	17.7	13¾	17.3	
22	15			21.2	23.5	22.4	17	17	23	14.2	18.9	19.1	13½	18.4	
23	15	15	15	22.1	24.7	23.8	18	17¾	23½*	16.3	20.2	20.1	14	19.5	* Art. Freshet
24		14¾	15¼	21.5	23.1	22.1	17¼	17	23½*	15.6	19.0	18.7	13½	18.6	* Art. Freshet
25	15	15		21.6	22.5	21.7	20	21	21¼	16.4	17.4	17.2	15	17.1	
26		15		21.2	22.2	21.6	20	19½	25*	14.1	16.2	15.6	14½	15.3	* Art. Freshet

Trout River, Inverness Co., N.S.
Record of Water Conditions ~~for June~~, 1938.

Date	Lake Height (in.) 7-8 a.m.	1-2 p.m.	7-8 p.m.	Lake Temperature (°C.) 7-8 a.m.	1-2 p.m.	7-8 p.m.	Brook (~~Bridge, June 20-July 5~~ Trap) Height (in.) 7-8 a.m.	1-2 p.m.	7-8 p.m.	Brook Temperature (°C) 7-8 a.m.	1-2 p.m.	7-8 p.m.	Brook (B2) Hgt." 1-2 p.m.	Temp.° 1-2 p.m.	Remarks
Aug.															
27	16	15½	15	20.2	22.5	21.7	18¾	18⅛	18¾	14.4	16.8	16.7	14	16.7	
28	15			21.4	21.1		18	18⅛		14.5	15.7		14	15.3	
29	15	14⅞	14⅝	19.3	22.3	21.4	21	20¼	19⅛	12.7	15.4	15.6	14⅜	15.4	Brook dark
30	14½	15	14⅝	19.7	22.5	21.1	18⅛	18	23⅛	11.6	15.8	16.8	13⅝	15.5	Brook dark
31	15	16	15	19.2	22.6	21.2	18¾	19	19⅛	13.5	17.4	16.8	14¼	16.6	Brook dark
Sept.															
1	14⅛	14	14	20.6	21.7	21.1	18⅛	18¼	18	13.5	17.4	17.3	14	17.1	Brook slightly dark
2	16	16	16	19.5	19.9	18.6	20	21⅛	21⅛	14.8	15.3	14.7	15	14.9	
3	15	15		19.4	20.7		19¾	19¼		11.2	13.6		14¼	13.6	Brook dark evening cold and clear
4	14⅛			19.0			18			10.7					
5	13¼	15	14¾	18.8	20.5	18.4	18	18	18	13.6	16.6	15.2	13¾	15.6	Water slightly dark
6	16	16	14	16.7	17.6	16.8	17	17¼	17¼	11.6	13.4	12.6	13⅛	13.0	
7	13½	13⅛	13	17.4	20.3	18.9	17	17	24 *	9.9	14.0	14.5	13¼	14.0	Art. Freshet. Brook light amber.

Trout River, Inverness Co., N.S.

Record of Manipulations of Water Discharge, 1938

h_{trap} = height of water on trap gauge

h_{lake} = height of water on lake gauge

Head = $\left\{(h_{trap} + 3\frac{1}{2}") - h_{lake}\right\}$

t_{trap} = temperature of water in trap

t_{lake} = temperature of lake water

Temp. Diff. = $t_{lake} - t_{trap}$.

Date	Time	Procedure	h_{trap} (in.)	h_{lake} (in.)	Head (in)	t_{trap} (°C)	t_{lake} (°C)	Temp. Diff. (°C)
July 9	10.30 a.m.	closed gates			$3\frac{1}{2}$			
	2.30 p.m.	opened gates			17			
	2.45 p.m.	dam washed out						
	3.15 p.m.				0	17.0	21.8	4.8
July 22	1 p.m.	Freshet on river	$25\frac{1}{2}$	$18\frac{1}{2}$	$10\frac{1}{2}$	15.1	21.4	6.3
	1.10 p.m.	dam washed out						
	1.40 p.m.	discharge at equilib.	16	19	$\frac{1}{2}$			
Aug. 2	7 p.m.	Closed gates	19		$3\frac{1}{2}$			
	9 p.m.		$24\frac{1}{2}$	19	9	19.0	23.5	4.5
	9.01	Opened gates	24		$8\frac{1}{2}$			
	9.08		$23\frac{1}{2}$		8			
	9.25		$22\frac{1}{2}$		7			
	10.00		$21\frac{1}{2}$		6			
	10.30		$20\frac{1}{2}$		5			
	11.00		20		$4\frac{1}{2}$			
Aug. 4	7 p.m.	Closed gates	$18\frac{1}{2}$		3			
	9	opened gates	24	19	$8\frac{1}{2}$	19.2	24.9	5.7
5	5 a.m.		18		$2\frac{1}{2}$			

Date	Time	Procedure	h_{trap} (in.)	h_{lake} (in.)	Head (in.)	t_{trap} (°C)	t_{lake} (°C)	Temp. Diff. (°C)
Aug.								
6	6 p.m.	Closed gates	18½		3½			
	7.30		22		7			
	8.30	opened gates	23⅜	18½	8⅜	20.4	23.9	3.5
	10.45		19¼		4¼			
7	8 a.m.		18		3			
8	5.30 p.m.	closed gates	18¼		4¼			
	8.30	opened gates	25	17½	9	19.8	23.4	3.6
	10.30		19¼		5¼	17.5		5.5app
9	7 a.m.		18		4	14.7	22.7	
10	5 p.m.	gates closed	19		5½	16.0	22.0	
	8.30	gates opened	25½	17	12	16.0	22.0	6.0
	12 p.m.		19¼		5⅜			
11	12.30 a.m.	closed gates	19		5½			
	4.30 a.m.	opened gates	27½	17	14	13.6	21.9	8.3
12	4.55 p.m.	gates closed	19¼	16¼	6½			
	7.25		25		12¼	16.0		
	7.30	gates opened	25½	16¼	12⅜	16.0	21.8	5.8
	7.38	closed gates	25	16¼	12¼			
	7.45	open gates	25½	16¼	12⅜			
	7.55	closed gates	25	16¼	12¼	16.0	21.8	5.8
	8.00	open gates	25½	16¼	12⅜			
	10. p.m.		20⅜	16¼	7⅜	15.0		
13	1.30 a.m.	closed gates	20	16½	7			
	5 a.m.	opened gates	28½	17	15			
	6.30 a.m.		24½		11	13.7	21.1	7.4
	9.30 a.m.		23	17⅜	8⅜			
14	5.30 p.m.	gates closed	21¼	17	7⅜			
	7.30 p.m.	gates opened except last board	26⅜	17	13½	18.2	22.0	3.8
	8.30 p.m.	gates closed	24⅜	17	11⅜			
	8.55 p.m.	gates opened	26	17	12½			
	10 p.m.		21⅜	17	7¼			
15	5.25 p.m.	gates closed	18⅜	16½	5⅜			
	7.40 p.m.	gates opened	24¾	16½	11¾	17.5	21.9	4.4
	10 p.m.		20		7	16.5	21.9	5.4

Date	Time	Procedure	h_{trap} (in.)	h_{lake} (in.)	Head (in.)	t_{trap} (°C)	t_{lake} (°C)	Temp. Diff. (°C)
Aug.								
16	5 p.m.	Gates closed	19	16	6 1/2	18.6		
	7.30 p.m.	gates opened	24 1/4	16	11 3/4	18.7	22.2	3.5
	8.20 p.m.	gates closed	22 1/4		9 3/4			
	9.35 p.m.		25		12 1/2	17.7		
	9.45 p.m.	gates opened	25 1/2	16	12 3/4			
17	12.15 a.m.		19 3/4		7 1/4	16.9		
	8.30 a.m.		18 1/4	16 1/2	5 3/4	16.6	21.9	5.3
	5.15 p.m.	gates closed	18			20.7		
	8.05	gates opened	24			20.9		
	8.35		22					
	9.00		21					
	9.30		20					
	10.00		19 1/2					
18	5.30 p.m.	Gates closed	18			21.2		
	7.50 p.m.	Gates opened except last board	23	16	10 1/2	21.1	22.5	1.4
	8.45 p.m.	gates closed	21		8 1/2			
	10 p.m.	gates opened	23		10 1/2			
19	5.30 a.m.		18		5 1/2	17.3	22.5	5.2
19	6. p.m.	Gates closed	18	16	5 1/2	19.9		
	9.30 p.m.	gates opened	25	16	12 1/2	19.9	24.8	4.9
22	4.15 p.m.	Gates closed	17	15	5 1/2			
	7.30 p.m.	gates opened	23		11 1/2	19.1	22.4	3.3
	10.00 p.m.		18		6 1/2			
23	4.00 p.m.	Gates closed	17 3/4	15	6 1/4			
	7.05 p.m.		23 1/2		12	20.1	23.8	3.7
	7.20 p.m.	gates open	23 3/4		12 1/2			
	7.20 - 7.27	Threw in muck and trash, grass, sticks, etc.						
	9.15 p.m.		19 1/2		7 3/4	19.1		
24	4.50 p.m.	Gates closed	17 1/4	15	5 3/4			
	7.50 p.m.	gates opened	23 1/2		12	18.7	22.1	3.4
	8.50 p.m.		20		8 1/2			

Date	Time	Procedure	h_{trap} (in.)	h_{lake} (in.)	Head (in.)	t_{trap} (°C)	t_{lake} (°C)	Temp. Diff. (°C)
Aug.								
26	5.10 p.m.	Gates closed	19¼	15	7¾	15.8		
	7.30 p.m.	Gates opened	25		13¾	15.6	21.6	6.0
	10.00 p.m.		20¼		9			
27	7.00 a.m.		18¾		7¼			
30	4.30 p.m.	Gates closed	18		7¾			
	7.00 p.m.	Gates opened	23¼	14¾	12¼	16.8	21.1	4.3
	9.00 p.m.		19¾		8¼			
31	7.00 a.m.		18¾	15	7¼			

Trout River, Inverness Co., N.S.
Record of Fish entering Trap, July 5-Sept. 8, 1938

Date	Time	Trout Large	Trout Small	Remarks	Post-Smolts No.	Post-Smolts Remarks	Other Fish
July							
5	7.00 p.m.	1					
6	8.00 a.m.		3)	Bright fish			
7	8.00 a.m.	9	20)	Condition good			
8	8.00 a.m.	6	10)	10-15 lice on each			
9-12	Washout - trap not functioning						
13	8.00 a.m.		2	bright, 3-4 lice each			
	7.00 p.m.		5				
14	8.00 a.m.		1	3 lice	1		
	7.00 p.m.		3	3-5 lice each			
15	8.00 a.m.		4	about 4 lice each	3		
	7.00 p.m.		3				
	9.30 p.m.		4	2-5 lice each bright			2 parr 10 suckers 1 eel
16	8.00 a.m.		0				
	7.00 p.m.		1		1		
17	8.00 a.m.		2	3 lice each	1		
	7.00 p.m.		1		2		
18	12.p.m.		2		1		
19	8.00 a.m.		2		2		1 parr
	7.00 p.m.		4		1	(gills (infected, (thin; died (on liberation	
20	8.00 a.m.		4	2-3 lice each	2		
	7.00 p.m.		0				
21	3.00 p.m.		4)	condition good	10	large, good condition	
	7.00 p.m.		1)	2-3 lice on most	1		
	9.30 p.m.		0				1 parr 4 suckers, 1 gaspereau
22	8.00 a.m.		2	good condition water dark			

Dam burst at old channel - trap functioning poorly

Trout River, Inverness Co., N.S.

Record of Fish entering Trap, 1938.

Date	Time	Trout Large	Trout Small	Remarks	Post-Smolts No.	Post-Smolts Remarks	Other Fish
July							
23	8.00 a.m.		2	good condition	3		
24	9.00 a.m.	1		heron wound in shoulder	1		1 sucker
25	8.00 a.m.		0		1		
	12.00 p.m.	Dam closed again					
26	9.30 a.m.		10	3 with 2 lice rest clean; all fish fat and clean and bright	1		1 parr 1 perch
	3.30 p.m.		6				2 parr
	10.00 p.m.		5				1 parr 2 perch 6 suckers
27	10.00 a.m.		7	3 fish with 3 argulus each mostly in excellent condition	5		
	2.00 p.m.		0				
	8.00 p.m.	1	2		2		
	9.15 p.m.	3	5	3 with lice (1-3 each)	1		1 parr
28	10.00 a.m.	1	16	6 with lice mostly good condition, 2 very thin			
	2.00 p.m.		11				
	7.00 p.m.		1				
	9.10 p.m.	3	4	mostly clean and bright			
29	9.00 a.m.		10	3 with 1-2 lice each			1 smelt
	3.00 p.m.		0				
	8.00 p.m.		6		1		1 parr
	9.15 p.m.	5	12	good condition, no lice			
30	9.00 a.m.	2	9	3 with 2.3 lice			
	12.00 p.m.		0				
	6.00 p.m.	Water high and dark - not fished					
31	9.00	5	17	4 with 2-3 lice mostly fat and bright	8	mostly in fairly good condition	
	2.00		0		1		
	7.00	1	2				

Trout River, Inverness Co., N.S.
Record of fish entering trap, 1938.

Date	Time	Trout Large	Trout Small	Remarks	Post-Smolts No.	Post-Smolts Remarks	Other Fish
Aug.							
1	9.00 a.m.	7	15	5 with 2-4 lice each	10		
	2.00 p.m.		0				
	7.45 p.m.		0				
	9.00 p.m.		8	all clean	3		6 suckers
							2 perch
2	8.30 a.m.	1	7	- 1 gravid argulus	1		
				3 very small argulus			
	3.00 p.m.		0				
	7.00 p.m.		0	Medium size fish			1 gaspereau
	9.00 p.m.	1		(23-27) are			
	11.00 p.m.	3	8	brightest	2	Very large, quite fat	
3	8.00 a.m.	3	23	1 with 4 lice			
	2.00 p.m.		2	good condition			
	8.00 p.m.		2				
	9.30 p.m.	3	2				
4	9.00 a.m.		5		1		
	3.00 p.m.		1	All fish clean			
	7.00 p.m.		2				
	9.00				1		4 suckers
							1 perch
	11.00 p.m.	2	13				
5	4.00 a.m.	4	17	lice on 1 large fish	1		1 sucker
	9.00 a.m.	1	1		1		
	8.00 p.m.		8	all clean			1 sucker
6	8.00 a.m.	1	13	1 with lice			
	3.00 p.m.		4	1 with 1 argulus	1		
	6.00 p.m.		0				
	10.45	2	21	4 with 1-3 lice			1 sucker
							1 perch
7	7.30 a.m.		17	all clean			
	7.15 p.m.		27	all clean			1 sucker
8	9.00 a.m.	5	41	2 with 2 lice each			
				small lice	1		2 suckers
							1 smelt in pond
	2.30 p.m.		4				
	5.30 p.m.	1	2		1		
	10.30 p.m.		23	1 with 1 argulus all fat	1		
9	7.00 a.m.	1	26	4 with 1-2 lice			
	2.00 p.m.		13	2 with lice			
	7.30 p.m.		2	Some of trout are thinner now.			

Trout River, Inverness Co., N.S.
Record of fish entering trap, 1938.

Date	Time	Trout Large	Trout Small	Remarks	Post-Smolts No.	Post-Smolts Remarks	Other Fish
Aug. 10	7.45 a.m.	3	78	1 with 1 argulus			3 small suckers
	2.00 p.m.		2				
	5.00 p.m.		0				
	12.00 a.m.		10		1		
11	4.30 a.m.		Gates closed - Opened at 4.30 a.m.				Smolts are
	10.00 a.m.		17	1 with 2 argulus	1		smaller and
	1.00 p.m.		1				thinner than
	8.00 p.m.		2	1 with 2 argulus			10 days ago.
12	9.00 a.m.		20	lice about equally divided between large gravid and very small specimens. fry active			3 small suckers
	5.00 p.m.		0				
	10.00 p.m.		9				1 sucker
13	5.00 a.m.	(Gates opened)					
	6.30 a.m.		0				
	9.30 a.m.		5	Trout seem darker and slimmer than 2-3 weeks ago	1		
	3.00 p.m.	1	1				
	9.00 p.m.	1	5				
14	10.00 a.m.	1	6		1		
	2.00 p.m.		0				
	5.30 p.m.		3				
	8.30 p.m.	3					
	10.00 p.m.		3				
15	8.00 a.m.		2		1		2 suckers
	2.00 p.m.		3				1 parr
	5.20 p.m.		1				
	9.30 p.m.	3	1				4 suckers
16	6.00 a.m.		10				4 perch
	2.00 p.m.		0				
	5.00 p.m.		3	lice seem to have disappeared			2 suckers 1 eel
	8.20 p.m.	1	1				
17	12.15 a.m.		1				2 suckers 1 perch
	8.30 a.m.		1				
	3.00 p.m.		2				1 sucker
	5.00 p.m.		0				1 sucker
	10.00 p.m.		2				
18	7.30 a.m.	1	8	all bright fish			2 suckers
	2.00 p.m.		0				
	5.30 p.m.		1				
	8.45 p.m.	1	1				
	10.00 p.m.		3				1 sucker

Trout River, Inverness Co., N.S.
Record of fish entering trap, 1938.

Date	Time	Trout Large	Trout Small	Remarks	Post-Smolts No.	Post-Smolts Remarks	Other Fish
Aug.							
19	5.30 a.m.	3	6				3 suckers
	6.00 p.m.		2		1		
	9.45 p.m.		0				
20	6.30 a.m.	2	17	1 large fish with 1 argulus			
	2.00 p.m.		2				
	8.00 p.m.		0			Smolts appear thin and very	
21	10.00 a.m.		11		4	weak now.	
	2.00 p.m.	1				Most have in-	
	7.30 p.m.		2	very thin		fested gills	
22	7.30 a.m.	4	12				1 sucker
	2.00 p.m.		0				
	10.00 p.m.		3	very thin fish			
23	9.00 a.m.		4				
	2.00 p.m.		0				
	9.15 p.m.		1	very fat specimen	1		
24	9.00 a.m.		6	mostly fat			1 sucker
	2.00 p.m.		0		1		
	8.50		0				1 sucker
25	9.00 a.m.	1	5				
	2.00 p.m.		0				
	7.30 p.m.	1	3				3 suckers 1 perch
	9.15 p.m.	2		1 very thin			suckers heavily
26	7.00 a.m.	1	13	1 with 2 lice			parasiti-
	2.00 p.m.		0				sed on
	6.30 p.m.		0				gills
	10.00 p.m.		5				1 eel
27	8.00 a.m.	1	8				
	2.00 p.m.		0		1		
	8.00 p.m.		0				
28	8.30 a.m.		8				
	2.00 p.m.		0				
29	10.00 a.m.	3	12		1		
	2.00 p.m.		1	1 argulus			
	7.00 p.m.		0				
30	9.00 a.m.		2				
	2.00 p.m.		1				
	7.00 p.m.		1				
	9.00 p.m.		1	very fat and bright			2 large, 1 small suckers

Trout River, Inverness Co., N. S.
Record of fish entering trap, 1938.

Date	Time	Trout Large	Trout Small	Remarks	Post-Smolts No.	Post-Smolts Remarks	Other Fish
Aug 31	8.00 a.m.		0				
	2.00 p.m.		0				
	7.00 p.m.		0				
	9.00 p.m.		0				
Sept. 1	9.00 a.m.		2	1 very fat			
	2.00 p.m.		0				
	7.00 p.m.				1		
2	8.00 a.m.		0	Conditions seem good			1 parr
	2.00 p.m.		0	for trout to enter.			
	7.00 p.m.		0	Apparently the "run" must be over, largely.			
3	9.30 a.m.		0				
	1.30 p.m.		0				
	7.00 p.m.		0				
4.	9.00 a.m.	1	1				
5	9.00 a.m.		1	Trapped 6			
	2.00 p.m.		0	Kingfishers at spill-			
	7.00 p.m.		1	way in last week. Does this indicate lack of			
6	9.00 a.m.		0	available fish in lower			
	1.30 p.m.		0	part of stream?			
	7.00 p.m.		0				
7	8.00 a.m.		0				
	2.00 p.m.		0				
	5.00 p.m.		0				
	8.20 p.m.		0				
8	8.00 a.m.		0				

Trap Removed

Note: "Large Trout" = those of 28 cm. or over (large enough to be tagged).
"Small trout" = those under 28 cm.

"Lice" refers to presence of Argulus canadensis.

Trout River, Inverness Co., N.S.
Trout caught by angling in 1938.

Date	No. of Lines	Trout caught No.	Trout caught Lb.	Availability Index
May				
21	9	1	1½	0.11
22	16	20	21½	1.25
23	13	42	24	4.0
24	16	0	0	0
25	0	0	0	
26	0	0	0	
27	0	0	0	
28	13	5	5	0.38
29	17	38	30½	2.25
30	20	19	21½	0.95
31	0	0	0	
June				
1	18	22	17	1.21
2	7	16	14	2.28
3	5	0	0	0
4	8	0	0	0
5	39	24	14	0.61
6	3	0	0	0
7	5	0	0	0
8	16	2	1	0.13
9	0	0	0	
10	10	0	0	0
11	0	0	0	
12	4	0	0	0
13	15	12	11½	0.80
14	0	0	0	
15	4	4	1½	1.0
16	14	8	4	0;56
17	6	7	7½	1.13
18	16	13	12	0.81
19	24	21	15½	0.88
20	6	10	6½	1.66
21	12	40	24½	3.33
22	13	9	8½	0.69
23	15	37	24	2.45
24	6	0	0	0
25	9	25	21½	2.77
26	11	6	3½	0.55
27	6	0	0	0
28	3	10	5½	3.33
29	0	0	0	
30	7	1	½	0.14
July				
1	38	17	9½	0.45
2	0	0	0	
3	17	29	8	1.70
4	0	0	0	
5	15	36	22	2.49
6	4	30	17	7.50
7	13	22	10	1.69
8	7	41	25½	5.86
9	6	15	7	2.50
10	7	48	31½	6.86
11	6	52	24½	8.67
12	3	0	0	0
13	0	0	0	
14	11	18	16½	1.64
15	0	0	0	
16	0	0	0	
17	4	17	17½	4.25
18	5	8	3½	1.60
19	0	0	0	
20	3	10	7	3.33
21	10	26	21½	2.60
22	0	0	0	
23	0	0	0	
24	2	6	4	3.00
25	0	0	0	
26	5	42	35	8.40
27	6	9	8	1.50
28	0	0	0	
29	5	18	9½	3.60
30	0	0	0	
31	4	0	0	0
Aug. 1	0	0	0	
2	7	34	19½	4.86
3	0	0	0	
4	1	1	½	0.25
5	3	3	½	1.00
6	5	14	9	2.80
7	0	0	0	
8	9	1	2	0.11
9	0	0	0	
10	0	0	0	
11	0	0	0	

Trout River, Inverness Co., N.S.
Trout caught by angling in 1938.

Date	No. of Lines	Trout caught No.	Trout caught Lb.	Availability Index
Aug. 12	9	47	28	5.22
13	0	0	0	
14	0	0	0	
15	11	17	6	1.54
16	4	5	3	1.25
17	0	0	0	
18	2	4	2	2.00
19	2	4	2	2.00
20	7	15	10	2.14
21	0	0	0	
22	2	0	0	0
23	0	0	0	
24	3	12	7	4.00
25	4	11	14	2.75
26	2	3	2	1.50
27	0	0	0	-
28	1	2	1	0.50
29	2	5	1	2.50
30	2	19	11	9.50
31	2	17	8	8.50

Trout River, Inverness Co., N.S.
Record of Tagged Trout, 1938

Tag No.	Date	Tagging Time	Length	Remarks	Recapture Date	Recapture Place	Remarks
7025	July 29	9.30 p.m.	34	left inside trap	July 30 Sept. 9	Trap Pool, ½ mile upstream	rear pin loose. tag removed and liberated; dark
7026	July 29	9.40 p.m.	33	left inside trap	July 30	Trap	placed in stream with 7024 and 7025
7029	July 30	9.00 a.m.	30	tag rather loose; lice	Aug. 20	?	Anglers seen ½ mile up stream; information not given.
7031	July 30	9.05 a.m.	32½	6 Argulus			
5013	July 31	9.00 a.m.	31½	numerous black cysts	Aug. 17 (Aug. 10)?	Bridge (Bridge)?	at 6.30 a.m. hind pin loose. previously hooked
5014	July 31	9.10 a.m.	37½	fat; lice			
5015	July 31	9.15 a.m.	38	thin; black cysts; rather dark colour	Sept. 11	1/3 mile up	under log jam, dark, rather thin, unspawned
7024A	July 31	8.40 a.m.	32	lice; black cysts			
7024B		9.20 a.m.	31	lice	Aug. 27 tag recovered Sept 11	alders above bridge	probably lost by Whalley Aug. 27. He lost 1 tag here.
5016	Aug. 1	9.00 a.m.	31	lice; black cysts			
5017	1	9.00 a.m.	33	lice; cysts; thin and dark			
5019	1	9.10 a.m.	30½	lice			
5020	1	9.15 a.m.	32				

Trout River, Inverness Co., N.S.
Record of Tagged Trout, 1938

Tagging					Recapture		
Tag No.	Date	Time	Length	Remarks	Date	Place	Remarks
7027	July 27	8,00 p.m.	37 cm.	Very fat			
7028		9.15 p.m.	29	Fat			
7030		9.20 p.m.	29½	Fat- 1 argulus			
5023		9.25 p.m.	30	Fat - 3 argulus, hiding under trap as liberated	July 28	Trap	Escaped under trap and re-entered at night
2300	July 28	9.10 p.m.	40	lice			
0119		9.10 p.m.	38	lice: Aug. 22 1 lb. 2 oz. tag chaffing badly. 5 lice on head	(Aug 22 (" 26	Trap Bridge	Apparently escaped under trap. Killed by angler;no lice.
0120	July 28	9.15 p.m.	33	rear pin of tag loose	Sept 11	1/3 mile up	Recovered tag lying loose on bottom of pool
0500	July 29	9.15 p.m.	38	lice. Numerous black cysts; fat, liberated in pool			
7022		9.15 p.m.	38	very fat, black cysts; left in trap overnight and returned to lake	Aug. 8	Trap	Deep wounds (osprey?) Died Aug. 10; wt. 1 7/8 lb.
7023		9.20 p.m.	34	fat, black cysts, fin slightly torn.			
7024		9.20 p.m.	31	lice. liberated in spillway	July 30 Sept 9(?)	Trap ½ mile up	Re-entered from spillway. tag torn off marked pectoral with 7025

Trout River, Inverness Co., N.S.
Record of Tagged Trout, 1938

Tag No.	Date	Tagging Time	Length	Remarks	Recapture Date	Recapture Place	Recapture Remarks
			cm.				
5021	Aug. 1	9.30 a.m.	29½	Caudal fin badly split			
5022	Aug. 2	8.30 a.m.	31	3 large, 1 small argulus			
2813A	Aug. 2	9.00 p.m.	40	very fat			
2813B	2	11.00 p.m.	36½	lice. Not as bright as smaller fish.			
2814A	2	11.10 p.m.	33½	lice. Not real bright			
2820A	2	11.15 p.m.	35½	Not real bright			
2820B	Aug. 3	8.00 a.m.	28	scar (loon?) on back 4 small argulus			
2817A	3	8.20 a. m.	29				
2817B	3	8.15 a.m.	40	fat: 2 large, 2 small argulus			
2816A	3	9.30 p.m.	32				
2816B	3	9.35 p.m.	38½		Aug. 17	Bridge	at 6.30 a.m.
2814B	3	9.40 p.m.	31½				
2821A	Aug. 4	11.00 p.m.	30				
2821B	4	11.05 p.m.	31				
2822A	5	4.00 a.m.	30½				
2822B	5	4.10 a.m.	39	lice; caudal and dorsal fins split			
2823B	5	4.15 a.m.	30½		Aug. 29	Above bridge	under alders
2823A	Aug. 6	8.00 a.m.	32½				
2716A	6	11.00 p.m.	38	lice			
2824A	6	11.10 p.m.	31½				
	Aug. 6	Trap and leads banked to prevent escape of fish under trap. Tagged fish reported (no numbers given) ¼ mile up stream.					
2716B	Aug. 8	9.00 a.m.	30½	heron wound on neck apparently healing well			
2717A	8	9.00 a.m.	30½	Wt. 14½ oz.			
2717B	8	9.05 a.m.	30	Condition similar 2717A			

Trout River, Inverness Co., N.S.
Record of Tagged Trout, 1938

Tag No.	Tagging Date	Tagging Time	Length	Remarks	Recapture Date	Recapture Place	Remarks
2720 B	Aug. 8	9.20 a.m.	37	Wt. 1 lb. black cysts	Aug. 13	Out going trap	D. fin badly chaffed by tag Died Aug. 14
2723A	Aug. 9	7.00 a.m.	32	1 argulus Wt. 12½ oz. rather thin	Aug. 25 (afternoon)	Alders above bridge	Rev. Whalley, Sydney
2723B	Aug. 10	7.45 a.m.	33½	heron wound behind head			
2719A	10	7.45 a.m.	29½	Wt. 7 oz.			
2731A	10	8.00 a.m.	35	Wt. 9½ oz.	Aug. 11	Bridge	Taken in evening
2730A	13	3.00 p.m.	28	Wt. 9 oz.			
2731B	13	9.00 p.m.	31	Wt. 9 oz.	Aug. 20	Bridge	Taken in a.m. Tag thrown away but recovered later
~~2730A~~	~~13~~	~~3.00 p.m.~~	~~28~~	~~Wt. 9 oz.~~			
~~2731B~~	~~13~~	~~9.00 p.m.~~	~~31~~	~~Wt. 9 oz.~~	~~Aug. 20~~	~~Bridge~~	~~Taken in a.m. Tag thrown away but recovered later.~~
2725B	14	10.00 a.m.	42	Wt. 1 lb. 6 oz. thin, very large head; black cysts.	Aug. 26	Bridge	after persistent angling: (also 0119 and 2744A)
2725A	14	8.30 p.m.	32½	Wt. 12 oz.	(Aug. 30 (Sept. 1	Outgoing trap - disappeared	Saprolegnia on eyes and head. appears sick. Left in trap colour very dark
2728A	15	9.30 p.m.	37½	1 lb 4½ oz.			
2828B	15	10.00 p.m.	39	1 " 7 oz.			

Trout River, Inverness Co., N.S.
Record of Tagged Trout, 1938

Tag No.	Tagging Date	Time	Length	Remarks	Recapture Date	Place	Remarks
2829A	Aug. 15	10.00 p.m.	28 cm.	Wt. 9 oz.	Aug. 25	Above bridge	Taken under alders Rev. Whalley
2829B+	Aug. 18	7.30 a.m.	30	Wt. 10½ oz: left in pen to check color and tag	Aug 21 - slightly darker. Tag cutting dorsal fin Aug.26 - large wound under tag; fish medium dark; fin smoky and pink edges. Aug.26 - Trap. 2.00 p.m. Escaped and returned Sept 8 - Fish very dark. Fin badly chaffed under tag. Otherwise healthy.		
2729A	Aug. 18	9.45 p.m.	35	Wt. 12 oz.	Aug. 26	Above bridge, under alders. Early morning.	Rev. Whalley. Fin not injured
2729B	Aug. 19	5.30 a.m.	35	Wt.12½ oz. Tag put on loosely to prevent chaffing			
2824B	Aug. 19	6.00 a.m.	34	Wt. 11oz. slightly dark			
2720A	Aug. 20	6.30 a.m.	30	Wt. 11 oz. 1 Argulus			
2733B	Aug. 20	6.30	32½	Wt. 13 oz.			
2733A+	Aug. 22	7.30 a.m.	32½	10 oz. 1 argulus; tagged in anal fin; put in pen	Aug. 26 - tag chaffing slightly; fin white and pale smoky; fish slightly darkened. Sept. 8 - tag wound healing well. Fins orange, white edged, smoky; a typical stream-coloured fish.		
2744B	Aug. 22	7.30 a.m.	31	10½ oz; lice; tagged in anal fin	Aug. 30	Under bridge	Tag lost in fight.
2744A	Aug. 22	8.00 a.m.	38½	1 lb, 4 oz; quite dark.	Aug. 26	Bridge	In afternoon - dull wet cool day.

Trout River, Inverness Co., N. S.
Record of Tagged Trout, 1938

Tag No.	Tagging Date	Time	Length	Remarks	Recapture Date	Place	Remarks
			cm.				
2747A	Aug. 25	9.00 a.m.	32½	10 oz. tag in anal slightly orange coloured			
2743A	25	9.30 p.m.	40	1 lb. 1 oz. (thin) tagged in anal fin			
2743B	25	9.30 p.m.	32	10 oz. tagged in anal fin			
2747B	Aug. 26	7.00 a.m.	39	1 lb. 6 oz.			
2753A	Aug. 29	10.00 a.m.	31	9 oz. tag put on loosely			
2753B+	Aug. 29	10.00 a.m.	33	12½ oz. tag put on loosely in pen for observation	Sept. 8	-	Fin appears alright. Fish with dark orange tinge

+ - Kept in pen in stream for observation
"Lice" refers to Argulus canadensis
Unless otherwise stated tags fixed in dorsal fin.

Fig. 1.

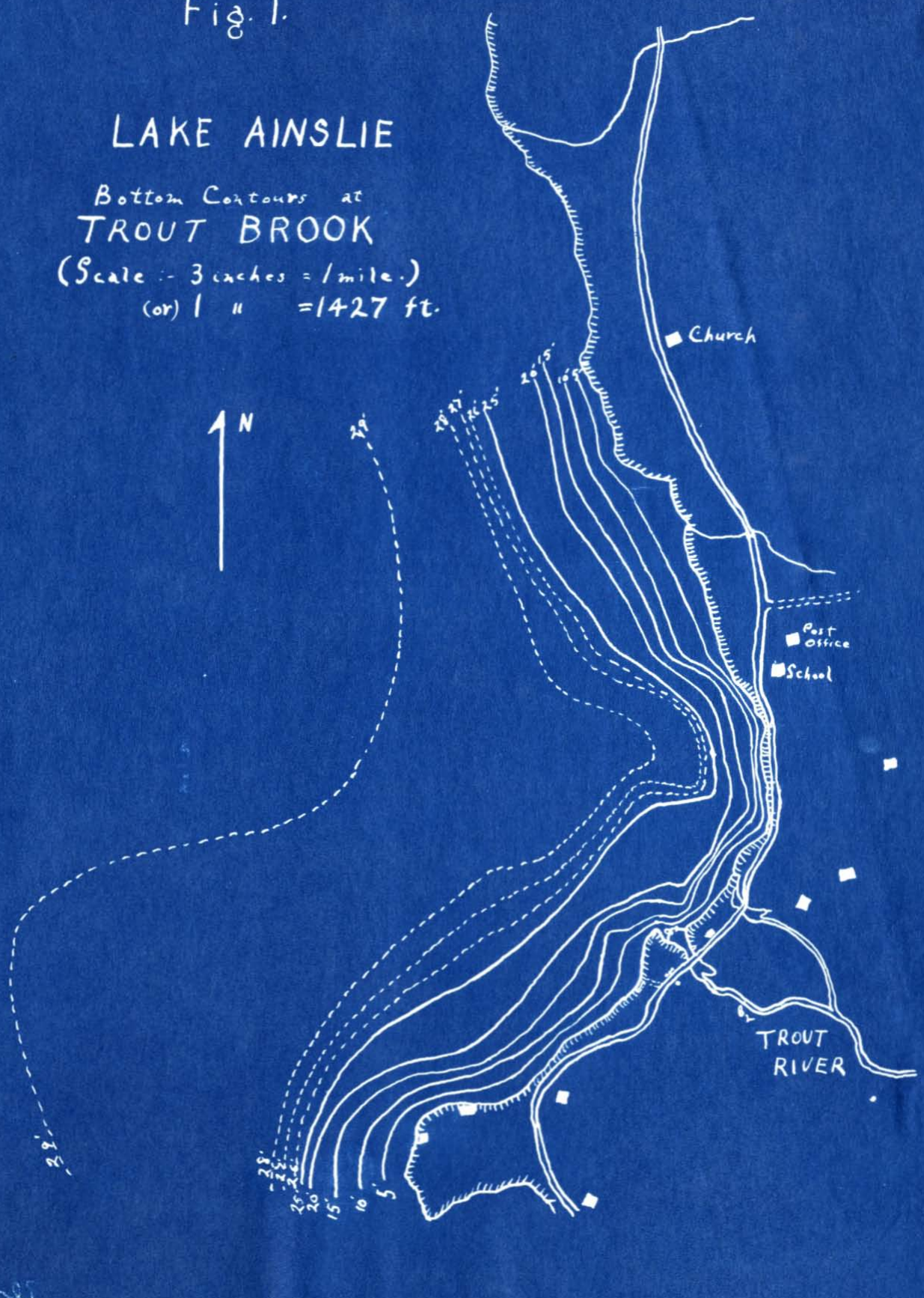
LAKE AINSLIE

Bottom Contours at

TROUT BROOK

(Scale :- 3 inches = 1 mile.)

(or) 1 " = 1427 ft.



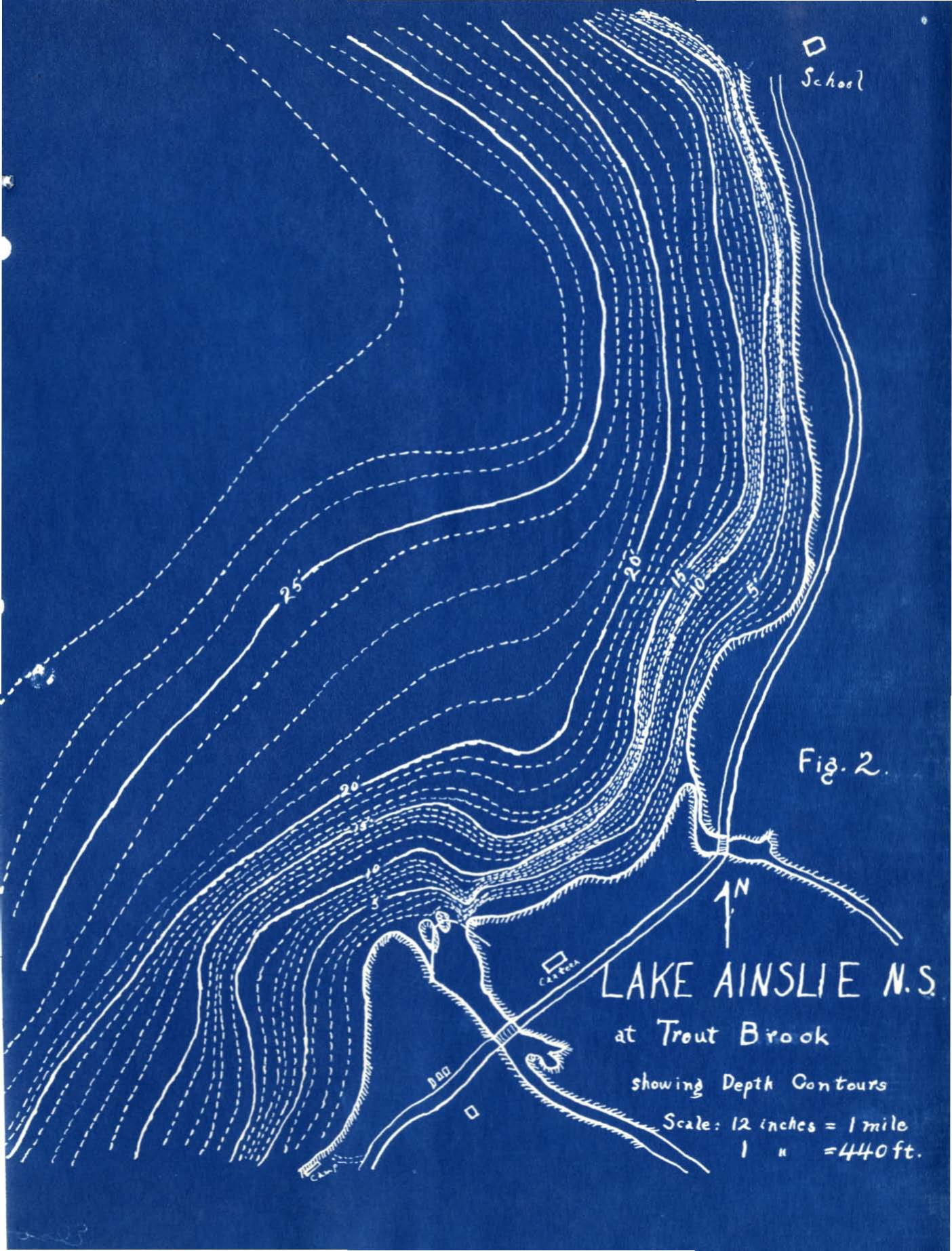


Fig. 2.

LAKE AINSLIE N.S.

at Trout Brook

showing Depth Contours

Scale: 12 inches = 1 mile

1 " = 440 ft.

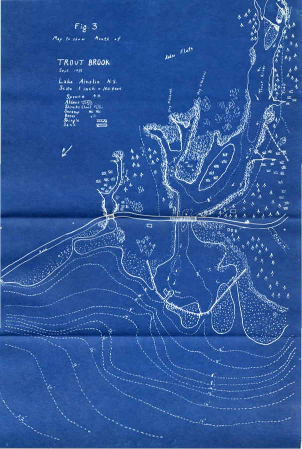


Fig. 3
Map to show Mouth of
TROUT BROOK
Sept. 1958
Lake Ainslie N.S.
Scale 1 inch = 100 feet
Spruce
Alders
Shrubs (low)
Swamp
Reeds
Shingle
Sand
N
Alder Flats
Dry Channel
Dry Channel
Trout River
Trail
Road

Fig. 4.

TROUT BROOK, N.S.

Bottom Isotherms at Mouth of Brook

August 1, 1938, 10.00 a.m. - 12.00 p.m.

Surface Temp. - 24.7° - 25.5°C

Wind ------ 1 - SW

Sky ------- 0

Air -- (12.00 p.m.) -- 28.4°C

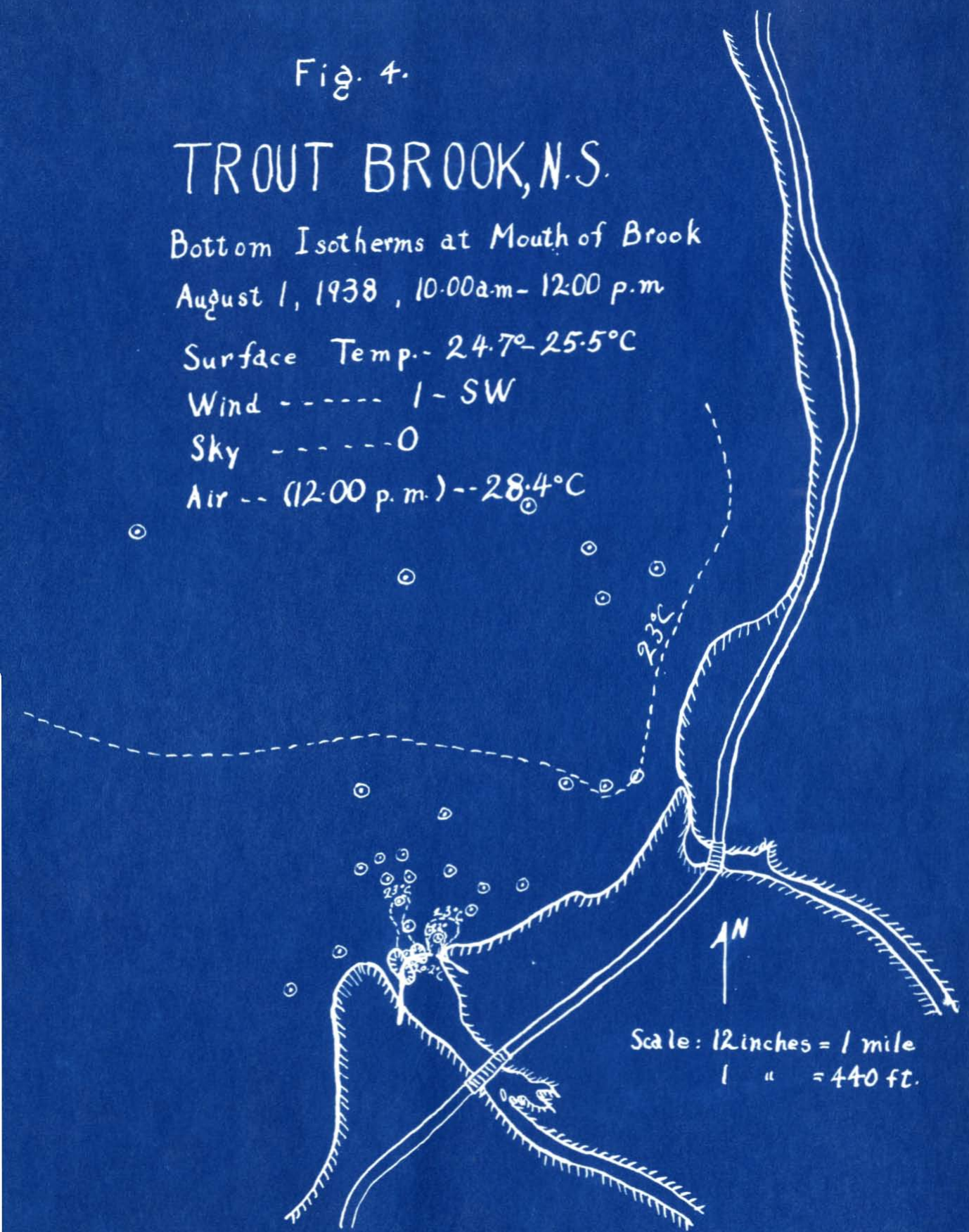


Fig. 5.

TROUT BROOK, N.S.

Bottom Isotherms at Mouth of Brook

August 15 - 1938
10.50 a.m - 12.30 p.m

Surface Temp. 22.9°C

Wind (12.00 p.m.) 1-SW
Sky ---------- 10
Air ---------- 25.6°C

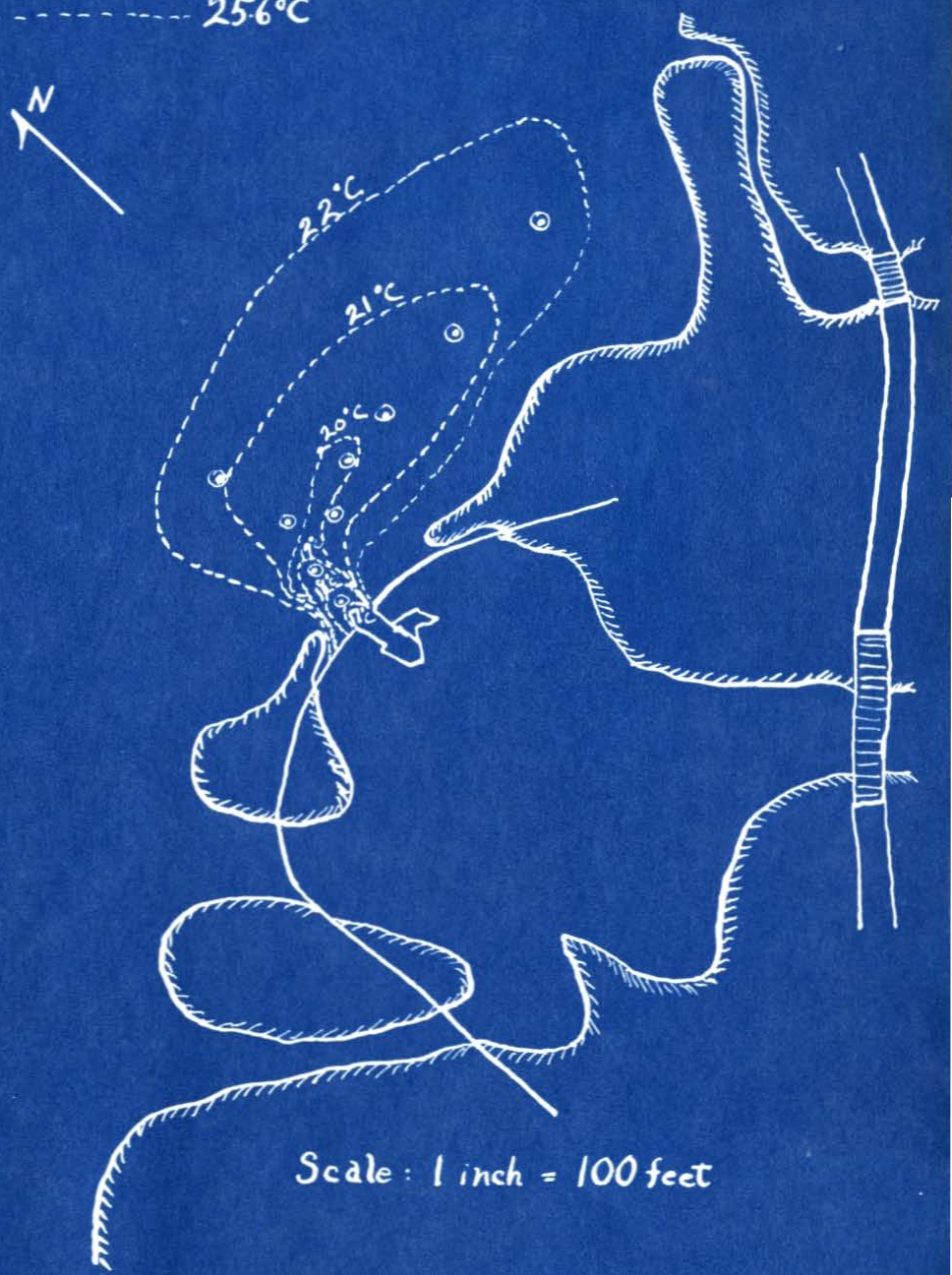
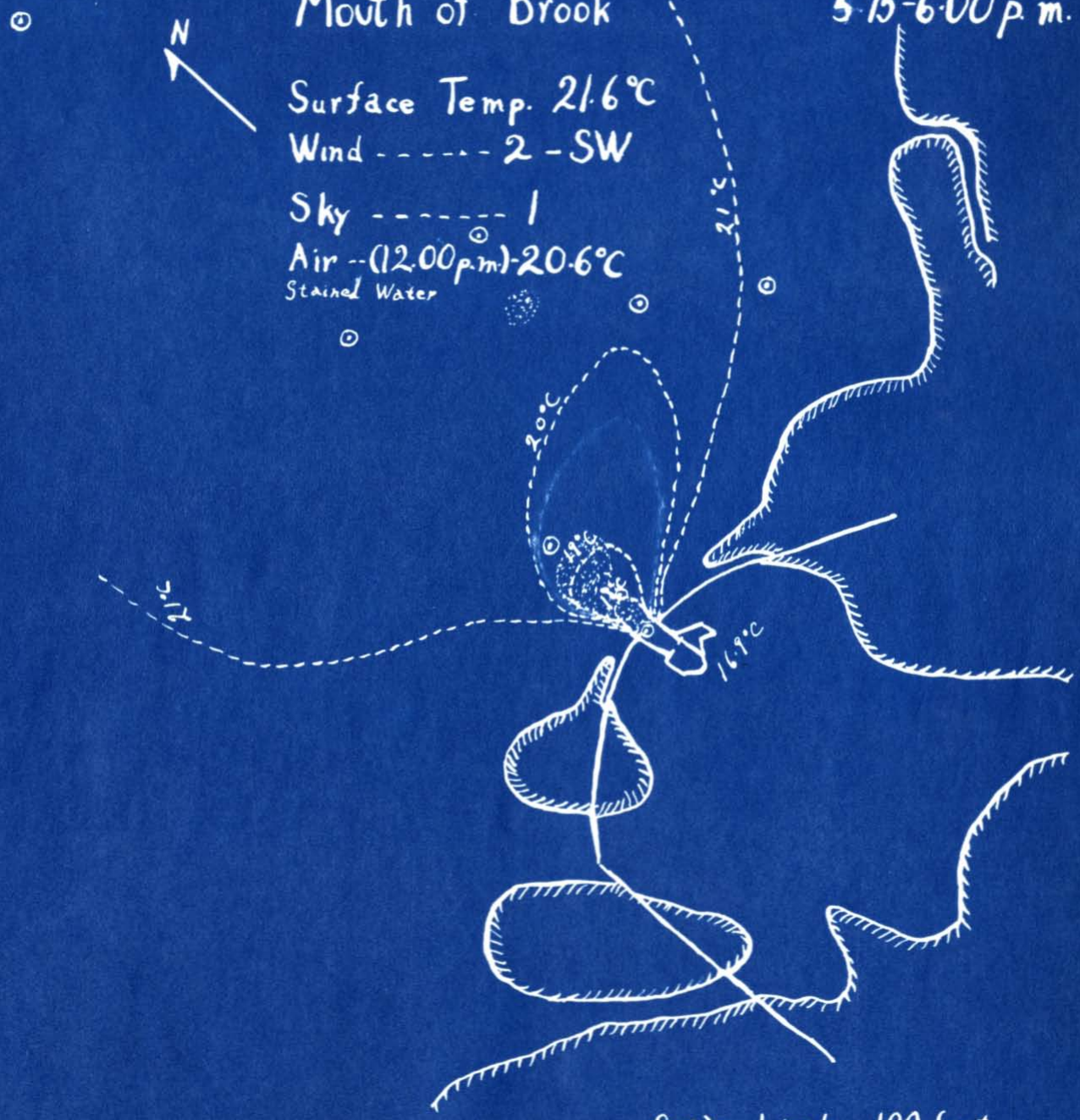


Fig. 6.

TROUT BROOK, N.S.

Bottom Isotherms at Mouth of Brook

Aug. 29, 1938
5.15-6.00 p.m.



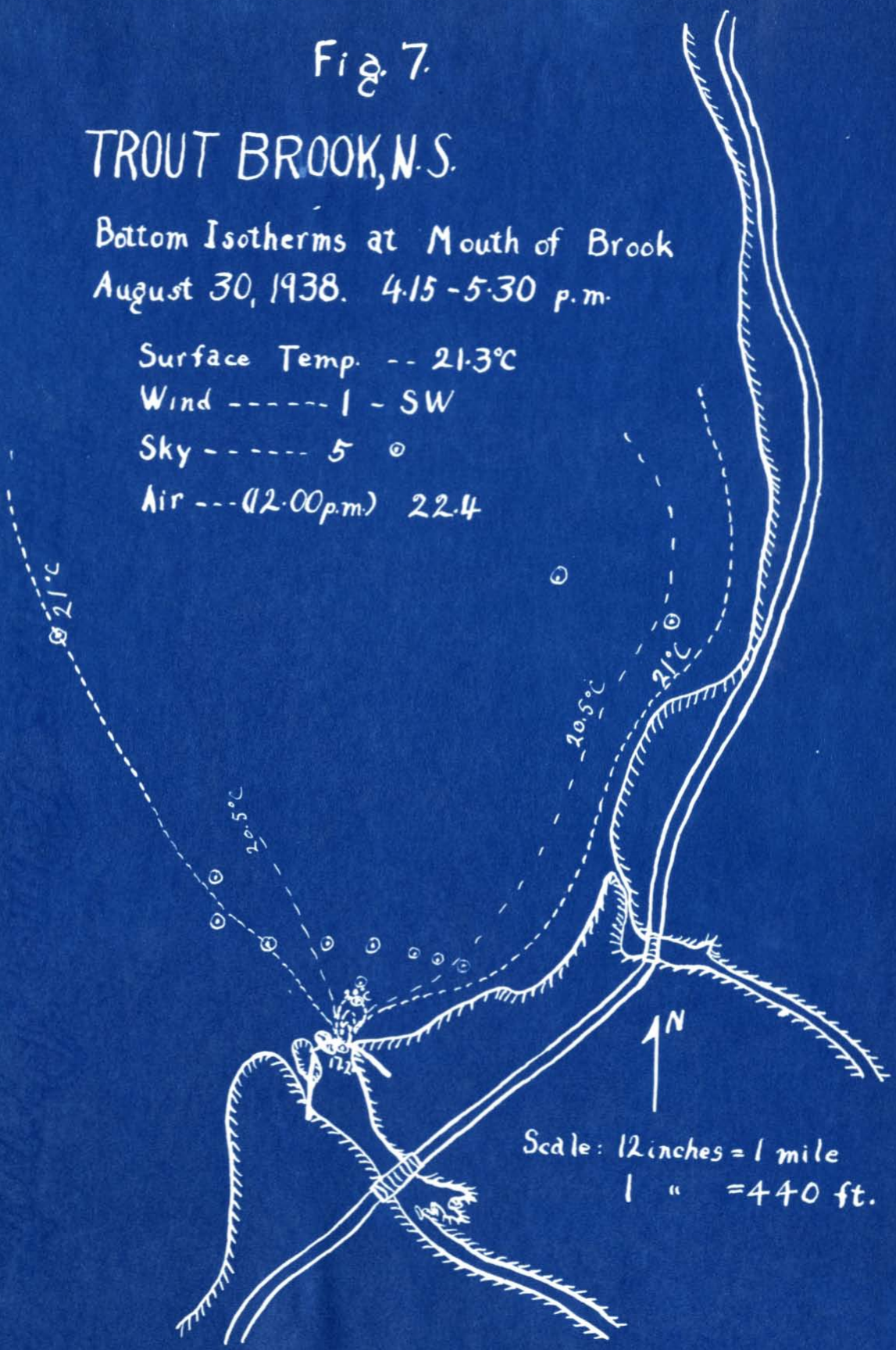
Scale: 1 inch = 100 feet

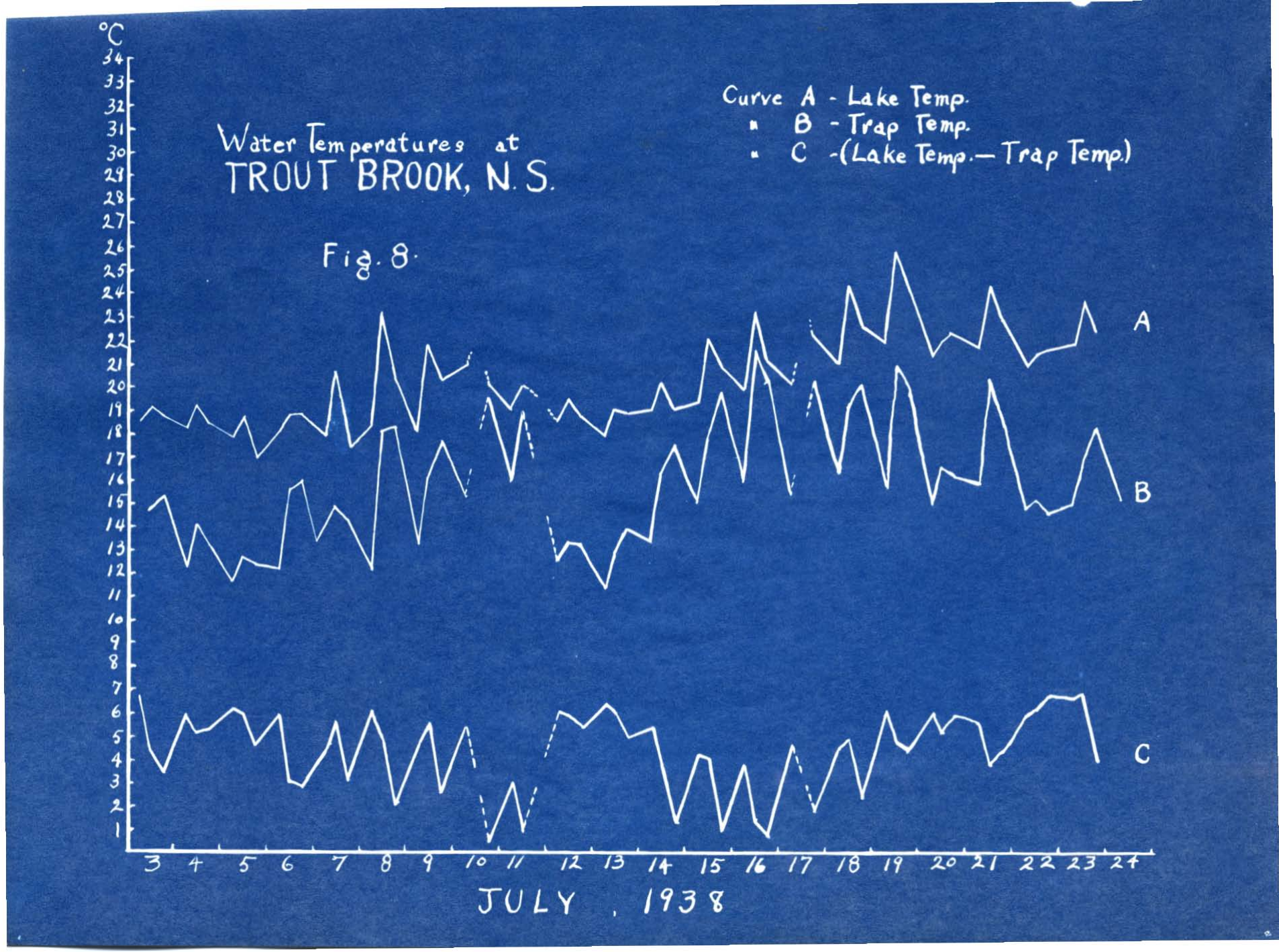
Fig. 7.

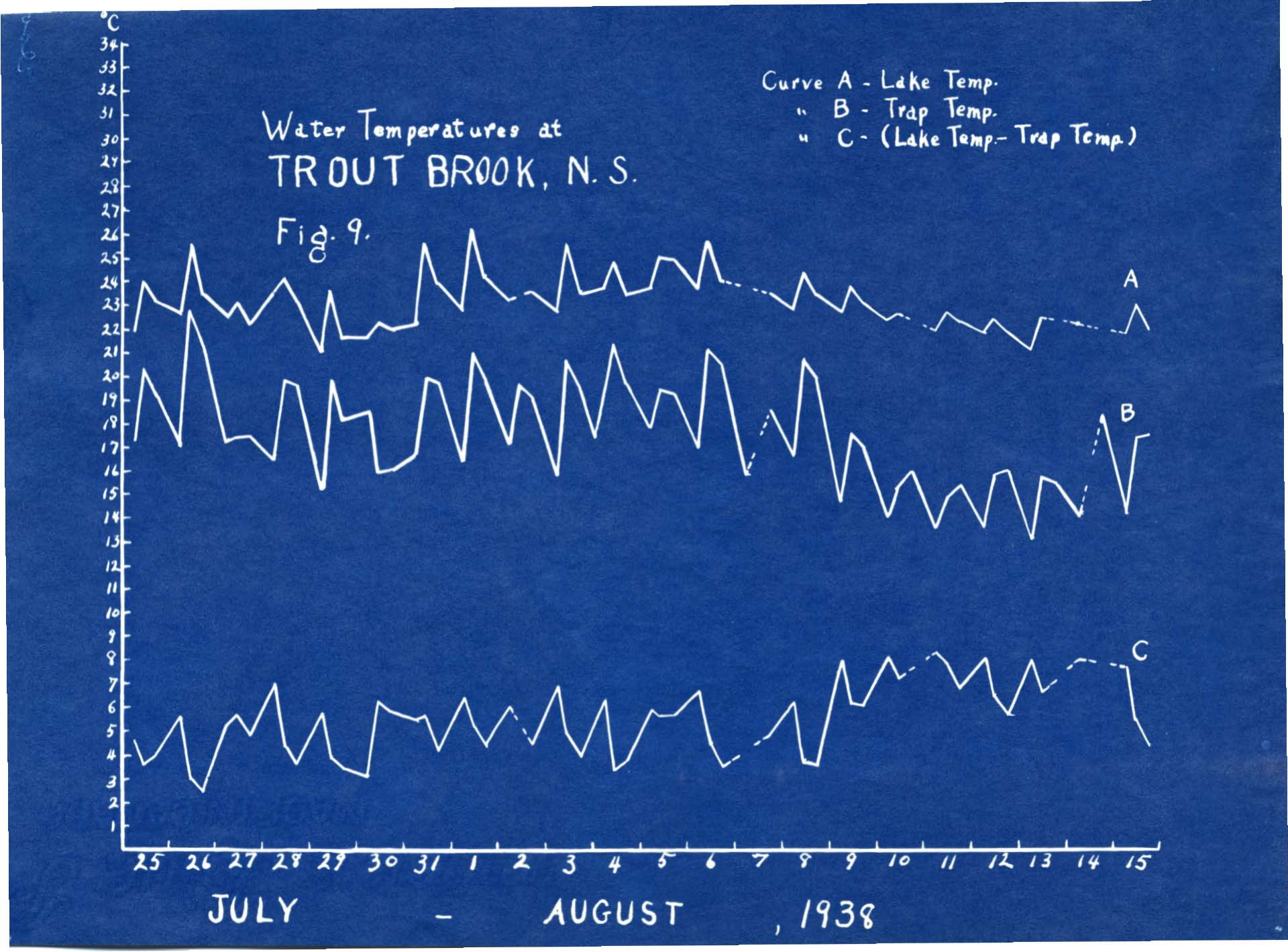
TROUT BROOK, N.S.

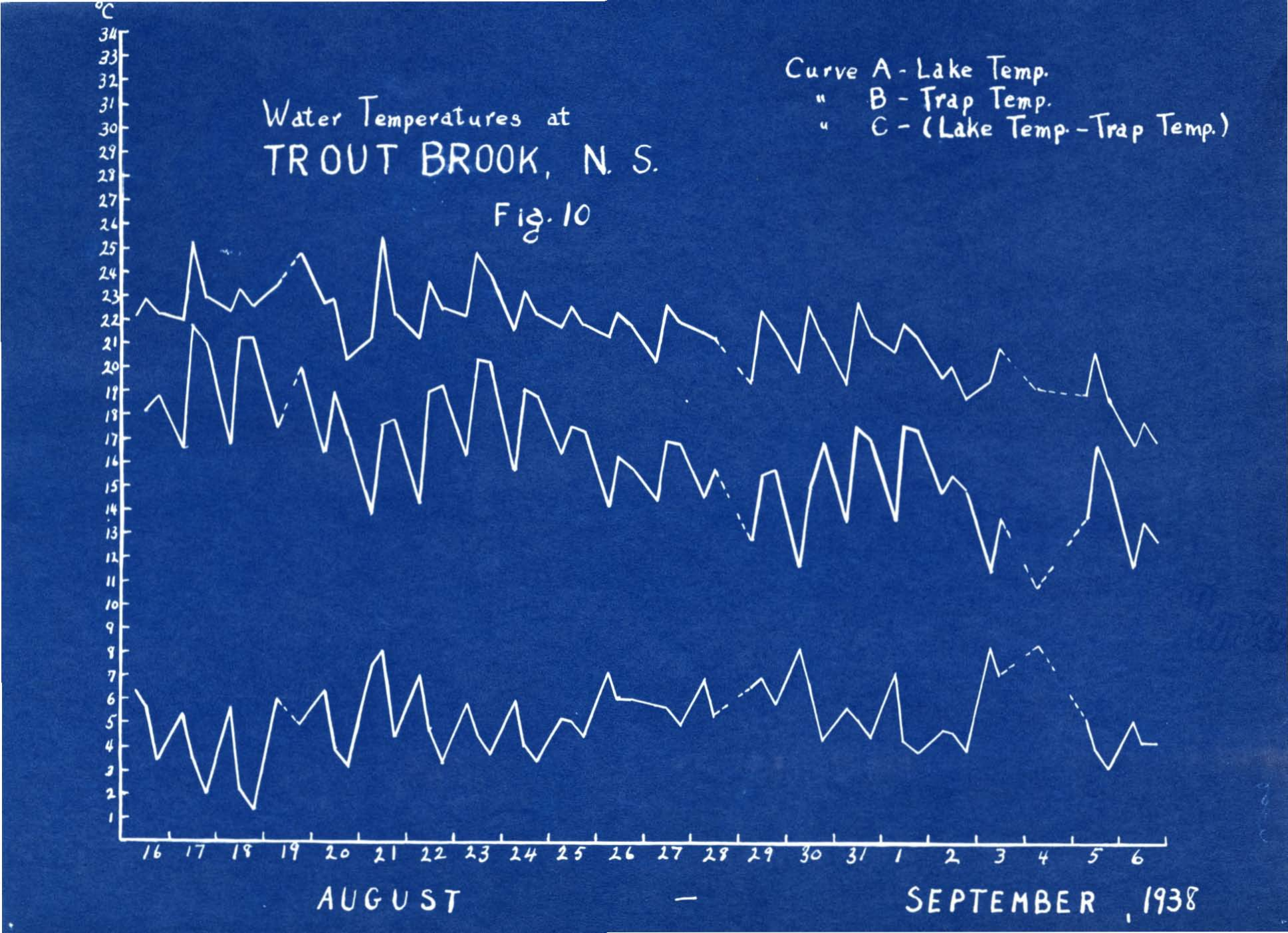
Bottom Isotherms at Mouth of Brook
August 30, 1938. 4.15 - 5.30 p.m.

Surface Temp. -- 21.3°C
Wind ------ 1 - SW
Sky ------ 5
Air --- (12.00 p.m.) 22.4




°C
34
33
32
31
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
Water Temperatures at
TROUT BROOK, N.S.
Fig. 8.
Curve A - Lake Temp.
" B - Trap Temp.
" C -(Lake Temp.— Trap Temp.)
A
B
C
3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
JULY, 1938


°C
34
33
32
31
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
Curve A - Lake Temp.
" B - Trap Temp.
" C - (Lake Temp. - Trap Temp.)
Water Temperatures at
TROUT BROOK, N. S.
Fig. 9.
A
B
C
25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
JULY - AUGUST, 1938


°C
34
33
32
31
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
Curve A - Lake Temp.
" B - Trap Temp.
" C - (Lake Temp. - Trap Temp.)
Water Temperatures at
TROUT BROOK, N. S.
Fig. 10
16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6
AUGUST — SEPTEMBER, 1938

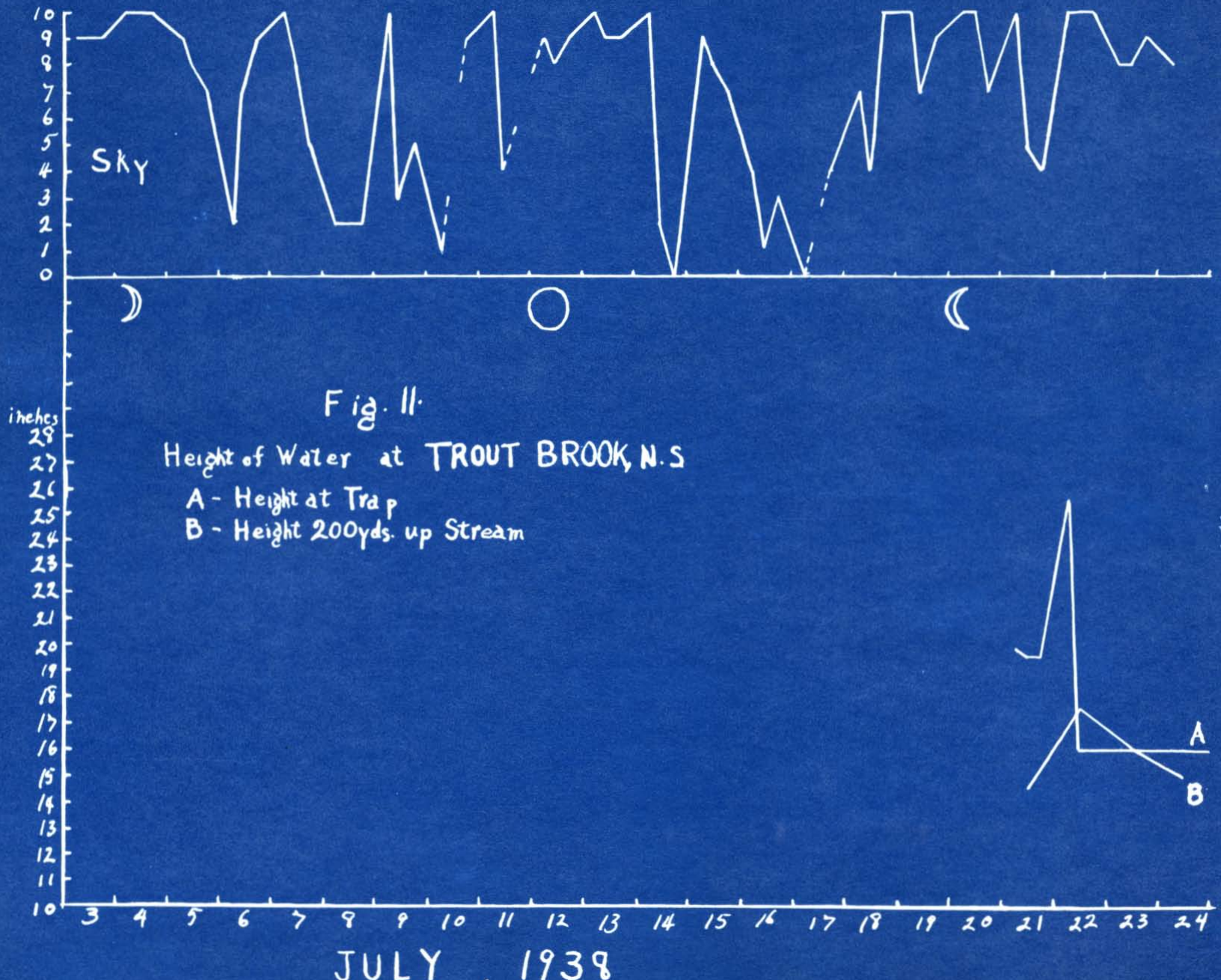
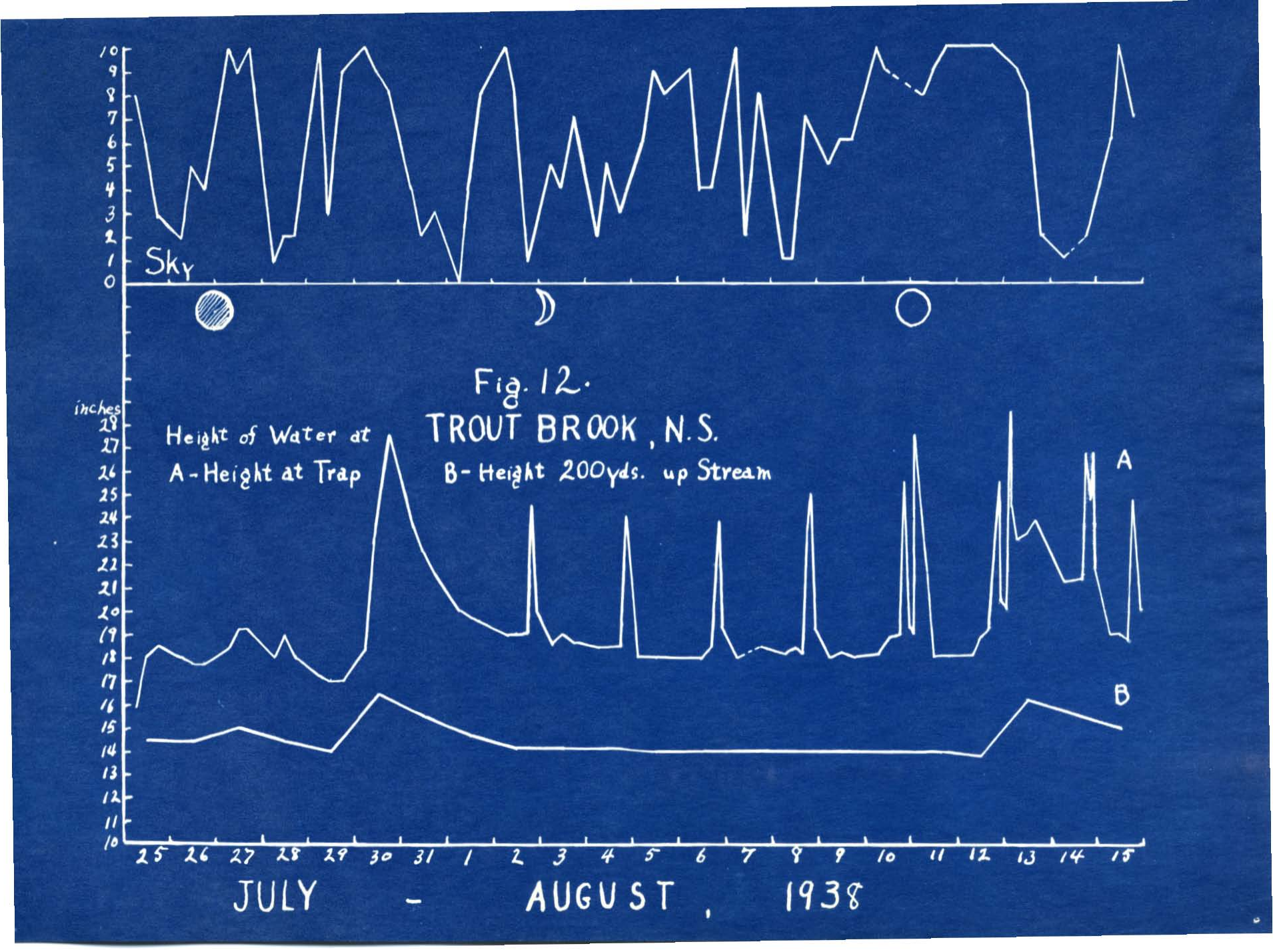


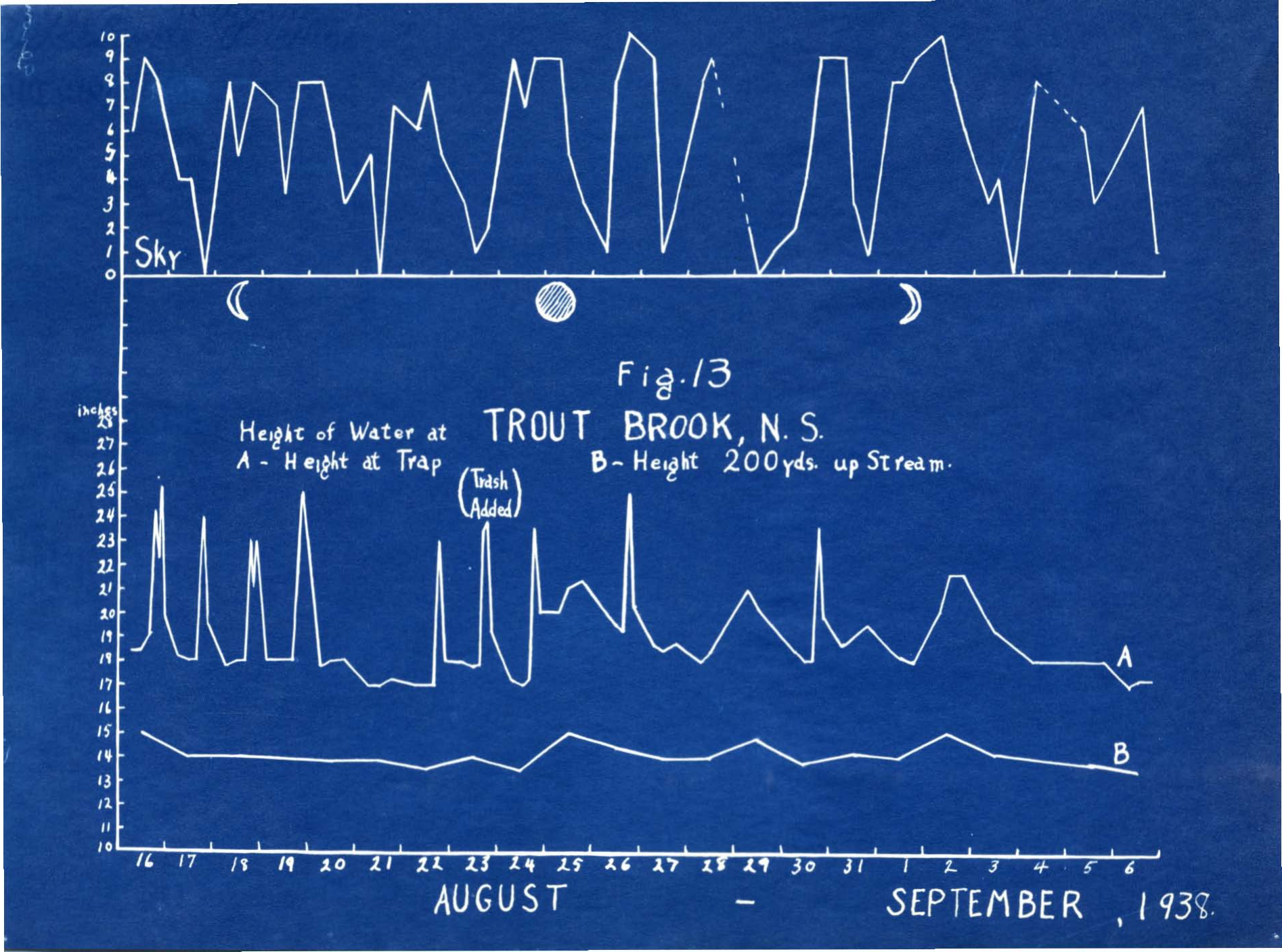
Fig. 11.

Height of Water at TROUT BROOK, N.S

A - Height at Trap

B - Height 200yds. up Stream


Sky
0 1 2 3 4 5 6 7 8 9 10
Fig. 12.
TROUT BROOK, N.S.
Height of Water at
A - Height at Trap
B - Height 200 yds. up Stream
inches
10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
A
B
25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
JULY - AUGUST, 1938


Sky
Fig. 13
TROUT BROOK, N. S.
Height of Water at
A - Height at Trap
B - Height 200 yds. up Stream.
(Trash Added)
inches
A
B
AUGUST - SEPTEMBER, 1938.

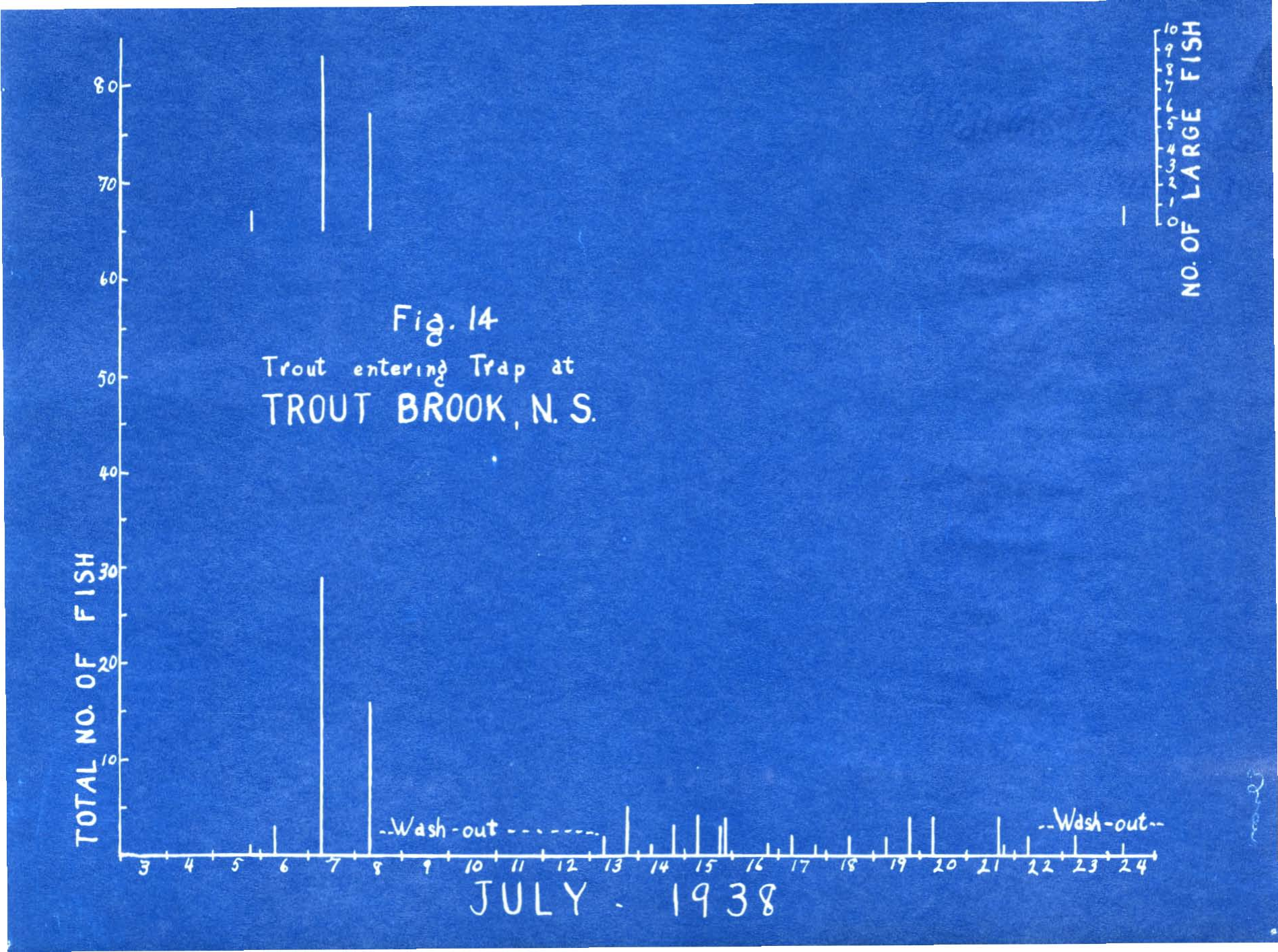


Fig. 14

Trout entering Trap at

TROUT BROOK, N. S.

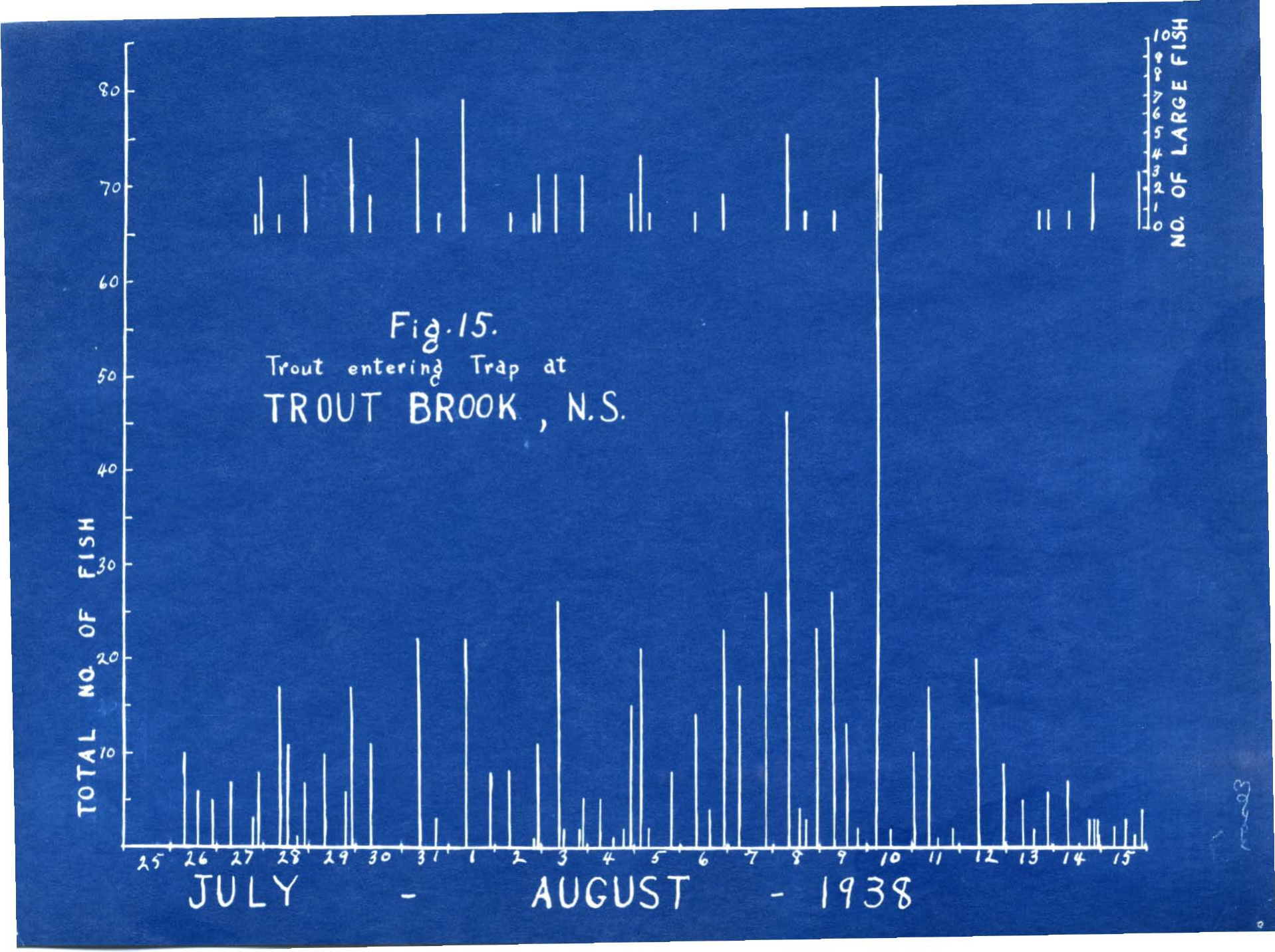


Fig. 15.

Trout entering Trap at

TROUT BROOK, N.S.

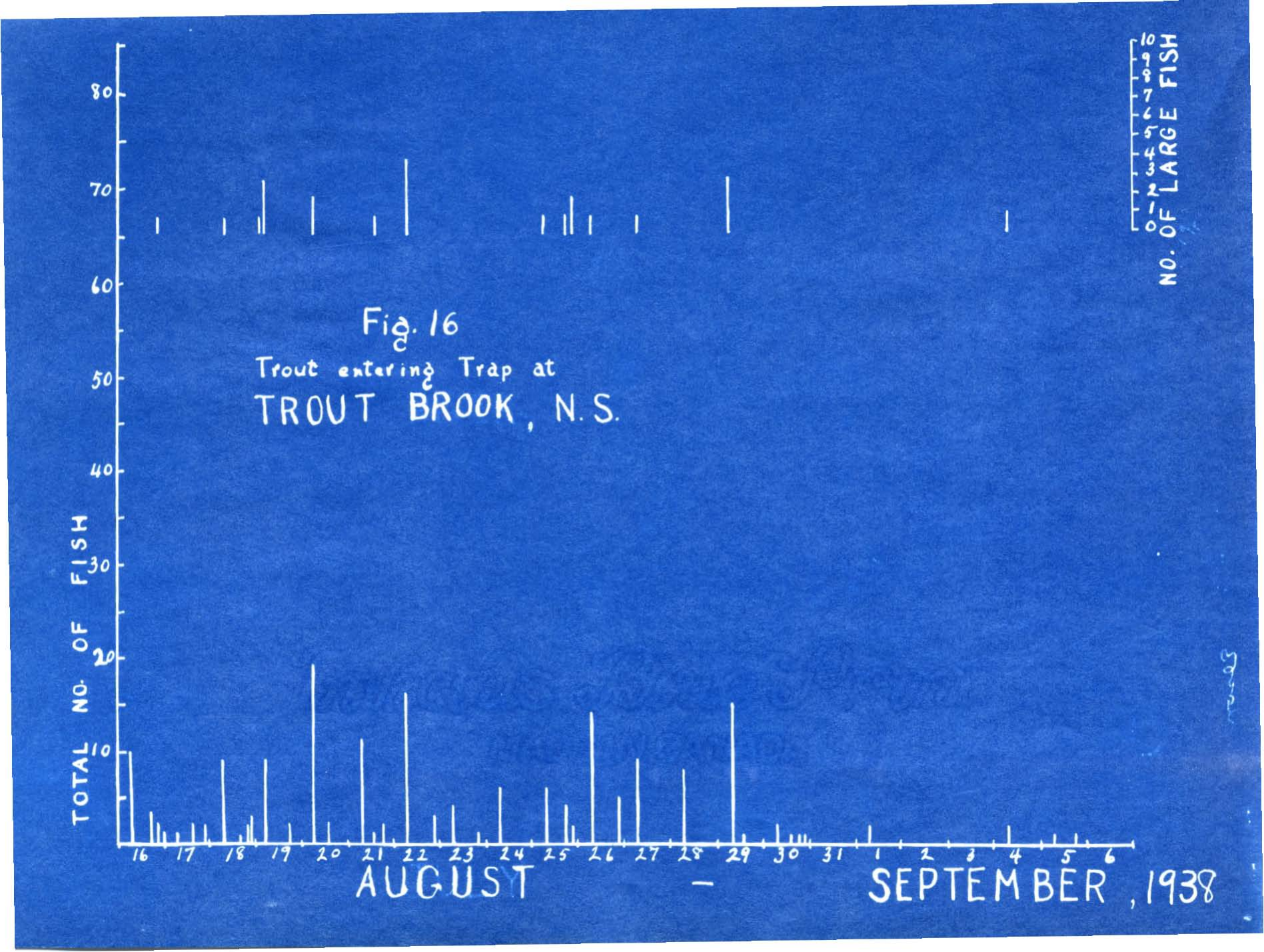
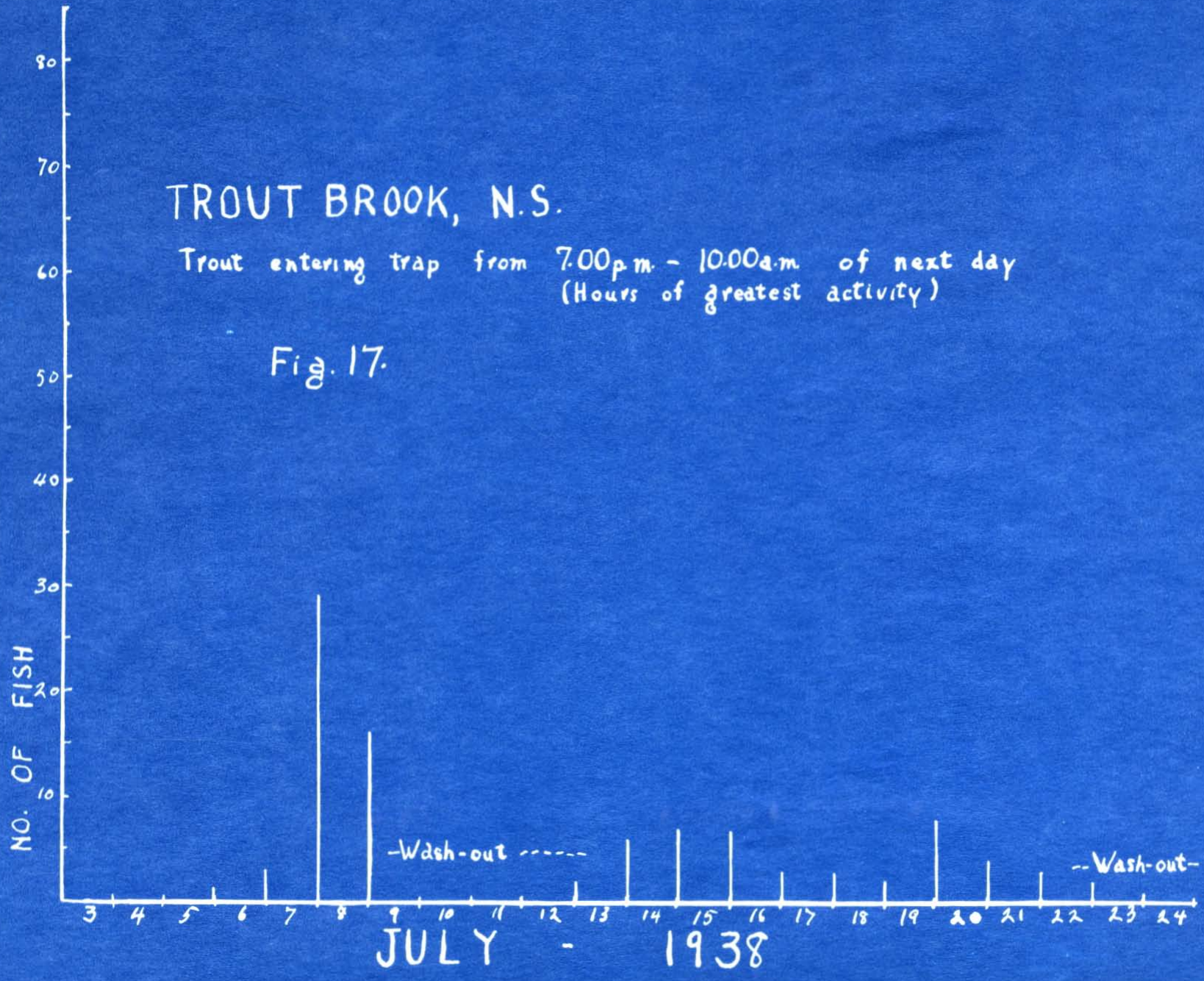
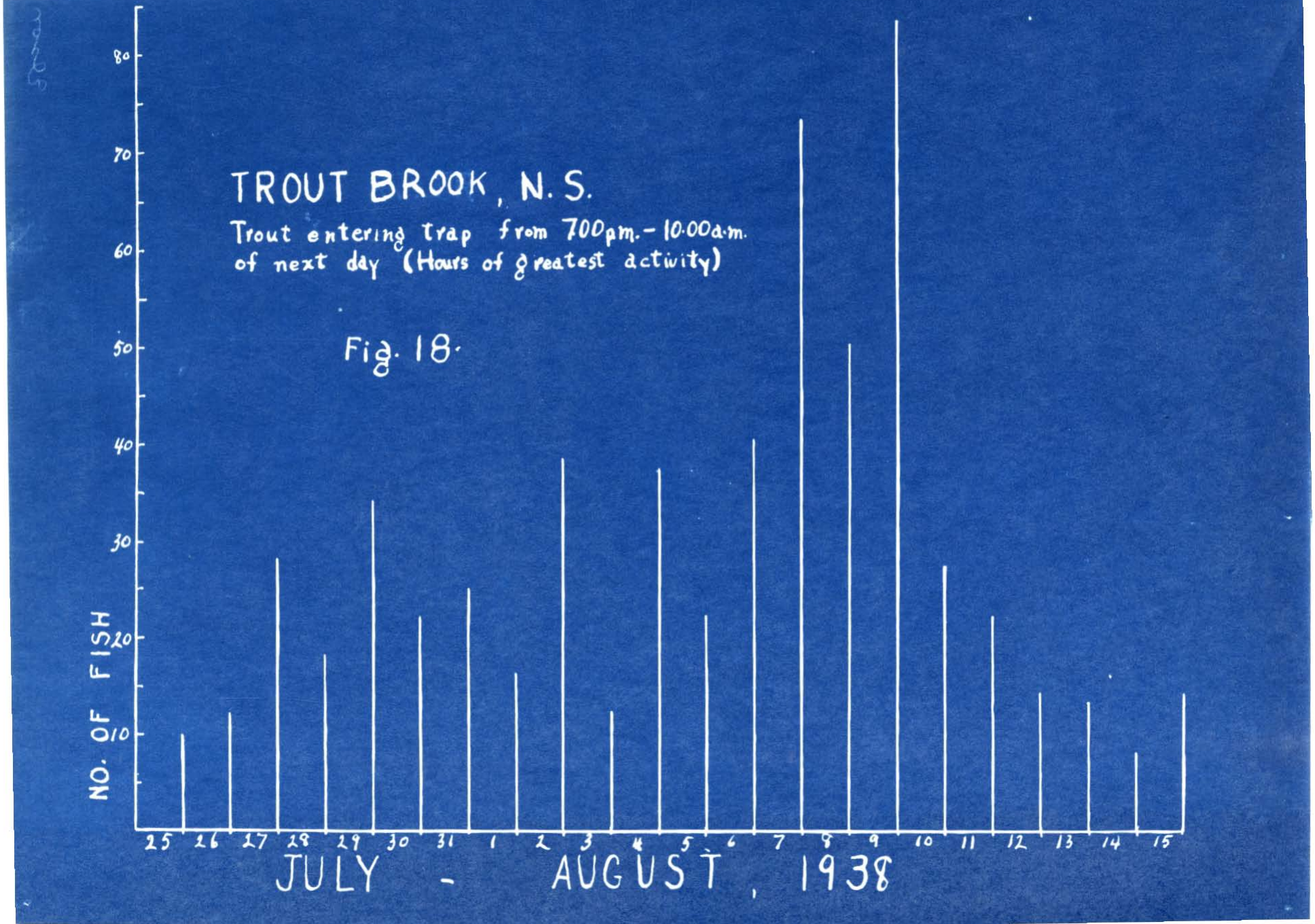
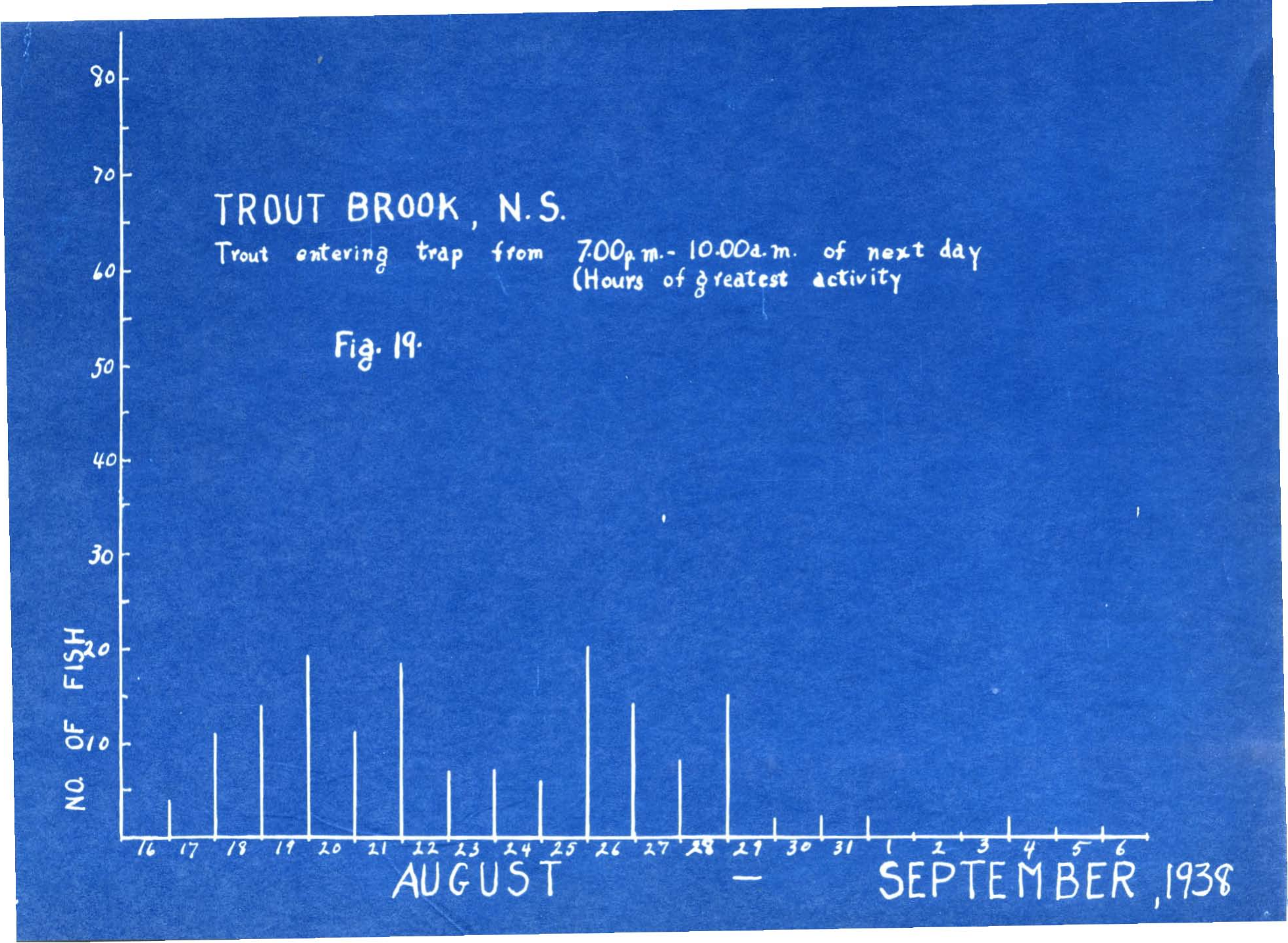
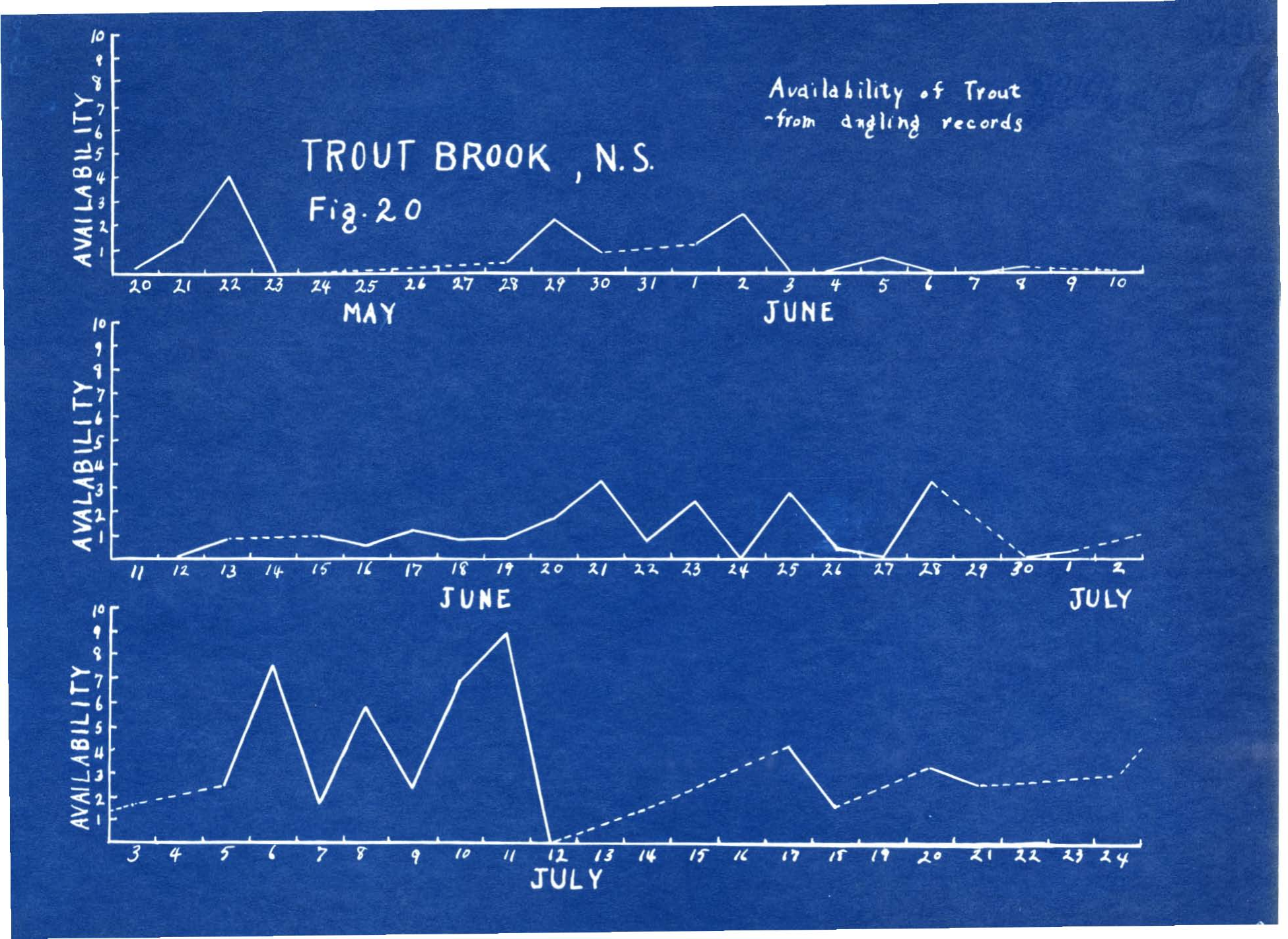


Fig. 16
Trout entering Trap at
TROUT BROOK, N.S.
TOTAL NO. OF FISH
NO. OF LARGE FISH
80
70
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
9
10
16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6
AUGUST – SEPTEMBER, 1938


TROUT BROOK, N.S.
Trout entering trap from 7.00 p.m. - 10.00 a.m. of next day
(Hours of greatest activity)
Fig. 17.
NO. OF FISH
80
70
60
50
40
30
20
10
-Wash-out ------
--Wash-out-
3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
JULY - 1938


TROUT BROOK, N.S.
Trout entering trap from 7.00 p.m. - 10.00 a.m. of next day (Hours of greatest activity)
Fig. 18.
NO. OF FISH
80
70
60
50
40
30
20
10
25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
JULY - AUGUST, 1938


TROUT BROOK, N.S.
Trout entering trap from 7.00 p.m. - 10.00 a.m. of next day
(Hours of greatest activity
Fig. 19.
NO. OF FISH
80
70
60
50
40
30
20
10
16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6
AUGUST — SEPTEMBER, 1938


Availability of Trout
-from angling records
TROUT BROOK, N.S.
Fig. 20
AVAILABILITY
10 9 8 7 6 5 4 3 2 1
20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10
MAY
JUNE
AVAILABILITY
10 9 8 7 6 5 4 3 2 1
11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 1 2
JUNE
JULY
AVAILABILITY
10 9 8 7 6 5 4 3 2 1
3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
JULY

TROUT BROOK, N.S.

Availability of Trout
-from angling records

Fig. 21.

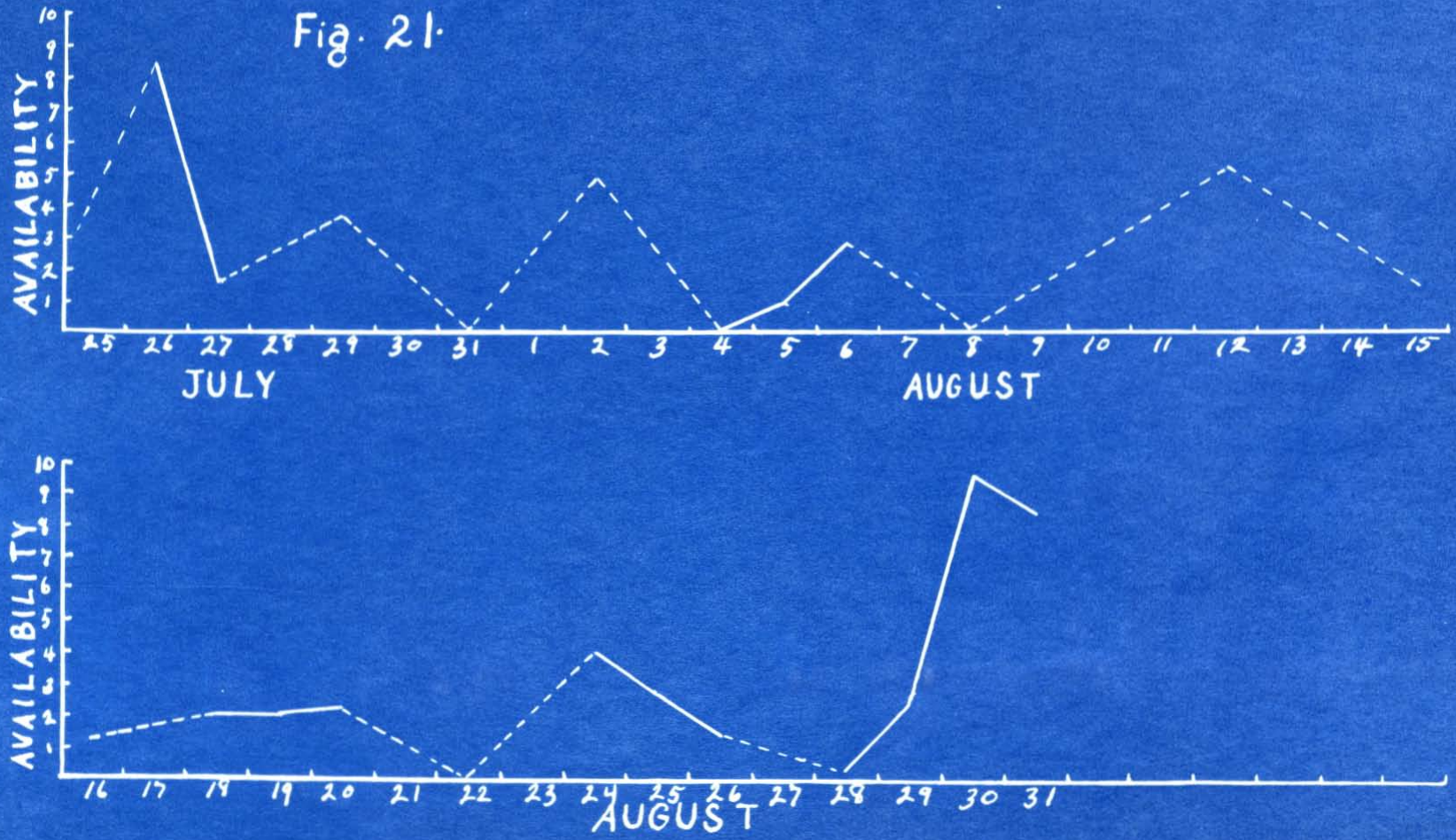


Fig. 22.

TROUT BROOK, LAKE AINSLIE, N.S.

Relation of Trout entering Trap to Lake Temperature.

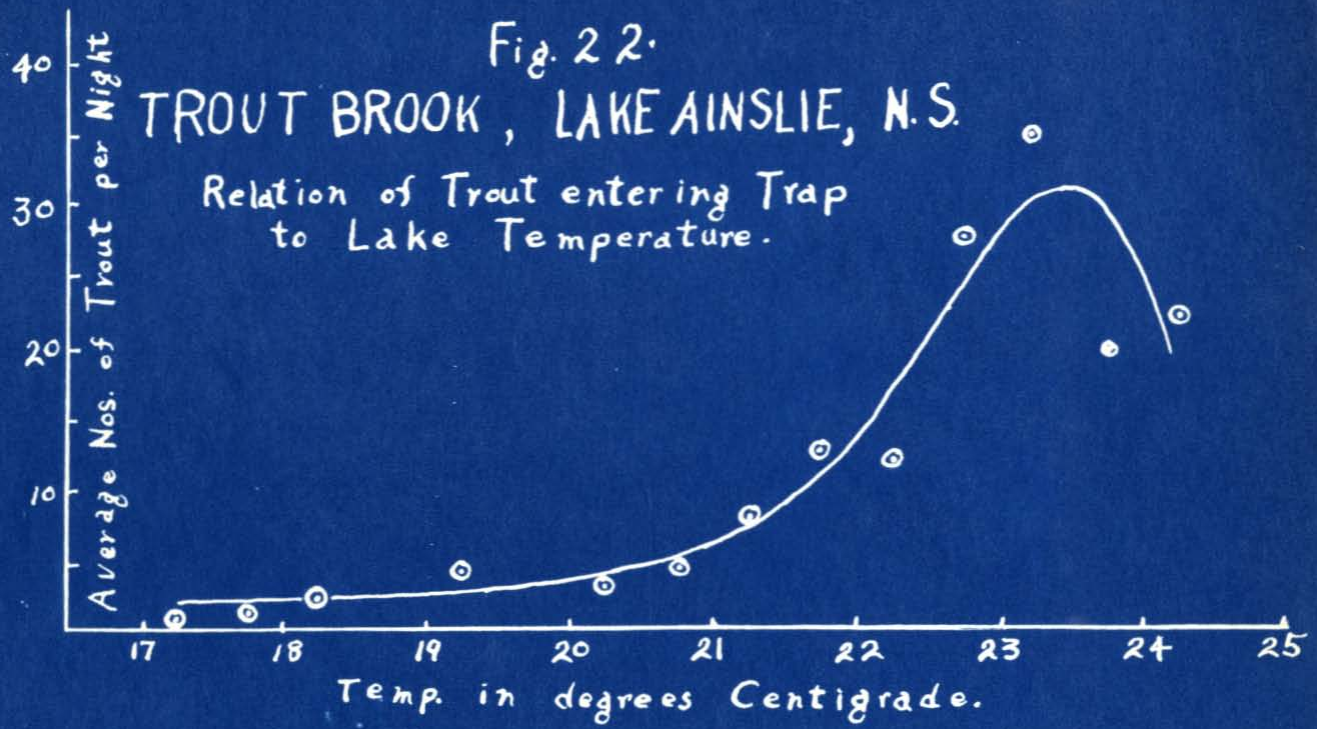


Fig. 23.

TROUT BROOK, LAKE AINSLIE, N.S.

Relation of Trout entering Trap to Difference between Lake and Brook Temperatures

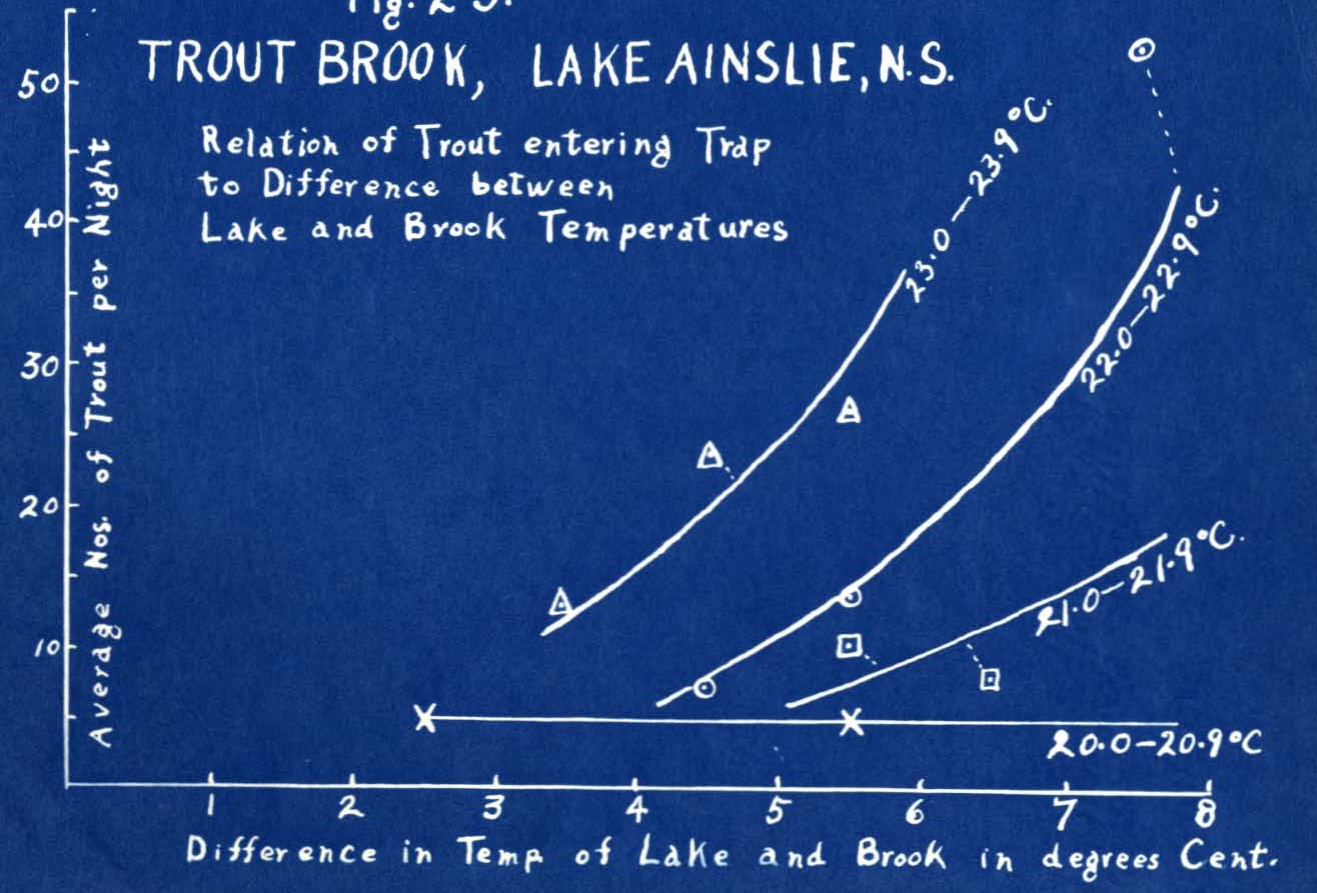


Fig. 24.

TROUT BROOK, LAKE AINSLIE, N.S.

Numbers of Trout entering Trap between 8.00 a.m. and 3.00 p.m. in relation to Cloudiness.

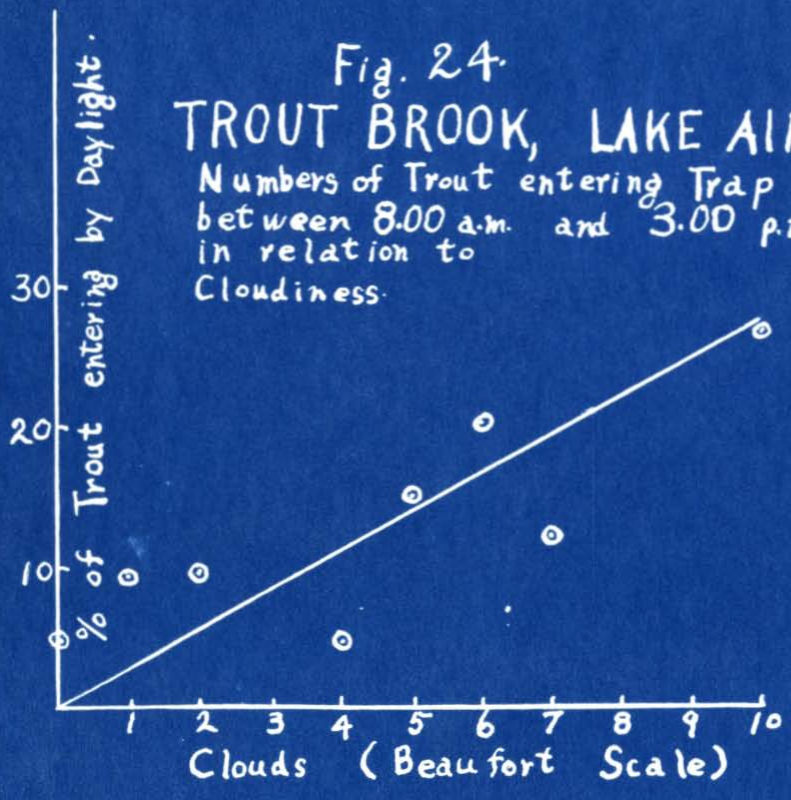


Fig. 25.

TROUT BROOK, LAKE AINSLIE, N.S.

Availability of Trout to Anglers in relation to Brook Temperature