KODIAK-SUMMER REPORT

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1951 SUMMER REPORT

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under the direction of

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This work was initially undertaken in an attempt to learn the extent of bear (Ursus middendorffi, Merriam) predation on pink salmon (Oncorhynchus gorbuscha). Although certain difficulties were anticipated, it was felt that this work could be done most efficiently by basing the investigator on a boat and thus allowing him to travel from stream to stream. In this way it was hoped that a good deal more area could be covered than by any other available means and thus a more representative picture of the situation could be obtained.

Indicative results have been obtained from work dealing with predation on red salmon (Oncorhynchus nerka) after the fish had reached the spawning lakes. However, no satisfactory predation studies had been made on these salmon during the period from the time they leave salt water to the time they enter the fresh water lakes. It was hoped that more information could be gathered on this phase of the general predation problem.

Further, information leading towards an estimate of the bear population on Kodiak Island was sought. This phase was to be patterned after the work of Dufresne and Williams who made an estimate of the brown bear population on Admiralty Island, Alaska, in 1932. These workers based their estimate on records of bear tracks seen along major salmon spawning streams during the period in which the salmon were available to the bears.

With these goals in mind, the investigator spent from July 7 through July 21, less a few days spent in helping construct a fish weir, in visiting various streams. Although the streams that were expected to support at least a moderate run of salmon were visited, salmon were found in only one, Dog Salmon Creek, which flows into Olga Bay on the south end of the island. Even here little bear sign was noted.

Because the emphasis was to be placed on pink salmon runs, few streams were

visited that were expected to support satisfactory red salmon runs. Of those visited, only one, Akalura River, showed signs of having red salmon ascend in the near future and even here the prospects were not favorable to the present study.

Bear tracks were measured wherever found but this method of population determination was found to be of little use here. Too few bears had congregated at the streams at the time the work was done and ground cover was unfavorable for recording the tracks. Gravel bars, grassy areas, and moist mud flats recorded only indistinct or smeared tracks. Some excellent tracks were found in slightly moist, tidal mud flat areas but these were few and far between.

Streams visited were:

1. Alpine Cove: 11 July; no fish seen in streams which appear to be barren with no algae visible; one bear track seen along stream; several bear trails; one fresh dropping composed entirely of grass.

2. Deadman Bay: 12 July; no salmon seen in stream; some tracks noted; two feces found, composed of grass.

3. Dog Salmon Creek: 15 and 18 July; 3-5,000 salmon in stream, mostly pinks but about one-quarter dogs; number of tracks seen; 12 feces noted ranging from a few days to several months old; 9 of these composed of grass only, 3 with a possible small percentage of salmon remains.

4. Horse Marine Creek: 17 July; no salmon seen in lagoon or creek; only bear sign seen was recent bear trail.

5. Jap Bay: 7 and 19 July; no salmon seen either date; water in streams extremely low; few tracks noted and grass found eaten on latter date; one month-old dropping composed of grass only found on latter date.

6. Kiliuda Bay: 21 July; no salmon in creeks; water very low; some salmon jumping in bay; no bear sign seen.

7. Sulua Bay: 9 July; no salmon seen; few tracks noted but no recent scats.

8. Three Saints Bay: 20 July; no evidence of bear or salmon.

Too few bears and the poor showing of salmon precluded any definite conclusions on the three named objectives of this work. Further, too large an area was covered

and the boat used, the SHEARWATER II, had a running speed of about 7½ knots which meant that most of the time was spent in merely travelling from one place to another. The period spent on this phase of the summer's work was not a complete loss, however. It served as an experimental project and led to some of the recommendations which are made at the close of this report.

When it was realized that the above work would not produce the desired results within the limits of the period available, the following program was laid out. This was pursued quite successfully for the remainder of the summer.

Second Phase

Objections to the supposedly deleterious effects of the brown bear on spawning salmon caused the Fish and Wildlife agents in Kodiak to seek some means of decreasing the amount of bear predation other than depletion of the bear population.

At least one type of automatic noise maker was tried by the former refuge manager, Mr. Frank Beals, but without success. It was hoped that the noise would deter the bears from going near the salmon streams.

The idea of using an electric fence was originated previously, but Mr. Paul Chapados, present refuge manager, was the first to actually make any preparations for its use. He had previously ordered the necessary equipment and the main problem was where to place the fence.

Karluk Lake was chosen as an ideal site for the following reasons:

1. Living quarters were available at two places on the lake,
2. Many bear were present and thus would make the work feasible,
3. Much work has been done previously at this lake and two of the streams were the subjects of bear predation work by Mr. R. F. Shuman, Fish and Wildlife Service,
4. Karluk Lake supports a larger salmon run than other lakes on the island,

5. Several boats were available at Karluk Lake,
6. The Fish and Wildlife Service plane made regular stops at Karluk Lake and provisions for the investigator would require little extra work, and
7. The writer desired to compare the situation at Karluk Lake with that at Red River (Ayakulik) Lake.

Moraine Creek

It was decided that Moraine Creek, at the northern end of the lake, would be a good stream on which to place the first fence for it was here that Shuman (1949) kept an accurate record of the salmon escapement and bear predation. Several deciding factors were as follows:

1. Moraine Creek is a typical tributary stream to Karluk Lake,
2. It can be expected to harbor in the neighborhood of 15,000 spawning salmon during the period from 1 July to 15 August,
3. A large proportionate number of bears are believed to feed on the stream, and
4. It is relatively free of brush along its banks and there is a glacial moraine through which the stream cuts, making an ideal observational point.

Therefore, on 27 July, Mr. Paul Chapados, Kodiak Refuge Manager, and Mr. David Spencer, Regional Refuge Supervisor, and the writer installed an electric fence along Moraine Creek. This single strand fence, located in the upper one-half of the spawning portion of the stream, extended along both banks completely enclosing an area about 675 feet long and from 15 to 20 feet wide. The wire ran about 3 feet above the ground. Steel stakes were placed along the bank wherever possible but at some points they had to be driven into the stream bed. Along most of the fence, excepting where it ran over the stream, grass had to be cut. One cutting sufficed for the period of this experiment. The farm type electric fence charger was attached

as soon as the fence was completed.

The fence was visited regularly to make sure that it was in good repair. During the whole period in which the fence was charged, not one instance of a bear going through or under the fence is known. This is suggested by the facts that no new bear trails were seen in the immediate vicinity of the fence, the ones present when the fence was installed showed no signs of continued use, and the charged fence remained intact.

Further, on August 8, near the end of the salmon run in Moraine Creek (see Figure 3) many dead salmon were noted within the fenced section but not more than 10 were to be found either above or below the section. This fact indicates that the bears cleared the dead salmon from the stream both above and below the fenced section but were deterred from taking salmon from inside the section. Seagulls are, for this study, ruled out as possible factors in removing fish for it is not likely that they would be frightened from the area by the artificial structure. Observation confirmed this. Foxes probably went under the fence and removed some fish but this does not harm the conclusion that the fence served as an effective means of discouraging bear activity on the fenced portion of the stream.

When the salmon were abundant in Moraine Creek, they were fresher, and perhaps more desireable to the bears in the lower portion of the stream. At that time the fence does not prove its effectiveness as well as when the live salmon were scarce throughout most of the stream yet relatively concentrated within the fenced section. At this latter time, the bears would be forced either to take salmon from within the fenced section or to move to another stream to obtain salmon. It is felt that the latter alternative was chosen here.

On 5 August the charger was removed from the Moraine Creek fence and on 16

August, the fence was broken for the first time. From the way that the wires were pulled, it is believed that one bear was responsible. This plus information gathered at another fence, suggests that the electric charge and not merely the fence was the deterring factor.

Salmon Creek

A fence was also installed at Salmon Creek, a small tributary to Thumb River, located on the north-east side of the lake. This fence, shown in Figure 1, was erected on 3 August. The site chosen for fence placement seemed ideal for at that point the stream was wide and shallow with a few deeper pools where the salmon apparantly congregated. More bear sign were noted there than on any other portion of the stream, and a well worn bear trail crossed the stream at that point.

The fence consisted of 6 steel stakes driven into the stream bed close to the bank. Aluminum wire was stretched between the stakes approximately 3 feet above the stream bed, enclosing an area roughly 65 feet long and 20 feet wide. One-half of the fence had an additional wire placed about 1 foot below the primary wire.

The fence was without any charge for 2 days, 4 and 5 August, and each day the wire was broken. The charger was then attached to the top wire only, set to give maximum shock, and the fence was not molested for one day. The following day, 8 August, however, the double strand portion was completely torn down. Presumably, three bears, probably two-year-olds, were responsible. It is felt that these were the same three bears which were often seen in the general vicinity.

On 9 and 10 August the lower uncharged wire was broken; on 11 August it was again broken as well as one part of the charged top wire. On 14 August the lower uncharged wire was again broken and was removed leaving only one charged wire, a set-up similar to the Moraine Creek fence.

The reason for removal of the lower wire will be explained below.

On 15 August, Mr. Paul Chapados and Mr. David Spencer, while flying over the fenced section in an airplane survey of the bear population, noticed one bear inside the fence and two more outside. The following day the wire was noticeably looser than before, probably due to the bear's bumping against them.

To prevent bears from crawling under the charged wire, another wire was placed roughly a foot below the primary wire and this too was electrified. The fence was not broken thereafter even though a great majority of the few fish in the stream were inside the fenced area. No marked increase in salmon in adjacent waters occurred that might account for the bear's fishing elsewhere.

It is thought that this fence was broken often because when it was first installed, it carried no electric charge and that later only one of the wires was charged. Hypothetically, the bears learned to experience only annoyance with the uncharged wires and the charged wire served only to confuse them. For this reason, the lower, uncharged, wire was removed on 14 August with the thought that if only a charged wire was present, this confusion might end. The bears then merely crawled under the wire. In spite of this, it is felt that learning is extremely important in causing bears to avoid the fence. Thus, if bears experience a shock in their first acquaintance with a fence, they will associate shock with the fence and not merely annoyance.

It was hoped that observation of the fence on Moraine Creek would be possible but during the time the fence was charged, the prevailing winds were such that when an observer was situated at the intended place, his scent would be carried to the fence and thus make any conclusions invalid. Observation at the Salmon Creek fence was not possible for no hills were near and the trees were small.

Correlated Work

Along with the above work, collections and records were made of bear feces in an attempt to lay the groundwork for a more intensive study of the bear's diet. In general, it appears that as the first run of salmon enter the streams tributary to the lake, the bears change from their previous diet of primarily grasses (Poa sp.) and angelica (Angelica lucida) to salmon. The salmon then comprise the great majority of the bear's food. Salmon remain the chief element of the diet until the first run begins to taper off. At this time the elderberries (Sambucus sp.) and the so-called high bush cranberries begin to ripen and they then comprise the bulk of the bear's intake. It is not yet known whether the bears switch from a meat to a plant intake because they are tired of eating salmon or because they like the berries better. In the fall when the second run of salmon enters the streams, the bears apparently take few salmon. The reason is not known.

It was noted that when the salmon were few and relatively hard to obtain, the bears eat each fish quite completely. The reverse is true when the fish are numerous. Then the bears catch many and eat only a small part of each one. Again, the reasons are not known for this but once they are, they may form a practical basis for control of bear predation on salmon.

The bear scat collections made, did not arrive in Ann Arbor, Michigan, in time to permit any work done which might be included here.

Further data was taken on the number of cubs per female and the habits of the bears but insufficient volume of data has been accumulated at this point to state any conclusions here.

Summary:

The first part of the summer was spent aboard a patrol vessel, the SHEARWATER II, in an attempt to gain information on three major points: 1) bear predation on

pink salmon, 2) bear predation on red salmon from salt water to the fresh water lakes, and 3) the bear population on Kodiak Island.

The second half of the summer was spent at Karluk Lake obtaining information on the effectiveness of electric fences against bears and on the general problem of bear predation on salmon.

A very poor showing of salmon and the almost non-existent concentration of bears prohibited any workable data from being collected concerning the work of the first half of the summer.

Information gathered during the latter half of the summer, however, showed quite conclusively that electric fences are effective against bears. Other data gathered has either not yet been worked over, or is not definite enough for any further conclusions at this point.

Recommendations:

1. The excellent results obtained from the first two experimental fences warrant further attention to this project.

The writer feels that a project designed to learn more about the reactions of the bears to fencing would be most profitable. From the work this summer it is known that fences on small portions of spawning streams are effective but it is not known whether these fences would be so effective if a majority of the stream , probably where the fish are most numerous, were fenced off.

The fences installed this summer merely forced the bears to content themselves with other portions of the streams and no reduction in salmon predation probably occurred. Rather, predation was merely heavier on the unfenced part of the stream.

The following plan would indicate whether the bears will content themselves with fewer total salmon, an ultimate consequence of widespread fencing. This must

be determined before any extensive fencing is installed for if the bears do move to other fishing grounds after fencing, the effectiveness of the fence is lost. Certain runs in fenced streams may be built up but at the same time, other runs would be wiped out due to increased fishing pressure.

The south-east side of the lake is fed by only three streams of any size: Grassy Point Creek, Halfway Creek, and Meadow Creek. By fencing off these streams all the bears for a distance of about eleven miles along the shore of the lake would be affected. If these streams were completely fenced off, the writer feels sure that the bears would merely move to Cascade Creek and the O'Malley system to obtain their salmon. If, however, the upper portions of the streams are left unfenced so that the bears will be unable to get the majority of the spawning salmon but will have access to, possibly, 15 per cent of the escapement, the writer feels that they will content themselves to those 15 per cent and not move elsewhere. If this proves to be the case, the effectiveness of the fences would be unchallenged and more extensive fences could be installed without fear placing undue predation pressure on the unfenced streams.

Small fences might be placed elsewhere to protect some unusually good spawning area but it is not felt that these would prove anything other than that which was proven by the fence at Moraine Creek.

Construction of Fences

Although the fence at Moraine Creek seemed to be satisfactory with only one wire about 3 feet above the ground, it is felt that an additional wire, placed about one foot below the top wire would prevent smaller bears from crawling under the fence as they did at Salmon Creek. Both wires should be charged.

Apparently, the farm-type electric fence charger used in these experiments

did not permit a strong enough shock for at Salmon Creek the bears broke the wire even though it was charged. The charge was apparently effective at Moraine Creek. In order to insure a completely effective fence in the future, however, a charger box that will allow a greater shock, perhaps twice that used here, is recommended.

Equipment

Equipment that would be useful in building future fences includes a machete, sickle, brush hook, and the tubular type of post setter. This latter tool resembles a section of pipe, weighted at one end, so that it may be placed over the steel post. By lifting the setter and allowing it to drop several times, the post is driven into the ground.

2. The patrol boat used this summer is not, in the writer's mind, well suited for its intended purpose. First, the living quarters are inconvenient and cramped. The boat is slow and too much time is consumed in merely travelling. Storage space is at a premium in the forecastle and wheelhouse while the hold is much larger than necessary. The auxillary boat is slow, large, and heavy. It would seem that a faster patrol vessel with larger proportionate living quarters, and a smaller, lighter auxillary boat would be far more desireable for use here.

3. If any further work of the type done during the first half of the summer is planned, the work should be restricted to a smaller area than was covered here and that a faster boat be provided to permit more time to be spent working than travelling.

4. In order to aid the reader in planning any further work at Karluk Lake, a series of graphs (Figures 2-6) are appended. These will enable the reader to know at what dates he may expect salmon to be in the streams and to plan work accordingly. Most of the graphs are drawn from records taken in 1950 but some

1951 records are plotted. It can be seen that the fish enter the various streams at nearly the same times each year. The numbers of salmon shown in the graphs are not total figures for the fish in the streams; they merely show the number of live fish found in a unit length, usually more than one-half of the spawning area used, of the stream. It can be seen, for example, that if a fence is to be erected on Cottonwood Creek (Figure 3), it must be installed by the first of July to protect all the entering salmon. The graphs are drawn from data supplied by Bevan.

5. In view of the publicity afforded the bear-salmon situation it would seem that additional funds might be requested for more widespread application of fencing.

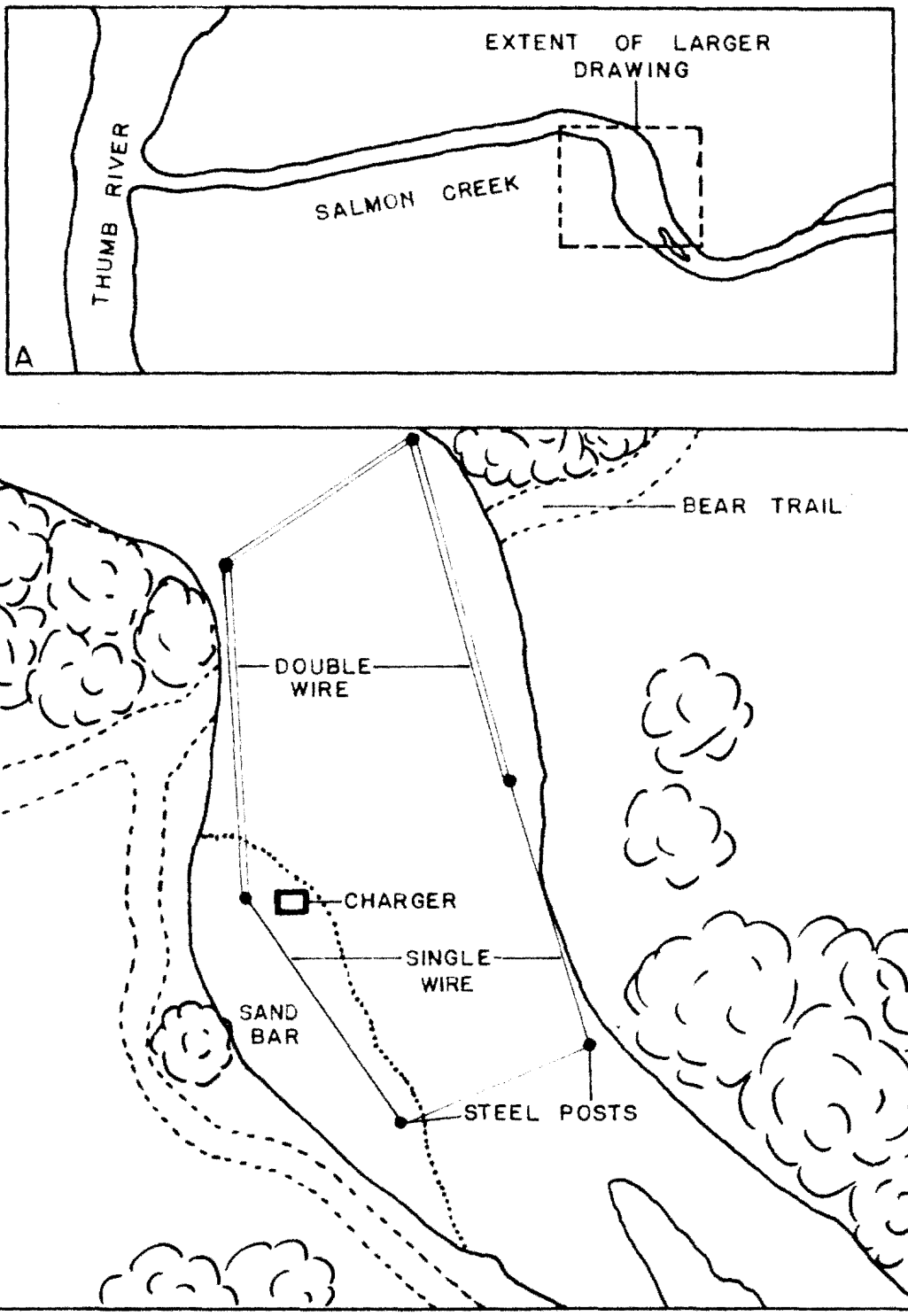

Figure 1, A and B. Diagram of fence erected at Salmon Creek.

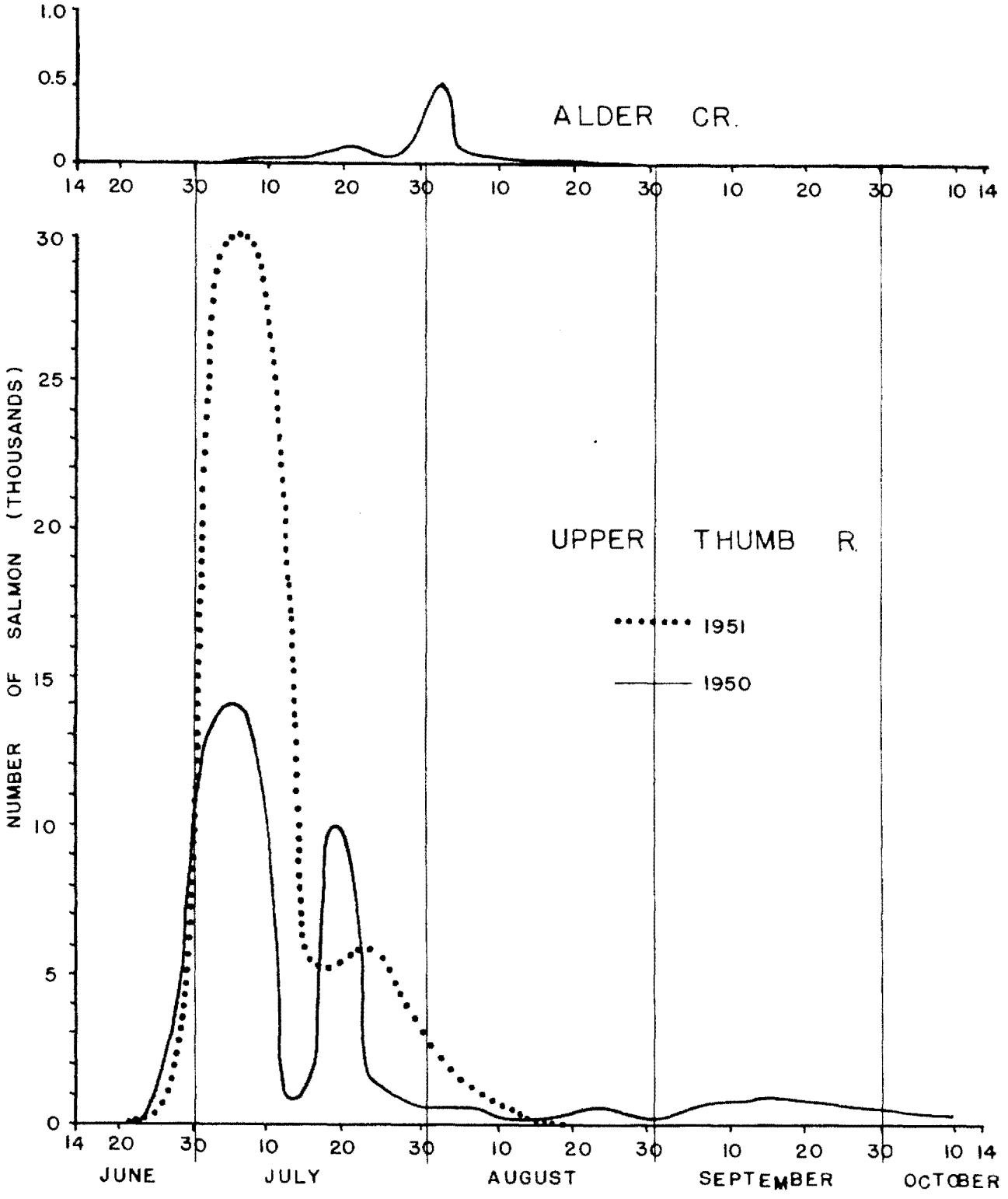

Figure 2. Number of live salmon in a unit length of stream plotted against time. The continuous line is drawn from data taken in 1950, the dotted line from data taken in 1951.

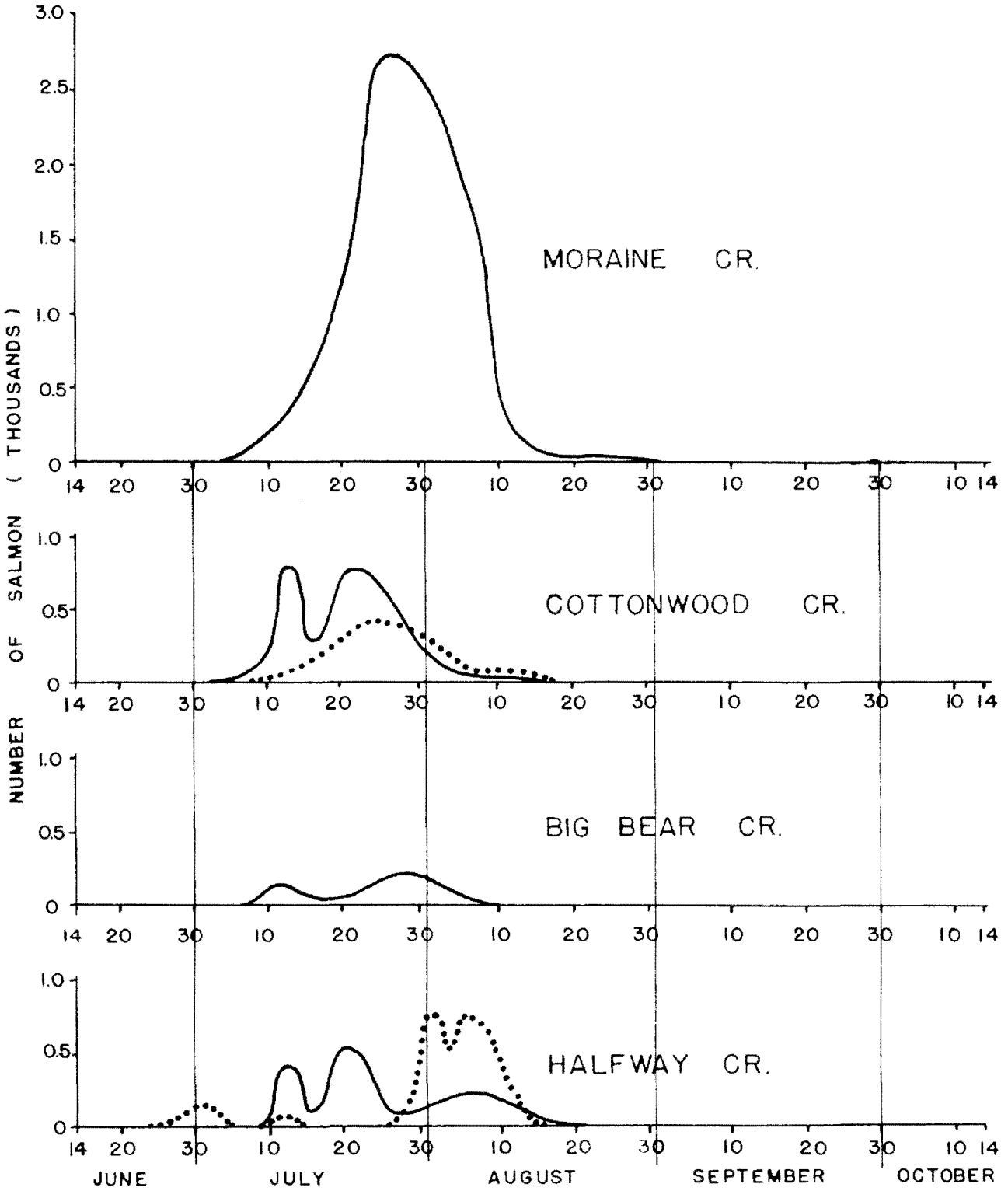

Figure 3. Number of live salmon in a unit length of stream plotted against time. The continuous line is drawn from data taken in 1950, the dotted line from data taken in 1951.

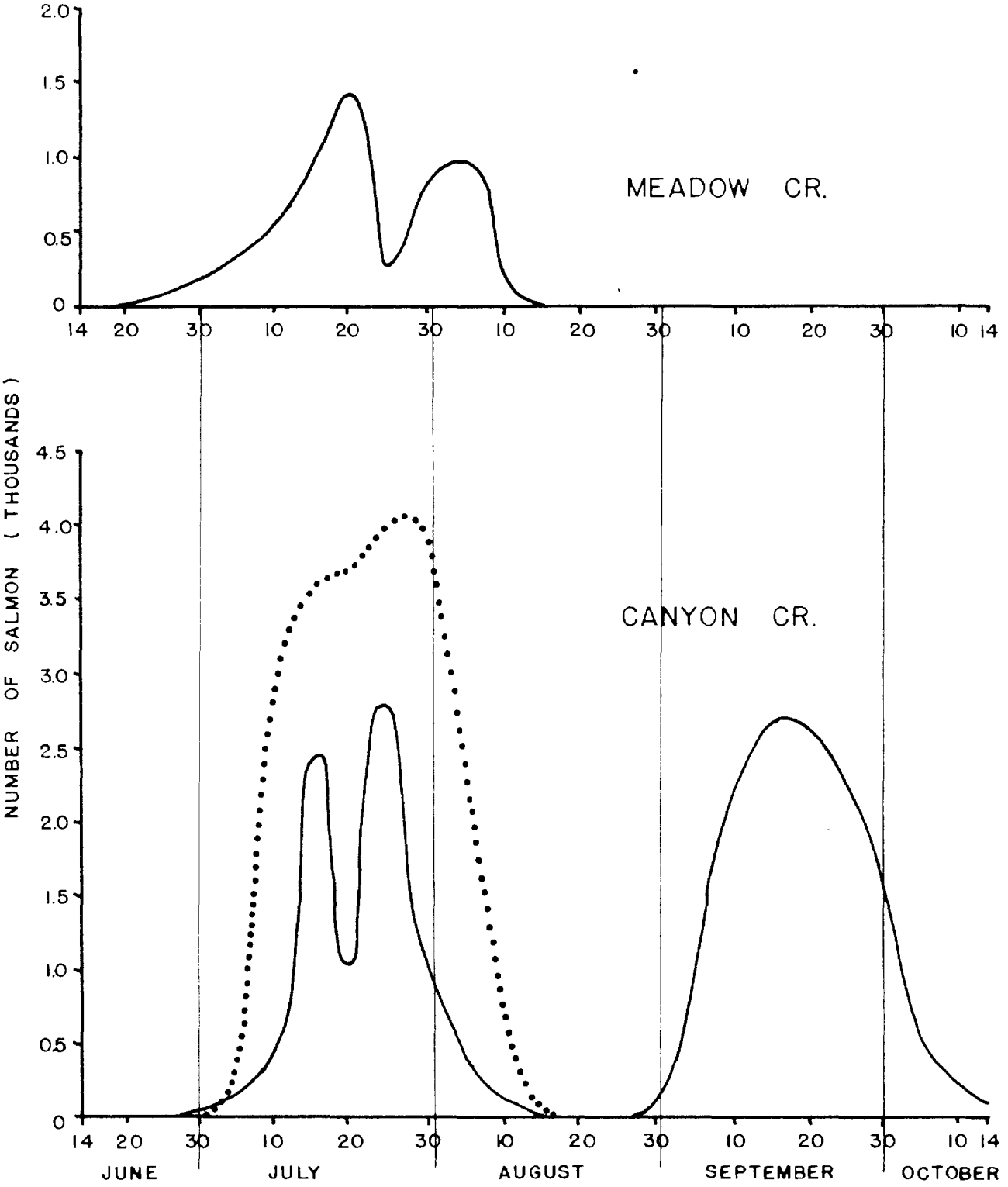

Figure 4. Number of live salmon in a unit length of stream plotted against time. The continuous line represents data taken in 1950, the dotted line from data taken in 1951.

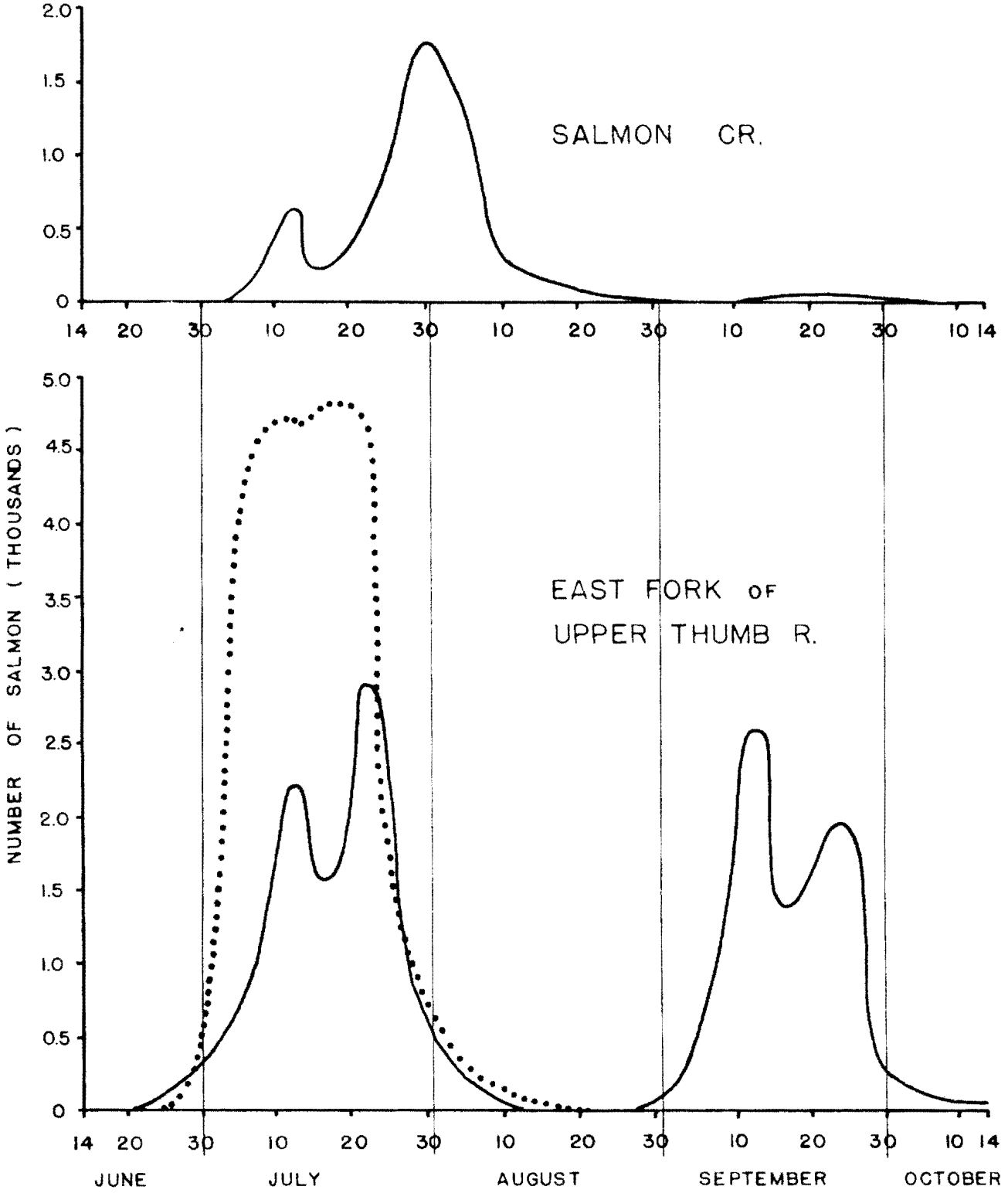

Figure 5. Number of live salmon in a unit length of stream plotted against time. The continuous line represents data taken in 1950, the dotted line from data taken in 1951.

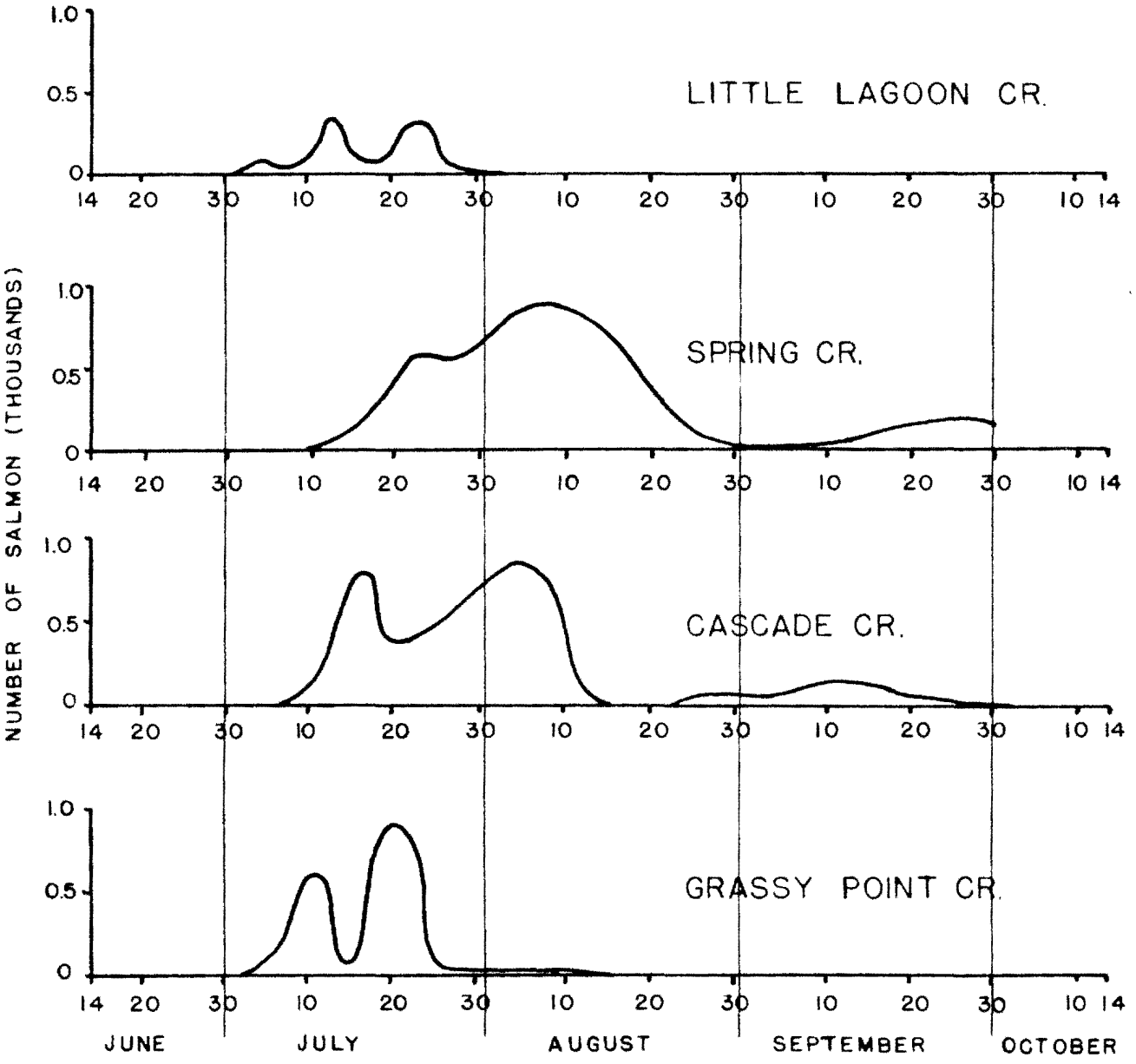

Figure 6. Number of live salmon in a unit length of stream plotted against time. The continuous line represents data taken in 1950.

Table 1. Lengths of time for which data was gathered at various streams.

Stream	From	To
Alder Creek, 1950	June 20	October 10
Big Bear Creek, 1950	June 20	October 10
Canyon Creek, 1950	June 26	October 12
Canyon Creek, 1951	June 23	August 14
Cascade Creek, 1950	June 26	October 12
Cottonwood Creek, 1950	June 20	October 10
Cottonwood Creek, 1951	June 29	August 12
East Fork of Upper Thumb River, 1950	June 23	October 11
East Fork of Upper Thumb River, 1951	June 25	August 15
Grassy Point Creek, 1950	July 2	October 14
Halfway Creek, 1950	June 18	September 1
Halfway Creek, 1951	June 23	August 14
Little Lagoon Creek, 1950	June 20	October 4
Meadow Creek, 1950	June 18	October 12
Moraine Creek, 1950	June 20	October 4
Salmon Creek, 1950	July 13	October 10
Spring Creek, 1950	June 20	September 28
Upper Thumb River, 1950	June 23	October 11
Upper Thumb River, 1951	June 25	August 15

References:

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Dufresne, Frank, 1932, Admiralty Island Deer Estimate; U.S.D.A. Pub. and Williams, J.T.

Gilbert, Charles H. and Rich, Willis H., 1927, Investigations concerning the red salmon runs to the Karluk River, Alaska. Bull. U.S. Bur. of Fisheries, XLIII, 1927, Part II, Wash.