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SECOND REPORT OF THE SALMON RESEARCH COMMITTEE
October 22, 1943

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SALMON RESEARCH COMMITTEE

Lester A. Stubbs
Gerald P. Cooper
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Woods Hole Laboratory
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The Salmon Research Committee, consisting of Mr. Lester A. Stubbs for the Maine Department of Sea and Shore Fisheries, Dr. Gerald P. Cooper for the Maine Department of Inland Fisheries and Game, and Dr. George A. Rounsefell for the Fish and Wildlife Service held its fourth meeting at Hampden Highlands, Maine on October 22, 1943. Mr. Louis D. Stringer, biologist, was present by invitation.

I. Review of action on previous recommendations.

The Committee reviewed action taken by various agencies on the recommendations of previous meetings. The action taken was as follows:
(Recommendations of April 30, 1942)

5a. The report on sawdust and woodwaste pollution on the St. George River was sent to Mr. Stobie in December 1942. On December 21, 1942 in replying to Mr. W. C. Herrington he states that little can be done until after the War, as these mills have the excuse that they are making materials for war purposes.

5b. No study has been initiated on the pollution in the Penobscot River.

6. No law has been passed defining an adequate fishway for salmon.

4a. Although a fair number of adults (171 with 121 females) were collected in 1942, only 54 with 25 females were taken in 1943. This is far below the number needed even for small experimental plantings and certainly must be increased if the work is to achieve any results. The Committee's recommendation that adults be collected on the Machias and at least one other river, as well as at Bangor, was shown to be well founded by last summer's experience. Only 54 fish ascended the Bangor dam fishway and the total run to the Penobscot barely exceeded 100 fish.

4f. A trap was maintained at the Veazie dam during part of the summer of 1943 to discover how many salmon surmounted the Bangor dam, by the Department of Inland Fisheries and Game. A permanently built trap at a dam that salmon cannot ascend except through the fishway would be a great aid to management of the Penobscot, since each year's run needs to be accurately enumerated.

(Recommendations of March 23, 1943)

A. The following table shows the estimated numbers of sea salmon on hand at the Craig Brook and Tunk Lake fisheries stations on January 15, 1943 (100,000 eggs shown at Tunk Lake were actually transferred from Craig Brook in February), the recommended disposal of each lot and their actual disposition during 1943.

Sea Salmon Stocking in Maine During 1943

Salmon on hand 1/15/43					Disposal recommended by Committee		Actual Planting		On Hand 10/1/43
Station	Egg Source	Year	Species	Number	Locality	Number	Locality	Number	
Craig Brook	Miramichi	1940	Atlantic	5,872	St. George	all	St. George R.	4/ 6,728	
" "	"	1941	"	12,566	" "	all	" "	4/ 3,448	
" "	Machias	1941	"	67,326	Machias R.	30,900	Machias R.	16,000	
					Narraguagus	8,400	Narraguagus R.	5,000	
					Dennys	5,600	Dennys R.	4,150	
					Penobscot	22,200	Sawtelle Brook	4/ 2,524	
							Mattawamkeag R.	4/ 6,642	
" "	Oregon	1941	Silver	21,839	Pemaquid	all	Pemaquid	4/ 19,922	
" "	Penobscot	1942	Atlantic	1/ 582,513	Penobscot	85,000		0	2/ 224,135
					St. George	40,000		0	
" "	Oregon	1942	Silver	44,764	Pemaquid	25,000	Pemaquid	4/ 10,220	3/ 12,217
Tunk Lake	Penobscot	1942	Atlantic	1/ 100,000	Narraguagus	20,000		0	2/ 72,000
					Dennys	12,000		0	
					Machias	8,000		0	
								74,634	

1/ Eggs, eyed.

2/ Hatchery estimate.

3/ Actual count by biologists.

4/ These six lots, totalling 49,484 were marked by fin clipping by biologists of the U. S. Fish and Wildlife Service.

During 1943 a total of 37,764, 18-month old Atlantic salmon, 6,728 30-month old Atlantic salmon, 10,220, 12-month old silver salmon and 19,922 18-month old silver salmon or a grand total of 74,634 sea salmon were planted. This is a reduction of 48 percent from last year's stocking.

It will be noted that the stocking was greatly curtailed by excessive mortality indicating the need for scientific knowledge on the technique of raising Atlantic salmon. Since the start of the salmon program (October 1, 1941) the output of young salmon has been insufficient to carry on properly the scientific studies needed in order to determine the best stocking policies.

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II. Recommendations of the Salmon Research Committee at the Fourth Meeting in Hampden Highlands, October 22, 1943.

The Committee, after discussion, unanimously approved the following recommendations, which are explained in the third section of this report.

To facilitate reference to recommendations of different dates the Committee will henceforth number all recommendations in a continuous series. Since there have been 12 previous recommendations, the first for this meeting will start with number 13. The recommendations are:

13. That the salmon-counting trap in the fishway at Veazie Dam, which was successfully operated by the Department of Inland Fisheries and Game during 1943, be operated annually as a permanent feature of the Penobscot River management program.

14. That a concrete wall be constructed below the foot of the fishway on the east bank of the Penobscot River at Bangor Dam to facilitate the passage of fish up through the fishway during summer low-water periods.

15. That the Rules and Regulations of the Department of Sea and Shore Fisheries 130, Resolves, 1941, c. 84, and the Commissioner's Ruling of March 26, 1942, amending it, be further amended. The present Ruling reads:

> "No fish shall be taken, except by hook and line, from the waters of Pemaquid River, above a line drawn from the most southerly end of Cardy's Point to the most southwesterly end of Old Fort Point, EXCEPT, that during the months of May and June fishermen shall be permitted to seine ALEWIVES from the waters of Pemaquid river with seine of not less than two inch mesh and Alewife nets of not more than three inch mesh.
> March 26, 1942."

The Committee feels that the present restriction will not provide the necessary protection either for the young silver salmon migrating downstream in April and May or for the adult salmon migrating upstream in the autumn. Therefore the Committee recommends that the latest Ruling be amended to read:

> "No fish shall be taken from the waters of Pemaquid River, above a line drawn from the most southwesterly tip of Thurston Point to the most southwesterly tip of Fish Point, EXCEPT, that during the months of May and June, ALEWIVES may be dipped at Pemaquid Falls in the manner determined by the fish committee of the Town of Bristol, with due regard for the downstream passage of young salmon."

16. That the Ducktrap River be henceforth considered suitable for salmon.

17. That the law prohibiting the taking of salmon after July 15 each year be more strictly enforced for the commercial gear in Penobscot Bay.

18. That accurate statistics of both sport and commercial catches of salmon be obtained for each river in the following manner:

a. Statistics will be compiled by individual rivers and shall show number of fish (also weight when obtainable), type of gear used in making the catch, whether sport or commercial, and dates fish were taken as accurately as possible.

b. All statistics will be compiled by the fisheries statistician of the Department of Sea and Shore Fisheries.

c. Reports will be collected each year immediately after the close of the salmon fishing season in each locality.

d. The statistics shall not include kelts (spawned out salmon, thin and emaciated, sometimes taken by so-called sport fishermen).

e. The Inland Fisheries wardens will gather all records of salmon caught in fresh water by sport gear or other means (including known cases of fish taken illegally), and of salmon taken while dipping alewives.

f. The Sea and Shore wardens will gather the statistics on the remainder of the catch, including the commercial.

g. The Sea and Shore fisheries statistician will make the detailed arrangements with the wardens of both fisheries departments in order to avoid duplication and to insure final centralized compilation.

19. That the collection of adult salmon for spawning purposes be carried out in conformity with the Committee's previous recommendation made on April 30, 1942.

20. That in carrying out the recommendations of the Committee in collecting adult salmon for hatchery use, the personnel do not select the fish, but take every second fish regardless of injuries, or other factors.

21. That certain vital statistics of hatchery operations, which are essential to the success of the salmon restoration program, be kept as follows:

a. Methods of enumeration or estimation of the numbers of eggs or fish will be approved and the counting or estimating supervised by the biologists conducting the salmon research program.

b. The number of adults taken by the hatcheries.

c. The number of adults of each sex spawned.

d. The number of eggs stripped.

e. The number of fry hatched.

f. The number of feeding fry placed in each pond and the date.

g. Records of mortality by individual ponds.

h. Record of disease or preventative treatments by pond, showing diagnosis, who made the diagnosis, treatment recommended, date and type of treatments actually used, including exact name of chemical, concentration, and time of exposure, and date and results of reinspection.

i. Weight and either an actual count or approved estimate of each planting.

j. An approved enumeration or accurate estimation of the total numbers of each lot of salmon held in the hatcheries at the time any stocking is done. This approved estimate to be obtained for all lots, regardless of whether any are planted, at least twice annually, preferably in May and October.

22. That controlled experiments to determine the effects on mortality and growth of crowding, cannibalism resulting when fish are not sorted into size categories, and of differences in the composition, amount and frequency of feeding, be carried out in an attempt to bolster the survival of young salmon in artificial propagation.

23. That all previous recommendations concerning planting of salmon of the 1942 brood year held at Craig Brook and Tunk Lake fishery stations are hereby revised, and planting shall, insofar as practicable, be in accordance with the following table:

Recommendations for Allocation and Stocking of Sea-salmon Held Over from 1943 during 1944

Station	Egg Source	Year	Species	Number estimated on hand by hatchery Oct. 1, 1943	Number estimated will be on hand by committee May 1944	Where to plant	Per-cent	Month to plant	Per-cent to hold	Biologist to mark and/or designate exact place of release
Craig Brook	Penobscot	1942	Atlantic	224,135	125,000	Penobscot	25	May		Yes
						St. George	15	"		Yes
						Penobscot	25	Sept.		Yes
						St. George	15	"		Yes
									20	
" "	Oregon	1942	Silver	1/ 12,217	10,000	Pemaquid	all	May		Yes
Tunk Lake	Penobscot	1942	Atlantic	72,000	30,000	Penobscot	50	"		Yes
						Narraguagus	25	"		No
						Denny s	15	"		Yes
						Machias	10	"		No

1/ Actual count by biologists

SALMON RESEARCH COMMITTEE
Gerald P. Cooper
Lester A. Stubbs
George A. Rounsefell

III. Explanation of recommendations made at the fourth meeting.

13. The need of an annual count of the number of spawners is self-evident, and is part of the approved general program included in the last report of the Committee (page 24). The operations of the counting trap in 1943 is explained in an appended report by Dr. Cooper.

14. For several seasons it has been necessary for Mr. George Montgomery, Superintendent of the U. S. Fisheries Station at Craig Brook, to build a temporary wall out of sandbags to make it possible for salmon to reach the fishway over the gravel bars and ledges below the Bangor Dam. A concrete wall is needed to eliminate this wasteful and expensive proceeding.

15. It is the intent of the Committee in establishing runs in streams now devoid of salmon to restrict all fishing until the run has become fully established.

16. In line with the policy of classifying streams as suitable or unsuitable for salmon under present conditions the Committee finds that the Ducktrap River is unobstructed and is otherwise suitable for salmon.

17. The Committee feels that attention should be called to this law and that it should be strictly enforced.

18. Accurate statistics of the numbers of salmon taken are an essential feature of any management program.

19. Owing largely to the present shortages of manpower and transport the hatcheries have not carried out the recommendations of the Committee concerning the taking of adult salmon for spawning purposes. Because of its proximity to Craig Brook and the ease with which the salmon may be trapped, all of the spawning fish for the past two seasons have been taken from the Penobscot River at Bangor. During 1942 the hatchery apparently took most of the Penobscot River run that ascended the Bangor dam. In 1943 only one fish was known to ascend past the Veazie dam so that the hatchery took the entire run. Thus the fate of an entire cycle of Penobscot River salmon rests on the hatchery, for there are no natural spawners. An epidemic under such conditions would be extremely unfortunate.

Taking the salmon from only one river has also had the distinct disadvantage of not providing sufficient adult salmon for spawning.

20. The recommendation of the Committee that in trapping salmon at a weir or fishway for spawning purposes the hatchery take the first ten fish and only every other fish thereafter is based on sound principles. Without natural spawners an epidemic in the hatchery may wipe out a cycle. Without natural spawners we can never learn what advantage may be gained by artificial propagation. Unless the natural spawners are allowed to come from each portion of the season's run, the natural run to some tributaries will be drawn on more heavily. Unless the spawners are taken throughout the season there is no assurance that the hatchery quota and the portion of the run permitted to escape will contain the same proportion of each sex.

The taking of every other fish that enters the trap, regardless of its condition is very necessary in order to insure that the fish used for hatchery purposes and those spawning naturally have equal reproductive potentialities. If a salmon is injured so that he soon succumbs in the holding pond there is no reason to believe it would have fared any better if permitted to remain in the river.

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IV. Information and reports submitted to the Committee at the fourth meeting, October 22, 1943.

A. Observations at the fishway on the Veazie Dam, Penobscot River, Veazie, Maine, Summer of 1943

Gerald P. Cooper
Assistant Professor of Zoology
University of Maine

July 26, 1943

Some data on the spawning run of Atlantic Salmon (Salmo salar) in the Penobscot River during the 1943 season were obtained by operating a counting trap in the fishway at the Veazie Dam. During the same period a trap in the fishway at the Bangor Dam, five miles below Veazie, was operated to collect adult salmon to be used for propagation purposes at the Federal hatchery at East Orland, Maine.

A knowledge of the total run of salmon in the Penobscot each year is necessary in view of various investigations and management practices now being done. Records are readily available on the numbers of salmon (1) collected at the Bangor fishway for propagation purposes, (2) those caught from the Bangor Pool -- records kept by the Bangor Pool Club, and (3) those caught commercially by weir fishermen from the river below Bangor --records, believed to be fairly reliable, are obtainable, according to Sea and Shore Fisheries Warden Lester Stubbs. The unknown portion of the run of salmon in the Penobscot, in our records for the past few years, consists of fish which, according to numerous reports, surmount the Bangor Dam without going through the fishway. Since the Veazie Dam (height, about 14 feet) is presumably insurmountable to ascending salmon, and any such fish must use the fishway, a count of salmon ascending the Veazie fishway would answer the question of salmon "jumping the Bangor Dam," and would supply the data needed for a total count of fish in the Penobscot run. This was the purpose of making a count at the Veazie fishway during 1943.

During the early Spring of 1943, the Veazie fishway was closed; therefore any ascending salmon in the 1943 run could not have passed this point. On May 29, a counting trap was installed in the upper compartment of the Veazie fishway. Mr. George Pearson was employed by the Maine Department of Inland Fisheries and Game as a full-time watchman for the trap. The trap was constructed so that fish reaching this upper compartment could not escape, until released by the watchman. Manipulation of water flow through the fishway made it possible to count the fish before releasing them upstream. The trap was examined twice daily. Records were kept of all fish passing upstream through the fishway (see tables at end of report).

The counting trap at Veazie was operated from May 30 to July 9, inclusive. During this period only one salmon was encountered in the trap (at 7:00 A.M., June 27). This fish, measured while in the water, was 30 inches long; its weight was estimated at 10 to 12 pounds. According to Pearson, this fish was faily dark in color (indicating that it was not an immediate arrival from salt water); but its weight-length proportion would indicate that it was a mature and spawning fish, rather than a kelt. Since, up to this date, no salmon had been liberated upstream from the trap at the Bangor Dam (according to Messrs. Montgomery of the East Orland hatchery, and Paul Hanscom of the Inland Fish and Game warden service), it is probable that this one salmon had jumped the Bangor Dam.

During this period of May 29 to July 10, a total of 35 salmon were taken at the trap in the Bangor fishway, and removed to the East Orland hatchery. In view of the records of 35 salmon in the Bangor fishway and only one salmon in the Veazie fishway, the writer concludes that, during the 1943-run, practically all salmon in the Penobscot run used the Bangor fishway rather than jumping the Bangor Dam. The possibility of ascending salmon jumping the Bangor Dam and then lying inactive for several weeks in the five-mile section of dead-water between Bangor and Veazie does not seem plausible.

The records for salmon in the 1943 Penobscot run up to July 10 were: 35 taken from the Bangor fishway, 5 taken by fishermen in the Bangor Pool, and 1 liberated above the Veazie Dam. Warden Lester Stubbs informs the writer that the commercial catch by weirs below Bangor was bout 40 to 50 fish. The total Penobscot run of salmon up to July 10 was, therefore, about 90 fish.[1] There is the possibility of a few fish entering small streams tributary to the Penobscot below Bangor, and of the commercial catch being somewhat larger than indicated, but it is believed that the number of such additional fish is small.

On July 10, the count at the Veazie fishway was discontinued, and the fishway was left open to free passage of fish. Since July 10, no salmon have been taken at the Bangor trap, and none have been seen jumping against the Bangor Dam. It is inferred that none have gone above Veazie during this period. Water in the river has been low since the last part of June, so that any further run of salmon this year may be delayed until Fall.

[1] No additional salmon have been taken up to August 8, 1943.

In addition to records of fish in the Veazie fishway, Mr. Pearson kept records of temperatures, weather, and water level. The water-level gauge was a yard-stick nailed to the upstream side of the fishway, installed on May 30 with the water level reading at 18 inches. By June 2 the water had dropped 2 inches to a reading of 16, etc. Since the water level above the Veazie Dam is controlled by the installment or removal of splash-boards (Hydro-electric plant uses the water) as well as by the amount of water flow, Pearson's readings on water level do not give a true picture of variation of flow of water in the river. Rather, the figures are of significance mostly in indicating the extent of variation of water head available to the mouth of the fishway.

RECORDS TAKEN AT SALMON-COUNTING TRAP
IN FISHWAY AT VEAZIE DAM, 1943
GEORGE PEARSON

Salmon-counting trap to be examined twice daily, and more frequently as the number of fish encountered may warrant. Record each examination as a separate entry in the following table, whether or not fish are encountered.

Date	Time trap examined	Notes on fish in trap, including all species. Number and individual lengths of salmon. Approximate number of alewives, etc. If no fish, state "no fish."
May 30	6 P.M.	25-30 Alewives, 7 Suckers.
" 31	9 A.M.	15-20 Alewives, 3 Suckers.
" "	5 P.M.	25-30 Alewives, 5 Suckers.
June 1	7 A.M.	10-15 Alewives.
" "	5 P.M.	5-10 Alewives, 2 Suckers.
June 2	9 A.M.	30-40 Alewives, 6-8 Suckers.
" "	4 P.M.	40-50 Alewives, 7-8 Suckers.
" "	6 P.M.	10-15 Alewives, 4 Suckers.
June 3	7 A.M.	2 Alewives.
" "	4 P.M.	25-30 Alewives, 3 Suckers.
June 4	7 A.M.	30 Alewives, 10-12 Suckers.
" "	4 P.M.	40-50 Alewives, 10-15 Suckers, 1 Lamprey.
June 5	9 A.M.	3-4 Alewives, 7-8 Suckers, 1 Lamprey, 1 Black Bass.
" "	6 P.M.	10-15 Alewives, 5-6 Suckers.
June 6	7 A.M.	2 Alewives.
" "	5 P.M.	2 Alewives, 3-4 Suckers, 1 Brook Trout.
June 7	7 A.M.	3 Alewives, 4 Lampreys, 1 Bass.
" "	4 P.M.	6-8 Alewives.
June 8	8 A.M.	5 Alewives, 1 Lamprey.
" "	6 P.M.	3 Alewives, 1 Bass, 1 Sucker.
June 9	9 A.M.	2 Bass.
" "	4 P.M.	40-50 Alewives, 1 Lamprey
June 10	7 A.M.	No fish.
" "	5 P.M.	30-40 Alewives, 6-8 Suckers.
June 11	7 A.M.	3 Alewives, 1 Sucker.
" "	4 P.M.	No fish.

Date	Time trap examined	Notes on fish in trap, including all species. Number and individual lengths of salmon. Approximate number of alewives, etc. If no fish, state "no fish."
June 12	8 A.M.	No fish.
" "	4 P.M.	3 Alewives, 1 Sucker, 1 Brook Trout, 1 White Perch.
June 13	9 A.M.	No fish.
" "	4 P.M.	1 Sucker.
June 14	7 A.M.	No fish.
" "	6 P.M.	2 Alewives, 1 Sucker.
June 15	10 A.M.	1 Brook Trout.
" "	4 P.M.	No fish.
June 16	7 A.M.	3 Alewives, 2 Suckers.
" "	6 P.M.	10-15 Alewives, 1 Sucker.
June 17	9 A.M.	5 Alewives, 3 Suckers.
" "	5 P.M.	10 Alewives, 4 Suckers.
June 18	7 A.M.	4 Alewives, 1 Sucker.
" "	5 P.M.	1 Sucker.
June 19	9 A.M.	No fish.
" "	4 P.M.	10 Alewives
June 20	8 A.M.	No fish.
" "	6 P.M.	1 Sucker, 1 Alewife
June 21	7 A.M.	No fish.
" "	4 P.M.	2 Suckers.
June 22	7 A.M.	No fish.
" "	6 P.M.	3 Alewives, 6-8 Suckers, 1 Bass.
June 23	7 A.M.	No fish.
" "	5 P.M.	3 Alewives, 5 Bass, 4 Suckers.
June 24	7 A.M.	3 Suckers, 1 Bass.
" "	4 P.M.	4 Bass, 1 Eel.
June 25	8 A.M.	1 Brook Trout, 1 Eel.
" "	6 P.M.	No fish.
June 26	7 A.M.	No fish.
" "	4 P.M.	2 Suckers, 1 Alewife.
June 27	7 A.M.	1 Salmon, 30" long, weight 10-12 lbs., 1 Eel.
" "	2&7 P.M.	No fish.
June 28	7 A.M.	No fish.
" "	6 P.M.	25-30 Eels.
June 29	9 A.M.	10-15 Eels.
" "	6 P.M.	Many Eels and 1 Sucker.
June 30	7 A.M.	10-15 Eels.
" "	4 P.M.	25-30 Eels.
July 1	8 A.M.	1 Sucker, 25-30 Eels.
" "	5 P.M.	10-15 Eels.
July 2	7 A.M.	No fish.
" "	4 P.M.	20-25 Eels.
July 3	9 A.M.	1 Alewife, 10-15 Eels.
" "	5 P.M.	No fish.
July 4	7 A.M.	10-15 Eels.
" "	4 P.M.	5-10 Eels.
July 5	8 A.M.	1 Alewife, 5-10 Eels.
" "	6 P.M.	No fish.

Date	Time trap examined	Notes on fish in trap, including all species. Number and individual lengths of salmon. Approximate number of alewives, etc. If no fish, state "no fish."
July 6	8 A.M.	1 Sucker, 10-15 Eels.
" "	5 P.M.	5-10 Eels.
July 7	7 A.M.	1 Brook Trout, 5-10 Eels.
" "	4 P.M.	1 Brook Trout, 15-20 Eels.
July 8	8 A.M.	No fish.
" "	4 P.M.	10-15 Eels.
July 9	7 A.M.	5-10 Eels.
" "	4 P.M.	2 Eels.

RECORDS TAKEN AT FISHWAY (SALMON-COUNTING TRAP)
AT VEAZIE DAM, 1943, BY GEORGE PEARSON

Date	Time	Water temperature	Air temperature	Water level above the dam, measured on temporary gauge (18" on May 30)	Weather conditions, preceding 24 hours
June 2	4 P.M.	62°	---	16 inches	Cloudy.
June 3	9 A.M.	63°	69°	12 "	Sunny.
" "	4 P.M.	65°	78°	10 "	Sunny.
June 4	9 A.M.	65°	66°	8 "	Sunny.
" "	4 P.M.	65°	72°	12 "	Cloudy.
June 5	9 A.M.	64°	72°	13 "	Cloudy.
" "	4 P.M.	66°	79°	13 "	Cloudy.
June 6	9 A.M.	63°	67°	11 "	Sunny.
" "	4 P.M.	66°	78°	19 "	Sunny.
June 7	9 A.M.	63°	42°	10 "	Sunny, cool.
" "	4 P.M.	63°	61°	8 "	Sunny, cool.
June 8	9 A.M.	62°	62°	10 "	Cloudy, rain.
" "	4 P.M.	62°	61°	6 "	Cloudy.
June 9	9 A.M.	61°	70°	4 "	Sunny, windy.
" "	4 P.M.	64°	74°	28 "	Sunny, windy.
June 10	9 A.M.	62°	58°	26 "	Sunny.
" "	4 P.M.	65°	80°	30 "	Sunny.
June 11	9 A.M.	63°	56°	23 "	Sunny.
" "	4 P.M.	61°	65°	23 "	Sunny.
June 12	9 A.M.	62°	62°	24 "	Rain.
" "	4 P.M.	65°	76°	28 "	Rain.
June 13	9 A.M.	63°	48°	27 "	Sunny, windy.
" "	4 P.M.	63°	58°	30 "	Sunny, windy.
June 14	9 A.M.	61°	65°	21 "	Rain.
" "	4 P.M.	65°	79°	21 "	Rain.

Date	Time	Water temperature	Air temperature	Water level above the dam, measured on temporary gauge (18" on May 30)	Weather conditions, preceding 24 hours
June 15	9 A.M.	63°	62°	20 inches	Sunny.
" "	4 P.M.	65°	70°	19 "	Sunny.
June 16	9 A.M.	63°	66°	32 "	Cloudy.
" "	4 P.M.	62°	72°	25 "	Rain.
June 17	9 A.M.	63°	65°	26 "	Rain.
" "	4 P.M.	64°	65°	31 "	Sunny.
June 18	9 A.M.	63°	60°	30 "	Cloudy, sunny.
" "	4 P.M.	64°	72°	33 "	Cloudy.
June 19	9 A.M.	63°	65°	26 "	Sunny, warm.
" "	4 P.M.	66°	75°	30 "	Sunny, warm.
June 20	9 A.M.	65°	73°	26 "	Cloudy.
" "	4 P.M.	65°	64°	31 "	Sunny.
June 21	9 A.M.	64°	74°	25 "	Rain.
" "	4 P.M.	66°	76°	23 "	Rain.
June 22	9 A.M.	65°	66°	28 "	Sunny.
" "	4 P.M.	68°	86°	36 "	Sunny.
June 23	9 A.M.	66°	70°	29 "	Cloudy.
" "	4 P.M.	68°	84°	33 "	Sunny.
June 24	9 A.M.	68°	78°	27 "	Sunny, hot.
" "	4 P.M.	72°	85°	30 "	Sunny, hot.
June 25	9 A.M.	70°	80°	23 "	Sunny, hot.
" "	4 P.M.	72°	84°	25 "	Sunny, hot.
June 26	9 A.M.	72°	78°	23 "	Sunny, hot.
" "	4 P.M.	73°	74°	22 "	Showers.
June 27	9 A.M.	72°	68°	28 "	Cloudy.
" "	4 P.M.	72°	73°	27 "	Showers.
June 28	9 A.M.	70°	62°	19 "	Cloudy.
" "	4 P.M.	71°	76°	18 "	Cloudy.
June 29	9 A.M.	69°	64°	17 "	Showers.
" "	4 P.M.	70°	59°	28 "	Showers.
June 30	9 A.M.	68°	64°	27 "	Cloudy and showers.
" "	4 P.M.	71°	67°	39 "	Cloudy and showers.
July 1	9 A.M.	68°	66°	41 "	Showers.
" "	4 P.M.	68°	68°	42 "	Sunny.
July 2	9 A.M.	66°	72°	39 "	Showers.
" "	4 P.M.	68°	74°	41 "	Sunny.
July 3	9 A.M.	66°	72°	38 "	Sunny.
" "	4 P.M.	68°	78°	39 "	Sunny.
July 4	9 A.M.	67°	70°	38 "	Sunny.
" "	4 P.M.	69°	74°	39 "	Sunny.
July 5	9 A.M.	67°	65°	35 "	Cloudy.
" "	4 P.M.	67°	59°	34 "	Cloudy.
July 6	9 A.M.	66°	76°	27 "	Showers.
" "	4 P.M.	68°	78°	33 "	Showers.
July 7	9 A.M.	67°	68°	27 "	Sunny.
" "	4 P.M.	70°	73°	32 "	Sunny.
July 8	9 A.M.	69°	67°	33 "	Sunny.
" "	4 P.M.	73°	75°	31 "	Sunny, hot.
July 9	9 A.M.	72°	76°	29 "	Sunny, hot.
" "	4 P.M.	75°	82°	27 "	Sunny, hot.

B. Notes on the 1943 salmon runs in the Dennys, East Machias, St. Croix, and Narraguagus rivers in Maine, as reported by various individuals to G. P. Cooper.

Dennys River

August 28, 1943. Talked with John Longmore of Pembroke today. He has fished on the Dennys a lot this spring and summer. He estimates that fishermen have caught approximately 175 adult Atlantic Salmon (fresh-run or "new" fish) from the Dennys River this year.

August 30, 1943. Talked with Mrs. H. H. Allen of Dennysville. She says that she has kept a tabulation of salmon caught in the Dennys this year; has a record of about 130 fish. (John Longmore believes that Mrs. Allen's records are incomplete, in that she did not get the records of all fish.)

Dennys River Spawning Run

Records of the numbers of salmon spawning redds on the different rips of the Dennys River during the 1940 and 1941 spawning seasons were obtained by Mr. Harry A. Goodwin, former Kendall Fellow in fisheries at the University of Maine. Similar records for the 1942 and 1943 seasons have been obtained by Mr. Bertrand E. Smith. In the following letter, Mr. Smith gives his counts for the 1943 run, together with figures for the three previous years for comparison. The figures for 1940 and 1941, and the data on length in yards of each rips, are from Goodwin's report. Note that Goodwin's figures for 1940 are partial totals for 2 or 3 rips combined. Mr. Smith's letter follows:

Moosehorn National Wildlife Refuge
Calais, Maine

November 6, 1943

Mr. S. B. Locke, Regional Director,
Fish and Wildlife Service,
Park Square Bldg.,
Boston, Mass.

Dear Mr. Locke:

Please be advised that early on the morning of November 2, 1943, in company with Harold Stanhope and Jay Gashwiler leaving from Meddybemps, I went down the Dennys River by canoe for the purpose of counting the salmon redds. Conditions were ideal, both for making the trip and counting the spawning beds. Only four fish were seen and those were all at Stoddard's Rips. The following report is submitted:

(Continued on next page)

Name of Rips	Length	1940	1941	1942	1943
Gilman's	400 yds.)	12	0	8	0
Gardiner's	920 ")		0	12	4
Bright Island	2,640 ")		13	38	28
Ayer's	450 ")	37	5	5	2
Clark's	880 ")		15	28	5
Stoddard's	1,760 ")		185	169	219
Little Falls	264 ")	200	3	0	0
Camp	1,841 ")		50	211	195
Town	1,760 "	0	0	0	3

Respectfully submitted,

B. E. Smith
Refuge Manager

East Machias and St. Croix rivers

Information related by Warden Supervisor Lloyd Clark of Milltown to G. P. Cooper, July 14, 1943.

A very few adult Atlantic Salmon run the East Branch Machias River up to Crawford Lake in Crawford. Warden Frank Hoar reports that about 50 sea salmon were taken at East Machias dipping alewives this year, and that a few get through the fishway at East Machias. There are many salmon parr along the East Branch Machias all summer.

William Woodruff has eel weir at foot of Crawford Lake in Crawford. He reported to Clark that in the eel season of 1942 he took about 6 salmon in his eel weir (these fish, up to 20 lbs., must have been sea salmon). (Note that there is some question as to how many, or what percent of the run of, sea salmon can get up the East Machias).

A considerable number of adult Atlantic Salmon come up the St. Croix to the dam in Calais, but can not get over the dam.

Narraguagus River

Information related by Warden Raymond Harrington of Deblois to G. P. Cooper, on July 10, 1943.

The Narraguagus has had a good run of Atlantic Salmon this year. There are now a considerable number of adults in the pool below the dam at the foot of Beddington Lake. Large numbers of salmon parr are now in the river from Deblois up to the mouth of Bog Brook. The section of the river from Beddington Lake to Deblois is the best part of the river for sea salmon. There are, also, some salmon in the river below Deblois.

C. Summary of restoration and management experiments in 1942 and 1943 by the Fish and Wildlife Service

George A. Rounsefell, Ph.D., Aquatic Biologist
Fish and Wildlife Service
U. S. Department of the Interior

1. Progress in Biological Investigations

During 1942 a series of marking experiments was started to show at what age and at what season the young salmon should be released in order to obtain maximum survival. These experiments were also designed to yield information on the best tributaries to stock. In October 1942, 25,000 11-month old Atlantic salmon (spawned in the fall of 1941) were marked and planted in the upper Penobscot, half of them in the Mattawamkeag River near Kingman, and the other half in Shin and Sawtelle Brooks, tributaries to the Sebois River.

It was planned to plant more of the same lot of fish in the spring of 1943 to test the results of stocking in spring and in fall and in these two tributaries, but only 2,524 were marked in May 1943 before the experiment had to be discontinued on account of disease. Dr. Clifford E. Nelson diagnosed the trouble and treated the fish for an amoebic head infection. These 2,524 fish were planted in Sawtelle Brook but we cannot consider this as a normal experiment. By July the remaining fish, 6,642, had recovered and were marked and planted in the Mattawamkeag River at Kingman.

The experiments on the St. George River were also continued. The salmon of the 1940 spawning (Miramichi River eggs) that were held over their second winter at Craig Brook had completely recovered by spring. These salmon, now 31 months old, averaged 14.7 per pound. They were all (6,728) marked and liberated in the St. George River below Sennebec Pond.

The Miramichi salmon (50,315 eyed eggs received) from the 1941 spawning made very little growth during 1942 as they were in hatchery troughs until September. The mortality was also quite high. Because of their very small size and reduced numbers it was decided to forego any attempt to mark any in the fall of 1942. In May 1943 the remainder of this lot was sorted and after discarding 2,992 fish which were extremely emaciated the remaining 3,448 were marked and liberated in the St. George River below Sennebec Pond. This cannot be considered as a normal lot of fish.

The marking experiments on Atlantic salmon, successfully started in 1942 were interrupted during 1943. Thus 46,380 were marked in 1942 and only 19,342 in 1943. In a marking program there are certain objectives to be attained. In order to have valid comparisons between the results from planting fish at different seasons, ages, and localities it is very essential that the material being used, i.e., the marked fish, be as uniform a product as possible. So far this has not been the case, and as a result there will be considerable variability in the returns of adult fish that cannot be assigned to the effect of the factors we are trying to measure.

In order to turn out sufficient quantities of fish of nearly uniform size and condition from year to year it is becoming increasingly apparent that we must acquire more information about the raising of Atlantic salmon. At present they are fed and handled largely by the same methods that have been developed for trout. Using these methods brook trout are raised with great success, but Atlantic salmon do not thrive under the same conditions.

Since the success of the remainder of the restoration and management program hinges to a large extent on the ability of the hatcheries to obtain consistent results it is strongly urged that the biologist be provided with means for developing methods for rearing Atlantic salmon. If necessary an experimental hatchery should be provided.

The experiments with the stocking of silver salmon in the Pemaquid River were continued. In September 1942, 15,000 marked silvers (of the 1941 brood year) were planted in the Pemaquid River. In May 1943 large numbers of these young silver salmon were observed descending the fishway at Poole's Mill on their down-stream migration to salt water. This furnishes proof that the silvers can survive the severe winter conditions in this stream.

In early June 1943, 19,922 of the same lot of fish were marked and released in the Pemaquid. During the nine months from September to the following June the silvers had more than doubled in size. The three lots released in September 1942 ranged from 77 to 99 fish per pound, while the two lots released in June averaged 25 and 28 fish per pound.

Since the silver salmon in the Pacific Northwest, from whence the eggs were obtained, mature almost exclusively at three years of age, it will, of course, be necessary to plant for at least three years in succession in order to have fish returning every year. In October 1943, 10,200 marked silvers of the 1942 brood year were planted in the Pemaquid. Over 12,000 more of this lot are being held over winter at Craig Brook to plant in the spring.

Since silver salmon normally spend only one summer in fresh water, and migrate to sea the following spring (about 18 months from the time the egg was spawned) they cannot be held in the hatcheries as long as the Atlantic salmon. This reduces the number of experiments necessary to determine the most advantageous age and season for stocking.

The survival of the silver salmon has been much better than that of the Atlantic salmon. They are apparently resistant to the diseases that attack the Atlantics, and gain nearly twice as fast in weight during the first year.

A comparison of the survival of the two species under hatchery conditions is given in the following table:

Survival of sea-salmon from the egg to time of planting

Egg Source	Year Spawned	Estimated number eggs taken	Fish planted and age (years) 1	$1\frac{1}{2}$	2	$2\frac{1}{2}$	Total Survival	Percent Survival
Atlantic salmon								
Miramichi	1940	1/ 51,150		17,645	3,703	6,728	28,076	54.9
"	1941	1/ 50,750		3,448			3,448	6.8
Machias	1941	268,480	75,032	34,316			109,348	40.7
Penobscot	1942	708,945	2/ 0				.	(41.8)
Silver salmon								
Oregon	1941	1/ 53,072	18,246	19,922			38,168	71.8
"	1942	1/ 44,764	3/ 10,220				4/ 22,437	(50.2)

1/ Eyed eggs, all fish planted are actual counts.
2/ Hatchery estimates give survival of 296,000 in fall of 1943, but this is much too high.
3/ Additional 12,217 survivors in October 1943, by actual count.
4/ To October 1943.

It will be noted that the survival of Atlantics has varied from 7 to 55 percent. The 1941 silvers, however, had a survival from the egg to time of planting of 72 percent and the 1942 silvers have a survival of 50 percent up to November 1943.

2. Hatchery Capacities

In the last report of the Committee (pages 16-19) there was a discussion of the capacity of the Craig Brook Fisheries Station in terms of plantable sea-salmon of various ages. Further information is now available on which a somewhat closer estimate of capacity may be calculated.

The first question in figuring the capacity is how many fish of each species, and of each age can be held in a given amount of water. This will vary somewhat according to the temperature, volume of flow, and other factors. Since no records are kept of the water flow, the turnover in the ponds when held at different depths cannot be estimated. Therefore we are basing all calculations on the surface area of the ponds in square feet. In the following table are some data on the numbers of fish actually carried in hatchery operations in Maine.

The number of pounds of fish carried per cubic foot of water in New York State trout hatcheries is considerably higher, but the data for trout do not necessarily apply to salmon. Judging from the high mortality in raising salmon, encountered during the past two seasons, it would be rash to crowd the fish into less space without first trying some controlled experiments.

There is little doubt that the concrete ponds in which the feeding fry are placed in the spring could hold considerably more fish when the fry are first put out into the ponds, but in general the practice has been to place in each pond only the quantity of fish that, with normal losses, will fill the pond to capacity in the late summer and fall. This is commonly held to be an advantage as it precludes the necessity of thinning the fish as they grow. There is a deep-rooted fear that handling fish, especially during the summer months will result in heavy losses.

Our experience does not uphold this contention. With the possible exception of the very hottest days, the salmon can be handled with no ill effects. In the few cases in which proper handling does cause a loss it nearly always will be found that the salmon killed already were practically dead from some other cause.

If we accept the maximum figures shown in the following table, then the capacity of Craig Brook Station would be limited to the number of feeding fry that could be placed in the 19 concrete rearing ponds (3 circular pools, 2 long 6-foot wide raceways, 13 rectangular 10-foot wide pools, and 1 concrete battery of 16 small tanks), which contain a total of about 10,017 square feet of surface area. Both in 1942 and 1943 the number per square foot of surface has been about 60. This would permit the ponding of 601,000 fry.

Date	Age of salmon in months	Species	Fish in pond		Area of pond (square feet)	Fish per square foot		Number of fish per pound
			Number	Weight (pounds)		Number	Weight	
June 1943	7½	Atlantic	1/ 30,118	16	500	60.2	.032	1,882.4
Oct. 1942	11	do	22,300	143	500	44.6	.286	155.9
May 1942	18½	do	17,545		425	41.4		
July 1943	20½	do	4,259	136	650	6.6	.209	31.3
Oct. 1942	23	do	8,500	303	650	13.1	.466	28.0
May 1943	30½	do	6,728	457	4,176	1.6	.109	14.7
July 1943	8	Silver	1/ 30,473	44	730	41.7	.060	692.6
Oct. 1943	11	do	12,217		730	16.7		
Oct. 1943	11	do	10,402	218½	650	16.0	.336	47.7
May 1943	18	do	9,869	244½	650	15.2	.376	24.8
May 1943	18½	do	11,228	310	730	15.4	.425	27.6

1/ Hatchery estimate

There are two ways in which the annual capacity of the station can be increased. One is to place more fry in the concrete ponds and then thin them, as they grow, into the dirt ponds. The other methods is to hold a portion of the fry in the hatchery until fall, when the fry in the concrete ponds will have been thinned by planting and transfer to dirt pools, leaving vacant space in the concrete ponds.

The second method has several objectionable features. Thus the second lot of Atlantic salmon from the Miramichi River (spawned in 1941) were held in the hatchery (awaiting pond space) until September 1942. This lot yielded only 7 percent survival of plantable fish compared to 55 percent on the 1940 lot of Miramichi salmon that were placed in ponds in the spring.

To obtain further evidence of the effect of confinement of fry in the hatchery during the summer growing season, samples were taken on July 23, 1943 of 3 lots of Atlantic salmon, all from the same (1942) spawning but differing in the time of imponding.

Lot No.	Date ponded	No. of Specimens	Total Weight (grams)	Number of fish per pound
1	June 10	100	77	589
2	July 6	102	46	1,006
3	In hatchery July 23	101	36	1,273

At the time they were placed in the pond the first lot to be ponded (June 10) weighed 7½ oz. per 1,000 (hatchery data), or 2,133 fish to the pound. Thus in the space of 43 days (six weeks) the fish in ponds had nearly quadrupled their weight while those in the hatchery had not doubled their weight.

This lack of growth in the hatchery-held fry is conducive to high mortality. Furthermore, the ponding of the fry at various times results in a lack of uniformity in the size of the young salmon of the same age. This introduces another variable into the present experiments on the effect of size, age and location of planting on survival, that may seriously impair the data.

A further effect, not applicable to trout, is the chances of retarding the normal time of seaward migration of the young salmon. Such an effect would seriously reduce the chances of survival to the adult. Studies on the Pacific salmon have shown that the time of seaward migration of the young salmon is dependent partly on age and partly on size.

Discarding the method of holding fry in the hatchery as unsound, leaves us with the necessity of thinning the fry during the summer into the dirt pools if the capacity of the station is to be increased.