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The stock status of Atlantic salmon (*Salmo salar* L.) in English River, Labrador, 1999

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ABSTRACT

The status of the Atlantic salmon (*Salmo salar* L.) stock in English River, Labrador in 1999 was determined using counting fence data, samples collected in the angling fishery, and records of angling mortalities. The stock assessment was conducted in relation to a commercial salmon fishery buyout in Labrador in 1998 and restrictions to the angling fishery. This is the first assessment for the English River, Labrador salmon stock. In 1999, total returns to the English River counting fence were 59 small and 48 large salmon. The number of spawners adjusted for angling mortalities were 54 small and 46 large salmon. Also, 138 small and 160 large charr and 82 trout were counted at the fence. Since this is the first year for this project, there is a lack of information with which to derive conservation requirements. However, returns of salmon appear to be very low compared to other rivers in Labrador. All counts are considered to be complete.

RÉSUMÉ

L'État du stock du saumon de l'Atlantique (*Salmo salar* L.) dans la rivière English, Labrador, a été déterminé en 1999 à partir du nombre de saumons dénombrés à une barrière de comptage, d'échantillons recueillis durant des pêches à la ligne et de données sur les mortalités dues à la pêche à la ligne. L'évaluation du stock a été réalisée en relation avec une réduction de la pêche commerciale de saumon au Labrador en 1998 et de restrictions à la pêche à la ligne. C'est la première évaluation du stock de saumons du Labrador réalisée dans rivière English. En 1999, les remontées totales dénombrées à l'aide d'une barrière de comptage sur la rivière English comptaient 59 petits et 48 grands saumons. Le nombre de géniteurs ajusté aux mortalités dues à la pêche à la ligne était de 54 petits et 46 grands saumons. De plus, 138 petits et 160 grands ombles chevaliers et 82 truites ont été dénombrés à la barrière de comptage. Vu que le projet en est à sa première année, il n'existe pas assez d'information pour déduire les besoins de conservation. Cependant, les remontées de saumons semblent très faibles comparativement à celles des autres rivières du Labrador. Tous les dénombrements sont considérés complets.

INTRODUCTION

English River is located in northern Labrador in Salmon Fishing Area 1 (SFA 1) and flows into Kaipokok Bay 8 km to the northeast of the town of Postville at 54^0 58' N 59^0 45' W (Anderson 1985) (Fig. 1). Near the mouth, the river is broken up into several islands and contains areas of gravel suitable for spawning and rearing (Murphy 1973). At 1 km above the river mouth, the river flows through a section of rapids with a small falls into a large lake. Upstream from this lake, the river consists of a network of small ponds connected by stretches of river with boulder and rubble substrate. Four falls are found on English River of which only one is considered to be a full barrier to salmonid migration. There is a small angling fishery on English River conducted by residents of Postville and occasionally is visited by fly-in anglers. Anadromous Atlantic salmon (*Salmo salar* L.), Arctic charr (*Salvelinus alpinus* L.), and both sea-run and resident brook trout (*Salmo trutta* L.) have been reported in the system (Anderson 1985). Murphy (1973) based on estimates of total rearing area for salmon determined that English River potentially could produce about 3,000 salmon. This estimate could vary depending on competing fish species in the system and the potential for rearing occurring in the standing water of the system.

In 1992, several major changes were introduced to the management of Atlantic salmon in Newfoundland and Labrador. A five-year moratorium was placed on commercial salmon fishing in the island portion of the province, for the Labrador commercial fishery the quotas first introduced in 1990 were reduced, and a voluntary retirement of commercial salmon licences was instituted for all of the province. In 1998, the commercial fishery was closed and fishermen were offered a buyout which most accepted. In 1999, a food fishery was available for members of the Labrador Inuit Association of 10 tonnes including catches in Lake Melville also in SFA 1. The West Greenland commercial salmon fishery closed for the 1993 and 1994 fishing seasons but was open again in 1995-97. Some English River multi-sea winter salmon may be caught in the Greenland fishery similar to other Labrador stocks (Pratt et al. 1974).

In the angling fishery, in 1992 and 1993, a quota on the number of fish that could be retained was introduced in each SFA. The quota was assigned for an entire SFA and was not administered on an individual river basis. Only hook-and-release fishing was permitted after the quota was caught. In 1994, quotas for the angling fishery were eliminated. In place of quotas, for Labrador, the season bag limit for retained salmon was lowered from eight to six fish, only two of which could be large salmon. In 1995 and 1996, the season bag limit for the angling fishery remained at six fish but only one large salmon could be retained. In 1999, the angling fishery was restricted to a seasonal limit of four salmon retained, one of which could be large, and four salmon hooked-and-released daily.

The main focus of this project, conducted in collaboration with the Labrador Inuit Association was to assess the population of salmon in a northern Labrador river within the background of closed commercial fisheries and new food fishery. This is the second counting facility to be operated in a river in SFA 1, in recent years. Thus, English River is

one of the few Atlantic salmon rivers in Labrador for which quantitative data are available. In this paper, the stock status of the English River salmon population in 1999 is examined.

METHODS

Angling fisheries data

Catch and effort data from the angling fishery in Labrador are collected by Department of Fisheries and Oceans (DFO) enforcement staff in conjunction with angling reports submitted by commercial sports camp operators and processed by DFO Science Branch. Procedures for the collection and compilation of angling fishery data are described by Ash and O'Connell (1987). However, as English River is not a scheduled river and because it has no sports fishing camp there is no angling data collected. In 1999, counting fence staff kept records when possible of the number of salmon caught by anglers on English River.

In 1994, a new system, viz. the License Stub Return System (LSRS) was initiated for collecting angling statistics in Newfoundland and Labrador. It is based on attaching to the provincial angling licence a detachable stub upon which the angler can record details of where fished, when, and the numbers of salmon caught and released (O'Connell et al. 1998). Because of concerns over a lack of comparability of DFO angling statistics and the LSRS data, DFO data will continue to be used for Labrador. Since there are no DFO angling catch and effort data available for English River, data from the LSRS will be used for comparison to data collected by counting fence staff.

Adult salmon counts

COUNTING TECHNIQUES

Between 27 June and 1 July 1999, a counting fence was constructed approximately 0.5 km upstream from the mouth of the river (Fig. 2). Upstream migrating adult salmon were enumerated from 1 July to 23 September. The counting fence consisted of 33 sections (each 3 m long) which were installed according to the description in Anderson and McDonald (1978). The fence spanned two branches of the river where it went around an island with two counting fences installed one on either side. The fence was constructed of conduit and channel iron, supported by steel posts and 5 cm x 15 cm wooden supports similar to other portable counting fences used in Newfoundland and Labrador. The fence was operated with every conduit in place so that counts of salmon, trout and charr could be obtained.

Once the counting fence was completely installed enumeration was done by manually releasing and counting salmon through a wooden fish trap. Distinction between large and small salmon and charr was made by comparison to a known measure placed in the bottom of the fish trap. For salmon, large were defined as those salmon with a fork length equal to or greater than 63 cm and small are those less than 63 cm. For charr, large are greater than

or equal to 45 cm and small are less than 45 cm. Trout were not sized. Salmon and charr counted in this manner are all migratory while brook trout are probably a combination of sea and resident brook trout.

The counting fence remained intact the entire period from 1 July to 23 September. During high water events vexar screens were placed at the top of the fence to maintain a complete count. Thus, the counts are considered to be complete and accurate.

Unrecorded Mortalities

Complete understanding of all life history factors including mortalities is an important part of any stock assessment (Ricker 1975). Mortalities due to fishing, but not recorded as part of the catch statistics, have been defined as non-catch fishing mortalities by Anon. (MS 1980) and Ricker (1976). Non-catch fishing mortalities could include fish killed due to illegal and legal fishing activities. Legal fishing mortalities for salmon in Labrador include catches in native food, and angling fisheries.

Another potential source of non-catch fishing mortalities is from hook and release angling. Booth et al. (1995) and Brobbel et al (1996) have studied the effects of hook & release angling on the delayed mortality of 'bright' or returning salmon. They have indicated that the length of time spent in fresh water and water temperature at time of exhaustive exercise such as angling, have an effect on mortality rates. Fish that have spent longer periods of time in freshwater appear to have a lower mortality rate than those that have recently entered freshwater. Also, higher water temperatures increased the mortality rate. They concluded that mortality due to catch & release in a controlled environment was about 12%, although the sample size was small (n=25). A comparison between maximum water temperatures and numbers of salmon hooked and released for Big Brook have indicated that maximum water temperatures were low during fishing activities. Therefore, we have included an estimate of 10% mortality of caught and released fish in our calculations of total river returns and spawning escapement.

Exploitation rates

Exploitation rates for the angling fishery were determined as the number of salmon reported to have been retained by the angling fishery divided by the total number of salmon entering the river adjusted for salmon caught below the enumeration facility.

Biological characteristics

Biological characteristics of adult Atlantic salmon were obtained by taking samples of angling catches. These data were collected at the Big Brook (Michaels River) fishing lodge in 1997 and 1999 with the assistance of fishing guides after instruction by DFO technical staff. Information on fork length, weight, sex, and scales were collected from the standard location and aged as recommended by Shearer (1992). Fecundity values used for English River salmon were from Sand Hill River the only river in Labrador where fecundity has

been measured. Fecundity is determined as number of eggs per kg of whole weight. The ovaries were collected from the angling fishery on Sand Hill River in 1994 and 1995 and indicate that the mean total egg count per small salmon was 3,808 eggs (n=96) and 5,096 eggs (n=23) per large salmon. Fecundity for small salmon was 1,998 eggs per kg and for large salmon 1,094 eggs per kg.

Total river returns and spawning escapement

TOTAL RIVER RETURNS

Total river returns (TRR) were calculated separately for small and large salmon as follows:

$$TRR = RC_b + C + HRM_b$$

where,

RC_b = angling catch below counting fence
C = count of fish at counting fence
HRM_b = 0.1 * No. of fish caught & released below counting fence.

SPAWNING ESCAPEMENT

Spawning escapement (SE) was calculated as the difference between the number of fish released from the counting fence (FR) and the angling catch retained above the fence (RC_a) minus 10% of catch and release fish above the counting fence.

$$SE = (FR - RC_a) - HRM_a$$

Species distribution survey

Standard fyke nets with a mesh size of 2.0 cm and collection bag of 0.5 cm were fished in the south-eastern end of English River Big Pond in order to determine species, relative abundance and distribution in English River. Locations, set, species and numbers caught were recorded.

Environmental data

During field operations, environmental data were collected at the fence site. Water temperatures were recorded by Hugrun thermograph set at 1 m from the surface at the fence site. Cloud cover, relative water levels, weather conditions and air temperatures were also recorded.

RESULTS

Angling and food fisheries data

In 1999, the quota for the food fishery by the LIA in northern Labrador and Lake Melville was 10 t.

Adult counts

In 1999, a total of 59 small salmon and 48 large salmon was counted upstream through the adult fence between 1 July and 23 September (Table 1 and 2, Fig. 3). During the same period, 137 small and 159 large charr were counted and 82 trout. These counts are accurate. Since there was no angling below the counting fence the counts are also the total returns to the river.

Exploitation rates

The angling statistics for the catch in the angling fishery collected by the counting fence staff show 5 small salmon and 2 large salmon were retained. All angling activity took place above the counting fence. In 1999, exploitation rates in the angling fishery were 10.2% for small retained salmon and 2.1% for large retained salmon as follows:

Year	Small retained	Small Released	Large retained	Large released
1999 (DFO)	8.5	0	4.2	0

Biological Sampling

In 1999, six adult salmon were sampled from the angling fishery (Table 3). These are too few samples to adequately define biological characteristics for English River salmon, trout and charr. Mean fork length (FL) of the salmon was 62.3 cm and mean whole weight (WW) was 2.6 kg (Table 3). Mean fork length of charr was 41 cm and mean WW was 0.9 kg. Mean FL of the three trout sampled was 24.0 cm. Freshwater (river) age for the salmon was 1 – 3 year old, 3 – 4 year olds, and 2 – 5 year olds. Sea ages were five grilse and a single two-sea-winter salmon.

Total river returns and spawning escapement

In 1999, the total river returns to English River were estimated at 59 small and 48 large salmon. All counts are considered complete as there were no fish at the counting fence for a couple of weeks after it was opened and none just prior to closing. There were no angled

salmon retained below the counting fence and 6 small and 1 large salmon above. The spawning escapement was 53 small and 47 large salmon corrected for angling catches.

Species distribution survey

In total, there were seven sets made in English River Big Pond in 1999 (Table 4). Sixteen trout and 154 sticklebacks were caught.

Environmental data

Figure 4 shows the daily minimum and maximum water temperatures and levels at the fence on English River. Water temperatures relative to more southerly rivers were cool in 1999. Water levels almost doubled from minimum to maximum.

DISCUSSION

In 1999, a total of 107 salmon, 296 charr and 82 trout were counted through the counting fence on English River. Since there were no removals in the river below the counting fence, these counts are the total returns to the river and are considered to be complete. Because this is the first year of the English River project, it is difficult to put these counts into a conservation perspective similar to what is done for other rivers in Newfoundland and Labrador (CSAS 2000). For English River, conservation requirements in terms of habitat area are not yet available but will be developed as the project progresses. In northern Labrador, only one other river has total return information, viz. Big Brook, which is to the south of English River (Reddin & Short 1998). It is recommended that the assessment be repeated in 2000 along with research directed at measuring the available habitat and furthering collection of information on species distribution. Also, assessments should be conducted on other northern Labrador rivers. Some consideration should be given to verifying and if necessary refining for Labrador rivers, the applicability of the standard conservation requirement for Eastern Canada of 240 eggs per 100 m^2 of parr-rearing habitat. This standard conservation requirement was derived from salmon rivers in the southern range of their distribution (Chaput MS 1997) and there is concern for its relevance for rivers in Labrador. Possibly lower conservation requirements for Labrador rivers compared to the rivers from which the standard conservation requirements were developed could arise from the underlying geology, climate and the presence of other salmonids, i.e. sea trout and charr that are absent to the south. On the other hand, Labrador rivers due to their isolation remain relatively pristine and unpolluted compared to some more southerly rivers.

Murphy (1973) considers that English River is capable of producing circa. 3,000 salmon annually. If 3,000 salmon is an appropriate value for its production capabilities then current levels are far below it. However, it should be kept in mind that total returns of salmon to English River are not equivalent to total production as some salmon produced at English River would have been taken in the food fishery in 1999 in Kaipokok Bay. Although in recent years as a result of the closure of the commercial fishing effort, a higher proportion of the total

population would be found in freshwater. In any case, the returns of salmon to English River in 1999 were very low whether comparison is made to other rivers or some estimate of potential production.

In the absence of suitable conservation requirements, an alternate means by which comparisons of salmon abundance can be made is to scale numbers of salmon and other salmonids returning to the river relative to the watershed drainage area. Thus, for English River comparisons of the numbers of returning salmon versus those of other rivers in Labrador where total returns are also known are relevant. In doing this for 1999 values, Big Brook has a value of 1.2 salmon per km ^{2}, compared to 1.0 for Paradise River, but only 0.33 for English River. Sand Hill River, in southern Labrador, was assessed from 1994 to 1996 during the commercial fishery and had a value of 2.6 salmon per km^2. In contrast, two rivers on the northern peninsula of Newfoundland, viz. Torrent River and Western Arm Brook have corresponding conservation requirements in the range of 1.1 to 2.0 salmon per km^2 of drainage. Actual returns for these rivers are far in excess of conservation, now ranging from 8 to 10 salmon per km^2. All of these comparison suggest that returns to English River are very low.

In terms of total salmonids, including trout and charr, then the value for English River increases to 1.5 fish per km^2 while Sand Hill and Big Brook remain the same as they have only a few charr and trout. Southwest Brook on Paradise River has a value of 1.7 salmonids per km^2 on average, 1998-99. Fraser River measured in the 1970s had 2.3 while Ikarut River and Reid Brook had values of 5.9 and 5.1 per km^2, respectively (B. Dempson, pers. comm.). Comparison of these values to English River values in 1999 also suggests that returns to English River were low.

There are a number of potential causes of low returns some of which are unique to Labrador rivers. Ranger seals (*Phoca vitulina*), grey seals (*Halichoerus grypus*) and harp seals (*Phoca groenlandica*) occur in Kaipokok Bay and in the estuary of English River. Seals were observed during travel by boat to English River in Kaipokok Bay feeding on fish populations. In addition, salmon populations are known for their high degree of annual variability and it may be that the salmon returns to English River in 1999 were low due to this variability while other years may have been and/or may be higher.

Exploitation patterns of fish stocks are important information for stock assessments. Because of a lack of assessments on northern and southern Labrador rivers, this information is generally lacking. For English River, angling exploitation rates in 1999 on small retained salmon were 8.5% and 4.2% on large salmon. There were no records of any salmon being hooked-and-released. Exploitation rates are also available for Big Brook of 13.8% on small retained salmon, 6.0% on small released salmon, 1.9% on large retained salmon and 1.0% on large released salmon. Exploitation rates are also available for Sand Hill River in southern Labrador (Reddin et al. 1995). In the early 1970s, average exploitation rates averaged 6% on small salmon and 2% on large salmon. In the 1990s, exploitation had increased to 11% on retained small salmon and 4% on retained large salmon. For released salmon, exploitation rates were 14% on small salmon and 4% on large salmon.

In conclusion, this paper summarizes the available information on the salmon population in English River, Labrador. This is the first assessment of the fish populations and in particular salmon in English River and the second river to be assessed in northern Labrador. Assessment of English River should be repeated to obtain assessment information for northern Labrador rivers in future years.

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Fig. 1. Location map depicting Labrador, Salmon Fishing Areas (SFAs) and English River.

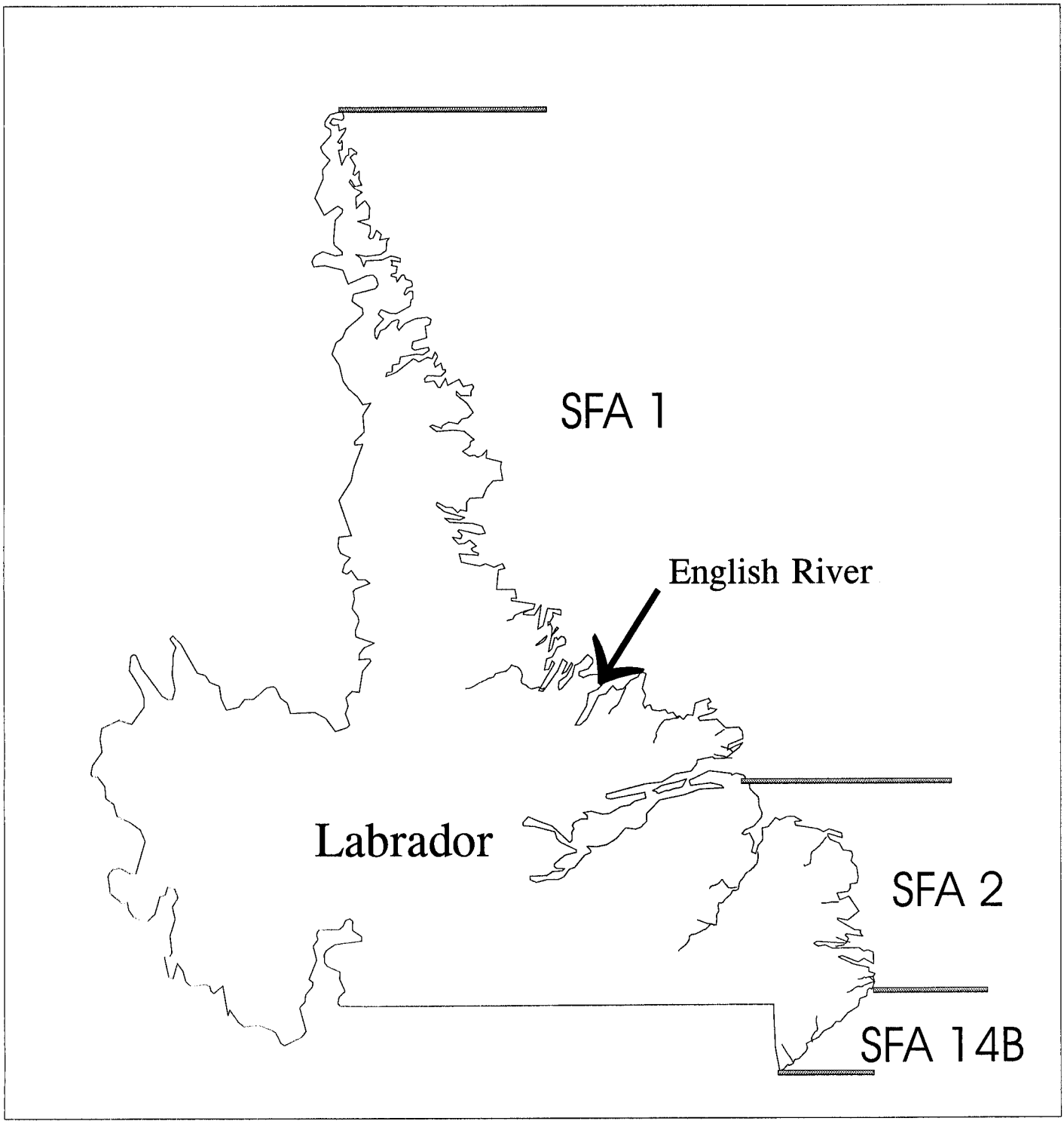

Fig. 2. Location map for English River, Labrador. L - are lakes, T - are tributaries, 1 - 4 are obstructions, and CF - is the counting fence.

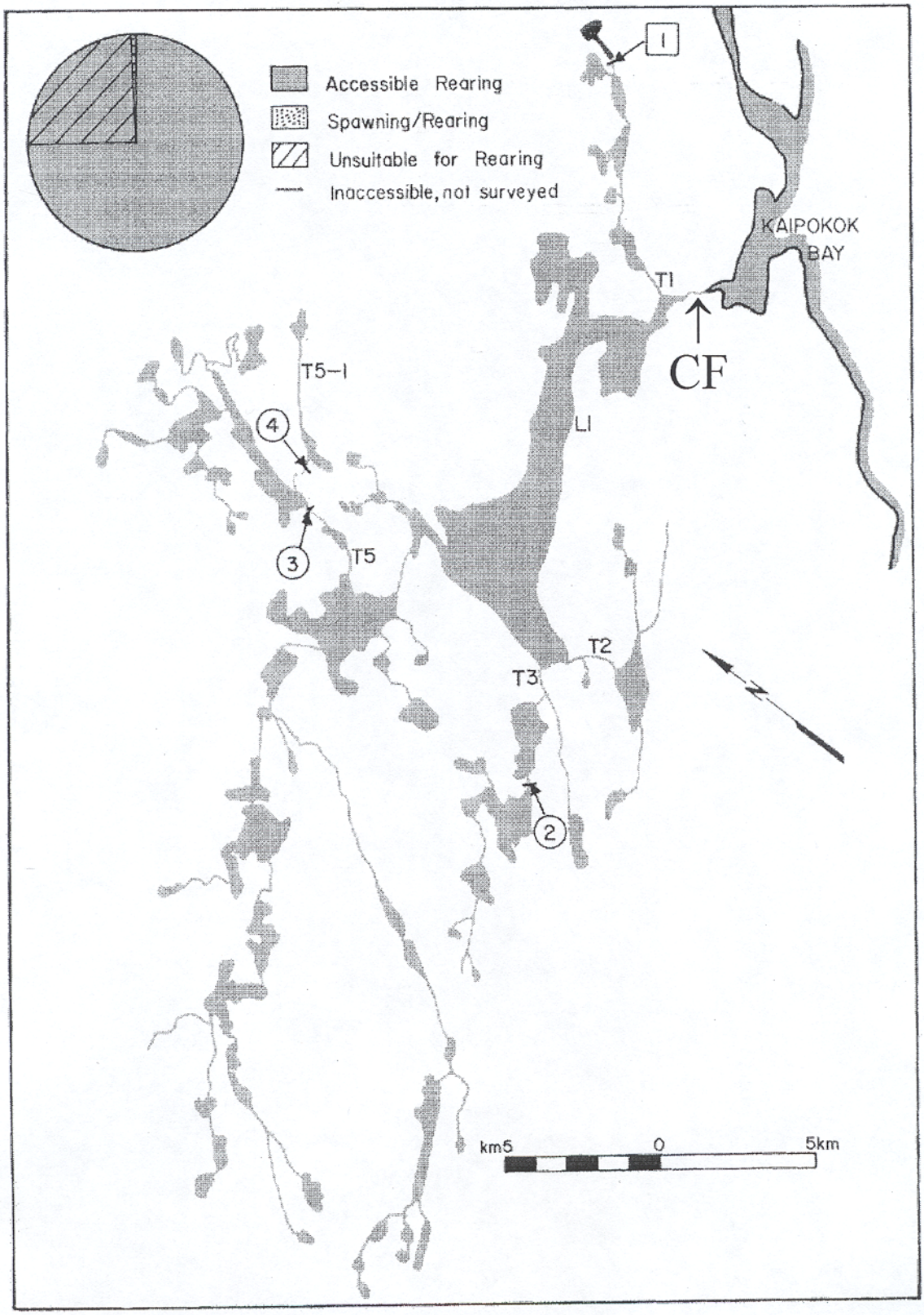

Fig. 3. Numbers and cumulative percent of salmon, trout and charr entering English River in 1999.

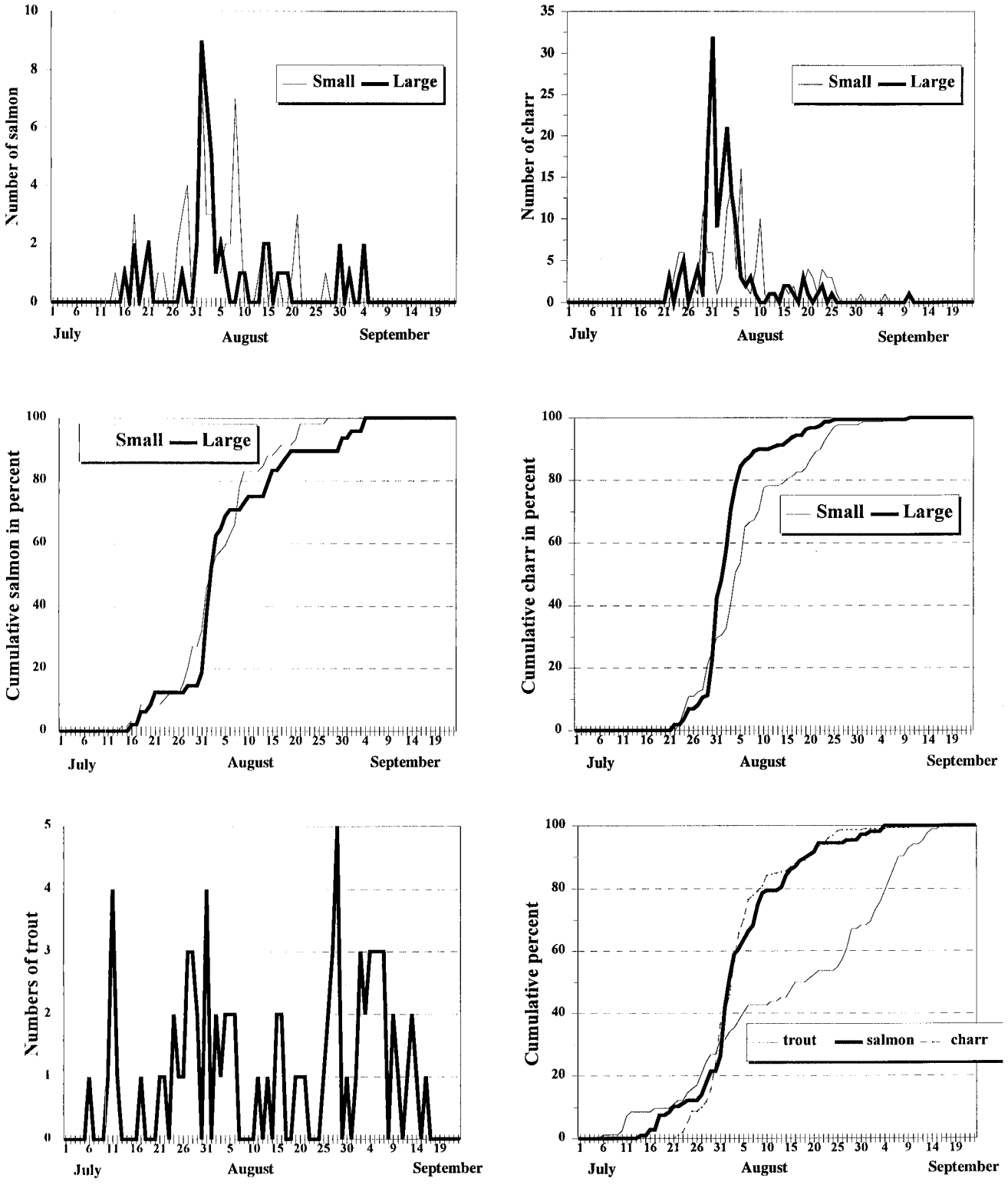

Fig.4. Water temperatures and levels at English River, Labrador in 1999. Solid lines are minimum and maximum daily water temperatures and dashed line is water level.

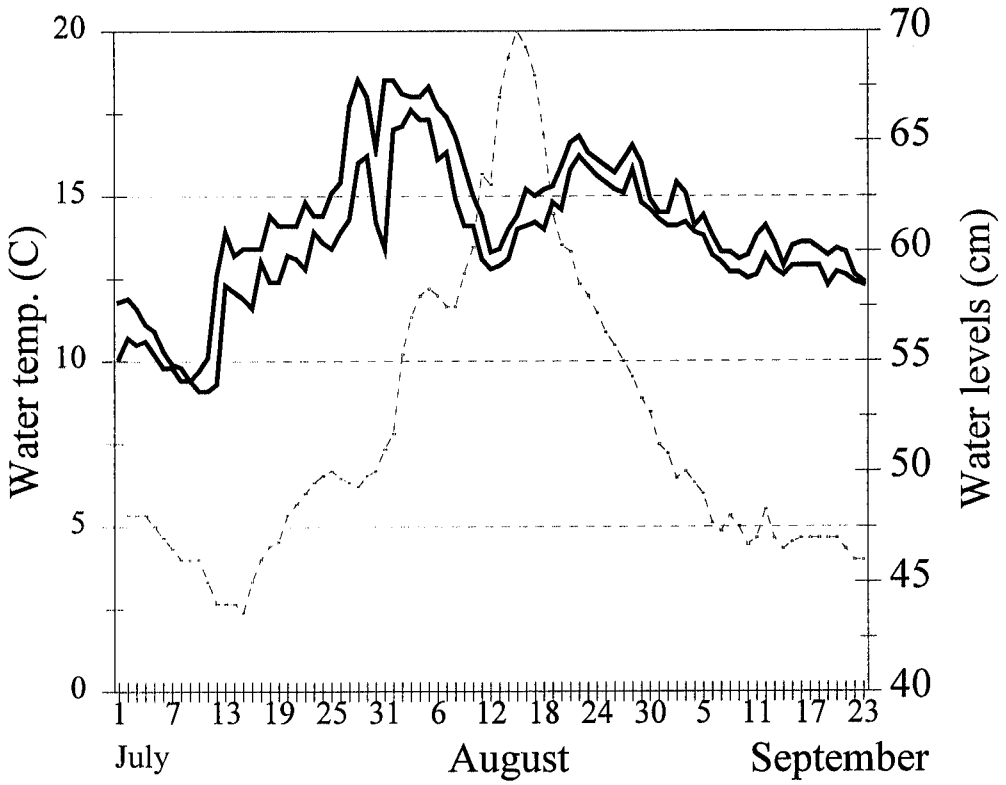

Table 1a. Daily counts of upstream migrating Atlantic salmon at English River, Labrador in 1999. Fence in operation from 1 July, 1999 to 1000 hours 23 September, 1999.

	Number of salmon		Cumulative numbers			Cumulative percentages			% large
DATE	SMALL	LARGE	SMALL	LARGE	TOTAL	SMALL	LARGE	TOTAL	salmon
1 July	0	0	0	0	0	0.0	0.0	0.0	
2 July	0	0	0	0	0	0.0	0.0	0.0	
3 July	0	0	0	0	0	0.0	0.0	0.0	
4 July	0	0	0	0	0	0.0	0.0	0.0	
5 July	0	0	0	0	0	0.0	0.0	0.0	
6 July	0	0	0	0	0	0.0	0.0	0.0	
7 July	0	0	0	0	0	0.0	0.0	0.0	
8 July	0	0	0	0	0	0.0	0.0	0.0	
9 July	0	0	0	0	0	0.0	0.0	0.0	
10 July	0	0	0	0	0	0.0	0.0	0.0	
11 July	0	0	0	0	0	0.0	0.0	0.0	
12 July	0	0	0	0	0	0.0	0.0	0.0	
13 July	0	0	0	0	0	0.0	0.0	0.0	
14 July	1	0	1	0	1	1.7	0.0	0.9	0
15 July	0	0	1	0	1	1.7	0.0	0.9	
16 July	1	1	2	1	3	3.4	2.1	2.8	50
17 July	0	0	2	1	3	3.4	2.1	2.8	
18 July	3	2	5	3	8	8.5	6.3	7.5	40
19 July	0	0	5	3	8	8.5	6.3	7.5	
20 July	0	1	5	4	9	8.5	8.3	8.4	100
21 July	0	2	5	6	11	8.5	12.5	10.3	100
22 July	0	0	5	6	11	8.5	12.5	10.3	
23 July	1	0	6	6	12	10.2	12.5	11.2	0
24 July	1	0	7	6	13	11.9	12.5	12.1	0
25 July	0	0	7	6	13	11.9	12.5	12.1	
26 July	0	0	7	6	13	11.9	12.5	12.1	
27 July	2	0	9	6	15	15.3	12.5	14.0	0
28 July	3	1	12	7	19	20.3	14.6	17.8	25
29 July	4	0	16	7	23	27.1	14.6	21.5	0
30 July	0	0	16	7	23	27.1	14.6	21.5	
31 July	3	2	19	9	28	32.2	18.8	26.2	40
1 August	8	9	27	18	45	45.8	37.5	42.1	53
2 August	3	7	30	25	55	50.8	52.1	51.4	70
3 August	3	5	33	30	63	55.9	62.5	58.9	63
4 August	1	1	34	31	65	57.6	64.6	60.7	50
5 August	1	2	35	33	68	59.3	68.8	63.6	67
6 August	2	1	37	34	71	62.7	70.8	66.4	33
7 August	2	0	39	34	73	66.1	70.8	68.2	0
8 August	7	0	46	34	80	78.0	70.8	74.8	0
9 August	3	1	49	35	84	83.1	72.9	78.5	25
10 August	0	1	49	36	85	83.1	75.0	79.4	100
11 August	0	0	49	36	85	83.1	75.0	79.4	
12 August	0	0	49	36	85	83.1	75.0	79.4	
13 August	1	0	50	36	86	84.7	75.0	80.4	0
14 August	2	2	52	38	90	88.1	79.2	84.1	50
15 August	0	2	52	40	92	88.1	83.3	86.0	100
16 August	1	0	53	40	93	89.8	83.3	86.9	0
17 August	1	1	54	41	95	91.5	85.4	88.8	50
18 August	0	1	54	42	96	91.5	87.5	89.7	100
19 August	0	1	54	43	97	91.5	89.6	90.7	100
20 August	1	0	55	43	98	93.2	89.6	91.6	0
21 August	3	0	58	43	101	98.3	89.6	94.4	0
22 August	0	0	58	43	101	98.3	89.6	94.4	
23 August	0	0	58	43	101	98.3	89.6	94.4	
24 August	0	0	58	43	101	98.3	89.6	94.4	
25 August	0	0	58	43	101	98.3	89.6	94.4	
26 August	0	0	58	43	101	98.3	89.6	94.4	
27 August	1	0	59	43	102	100.0	89.6	95.3	0
28 August	0	0	59	43	102	100.0	89.6	95.3	
29 August	0	0	59	43	102	100.0	89.6	95.3	
30 August	0	2	59	45	104	100.0	93.8	97.2	100
31 August	0	0	59	45	104	100.0	93.8	97.2	
1 Sept	0	1	59	46	105	100.0	95.8	98.1	100
2 Sept	0	0	59	46	105	100.0	95.8	98.1	
3 Sept	0	0	59	46	105	100.0	95.8	98.1	
4 Sept	0	2	59	48	107	100.0	100.0	100.0	100
5 Sept	0	0	59	48	107	100.0	100.0	100.0	
6 Sept	0	0	59	48	107	100.0	100.0	100.0	
7 Sept	0	0	59	48	107	100.0	100.0	100.0	
8 Sept	0	0	59	48	107	100.0	100.0	100.0	
9 Sept	0	0	59	48	107	100.0	100.0	100.0	
10 Sept	0	0	59	48	107	100.0	100.0	100.0	
11 Sept	0	0	59	48	107	100.0	100.0	100.0	
12 Sept	0	0	59	48	107	100.0	100.0	100.0	
13 Sept	0	0	59	48	107	100.0	100.0	100.0	
14 Sept	0	0	59	48	107	100.0	100.0	100.0	
15 Sept	0	0	59	48	107	100.0	100.0	100.0	
16 Sept	0	0	59	48	107	100.0	100.0	100.0	
17 Sept	0	0	59	48	107	100.0	100.0	100.0	
18 Sept	0	0	59	48	107	100.0	100.0	100.0	
19 Sept	0	0	59	48	107	100.0	100.0	100.0	
20 Sept	0	0	59	48	107	100.0	100.0	100.0	
21 Sept	0	0	59	48	107	100.0	100.0	100.0	
22 Sept	0	0	59	48	107	100.0	100.0	100.0	
23 Sept	0	0	59	48	107	100.0	100.0	100.0	
Total	59	48							45

Table 1b. Daily counts of upstream migrating Arctic charr and Brook trout at English River, Labrador in 1999. Fence in operation from 1 July, 1999 to 1000 hours 23 September, 1999.

	Number of charr		Cumulative numbers			Cumulative percentages			% large	Number	Cumulative	
DATE	SMALL	LARGE	SMALL	LARGE	TOTAL	SMALL	LARGE	TOTAL	charr	of trout	Number	Percent
1 July	0	0	0	0	0	0.0	0.0	0.0		0	0	0.0
2 July	0	0	0	0	0	0.0	0.0	0.0		0	0	0.0
3 July	0	0	0	0	0	0.0	0.0	0.0		0	0	0.0
4 July	0	0	0	0	0	0.0	0.0	0.0		0	0	0.0
5 July	0	0	0	0	0	0.0	0.0	0.0		0	0	0.0
6 July	0	0	0	0	0	0.0	0.0	0.0		1	1	1.2
7 July	0	0	0	0	0	0.0	0.0	0.0		0	1	1.2
8 July	0	0	0	0	0	0.0	0.0	0.0		0	1	1.2
9 July	0	0	0	0	0	0.0	0.0	0.0		0	1	1.2
10 July	0	0	0	0	0	0.0	0.0	0.0		1	2	2.4
11 July	0	0	0	0	0	0.0	0.0	0.0		4	6	7.3
12 July	0	0	0	0	0	0.0	0.0	0.0		1	7	8.5
13 July	0	0	0	0	0	0.0	0.0	0.0		0	7	8.5
14 July	0	0	0	0	0	0.0	0.0	0.0		0	7	8.5
15 July	0	0	0	0	0	0.0	0.0	0.0		0	7	8.5
16 July	0	0	0	0	0	0.0	0.0	0.0		0	7	8.5
17 July	0	0	0	0	0	0.0	0.0	0.0		1	8	9.8
18 July	0	0	0	0	0	0.0	0.0	0.0		0	8	9.8
19 July	0	0	0	0	0	0.0	0.0	0.0		0	8	9.8
20 July	0	0	0	0	0	0.0	0.0	0.0		0	8	9.8
21 July	0	0	0	0	0	0.0	0.0	0.0		1	9	11.0
22 July	0	3	0	3	3	0.0	1.9	1.0	100	1	10	12.2
23 July	3	0	3	3	6	2.2	1.9	2.0	0	0	10	12.2
24 July	6	3	9	6	15	6.5	3.8	5.0	33	2	12	14.6
25 July	6	5	15	11	26	10.9	6.9	8.7	45	1	13	15.9
26 July	0	0	15	11	26	10.9	6.9	8.7		1	14	17.1
27 July	2	2	17	13	30	12.3	8.1	10.1	50	3	17	20.7
28 July	1	4	18	17	35	13.0	10.6	11.7	80	3	20	24.4
29 July	11	1	29	18	47	21.0	11.3	15.8	8	2	22	26.8
30 July	6	18	35	36	71	25.4	22.5	23.8	75	0	22	26.8
31 July	6	32	41	68	109	29.7	42.5	36.6	84	4	26	31.7
1 August	1	9	42	77	119	30.4	48.1	39.9	90	0	26	31.7
2 August	3	15	45	92	137	32.6	57.5	46.0	83	2	28	34.1
3 August	11	21	56	113	169	40.6	70.6	56.7	66	1	29	35.4
4 August	14	13	70	126	196	50.7	78.8	65.8	48	2	31	37.8
5 August	4	9	74	135	209	53.6	84.4	70.1	69	2	33	40.2
6 August	16	3	90	138	228	65.2	86.3	76.5	16	2	35	42.7
7 August	2	2	92	140	232	66.7	87.5	77.9	50	0	35	42.7
8 August	1	3	93	143	236	67.4	89.4	79.2	75	0	35	42.7
9 August	4	1	97	144	241	70.3	90.0	80.9	20	0	35	42.7
10 August	10	0	107	144	251	77.5	90.0	84.2	0	0	35	42.7
11 August	1	0	108	144	252	78.3	90.0	84.6	0	1	36	43.9
12 August	0	1	108	145	253	78.3	90.6	84.9	100	0	36	43.9
13 August	0	1	108	146	254	78.3	91.3	85.2	100	1	37	45.1
14 August	1	0	109	146	255	79.0	91.3	85.6	0	0	37	45.1
15 August	2	2	111	148	259	80.4	92.5	86.9	50	2	39	47.6
16 August	1	2	112	150	262	81.2	93.8	87.9	67	2	41	50.0
17 August	2	1	114	151	265	82.6	94.4	88.9	33	0	41	50.0
18 August	0	0	114	151	265	82.6	94.4	88.9		0	41	50.0
19 August	2	3	116	154	270	84.1	96.3	90.6	60	1	42	51.2
20 August	4	1	120	155	275	87.0	96.9	92.3	20	1	43	52.4
21 August	3	0	123	155	278	89.1	96.9	93.3	0	1	44	53.7
22 August	1	1	124	156	280	89.9	97.5	94.0	50	0	44	53.7
23 August	4	2	128	158	286	92.8	98.8	96.0	33	0	44	53.7
24 August	3	0	131	158	289	94.9	98.8	97.0	0	0	44	53.7
25 August	3	1	134	159	293	97.1	99.4	98.3	25	1	45	54.9
26 August	1	0	135	159	294	97.8	99.4	98.7	0	2	47	57.3
27 August	0	0	135	159	294	97.8	99.4	98.7		3	50	61.0
28 August	0	0	135	159	294	97.8	99.4	98.7		5	55	67.1
29 August	0	0	135	159	294	97.8	99.4	98.7		0	55	67.1
30 August	0	0	135	159	294	97.8	99.4	98.7		1	56	68.3
31 August	1	0	136	159	295	98.6	99.4	99.0	0	0	56	68.3
1 Sept	0	0	136	159	295	98.6	99.4	99.0		1	57	69.5
2 Sept	0	0	136	159	295	98.6	99.4	99.0		3	60	73.2
3 Sept	0	0	136	159	295	98.6	99.4	99.0		2	62	75.6
4 Sept	0	0	136	159	295	98.6	99.4	99.0		3	65	79.3
5 Sept	1	0	137	159	296	99.3	99.4	99.3	0	3	68	82.9
6 Sept	0	0	137	159	296	99.3	99.4	99.3		3	71	86.6
7 Sept	0	0	137	159	296	99.3	99.4	99.3		3	74	90.2
8 Sept	0	0	137	159	296	99.3	99.4	99.3		0	74	90.2
9 Sept	0	0	137	159	296	99.3	99.4	99.3		2	76	92.7
10 Sept	1	1	138	160	298	100.0	100.0	100.0		1	77	93.9
11 Sept	0	0	138	160	298	100.0	100.0	100.0		0	77	93.9
12 Sept	0	0	138	160	298	100.0	100.0	100.0		1	78	95.1
13 Sept	0	0	138	160	298	100.0	100.0	100.0		2	80	97.6
14 Sept	0	0	138	160	298	100.0	100.0	100.0		1	81	98.8
15 Sept	0	0	138	160	298	100.0	100.0	100.0		0	81	98.8
16 Sept	0	0	138	160	298	100.0	100.0	100.0		1	82	100.0
17 Sept	0	0	138	160	298	100.0	100.0	100.0		0	82	100.0
18 Sept	0	0	138	160	298	100.0	100.0	100.0		0	82	100.0
19 Sept	0	0	138	160	298	100.0	100.0	100.0		0	82	100.0
20 Sept	0	0	138	160	298	100.0	100.0	100.0		0	82	100.0
21 Sept	0	0	138	160	298	100.0	100.0	100.0		0	82	100.0
22 Sept	0	0	138	160	298	100.0	100.0	100.0		0	82	100.0
23 Sept	0	0	138	160	298	100.0	100.0	100.0		0	82	100.0
Total	138	160							54	82		

Table 2. Summary of numbers of small (<63cm) and large (>=63cm) salmon, small (<45cm) and large (>=45cm) arctic charr and Brook trout counted in Traps 1 and 2 in English River counting fence, 1999.

	Salmon							Charr		Brook trout
				Angled above fence		Spawning escapement				
Trap #	Small	Large	Total	Small	Large	Small	Large	Small	Large	
1	28	25	53	5	2			110	115	55
2	31	23	54					28	45	27
Total	59	48	107	5	2	54	48	138	160	82

Table 3. Biological characteristics data from salmon, charr, and trout sampled at English River, 1999.

Species	Date	Spec. No.	FL(cm)	WW(kg)	Sex	RA	VSA	SM	YSM	TSA	TA
Charr	July 21	1	45.8								13
Charr	August 6	2	50	1.5	M						9
Charr	August 19	3	38.4	0.3	F						12
Charr	August 22	4	57	2	M						10
Charr	August 24	5	28	0.2	F						5
Charr	September 4	6	19		M						3
Charr	September 21	7	50.5	0.5	M						NA
Trout	July 14	1	34.6		M						5+
Trout	July 14	2	21.3		F						3+
Trout	August 8	3	16.2								3+
Salmon	August 17	1	55.7			3	1			1	4
Salmon	August 17	2	60.3			4	1			1	5
Salmon	August 21	3	59	1.75	M	4	1			1	5
Salmon	August 21	4	63	2.5	F	4	1			1	5
Salmon	August 31	5	77	4.5	M	5	2			2	7
Salmon	September 10	6	59	1.75	M	5	1			1	6

Table 4. Fyke netting at Big Pond on English River, 1999.

			Catch	
Date Set	**Date Checked**	**Net No.**	**Trout**	**Sticklebacks**
August 28	August 30	1	0	42
		2	15	2
August 30	August 31	1	0	13
		2	0	0
August 31	September 1	1	0	11
		2	0	9
September 1	September 3	1	0	14
		2	0	3
September 3	September 4	1	0	3
		2	1	0
September 4	September 6	1	0	45
		2	0	3
September 6	September 8	1	0	8
		2	0	1
	Total		**16**	**154**