

# ANGLER HARVEST OF NATIVE BROOK TROUT (*SALVELINUS FONTINALIS*) AND RAINBOW TROUT (*SALMO GAIRDNERI*) POPULATIONS IN THE DUNK RIVER SYSTEM, PRINCE EDWARD ISLAND

C.E. JOHNSTON and J.C. CHEVERIE

*Department of Biology  
University of Prince Edward Island  
Charlottetown, P.E.I. C1A 4P3*

Angler harvest of native brook trout and rainbow trout populations were investigated in the Dunk River system, P.E.I. from 1972 to 1975. Of the fishermen interviewed, 89.2% were residents of P.E.I., 91.3% of these were males, and most lived within 10.0 to 20.0 km of the river. During the summer months, 50.9 to 143.2 h ha<sup>-1</sup> were expended fishing in the Lower Dunk River with more during late spring than late summer. Fishing pressure on Scales Pond was much lower. Residents angling in the coastal river environment caught between 164 and 245 brook trout ha<sup>-1</sup> (18.3-23.6 kg ha<sup>-1</sup>) and 30 to 36 rainbow trout ha<sup>-1</sup> (6.0-6.7 kg ha<sup>-1</sup>). Non-residents caught only 11 to 19 brook trout ha<sup>-1</sup> (1.1-2.1 kg ha<sup>-1</sup>) and 3 to 5 rainbow trout ha<sup>-1</sup> (0.3-0.9 kg ha<sup>-1</sup>). Estimates of harvest were much lower for Scales Pond, 15 to 106 brook trout ha<sup>-1</sup> (1.1-4.0 kg ha<sup>-1</sup>) and 2 to 7 rainbow trout ha<sup>-1</sup> (0.5-1.3 kg ha<sup>-1</sup>) for residents, and 1 to 4 brook trout ha<sup>-1</sup> (0.1-0.3 kg ha<sup>-1</sup>) and 0.2 to 0.7 rainbow trout ha<sup>-1</sup> (0.04-0.2 kg ha<sup>-1</sup>) for non-residents. Population estimates for 2+ and older trout ranged between 236 and 570 brook trout ha<sup>-1</sup> and 78 to 118 rainbow trout ha<sup>-1</sup>. Estimates of total biomass for 0+ and older trout varied from 28.1 to 86.0 kg ha<sup>-1</sup> for brook trout and 6.0 to 17.7 kg ha<sup>-1</sup> for rainbow trout for the 2 yrs. Minimum exploitation rates of the precensused brook trout population in May in the Lower Dunk River varied from 0.26 to 0.44 for brook trout and from 0.33 to 0.47 for rainbow trout during 2 yrs of the study.

## Introduction

Recreational fishing in Prince Edward Island has been steadily increasing during the last 25 years. Acres Research and Planning Limited (1967) reported that the number of angling licenses sold between 1950 and 1954 increased by 1960 to 1964 by 50% for resident and 58% for non-resident anglers. A more recent study by Thomson (1976) showed that the number of licenses issued between 1966 and 1974 increased a further 29%. With a growing human population in urban centers and a growing tourist industry, angling pressure will continue to increase in the future and will make accessible trout populations more susceptible to overfishing.

Information concerning the characteristics of trout populations and of angler harvest in ponds, rivers and estuaries of Prince Edward Island is limited to the reports by Smith (1947; 1951; 1963), Smith and Saunders (1968), Saunders and Smith (1955; 1964), Thompson (1976) and, most recently, an anonymous survey (Anon. 1978).

The objectives of this 3-year study were to evaluate the effect of angling and other factors on the sport fishery in two regions of the Dunk River system and to establish base-line data so that any future changes in the fishery could be recognized and evaluated.

## Description of the Study Area

The Dunk River system flows through agricultural lands of eastern Prince and western Queens Counties and discharges into Bedeque Bay (Fig 1). The system is divided by dams into the coastal Lower Dunk River, the freshwater Scales Pond and the small inland Upper Dunk River. The Lower Dunk River and Scales Pond are

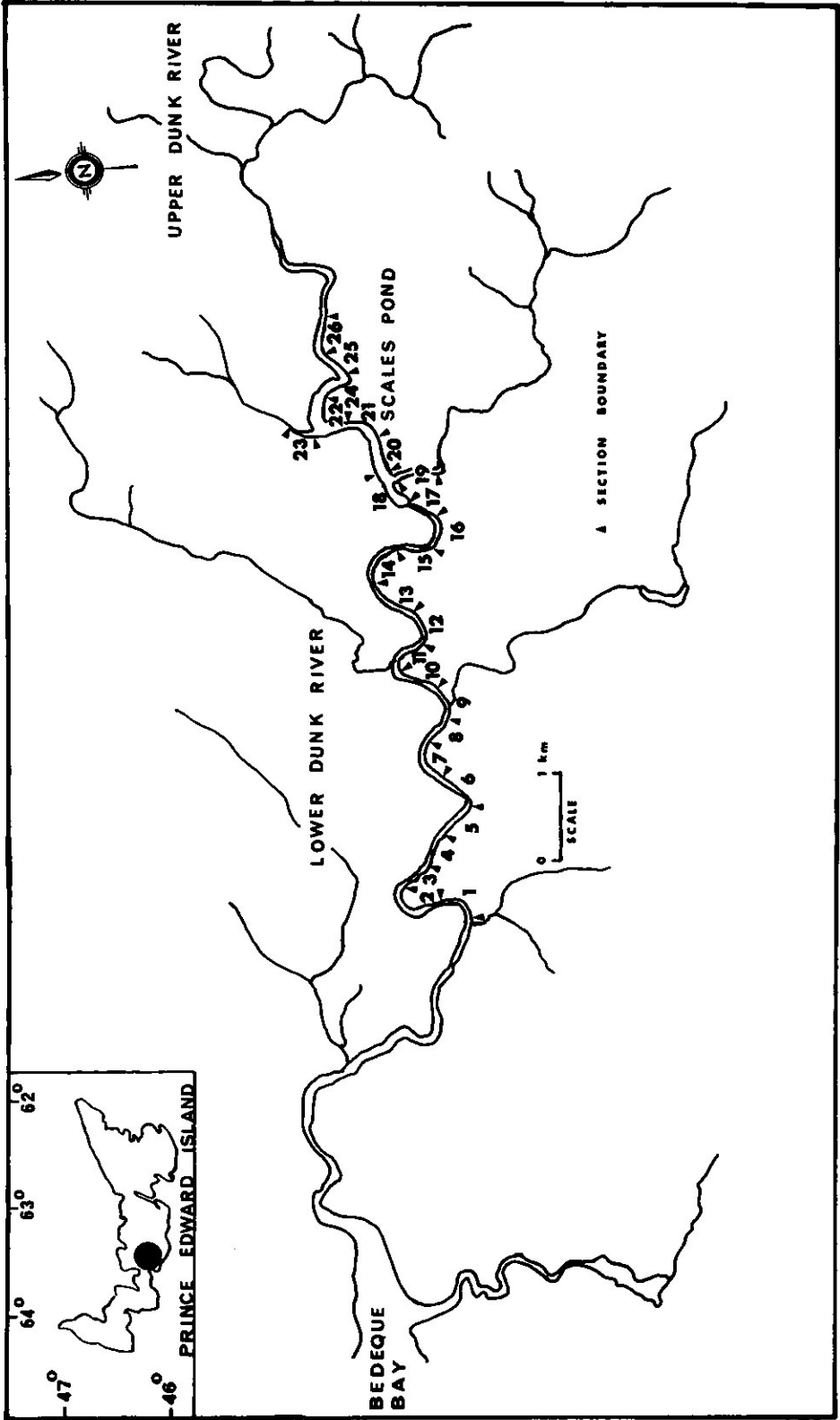


Fig 1. Location of the study area and sections used in defining the catch by area for Lower Dunk River and Scales Pond.

separated by an impassable dam, making it possible to describe separately the characteristics of the sportfishery for each area.

The physical, chemical and biological features of the Lower Dunk River and Scales Pond have been described already in earlier publications (Anon. 1975, Johnston 1974, Johnston & McKenna 1976, Johnston & Cheverie 1980; Staker 1976).

#### *Aspects of the Dunk River Sportfishery*

The Dunk River sportfishery is based upon the brook trout (*Salvelinus fontinalis*) and the rainbow trout (*Salmo gairdneri*). Atlantic salmon in the Lower Dunk River contribute little to the summer sportfishery, because adult fish are rare and arrive only in late fall. The dominant sportfish is the indigenous sea-running speckled brook trout. These are much sought after by local and visiting anglers, who have caught fish larger than 2 kg during spring or fall runs.

Since 1913, sea trout populations have been supplemented annually with hatchery-reared brook trout. Most plantings prior to 1960 were with fry hatched from eggs collected locally, but plantings after that date were mostly with yearlings, cultured from domesticated strains from Nova Scotia or New Brunswick (Table I). The contribution of domesticated hatchery-reared brook trout to the Dunk River sportfishery has been assessed in another report by Johnston and Cheverie (1980).

Unlike the indigenous brook trout, rainbow trout were first introduced to the Dunk River System in 1941 and were stocked sporadically until 1964 (Table II). Rainbow trout have become naturalized and now maintain their numbers through reproduction. In recent years, some have been caught weighing more than 3.6 kg. Stocks in the Lower Dunk River run to the sea and return to the river throughout the summer and fall to spawn in early winter and spring. Because of the impassable dam at Scales Pond, brook and rainbow trout cannot move into Scales Pond from the Lower Dunk River.

The fishing season for both species in Prince Edward Island begins on April 15 and terminates on September 30. The daily creel limit is 20 brook trout and 5 rainbow trout per day with no annual limit.

## Methods

#### *Stratified Creel Census*

The angler harvest was determined in 1973-75 through a stratified creel census conducted on the Lower Dunk River and Scales Pond between May 7 and September 3. The fishing season from April 15 to May 6 and from September 4 to 30 was not censused. Except for opening day and the first few weekends, fishing pressure is less during the first 22 days and the last 27 days of the fishing season than during the rest of the season. The census and harvest-estimate methods have been described before (Johnston & Cheverie 1980).

#### *Population Estimates in the Lower Dunk River*

In 1973 and 1974, brook trout and rainbow trout populations in the Lower Dunk River were estimated by sampling randomly selected areas of the river with electrofishing equipment, according to the methods described already by Johnston and Cheverie (1980).

#### *Weight Determinations*

Throughout the study period, accurate weight and length measurements for native brook trout and rainbow trout were taken monthly during site sampling. These data were used to calculate weights from lengths of fish recorded in the creel census and population study, using the relationship  $W = aL^b$  where in any month

Table I. Stocking history for the Dunk River system, 1960 to 1975 inclusive

Year	Release Period	Lower				Upper			
		Dunk River		Scales Pond		Dunk River		Wrights Pond	
		Brook Trout	Rainbow Trout	Brook Trout	Rainbow Trout	Brook Trout	Rainbow Trout	Brook Trout	Rainbow Trout
1960	Spring	4,000(2)*	-	12,000(2)	-	-	-	-	-
	Fall	-	-	5,000(3)	-	-	-	-	-
1961	Spring	4,800(4)	-	8,000(3,4)	7,800(3)	-	-	-	-
	Fall	-	-	-	-	-	-	-	-
1962	Spring	6,000(4)	-	6,000(4)	-	-	-	3,000(3)	-
	Fall	-	-	-	-	-	-	-	-
1963	Spring	4,200(3)	6,270(3)	4,200(4)	6,270(3)	-	-	-	-
	Fall	-	-	-	-	-	-	-	-
1964	Spring	4,500(4)	5,000(3)	4,500(4)	5,000(3)	-	-	-	-
	Fall	-	-	-	-	-	-	-	-
1965	Spring	3,240(4)	-	4,050(4)	-	-	-	2,430(4)	-
	Fall	-	-	-	-	-	-	-	-
1966	Spring	1,680(sf)	-	-	-	-	-	-	-
	Fall	-	-	-	-	-	-	-	-
1967	Spring	1,700(sf)	-	-	-	-	-	2,500(3)	-
	Fall	1,350(3)	-	1,360(3)	-	-	-	-	-
1968	Spring	1,000(4)	-	5,000(4)	-	5,000(4)	-	2,000(4)	-
	Fall	-	-	840(5)	-	-	-	-	-
1969	Spring	-	-	-	-	-	-	-	-
	Fall	-	-	-	-	-	-	-	-
1970	Spring	2,000(sf)	-	2,500(sf)	-	-	-	-	-
	Fall	-	-	-	-	-	-	-	-
1971	Spring	5,500(4)	-	-	-	-	-	2,500(4)	-
	Fall	-	-	-	-	-	-	-	-
1972	Spring	989(sf)	-	7,000(4)	-	-	-	-	-
	Fall	-	-	4,000(sf)	-	998(sf)	-	3,000(4)	-
1973	Spring	970(sf)	-	1,494(sf)	-	-	-	-	-
	Fall	-	-	1,473(sf)	-	981(sf)	-	1,000(sf)	-
1974	Spring	998(sf)	-	1,498(sf)	-	998(sf)	-	-	-
	Fall	-	-	-	-	-	-	-	-
1975	Spring	998(sf)	-	1,498(sf)	-	996(sf)	-	-	-
	Fall	-	-	-	-	-	-	-	-

\* The numbers or letters in parentheses represent the stage of trout development: 1 — 8 weeks after systematic feeding begins 2 — 14 weeks after systematic feeding begins 3 — 20 weeks after systematic feeding begins 4 — 26 weeks after systematic feeding begins 5 — 26 weeks — 1 year after systematic feeding begins sf — yearling

the coefficients a and b were determined from fish measured. Weights for trout caught by fishermen during May were computed from a and b values derived from the site sampling in June.

### Results

While the number of resident and non-resident angling licences purchased in Prince Edward Island during the last 20 years has been steadily rising, the number of anglers interviewed on the Dunk River System did not increase markedly during the study period. During the study, 3,758 resident and 453 non-resident fishermen were interviewed on the Lower Dunk River and 1,381 resident and 172 non-resident anglers were interviewed on Scales Pond. Of those interviewed, 89.2% were residents, of which 91.3% were males, and 11.4% of them less than 16 years of age (compared with only 1.2% of the resident female group). Similar findings were documented for non-resident male and female anglers, respectively.

#### Angler Origin

In all years, over 75% of the angling trips were made by fishermen who lived within 10.1 to 20.0 km of the river (Table III). Only a small percentage of the trips (5.0-12.5%) were made by fishermen living along the river or living more than 20 km away.

Most of the non-resident angler trips (72.3-83.9%) were made by Canadians who were more frequently from Ontario, Nova Scotia, New Brunswick and Quebec than elsewhere (Table IV). Non-resident anglers from the United States were most frequently from Massachusetts, New York and New Hampshire while smaller percentages were from other states (Table V).

#### Fishing Gear and Angling Success

Resident and non-resident anglers regardless of location most frequently angled with bait. Bait angling was more common on Scales Pond than in the Lower Dunk River. In most cases, the bait consisted of live earthworms, but corn, pieces of cooked mackerel, live smelts, and killifish were also used.

Resident bait fishermen angling in the Lower Dunk River caught a much smaller percentage of the total catch (62.8-69.4% for the brook trout and 52.3-75.5% for

**Table II.** Summary of the number of rainbow trout stocked in the Dunk River system

Year	Source	Number of trout stocked in the Dunk River system
1941	Cape Cod	18,000
1954	U.S.A.	8,000
1955	U.S.A.	15,400
1957	St. John, N.B.	5,000
1958	U.S.A.	5,000
1959	U.S.A.	6,000
1961	U.S.A.	7,800
1963	Cape Breton Island	12,540
1964	St. John, N.B.	10,000

**Table III.** Summary of the number of fishermen interviewed and the distance they travelled to fish in the Dunk River system

Year	Area	Number of fishermen interviewed and distance travelled			
		0-5 km	5.1-10 km	10.1-20 km	20 km
1973	Lower Dunk River	125	31	927	48
	Scales Pond	52	2	202	24
	Total	177	33	1129	72
1974	Lower Dunk River	76	56	1304	99
	Scales Pond	45	20	524	69
	Total	121	76	1828	168
1975	Lower Dunk River	96	59	783	72
	Scales Pond	25	13	318	50
	Total	121	72	1101	122

rainbow trout) than those on Scales Pond (82.7-93.2% for brook trout and 78.6-90.5% for rainbow trout). Fly fishermen were generally more successful in catching trout in the Lower Dunk River than in Scales Pond. Regardless of gear, however, resident fishermen were consistently more successful, as determined by catch per trip, than non-resident anglers. Knowledge of the river and of local angling techniques probably accounted for this difference in success.

#### *Fishing Pressure per Hectare and Catch per Hour*

Fishing pressure in the Lower Dunk River area (Table VI) during the summer months fluctuated between 50.9 and 143.2 hours/hectare with higher fishing pressure in the late spring than in the late summer. Resident and non-resident anglers expended 3,017 to 4,971 hours/season. Catch per hour values changed irregularly and did not always vary directly with fishing pressure. Regardless of area or month, anglers always caught more brook trout per hour than rainbow trout.

The estimates of fishing pressure and catch per hour values for Scales Pond (Table VII) were markedly lower than those for the Lower Dunk River. The extremely low values for July and August in 1975 were due to a lowering of the water level in Scales Pond to permit construction of a fish ladder at the dam. Reduction in the pond volume uncovered the accumulated soft-bottom sediments and prevented

**Table IV.** Number of non-resident fishermen interviewed from Canada, angling on the Dunk River between 1973 and 1975. Percentages are shown in parentheses

	1973	1974	1975
New Brunswick	21(17.5)	70(26.8)	15(12.9)
Nova Scotia	32(26.7)	60(23.0)	34(29.3)
Newfoundland	-	2( 0.8)	1( 0.9)
Quebec	14(11.7)	42(16.1)	28(24.1)
Ontario	46(38.2)	81(31.0)	36(31.0)
Manitoba	3( 2.5)	-	1( 0.9)
Saskatchewan	-	1( 0.4)	-
Alberta	2( 1.7)	3( 1.1)	1( 0.9)
British Columbia	2( 1.7)	2( 0.8)	-
Total	120(100)	261(100)	116(100)

**Table V.** Number of non-resident fishermen interviewed, from the United States and abroad, angling on the Dunk River between 1973 and 1975. Percentages are shown in parentheses.

	1973	1974	1975
New York	16(21.7)	5( 7.8)	6(21.4)
Wash. D.C.	2( 4.3)	-	-
Massachusetts	20(43.5)	22(34.4)	12(42.8)
N. Carolina	1( 2.2)	-	-
Tennessee	1( 2.2)	-	4(14.3)
New Hampshire	8(17.4)	2( 3.1)	-
Maine	2( 4.3)	5( 7.8)	2( 7.7)
Indiana	1( 2.2)	-	-
California	1( 2.2)	1( 1.5)	-
Iowa	-	2( 3.1)	-
Arizona	-	1( 1.6)	-
New Jersey	-	9(14.1)	-
Pennsylvania	-	2( 3.1)	-
Ohio	-	1( 1.6)	-
Connecticut	-	2( 3.1)	3(10.7)
Vermont	-	2( 3.1)	-
Virginia	-	1( 1.6)	-
Unknown	-	9(14.1)	-
France	-	-	1( 3.6)

**Table VI.** Summary of the estimated fishing pressure in hours per hectare and mean catch per hour by resident and non-resident fishermen on the Lower Dunk River between May 7 and September 3, 1973 to 1975.

Period	1973			1974			1975		
	Fishing pressure (h ha <sup>-1</sup> )	Mean Catch per hour	Total	Fishing pressure (h ha <sup>-1</sup> )	Mean catch per hour	Total	Fishing pressure (h ha <sup>-1</sup> )	Mean catch per hour	Total
		BK <sup>1</sup>	RB <sup>2</sup>		BK	RB		BK	RB
May 7-June 5	142.6	0.71	0.06	143.2	0.61	0.08	91.4	0.37	0.05
June 6-July 5	83.6	1.05	0.10	135.6	0.57	0.07	94.1	0.81	0.11
July 6-Aug. 4	63.0	0.55	0.19	100.8	0.53	0.10	50.9	0.75	0.17
Aug. 5-Sept. 3	53.0	0.60	0.10	99.4	0.38	0.08	53.8	0.63	0.32

1 Brook trout    2 Rainbow trout

**Table VII.** Summary of the estimated fishing pressure in hours per hectare and mean catch per hour by resident and non-resident fishermen on Scales Pond between May 7 and September 3, 1973 to 1975.

Period	1973			1974			1975		
	Fishing pressure (h ha <sup>-1</sup> )	Mean catch per hour	Total	Fishing pressure (h ha <sup>-1</sup> )	Mean catch per hour	Total	Fishing pressure (h ha <sup>-1</sup> )	Mean catch per hour	Total
		BK <sup>1</sup>	RB <sup>2</sup>		BK	RB		BK	RB
May 7-June 5	19.8	0.19	0.05	35.4	0.46	0.07	36.4	0.33	0.03
June 6-July 5	13.8	0.40	0.11	36.4	0.35	0.06	22.7	0.37	0.04
July 6-Aug. 4	9.7	0.53	0.02	21.9	0.47	0.04	0.3	4.60	0.30
Aug. 5-Sept. 3	10.0	0.16	0.07	25.7	0.41	0.07	0.6	1.18	0.32

1 Brook trout    2 Rainbow trout



fishermen from angling. As a result, fishing pressure declined and abnormal catch per hour values were recorded.

### *Angler Harvest*

Estimates of resident angler harvest (Table VIII) in the Lower Dunk River for the study years ranged between 164 and 245 brook trout/hectare (18.3-23.6 kg ha<sup>-1</sup>) and between 30 and 36 rainbow trout (6.0-6.7 kg ha<sup>-1</sup>). In comparison, non-resident anglers harvested between 11 and 19 brook trout/hectare (1.1-2.1 kg ha<sup>-1</sup>) and 3 to 5 rainbow trout (0.3-0.9 kg ha<sup>-1</sup>)/season.

In all years, there was a greater number of resident fishermen in the Lower Dunk River area between May 7 and July 5 than at any other time, probably stimulated by upriver movements of native trout from the estuary. Decreased angling activity in late summer was probably related to poorer catches due to low and warmer water.

During the study period resident anglers at Scales Pond (Table VIII) expended 1,009 to 2,399 hours/season and took 15 to 106 brook trout/hectare (1.2-4.0 kg ha<sup>-1</sup>) and 2 to 7 rainbow trout/hectare (0.5-1.3 kg ha<sup>-1</sup>). Non-resident anglers fished 40 to 407 hours and harvested 1 to 4 brook trout/hectare (0.1-0.3 kg ha<sup>-1</sup>) and 0.2 to 0.7 rainbow trout/hectare (0.04-0.2 kg ha<sup>-1</sup>).

### *Catch by Area*

The study areas were mapped and divided into sections (Fig 1) so that the approximate capture locations could be determined. About 35% of all brook trout and 30% of all rainbow trout were caught in the region just below Scales dam (section 17) with other major catches occurring in deep pools in the river sections with tributaries (sections 9 and 11). Most of the trout harvested in Scales Pond were angled near the dam (sections 18 and 19) where the water was deeper and generally cooler than in upstream sections.

### *Size of Trout Harvested*

Both groups of anglers most frequently caught trout that ranged in size between 15.0 and 30.0 cm in fork lengths and in age between 2 and 4 years. Anglers caught very few brook trout older than 4+ years; however, a slightly larger number of older rainbow trout were caught in both areas.

### *Number of Trout Creeled per Fishing Trip*

The number of fishermen catching more than 5 trout/trip in the sample of fishermen interviewed was small in comparison to those catching between 1 and 5 trout/trip. The number of fishermen catching more than 10 trout/trip was large for resident anglers, particularly in the Lower Dunk River. These fishermen, while few in number in comparison to the other groups, harvested almost as many trout as those catching 1 or 2 trout/trip.

### *Population Estimates*

Populations were estimated for the Lower Dunk River area between Johnston's Bridge and the dam at Scales Pond in August of 1973 and 1974 (Table IX).

Poor sampling of 0+ and 1+ trout is the most likely cause for their low estimates in 1973, since 1+ and 2+ trout in 1974 were abundant. Also, trout tagged in the tributaries, North Brook, and Southwest Brook were later recaptured in the Lower Dunk River and similarly, trout tagged in the Lower Dunk River were later recaptured in the tributaries in the fall prior to spawning. However, the extent of recruitment to or loss from trout populations in the Lower Dunk River cannot be accounted for in these estimates.

**Table VIII.** Estimated catch of native brook trout and rainbow trout by resident and non-resident fishermen angling in the Lower Dunk River and Scales Pond between May 7 and Sept. 3, 1973 to 1975. Numbers in parentheses under each total are estimated weights for the estimated numbers of trout caught and are based on weighed samples

		Estimated harvest + 1 SE											
		Lower Dunk River						Scales Pond					
Stratum	Year	Brook trout		Rainbow trout		Non-res. <sup>2</sup>	Brook trout		Rainbow trout		Non-res.		
		Res. <sup>1</sup>	Non-res. <sup>2</sup>	Res.	Non-res.		Res.	Non-res.	Res.	Non-res.			
May 7 to June 5	1973	1018 ± 69	22 ± 12	84 ± 14	2 ± 1		77 ± 15	12 ± 6	22 ± 7	0			
	1974	872 ± 82	27 ± 12	118 ± 31	2 ± 2		371 ± 64	15 ± 10	55 ± 15	5 ± 4			
	1975	344 ± 36	0	44 ± 10	0		285 ± 52	0	24 ± 4	0			
June 6 to July 5	1973	864 ± 93	29 ± 16	81 ± 11	6 ± 3		131 ± 29	0	35 ± 8	0			
	1974	758 ± 55	33 ± 16	97 ± 11	4 ± 3		292 ± 39	12 ± 9	56 ± 13	0			
	1975	778 ± 87	4 ± 2	103 ± 12	0		199 ± 42	0	21 ± 7	0			
July 6 to Aug. 4	1973	307 ± 50	48 ± 14	89 ± 8	33 ± 9		112 ± 30	10 ± 6	5 ± 2	0			
	1974	487 ± 39	57 ± 27	83 ± 10	19 ± 11		213 ± 37	28 ± 8	23 ± 5	0			
	1975	252 ± 53	135 ± 51	57 ± 7	57 ± 7		30 ± 14	0	2 ± 1	0			
Aug. 5 to Sept. 3	1973	314 ± 641	10 ± 3	51 ± 6	4 ± 1		31 ± 16	8 ± 3	12 ± 4	5 ± 1			
	1974	310 ± 51	73 ± 13	74 ± 8	5 ± 2		209 ± 35	40 ± 13	31 ± 13	11 ± 3			
	1975	303 ± 29	44 ± 21	158 ± 23	16 ± 15		18 ± 17	0	5 ± 4	0			
Total	1973	2503 ± 253 (240.82) <sup>3</sup>	109 ± 45 (11.32)	305 ± 39 (68.73)	45 ± 14 (3.96)		351 ± 90 (27.05)	30 ± 15 (3.34)	74 ± 21 (11.25)	5 ± 1 (0.85)			
	1974	2427 ± 227	190 ± 68	372 ± 60	30 ± 18		1085 ± 175	95 ± 40	165 ± 46	16 ± 7			
	1975	1677 ± 205 (186.29)	183 ± 74 (21.44)	362 ± 52 (63.21)	49 ± 32 (9.19)		532 ± 125 (56.75)	0	52 ± 16 (15.88)	0			

<sup>1</sup> resident fishermen      <sup>2</sup> non-resident fishermen      <sup>3</sup> kilograms

**Table IX** Estimates of the number of native brook trout and rainbow trout in the Lower Dunk River populations in August 1973 and 1974. Standard errors are shown for each total.

Species	Date of estimate	Estimates of the number of trout in each age class (yr)						Total
		0+	1+	2+	3+	4+	5+	
Brook Trout	Aug. 1973	2295	1311	2090	451	37	-	6184 ±1007
	Aug. 1974	12096	6431	5255	998	210	22	25012 ±1722
Rainbow Trout	Aug. 1973	49	597	294	59	-	-	999 ±63
	Aug. 1974	2600	417	587	139	32	6	3781 ±200

**Table X.** Summary of the estimated angler's harvest and population size of native brook trout and rainbow trout in the Lower Dunk River in 1973 and 1974

Species	Year	Angler harvest of 1+ trout	Angler harvest <sup>1</sup>	Population	Pre-May population size <sup>1</sup>	Exploitation rate of pre-May population <sup>1</sup>
Brook trout	1973	242	2370	2578	4948	0.48
	1974	381	2236	6485	8721	0.26
Rainbow trout	1973	34	316	353	669	0.47
	1974	27	375	764	1139	0.33

12+ and older trout

Estimates of population biomass (0+ and older) in 1973 were 294 kg brook trout (28.3 kg ha<sup>-1</sup>) and 55 kg rainbow trout (5.3 kg ha<sup>-1</sup>); in 1974 these were 980 kg brook trout (94.3 kg ha<sup>-1</sup>) and 158 kg rainbow trout (15.2 kg ha<sup>-1</sup>).

### *Exploitation Rates*

The exploitation rates of the precensused brook trout and rainbow trout populations (2+ and older) are presented in Table X. Since small numbers of 1+ brook trout and rainbow trout were creelied by anglers and since 1+ population estimates were low, the final estimates of harvest and population size were adjusted to account only for 2+ and older trout.

### **Discussion**

Total estimated harvests of brook trout and rainbow trout varied little between years. Unfortunately, there are few other studies for Prince Edward Island with which to compare the minimum yield data for the Lower Dunk River and Scales Pond. Most earlier reports concern only brook trout in pond environments (Smith 1951; 1963; Saunders & Smith 1968) and there is nothing on the harvest of rainbow trout. Annual yields of brook trout from Scales Pond were much lower than the 20.0 to 39.2 kg/hectare for Montague Pond in eastern Prince Edward Island (Smith 1951) or 13.6 to 20.6 kg/hectare for Wilmot Pond in central Prince Edward Island (Smith 1963) or 8.0 to 50.2 kg/hectare for Ellerslie Pond in western Prince Edward Island (Saunders & Smith 1968). Persistently low yields suggest that only a small population of trout occurs in Scales Pond, and this is believed to be caused by unsuitable trout habitat. In July 1975, when the water level in the Pond was reduced for construction of a fish ladder at the dam, it became apparent that the pond basin was heavily silted (0.25-1.00 m thick) with few aquatic plants and other suitable hiding places on bottom. The lack of suitable hiding places and silting have been found to affect the carrying capacity and harvest in other Prince Edward Island localities (Saunders & Smith 1962; 1968; 1965; Smith 1963).

Information on yields and standing crops of brook trout in other coastal river environments of Prince Edward Island is also scarce. Saunders and Smith (1955) reported that the mean biomass of the standing crop of brook trout in Hayes Brook was 151.8 kg/hectare, considerably higher than the 28.2 to 86.0 kg/hectare for the Lower Dunk River area. Hayes Brook is the smaller system, less open, with more cover and less silting. The Lower Dunk River also supports 3 species of salmonids which may compete for food, living space and spawning sites.

While standing crops in the Dunk River system were lower than elsewhere, exploitation levels for 2+ and older trout (0.28-0.49) were equal to or greater than those reported by Smith and Saunders (1968) for the Ellerslie stream (0.11-0.34). Exploitation rates for brook trout in Lower Dunk River were high in 1973, but lower catches in 1974 did not occur. Instead, higher catches and lower exploitation levels were recorded, suggesting a higher trout density. This higher trout density could have occurred only as a result of recruitment from the Pond or, most probably, from the estuary. Our observations on a 905-m section of the North Brook suggest that trout move into this tributary in the fall and leave it in winter, spring or early summer. Tributaries appear to be important nursery areas and important sources of trout, and their role in sustaining the fishery in the more heavily fished zones of the Dunk River system needs to be evaluated.

Unlike brook trout, rainbow trout are not as easily caught and, based on catch data for all years, many more older trout existed in their population. Our results add to Gard and Seegrist's (1972) findings that rainbow trout are harder to catch than brook trout. It appears that rainbow trout provide a more diversified and higher

quality fishing experience even though total standing crop may be less than that for single species fishery.

### Management Implications

In the Dunk River, as in the Ellerslie system (Smith & Saunders 1968), anglers substantially exploit native brook trout populations below impassable dams where migratory sea trout concentrate. At present, there are no regulations in Prince Edward Island controlling the harvest of trout from these areas. Excessive cropping of larger, older trout leaves only the smaller trout to reproduce, and possibly increases genetic selection in favour of smaller, shorter-lived, non-sea-running stocks. Johnston and McKenna (1976) have shown that older sea trout produce a greater number of larger eggs than do smaller trout. Larger eggs produce larger fry that are more robust and more able to survive in highly competitive environments (Svardson 1949). High standing crops of trout in Island waters appear to be related in part to older sea trout in the population, and any management strategy should attempt to ensure their presence.

In this study most brook trout caught by fishermen or captured in population estimates were less than 4 years old. While studies elsewhere have demonstrated that creel limits are ineffective in allowing fish to survive to an older age (Hunt 1964; Latta 1973; Shetter 1967), our data suggest that approximately 20% of the trout angled would not have been harvested if the creel limit of 20 had been reduced to 10 brook trout/day and if the angling pressure remained the same as during the study.

While little is known about the potential carrying capacity of Island streams and ponds, it would appear that the Dunk River system is below this potential. Excessive sedimentation by soil erosion from nearby fields and roads seems to be the most important limiting factor. Stewart and Himelman (1974) studying soil erosion in the Dunk River watershed, estimated that during snow melt in April up to 16.4 t/acre are eroded. If salmonid populations in Island waters are to be enhanced, programs of soil erosion abatement and habitat rehabilitation must be implemented to improve ponds, streams and estuaries.

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