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J.B. Sprague, P.F. Elson, and J.R. Duffy

**Establishment**

Biological Station  
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Data record of DDT-residues in juvenile Atlantic salmon  
collected in 1966 from Maritime streams of different DDT-history

J.B. Sprague, P.F. Elson, and J.R. Duffy

INTRODUCTION

This manuscript report is essentially only a data record. It gives the detailed data of a study of DDT and its analogs in immature Atlantic salmon from New Brunswick and Nova Scotia. A paper is being prepared for publication and all of the details cannot be included in that publication. They are therefore given here so as to be available if required.

Since the results will be discussed, and conclusions drawn, in the published paper, such verbiage is omitted from this manuscript report.

The data follow in a series of tables and descriptive pages.

ACKNOWLEDGEMENTS

The fish were collected under cold and difficult conditions in December 1966. Emerson Schofield led the electro-seining party consisting of Ivan M. Jones and William R. Currie.

We very much appreciate the efforts by these men which made this project possible.

Fig. 1. Location of sampling points in streams sprayed with DDT in New Brunswick.

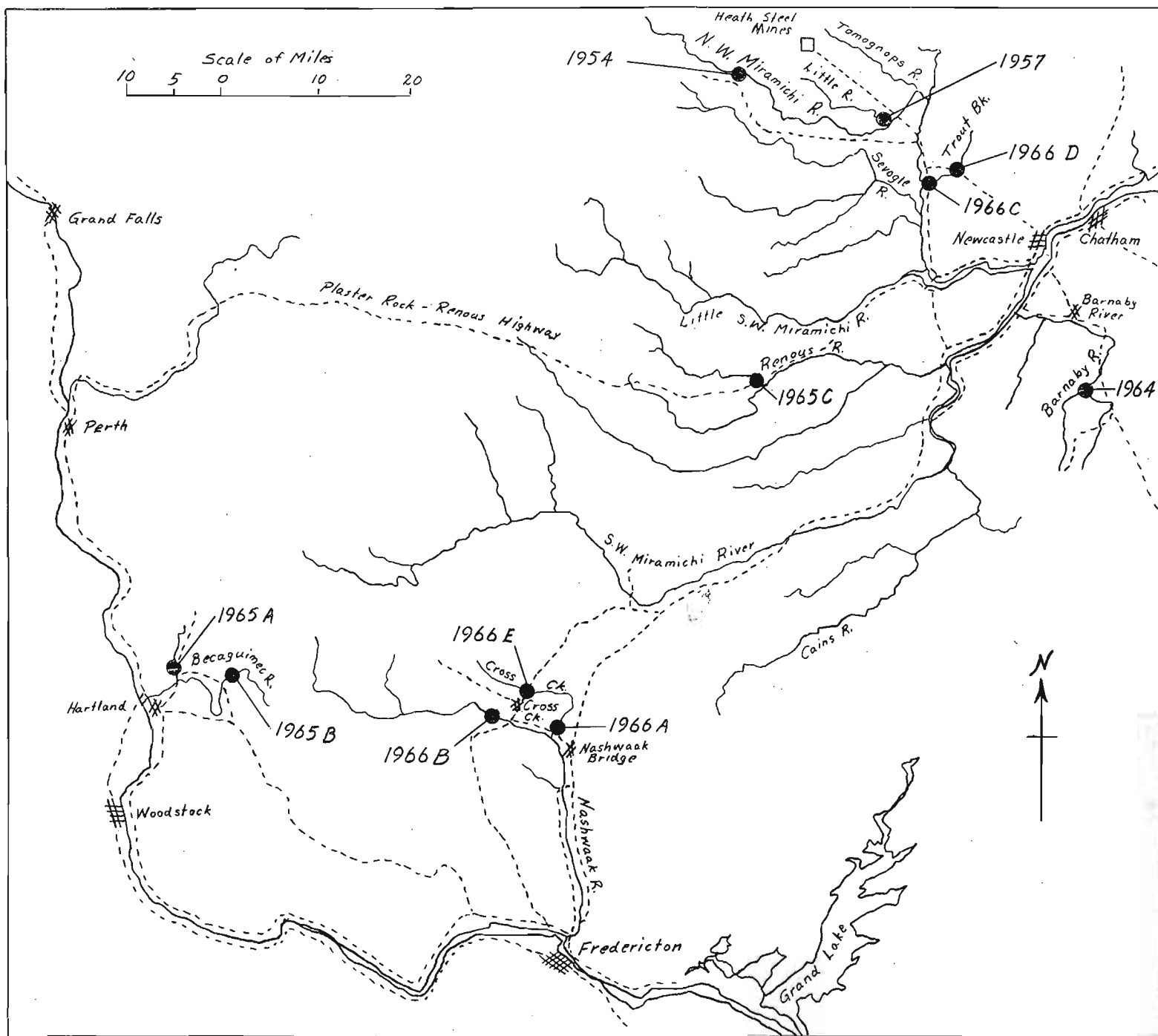


Table I. List of locations where salmon were collected  
in December 1966

<u>Sample No.</u>	<u>Location</u>
1966A	Cross Creek above highway bridge at Cross Creek station. Saint John system.
1966B	Nashwaak River above Stanley. Saint John system.
1966C	Trout Brook near F.R.B. counting fence at mouth. Miramichi system.
1966D	Trout Brook at Chaplin Island Road. Miramichi system.
1966E	Cross Creek below bridge of highway connecting Stanley, Cross Creek, and Parker Ridge (Highway 25). Saint John system.
1965A	Coldstream River, at bridge at Bannon, about 2 miles above junction with Becaguimec River. Saint John system.
1965B	North Becaguimec River, 2 miles above Carlisle, about 4 miles east of station 1965A. Saint John system.
1965C	North Branch Renous River, about 1 mile above junction with South Renous, at bridge on Plaster Rock - Renous road. Miramichi system.
1964	East Branch of Barnaby River in West Collette area, just above junction with Middle Barnaby River. Miramichi system.
1957	Little River at old mining camp site, about 1 mile above junction with Northwest Miramichi River.
1954	Northwest Miramichi River at "Camp 42" on Fraser-Burchill road. This is 3 miles west of west end of South Little River Lake.
Control	Gallant River at second bridge. Margaree River system, N.S.

Explanation of symbols used in Table II  
and significance

$\frac{1}{2}$  and  $1/4$  refer to the pounds of DDT sprayed per acre of forest.  
 $\frac{1}{2}$  =  $\frac{1}{2}$  pound of DDT per acre. This was sprayed in an oil base.

$2 \times 1/4$  means that two treatments at  $1/4$  lb/acre DDT were given, thus totalling  $\frac{1}{2}$  lb/acre. Usually the two treatments were about 10 days apart.

+ P means that the rivers and immediately adjacent forest (400 yards each side) received treatment with the organophosphate Phosphamidon instead of DDT. This treatment meant that small tributaries extending more than 400 yards into the forests still carried DDT into the stream. However the total amount of DDT reaching the stream was of course reduced. The net effect seems to have been reducing the DDT reaching streams to about half (Elson and Kerswill, 1967)

aerial drift means that DDT probably reached the stream by drifting through the air from adjacent spray plots. The treatment of the adjacent plots is indicated by the terminology described above. It is difficult to evaluate the doses of DDT reaching streams from this source, but it is probably relatively light.

downstream drift means that the collecting site itself was not sprayed directly, but the river or its tributaries were sprayed upstream. It seems that in general effects of DDT spraying are just as bad in the 5 miles of unsprayed stream below a sprayed area, effect is reduced by about half at 10 miles downstream, and some effects may continue 20 miles downstream. (Elson, 1967)

upstream coverage means that spraying covered the indicated number of miles of river in an upstream direction, and above that there was no spraying. It seems that maximum effect on aquatic life is caused by 15 or 20 miles of upstream coverage, (Elson and Kerswill, 1967) whereas, 2 miles of upstream coverage gives a relatively light effect, (Elson, 1967), suggesting that amount of DDT reaching stream is only about one-third that for 20 miles of upstream coverage.

Table II. Spray history of streams where fish were collected

Sample No.	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
1966A	-	-	-	-	½	-	½	1/4	-	-	½ + P	2x1/4+P	2x1/4+P
1966B	-	-	-	-	½	-	½	1/4	-	aerial drift 2x1/4	½ + P	2x1/4+P	2x1/4+P upstrm coverage 8 miles
1966C	-	-	½	½	-	-	-	-	-	-	-	-	2x1/4+P upstrm coverage 6 miles
1966D	-	-	½	aerial drift, ½ probable	-	-	-	-	-	-	-	-	2x1/4+P upstrm coverage 2 miles
1966E	-	-	-	-	½	-	½	1/4	-	1/4 upstrm coverage 2 miles	½	2x1/4	dnwnstrm drift 2x1/4 see note (a)
1965A	-	-	-	-	aerial drift, ½	-	½	2x1/4	-	-	-	2x1/4	-
1965B	-	-	-	-	-	-	½	1/4 upstrm coverage 6 miles	-	-	-	2x1/4	-
1965C	½ see note (b)	-	½	½	aerial drift, ½	-	1/4	1/4	1/4	aerial drift 1/4, light	½+P upstrm coverage 0.5 miles	2x1/4+P	-
1964	-	-	-	-	-	-	-	-	-	-	½ see note (c)	-	-
1957	½	-	aerial drift, ½	½	-	-	-	-	-	-	-	-	-
1954	½	-	-	-	-	-	-	-	-	-	-	-	-
Control	-	-	-	-	-	-	-	-	-	-	-	-	-

- (a) spray coverage started 8 miles upstream, covered 6 miles further upstream;  
 (b) received downstream drift from 5 miles upstream, equivalent to direct coverage;  
 (c) upstream coverage 2 miles on one tributary, none on other tributary.

Table III. Results of analyses for DDT and its metabolites in Atlantic salmon parr. (p.p.m.)

Source	Weight	p,p'-DDT	o,p'-DDT	DDE	DDD	Total DDT	DDT + DDE	DDT + DDE + DDD
1966A	8.5	1.10	1.19	7.02	t	2.29	9.31	9.31
	11.3	1.74	0.94	3.11	t	2.68	5.79	5.79
	16.3	0.68	0.66	4.25	t	1.34	5.59	5.59
	18.7	0.55	0.42	2.52	t	0.97	3.49	3.49
	23.5	1.12	0.79	2.73	t	1.91	4.64	4.64
average	15.7	1.04	0.80	3.93	t	1.84	5.76	5.76
1966B	9.0	0.56	0.39	3.90	0	0.95	4.85	4.85
	10.8	0.39	0.45	2.13	0	0.84	2.97	2.97
	12.5	t	t	2.00	0	t	2.00	2.00
	17.2	0	t	1.73	0	t	1.73	1.73
	27.8	0.24	0.32	1.38	0	0.56	1.94	1.94
average	15.5	0.24	0.23	2.23	0	0.47	2.70	2.70
1966C	6.9	1.52	0.89	2.40	0	2.41	4.81	4.81
	8.4	t	t	1.96	0	t	1.96	1.96
	12.3	1.48	0.95	1.70	t	2.43	4.13	4.13
	13.2	t	0.49	2.04	0	0.49	2.53	2.53
	17.8	1.28	0.74	2.80	t	2.02	4.82	4.82
average	11.7	0.86	0.61	2.18	t	1.47	3.65	3.65
1966D	8.3	0	0	4.90	0	0	4.90	4.90
	12.1	t	0	3.45	0	t	3.45	3.45
	16.9	0.82	t	2.98	0	0.82	3.80	3.80
	21.5	1.27	0.42	2.23	0	1.69	3.92	3.92
	27.6	1.54	0.73	2.85	0	2.27	5.12	5.12
average	17.3	0.73	0.23	3.28	0	0.96	4.24	4.24
1966E	6.4	0.88	0	3.70	0	0.88	4.58	4.58
	8.2	0.29	0	1.97	0	0.29	2.26	2.26
	9.8	0	0	1.93	0	0	1.93	1.93
	12.4	0.43	0.14	2.31	0	0.57	2.88	2.88
	12.8	0.32	0.29	1.25	0	0.61	1.86	1.86
average	9.9	0.38	0.09	2.23	0	0.47	2.70	2.70

t = trace = a positive indication of presence of the compound, but in concentration less than 0.01 p.p.m.

0 = no detectible amount.

Weight of fish is wet weight, in grams.

Table III. (continued) Results of analyses for DDT and its metabolites in Atlantic salmon parr.

Source	Weight	p,p'-DDT	o,p'-DDT	DDE	DDD	Total DDT	DDT + DDE	DDT + DDE + DDD
1965A	7.1	0	0	1.22	0	0	1.22	1.22
	10.0	0	0	0.85	0	0	0.85	0.85
	14.8	0	0	0.83	0	0	0.83	0.83
	19.4	0	0	0.10	0	0	0.10	0.10
	26.7	0	0	0.81	0	0	0.81	0.81
average	15.6	0	0	0.76	0	0	0.76	0.76
1965B	6.0	t	0	1.72	0	t	1.72	1.72
	9.2	t	0	1.40	0	t	1.40	1.40
	10.3	0	0	1.07	0	0	1.07	1.07
	13.1	t	0	1.67	0	t	1.67	1.67
	14.1	0	0	1.56	0	0	1.56	1.56
average	10.5	t	0	1.48	0	t	1.48	1.48
1965C	10.7	0.63	0.39	1.89	0	1.02	2.91	2.91
	16.5	0	0	0.82	0	0	0.82	0.82
	16.7	0.26	t	0.98	t	0.26	1.24	1.24
	18.4	0.23	0	1.22	0	0.23	1.45	1.45
	28.2	0.36	0.32	2.04	t	0.68	2.72	2.72
average	18.1	0.30	0.14	1.39	t	0.44	1.83	1.83
1964	10.6	0	0	0.45	0	0	0.45	0.45
	20.3	0	t	1.08	0	t	1.08	1.08
	24.4	0	0	0.93	0	0	0.93	0.93
	27.4	0	0	0.55	0	0	0.55	0.55
	33.7	0	0	0.51	0	0	0.51	0.51
average	23.3	0	t	0.70	0	t	0.70	0.70
1957	7.7	0	0	0.39	0	0	0.39	0.39
	8.8	0	0	0.40	0	0	0.40	0.40
	9.2	0	0	0.70	0	0	0.70	0.70
	11.9	t	0	0.38	0	t	0.38	0.38
	30.9	0.08	0	0.36	t	0.08	0.44	0.44
average	13.7	0.02	0	0.45	t	0.02	0.46	0.46

t = trace = a positive indication of presence of the compound, but in concentration less than 0.01 p.p.m.

0 = no detectible amount.

Weight of fish is wet weight, in grams.

Table III. (continued) Results of analyses for DDT and its metabolites in Atlantic salmon parr.

Source	Weight	p,p'-DDT	o,p'-DDT	DDE	DDD	Total DDT	DDT + DDE	DDT + DDE + DDD
1954	4.0	0	0	0.12	0	0	0.12	0.12
	10.8	0	0	0.13	0	0	0.13	0.13
	11.3	0	0	0.11	0	0	0.11	0.11
	21.7	0	0	0.15	0	0	0.15	0.15
	23.1	0	0	0.27	0	0	0.27	0.27
average	14.2	0	0	0.16	0	0	0.16	0.16
Control	9.1	0	0	0	0	0	0	0
	12.9	0	0	0	0	0	0	0
	13.6	0	0	0	0	0	0	0
	16.2	0	0	0	0	0	0	0
	18.3	0	0	t	0	0	t	t
average	14.0	0	0	t	0	0	t	t

t = trace = a positive indication of presence of the compound, but in concentration less than 0.01 p.p.m.

0 = no detectible amount.

Weight of fish is wet weight, in grams.

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