PRELIMINARY REPORT ON THE IMPACT OF MATACIL® FORMULATIONS ON TERRESTRIAL INVERTEBRATES, BATHURST, NEW BRUNSWICK, 1981.

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INTRODUCTION

Recent controversy over the environmental effects of nonylphenol, a component of commercial aminocarb formulations, has led to research on new MATACIL® formulations. Field studies on the efficacy of these new formulations were initiated in 1981 by the field efficacy unit of the Forest Pest Management Institute in New Brunswick. Terrestrial studies were conducted on these 50 ha efficacy blocks by FPMI's Environmental Impact Section to assess the effects of the different formulations on their native arthropod fauna.

PLOT TREATMENTS

Terrestrial arthropod knockdown was studied on efficacy plots treated with MATACIL 180F[1] applied aerially in Insecticide Diluent 585 and as water based sprays; MATACIL 1.8D[2] applied in Insecticide Diluent 585 and Sunspray 6 N oil and also on a plot treated with Atlox and water without any insecticide. Plot numbers and treatments and details of application times and prevailing weather conditions during treatments are summarized in Table 1.

SAMPLING METHODS

Terrestrial invertebrate knockdown was monitored by collecting invertebrates from plastic wash buckets set out under balsam fir, Abies balsamea (L.). Fifteen buckets were sampled on each block including control, of which ten were 39 x 33 x 15 cm deep and five were 36 cm in diameter, 21 cm deep. Buckets were distributed along budworm sampling transect lines to facilitate coverage of the block and thereby sample a number of spray swaths. Each bucket contained 1 L of a dilute (<1%) formalin solution. Organisms were collected early in the day, generally between 0800 and 1400, for five days before treatments began and up to six days after the second application. The organisms from all buckets in each plot were transferred directly into a vial containing 30% methanol. A separate vial was used for each bucket on spray days. Collections were later identified in the laboratory. Meteorological conditions (precipitation, max-min temperatures) in the experimental area were recorded daily (Table 2).

RESULTS

Insects collected in knockdown buckets have almost all been identified to family, but are presented in this report to order only

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[1] 180 g a.i./L

[2] 1.8 lbs. a.i./Imperial gallon

Table 1. Summary of treatments, application times and prevailing weather conditions during applications

Block	Treatment	Dates	Times	Average weather conditions during application			
				Temp. (°C)	Wind (kph) and direction	Cloud cover (%)	R.H. (%)
2	MATACIL 180F + Atlox & water	12 June	2005-2015 hrs	13.00	0.25 E	10	83
		18 June	0635-0645 hrs	10.75	2.00 SW-W	10	96
4	MATACIL 180F + I.D. 585	12 June	2100-2115 hrs	10.00	0.00 E	0	96
		18 June	0720-0735 hrs	13.75	5.00 W	10	73
6	MATACIL 1.8D + Sunspray 6N	13 June	2024-2035 hrs	17.25	0.00 SE-S	0	69
		18 June	2034-2046 hrs	20.75	1.00 W	0	56
8	MATACIL 1.8D + I.D. 585	16 June	0610-0620 hrs	10.00	0.50 S-SW	100	79
		19 June	0724-0745 hrs	18.00	1.00 W-NW	0	87
9	Atlox + water	15 June	2030-2040 hrs	12.50	1.00 SE-E	100	77
		19 June	0608-0619 hrs	13.75	0.00 SW	0	85
Control	untreated	N/A	N/A	-	-	-	-

Table 2. Daily weather data during MATACIL trials, Bathurst, N.B. 1981.

Day of June	Temperature (°C) Maximum	Minimum	Precipitation (cm)	Cloud cover (%) and comments
5	-	-	0.00	-
6	-	-	0.00	-
7	-	-	0.43	mainly 100
8	20.6	-4.4	0.53	mainly 100
9	18.9	-1.7	0.00	0.20 (extremely windy)
10	14.4	-3.9	2.77	100
11	14.4	-3.9	0.89	90
12*	20.0	0.6	1.14	50
13*	12.8	-2.8	0.10	80
14	21.1	-3.9	0.00	10
15*	23.3	2.2	0.05	50
16*	18.3	0.0	0.05	80
17	15.6	0.6	0.74	100
18*	23.9	-1.7	0.15	70
19*	25.0	-2.2	0.00	0
20	32.2	5.0	0.18	-
21	23.9	-5.6	0.25	50
22	13.9	-3.9	0.02	100
23	22.8	1.1	1.04	100
24	16.1	-1.7	0.00	100
25	20.6	-3.9	0.00	30

*various spray dates (see Table 1)

(Tables 3-8). Extremely large catches (as high as 770/sample) of Coleoptera: Staphylinidae were present in many samples, and have been presented separately from other Coleoptera on Tables 3-8 and graphed for each plot (Figs. 1 and 2). The large numbers of staphylinid beetles found in many samples from the untreated control plot and in some pre-spray samples from the treated plots indicate that large catches of this group occurred independently of effects of spray applications, and might be the result of some sort of attraction to the sampling buckets, possibly due to the presence of the formalin solution. In all cases, with the exception of treatments to Block 8, spray applications did not appear to result in increases in the knock-down of staphylinids readily discernible from fluctuations in catches on the untreated control plot. Catches of Staphylinid beetles have been excluded from the presentation of total catches of terrestrial arthropods for each treatment block to prevent them from masking effects on other insect groups (Figs. 3-7). Catches of spruce budworm (Choristoneura fumiferana Clem. larvae have also been presented on Tables 3-8 separately from other Lepidoptera. Knockdown of budworm larvae was apparent after each application containing MATACIL, but relative numbers knocked down should not be considered to necessarily reflect relative efficacy of the various treatments, as they do not take into account differences in the initial densities and development of budworm in the different blocks.

Patterns of pre-spray catches in the treatment blocks generally reflected patterns seen in the untreated control plot, showing the influence of changes in weather conditions on stimulating or inhibiting insect activity. Numbers collected on 10 June were very low on all blocks due to heavy rainfall over the sampling period. Insect catches excluding Coleoptera: Staphylinidae in the untreated control plot did not differ dramatically between the prespray (6-10 June) and postspray (13-25 June) periods, but some trends within individual orders were evident. A short surge in springtail (Collembola) catches around 17-18 June was also discernible in all other blocks. A gradual increase in the catch of Hymenoptera was apparent in the untreated control plot over the sampling period, while Diptera showed a sharp increase on the last two sampling days (24-25 June).

Block 2 - MATACIL 180F + Atlox and Water

Knockdown was slight, averaging about a two-fold increase over a three day period after each spray application (Fig. 3). Spruce budworm larvae were the most noticeable group affected. Although Diptera numbers were high immediately after both spray applications (Table 4), pre-spray numbers were also large, as were the 'natural' trends exhibited in the control. Predominant increases among dipterans were of Ceratopogonidae, Chironomidae, Cecidomyidae and Empididae, while other immediate increases were of Araneida and Homoptera, mainly Aphidae and Psyllidae.

Block 4 - MATACIL 180F + Insecticide Diluent 585

Knockdown was similar to that of Block 2, an average increase of about twice the mean prespray catch, over the 3 days immediately following both applications. Day 1 following the first application, was a 12 hour sample as opposed to the regular 24 hour sampling period. When compared to day 1 in the control (also 12 hours), it is apparent that knockdown due to this treatment was above the anticipated levels for unsprayed conditions (Figure 4).

Lepidoptera (predominantly budworm) were a major portion of the spray-related knockdown as in Block 1 (Table 5). The largest numbers of invertebrates collected were Diptera, predominantly the families Ceratopogonidae, Empididae, and Chironomidae on both spray days and Tipulidae as well following the second application. Large numbers of acarina (mites) collected on 14 June (Table 5), were dislodged from another organism in the vial, and therefore were only indirectly spray related. Other modest increases occurred among Araneida, and Homoptera (Aphidae and Psyllidae).

Block 6 - MATACIL 1.8D + Sunspray 6N

Knockdown was more pronounced in this block than in the preceding blocks, with a greater variation between treatment and control evident (Fig. 5). Spray day catches were 5½ and 4½ times those on the untreated control plot for the same days. Lepidoptera, mostly budworm, and Diptera were again major components of the knock-down. Although the largest numbers were Diptera, pre-spray numbers and the numbers on control were quite large, and the actual effect was comparable to blocks 2 and 4. Lepidoptera however, increased dramatically from both pre-spray and control levels, and the effect was still apparent 5 days after both applications. Effects were evident on Coleoptera (excluding Staphylinidae), Hymenoptera, Araneida and Homoptera and possible effects were indicated on Acarina and Hemiptera. The large numbers of Acarina collected on 21 June were parasitic and therefore not directly related to the treatment. Large numbers of Collembola collected on 18 June reflected increased numbers collected in the control. Effects were slight for all groups, except for a fairly substantial increase of Hymenoptera on spray days. Increases of Araneida and Homoptera were similar to those seen in Blocks 2 and 4.

Block 8 - MATACIL 1.8D + Insecticide Diluent 585

Knockdown in Block 8 was restricted to slight increases on spray days with similar trends in catches to those exhibited on control evident at other times (Figure 6). Lepidoptera, mainly spruce budworm, were again a major component of the knockdown, however,

increases were less than in Block 2, much less than those of Block 6 and comparable to those for Block 4. Due to the large numbers present in the control block and the similarity between their trends, knockdown of Diptera due to this treatment was judged to be negligible, except perhaps on spray day of the second application (Table 7). The families possibly affected were Rhagonidae, Empididae and Ceratopogonidae. Increases of Acarina, Araneida and Homoptera were again slight. Homoptera were affected by the second spray only, were mainly of the family Aphidae, though Cicadellidae were present to a lesser extent. There was no observed effect on Psyllidae. This is the only block where Coleoptera: Staphylinidae increased following treatment without a corresponding increase in the control area. Although it is difficult to definitely attribute this increase to spray effects in light of the large fluctuations in staphylinid catches throughout this study, it was substantial in terms of its magnitude.

Block 9 - Atlox and water

Overall terrestrial arthropod catches (exclusive of Coleoptera: Staphylinidae) in Block 9 were very similar to those in Block 8 (Fig. 7). There was no observed knockdown of budworm larvae, however large numbers of purple-striped and yellow-striped spruce shoot worms, Zeiraphora destitutana (Walker) and Z. canadensis (Matuura and Freeman) respectively, were collected (Table 8). Diptera were affected by the first application only, as fluctuations were similar to those in the control plot for the second application. A slight increase was observed after both applications for Hemiptera, and after the second application only for Araneida, Homoptera, and Mecoptera (Table 8).

SUMMARY AND CONCLUSIONS

Differences in the deposit of emitted sprays are not yet available for consideration in this report, and may greatly affect the conclusions reached when taken into account.

Knockdown on Block 6 (1.8D + 6N) was more pronounced than on any other block, and more diversified, including a number of groups (orders) which were not affected on the other blocks. Knockdown on Block 8 (1.8D + 585) was, however, comparable to that on Block 9, (Atlox + H_2O), and less than that of Blocks 2 (180 F + H_2O) and 4 (180 F + 585), suggesting that the sunspray 6 N was either the more toxic element of the Block 6 formulation or greatly increased the deposit of active ingredient over water or 585 based treatments. The new flowable MATACIL (180 F) formulations appeared to exert a slightly greater knockdown effect than the original 1.8D formulation. No prominent differences were noted between the water and oil based sprays of the flowable MATACIL, although the water based treatment

appeared to be more effective on Lepidoptera. Some of the effects of the water based spray may be attributable to Atlox, as a short term knockdown effect was documented on Block 9 (Atlox + H O).

ACKNOWLEDGMENTS

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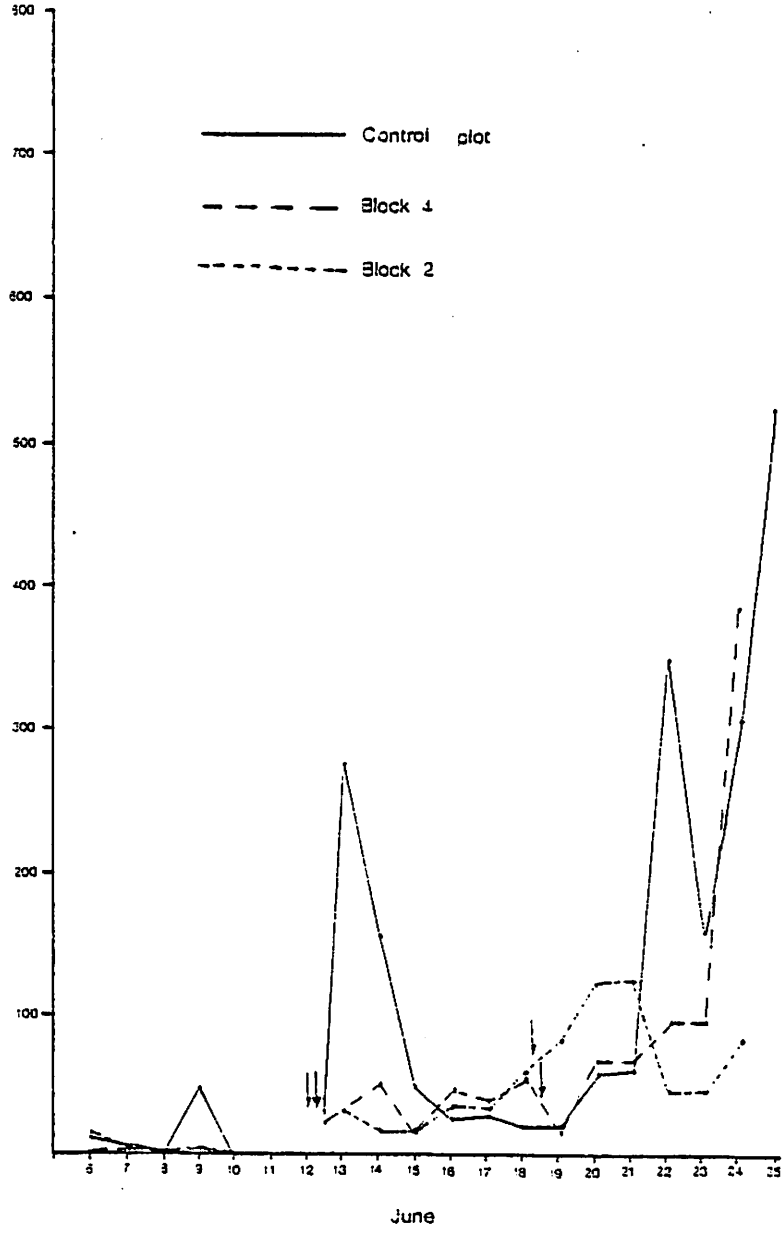

Fig. 1. Coleoptera: Staphylinidae catches in knock-down buckets - untreated control plot and treatment blocks 2 and 4, Bathurst, N.B. 1981.

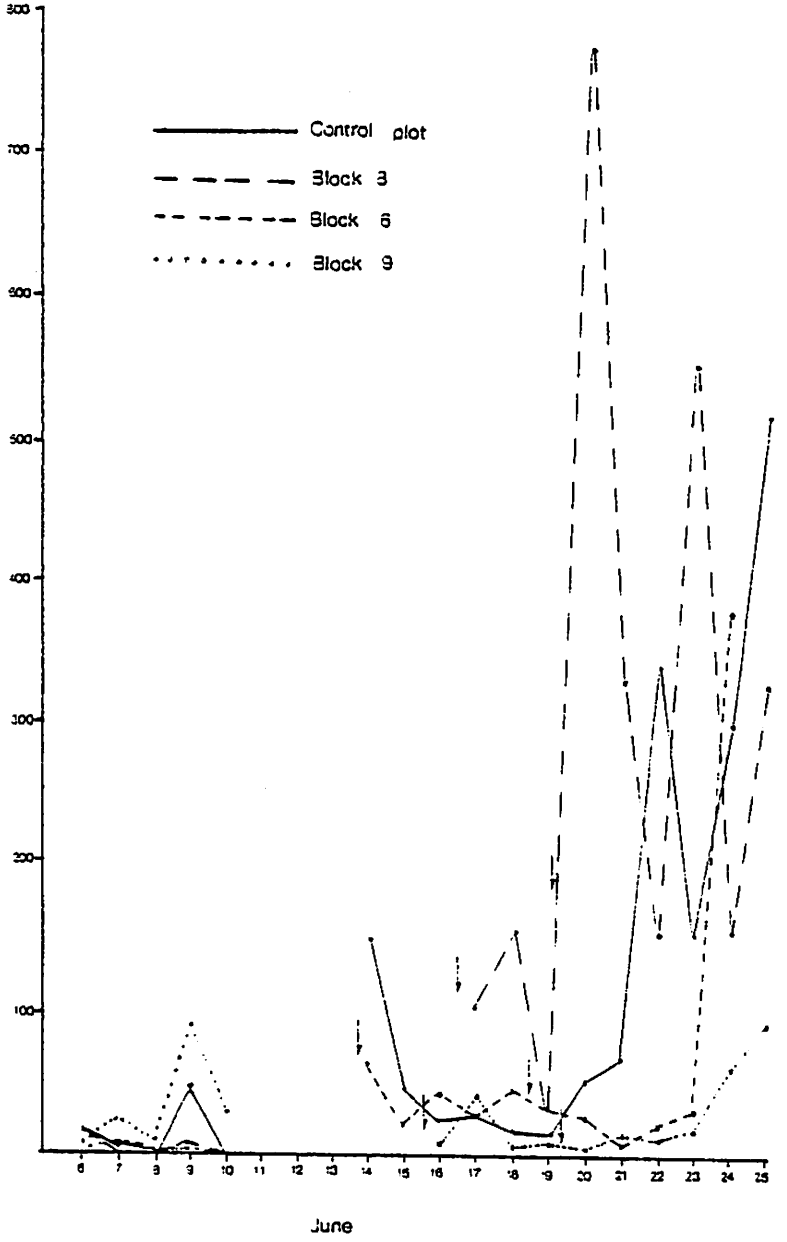

Fig. 2. Coleoptera: Staphylinidae catches in knock-down buckets - untreated control plot and treatment blocks 6, 8 and 9. Bathurst, N.B. 1981.

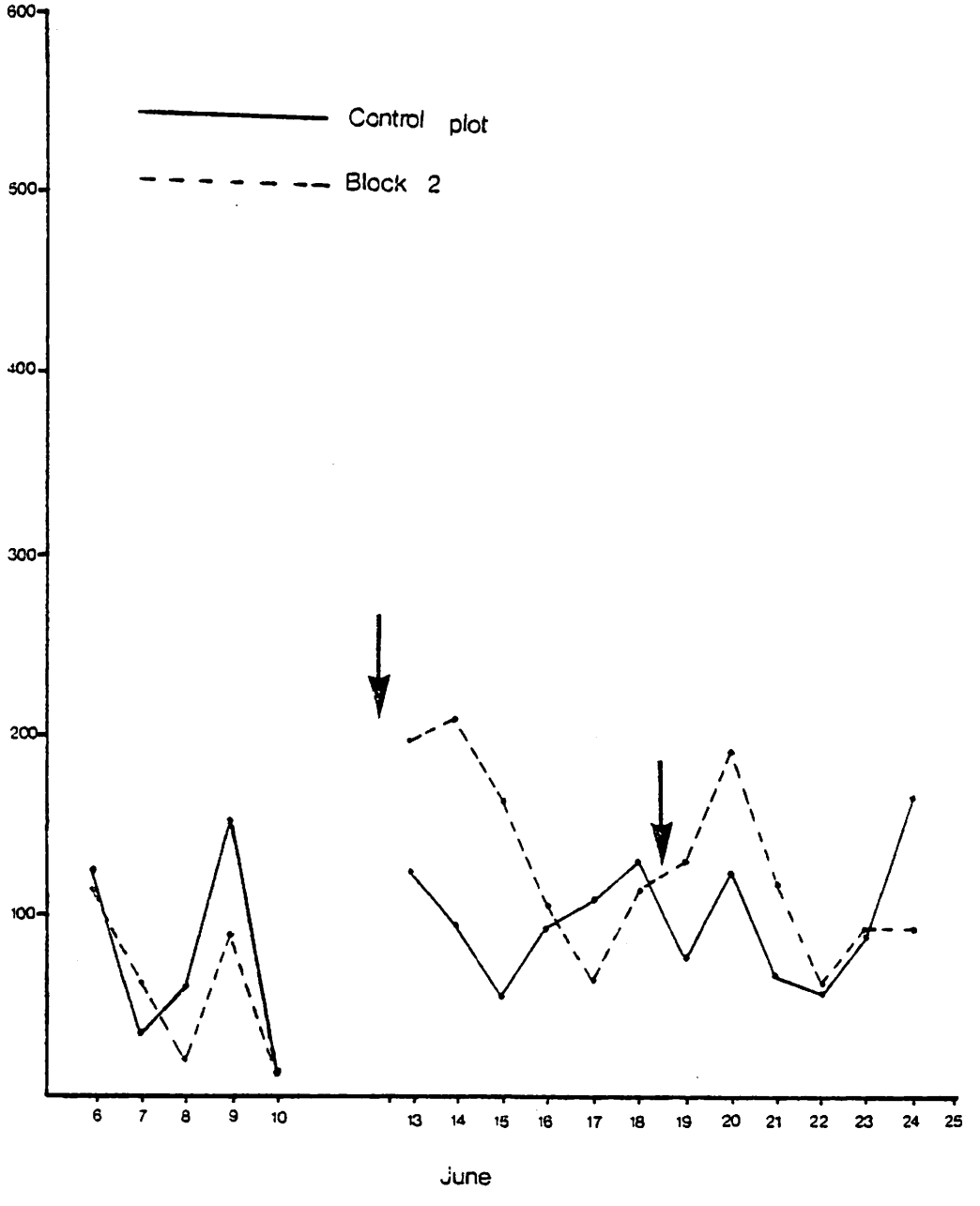

Fig. 3. Terrestrial arthropod catches (excluding Coleoptera: Staphylinidae) in knockdown buckets - untreated control plot and treatment block 2. Bathurst, N.B. 1981.

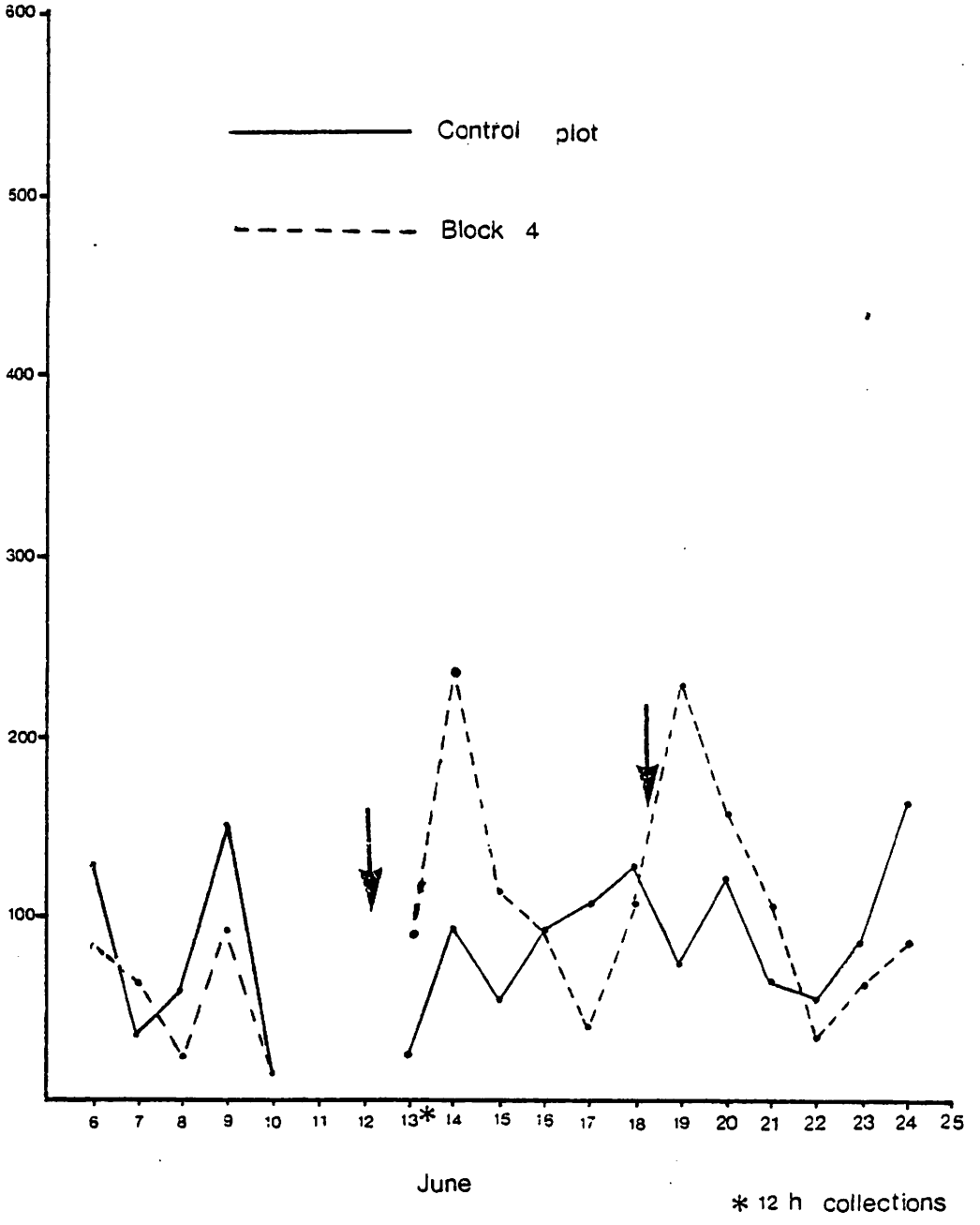

Fig. 4. Terrestrial arthropod catches (excluding Coleoptera: Staphylinidae) in knockdown buckets - untreated control plot and treatment block 4. Bathurst, N.B. 1981.

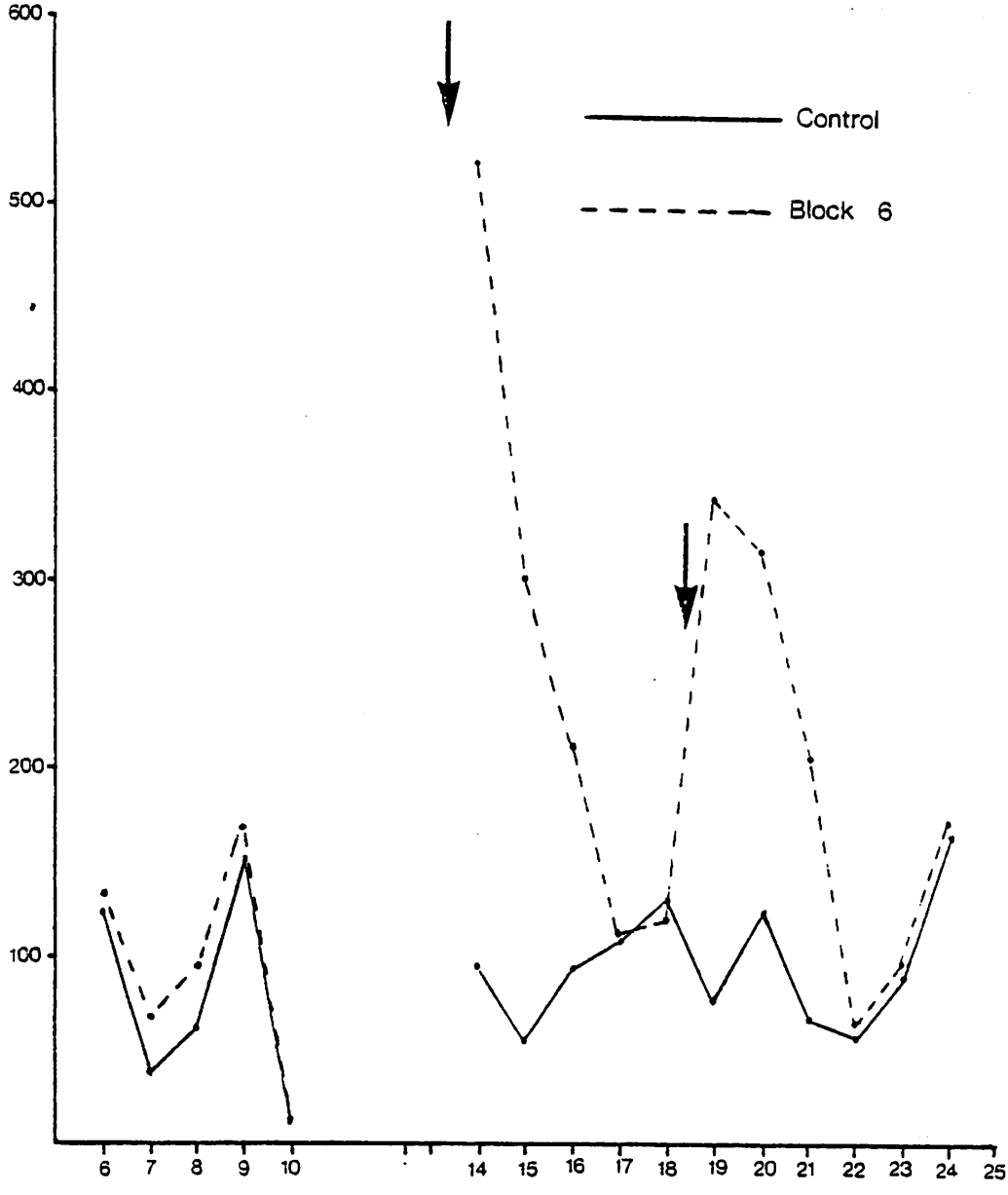

Fig. 5. Terrestrial arthropod catches (excluding Coleoptera: Staphylinidae) in knockdown buckets - untreated control plot and treatment block 6. Bathurst, N.B. 1981.

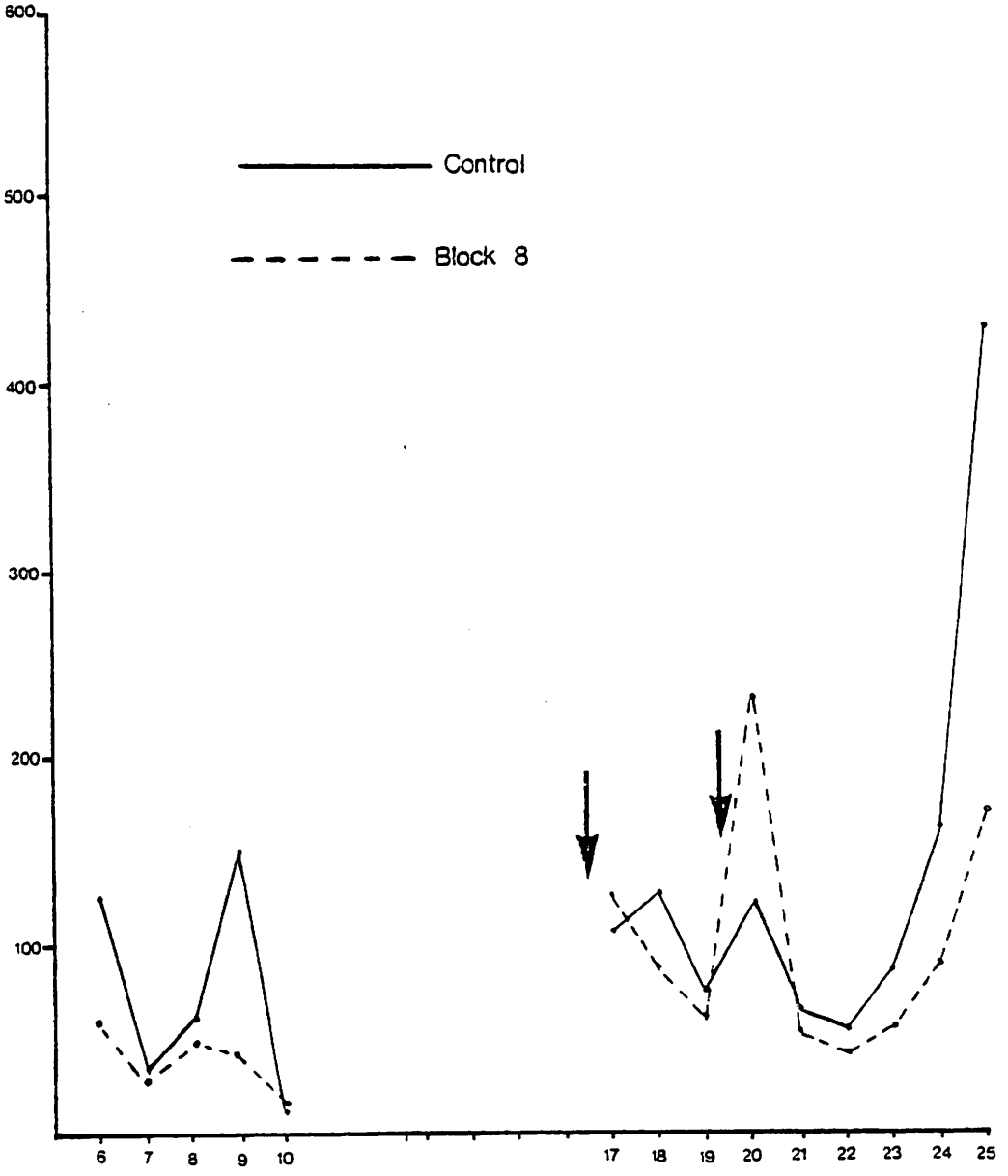

Fig. 6. Terrestrial arthropod catches (excluding Coleoptera: Staphylinidae) in knockdown buckets - untreated control plot and treatment block 8. Bathurst, N.B. 1981.

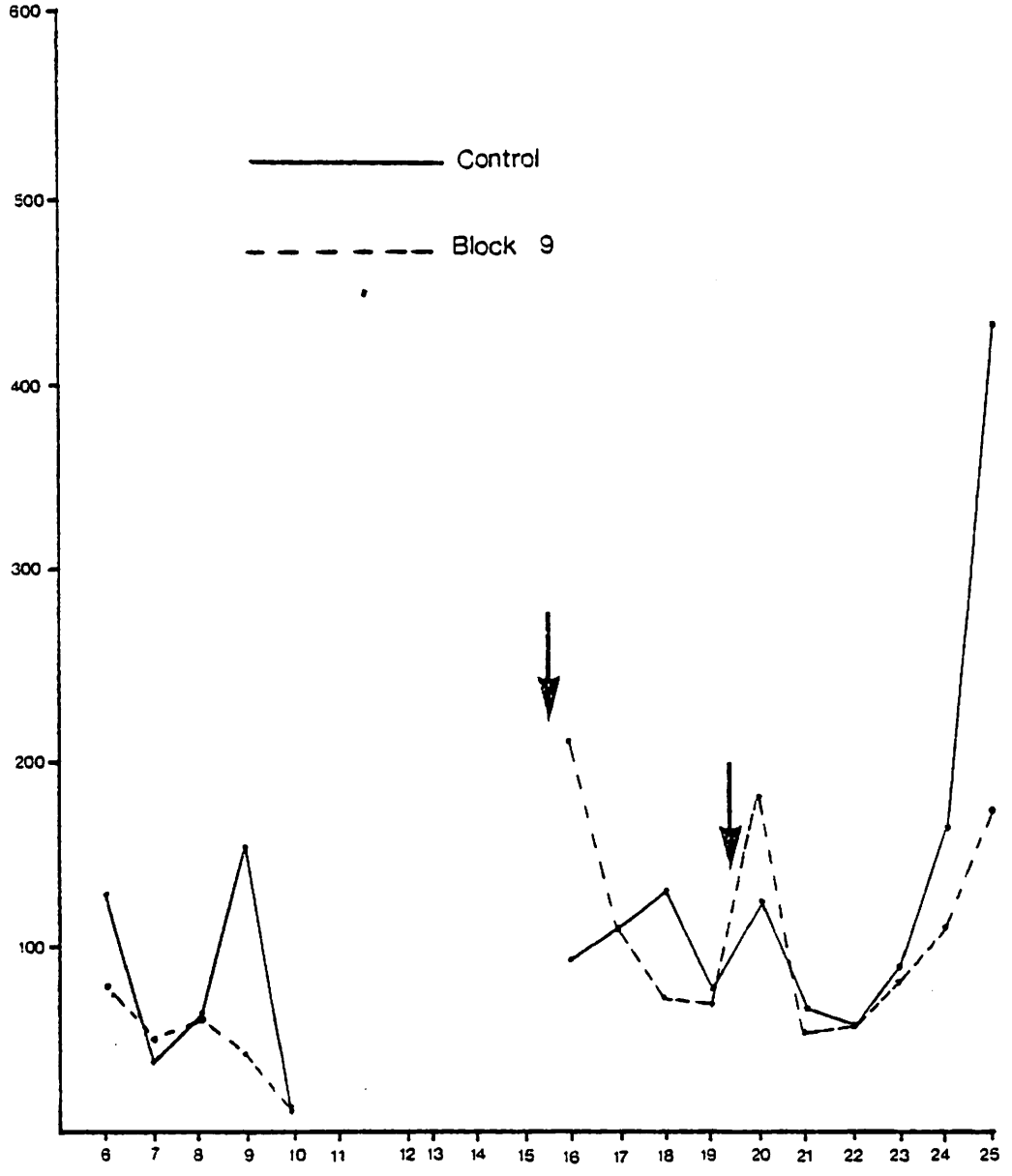

Fig. 7. Terrestrial arthropod catches (excluding Coleoptera: Staphylinidae) in knockdown buckets - untreated control plot and treatment block 9. Bathurst, N.B. 1981.

Table 3
Terrestrial arthropod knockdown from balsam fir
Untreated control plot
Bathurst, New Brunswick
6-25 June 1981

	June 6	June 7	June 8	June 9	June 10	June 13 (12h)	June 13 (24h)	June 14	June 15	June 16	June 17	June 18	June 19	June 20	June 21	June 22	June 23	June 24	June 25
Acarina	–	–	–	–	–	–	2	–	2	–	–	–	–	–	–	–	–	–	–
Araneida	–	1	–	–	1	2	2	4	2	–	1	1	2	1	2	1	3	1	1
Protura	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–
Collembola	–	–	–	2	–	–	3	–	–	–	11	14	2	3	1	–	–	1	1
Ephemeroptera	1	–	–	1	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–
Plecoptera	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–
Psocoptera	1	–	–	–	–	–	–	2	1	–	–	1	–	–	1	–	–	–	–
Homoptera	1	–	2	3	–	–	–	–	–	1	1	1	3	1	2	2	–	–	4
Coleoptera: Staphylinidae	14	4	1	47	–	30	272	152	47	25	28	20	14	60	69	343	157	303	519
Others	5	1	1	4	–	1	1	7	3	1	3	8	9	3	4	–	4	1	2
Neoptera	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	1
Lepidoptera: Balsam larvae	5	1	2	1	–	2	4	4	–	3	2	2	1	7	3	2	3	1	8
Others	4	–	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	1	–
Diptera	101	28	56	132	11	19	98	74	46	88	86	94	53	96	38	45	59	140	358
Hymenoptera	6	–	–	8	–	3	13	4	2	2	3	8	5	12	17	8	21	44	61
Total Arthropoda	138	37	60	198	12	58	397	247	103	120	137	148	90	184	137	401	247	492	953

Table 4
Terrestrial arthropod knockdown from balsam fir,
Treatment Block 2*
Bathurst, New Brunswick
6-24 June 1981

	PRESPRAY					POSTSPRAY I						POSTSPRAY II					
	June 6	June 7	June 8	June 9	June 10	June 13	June 14	June 15	June 16	June 17	June 18	June 19	June 20	June 21	June 22	June 23	June 24
Acarina																	
Araneida	6	2	1	2	1	8	7	1	3	4	1	8	1	–	–	2	–
Protura	–	–	–	–	–	–	–	–	–	–	3	–	–	–	–	–	–
Collembola	–	–	–	1	1	2	–	2	–	4	3	3	–	1	4	–	–
Ephemeroptera	1	–	1	1	–	–	–	2	–	1	1	1	–	1	–	4	2
Plecoptera	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–
Psocoptera	–	2	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–
Thysanoptera	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–
Hemiptera	1	–	–	–	–	–	–	1	1	–	–	1	1	–	–	1	–
Homoptera	–	1	–	–	–	–	1	2	2	–	5	3	5	5	–	1	5
Coleoptera: Staphylinidae	17	5	2	7	–	34	19	20	37	29	59	80	121	122	43	45	82
Other	3	4	1	2	–	1	2	6	–	–	1	10	3	1	–	1	1
Neoptera	–	–	–	–	–	–	–	–	–	1	1	–	1	–	–	1	–
Lepidoptera: Budworm larvae	3	2	1	2	–	39	45	35	12	3	10	45	23	6	3	8	4
Others	–	–	–	–	–	–	–	–	–	1	1	–	2	–	–	–	1
Diptera	105	51	18	75	10	146	149	111	83	48	83	150	138	100	49	63	71
Hymenoptera	–	2	1	2	–	2	9	4	3	2	6	6	11	4	3	10	12
Total Arthropoda	136	70	25	94	12	232	233	185	143	94	177	309	308	241	103	136	178

* treated 12 June AM and 18 June AM with 70 g/ha MATACIL 180 F applied as an emulsion in water.

Table 5
Terrestrial arthropod knockdown from balsam fir,
Treatment Block 4*
Bathurst, New Brunswick
6-24 June 1981.

	PRESPRAY					POSTSPRAY I						POSTSPRAY II					
	June 6	June 7	June 8	June 9	June 10	June 13**	June 14	June 15	June 16	June 17	June 18	June 19	June 20	June 21	June 22	June 23	June 24
Acarina	–	1	–	–	–	1	31	1	–	3	4	2	2	1	–	–	–
Araneida	1	2	–	3	1	8	4	2	1	1	3	4	1	2	1	4	1
Protura	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Collembola	–	1	–	2	–	–	3	–	–	4	22	1	2	1	1	–	–
Ephemeroptera	–	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	–
Plecoptera	2	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–
Psocoptera	–	1	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–
Hemiptera	–	1	–	1	–	–	–	–	–	–	–	–	–	–	–	1	–
Homoptera	–	1	1	–	–	–	5	5	1	1	4	3	4	5	1	6	3
Coleoptera: Staphylinidae	1	3	–	5	–	25	51	18	45	35	58	19	66	65	91	90	382
Other	1	2	1	–	–	1	1	3	1	3	2	2	1	1	–	2	–
Mecoptera	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–
Lepidoptera: Budworm larvae	–	2	–	3	–	16	25	13	15	4	6	23	20	8	1	6	–
Other	1	–	–	–	–	1	2	–	–	–	3	–	2	1	1	–	1
Diptera	76	48	22	82	11	58	168	88	72	25	68	181	119	82	33	47	77
Hymenoptera	3	6	1	4	–	4	5	5	4	2	6	10	9	13	1	4	13
Total Arthropoda	85	68	25	101	12	114	292	135	139	79	174	246	227	178	130	159	476

* treated 12 June PM and 18 June AM with 70 g/ha MATACIL 180 F applied in insecticide Diluent 585.
** 12 h collection after spray application (all other collections of approximately 24 h duration).

Table 6
Terrestrial arthropod knockdown from balsam fir
Treatment Block 6*
Bathurst, New Brunswick
6-24 June 1981

		PRESPRAY					POSTSPRAY 1					POSTSPRAY 1					
		June 6	June 7	June 8	June 9	June 10	June 14	June 15	June 16	June 17	June 18	June 19	June 20	June 21	June 22	June 23	June 24
Acarina																	
Araneida		4	1	–	4	–	10	6	–	–	1	8	2	2	3	2	–
Collembola		1	2	4	2	–	7	–	–	8	48	1	2	4	2	–	1
Ephemeroptera		–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–
Plecoptera		–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	–
Psocoptera		–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–
Thysanoptera		–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–
Hemiptera		–	–	1	–	–	1	1	–	–	1	1	7	1	–	1	–
Homoptera		–	1	–	4	–	5	7	–	2	7	5	6	2	–	1	1
Coleoptera:	Staphylinidae	2	8	2	2	–	61	24	44	27	48	31	26	11	23	29	380
	Other	3	1	–	2	–	11	4	1	2	8	7	12	7	–	2	6
Trichoptera		–	–	–	–	–	1	–	–	–	1	–	1	1	–	–	–
Lepidotera:	Budworm larvae	3	2	–	–	–	141	60	46	15	17	61	35	22	3	7	2
	Other	–	–	2	1	2	–	2	–	11	18	–	10	4	3	5	5
Diptera		109	59	85	152	9	313	212	161	76	119	230	234	122	43	71	150
Hymenoptera		8	1	2	3	–	34	6	3	4	3	20	7	1	4	5	8
Total Arthropoda		131	75	96	172	11	585	325	258	146	271	371	345	219	84	126	553

* treated 13 June AM and 18 June AM with 70 g/ha MATACIL 1.8 D applied in Sunspray 6N oil.

Table 7
Terrestrial arthropod knockdown from balsam fir
Treatment Block 8*
Bathurst, New Brunswick
6-25 June 1981

	PRESPRAY					POSTSPRAY I			POSTSPRAY II					
	June 6	June 7	June 8	June 9	June 10	June 17	June 18	June 19	June 20	June 21	June 22	June 23	June 24	June 25
Acarina	–	6	2	–	–	7	–	–	–	–	–	–	–	–
Aranefda	2	1	1	3	–	12	2	1	5	–	1	3	2	2
Protura	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Collembola	–	–	–	2	2	11	16	–	1	1	–	2	–	–
Thysanura	–	–	–	–	–	1	–	–	–	–	–	–	–	–
Psocoptera	–	–	–	–	–	1	–	–	1	–	–	–	–	–
Hemiptera	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Homoptera	1	–	–	–	1	3	1	1	14	2	5	2	–	11
Coleoptera: Staphylinidae	15	1	–	4	–	104	163	32	771	330	159	552	157	330
Other	3	1	–	2	–	1	3	2	4	–	1	1	2	5
Mecoptera	–	–	–	–	–	–	–	–	1	–	–	–	–	–
Lepidoptera: Budworm larvae	–	–	1	–	2	29	22	22	47	5	7	13	5	4
Other	–	–	–	–		–	2	2	–	2	–	2	–	–
Diptera	54	20	44	33	10	61	33	34	144	47	24	33	64	134
Hymenoptera	1	–	1	–	–	3	5	5	18	1	5	12	13	15
Total Arthropoda	76	29	49	44	15	231	247	99	1003	386	204	619	243	501

* treated 16 June AM and 19 June AM with 70 g/ha MATACIL 1.8 D applied in Insecticide Diluent 585.

Table 8
Terrestrial arthropod knockdown from balsam fir
Treatment Block 9*
Bathurst, New Brunswick
6–25 June 1981

	PRESPRAY					POSTSPRAY I				POSTSPRAY II					
	June 6	June 7	June 8	June 9	June 10	June 16	June 17	June 18	June 19	June 20	June 21	June 22	June 23	June 24	June 25
Pseudoscorpionida	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Chilopoda	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–
Araneida	1	1	–	–	2	2	–	1	2	4	3	–	2	1	–
Opilionida	–	1	–	–	–	–	5	7	–	1	–	–	–	–	–
Collembola	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–
Protura	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–
Diptera	–	–	–	–	–	1	1	–	–	2	1	–	–	–	–
Hemiptera	1	–	1	1	–	2	–	–	–	4	2	4	3	4	5
Homoptera	6	24	8	83	30	13	40	7	15	4	11	14	20	62	90
Coleoptera: Staphylinidae	–	2	4	1	–	4	1	3	5	2	1	–	3	–	3
Other	–	–	–	–	–	–	1	–	–	5	–	1	1	1	2
Neoptera	–	–	–	1	–	–	1	1	4	3	–	–	–	3	2
Lepidoptera: Bud worm larvae	1	5	3	3	1	1	7	11	24	47	5	1	–	2	2
Other	68	37	50	34	9	194	91	48	29	100	42	48	60	87	146
Diptera	4	1	–	4	–	6	3	3	6	14	1	7	13	18	13
Hymenoptera															
Total Arthropoda	82	72	66	127	42	224	150	81	85	186	66	76	102	178	263

* treated 15 June PM and 19 June AM with Arlox and water.