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RECORDS OF CADDIS FLIES (TRICHOPTERA) FROM ROTHAMSTED LIGHT TRAPS AT FIELD CENTRES

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ABSTRACT

With 49 species recorded, compared with 47 at Rhyd-y-Creuau, Preston Montford has the richest caddis fly fauna of the seven F.S.C. Field Centres for which light trap data are available. Both these sites are close to large rivers, but it is interesting that the Preston Montford trap is not visible from the water. Flatford Mill, on another river, has 31 species: three fewer than Nettlecombe which has only a small stream and isolated ponds in its vicinity. The western Centres have fewest species; Slapton Ley and Orielton, both reasonably close to lakes, each gave 22 species, whilst the trap at Dale Fort yielded 16 despite its position on a windswept headland some distance from any likely larval habitat.

The species lists and associated information on flight periods are published to support the regular observations of caddis larvae made at the Field Centres.

INTRODUCTION

THE Rothamsted Insect Survey was started in 1964 to monitor changes in insect populations, particularly of Macrolepidoptera. It is based on the Rothamsted light trap (Williams, 1948) using a 200w tungsten filament lamp, operating during the hours of darkness all through the year. The light traps are sited throughout Great Britain, some having been in use since the beginning of the survey, and others for shorter periods. At the end of 1979 there were 165 traps in operation out of a total of 411 traps listed. Records of Macrolepidoptera are stored and analysed at Rothamsted and have been the source of a number of papers. Information has been collected on a less regular basis for some other insect groups. Thus, specimens of Trichoptera have been picked out from the catches at 72 sites, principally during the years 1964 to 1971.

All the F.S.C. Field Centres, except Epping Forest and Juniper Hall, have operated light traps of the survey; caddis flies have been sent to Reading from all except that at Malham Tarn. The present study presents results from the other seven Field Centres for the years indicated in Table 1.

Caddis flies are normally caught in light traps from late April until December. In Table 1 a continuous record is indicated if catching covers this entire period, but where there are breaks, the year is entered as an incomplete record.

HANDLING OF CATCHES AND RECORDS

In each light trap, insects were caught in a glass jar lined with plaster of Paris impregnated with tetrachlorethane as a killing agent. The jar was emptied daily. The caddis flies were picked out and sent to Reading as dry specimens for identification, sexing and recording. No attempt was made to pick out the minute Hydroptilidae from large numbers of other small insects because of the labour involved. In very large catches, the larger species of caddis were first picked out and then the remaining mass of small insects was sub-sampled to give an estimate of numbers. Many

Table 1. *The years during which Trichoptera were separated out from Rothamsted light trap catches at seven Field Centres. (x, a continuous record; x, an incomplete record.)*

Site No.	Field Centre	'64	'65	'66	'67	'68	'69	'70	'71	'78
71	Rhyd-y-Creuau				x		x			
17	Dale Fort	x	x	x	x	x	x	x		
73	Orielton				x	x				
53	Preston Montford			x	x		x			
18	Flatford Mill	x	x	x	x	x	x			
92	Nettlecombe Court					x	x	x	x	
67	Slapton Ley				x	x	x	x	x	x

caddis had to be soaked in a 5% solution of potassium hydroxide for a few hours, to bring about protrusion of genitalia and softening of other parts, before they could be identified.

Caddis flies were identified from Mosely (1939), from the several papers listed by Kimmins (1966) in his check-list of the British Trichoptera, and from Macan (1973). The check-list is followed for the names of species and their order, except for the genera *Hydropsyche* and *Athripsodes*. Specimens identified as *Hydropsyche instabilis* from Mosely (1939) are recorded here as *H. siltalai*, since it was not possible to re-examine the material. Babcock (1978) has given an account of the recent controversy over these species. Certain species of the genus *Athripsodes* are now assigned to *Ceraclea* (Morse, 1975). Thus, in Britain, *Athripsodes* includes only *albifrons, aterrimus, bilineatus, cinereus* and *commutatus*, while *Ceraclea* includes *albimacula, annulicornis, dissimilis, fulva, nigronervosa* and *senilis*.

While records have been kept of each night's catch of caddis, in the histograms they are given as weekly totals. The Rothamsted Insect Survey uses a year of exactly 52 numbered weeks by leaving out 29 February and 31 December. This omission has no effect on the caddis records because it is unusual for any to be captured during these winter months.

RECORDS OF TRICHOPTERA

The total catches of Trichoptera for years with continuous records are listed in Tables 2, 3 and 4. Numbers caught in years with incomplete records are not given,

Table 2. *Numbers of Trichoptera caught in Rothamsted light traps, in years with continuous records, at Rhyd-y-Creuau, Dale Fort and Orielton.*

	Rhyd-y-Creuau		Dale Fort				Orielton
	1967	1969	1965	1966	1967	1969	1967
RHYACOPHILIDAE							
Rhyacophila dorsalis (Curt.)	64	34					
R. obliterata McL.	1						
R. munda McL.	3	1					
Glossosoma boltoni Curt.	4139	*c.* 5206					
Agapetus ochripes Curt.	15	425					
A. delicatulus McL.	7	*c.* 105					

POLYCENTROPODIDAE							
Plectrocnemia conspersa (Curt.)	4	11					5
P. geniculata McL.		2				1	1
Polycentropus flavomaculatus (Pict.)	53	67					
P. kingi McL.	1	18					
Cyrnus trimaculatus (Curt.)	2	24					
PSYCHOMYIIDAE							
Tinodes waeneri (L.)	124	40					2
Psychomyia pusilla (F.)	38	*c.* 1098					
HYDROPSYCHIDAE							
Hydropsyche pellucidula (Curt.)		101					
H. angustipennis (Curt.)							2
H. siltalai Döhler	59	21					
PHRYGANEIDAE							
Phryganea grandis L.							1
LIMNEPHILIDAE							
Drusus annulatus (Steph.)	32	30					
Ecclisopteryx guttulata (Pict.)	5	2					
Limnephilus rhombicus (L.)	13						
L. flavicornis (F.)	1						3
L. marmoratus Curt.	6	5	2		4	11	72
L. lunatus Curt.	14	5	19	21	12	6	42
L. luridus Curt.	3	5					
L. elegans Curt.	2	1					
L. affinis Curt.	2		8	8	6	7	6
L. centralis Curt.	3	6					4
L. sparsus Curt.	13	8	1	1		4	14
L. auricula Curt.	2		3	11	16	14	13
L. vittatus (F.)	1		10	16	4	9	6
L. extricatus McL.	1	1					
Glyphotaelius pellucidus (Retz.)						1	2
Anabolia nervosa (Curt.)	8						
Potamophylax latipennis (Curt.)		2					
P. cingulatus (Steph.)	7	2					
Halesus radiatus (Curt.)	26	10		1			7
H. digitatus (Schrank)			1				
Stenophylax permistus McL.		2		1	1		
S. vibex (Curt.)		1	1	3	1		
S. lateralis (Steph.)		1					1
S. sequax (McL.)						1	
Hydatophylax infumatus (McL.)	1						
Chaetopteryx villosa (F.)	3						1
ODONTOCERIDAE							
Odontocerum albicorne (Scop.)	3	10					1
LEPTOCERIDAE							
Ceraclea albimacula (Ramb.)	1						
C. dissimilis (Steph.)	9	12					
Mystacides azurea (L.)		1					
Oecetis lacustris (Pict.)	4						
O. testacea (Curt.)	1	2					
GOERIDAE							
Goera pilosa (F.)	8	95					
Silo pallipes (F.)	5	4				1	
LEPIDOSTOMATIDAE							
Lepidostoma hirtum (F.)	207	*c.* 3789					7
Total Trichoptera	4891	*c.* 11147	45	62	44	55	190
Limnephilidae, % of total	2.9	0.7	100	100	100	96.5	90.0
Total number of species	47			14			19

Table 3. *Numbers of Trichoptera caught in Rothamsted light traps, in years with continuous records, at Preston Montford and Flatford Mill.*

	Preston Montford			Flatford Mill		
	1966	1967	1969	1966	1967	1969
RHYACOPHILIDAE						
Rhyacophila dorsalis (Curt.)	5	2	1			
Glossosoma conformis Neb.	7		1			
G. boltoni Curt.	3	1	22			
Agapetus ochripes Curt.	*c.* 748	*c.* 5268	*c.* 30647			
A. delicatulus McL.	1					
POLYCENTROPODIDAE						
Plectrocnemia conspersa (Curt.)			2		1	
Polycentropus flavomaculatus (Pict.)		9	28		10	110
Holocentropus picicornis (Steph.)			1			
Cyrnus trimaculatus (Curt.)				4	44	54
C. flavidus McL.	1					
PSYCHOMYIIDAE						
Tinodes waeneri (L.)			4	77	178	1362
Psychomyia pusilla (F.)	*c.* 8301	*c.* 10697	*c.* 194			
Lype phaeopa (Steph.)						1
HYDROPSYCHIDAE						
Hydropsyche pellucidula (Curt.)	*c.* 386	286	487			1
H. angustipennis (Curt.)					7	11
H. contubernalis McL.	*c.* 521	161	1463			
PHRYGANEIDAE						
Phryganea grandis L.	2	1		2		8
LIMNEPHILIDAE						
Limnephilus rhombicus (L.)			1		1	
L. flavicornis (F.)	3	8	6	1		5
L. marmoratus Curt.	1			7	2	2
L. lunatus Curt.	25	13	4	32	21	51
L. ignavus McL.			1			
L. bipunctatus Curt.	1		3			
L. affinis Curt.	1	1	6	38	34	22
L. hirsutus (Pict.)	2	1				
L. sparsus Curt.	1	4				
L. auricula Curt.	5	2	4	1	2	3
L. vittatus (F.)	21	22	16		1	
L. fuscicornis (Ramb.)		1	1			
Grammotaulius atomarius (F.)	2		1			
Glyphotaelius pellucidus (Retz.)	1			2	2	
Anabolia nervosa (Curt.)	1	9	2	9	15	22
Rhadicoleptus alpestris (Kol.)		1				
Potamophylax cingulatus (Steph.)		1				
P. rotundipennis (Brauer)		1				
Halesus radiatus (Curt.)	91	12		1		19
H. digitatus (Schrank)	16	5				
Stenophylax permistus McL.	19	3	3			
S. vibex (Curt.)	1					
MOLANNIDAE						
Molanna angustata Curt.				2	19	
ODONTOCERIDAE						
Odontocerum albicorne (Scop.)			5			105

LEPTOCERIDAE						
Athripsodes cinereus (Curt.)			1			1
Ceraclea albimacula (Ramb.)		2				
C. annulicornis (Steph.)	*c.* 72		2			
C. dissimilis (Steph.)	51	121	140			
C. fulva (Ramb.)		1	1			
Mystacides nigra (L.)	1		5		2	10
M. azurea (L.)			1		1	1
Oecetis ochracea (Curt.)					6	
O. lacustris (Pict.)		1	1	1	92	289
Setodes punctatus (F.)		2	30			
GOERIDAE						
Goera pilosa (F.)		3	30			1
LEPIDOSTOMATIDAE						
Crunoecia irrorata (Curt.)		1				
Lepidostoma hirtum (F.)	38	30	125			
Total Trichoptera	*c.* 10328	*c.* 16670	*c.* 33239	177	438	2078
Limnephilidae, % of total	1.8	0.5	0.1	51.4	17.8	6.0
Total number of species		49			26	

Table 4. *Numbers of Trichoptera caught in Rothamsted light traps, in years with continuous records, at Nettlecombe Court and Slapton Ley.*

	Nettlecombe Court			Slapton Ley				
	1968	1969	1971	1967	1968	1969	1971	1978
RHYACOPHILIDAE								
Rhyacophila dorsalis (Curt.)	4	4	1		2	4	1	
R. obliterata McL.	4	1	1					
R. munda McL.			3					
Glossosoma boltoni Curt.	14	18	1	1		1	2	
Agapetus ochripes Curt.			8					
A. delicatulus McL.	*c.* 689	486	689					
PHILOPOTAMIDAE								
Wormaldia occipitalis (Pict.)	2	1						
POLYCENTROPODIDAE								
Plectrocnemia conspersa (Curt.)	8	14	3	2	4	2	3	
Polycentropus flavomaculatus (Pict.)	3	5		1				
P. kingi McL.							1	
PSYCHOMYIIDAE								
Ecnomus tenellus (Ramb.)							2	
HYDROPSYCHIDAE								
Hydropsyche pellucidula (Curt.)	6	4	3					
H. siltalai Döhler		3	6	2	1			
PHRYGANEIDAE								
Phryganea grandis L.								3

LIMNEPHILIDAE								
Drusus annulatus (Steph.)	6	32	18					
Limnephilus rhombicus (L.)	1							
L. flavicornis (F.)		1						
L. marmoratus Curt.	4	19	24	2051	1641	743	604	1242
L. lunatus Curt.	116	57	30	2573	1703	574	131	122
L. affinis Curt.	2	6	1	44	32	14	6	6
L. centralis Curt.				2				
L. sparsus Curt.	7	10	6	1		1	1	
L. auricula Curt.	6	17	60	7	7		3	1
Glyphotaelius pellucidus (Retz.)				4	6	1	5	4
Anabolia nervosa (Curt.)				1	6	1		1
Potamophylax latipennis (Curt.)		2	1					
P. cingulatus (Steph.)	7	9	1					
Halesus radiatus (Curt.)	14	12	7	2	2	3	3	4
H. digitatus (Schrank)	12	19	5			2		
Stenophylax permistus McL.	5	10	3	2	2			
S. vibex (Curt.)	1							
S. sequax (McL.)	2	3	3					
Chaetopteryx villosa (F.)	5	3	1					
ODONTOCERIDAE								
Odontocerum albicorne (Scop.)	1	5				3		
LEPTOCERIDAE								
Mystacides nigra (L.)		1						
GOERIDAE								
Goera pilosa (F.)	3		5					
Silo pallipes (F.)	7	10						
LEPIDOSTOMATIDAE								
Crunoecia irrorata (Curt.)		2						
Lepidostoma hirtum (F.)	10	17	1		1	1	1	
SERICOSTOMATIDE								
Sericostoma personatum (Spence)						1	1	
Total Trichoptera	*c.* 939	771	881	4693	3407	1351	764	1383
Limnephilidae, % of total	20.0	25.9	18.2	99.8	99.8	99.1	98.6	99.8
Total number of species		33				22		

but species from them not otherwise included in the tables for a site are listed below:

Dale Fort: *Glossosoma boltoni* Curt., 1 in 1968
Lepidostoma hirtum (F.), 1 in 1968

Orielton: *Hydropsyche siltalai* Döhler, 1 in 1968
Halesus digitatus (Schrank), 3 in 1968
Stenophylax sequax (McL.), 2 in 1968

Flatford Mill: *Cyrnus flavidus* McL., 1 in 1965
Hydropsyche siltalai Döhler, 1 in 1965
Limnephilus politus McL., 1 in 1965
L. sparsus Curt., 1 in 1965, 1 in 1968
Ceraclea senilis (Burm.) 1 in 1965

Nettlecombe Court: *Limnephilus centralis* Curt., 1 in 1970

All the species recorded here from Field Centres are widely distributed and often common, except for *Setodes punctatus*, of which 22 males and 10 females were caught at Preston Montford. This record is of some interest because the only other known locality in Britain is from the River Wye (I. D. Wallace, *in litt.*).

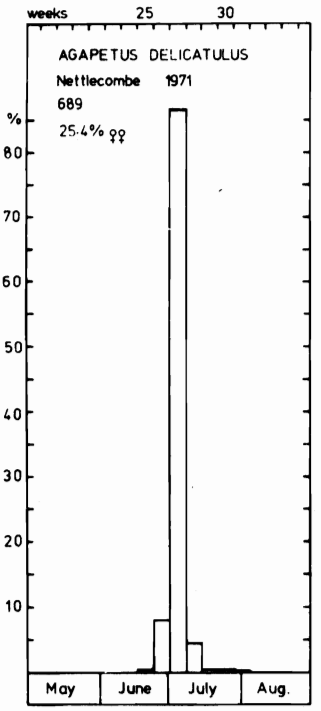
There appear to be no published records of Trichoptera from the immediate vicinity of any of the seven Field Centres considered in this paper. We are indebted to the Warden at Preston Montford for a species list from that Centre, in which *Ceraclea nigronervosa* (Retzius) and *Brachycentrus subnubilus* Curt. from the River Severn are additional to those already recorded from the light trap. These two species are listed with *Agapetus fuscipes* Curt., *Athripsodes albifrons* (L.), *Triaenodes bicolor* (Curt.) and *Silo nigricornis* (Pict.), as common and widely distributed caddis flies known to be day-fliers which have not been caught in any of the survey light traps (Crichton, Fisher & Woiwod, 1978). Although most caddis flies are active in the evening or at night, it should be remembered that there are some which fly only in the daytime, so that a light trap gives an incomplete picture of the caddis fauna of a locality.

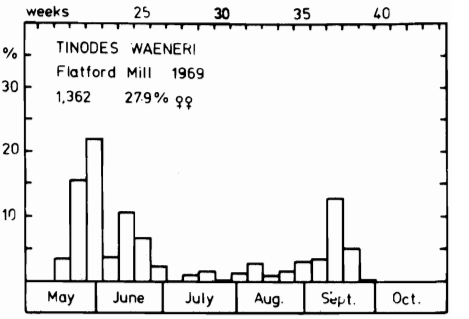
In addition to the number of species from each site and the total individuals for each year of trapping, Tables 2, 3 and 4 give the numbers of Limnephilidae as a percentage of the total catch. The limnephilids are the larger and longer-lived caddis flies which are known to disperse far from water. They represented the whole catch at Dale Fort in three of the four years of trapping, and in the catches at Slapton Ley 98–99% were members of this family. Few catches would be expected at Dale Fort because of its exposed coastal position on a rocky headland. It is of interest to note that the larvae of *Limnephilus affinis* were found, in April 1965, in brackish pools over a mile away from the trap. This is the only limnephilid larva in Britain known to tolerate brackish water, so these pools could have been the source of the adults caught at Dale Fort. The trap at Slapton Ley was not close to water, but the Ley, about half a mile distant, must have been the source of the large numbers of limnephilids. In contrast, limnephilids formed a very small proportion of the catch at Rhyd-y-Creuau and Preston Montford where the traps were situated close to the Rivers Conway and Severn respectively. At these sites the catches were dominated by large numbers of such species as *Glossosoma boltoni, Agapetus ochripes, Psychomyia pusilla, Hydropsyche pellucidula, H. contubernalis* and *Lepidostoma hirtum* which had presumably emerged from the rivers. On many nights the numbers of the smaller species, particularly *A. ochripes* and *P. pusilla* were estimated from sub-samples.

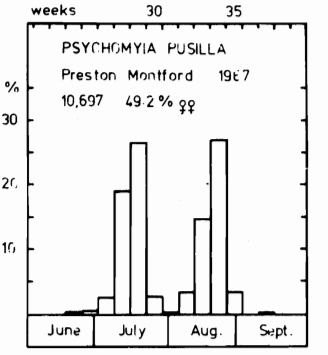
The large catches at Preston Montford are of interest because the light trap was not visible from the River Severn although close to it at the top of a steep wooded bank. It is probable that the caddis were carried up the bank by westerly winds. Preston Montford yielded the largest number of species—49; at Rhyd-y-Creuau there were 47. Nettlecombe Court, with only a small stream and isolated ponds in the vicinity, produced varied and abundant catches, with 34 species represented. Despite the proximity of the River Stour at Flatford Mill the numbers of species and individuals were not large.

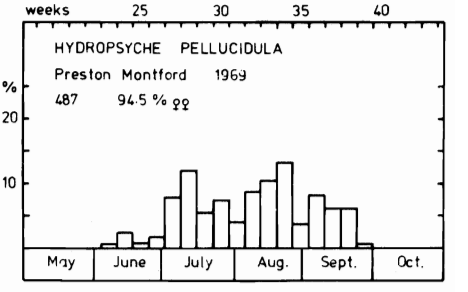
It is to be expected that the larvae of most species of caddis recorded from these traps would be found in the nearby rivers or ponds, although some of the limnephilids may have flown in from more distant habitats. These records may stimulate other workers to find the larvae.

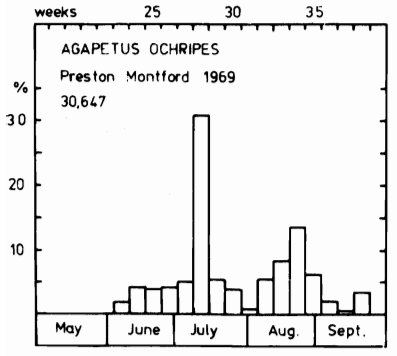
The continuous operation of a light trap gives a record of the period of flight acti-











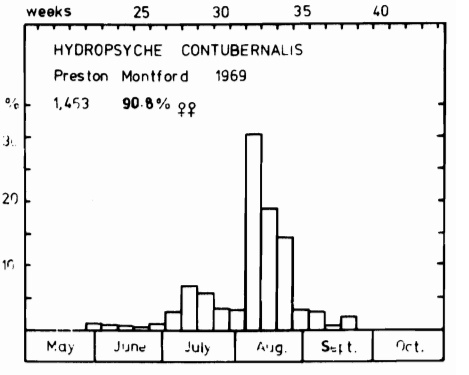
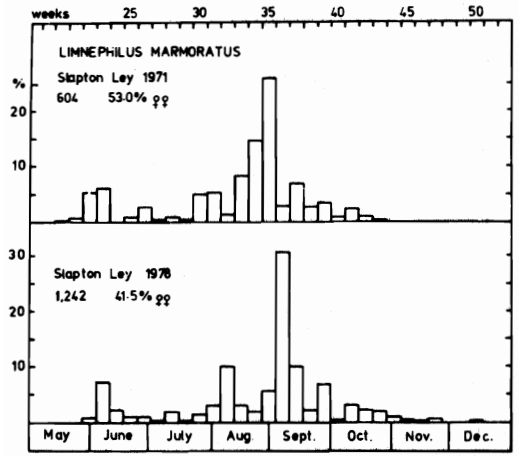
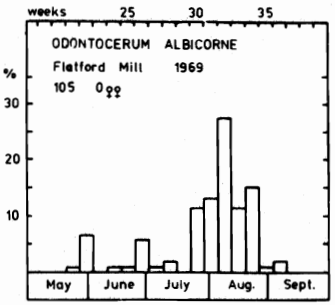
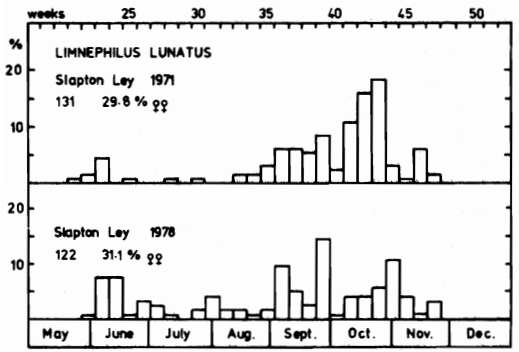


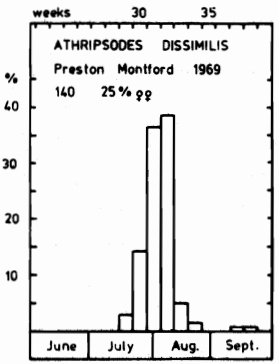
FIG. 1.

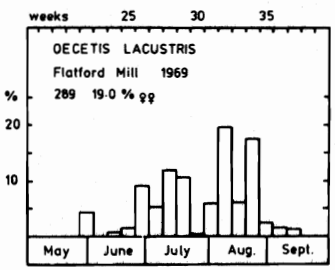
Weekly catches of *Agapetus delicatulus, A. ochripes, Tinodes waeneri, Psychomyia pusilla, Hydropsyche pellucidula* and *H. contubernalis,* expressed as percentages of the total catch for each Field Centre light trap. The total catch and the percentage of females are given for each site.

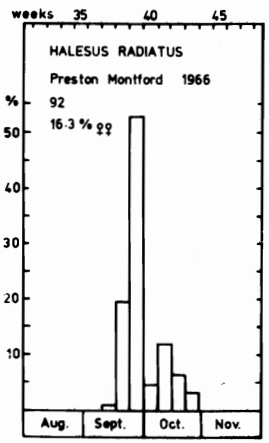












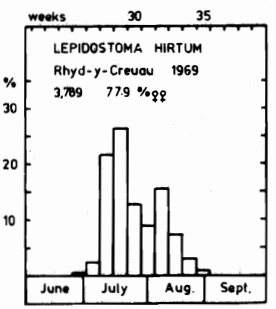


FIG. 2.

Weekly catches of *Limnephilus marmoratus, L. lunatus, Halesus radiatus, Odontocerum albicorne, Athripsodes dissimilis, Oecetis lacustris and Lepidostoma hirtum,* expressed as percentages of the total catch for each Field Centre light trap. The total catch and the percentage of females are given for each site.

vity of a species as well as an indication of its relative abundance. Information on caddis flight periods has been published in several papers (Crichton, 1960, 1971, 1976; Crichton, Fisher & Woiwod, 1978). From such material, deductions can be made concerning life cycles, which can often be confirmed by published information from regular collections of larvae. Histograms of flight periods of a number of species from the Field Centre light traps are given in Figs. 1 and 2.

In each histogram the catches are shown for the numbered weeks of the Rothamsted Insect Survey as percentages of the total number of the species caught in the year. Most caddis flies are univoltine,* with a flight period that may be of short duration, as shown for *Agapetus delicatulus*, *Athripsodes dissimilis*, *Halesus radiatus* and *Lepidostoma hirtum*, or of longer duration as for the species of *Hydropsyche* and *Limnephilus*. Both *Limnephilus marmoratus* and *L. lunatus* belong to a group of limnephilids where the adults may be caught from May until November or even into December. Those which emerge early enter a diapause, which is ended by the shortening days of autumn bringing about development of the ovaries so that they lay eggs in September and October. The histograms for these species in Fig. 2 show the initial period of dispersal in June, followed by smaller catches in July, when they are mostly in diapause, before their greatly increased activity in August, September and October. More details are given in Crichton (1971), where British limnephilids are grouped into three categories: a first, of these species with an extended flight period, usually with a diapause; a second, with a shorter summer period without a diapause; and a third, with a short autumnal period also without a diapause. *Halesus radiatus*, in Fig. 2, is an example of this third category. Further information on certain species is given in Crichton & Fisher (1981).

There is evidence that a few species of caddis are bivoltine. Examples in Fig. 1 are *Agapetus ochripes*, *Tinodes waeneri* and *Psychomyia pusilla*. In northern Britain they appear to be univoltine (Crichton, Fisher & Woiwod, 1978).

It is hoped that these histograms may be useful to collectors at Field Centres in indicating the time of year when adults are most likely to be found, and this information can be related to other stages in life cycles.

The histograms also give the percentages of females. For many species this percentage is low because the males are normally more active and thus more likely to be caught in a light trap. However, the reverse condition seems to apply to species of *Hydropsyche*.

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REFERENCES

BADCOCK, R. M. (1978). Taxonomic controversies in the Hydropsychidae. *Proceedings of the 2nd international Symposium on Trichoptera*, 175-182.

CRICHTON, M. I. (1960). A study of captures of Trichoptera in a light trap near Reading, Berkshire. *Transactions of the Royal entomological Society of London*, **112**, 319-344.

* Univoltine = one generation per year.

CRICHTON, M. I. (1971). A study of caddis flies (Trichoptera) of the family Limnephilidae, based on the Rothamsted Insect Survey, 1964-68. *Journal of Zoology*, **163**, 533-563.

CRICHTON, M. I. (1976). The interpretation of light trap catches of Trichoptera from the Rothamsted Insect Survey. *Proceedings of the 1st international Symposium on Trichoptera,* 147-158.

CRICHTON, M. I. & FISHER, D. B. (1981). Further observations on limnephilid life histories, based on the Rothamsted Insect Survey. *Proceedings of the 3rd international Symposium on Trichoptera,* 47-55.

CRICHTON, M. I., FISHER, D. & WOIWOD, I. P. (1978). Life histories and distribution of British Trichoptera, excluding Limnephilidae and Hydroptilidae, based on the Rothamsted Insect Survey. *Holarctic Ecology,* **1**, 31-45.

KIMMINS, D. E. (1966). A revised check-list of the British Trichoptera. *Entomologist's Gazette.*, **17**, 111-120.

MACAN, T. T. (1973). A key to the adults of the British Trichoptera. Freshwater Biological Association, Scientific Publication 28.

MORSE, J. C. (1975). A phylogeny and revision of the caddisfly genus *Ceraclea* (Trichoptera, Leptoceridae). Contributions of the American Entomological Institute, **11**, 1-97.

MOSELY, M. E. (1939). *The British caddis flies (Trichoptera): a collector's handbook*. Routledge, London.

WILLIAMS, C. B. (1948). The Rothamsted light trap. *Proceedings of the Royal entomological Society of London*(A), **23**, 80-85.