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The ubiquitous occurence of *Simulium posticatum* (Diptera) in rivers around Oxford

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Introduction

Blackfly (Simuliidae) are haematophagous Diptera. The larval and pupal stages attach to plants or stones and filter feed detritus, usually in fast-flowing rivers and streams. *Simulium posticatum* Meigen 1838 (syn. *S. austeni* Edwards 1915) occurs in Britain and is commonly known as "The Blandford Fly". The bite of this fly causes a severe reaction in some people and is of undoubted public health importance around the town of Blandford on the banks of the River Stour, Dorset. In Britain, *S. posticatum* is a univoltine species. Eggs are laid from July onwards in the soil of riverbanks and hatch in the following February and March when water levels have risen substantially (Ladle, Bass and Cannicott, 1985). Larvae attach to aquatic plants and go through at least six instars before pupating in late April. Adults emerge mid-May to June (Hansford, 1978). It is in the Stour and associated tributaries that the abundance of *S. posticatum* is believed to be greatest.

This species has recently attracted attention for the novel control measures which have been used against populations of the insect around Blandford (see for example: Guardian, 9th March 1990). Indeed, the first use of the microbial insecticide, *Bacillus thuringiensis* var. *israelensis* in water courses in Britain was a trial on a tributary of the Stour against *S. posticatum*. A significant reduction in the number of *S. posticatum* larvae was achieved with little detrimental effect on non-target organisms downstream of the treatment sites (Jon Bass, pers. comm.).

The distribution of many blackfly species is poorly described. Lack of geographically diverse records means that the maps published by the Freshwater Biological Association (Davies, 1968) can be misleading for all but the most common species (Crosskey, 1982). This note describes the distribution and relative abundance of simuliid species in the Oxford area, with particular reference to *S. posticatum*.

Sampling

Weed samples were taken between 5 - 26th April 1990 from 10 rivers, at a total of 21 sites within a 20 mile radius of Oxford. The table below gives the sites visited along with the number of *S. posticatum* taken and other species identified in the sample. Map references shown in the table relate to o.s. map number 164. The density of *S. posticatum* pupae and large larvae (only later larval instars can positively be identified) is expressed as numbers per gram wet weight of vegetation. The Wilhelmia and Ornatum groups are complexes each containing three species,

the larvae of which cannot reliably be separated until they pupate. Therefore, where members of these groups are identified to species it is because the pupae were present.

Results and Discussion

Blackfly larvae were found at 18 of the 21 sites sampled. *S. posticatum* was present at all 18 of these sites, the numerically dominant species at 16 sites, and was more abundant than all other simuliid species put together at 14 sites. Clearly, for this springtime period, *S. posticatum* must play a significant role in the ecology of many of the lowland rivers examined.

The samples were of a qualitative nature and should not be considered in relation to absolute Simuliid population densities published elsewhere (Colbo, 1987). The fact that densities of larvae are presented as number per gram of wet vegetation means that they must be multiplied by a factor of approximately 17 (*Ranunculus* spp. contain approximately 94% water by weight) to compare with Simuliid densities per gram dry weight of plant material published by Ladle, Bass and Jenkins (1972) for example. If this is done, larval densities of as much as $425g^{-1}$ dry wt. at Shipton-on-Cherwell are probably realistic estimates. Local pupal densities as high as $322g^{-1}$ dry wt. on filaments of *Ranunculus* sp. were also recorded. These compare with peaks of 55 and $180g^{-1}$ dry wt. recorded by Hansford (1978) for *S. posticatum* pupae in the Blandford area in 1973 and 1974 respectively. His methods were of a similar qualitative nature to my own. The area of freshwater around Blandford, however, may actually be capable of supporting a far larger population of *S. posticatum* than found at the small, local sites on the River Cherwell.

The distribution of simuliid immatures is dictated by the presence of suitable sites. These must be fairly fast flowing with well oxygenated, unpolluted water, such as found in upland streams, in the shallow riffle areas of clean rivers, or by weirs. (The three sites which yielded no simuliids were deficient in one of these factors.) The population distribution of larvae and pupae in lowland rivers is therefore highly contagious and such contagion can result in locally high population densities. For sites such as Shipton-on-Cherwell, there must come a point when intraspecific competition for *space* on aquatic plants will be as important a factor limiting local abundance as the availability of food, disease, or predation by fish.

Future work will focus on development of a quantitative sampling method which can be used to relate weekly counts of larvae on artificial substrates to the true size of the larval/pupal population present in the rivers. These observations do, however, give an insight into the ubiquity of *S. posticatum* in the rivers of Oxfordshire, including the Thames. As such waterways become cleaner and given the provision of fast flowing sections by weirs etc., it may prove interesting to investigate the distribution and abundance of this potentially important species where high densities of humans and flies coincide.

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Site	O. S. Map Reference	River	*S. posticatum* present? (No. taken)	Density of *S. posticatum* (No. g^{-1} wet wt. vegn.)	*S. posticatum* dominant? (% of sample)	Other species present in sample
Lower Heyford Bridge	SP 478 248	Cherwell	Yes (39)	0.2	Yes (100)	None
Lower Heyford Mill	SP 489 250	Cherwell	Yes (290)	0.7 - 14.3	Yes (98)	*S. pseudequinum* Wilhelmia group larvae
Hampton Poyle	SP 500 155	Cherwell	Yes (7)	Very Low	Yes (100)	None
Shipton on Cherwell	SP 483 165	Cherwell	Yes (>1000)	4.6 ->25	Yes (100)	*S. pseudequinum* , *S. equinum*
Pigeon Lock	SP 487 195	Cherwell	Yes (8)	Very Low	Yes (100)	None
Rousham Gap	SP 454 223	Dorn	Yes (3)	Very Low	No (38)	*S. ornatum* s.l., Wilhelmia group larvae
Ashford Mill	SP 386 155	Evenlode	Yes (42)	0.4	Yes (82)	*S. pseudequinum* Wilhelmia and Ornatum group larvae
Stratford Bridge	SP 444 186	Glyme	Yes (42)	0.8	Yes (96)	*S. ornatum* s.l.
Garford	SU 434 964	Ock	Yes (9)	Very Low	Yes (82)	Wilhelmia and Ornatum group larvae
Street Hill	SP 566 169	Ray (tibutary)	No	-	-	None
Logg Farm	SP 548 145	Ray	No	-	-	None
Wytham	SP 477 095	Seacourt Stream	Yes (30)	1.5	Yes (93)	Wilhelmia and Ornatum group larvae
Cuddesdon Mill	SP 612 028	Thame	Yes (3)	Very Low	Yes (100)	None
Draycot Bridge	SP 648 065	Thame	Yes (95)	2.3	Yes (100)	None
Overy Mill	SU 584 942	Thame	Yes (67)	0.6 -0.7	Yes (100)	None
Overy Mill Weir	SU 585 944	Thame	Yes (15)	0.8	Yes (100)	None
Dorchester	SU 578 933	Thame/Thames	No	-	-	None
Kings Weir	SP 480 104	Thames	Yes (155)	1.0	Yes (97)	Wilhelmia and Ornatum group larvae
Ducklington	SP 361 076	Windrush	Yes (5)	Very Low	Yes (45)	*S. ornatum* s.l., Wilhelmia group larvae
Gill Mill	SP 379 069	Windrush	Yes (6)	0.3	Yes (50)	*S. pseudequinum*, *S. ornatum* s.l. Wilhelmia and Ornatum group larvae
Tar Barn Footbridge	SP 383 067	Windrush	Yes (39)	0.3	No (33)	*S. pseudequinum*, *S. equinum* Wilhelmia and Ornatum group larvae

Table 1. Rivers and sites sampled for *Simulium posticatum* larvae and pupae in April 1990.

Summary

The distribution of *Simulium posticatum* larvae in 10 rivers around Oxford was investigated in April, 1990. Samples of aquatic vegetation were taken and all blackfly stages present were identified. *S. posticatum* was detected at 18 of the 21 sites sampled and was usually dominant over all other blackfly species during this springtime period.

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