The Rise and Fall of the Blandford Fly

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In the late 1960's a problem arose when people living in and around the valley of the Dorset River Stour were being bitten by insects.

Intensive biological investigations at the FBA's River Laboratory identified the cause of the biting as *Simulium austeni*, now named *Simulium posticatum*, and established most of the basic ecological parameters of the species. The females of the "Blandford Fly", as it is commonly known, require a blood meal in order to mature their two to three hundred eggs. The blood meals are frequently obtained from men and women.

In May and June the inhabitants of a considerable area of South Dorset are afflicted by painful bites from these insects, usually on the lower legs. The bites often bleed and are surrounded by large swellings which itch and cause considerable discomfort. In severe cases secondary infection, blistering and ulceration attend the bites and symptoms such as dizziness and nausea have been reported. It is estimated that, in bad years, tens of thousands of people in the towns and villages in and around the Stour valley may be bitten.

A Blandford Fly bite.

The eggs of the Blandford Fly taken from the river bank.

Despite strenuous efforts in the past to find a satisfactory method of control for the species, environmental, economic and political considerations rendered them ineffective or impractical. For example, removal of the larvae by the use of chemical pesticides was ecologically unacceptable. The development of biological control agents such as parasitic nematodes, fungi and viruses held little hope of a rapid, financially viable solution. Only the use of cutting and removal of river weeds and the associated mortality of larvae was believed to offer a possibility of control and was actually tried. The method proved to be inefficient, difficult and costly, with no prospect of long term control.

Hope of a new avenue of research, with control potential, arose when the peculiar oviposition behaviour of the species was discovered by our own group at the Institute of Freshwater Ecology (Then the Freshwater Biological Association). It was already known that the "Blandford Fly" has a single generation each year with an eight month resting egg stage. The egg laying sites,however, remained undiscovered for many years. The fly proved to be unique within the family Simuliidae, in that it lays its eggs high-and-dry in the vertical river banks only in places where there is overhead tree cover, loamy soil with desiccation cracks and moist, mossy overhangs. However, there was no obvious means of destroying the eggs and although mechanical egg-removal was attempted and an estimated four million eggs were scraped from ten metres of river bank the task of treating forty kilometres of river proved too daunting.

Only with the commercial availability of *Bacillus thuringiensis* did control of *S. posticatum* became a real possibility. This micro-organism

produces a crystalline body in association with its spore, which is toxic to some insect larvae. Simuliidae, the family of insects to which the "Blandford Fly" belongs, is susceptible to one particular strain of this material known as *Bti (Bacillus thuringiensis israelensis)*. The pesticide must be swallowed by the fly larvae and is activated by the specialised conditions within the gut. The cell walls of the gut lining rapidly break down and the larvae die.

The Health and Safety Executive was approached and gave North Dorset District Council permission for an experimental application of *Bti*. Following a successful small scale trial conducted by IFE in 1989 the Council was then given permission for IFE to treat and monitor four main river sites of the River Stour on an experimental basis in 1991.

The requirements demanded for application of *Bti*, assessment of "Blandford Fly" mortality, environmental impact determination and the resultant reduction in biting activity were extensive and rigorous. The concentration of pesticide in the river had to be maintained at no greater than 0.8 parts per million for only ten minutes at each application point, much less than is normally used in Europe and other countries for blackfly control. This dictated the need for "on the day" measurement of river flows. Salt dilution studies provided information on transit times and a mathematical model was applied to estimate theoretical carry distances of *Bti* particles.

The Blandford Fly

Population densities of living and dead *Simulium* were determined at control sites and at treated sites up to one kilometre downstream of pesticide application points for twelve weeks after treatment. The numbers of living and dead chironomid midges were determined in a similar manner both on weed samples and in river bed gravels. Indices of invertebrate community structure were also established and sampling of drifting animals and of dixid midges was carried out. In all about 6,000 samples were taken and analysed over the twelve weeks of study in an exercise which involved more than half the staff of the IFE River Laboratory.

Dribble bar for Bti application

The results of the monitoring work have now been collated and examined. The overall estimate of Blandford Fly mortality was 84% and high mortalities were observed more than a thousand metres downstream of the application points. Because of our detailed knowledge of the blackfly ecology, gained over many years, the river was treated when no other susceptible simuliids were present in the larval state. There was no detectable mortality of other invertebrates nor was there any long term (months) shift in community structure due to treatment with *Bti*. Even the chironomid midges, which are known to be somewhat susceptible to high concentrations of *Bti*, were not affected.

Following the success of the 1991 experimental treatment the local authorities are hoping to obtain permission to treat the river as and when it is appropriate. It seems probable that the end is now in sight for the notorious Blandford Fly.