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BRITISH SIMULIID GROUP BULLETIN

Number 6 December 1995

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FROM THE EDITOR

The time for compiling the biannual Bulletin has come round again with this the second number in 1995. Once more we report on the latest meeting of the British Simuliid Group which was held for the first time at Birmingham University.

Everyone that I have spoken to has been full of praise for the way the meeting was organised, and for its content. It was refreshing to hear more presentations with an ecological theme, as some of us were concerned that past meetings contained too much molecular biology. It is very hard to obtain a good balance of subjects in a one day meeting when so many disciplines are involved, but our hosts Malcolm Greenwood and Melanie Bickerton achieved it very well. Those of us who came down the night before experienced a "Balti" dinner which was memorable for spice and quantity, while the accommodation provided in the University was most luxurious. We are most grateful to Professor Geoff Petts for allowing us to invade his department, and to Malcolm and Melanie for organising everything.

How many of you read books on travel or exploration? I am not an avid reader and tend to read such books only when they are given to me as presents. Nevertheless I have come across some interesting snippets relating to nuisances caused by blackflies. I think it would add light-hearted interest to have a "Travellers' Tales" section in future numbers of the Bulletin. In the next issue I will kick off with an excerpt culled from one of the late Gerald Durrell's amusing accounts of his collecting trips, and hope that members will also send in their discoveries.

Let me remind you that I hope to bring out Number 7 in June or July 1996, so if there is anything you would like included - send it in NOW - don't wait until it is too late!

Finally, thanks to Roger Crosskey and Trefor Williams who commented on and proof-read the draft of this Bulletin.
John B. Davies: Liverpool School of Tropical Medicine, Pembroke Place, Liverpool L3 5QA, UK.

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THE 18th ANNUAL MEETING AT BIRMINGHAM UNIVERSITY

The 18th Annual Meeting of the British Simuliid Group was held in the Department of Geography, University of Birmingham on Wednesday 13th. September 1995. The meeting was organised by Malcolm Greenwood and Melanie Bickerton, and opened with an address by Professor Geoff Petts, Director of Environmental Science.
About 45 members and students were present. Titles and short accounts of the papers are given below, and I am grateful to Malcolm Greenwood for help with the following summary of the discussion.

As usual, the later session of the afternoon was given over to a most lively and stimulating debate covering two main issues. The first of these was how best to bring together those members whose field experience was driven by taxonomic and vector control needs with those of the ecologist/geographer who, as a function of working at a larger spatial scale, sees the blackfly as an important but not the only component of the much broader picture. It became clear (to no body's great surprise!) that sound taxonomic appraisal is essential underpinning to these applied studies but all agreed that the available expertise was there to be shared.

This opened the way for a very positive attempt to adjoin these views in collective action and many offers of help were expressed, from taxonomist to geographer and vice versa. An example was well illustrated by the expression of interest as to the effects of River Regulation on blackfly populations. Changes in flow condition as the result of dam construction 'modify' the available habitat and with it the blackfly fauna and any associated health risk. If, a collaborative effort could be made to control the insect, surely this must be the most productive way forward. I was very much reminded, whilst listening to the overall debate, of the old adage which says that, "one plus one equals two and a half". For me the great wealth of experience embedded in 18 BSG meetings is and indeed must be tapped, by those with expertise elswhere. I hope this positive and enthusiastic response was shared by others attending the day in Birmingham.

The second issue was raised by Roger Wotton who reminded us of Doug Craig's note in Bulletin No. 5 when he put forward the idea of holding an international simuliid meeting in 1997. This stimulated a wide ranging discussion as a result of which the consensus favoured a meeting in either Africa (to make it easier for the many African simuliid workers to attend) or Europe. For Africa, South Africa was suggested, but it was appreciated that most participants would require funding for part of their expenses at least. Roger Crosskey informed us that he had discussed the possibility with Ferdy DeMoor, and agreed to follow it up.

[I have since received a note from Ferdy DeMoor saying that both he and Rob Palmer are keen to have a meeting in South Africa. They are at present tentatively looking at ways of forming an organising committee with a view to investigating how they can enlist sources of funding etc. He now needs to hear from people whether in principle they would want to attend. I suggest that anyone interested should contact Ferdy directly by e-mail at amfd@warthog.ru.ac.za, or let me know and I will pass on the message to him. - Ed.].

ARTICLES BASED ON ORAL PRESENTATIONS

Introduction to the Meeting

Professor Geoff Petts: Director of Environmental Science, School of Geography, University of Birmingham, Birmingham, B15 2TT, UK.

Early studies of the distribution of aquatic invertebrates along rivers focused on longitudinal zonations with temperature and 'distance from source' as the primary environmental variables. Research over the past thirty years has not only elucidated the roles of a wide range of environmental variables but has also demonstrated different relationships over a range of spatial scales, including the river, sector, and meso-habitat. The role of flow hydraulics on the distribution of aquatic invertebrates has been clearly established. Other studies have demonstrated the influence of substratum type, variations of channel form, water quality and the riparian zone upon the distribution of biota. Research is now focusing on the influence of short-term (one to a few days), seasonal, and annual variations of these dynamic environmental variables on species distributions.

Research at the University of Birmingham seeks to integrate hydrological and geomorphological studies as a basis for understanding the dynamics of river ecosystems (an approach that has been advanced as the study of 'fluvial hydrosystems' by Amoros and Petts, 1993; Petts and Amoros, 1996).
Current research focuses on the effects of different flow regimes on (i) river-floodplain interactions and (ii) aquatic macroinvertebrate communities.
The second is concerned with species and community responses to (a) drought, (b) water abstraction, (c) flow regulation below dams, and with community succession in response to environmental changes, especially in cold streams. With regard to the latter, the University is a partner in a European network studying streams in Iceland, Spitzbergen, Norway, the Alps and the Pyrenees.

Simuliids are highly sensitive to flow hydraulics and the availability of specific meso-habitat types. The effects of flow regulation below dams on blackflies have been described (see Petts, 1984), most demonstrating a marked increase in the abundance of simuliids, but since founding the interdisciplinary journal Regulated Rivers in 1987 (we are now publishing volume 11), there have been only 2 papers that have focused specifically on blackfly problems. Little progress seems to have been made in modelling flow-habitat relationships for simuliid species, and for their different life stages, with a view to predicting the consequences of natural and artificial hydrological changes on their distribution and abundance. Our research seeks both pure and strategic objectives: to advance ecosystem-level models of invertebrate community dynamics to aid river management (e.g. by determining minimum acceptable flows and recommending physical habitat management). The approaches could be developed to aid the management of specific problem species, such as some simuliids.

We were delighted to host the 18th annual meeting of the British Simuliid Group and to help to foster a wider environmental interest in simuliid studies.
We look forward to continuing our association with the Group in the future.

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Blackflies in amber - what can they tell us?

Roger W. Crosskey: Department of Entomology, Natural History Museum, Cromwell Rd., London SW7 5BD, UK.

Blackflies in amber are rare. Only four specimens exist, for example, among 25,000 pieces of fossiliferous amber in the Natural History Museum in London (BMNH), which has one of the top scientific amber collections. These specimens are all in Baltic amber, the only type of amber in which until recently blackfly fossils had been found (excluding an ancient and unconfirmable record of Simulium from Sicilian amber); they are therefore about 35-40 million years old, Baltic amber being geologically dated as Upper Eocene to Lower Oligocene. Recently, one specimen has been found in Cretaceous amber from coastal New Jersey, and several in Tertiary ambers rather younger than the Baltic amber, namely in Saxonian (Bitterfeld) amber from Germany of Miocene age (Schumann & Wendt, 1989) and Dominican amber from Hispaniola of mainly Oligocene/Lower Miocene age (Poinar, 1992). The Saxonian and Dominican specimens await specialist study, but Canadian specialists are currently examining the specimen from New Jersey amber - which is the oldest amber blackfly yet found.

The only named amber blackflies are from the Baltic amber: Ectemnia cerberus Enderlein (see Crosskey, 1994), Simulium oligocenicum Rubtsov (see Rubtsov, 1936), and three Simulium species described by Meunier (1904). The last (S. affine, S. importunum and S. pulchellum) are at present uninterpretable because the types, originally in the Royal Amber Collection at Königsberg (now Kaliningrad), have not yet been located; they might not still exist.

Study of amber blackflies is frustrating. Only rarely can specimens be confidently assigned to a genus or subgenus (let alone a species group), for two reasons: (1) simuliid taxonomy depends more than that of other Diptera on combination adult and early stage characters and in amber studies only adult characters are available; (2) specimen preservation is rarely good enough to reveal sufficient characters adequately (most specimens could fit any one of several supraspecific taxa). The 'workability' of specimens depends not only on their orientation in the amber pieces (often they lie in such a way that polishing can do little to reveal important features) but on the quality and origin of the amber. Old exposed amber darkens and readily fractures, and features are often obscured by cloudiness or finely streamed air bubbles; this is particularly true of Baltic amber. In general, the antennae and legs are fairly readily visible, but the leading wing veins and the terminalia are usually very much obscured; the katepisternal sulcus, a major character for distinguishing the primitive prosimuliines from simuliines, is rarely well displayed, tending to be covered by the positions of the leg bases or invisible because of the general body orientation.

Although amber blackflies reveal little in a direct sense - they bear such indefinite taxonomic 'signatures' - some telling points emerge when we summarize what is known from specimens so far studied. The principal shared characters, i.e. basal section of the radial vein haired, fore tarsi slender, scutum without pattern, and females with strong claw tooth, form a combination suggestive that the amber blackflies were rather primitive bird-biting forms. Interestingly, several specimens have antennae with only 10 segments (8 flagellar segments), a feature among modern blackflies almost confined to Greniera and Austrosimulium. Lastly it is worth emphasizing that the Simulium sensu stricto blackfly 'model', typically characterised by bare radial vein base, dilated fore tarsi, patterned scutum (one sex or both), toothless female claws (of 'mammalophilic' type) and long and heavy male gonostyles, has yet to be found in amber - does the Baltic amber pre-date the evolution of such forms?[Transparencies of three of the BMNH unnamed Baltic amber specimens and of Ectemnia cerberus were shown as part of the presentation. My thanks to Peter York, of the Natural History Museum, for the photography.]

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The latest in the Simulium damnosum oviposition/aggregation pheromone story

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At the last BSG meeting in Liverpool 1994, I reported on work carried out in Sierra Leone in 1993/ 1994, demonstrating that volatiles collected from freshly laid eggs of Simulium leonense were effective in attracting gravid flies to oviposit, in a laboratory bioassay. Those studies also showed that in gas chromatography 2 major peaks were associated with attractiveness. These peaks, labelled A & B, were present in fresh egg volatiles, but were significantly reduced in volatiles from 12 hr old eggs, which had no attractiveness in bioassay (McCall, 1995). The studies reported here, carried out in 1995, set out to confirm the role of the volatiles represented by these peaks as attractants. A series of chemical fractions was prepared by Bob Heath and Barbara Dueben at the Insect Attractants, Behavior & Basic Biology Research Laboratory, Gainesville, Florida, from mass dissections of gravid ovaries of S. leonense collected in 1994 in Sierra Leone. Four fractions were prepared with fraction 3 containing peaks A and B. As a result of the escalating civil war in Sierra Leone, the study relocated to Ghana where with the support of Dr. Mike Wilson at the Noguchi Institute in Accra, and the Onchocerciasis Control Programme, I set up a field laboratory at the OCP subsector office in Hohoe, Volta Region. Bloodfed flies (identified by Mike Wilson using adult fly morphometrics as S. yahense) were collected from Tsasadu Falls, about 10km southwest of Hohoe (I am extremely grateful to OCP who ceased their irregular insecticidal treatment of this site for the duration of the study) and maintained in the lab for 4-5 days until gravid. The bioassay procedure was essentially the same as that previously described (McCall, et al, 1994), but modified to allow multiple choice rather than simple two-choice tests. In an initial test the recombinant mixture of all four fractions attracted significantly more ovipositions than a control. Thus no significant activity had been lost in preparing the fractions. Furthermore, this demonstrated that the material isolated from the ovaries of S. leonense in Sierra Leone was attractive to S. yahense in Ghana.

A series of multiple choice bioassays showed that fraction 3 was the most attractive of the fractions tested, indicating that peaks A and B are important in mediating aggregation, though fraction 4 also showed some attraction. However, fraction 3 did not attract significantly more ovipositions than a control substrate in a two-choice bioassay. In fact fraction 3 was active

only when fraction 4 (containing a number of compounds which had higher retention times on gas chromatography than peaks A or B, but which are present at very low concentrations) was also present, though in these cases the ovipositions occurred preferentially on substrates baited with fraction 3.
This suggests that although peaks A and/ or B are the major peaks involved, and therefore can be considered to be the likely main constituents of the aggregation pheromone, certain compounds present in fraction 4 are also necessary for attraction. This suggests that two stages of attraction might be occurring, possibly in a sequence of events leading up to final oviposition
site choice. My own observations on oviposition behaviour in the laboratory suggest that other sensory factors may also be involved in attraction - contact physical or chemical cues and visual cues are likely to be involved (of interest here is the fact that we [Gryaznov, McCall & Trees] have not detected volatile compounds from dissected gravid ovaries of S. erythrocephalum in Britain, although this species exhibits aggregated oviposition in a laboratory bioassay).Peaks A and B have now been detected in S. leonense from Sierra Leone, S.
yahense, S. sanctipauli and S. damnosum/ sirbanum from Ghana (identified by Mike WIlson), and from S. squamosum (identity to be confirmed) from Ngaoundere, Cameroon. Thus it is possible that all the species within the S. damnosum complex share the same pheromone system, though differences
in the lesser constituents cannot yet be ruled out. If so, this would not be surprising; as we have suggested, that some of the advantages conferred by oviposition aggregation may not be species specific (McCall & Cameron, 1995).

Currently, spectrometric studies are underway to identify peaks A and B, for which the molecular weights and basic structures are known, and to determine the content of fraction 4. Future work will attempt to elucidate the sequence of events which may be involved in aggregation with a view to an increased understanding of blackfly oviposition, and to the development of a pheromone-baited trap system for S. damnosum s.l.

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A report from Brazil

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Onchocerciasis has long been known to occur in an isolated area of tropical rain forest in northern Brazil inhabited by Yanomami indians. During the last couple of decades the discovery of minerals in the area has led to the invasion of Yanomami territory by miners, many of whom will have become infected with onchocerciasis. Many of these miners have subsequently moved to other parts of Brazil and their presence in Minaçu, a town some 2000kms from the Amazon focus and a few hundred kms to the north of the country's capital Brasilia, has probably provided the source of infection for local people which serological tests have shown to have been in contact with the parasite. Minaçu is also the site of a new hydroelectric dam on the R.Tocantins, a southern tributary of the Amazon.

The project for Minaçu sets out as its main objective to assess the effects of the dam on simuliid populations and future onchocerciasis transmission in the area. In the first year collections of simuliids from all rivers in the area and from biting catches will be used to indicate the species present and and to provide identification keys. Collecting sites at the R.Tocantins and three of its tributaries have been set up and larval and adult collections are being made on a monthly basis to assess population size in relation to season. Results of this work will be presented at next year's meeting.

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Recent advances in Simulium control with regard to the Onchocerciasis Control Programme in West Africa

David Partridge: Aerial Operations Officer, OMS-Oncho, BP 504, Odienné, Côte d'Ivoire

The Onchocerciasis Control Programme first started large scale aerial spraying against Simulium larvae in the river systems of West Africa in 1975. Pioneering treatments started with one larvicide, temephos, which was applied using a simple drop-release system from either a fixed-wing aircraft or a rather large and clumsy helicopter. Since then, numerous advances in spray technology, treatment technique and data collection have been made, allowing the aerial operations teams to improve their ability to deliver a variety of chemicals, in the right place, at the right time, and at the precise dose required. This has resulted in less chemical wasted, fewer overdosing "accidents", fewer treatment failures, and a continuous and dependable break in transmission. Current operations are conducted by 8 helicopters flying from two bases, one in Côte d'Ivoire, the other in Togo. In a typical week, mission planning and pilot briefing occur on Monday. Helicopters depart on Tuesday and follow a two to four day treatment circuit, refuelling at remote caches and spending the night at hotels and guest houses in the field. Technical advances affecting vector control operations include:

1. Choice of helicopter - Hughes 500D and E: compact, manoeuverable, short rotor diameter, autonomy 1h45, 250 litre larvicide weight capacity. In spray mode carries pilot and observer. In prospection mode, carries pilot and three entomologists.
2. Spray system - custom design by Simplex/Micronair: streamlined external tank, 8 nozzles: 6 spray and 2 dribble for canopy penetration, computerized control and recording, accuracy of 1%.
3. Larvicides - 7 approved larvicides from 4 chemical families, chosen for their efficacy, softness on non-targets, safety and economy of use. Formulated for quick dispersal in water. Each has characteristics of toxicity and "carry" that favour use at different discharges and river conditions. Used in rotation to prevent resistance.
4. Hydrological surveillance by satellite - 80 satellite beacons deployed on important and inaccessible rivers. Three French Argos satellites pass overhead 10 times per day. SRDA reception stations at each airbase collect river heights in real time. Dosage updates are sent to helicopters by HF radio.
5. GPS satellite navigation - enabling positioning to within 20 m. Increased navigational confidence leads to lower flight hours, better treatment coverage and fewer lost or bewildered pilots.
6. "Combined operations" with ivermectin distribution. In addition to immediate relief for sufferers of the disease, there is increasing evidence of reduced transmission and reduced adult longevity. May possibly reduce number of years of spraying.
7. Vector and parasite identification by DNA probe - allowing rapid differentiation of Simulium vectors and separation of Onchocerca ochengi, and O. volvulus blinding and non-blinding forms.

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Recent events in Guatemala

John B. Davies: Liverpool School of Tropical Medicine, Pembroke Place, Liverpool L3 5QA, UK.

Members may be interested to know about a Workshop "On the Transmission Cycle of Onchocerca volvulus by Simulium ochraceum" whichwas held at the Universidad del Valle de Guatemala between 6 and 9 June 1995 and sponsored by the Onchocerciasis Elimination Program for the Americas (OEPA). The sessions were led by Richard Collins (Arizona), and the entomologist participants apart from myself were: M-G Basáñez (Oxford & Venezuela), O. Ochoa (Guatemala), C. Porter (CDC Atlanta), V. Py-Daniel (Brazil), J. Ricardez-Esquina and M. Ridríguez (Mexico), and J.C. Viera (Ecuador & Arizona). Objectives were to examine the role of entomological assessment in the ivermectin treatment campaigns with particular regard to the very low proportion of S. ochraceum that is usually found carrying infective Onchocerca larvae (about 0.2%), and to examine the role of epidemiological models in planning and assessing campaigns.

The most important conclusions were that, in future, transmission indices should be based on a modification of the classical Annual Transmission Potential which is restricted to third stage larvae, by including total

numbers
of all Onchocerca larval stages (because this gives higher numbers, requiring fewer dissections); limit entomological activity to the 3 months of highest transmission; catch in the afternoon when parous rates are highest; and continue research into methods of mass screening flies for infections, eg. PCR and DNA probes.

Other points that arose during the course of the workshop were that Dr. Ochoa reported that the vector control programme that had started as a joint Guatemala/Japanese project in 1979 had been continued for another five years after the departure of the Japanese team in 1983-84. A careful check in 1988-89 showed that all catching sites in the controlled area were negative for S. ochraceum, while a skin-snip survey in 1990 showed that there were no infected children in the 0-9 age group, compared to about 50% before control. A paper describing the activities 1984-89 period is being prepared by Dr. J. Onofre Ochoa.

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PESENTATIONS RECORDED AS TITLES

Simuliids as habitat indicators - setting minimum acceptable flow in UK rivers

M.A. Bickerton: Department of Environmental Science, School of Geography, University of Birmingham, Birmingham, B15 2TT, UK.

The role of Simuliidae in the colonisation of streams in Alaska

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ARTICLES BASED ON POSTERS

Chromosomal variation in the onchocerciasis vector blackfly

Simulium guianense in Brazil

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Simulium guianense is the primary vector of human onchocerciasis in highland areas of the Amazonian focus on the Brazil/Venezuela border (Fig. 1). Variation in female biting habits of S. guianense populations in different areas has led to the suggestion that a species complex occurs consisting of allopatric anthropophilic and zoophilic populations. The high vector capacity of some anthropophilic S. guianense populations is believed to be responsible for the current distribution of onchocerciasis in the Amazon and its dispersal to Minaçu, 2500 km to the south, and potentially to other parts of Brazil (Shelley et al., in press).

In order the analyse the species composition of the putative S. guianense complex, this cytogenetical study describes the polytene chromosomal banding pattern and interprets 3 other cytotypes. Particular attention was paid to investigating any evolution in the sex-determining systems as the accumulation of sex-linked inversions is often related to speciation in simuliids.

Larvae were collected (and put into Carnoy's fixative) from five sites where this species is known to bite humans, including rivers from the Minaçu focus of onchocerciasis in Goiás State (sites 1 and 2; Fig. 1). No material was collected from the Amazonian focus, as the breeding grounds of this species have not yet been located. Polytene chromosome preparations were made using the Feulgen method (see Charalambous et al., 1995) and compared to the banding pattern of S. guianense cytotype A, which was arbitrarily chosen as the "standard sequence".

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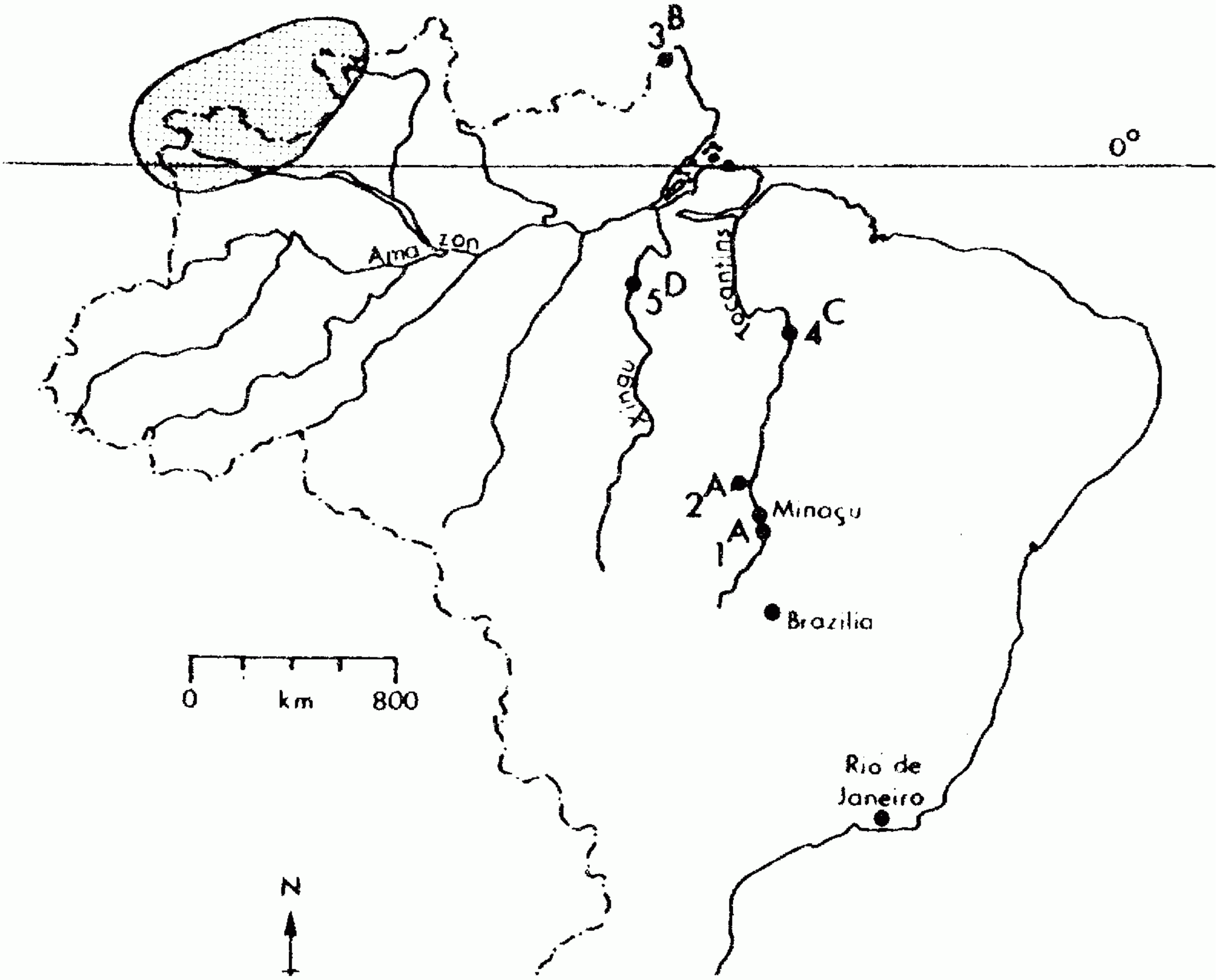

Fig.1
The collection sites of S. guianense s.l. in Brazil (numbers 1-5) used in this study in relation to the Amazonia focus of onchocerciasis (dotted area) and Minaçu. The locality details of each site are given in Table I. Superscripts denote which cytotypes are present at each site.

The results confirmed the presence in Brazil of a S. guianense species complex of at least four segregates, designated A, B, C and D. The fixed chromosome differences that distinguish the cytotypes, and which do not involve novel sex-determining systems, are shown on the idiograms (Fig. 2). These segregates have only been found allopatrically, so without evidence of their assortative mating, we cannot yet infer whether they are distinct species. They have therefore been given the taxonomic status of 'cytotype' as each represents a cohesive group that differs from the other groups. Evidence for sibling species status will be dependent on reproductive isolation between cytotypes from areas of sympatry, which will be evident if heterozygotes for the fixed paracentric inversions are absent. A potential area of sympatry occurs along the middle reaches of the Rio Tocantins, as cytotype A occurs up-river towards Brasilia and cytotype C occurs further down river (Fig. 1).

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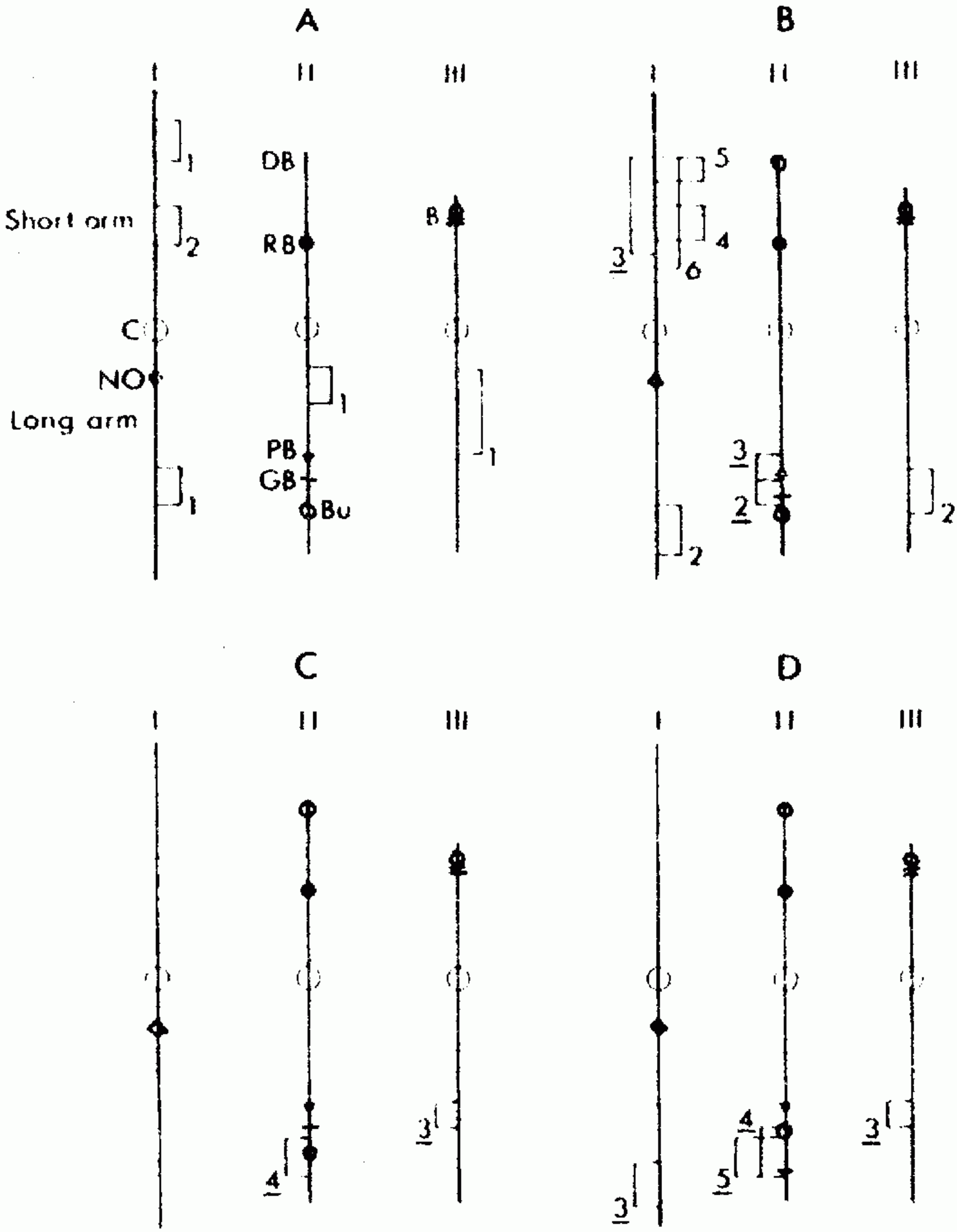

Fig. 2
Idiograms of the four cytotypes (A-D) of S. guianense in Brazil. The relative positions of markers are: C, centromere; NO, nucleolar organiser;

DB, double bubble; RB, Ring of Balbiani; GB, grey band; Bu, bubble; B, blister. Solid brackets on the left and right hand sides indicate fixed and polymorphic inversions, respectively. The length of the chromosome that each inversion occupies is drawn to scale.

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Low flows and recovery of Simuliidae in the Little Stour, Kent

P.J. Wood: School of Geography, The University of Birmingham, Birmingham, B15 2TT UK.

The 29 month period between February 1990 and July 1992 represents the driest period in England and Wales since the 1850's with a cumulative rainfall deficit ranging from 450-550mm for much of Central and Southern England.

The recovery of Simuliidae after a protracted drought (1989-1992), exacerbated by groundwater abstractions, was recorded in the Little Stour, a small regulated English chalk stream. Groundwater levels in the area declined to the extent that two dry reaches developed. Prior to 1989, simuliidae (primarily Simulium ornatum) were recorded in 38 of 93 (41%) of samples from the river, although this rose to 58% for

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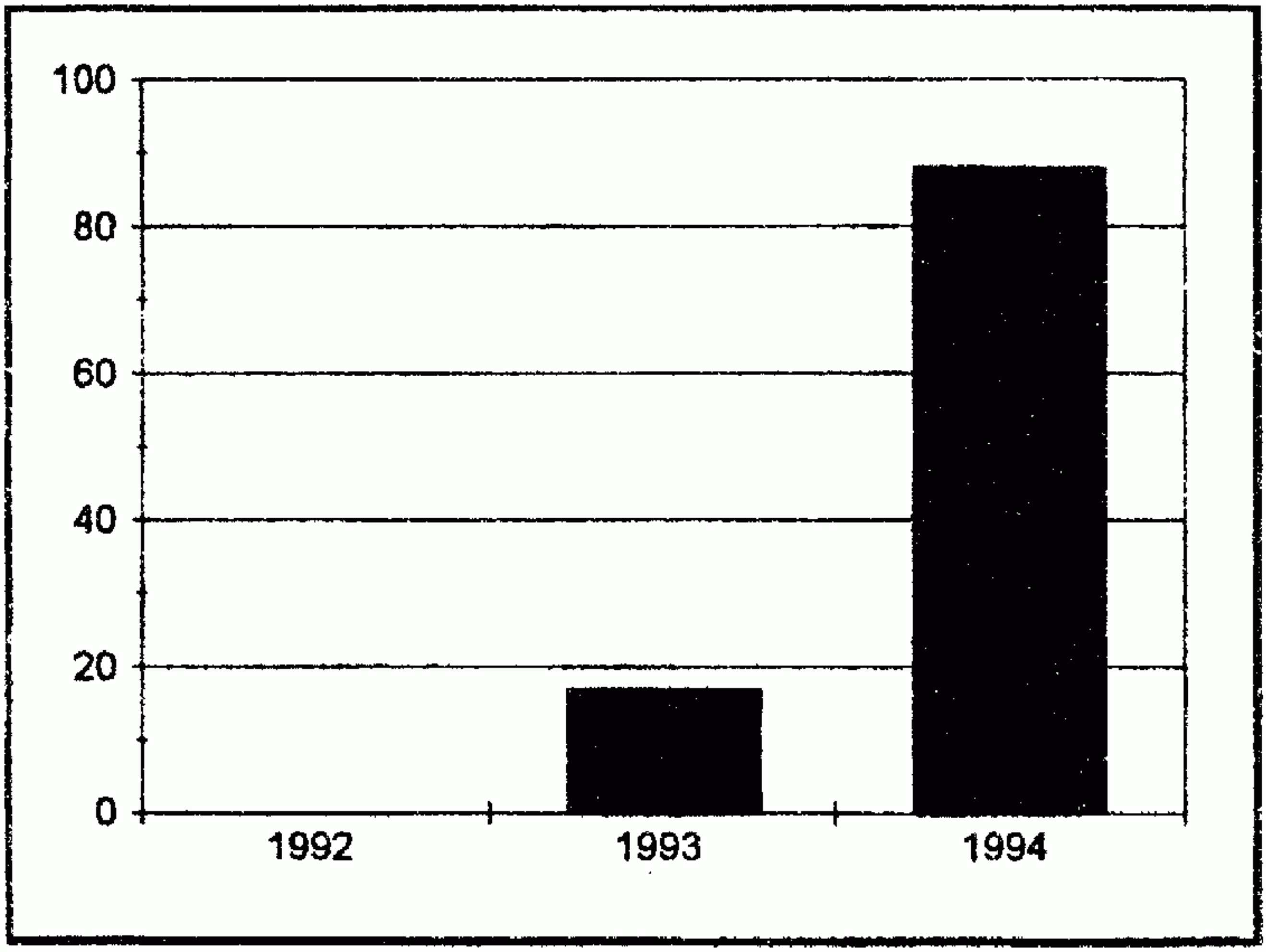

Figure 1. Total number of Simuliidae recorded on the Little Stour 1992 - 1994.

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riffle sites where these were historically dominant or sub-dominant (32 of 55 samples) (Source: NRA routine sampling record). However in the current study there was only one record of Simuliidae between 1989-1992, reflecting reduced flow velocities and an increase in the deposition of fine sediment within the channel.

In 1993 low numbers of Simuliidae were recorded at 3 sites, suggesting that recovery was underway. In 1994 there was further recovery extending to the riffle sites which had been dry during the drought, though this was relatively low compared to other taxa such as Gammarus pulex (Figs. 1 and 2).

The recovery of Simuliidae reflects both an increase in flow and a reduction in surface silts along the river. The rapid increase of Gammarus pulex may relate to an increase in the availability of detrital food material with the resumption of flow. The varied response of taxa suggests a need to understand specific faunal responses to the effects of drought and low flows.

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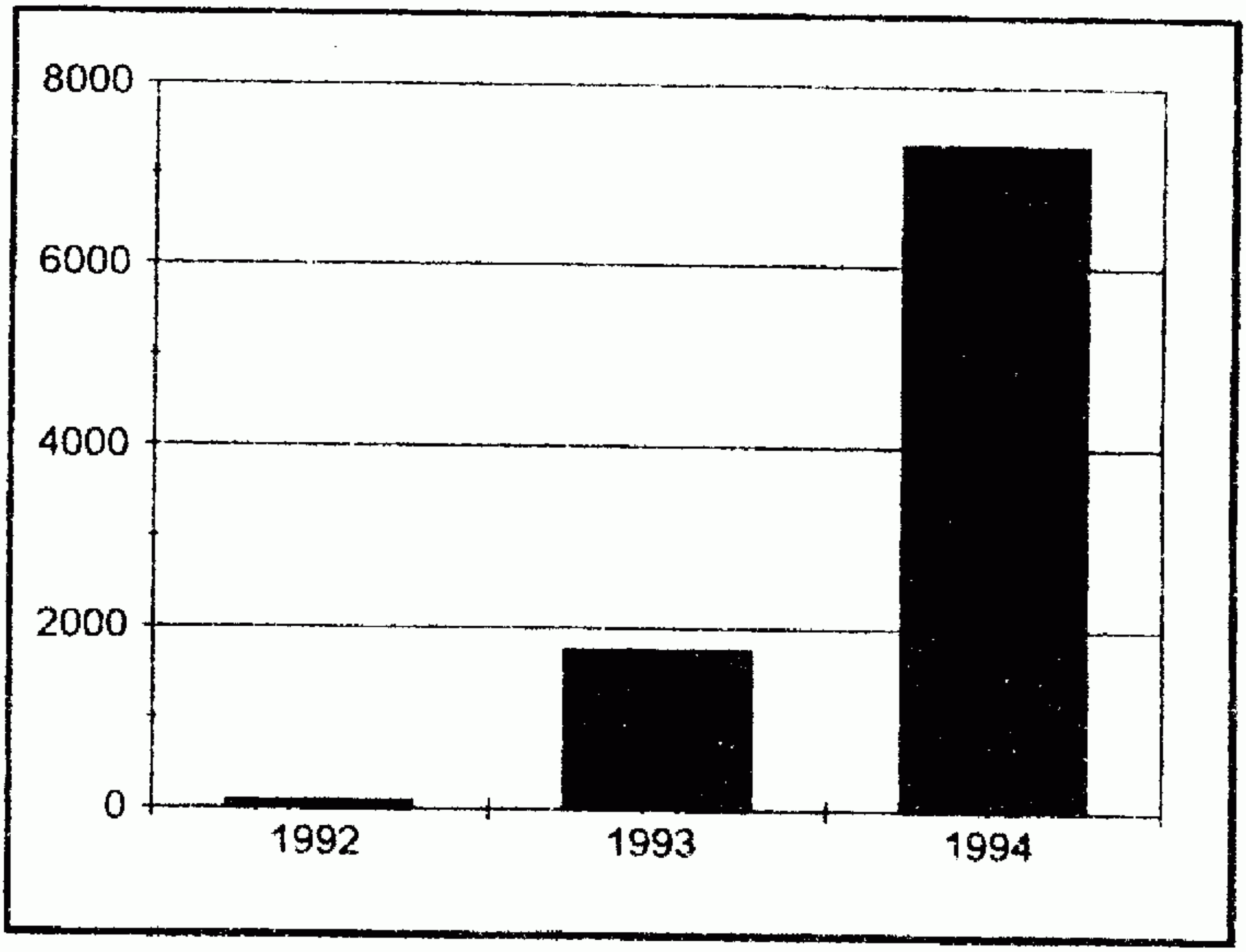

Figure 2. Total number of Gammarus pulex recorded on the Little Stour 1992 ☙1994.

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☙

☙SCIENTIFIC CONTRIBUTIONS

Simulium guimari and Simulium tenerificum: a correction.

R.W.Crosskey: Department of Entomology, Natural History Museum, Cromwell Road, London SW7 5BD, UK.

Simulium guimari Becker and S. tenerificum Crosskey are two species of the Simulium aureum group (= subgenus Eusimulium s.str.) endemic in the Canary Islands. Both are present in Tenerife but only S. guimari occurs in Gran Canaria. The latter island has been thought devoid of running water but investigations since 1987 have resulted in the collection of material from several small streams in Gran Canaria that survive 'against the odds'. (Water capture for human use is so efficient that the number of flowing streams has declined this century from 200 or more to almost nil.)

Study of the new Gran Canaria material has revealed an error in my paper on the Canaries Simuliidae (Crosskey, 1988) which I now correct. The larvae of guimari and tenerificum are easily distinguished by the postgenal cleft: this is a quadrate notch (typical of the aureum group) in tenerificum but is a shallow crescentic excavation in guimari. Figure 9 of my paper shows the guimari (not tenerificum) cleft and Figure 18 shows the tenerificum (not guimari) cleft. It seems that at some stage in MS production the typescripts for the larvae were inadvertently transposed. Information given in my Canaries paper for the larval stage of guimari pertains to tenerificum and vice versa. (Other life stages are unaffected.)

Reference

Crosskey, R.W. (1988). Taxonomy and geography of the blackflies of the Canary Islands (Diptera: Simuliidae). J. nat. Hist. 22: 321-355.

MEETING NOTICES

The 19th Annual Meeting of the British Simuliid Group

At the 18th. Annual Meeting, Jon Bass offered to host the 1996 meeting at Monks Wood. This proposal was accepted by acclamation. We are all grateful for this offer and the date will be announced in the next Bulletin.
NE-118, Florida, 22/23 February 1996

Possibly the last annual meeting of the North Eastern Regional Project which has become the annual meeting for North American workers on blackflies will be held in Everglades, Florida, 22nd. to 23rd. February 1996. The history of this meeting was told by Doug Craig in Brit. Simuliid Grp. Bull. 5 (1995). Anyone interested in attending should contact the meeting secretary Dr. Jim Sutcliffe, Department of Biology, Trent University, Peterborough, Ontario, Canada. K9J 7B8. [Phone (403) 748 1424, FAX (403) 748 1205, e-mail jsutcliffe@trentu.ca]

Ninth German Simulium Symposium, Vienna, 27/29 September 1996

It is understood that plans are underway to hold the Ninth German Simulium Symposium in Vienna between 27th. and 29th. September 1996. The organiser is Dr. Manfred Car, A. Hruzastr. 3, A-2345 Brunn am Gebirge, Austria.

NOTES, NEWS, VIEWS AND CORRESPONDENCE

Ivan Antonovich Rubtsov

The Russian blackfly specialist I.A. Rubtsov (= Rubzov) died in September 1993 at the age of 91. His obituary and bibliography have now been published (in Russian) in the Entomologicheskoe Obozrenie (1995, volume 74, pp. 239-253). It is aimed to prepare an English translation of the obituary (pp. 239-242) and to make a further announcement on our Group E-mail bulletin board when the translation becomes available.
[Contributed by R.W. Crosskey Natural History Museum, Cromwell Rd. London SW7 5BD UK.]

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A fourth Simulium species found in the Channel Islands

Three species have been known to occur in the Channel Islands, viz. Simulium angustipes Edwards, S. ornatum Meigen and S. trifasciatum Curtis (syn. spinosum Doby & Deblock). There are, however, at least four. A pinned male specimen recently found among unworked material in the BMNH belongs to the familiar lake-outfall species Simulium noelleri Friederichs, as shown by genital slide preparation. Its data are: Jersey, Osier St. Catherine,
9.8.1972 (W.J. Le Quesne).

[Contributed by R.W.Crosskey, Natural History Museum, Cromwell Rd. London SW7 5BD UK.]

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Simulium symposium in Santiago, Chile

The day long onchocerciasis symposium chaired by Tony Shelley at the 12th meeting of the Latin American Federation of Parasitologists in Santiago, Chile, in October was a great success with several long discussions generated by the diverse topics presented.
The following talks were given:

Tony Shelley (Natural History Museum, London) - Introduction and recent developments in research on simuliids and onchocerciasis.
Marilza Maia Herzog (Oswaldo Cruz Institute, Brazil) - Oncocercose e sua dispersao no Brasil.
Sixto Coscarón (Museu La Plata, Argentina) - Factores que afectan la distribución de los vectores de oncocercosis en Latino-America.
Sergio Luz (Natural History Museum, London)- Complexos de espécies vectoras de simulideos e sua importância na transmissao de oncocercose na America Latina.
Ron Guderian (Vozandes Hospital, Ecuador) - Estrategias para el control de la oncocercosis en el Ecuador.
Carlos Coutinho (SUCEN, Brazil) - O potencial para controle de simulideos na America Latina.
Philip McCall (Liverpool School of Tropical Medicine, UK) - Oviposition pheromones: a new aspect of blackfly behaviour for monitoring and control.

Following the meeting Tony Shelley, Sergio Luz and Marilza Maia Herzog visited two oases in the Atacama desert of northern Chile in an attempt to

obtain Simulium llutense, a locally prolific man-biting species of the subgenus Notolepria to which the vector of onchocerciasis S.exiguum belongs. Although unsuccessful in obtaining S.llutense they did collect a possibly undescribed species as well as the orange form of the man-biting species S.escomeli. Hopefully, Magda Charalambous will be able to obtain polytene chromosome preparations from this material for comparison with the Pacific lowland orange form and Andean black form of this species from Ecuador.
[Contributed by A.J.Shelley, Natural History Museum, Cromwell Rd., London SW7 5BD]

Return to Start

BSG Bulletin No. 7, July 1996

FROM THE EDITOR

Several members have made suggestions for improving the layout and appearance of the *Bulletin,* which I have tried to incorporate into this number. You will note that the *Contents* have moved to the back cover, and the style of the cover and headings has changed. I hope that you will find this an improvement.

Trefor Williams has provided an up-to-date list of 105 members and 7 libraries who receive the *Bulletin*. E-Mail addresses, where known, have been included. If you spot any errors or omissions, please let Trefor or myself know.

Those with access to the internet should note a change in the address of the archives of the *Simuliidae* Mail List., and comments on separate membership of BSG and *Simuliidae* on page 7.

Jon Bass has kindly agreed to organise the next meeting of the group which will be held at Monkswood in September. Details are given below.

Our membership keeps growing. This is a healthy sign, but I estimate that the cost of preparing, printing and posting 130 copies of the *Bulletin* in its present form comes out at about £80 to £90 per issue, depending on the number of pages. Most of this cost is provided by Liverpool University. Printing and paper costs about £30 per issue, which I consider to be very modest, while most of the rest is postage. With the present reorganisation of departments, and tighter curbs on expenditure, we may find someday that we will have to find alternative sources of funds for producing the *Bulletin*. I think that it is time to investigate other options, so that we will not be caught unprepared.

I was very fortunate to be able to attend the NE-118 blackfly meeting in Florida last February, where I gave a short account of the organisation of our Group, the way in which we arrange our meetings, and produce the *Bulletin.* I was most impressed by the amount of fundamental research that is being done by students in the United States, as you will see from the programme contributed by Jim Sutcliffe.

John B. Davies *Liverpool School of Tropical Medicine, Pembroke Place, Liverpool, L3 5QA, UK.*

MEETINGS

19th. Annual Meeting at Monkswood

The 19th. Annual Meeting of the British Simuliid Group will be held at the Institute of Terrestrial Ecology, Monkswood Experimental Station, Abbots Ripton, Huntingdon, on Tuesday 17th September 1996, starting at around 10.30am. The Meeting will be organised and hosted by Jon Bass. It is proposed to have the customary meal on the evening of Monday 16th. at the Pike and Eel Inn, Needlingworth which is 12 miles from Monkswood, for those who arrive the day before the meeting. This will allow most members time to return home on the Tuesday evening.

Jon will be sending out a detailed announcement soon. But to help with your foreward planning, the nearest rail stations are at Huntingdon and Peterborough 15 min and 25 min drive respectively from Monkswood. There are three trains leaving Kings Cross for each destination between 08.15 and 09.30 in the morning which should arrive in time for the meeting. Hotels are located at Godmanchester, Huntingdon, St. Ives, and Needlingworth, prices range between £35 to £57 single or £54 to £70 double.

Remember that the success of the meeting depends a on the number and quality of papers or posters presented, so Jon would like to hear from anyone who would like to give a presentation. Don't wait for the formal announcement! As before, papers will be published in the December number of the *Bulletin*, so here's a chance to get something into print.

NE-118

The following posting is the programme from the latest meeting of the NE-118 black fly group. This group, in existence for several years, is composed of a core of technical committee members some of whom receive funding through agricultural research stations (ARS) connected with certain U.S. Land Grant Universities and some of whom are self-funded. (The "NE- 118" refers to the grant number under which ARS funding is made available.) Several others pariticipate in NE-118 meetings informally and out of interest. This includes black fly researchers from the U.S. and Canada as well as other countries. Meetings of the group are informal and stimulating and usually held in warmer parts of the continent. Although this is the last year for which ARS funding is available through the NE-118 grant, the group has agreed to continue to meet annually. Next year's venue is probably Vero Beach in Florida - international attendees are most welcome!

If you have any questions about the group, please feel free to ask me

Jim Sutcliffe NE-118 Secretary, Dept. Biology, Trent University

NE-118 Annual Meeting 1996 Programme

Flamingo Lodge Marina and Outpost Resor Everglades National Park,
Florida February 22-24, 1996
Chair: Fiona Hunter, Vice-Chair: John McCreadie, Secretary: Jim Sutcliffe

Friday, 23 February 1996
9:00-9:15am Welcome, Introductory Comments & Announcements
Fiona Hunter (Chair) ; **Jim Sutcliffe** (Secretary)

NE-118 Technical Committee Reports

9:15-10:15am
Peter Adler and John McCreadie (Clemson University): Perspectives on the North American black fly fauna. (15 minutes)
John F. Burger (Univ. New Hampshire): Habitat change and black fly management at the Dixville study site. (15)
Kenneth Pruess (University of Nebraska): Selecting molecular markers. (15)
Rich. Merritt (Michigan State University): Update on Michigan black flies. (15)

Research reports from other workers

10:45-12:0 am

Neusa Hamada (Clemson University): Cytotaxonomy and ecology of the Simulium perflavum group in Amazonia, Brazil. (15)

Doug Craig (University of Alberta): Polynesian Simuliidae: reconstructed phylogeny and zoogeography. (15)

Jan Conn (University of Vermont): Interspecific variation in polynesian black flies. (15)

Alison Stuart (University of Toronto): Why behavioural characters are so misunderstood: A case study using black fly cocoon-spinning behaviour. (15)

1:30-3:00pm

Fiona Hunter (Brock University): Sugar-feeding in black fly adults. (10)

Charles Beard (Clemson University): Fungus fun in flies or gut filling. (10)

Doug Currie (University of Toronto): Evolution of blood-feeding behavior in black flies (Diptera: Simuliidae). (20)

Jim Sutcliffe (Trent University): What attracts female *Simulium euryadminiculum* to the common loon? An educated guess. (15)

Elmer Gray (Clemson University): Economic impact of black flies in South Carolina. (15)

John Davies (Liverpool School of Tropical Medicine): The British Simuliid Group. (10)

3.30-4.30pm

John McCreadie & Peter Adler (Clemson University): Spatial consideration of species assemblage patterns. (15)

Jennifer Zettler (Clemson University): The relationships between substrate colour and larval pigmentation. (15)

Fiona Hunter (Brock University): Filter-feeding in black fly larvae. (10)

Elmer Gray (Clemson University): Update on the Clemson University orbital shaker bioassay. (10)

Dan Arbogast (State of Pennsylvania): Noted failures of Bti to effectively control black flies in Pennsylvania. (15)

4:30-5:00pm NE-118 Business Meeting

Saturday, February 24

9:00am Overflow and unscheduled papers.

NE-118 Business Meeting (continued)

Adjournment

6:00pm Closing Barbecue

International Meeting

While at the NE-118 Meeting I canvassed opinion about the possibility of holding an International Simulium Meeting in South Africa.as we discussed last year As with our group, there was a mood of cautious optimism, provided sponsorship could be provided for the majority of the 20 - 25 scientists that might travel from North America. The real problem lay with finding a suitable time. Everyone agreed that the meeting should be held during the northern winter, and that February was the preferred month as most Universities held a short recess then. Obviously there was insufficient time to organise anything for February 1997, leaving February 1998 as the earliest possible date.

When I put this to Ferdy de Moor, he replied that after discussion with Rob Palmer, they are still interested in holding the meeting in South Africa. Unfortunately, Ferdy will be out of the country during January and February 1998, which moves us on to 1999 as the earliest available February. This might be an advantage as Rhodes University, where the meeting would probably be held, has new Vice Chancellor who will need time to settle in before being approached, and the new government and independent funding agencies are at the moment finding a lot of new priorities which were not addressed previously. Hopefully, the situation will be clearer by early 1997, and Ferdy feels that he may be in a better position to assess the viability of a blackfly meeting in SA then. - Ed

NOTES, VIEWS & CORRESPONDENCE

Natural History Museum, London: New Serials List

Bulletin readers might like to know that the Natural History Museum in London has just issued a new list of the periodicals represented in its extensive natural science libraries. This supersedes the last such list of twenty years ago. That was used a fair bit among blackfly workers - for instance, Doug Craig took a set to Edmonton

The following information might be helpful if anyone wants to urge their library to get a copy:

Title: "The Natural History Museum: Serial Titles held in the Department of Library and Information Sources, 4th edition, 1995"
Basis: printout from Museum's electronic library serials catalogue
Scope: lists 25,000 serials held in the museum, of which 7,000 titles are additional to the last serials list of 1975. Fields covered are all natural history and natural sciences, biomedicine, botany, entomology, geology, palaeontology, zoology.
Format: 1844 double-column pages issued in five ring-bound volumes. Serials listed alphabetically in full title with year span of publication and Museum holding, place of publication, in-house details of whereabouts and shelf-marks etc.
International reference: ISBN 0-565-09014-3
Price: £70 pounds (packing and postage extra)
Orders or further information: apply to Head, Department of Library and Information Services, Natural History Museum, Cromwell Road, London SW7 5BD, UK.
E-mail address: c.mills@nhm.ac.uk

The Museum's library resources can be accessed through the photocopy service. It is not cheap, but application to the Museum can often short-circuit long delays in getting literature by other means such as inter-library loans.

Photocopy Price: £0.40 (40 pence) per spread + postage (+VAT on UK orders)
Photocopy Orders: FAX - 44 (England) (0) 171 938 9290.
E-Mail: genlib@nhm.ac.uk

Names of British Simuliids

Bulletin readers might like to have a list for easy reference of the name changes for British simuliids since the F.B.A. Handbook was published in 1968.Taxonomic investigations based on more material (including types) have led to better correlation with the Continental European fauna and to weeding out of synonyms and misidentifications.
Here are the changes (*P. = Prosimulium, S. = Simulium*):

<u>FBA Handbook Name</u>	<u>Present Name</u>
P. arvernense	*P. tomosvaryi* Enderlein
P. inflatum	*P. latimucro* Enderlein
S. angustitarse	*S. lundstromi* Enderlein
S. argyreatum	*S. noelleri* Friederichs
S. aureum group sp. (unnamed)	*S. velutinum* Santos Abreu
S. austeni	*S. posticatum* Meigen
S. brevicaule	*S. cryophilum* Rubtsov
S. cambriense (celticum)	*S. angustitarse* Lundström
S. latigonium	*S. lundstromi* Enderlein
S. latipes	*S. vernum* Macquart
S. monticola	*S. argyreatum* Meigen
S. nitidifrons	*S. intermedium* Roubaud
S. salopiense	*S. lineatum* Meigen
S. spinosum	*S. trifasciatum* Curtis
S. subexcisum	*S. latipes* Meigen
S. sublacustre	*S. rostratum* Lundström
S. tuberosum	*S. tuberosum* s.l. *
S. yerburyi	*S. latipes* Meigen
S. zetlandense	*S. equinum* Linnaeus

* Anyone using the name *tuberosum* for British specimens should add 's.l.'. Peter Adler's studies on Holarctic *tuberosum* show it to be a species complex. Our '*tuberosum*' in Britain is not *tuberosum* s.str. (from Finland) but could be one of the other named species that come within the morphospecies *tuberosum*.

Besides name changes there are a few additions and deletions of species to and from the British list:

<u>Additions</u>	<u>Deletions</u>
Metacnephia amphora Ladle & Bass	*Cnephia tredecimata*
S. juxtacrenobium Bass & Brockhouse	*S. britannicum*
S. pseudequinum Séguy	

[List provided by Roger Crosskey who should be contacted if you need the background to any of the changes - Ed]

Membership of the *British Simuliid Group* and the Mail List *Simuliidae*

A number of complaints have been received from BSG members who claim that they have not been getting any of the correspondence from the *Simuliidae* electronic list, and from members of the list who have not received copies of the *Bulletin*.

The explanation is that the two memberships are separate, and not linked. Membership of one does not automatically confer membership of the other. Please refer to the inside of the front cover for information on joining.

MAILBASE of Newcastle University who administer the *Simuliidae* list have just informed us that they no longer support the *Gopher* system. This means that from now on the *Simuliidae* archives can only be viewed via the WWW at URL: *mailbase@www.mailbase.ac.uk/lists-p-t/simuliidae* This is unfortunate for those members who do not have access to a web browser.

On the Internet

Searching the World Wide Web for the word 'simuliid' produced 45 references, most of these related to our *Simuliidae* mail list, but two other sites of potential interest to British simuliidologists turned up. They are:

Pictures of Simuliidae Twenty-two images collected by Doug Craig are available for viewing or downloading at URL:

http://gause.biology.ualberta.ca/craig.hp/simuliid/simul.hp

Warning! Viewing this site may seriously increase your telephone bill!

Checklist of Belgian Simuliidae prepared by Dominique Van Den Neucker in 1991 can be found at URL:

http://alt-www.via.ac.be/u/intpanis/simulis.html

TRAVELLERS' TALES

Kabowra Flies

In 1950, Gerald Durrell visited Guyana on one of his animal collecting trips. This extract is from pages 91 to 92 of his book "Three Singles to Adventure" He describes how, accompanied by Robert Lowes, he visited the McTurk ranch at Karanambo (3° 33' N, 59° 10" W) in the Rupununi Savannah in the South of the country.

> When we had finished the meal, McTurk suggested, to lighten our gloom, that we might like to accompany him on a fishing trip he was making down the river. It would give us a chance to spy out the land and work out some sort of a plan. We made our way down through the trees to the river, and there, in a tiny bay, we found an odd collection of boats. Some were native canoes, some resembled ships' lifeboats, and one of them was a small tubby dinghy with an outboard engine. McTurk climbed into the dinghy and was carrying out some kind of adjustments to the engine, and Bob and I reclined on the bank above to have a smoke. No sooner had we settled ourselves than we were fiercely attacked by great numbers of tiny black flies a little larger than a pin-head but with a bite that was out of all proportion to their size. You felt as though you were being stabbed all over with thousands of cigarette ends, and Bob and I were soon leaping about the bank cursing and slapping and hurriedly rolling down the sleeves of our shirts. McTurk watched our antics with amusement.
>
> "They're kaboura flies", he explained, "but they're not so bad now. You should see them in the rains, millions of them".
>
> The kabouras continued their assault on us until the dinghy was pushed out into mid-stream and the engine started. A few of them flew after us, but we soon left them behind. McTurk explained that they only lived in moist places, and so during the dry season they inhabited only the margin of the river. During the rains, when vast areas of the savannah were covered with water, the flies had a greatly increased range which they took full advantage of, settling on you in clouds if you ventured out unprotected.
>
> The river was not very wide, but the tawny waters were deep and the current fast. Where the river curved, the rippling waters had piled up great banks of golden sand, dotted with the rotting trunks of fallen trees or great slabs of smooth grey rock.

"Three Singles to Adventure" Heineman, London 1962 (First published 1954).

[John Smart (Simuliidae (Dipt.) from British Guiana and the Lesser Antilles; Transactions of the Royal Entomological Society of London 90 (1): 1-11.) writes that the name 'Cabowra flies' refers to *Simulium haematopotum* Malloch. However, when I visited the Rupunini near the Guyana/Brazil border in 1973-5 I found that the term was applied to any species of biting *Simulium,* including *S. guianense* and members of the *S. amazonicum* group. Ed.]

Pests of the Pushal

In 1956 Eric Newby accompanied by Hugh Carless set out to attempt to climb the mountain of Mir Samir in Nuristan which lies NE of Kabul and N of Jalalabad. On their way back they stopped at Pushal, capital of the Ramgul Katirs and located on the Pushal River in the Ramgul valley. (approx. 30° 30' N , 70° 20' E) He writes:

p. 211
"There was no main street in Pushal because no two houses were at the same level. The way through it was like a gully, far too steep even for our horses, which had to cross the river and ford it again lower down beyond the town. There were no shops, no *chaie-khana* but, as in Panjshir, the roofs were covered with apricots and mulberries. Among the fruit, watching us go by, stood wraithlike figures in white so muffled up that it was impossible to say whether they were men or women......."

p. 221
"The children were covered with sores, but then so was every-one else, and as time passed so were we: attacked by an abominable fly, a small yellow-backed variety that drilled holes in us, making a sort of bridgehead for larger filthier flies. This fly had the facility, like a fighter attacking out of the sun, of being able to pick a blind spot and alight on one's nose without being observed. For some reason known only to themselves they were particularly attracted to Hugh's. Soon it was covered with craters that gave him a particularly dissipated appearance of which he was acutely conscious."

Extracted with the author's permission from: "A short walk in the Hindu Kush" by Eric Newby, Secker and Warburg, London 1958 247 pp.

[Note: Elsewhere in the book Newby mentions mosquitoes, so these insects were different, It is unlikely that the colour of *Culicoides* would have been noticed, and *Culicoides* are usually described as "minute", and most species are crepuscular. The presence of a nearby mountain river suggests simuliidae, but could they perhaps have been a yellow species of Stomoxyinae? Can anyone hazard an identification? Ed.]

British Simuliid Group Bulletin

Number 8, December 1996

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FROM THE EDITOR

Another *Bulletin* is about to come out, and I would like to thank all contributors for sending in their pieces so promptly.

Trefor Williams, who was the editor of the first numbers of the Bulletin, and of all the Newsletters that preceeded it, retired in October. Since Trefor could not attend the September meeting the opportunity was taken for everyone to sign a card of congratulation (if that is the right sentiment). Trefor tells me that he will continue his teaching commitments for the next two years, and will be happy to continue as secretary of the group. He will still occupy his office in the University, and his address remains unchanged.

John Brooks has looked at the pros and cons of registering the *Bulletin* for an ISSN number. To have a number would help librarians in ordering and cataloguing the *Bulletin* but since we send to only 7 libraries and have a relatively small circulation, it hardly seems worthwhile, so I will not apply unless enough members have other views.

We have received quite a few amendments to the address list published in the last *Bulletin*. The changes and additions are given at the end.

THE 19th ANNUAL MEETING AT MONKS WOOD

The 19th Annual Meeting was held at the Eastern Rivers Laboratory of the Institute of Freshwater Ecology, Monks Wood Experimental Station, Abbots Ripton, Huntingdon on 17th September 1966. The meeting was organised by Jon Bass .

As is with previous meetings, those who managed to arrive the evening before, met for an informal dinner which this year took place at the Pike and Eel Inn, Needlingworth. Fourteen members and friends were assembled and some were brave enough to sample the "Wild Boar" (if an animal that has been reared in captivity can be called "wild").

The meeting itself was attended by 21 members and was opened by Dr. Clive Pinder who introduced the work of the Eastern River Laboratories. He explained that there had been a major decline in freshwater fisheries since 1970. This was mostly attributed to the management of the rivers for navigation and to reduce flooding. Dredging reduced the reaction between the river and the flood plain and the occasional high floods now flushed out the pools and backwaters which served as refuges for young fish. The NRA only censor large fish so MW is concentrating on habitat selection and survival by young fish using Beam as the indicator species.

Copies of newspapers carrying inaccurate accounts of an outbreak of the "Blanford Fly" in the Oxford area in the summer of 1996 and featuring a photograph of a prominant member of the Group on the front page were put on show. Titilating headlines such as "SUPERBUG - Sucking blackfly strikes - Experts baffled" indicated the tone of the articles. For those who might wish to follow up this story, the papers were the *Oxford Mail* of August 29, and the *Oxford Times* of August 30 1996, both articles by Chris Dignan.

Five papers and one poster were presented during the morning and early afternoon.

After tea, there followed a lively discussion on a number of topics. Tony Shelley, on behalf of the Natural History Museum, offered to host the 20th (1997) Meeting, an offer which was accepted by acclaim. The question of future funding of the *Bulletin* was raised. Preparation, printing and postage currently costs about £80.00 per issue. At present this cost is borne by Departments of Liverpool University the Liverpool School of Tropical Medicine, and a research grant. However, the research grant will end in 1997, and reorganisation of University Departments and

their financial structure may make future funding uncertain. The discussion which followed showed that the membership favoured continuing with two issues of the *Bulletin* each year, and alternative sources of funds were discussed. A suggestion that a membership fee or attendance fee be charged at meetings was considered impractible because this would mean keeping accounts etc. A final decision was postponed until the next meeting when the financilal situation would be clearer. In the meantime members would investigate
other alternatives

Members were asked for their views on compiling a register of collections made by members, starting with those that did not figure in any publication. Feelings were mixed. There was the problem of errors in identification becoming perpetuated. However a suggestion that a map should be compiled showing areas where collections had been made so that members would know where the records were lacking won general approval and Roger Crosskey was asked whether he could try to do this.

There was no further information to report concerning the proposal to hold an international meeting in South Africa.

The meeting ended with a vote of thanks to Jon Bass for organising such a successful meeting

British Simuliid Group Bulletin, Number 8, December 1996

ARTICLES BASED ON PRESENTATIONS GIVEN TO THE MEETING

Effect of vector control and community based distribution of ivermectin on the transmission of *Onchocerca volvulus* by *Simulium neavei* in western Uganda

Rolf Garms[1], James Katamanywa[2], John Yocha[3], Tom Rubaale[3]
[1] *Bernhard Nocht Institute for Tropical Medicine, Hamburg, Germany*
[2] *Vector Control Unit, Ministry of Health, Fort Portal, Uganda*
[3] *GTZ Basic Health Services, Fort Portal, Uganda*

In Uganda 1.2 million people are believed to be infected with *Onchocerca volvulus* (World Health Organization, 1995). About 800.000 of them now receive annual treatments with ivermectin, which has become the means of choice for the control of onchocerciasis. In Kabarole district in western Uganda community based distribution of ivermectin began in the second half of 1991. The effect of these treatments on the transmission of *Onchocerca volvulus* by the vector *Simulium neavei* has been studied in the northern of the two onchocerciasis foci in the district from 1991 to 1995.

The focus is located around the Itwara forest reserve about 25 km north-east of Fort Portal, the headquarters of Kabarole district. The reserve covers 87 km^2 of steeply undulating terrain. It is bordered to the west, south and east by large tea estates which are highly important economically, and to the north by subsistence farms with some large cattle ranches. The area is densely populated and onchocerciasis is highly endemic. The vector is *S. neavei* which has its breeding sites in the Sogohi system which bisects the forest. The Itwara focus is not completely isolated from a smaller secondary focus along the lower Sisa and Kyasa rivers and parts of the Muzizi where it flows through forest. Altogether, at least 40,000 people are infected with *0. volvulus* in northern Kabarole out of a population of about 800,000 in the whole district.

In order to monitor the effect of the ivermectin treatments on the transmission of onchocerciasis, flies were routinely caught by vector collectors at four catching sites and examined for infections with *O.volvulus*. In general, immediately after the treatments infection rates declined significantly but started to increase again two to four months later. In 1991, of a total of 1553 parous flies which were dissected 27.8% carried 1st and/or 2nd stages (L1/L2) of *O. volvulus* and 2.6% carried third stage larvae (L3) in the head. Corresponding figures for the following years were 6841/31.0/5.6 in 1992; 3990/26.8/3.5% in 1993; 3162/21.6/3.8 in 1994; and 1672/15.7/2.9 in 1995. Infection rates of the flies became significantly lower than was observed before the treatments when more than 40% of the flies were infected. However, it became clear that over the first four years of the programme the transmission was not being reduced sufficiently to halt transmission. It was estimated that 1000 parous flies carried 124 infective larvae of *O. volvulus* in their heads in 1991, 276 in 1992, 169 in 1993, 176 in 1994 and 151 in 1995. A similar pattern was shown when the individual parasitic loads of the infected flies with L1/L2 or L3(in the heads) were compared (Fig. 1). There was a decline of the numbers of L1/L2 per infected fly but, interestingly, not of the numbers of L3. The reason for this could be a limitation of the numbers of infective larvae tolerated by the flies. Results suggested that ivermectin treatments would have to be continued over many years unless carried out at other intervals or dosages or combined with other measures, such as vector control.

[Graph File Bull8F1.gif here]

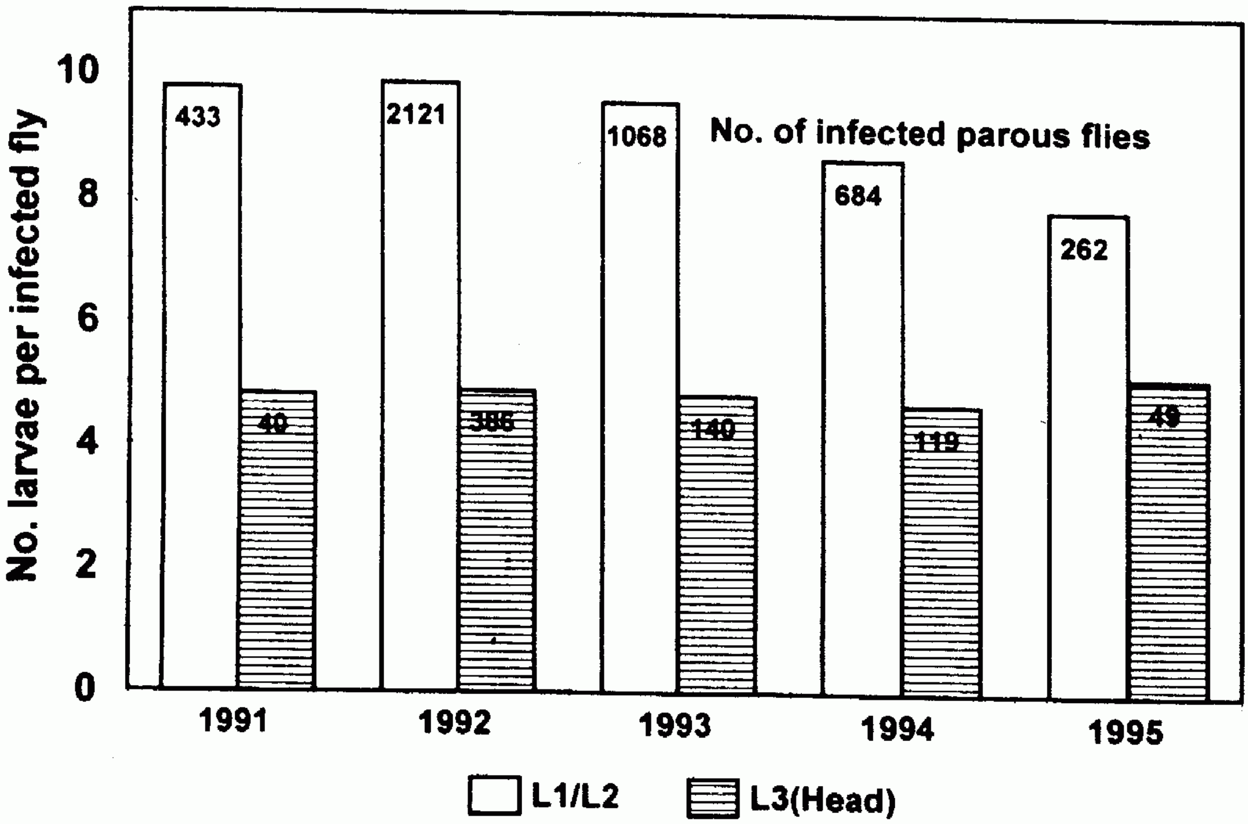

Figure 1: Parasitic loads with L1/L2 or L3(head) of *Onchocerca volvulus* in *Simulium neavei* infected with L1/L2 or L3(head). Northern onchocerciasis focus of Kabarole district (1991 to 1995).

Figure 1: Parasitic loads with L1/L2 or L3(head) of *Onchocerca volvulus* in *Simulium neavei* infected with L1/L2 or L3(head). Northern onchocerciasis focus of Kabarole district (1991 to 1995).

An attempt was therefore made to investigate the feasibility of vector control in the sufficiently isolated northern focus of Kabarole district using the organophosphorous larvicide temephos (Abate<) which is regarded as safe for the environment. First experimental treatments were carried out at two sites on the Sogohi river in 1994. Concentrations of 0.2 to 0.3 mg/l temephos (calculated for a river discharge of 10 minutes) were sufficient to kill the larvae of *S. neavei* over a distance of more than 3 km. No adverse effects were noted on the river crabs (*Potamonautes aloysiisabaudiae*), which are the phoretic hosts of the immature stages of the vector. The first treatments were followed by an immediate reduction of biting densities of *S. neavei* at a nearby catching site, where only 65 flies were caught in 1995, in comparison with an average of more than 3600 flies during the three previous years.

Following these promising results, Abate treatments were gradually extended to all rivers of the focus, where *S. neavei* was known to breed. They were repeated at 1 or 2 months intervals. Finally, 29 dosing points were utilised. The extension soon led to a virtual disappearance of flies from the catching sites around the Itwara forest and the last fly was caught on 3 August 1995 at the Sogohi catching site.

It appears that, at present, there is no longer any substantial transmission in large parts of the focus. The effect of the treatments was also checked and confirmed by the routine examination of river crabs, which became almost free of immature *S. neavei*. Plans are now being made for a routine project aiming at an eradication of the vector and the disease, from the focus. By a combination of vector control and ongoing ivermectin treatments

Blackfly larvae and bioengineering

Roger Wotton, *Dept. of Biology, University College London, Gower St., London WC1E 6BT*

Bioengineering is a "buzzword" used to describe the way animals modify their environment. Blackfly larvae have an effect on the streams in which they live but they are also elegantly engineered. I will therefore use two sub-headings: 1. Engineering *of* blackfly larvae and 2. Engineering *by* blackfly larvae

1. Engineering of blackfly larvae

(a) Silk is produced from prominent glands that run almost the length of the larval body. Silk is used by larvae in several ways. For attachment to the substratum; a thread of silk serves as a life-line when larvae are dislodged; and pre-pupae spin a silk cocoon in which the pupa is attached. Although no measurements have been made, observation suggests that blackfly silk is a very strong material indeed.

(b) The body shape of blackfly larvae, with the widest part of the abdomen about one third from the posterior of the body, provides a streamlined profile as larvae trail in the water current.

(c) Anyone viewing the head fans present in most blackfly larvae cannot but be impressed by their engineering. Not only are rays delicate yet strong, but rays can be folded and extended with what appears to be a minimum of energy. The head fans are effective trapping devices and many materials will become impacted on to the microtrichia, larger particles being trapped by sieving.

(d) One of the advantages of the living engineering shown by larvae is that growth, and replacement, of the exoskeleton are achieved by moulting. Inorganic engineering has a lot of catching up to do.

2. Engineering by blackfly larvae

(a) We know from the studies of Doug Craig and his students that complex currents pass over the blackfly larval body and also over/through the head fans. There is a hydrodynamic effect of these currents downstream and this is the explanation for the presence of rows of larvae often seen over horizontal surfaces. The larvae clearly engineer an effect on the pattern of water flow.

(b) Some species (e.g. *Simulium noelleri* in the palaearctic and the closely related *S. decorum* in the New World) form dense aggregations and their effect on the water flowing over them must be considerable. Aggregations are often formed in shallow water and the numbers of large particles (> 40 mm in diameter) being carried by the water are reduced in just a few centimetres of stream length. In thin films of water the tips of the larval head fans are seen to distort the surface film and the effect of larvae on current patterns must be complex and involve much turbulence.

(c) We know that blackfly larvae ingest a wide range of matter, both organic and inorganic, from the water column.

Suspension feeding is not the only strategy and larvae of some species graze exclusively by scraping the substratum, others using this strategy occasionally. We are still a long way from understanding what are the main foods of larvae and sophisticated techniques will be required to see whether exudates and the adsorbed coatings of ingested mucopolysaccharide fibrils play a significant part in nutrition. I suspect that they do.

(d) Blackfly larvae have a low assimilation efficiency and feed continuously. The result is that large numbers of faecal pellets are produced by each larva. In June and July of this year I joined Björn Malmqvist of Umeå University to study the abundance of blackfly faecal pellets in a stream that flowed 500 m from a lake to the Baltic. We monitored the number of faecal pellets in transport and used sedimentation traps to record numbers depositing on the substratum. Blackfly larvae were present in the upper part of the stream at densities of 1 million per m^2 and these larvae produced huge numbers of pellets, having ingested a very wide range of particulate and dissolved materials from the water. They are thus important bioengineers in capturing materials from suspension, packaging them into much larger aggregates, and then causing these large particles to be transported downstream. Our study showed that some pellets were ingested by blackfly larvae and others were sedimented and used by other members of the benthic community. This is probably an important process in the stream we studied and may well be in many stream and river systems.

The Blandford Fly - Absolutely the last word.

Mike Ladle and Stewart Welton. *IFE River Laboratory, East Stoke, Wareham, Dorset, BH20 6BB.*

The "human-biting" Blandford Fly (*Simulium posticatum* Meigen), abundant in the valley of the Dorset River Stour, has been the subject of ecological investigation since the late 1960's. In this period it has been the topic of a PhD thesis, numerous scientific papers, countless newspaper articles, several poor cartoons, a love story and a detective novel. In the course of studies aimed at the ultimate control of the biting problem several fascinating features of the biology of this species have emerged.

The fly has a single annual generation involving the choice of a unique oviposition site in the cracked soil of the river banks, a prolonged egg diapause, huge populations of larvae in the fast flowing reaches of the river in springtime, pupation and emergence over a short period in late April to mid-June and a predeliction for human blood. The latter is associated with biting of the lower legs of humans and often severe reactions to the bites resulting in oedema, irritation, blistering and ulceration.

Following a long campaign, involving NRA, Bournemouth Water Company and HSE, North Dorset District Council were given an experimental permit in 1989 for treatment of the Blandford Fly larvae with the bacterial insecticide Bti. The IFE have since carried out pilot treatments with this material and now, in four successive years, full treatments of the River Stour. Over this period the numbers of people reporting bites at monitored local health centres has been reduced, by two orders of magnitude, to single figures in 1996.

Simulium damnosum s.l.: Identification of inducible immune molecules and their possible implications for the transmission of *Onchocerca* spp. in an endemic area of human onchocerciasis in North Cameroon.

H.E.Hagen, S.L.Kläger, D.V.Barrault, P.J.Ham[1], J.H.McKerrow[2] & D. Hultmark[3] [1]. *Keele University, Staffordshire, UK.;* [2]. *VAM/UCSF, San Francisco, USA;* [3]. *University of Stockholm, Sweden.*

A variety of inducible immune molecules have been observed in *Simulium damnosum* s.l. following an infection with the bovine parasite *Onchocerca ochengi*. Amongst these haemolymph components are phenoloxidase, serine proteases, lectins, lysozyme and at least one defensin-like antibacterial peptide that has not been fully characterised.

For some of these components direct evidence is available that they are potentially lethal to microfilariae and the infective third stage larvae of *Onchocerca* spp. *In vitro* assays could demonstrate that haemolymph of infected blackflies kills the parasite more effectively than control haemolymph. Serine protease inhibitors, when co-injected with microfilariae of *O. ochengi*, were the most effective type of protease inhibitor to increase parasitic survival. This indicates the role of this type of protease in the defense against parasites either directly or via the activation of prophenoloxidase. Co-injection of certain sugars together with the parasites again led to the enhancement of parasitic survival. This is most likely due to their successful blocking of the respective type of haemolymph lectin.

In summary, from our knowledge of the blackfly's immune apparatus it can be concluded that it constitutes some of the important intrinsic factors that determine the vector capacity of a given cytospecies or population of *S. damnosum* s.l.

On blackflies from Tierra del Fuego and Patagonia

Roger W. Crosskey: *Department of Entomology, Natural History Museum, Cromwell Rd., London SW7 5BD, UK.*

The informal contribution comprised a transparency-assisted ramble in parts of Tierra del Fuego and Patagonia where, in January-February 1994, I collected blackflies in company with Monty Wood (Ottawa). Some of the key facts highlighted by way of an introduction to the southern Andean fauna (not hitherto touched on in a Group meeting) were these:

The dominant Andean genus is *Gigantodax* (68 species, Tierra del Fuego to Mexico, one new species in press from Arizona [Kevin Moulton, pers. comm.]). The genus is unique in Simuliidae because of the straight instead of sinuous wing vein Cu1A. Just half of the species occur in southern Andes (Peru southwards). *Simulium* is represented in the southern Andes almost solely by subgenus *Pternaspatha* (29 species, Peru to Tierra del Fuego, one species in Ecuador). The affinities are unclear. Member species lack the calcipala (rounded lobe on inner tip of hind basitarsus) nearly always present in *Simulium*. Additionally, *Paraustrosimulium* (1 species), *Cnesia* (3 species) and two (not mentioned) monospecific genera occur in southern Chile and Argentina. Sites on both sides of the Beagle Channel and in Isla de los Estados, easternmost fragment of the Tierra del Fuego archipelago, are the most southerly point in world range of the Simuliidae (approximately 54°50' South). Thirteen species are known from the archipelago

A collecting trip by F.W. Edwards (a Natural History Museum dipterist) to the southern Andes in 1926 resulted in the collection of 20,000 Diptera, most written up in later years in a series entitled "Diptera of Patagonia South Chile". Edwards collected mainly in the area of Bariloche (Argentina), so this is of special interest because it is the type locality for many southern Andean Diptera. Edwards, being a Nematocera specialist, wrote up the simuliids himself and made the first significant contribution to knowledge of *Gigantodax*; only the original type species was known before, and Edwards (1931) described eight new species (his good series of adults are in the Museum). Edwards (1927) wrote a little known account of the entomological expedition.

References

Edwards, F. W. (1927). Insect collecting in the southern Andes *Natural History Magazine* **1**, 111-125

Edwards, F. W. (1931). Simuliidae. Pp. 121-154 in *Diptera of Patagonia and .South Chile*, Part II Nematocera (excluding crane-flies and Mycetophilidae) 331 pp. British Museum (Natural History), London.

ARTICLES BASED ON POSTER PRESENTATIONS

The use of image analysis systems in simuliid taxonomy

C.A. Lowry, A.J. Shelley, S. Luz and M. Maia-Herzog*
Medical and Veterinary Division, Department of Entomology, The Natural History Museum, London, U.K.
**Departmento e Entomologia, Instituto Oswaldo Cruz, Rio de Janeiro, Brazil*

Recent work on Neotropical simuliid vectors of human onchocerciasis, has shown that behavioural and vectoral differences can be attributed to the existence of sympatric populations of closely related species or of species complexes defined by cytological and molecular methods. A search for fine morphological characters for rapid field identification of members of species groups and complexes involves the need for simultaneous comparisons.

*Synoptics** developed an image composition system, "Montage", within their image analysis software, *Semper*. Images captured and composed using this system can be archived using their image database software, *Treasury*. Multiple images can then be compared simultaneously on screen allowing numerous features to be scrutinised in detail.

Integral within the system is a compound microscope. The range of objectives available allows images of both whole specimens or parts of specimens on slides mounts to be viewed and captured. The composite computer image is constructed from various focal plains of specimens viewed through the microscope. The montage of images to form a single picture is unlimited, thus allowing a precisely focused image of the specimen to be produced. This has surmounted previous problems of micro photographic reproductions that have precluded the full definition of morphological features in a single photograph because of depth of field problems.

The composed image together with any relevant data associated with that image e.g. determination, stage, sex, locality, etc. can be added to the database systems Treasury. The system then allows searches to be done for any words within the text for quick retrieval of images, which can be viewed simultaneously for comparison.

This technique has been effectivly used in differentiating *Simulium oyapockense* Floch & Abonnenc from *S. roraimense* Nunes de Mello, both vectors of onchocerciasis in the Brazilian Amazon, and from the morphololgically similar non vector *S. minusculum* Lutz. On close inspection under standardised lighting *S. minusculum* can be identified by the length of the triangular intervital marks which are short in comparison to those of *S. oyapockense* and *S. roraimense*. Separation of females of *S. oyapockense* amd *S. roraimense* has proved more difficult and the valididy of these two species questioned. However, recent cytological study has show that they are good taxa, with a major fixed inversion in the short arm of chromosome II. Using the above equipment to compare simultaneously on screen numerous features, an area highlighted for further study is the number of cibarial teeth present in these species. However, these comparisons have also indicated that *S. oyapockense* is probably a species complex and further investigation is required.

* *Synoptics* is the name of a commercial organisation - Ed

SCIENTIFIC CONTRIBUTIONS

New records of Simuliidae from Tierra del Fuego and the southern Andes

Roger W. Crosskey: *Department of Entomology, Natural History Museum, Cromwell Road., London SW7 5BD, UK*

In January-February 1994, during a visit to Tierra del Fuego and the southern Andes with Dr. M. Wood, I made a collection intended to augment the somewhat meagre holding of southern Neotropical blackflies in the Natural History Museum. The material obtained is now in the NHM and the following is a succinct account of the new records, the species list given first followed by the list of sites represented by the appended numbers.

Cnesia dissimilis (Edwards).......................................7, 8, 15
Gigantodax antarcticus (Bigot)..................................10, 17, 22
Gigantodax brophyi (Edwards)..................................3, 4, 16, 18, 19
Gigantodax chilensis (Philippi)...................................7, 8, 9, 10, 17, 24
Gigantodax fulvescens (Blanchard)...........................7, 8, 9, 10, 11, 14, 20, 22, 23, 24
Gigantodax igniculus (Wygodzinsky & Coscarón).....2, 5, 6, 7, 13
Gigantodax marginalis (Edwards)..............................13, 20, 21, 22
Gigantodax rufescens (Edwards)..............................13, 21
Paraustrosimulium anthracinum (Bigot).....................1, 16
Simulium (Pternaspatha) ? nemorale Edwards..........1, 12, 17

Site data:

Argentina

1. Tierra del Fuego Province, Tierra del Fuego, Rio Olivia, 14 km E of Ushuaia, on Rio Grande road, 25.i.1994
2. Tierra del Fuego Province, Tierra del Fuego, stream 33 km E of Ushuaia just before road junction to Harberton, 25.i.1994
3. Tierra del Fuego Province, Tierra del Fuego, stream into Lake Fagnano, 11.4 km S of Kaikén, 25.i.1994
4. Tierra del Fuego Province, Tierra del Fuego, stream 16.5 km S of Kaikén, on Rio Grande to Ushuaia road, 25.i.1994
5. Tierra del Fuego Province, Tierra del Fuego, mountain cascade on Garibaldi Pass 50 km from Kaikén on road to Ushuaia (above Hosteria El Petrel and Lago Escondida), 25.i.1994
6. Tierra del Fuego Province, Tierra del Fuego, river 25 km E of Ushuaia at Las Catorras ski centre, 25.i.1994
7. Neuquen Province, Rio Tromen on Mamuil Malal Pass (Pucín to Jun¡n de los Andes road, 4.ii.1994
8. Neuquen Province, San Martín de los Andes area, stream 6 km N of Rio Quilquehue bridge, on road to Carirrine Pass, 5.ii.1994
9. Neuquen Province, San Mart¡n de los Andes area, stream on north shore of Lago Lolog 4 km NW of Rio Quilquehue bridge, 5.ii.1994
10. Neuquen Province, San Martín de los Andes area, stream at end of track along north shore of Lago Lolog 5 km NW of Rio Quilquehue bridge, 5.ii.1994
11. Neuquen Province, San Martín de los Andes area, runnel under track along north shore of Lago Lolog 2.5 km NW of Rio Quilquehue bridge, 5.ii.1994
12. Neuquen Province, San Martín de los Andes area, Rio Quilquehue below bridge at outlet of Lago Lolog on road to Carirrine Pass, 6.ii.1994
13. Neuquen Province, stony brook flowing west to Lago Hermoso on 'Seven Lakes' road between San Martín de los Andes and Correntoso, 6.ii.1994
14. Neuquen Province, Nahuel Huapi National Park, forest seepage just south of Lake Falkner, 6.ii.1994
15. Neuquen Province, Nahuel Huapi National Park, Arroyo de la Estacada, at crossing of Correntoso to Bariloche road, 14 km SE of Villa La Angostura, 8.ii.1994

Chile

16. Magallanes Region, north-flowing stream on Punta Arenas to Puerto Natales road, 2.5 km N of Morro Chico near Estancia Morro Chico, 27 and 30.i.1994
17. Magallanes Region, Torres del Paine National Park, stream draining Laguna Margarita into Rio Grey near S end of Lago Grey 1.5 km E of Guarderia Lago

Grey, 28.i.1994

18. Magallanes Region, west-flowing stream to Lago Figueroa, 45 km N of Puerto Natales on Torres del Paine road (near 290 km distance marker from Punta Arenas), 29.i.1994
19. Magallanes Region, Estero Creek, on Punta Arenas to Puerto Natales 5 km E of Renoval, near Estancia Eliana Maria, 30.i.1994
20. Biobio Region, Nuble Province, Estero Renegado 2 km E of Las Trancas, on road to Termas de Chillan, 1.ii.1994
21. Biobio Region, Nuble Province, Termas de Chillan, stream in valley SE of main fumeroles, 2.ii.1994
22. Biobio Region, Nuble Province, Termas de Chillan, stream 1 km SSW of ski centre, 2.ii.1994
23. Biobio Region, Nuble Province, river at Puente Torrealba about 5 km ENE of Las Trancas on Termas de Chillan road, 2.ii.1994
24. Araucania Region, Cautín Province, Rio Momolluco near Chilean customs post at Puesco on Pucón (Chile) to Junín de los Andes (Argentina) road, 4.ii.1994

Acknowledgement

I thank Dr Sixto Coscarón for confirming my identification of Gigantodax marginalis.

First report of Simuliidae in Fuerteventura, Canary Islands

Marcos Baez: *Dep. de Biologia Animal, Universidad de La Laguna, 38206 La Laguna, Tenerife, Canary Islands*

Blackflies are quite well known in Gran Canaria, La Gomera, La Palma and Tenerife, though they have a very restricted distribution in these Canarian islands because of the scarcity of running water. Until lately, however, they have been undiscovered in the highly arid easternmost islands of the archipelago, viz. Fuerteventura and Lanzarote, where lotic habitat is almost non-existent. They are still unknown (and seem unlikely to occur) in Lanzarote but I have found two breeding sites in Fuerteventura and can now report the occurrence of at least one species in the island. Its identity has been verified by Roger Crosskey as *Simulium (Nevermannia) ruficorne* Macquart, a species widespread in Africa and fairly common in sun-warmed lotic habitats in Gran Canaria, La Gomera and Tenerife. I collected pupae and obtained reared adults in February 1990 from the barranco (ravine) to the Embalse de las Peñitas near Vega de Rio Palmas (UTM grid ref. ES9940) and in April 1996 I collected early stages and adults from a trickle near Llanos de la Concepción (UTM grid ref. ES9149). Both places are on the west side of Fuerteventura island, near the road from Puerto de Rosario (the island capital on the east coast) to Pájara (in the southwest). Specimens from both sites are deposited in my collection and in the Natural History Museum in London.

MEETINGS

Fourth International Congress of Dipterology

The Fourth International Congress of Dipterology will be held in Oxford, U.K., 6-13 September 1998. Chairman: Dr. R.P.Lane, Department of Entomology, The Natural History Museum, Cromwell Road, London SW7 5BD, UK. (fax: 44 171 938 8937; e-mail R.Lane@nhm.ac.uk). Secretary: Dr. A.C.Pont, hope Entomological Collections, University Museum, Parks Road, Oxford OX1, 3PW, UK. (fax: 44 1491 873749).

To register your interest or for further information, please contact: Oxford International, ICD4, Summertown Pavillion, Middle Way, Oxford OX2 7LG, UK. (fax: +44 1865 511570; e-mail:

101475@compuserv.com).

[At the 3rd. International Congress of Dipterology, which was held in Guelph, there was a special blackfly workshop. Do we want to want to have one at the next?]

TRAVELLERS' TALES

Pallas and the Moshkis

Roger W. Crosskey: *Department of Entomology, Natural History Museum Cromwell Road., London SW7 5BD, UK.*

By the late eighteenth century the Russian empire had been expanded southwards to the Caspian and eastwards across Asia to the Pacific. There was, however, profound ignorance of what these vast lands contained in the scientific sense until the Empress Catherine the Great, stung by western criticism of Russian academic backwardness and scientific ignorance of her vast territories, set about putting things right. Educated travellers were sent hither and thither on journeys of scientific exploration. One of these men, and perhaps the most eminent, was Peter Simon Pallas, a German graduate in medicine who spent 42 years in the service of the Russian government, adding enormously to knowledge of the natural history, geology and geography of the Empress's domains (ornithologists know his name well from Pallas's Sandgrouse). He must have given satisfaction since late on in life Catherine gave him an estate in the Crimea, the area he loved best. Pallas ultimately returned to Berlin, where he had been born (1741) and where he died (1811)

Pallas's travels, especially in the six years 1768-1774 when he was in the regions of the lower Volga, Tartary, the Urals and the Altai, brought him into contact with blackflies and in 1781 he wrote some paragraphs about these biting pests that I think qualify for our "Travellers' Tales" section of the Bulletin.

At the time Pallas wrote about blackflies the name *Simulium* had not been coined (that was 1802) so he had to make the insects he was talking about comprehensible by comparing them to the famous Golubatz fly of Banat on the Middle Danube. Here are some interesting passages (from the German).

"I turned to the excellent Mr von Born* ... and thanks to his intervention I recently received a small plate full of the correct Golubatz midges, every one of which I was able to recognize immediately as the Russian moshkara**, although somewhat larger, and also as the same insect that I had frequently cursed whilst collecting plants and insects on the river Volga and in the Altai mountains... [Description] ... This is how I have found the Golubatz midge, and I have also seen the Volga and Siberian moshkara to be in perfect agreement with this, except that they are rather smaller and do not have such broad white rings on the legs, and so I no longer have the slightest doubt that both belong to one kind. I am equally completely convinced that Linn,'s *Culex reptans* is nothing but this insect, rather smaller and not quite so abundant in the northern regions".

Later:

"This biting fly, as it could appropriately be called, is found in the northern forests of Russia ... and for the most part it runs around amongst the hairs of cattle. On the Volga below Kazan, where the river begins to flow between forested hills and approaches a warmer region, and especially in the area from Simbirsk to Saratov and Kamyshin, ... the same species is found from the beginning of May to the middle of June ... in such unimaginable numbers in low, sheltered, bushy areas and on the forested hills that midges seem to fill the air like hailstones; they fall blindly and with force into one's face, as if someone was throwing sand at you, they fly into the eyes, nose and mouth, and they settle stubbornly on the skin; with their blunt proboscis they pierce the skin (often painfully), so that on each occasion a bloody spot is left, although it does not itch. Fishermen, hunters and anyone else who has business in the open or who is travelling provides himself at this time with a spacious gauze hood, impregnated with birch oil ... because it has been observed that the moschka, though it throws itself blindly against everything else, does not dare fly through a gauze veil soaked in this strong-smelling oil, no matter how broad the netting. Without this protection it is often hardly possible to open the eyes. If the insect has the chance to alight unnoticed on the skin and to suck robustly the abdomen fills up with blood like a balloon and there is no way of removing it except by crushing it to death. As it is impossible to open the mouth without several of them inside all at once, it often happens that they are crushed or bitten as they are spat out, and one then learns involuntarily that their innards have the sweet flavour of honey".

"These biting flies are no less abundant in the more southern part of the Ural mountains; but still more abundant when one approaches the forested mountains of southern Siberia and also beyond Lake Baikal. Even in the mountains one is pursued by these pests in June, right up to the cold elevations where there is no longer any forest. However, they are not to be found here in late summer. If one travels from Yakutsk to the Sea of Okhotsk [edge of the Pacific], indescribable numbers of the flies are again encountered once the Aldan river is crossed; and presumably they also occur in North America [!]".

"There are also reports from the mountains of Siberia and the Urals that these little insects, together with the cattle-warbles which are common at the same time, are able to worry horses and cattle to death if they wander into the forest and find no refuge in open spaces or around a smoky fire ... I have also noticed in Siberia that the bite sometimes produces large swellings in man which have still barely subsided after 48 hours".

"Mr von Born ... confirmed in his letters to me the great damage caused by the pest [in Banat] ... they attack cattle, creep through the anal orifice, the nasal openings and the ears into the inside, and kill the animal within four or five hours. If one cuts the animal open, they are found in clusters in the lungs and viscera, both of which are completely inflamed. The plague lasts for three or four weeks, and then vast numbers of dragonflies arrive (*Libellula grandis* and *aerea*) and devour them all, and then again they are consumed by swallows which also appear in flocks. At the end of July or the beginning of August the second generation hatches and the circumstances are the same".

[Is this perhaps the earliest reference to predators of blackflies ?]

Reference

Pallas, P.S. (1781). Ueber die kolumbachischen oder bannatischen, viehtödtenden Mücken [On the Golubatz or Banat, cattle-killing midges]. Pp. 349-354 *in* Pallas, P S. (Ed.), *Neue Nordische Beyträge zur physikalischen und geographischen Erd-und Völkerbeschreibung, Naturgeschichte und Oekonomie* **2**, 375 pp. St Petersburg and Leipzig.

* Von Born was an eminent polymath scientist, born in Bohemia, who studied in Vienna. He was a freemason and Grand Master of the lodge of which Mozart was a member. He is thought to be the basis of Sarastro in "The Magic Flute". (Information from Adrian Pont, 8/1/1991.)

** The usual Russian word for blackfly, transliterated from Cyrillic, is moshka (plural: moshki). Pallas said that moshkara was the name along the Volga and that mokriza was in use in Siberia.

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Deletion

Mr. Kevin Darling, has written to say that he is leaving science shortly, and will no longer continue his interest in the Simuliidae.

Return to Start of Document

British Simuliid Group Bulletin Number 9, July 1997.

FROM THE EDITOR

Wonders will never cease! Most of the pages of this Bulletin were spoken for three months before the deadline. In Bulletin No. 6 of December 1995 it was announced that an obituary to I.A. Rubtsov had been published in Russian and that when an English version was produced it would be made available to members. The translation now appears on page 2.

At the Monks Wood meeting of the British Simuliid Group in September 1996, it was suggested that in order that members could know where records were lacking, a map should be compiled to show all areas where Simuliids had been collected. Thanks to considerable effort by Jon Bass and Roger Crosskey, this has been done, and it is included in this Bulletin as detachable supplement. It is quite remarkable how much of the country has now been covered. But there are still many spaces, particularly in the midlands. Even in areas where collections have been made the records may be old or not completely representative. So there is no excuse, next time you go for a picnic, *pick up a pupa!*

We have a review of Simuliid control in Brazil from Victor Py-Daniel which reveals how widespread the nuisance problem is in that country, and how seriously it is regarded. I confess that I had no idea of the extent of the problem until I read his article.

Lastly we have an index compiled by Roger Crosskey of the numerous Simuliid related items that appeared in the early *Newsletters of the British Simuliid Group* between 1979 to 1987 . While *Bulletins* 1 to 4 were indexed by Trefor Williams, I confess that I have not indexed the numbers under my editorship, but will see if I can produce an index for inclusion in Bulletin No. 10.

Trefor Williams tells me that he was amazed and amused to receive the retirement card following the Monks Wood meeting even though it was a little premature as he is only semi-retired. He warns anyone contemplating semi-retirement that it involves 90% of the work for only 30% of the salary!

Corrections to *Bulletin* No. 8

Please correct the following errors in Bulletin No. 8 of December 1996.

Page 1, paragraph 6: the Pike and Eel Inn is at "Needingworth" .
Page 2, second line should read "using bream as the indicator species"
Page 6, paragraph 6, line 5: error in units, replace "mm" with "µm"

MEETING NOTICE

Preliminary Notice of the 20th Annual Meeting of the British Simuliid Group, 25 November 1997

The 20th Annual Meeting will be held at the Natural History Museum in London on Tuesday 25 November, 1997. Further details will be circulated in due course. However, the organisers would welcome hearing from anybody wishing to volunteer a talk or poster presentation.

Correspondence to BSGM c/o Mrs. Carolyn Lowry or Dr. Tony Shelley, Medical and Veterinary Division, Department of Entomology, The Natural History Museum, Cromwell Road, London SW7, 5BD (e-mails: cael@nhm.ac.uk and ajs@nhm.ac.uk respectively)

IN MEMORY OF I. A. RUBTSOV (1902-1993)

V. N. Tanasychuk and V. A. Tryapitsin

Translated from *Entomologicheskoe Obozrenie* **74**: 239-242 (1995)

Ivan Antonovich Rubtsov, eminent entomologist, professor and doctor of biological sciences, died on 22 September 1993, in his ninety-second year.

His path into science was neither easy nor simple. I.A.R. was born on 16 January 1902, in the village of Novolitovskoe in the Maritime Territory [Primorsky, eastern Siberia], in a peasant family with many children. He attended the village school and subsequently worked in a post-office while preparing external exams for middle school. Having completed his school education in this way, he worked for several years as a primary school teacher, and, in 1924, entered the Biological-Geographical Faculty of the Irkutsk State University, from which he was to graduate in 1928. At the University, as well as at the Station for Plant Protection (STAZRA), where I.A.R. worked while still a student, his scientific interests began to emerge. His first studies, published immediately after graduation, dealt with the Siberian planarian fauna, but after these first works he began an in-depth research into the locusts of Siberia, focusing mainly on problems related to their mass-scale breeding outbreaks and the means of combating them. His early works on this topic were noticed, refereed and approved by B.P. Uvarov. After graduation, I.A.R. remained as a postgraduate research student at the Department of Zoology of Invertebrates, completing his postgraduate study in 1932; he then began work at the Irkutsk Station for Plant Protection (STAZRA) as a scientific researcher, subsequently becoming the head of its entomological section. At this time he began to be interested in the systematics and faunistics of the family Simuliidae, which at that time had hardly been examined at all in the territory of the USSR (only two species had been known). In 1934 I.A.R. became a doctoral candidate at the Zoological Institute of the Academy of Sciences of the USSR in Leningrad [now St Petersburg]. In 1935 he successfully defended his candidature-dissertation on locusts, and - already by 1936 - his doctoral thesis, entitled "The Simuliidae of the USSR, their Systematics, Geographical Distribution, Biology and Ecology". In the two subsequent years I.A.R. headed the zoological laboratory of the All-Soviet Institute for Plant Protection (VIZR), while simultaneously editing the Plant Protection Journal. In 1938 he joined the staff of the Zoological Institute, where he was to work for forty-one years - up to his retirement in March 1979.

In 1940, I.A.R. published a monograph on blackflies (Simuliidae) in the "Fauna of the USSR" monograph series. In it he made much use of such progressive taxonomic methods as the examination of the genitalia and the analysis of the morphological characteristics of the pre-imaginal stages. Eighty species of blackflies were recognized in the territory of the USSR, and this number rapidly increased. By 1956, in a new edition of the same book, the simuliid fauna of the USSR already included 280 species. I.A.R.'s tome, under the title Simuliidae, appeared in 1959-1964 in Lindner's series "The Flies of the Palaearctic Region" and contained descriptions of more than 300 species. In our own time, as a result of research by I.A.R. and his students, we know of around 650 species of blackflies in the Palaearctic region, more than 350 of which were described by I.A.R. himself.

Together with other employees of the Zoological Institute, faced with the outbreak of the Second World War, I.A.R. took part in defence activities and the protection of the Institute, surviving the first and most terrible winter of the blockade of Leningrad. In 1942, together with a large group of employees of the Institute, he was evacuated to Dushanbe (called Stalinabad at the time), and there, while continuing with his research into blackflies, he also started a new study conceived before the war and related to the biological control of harmful insects. In Tajikistan, in the environs of Kurgan-Tjube, I.A.R. set up an entomological station where he studied parasites of the shield-bug *Eurygaster integriceps* Put. (Heteroptera). This research, alongside his study of blackflies, became a new direction of his work. Returning to Leningrad in 1945, I.A.R. devoted a lot of time to an examination of the theoretical foundations of biological control and published numerous studies related to the problems of introduction and acclimatization of entomophages. His monograph "The Biological Method of Combat Against Harmful Insects" (1948), combining vast amounts of foreign and national material, provided a strong stimulus for developments in this direction both in the USSR and beyond its borders: abroad it has been translated more than once. In this volume, for the first time in the national literature, I.A.R. dealt with many theoretical aspects of the 'biomethod'. The book has not lost its importance to the present day. The title was submitted to the publisher at the beginning of 1948, and soon after the painful and infamous session of the All-Soviet Academy of Agricultural Sciences (in August 1948), was subjected to harsh criticism at a special sitting of the Academy. I.A.R. was charged with an inclination towards "formal genetics" and, in particular, rebuked for citing the works of I.I. Shmal'gauzen [Schmalhausen]. Luckily for I.A.R. he also referred in his book to some works of T.D. Lysenko and this somewhat weakened the position of his accusers. Nonetheless, at the time of his trial, I.A.R. had to "justify himself" in all seriousness and own up to his "errors".

An important part of the book was its fifth chapter devoted to the aims of the biological method in the USSR, which included lists of entomophages of the more important harmful insects and recommendations about the introduction of parasites and predators from abroad. However, this section was written hastily and contained some unchecked information, so provoked many critical remarks from the experimental specialists in biomethods.

I.A.R. played a part in the introduction of several parasitic Hymenoptera into the USSR. In 1947, while on a duty trip to Italy, he visited the Laboratory for General and Agricultural Zoology in Portici (near Naples), where Professor Filippo Silvestri, one of the living patriarchs of the biomethod, was still at work. From Italy, I.A.R. despatched to Batumi [Georgia] some twigs of mulberry, with the mulberry scale *Pseudaulacaspis pentagona* Targ.-Tozz., infected by the ichneumon fly *Encarsia berlesei* How. This scale-parasite acclimatized itself in the Caucasus. Accidentally, the same package contained a male and a female specimen of the ladybird

Lindorus lophanthae Blaisd., from which was initiated the population of this scale predator in Georgia.

Because of his outstanding talent as a researcher, applied with enormous erudition, an exceptional love of work and capability, I.A.R. became a most eminent specialist in all fields of knowledge in which he chose to immerse himself. This was the case with the fourth direction of his research, the examination of the mermithid worms, which represented a logical development in his study of biological control. An enormous experience of morphological work accumulated in his study of insects enabled him to produce a major contribution to knowledge of this group. He published one hundred studies dealing with this topic, including "The Freshwater Mermithids of Estonia" (1973), the two tomes on "Aquatic Mermithids" (1972 and 1974), the first monographic study on this subject in world science "Mermithids" (1977 and 1978), and "Parasites and Enemies of Fleas" (1981). He described more than four hundred and fifty species of mermithids, and considered in detail the questions of origin, taxonomy, distribution and biocenotic relations of these animals. He examined their role in nature and the possibilities for their practical application. He also described a new order of parasitic worms - Marimermithida - discovered on the Asteroidea from the seas of the Antarctic.

In total, I.A.R. produced more than four hundred scientific studies, including several dozen monographs, devoted to blackflies, mermithids and biological control. He executed himself tens of thousands of extraordinary drawings illustrating these studies. However, an excessive hastiness, characteristic of I.A.R. and reflected in his works, not unrarely provoked justified objections from his colleagues.
The works of I.A.R. were highly praised by zoologists - both at home and abroad - and this is reflected in his many invitations to foreign institutes and the translations of his books into foreign languages (about which he sometimes learnt purely by accident).

I.A.R.'s contribution to science was recognized through a number of awards at home, as well as an Italian medal named after Mario Bezzi which was awarded for his study of the Italian blackflies (1947-1961). He took part in numerous scientific congresses and conferences at home and abroad.

I.A.R.'s productivity as a scholar caused amazement among his colleagues. Thus, a correspondent-member of the Academy of Sciences of the USSR, V.V. Popov, the head of the Department of Land Invertebrata at the Zoological Institute (now the Laboratory for the Systematics of Insects), spoke of the "powerful work force" I.A.R. possessed. In one of the review reports of the department, V.V. Popov underlined the fact that "approximately one third of the entire published production of the department in the past year was written by I.A. Rubtsov".

I.A.R.'s scientific thinking was characterized by considerable independence and in some cases oddity. On occasion he would express ideas which were not accepted unconditionally and on trust by his colleagues, and this led to discussions which were not infrequently rather sharp. Nonetheless, I.A.R. defended his ideas gently and tactfully. To one of his scientific opponents, for example, he gave a present - an offprint of his study - with the following dedication: "To the opponent of the ideas expressed herein, with the hope of mutual understanding". Among his ideas of this kind is certainly the concept of mutualist relationships (i.e. relationships of mutual benefit) between the parasite and its host, as well as his exaggeration of the role of heterosis in the biomethod. As a systematist I.A.R. sometimes expressed criticism of what he called a purely "museum" tradition in the study of species, and spoke in favour of a multi-faceted study (biology, ecology, genetics, etc.), to which nobody objected. I.A.R., however, maintained that each "museum" species would finally be shown to consist of dozens of "true, natural" species, so bypassing the hierarchical classification of species into subordinate taxa. As the years passed, I.A.R. keenly followed the development of new scientific directions in the USSR, supporting the establishment of a laboratory devoted to karyosystematics. He became a consultant on research into the karyosystematics [cytotaxonomy] of blackflies undertaken by L.A. Chubareva and N.A. Petrova.

I.A.R. was an able teacher to many now famous scientists. It will suffice to mention such specialists in the study of Simuliidae as Z.V. Usova, A.E. Terteryan, Sh.M. Djafarov, E.O. Konurbaev, V.D. Patrusheva and A.V. Yankovsky. His students now work in all the republics of the former USSR, and many foreign scholars also consider themselves to be his disciples. One of the authors of this obituary (V.N. Tanasychuk) himself began research under the supervision of I.A.R.

It should also be said that the results of I.A.R.'s work would not have been so enormous, and this is a prevailing belief among his colleagues, without the help he received over many years from his devoted co-worker A.A. Il'ina, with her extraordinary love of work, self-sacrifice and application.

I.A.R. was a very versatile man. He loved classical literature and knew it intimately, he was not a bad painter, and his flat, although not very large, was furnished with magnificent furniture and sculpture, resembling a small corner of the Hermitage. When I.A.R. moved to the Home for Veterans of Science he donated all that treasure to the Priyutino Museum.

The chief passion of Ivan Antonovich, nevertheless, was always science. To it he gave more than sixty years of his long life. In it and in its history he will remain.

British Simuliid Group Bulletin Number 9, July 1997.

SCIENTIFIC CONTRIBUTION

Simuliid “Borrachudo/Pium” control in Brazil

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The control of simuliids (Diptera, Culicomorpha, Simuliidae) in Brazil has never been associated with species that transmit pathogens, but with species present in the southeastern and southern regions that adversely affect human activity such as tourism, agriculture, and housing development etc.). In these areas biting simuliids are known by the common name of “borrachudo” and control has been undertaken and techniques developed in the states of Rio Grande do Sul, Santa Catarina, Paraná, São Paulo and Espírito Santo. The main target species for the control activities, in all the states is *Chirostilbia pertinax* [1](Kollar,1862).

1*Editor's Note: Readers who are unfamilliar with the simuliid fauna of Brazil may not recognise the generic name *Chirostilbia*. In this paper the authors have elevated some subgenera of the widely accepted genus *Simulium* to generic status. This is not the place to enter into a discussion on taxonomic hierarchical systems, so I have decided to allow the names to stand. All the "generic" names in this paper may be referred to in other works as subgenera of *Simulium* Latreille, 1802. More details are given in Py-Daniel and de Moreira Sampaio (1994a, 1995).

Rio Grande do Sul

In the mountain-range region of this state, where most of the tourist activity occurs, these insects may constitute a plague affecting the economic exploitation of the scenic landscapes, and limiting agricultural activity.

Before 1972, it is understood that control activities were initially the responsibility of the Agriculture and Tourism Secretaries and some highly toxic pesticides such as the organochloride DDT were used. From 1972 until 1982 the State Health and Environmental Secretary (SSMA) became responsible for control and started to use the organophosphate larvicide temephos to reduce the action of the simuliids. The SSMA also providing training so that control

could be carried out by the administrations of the municipal areas involved.

Between 1982 and 1983 the treatments with this organophosphate were interrupted because it was suspected that resistance to temephos dad developed. Trials were conducted that confirmed the low efficiency of the product against the target species. The use of temephos was abandoned and replaced by mechanical control activities in which the walls of dams and sluices were brushed to remove the immature stages of the target species, and action was taken to and deviate the water flow to kill larvae.

In 1984 a pilot biocide control project based on the use of *Bacillus thuringensis* var. *israelensis* (Bti, H14.) was initiated in five municipal areas: Gramado, Feliz, Dois Irmãos, Sapiranga and Nova Petropolis. To set up this project trials and hydrological studies were first carried out with the objective of obtaining a suitable methodology for determining the discharge measurements necessary for calculating the dosages required for Bti. treatments.

Special modified Pashall troughs were constructed in different dimensions relating to the topography of each creek. At the same time trials were carried out by the Technical Assistance and Rural Enterprise (EMATER) prefectures and municipal schools in the communities involved to involve and inform the population about this type of biological control, and enlist help from the communities. Many imported formulations of Bti. from different manufactures have been tested since 1984), Now, even after 12 years of use, Bti. is still effective and today about 80 municipal areas are using Bti. to control simuliids in an area of 37.855,5 Km2, with about 2,358,000 people benefiting

.

We wish to emphasise that Rio Grande do Sul is important because it was the first Brazilian state to set up Simuliidae control using Bti. . This State now has a technical and methodological structure that conducts annual training sessions for personnel from other States, as well as expanding its own control areas.

A short bibliography of papers relating to Simuliid control in the State of Rio Grande do Sul is appended to the References section.

Santa Catarina

According to Prando (1995) the State Simuliid Research Program was begun in 1984, following a request from rural and political leaders, mainly in the mountainous region of Joinville. Although the initial assumption was that the major problem would be in the Joinville region, a later survey revealed that more than 80% of Santa Catarina municipal areas also needed solutions related to simuliid control.

In the years of 1984 and 1985 the Santa Catarina Agriculture Research Enterprise (EMPASC), (now Santa Catarina Research and Technology Diffusion Enterprise: EPAGRI) undertook the following work:

1. Simuliid species survey: 25 simuliid species were identified in the Santa Catarina area.
2. Studies on the seasonal abundance of different simuliid species in which larvae and pupae densities were estimated, and observations made on the oviposition and host preferences of the adults.
3. A survey of fish predatory on aquatic stages of simuliids. Although 35 species of fish were examined, the presence of simuliid immatures was found the gut of only five species;
4. Studies related to the biology of the anthropophilic simuliids to confirm the life cycle, the egg stage duration, larvae, pupae and adults of the target species, *Chirostilbia pertinax.*
5. Simuliid control: Different larvicide formulations of Bti. were tested in a variety of concentrations.

The EPAGRI is developing training courses to pass on the Bti. control methodology, through technical co-operation agreements with a number of prefectures. In addition to the control work and the diffusion of the technology, campaigns are being organised to assist the preservation and management of the springs and water sources which are also simuliid breeding sites. In 1992 more than 160 technicians were trained to identify the “borrachudos” breeding sites, measure the water flow and apply Bti. At present, the simuliid control work in Santa Catarina is a result of the control technology transference by EPAGRI to local interested technicians in many municipal areas, where “Vectobac” and “Teknar” are applied by private or prefectural initiative.

Paraná

According to Guimarães (1990), the Simuliid Control Program at that time mncluded all state regions (coast, first, second and third plateaux), covering approximately 70% of the municipal areas, The work is coordinated by the State Environmental Agency (SUREMA), guiding and passing on the control methodology to the prefectures, communities, industries, schools and other governmental agencies. As a control measure they adopted in an integrated approach to obtain a high effectively in which the chemical methods (temephos (Abate®) larvicide), mechanical (cleaning), sanitation and environmental improvement (pollution control, forest recuperation and fish re-colonization).

São Paulo

According to Araújo-Coutinho (1995), the Health Secretariat of São Paulo State started the Simuliid Control Program in 1957, initially using the organochlorides DDT and BHC and in 1971 changing to the organophosphate temephos. The program covered an area of 893 Km2 throughout Serra do Mar.

A decision that alternative uses of nonchemical control techniques should be studied was taken in 1984 and in 1986 a pilot project was set up to develop a Bti. application methodology. Following the satisfactory results obtained in the pilot project, a complete cover of the selected area was initiated in 1990 using Bti. and in 1994 a study was started with the purpose of evaluating cost/benefits, mainly in the sense of assessing the direct and indirect impact of the continuous use of Bti.

Espírito Santo

This state, has been using the Bti. control method, In 1991 an experimental production of Bti. was organised through a collaboration between EPAGRI and EMCAPA (Espírito Santo) in Itajaí Experimental Station (EPAGRI). (Prando, 1995)

Amazonia

This region, where biting simuliids are commonly named "pium", is characterized by its extensive area, its lack of road systems that increase the operational cost, the great river discharges and an aquatic trophic chain in which the basic source of food for most Amazonian fishes is concentrated on chironomids, over which Bti. has accentuated action, hence a large scale simuliid control programme is not relevant. Studies related to the control could be feasible only in small areas, where the biological, chemical and physical parameters are already known for some certain species.

<u>Amazonas / Roraima</u> - *Onchocerca volvulus*

The onchocerciasis focus occurs in the Yanomami/Ye'kuana Indian areas of these two states, in the north of Amazonas and in the west of Roraima.

Four species are suspected of being involved in the transmission of this filaria: *Thyrsopelma guianense* (Wise,1911), *Psaroniocompsa incrustata* (Lutz,1910), *Cerqueirellum oyapockense* (Floch & Abonnenc,1946) and *Notolepria exiguua* (Roubaud,1906). Each species presents a different degree of involvement in the transmission such as abundance, diurnal activity, and physiological and morphological differences that may hinder the development of the parasite. It seems likely that the main species involved in the transmission is *Thyrsopelma guianense*.

According to Py-Daniel (1994) and earlier workers the immature stages of species of the genus

Thyrsopelma Enderlein,1934, have an close association with plants of the Podostomaceae family, which are restricted to rock surfaces in or near to waterfalls and rapids . Based on this specificity of *Thyrsopelma* with Podostomaceae, the authors suggest that as part of integrated management for onchocerciasis elimination an auxiliary method of control might be achieved by removal of the plants from the breeding sites in a 5-kilometre radius of each community being treated with Ivermectin.

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THE SIMULIIDAE OF GREAT BRITAIN

A SITUATION MAP SHOWING THE DISTRIBUTION OF COLLECTIONS ON RECORD JANUARY 1997

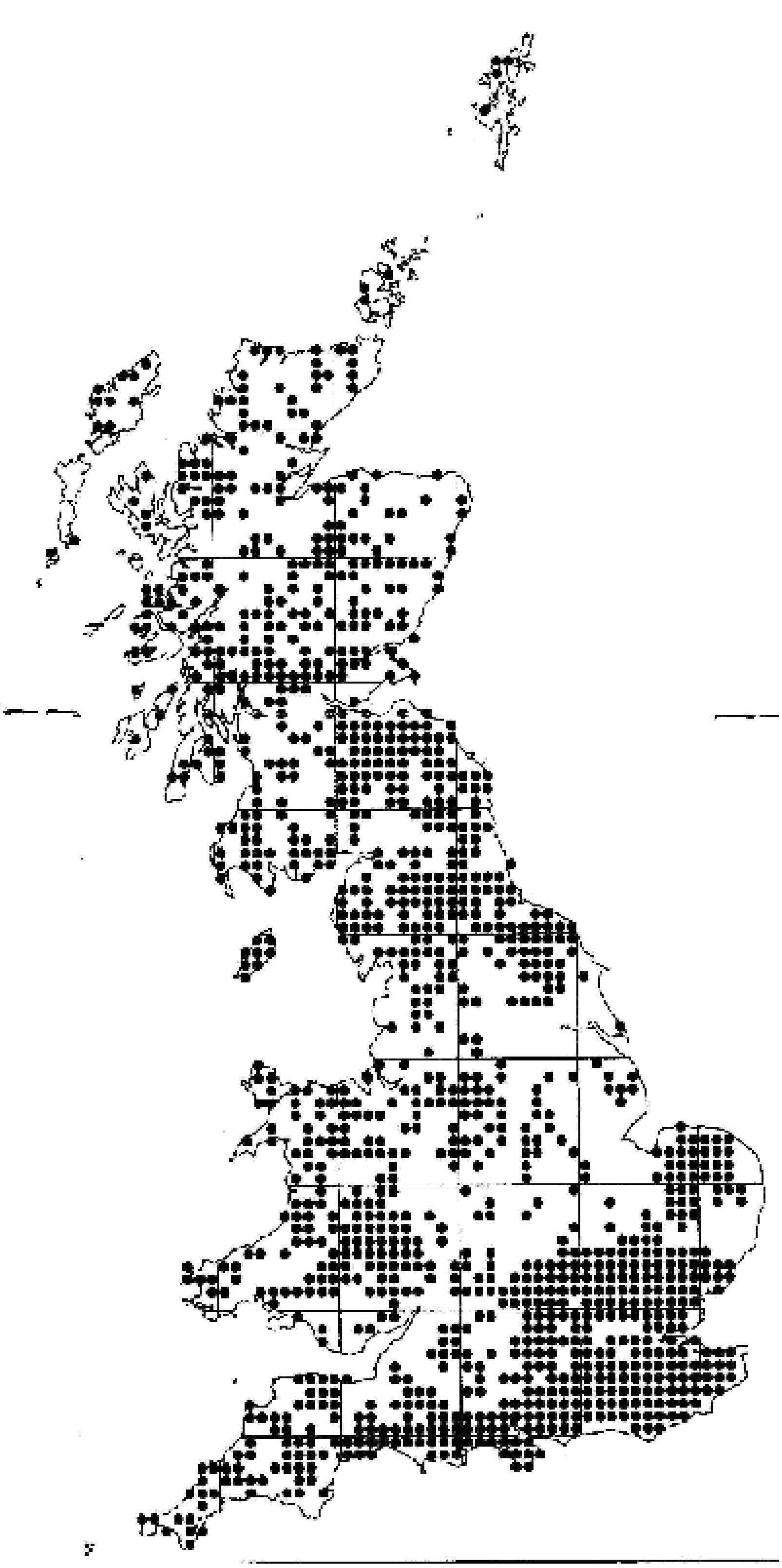
The map overleaf shows the distribution of existing records of Simuliids compiled by Jon Bass and Roger Crosskey using data held at the Biological Records Center, Institute of Terrestial Ecology, Monks Wood, and the Natural History Museum, London. The main sources are: Natural History Museum (R.W.Crosskey - SE England and the Lewis Davies collection), the Institute of Freshwater Ecology River Communities Survey (Kay Syme), and additional occasional records from Jon Bass, Mark Taylor, Melanie Bickerton, Malcolm Greenwood and John Davies.

The map is intended to highlight gaps where simuliid records are lacking and to stimulate visits to particular areas to check whether simuliids are present. It is probable that discrete distributions for certain species have changed since the 1960's when Lewis Davies published maps with his key to the British species.

On the map the large grid represents the 100Km squares of the National Grid Reference System which are identified by letters (for example, Anglesey and NW Wales lie within square SH). Each black dot on the map is located at the center of any 10 Km square in which specimens from one or more collections exist. White areas indicate no knowledge mainly because no sampling has been done, but may also indicate a genuine absence of simuliids as in Central London. The white areas are priority areas for future collections.

[Graphic File Bull9MapA.gif here]

Situation Map of Collections of Simuliidae in Great Britain



Acknowledgements

The map was produced by Henry Arnold of the Biological Records Centre, Monks Wood using the DMap Computer Mapping Programme.

Indexes to the 'Newsletters of the British Simuliid Group'

The *Newsletter*, forerunner of the present *Bulletin*, ran from 1979 to 1987. There were thirteen issues, the dates and number of pages as follows: No. 1, April 1979, 9 pp.; No. 2, November 1979, 6 pp.; No. 3, April 1980, 10 pp.; No. 4, November 1980, 4 pp.; No. 5, May 1981, 11 pp; No. 6, November 1981, 7 pp.; May 1982, 2 pp. [+ 4 pp. mailing list separately paginated]; No. 8, December 1982, 6 pp. [+ 1 unnumbered p. mailing list addition]; No. 9, August 1983, 2 pp.; No. 10, May 1984, 10 pp.; No. 11, April 1985, 8 pp. [+ 3 unnumbered pp. of figures]; No. 12, May 1986, 7 pp.; No. 13, June 1987, 10 pp. [Note: in issues 2-6 *Simulium* was used in the title and not Simuliid.]

There is a complete hard-cover bound set of the *Newsletter* kept at shelf-mark ES 104 in the Diptera floor divisional library of the Department of Entomology in the Natural History Museum, London. Working with this complete set, Roger Crosskey has compiled the indexes given here, following the principle that any item of scientific information attributable to an author-contributor might be helpful. Thus individuals and topics are not indexed when they appear (for example) only in a list of talks given at a meeting. Another complete set is kept by Trefor Williams.

To make the information most easily accessible there are separate indexes to authors (contributors), organisms and topics. For location the Newsletter number is given first, followed by a colon and the page(s). A stroke (slash) between page numbers shows that the subject appears in a separate context in multiple places within the issue. Brackets in the author index show when there are unrelated items by the same author appearing on the same page.

[Originally printed in two columns – Ed.]

Author Index

Organism Names Index

Blackflies:

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Protozoans:

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British Simuliid Group Bulletin
Number 10, January 1998

FROM THE EDITOR

This Bulletin No. 10 is a little late due to the combined effects of holding the Annual Meeting later than usual in November, and my involvement in the Onchocerciasis Control Programme and Mectizan meetings which were held in Liverpool during the first two weeks of December. In addition, I waited for delivery of some new software which is designed to help with arranging the pagination of booklets. The problem with most word processors is that pages are normally printed in sequence, while in the case where two A5 pages are printed on a single A4 sheet, as with the Bulletin, the center sheet pages would be numbered 10 and 11, for example, while the other side of the same sheet would carry pages 9 and 12. The new software rearranges the pages to suit the pagination and scales the type to fit, but as usual has taken me time to get used to it.

In the past, I have raised doubts about the continued funding of the Bulletin, so it is with great relief and gratitude that I can announce that due to the representations of Trefor Williams and Professor Brian Moss, it has been agreed by Professor Julian Crampton, Head, School of Biological Sciences, and Professor David Molyneux, Director, Liverpool School of Tropical Medicine that the costs of producing and distributing the Bulletin will be divided between their respective departments. I am sure that all members are grateful for this generosity.
John B. Davies, Editor

THE 20TH ANNUAL MEETING AT THE NATURAL HISTORY MUSEUM, LONDON

The 20th. Annual Meeting was held on Tuesday 25th. November 1997 at the Natural History Museum, London. The Meeting was convened by Dr. Tony Shelley, who was in the chair, and organised by Dr. Carolyn Lowry and helpers, to whom we are grateful. Tony Shelley opened the meeting with words of welcome, and went on to describe the recent re-organisation of the departments within the Entomology section of the museum. He then continued with his talk on the recent findings in Brazil.

Six scheduled papers and four posters were presented. In addition, Roger Crosskey gave an unscheduled entertaining talk on a trip that Peter Adler and he had recently made to St. Petersburg to examine I.A.Rubtsov's simuliid collection. An account of this trip is promised for the next issue.

Discussion: As usual the meeting concluded with an informal discussion during which the following points were raised:

British Distribution Map: Having published in Bulletin No. 9 a map showing the areas where collections of simullids had been made, the question was raised as to what should be done next. It was asked whether it would now be possible to use the database behind the map to display the distribution of individual species. To this the answer was no, because so far the data only records the presence of a positive collection with no details, and there was also the problem of accuracy of identification. In this connection, the meeting noted the imminent publication of Jon Bass' key to the larvae and pupae of British Simuliids (see Announcement p. 15). Obviously, the next activity should be to try to fill in the gaps in the map. Angus McRae suggested that perhaps the Group should mount an expedition to a specific area at the best time of year, and was promptly "volunteered" to organise a prospection of the area north of Oxford within a rectangle bounded by Birmingham, Oundle, Bedford and Evesham during the first half of April 1998.

Where what to collect: Roger Crosskey advised that because the identification of adults and early instars of larvae of many species was very difficult, collections should be restricted to late instar (gill-spot) larvae and pupae (particularly older, black pupae). They should be preserved in 80% ethanol. Collections should be made in any blank 10km square on our map, selecting the following habitats, if present, after reference to an Ordnance Survey Map: 1) A main named river. 2) At least one moderate sized river or stream. 3) A lake outlet. 4) The first 200-300m of a spring-fed stream. This last habitat is characteristic of limestone/chalk areas, and is the unique habitat of *S. costatum* (4 filamented pupa, no horn to cocoon).

Next Meeting: John Davies offered to see whether the next meeting could be held in Liverpool. It might be advantageous to arrange the meeting to coincide with the Liverpool School of Tropical Medicine's centenary celebrations and/or the 2nd European Conference on Tropical Medicine, Liverpool, 14-18 September (and incidentally, the 4th International Congress of Dipterology, Oxford, 6-13 September) so that some of our overseas members might be able to attend. However, this would probably mean that the meeting would have to be held on a Saturday. John would like some feed-back from the membership on this suggestion before making any official enquiries.

ARTICLES BASED ON PRESENTATIONS GIVEN TO THE MEETING

Six scheduled papers and 4 posters were presented to the meeting, from which 4 papers and 3 posters are reproduced in this Bulletin. Due to lack of space the remainder (listed below), together with a version of Roger Crosskey's talk, are scheduled to appear in Bulletin No. 11.

P. McCall The "Invitation Effect" in *Simulium damnosum* s.l.
R. J. Post The potential reinvasion of the Island of Bioko after the eradication of *S. damnosum* s.l.
J. B. Davies *et al.* The effect of ivermectin treatments in Guatemala on the uptake of *O.volvulus* microfilariae by *S. ochraceum*. [Poster]

Confirmation of a new focus of onchocerciasis in Brazil

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The talk was based on results from the following collaborators - Magda Charalambous (NHM) [cytotaxonomy], Jan Bradley (Salford University) and Marilza Maia-Herzog (Oswaldo Cruz Institute) [serology and taxonomy]; Rory Post (NHM) and Jose Rubio (Madrid University) [molecular biology] and Tony Shelley and Carolyn Lowry (NHM) and Paulino Luna Dias (Oswaldo Cruz Institute) [taxonomy, biology and infection studies].

Following the discovery some 10 or so years ago of an autochthonous case of human onchocerciasis in the town of Minaçu, central Brazil some 2500 kms south of the Amazonia focus of the disease, biopsies of 2500 local citizens were all found to be negative for microfilariae. The objective of our work was to make an attempt at finding other cases of onchocerciasis using more sensitive detection measures, assess the simuliid species present in the area, study the basic biology of anthropophilic species and investigate their potential to act as hosts to *Onchocerca volvulus*.

Blood samples were taken from over 700 people of whom about 2% reacted positively to the serodiagnostic test developed by Jan Bradley. This showed that these people had been in contact with the disease but not that they necessarily were microfilaria carriers. Skin snips taken from several seropositives reacted positively to the DNA probe of Meredith and some of these also showed a positive Mazzotti reaction. It was concluded that microfilaria carriers were present in Minaçu and the neighbouring town of Formoso and the Buracao gold mine. It appeared that positive cases are probably associated with small rivers in the area. The serodiagnostic test, DNA probes and Mazzotti test will be used in the future to determine the extent of this new onchocerciasis focus and the prevalence rate of the disease.

Nine species of simuliid were collected in the area and of these *Simulium minusculum, S.nigrimanum, S.guianense* (probably cytotype A) and *Simulium (Psaroniocompsa)* sp. were anthropophilic. The first two species bit man throughout the year with biting peaks occurring in the dry season. The latter two species were less common and were more apparent during the dry season.

Simulium minusculum occurred in all river types in the area but was found in greatest numbers in the largest river (Tocantins) while *S.guianense* occurred only rarely in smaller rivers being more common in the medium size rivers and the R.Tocantins. The other two species were small river breeders.

Experimental infection of the four anthropophilic species with *Onchocerca volvulus* showed that microfilariae developed to infective larvae in all four.

Future work in the area will focus on defining parasite distribution and prevalence, discovering the natural vector of onchocerciasis and determining the effect of the newly constructed dam on the R.Tocantins on simuliid populations in the area.

These data will be published fully in the Memorias do Instituto Oswaldo Cruz.

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Modelling human Onchocerciasis with particular reference to the *Simulium - Onchocerca* interaction

María Gloria Basáñez *Wellcome Trust Centre for Epidemiology of Infectious Disease, University of Oxford, and Centro Amazónico para Investigación y Control de Enfermedades Tropicales, Amazonas, Venezuela*

This talk used the information presented in Basáñez *et al.* (1994, 1995, 1996) with the objective of presenting simple analytical models of the population biology of human onchocerciasis. Currently available mathematical frameworks for the transmission dynamics of *Onchocerca volvulus* were briefly reviewed. Few consider inclusion of regulatory assumptions within the human host and none addresses the issue of facilitation in simuliids with toothed fore-guts. Current views regarding transmission breakdown points in filarial host-parasite systems were discussed. Data suggestive of the operation of checks on parasite abundance within humans were presented. Two possible functional relationships between the mean microfilarial load per person in the village and the intensity of transmission (measured as the annual transmission potential) were introduced. The former assumes severe limitation of parasite establishment within the definitive host with increasing annual exposure to L3 larvae; the latter considers that this limitation is incomplete and that a small fraction of infective larvae succeeds in maturing to the adult stage (Dietz, 1982). The model describes, within a deterministic framework, the rate of change with respect to time of the mean number of adult worms and mff/mg per person and of the mean number of L3 per fly. Regulatory assumptions include constraints on parasite establishment within humans and flies and excess mortality of infected vectors. The model does not incorporate age-structure, latency, or heterogeneities in human, vector, or parasite populations. Expressions for the basic and the maximum reproductive ratio, respectively, R_0 and R_{max} were presented and related to the minimum vector density required for parasite persistence in localities where vectors lack or possess well-developed cibarial armatures. The values thus calculated for West African savanna villages (*S. damnosum s.s./S. sirbanum*) and Central American settings (*S. ochraceum s.l.*) are in agreement with previous estimates and indicate that much higher biting rates are necessary for onchocerciasis to be endemic in those areas where the main vector exhibits initial facilitation. In the absence of non-linearities concerning mating probabilities of adult worms, the *Onchocerca* - *Simulium* systems in which the flies are unarmed exhibit a single, stable endemic equilibrium for $R_0 > 1$ (West Africa), whilst unstable equilibria may arise in those parasite - vector combinations characterised by armed flies (Central America). However, the epidemiological significance of these transmission breakdown points does depend on vector abundance, becoming practically negligible for the high annual biting rates observed in Guatemala and Mexico. In addition to statics considerations, some dynamic projections under a scenario of mass annual ivermectin distribution were discussed. Best results were obtained when it was assumed that ivermectin irreversibly reduces fecundity of adult female worms in agreement with Plaisier *et al.* (1995).

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British Simuliid Group Bulletin Number 10, January 1998

Simulium damnosum s.l.: Innate Immunity and Transmission of *Onchocerca*

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In spite of the lack of cellular encapsulation and melanisation blackflies have the ability to kill *Onchocerca* parasites in a rapid and species specific manner. Some of the humoral components of the innate immune system have been demonstrated to be involved in this process. Co-injection of *O. ochengi* microfilariae and inhibitors for serine proteases, a type of protease involved in the activation of prophenoloxidase (PPO), led to an increased survival of the parasites. Subsequent analysis of the haemolymph of *S. damnosum* s.l. revealed that this effect was partially due to the diminished activation of PPO. Enhanced parasite survival could be observed for haemolymph lectins following co-injection of D(+)-galactose and methyl-D-mannopyranoside. Thus the innate immune system is at least to some extend determining the vectorial capacity of the vector by controlling the number and species of parasites successfully developing. However, as most of these immune molecules described so far have to be induced and/or activated some other immune components must be involved during the initial phase of the immune reaction. Haemocytes are prime candidates to mediate the immune response as they are mobile, have the ability to phagocytose, mediate site-specific immune responses that target foreign surfaces, produce some antimicrobial peptides and probably mediate the main production of peptides in the fat body via the release of stimulatory factors. Therefore future work will focus on the role of haemocytes of blackflies during the early phase of an *Onchocerca* infection, the recognition of non-self.

Recent studies of the *Simulium damnosum* complex in western Uganda

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Almost 40 cytotypes and cytospecies are currently recognised in the *S. damnosum* complex. Four of them occur in our study area in western Uganda located east of the Rwenzori mountains between Lake Albert in the north and Lakes Edward and George in the south. This was the area, from where Dunbar (1966), in the sixties, received the material for the description of the first cytological segregates of the complex. At that time man-biting *S. damnosum* s.l. were widely distributed south and east of the Rwenzori mountains. Nowadays *S. damnosum* s.l. still occupies the same area, but anthropophilic *S. damnosum* s.l. are restricted to two rather small and limited foci, one in the south on the border with Congo (Kasese district), and one further north along the rivers Mahoma and Nsonge (Kabarole district south of Fort Portal). One possible reason of this change could be the control programme carried out in the sixties and early seventies designed to alleviate the biting nuisance caused by the flies. Looking into old data (Vector Control Unit, Fort Portal, unpublished) the northern focus of man biting *S. damnosum* s.l. apparently did not exist at that time. The area was forested and *S. neavei* was the anthropophilic blackfly. Meanwhile the forest and *S. neavei* have disappeared. *S. damnosum* s.l. moved in and became a nuisance. Biting densities are extremely high now in both areas and can easily exceed 1000 flies/man/day. Interestingly onchocerciasis is only hyperendemic in the southern focus, but almost absent in the northern one.

Surveys of breeding sites and cytological identifications of *S. damnosum* s.l. larvae revealed that four cytotypes of the complex occur in the study area. These are 'Nyamagasani', which is assumed to be identical with *S. kilibanum*, 'Nkusi', 'Sebwe' and a new form, preliminary named 'Sogohi'. From the epidemiological point of view it was important to find out which cytotypes are the highly anthropophilic ones and potential vectors of onchocerciasis.

In the southern focus 'Nyamagasani' could be incriminated as the sole man-biting form and vector of *Onchocerca volvulus*. The situation in the northern focus along the rivers Mahoma and Nsonge was more complicated. Results of first surveys had suggested that this was a 'Nkusi' population. Since 'Nkusi' is generally regarded as non-anthropophilic more detailed studies were carried out, which resulted in the detection of 'Nyamagasani'. However, cytologically the frequent occurrence of heterozygous loops on the long arm of chromosome II was a striking feature. Exactly in this region 'Nkusi' has its diagnostic inversion IIL-5, which also appears on one of the loop cords, whereas the non-inverted cord is typical for 'Nyamagasani'. This was the first indication for a hybridisation of the two cytotypes in this river system. Therefore it was not clear, which form was the anthropophilic one and source of the nuisance. The man-biting females, which cannot be distinguished by using cytological methods, had to be identified. Morphologically the adults of 'Nkusi' and 'Nyamagasani' turned out to be very similar. Also a multivariate analysis applying the criteria of Wilson et al. (1993) for the West African species, revealed that females of 'Nkusi' and 'Nyamagasani' only slightly differed from each other and that the Mahoma population had an intermediate status. However, it remained difficult to identify single specimens.

Attempts were therefore made to identify the females by using molecular approaches proposed by Brockhouse et al. (1993) and Tang et al. (1996). Their methods were based on the PCR amplification of a fragment from nuclear DNA, which encodes the ribosomal 18S, 5,8S and 28S RNA genes including the internal transcribed spacer (ITS). DNA was extracted from complete flies or larvae, the fragment amplified and the products separated by gel electrophoresis. The digestion of the entire ITS fragment with the restriction enzyme Rsa I produced several specific sub-fragments. But still 'Nkusi' and 'Nyamagasani' were very similar. The amplification of the first half of the ITS, the ITS1 region with an approximate length of 300 bp, of specimens from Mahoma/Nsonge showed that some of them had only one band, which was identical with that of 'Nyamagasani' specimens, others had double bands typical for 'Nkusi' or multiple bands, which assumingly indicated the hybrids. All tested females caught on man or cattle showed the single 'Nyamagasani' band. A sequence analysis of the ITS 1 fragment confirmed that 'Nkusi' differs from 'Nyamagasani' by carrying at least two alleles for this region. All together the West Ugandan cytotypes share some mutations different from West African species.

Results of cytotaxonomical, morphological and molecular methods agreed with each other. The close relationship among the three forms 'Nyamagasani', 'Nkusi' and 'Sebwe', which belong to the 'Sanje group', often makes it difficult to distinguish them by using just one method. The systematic position of 'Sogohi', which is morphologically different, is not clear. So far only 'Nyamagasani' could be incriminated as a voracious man-biting species and vector of *O.volvulus* in western Uganda. 'Sebwe' and 'Sogohi' are certainly non-anthropophilic. Concerning 'Nkusi' the situation is not clear. In general it seems to be non-anthropophilic, but in case of geographical overlapping hybrids may behave like 'Nyamagasani'. The situation in the Mahoma-Nsonge area should be carefully monitored.

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POSTERS DISPLAYED AT THE MEETING

Relationship Between Onchocerciasis Endemicity, Altitude, and Blackfly Composition along Two Fluvial Axes of the Upper Orinoco Region, South Venezuela

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The Amazonian focus of human onchocerciasis, affecting Yanomami Amerindians, comprises areas situated between Venezuela and Brazil. Yarzábal et al. 1983 described the infection in the highland areas of Sierra Parima, southern Venezuela. In this area (high endemicity), the main vector *S. guianense*, whilst in the lowland areas (lower prevalence), *S. oyapockense* prevailed (Basáñez et al. 1988). Ivermectin delivery programmes require detailed knowledge on the extent and severity of onchocerciasis in areas not studied previously. The working hypothesis was the existence of a relationship between altitude, simuliid species composition and onchocerciasis endemicity that could provide guidelines for designing regional control schemes. Two fluvial axes of the Upper Orinoco basin were studied. These were the rivers Ocamo - Putaco (9 communities), and Orinoco - Orinoquito (8), covering a range of altitude between 50 and 1,000 m. Endemicity was calculated by measuring in the whole population the age-standardised prevalence and intensity of dermal microfilariae (mf/mg) identified as *Onchocerca volvulus* (Botto et al. 1997). Entomological indicators were species composition (percentage of total no. of biting flies captured on human bait during 3-5 consecutive days during rainy and dry seasons at each locality); daily biting rates (no. of bites per person/day during 12 hr of exposure), and hourly parity rates (average proportion of parous flies in each hourly sample). Species were identified according to Ramírez-Pérez et al. 1982 and Shelley et al. 1997.

Prevalence varied between 0.0% and 86.3%; it was positively correlated with altitude (r = 0.68), and non-linearly related to intensity. A total of 97,151 adult female blackflies were collected and identified. Species were *Simulium oyapockense* s.l., *S. incrustatum* s.l., *S. guianense* s.l., *S. bipunctatum*, and *S. exiguum* s.l. Up to 200 m *S. oyapockense* was predominant and onchocerciasis ranged from hypo- to mesoendemic according to the biting rate (r = 0.54). Above 200 m, onchocerciasis was hyperendemic; the abundance of *S. incrustatum* increased followed by *S. guianense*, and beyond 700 m *S. guianense* was the dominant species followed by *S. bipunctatum*. Parity rates of *S. oyapockense* ranged between 41% and 80%; those of *S. incrustatum* between 47% and 53%, and for *S. guianense* between 22% and 52%. The vector competence of *S. guianense* (a species lacking cibarial armature) is generally higher than that of *S. oyapockense* (an 'armed' species), perhaps requiring lower biting rates to ensure onchocerciasis endemic persistence; this has been shown for *S. damnosum* s.l. (unarmed) and *S. ochraceum* s.l. (armed) (Basáñez, 1996). The vector competence of *S. incrustatum* is presently being investigated. Communities at high risk of onchocerciasis are those in which the main anthropophilic simuliids are *S. incrustatum* s.l. and *S. guianense* s.l. In these localities, mass treatment with ivermectin is recommended as a priority. *S. oyapockense* s.l. is capable of maintaining mesoendemic transmission when daily biting rates are very high. In such cases mass chemotherapy is also suggested. In hypoendemic areas target treatment should be implemented.

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Sample Sizes of *Simulium ochraceum s.l.* for the Estimation of *Onchocerca volvulus* Infection under Ivermectin Control Programmes

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Pre- and post-ivermectin *Simulium ochraceum* s.l. monthly samples from southern Mexico were analysed for *Onchocerca volvulus* infection rates, infection intensity, and the characteristics of larval distribution among the flies (see Rodríguez-Pérez et al. 1995). The variance over mean ratio (VMR) indicated that in all cases this distribution departed from Poisson and was strongly aggregated (VMR > 1; Anderson & May, 1995). The negative binomial was found to be an adequate model (Grenfell et al. 1990) with a small value of the aggregation parameter k but the degree of larval overdispersion increased as the mean larval load decreased, invalidating the use of a common k_c value (Elliot, 1977; Ludwig & Reynolds, 1988). A linear relation between k and the mean (m) was then established ($k(m) = k_1 m$) which permitted exploration of the relationship between the observed proportion of infected flies, p, and the estimated mean larval burden per fly, m (all larval stages in parous flies, see also Basáñez et al. 1995). This would allow mean numbers of larvae per parous fly to be predicted from presence-absence data (Gerrard & Chiang, 1970); e.g. from infection rates provided by PCR methods applied to pools of flies (Toe et al. 1994; Oskam et al. 1996). The method requires, however, an assumption that k_1 is known. Given that both p and m are naturally low in *S. ochraceum*, their relationship was practically linear in the range of observed values. Predictions were tested with the Mexican data from which the clumping parameter was estimated as well as for Guatemalan data for which this information was not available (Cupp et al. 1992). Results showed a highly satisfactory degree of agreement between predictions and observations. The sample sizes required to estimate mean larval loads from prevalence data for fixed levels of precision (defined as the ratio between SE(m) and m) were calculated for realistic *S. ochraceum* infection rates (those found in published pre- and post-control field surveys as well as in this work). For the special case in which the relationship between k and the mean is linear and goes through the origin, $k(m) = k_1 m$, the number of flies to be checked for *O. volvulus* infections does not explicitly depend on the aggregation parameter but does depend on the unknown proportion of infected flies. Practical recommendations for the calculation of sample sizes are discussed. The linearity between onchocercal infection rate and infection intensity in the fly population suggests that relationships between the former and onchocerciasis patterns in the human population should be further explored for the purposes of monitoring the impact of ivermectin control programmes through entomological evaluations.

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The detection of *O. volvulus* DNA in wild-caught *S. ochraceum* before and after ivermectin treatments in Guatemala.

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It has been shown by Oskam *et al*. (1997) and Katholi *et al.* (1995) that the detection of *Onchocerca volvulus* DNA in single infected blackflies in pools of uninfected flies can be carried out with considerable sensitivity using the polymerase chain reaction (PCR) screening technique. In our preliminary trials a single *Simulium* inoculated with 1 microfilaria was detected in a pool of 80 uninfected flies.

Because the prevalence of *O. volvulus* larvae in *S. ochraceum* is normally of the order of 1% their detection by dissection requires many hundreds of flies to be painstakingly dissected in order to obtain a reasonable estimate. We therefore tested pools of wild-caught biting *S. ochraceum* collected in 1994 before and after ivermectin treatments at the hyperendemic Finca of El Brote to see whether we could detect *O. volvulus* DNA and detect any change in the proportion of positive pools following the treatments. Flies which had been collected biting in February 1994, 13 weeks before the first treatment (97% of eligibles treated on 16/5/94), were compared with flies collected in July 1994, 7 weeks post-treatment. The flies had been stored in 95% commercial ethanol since collection. Flies containing visible blood were discarded and not tested. Negative controls comprised 10 pools containing 10 *S. ornatum* from England in each. They were randomly distributed amongst the others and all were negative.

In February 1997 we tested 360 flies in 18 pools (Table 1) using the techniques described in Oskam *et al*. (1997). The proportion positive was higher than expected. Nine out of 10 pre-treatment pools were positive for *O. volvulus* DNA, while at 50 days post-treatment 3 of 8 pools (37.5%) were positive. This difference is significant (p= 0.04). It appears that the treatment suppressed the level of infection in the vector by about 60%.

This project was supported by the European Economic Community

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Table 1 Results of PCR Tests on pools of *S. ochraceum* from El Brote, pre- and post-ivermectin treatment.

Collection &Date	Days (Weeks) before/after Treatment		No. Flies per Pool	No. of Pools	Pools PCR +ve	% +ve Pools
Pre- 8 Feb 94	-97	(-13)	20	10	9	90.0*
Post- 5 July 94	+50	(+7)	20	8	3	37.5*

⓾Differences between proportions significant (p = 0.04; Chi2 ,Fisher's Exact Test).

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ANNOUNCEMENTS

Identification Key to the Last Instar Larvae and Pupae of the Simuliidae of Britain and Ireland.

Jon Bass: *Eastern Rivers Group, Institute of Terrestial Ecology, Monkswood Experimental Station, Abbots Ripton, Huntingdon, PE17 2LS*

Publication of the revised key is anticipated around about Easter (1998). It includes short notes on collecting, preserving, examining larvae and pupae, together with the seasonality and preferred habitats of each species. Name changes and faunal additions/deletions since Lewis Davies' 1968 key are also provided. The key will be published by the Freshwater Biological Association (based at -The Ferry House, Far Sawrey, Ambleside, Cumbria LA22 0LP). At present, the price of the new key is not known.

I will be very interested to hear of any collecting or identifications you may embark on - and I would like to see some specimens.

North American Black Fly Meeting

The annual North American black fly meeting (previously NE-118) will be held this year in Vero Beach, Florida, beginning at 8:30 AM on Sunday, 8 February and running through 12:00 noon on Monday, 9 February 1998.

Plan to travel on Saturday (7 February). Vero Beach is the home of the Florida Medical Entomology Laboratory. The setting consists of 300 acres of pristine Oak Hammock with walking and canoe trails and excellent bird watching. You can fly into one of three airports and then rent a car: Orlando (2 hours by car), West Palm Beach (1.5 hours by car), or Melbourne (40 minutes by car). Lodging will be in a bunkhouse ($10.00 per night) or a trailer ($15.00 per night).You will need to bring sheets or a sleeping bag and a towel. Blankets will be furnished for a minimal charge. A tour of the facility and a canoe trip are planned. Registration will be approximately $25.00 to cover beverages, snacks, and a lunch on Sunday. Individuals wishing to stay longer may do so. For further information, please contact Co-Chairs P. H. Adler (864-656-5044, adler@clemson.edu) or R. W. Merritt (517-355-8309, merrittr@pilot.msu.edu).

NOTES, VIEWS AND CORRESPONDENCE

Note on the *Simulium damnosum* complex in Zambia

Roger W. Crosskey: *Department of Entomology, Natural History Museum, Cromwell Road, London SW7 5BD, UK.*

I have been asked from time to time whether *Simulium damnosum* s.l. occurs in Zambia. The answer is yes, though this is only scantily evident from the literature. Such few references as have existed until now derive from two female flies in the Natural History Museum in London. These are the basis upon which Zambia (as 'N. Rhodesia') was listed by Freeman & de Meillon (1953) in their synopsis of *S. damnosum* distribution, the first reference for the country. These authors gave no other data, but Raybould & White (1979) fleshed out Freeman & de Meillon's statement slightly by writing that specimens of *S. woodi* are "in the British Museum (Natural History), together with females of *S. damnosum* s.l. from Kaomba - one of which was caught biting man". The same two specimens are the basis upon which a record spot is shown for Zambia on the distribution maps for *S. damnosum* s.l. given in de Meillon (1957) and those prepared by me at various times and published in Smith (1973) and World Health Organization (1976, 1978).

Since the information about *S. damnosum* in Zambia has been vague up to now, and no adults (to my knowledge) have been collected there since 1952, it is worth providing here some more detail about the two known female adults, and worth recording a new record based on a sample obtained in 1979 by David Baldry in a quite different part of Zambia and found among some samples of Zambian simuliids sent to me for identification.

Of the two females in the Natural History Museum, one is labelled "N. Rhodesia:/Kaomba R./Serenje Boma./4,200 ft. April 1930./Dr. R.E. Lloyd" (printed Label) and the other is labelled "N. Rhodesia:/Serenji,/Kaombi R./Biting man." (hand-written label). Both flies are clearly from the same locality, although the place name on the labels is differently spelt. Each fly also bears a printed Museum accession label, these reading respectively "Brit. Mus. 1930-292" and "J.J.C. Buckley. B.M. 1952-151". The fly caught by Buckley while biting man is in excellent condition but the other is in poor state (antennae missing, proboscis damaged, right fore leg missing, most of left fore tarsus missing, right wing torn). The co-ordinates of Serenji are 13º 12'/30º 15E

The immatures received from Baldry comprise 5 larvae and 1 pupa with the data "Central Province, Mumbwa Game Management Area, Nansenga river, 19.vi,1979" (Natural History Museum, London). Interestingly, the larvae in this sample possess enormous abdominal tubercles and two sizes of posterior abdominal scales like the larva of *S. luadiense* from Zaire illustrated by Elsen *et al*. (1983) and rather like the larvae occurring in certain forest-related cytospecies of the *S. damnosum* complex in West Africa. The Nansenga river flows southwards to join the Kafue and the collecting site was near its northern end at 15º 00'S/26º 34'E.

Other species of *Simulium* present in the same general stretch of the Nansenga, as shown by material that I identified for Baldry and also for Dr. John E. Davies (no connection with Bulletin editor John B. Davies), were *S. adersi, S. alcock*i group sp (10 filamented pupal gill, ? *impukane*), *S. bequaerti, S. hargreavesi, S. medusaeforme* and *S. nigritarse.*

The situation in Zimbabwe is not a lot clearer than in Zambia. Meeser (1942) reported *Simulium damnosum* from several sites in "Southern Rhodesia" (everywhere non-anthropophilic), but not from the Zambezi river, the border with Zambia. Still, the occurrence of the complex in the Zambezi is confirmed by the presence of a reared male in the Natural History Museum collection bearing a hand-written label "Rhodesia./R. Zambesi,/Victoria Falls/From pupae". There is no label giving the collector's name or the collection date but the collection label is in the identical hand to that on the "Serenji" man-biting female from Zambia and I am confident that the Zambezi specimen was also collected by J.J.C.Buckley, in or a little before 1952. Meeser's paper is the basis of all subsequent reports of *S. damnosum* s.l. in Zimbabwe (the erstwhile Rhodesia or Southern Rhodesia).

Information about onchocerciasis in Zambia is even more scanty than for *Simulium damnosum* complex. The country is neither mentioned in the text nor included in the disease-range maps given in any of the various WHO Expert Committee Reports on Onchocerciasis (1954, 1966, 1976, 1987, 1995). However, a note by Beaver et al. (1993) - which has not rated a notice in the Expert Committee Reports that post-date it - records an infection with *Onchocerca volvulus* in a young girl living in the village of Macha (26º 16'S/26º 48'E). So far as I know, this is the only published reference to human onchocerciasis in Zambia. I recall that the late Frank Budden (pers. comm.) found no indication of ocular onchocerciasis when he undertook a consultancy on eye disease in Zambia in the 1970s. It seems that a serious attempt at prospection for the disease and its potential vectors would be worthwhile and that the Zambesi river border region with Zimbabwe should be included in the coverage.

[Note: Zambia was accidentally omitted from the distribution for *S. damnosum* complex in the recently published inventory of World blackflies (Crosskey & Howard, 1997) - a case of *mea culpa,* the country name having been 'lost' at a late production stage while I was re-jigging the relevant part of the text!]

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New Members

We welcome the following new members to the Group (*e-mail addresses given in italics*)

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