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BRITISH SIMULIID GROUP BULLETIN NO. 11, JUNE 1998

Contents **Number 11, June 1998**

FROM THE EDITOR

The most significant event so far this year has been the publication of Jon Bass's "Key to the Simuliidae of Britain and Ireland" details of which are given on page 2. Also in this number are the presentations from the 20th Annual Meeting which could not be included in Bulletin No. 10, including an account of Peter Adler and Roger Crosskey's trip to St. Petersberg to see Rubtsov's collection. There is also a summary of the papers presented to the Annual North American Black Fly Meeting.

It has been decided to hold the 21th. Meeting of the Group in conjunction with the *Simulium* Workshop incorporated in the Fourth International Congress of Dipterology in Oxford, England, 6-13 September, 1998, details are given in the next article.

It has been a great sorrow to report the death on March 20th. 1998, of Professor W.E. Kershaw at the age of 87. "Willy" Kershaw was one of the "characters" of tropical medicine and a great supporter of the Group, and attended most of our meetings up until the Salford meeting of 1988. Although primarily a parasitologist, he was involved in aspects of the 1950's work on the biting habits of *Simulium damnosum* in studies on the dynamics of the transmission of onchocerciasis in West Africa.

John Davies

THE 21ST. ANNUAL MEETING

At the 20th Annual Meeting held at the Natural History Museum, London last year, it was proposed to hold this year's meeting in Liverpool before or after the anniversary celebrations of the Liverpool School of Tropical Medicine, and the Second European Congress on Tropical Medicine, on 14-18 September, 1998. On later consideration it was thought that there was little point in following the *Simulium* Workshop destined to be included in the Fourth International Congress of Dipterology in Oxford on the morning of 9th. September 1998 with a second *Simulium* meeting a week or two later. We have been fortunate that the organisers of the Oxford meeting have been favourably disposed to combine the two meetings, and to waive the congress registration fee for BSG members attending a combined meeting.

One hundred and twenty members were canvassed by e-mail, letter and telephone, one third responded and all but one were in favour of having the combined meeting in Oxford on 9th September 1998.

We have therefore decided to go ahead with organising a combined meeting with the *Simulium* Workshop. Since the workshop will occupy the morning only and a number overseas members will be present, we plan to organise a get-together for lunch somewhere in Oxford during the afternoon where there would be plenty of opportunity to make new friends or meet old ones and to continue discussions. (It has been suggested that a field trip could be arranged). Some members from further afield may find it easier to arrive in Oxford the day before, and for them we may also organise the customary evening meal.

Please note the date **9th September 1998** in your diary. Notices giving more details will be sent out later. There may be a chance for BSG members to contribute short presentations or posters at the workshop, so please start thinking about them now. Any queries should be addressed to myself or to Carolyn Lowry at the Natural History Museum, London.

John Davies, Liverpool School of Tropical Medicine, Pembroke Place, Liverpool L3 5QA, Uk. (e-mail: daviesjb@liv.ac.uk, home phone: (44) 151 632 4031)

[British Simuliid Group Bulletin No. 11, June 1998]

KEY TO THE SIMULIIDAE OF BRITAIN AND IRELAND

Last Instar Larvae and Pupae of the Simuliidae of Britain and Ireland: A Key with brief Ecological Notes.

by Jon Bass Freshwater Biological Association. Scientific Publication No. 55, (1998), 102pp.

This long-awaited successor to Lewis Davies's Key to the British Species of Simuliidae is now available from The Freshwater Biological Association, Dept. DWS, The Ferry House, Far Sawrey, Ambleside, Cumbria, LA22 0LP, UK. Price £14.00 (including postage). Members of the FBA can claim a 25% discount.

PRESENTATIONS GIVEN AT THE 20TH ANNUAL MEETING

The 'Invitation Effect' in *Simulium damnosum* s.l.

Philip J. McCall: *Tropical Parasitic Disease Unit, International Institute for Parasitology, CAB International, St. Albans . (current address: Division of Parasite & Vector Biology, Liverpool School of Tropical Medicine, Pembroke Place, Liverpool L3 5QA. UK.*

In certain haematophagous Diptera, the presence of an initial group of individuals bloodfeeding on a host can attract other host seeking individuals of the same species. This phenomenon was first demonstrated by Alekseev *et al.* (1977) in *Aedes communis* and was termed the 'invitation effect'. Subsequent studies have shown similar behaviour in *Aedes aegypti*, *Phlebotomus papatasi* (Psychodidae) and *Culicoides impunctatus* (Ceratopogonidae). The behaviour appears to be an olfactory response to the feeding insects, and evidence from the studies on *P. papatasi* and *C. impunctatus* suggest it is probably mediated by a pheromone emitted by the actively feeding insect.

No intraspecific communication of any kind has been recorded during host-seeking or feeding in any blackfly species. However, during studies on behaviour of *S. damnosum* s.l. in Sierra Leone the author observed that greater fly densities stimulated higher rates of bloodfeeding, an effect which may be analogous to this 'invitation effect'.

The study involved feeding flies in chambers applied to the ears of a pig, with 4 chambers used simultaneously in each feeding trial. Each chamber received flies at densities of either <10, 10-14, 15-19 or $\geq$20 individuals. On completion, all blackflies were aspirated from the chambers and the numbers of fed and unfed individuals counted.

A total of 934 blackflies were tested in 72 chambers, in 18 trials. Of these, 431 (46%) fed on blood. The results clearly demonstrated that chambers containing higher numbers of flies resulted in higher feeding rates. A comparison of the four groups tested showed an increase in feeding rates with chamber density, with the most pronounced increase occurring at densities of 20 or more flies per chamber. There was also a strong correlation between the density in each chamber and the proportion of flies that fed (r^2=0.74).

In demonstrating that the number of flies assembled at the host influences the proportion which subsequently begin feeding, the data provides evidence for intraspecific communication during bloodfeeding in *S. damnosum s.l.*. It is possible that this behaviour may represent a later event in a sequence of interactive events involved in host location and bloodfeeding by *S. damnosum s.l.*; a sequence that could begin with the attraction of blackflies over distance in a manner similar to that described in other Diptera.

Since neither the mediator nor the evolutionary significance of such behaviour are known, the author invited suggestions and discussion from the audience. There ensued a lively debate on the significance of the findings, the possible origins of such behaviour and its relationship to host selection and disease transmission.

References

Alekseev, A. N., Rasnitsyn, S. P. and Vitlin, L. M. (1977). Group attack by females of blood-sucking mosquitoes (Diptera, Culicidae, *Aedes*). Part 1. discovery of the "invitation effect". *Meditsinskaya. Parazitologiya i Parazitarnye Bolezni Moscow*. **46**: 23-24. [in Russian; read in English translation].

McCall, P.J. & Lemoh, P.A. (1997) Evidence for the "Invitation Effect" during Bloodfeeding by Blackflies of the Simulium damnosum complex (Diptera: Simuliidae). *Journal of Insect Behavior*, **10**, 299-303.

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The Simuliid Collection in the Zoological Institute, St. Petersburg, Russia

Peter H. Adler: *Department of Entomology, Clemson University, Clemson, SC 293634-0365 USA*
Roger W. Crosskey: *Department of Entomology, The Natural History Museum, London, England SW7 5BD*

This paper is an expanded version of a short, unscheduled presentation given by one of us (RWC) at the 20th Annual Meeting of the British Simuliid Group and foreshadowed (British Simuliid Group Bulletin 10: 1, January 1998) by the editor for the current issue of the Bulletin. The Zoological Institute in St. Petersburg, Russia, houses one of the world's three major collections of Simuliidae, the others being in London and Washington. From 27 to 31 October 1997, we were able to study the collection, graciously hosted and assisted by A. A. Ilyina, V. A. Krivokhatsky, O. G. Ovtshinnikova, V. Richter, V. N. Tanasychuk, A. V. Yankovsky, and the Deputy Director V. F. Zaitzev.

The simuliid collection was amassed under the direction of Ivan Antonovich Rubtsov. When Rubtsov began his work on simuliids in 1934 the published literature had recorded only three species from the former Soviet Union. Under Rubtsov's tenure at the Institute, which began in 1938 and continued even beyond his retirement 41 years later, the number of species recognized by him from the area increased to roughly 400. Although formed particularly of material from Russia and the former Soviet republics, the collection also has a wealth of material from Mongolia and northern China. The collection contains nearly 400 primary types of simuliids, of which approximately one third are lectotypes.

The collection is in excellent condition, owing largely to the dedication and loyalty of Anna A. Ilyina, Rubtsov's assistant, who has served the collection since 1949 and continues to work on an ad hoc basis. No pesticides are used to deter dermestid beetles and similar pests; however, we saw no evidence of pest problems. The slide and pinned material is housed in a single, narrow room on the second floor of the Institute, the slides along the left wall and the pinned material along the right wall. Desk space, although at a premium, can accommodate four workers. One compound and two dissecting microscopes were available in the room for our use. We did not have the opportunity to view the alcohol collection.

The majority of species in the collection are represented by both pinned and slide- mounted examples. Slides prepared by Anna are in very fine condition, mounted in Canada balsam and well labelled. Some slides, particularly those of 1970s vintage that were prepared by other workers, are made with a different mounting medium and these have become uninterpretable because of shrinkage of the medium and encroachment of air bubbles. These slides include type specimens and eventually will need to be broken down and the parts remounted. Fortunately, the Anna Ilyina preparations form the bulk of the slide collection. The slide mounts include larvae, pupae, and adults. Larval mounts from about 1949 to the present include only the head capsule and terminal portion; the intervening larval cuticle, often with diagnostic setae and scales, evidently was discarded. Slides are held in double-wide cardboard trays which, in turn, are held in boxes (up to 10 per box) arranged in fine-wood cabinets, following Rubtsov's classification scheme for the family. The edge of each tray shows, in typescript, the names of the contained species and is marked with a red dot against the species name if slides of types are included.

Nearly all of Rubtsov's illustrations in his taxonomic papers were drawn from slides in the collection, and one can often determine precisely which specimen was drawn by the peculiarities of the particular preparation. Although Rubtsov's drawings are true to the slides, they sometimes incorporate distortions caused by damage or poor orientation during preparation of the mount.

The pinned material is organized, according to Rubtsov's classification, in wooden drawers stored in wooden cabinets. Specimens of each species are arranged in rows with ample space between taxa to accommodate new material and new species. The dry pupal exuviae are sometimes associated with the adult on the pin. Many species are represented by good series from multiple localities.

Each slide mount and pinned specimen has been logged into a series of record books maintained since the early days of the collection. Entries for each specimen include a preparation number, species name, and collection data. A card index is maintained by Anna, and from this index a catalogue of the types of about 385 taxa was generated by A. V. Yankovsky (Yankovsky, A. V. & K. N. Ulyanov. 1995. Catalogue of type specimens in the collection of the Zoological Institute, Russian Academy of Sciences, Diptera. No. 5.

Simuliidae, Culicidae. Zoological Institute, St. Petersburg). A useful feature of this publication is the citation of label data on the type specimens, but the relevant data in the catalogue are best associated with the type specimens by means of the preparation numbers. At the time of our visit, the 137 lectotypes that were designated in the catalogue were not indicated on the actual specimens; however, we understand that since our visit, the task of applying the labels has begun. In relatively few cases, types have gone unrecognized and others have labels of dubious authenticity.

Careful study of this impressive and valuable collection by the international community of simuliid specialists is likely to reveal numerous synonymies between and within zoogeographical regions. During our short visit, we gained much insight into Rubtsov's approach to simuliidology and to the riches of the collection. Unfortunately, one week was woefully inadequate for mining the vast treasures of what has come to be known informally as the 'Rubtsov Collection'.

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POSTER PRESENTED AT THE 20TH ANNUAL MEETING

The effect of Mectizan® treatments in Guatemala on the uptake of *O. volvulus* microfilariae by the vector *S. ochraceum*

J.B.Davies *Liverpool School of Tropical Medicine, UK.*
R.Luján *Universidad del Valle de Guatemala, Guatemala, CA*.

The following three examples are taken from our studies on the transmission of onchocerciasis by *Simulium ochraceum* Walker in Guatemala

1. Vector Microfilarial Uptake VmfU) vs. Skin-Snips as a measure of infection.

We have coined the term *vector microfilarial uptake* (VmfU) for use when microfilaria loads are estimated by feeding flies (in our case *Simulium ochraceum*) on volunteers. This parameter is obtained from the estimated numbers of mf in the fly's blood meal as determined by staining and dissection. Ten flies were usually fully engorged on the bare back each volunteer, and the geometric mean (GMean) calculated to give the VmfU for each person. For a community or cohort of volunteers, the GMean of all members' VmfU is used. (Davies et al. Trop. Med. Int. Hlth. 1997, 2 (4):348-355)

Apart from indicating skin mf. densities, VmfU provides a measure of the infectiousness of subjects to the vector, and can be used to show the effect of the campaign on the availability of mf to the vectors. We have also found that this technique is more acceptable to the study communities than taking skin-snips.

Figs. 1 and 2 show the VmfU as mf/fly compared with the GMean skin-snip mf densities and dates of the ivermectin treatments in 2 sets of adjacent coffee plantations (fincas). Arrows indicate treatment dates. Fig. 3 shows the rate of recovery up to 2½ years post-treatment.

[Graphics File Bull11F1.gif here]

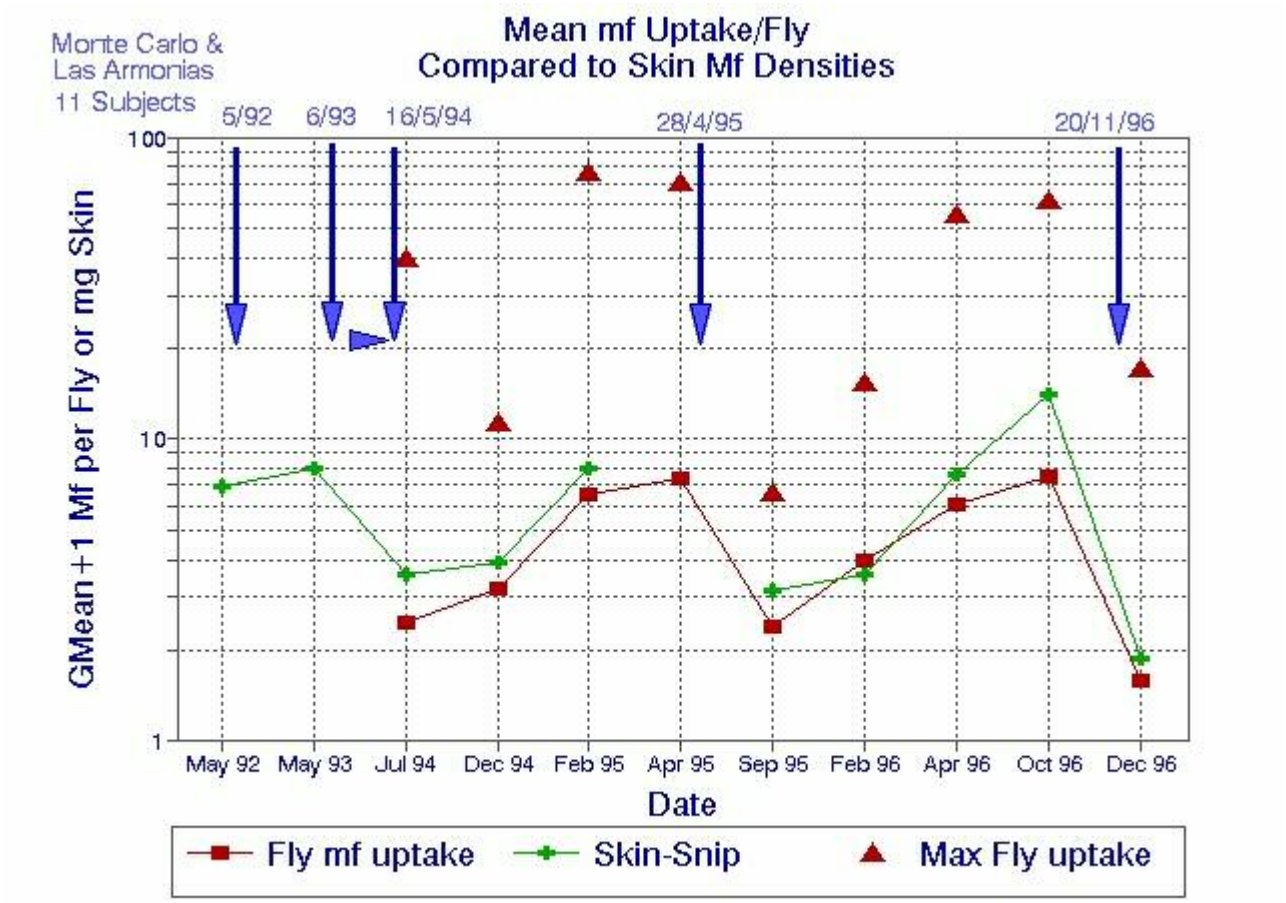

Fig. 1 The effect of 5 annual treatments (arrows) at two adjacent fincas. Demonstrating the annual fall in both skin-snip densities and VmfU which follow the ivermectin treatments and their subsequent recovery. Both parameters are of the same magnitude.

Values of VmfU in Figs. 1 and 2 are geometric means from all persons in the sample. Because infectivity varies greatly between individuals the maximum individual VmfU obtained at each visit is also plotted (as Max. Fly uptake) for comparison. For example, in Fig. 1 in July 1994 the VmfU for the 11 subjects was about 2.5, but for one individual it was 40, and since this value is itself a mean of 10 flies, single flies must have ingested considerably more. We suspect from this that intermittent transmission is still taking place.

[Graphics File Bull11F2.gif here]

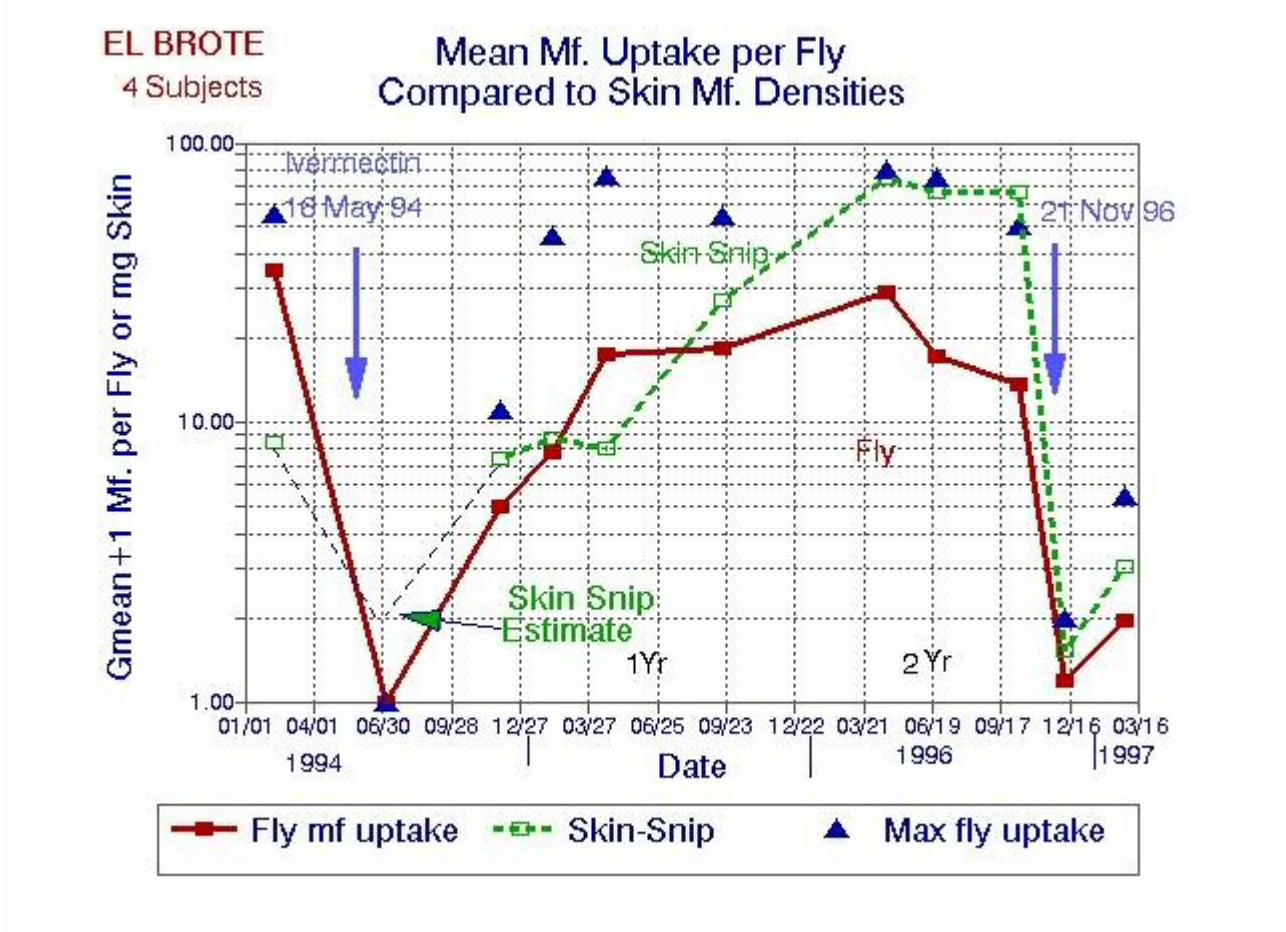

Fig. 2 In this finca there was almost a 2½ years gap between treatments during which skin-snip mf. levels recovered to almost ten times the pre-treatment level. (We suspect that this may be the result of the abandonment of the long running nodulectomy campaign.). VmfU showed a post-treatment climb to a maximum at about 2 years post-treatment.

2. Collection of *S. ochraceum* on fully clothed and partially clothed human attractants

To examine the occurrence of blood in *S. ochraceum* coming to bite, flies were caught on either of two 30 to 40 year old male volunteer attractants who were known to be infected with onchocerciasis. The two baits (A and B) were seated 5 m apart on either side of a bridge . The bait, collector and location were kept constant throughout the experiment to provide a single site/collector/bait variable.

[Graphics File Bull11F3.gif here]

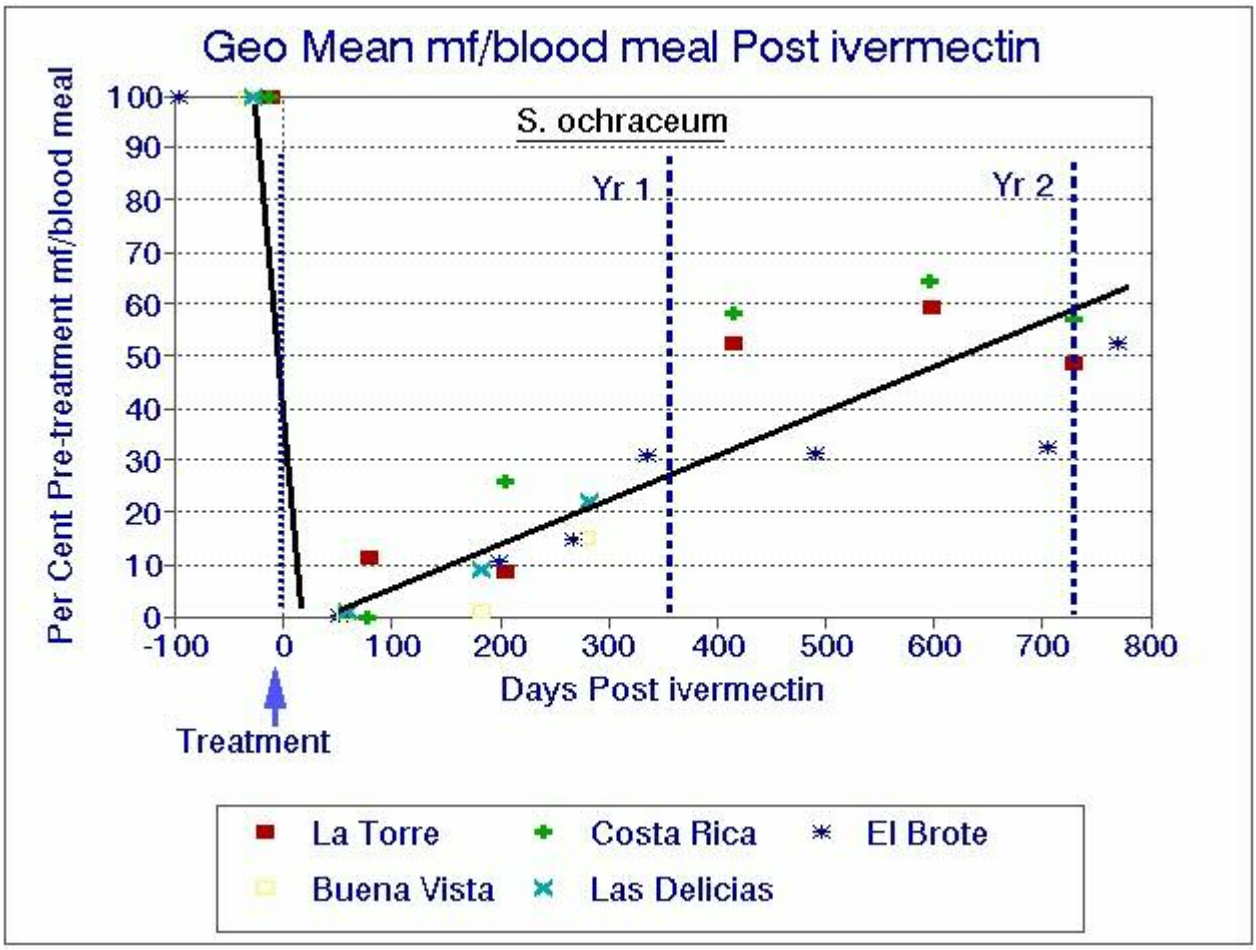

Fig. 3 Combined results from 5 communities which demonstrate the rate of recovery of community VmfU up to 2½ years after a single treatment with ivermectin expressed as a percentage of the pre-treatment level. (Slope lines fitted by eye)

Collections were made during four consecutive 20-minute sessions between 11.30 am and 12.50 pm. During each session one of the baits wore a bright blue shirt with long sleeves buttoned at the neck, whilst the other was bare above the waist. Flies were recorded as containing no blood, old blood or recent blood. Later, the abdomens of all flies were opened up to confirm the original classification and to detect any minute traces of blood invisible from the outside. Results are in Table 1

We found that the fully clothed human bait attracted about 41% of the number of *S. ochraceum* that would be attracted to an partially clothed bait. At high biting densities this would still attract enough flies for transmission studies.

Less than 2% of *S. ochraceum* caught at covered bait contained traces of fresh blood compared to 17% of those caught at bare bait.

About 5% of *S. ochraceum* caught at both baits contained traces of blood from a previous meal.

About 36% of blooded *S. ochraceum* could be detected only by internal examination.

Table 1. Numbers of *S. ochraceum* collected at each bait/cover/time combination at Finca Las Armonias 31 July 1996.

	BAITS					
	A		**B**			Diff.
Time	Covered	Bare	Covered	Bare	Total	Sig. Level
11.3-11.50		62	29		91	a
11.50-12.10	10			35	45	a
12.10-12.30		25	10		35	b
12.30-12.50	8			17	25	ns
Totals	18	87	39	52	196	
Cover Totals		**139**	**57**			a
Bait Totals	**105**		**91**			ns

a $p<0.001$
b $p>0.1, <0.02$
ns $p>0.05$, not significant

3. PCR tests on Single *S. ochraceum* with and without visible blood

Using PCR we individually tested 195 *S. ochraceum* caught at baits for the presence of *O. volvulus* DNA . Details of the tests are in Table 2.

8.8% of flies with no externally visible blood contained *O. volvulus* DNA.
7.5% of flies with no detectable blood contained *O. volvulus* DNA.
10.8% of all flies contained *O. volvulus* DNA.

Because the site of the DNA is not known, interpretation of these results is uncertain.

Acknowledgements
This work was supported by a grant from the European Economic Community.

Table 2 Results of PCR tests for *O.volvulus* DNA on single *S. ochraceum* from Las Armonias collected when coming to bite and classified by presence or absence of internally or externally visible blood.

S. ochraceum	Number	No. PCR +ve	% PCR +ve	Significance
Total tested	195	21	10.8	
With externally visible blood	25	6	24	Yes
No externally. visible blood	170	15	8.8	p = 0.022
With int. or ext. visible blood	35	9	25.7	Yes
No ext. or int. visible blood	160	12	7.5	p = 0.002
With new blood	24	7	29.17	No
With old blood	11	2	18.18	p = 0.49

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TRAVELLER'S TALES

Two accounts from North-eastern North America

The sources of both of the following excerpts were suggested by Roger Crosskey.

A Contemporary Traveller

The Appalachian Trail stretches over 2000 miles along the East Coast of the United States of America from Georgia to Maine. With his friend Stephen Katz, Bill Bryson recently attempted to walk the 2000 or more miles of the trail and wrote about his experiences in his book "A Walk in the Woods" (Doubleday, 1997, 320pp.). The following extract from page 244 describes events on a section of the Appalachian Trail through the Berkshire Mountains south of Cheshire, Massachusetts, in June.

> "I spent the night in a motel and the next day hiked on to Cheshire. It was only nine miles over easy terrain, but the black-fly made it a torment. I have never seen a scientific name for these tiny, vile, winged specks, so I don't know what they are other than a hovering mass that goes with you wherever you go and are forever in your ears and mouth and nostrils. Human sweat transports them into a realm of orgasmic ecstasy, and insect repellent only seems to excite them further. They are particularly relentless when you stop to rest or take a drink - so relentless that eventually you drink while moving and then spit out a tongueful of them. It's a kind of living hell. So it was with some relief that I stepped from their woodland domain in early afternoon and strolled into the sunny, dozing straggle that was the little community of Cheshire."

[I asked Peter Adler his opinion on the identity of these "vile specks" and he consideres that most of them are undoubtedly *Simulium venustum* s.s. **Ed**.]

Newfoundland in the 1880s

The next extract is one of many to be found in Marshall Laird's annotated book on the Natural History of Newfoundland (Laird, M. 1980. *Bibliography of the Natural History of Newfoundland and Labrador*. lxxi+376 pp. Academic Press)

Marshall Laird explains that a Captain Kennedy was in command of HMS "Druid" from 1879 to 1882 protecting the English fisheries on the coast of Newfoundland. He was evidently a dedicated hunter and fisherman and described his exploits in a series of letters to the *Field* under the nom-de-plume "Mariner" as well as in a book; (Kennedy, Captain W.R. (1885) "*Sport, Travel and Adventure in Newfoundland and the West Indies*" Edinburgh and London, Wm. Blackwood & Sons. x+399 pp.) .

> "Returning to our camp [*on the Exploits River*], we found the tent pitched, fire lighted, and tea ready, and we looked foreward to refreshment and repose; but alas! there was was none of it, for the blackflies were masters of the situation. They were in millions, and attacked us from all quarters, notwithstanding repeated applications of tar and oil, until we had to take refuge in the smoke of our fire, where we passed a miserable time, with our eyes running with water, mingled with grease and tar. We endeavoured in vain to make ourselves comfortable for the night; but the flies got into our eyes, ears and mouth.... Darkness set in, and we flattered ourselves we should have peace but there was no peace for the wicked. The flies disappeared, but the mosquitoes took their place."

Further on Captain Kennedy comments:

> "it would be simply impossible for anyone to settle on the banks of that or any other river in the island, with any degree of comfort unless the bush be first cleared away. Some of the old settlers of thirty and forty years' standing told us that they were bitten just as badly as when they first came into the country, and their bleeding hands and faces testified to the fact. The wretched women and children could not leave their houses to work in the garden unless it was blowing a gale or raining in torrents; and these pests last from June until October, the best months in the year."

Nevertheless, Captain Kennedy's enthusiasm for fishing triumphed as he later remarked:

> "although undoubtedly a great drawback they are not sufficient to deter a keen angler from enjoying his

favourite pastime. We found the best remedy to be Stockholm tar and oil, or carbolic and oil - twenty parts of the latter to one of the former - the flies buzz round, but they don't hanker after it. As to veils, I wouldn't be bothered with them. They are all very well for loch-fishing, but when as in Newfoundland, you have often to walk for miles to reach the water, or wade up the river to reach the pools - climbing over boulders, with an occasional header into the river - a veil would be worse than useless; besides, it is uncomfortably hot and interferes with smoking..."

[Captain Kennedy was fortunate - he could always escape to his ship when the torment became unbearable, unlike the long-suffering residents! **Ed**.]

MEETING NOTICES AND REPORTS

Forthcoming Meetings

Fourth International Congress of Dipterology in Oxford, England, 6-13 September, 1998 (includes a Simulium Workshop on the morning of 9 September).

Second European Congress on Tropical Medicine, Liverpool, England, 14-18 September, 1998

X1th European Meeting of the Society for Vector Ecology, Lisbon, Portugal, 13-17 October 1998

Entomology '98, September 9-11 1998, Ex

eter University, UK.
Convenor: Robin Wootton, Biological Sciences Dept., Hatherly Laboratories, Prince of Wales Rd., Exeter, Devon, EX4 4PS, UK. *(r.j.wootton@exeter.ac.uk)*

10th German/ 2nd European Simuliid Symposium will be held on the 18.-20.September 1998. in Aarhus, Denmark. Organiser: Dr. F. Jensen Naturhistorisk Museum Århus, Universitetsparken, Bygning 210, DK-8000, Århus C, Denmark.

The XXI International Congress of Entomology will be held at Iguassu Falls (Brazil), August 20-26, 2000. You can find all updated information about the ICE. on the WWW at http://www.embrapa.br/ice.

Meeting Report
Annual North American Black Fly Meeting

Peter H. Adler & John W. McCreadie: *Department of Entomology, Clemson University, Clemson, SC 29634-0365 USA*

The 21st annual meeting of North American black fly workers was held 8-9 February 1998 at the Florida Medical Entomology Laboratory in Vero Beach, Florida. The meeting was held for the first time as a Southern Extension and Research Activities-Information Exchange Group, the replacement vehicle for the now-defunct Northeast Regional Black Fly Technical Committee or NE-118. Peter Adler and Richard Merritt served as Co-Chairs and John McCreadie was the Program Organizer. Twenty-six people attended the meeting. Eighteen research reports were presented, following introductory comments by the Co-Chairs and a presentation about the Florida Medical Entomology Laboratory by its director, Dick Baker, who also provided a tour of the Laboratory's facilities.

Next year's meeting will be held 7-8 February 1999 at the Flamingo Lodge in the Everglades National Park, Florida.

The following presentations were made:

Algae and Bti failures on the Susquehanna River (**D. Arbegast**)

Involvement of citizen groups in the Delaware River black fly program (**J. Fitzpatrick**)
Initial steps towards black fly management in the Negro Valley of Argentina **(E. Gray)**
Bioindicator studies with black flies: new toxicology testing methods (**A. Hyder**)
Update on Michigan black fly program (**R. Merritt)**
There's a SOOP (*Smittium* or other partner) in my fly (**C. Beard**)
Do black flies pollinate ericaceous shrubs (**F. Hunter**)
Oviposition sites of black flies (**C. Hazzard**)
Black fly parasites and pathogens (**J. McCreadie & P. Adler**)
Structuring mechanisms in a black fly community in southern California (**T. Pachon**)
Simulium jenningsi research in New Jersey **(D. Bidlack**)
Evolution of the mitochondrial CO-II gene in black flies (**K. Pruess**)
Autogeny in black flies: a new marker (**C. Brockhouse**)
Finally a phylogeny for *Inseliellum* (**D. Craig**)
Significance of spermathecal structure in black flies (**C. Evans & P. Adler**)
Simulium parnassum - is it a complex? (**E. Paysen & P. Adler**)
Black flies of northwestern North America (**D. Currie**)
The black flies of North America (**P. Adler**)

[Anyone wishing for more details on these presentations should contact Jim Sutcliffe or Peter Adler for addresses – **Ed**.]

List of the Inaugural and Annual Meetings of the British Simuliid Group, 1979 - 1996

Listed By: Date; Venue; Organiser(s); Account in Newsletter or Bulletin

Inaugural Meeting. February 1979
British Museum (Natural History), London
Drs RW Crosskey (NHM) &
AG Gatehouse(University College of North Wales)
Newsletter 1 (1979)

Annual Meetings

1. July 1979
Liverpool School of Tropical Medicine
Dr H Townson
Newsletter 2 (1979)

2. July 1980
Department of Biology, Salford University
Dr S Frost
Newsletter 4 (1980)

3. November 1981
Freshwater Biological Association River Laboratory
Mr JAB Bass
Newsletter 6 (1981)

4. November 1982
Winches Farm Field Station, London School of Hygiene and Tropical Medicine
Dr PS Ham
Newsletter 8 (1982)

5. September 1983

Department of Biological Sciences, Exeter University
Dr NL Hywel-Jones
Newsletter 10 (1984)

6. November 1984
British Museum (Natural History), London
Dr RW Crosskey
Newsletter 11 (1985)

8. November 1985
Liverpool School of Tropical Medicine
Dr RJ Post
Newsletter 12 (1986)

9. September 1986
School of Biological Sciences, Portsmouth Polytechnic
Dr ST Moss
Newsletter 13 (1987)

10. September 1987
Freshwater Biological Association River Laboratory
Mr JAB Bass
Bulletin 1 (1982)

11. September 1988
Department of Biology, Salford University
Dr M Curtis
Bulletin 2 (1993)

12. November 1989
Liverpool School of Tropical Medicine
Dr PS Ham
Bulletin 2 (1993)

13. September 1990
The Natural History Museum, London
Mrs CA Lowry
Bulletin 2 (1993)

14. September 1991
School of Biological Sciences, Portsmouth Polytechnic
Dr ST Moss
Bulletin 2 (1993)

15. September 1992
Centre for Applied Entomology and Parasitology, Keele University
Prof PS Ham
Bulletin 3 (1994)

16. November 1993
The Natural History Museum, London
Dr M Charalambous
Bulletin 3 (1994)

17. September 1994
Liverpool School of Tropical Medicine & Department of Environmental and Evolutionary Biology, Liverpool University
Dr JB Davies
Bulletin 4 (1994)

18. September 1995
Department of Geography, Birmingham University
Dr M Greenwood (Loughborough University) & Miss MA Bickerton (Birmingham University)
Bulletin 5 (1995)

19. September 1996
Monkswood Experimental Station, Institute of Terrestrial Ecology
Dr JAB Bass
Bulletin 8 (1996)

20. November 1997
The Natural History Museum,
London
Dr. A.J.Shelley, Mrs. C.A.Lowry.
Bulletin 10 (1997)

T.R. Williams *School of Biological Sciences Liverpool University*
PO Box 147, Liverpool L69 3BX UK

MEMBERSHIP NOTICES

Death

We regret to report the deaths of the following members:

Professor W. E. Kershaw CMG, VRD, MD, DSc, in UK. on March 20 1998
Dr. T. Timm, Essen, March 1996

New member

We welcome as a new member (e-mail address in italics):

Dr. Ladislav Jedlinka, Department of Zoology, Comenius University, Mlynska Dolina B-1, SK-842 15 Bratiskava, Slovakia. *JEDLINKA@fns.uniba.sk*

New Addresses for Existing Members

Dr D. A. Boakye, 206 Vale Avenue, Brmingham, Alabama, AL 35209, U.S.A.

Professor R.A.Cheke, Pest Management Dept., Natural Resources Institute, University of Greenwich Central Avenue Chatham Maritime, Chatham, Kent ME4 4TB, UK. *r.a.cheke@greenwich.ac.uk*

Professor Marshall Laird, 193 Wharawhara Rd., RD2, Katikati, 3063 New Zealand

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BRITISH SIMULIID GROUP BULLETIN - Number 12, December 1998

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FROM THE EDITOR

I happened to be searching the British Library catalogue for a journal when I thought it would be interesting to see whether our Bulletin was listed - and there it was under ISSN Number 136 33376, DSC Shelfmark 2424.100000n. So we do have a number after all, can't think why I didn't check before.

As usual, the second Bulletin of the year carries an account of the Annual Meeting. This year it was held in conjunction with the 4th. International Congress of Dipterology, and I am indebted to the organizer, Adrian Pont, and his colleagues for providing the texts of the abstracts of talks and posters presented to the meeting, and for permitting them to be published in the Bulletin.
John Davies

COMBINED 21ST. ANNUAL MEETING OF THE BRITISH SIMULIID GROUP AND THE SIMULIIDAE WORKSHOP OF THE 4TH. INTERNATIONAL CONGRESS OF DIPTEROLOGY

The 21st. Meeting was unusual in that it was held in conjunction with the Simuliidae Workshop in the 4th. International Congress of Dipterology Keble College, Oxford, on Wednesday 9 September 1998, because this would enable overseas members attending the Congress to take part, and avoid conflict between the two meetings. We are most grateful to Adrian Pont and the organizers of the Congress for allowing us to join them.

The pre-meeting supper got off to a bad start. The management of the Chang Mai Restaurant had initially told us that there would be no need to book, but when we checked two days before they said they were filling up, so I booked for 20 as 17 had indicated they would be attending. In the event, 30 members and friends turned up, and we only just squeezed everyone in. However, the food was good, and conversation spirited, so I think it was enjoyed by all.

The formal part of the meeting opened at 9.30. am under the chairmanship of Tony Shelley, when 4 papers were presented to an audience of about 45. There then followed a short informal discussion of the BSG's business before the lunch interval. After lunch members gathered around the poster displays for informal discussions on matters raised by the posters and other subjects.

The informal discussions were opened by John Davies who for the benefit of visitors gave a brief outline of the objectives and activities of the Group and details of the biannual *Bulletin* and the electronic mail list *Simuliidae*. This gave rise to a suggestion that we should look into the possibility of linking *Simuliidae* with the neotropical mail-list *SimNeo-L* so that messages sent to one list would be automatically sent to the other. A request was made by Dr. Coscarón that he and his colleagues would appreciate the compilation of a reading list of papers relating to the agricultural and economic consequences of blackfly biting, *e.g*. loss of milk yield in cattle. Perhaps these could be posted on the *Simuliidae* list. These possibilities will be discussed with the Hon. Secretary who is the *Simuliidae* list owner.

In the afternoon, Roger Crosskey announced that Neal Evenhuis of Bishop's Museum, Hawaii was compiling a World Catalogue of Diptera Systematists as an extension of the Afrotropical List published in Roger's *Catalogue of the Diptera of the Afrotropical Region* (1980). This was being published on the WWW, and everyone was invited to peruse it and offer amendments or additions. The catalogue can be found at: http://www.bishop.hawaii.org/bishop/ento/dipterists.

[BRITISH SIMULIID GROUP BULLETIN - Number 12, December 1998]

PRESENTATION ABSTRACTS

Effect of human activity and environmental change on vector/host/parasite distribution and epidemiology of onchocerciasis

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In this paper we examine the possible role of parasite migration in changing the epidemiology of onchocerciasis. Parasite migration can occur with the human host or Simuliid vector. The role of human activity (such as deforestation) in the migrations is examined using examples from Brazil, Malawi, Sierra Leone and Ghana. (The Simuliidologists listed for each study are those primarily responsible for the work reported, but are not necessarily responsible for the opinions and interpretations expressed in this abstract).

Brazil
(M. Maia Hertzog, A.J.Shelley, A.PA.Luna Dias, & R.J.Post)

A new focus of onchocerciasis was recently confirmed (in 1997) at Minaçu, in central Brazil where endemic transmission was found to be taking place to residents who have never left the area. Of the 10 species of *Simulium* in the area, 4 are anthropophilic and presumed capable of transmitting *O. volvulus,* they are; *minisculum, guianense, pseudoincrustatum* and *nigrimanum.* This focus is believed to have been caused by an immigration of gold miners, who had been previously infected when working in the onchocerciasis focus of the Brazil/Venezuelan border area. At Minaçu there just happened to be a population of vectors capable of transmitting the disease.

Malawi
(C.G.Vajime, P.J.Tambala, J.B.Davies, A.Krüger & R.J.Post)

The Thyolo focus of Malawi is the southernmost focus of onchocerciasis in Africa. The disease has been known there since 1939, but about 10 years ago it was noticed that biting by *Simulium* was spreading and increasing, and this has been associated with an increase in deforestation, which is itself a result of an increase in human population from 18,000 in 1900 to a present ½ million. The area is the type locality of *S. woodi* which breeds on crabs in small forested streams, and which was common in 1950's but now comprises less than 1% of biting flies, the rest being 5 or 6 cytospecies of the *S. damnosum* complex which prefer open country. The increase in the latter species has been followed by an increase in the spread and intensity of onchocerciasis.

Sierra Leone
(M.Thomson, J.B.Davies & R.J.Post)

The original extent of true forest is controversial due to long term degradation. At present forest exists mostly only in forest reserves. Most of the forest was destroyed long before the first detailed *Simulium* surveys of 1980 and 1981. These showed the expected distribution of *S. damnosum* cytospecies, with the "forest" forms found mainly in the forest and the "savanna" forms which carry the severe blinding form of onchocerciasis in the savanna. Later studies described a new cytospecies, *S. leonense*, which became associated with blinding onchocerciasis in central areas.

However, surveys by OCP in 1988 reported that savanna flies were widespread throughout the wooded southern part of the country. To try to explain this apparent contradiction pre-1988 records were searched by Madeline. She found 1272 identifications from wooded areas made between 1983 and 1987 at the end of the dry and during the wet seasons, amongst which only 1% were savanna flies.

Therefore, in 1988 something (probably not deforestation) induced savanna flies to suddenly invade the south of the country and the area previously occupied by *S. leonense*. Unfortunately, due to the prolonged civil unrest in Sierra Leone, it has not been possible to carry out any follow-up studies.

Ghana
(M.Wilson, R.A.Cheke, M.Osei, & R.J.Post)

Southern Ghana west of the Volta Lake is an area of moist deciduous forest lying between montaine forest to the north and tropical rain forest to the south. The rivers flow from north to south across these zones. The objective was to see if there was, **a)** a southward spread of "savanna" cytospecies of *S. damnosum,* and, **b)** deforestation as shown by remote sensing data. The latter data shows first of all that the original forest reserves as established in the first half of the century to conserve water catchment still largely exist, but have been nibbled away around the periphery by human encroachment. However, it is not yet clear whether farming intensity has increased outside the tropical forest areas. The overall impression given by the NDVI (a measure of vegetation cover) is that this has been little changed over the period 1984-1991, except for a small drop in 1991.

An analysis of savanna/forest ratios in 21,294 cytospecies identifications over the last 25 years show that forest species are present all the year round, but savanna species are concentrated into the period between the end of the dry season and beginning of the rains. So far, data analysis has shown a small but consistent increase in the population of savanna cytospecies, taking all sites together. However, this has not been demonstrated for individual rivers and the data show strong seasonal and geographical bias, to counteract which statistical approaches are being explored.

[BRITISH SIMULIID GROUP BULLETIN - Number 12, December 1998]

Cladistic analysis of Neotropical/Afrotropical *Simulium* Latreille subgenera (Simuliidae) - a preliminary scenario

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The Neotropical/Afrotropical *Simulium* Latreille fauna is one of the richest in the world, comprising 25 out of 42 subgeneric taxa and two species-groups of subgeneric rank. Traditionally both faunas have been seen as two separated groups and the Neotropical Region alone has been considered a monophyletic taxon.

A preliminary cladistic analysis of Neotropical/Afrotropical *Simulium* subgenera based on morphological characters from the larva, pupa and adults shows that the Neotropical subgenera are not a monophyletic taxon. *Thyrsopelma* Enderlein + *Trichodagmia* Enderlein are more closely related to *Xenosimulium* Crosskey + *Freemanellum* Crosskey + *Anasolen* Enderlein than to any other subgenera. The other Neotropical subgenera form a clade with those taxa and the other Afrotropical subgenera another separated subclade. The position of the *blancasi* species group is controversial since the present analysis shows that it may be the sister-group of all Neotropical + Afrotropical taxa or the sister-group of some Neotropical clades.

Taxonomic status of *Simulium* Latreille subgenus *Simulium* in the Neotropical Region (Simuliidae)

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The subgenus *Simulium* (*Simulium*) Latreille s.str. is a very well represented taxon in the Neotropical realm with 25 recognised species distributed from SW of the USA and northern Mexico to the north of Chile. The revision led to the discovery of two new species from Mexico and the synonymy of another two species. A phylogenetic approach based on analysis of 25 Neotropical species plus the type species of the 20 non-Neotropical species groups using 29 morphological characters gave a strict consensus tree that grouped the New World species independently of the remainder.

[BRITISH SIMULIID GROUP BULLETIN - Number 12, December 1998]

Fennoscandian black flies (Simuliidae); a progress report

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The black fly fauna of Fennoscandia and Denmark comprises about 70 assumed valid nominal species. There are six *Prosimulium* Roubaud spp. (s.g. *Helodon* Enderlein and *Prosimulium*), eight or more species of *Cnephia* Enderlein (*Metacnephia* Crosskey, *Cnephia*, and *Stegopterna* Enderlein), 30 species of *Eusimulium* Roubaud (*Hellichiella* Rivosecchi & Cardinali, *Nevermannia* Enderlein, *Eusimulium*, and *Schoenbaueria* Enderlein), and 25 or more species of *Simulium* Latreille (*Wilhelmia* Enderlein, *Parabyssodon* Rubzov, *Boophthora* Enderlein, *Gnus* Rubzov, *Odagmia* Enderlein, and *Simulium*).

POSTER ABSTRACTS

The autumn aspect of black flies (Simuliidae) of the spring areas in the highest mountains of Spain and Andorra

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In October 1997, detailed collections of black fly preimaginal stages were made in the Esera River valley (Cobierno de Aragon), which originates beneath the highest mountain of the Pyrenees - Pico de Anetto, and in the alpine stream originating beneath the peak of Pico de Veletta in the Sierra Nevada mountains. In the upper part of the Esera River (1,900 m a.s.l.), samples were taken from four localities. The Esera River has the character of an alpine stream in this part (it is 0.5 - 2m wide and the water temperature is 7°C). The water in the stream very often disappears in moraine deposits and appears subsequently as springs in several places. In addition, a sample from the right-side tributary was taken. This stream runs out from the alpine mountain lake at an altitude of about 2,500m and it descends steeply. The sample from the Esera River contained the following species: *Simulium cryophilum* Rubzov, *S. oligotuberculatum* Knoz, *S. vernum* Macquart, *S. monticola* Friederichs, *S. variegatum* Meigen, *S. ornatum* Meigen, *S. trifasciatum* Curtis. In the alpine stream under the peak of Pico de Veletta the following species were found: *S. monticola* and *S. carthusiense* Grenier & Dorier. In the mountain river Rio Gran Valira under the capital of Andorra (Andorra la Vella) two species were obtained: *S. bezzii* Corti, *S. ornatum* Meigen. Detailed data on the ecology and distribution of each species were presented.

The morphometric variability of pupal gills and respiratory surface area in the *Simulium ornatum* Meigen species-group (Simuliidae)

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The number, form and branching of pupal gills are widely used in the taxonomy and identification of black flies. In the *Simulium ornatum* Meigen species-group their number is constantly eight, paired on four basal trunks on each side of the body. The length and width of basal trunks, their ratio and the sum of the trunks' length were used by some authors in the differentiation of taxa at species and infraspecies level in this group (e.g. *S. apenninicum* Rivosecchi, *S. baracorne* Smart, *S. flaveolum* Rubzov, *S. frigidum* Rubzov, *S. hibernale* Rubzov, *S. pratorum* Friederichs, *S. rotundatum* Rubzov, forms of *S. ornatum* and *S. caucasicum* Rubzov, many of them synonomised by later authors). The morphometry of pupal gills was analysed in *S. ornatum* and *S. trifasciatum* Curtis from the West Carpathians and Pannonian lowlands, to show the overall variability, individual variability and variability between different generations of the same species. While the variation of the length of first, second and third basal trunk between generations is not significant, the length of the second basal trunk, the width of all basal trunks and the length:width ratio of all trunks vary significantly.

Significant differences were also found in the sum of trunk lengths. All characters under study show a high individual variability (coefficient of variation over 10%); the width of all basal trunks, and the length:width ratio of second and third basal trunks are ecologically very variable with 20-80% of variation explained as due to differences between generations and/or local populations.
The length of basal trunks and the length:width ratio increase with increasing temperature during the larval development, while the width of basal trunks decreases with increasing temperature. The highest variability was found in measurements of the second basal trunk which were most frequently used in differentiation of taxa.

The respiratory surface area varies between 6.63 mm^2 (spring generation) and 4.25 and 4.52 (in the summer and autumn generations respectively). The differences are significant between the spring generation on the one hand, and summer and autumn generations on the other hand ($F=16.809$, $P<0.001$).

[BRITISH SIMULIID GROUP BULLETIN - Number 12, December 1998]

Spatial and temporal variations in biting activity of the *Simulium* Latreille vectors in the Amazonian onchocerciasis focus, southern Venezuela

M.E.Grillet[1,3], S.Vivas-Martínez[2,3], N.Villamizar[3], H.Frontado[3], J.Cortéz[3], C.Botto[3] & M.G.Basáñez[3,4]

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Previous studies of onchocerciasis in southern Venezuela, which affects the Yanomami people, have shown that it is located in the highland areas where *S. guianense* Wise is the main vector. More recently, this range was extended to the lowland areas and the extent to which other blackfly species may be involved in *Onchocerca volvulus* transmission is presently being evaluated. Since vector density partially determines the transmission, the biting activity of the anthropophilic blackflies at 18 Yanomami villages found along two river systems of the Upper Orinoco river basin was evaluated. Gradients of altitude and onchocerciasis prevalence (low altitude - low prevalence to high altitude - high prevalence) were covered. Blackfly catches were made on local volunteers during 3 - 5 days, over three years (dry: DS, and rainy: RS, seasons). Simuliid species richness increased with altitude and during the RS. *S. oyapockense* Floch & Abonnenc predominated at low altitude, and their monthly parous females biting rate (MPBR) and parity rate (PR) reached a peak in the RS. *S. incrustatum* Lutz dominated at moderate altitude, showing MPBR and PR values higher during the RS. *S.guianense* occurred at highest altitude, mainly during the RS. *S.exiguum* Roubaud and *S. bipunctatum* Malloch bit in small numbers at high altitude, mainly during the RS.

These results suggest that the pattern of onchocerciasis endemicity in the area coincides with the differential distribution of three main blackfly species showing different biting activities and vectorial efficiencies. *S. oyapockense* (low vector competence) is the main vector in the hypo- and mesoendemic lowland areas of the Amazonian focus, mainly because of its high parous biting activity. *S. guianense* (highly efficient vector) is the main vector in the hyperendemic highland areas despite its low biting activity. The vectorial role of *S. incrustatum* remains to be elucidated.

Parasite and vector survival in the blackflies (Simuliidae) of the Amazonian onchocerciasis focus of southern Venezuela in relation to the implementation of ivermectin control programmes

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Density-dependent mechanisms are assumed to regulate *Onchocerca volvulus* populations. Within *Simulium* Latreille, parasite survival and development, as well as parasite-induced mortality play an important role. Among the former, the patterns of limitation and initial facilitation have been associated, respectively, with vectors lacking or possessing well-developed cibarial armatures.

Of the anthropophilic simuliids present in the Amazonian onchocerciasis focus of Brazil-Venezuela, only *S. guianense* Wise s.l. (an unarmed species) has been studied in detail. This work presents, for *S. oyapockense* Floch & Abonnenc s.l. (with armed fore-gut), the relationship between parasite intake, parasite damage inflicted by the armature, and vector survival before and after treatment of onchocerciasis carriers with the microfilaricidal drug ivermectin (IVM). Pre-IVM microfilarial (mf) intakes ranged from 3.9 to 70.9 mf/fly whereas post-IVM average intakes after 48 h, 96 h, 4 months, and 6 months, ranged from 0.0 to 3.4 mf/fly. The proportion of undamaged mf in the blood-meal varied between 0.0 and 0.5, exhibiting a nonlinear relationship with total ingested: for low intakes most mf were scathed by the cibarium, whilst for higher

intakes the proportion of surviving parasites increased and levelled off. There was, however, more heterogeneity for lower intakes. A density-dependent effect of the armature upon ingested mf is a prerequisite for this mechanism to be responsible for the initial non-linearity characteristic of facilitation in armed vectors. In turn, this implies that mf depression through IVM treatment is likely to have a greater impact in locations where these flies prevail (*e.g*. lowlands of the Amazonian focus). Although overall survivorship of wild *S. oyapockense* in captivity was low (perhaps due to its high parous rate), there was a positive relationship between early mortality (within 24 h post-engorgement) and mf uptake. Discussion focuses on the theoretical implications for parasite transmission dynamics and practical criteria for IVM distribution in southern Venezuela.

[BRITISH SIMULIID GROUP BULLETIN - Number 12, December 1998]

Microalgae as food of *Simulium perflavum* Roubaud (Simuliidae) larvae in streams of Central Amazonia, Brazil

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The stomach contents of *Simulium perflavum* Roubaud larvae were analyzed to identify the phycoflora present in the feeding process of this species, and to compare these with the species present in the plankton and periphyton. The collections were made in five streams in Central Amazonia (Manaus and Presidente Figueiredo counties), in September-October 1996 (dry season) and February-March 1997 (rainy season). We dissected 1,400 larvae to analyze the stomach contents using two different methods: fresh and after oxidation. In the stomach contents we identified 43 species of Bacillariophyta, 38 of Chlorophyta, two of Cyanophyta, one of Euglenophyta and one of Pyrrhophyta. In each stream, qualitative and quantitative samples of plankton and periphyton were collected. These were mounted between slides and cover glass and the specimens were counted in a Sedgwick-Rafter chamber. In the qualitative samples of the plankton we identified 29 species of Bacillariophyta, 53 of Chlorophyta, seven of Cyanophyta, two of Euglenophyta, two of Rhodophyta and one of Pyrrhophyta.

In the samples of the periphyton we identified 21 species of Bacillariophyta, 32 of Chlorophyta and one of Rhodophyta. One species of Rotifera was present in all the samples. Cluster analysis, based on the species composition of the organisms present in the stomach contents, grouped the streams into two major groups. Correlation, based on presence/absence of species of microalgae in the stomach contents, plankton and periphyton indicated significant association ($p<0.05$) between stomach contents and plankton and between plankton and periphyton (significance test based on z test); the Sorensen similarity coefficient and Cluster analysis agreed with these results.

Black fly (Simuliidae) species distribution, co-occurrence and richness among streams in Central Amazonia, Brazil

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J.W.McCreadie and P.H.Adler: *Department of Entomology, Clemson University, Clemson, SC 29634, USA*.

Distribution, co-occurrence and species richness of the black fly fauna collected in five counties in the state of Amazonas, Brazil are evaluated. Previously, six species were known from streams of this region; five species are added to this list, bringing the total to 11 species. We sampled 82 sites between March and August 1996; at each sampled site, 11 parameters were measured: temperature, water velocity, depth, width, discharge, stream bed particle size, riparian vegetation, canopy cover, pH, presence of impoundment, vegetation type (forest, campina, agriculture). Principal component analysis (PCA) and stepwise logistic regression were used to determine significant associations between stream site conditions and the larval distribution of each species.

Based on stream site characters, the occurrence (presence/absence) of larvae of the different species of black fly in the area were highly predictable (76-90%), indicating that the distributions of black fly larvae are not random. The predictive value of stream size and presence of impoundments agrees with the results of similar work in the Nearctic Region, suggesting that the general responses of black fly distribution to environmental parameters might be universal in nature. Cluster Analysis (UPGMA, Jaccard distance) based on species occurrence indicated three groups that reflect the physical characteristics of the habitats of the species; presence of impoundments, riparian vegetation and landscape type were especially important. Co-occurrences were assessed by Spearman correlation; species grouped in the Cluster Analysis showed positive correlations, while species in different groups were negatively correlated. Species richness was negatively associated with presence of impoundments and was lower than the values reported for the temperate zone, with a maximum of four species per stream; 36% of the streams had only two species, indicating that the black fly fauna in the studied area is less rich than several places in the temperate zone.

[BRITISH SIMULIID GROUP BULLETIN - Number 12, December 1998]

Studies on bioacoustic behaviour in blackflies (Simuliidae)

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In blackflies, swarming behaviour typically occurs before mating. So far, only optical and chemical signals have been discussed in species identification and recognition between males and females. Blackflies of both sexes can also produce sounds, by vibrating either their wings or their abdomen. Wing and abdomen vibration is a very common method of sound production in these insects. The sounds are characteristically of lower frequency in contrast to those produced by stridulation and percussion.

The songs of males and females of different genera are described, together with methods for observing behaviour in the presence of conspecific songs and songs of other species. These vibrations fall into different categories: flight songs, positive responses to other songs, and body reactions. Bioacoustic patterns have characteristics that are correlated to male and female size. Song parameters, such as inter-pulse interval, burst length, number of pulses per burst and intra-pulse frequency, were measured and differences are given.

[British Simuliid Group Bulletin - Number 12, December 1998]

Onchocerciasis in the Amazonian focus of southern Venezuela: altitude and blackfly (Simuliidae) composition as predictors of endemicity in the selection of communities for ivermectin control programmes

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The pre-ivermectin prevalence and intensity of infection due to *Onchocerca volvulus* as well as the species composition and abundance of *Simulium* Latreille vectors were investigated in 22 Yanomami communities situated along two altitudinal transects in the southern Venezuelan onchocerciasis focus. These transects corresponded to the Ocamo-Putaco and Orinoco-Orinoquito river systems, covering a range of elevation between 50 and 1,050 m above sea level (asl). A total of 836 people underwent parasitological examination in this survey and an additional 196 patients from a previous study in Parima-B were included in the analysis. A total of 92,659 man-biting blackflies were collected and identified to morphospecies. *S. oyapockense* Floch & Abonnenc s.l. was the predominant simuliid up to 150 m asl, whereas *S. guianense* Wise s.l. and *S. incrustatum* Lutz s.l. prevailed above 150 m. Communities located below 150 m were found to range from hypo- to mesoendemic; all villages above 150 m proved to be hyperendemic (> 60% microfilarial prevalence). Age above 10-14 yr, altitude of the village and biting rate of *S. guianense* s.l. up to 200 m asl were found to be statistically significant independent predictors of infection by multivariate logistic regression using a spline model. There were no differences in infection status according to sex. Above 200 m, microfilarial rate and

density remained approximately constant, prevalence reaching an average of 79% regardless of blackfly abundance. Altitude and blackfly composition might be adopted as useful indicators aiding selection of most affected communities for the implementation of ivermectin-based onchocerciasis control programmes in the Amazonian focus.

[BRITISH SIMULIID GROUP BULLETIN - Number 12, December 1998]

NOTES, VIEWS & CORRESPONDENCE

The meanings of the scientific epithets of British blackflies

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Recognizing the classical or other origins of the scientific names of organisms can help to make them more easily remembered. Here is a list of the specific epithets of blackflies present in our fauna and what they mean, with valid epithets alphabetical in the genus and their synonyms indented beneath them. The meanings of the 50 epithets fall into five categories: 30 morphological (related to structure possessed or compared, colour or pattern); 7 geographical (related to original locality); 4 environmental (related to habitat or season); 3 behavioural (related to host); 6 personal (based on names of people). Most derive from Latin (L.) but a few from Greek (Gr.) or latinized Greek. The epithets in the personal category are nouns in the genitive case and have the '*-i* ' suffix appropriate to a name based on one male person. There are no epithets in the British fauna applying to the name of a woman (when '*-ae*' suffix is requisite) or to persons in the plural (when '*-arum*' or '*-orum*' suffix is requisite depending on gender combination). [Examples are *sommermanae*, named for Kathryn Sommerman, and *woodorum* named for Monty and Grace Wood (both in *Prosimulium*).]

Simulium and *Prosimulium* are neuter generic names, therefore adjectival epithets combined with them must take neuter suffixes (*-e*, *-um*). Where relevant the adjectival *-us* (masculine) and *-a* (feminine) endings are shown that apply when the species is placed (as still occasionally in European literature) in a non-neuter genus: e.g. *Boophthora erythrocephala* and *Odagmia ornata* (feminine) and *Gnus rostratus* (masculine). The geographical suffix denoting place is *-ensis* in the masculine and the feminine but *-ense* in the neuter, therefore *-ense* is required for *Simulium* (and for any generic name suffixed *-simulium*); names in the list with an *-ense* suffix denote the provenance of the original specimens.

Metacnephia

amphora Ladle & Bass - wine-vase or pitcher (L. *amphora*, pitcher, wine jar). Refers to the amphora-like outline shape of the larval postgenal cleft.

Prosimulium

hirtipes Fries - haired legs (L. *hirtus*, hairy or shaggy + L. *pes*, foot). Refers to the hairy legs in *Prosimulium*.

latimucro Enderlein - broad point (L. *latus*, broad + L. *mucro*, thorn, point). Refers to the shape in the female of the basal tooth of the claws, noted by Enderlein with the statement "Klaue halb so lang wie das letzte Tarsenglied, fast die Basalhälfte stark verbreitert".

inflatum Davies - bulbous (L. *inflatus*, *-a*, *-um*, puffed up, swollen). Refers to the female clypeus, more bulbous in profile than in the *P. hirtipes* female.

tomosvaryi Enderlein - named for Dr Tömösvary (Hungary).

arvernense Grenier - of the Auvergne (L. *-ense*, suffix denoting place). Refers to the geographical provenance of the original specimens (Clermont-Ferrand, France).

Simulium

angustipes Edwards - slender-legged (L. *angustus*, narrow + L. *pes*, foot). Refers to the undilated fore tarsi.

angustitarse Lundström - slender-footed (L. *angustus*, narrow + Gr. *tarsos* latinized to *tarsus*, foot from heel to toes). Refers to the undilated tarsi of both sexes.

argyreatum Meigen - silvery (Gr. *argyreos*, of silver). Refers to the silvery pattern of the female scutum.

armoricanum Doby & David - of Armorica (L. *Armoricae*, *-arum*, Roman name for the northwestern part of Gaul equivalent now to Brittany peninsula and part of Normandy). Refers to the original specimens being from Brittany.

aureum Fries - golden (L. *aurum*, gold). Refers to the golden appearance of the fly, especially the scutum.

costatum Friederichs - ribbed (L. *costa*, rib, *costatum*, *-a*, *-um*, ribbed). Refers to strong wing venation in this large species, emphasised by Friederichs in his species key with the words "Flügelgeäder etwas kräftiger als gewöhnlich" (= wing-veins rather stronger than usual).

cryophilum Rubtsov - cold-loving (Gr. *kryos*, frost + Gr. *philos*, friend or affection). Presumably refers generally to the Russian original provenance since temperatures of the aquatic habitat are not notably low.

brevicaulis Dorier & Grenier (legitimized Davies) - short stalk (L. *brevis*, short + L. *caulis*, stalk, stem). Refers to the (two) short common stalks of the four-filamented pupal gill.

dunfellense Davies - of Dun Fell (L. *-ense*, suffix denoting place). Refers to Great Dun Fell in the northern Pennine Mountains of Cumbria, source of the Knock Ore Gill type locality stream.

equinum Linnaeus - of horses (L. *equus*, horse, *equinus*, *-a*, *-um*, of horses). Refers to the equine host of the female fly.

brunettii Enderlein - named for Enrico Adelelmo Brunetti (1862-1927), bandmaster, amateur dipterist and collector of the type specimen.

zetlandense Davies - of Shetland (L. *-ense*, suffix denoting place). Refers to the Shetland Islands type locality.

erythrocephalum De Geer - red-headed (Gr. *erythros*, red + Gr. *kephale*, head, Latinized *cephalus*, *-a*, *um*). Refers to red appearance of the male head caused by the red-coloured eyes. [Species described in 1776 from a male swarm.]

sericatum Meigen - silky (L. *sericatus*, *-a*, *-um*, clothed in silk). The reason for the name is obscure. Meigen described the species from a male fly that had already lost its abdomen. The name perhaps alludes in some way to the bright silvery parts of the scutal pattern.

intermedium Roubaud - intermediate (L. *intermedius*, *-a*, *-um*, that which is between). Refers to the small claw tooth in the female, intermediate between the toothless condition and the heavily toothed condition of various species. Reason clear from Roubaud's statement in original description "les griffes de cette intéressante espèce constituent un terme de passage entre les griffes simples et les griffes à talon basilaire".

nitidifrons Edwards - shiny frons (L. *nitidus*, *-a*, *-um*, shining + L. *frons*, forehead). Refers to the shining black frons of the female, which contrasts with the dull grey frons in *S. ornatum*. [*S. nitidifrons* was originally described as a variety of *ornatum*.]

juxtacrenobium Bass & Brockhouse - near *crenobium* (L. *juxta*, near + *crenobium* species epithet). Refers to close kinship with the Central European species *S. crenobium* (its name derived from Gr. *krene*, spring).

latipes Meigen - wide foot (L. *latus*, broad + L. *pes*, foot). Refers to the enlarged hind basitarsi of the male.

subexcisum Edwards - feebly excavated (L. *sub*, in sense of somewhat or less than + L. *excidere*, to cut out, *excisum*, *-a*, *-um*, excavated). Refers to the very shallow pedisulcus of the hind leg in both sexes of this species, a contrast to the deep pediculcus of most *Simulium* species.

yerburyi Edwards - named for John William Yerbury (1847-1927), British army officer and amateur dipterist.

lineatum Meigen - striped (L. *linea*, thread or line, *lineatus*, *-a*, *-um*, of a line). Refers to the three narrow dark stripes that form a somewhat lyre-shaped pattern on the scutum of the female.

salopiense Edwards - of Salop (L. *-ense*, suffix denoting place). Refers to the type locality being in the English county of Shropshire (= Salop).

lundstromi Enderlein - named for Carl August Lundström (1844-1914), Finnish entomologist.

latigonium Rubtsov - wide ventral plate (L. *latus*, broad + Gr. *gonos*, that which produces seed). Refers to the wide ventral plate (adminiculum) of the male genitalia.

morsitans Edwards - biter (L. *morsus*, bite). Refers to the bloodsucking habit of the female.

naturale Davies - of nature (L. *naturalis*, *-e*, pertaining to or having the quality of nature). Refers to the type locality stream being in the Moor House National Nature Reserve in Cumbria.

noelleri Friederichs - named for the German parasitologist Dr W. Nöller (Hamburg).

subornatum Edwards - somewhat ornate (L. *sub*, in less than or somewhat sense + *ornatum*

species epithet). Refers to the resemblance, because of an essentially similar *ornatum*-like scutal pattern, to *S. ornatum* (next).

ornatum Meigen - decorated or adorned (L. *ornare*, to adorn or furnish), *ornatum*, *-a*, *-um*, adorned). Refers to the conspicuous pattern of the scutum of the female.

posticatum Meigen - meaning uncertain (L. *post*, after, behind, *posticus*, *-a*, *um*, that is behind). The reason why Meigen chose this (apparently malformed) epithet is unclear. It evidently derives from *posticus* (to the back) and presumably was meant to indicate something about the abdomen of the original female specimen.

austeni Edwards - named for Ernest Edward Austen (1867-1938), Natural History Museum dipterist and collector of the holotype.

pseudequinum - false equinum (Gr. *pseudos*, fallacy + *equinum* species epithet). Refers to deceiving similarity between the species and *S. equinum* (above); adults of the two species are alike externally.

reptans Linnaeus - crawler (L. *reptare*, to creep or crawl). The reason for the name is not fully certain. Macquart (1826, *Insectes Diptères du Nord de la France*, p. 21-22) noted how the simuliid's fore tarsi are constantly patting when on a surface and presumed this to be the explanation for the name *reptans* ("C'est cette habitude qui a fait donner par Linnée le nom de *Culex reptans* à l'espèce la plus connue"). The habit applies when the fly is on a host and Linneaus knew his *reptans* to be a pest.

galeratum Edwards - capped (L. *galea*, helmet or cap, *galeratus*, *-a*, *-um*, capped). Refers to the pigmentation pattern of the larval head, as stated in the original description "The name has reference to the cap-like black patch on the head of the larva".

rostratum Lundström - having a beak (L. *rostratus*, *-a*, *-um*, beaked). Refers to the beak-like ventrally directed process of the ventral plate in the male genitalia (the shape of which provided the diagnostic character in the description).

sublacustre Davies - (L. *sub*, in sense of from or beneath + L. *lacus*, lake, *lacustrinus*, *lacustris*,*-e*, of lakes. Refers to the lake outlet habitat of the aquatic stages.

trifasciatum Curtis - three-banded (L. *tres*, three + L. *fascia*, band, *fasciatus*, *-a*, *-um*, banded). The reason for the name is obscure. The one original specimen (holotype) is a female of the *ornatum*-group and the name perhaps refers to the black tergites of the basal half of the female abdomen and the manner in which they stand out against the general grey background. [Note: the species was described in 1839 and is the only one described from Britain before Edwards's work of 1915. I have seen the holotype: it is in the National Museum of Victoria, Melbourne.]

spinosum Doby & Deblock - thorny (L. *spina*, thorn, *spinosus*, *-a*, *-um*, thorny). Refers to the thorny tubercles of the pupal thorax.

tuberosum Lundström - protuberant (L. *tuber*, a swelling or protuberance, *tuberosus*, *-a*, *-um*, lumpy). Refers to the conspicuous tubercle present on the inner surface of the style in the male genitalia.

urbanum Davies - urban (L. *urbs*, town, city, *urbanus*, *-a*, *-um*, of the city). Refers to the original provenance being near London. The type locality is on the northern edge of Greater London but is a tiny rill on the undisturbed heathland of Stanmore Common and not actually urban.

variegatum Meigen - parti-coloured (L. *variegatus*, *-a*, *-um*, of varied sorts, particularly in coloration). Refers to the multicoloured yellow and brownish black legs of the female.

velutinum Santos Abreu - velvety (New Latin, *velutinus*, *-a*, *-um*, derivative from classical *villus*, a tuft). Refers to the velvety appearance of the male scutum.

latinum Rubtsov - of Rome area of Italy (L. *Latinus*, *-a*, *-um*, classical *Latium* district of central Italy). Refers to type locality near Rome.

vernum Macquart - of the spring (vernal) season (L. *vernus*, *-a*, *-um*, of springtime). Refers to the month of May when the original adult fly was captured. Macquart dubbed the species with the French vernacular 'Simulie printanière' and gave the date as 'Au commencement de Mai'.

Acknowledgement: I was not sure why Lewis Davies had chosen the names *inflatum* and *naturale* and thank him for putting me wise on this. (He commented in reply that the Moor House Nature Reserve and its buildings are now in ruins.)

[BRITISH SIMULIID GROUP BULLETIN - Number 12, December 1998]

TRAVELLERS' TALES

The *NAMU* of New Zealand

Marshall Laird writes to say that since "retiring" back to New Zealand in 1983, he has been assembling data for a publication the genesis of which was his *Bibliography of the Natural History of Newfoundland and Labrador* (see *Bulletin* No. 11). It is to appear as a CD-rom entitled *New Zealand's Natural History - Synopsis and Recommended Reading** around the dawn of the third millennium. The following accounts and comments are taken from the TOPIC concerning blackflies.

In early April 1773, George Forster (1777) of Captain James Cook's second voyage to NZ reported that when HMS *Resolution* was in Dusky Sound (Lat. 45° 47' S, Long. 166° 26' E.) "a sort of little crane-flies... became remarkably troublesome during the bad weather. They were numerous in the skirts of the woods, not half so large as gnats or musketoes, and our sailors called them sandflies." This understandable association of the pests with the sandy shore of the landing place was probably, as Crosby (1973) wrote, "the earliest authentic reference to Simuliidae as 'sandflies'", the name still in common usage in NZ (and Australia too) for blackflies (Laird 1981)[1]. The earliest reference that I've found to the use of the latter name in this country for what could only have been a simuliid is that of MacKenzie (1893). Writing of his early November 1853 trip along the Waipa River not far from Ngaruawahia (37 ° 40' S, 175° 09' E) in the North Island's King Country, he complained that "The mosquitoes are very annoying here, as also a kind of small black fly which bites as badly as a flea."

While praising the wealth of fish, birds and timber at Dusky Sound in 1791, Captain George Vancouver (1798) declared that "... no sooner did we get our feet on shore than we were covered with these flys, and their sting is as painful as that of a Musquitto, and made us scratch as if we had got the itch."

Almost a century later Andreas Reischek spent April to October of 1884 searching for birds in Fiordland, SW South Island, notably at Dusky Sound and Chalky Inlet (46° 04' S, 166° 30' E). By then the special abundance of simuliids in that region and northward along the South Island's west coast had become proverbial thanks to the rapids of so many rivers and streams discharging from the mountains of NZ's wettest area. Reischek's (1930) reminiscences spoke of his being "... so pestered with sand-flies that I was frequently compelled to run away from them and bathe my eyes. They were sometimes so bad as to kill penguins on the beach, while three young ground-parrots (the now critically endangered Kakapo ...*ML*) I captured were so badly attacked that a few hours after capture ... I found one dead and the others covered with these insects." More recently Fallis *et al.* (1976) described the haematozoan, *Leucocytozoon tawaki*, from the Fiordland Crested Penguin, identifying early stages of its sporogonic cycle from the midgut of *Austrosimulium* spp.; while Allison *et al.* (1978) elucidated the complete sporogonic cycle and the parasite's transmission to chicks of the same penguin by *A. ungulatum,* which their springtime (September to October) data established as the primary vector of *L. tawaki*. The latter authors observed "heavy mortality among *A. ungulatum* that had fed on a heavily infected penguin chick, as compared to flies that had fed on a lightly infected bird...."

Back to earlier days at Chalky Inlet, from which McNab (1913) refers to a mid-December 1836 opinion from the papers of John Balleny of a visiting schooner. This man wrote that "I do not think either natives or settlers could live any great time in this part from the myriads of poisonous flies in the summer", and that they "fasten on us with such fury and fly into the nose mouth and ears; the itching they leave is positively enough to drive one mad."

As we all know, there was little that could be done to alleviate the biting. At Sealer's Bay (46° 46' S, 167° 39' E), Codfish Island, Poppelwell (1912) had found at Easter of the previous year that the most abundant adventitious plants were Mint and Fennel planted for their flavouring virtues by sealers of the early 19th century. Wilson (1959), noted that *Mentha spicata* had long been believed to discourage simuliids. When at Sealer's Bay in 1935 he and another ornithologist camped in a large bed of *M. spicata* near the remains of a trying-out station which had been disused for a century or so, Wilson remarking that "though there were a good number of sandflies on the island, we did not suffer from them on our bed of mint."

Long before the arrival of Europeans, Maori had countered the attacks of *Namu* (sandflies) by eating outdoors under the shelter of smoke from a circle of fires (Brunner, 1848). In ancient times these occasioned bushfires and a more lasting solution to simuliid problems via habitat destruction, which continued apace after European settlement led to draconian forest clearance to open up land for farming. Little short of 80 years ago Thomson (1922) linked habitat destruction with the disappearance of both simuliids and mosquitoes from districts where they were formally very common.

A pre-European contribution to combatting *Namu* (a word which means mosquitoes throughout the tropical Polynesian atolls that lack streams offering blackfly larval habitat) was the use of the oily liquid from an indigenous myoporacean tree, the *Ngaio* (*Myoporum laetum*); which occurs from NZ's subtropical Dependency of the Kermadec Islands, nearly 1000 km NE of Aukland, to the vicinity of Dunedin. The oily liquid from this tree served as a repellent to blackflies and

mosquitoes, crushed leaves or an infusion of the bark being rubbed into the skin (see Riley, 1997 for references). Perhaps *Ngaio* juices merit modern investigation as the basis of a commercially viable blackfly repellent?

As regards the natural enemies of NZ simuliids, any contribution any contribution to the destruction of their adults by insectivorous birds seems slight, even though it was said by Reischek (1930) that at lake Brunner (42° 37' S, 171° 27' E) on 28 December 1877 Fantails "were flitting about like butterflies and catching gnats and sandflies which were here in myriads. Whenever they caught anything they would snap their beaks together in a satisfied way." And turning to freshwater fish, while the Torrentfish presumably includes immature blackflies in its diet when feeding on larval insects among the rocks of rapids, it is one of NZ's rarest and least seen species. (McDowall, 1973, 1992)

From his vast reserves of Maori lore, Elsdon Best (1942) provides an appropriate note to conclude on. For tribal elders had assured him that although great numbers of *Namu* perish in their onslaught, "they'll gladly loose a thousand, or two thousand, disdaining death as long as Maori blood wells forth... a saying of the sand-fly folk is 'What matter if I perish, if only his blood flows'."

[* To be published by PolyMEDIA of Nelson New Zealand. To register an interest in acquiring a copy when issued send an e-mail to Richard Clark, at mail@polymedia.co.nz.]

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[BRITISH SIMULIID GROUP BULLETIN - Number 12, December 1998]

FORTHCOMING MEETINGS

Annual North American Black Fly Meeting

The 1999 meeting is planned for 7-8 February at the Flamingo Lodge, Everglades National Park, Florida. Contact Jim Sutcliffe or Peter Adler for details.

International black fly researchers' meeting in year 2000?

There has not been a major international meeting of black fly workers since the one held at the Pennsylvania State University in May of 1985.

I have recently surveyed some of the black fly researchers in North America about their interest in an INTERNATIONAL MEETING IN YEAR 2000 and the response was very favourable.

The proposed meeting site is the campus of Brock University in St. Catharines, Ontario, Canada for spring/summer year 2000. This would mean that accommodation (single or double rooms) would be available in University residences at prices well below those of hotels in the area. St. Catharines is in the heart of the wine-growing region of Ontario. It is approximately 1-1.5 hours from both the Toronto Airport (Canada) and the Buffalo Airport (USA).

Trips that could be arranged include visits to Niagara Falls (20 minutes away), Niagara Parks Butterfly Conservatory (15 minutes away), Winery Tours, Royal Ontario Museum (1.5 hours away), Algonquin Provincial Park
(with an overnight stay at the Wildlife Research Station there), etc.

I would like to know whether British simuliid workers would be interested or able to attend such a meeting. Are there any blocks of time in spring or summer 2000 that are already booked for scientific meetings and would preclude participation in the St. Catharines Black Fly Meetings?

Please let me know YOUR views so that I can proceed with the plans!

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[BRITISH SIMULIID GROUP BULLETIN - Number 12, December 1998]

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FROM THE EDITOR

We have quite a varied selection in this issue. Accounts of two recent blackfly meetings, and announcements about another three forthcoming. There are reports of work being carried out in Italy, and the extension of man-biting *Simulium damnosum s.l.* into South Africa. The Travellers' Tales section carries a description of a South Seas "paradise", and there are details of two recent publications of general interest.

The flow of material continues, and I wish to thank all those who have contributed text or ideas for articles - please keep them coming in.

John Davies

MEETING ANNOUNCEMENTS

22nd ANNUAL MEETING

We are hoping to hold the 22nd Annual Meeting of the British Simuliid Group at Liverpool University sometime between the middle of October and the middle of November 1999. The date cannot be announced until the time-table of lecture theatre usage for the autumn term has been finalised and we can find a convenient vacant slot.

The 25th Nordic-Baltic Congress of Entomology VESTFOLD, NORWAY 28th June to 2nd July, Year 2000

The meeting is organized by the Norwegian Entomological Society and the University of Oslo (Zoological Museum) And will be held at Melsomvik School of Agriculture in beautiful surroundings between Tønsberg and Sandefjord.

Topics of the symposia:

Section 1. NORDIC-BALTIC ENTOMOLOGY

1 General entomology

2 Special sections and workshops (Lepidoptera, Coleoptera, Diptera, Hymenoptera, Aquatic insects,

etc.)
Section 2. NORDIC-BALTIC FAUNISTICS, COLLECTION
MANAGEMENT AND USE OF DATABASES
Section 3. THREATENED INSECTS AND CONSERVATION
STRATEGIES IN THE NORDIC-BALTIC COUNTRIES

At the opening of the congress there will be a plenary session with selected topics of entomology presented by invited speakers. Plenary sessions, symposia, poster presentations and excursions will be organised. The language of the Congress is English. Participants are invited to present their contribution as lectures/posters on the sections as suggested above. Each lecture should be 15 min (+ 5 min for discussion). The main sections will be held with as little overlapping as possible, while sections on special taxonomic groups may be run simultaneously. Besides insects, the Congress covers also other terrestrial arthropods.

Excursions to interesting places for the collector:
Tjøme (seashore meadows and dry meadows) –localities for rare
Lepidoptera and Hymenoptera etc.
Larvik (old pine and deciduous forests) – Coleoptera localities
Drangedal (forest) – rare Coleoptera

For preliminary registration of participants for further information, please send your name and address by letter or by e-mail to:

Organising Committee of the XXV Nordic-Baltic Congress of Entomology c/o Zoological Museum, University of Oslo, Sarsgt. 1, N-0562 Oslo, Norway

E-mail address: **j.e.raastad@toyen.uio.no**
WEB SITE: http://www.toyen.uio.no/NBCE2000/

BLACK FLIES IN THE NEW MILLENNIUM

An International Meeting of Black Fly Workers will be held at Brock University, St. Catharines, Ontario, Canada from June 17-21, 2000.

The tentative schedule is as follows:

Sat. June 17
Arrival, Registration and Welcome Reception
Sun. June 18
Theme I: Systematics and Taxonomy of Black Flies
Theme II: Ecology and Behaviour of Immatures
Mon. June 19
Theme III: Ecology and Behaviour of Adults
Special: Student Papers and Poster Competition
BANQUET
Tues. June 20
Theme IV: Disease Transmission
Theme V: Biological Control
Wed. June 21
Departure Day
Optional (Overnight) Field Collecting Trip to Algonquin Provincial Park (sleeping bags required)

If you are interested in being a Symposium or Workshop leader, please contact Fiona F. Hunter.
To be put on an e-mail list for updates about this conference, please send your request to **hunterf@spartan.ac.brocku.ca**
Please note that a Web Site for Conference Information is currently under construction!

Fiona F. Hunter, Conference Organizer, Dept. of Biological Sciences, Brock University, St. Catharines, Ontario, CANADA L2S 3A1. Tel. 905-688-5550 ext. 3394 or 3388 Fax. 905-688-1855 e-mail: hunterf@spartan.ac.brocku.ca.

[BRITISH SIMULIID GROUP BULLETIN Number 13, June 1999]

MEETING REPORTS

Report from a blackfly workshop 6-7 December 1998 in Sweden

Björn Malmqvist: *Department of Ecology and Environmental Science, Umeå University, SE-90187 Umea, Sweden*

Recent studies of blackfly ecology in northern Sweden have shown that these insects are highly significant members of the communities of streams and rivers in this region. Their importance is related to the large numbers in which they occur. In addition to the significant effect on transported material in the rivers, they can be expected to influence other processes in the system as well as human activities and those of domestic animals. With this background, sixteen invited participants met at the Umeå University field station at Kronlund to discuss future research possibilities. The meeting was funded by FRN (The Swedish Council for Planning and Coordination of Research) and the theme for the workshop was: 'Blackflies – ecologically important animals in North Sweden. Planning of a work program'.

In addition to myself, participants were from North America (Peter H. Adler, Jan Ciborowski, Richard W. Merritt), UK (Roger Wotton), Germany (Ellen Kiel), Iceland (Gïsli Mär Gïslason), Finland (Kalevi Kuusela, Timo Muotka) and Sweden (Jan Chirico, Åsa Eriksson, Tim Hipkiss, Micael Jonsson, Jean Lacoursière, Christian Otto, Yixin Zhang).

The first day, the participants reported from their own, current research. The presentations served to update and inform about their research directions and interests. In addition to oral presentations, an inspiring and professional-quality clip from a video film about predation on blackfly larvae was shown by Timo Muotka. Christian Otto presented North Sweden in terms of geography, climate and ecology. Among many interesting contributions, the elegant long-term (21 years) study by G'sli Mär Gïslason on blackflies in Iceland and the strong regulatory effects of these insects on their predators (salmon, birds) boosted an intense discussion. Rich Merritt advocated for the use of Bti to control blackflies, a technique which unusually enough seems to be safer the more studies on their side effects are carried out. Ellen Kiel, Roger Wotton and Jan Ciborowski all gave very stimulating talks on sophisticated aspects of larval activities such as the ageing of larval silk and its influence on subsequent colonisers, the food and faeces of the larvae, and the uptake of dissolved organic matter from the water. Peter Adler presented, among other things, an overview of his work on the North American blackfly fauna illustrated with beautiful drawings of blackflies. Jean Lacoursi□re gave a timely account on the blackflies' capacity to detect UV-B light and avoidance behaviour (dispersal, drift) in response to this. Timo Muotka showed that blackfly larvae might be more important prey to invertebrate predators than is usually believed, and Kalevi Kuusela discussed fluctuating asymmetry in blackfly female genitalia. Jan Chirico reviewed the veterinarian importance, as far as it is known, of blackfly biting in Sweden. An information-saturated talk was given by Yixin Zhang, who successfully defended his PhD thesis only two weeks after the meeting. Three other PhD students, Åsa Eriksson, Tim Hipkiss and Micael Jonsson, presented interesting information on blackfly distributions in lake outlet streams, relationships between blackflies and Tengmalm's owl, and ecosystem process rates in relation to species diversity, respectively. My own contribution was a summary of recent blackfly work in Sweden leading up this workshop.

The second day, the participants were divided into two groups with the aim of discussing possible research directions. The two subjects were: (1) Blackflies as an economic factor in northern countries (including tourism, pollination by blackflies, blackflies as vectors of disease, blackfly effects on wild and domestic animals, control programs, use of Bti, blackflies in environmental research), and (2) Blackflies and ecosystems (blackflies as test animals in ecological theory, material engineering, blackflies as prey - aquatic and terrestrial, possible fertilisation of river banks through sedimentation of larval faecal material, blackflies as habitat modifiers for other organisms, behaviour).

The group arrived at three main research areas that would be particularly fruitful for future studies in Swedish rivers. These were: 1) Larval dynamics, including the importance of blackfly larval biomass to aquatic predators, what role aquatic predators play for the populations of blackflies, and the significance of blackfly-produced materials (silk, polysaccharides and flocculated material); 2) Faecal matter. Recent studies have shown that blackflies are quantitatively important transformers of riverine particles influencing the transport and utilisation of such particles. However, there remain many questions, including how durable this material is and how it is used by the biota; 3) Feeding biology and dispersal of adults. The knowledge about blackflies as parasites on wildlife and livestock in Sweden is very limited. Given the massive populations of blackflies it would be an urgent task to map their importance. Of economic interest is also the potential effects blackflies may have on tourism in northern Sweden. Plans for an evaluation of negative effects and possible strategies for the mitigation of such effects were discussed. Altogether, these aspects form an excellent basis for a large cross-disciplinary research programme.

Kronlund offered a fine atmosphere for informal discussions. Many participants enjoyed long walks in the snowy and cold (-15°C) late nights, and the generous and tasty meals, including reindeer meat, salmon and ostrich, served in the yellow house made strong impressions.

[BRITISH SIMULIID GROUP BULLETIN Number 13, June 1999]

Third Annual SERA-IEG Meeting (Flamingo, Fla. 1999)

John R. Wallace *Department of Biology Millersville University Millersville, PA 17551*
Alison H. Hyder *South Carolina Army National Guard,Columbia, SC*

Flamingo Lodge, nestled in the heart of Everglades National Park, Florida was the location for the third annual Southern Extension and Research Activities - Information Exchange Group meeting on Black Fly biology, economic problems and management. This year's meeting was co-organized by John R. Wallace (Millersville University, Millersville, PA) and Alison H. Hyder (South Carolina Army National Guard, Columbia, SC). Mr. Eric Naguski, (Millersville University, student) managed the audio-visual equipment during all

sessions. There were approximately 29 registrants representing three continents and six countries including Sweden, England, Canada, Columbia, Brazil, and the United States. The meeting included three subsections: Population Management and Water Quality; Ecology and Behavior and; Genetics and Systematics. The meeting culminated with a business discussion on Monday, February 15.

Those present were: Peter Adler, Dan Arbegast, Doug Currie, Doug Craig, Ken Cummins, Peter Dechant, Joe Fitzpatrick, Bob Fusco, Elmer Gray, Robin Gray, Neusa Hamada, Ozzie Hernandez, Michael Higgins, Christie-Lee Hazard, Fiona Hunter, Alison Hyder, John McCreadie, Bjorn Malmquist ,Richard Merritt. Ken Minson, Eric Naguski, Ray Noblet, Jay Overmyer, Ken Pruess, Will Reeves, Jim Robinson, Alison Stuart, Claudia Velasques, John Wallace, and Roger Wotton.

Population Management and Water Quality (Feb. 14, 10 am. - 12 pm):

Dan Arbegast (PA DEP) discussed black fly suppression programs in Pennsylvania. Approximately 1700 stream miles in PA are treated with Bti. The focus of his talk was on small stream (Yellow Breeches) treatment with cooperation of fly-fishing groups enabling PA Fish & Game to use Bti in future projects. Elmer Gray (Clemson University) presented a paper on projected costs of black fly management in Argentina. Elmer mentioned several factors that may affect cost, e.g., frequency of larvicide applications, flight range, larval habitat and whether vector or nuisance pest. Alison Hyder (South Carolina Army National Guard) presented her research on bioindicator studies with black flies and new toxicology testing methods. Alison examined 24 and 48h LC50 of chlorpyrifos with three species of black flies and found 1) older larvae may be less susceptible and sensitive to chlorpyrifos than younger larvae and; 2) none of the species examined were more susceptible than any other in her trials. Jay Overmyer (University of Georgia) presented a preliminary information using black flies as biomonitors of environmental contamination. Rich Merritt (Michigan State University) concluded the first session with a presentation on the Black Fly International Workshop held recently in Sweden and the current status of black fly control programs in Michigan. The workshop in Sweden focused on the generation of funding opportunities and possible collaborations for future black fly research. Michigan black fly programs e.g., Copper Harbor and Betsie River are still active.

Ecology and Behavior (Feb. 14, 1:30 pm. - 4:30 pm):

Roger S. Wotton (University College, London, UK) presented a paper on the processing of organic matter by black fly larvae. The fate of organic material from labral fans to faecal pellets was discussed as well as the importance of faecal pellets in streams and rivers. Christie-Lee Hazard (Brock University) examined four diets for engorged female flies and discussed the effects of sugar meals on the development and transmission of *Leucocytozoan* sp. Fiona F. Hunter (Brock University) presented research on black fly saliva, blood-feeding and sugar-feeding. Salivary gland protein differences among species and their recycling were discussed. In addition, Fiona discussed on-going plans to hold an International Black Fly meeting at Brock University, June 17-21, 2000 (tentatively). Any thoughts or comments regarding this meeting should be directed to Fiona Hunter (Brock University, Ontario, Canada). Björn Malmquist (Sweden) presented a talk on the importance of black flies in North Sweden ecosystems. He discussed the importance of engineering of faecal pellets and increases in carbon output and included studies on lake outlet streams, large free-flowing rivers and chalk streams. John McCreadie (Clemson University) presented a talk (co-authored with Maria Grillet and Neusa Hamada) on the effects of El Niño on black fly communities. Using Monte Carlo simulations, John discussed the species richness of black flies during wet and dry seasons in Venezuela. Will Reeves (Clemson University) discussed new records of black flies in unique cave habitats. Two species of simuliids were found in his cave systems, *S. parnassum* and *Prosimulium saltus*. Claudia Velasques (Brazil) presented a talk on the microhabitat of *S. goeldi* and *Simulium* "6B1" in Central Amazonia, Brazil. Claudia discussed differences in head capsule width among black fly larvae inhabiting five streams differing in substrate type. To conclude this session, Doug Craig (University of Alberta) waxed hydrologic commenting on one of Björn's recent papers regarding "why a river ends up the way it is!"

Genetics and Systematics (February 15, 9:00 am. - 11:30 pm):

Peter Adler (Clemson University) presented a compilation of recent advances in black fly systematics. Peter provided data from North America Black Fly fauna on polytene chromosome mapping, species numbers, new natural enemies of black flies, as well as blood-feeding strategies. Doug Craig (University of Alberta) presented an update on Polynesian/Pacific black flies. Several new species were collected on Doug's most recent visit which have contributed interesting aspects to the Polynesian clades. Doug Currie (Royal Ontario Museum) co-authored a presentation with Art Borkent on the discovery of the female of *Parasimulium (Astoneomyia) melanderi* with discussion of the phylogenetic position of *Astoneomyia*. This species of black fly was discovered in a cave on Vancouver Island. Doug stated that *Astoneomyia* may be more closely related to other black flies, both *Astoneomyia* and *Parasimulium* were monophyletic but that the former may have similar a habitat as the latter. Alison Stuart (University of Toronto) presented a paper on the

phylogenetic placement of *Ectemnia* based on cocoon spinning behavior. Based on data collected on six spinning stages and the following behavioral synapomorphies 1) the method of spinning structures and; 2) lack of pull front/back stages, Alison concluded that *Ectemnia* is a sister group to the *Simulium* and *Eusimulium* clade. Neusa Hamada (Brazil) co-authored a talk with Peter Adler and Maria Grillet on news on the chromosomes of black flies in the *S. perflavum* Group. Neusa provided new cytological and geographical information on this group emphasizing the gill pattern similarities as well as chromosomal arrangement. Ken Cummins (South Florida Water Management District) was invited as a guest speaker to conclude this year's meeting. Ken presented a summary of the WHO black fly control program in West Africa. Ken highlighted the ecological aspects of the *S. damnosum* complex relative to onchocerciasis (river blindness), control strategies, medical treatment strategies for onchocerciasis, and future directions and impacts of humans on these systems.

Business Meeting (February 15, 11:30 am - 12:00 pm):

Fiona Hunter discussed the format of the international black fly meeting to be held in June, 2000 at Brock University, Ontario. She stated that the meeting will cover the population management, ecology/behavior, and genetics/systematics themes with plans to publish the proceedings. It was suggested that the 2000 SERA-IEG meeting should be rescheduled for 2001 in lieu of the international meeting to be held at Brock University. The work group unanimously decided that the 2001 meeting will be held the first week in February at the Archbold Field Station in central Florida. Dan Arbegast and Elmer Gray volunteered to co-organize the meeting.

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[BRITISH SIMULIID GROUP BULLETIN Number 13, June 1999]

TRAVELLERS' TALES

The Horrors of Hatiheu

Jimmy Whitworth, now in Uganda, has suggested passages written by Gavin Bell in *In search of Tusitala* in which he describes his adventures in 1992-3 while attempting to retrace the travels of Robert Luis Stevenson who sailed around the South Seas in 1888-89. One place visited by Stevenson is the Bay of Hatiheu on the island of Nuku-Hiva in the Marquesas Islands. In Stevenson's time it was a thriving community of about 10,000 people, but since then a cholera epidemic introduced by a visiting ship and later a tidal wave on 1st April 1946 wiped out almost everybody. Gavin Bell writes...

> "There is a savage beauty about the, place which is almost intimidating. The usual cluster of bungalows with ubiquitous corrugated-iron roofs lines the shore, beneath a wall of mountains; at the western end rises a series of fantastic needles of rock swathed in dark green vegetation; in the absence of a reef the bay is a restless expanse of grey. water with strong currents. Less than two hundred people were making a living from fishing and copra when I was there, and the population over the ridge was a mere fifteen."

Gavin Bell continues ..

> "I turned away and looked out to sea, feeling lonely. I reflected that Stevenson had been fortunate in having the company of his family and the crew of his yacht in this wild place.
>
> I had another problem. My arms and legs had come to resemble the volcanic topography of the island, being a mass of infected sores. The culprits were microscopic vampires known to scientists as *Simulium buissoni* , to other interested parties as blackflies, and to Marquesans as *no-nos* . They rank among the world's worst blood-sucking pests and carriers of disease - in Africa they are responsible for 'river blindness' - and Nuku-Hiva is infested with countless millions of them. The good news is they are not found on beaches. The bad news is the beaches are the domain of their white cousins, *Styloconops albiventris*, which are equally voracious. During my visit, a team of French entomologists was waiting patiently for the rain to stop so they could pour chemicals into mountain streams to eradicate blackflies.

They had been waiting for three months

One of them explained to me the difference between the *modus\ operandi* of mosquitoes and blackflies. The former are like flying hypodermic needles, inserting suckers and withdrawing blood with surgical precision; the latter chew and tear at flesh to drink the blood, leaving ragged wounds susceptible to infection. Marquesans eventually become immune to the insect saliva that causes irritation, but there is no respite for the unsuspecting traveller. In 1904, a severe infestation forced French administrators to move lock, stock, and wine-barrel from Nuku-Hiva to Hiva-0a. To be on the safe side, they stayed there for forty years. The French expert obligingly showed me a reference work on the subject by a member of the Natural History department at the British Museum. Referring to social and economic disruption caused by these vermin, the author notes: '*The experience of being continually bitten, unable to step outside without soon oozing blood from countless bites, is a demoralizer with few equals*.'

I heartily endorse this view. On my first night at Hatiheu, I had a beautiful dream. I was lying in a darkened room, between crisp, clean white sheets. Every so often a nurse would come to my bed and silently bathe my arms and legs in a cooling solution. I was awakened from this reverie by the infernal screeching of a cock outside my window in the middle of the night, to find myself scratching a profusion of insect bites behind my right knee. A thin trickle of blood was staining the sweat-soaked sheets."

The above quotation comes from page 7, of Roger Crosskey's *The Natural History of Blackflies.* In Chapter 18, Roger also quotes the experiences of the late Evelyn Cheesman who visited the same valley in 1924. He writes...

"With the exception of the Marquesas, the Pacific islands are virtually free from man-biting. *Simulium jolyi* in Vanuatu, and *S. laciniatum* in Fiji, occasionally make their presence felt, but only *Simulium buissoni* is ever an intolerable pest. This blackfly is endemic in the Marquesas archipelago, where it is innocuous on most islands but attacks man in a valley on Nuka-Hira with a ferocity unequalled anywhere else in the Pacific. It is the dreaded *no-no* (or *nau-nau*), of which the late Evelyn Cheesman wrote vividly, but without exaggeration, in her autobiographical accounts of the insect collecting in the Pacific to which she devoted her life. A passage in *Hunting insects in the South Seas* (Cheesman, 1932) describes matters perfectly:

> "There is a famous valley of the Marquesas which is so plagued with one species of sandflies [Simulium] that it is practically uninhabitable. ...The scenery is superb and its beauty not exaggerated ... but no natural beauties can make up for the torture inflicted by these small flies. When I visited it with the Saint George Expedition in 1924, none of us had any idea of what was waiting on shore. The sandflies did not even wait for us, but, eager to suck the blood of the newcomers, came out to the yacht as she anchored at sundown. I noticed that bites of some sort of insect had raised blains on my arms and neck that night. ... Next day the whole party suffered to a lesser or greater degree when we went ashore; but I came out worst because I was collecting until sundown in cottonfields at the mouth of the valley and was attacked by dense clouds of sandflies. Wherever any of my flesh was visible it was literally black with the insects, and at intervals one swept them off, killing hundreds each time and in a very few minutes more had taken their place ... For a whole day afterwards I could not walk but had to spend hours in bathing swollen limbs; and some of our party had bad sores for weeks afterwards ... These little insects have made one of the most lovely valleys in the world unfit for human habitation ... there might have been a thriving colony for all that land is very fertile"

"Later, in *Things worth while* (1957), when it was known to her that the flies were simuliids, she wrote "I got a guide and went up the valley to where a grand view showed the Tai-pi Vai, the River Tal-pi, winding to the sea. But always the Simuleum flies [sic] were relentless; only death can stop them and it is difficult to kill such large numbers". Miss Cheesman's memory of the flies was so vivid that when, in her eighties, she told blackfly specialists about them she seemed to be recounting something which happened only yesterday."

In his taxonomic revision of the simuliids of the Marquesas, Doug. Craig (Craig et al, 1995) gives more on the historical background to these pests from the writings of Herman Melville (author of Moby Dick) in 1847 to the present. He also gives more information on the control activities.

"Under the auspices of ORSTOM and ITRMLM*, an attempt was made during January to April, 1993, to eradicate *S. buissoni* from Nuku Hiva. Temephos (Abate®) was added to all flowing rivers every two weeks. After the first two applications of insecticide, populations of biting females were reduced to 4% of

previous levels. However, heavy rain in March, 1993 precluded further reductions of the populations. By October, 1993, populations of *S. buissoni* had increased to pretreatment densities (Fossati & Séchan 1993, Séchan *et al*. 1993). "

[* I understand that the control was carried out by persons some of whose names will be familiar to followers of onchocerciasis control: O. Fossati, P. Guillet, P. Martin, J. Roux & Y. Séchan]

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J.B.Davies

[BRITISH SIMULIID GROUP BULLETIN Number 13, June 1999]

RECENT PUBLICATIONS

First Update to the New Taxonomic and Geographical Inventory of World Blackflies

by **R.W. Crosskey** *Natural History Museum, London*

Included with this issue of the *Bulletin* is a supplement to *The New Taxonomic and Geographical Inventory of World Blackflies* by R.W.Crosskey and T.M.Howard recently published by the Department of Entomology, Natural History Museum, London. Together with the original inventory this *First Update* collates information available up to the end of 1998.

For those who are not aware of the original inventory there follow details of the work and how to order it.

Title: Crosskey, R.W. and Howard, T.M.*, 1997, The New Taxonomic and Geographical Inventory of World Blackflies* (Diptera: Simuliidae) ISBN0-565-09021-6. Soft cover, 144pp.

Main Contents

3 •All world species listed in their current genera, sub-genera and species groups (with authors, dates and synonyms)

4 •Countries of the distribution of each species are individually listed and included in a country index (enabling a checklist for any country to be easily extracted)

5 •A bibliography of works that include identification keys (entries arranged by region, country and life-stage)

To order: Orders should be addressed to:

Departmental Administrator
Department of Entomology
Natural History Museum
Cromwell Rd, London SW7 5BD, UK.
e-mail: mps@nhm.ac.uk (or m.scott@nhm.ac.uk)

Price: 25 pounds sterling (postage and packing included)
Usual credit cards are accepted

Diptera Simuliidae
by **Frank Jensen** *Natural History Museum Århus, Denmark*

in *Aquatic Insects of North Europe - A Taxonomic Handbook*. Vol. 2 pp209-241 *Ed*. Anders N. Nilsson, 1997. Apollo Books, Kirkeby Sand 19, DK-5771, Stenstrup, Denmark

This work deals with the Simuliidae to be found in Denmark, Norway, Sweden, Finland, Fennoscandian Russia, Estonia, Latvia, Lithuania, Northern Poland & Germany, Iceland and the Faroes. There is an excellent brief summary of the biology and morphology, followed by well illustrated keys to the genera of adults, and to the species of pupae and mature larvae. In all, 18 species of Prosimuliini and 61 species of Simuliini are referred to, many of which can also be found in the British Isles.

[BRITISH SIMULIID GROUP BULLETIN Number 13, June 1999]

NOTES, VIEWS AND CORRESPONDENCE

Blackflies at the Honeypot

The recent clutch of very interesting papers by Steve Burgin and Fiona Hunter (1997a-c) on homopteran honeydew as a sugar source for blackflies which supplements, or perhaps in some circumstances even substitutes for, floral nectar brings to mind the old adage that there is nothing new under the sun. Observation and anecdotal reference to honeydew-feeding is amazingly old, going back to the work in which Macquart (1826) described *Simulium vernum*. Macquart classified simuliids as 'Tipulaires rampantes' and discussing them wrote a rather remarkable passage in very idiomatic and slightly old-fashioned French "Comme ces insectes habitent ordinairement les buissons situés sous les arbres, et qu'ils y recueiiient avec la trompe les sucs répandus sur les plantes, et particulièrement ceux produits par les Pucerons, leurs tarses font les functions de palpes; ils servent à reconnaître ces aliment, et on les croirait l'organe d'un sens supérieur au toucher" - for which an English rendering would be "As these insects usually live among bushes situated beneath trees, and collect with their proboscis the sugars which are scattered on the plants, especially those which have been produced by aphids, their tarsi function as palps; they serve to recognize this food, and one could believe that they are superior tactile organs".

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Roger W. Crosskey

Anthropophilly and Autogeny in *S. damnosum* in South Africa

In a recent publication R. Palmer and F. de Moor (1998) report on the occurrence of man-biting *Simulium damnosum s.l.* in South Africa, On page 231 they write:

> "members of the *S. damnosum* complex are anthropophilic along the Orange and Vaal Rivers and in the vicinity of Johannesburg (Begemann 1986; Jupp and Palmer, in press). They appear to be non-anthropophilic elsewhere in southern Africa. Steenkamp (1972) reported *S. damnosum s.l.* as a pest of livestock, causing loss of condition in cattle in the vecinity of Parys, Vaal River. In the Vaal River about 7% of the *S. damnosum* population was autogenous"

This and similar recent reports extend the known distribution of the anthropophilic forms further south than the generally accepted limit of southern Malawi (as shown in Fig. 3 of W.H.O., 1987 for example). The latest W.H.O. Technical Report *Onchocerciasis and Its Control* (W.H.O. 1995) states on page 6 "In Africa, wherever anthropophilic members of the two vector complexes [i.e. *S. damnosum* or *S. neavei*] occur, the human population suffers from some degree of onchocerciasis". Let us hope that this will prove to be an inaccurate statement rather than a prophecy. Is the cytospecies of these biters known? Where have they come from?

The report of autogeny is extremely interesting. Is it the first for *S.damnosum*? Does anyone know of other reports, and what are the possible implications? Could this form be another candidate for colonisation? Please send your comments to the Editor for publication in the next Bulletin.

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J.B.Davies

Bulletins on the Internet

Many members who have access to the Internet have also joined the Simuliidae mail-list which is operated by "Mailbase" at the University of Newcastle. This list also incorporates a Web Site. Whether you have registered with Simuliidae or not, information about the Simuliidae list and its membership is available to anyone with a web browser at the URL :

http://www.mailbase.ac.uk/lists/simuliidae

Once at this site, go to List Resources, then Read, then Other Files. Here will be found public files posted by the list owners. These include a general description of the British Simuliid Group, a complete listing of the Contents pages of *Bulletins* Nos. 1 to 10, and the entire text of *Bulletins* Nos. 11, 12 and eventually this one.

If you find this site interesting, or have any suggestions for improvement, or ideas for additional information files, please contact the list owners at the addresses inside the front cover of this *Bulletin*

Animation of black fly larvae

The Department of Biological Sciences, University of Alberta, has a digital imaging facility and an industrial intern, who is learning to do all the arcane stuff associated with multimedia presentations. As part of his work, he digitized and animated the flow patterns around a black fly larva. Although apparently rather simple in nature, it required him to make the labral fans flick open and closed, quite remarkable in that he began with a digitized image of a drawing of the larva. The animation can be viewed on the WWW at the URL:

http://www.biology.ualberta.ca/multimedia/entomology/blackfly.htm

To view the various flow paths, click on the button on the right-hand side of the screen and enjoy

Doug. Craig

[BRITISH SIMULIID GROUP BULLETIN Number 13, June 1999]

Black flies (Diptera: Simuliidae) in Friuli Venezia Giulia, Italy.

Ghetti P.F., Losso C., Pedron M., Tagliapietra D., Volpi Ghirardini A. *Università degli Studi Ca' Foscari di Venezia - Dipartimento di Scienze Ambientali, Calle Larga S. Marta 2137, Venice, Italy*

During the last two decades black flies have bothered the population of Friuli Venezia Giulia Region (NE Italy) Lower Plain. At the beginning, the affected area was restricted to the Stella River basin, a little tributary of the Marano lagoon but, more recently, frequent complaints indicate that the situation has worsened.

These facts prompted Friuli Venezia Giulia local government to ask for a investigation by the Department of Environmental Sciences of the University of Venice.

The aim of the study was to substantiate the knowledge about Simuliid autoecology and to determine the current black fly distribution.

The study concentrated on the aquatic stages (eggs, *larvae* and *pupae*) and consisted of two parts:

1. A monitoring phase conducted on three sites, characterised by a different degree of artificiality, over one year from July 1997 to August 1998. During this phase artificial substrata were used.
2. A survey carried out along a series of thirty stations representing different channel typologies and degree of human impact such as distance from built-up areas, arable lands and pisciculture plants.

The investigated sites were located in the flood-plain along a line approximately parallel to the coast consisting of a sequence of springs (Italian: “Linea delle Risorgive”). The natural emergence of ground water occurs at the boundary between layers of the permeable gravelly soils and the impermeable ones.

6 In summary, the result achieved were the following:

7 The species found during the whole study were *Simulium ornatum* Meigen, *S. angustitarse* Lundstrom, *S. paraequinum* Puri and *S.erytrocephalum* De Geer.

8 Study 1) The three stations displayed different population dynamics ranging from the most natural site which showed the lower black fly presence to the canalised one which in turn presented a stronger and more variable colonisation. *S. paraequinum*, a species known as bothering for humans was present only at this last station.

9 Study 2) Simuliids were present along the whole transect showing that black flies had spread, from the original foci, through the lower Friuli Venezia Giulia plain. A positive correlation was found between *S.paraequinum* presence and flow rate.

10 Detailed papers on the subject are in preparation.

11 ----------

MEMBERSHIP NOTICES

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BRITISH SIMULIID GROUP BULLETIN - Number 14, December 1999

Contents Number 14, December 1999

FROM THE EDITOR

This, the last number before the millennium, is again packed with items of interest. There is a report on the 22nd Annual Meeting held in Liverpool in October, and an announcement for the 23rd Meeting which is to be held at the unusually early date of April 2000, and which will include a workshop on collecting and identifying British simuliids. In this connection a sample Field Data Collection Form has been included. We also have papers from contributors as far afield as Japan and South Africa.

John B. Davies, Editor.

THE 23rd ANNUAL MEETING - ANNOUNCEMENT

The next meeting of the Group will probably be held at Salford University on Wednesday 12 April 2000

Please mark your diary now!

THE 22nd ANNUAL MEETING OF THE BRITISH SIMULIID GROUP

The meeting was held in the Lord Pilkington Lecture Theatre of the Liverpool School of Tropical Medicine on Wednesday 20th October, and was attended by eleven members and one visitor, Prof. M.N. Madhyastha from Mangalore University, India, who was introduced by Stan Frost.

As in the past, those who had traveled to Liverpool the previous day, met for an informal dinner at the Yuet Ben Chinese Restaurant on Tuesday evening.

The meeting was opened by **Harold Townson**, Selwyn-Lloyd Professor of Medical Entomology, and was followed by three formal presentations, abstracts of which are published below, and two posters.

Professor **R.A. Cheke** ended the lectures with talk on the on-going studies on "Deforestation and *S. damnosum s.l.* in Ghana and Western Togo". This was an update on the information given by Professor **R.J. Post** at last year's meeting. By re-analysing the cytotaxonomic data collected over the years 1975 to 1997 by grouping into 5-year time intervals with four annual seasons instead of the 3 seasons used previously, the increases in proportion of savanna type flies with time was found to be statistically significant. However, this result could have been caused by seasonal sampling bias, so the data was reorganized by eliminating all zero or single instances of savanna flies. Only 8 rivers met this criterion, and only in the January - March season. Nevertheless the increasing trend in proportion of savanna flies taking into account the degree of heterogeneity of the rivers was still relevant. In addition, dissections of savanna and forest flies from the Tano River show the presence of savanna flies with infective *O. volvulus* larvae in the head, and important monthly biting rates.

The job now is to try to link the presence of savanna flies with deforestation. This is being done by classifying satellite images of the area into areas of vegetative cover. They show that the edges of forest reserves along the Tano River are being eroded, and in most areas there is a general increase in the urban/village/cleared ground category. The analysis continues.

General Discussion

The talks were followed by a lively discussion which covered the following topics.

The Bulletin: A suggestion that we try to reduce the cost of printing and posting the Bulletin by sending printed copies only to U.K. residents and overseas members without e-mail addresses, everyone else to receive theirs by e-mail, was not well received. It was decided that we should continue to post copies to all members for as long as possible.

Change in Meeting Format: There was agreement that the main function of our meetings was the opportunity to meet colleagues and have informal discussions. The format of the present meeting with four half-hour talks was thought to be about right, as this gave time for a lengthy lunch break, and long general discussion period.

Group Project: It was considered that the only feasible group project would be to try to increase the coverage of the British Simuliid distribution surveys. To this end, it was proposed that part of the next meeting should be devoted to a practical workshop on collecting and identifying British simuliids. Jon Bass offered to produce a standard collection data form (published on page 19). It was hoped that the next meeting might be held earlier in the year, so that members could bring material for identification. Sabine Kläger offered to see if the meeting could be held at Salford.

The meeting ended with a vote of thanks to the organisers, John Davies and Philip McCall, with particular praise for Lisa Bluett who had arranged the excellent sandwich lunch.

[BRITISH SIMULIID GROUP BULLETIN - Number 14, December 1999]

ABSTRACTS OF MEETING PRESENTATIONS

Plasticity of blackfly distributions: what are the key factors?

Jon Bass *Institute of Freshwater Ecology, River Laboratory East Stoke, Wareham Dorset, BH20 6BB [j.bass@nerc.ac.uk]*

This short talk considers the various scales at which we observe blackfly species distributions - from a single rock or grass blade to the broader scale of country/region and from daily to year-by-year changes. The overview was stimulated by the increasing availability of analytical 'packages' for data analysis and the thought that some critical variables determining distribution patterns may be easily overlooked, i.e. - perhaps statistically valid conclusions may not always provide us with the correct interpretation?

The precise ecological characteristics/requirements of all life stages is known for very few species. (Slides were shown illustrating some UK blackfly habitat types and life cycle patterns). Information available suggests, not unexpectedly, that for some species the life cycle characteristics vary across geographic ranges and through the year. At the other extreme, the species niche can be very narrow and easily defined (if not fully understood!).

Species distributions are most conveniently monitored during the larval stages. Though these distributions are real they are constrained. They reflect the scope for adult oviposition combined with the effects of variable conditions for larval growth, survival and development. These constraints may be associated with adequately maintained water flow, water/food quality, habitat quality and interactions with other fauna. None of these factors are robustly described by the 'spot sampling' of larval site characteristics - which are conveniently used to analyse and interpret species distribution.

To summarise -

Relating presence/absence/abundance to environmental variables is now technically easy.
We must take on board:

- The spatial/temporal context - how complete are the data?
- Relating presence/absence to environmental/ecological constraints - is there a limited knowledge base?
- Do we consider the appropriate constraining variables?

Natural born killer: the *Simulium*'s innate immune system.

Hans-E Hägen. *The Wellcome Trust, 183 Euston Rd., London NW1 2BE*

Onchocerca microfilariae upon entering the haemocoel of *S. damnosum* are killed and removed in a swift and species-specific manner. This process does not involve any encapsulation or humoral melanisation reactions. Using caspase inhibitors and an *in situ* cell death detection assay (TUNEL) it was possible to show that the microfilariae die due to elevated levels of apoptosis. Moreover it seems that this induction of apoptosis is mediated by serine proteases. Additional *in vivo* experiments using the peptide RGDS as an inhibitor for putative integrin-like receptors have revealed that in the presence of this peptide survival of microfilariae in its vector *S. damnosum* is enhanced. This is the first indication that haemocytes are involved in the killing of the parasite, and that this killing is receptor-driven. These finding have led to the hypothesis that microfilariae might be killed by Natural Killer-like haemocytes which patrol the haemocoel.

[BRITISH SIMULIID GROUP BULLETIN - Number 14, December 1999]

Phosphoglucomutase and trehalase isoenzymes of *Simulium ochraceum s.l.* in Guatemala.

J.B. Davies, *Liverpool School of Tropical Medicine, Liverpool, L3 5QA, U.K.*
R. Mendizabál Solé de Cabrera, A.J. Paniagua-Alvarez, and **R. Luján,** *Center for Health Studies, Universidad del Valle de Guatemala, Guatemala, C.A.*

In Guatemala, onchocerciasis and its vectors, particularly *Simulium ochraceum s.l.,* have been known and studied since 1915. Detailed investigations into the behaviour and transmission dynamics have suggested that *S. ochraceum* is probably a species complex. It is surprising, therefore to find that relatively little attention has been paid to the cytotaxonomy of this species. Hirai and Uemoto (1983) confirmed this prediction by recognising 3 cytotypes within *S. ochraceum*, but this was not followed up until Hirai et al. (1994) recognised 3 taxa which they called A, B and C. Taxon A was highly anthropophilic in the Guatemalan onchocerciasis foci,. Taxon B was only found in the onchocerciasis focus of Oaxaca, Mexico, while taxon C was limited to the dry non-endemic savannahs of SE Guatemala. these identifications were based on material collected from 2 localities in Mexico and 11 in Guatemala, one of which was the hyperendemic Finca (Coffee estate) of El Brote, Solola.

As part of our studies into the effect of ivermectin based onchocerciasis control in Guatemala, *S. ochraceum s.l.* were collected when attracted to human bait in 6 fincas in two localities. The Chicacao area with fincas El Brote, Monte Carlo and Las Armonias, and Pochuta area with fincas Costa Rica, Las Delicias and Buena Vista. The greatest horizontal distance between fincas within each group was 10km, while the distance between the two groups was about 30km. Flies were collected between 2 November and 4 December 1994. Each fly was ground up in 4µl of water and tested for the two enzyme systems by electrophoresis on cellulose acetate membranes using the techniques of Thomsom et al. (1989).

In the 542 *S. ochraceum s.l.* processed, only one trehalase band was found, compared to 3 bands with phosphoglucomutase (PGM). The bands were labelled C, D and E, and all possible heterozygote pairs were found. Analysis of observed and expected Hardy-Weinberg band frequencies showed that at all fincas there was a significant scarcity of heterozygotes, particularly between the E and D bands. Examination of the band frequencies showed that the population at El Brote (taxon A of Hirai *et al.*) was similar to the others in the Chicacao group, but differed significantly from the fincas in the Pochuta group.

We conclude that in the area studied there are probably at least two populations within *S. ochraceum s.l.* (Taxon A) which are not freely interbreeding, and the proportions of these populations differ between localities. The cytotaxonomy of this species complex requires much greater study.

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Posters

R. Morales Hojas, R.J. Post, A.J. Shelley and M. Mia-Hertzog:
The Natural History Museum, London
Molecular tools for identification of *O. volvulus* and *M. ozzardi* in Brazil

Fiona Hunter, *Brock University, Ontario, Canada*. Black Flies in the New Millennium: An International Meeting of Black Fly Workers, June 17-21 2000 at Brock University, Canada.

[BRITISH SIMULIID GROUP BULLETIN - Number 14, December 1999]

SCIENTIFIC CONTRIBUTIONS

Discovery of a blackfly species with three spermathecae

Hiroyuki Takaoka *Department of Infectious Disease Control, Oita Medical University, Hasama, Oita 879-5593, Japan, [takaoka@oita-med.ac.jp]* and
Chaliow Kuvangkadilok *Department of Biology, Faculty of Science, Mahidol University, Rama VI Road, Bangkok 10400, Thailand*

Our recent faunistic survey on Simuliidae in northern Thailand revealed an intriguing new species which has three spermathecae in place of a single, typical one. This species is represented by only two female adults reared from pupae collected from a small stream 0.5-1.0 m wide, with a water temperature of 19'C, at Tontong waterfall (altitude 500 m), Doi Phuka National Park, Nan Province, northern Thailand, on December 9, 1998. Both female adult specimens examined had three spermathecae (one principal and two accessory), as shown in Fig.1. The principal spermatheca is large, pear-shaped, and is connected with a typically long major spermathecal duct, while the two accessory ones are of equal small size, oblong, curved, and are connected with somewhat shorter spermathecal ducts arising from the main duct near its base. All are well sclerotized and dark brown, and show internal setae. Since there is no difference in the size, shape, and disposition of the three spermathecae between these two apparently-normal females, we think it unlikely that they were aberrant and that the two additional spermathecae, as an outcome of teratogenesis, happened to occur coincidentally. Possession of multiple spermathecae must be a normally inherited character of this new species, though this inference should be verified by examining extra female specimens.

The new species concerned is placed in the *multistriatum*-group of the subgenus *Simulium* (*Simulium*), defined by Takaoka and Davies (1996), and is easily distinguished from the other known species of the same species-group by its corbicular cocoon and by the wide forwardly directed projection on each arm of the genital fork.

[Graphics File Bull14F1.jpg here]

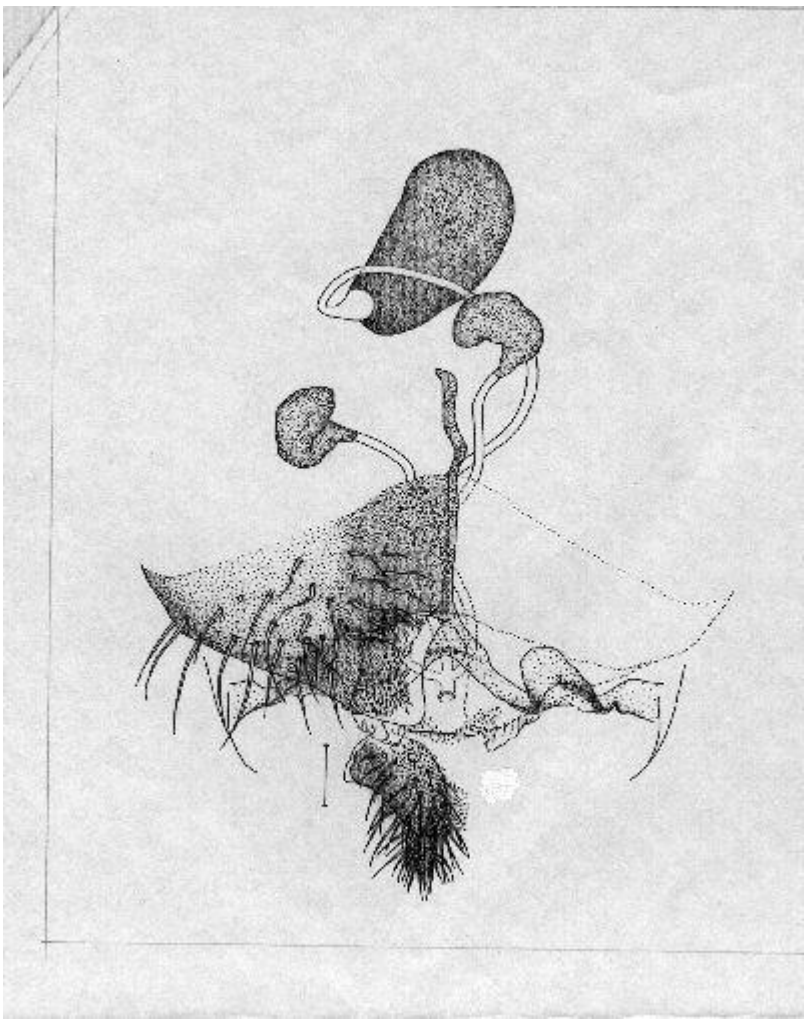

Fig.1. Female genitalia *in situ* (ventral view) showing three spermathecae. Scale Bar = 0.05mm.

The presence of a single spermatheca is usual in Simuliidae and normally diagnostic for the family (Crosskey, 1990). However, females retain two additional spermathecal ducts arising from the main spermathecal duct near its base. both of which are typically much shorter than the main one. Three spermathecae are considered to be the evolutionarily basic complement for the Diptera (Downes, 1968). In other nematocerous insects, such as mosquitoes and biting midges, the number of spermathecae varies from one to three in different taxa (Crosskey, 1993). Therefore, it is perhaps not unexpected to encounter a species carrying two or three spermathecae even in the small family Simuliidae. Our finding is the first to record a species with three spermathecae in the Simuliidae. Bernard (1974) reported two spermathecae of almost the same size in a freak specimen of *Simulium erythrocephalum*. Hunter and Adler (pers. comm) also found aberrant females with two spermathecae of different size in colony-reared *S. vittatum*.

The new species will be described in a separate paper, together with three other new species (Takaoka and Kuvangkadilok, 1999).

Acknowledgements
We thank Dr. R.W. Crosskey, the Natural History Museum, U.K., for reading the manuscript and giving valuable suggestions. Thanks are also due to Dr. D.A. Craig, Professor emeritus, University of Alberta, Canada, Prof. P.H. Adler, Clemson University, USA, and Dr. D.C. Currie, Royal Ontario Museum, Canada, for their useful information on multiple spermathecae of dipteran insects. This work was supported by the Grant-in Aid of Ministry of Education, Science and Culture, Japan (no. 11670246) to HT, and also by the TRF/BIOTEC Special Program for Biodiversity Research and Training grant BRT 139007 to CK.

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[BRITISH SIMULIID GROUP BULLETIN - Number 14, December 1999]

Simulium damnosum s.l. complex widespread in Southern Africa

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A recent study has shown that the *Simulium damnosum s.l.* complex in southern Africa is far more widespread than previously known (Palmer & de Moor 1998). Indeed, *S. damnosum s.l.* is now considered among the most common and widespread of blackflies in southern Africa (Figure1). Furthermore, some *S. damnosum* members in South Africa are anthrophophilic, which changes the long-held belief that the *S. damnosum s.l.* complex in southern Africa is strictly zoophilic (Jupp and Palmer 1999). This article discusses some of the recent records of *S. damnosum s.l.* in southern Africa, and suggests that, besides more in- depth sampling, increased distribution records of *S. damnosum s.l.* in southern Africa are the result of greater river regulation and catchment development.

The most recently published distribution map of *Simulium damnosum s.l.* in Africa shows that the complex is patchily distributed in southern Africa, with most records collected along the eastern side of the subcontinent (Crosskey 1990). The complex was considered absent from the southwestern Cape, as it was not recorded during a detailed study of the Berg River in the 1950's (Harrison & Elsworth 1958). In 1996 the complex was recorded for the first time from the Berg River at Sonkwasdrift (33°20'S; 18°58'E). In the same year it was also recorded from the middle Olifants River near Citrusdal (32°35'S; 19°00'E), the Bree River near Ceres (33°22'52"S; 19°18'10"E), and the Klein Berg River at Nuwekloofpas (33°18'41"S; 19°04'31"E). The discovery of *S. damnosum s.l.* in four major river systems in the south-western Cape Province suggests that their distribution and abundance has increased in recent years.

[Graphics File Bull14F2.gif here]

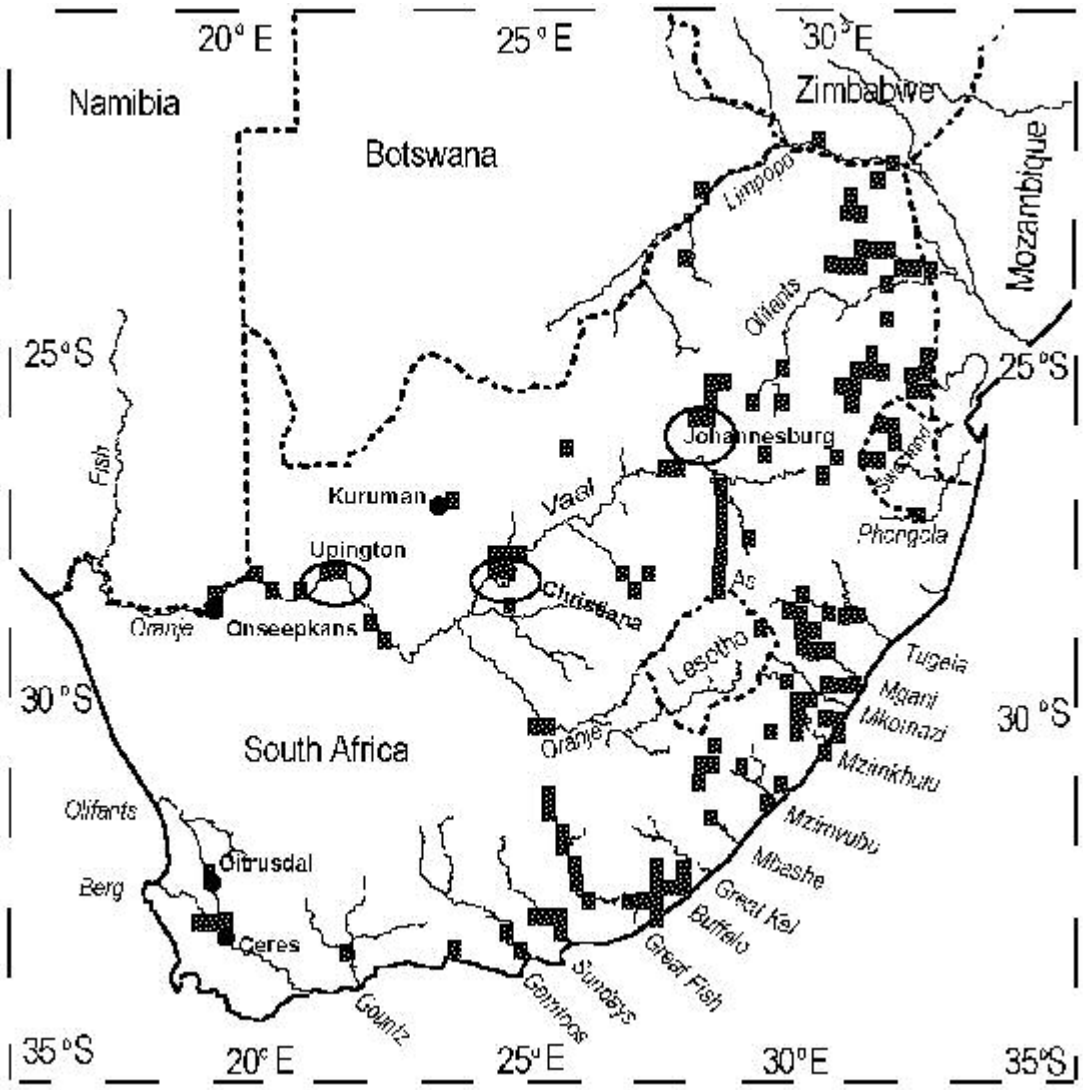

Figure 1. The distribution of the *S. damnosum s.l.* complex in southern Africa (squares), showing major rivers and key towns mentioned in the text. Large circles indicate where *S. damnosum* has been known to bite humans [Adapted from Palmer & de Moor 1998, with permission from African Entomology.]

Simulium damnosum s.l. has a preference for conditions downstream of impoundment outlets. In May 1981 it was recorded by Begemann in the Pienaars River downstream of Roodeplaat Dam (2528CB). In August 1989 it was found in the Phongolo River downstream of Jozini Dam during low-level release (27°23'S; 31°49'E), and in the Mgeni River downstream of the Albert Falls Dam (29°27'S; 30°28'E). In 1996 it was recorded in the Mgeni River downstream of Midmar Dam, when the water was slightly green and mildly turbid (29°29'S; 30°14'E). During a three-year study of the Buffalo River, Eastern Cape Province, it was common throughout the year, particularly near impoundment outlets during low-level releases (32°59'30"S; 27°43'45"E). In 1990 it was recorded from the Orange River, about 5 km downstream of Gariep Dam (30°37'S; 25°27'E). In 1997 it was recorded in the Komati River downstream of the Vygeboom Dam (25°53'S; 30°37'E), and in 1998 it was recorded in the Olifants River (Northern Province) downstream of Loskop Dam (25°24'08.3"S; 29°22'18.2"E) and Arabie Dam (24°44.4'S; 29°24.2'E).

A survey of 33, mostly un-impounded rivers in the former Transkei region of the Eastern Cape Province, recorded the presence of *S. damnosum s.l.* in the Mngazi River only (31°36'39"S; 29°24'16"E). Likewise, a survey of eight rivers in the south-western part of the Eastern Cape Province did not record any *S. damnosum s.l.* Some rivers influenced by agricultural development and small weirs in the north-eastern regions of the Eastern Cape Province did, however, reveal low numbers of *S. damnosum s.l.* These records suggest that the building of dams has significantly increased the distribution of the Simulium damnosum *s.l.* complex in southern Africa.

Simulium damnosum s.l. was considered absent from Namibia (Crosskey and Howard 1996), but the omission was later corrected (Crosskey 1999). It is now known from the extreme north and south of the country. In 1985 it was collected by Shirley Bethune in the Mkena Channel, Kavango (Okavango) River (1820BB), and in 1986 on the same river at Popa Falls, at the western end of the Caprivi Strip (1821BA) (Curtis, 1991). In 1994 Dr Mark Chutter collected *S. damnosum s.l.* from the Kavango River at Andara, upsteam of Popa Falls. It is therefore likely that *S. damnosum s.l.* also occurs in the Kavango River within Botswana and Angola. An intensive survey of the lower Kunene River in Namibia in 1997 and 1998, however, revealed that *S. damnosum s.l.* was absent, with *Simulium fragai* the only species recorded. *Simulium damnosum s.l.* is also known in the Orange River as far downstream as Onseepkans (28°44'12"S; 19°18'25"E), and it is highly likely that it occurs further downstream during clear conditions.

Simulium damnosum s.l. occurs in a wide range of water-quality conditions, but is often present in medium to large sized rivers, particularly when the water is visibly green owing to the presence of planktonic algae. During a five year study of the middle reaches of the Orange River, *S. damnosum s.l.* was abundant during clear water conditions only, when flows were moderate to low. Developments in the upper and middle Orange River are likely to reduce flows in the river, and convert the river from a flashy, turbid system, to a more stable, clear-water system. These changes are likely to favour *S. damnosum s.l.*

The adaptability of *Simulium damnosum s.l.* is illustrated by its presence, in high numbers, in a clear, isolated dolomitic spring on the edge of the Kalahari Desert at Kuruman (27°27S; 23°27'E). It is also known from the centre of Johannesburg, one of the most urbanised areas in Africa (26°08'S; 28°08'E). *Simulium damnosum s.l*. was also recorded in very cold water (4°C), in the upper reaches of the As River (Free State Province) at an altitude of 1640m (28°22'45"S; 28°21'54"E), and in the Great Fish River at Middelton (Eastern Cape Province) (32°57'S; 25°48'E).

Simulium damnosum has been recorded biting humans in the vicinity of Johannesburg (26°08'S; 28°08'E), Upington (28°28'S; 21°13'E) and Christiana (27°50'S; 25°14'E) (Jupp and Palmer 1999). It is likely that *S. damnosum s.l.* in southern Africa comprises several sibling species. Larvae collected from the lower Vaal River show distinct morphological differences to those from Swaziland (pers. obs F.C. de Moor). The fact that certain populations show distinct zoophilic, ornithophilic or anthropophilic host preferences further corroborate these observations. Detailed studies on different populations of *S. damnosum s.l.* in southern Africa are required to verify these observations.

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Editor's Note:

For completeness, it should be noted that unpublished chromosome studies carried out by Manfred Carr in about 1980 revealed three sibling species in S.A. and a fourth in Swaziland, all of which differed from any previously known inversion patterns. See Crosskey, R.W. (1987) Ann. trop. Med. Parasit. 81 (2) p. 188

NOTES, VIEWS & CORRESPONDENCE

The new International Code of Zoological Nomenclature

The new (4th) edition of the *International Code of Zoological Nomenclature*, in combined English and French versions, was published in August 1999 and comes into force on 1 January 2000. Here are details of the work:
Title: *International Code of Zoological Nomenclature*: *fourth edition*.
Publisher: International Commission on Zoological Nomenclature.
Supplier: International Trust for Zoological Nomenclature, The Natural History Museum, Cromwell Road, London SW7 SBD, U.K. (e-mail: iczn@nhm.ac.uk).
Specification: ISBN 0 85301 006 4; Hardback, xxix + 305 pp.
Price: £40 or $65, including surface postage (air supplement £2 or $3).
Discounts: available for members of scientific societies and students. (e-mail as above for details or see ICZN Web site 'www.iczn.org', *Bulletin of Zoological Nomenclature*, volume 56, page 107).

This new edition is quite considerably revised as compared to the 3rd edition (1985). It contains several new provisions, removes some former ambiguities, contains many more examples which demonstrate the purport of mandatory Articles, and contains many more helpful Recommendations (i.e. guidelines that are advised for good practice). An example of tightening up is the proviso, now mandatory but previously only a recommendation, that a new species name must be accompanied by designation of a holotype or syntypes and a statement of the type depository.

There are no adverse effects of the new Code to worry simuliidologists because present-day blackfly taxonomy is procedurally good, already in the main observing the technicalities of zoological nomenclature. Whether zoological judgement is always sound is another question!

If anyone has queries of a nomenclatural kind I will be happy to help
(e-mail: rwc@nhm.ac.uk).

Roger W. Crosskey

[BRITISH SIMULIID GROUP BULLETIN - Number 14, December 1999]

A novel form of *Simulium* control

The following excerpt from NATURE: January 1st 1880 is interesting, not only because the efforts were wildly misdirected, but also because of the variety of names used for the pest fly *Simulium colombaschense* (Fabricius, 1787).

Hungarian Earthquakes and the Kolumbács Flies

A NOTE in NATURE, Vol. xxi. p. 89, speaking of the recent Hungarian earthquakes, contains, amongst others, the following, passage:- "Near Weisskirchen, the old ruins of the Castle of Golubacz have fallen in completely, and in the vicinity several caves were rendered inaccessible. These caves were the breeding places of the dreaded Kolumbács mosquitos, and if this insect is thus exterminated the earthquake may, with all the damage it did, have yet been of some use."

This report is based on obvious error, for it is a well-known fact that the small (3-4 miilim. long) Kolumbács flies (*Simulia golumbacensis*, Fabr.), which, in the southern part of Hungary, especially in the old Banat and the county of Hunyad, cause considerable damage among the pasturing cattle (especially among horned cattle, horses, swine, and sheep), breed by no means in those caves which are to be found around the ancient Galambócz (known nowadays under the name of Golubácz or Kolumbács, on the Servian territory), but in the shallower parts of the waters extending in great quantities in that country. The course of life of the Kolumbács fly is, for the most part, in conformity with that of many families of the Nemocera, or Tipulariae group, as are the Culicidae, - many species of flies (Brachycera), the Phryganidae, &c. The mature and fecundated mother-fly lays her eggs upon the plants vegetating on the water-borders, whence they get on the stones under the water, and other objects, there living through their larva and nymph states until they arrive at their full development.

But, in the first years after 1850, under the rule of the Austrian military system of that time, there did occur the curious fact that - upon the advice of a military officer of the frontier-districts, who, as it was supposed, had made out that the breeding-nests of these flies are in the caves around Galambócz, Old Moldavia, and their environs - the Government of Vienna officially decreed the walling up of the openings of the caves. And actually they were walled up. But in the next mild spring, the conditions of development being favourable a gain, the Kolumbács fly appeared and ravaged once more. The Viennese Government, on learning this unpleasant and disappointing news, hastened to amend the blunder, and sent to the place a Hungarian *savant*, Vincent Kollár, and a German entomologist, Joseph Mann, to take the question under examination. These, in a brief space of time succeeded in clearing up the true state of things, and in gathering such a series, as contained all the stages of the development of the Kolumbács fly in numerous specimens. This collection is to be seen now in the entomological section of the Naturalien Cabinet of Vienna, grouped in the best order.

The imputation, therefore, as if it were the Hungarians who had walled up the orifices of the caves in the vicinity of Galambócz, in order to exterminate the Koluinbács flies by that means - an opinion which, as I, this year, happened to hear at the lecture of an eminent German *savant*, is propagated even in Germany - is entirely erroneous and without any foundation.

Budapest, December 2 JULIUS LETHÖ

Blackflies on the World Wide Web

A Web site devoted entirely to Blackflies has been opened on the World Wide Web, with the URL: **www.blackflies.org.uk.**

These pages are intended to act as a hub with links to information pages and other web sites of similar interest. They will be updated periodically as more information becomes available. Please visit the site, and if you have any suggestions as to content, or useful links, or wish to contribute, please e-mail me at

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John Davies

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APPENDIX

British Blackfly Records

County

Collector:

Sample date:

Address:

National Grid Reference Number:

Site/river/stream name:

Occupied Substrate (tick):	**weed**	**stones**	**trailing grass**	**trapped debris**	**Other (specify)**
larvae					
pupae					

Identity checked: **(Yes / No)**
Sent for checking to: **(Date:)**
Material returned: **(Date:)**

Species or species group present:

indicate stage: larvae (lar) / pupae (pup) + associated adult (ad) and D - dominant; C - co-dominant or P - present

eg: ornatum gp	**lar/pup**	**D/C/P**	**Notes**
1			
2			
3			
4			
5			
6			

Return to Start of Document

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BRITISH SIMULIID GROUP

BULLETIN – Number 15, June 2000

Contents Number 15, June 2000

From the Editor

As this is the first number to be published in the year 2000, I suppose we should follow the trend and call it our “millennium number”. The content differs from previous issues in that the June number has never before contained reports of our Annual Meeting, but much more significantly, it contains the first ever contribution in the French language offered to us by a new member from Morocco. So here is a challenge to all members - no more can you hide behind the excuse that your English is not good enough. Contributions in any EEC accepted language will now be considered. Finally, my thanks to Frank Walsh for his report on the afternoon session of our Annual Meeting.

John Davies

The 23rd annual meeting of the British simuliid group

In a break with tradition, the meeting was held in the spring instead of in the second half of the year, so that members would have a chance to collect specimens to bring along to the simuliid identification workshop. It took place on 12 April 2000 at the Division of Biological Sciences, University of Salford, and was organised by Sabine Kläger assisted by Stan Frost. The evening before, those of us who were near to Salford, met at the Kailash Nepalese Restaurant for a most pleasant social get-together.

The meeting began with coffee at 10.00am and was then formally opened by Professor P. Craig, Head of

the Division of Biological Sciences, who congratulated us on achieving 23 consecutive meetings, and greeted some familiar faces from his days at Liverpool. Twelve members were present. The serious part of the meeting began with an update on the numbers of taxa and names of Simuliidae in the year 2000 by Roger Crosskey, a description of the possibilities of plotting species and collection distributions by means of computer programs such as Dmap by John Davies, followed by a talk on modelling vector dynamics and onchocerciasis by Maria-Gloria Basáñez.

In the short business session which followed, it was proposed that because the 1995 joint meeting with the freshwater biologists at Birmingham University had been so successful, the Hon. Secretary should approach Malcolm Greenwood at Loughborough or Melanie Bickerton at Birmingham to see whether a similar joint meeting could be set up for next year.

Following a pleasant lunch break in the bar of the Staff House several of us visited the small exhibition of Lowry works in the Salford Art Gallery before returning for coffee and tea and in the lecture theatre. There Jon Bass, expertly using the over-head projector, gave a brief introduction to simuliid larval morphology. Among items covered were the cervical sclerites characteristic of *Prosimulium* species, the use of the name *rectal organ* in preference to *anal gill*, and the shrinkage of rectal organs and anal papillae which can occur in preserved material.

We then moved to a laboratory equipped with Wild dissecting microscopes where Jon had provided a collection of larvae and pupae of about 20 species/species groups, together with some undetermined material. In addition, several people had brought recently collected material for determination. The pointed microtubercles on the thoracic cuticle of *Simulium triifasciatum* were shown on screen via a micro projection apparatus. Some of us then proceeded, with varying degrees of success, to use Jon's recently published key to larvae and pupae, on sale at the meeting, beautifully produced and a snip at £14,50 from the Freshwater Biological Association. Those of us seriously out of touch had the advantage of Jon's guiding hand, while the sages chatted to one another. This laboratory session was very helpful and gave further evidence that the members of the BSG could make a valuable input to mapping simuliid distribution in the British Isles. Shortly after 4.00 p.m. we retired for cups of coffee and tea before departing on our various journeys home refreshed, not only by the drinks, but also by a pleasant day spent in the company of fellow enthusiasts.

We are most grateful to Sabine Kläger, Stan Frost who arranged the meeting and the several technicians who made equipment available. Thanks also go to Professor Craig for hosting the meeting in his department at Salford.

Abstracts of Meeting Presentations

How many blackfly species on reaching the year 2000?

Roger W. Crosskey, *Department of Entomology, Natural History Museum, Cromwell Road, London SW7 SBD, UK. rwc@nhm.ac.uk*

In 1985 I succumbed to a request from the organizers of the international blackfly meeting held in May that year at Pennsylvania State University to provide a talk on "The future of blackfly taxonomy". The upshot was a chapter of this title in the Kim & Merritt book, published on lst March 1988, in which (inter alia) I charted the cumulative growth of blackfly species description and formal naming - and tried my hand at soothsaying by extrapolating the line from 1450 species listed as valid in 1984 to “? 1950!” as the number of species that might pertain by 2000. Was this a reasonable estimate? To answer this, here is a revised cumulative chart (Figure 1) and some updating statistics. (The original chart attempted to include recognized but unnamed cytospecies: these are not considered here but it can be said that the dotted line for these has certainly dipped well below the projected take off because of the relative demise of cytotaxonomy in the past dozen years or so.)

The number of species listed valid rose from 1450 in 1984 to 1670 by the end of 1996 and 1720 by the end of 1998 (sources: Crosskey & Howard 1997; Crosskey 1999). It is now 1740 at the start of year 2000 (Crosskey ongoing database). Currently, anyone wanting to state how many species of the Simuliidae there are should take 1750 as the ballpark figure.

A quick eyeballing of the chart suggests that the projected possible figure of 1950 species at year 2000 was close to the mark, because adding the new species described in the 1980s (272) and 1990s (209) to the 1450 figure in the Kim & Merritt book gives a total of 1931 species. However, there is a profit and loss account and this total does not actually apply because many species names that had previously to be listed as valid have proved to be synonyms. Hence there is a considerable discrepancy between the 1740 valid species figure pertaining now and the 1900+ figure that would have applied if no new synonyms had been established in the past fifteen years. This is the reason for most of the gap between the projected line (broken) and the actual line.

[Graphic File Bull15F1.gif here]

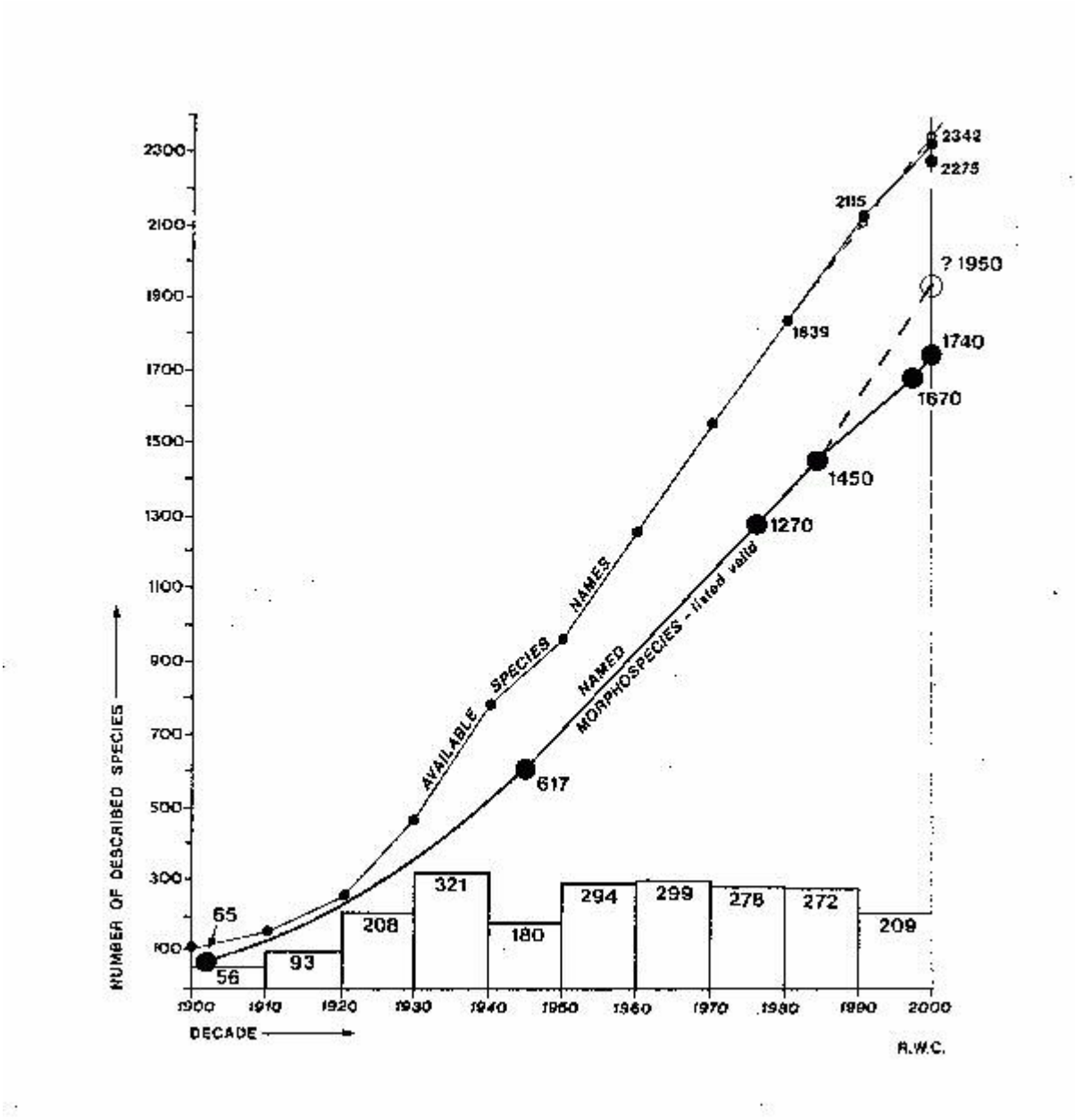

Figure 1. Chart showing the cumulative growth in the description and formal naming of species of blackflies (Simuliidae). Numerals by large black dots on the thick line show the number of species listed as valid at the date concerned. Sources: Kerteszls Diptera catalogue 1902 (65); Smart's simuliid catalogue 1945 (617); Crosskey's chapter in Laird book 1981 (1270); Crosskey's checklist in Kim & Merritt book 1988 (1450); Crosskey & Howard's world inventory, 1997 (1670); world database at Natural History Museum, London as at 1 January 2000 (1740).

Since all properly proposed new species names are available, i.e. can be legitimately used for species irrespective of their accepted validity at any particular time, the line showing the total number of species names has risen along with the valid species total. In all, 2275 nominal species* have been described from Linnaeus onwards to the start of year 2000, as can be seen by summing from the chart the 65 species total applying up to year 1900 and the ten individual decade totals. The total of all available species names is 2432; the difference between this figure and the described species total represents substitute names published for junior homonyms.

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* Technically coordinate 'species-group taxa' in the sense of the *International Code of Zoological Nomenclature* as subsumed as if species are the few subspecies and pre-1961 varieties.

Plotting *Simulium* distributions with Dmap

John Davies *Liverpool School of Tropical Medicine, Pembroke Place, Liverpool L3 5QA, UK. daviesjb@liv.ac.uk*

The situation map of collections of Simuliidae in Great Britain published in Bulletin No 9 (July 1997) was compiled by Henry Arnold of the Biological Records Centre at Monks Wood using the Dmap computer mapping program from data provided by Jon Bass, using personal and Institute of Freshwater Ecology records, and those supplied by Roger Crosskey, which included records at the BM. Dmap accepts data in the form of a list of National Grid references or Latitude and Longitude co-ordinates and will plot a symbol at the corresponding location or grid square on an outline map of the country. The data is simply a list in the form of a word processor document with the grid references listed thus: HU39 HY33 NB00 NB03 .... for 10Km grid squares, or SU5273 SU4778 SU3586 ... for 1 Km squares.

Some examples were shown of the IFE and Crosskey records plotted separately using different symbols for each. By means of other commonly available graphics programs such maps may be overlaid to show two or more sets of records on the same map. This was demonstrated for the IFE/Crosskey data sets and for 4 species taken from the maps in Lewis Davies's 1968 Keys. (A Key to the British Species of Simuliidae (Diptera) in the Larval, Pupal and Adult Stages. Freshwater Publication No. 24, 1986).

BRITISH SIMULIID GROUP BULLETIN – Number 15, June 2000

Modelling onchocerciasis in settings where vectors have a cibarial armature: a research problem

M.G. Basáñez *Wellcome Trust Centre for Epidemiology of Infectious Disease (WTCEID), Department of Zoology, University of Oxford, Oxford OX1 3FY, UK, and Centro Amazónico para Investigación y Control de Enfermedades Tropicales (CAICET), Puerto Ayacucho, Amazonas, Venezuela.* [*E-mail: maria-gloria.basanez@ceid.ox.ac.uk*]

This talk discussed a simple analytical model for the population biology of *Onchocerca volvulus* when the vectors lack or possess a well-developed cibarial armature. The main regulatory constraints to parasite population abundance were: a) parasite establishment in the simuliid vector (limitation or initial facilitation); b) parasite-induced vector mortality, and c) parasite establishment in the human host (limitation or asymptotic proportionality) depending on the annual transmission potential (ATP). The model was parameterised for West Africa and Guatemala/ Mexico using experimental results (flies) and epidemiological data in endemic communities (humans) in settings where, respectively, main vectors were savanna *Simulium damnosum* s.l. (unarmed) and *S. ochraceum* s.l. (armed).

For West African settings, the model satisfactorily described pre-control infection intensity and prevalence when density-dependence was assumed to operate both in simuliids and humans, although best results were obtained when constraints within the human host were weak (suggesting absence of solid protective immunity, see Basáñez & Boussinesq, 1999). In these settings, the proportion of blood-meals taken on humans (h) was considered to range from 0.10 to 0.99 (being lower for Cameroon and higher for Burkina Faso and Côte d'Ivoire). By contrast, results for Central American settings required a dramatic reduction of the parameters describing vector competence given the very high biting rates recorded in Guatemalan and Mexican localities. The model-derived parameters showed little agreement with vector competence estimates obtained from fly-feeding experiments. When the relationship was analysed between mean microfilarial load in the village and ATP, there was a good non-linear fit for all villages regardless of vector species, whereas when the relationship between the former and annual biting rate was explored, villages segregated into two clusters (Figure 1). West African savanna localities required a lower threshold biting rate for stable endemicity (roughly 1,000 bites/person.yr, depending on anthropophily) than their Central American counterparts (roughly 10,000 bites/person.yr, with human-blood index varying between 0.25 and 0.99). The experimental data had suggested a 10-fold difference in vector competence between *S. damnosum* s.l. and *S. ochraceum* s.l. .

[Graphics File Bull15F2.gif here]

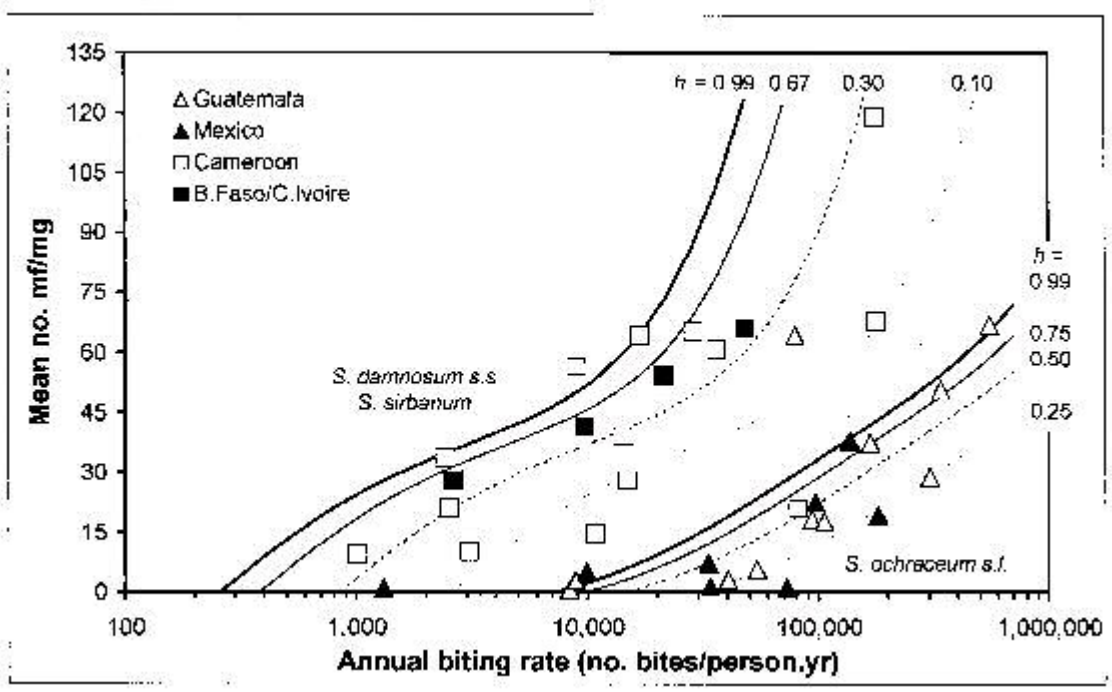

Figure 1. Relationship between pre-control community microfilarial load and annual biting rate in settings where vectors are unarmed (*S. damnosum* s.l. = squares), and armed (*S. ochraceum* s.l. = triangles). The lines represent model outputs with varying h = human-blood index

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This research problem was presented to the attendants of the meeting who suggested the following explanations: a) greater uncertainty in Central America with respect to biting rate estimates due to very high vector densities; b) possible existence of various cytotypes in the biting populations of *S. ochraceum* s.l. with varying degrees of vector efficiency; c) higher than estimated mortality rates in the field; d) density-dependent feeding success, and e) lack of updated estimates for the origin of vector blood-meals. These aspects will be taken into account in future versions of the model This research problem was presented to the attendants of the meeting who suggested the following explanations: a) greater uncertainty in Central America with respect to biting rate estimates due to very high vector densities; b) possible existence of various cytotypes in the biting populations of *S. ochraceum* s.l. with varying degrees of vector efficiency; c) higher than estimated mortality rates in the field; d) density-dependent feeding success, and e) lack of updated estimates for the origin of vector blood-meals. These aspects will be taken into account in future versions of the model

MGB acknowledges the Wellcome Trust for financial support.

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Abstracts of Posters Presented at the Meeting

Aspects of the Vectorial Competence of Onchocerciasis Vectors in the Amazonian Focus of Southern Venezuela before and during Ivermectin Distribution

M.E. Grillet[1,3], M.G. Basáñez[2,3], N.J. Villamizar[3], H. Frontado[3], J. Cortez[3] P. Coronel[3], M. Escalona[3] & C. Botto[3]

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A positive association between altitude and microfilarial prevalence has been reported in the Amazonian onchocerciasis focus of southern Venezuela (Vivas-Martínez et al. 1998). This association could be partially explained by clinal variation in the *Simulium* species composition, abundance, and vectorial efficiency along the altitudinal gradient (Grillet et al. 1998). *Simulium oyapockense* s.l. prevails in the lowlands (<150 m asl) whilst *S. incrustatum* and efficient vector *S. guianense* s.l. occur above this altitude (Basáñez et al. 1988, 1995).

To provide entomological support in favour of the clinal hypothesis of prevalence, the susceptibility of these 3 species to experimental infection with microfilariae (mf) of *Onchocerca volvulus* was investigated. Four meso- to hyperendemic Yanomami sentinel communities (Maweti, Mahekoto, Aweitheri and Pashopeka) of the ongoing control programme in southern Venezuela were selected. Flies were collected before and 1 to 6 mo. after the first dose of mass ivermectin treatment. The location of the communities can be found in Vivas-Martínez et al. (1998).

In each community, flies were fed on *O. volvulus* carriers whose Mf loads were classified into Type I (2-20 mf/mg), Type II (21-60), and Type III (61-140). A tenth of the total no. of flies fed on each carrier were dissected 8-10 hr post-engorgement to assess mf intake, damage by the cibarial armature, and establishment in the thoracic muscles. Remaining insects were maintained alive for about one week until completion of the extrinsic incubation period (EIP) They were then fixed in alcohol, stained with Mayer's haemalum and dissected in glycerine. Successful larval development at the end of EIP is shown as percentage of flies with L3 larvae (Pinfective, Table 1).

[Graphics File Bull15F3.gif here]

Endemicity +

Community	mf	sp	Pre-ivermectin No. flies	Pre-ivermectin Mean no. mf/fly (range)	Pre-ivermectin $P_{infective}$ (%)	Post-ivermectin[a] No. flies	Post-ivermectin[a] Mean no. mf/fly (range)	Post-ivermectin[a] $P_{infective}$ (%)
Maweti	I	*So*	262	6 (0-49)	0	568	0.4 (0-9)	0.2
Mahekoto	I	*So*	212	5 (0-27)	0	-	-	-
"	II	*So*	157	17 (0-162)	1	184	5 (0-53)	0
"	III	*So*	394	63 (1-274)	0	331	0	0
Aweitheri	I	*So*	24	-	0	-	-	-
"	I	*Si*	146	2 (0-26)	1	-	-	-
"	II	*So*	56	58(14-136)	4	91	0	0
"	II	*Si*	167	21 (0-101)	4	94	0	0
"	III	*So*	170	65(10-236)	2	131	64(0-238)	2
"	III	*Si*	159	50 (2-165)	3	24	31 (0-151)	1
"	III	*Sg*	15	-	0	8	-	10
Pashopeka	I	*So*	72	6 (0-9)	1	188	0.04 (0-1)	0
"	I	*Si*	143	20 (0-130)	1	116	-	0
"	I	*Sg*	30	34 (6-62)	7	-	-	-
"	III	*So*	43	44(35-52)	5	76	0	0
"	III	*Si*	70	58 (3-377)	6	52	-	0
"	III	*Sg*	25	-	12	54	-	1

[a] In Maweti and Mahekoto: 6 mo. post-ivermectin; in Pashopeka and Aweitheri: 1 mo. post-ivermectin
(-) Not determined

The mean no. of mf/fly was positively associated with the mean no. mf/mg of the carriers, with Spearman rank correlation coefficient, rS = 0.83 (P <0.05) for *S. oyapockense* s.l. and rS = 0.60 (P =0.04) for *S. incrustatum*. The proportion of mf damaged by the cibarial armature of *S. oyapockense* in

mesoendemic communities (Maweti and Mahekoto) was higher than that in the hyperendemic localities (Aweitheri and Pashopeka), and the former values were also higher than those recorded for *S. incrustatum*. Larval development was successful in the 3 simuliid species, with higher Pinfective in *S. guianense* than in *S. oyapockense* and *S. incrustatum* (sample sizes of *S. guianense* were too small to analyse). Also, Pinfective increased with endemicity level and individual mf load. The ability of patients to infect feeding flies 1 and 6 mo. after the first dose of ivermectin treatment was reduced, as post-ivermectin experimental infections were mostly, but not all, negative.

Conclusions: *S. oyapockense* s.l. and *S. incrustatum* may contribute to onchocerciasis transmission in the Amazonian onchocerciasis focus of southern Venezuela. Their vector competence is lower than that of *S. guianense* s.l. However, there is a trade-off between the low vector competence of *S. oyapockense* s.l. and its high biting rate at lower altitudes (Grillet et al. 1998) that determines its role in hypo- and mesoendemic levels in the focus. In those hyperendemic areas located between 150 and ~200 m asl, both *S. guianense* and *S. incrustatum* play a vectorial role. The former because of its high vector competence albeit lower abundance; the latter because of moderate abundance but possibly higher survival rates (Basáñez et al. 1998). As these species are themselves distributed along the altitude gradient described earlier, our results provide entomological support to the clinal hypothesis of onchocerciasis prevalence. The data also corroborate the efficiency of ivermectin in reducing levels of *O. volvulus* mf available to the blackfly biting population, although issues of coverage, compliance, and treatment failure cannot be overlooked.

This study was supported by the World Bank, PAHO, and the Wellcome Trust.

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Vivas-Martínez et al. 1998 Trans. R. Soc. Trop. Med. Hyg. 92, 613-620

BRITISH SIMULIID GROUP BULLETIN – Number 15, June 2000

Pre-ivermectin Entomological Indices in the Onchocerciasis Amazonian Focus of Southern Venezuela

M. G. Basáñez[1,3], M. E. Grillet[2,3,] S. Vivas-Martínez[3], M. Escalona[3], H. Frontado[3], N. Villamizar[3], J. Cortéz[3], P. Coronel[3], W. Bourgeón[3], N. Vásquez[3] & C. Botto[3]

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In onchocerciasis, the degree of human-vector contact (measured by biting rate on humans) and the transmission intensity (measured by annual transmission potential or ATP) are important factors determining endemicity, intensity of infection, and morbidity in affected communities. Mass distribution of ivermectin, by reducing the skin microfilarial (mf) reservoir of *Onchocerca volvulus* in treated populations, should produce progressive decrease of entomological infection indices. Impact of ivermectin in the Amazonian focus of southern Venezuela has been measured through experimental infection of flies fed on mf carriers before and after 1 treatment dose (Grillet et al. this volume). This permits estimation of the ability of treated individuals to provide infecting blood-meals to vectors. Here we present preliminary data on natural infection rates of such vectors before the start of control which will provide a baseline against which to monitor treatment impact.

Flies that landed to bite on humans were collected in 6 sentinel communities of the southern Venezuela onchocerciasis control programme, comprising the 4 villages of the previous communication plus Niyayowë and Coyowë. In each community, and during 3-8 consecutive days covering dry -D- or rainy -R-

seasons. Blackflies were caught during the first half hour of each hour from 7:00 to 18:30 hr. Parity was evaluated in the field. The remains of the flies were preserved in alcohol for further staining, dissection, and assessment of infection with

[Graphics File Bull15F4.gif here]

Locality (altitude)	Year (Season)	sp*	Total flies	Parity	P_i (%)	ABR	No. L3 / fly	ATP	Mf / mg	Prevalence (%)
Altamira (800 m)	1990 (all yr)	*S m* *S e*	6,230 1,444	ND¶ ND	0.03 -	265,096 44,074	0.0003 -	85 -	8.3	18.9
Maweti (140 m)	May 1995 (D → R)	*S o*	8,878	0.76	0.05	648,240	0.0016	259	3.3	28.0
Pashopeka (240 m)	June 1995 (R)	*S i*	471	0.55	0.00	71,248	-	-	25.4	79.8
"	Jan 1997 (D)	"	943	0.47	0.21	136,145	0.0021	289	"	"
Aweitheri (162 m)	June 1995 (R)	"	461	ND	0.00	250,025	-	-	64.7	66.8
"	July 1997 (R)	"	1,137	0.68	0.00	144,905	-	-	"	"
Pashopeka (240 m)	June 1995 (R)	*S o*	71	0.61	1.41	9,052	0.0100	91	25.4	79.8
Aweitheri (162 m)	June 1995 (R)	"	58	ND	0.00	20,057	-	-	64.7	66.8
"	July 1997 (R)	"	515	0.61	0.00	112,420	-	-	"	"
Pashopeka (240 m)	June 1995 (R)	*S g*	67	0.57	0.00	9,709	-	-	25.4	79.8
Aweitheri (162 m)	June 1995 (R)	"	29	ND	0.00	13,870			64.7	66.8
"	July 1997 (R)	"	207	0.56	0.00	31,390	-	-	"	"
Niyayowë (950 m)	1985-1987 (D + R)	*S g*	4,368	-	0.62	128,480	0.0105	1,349	66.5	77.5
Coyowë (250 m)	1985-1993 (D + R)	*S g*	7,697	0.62	0.48	294,592	0.0138	3,888	63.6	77.1

*S m = *S. metallicum s.l.*; S e = *S. exiguum*; S o = *S. oyapockense s.l.*; S i = *S. incrustatum*; S g = *S guianense s.l.*
¶ND = not determined

Table 1. Pre-ivermectin entomological indices in the Amazonian onchocerciasis focus of southern Venezuela (Altamira is in the northern focus) D: dry season, R: rainy season D→R transition between dry and rainy seasons.

O. volvulus larvae. These are compared with 1990 data from the Altamira locality of the Venezuelan northern focus. Age- and sex-adjusted prevalence of irreversible ocular lesions (sklerosing keratitis, choroidoretinitis, iritis, and optic nerve damage) and their relation to ATP were calculated from reports of ophthalmological consultancies (Onchocerciasis Elimination Programme for the Americas) and published records.

For each locality, collection season or year, and blackfly species the following entomological indices were quantified for the total no. of flies (not just the parous flies),

$$\text{Parity rate} = \frac{\text{No. parous flies}}{\text{Total No. flies}} \quad (1)$$

$$P_I = P_{infective}\ (\%) = \frac{\text{No. infective flies} \times 100}{\text{Total No. flies}} \quad (2)$$

ABR = Annual biting rate = No. bites/person . yr

$$\text{Mean No. } L_3\text{/fly} = \frac{\text{Total No. infective larvae } (L_3)}{\text{Total No. flies}} \quad (3)$$

ATP = Annual transmission potential = No. L_3/person . yr

$$ATP = ABR \times \text{Mean no. } L_3 \text{ larvae/fly} \quad (4)$$

Results are summarised in Table 1. In the Amazonian focus, the number of. L_3/fly in species with a well-developed cibarial armature (*S. oyapockense* s.l. and *S. incrustatum* s.l.) was, of an order of magnitude lower than that of species lacking such an armature (*S. guianense* s.l.). *S. metallicum* s.l. and *S. exiguum* s.l., also with unarmed cibarium, but from Altamira showed low infection rates

The results agree with data from Guatemala/Mexico (*S. ochraceum* s.l. / *S. metallicum* s.l.) and West Africa (*S. damnosum* s.l.). The pre-control ATP's recorded for the Amazonian focus are comparable to West African savanna pre vector control levels. The higher ATP's corresponded to *S. guianense* (high vector competence). But the high biting rates of blackflies with lower vector competence (*S. oyapockense*, *S. incrustatum*, and *S. metallicum*), may compensate for the low L_3/fly, and generate levels of transmission compatible with recorded endemicity.

The Figure below shows the prevalence of irreversible ocular lesions against ATP for localities in West African savanna, Guatemala, and southern Venezuela, and confirms the threshold of ~100 L3/person.yr for severe ocular onchocerciasis. In the Amazonian focus, where >70% of villages are hyperendemic, this level of ocular severity corresponds to a community mean of 20 mf/mg and mf prevalence >60%. These results may provide a starting point for the identification of transmission and morbidity thresholds to be considered in the regional guidelines for elimination criteria.

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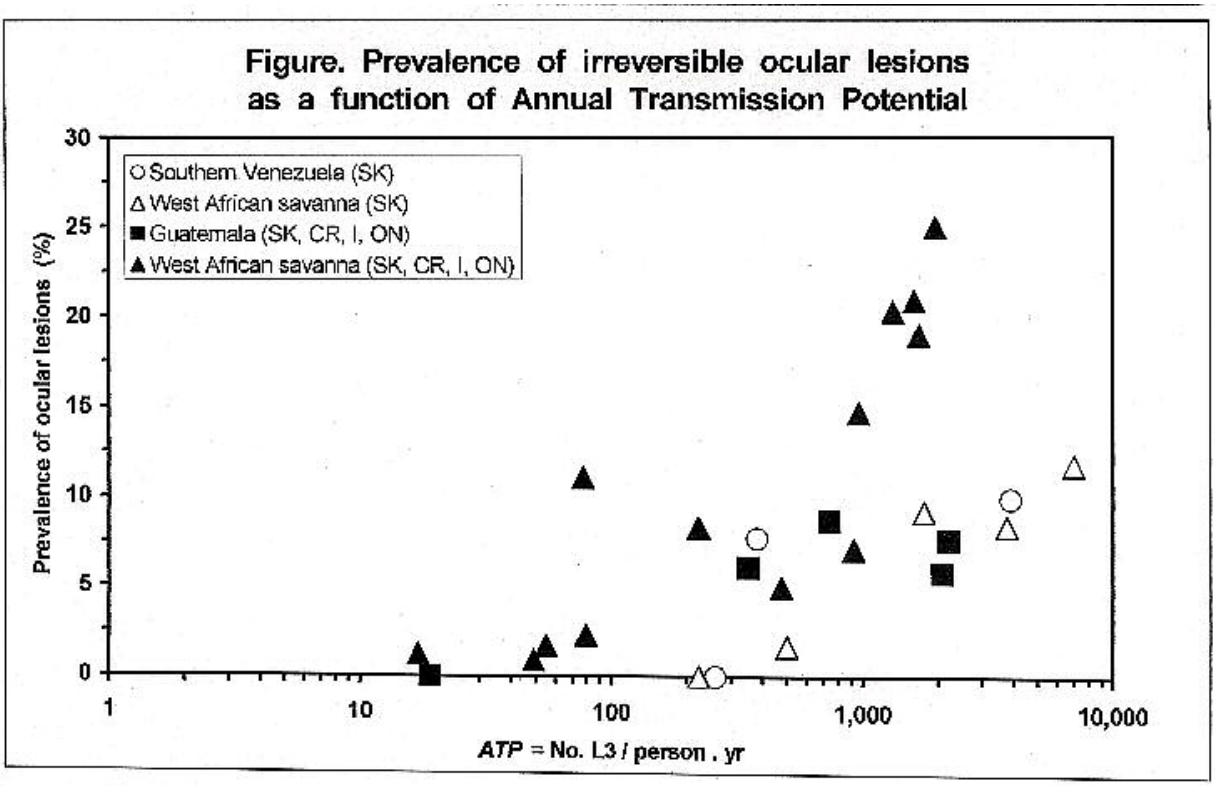

SK = sclerosing keratitis; CR = choroidoretinitis; I = iritis; ON = optic nerve atrophy

This study was supported by the Wellcome Trust, the British Council Academic Link Programme, the World Bank, and PAHO.

Simulium's innate immune system: involvement of cytotonic haemocytes?

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Recorded by title only

Scientific Contributions

Découverte de *Simulium (Obuchovia) galloprovinciale* et *Simulium (Obuchovia) auricoma*: deux nouvelles espèces pour le Nord de l'Afrique

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Le sous-genre *Obuchovia* Rubtsov est un taxon caractéristique de la faune Simulidienne des massifs montagneux dont les limites de distributions s'étendent du Sud-Ouest d'Europe jusqu'en Asie centrale.
Les espèces d'*Obuchovia* affectionnent les cours d'eau violents. Ainsi, à l'état pré-imaginal elles sont cantonnées dans les cascades. Les nymphes possédant 6 filaments respiratoires sont enfouies dans un cocon caractéristique à talon très prononcé et solidement accrochées à la surface des roches où elles donnent l'impression d'une masse argentée.

Les larves et les adultes sont très difficiles à différencier tellement ils se ressemblent. Néanmoins, les principaux caractères discriminatifs sont fournis par les caractères nymphaux tels que, la forme du cocon, la structure (rugosité) du tégument de la face dorsale du thorax et du capuchon céphalique et enfin, de la disposition et de l'aspect des filaments respiratoires.
A l'état actuel de nos connaissances, une seule espèce, *Simulium (Obuchovia) marocanum* Bouzidi et Giudicelli 1988 est connue dans le Nord de l'Afrique (principalement, dans le haut Atlas Marocain). Elle a été récoltée au Maroc dans deux localités :

7. Dans le Massif du Rif : oued Bou Adel, affluent de la rive gauche de l'Oued Ouerha.
8. Dans le massif du Haut Atlas : un petit affluent temporaire du Rdat, près de la route qui conduit de Marrakech au col de Tischka.

Au cours de nos prospections entomologiques effectuées dans le massif Rifain Nord marocain, nous avons trouvé deux autres espèces appartenant au sous-genre *Obuchovia*: *Simulium (Obuchovia) galloprovinciale* Giudicelli 1963 et *Simulium (Obuchovia) auricoma* Meigen 1818 élevant à trois le nombre d'espèces du sous-genre *Obuchovia* au Maroc.

Ainsi, ces deux nouvelles citations élargissent considérablement l'aire de distribution jusqu'en Afrique du Nord d'espèces qui n'étaient connues jusqu'à présent qu'en Europe continentale et que je détaille dans cette note.

Répartition au Maroc

Simulium (O.) auricoma:

Cette espèce a été récoltée en quatre stations situées sur la côte méditérranéenne, dans la province de Chaouen (Figure).

9. Oued Aarkôb,100m, localité Arherarose, 35°16'22"N;4°50'12"W le 17-XI-1997: 1 nymphe. le 27-IV-1998: 44 nymphes. le 15-IV-1999: 11 nymphes
10. Oued Sidi Yahya Aârab, 80m, localité Sidi Yahya Aârab, 35°17'33"N;4°53'25"W le 5-III-1998: 2 nymphes. le 27-IV-1998: 1 nymphe
11. Oued Jenane en Nich, 60m, localité Jenane en Nich,35°16'29"N;4°52'01"W le 27-IV-1998: 1 nymphe. le 15-IV-1999: 1 nymphe
12. Oued Amazithen, 80m, localité El Ouesteyine,35°18'33"N;4°54'36"W le 27-IV-1998: 1 nymphe. le 15-IV-1999: 4 nymphes

Simulium (O.) galloprovinciale:

Les récoltes de cette espèce ont eu lieu dans l'une des stations côtières pré - citées (Oued Aarkôb) et dans une petite cascade de la rivière Nakhla située dans la péninsule tingitane (fig.1).

13. Oued Aarkôb le 27-IV-1998: 5 nymphes. le 15-IV-1999: 2 nymphes
14. Oued Nakhla, 80m, localité koudiet Krikra, province de Tétouan, 35°27'09"N ;5°25'29"W le 12-XI-1998: 4 nymphes. le 3-V-1999: 7 nymphes

Répartition ailleurs

La répartition du sous genre *Obuchovia* dans les pays voisins d' Europe se présente comme suit :

Simulium (Obuchovia) galloprovinciale,

En **France** : Elle a été trouvée dans un petit cours d'eau, le Baillon, qui se jette dans l'Arc, dans la région d'Aix-en-Provence (Bouches -du -Rhône). Et dans le ruisseau du Gaudin qui se jette dans la rivière de Caramy. En **Espagne,** cette espèce a été recensée dans la rivière Guadalquivir, en Andalousie. En **Italie**, elle a été trouvée dans diverses localités telles que la rivière Tronto dans la vallée de Gole di Arquata (Marche), dans le torrent Castellano et son affluent, et dans les torrents Salinello et Chiarino.

Simulium (Obuchovia) auricoma

Quant à elle a été décrite d'**Autriche** puis trouvée en **France** (Vosges et Pyrénées et Corse (la vallée de Restonica) . En **Italie** cette espèce a été récoltée dans différentes localités aussi : dans un torrent situé dans la province de Latina, dans la rivière Tronto (gole di Arquata), dans les vallées Staffora et Trebbia et enfin dans le Mont Sibillini (cascade gole di Pioraco). L'espèce a aussi été signalée en **Yougoslavie.** Elle a été trouvée aussi dans le nord du **Portugal** et en **Espagne** (Catalonie),

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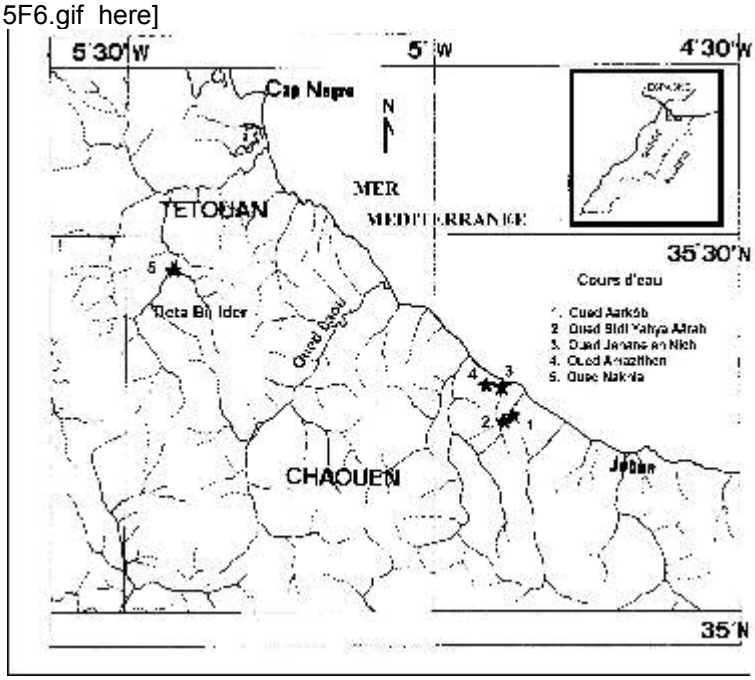

Figure 1. Répartition de *Simulium (Obuchovia) galloprovinciale* Giudicelli et *Simulium (Obuchovia) auricoma* Meigen dans le Rif. (Maroc) (★).

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la **Tchécoslovaquie**, la **Bulgarie**, l'**Allemagne**, du **Liban**, les Isles de **Grèce** et l'ile de **Chypre**.

Remerciements:

J'adresse mes remerciements au Dr. R. W. Crosskey pour avoir examiné mes spécimens et pour m'aider dans mes déterminations.

Références:

Bouzidi A.& Giudicelli J. 1988. Contribution à l'étude faunistique et écologique des Simulies (Diptera, Simuliidae) du Maroc. II. *Simulium (Obuchovia) marocanum* n. sp. et les espèces méditerranéennes d'*Obuchovia* Rubzov. *Annales de Limnologie*., **23** (3), (1987): 185-195.

Giudicelli J.1963. *Simulium galloprovinciale* n. sp. (Diptera, Simuliidae), une Simulie nouvelle du groupe *auricoma*. Comparaisons avec les espèces du genre *Obuchovia* Rubzov, 1951. *Bulletin de la Société de Parasitologie exotique.* 55 (5) (1962): 882-892.

BRITISH SIMULIID GROUP BULLETIN – Number 15, June 2000

NOTES, VIEWS AND CORRESPONDENCE

A curious abnormality of the male genitalia in *Simulium* s. str.

Simulium s. str., the largest subgenus of *Simulium* s.l., is a northern hemisphere taxon in which the male genitalia have long heavy styles that exceed the coxites in length and that lie horizontally and parallel to one another. Style shape, especially the sinuosity of its outline and the degree of development of an inner basal swelling or tooth, varies between species but the bluntly rounded form of the style tip is very uniform; a typical style is shown in Figure lc. Given the well known constancy of apical form shown by the styles in the many species of *Simulium* s str it was a surprise to come upon a specimen of the subgenus in which the ends of the styles are malformed, slightly inflated and flared out in the dorsoventral plane to two moderately sharp points (Figure la and ib); another aspect of the abnormality is that the left and right styles are not fully symmetrical, the left one as the hypopygium is orientated on the fly (right one in the illustration) being more

drawn out to the tip and less strongly splayed into definite points. The usual apical spinule of each style is more or less aborted. All structures of the hypopygium other than the styles are entirely normal. The specimen concerned is a pharate adult male of *Simulium (Simulium) monticola* that I found whilst identifying my material from the Sierra Nevada in Andalusia. The collecting data are: Spain, Granada Province, RÍo Trevélez at Trevélez, 1400 m, UTM Grid 10 km square VF7696, 22.iii.1996 (Crosskey), male pupa/pharate with separate removed and undissected hypopygium in alcohol microvial (Natural History Museum, London).

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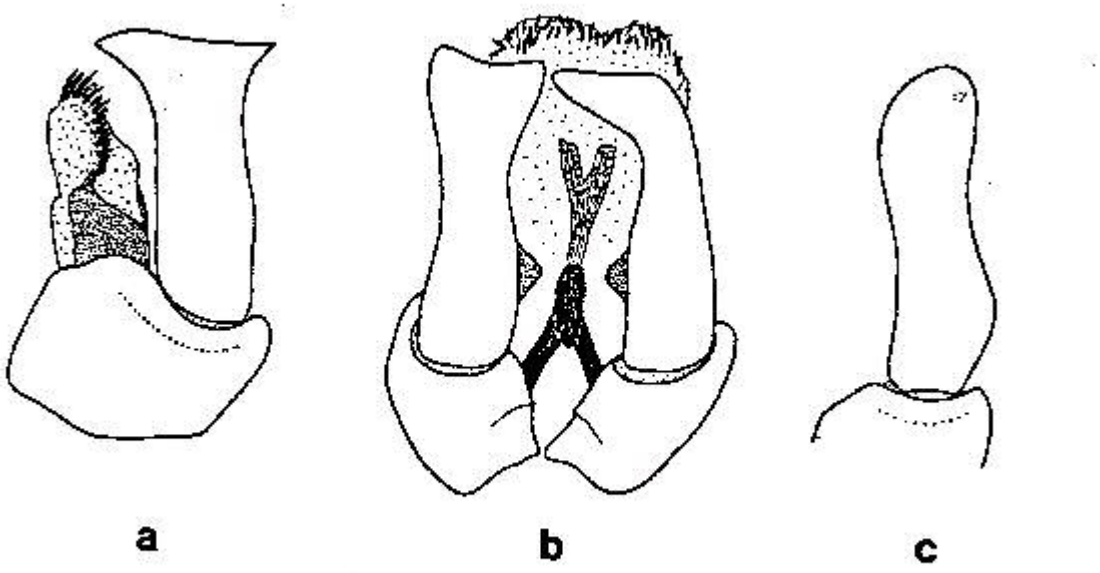

Figure 1. Male hypopygium of a specimen of *Simulium (Simulium) monticola* with aberrant styles, in right lateral view (**a**) and ventral view (**b**), and, for comparison, a typical style (**c**) in the subgenus *Simulium* s. str. (**c**).

The aberrant hypopygium was sent to Peter Adler to be seen by a second pair of experienced eyes and I am grateful to him for his comments. Neither of us has seen such an abnormality before or knows of a literature reference to anything similar.

Roger W. Crosskey

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