The British Simuliid Group Bulletin

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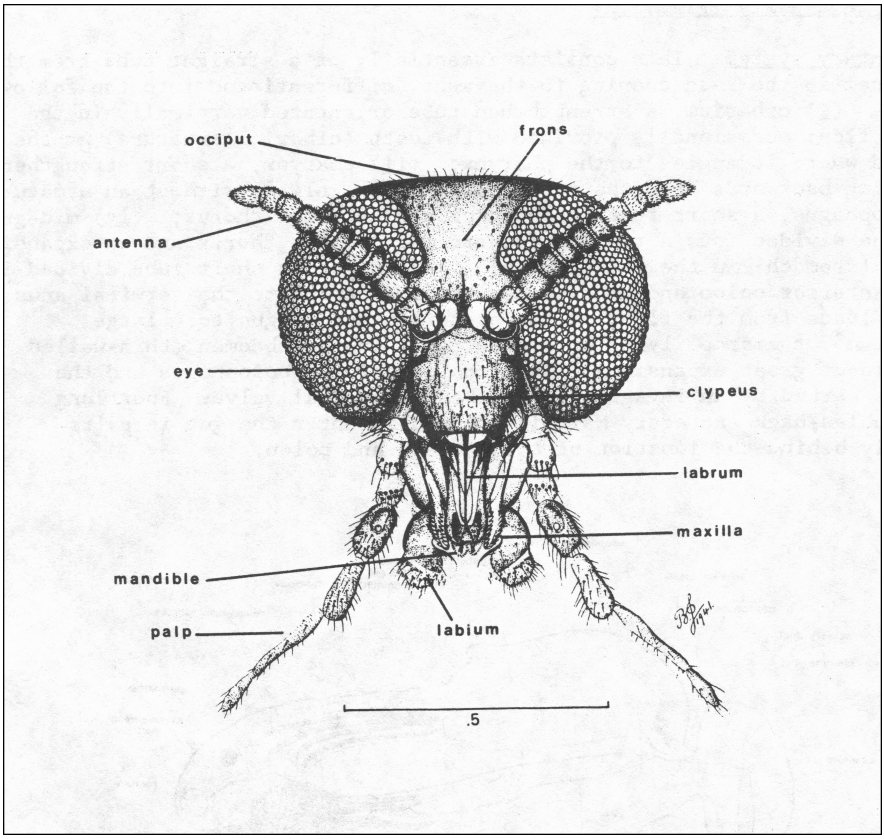

NATURAL HISTORY MUSEUM

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Cover Image: *Anterior view of the head a typical* Simulium *female. From Jobing, B.* "Anotomical drawings of bitingfies". *Natural History Museum and Wellcome Tust (1987). 119pp.*

FROM THE EDITOR

I fear that uncertain times are on the horizon for the *Bulletin.* For a number of reasons it seems probable that we will soon have to seek an alternative to the current system whereby the *Bulletin* is published by the Natural History Museum. Since Number 18, March 2002, we have had an informal arrangement with the Museum which has worked very well, but with expected changes in administration and policy this looks likely to change, and we may be no longer able to continue the arrangement.

It has been suggested that we publish only in electronic form, on the internet and by e-mail. However I, and those that I have consulted, are determined to try to maintain a printed version in some form. We believe that there is nothing like a printed document for ease of use and that members, many of whom are retired and may not have access to the internet, look forward to receiving their personal copy from the postman.

When looking for alternative methods of dissemination, the main problem is the cost of postage. With the recent increase in postage rates in the U.K., each biannual issue of the *Bulletin* will now cost about £150.00 (US$ 216, € 185) to post to our 140 members. Whilst this is not a lot, it has to be found from somewhere. We are examining alternatives. We are reluctant to start asking for contributions because this will involve some degree of financial accountability and difficulties with transferring money. A possible compromise might be to send printed copies to libraries and U.K. residents (the lowest postal rates), and for overseas members make available an electronic version in pdf or other format that could be printed out individually should members wish. We already post versions on the web at **www.blackfly.org.uk** anyway.

What do members think? Could the matter be discussed at the upcoming Symposium in Turkey? If you have any suggestions, please contact me by mail to the address inside the cover, or by e-mail to **daviesjb@liv.ac.uk**

John B. Davies

MEETINGS

4th INTERNATIONAL SIMULIIDAE SYMPOSIUM

The 4th International Simuliidae Symposium incorporating the 31st Annual Meeting of the British Simuliid Group will be held at Hotel Sun Zeynep in Belek, Antalia, Turkey, on 12 to 15 October 2010.

The final details and costs of registration and hotel reservation are yet to be announced., and will be posted on the Symposium website at : **www.simuliid10.hacettepe.edu.tr**, and also on: **www.blackfly.org.uk.** They will also be circulated by e-mail to those who registered for the last two symposia and who participated in the ballot for the venue.
Hotel information can be found at: **www.lux-hotels.com/turkey/sun-zeynep**

For any other information contact:

Kaharaman Ipekdal,
kipekdal@gmail.com

or: Selim Sualp Çaglar, PhD –(head of the local organizing comittee)
sualp@hacettepe.edu.tr.

Hacettepe University Department of Biology, Ecological Sciences Research Laboratories, 06800, Beytepe, Ankara, Turkey
Tel.: +90 312 297 64 35, Fax: +90 312 299 20 28

Members who do not have access to the internet may write to J. B. Davies, 57 North Parade, Hoylake, Wirral, CH47 3AL, U.K.

BOOK NOTICE

A new Monograph on Blackflies of Brazil.

The following is the publisher's style of citation.

> Anthony J. Shelley, Luis M. Hernández, Marilza Maia-Herzog, Antonio P. A. Luna Dias & Paulo R. Garritano. 2010. The Blackflies (Diptera: Simuliidae) of Brazil. In: Arias, J.R., Golovatch, S., Wantzen, K. M. & E. Dominguez (Eds.), Aquatic Biodiversity in Latin America (ABLA). Vol. 6. Pensoft, Sofia-Moscow, 821 pp.

The book describes in English the adults and pupae of the 80 species found in

Brazil and provides keys (in English Portuguese and Spanish) for their identification. It is comprehensively illustrated, set wherever relevant in a wider Neotropical context, and includes maps showing species distributions ad the main features of the Brazillian environment.

[Anyone wanting further information should conact Lius Hernández. E-mail: luih@nhm.ac.uk. Postal Address: Department of Entomology, The Natural History Museum, Cromwell Rd., London S7 5B, U.K.]

Scientific papers

On Simuliidae from the Okavango Delta of Botswana

Roger W. Crosskey[1], John E. Davies[2] and A. Gavin Gatehouse[3]

[1] 2 Willow End, Totteridge, London N20 8EP, U.K.
[2] Tribwthyn, Llantrisant, Usk, Gwent NP15 1LQ, U.K.
[3] Tremynfa, Abergwyngregyn, Llanfairfechan, Gwynedd L133 OLH, U.K.

So little published information is available on blackflies in Botswana that we are led to think that we should place on record in the *Bulletin* the findings from a collection that was made in the Okavango Delta (Ngamiland) about thirty years ago. The material, now deposited in the Natural History Museum (BMNH) in London, was independently collected by JED and AGG and studied taxonomically by RWC. In this article we detail the sampling sites and the material seen, including also some notes on the Okavango Delta as simuliid habitat. Four species were found in the material: *Simulium albivirgulatum, S. adersi, S. awashense* and *S. evillense.* The first three represented new records permitting Botswana to be entered for these species in the inventory of world Simuliidae (Crosskey & Howard, 1997 and Adler & Crosskey, 2010). The fourth species, *S. evillense,* had previously been recorded from the 'Okavango Swamps' but under the name *Simulium merops* because of misidentification (see later under *S. evillense).* Surprisingly, *Simulium ruficorne,* a species almost universally distributed in the Afrotropical region, was not found and Botswana remains one of the now very few countries in Africa from which it is unknown, despite the availability of suitable aquatic habitat.

The four species found in the Okavango Delta are easily identified in the pupal stage and we include a simple key in which are included literature references to good gill figures. Life stages of the collected material are indicated as L (larva), F (female adult), M (male adult), P (pupa) and Pe (pupal exuviae). Locality data are indicated by means of the numbers (1-10) used in the collecting sites list

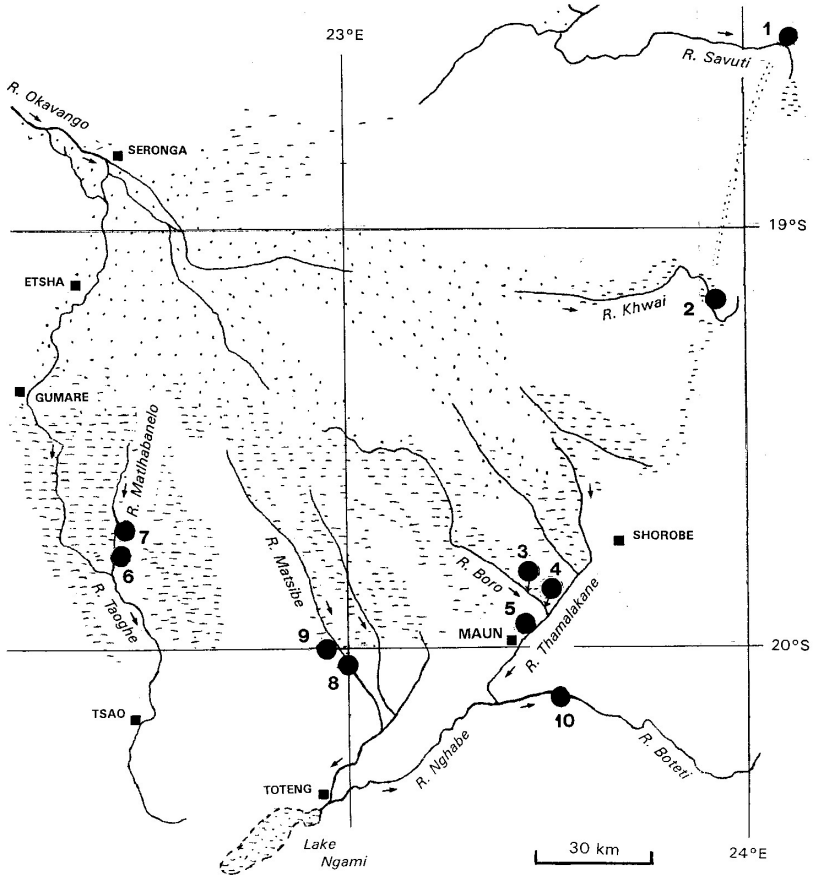

Figure 1 Map of the Okavango Delta of Botswana (Ngamiland) showing the positions of the simuliid collecting sites 1-10 and the main water channels. Dash-shading indicates areas mostly flooded, dot-shading areas seasonally flooded.

The Okavango Delta habitat

As Botswana is a largely arid and desertic country relatively little of it provides lotic habitat supporting simuliid development. The main area where blackflies occur is the Okavango Delta of the north (Ngamiland), a wetland area which occupies the Okavango Basin (18°-20^{0}S and 22°-24°E). Hydrologically the Okavango is a swampy inland delta of the Okavango river, a watercourse that flows southeastwards out of Angola into northwestern Botswana before vanishing into the sands of the Kalahari (Wilson & Dincer, 1976). The delta has the typical sector shape of a coastal delta and measures about 160 x 200 kilometres. It has a slope of only about one in 3600 but slight irregularities in the surface create a complex pattern of channels, wooded islands and lagoons. There is very little outflow and about 96% of the water delivered by the Okavango river is evaporated or transpired from the surface of the Delta. The surface water is very thinly spread and the flood waters evaporate over an area which varies considerably according to the inflow. Two thirds of the latter is from the Okavango river and one third from rainfall. Rainfall is from November to March and out of phase with the river flood, the latter reaching a maximum above the delta in March but not peaking at the foot of the delta till August. The area of the swamp depends mostly on the river flood and is maximal in June and July and minimal in December and January. Movement of the annual flood through the delta is mainly through the swamp outside of the main channels, as shown by the slow average speed <5 cm/sec), but it is the main channels that provide the just-lotic habitat occupiable by simuliids. Water movement through these channels ('rivers') is generally to the south and east (map, Figure 1). Some notes on the nature of the habitats at sites where specimens have been found are included with the collecting site data in the next section.

List of collecting sites

The positions of the sites in the Okavango Delta are shown on Figure 1.

1. Savuti channel, near crossing at tourist campsite, 18°34'S/24°04'E [Narrow water channel with stony bed in *Acacia* woodland]
2. Khwai (= Kwai) river, near Department of Tsetse Fly Control ox camp, 19°09'S/23°55'E. [Water channel about 10 metres wide and up to one metre deep with bed of flooded grasses in *Acacia* woodland]
3. Boro river, approximately 8km NW of junction with Thamalakane river, 19°51'S/23°28'E. [Narrow area where rapids exposed at low water (flowing when visited by AGG in September 1978)]

4. Boro river, approximately 3km NW of junction with Thamalakane river,

19°54'S/23°30'E. [Site flowing when visited by AGG in September 1978]

5. Government houses at Maun, near Thamalakane river, 19°58'S/23°27'E. [Wide deep river, water rising in May and June 1979 when large numbers of *Simulium adersi* adults noticed in Maun. Woodland of mopane (small leguminous southern African tree of dry areas), some *Acacia* and riverine vegetation]
6. Matlhabanelo river, approximately 5km N of junction with Taoghe river, 19°47'S/22°26'E. [Narrow channel quite deeply incised and containing a narrow stream 2m across and 10cm deep flowing at about 1m/sec in *Acacia* woodland, all stages of immatures attached to grass stems and leaves. The channel had been flooded for a month before collections were made and had not been flooded for many years prior to 1978. Females were biting at mid-day on 14.viii.1979 when water was much lower though still packed with immatures. No flies biting at mid-day on 18.viii.1979 when 'running' section of the stream had completely dried out]
7. Matlhabanelo river, at Department of Tsetse Fly Control ox camp, approximately 10km N of junction with Taoghe river, 19°43'S/22°26'E. [Wide shallow flooded molapo up to 1m deep and not flowing except through wind action. On 3, 14 and 17.viii.1979 adult flies common flying around faces of humans and occasionally biting, especially in late afternoon, immatures not seen except for pupal cocoons found on 17th in water up to 20cm wide and 10cm deep flowing through grass stems at about 0.2 metres per second]
8. Matsibe river, at Matsibe bridge, 20^{0}03'S/23°00'E. [River flowing through *Acacia* and riverine woodland at very low water with slow flow when sampled on 23.xi.1979 (but river often quite wide and deeply fast flowing)]
9. Matsibe river, upstream of Matsibe bridge, 20^{0}00'S/22°55'E. [Adult flies common in afternoon (8.vii.1979) around humans in *Acacia* woodland by shallow grassy flood plain, no immatures found on flooded grass]
10. Botletle (= Boteti) river, Samadupe drift bridge across river, 20^{0}06'S/23°32'E. [Water flowing fast and deep with reed beds immediately beneath the bridge where immatures collected, very little flow anywhere else, in open *Acacia* woodland. Note: all four species were present together at this site when it was sampled on 18.x.1979 (JED)]

Identification key to pupae

1 Gill with 11 fine filaments, spreading from near base [Fig. 32i in Freeman & de Meillon]…….. *S. adersi*

Gill with more than 11 filaments ……. 2

2. Gill with 12 filaments arising from long thick common stem (similar to stem in *S. mcmahoni)* [Fig. 1N in Uemoto et al.] ……..….*S. awashense*

Gill with more than 12 filaments, these not on long thick common stem ……. 3

3 Gill filaments 15 (occasionally 13 or 14 on one or both gills) [Fig. 1 in Fain et al.] ……. *S. evillense*

Gill filaments typically about 30 (varying 25-40), all *very* delicate and arising in groups from four or five *very* short main trunks. [Fig. 66h in Freeman & de Meillon] …… *S. albivirgulatum*

Simulium (Heilloniellum) adersi Pomeroy

Material. Site 1: 1M (reared, no Pe), 14P, 4Pe, 35L, 22.ix.1978 (AGG). Site 2: 1F (reared, no Pe), 17.ix. and lP, 3Pe, 17L, 18.ix.1978 (AGG). Site 5: 19F, 'in house' 26.v.1979 (JED) and 103F, 'in house', 1-7. vi .1979 (JED). Site 6: 3M (2 with Pe, 1 with genitalia slide), 3F (one with Pe), 96P, 4Pe, 66L, 3.viii. and 2M (with Pe), 14.viii.1979 (JED). Site 7: 1F, 25.vii. and 4F, 2Pe, 17. viii .1979 (JED). Site 9: 7F, 8. vii .1979 (JED). Site 10: 12P, 1Pe, 44L, 18.x.1979 (JED).

Remarks. This familiar and abundant species (or perhaps complex, cytological data lacking) is common in diverse habitats throughout mainland tropical and southern Africa and has also been collected by John B. Davies [no relation to present coauthor] in Mauritius. The characteristic pupal gill of *S. adersi,* comprising 11 slender filaments grouped in 3+5+3 configuration, is extraordinarily stable throughout the massive range of the species and specimens from Botswana fully conform with material from elsewhere regarding this feature and other characteristics (including the feeble weave of the cocoon). However, at Site 6 there was remarkable variation in pupal size, body length ranging in the sample from 1.8-3.4 mm. In the Okavango *S. adersi* appears to be the most abundant of the four *Simulium* species present. In Maun, at times when numbers are generally high, females can be found on windows inside houses and tents but are not normally troubling to humans. Lastly we note a record for *S. adersi* in southern Botswana: near Gabarone, Kolobeng river, 25°41'E/24°40'S, 7.iii.1981 (Procter) (25 larvae, determined by RWC, in BMNH) .

Simulium (Pomeroyellum) awashense Uemoto, Ogata & Mebrahtu

Material. Site 1: 3L, 22.ix.1978 (AGG). Site 3: 1M (reared, with Pe, genitalia slide), 2L, 28.ix.1978 (AGG). Site 10: lP, 1L, 18.x.1979 (JED)

Remarks. Despite the differences between this species and *S. mcmahoni* mentioned in the original description of *awashense* (Uemoto et al., 1977) there is some doubt about whether they are separate species. The pupal gill in both has a long common stem from the sides and tip of which arise several delicate filaments, and both nominal taxa have similar broadly lamellate male ventral plates in which the apical margin is developed into prominent 'shoulders'. In *awashense* the filaments number 12 (rarely 10) whereas in *mcmahoni* they number 8 (6 on one side recorded), and the saddle between the shoulders of the ventral plate is much more developed than in *mcmahoni.* In the latter there is only a faint concavity exactly as shown in Fig. 21b of Freeman & de Meillon (1953). So far, specimens answering to these *awashense* characters have been found only in Ethiopia and Botswana. The entity with the 8-filament gill *(mcmahoni)* is known from 17 countries ranging from Mali and Nigeria to South Africa (Adler & Crosskey, 2010). Interestingly, Freeman & de Meillon (1953) mentioned under *S. mcmahoni* a pupa with 12 gill filaments but without making it clear whether this was their 'Bechuanaland, Ngamiland' specimen. Presumably it was. At present we accord *awashense* the benefit of the doubt, treating it as valid, and noting that the Okavango material here recorded has been compared directly with material from Ethiopia (type locality) .

Simulium (Pomeroyellum) evillense Fain, Hallot & Bafort

Material. Site 1: 6L, 22.ix.1978 (AGG). Site 2: 1M (genitalia on slide), 2F, 17.ix. and lP, 4Pe, 25L, 18.ix.1978 (AGG). Site 3: lP, 6L, 28.ix.1978 (AGG). Site 5: IF, 'in house', 26.v. and 3F, 'in house', 1-7.vi.1979 (JED) Site 6: 3F, 4L, 3.viii.1979 (JED). Site 7: 53F, 3.viii. and 102F ('biting man and in tent'), 1Pe, 17.viii.1979 (JED). Site 8: 8L, 23.xi.1979 (JED). Site 10: 4L, 18.x.1979 (JED)

Remarks. Described originally from Katanga by Fain et al. (1966), this species was named for Eville, the contraction of Elizabethville (now = Lubumbashi) used by the Belgian expatriates in the colonial era. Five pinned female paratypes collected between January and March 1962 near Elizabethville by Marcel Lips are in the BMNH. Freeman & de Meillon (1953), writing of the species under the mistaken name *S. merops,* noted that "Females were taken in appreciable numbers biting man, at several places in Okavango Swamps, Ngamiland (B. de Meillon, July, 1949)". Three of the original specimens for this record are in the BMNH, each labelled in de Meillon's hand 'Ngamiland/ Gomare [= Gumare 19°23'S/22°10'E]/Biting man/vii.49/B.De Meillon'. These females, together with our material of immatures and adults, confirm that the record of *S. merops* from Botswana is due to misidentification, as had previously been suspected by Fain et al. (1966) and by Palmer & de Moor (1998). *Simulium*

merops is a strictly South African species, confined to the southern and southwestern Cape, and with different pupal gill structure (the gill of *merops* having a somewhat tufted form of 18 filaments arising from the gill base without any common stem: Freeman & de Meillon, Fig. 15j). Its larva has been described by Palmer (1991: 212-213).

Freeman & de Meillon (1953) noted that "In spite of repeated search the immature stages [of their *'merops'*] could not be found in the rather slow-moving waters of the swamps". Later work has shown that elusiveness of the early stages compared to the abundance of the adult females is a hallmark of *S. evillense!.* Johnson et al. (1982) found in West Africa that suction traps pulled in huge numbers of females (far exceeding those of any other *Simulium* spp.) but that searches for possible breeding sites were a failure. Although we (AGG and JED) obtained a very few immatures these were disproportionately few in relation to the numbers of adult females. The question presents itself: where are the major reservoir breeding sites? Are these being missed within the Delta through sampling in the wrong places or does the species have a migratory tendency bringing females in from distant natal sites? It seems possible that searches on the Okavango river to the northwest of Ngamiland, on the Angola-Namibia border and where the Okavango traverses the Caprivi Strip of Namibia, might be revealing. It is also hard to avoid the suspicion that immatures mainly inhabit atypically slow, perhaps nearly static water, possibly near the bottom - in the manner in England of *S. latipes* whose immatures can sometimes be found near the bottom of pasture seepages attached to decomposing grasses.

It is pertinent to note that we have seen some variation in pupal gill branch number. Pupae from the Boro river (Site 3), the Matlhabanelo river (Site 7) and two of those from the Khwai river (Site 2) have the typical 15 filaments in each gill, but 15+14 and 15+13 gill configurations are present in the other two specimens from Site 2. The gills bear close general resemblance to those of *S. allaeri,* another member of the *S. alcocki* group, and one in which the gill is normally 12-filamented (Freeman & de Meillon, 1953:76, fig. 18*). Simulium allaeri* was described by Wanson (1947) from near Banningville (now Bandundu in Democratic Republic of Congo) and pupae were collected from swamp conditions "au bord d'un marais s'ecoulant doucement et sur un fond boueux" .
The male sex of S. *evillense* is undescribed but the one male obtained from Site 2 (Khwai river) allows us to show the main feature of the genitalia, the form of the ventral plate (Figure 2). The notably simple outline shape of the plate invites comparison with that illustrated for *S. allaeri* by Wanson (1947, fig. 23) and Freeman & de Meillon (1953, fig. 18c). The apical margin of the plate in the Botswana *S. evillense* male appears to be broader and more definitely provided with 'shoulders', but the shape of the styles and the (single) parameral spine conform exactly to the Freeman & de Meillon figures (18a and 18e) for these features in *S. allaeri.* Very close affinity between *S. evillense* and *S. allaeri*

cannot be doubted, and it is possible - even likely - that the two are in reality a single species, one in which there is unusual variation in the pupal gill filament number. At present the recorded number of filaments for *allaeri* is 11-12 and for *evillense* 13-15. If one species is actually involved (filament range 11-15) one might guess that the flexibility in number is in some manner an adaptation to the unusual aquatic habitat, both nominal species occurring in swamps and other virtually lentic places.

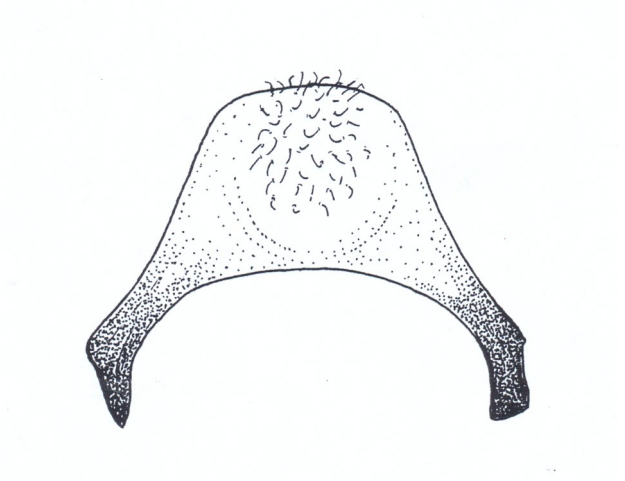

Figure 2. *Simulium evillense:* ventral plate of male genitalia. Specimen from Site 2, Khwai river, Ngamiland, Botswana

Simulium (Metomphalus) albivirgulatum Wanson

Material. Site 3: 1F, 2P (pharate M with genitalia slide, pharate F), 1Pe, 11L, 28.ix.1978 (AGG). Site 4: 1M (reared, with Pe, genitalia slide), 1F, 18P (pharate M, 1 with genitalia slide), 27L, 28.ix.1978 (AGG). Site 10: 1L, 18.x.1979 (JED).

Remarks. This poorly known species is absent from East and West Africa and has a patchy distribution from the Congo Republic to Katanga, Zambia and a few other parts of southern and central Africa. Palmer & de Moor (1998) do not record it from South Africa and it seems that *S. albivirgulatum* may be at its southerly limit in the Okavango. The larva has some unusual features, all confirmed for the Botswana materal. These notably include the dense covering of the body cuticle with conspicuous scales, the unusual body profile and rather elongate head, the elliptical shape of the postgenal cleft, and the unusual

configuration of the hypostomial teeth (see Crosskey, 1969: Figs 259, 281, 287).

Note on *Simulium damnosum* s.l. in Botswana

Palmer & de Moor (1999), in their distribution map for *Simulium damnosum* s.l. in Southern Africa, have marked for the presence of this complex at the Limpopo, where this river forms the border between Botswana and the Republic of South Africa. The origin of the record is slightly uncertain at present (Palmer and de Moor, *pers. comm*.) but in any event it would have no obvious relevance to whether or not *S. damnosum* s.l. might occur in the Okavango Delta - an area from which it is at present unknown. Prima facie, given the almost lentic nature of the delta swamplands, it seems improbable that *damnosum* could breed there. On the other hand, the possibility exists of immigrant flies arriving from the northwest. This is made the more conceivable because there are records of breeding sites in the Okavango river where it crosses Caprivi, the narrow strip of land (part of Namibia) lying between Angola and Botswana. Barbara Curtis (1991) recorded the finding of *S. damnosum* s.l. at her 'Kavango River' site in the Caprivi Strip but without precise locality data. However, Rob Palmer informs us (via letter to RWC on 3 January 1999) that he identified *S. damnosum* s.l. in material collected at Popa Falls and the Mkena Channel on the Caprivi stretch of the Okavango, and also material collected by Mark Chutter at the Andara Weir (18°04'S/21°26'E). These findings suggest that breeding sites on the stretch of the Okavango where it traverses the Caprivi Strip are potential sources for infestation of the river within Botswana - perhaps by larval drift if not female immigration.

Acknowledgements

We thank Rob Palmer and Ferdy de Moor for providing information for the item on *S. damnosum* s.l. given above.

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Late-instar *Simulium ornatum s.l.* found attached to seaweed close to the high tide mark in a coastal stream in north east England

J.L. CRAINEY[1] and R.J. POST[2]

[1]*Department of Infectious & Tropical Disease, London School of Hygiene & Tropical Medicine, Keppel St, London WC1E 7HT; lee.crainey@lshtm.ac.uk*
[2]*Department of Entomology, Natural History Museum, Cromwell Rd, London SW7 5BD; r.post@nhm.ac.uk*

The ecological range of insects is, generally, not thought to extend much into the marine environment and thus there are relatively few insect species living below the high tide mark (Gullan and Cranston, 1994). In view of this it is not surprising that there have been comparatively few accounts of simuliids breeding in waters subjected to marine influences (Crosskey, 1990) in spite of their broad distribution within freshwater streams. Williams and Williams (1998) and Post (2008) reported *Simulium variegatum* and *Simulium erythrocephalum* (respectively) in the tidal regions of two UK rivers, but the extent to which the specimens they collected would have been subjected to salt waters was unclear. Williams and Williams (1998) noted that because the tidal salt water is heavier it usually forms a wedge underlying the freshwater. They were sampling the benthic fauna, and the point furthest downstream where blackfly larvae were found would have been inundated by salt water by 50% of high tides. However, very few simuliids were found at this point and it is unclear whether sampling was carried out during periods of spring or neap tides (i.e. the consecutive periods of about a week when the sampling point would, or would not, have been inundated by almost every tide). Post (2008) noted that blackflies in the tidal region of the river Cuckmere (near Alfrison) were attached to *Sparganium emersum*, which is a plant known to dislike brackish water. Clearer evidence of

blackflies tolerating salt water come from Siberian *Simulium salinum*, which was collected from a stream with extremely high salt content (Rubstov, 1956), and from a few records
of blackfly larvae found close to or below the high tide mark. Minhas et al. (2005) found *Simulium vittatum* below the high tide mark attached to the shells of molluscs on a Prince Edward Island beach (in Canada) and Day (2010; 2006) collected five *Simulium angustipes* pupae and larvae from the tidal zone in Cornwall and a *Simulium cryophilum* pupal case from a coastal stream in Fife, near the high tide mark.

We record *Simulum ornatum* complex larvae in Brierdene Burn where it flows over the beach in Whitley Bay, Tyneside, on the north east coast of England (Ordinance Survey grid reference: NZ351739). Fig. 1 shows the collection site with the exact location where the larvae were found circled. Larvae were collected on the 5th of April 2010 from a variety of substrates including plastic bags, twigs and three separate pieces of tide-swept uprooted seaweed (in varying states of decay) near to the highwater neap tide/highwater spring tide level (PJW Olive, personal communication). In total 16 blackfly larvae were collected and morphologically identified using published keys (Bass, 1998; Davies, 1968). The collection included last-instar larvae, which had their identification confirmed by dissection of the developing gills in the dark pupal histoblasts.

In Crosskey's account of *Simulium adersi* from the River Limbe in Cameroon he wrote that pupae were found "attached to herbage on piles of the wharf in brackish water where a small stream discharges into the sea; it seems likely that this is not a natural habitat and that the pupae are fixed to freshwater vegetation which has accidentally been caught up on the piles" (Crosskey, 1960). A similar scenario could explain the occurrence of our specimens in Brierdene Burn. Some were found on twigs which may have been washed downstream, but others were attached to seaweed, although the larvae may still have been washed downstream. The salinity of the stream at this point was not measured.

It is perhaps not surprising that blackflies from the *S. ornatum* complex may be added to the list of those which might be suspected of salt-tolerance, given the known diversity of the taxon and the ecological niches they inhabit. British *S. ornatum* s.l. has been found in a wide variety of habitats and in ten months of the year (Crosskey and Crosskey, 2002) and is known to be composed of at least four different cytospecies (Bass, 1998).

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Notes and new records for Simuliids in Mauritius

Roger W. Crosskey[1] and John B. Davies[2]

[1] 2 Willow End, Totteridge, London N20 8EP, U.K.
[2] 57 North Parade, Hoylake, Wirral CH47 3AL, U.K

Very little is on record about blackflies in Mauritius so we think it appropriate to report on a small collection that one of us (JBD) was able to make in the island in April 1991 and on the findings yielded by this material when it was eventually studied (RWC). Stating the main, and unexpected, outcome at once it is that instead of there being, as long presumed, only the species *Simulium ruficorne* in the island there are at least three species. The additional two now known are *Simulium adersi,* a familiar Afrotropical species with characteristic 11-filamented pupal gill, and *Simulium triplex.* The latter, a member species of the *S. ruficorne* group, has been described very recently from the Mascarene island of Réunion (Giudicelli, 2008) and is characterized mainly by the pupal gill possessing three long and finely tapering filaments (illustrations in Giudicelli, *op. cit.).* We should note that it was on the basis of the JBD material that Mauritius was listed in the synopsis of *S. adersi* distribution in the world inventory of Crosskey & Howard (1997: 41) and repeated in subsequent inventory updates.

The Republic of Mauritius in the western Indian Ocean is comprised almost entirely of two substantial islands, Mauritius and Rodrigues. Both have a volcanic origin. Rodrigues Island, by far the smaller, lies about 560 km east of Mauritius proper and was the earlier of the two islands in which the existence of Simuliidae was confirmed. Adult specimens of *Simulium ruficorne* were obtained there between August and November 1918 during the Rodrigues insect collecting expedition of H.P. Thomasett and H.J. Snell (see Snell & Tams, 1920). The flies were examined by Edwards (1923) and described as a new species with the name *Simulium diversipes*.* Later, however, Edwards (1934) realized that this was a mistake and synonymized *diversipes* with *Simulium ruficorne,* a super-widespread Afro-Palaearctic species originally described (in 1838) from Réunion. This island has been moderately well collected for simuliids in modern times (*S. ruficorne* being well known there) but to our knowledge nobody has collected simuliids in Rodrigues since 1918. Probably *S. ruficorne* is still present.

The earliest specimen of Simuliidae collected in Mauritius (main island) of which we have knowledge is a female of *Simulium ruficorne* caught by a UV light-trap in November 1939. This was obtained by L.J. Vinson at Moka

(20°13'S/57°30'E), a few kilometres south of Port Louis, the island capital. The specimen is in the South African Institute for Medical Research (SAIMR) and is accompanied there by two other females, these collected by L.A. Moutia on 30 January 1940 (locality not given). All three specimens have the late Botha de Meillon's determination labels as *S. ruficorne,* a fact which strongly suggests that the specimens provided the basis for Freeman & de Meillon's (1953: 99) citation of Mauritius as one of five African territories for which "there are the new records". These authors provided no other data, leaving unexplained the source for their note about *S. ruficorne* being "new" in Mauritius. Still, the SAIMR was de Meillon's base and these specimens would have been to hand with him when the Freeman & de Meillon book was being prepared (1950-1952). André Moutia and Lucien Jean Vinson, collectors of the specimens, were longtime entomologists in Mauritius and we suspect that *Simulium ruficorne* - though not common - was probably quite well known to them and others in Mauritius from the 1930s onwards; Orian's (1962: 8) comments on the species in his list of Mauritian Diptera seem to suggest so - "Adults sometimes in swarms at sunset. Larvae in stagnant pools and in streams with scarcely any flow attached to filaments of *Spirogyra* [a habit common with *ruficorne* in other areas]; pupae on small stones", and also "females which are sometimes gorged with blood feed on poultry and sparrows. The species is suspected to transmit fowl pox disease in Mauritius".

Lastly, reference should be made to the simuliids collected in 1974 by the Austrian Hydrobiological Mission to the western Indian Ocean archipelagos (Seychelles, Comoros and Mascarenes). Mauritius was included in the Mission's itinerary and freshwater macro-invertebrates were obtained from 30 widely distributed sites sampled between 27 April and 8 May (Starmühlner, 1979: map and site descriptions). Simuliids were unexpectedly rare and Starmühlner (1976: 122) reported that "It was astonishing and surprising to find that the larvae and pupae of Simuliidae, typical of strong current in waterfalls and cascades, were always very rare, in small numbers, or absent". This scarcity was reflected in the minimal quantity of simuliid material sent by Starmühlner to RWC for identification (1975). Only three specimens, all immature larvae of *S. ruficorne,* were collected, each from a separate site. These are previously unpublished records and the data are as follows: Site 11 - Chemin Grenier, south coast, R. Gallets at confluence of rivulet Jacot and ruisselet Fay d'Herbe, 130m, 1.v.1974; Site 12 - South coast, NE of Chemin Grenier, R. Patates, on southern slope of Piton Savanne in Savanne Mountains, 220m, 1.v.1974; Site 16 - upper course of Poste river, on Grand Bassin Road between Le Petrin and Grand Bassin, 700m, 2.v.1974.

The JBD material from Mauritius

The Davies sampling sites and the species obtained at each are as follows: (Pupal exuviae examined shown by numbers in backets)

(1) Pamplemousses, drainage channel in Botanical Gardens, c. 10 km NE of Port Louis, 20^{0}05'S/57°35'E, 23.iv.1991

Simulium adersi - 1(+3) pupae.

Simulium ruficorne - 99 larvae, 12(+1) pupae, two females (reared)

(2) River Gauga Talao, 1 km W of Grand Bassin Lake, at bridge on road from Maccachace Reserve, 20^{0}25'S/57°25'E, 25.iv.1991

Simulium adersi - 1 larva.

Simulium ruficorne – 3 larvae, 1(+2) pupae

Simulium triplex - 5 larvae, 6(+5) pupae.

(3) Near Piton Grand Bassin, ditch on Le Petrin to Chamarel road, 20^{0}27'S/57°27E, 25.iv.1991

Simulium ruficorne – 5 larvae, 6 (+1) pupae, :2 females.

Simulium triplex - 1 larva (mature, pharate pupal gill identity check)

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*The original material of *S. diversipes* comprised one female and six male syntypes, data 'Rodriguez Island, viii-xi.191B H.J.Snell and H.P.Thomasett'. Two males and the female are in the Natural History Museum, London, and one of the males has earlier been designated lectotype by RWC (Crosskey in Crosskey & Lowry, 1990). The other four males remain unlocated.

BOOK NOTICE

A new Monograph on Blackflies of Brazil.

The following is the publisher's style of citation.

> Anthony J. Shelley, Luis M. Hernández, Marilza Maia-Herzog, Antonio P. A. Luna Dias & Paulo R. Garritano. 2010. The Blackflies (Diptera: Simuliidae) of Brazil. In: Arias, J.R., Golovatch, S., Wantzen, K. M. & E. Dominguez (Eds.), Aquatic Biodiversity in Latin America (ABLA). Vol. 6. Pensoft, Sofia-Moscow, 821 pp.

The book describes in English the adults and pupae of the 80 species found in Brazil and provides keys (in English Portuguese and Spanish) for their identification. It is comprehensively illustrated, set wherever relevant in a wider Neotropical context, and includes maps showing species distributions ad the main features of the Brazillian environment.

[Anyone wanting further information should conact Lius Hernández. E-mail: luih@nhm.ac.uk. Postal Address: Department of Entomology, The Natural

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India
skashyap28@yahoo.co.in.

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72070 Tübingen,
Germany
j.gwald@yahoo.de