



Collection of Aquatic Insects, namely Simuliidae (Black Flies)

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## **Introduction.**

Black flies (Simuliidae) were first collected from Vanuatu in 1903, from Port Sandwich, Malekula. Related to black flies of Fiji, they were both thought to constitute an unusual group, not related to any other black fly in the region and hence they were placed in their own subgenus - *Hebridosimulium*. It is now apparent that they are related to a subgenus that is widespread in the Philippines and Indonesia, namely *Wallacellum*, but there is nothing in between Vanuatu and those more western localities.

While collections of *Hebridosimulium* from Vanuatu have been made in 1971 by the Royal Society, London, and by the present investigator in 1982, the material taken then is not in good enough condition to do more modern analyses, such as molecular and cytological (chromosomes) to determine the detailed relationship between *Hebridosimulium*, *Wallacellum* and other such groups in the western Pacific. Hence the present collection effort.

## **Methods.**

Islands collected from, in order, between 22nd August and 9th October, were Santo, Vanua Lava, Malekula, Epi, Ambrym, Santo, Ambae, Pentecost, Erromango, Tanna and Efate. In any island, streams, rivers and cascades were located through advice from locals, with care being taken to obtain permission from land owners. In general because of time constraints and damage to trails by recent cyclones, localities visited tended to be of low altitude and on the periphery of the island. Maewo and Aneityum were not visited because of air flight schedule changes and time constraints.

At any site a standard protocol was followed. The fastest water was located and leaves and roots trailing in the water examined for the presence of black fly larvae and other aquatic insects. Further, the rock substrate was brushed while holding a fine net downstream. Any specimens taken were preserved in 98% ethanol (ETOH) for morphological and molecular analysis and, if enough material was available, some was preserved in Carnoy's fixative (1:3 of glacial acetic acid to 98% ETOH) for cytological (chromosome) analysis.

Physical parameters recorded (Table 1), were GPS (lat. & long.), air and water temperature, water conductivity and pH, general character of the river and the water velocity noted, and photographs taken. Names of some localities presented problems as they were various and have changed over the years, so the latest one, if available, was recorded.

## **Results.**

*General:* Black fly larvae were found on all islands visited except those of Ambrym, Epi and Ambae. For the later, this is perhaps expected, since locals on the island were quite definite that there was no running water except during the rainy season, and certainly none during this visit. Ambrym may well have black flies, however, no suitable streams could be visited and also the ash layer all over the island may well preclude black flies. In Epi a single caddisfly larva (Trichoptera) was found in the Rovo Bay village water source at high altitude. The black flies on Pentecost, although from only a single river, are a new record for that island.

*Biting:* There are only three records of black flies biting humans in Vanuatu. Two are from Santo, one is anecdotal from the 1971 Royal Society expedition, the other can be confirmed by the present investigator from 1982. The third was from Aneityum in the 1930's. But, nowhere in Vanuatu did anybody seem to be aware that there were Simuliidae in the running water. Indeed, at Mele Cascade, the number of larvae is astronomical, but no one ever appears to have been bitten! Hence, there is no common name for black flies in Vanuatu, although it was suggested that in Bislama they would be referred to as "Black little fellas". So, unlike black flies in other parts of the world, in Vanuatu they clearly do NOT constitute a nuisance problem.

*Water:* In general, running water habitats in Vanuatu appear to be in relatively pristine condition, however, by definition these were the type of habitat sought out. Since much of the running water flows over uplifted fossil coral beds, the water tends to be very hard with much dissolved material (see conductivity, Table 1). Water in Vanua Lava was the least hard, with that of Efate being amongst the most hard and actually forming travertine terraces by depositing calcium carbonate. Hence, the wonderful pools and terraces at the Ewor River (La Cressioniere) and particularly those of Mele Cascade.

*Other insects:* High velocity water required by black fly larvae tends to preclude other aquatic insects, so few other groups of insects are normally encountered. Still, midge larvae (Chironomidae) were almost always encountered in all habitats examined as were the unusual aquatic lepidopteran (moth) larvae - widespread in the western Pacific. Caddisflies (Trichoptera) were only found twice in Vanuatu, once in the spring that is the water source for Rovo Bay, Epi (one larva only), however, they were common in the right branch (looking upstream) of the William River, Erromango (two different types). Of particular note is that a single larva of a Mayfly (Ephemeroptera) was also found there - and nowhere else in Vanuatu. It is not known if these are new records for Vanuatu - that will need to be ascertained, however, it attests to a higher biodiversity in the Williams River, than elsewhere in Vanuatu.

Overall the aquatic insect fauna of Vanuatu is depauperate (low diversity), but this is normal for tropical Pacific islands distant from continental land masses.

### **Further work**

Taxonomic analysis of the black fly larvae collected will commence in January 2005, on my return to Canada. A final formal report on the collection should be available by July, 2005. The first scientific (taxonomic) publication should be in press by the end of 2005. Probably at least two other publications will arise from the material collected, one on molecular analysis the other based on chromosome analysis. Copies of the final report and any scientific publications will be provided to the Environmental Unit.

After examination and identification, subsamples of the larvae will be deposited with the Environmental Unit. These will be fully labeled, in glass vials with 98% ethanol and impervious stoppers. This should provide permanent preservation.

Douglas A. Craig

7th October, 2004  
Port Vila, Efate,  
Vanuatu.