dangerous: slippery and deep. Always gloomy (Fig. 6) and distinctly primeval. Simuliid larvae were almost always found on trailing vegetation, rarely on boulders.

Amongst the major hikes we did was one of over eight hours to get to a place called Sawyers Beach on the northern side of the island. There there is a stream with cobble substrate (Fig. 7): unusual for Stewart Island. And guess what - a new species - the larvae of which appear to like cobble. But, we did know about it already – it's why we went. What was most surprising was that larvae occurred on the stones right down to high tide mark. They must be killed when there is a storm though – simuliid larvae cannot tolerate even brackish water for long.

So that is pretty much it for collecting expeditions to New Zealand for *Austrosimulium*. Now it is a matter of completing the strict taxonomic work, doing a reconstructed phylogeny based on morphology and see if we can make sense of it in relation to historical biogeography and writing it all up. Phew! Sometime towards the end of 2011 it may appear as one of the Fauna of New Zealand monographs published by Landcare Research Inc. Then later there may well be papers on the molecular analysis and that of the chromosomes.

Oh, above I mentioned the wine, sorry I forgot the cheese – to die for.....

****

In search for dolichopodid flies in southern Ecuador: the true story

by Marc Pollet

Dept Entomology, Royal Belgian Institute of Natural Sciences,
Brussels, Belgium
&
Research Group Terrestrial Ecology, Dept Biology, Ghent University,
Ghent, Belgium; mp@iwt.be

Having roamed Costa Rican rainforests three times since 2003, last year I thought it was time to broaden my Neotropical horizon and embark upon an expedition to some other Central or South American country in 2009. All of the countries in this part of the world are really interesting to me, but French Guiana, Chile, Surinam and Nicaragua had some assets that made them valuable candidates. My final destination, however, came from a totally different direction. In April 2007, my colleague and friend Maurice Leponce (ant specialist at the RBINS[1], maurice.leponce@naturalsciences.be) told me about his intentions to inventorise and monitor the insect fauna of the Podocarpus National Park and the adjacent Reserva Biológica San Francisco (RBSF) in southern Ecuador (see further). Early 2008 plans turned from hypothetical to realistic as Podocarpus NP had been proposed as a candidate non-European ATBI+M[2] site in the frame of Work Program 7 (WP7) of EDIT[3] which created a suitable basis for a coordinated action. We are still waiting for a Memorandum of Understanding (MoU) to be signed between EDIT WP7 and DFG RU-816[4] - which co-runs the Estación Biológica

[1] Royal Belgian Institute of Natural Sciences (Brussels, Belgium)
[2] All Taxa Biodiversity Inventory + Monitoring
[3] European Distributed Institute of Taxonomy (http://www.e-taxonomy.eu/)
[4] Deutsche Forschungsgemeinschaft Research Unit 816

San Francisco (ECSF[5]) within the RBSF. But that did not stop us from executing our plan. So in February 2009, a team of 8 primarily Belgian entomologists (Fig. 1) headed for southern Ecuador in search for ants, termites and long-legged flies. My wife, Anja, and I planned to reside most of our time (February 11 – March 7, 2009) at the ECSF, only to escape twice for two days to a lodge near Zamora and Vilcabamba that offered somewhat more privacy (for Anja) and new collecting sites (for me). But first let me introduce the Podocarpus National Park and RBSF.

Figure 1. Non-Pollet members of the Belgian EDIT-team (from right to left: Maurice Leponce, Nina Wauters, Yves Roisin, Justine Jacquemin) and Tati – my favorite local driver/friend)

The **Podocarpus National Park** is the southernmost national park in Ecuador, situated in the provinces of Loja and Zamora-Chinchipe (Fig. 2). It was created in 1982 to shelter the largest remaining forest of tree species of the genus *Podocarpus*, the only native conifer in the Ecuadorian Andes. The park spans 1,463 km² between appr. 900m and 3700m above sea level (asl) and encompasses at least 6 life zones: montane humid forest, low montane humid forest, very humid montane forest, very humid premontane forest, very humid lowland forest, and páramo. In Ecuador, Podocarpus NP is regarded as unique due to both its high biodiversity and the high degree of endemism of its fauna and flora. This seems to be explained by its position within a centre of endemism and at the border of another centre, and its wide altitudinal range. Further more, the Podocarpus PN is also situated within an Andean depression (Amotape-Huancabamba zone), which creates a corridor for species to interchange between the dry western areas, the central and northern Andes and the Amazon

[5] Estación Científica San Francisco

region. Thus far, 260 butterfly species, 600 bird species, over 40 mammals, and appr. 4000 vascular plant species (of which 40% endemic) have been detected here, but information on some dominant insect orders like Coleoptera, Hymenoptera and Diptera is almost entirely lacking. It can be assumed, though, that the park also harbours an unprecedented species diversity of beetles, bees and wasps, and flies.

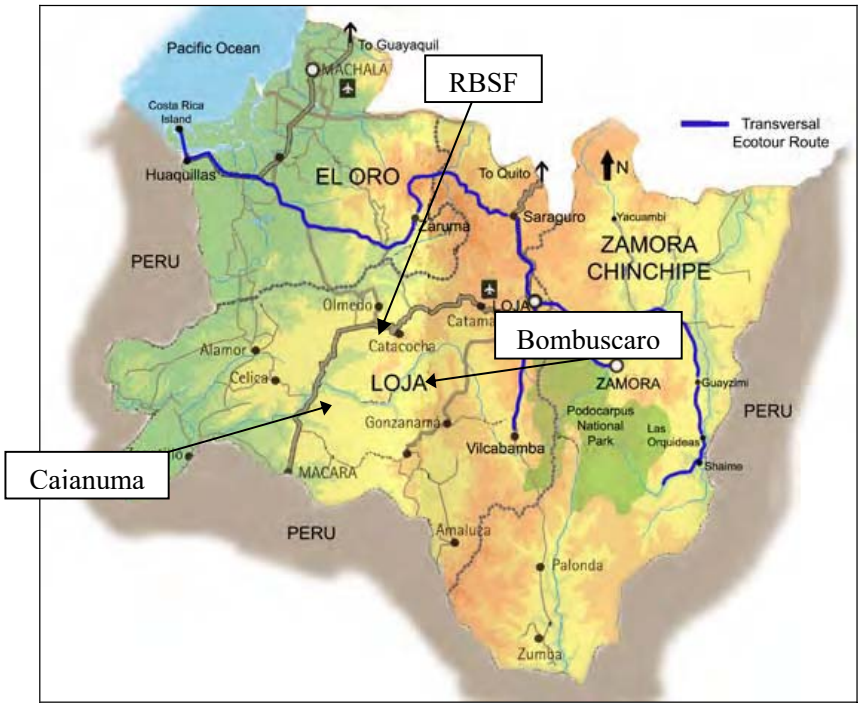


Figure 2. Southern Ecuador with the Podocarpus National Park and the three sampling locations indicated

The Podocarpus NP has three entrances, two of which are frequently used. **Bombuscaro** (Fig. 2) is situated at ~ 1000m asl, south of Zamora in the Oriente (prov. Zamora – Chinchipe). Zamora is easily reached by bus (twice an hour a bus passes by but generally stops at the slightest waving gesture) and costs only 1.25 US$. In Zamora, a taxi takes you to the parking lot (4-5 US$), where only an up- and downhill road (20 min.) separates you from the actual entrance of the park.

Cajanuma (Fig. 2) at ~ 3000m asl is situated south of Loja (prov. Loja) on the road to Vilcabamba (see further). Again, a bus brings you to the Loja bus terminal (1 US$) where a taxi takes over until the guard post at about 2750m asl. This is more pricy (10-15 US$), but you'll understand why, once you made the 8 km bumpy and winding drive up from the entrance … in a non-4WD vehicle. At both sites, you best ask the cab driver to pick you back up at a certain time (it worked for us all the time, except in Vilcabamba). Or … when residing at the ECSF, one of the drivers can take you there – while getting acquainted – for 0.10 US$/km.

At the northern border of the Podocarpus NP settles the ECSF within the **Reserva Biológica San Francisco** (RBSF) (Fig. 2). The RBSF occupies 11km² of montane habitats between 1800m and 3160m asl. Since 1997, a conglomerate of German research groups currently known as the Deutsche Forschungsgemeinschaft Research Unit 816 (**DFG RU-816**) have been investigating the RBSF and the Podocarpus NP. Beck *et al.* (2008) present an excellent overview of the past and on-going research

projects. Insect biodiversity here too is astonishingly high, as illustrated by over 1250 species of Geometridae (Lepidoptera), recorded by Brehm *et al.* (2005). Moreover, not only yielded this combined effort an unrivaled data set on both the biotic and abiotic compartments (essential to understand the functioning of the montane rainforest ecosystem), but at the same time updated and extended the station facilities considerably. Both features guarantee researchers to work in the very best conditions possible.

So on February 11, we took the train – in an excellent mood - from our home town to the Schiphol airport (Amsterdam – The Netherlands) only to find out that the KLM flight was overbooked and we might be asked to stay the night over in a nearby hotel! That did not exactly fill me with delight, I must say. Fortunately, it turned out all right in the end and at the gate, we joined Nina, one of our EDIT-team mates (Fig. 1). After stops in Bonaire, Guayaquil and Quito, on February 12 in the late afternoon we took off with TAME to Loja (actually, the airport is situated near Catamayo, 40 km northwest of Loja) where Robert (one of the ECSF drivers) was waiting for us. It took us another 65 km to finally reach the ECSF, which is situated along the road between Loja and Zamora (Fig. 2).

Figure 3. The Estación Científica San Francisco

The ECSF (http://www.tropicalmountainforest.org/; Fig. 3) is, indeed, a fairly large scientific facility that can easily house over 30 scientists (at the end of our staying, the population grew to a crew of 37 field researchers – although some of them seemed mainly involved with theoretical studies). Jörg Zeilinger and dr Felix Matt are the two (German but local) coordinators who take care – in turns – of practical day to day issues. The station encompasses an excellent infrastructure with a computer room, labs, drying rooms, dormitories, a patio, porches, washing machines, and a large kitchen where an

Ecuadorian team/family of very warm-hearted people (Maria, Rocio, Diana and others) daily serves the most wonderful and tasty meals (I hardly lost some weight while some others even …). Three drivers (Tati, Robert, and Abraham) are almost permanently standby to bring researchers to the Podocarpus NP. The station is actually situated in the middle of nowhere and the nearest village (Sabanilla) is not much more than some houses lining up along the main road. Groceries and other stuff (I can truly recommend the local Ron San Miguel 5 años – about 6 US$) must be purchased in a small supermarket in Zamora or the Supermaxi supermarket in Loja. Fruit and vegetables are plentiful, fresh and sometimes unknown at local markets (Fig. 4).

Figure 4. Fruit stand at market in Zamora

Nearly all members of the EDIT-team arrived on February 12 (more or less). While the others looked for ants and termites at different altitudes between 1000m and 2500m asl, and set up field experiments, Anja and I started collecting flies, mainly Dolichopodidae. The goal of our survey was multifold as I wanted to find answers to the following questions related to the local long-legged fly faunas:

1. How high is the **dolichopodid species diversity** in the southern Ecuadorian Andes?
2. What is the **impact of altitude – habitat type** on the species diversity and community structure?
3. What are the **ecological** characteristics of the different dolichopodid species?
4. What is the **vagility** of the different species in the field?
5. How do **biodiversity patterns** observed here relate to patterns from similar faunas in other South and Central American countries?

To gather the necessary information, both traps and sweep nets were used. As for the continuous sampling, the following strategy was applied:

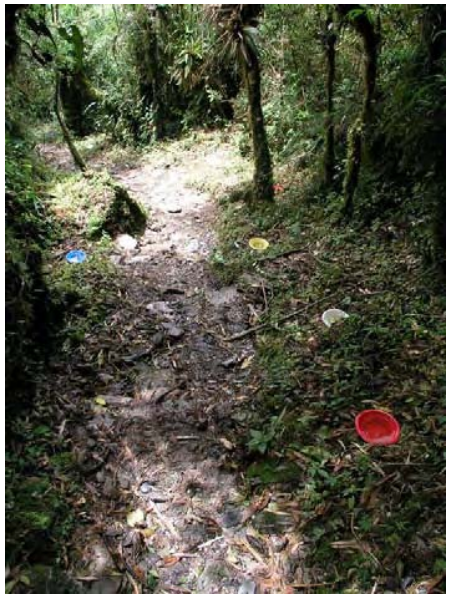
- Flies were collected in **three life zones** at three altitudes: premontane rainforest at Bombuscaro (~1000m asl)(Fig. 5), lower montane rainforest at the RBSF (~2000m asl)(Fig. 6) and upper montane rainforest or cloudforest at Cajanuma (~3000m asl)(Fig. 7);

Figure 5. Podocarpus National Park at Bombuscaro (~1000m)

Figure 6. The Reserva Biológica San Francisco (~2000m)

Figure 7. Podocarpus National Park at Cajanuma (~3000m)

- Traps were installed at all three locations as soon as possible upon arrival (February 13-15). At each location, three sampling sites were selected: a primary site (**PR**), and two supplementary sites (**S1**; **S2**).
- The basic set-up per primary site (**PR**) consisted of 1 Malaise trap (MT: Fig. 8), and 4 units of 10 pan traps (PT) of 4 different colours (yellow, white, blue, red: Fig. 9). Collecting jars of Malaise traps were filled with 75% alcohol solution, whereas 5% formaline solution (= 2% formaldehyde) with detergent was used as fixative in the pan traps.



Figures 8-9. At Cajanuma. 8. Malaise trap 9. Pan traps of different colours

- In each of the supplementary sites (at least **S1** and **S2**), one unit of 10 yellow pan traps was in operation in order to gather information on the representativeness of the primary site. In the RBSF, two additional supplementary sites (**S3**; **S4**) were involved in the program.
- In each site, PT were placed as much as possible in well-lit spots at the edge of trails or in the forest in order to optimize the collection of flies. Each of the Malaise traps was installed over a small stream (quebrada), perpendicular to the stream's course.
- Traps were operational during a total period of 18-19 days and serviced/emptied after every 5-7 day sampling period (to secure the yields from disturbance or heavy rainfall). During servicing, yields of five traps of the same colour were pooled; each servicing thus produced two samples per **Sx** site and eight per **PR** site. The formaline solution in the pan traps was recycled and re-used with a slight adjustment of the concentration after rainy periods.
- A total of three Malaise traps and 200 pan traps were in operation during most of the sampling period. Apart from two traps that were washed out by the rain in Cajanuma and the Malaise trap in Bombuscaro that looked like chewed upon by mammals, no disturbance was reported and the campaign could be considered a real success. The only thing that is less certain are the dolichopodid yields, but time will tell.

In addition, at each site Dolichopodidae were actively collected with **sweep nets**. Podocarpus NP at Bombuscaro was sampled with sweep nets during 6 ocassions, and at Cajanuma during 4, whereas the nearby RBSF was explored with sweep nets 8 times. Special attention was drawn to some microhabitats with a specialized dolichopodid community like seeps, springs and small streams (quebradas), water falls (cataratas: Fig. 10) and bolders in rivers (Fig. 11). In contrast, tree trunks, another microhabitat of special interest, proved very poor in species (if any at all) and further attempts to sample them were ceased after repeated unsuccessful efforts.

Figures 10-11. At Bombuscaro. 10. Small waterfall 11. Small river

On one ocassion at each site, environmental variables (temperature, aerial humidity, light intensity) were also recorded. The results of this recording scheme must be treated with caution as we witnessed on a nearly daily basis that the weather conditions could change rapidly and substantially. Nevertheless, Cajanuma was considerably colder (14-15°C) than Bombuscaro and the RBSF (18-22°C).

The entire operation produced 3 Malaise traps samples and 118 pooled pan traps samples. All traps seemed to work as expected, and even the white traps (Fig. 12) were sometimes filled to the rim with all kinds of insects. In some cases, I got evidence that army ants passed by (well, "by" …)(Fig. 13).

Figure 12. White pan trap at the RBSF

Figure 13. Blue pan trap filled with army ants at Bombuscaro

In addition, a total of 200 (primarily dolichopodid) samples were collected with sweep nets, with 50, 94 and 23 gathered at Bombuscaro, the RBSF and Cajanuma respectively. The remaining 33 originate from two other sites we visited (see further). By far the most productive site - in terms of dolichopodid flies observed in the field - proved to be a tiny stream (seep) between site PR and site S4 in the RBSF (Fig. 14). Other species-rich or special habitats were the several quebradas (Bombuscaro, RBSF), muddy places (RBSF, Cajanuma) and rocky river banks with bolders (Bombuscaro, RBSF). Cajanuma was clearly different from the other locations due to the fact that its dolichopodid fauna was dominated by Sympycninae, whereas Dolichopodinae were most numerous at Bombuscaro and the RBSF. On the other hand, large Stolidosomatinae seemed entirely confined to the quebradas (also observed in Monteverde, Costa Rica).

Figure 14. Most productive dolichopodid collecting site at the RBSF

On February 22, after having collected flies at Bombuscaro – for a change -, we hiked back for 30 minutes to the Cabañas Ecológical Copalinga (http://www.copalinga.com/) down the road to Zamora, and stayed there for two days. Copalinga is – coincidently – owned by Catherine and Boudewijn, two bio-engineers from the University of Ghent (Belgium), who decided to change their life style completely. And they did a wonderful job (Figs 15). The lodges - with porch - are clean and rather spacy with a nice view into the garden, Catherine and Boudewijn are very hospitable and very much welcome researchers, and the food is just fantastic (worth at least one Michelin star, honestly!).

Moreover, their property (about 1 km²) of mainly primary rainforest along an altitudinal gradient from 950m to 1450m offers different interesting habitats and excellent opportunies for research. I collected along the quebradas which cross the trails at different altitudes as well as along the larger quebrada El Libano (Fig. 16) that borders their terrain, with good result. If you intend to visit Bombuscaro, I would certainly recommend to stay at least a couple of days at Copalinga, you won't regret it!

Figure 15. Lodge at Cabañas Ecológicas Copalinga

Figure 16. Cascades on the quebrada El Libano (Copalinga)

Another “hostería” that is equally worth staying at is Hostal Izhcayluma (http://www.izhcayluma.de/), 2 km south of Vilcabamba (Fig. 2) where we resided from February 27 until March 1. It is owned by two German brothers who succeeded wonderfully in keeping a family-like atmosphere. Here too, the lodges are spacy, clean and present a magnificent view on the nearby hill, or Vilcabamba in the valley. Looking over the Vilcabamba valley is also the view you get for free during breakfast with tasty home-made marmelade and bread (and more hearty stuff, por supuesto). There is also a small swimming pool to cool down; Vilcabamba is, indeed, substantially warmer than the other sites we have been. The terrain itself hardly offers interesting collecting sites although it’s worth trying. We did roam the garden in the early morning and late afternoon, and managed to collect 11 samples with a fair series of species that were not collected at Bombuscaro, Cajanuma nor the RBSF. Hostal Izhcayluma is certainly worth visiting as a breakaway from an expedition.

In the course of the third week of our survey, I started to consider the mission successful and nearly accomplished. I should have known better by now … As a matter of fact, one evening Jörg approached us and remarked that the ministery of environment had started a reorganisation unexpectedly. I frankly could not care less until he said that because of that, collecting and export permits could not be released. Did he get my instant attention!!! I had been contemplating before to return our clothes by mail in order to take the samples home ourselves, but this apparently proved impossible. As a result, on March 6, we left the station, empty handed sample-wise. To compensate the temporary loss, we took 7 bottles of rum home. Thank God and Justine Jacquemin (Fig. 1), el ministerio del ambiente accomplished its organisation earlier than I expected and Justine arrived home on April 12, carrying all EDIT samples, including mine (we waited for her at the airport, of course).

For various reasons, I have not yet been able to process many samples. On the ocassion of my birthday though, I treated myself with pulling invertebrates from some of the last Cajanuma pan trap samples. In the five finished thus far, the most diverse and abundant flies were Phoridae (Fig. 17), Mycethophilidae (Fig. 18), Empididae – Hybotidae (Fig. 19), and surprisingly, apterous and brachypterous Sphaeroceridae (Fig. 20). It occurred to me that apterous forms from other families appeared quite abundant too. Dolichopodidae, on the contrary, were far less numerous, but did comprise new Achalcinae species. This holds true for the RBSF fauna as well where Maurice Leponce collected a new achalcine species in September–October 2008 with yellow and white pan traps (Fig.21).

Figure 17. Selection of Phoridae from pan traps at Cajanuma

Figure 18. Selection of Mycethophilidae from pan traps at Cajanuma

Figure 19. Selection of Empididae - Hybotidae from pan traps at Cajanuma

Figure 20. Selection of Sphaeroceridae from pan traps at Cajanuma

Figure 21. New species of Achalcinae from the RBSF

Processing all samples will take several more months but at the end, and considering the particular sampling set-up, I am sure that I will be able to provide answers to the aforementioned questions. And I think that this might be the case for several other dipteran – and even coleopteran and hymenopteran – taxa as well. Anyway, colleague-dipterologists that currently make part of my regular exchange program can start being excited in anticipation of receiving the samples after the summer.

Looking back at these amazing 24 days in southern Ecuador, what stroke me the most next to the dazzling nature was the hospitality of the Ecuadorian people and their warm-heartedness. We appreciated the kind assistance and service by the drivers and cooks very much and even became true friends. We had the honour to be invited by Rocio and Tati at their home in Loja and to show our appreciation, we prepared dinner (including starters which seemed unusual to them) for the entire family. It was a wonderful night to remember. Rocio, Tati, Maria y su familia: les agradacemos muchísimo para su amistad y su hospitalidad, y la tarta de tres leches muy deliciosa (Fig. 22).

Figure 22. A token of true friendship (from left to right: Anja, Rocio, yours truly)

Also thanks to the EDIT-team for the nice company, also during the many lemon-rum parties. And to Justine in particular for bringing my "*precious*" home. And last but not least, I would like to express my sincere gratitude to my wife and partner, Anja, who kept on going (under permanent pressure, eh, stimulated by me), assisted me in a semi-telepathic way (Fig. 23) and shared both sunny and awefully rainy moments with me. I owe her big time for being at my side all the way and the expedition would not have been so successful without her. Thanks a lot, sweety!

Figure 23. “What exactly did you want me to hand over?” (Anja)

References

Beck, E., Bendix, J., Kottke, I., Makeschin, F. and Mosandl, R. (2008) Gradients in a tropical mountain ecosystem of Ecuador. *Ecological Studies* 198: 1-525.

Brehm, G., Pitkin, L.M., Hilt, N. and Fiedler, K. (2005) Montane Andean rain forests are a global diversity hotspot of geometrid moths. *Journal of Biogeography* 32: 1621-1627.