Flying in Africa – 9th International Congress of Dipterology, Namibia

Peter S. Cranston
Honorary Professor, Australian National University, Canberra

Introduction

In late November 2018, 300 aficionados of flies (order Diptera) assembled in Windhoek, the capital of Namibia, for the 9th meeting of the International Congresses of Dipterology (ICD), held for the first time in Africa.

So why Namibia? Our host, Ashley Kirk-Spriggs (Fig. 1), originally from Wales, had been employed in Namibia although was now based in the National Museum, Bloemfontein, in South Africa. Ash continues to expose truly unexpected elements in the fly fauna of this arid country. Fellow dipterists were enthusiastic to visit and participate in the meeting and to investigate the local biodiversity: many came early and/or stayed on later to explore.

The conference included the book launch of the Manual of Afrotropical Diptera (Fig. 2), a multi-authored total overview of the order, a decade-long in preparation but now with the first two volumes completed and free to download (or available at a modest price for hardback editions). Editors Ashley Kirk-Spriggs and Bradley Sinclair (Canadian Food Inspection Agency, Ottawa) obtained substantial sponsorship for the project, enabling appropriate inexpensive dissemination (see www.afrotropicalmanual.org for further details). Recall the high diversity of medically-significant flies in Africa and for this reason alone the widest community will welcome this authoritative work.

A second conference event bringing all delegates together was a public lecture introducing ‘the year of the fly’, that is, 2019. This was due to be presented by Steve Marshall, author of the magnificent and definitive ‘Flies: The Natural History and Diversity of Diptera’ (2012, Firefly Books). However, Steve was unable to attend, and at very short notice his Canadian colleague Jeff Skevington (Canadian National Insect Collection, Ottawa) took over the presentation accompanied by Steve’s beautiful photographs.
The scientific sessions

With four concurrent sessions it was not possible to attend all the presentations that I would have wished, so I’ll start with acknowledging some I missed. First, a session on forensic entomology - thanks to CSI, we all know that fly larvae play an important role in decomposition. Molecular techniques and new analytical tools are making rapid advances in this field, as reviewed by plenary speaker Martin Hall (Natural History Museum, U.K.). I regretted also missing Adrian Pont’s (Oxford University Museum of Natural History, U.K.) tribute to the life of the late Roger Crosskey, an honorary member of the ICD (see obituaries in Antenna 42: 87–93 and Zootaxa 4455: 35–67).

Dipterists are at the forefront of entomological phylogenomic studies and several sessions and posters were concerned with both ‘new’ results and methodological issues. A trite summary of these many presentations is that well-established evolutionary relationships, including those established on morphological data from all life stages, can be robust and appear also from mega-molecular datasets. Addition of the remarkable amount of novel data from genomics can lead to better support for traditional relationships, new insights, and yet can fail to provide guidance in areas of contention. Thus, more data are not necessarily better and we need insights into which subset of genes ‘works best’ and why conflicts remain and how to deal with them. The student prize-winner (see below) addressed some of these methodological issues.

By no means were systematists the dominant contributors. A fascinating half-day session concerned the biology and diversity of the frog-feeding flies (Corethrella, family Corethrellidae, and Syconex, family Psychodidae). The females of these flies are mandibulate and feed on the blood of amphibians, with Corethrella locating their hosts by ‘voice recognition’. The session was co-organised by Ximena Bernal (Purdue, USA) who in summary addressed the critical question of how the flies actually ‘hear’ their hosts calling. All other known insect ‘hearing’ morphologies can be eliminated, not least by the very small size of the flies with respect to the wavelength of the sounds that they respond to. An international, especially Brazilian, assembly of researchers assured the
audience that there is much unexplored diversity and studies must continue, including those by herpetologists. Coincidentally, during the meeting I was sent an image from an Australian herpetologist showing a hylid frog covered with Sycorax flies (Fig. 3). There remains much to be discovered in this world-wide special association.

Several interesting fly-plant interactions are well studied in southern Africa, including both pollination syndromes and phytophagy. An excellent plenary talk by Netta Dorchin (Tel Aviv University, Israel) on the potentially enormous taxonomic and ecological diversity of the Cecidomyiidae (gall midges) prepared us for presentations that included galling of the hyper-radiation of southern African succulents belonging to the family Aizoaceae. Genomic studies suggest that the astonishing species-richness of gall midges may be true of many other groups, some unexpected based on their morphological uniformity. Under the term ‘open-ended’ taxa, presentations on such megadiverse groups, and how to study them, were provided by several speakers.

A fascinating session convened by Kurt Jordans (Royal Museum for Central Africa, Tervuren, Belgium) concerned long-probosics flies and nectar-producing native flowers with long tubes or spurs. These ‘long-tongued’ flies belong to the families Nemestrinidae and a part of the austral radiation of the Tabanidae (horseflies). These ‘coevolutionary systems’ have been studied especially in southern Africa in seasonal rainfall areas of both western (summer dry) and eastern (summer wet) vegetation. However, an iconoclastic study in Cameroon presented by Ximo Mengual (Alexander König Museum, Bonn, Germany) showed that pollinator dynamics may be more ‘fluid’ than expected by ‘coevolution’: long-spurred plants may have sequential visitors. An Impatiens (balsam) species is visited early in the day by a short-probosics syrphid when the spur is replete with nectar, but later in the morning an Apis (honeybee) drinks from the now half-empty spur. After noon, the deplored spur provides nectar that is accessible only to the long-tongued hoverfly Rhingia meyrom – yet all three visitors can pollinate. The generality of this requires further study but undermines the Darwinian view of an evolutionary ‘arms race’ between the plant and ever more specialised pollinators.

Another presentation, fortunately without associated olfactory delights, reviewed the diversity of flowers that produce luring smells of faeces, carrion, roadkill and the like. This is well known in the ‘stapelid’, a group of stem succulents popular amongst cactus and succulent horticulturists. They will know of the odour (giving rise to the name ‘carrion flowers’) and the range of blowflies and relatives lured to them. In the genus Ceropogia, the trap flowers are solely pollinated by flies, using a lock-and-key system that lures, traps and then releases the pollen-laden flies. The system involves only chemical mimicry with no reward provided.

Staying locally, one of the major tourist attractions in the karoo vegetation of western South Africa (Namaqualand) is a mass spring flowering of multi-coloured daisies. Pollination is largely by flies, notably Megalopterus capensis, a bombylid, with no bees involved. But what pollinates the invasive Namaqua daisy (Arctotis calandula, ‘capeweed’) on Australian roadsides verges and grasslands, in the absence of the specific bee? There is an honours project awaiting.

The prize-winners

The winning student talk from amongst many high-quality presentations was by Jessica Gillung (University of California, Davis) (Fig. 4) for “Phylogenetic relationships of spider flies (Acroceridae) and the perils of phylogenomics”. Runner-up was her fellow Brazilian Diego A. Fachin (Universidad de Sao Paulo), with “A phylogeny of Sarginae (Stratiomyidae) – monophyly, new characters, species-rich genera and the problem of the Chrysoclininae/ Herminiae”.

From a large field, the poster competition was won by Isabel C. Killion Salas (Alexander König Museum, Bonn, Germany) with “Barcoding Dipteran pollinator networks in agroecosystems”, and the runner-up was Xuankun Li (Australian National Insect Collection, Canberra, Australia) with “Towards a revision of the Bombbyliinae of Australia” (Fig. 5).

In the photography contest, Ana Goncalves (Centre for Ecology, Evolution and Environmental Changes, Lisbon, Portugal) won with “Anahydrophorus cinereus” (Dolichopodidae) feeding on an amphipod” (Fig. 6). Steven Gaimari (California Department of Food and Agriculture, Sacramento) was awarded 2nd place for “Male of Notothybus longicolis (Notothybidae) from Sabah, Malaysia” (Fig. 7) and Nathan Butterworth (University of Wollongong, Australia) was 3rd for “Acridophagus paganicus (Mythicomyiidae) from Hobart, Australia” (Fig. 8). This latter fly was of particular interest in that it was re-encountered for the first time in 100 years to the day!

In conclusion, this fascinating meeting attracted geographically and scientifically diverse participants, notably from Brazil (well represented among the prize-winners) and from throughout sub-Saharan Africa. Fly research was showcased across the continent, worthy publicity was provided for the new regional Manual, and the ‘year of the fly’ was introduced. The scientific content was exceptional, due to a cadre of organisers for the many sessions. Congratulations especially to Ashley Kirk-Spriggs for all aspects of his bold and successful decision to stage such a meeting in Namibia. We look forward to the next meeting, to be hosted in California (or just over the border in Nevada) during a cooler month in 2022.

Acknowledgements

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