The IX International Congress of Dipterology, Namibia

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In late November 2018 three hundred or so dipterists assembled in Windhoek, the capital of Namibia for the 9th meeting of the International Congress of Dipterology (ICD), held for the first time in Africa. Our host, Ashley Kirk-Spriggs (Fig. 1) originally from Wales and now back in the UK at the Natural History Museum has a remaining affection for Namibia where he had worked, and 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 investigate the local biodiversity: many came early and / or stayed on later to explore.

During the conference the *Manual of Afrotropical Diptera*, a multi-authored total overview of the order, was formally launched (Fig. 2). This was a decade-long in preparation is available at a modest price for hardback editions, snd free to download. Editors Ashley Kirk-Spriggs and Bradley Sinclair (Canadian Food Inspection Agency) obtained substantial sponsorship for the project allowing appropriate inexpensive dissemination (see http://afrotropicalmanual.org/ for further details). Given the high diversity of medically-significant flies in Africa, for this reason alone the widest community will welcome this authoritative work.

A second conference event bringing all delegates together was a public lecture to introduce 2019 as 'the year of the fly'. This was to be presented by Steve Marshall, author of the magnificent and definitive *Flies: The Natural History and Diversity of Diptera* (2012, Firefly Books), but Steve was unable to attend with a late-breaking medical issue. At short notice Canadian colleague Jeff Skevington (Canadian National Insect Collection, Ottawa) took a break from birding (with the author) and took over the lecture accompanied by Steve's beautiful photographs. At the time of writing this report, Steve's health has improved enough to take study leave in Australia.

The scientific sessions

With three 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 fly larvae play an important role in decomposition. Molecular techniques and new analytical tools are advancing fast this field as reviewed by plenary speaker Martin Hall (Natural History Museum, U.K.). I regretted also missing Adrian Pont's (Oxford Museum, U.K.) tribute to the life of the late Roger Crosskey, an honorary member of the ICD (see Obituary *Antenna* 42: 87-93).

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 may not be better so we need insights into which subset of genes 'work best', why conflicts remain and how to deal with them. The student prizewinner (see below) addressed many 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 *Sycorax*, family Psychodidae. The mandibulate females feed on the blood of amphibians and those of *Corethrella* locate 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 locate ('hear') their host calling. All other known insect 'hearing' morphologies can be eliminated, not least by the diminutive 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, including by herpetologists, must continue. Coincidentally during the meeting I was sent an image from an Australian herpetologist showing a hylid frog covered with *Sycorax* flies (Fig. 3) – which seem little known on this continent. There remains much to be discovered in this world-wide special association.

The range of interesting fly-plant interactions is well known 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 later 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 because of their morphological uniformity. Under the term 'open-ended' taxa, presentations on such megadiverse groups, and how to study them, were provided by several authors.

A fascinating session convened by Kurt Jordaens (Royal Museum for Central Africa, Tervuren, Belgium) concerned long-proboscis 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. An iconoclastic study presented by Ximo Mengual (Zoologisches Research Museum, Bonn, Germany) showed that pollinator dynamics in Cameroon 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 probosciis syrphid while the spur is replete with nectar, but later in the morning an *Apis* (honeybee) drinks from the by-now only half-filled spur. After midday, the depleted spur provides nectar that is accessible only by the long-tongued hoverfly *Rhinia mecyana* -
yet all three visitors can pollinate. The generality of this requires further study, but evidently this undermines the Darwinian view of an evolutionary 'arms race' between the plant and ever more-specialised pollinator.

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 'stapeliads' a group of stem succulents popular amongst cactus and succulent horticulturalists. They will know of the odour (giving rise to the name 'carrion flowers') and the range of blowflies and relatives lured to them. In genus Ceropogia, the trap flowers are pollinated solely by flies, using a lock-and-key system that lures, traps and then releases 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 springtime flowering of multi-coloured daisies. Pollination is largely by flies, notably Megalopus capensis, a bombylid, and no bees are involved. But what pollinates the invasive Namaqua daisy (Arctotheca calendula, 'capeweed') so abundant in Australian roadsides verges and grasslands, in the absence of the specific beefly? An honours research project is waiting.

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

From a large field, the poster competition was won by Isabel C. Kilian Salas (Zoologisches Research 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 Bombyliinae of Australia” (Fig. 5).

In the fly photography contest, Ana Gonçalves (Centre for Ecology, Evolution and Environmental Changes, Lisbon, Portugal) won with “Anahydropus cinereus (Dolichopodidae) feeding on an
amphipod” (Fig. 6), Stephen Gaimari (California Department of Food and Agriculture, Sacramento) was awarded 2nd place for “Male of Nothybus longicollis (Nothybidae) from Sabah, Malaysia” (Fig. 7) and Nathan Butterworth (University of Wollongong, Australia) was 3rd for “Acridophagus pagonicus (Mythicomyiidae) from Hobart, Australia” (Fig. 8). This latter fly was of particular interest in that it was re-encountered the first time in 100 years TO THE DAY!).

In conclusion, this fascinating meeting attracted geographically and scientifically diverse participants, notably from Brazil (highly represented among the prizewinners) and from throughout subsaharan Africa. Fly research was showcased across the continent, worthy publicity 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 this 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 one of the cooler months in 2021.

Acknowledgements
I thank the Royal Entomological Society particularly Lin Field (Publications Officer) for supporting my registration associated with the promotion of two 'virtual' issues for the meeting. One issue showcased Diptera papers in Systematic Entomology, the other included two papers each from the remaining RES entomological journals. These promoted the full range of our journals to the wide Dipterological community, with all papers free to view and download from bit.ly/diptera. Many people willingly providing images, particularly the three winners of the photographic competition, as did Adrian Pont.

Figures 6-8. Photographic prize winners, see text for details

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