

THE CERATOPOGONIDAE INFORMATION EXCHANGE

The CIE, issued twice a year (no subscription fee), was begun in 1967-68 as a newsletter to facilitate communication among workers interested in the Ceratopogonidae. The format is extremely flexible. Contributions may be of any length and deal with any subject having some bearing on the study of ceratopogonids. For example, contributors may report their current interests or plans, observations or techniques of probable value to the readership, requests for addresses, study material or reprints, or any other matter of concern. The newsletter serves also as a bulletin for planning and communicating information on meetings, symposia, workshops and so forth. Finally, there is in every issue a compilation of recent literature in the field. Any person(s) wishing to contribute to the newsletter or to receive future issues by email should contact:

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CIE No. 100! –December 2017 -The Ceratopogonidae Information Exchange Newsletter

Colleagues,

I hope that you will find something useful and interesting in this December, 2017 issue of the CIE Newsletter. This issue represents a milestone for us and I am excited to include a [contribution](#) from this newsletter’s founding Editor, John Boorman. The Recent Literature section contains 163 original research papers, reviews, reports and letters representing diverse research areas. I have included [figures with striking images](#) from three of these papers on the last page of this issue. “[The Dark Side of Light Traps](#)” review paper by McDermott and Mullens...I wonder if these authors planned for their paper to be published just prior to the release of the latest *Star Wars* film in the U.S.A.?

Many thanks to colleagues like Simon Carpenter who kindly sent material to be included in this issue. I think you will find Simon’s report from the Pirbright Laboratory, which includes information about the *Culicoides sonorensis* genome project, to be of interest.

Lastly if anyone is not listed in the [Directory of Workers](#), please send your contact information (or an update) to me. Lastly, please also send copies of your published papers, research summaries, requests for information, etc. to me for the May, 2018 issue by Friday, May 4th.

With Kind Regards and Best Wishes for a Merry Christmas,
 Steve Murphree, Nashville, Tennessee, U.S.A.

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New CIE Subscribers, Address Updates

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Obituary

In Memory of Roger W. Crosskey

From: Gert Venter



ROGER WARD CROSSKEY

1930 - 2017

Dear Fellow dipterists,

Daniel Whitmore has requested that we distribute the following message:

Many of you will have heard that former member of BMNH staff and entomologist Roger W. Crosskey passed away on the 4th of September (2017) after a brief period in hospital. [Roger was born in 1930 – Ed.]

He will be remembered for his outstanding contributions to dipterology, most notably on the biosystematics of Simuliidae and Tachinidae but also of other calyptrate families such as the Muscidae, Rhinophoridae and Calliphoridae. His works include several large monographs published in the Bulletin of the British Museum (Natural History) such as the taxonomic conspectuses of Oriental and Australasian tachinids. He was editor-in-chief of the Afrotropical Diptera

Catalogue and contributed chapters to the Afrotropical, Australasian and Oriental regional catalogues, which are still widely in use by the scientific community today, and is author of the cornerstone book on simuliids, "The Natural History of Blackflies". He was a respected biogeographer and a member of the management committee for the International Trust for Zoological Nomenclature.

Roger began his career as a medical entomologist for the Nigerian Ministry of Health (1951-1958), then worked for the Commonwealth Institute of Entomology (1959-1972) before joining the Natural History Museum. He started as head of the Hymenoptera section, then moved to Diptera as head of section before being promoted to Senior Principal Scientific Officer and spending his last years purely on research. He retired in 1990 but remained as a Scientific Associate until 2016.

He will be warmly remembered by former colleagues and friends and by all of those who are familiar with his scientific legacy.

[A contribution by Alan Cranston entitled, "Some reminiscences of Roger Crosskey" can be viewed on page 48 of the October, 2017 issue of Fly Times at: <http://www.nadsdiptera.org/News/FlyTimes/issue59.pdf> - Ed.]

The CIE Newsletter at 50 Years

John Boorman, Guildford, United Kingdom

Dear All,

As this is issue 100 of the CIE, perhaps a word about how it all started is appropriate, although after 50 years the exact details are a little hazy.

The idea was hatched during a (1967) visit to Denver, Colorado to see Bob Jones' setup for colonising *Culicoides*. We contacted Bill Wirth, Alan Dyce and anyone else who might be interested as soon as possible and the general opinion was that it was a good idea, but no one had either the time or inclination to take it further. However, following my return to Pirbright I decided to go ahead and wrote to as many colleagues as I could asking for their opinion and (hopefully) a short contribution about work in progress.

The results were gratifying with a number of positive replies, enough to make a good start. The letters were edited, copied onto stencils by one of our long-suffering typists, put through a duplicating machine, and finally dispatched. This was all in the days before computers and the Internet. Fortunately my Director turned a blind eye.

Regrettably, I no longer have any of the early issues; they would make interesting reading.

John Linley took over from me around 1986, and the CIE is now under the excellent stewardship of Steve Murphree. I know how difficult this can be, but Steve's job can be made easier if you all send in contributions. I am no longer actively engaged in midge work, but the CIE enables me to keep up to date. Thank you, Steve, and one and all for your contributions, past and present; best wishes and here's to the next 50 years!

John Boorman

email: john.boorman2@btinternet.com

[Please join me in thanking John Boorman for his initiative and management of this newsletter! – Ed.]

Announcements

2017 Biting Fly Workshop Reunion Meeting Report

Thanks to **past CIE Editor Dan Hagan** for submitting the photograph below of a gathering of old and new friends on a rather warm June day in Savannah, Georgia, U.S.A. Though collecting could have been better, the research reports and collegial conversations most certainly made up for it. [Editor].



2017 Biting Fly Workshop
Skidaway Island State Park
Savannah, GA
LIWC - June 24, 2017

Front Row (L to R): Nancy Hinkle, Kateryn Rochon, Natalie Wong, Amy Murillo, Gary Mullen, Bill Grogan
Back Row (L to R): Zell Smith, Alec Gerry, Caleb Hubbard, William Nicholson, Levi Zahn, Brad Mullens, Dan Hagan, Steve Murphree

Thanks also to **Brad Mullens** who, in going through his files before his June, 2018 retirement, sent the image below taken at the June 11-13, 1986 Biting Fly Workshop held in Knoxville, Tennessee. It is interesting to see how the four of us who attended both gatherings have changed over the years! [Editor].



Front Row (2nd from left: Brad Mullens) Second Row (1st from left: Gary Mullen; 3rd: Steve Murphree, 4th: Dan Hagan)

A *Culicoides (Haematomyidium) glabrior* female from the Brazilian Amazon. Submitted by Luis Paulo Costa de Carvalho, Porto Vehlo, Brazil (lpccbio@gmail.com)



**From: Nancy Hinkle, Department of Entomology,
University of Georgia, Athens, Georgia, U.S.A.**

Below is an announcement of the 2018 Livestock Insect Workers Conference, to be held June 17-20 in San Juan, Puerto Rico.

Note that contact information for the organizer and host, Manuel Lluberas, is Manuel@mosquitoden.com, while the direct LIWC contact is LIWC2018@gmail.com.

Get this on your calendar!
N. C. Hinkle, Ph.D.
NHinkle@uga.edu ; 706-583-8043



62nd Livestock Insect Workers Conference

June 16th – 20th, 2018

Sheraton Old San Juan, San Juan, Puerto Rico

Manuel@mosquitoden.com 1.904.813.5224

LIWC 2018 Contact info: LIWC2018@gmail.com

The 62nd Livestock Insect Workers Conference will be held in San Juan, Puerto Rico between June 16th and June 20th, 2018 at the Sheraton Old San Juan. The meeting is open to livestock and veterinary entomologists working with



t i c k s , mosquitoes, tsetse flies, filth and biting flies and other blood-sucking arthropods affecting domestic animals and farm animals. It is a great opportunity to meet fellow livestock and veterinary entomologists and industry professionals under a friendly, tropical environment. We have blocked a number of rooms at a very special rate for the days of our conference. If you wish to stay a few more days, the rate will be available 3 days pre and post based on hotel availability. For more information, please send a note to LIWC2018@gmail.com. We will be providing details and additional information as we finalize details and sending a request for speakers later in the year. Room bookings can be made directly by going to:

<https://www.starwoodmeeting.com/Book/LIWC>

We look forward to seeing you in San Juan.

The Sheraton Old San Juan

The Sheraton Old San Juan is a delightfully captivating upscale hotel in the heart of picturesque Old San Juan, a city as rich in history as it is in culture. Discover the history behind the oldest settlement in Puerto Rico, the second oldest city in the New World, and come home every night to the comfortably appointed accommodations. Wander down blue cobblestone streets, enjoy a delicious meal in an open-air cafe on a shady plaza, and tour the many historical sites. You won't be able to imagine yourself anywhere else.

The Sheraton Old San Juan Hotel is located just a short ride from the international airport and right on the waterfront, providing gorgeous views of San Juan Bay and the historic city. Just steps from our front door, you will be introduced to world class shopping, the finest restaurants, exciting nightlife and the beautiful architectural landmarks of Old San Juan, a city with over 500 years of history.

The LIWC 2018 is brought to you by:



HC 1 Box 13526, Rio Grande, PR 00745
787.355.7397, 904.813.5224

Eliminating Mosquitoes One Community at a Time



9th International Congress of Dipterology

25–30 November 2018

Windhoek, Namibia

<http://icd9.co.za/>

Ashley Kirk-Spriggs, ICD9 chair
National Museum, 36 Aliwal Street
Bloemfontein, SOUTH AFRICA
ashley.kirk-spriggs@nasmus.co.za

Please consult the Second Circular (<http://icd9.co.za/wp-content/uploads/2017/11/ICD9-Second-circular.pdf>) for details, including post-Congress tours, travel information, social events, information on accommodations and accompanying persons, and invitations from the Council for the International Congresses of Dipterology and the ICD9 Organizing Committee.

Registration information

Separate online forms for Registration (<http://icd9.co.za/registration/>) and Abstract submissions (<http://icd9.co.za/abstractsubmissions/>) are available. Payment should be made at the time of Registration. Note, no registrations or abstract submissions will be allowed after 1 September 2018.

[Rudy Meiswinkel will give a plenary address entitled, “*Culicoides* as vectors for viruses causing disease in livestock” (<http://icd9.co.za/plenaries/>) and Daniel Kline is organizing a symposium entitled, “Taxonomy and ecology of Ceratopogonidae” (dan.kline@ars.usda.gov) – Ed.]

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Contributions/Requests from Scientists:

Simon Carpenter, Institute for Animal Health, Pirbright Laboratory, UNITED KINGDOM

The Gnatwork project was launched on 1st July. This BBSRC funded network aims to bring together workers on sandflies, blackflies and biting midges. As part of the project there are funds available for research on Ceratopogonids which are aimed at providing funding to early career researchers in countries receiving Official Development Assistance.

For further details please see

https://twitter.com/the_gnatwork which links to the

call. There will be a second call for proposals in

2019. We will also be revising our web-based resources including re-releasing the information that was originally held at www.culicoides.net.



The *Culicoides sonorensis* genome project is completed and the first full genome build for this species will be released via Vectorbase. We are additionally working with Cirad (Montpellier), IZS (Teramo) and the European Bioinformatics Institute on transcriptomics in both *Culicoides imicola* and *Culicoides obsoletus* as part of **Culiome** (<https://www.anihwa-submission-era.net/culiome>). We are also part of the EU Horizon 2020 grant **PALE-Blu** <http://www.palebludata.com/> which is based on understanding bluetongue virus in the EU.

If anyone wants further information on these projects, let me know.

Cheers!

Simon

Oke Philip Oladele, University of Ibadan, NIGERIA

Good day! I am Oke Philip Oladele, a lecturer in the department of Veterinary Parasitology & Entomology, College of Veterinary Medicine, Federal University of Agriculture Makurdi and a Ph.D. student at the University of Ibadan, Nigeria.

I have been working on *Culicoides* and currently I am working on Transmission and Population Dynamics of *Culicoides* in Benue State. My focus is on:

- 1) Morphological and molecular identification of collected midges
- 2) Identification of sources of blood meals
- 3) Detection of pathogens harboured by biting midges

Culicoides research in Nigeria is still at the preliminary stage and many aspects have not been worked on. I have been collecting adult *Culicoides* species using light traps in Benue State since January and I have been separating the trapped midges based on parity. Just last month (June, 2017), I discovered four (4) *Culicoides* with developmental abnormalities (double abdomen, triple abdomen and two gynandromorphs).

I would very much like to collaborate with other CIE researchers.

Oke Philip

dvmoke@yahoo.com

Abhijit Mazumdar, University of Burdwan, West Bengal, India

Dear All,

I shall be thankful to receive a copy of the following article:

Okada, T. 1942. *Alluaudomyia* (Diptera, Heleidae) from Formosa with a revised key. *Transactions of the Natural History Society of Formosa*. 32: 315-320.

With Best Wishes,

Abhijit Mazumdar, Ph.D., Professor

abhijitbu02@gmail.com

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Recent Literature:

Taxonomy and Morphology

- Alwin-Kownacka, A., R. Szadziewski, and J. Szwedo. 2017.** Predatory midges of the tribes Palpomyiini and Sphaeromiini (Diptera: Ceratopogonidae) from the Middle East, with keys and descriptions of new species. *European Journal of Taxonomy* 318: 1-30.
- Anjos-Santos, D., C. G. Cazorla, and M. M. Ronderos. 2017.** First description of immature stages and adult females of *Stilobezzia (Acanthohelea) megatheca* (Diptera: Ceratopogonidae) from Patagonia. *Annales de Limnologie* 53: 175-188 ([Read Abstract](#)).
- Augot, D., B. Mathieu, L. Hadj-Henni, V. Barriol, S. Zapata Mena, S. Smolis, D. Slama, F. J. Randrianambinintsoa, G. Trueba, M. Kaltenbach, N. Rahola, and J. Depaquit. 2017.** Molecular phylogeny of 42 species of *Culicoides* (Diptera, Ceratopogonidae) from three continents. *Parasite* 24: 23: 1-16.
- Carvalho, L. P. C., E. S. Farias, L. H. S. Gil, F. A. C. Pessoa, and J. F. Medeiros. 2017.** New species records of *Culicoides* biting midges (Diptera: Ceratopogonidae) for the state of Rondonia in Brazilian Amazon. *Biodiversity Data Journal*: e13075.
- Cazorla, C. G., E. A. Cardoso, and M. L. Felipe Bauer. 2017.** Contributions to the knowledge of predaceous midges of the subgenus *Eukraiohelea* Ingram & Macfie of *Stilobezzia* Kieffer (Diptera: Ceratopogonidae), from Brazil. *Zootaxa* 4324(3): 557-570 ([Read Abstract](#)).
- Chang, Q. Q., X. H. Jiang, G. P. Liu, X. F. Li, and X. H. Hou. 2017.** A species checklist of the subgenus *Culicoides (Avaritia)* in China, with a description of a new species (Diptera, Ceratopogonidae). *Zookeys* 706: 117-135.
- Felippe-Bauer, M.L., Cardoso, E.A, and Trindade, R.L. 2017.** New species and new records of *Monohelea* Kieffer from eastern Amazon, Brazil (Diptera: Ceratopogonidae) *Zootaxa* 4358 (1): 142-160 ([Abstract & References](#)).
- Grogan, Jr., W.L., Howarth, F.G. and L.H. Hribar. 2017.** The Afrotropical biting midge, *Forcipomyia (Forcipomyia) biannulata* (Diptera: Ceratopogonidae) established in the United States. *Bishop Museum Occasional Papers* 119: 29-37.
- Harsha, R., N. Paul, and A. Mazumdar. 2017.** Description of immature stages of *Culicoides peregrinus* (Diptera: Ceratopogonidae), a potent vector of bluetongue virus. *Turkish Journal of Zoology* 41(5): 812-820.

- Harsha, R., N. Paul, G. Bellis, and A. Mazumdar. 2017.** Ultrastructure of the eggs of four species of *Culicoides* Latreille (Diptera: Ceratopogonidae) with a key to the eggs of all studied species by SEM. *Zoologischer Anzeiger* 269: 155-165 ([Read Abstract](#)).
- He, J., Z. Liu, and Y. Yu. 2017.** A new species in the genus *Palpomyia* (Diptera: Ceratopogonidae) from Qinghai Province, China. *Entomotaxonomia* 39(1): 82-84.
- Huerta, H., and G. R. Spinelli. 2017.** A distinctive new species of biting midge in the subgenus *Euprojoannisia* Brethes from Mexico with new records of Neotropical species of *Forcipomyia* Meigen (Diptera: Ceratopogonidae). *Zootaxa* 4329(2): 189-195 ([Read Abstract](#)).
- Huerta, H., and W. L. Grogan, Jr. 2017.** New species and new records of predaceous midges in the genera, *Schizonyxhelea* Clastrier and *Stilobezzia* Kieffer from Mexico (Diptera: Ceratopogonidae). *Zootaxa* 4294(4): 401-418 ([Read Abstract](#)).
- Kanasugi, T. 2017.** New Record of *Alluaudomyia tripartita* Okada, 1942 (Diptera: Ceratopogonidae) from Japan. *Japanese Journal of Systematic Entomology* 23(1): 153-154.
- Liu, G.-P., Y. Feng, S.-H. Fu, S.-H. Cui, H.-L. Zhang, W.-H. Yang, and G.-D. Liang. 2017.** Description of a New Species of *Culicoides* (*Jilinocoides*) and Male *Culicoides marginus* Chu, 1984 (Diptera: Ceratopogonidae) in Yunnan, China. *Jishengchong Yu Yixue Kunchong Xuebao* 24: 48-51.
- Liu, Y., H. Chen, and Y. Yu. 2017.** Description of two new species in the genus *Forcipomyia* (Diptera: Ceratopogonidae) from China. *Entomotaxonomia* 39(1): 77-81.
- Marino, P. I., G. R. Spinelli, R. Ferreira-Kepler, and M. M. Ronderos. 2017.** Description of fourth instar larva and pupa of *Atrichopogon delpontei* Cavalieri and Chiossone (Diptera: Ceratopogonidae) from Brazilian Amazonia. *Anais Da Academia Brasileira De Ciencias* 89(3): 2081-2094.
- Navai, S., Dominiak, P. and R. Szadziewski. 2017.** Vertebrate blood-feeding biting midges of the subgenus *Lasiohelea* Keiffer of *Forcipomyia* Meigen in Europe (Diptera: Ceratopogonidae) with new synonyms. *Annales Zoologici (Warszawa)* 67(4): 823-835 ([Abstract & References](#)).
- Perkovsky, E. E. 2017.** Comparison of Biting Midges of the Early Eocene Cambay Amber (India) and Late Eocene European Ambers Supports the Independent Origin of European Ambers. *Vestnik Zoologii* 51(4): 275-284.
- Perruolo Laneti, G., A. Chacon-Ortiz, and W. Tovar Rodriguez. 2016.** The bloodsucking biting midges *Culicoides* (Diptera: Ceratopogonidae) of Yaracuy state, Venezuela. *Boletin de Malariologia y Salud Ambiental* 56: 131-144.
- Ronderos, M. M., G. R. Spinelli, and W. L. Grogan, Jr. 2017.** The Neotropical species of the predaceous midge genus *Austrohelea* Wirth & Grogan (Diptera: Ceratopogonidae). *Zootaxa* 4276(2): 255-269 ([Read Abstract & References](#)).
- Saha, P., Brahma, S. and N. Hazra. 2017.** Descriptions of a new species and the pupae of two known species of *Culicoides* Latreille (Diptera: Ceratopogonidae) from India. *Annales de la Société entomologique de France (N.S.)* 53(6): 413-421 ([Read Abstract](#)).

- Sarvasova, A., A. Kocisova, E. Candolfi, and B. Mathieu. 2017.** Description of *Culicoides (Culicoides) bysta* n. sp., a new member of the *Pulicaris* group (Diptera: Ceratopogonidae) from Slovakia. [Parasites & Vectors 10: 279 \(1-14\).](#)
- Stebner, F., R. Szadziewski, P. T. Ruehr, H. Singh, J. U. Hammel, G. M. Kvifte, and J. Rust. 2017.** A fossil biting midge (Diptera: Ceratopogonidae) from early Eocene Indian amber with a complex pheromone evaporator (**Corrigendum-** vol 6, 34352, 2016). [Scientific Reports 7: 41899.](#)
- Vinko, D., D. Kulijer, M. Billqvist, and A. Martens. 2017.** The biting midge *Forcipomyia paludis* (Macfie, 1936) (Diptera: Ceratopogonidae) in Slovenia, Bosnia and Herzegovina, Croatia and Sweden. [Natura Sloveniae 19\(1\): 5-21.](#) [*F. paludis* is the only biting midge in Europe known to feed on dragonflies as temporary ectoparasites – Ed.]
- Xiao-Jing, H., X.-F. Li, Q.-Q. Chang, and X.-H. Hou. 2017.** Description of a new species of *Forcipomyia (Euprojoannisia)* Brethes, 1914 (Diptera: Ceratopogonidae) and a key to Chinese species of the subgenus. [Entomologica Fennica 28\(2\): 107-112.](#)
- Yang, Q.-G., D.-Y. He, L. Zhang, W.-Y. Qiu, and Y.-X. Yu. 2017.** Two New Species of *Dasyhelea* from Changzhou City, Jiangsu Province, China. *Jishengchong Yu Yixue Kunchong Xuebao* 24: 52-55.

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Ecology and Methodology

- Augot, D., L. Hadj-Henni, S. E. Strutz, D. Slama, C. Millot, J. Depaquit, and J. M. Millot. 2017.** Association between host species choice and morphological characters of main sensory structures of *Culicoides* in the Palaearctic region. [PeerJ 5: e3478: 1-21.](#)
- Bandeira, M. d. C. A., G. A. Brito, A. da Penha, C. L. C. Santos, and J. M. M. Rebelo. 2017.** The influence of environmental management and animal shelters in vector control of *Culicoides* (Diptera, Ceratopogonidae) in northeastern Brazil. [Journal of Vector Ecology 42\(1\): 113-119.](#)
- Burgin, L., M. Ekstrom, and S. Dessai. 2017.** Combining dispersion modelling with synoptic patterns to understand the wind-borne transport into the UK of the bluetongue disease vector. *International Journal of Biometeorology* 61(7): 1233-1245 ([Read Abstract](#)).
- Erram, D., and L. Zurek. 2017.** Larval Development of *Culicoides sonorensis* (Diptera: Ceratopogonidae) in Mud Supplemented with Manure of Various Farm Animals. *Journal of Medical Entomology* doi.org/10.1093/jme/tjx197 ([Read Abstract](#)).
- Gonzalez, M. A., P. M. Alarcon-Elbal, G. J. Venter, and S. Lopez. 2017.** Flight and swarming behaviour of *Culicoides* species (Diptera: Ceratopogonidae) on a livestock farm in Northern Spain. [Veterinaria Italiana 53\(2\): 157-166.](#)
- Isberg, E., D. P. Bray, Y. Hillbur, and R. Ignell. 2017.** Evaluation of Host-Derived Volatiles for Trapping *Culicoides* Biting Midges (Diptera: Ceratopogonidae). [Journal of Chemical Ecology 43\(7\): 662-669.](#)

- Jacquot, M., K. Nomikou, M. Palmarini, P. Mertens, and R. Biek. 2017. Bluetongue virus spread in Europe is a consequence of climatic, landscape and vertebrate host factors as revealed by phylogeographic inference. [Proceedings of the Royal Society B 20170919](#).
- Jess, S., G. M. Thompson, S. Clawson, I. W. N. Forsythe, I. Rea, A. W. Gordon, and A. K. Murchie. 2017. Surveillance of biting midges (*Culicoides* spp.) in Northern Ireland: influence of seasonality, surrounding habitat and livestock housing. [Medical and Veterinary Entomology 10.1111/mve.12258](#) [Early View].
- Jonsdottir, S., V. Svansson, S. B. Stefansdottir, E. Mantyla, E. Marti, and S. Torsteinsdottir. 2017. Oral administration of transgenic barley expressing a *Culicoides* allergen induces specific antibody response. *Equine Veterinary Journal* 49(4): 512-518 ([Read Abstract](#)).
- Kifle, Y. W., N. Hens, and C. Faes. 2017. Using additive and coupled spatiotemporal SPDE models: a flexible illustration for predicting occurrence of *Culicoides* species. [Spatial and Spatiotemporal Epidemiology 23: 11-34](#).
- Larska, M., M. Grochowska, L. Lechowski, and J. F. Zmudzinski. 2017. Abundance and species composition of *Culicoides* spp. biting midges near cattle and horse in South-Eastern Poland. *Acta Parasitologica* 62(4): 739-747 ([Read Abstract](#)).
- Lim, G. S., and R. A. Raguso. 2017. Floral Visitation, Pollen Removal, and Pollen Transport of *Tacca cristata* Jack (Dioscoreaceae) by Female Ceratopogonid Midges (Diptera: Ceratopogonidae). [International Journal of Plant Sciences 178\(5\): 341-351](#).
- Magliano, A., P. Scaramozzino, S. Ravagnan, F. Montarsi, D. A. R. G, G. Cincinelli, A. Moni, P. Silvestri, A. Carvelli, and D. E. L. C. 2017. Indoor and outdoor winter activity of *Culicoides* biting midges, vectors of bluetongue virus, in Italy. [Medical and Veterinary Entomology doi: 10.1111/mve.12260](#) [Early View].
- Martinez-de la Puente, J., J. Navarro, M. Ferraguti, R. Soriguer, and J. Figuerola. 2017. First molecular identification of the vertebrate hosts of *Culicoides imicola* in Europe and a review of its blood-feeding patterns worldwide: implications for the transmission of bluetongue disease and African horse sickness. [Medical and Veterinary Entomology 31\(4\): 333-339](#).
- McDermott, E.G. and B.A. Mullens. 2017. The Dark Side of Light Traps. [Journal of Medical Entomology XX\(X\):1-11](#). [Review]
- Mukhopadhyay, E., S. Hazra, G. K. Saha, and D. Banerjee. 2017. Altitudinal variation and bio-climatic variables influencing the potential distribution of *Culicoides orientalis* Macfie, 1932, suspected vector of Bluetongue virus across the North Eastern Himalayan belt of Sikkim. *Acta Tropica* 176: 402-411 ([Read Abstract](#)).
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Fig. 3 A, Collar trap on erect flowers of *Tacca cristata*. B, Midges trapped on upper edge of collar trap.

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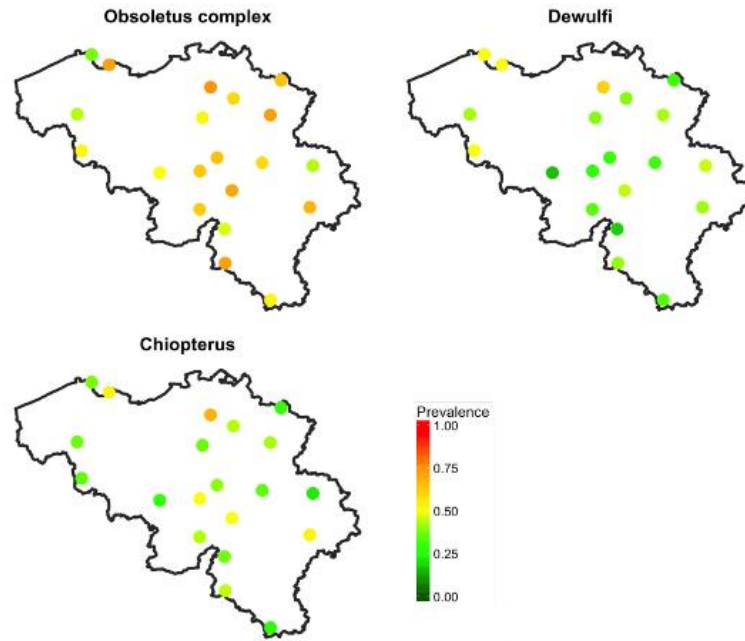


Fig. 1. The average observed prevalence of positive catches of *C. obsoletus complex*, *C. dewulfi* and *C. chiopterus* at the 20 sampled trap locations from April 2007 to December 2008 in Belgium.

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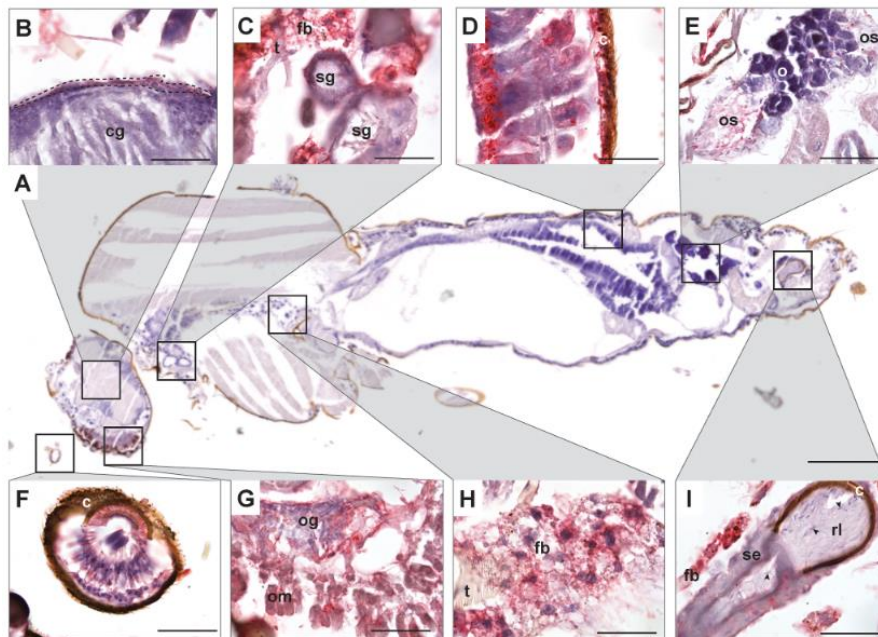


Fig 1. IHC staining of EHDV-2 infected tissues throughout *C. sonorensis*. Representative images were taken from orally infected midges at 7–10 dpf. (A) The internal anatomy of *C. sonorensis* revealed by a hematoxylin-stained sagittal section of the whole midge. No staining for EHDV-2 is provided in this section. Boxes indicate locations of tissues positive for EHDV-2 by IHC staining (red). (B) the neural lamella (dotted line) of the cerebral ganglia (cg); (C) salivary gland (sg), fat body (fb), trachea (t); (D) posterior midgut, cuticle (c); (E) ovarian sheath (os), ovariole (o); (F) Johnston's organ (antenna); (G) eye containing the ommatidia (om) and optical ganglia (og); (H) fat body (fb); and (I) spermatheca, which contains the spermathecal epithelia (se), reservoir lumen (rl), and sperm (arrow). All sections were counterstained with hematoxylin (blue) to reveal overall tissue structure. Scale bars: (A) = 200 μ m, (B-D and F-I) = 25 μ m, and (E) = 50 μ m.

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