

## THE CERATOPOGONIDAE INFORMATION EXCHANGE

The CIE, issued twice a year (no subscription fee), was begun in 1968 as a newsletter to facilitate communication among workers interested in the dipteran family 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 via e-mail should contact:

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### CIE No. 99–May 2017-The Ceratopogonidae Information Exchange Newsletter

Colleagues,

I hope that you will find something of interest or find a way that you can assist a colleague in this issue of the CIE Newsletter. The Recent Literature section contains 128 original research papers, reviews, reports and letters representing diverse research areas. “Picky eaters are rare..” – what an interesting title by [Hopken et al.](#)! Andrey Przhiboro and Natalia Brodskaya’s digitization project of type specimens from the former Soviet Union is an excellent resource. I have again placed three images from papers in the Recent Literature section on the last pages of this issue. Also, I hope you will read the excellent historical account of the life of Daniel William Coquillett (who described 70 ceratopogonid species) by Neal Evenhuis in the April issue of Fly Times, our sister publication.

Recall that the December issue of this newsletter will be no.100! Please send your ideas for what might be included in the December issue as we reach that milestone.

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 towards the December, 2017 issue no later than Friday, December 8<sup>th</sup>.

With Kind Regards,  
 Steve Murphree, Nashville, Tennessee, U.S.A.

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## **New CIE Subscribers/Address Update**

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## **Request for Support**

**From: Alec Gerry, Department of Entomology, University of California, Riverside, U.S.A.**

### **REQUEST FOR SUPPORT – *CULICOIDES* FOR SPECIES IDENTIFICATION DATABASE**

Many of you were likely present at the International Congress of Entomology to hear Anca Paslaru (of the Institute of Parasitology, National Center for Vector Entomology, Switzerland) present her recent research using MALDI-TOF Mass Spectrometry (MS) to identify *Culicoides* to species. You may remember from Anca's presentation that this method worked well for species that were collected in Switzerland (see Kaufmann et al. 2012, DOI: 10.1186/1756-3305-5-246). This method has also been recently applied to sand flies (Mathis et al., 2015; DOI: 10.1186/s13071-015-0878-2). The MALDI-TOF MS is apparently commonly used in Europe and can provide accurate, fast, and relatively inexpensive identification of insects to species. There is currently a growing database of publicly accessible species profiles using the MALDI-TOF MS (list of species available at <http://mabritec.com/insects-id.html>).

I had a recent discussion with Anca and with Alexander Mathis of the National Center for Vector Entomology in Switzerland, and I suggested that our *Culicoides* community could support the development of their reference MS

database by providing many other voucher *Culicoides* identified to species for examination using the MALDI-TOF MS technique.

Currently, the database is housed by a private company (Mabritec) as this ensures both a customer-oriented service and a greater sustainability. In the near future, the database should be hosted via a publicly accessible on-line platform, so that anyone with access to a MALDI-TOF MS machine could measure specimens of arthropod vectors on his or her own equipment and obtain automated species identification in a cost-efficient manner by submitting mass spectrometry data to the centralized data base. Further, the platform will provide access to standard operating procedures and also a user forum with the possibility for information exchange, troubleshooting etc. Ultimately, Alexander is confident that they can secure funding to assure free access for non-commercial institutions.

To support development of this database, we ask that you submit any *Culicoides* species that you can collect. Please submit a minimum of 5 voucher specimens - same identified species from the same location. Retain specimens at 4 C in 70% EtOH or higher or frozen from collection until submission. To ship, place specimens of a single identified species into a 1.5 ml PCR tube in 70% or higher EtOH. If shipping in EtOH is problematic, voucher specimens can be placed in the PCR tube on top of a small piece of tissue paper soaked with 100% EtOH to eliminate free EtOH in the tube. Send via 2-3 day shipping to the address below. Of course there is no fee for testing the voucher specimens that would be used to expand the database. If you have questions or would like more information about this technique, Alexander is happy to provide further information ([alexander.mathis@uzh.ch](mailto:alexander.mathis@uzh.ch)).

**Ship voucher specimens to:**  
**Dr. Alexander Mathis**  
**National Centre for Vector Entomology**  
**Institute of Parasitology**  
**University of Zurich**  
**Winterthurerstr. 266A**  
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## **Research Report**

**From: Andrey Przhiboro and Natalia Brodskaya, Zoological Institute, St. Petersburg, Russia**

Dear Colleagues,

We are glad to inform you about our recent work of digitization of the Ceratopogonidae type specimens kept in the collection of the Zoological Institute, Russian Academy of Sciences (St Petersburg).

The Zoological Institute holds one of the richest Ceratopogonidae collections, especially of bloodsucking biting midges of the Holarctic Region. In total, the collection contains several million of Ceratopogonidae specimens in more than 400 species. It includes rich material of larvae and pupae associated with the reared adults. The

collection includes the type specimens of the vast majority of species described in the genera *Culicoides* and *Leptoconops* from the territory of the former Soviet Union. A preliminary catalogue of the type specimens (except for *Leptoconops*) was published by Glukhova and Brodskaya (1995).

In 2016, we contributed to the project of digitized collections of the Zoological Institute, an internet resource developed for the website of the Institute ([http://zin.ru/Collections/collections\\_en.html](http://zin.ru/Collections/collections_en.html)).

This work has been done in cooperation with and with technical support from the members of the IT department of the Zoological Institute, Alexey Golikov and Roman Khalikov.

The digitized collection of Ceratopogonidae is available:

in English ([http://zin.ru/Collections/Ceratopogonidae/index\\_en.html](http://zin.ru/Collections/Ceratopogonidae/index_en.html)) and

in Russian (<http://zin.ru/Collections/Ceratopogonidae>).

It includes the brief description of the collection, with a short introduction into its history, and the pages about each digitized specimen. At present, the digitized collection contains the images and information for the 110 slide-mounted type specimens of 61 species in the genus *Culicoides* described from the territory of the former Soviet Union and kept in our collection. For each specimen, we provided the general view of its slide, microscopic images of the details of diagnostic value, the detailed label data in Russian, the same data transliterated and translated into English, the references to the original descriptions, and some additional data on the types. For most of these species, no photographs of the types were published.

The microscopic images were taken under a Leica DFC320 microscope with a Leica DM5000B digital camera, mostly using Nomarski interference contrast. In all cases, we took a series of images, then z-stacked them using Helicon Focus 5.1 software and edited using Adobe Photoshop CS software. Considering the different state of preservation, not all the type specimens for each species were digitized. First of all, we included the specimens in better condition. For the same reason, we could not take microscopic images of some body parts of the specimens.

However, we hope that this resource will be useful. In the future we plan to display the type specimens of more species in *Culicoides* and other genera.

Andrey Przhiboro and Natalia Brodskaya

[**Editor's Note:** this is an important contribution to our science and many thanks to Andrey and Natalia and their colleagues at the Zoological Institute!]

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## **Recent Literature:**

### **Taxonomy and Morphology**

**Alarcon-Elbal, P. M., R. Estrada, V. Jesus Carmona-Salido, C. Calvete, and J. Lucientes. 2016.** Faunistic composition and population dynamics of *Culicoides* biting midges (Diptera: Ceratopogonidae) from Castile-La Mancha. [Anales de Biología 38: 37-61](#). [In Spanish]

- Brahma, S., P. Saha, and N. Hazra. 2016.** Two new species and new records of biting midges of the genus *Dasyhelea* Kieffer (Diptera: Ceratopogonidae) from India. *Annales de la Societe Entomologique de France* 52(4): 233-242 ([Abstract](#)).
- Carvalho, L. P. C., A. M. Pereira, E. S. Farias, J. F. Almeida, M. S. Rodrigues, F. Resadore, F. A. C. Pessoa, and J. F. Medeiros. 2017.** A study of *Culicoides* in Rondonia, in the Brazilian Amazon: species composition, relative abundance and potential vectors. *Medical and Veterinary Entomology* 31(1): 117-122.
- Cazorla, C. G. 2016.** New records of "jejenes" on the subgenus *Stilobezzia* of *Stilobezzia* (Diptera: Ceratopogonidae) from the Neotropical Region. *Revista de la Sociedad Entomologica Argentina* 75(3-4): 186-190.
- Diaz, F., M. L. Felipe-Bauer, and G. R. Spinelli. 2017.** Two New Neotropical Species of the *Dasyhelea mutabilis* Group (Culicomorpha: Ceratopogonidae). *Papeis Avulsos de Zoologia (Sao Paulo)* 57: 17-22.
- Dik, B., O. Kuclu, and R. Ozturk. 2017.** *Culicoides* Latreille, 1809 (Diptera: Ceratopogonidae) species in the Western Black Sea Region of Turkey, new records for the Turkish fauna. *Turkish Journal of Veterinary & Animal Sciences* 41: 228-237.
- Filatov, S., and R. Szadziewski. 2017.** Annotated checklist and distribution of *Culicoides* biting midges of Ukraine (Diptera: Ceratopogonidae). *Journal of Natural History* 51(9-10): 487-511 ([Abstract](#)).
- Jewiss-Gaines, A., L. Barelli, and F. F. Hunter. 2017.** First Records of *Culicoides sonorensis* (Diptera: Ceratopogonidae), a Known Vector of Bluetongue Virus, in Southern Ontario. *Journal of Medical Entomology* 54(3): 757-762 ([Abstract](#)).
- Li, J.-H., D. Gopurenko, D.-C. Cai, Y.-M. Yang, R. Hu, A. Thepparat, A. H. Wardhana, H.-C. Kim, T. A. Klein, M.-S. Kim, and G. A. Bellis. 2017.** *Culicoides* Latreille biting midges (Diptera: Ceratopogonidae) of the Dongzhaigang mangrove forest, Hainan Province, China. *Zootaxa* 4227(1): 49-60 ([Abstract](#)).
- Mancini, J. M. D., C. A. Veggiani-Aybar, A. D. Fuenzalida, M. S. L. de Grosso, and M. G. Quintana. 2016.** Ceratopogonidae (Diptera: Nematocera) of the piedmont of the Yungas forests of Tucuman: ecology and distribution. *PeerJ* 4:e2655.
- Navai, S. and R. Szadziewski. 2016.** Biting Midges of the Genus *Forcipomyia* Meigen (Diptera: Ceratopogonidae). Pages 65-95 In: *Diptera Stelviana 2: Studia Dipterologica* Supplement 21([Request PDF from Author](#)).
- Przhiboro, A. 2015.** Taxonomic composition and community structure of Diptera (Insecta) that develop in the water margin zone of standing and running waters in Mongolia. In: [Ecosystems of Central Asia under current conditions of socio-economic development](#): Proceedings of International Conference, Ulaanbaatar (Mongolia), September 8-11 2015. Vol. 2. Ulaanbaatar: 94-97. [In Russian].
- Ronderos, M. M., G. R. Spinelli, P. I. Marino, and R. L. Ferreira-Keppler. 2017.** Description of unknown or poorly known pupae and adult males of Neotropical *Heteromyia* Say (Culicomorpha: Ceratopogonidae), with a specific key to pupae. *Zoologischer Anzeiger* 266: 177-188 ([Abstract](#); [Request PDF from Author](#)).
- Ronderos, M. M., P. I. Marino, and F. Diaz. 2017.** First description of the pupa and male of the Neotropical predatory midge *Pellucidomyia oliveirai* (Lane) (Diptera: Ceratopogonidae). *Annals of Limnology – International Journal of Limnology* 53:57-65 ([Abstract](#); [Request PDF from Author](#)).

**Stebner, F., R. Szadziwski, H. Singh, S. Gunkel, and J. Rust. 2017.** Biting Midges (Diptera: Ceratopogonidae) from Cambay Amber Indicate that the Eocene Fauna of the Indian Subcontinent Was Not Isolated. [PLoS One 12: e0169144.](#)

**Staff, P. O. 2017.** Correction: Biting Midges (Diptera: Ceratopogonidae) from Cambay Amber Indicate that the Eocene Fauna of the Indian Subcontinent Was Not Isolated. [PLoS One 12:e0173135.](#)

**Stebner, F., R. Szadziwski, P. T. Ruhr, H. Singh, J. U. Hammel, G. M. Kvifte, and J. Rust. 2017.** Corrigendum: A fossil biting midge (Diptera: Ceratopogonidae) from early Eocene Indian amber with a complex pheromone evaporator. [Scientific Reports 7: 41899.](#)

**Talavera, S., F. Munoz-Munoz, M. Verdun, and N. Pages. 2017.** Morphology and DNA barcoding reveal three species in one: description of *Culicoides cryptipulicaris* sp nov and *Culicoides quasipulicaris* sp nov in the subgenus *Culicoides*. [Medical and Veterinary Entomology 31\(2\): 178-191.](#)

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## **Ecology and Methodology**

**Brand, S. P. C., and M. J. Keeling. 2017.** The impact of temperature changes on vector- borne disease transmission: *Culicoides* midges and bluetongue virus. *Journal of the Royal Society Interface* 14(128), ([Abstract](#)).

**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* (14 January 2017- Epub ahead of print-[Abstract](#)).

**Conte, A., M. Goffredo, L. Candeloro, P. Calistri, G. Curci, V. Colaiuda, M. Quaglia, G. Mancini, A. Santilli, A. Di Lorenzo, S. Tora, L. Savini and G. Savini. 2016.** Analysis of climatic factors involved in the BTV-1 incursion in Central Italy in 2014. [Veterinaria Italiana 52\(3-4\): 223-229.](#)

**De Keyser, R., C. Cassidy, S. Laban, P. Gopal, J. A. Pickett, Y. K. Reddy, M. Prasad, G. Prasad, S. Chirukandoth, K. Senthilven, S. Carpenter, and J. G. Logan. 2017.** Insecticidal effects of deltamethrin in laboratory and field populations of *Culicoides* species: how effective are host-contact reduction methods in India? [Parasites & Vectors 10: 54.](#)

**Gao, X., H. Wang, H. Qin, and J. Xiao. 2017.** Influence of climate variations on the epidemiology of bluetongue in sheep in Mainland China. [Small Ruminant Research 146: 23-27.](#)

**Gonzalez, M., P. M. Alarcon-Elbal, J. Valle-Mora, and A. Goldarazena. 2016.** Comparison of different light sources for trapping *Culicoides* biting midges, mosquitoes and other dipterans. [Veterinary Parasitology 226: 44-49.](#)

**Hopken, M. W., B. M. Ryan, K. P. Huyvaert, and A. J. Piaggio. 2017.** Picky eaters are rare: DNA-based blood meal analysis of *Culicoides* (Diptera: Ceratopogonidae) species from the United States. [Parasites & Vectors 10: 169.](#)

- Kameke, D., H. Kampen, and D. Walther. 2017.** Activity of *Culicoides* spp. (Diptera: Ceratopogonidae) inside and outside of livestock stables in late winter and spring. [Parasitology Research 116: 881-889](#)
- McDermott, E. G., C. E. Mayo, and B. A. Mullens. 2017.** Low Temperature Tolerance of *Culicoides sonorensis* (Diptera: Ceratopogonidae) Eggs, Larvae, and Pupae from Temperate and Subtropical Climates. *Journal of Medical Entomology* 54(2): 264-274 ([Abstract](#)).
- Mills, M. K., D. Nayduch, D. S. McVey, and K. Michel. 2017.** Functional Validation of Apoptosis Genes IAP1 and DRONC in Midgut Tissue of the Biting Midge *Culicoides sonorensis* (Diptera: Ceratopogonidae) by RNAi. *Journal of Medical Entomology* 54(3): 559-567 ([Abstract](#)).
- Przhiboro A. A. 2014.** Dipterous insects (Insecta: Diptera) in lakes of Mongolia. In: Dgebuadze Yu.Yu. (Ed.). *Limnologiya i paleolimnologiya Mongolii [Limnology and palaeolimnology of Mongolia]*. Second edition. Moscow: Russian Agricultural Academy Press. p. 186-192. [In Russian with English summary].
- Przhiboro, A. 2014.** Diversity and adaptations of immature Diptera in semiaquatic habitats at shorelines of hypersaline lakes in the Crimea, with a brief review of Diptera in mineralized bodies of water. *Acta Geologica Sinica* (English edition), 88, Suppl. 1: 98-100.
- Przhiboro, A. A., Prokin A. A., Philippov D. A. 2016.** Communities of macroinvertebrates in habitats of bipolar-distributed *Sphagnum* species as a model to evaluate the relationships of historical and ecological factors in the evolution of communities: a preliminary comparison of bogs in European Russia and Southern Chile. In: Lapshina E.D., Galanina O.V. (Eds). [Proceedings of the VI International Field Symposium "Biology of Sphagnum"](#) (Saint Petersburg; Khanty-Mansiysk, July 28 – August 11, 2016). Tomsk: Publishing House of Tomsk State University: 59-62.
- Przhiboro, A. A. 2016.** Dipterous insects (Insecta: Diptera) in freshwater and shoreline semiaquatic habitats of the environs of Belyi Nos station, Vaigach Island and northern part of Novaya Zemlya Archipelago. In: Zaikov K.S., Polikin D.Yu. (Eds.). [Complex scientific-educational expedition "Arctic floating university – 2016"](#). Arkhangelsk: KIRA: 38-50. [In Russian].
- Salvato, M., H. Salvato and W. L. Grogan, Jr. 2016.** A biting midge, *Forcipomyia (Trichohelea)* sp. (Diptera: Ceratopogonidae), an ectoparasite of the Toltec Roadside Skipper, *Amblyscirtes tolteca prenda* (Hesperiidae). [News of the Lepidopterists Society 58\(4\): 171](#).
- Venter, E. H., J. Steyn, P. Coetzee, M. van Vuuren, J. Crafford, C. Schutte, and G. Venter. 2016.** The prevalence of *Culicoides* spp. in 3 geographic areas of South Africa. [Veterinaria Italiana 52\(3-4\): 281-289](#).
- White, S. M., C. J. Sanders, C. R. Shortall, and B. V. Purse. 2017.** Mechanistic model for predicting the seasonal abundance of *Culicoides* biting midges and the impacts of insecticide control. [Parasites & Vectors 10: 162 \(14 pages\)](#).
- Zatsepina O.G., Przhiboro A.A., Yushenova I.A., Shilova V., Zelentsova E.S., Shostak N.G., Evgen'ev M.B., Garbuz D.G. 2016.** A *Drosophila* heat shock response represents an exception rather than a rule amongst Diptera species. *Insect Molecular Biology*, 25(4): 431-449 ([Abstract](#)). [includes data on three species in *Dasyhelea*]

## **Bluetongue Virus and Other Pathogens**

- Ambagala, A., S. Pahari, M. Fisher, P. Y. A. Lee, J. Pasick, E. N. Ostlund, D. J. Johnson, and O. Lung. 2017.** A Rapid Field-Deployable Reverse Transcription-Insulated Isothermal Polymerase Chain Reaction Assay for Sensitive and Specific Detection of Bluetongue Virus. *Transboundary and Emerging Diseases* 64(2): 476-486 ([Abstract](#)).
- Asgeirsson, H., A. Harling, and S. Botero-Kleiven. 2017.** Successful treatment of 2 imported cases of *Mansonella perstans* infection. *PLoS Neglected Tropical Diseases* 11: e0005452.
- Becker, E., G. J. Venter, T. Greyling, U. Molini, and H. van Hamburg. 2017.** Evidence of African horse sickness virus infection of *Equus zebra hartmannae* in the south-western Khomas Region, Namibia. *Transboundary and Emerging Diseases* (12 April 2017- Epub ahead of print-[Abstract](#)).
- Bekker, S., P. Burger, and V. van Staden. 2017a.** Analysis of the three-dimensional structure of the African horse sickness virus VP7 trimer by homology modelling. *Virus Research* 232: 80-95.
- Ben Dhaou, S., C. Sailleau, B. Babay, C. Viarouge, S. Sghaier, S. Zientara, S. Hammami, and E. Breard. 2016.** Molecular Characterisation of Epizootic Haemorrhagic Disease Virus Associated with a Tunisian Outbreak Among Cattle in 2006. *Acta Veterinaria Hungarica* 64: 250-262.
- Bessell, P. R., K. R. Searle, H. K. Auty, I. G. Handel, B. V. Purse, and B. M. Bronsvoort. 2016.** Assessing the potential for Bluetongue virus 8 to spread and vaccination strategies in Scotland. *Scientific Reports* 6: 38940.
- Bicalho, J. M., A. A. Junior, C. H. S. de Oliveira, C. F. Resende, T. D. Kassar, G. C. Galinari, A. P. Oliveira, L. D. Orzil, J. K. P. dos Reis, and R. C. Leite. 2016.** Molecular detection of Bluetongue Virus (BTV) and Bovine Leukemia Virus (BLV) in uterine biopsies of dairy cows with or without reproductive problems. *Semina-Ciencias Agrarias* 37(2): 3125-3131.
- Boshra, H. Y., D. Charro, G. Lorenzo, I. Sanchez, B. Lazaro, A. Brun, and N. G. A. Abrescia. 2017.** DNA vaccination regimes against Schmallenberg virus infection in IFNAR(-/-) mice suggest two targets for immunization. *Antiviral Research* 141: 107-115.
- Bouyou Akotet, M. K., M. Owono-Medang, D. P. Mawili-Mboumba, M. N. Moussavou-Boussougou, S. Nzenze Afene, E. Kendjo, and M. Kombila. 2016.** The relationship between microfilaraemic and amicrofilaraemic loiasis involving co-infection with *Mansonella perstans* and clinical symptoms in an exposed population from Gabon. *Journal of Helminthology* 90(4): 469-475 ([Abstract](#)).
- Brand, S. P. C., and M. J. Keeling. 2017.** The impact of temperature changes on vector- borne disease transmission: *Culicoides* midges and bluetongue virus. *Journal of the Royal Society Interface* 14(128), ([Abstract](#)).
- 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* (14 January 2017- Epub ahead of print-[Abstract](#)).



- Carpenter, S., P. S. Mellor, A. G. Fall, C. Garros, and G. J. Venter. 2017. African Horse Sickness Virus: History, Transmission, and Current Status, pp. 343-358. In M. R. Berenbaum (ed.), *Annual Review of Entomology*, Vol 62, vol. 62: 343-358 ([Abstract](#)).
- Celma, C. C., M. Stewart, K. Wernike, M. Eschbaumer, L. Gonzalez-Molleda, E. Breard, C. Schulz, B. Hoffmann, A. Haegeman, K. De Clercq, S. Zientara, P. A. van Rijn, M. Beer, and P. Roy. 2017. Replication-Deficient Particles: New Insights into the Next Generation of Bluetongue Virus Vaccines. *Journal of Virology* [91\(12\):1-16](#).
- Chand, K., S. K. Biswas, A. B. Pandey, A. Saxena, N. Tewari, and B. Mondal. 2016. Isolation of bluetongue virus-1 from cattle in India and phylogenetic analysis of the complete coding sequence of the segment-2 gene. *Tropical Biomedicine* [33: 824-826](#).
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- Chatzinasiou, E., S. C. Chaintoutis, C. I. Dovas, M. Papanastassopoulou, and O. Papadopoulos. 2017. Immunosuppression in sheep induced by cyclophosphamide, bluetongue virus and their combination: Effect on clinical reaction and viremia. *Microbial Pathogenesis* [104: 318-327](#).
- Conte, A., M. Goffredo, L. Candeloro, P. Calistri, G. Curci, V. Colaiuda, M. Quaglia, G. Mancini, A. Santilli, A. Di Lorenzo, S. Tora, L. Savini and G. Savini. 2016. Analysis of climatic factors involved in the BTV-1 incursion in Central Italy in 2014. *Veterinaria Italiana* [52\(3-4\): 223-229](#).
- Courtejoie, N., B. Durand, L. Bournez, A. Gorlier, E. Breard, C. Sailleau, D. Vitour, S. Zientara, F. Baurier, C. Gourmelen, F. Benoit, H. Achour, C. Milard, S. Poliak, C. Pagneux, C. Viarouge, and G. Zanella. 2017. Circulation of bluetongue virus 8 in French cattle, before and after the re-emergence in 2015. *Transboundary and Emerging Diseases* (2 May 2017- Epub ahead of print-[Abstract](#)).
- Culquichicon, C., J. A. Cardona-Ospina, A. M. Patino-Barbosa, and A. J. Rodriguez-Morales. 2017. Bibliometric analysis of Oropouche research: impact on the surveillance of emerging arboviruses in Latin America. *F1000Research* [6: 194:1-12](#).
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[From: [Salvato, M., H. Salvato and W. L. Grogan, Jr. 2016](#)]

Fig. 1. An adult female biting midge *Forcipomyia* (*Trichohelea*) sp. attached to the ventral hindwing of *Amblyscirtes tolteca prenda* in Patagonia, Arizona (Cochise County) (Photo by H. L. Salvato).



[From: [Alarcon-Elbal et al. 2016](#)]

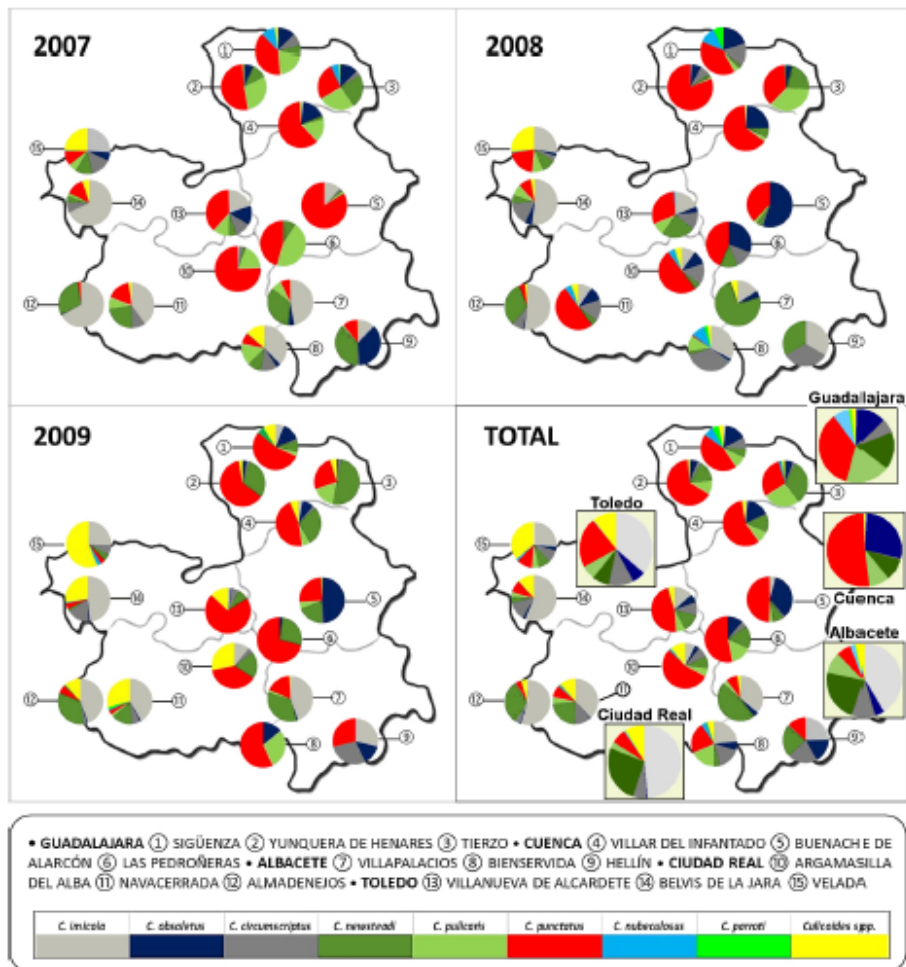


Figura 2. Frecuencia de captura (%) de las diferentes especies de *Culicoides* (mamófilos y/o generalistas más abundantes) en las estaciones de muestreo de Castilla-La Mancha.

Figure 2. Frequency of capture (%) of different species of *Culicoides* biting midges (mammal and/or generalist feeders more abundant) in sampling locations of Castilla-La Mancha.

[From: [Stewart 2016](#)]



A biting midge (*Culicoides nubeculosus*) engorged with blood – a potential transmitter of Bluetongue disease.  
Sinclair Stammers/Science Photo Library

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