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 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. 107 –May 2021 -The Ceratopogonidae Information Exchange Newsletter

Research Colleagues,

I hope that this issue of the CIE Newsletter again finds each of you in good health during this challenging period of our history. I continue to be thankful for the help of a Vanderbilt University science librarian in searching databases for recent literature due to COVID-19 library closures. The Recent Literature section contains citations of 121 original research papers, reviews, books, reports, and letters representing diverse areas of research. I have again included figures with images from four of these papers on the last pages of this issue.

I would like to highlight the Sontag et al. tribute to Professor Ryszard Szadziewski, and encourage you to read about the path Ryszard took to become the preeminent paleoentomologist of the Ceratopogonidae. My thanks to all who sent material to be included in this issue.

Summary of Contents:

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 December, 2021 issue by Friday, Dec. 3rd.

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

New CIE Newsletter Subscribers/ Address Updates

Dr. Jessica Stokes The Pirbright Institute Ash Road, Pirbright GU24 0NF Surrey, UNITED KINGDOM e-mail: Jessica.stokes@pirbright.ac.uk Dr. Chin-Seng Chen Professor Emeritus Chang Jung Christian University Tainan, TAIWAN e-mail: cschen1tw@gmail.com	Gert Venter email: venterjgert@gmail.com Jean-Claude Delecolle email: jean-claude.delecolle@numericable.fr

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Announcements

Cancelation of the Livestock Insect Workers Conference (LIWC) June 14-17, 2020 in Dallas Texas

The 2021 LIWC that was to have been held in Kerrville, Texas, on June 13-16, has been cancelled due to travel restrictions and other uncertainties. An in-person LIWC Conference will be held in Dallas, Texas, in summer, 2022.

Arthropod-Borne Animal Disease Research Unit

- **Position: Post Doctoral Research Associate**
- Location: Manhattan, KS
- Application Deadline: Open until filled
- Tentative start date: Oct 2021

Job Description

We are recruiting a motivated Postdoctoral Research Associate to join our team at the Arthropod-Borne Animal Diseases Unit to study the potential role of RNAi in blocking arbovirus transmission by *Culicoides* biting midges. These extremely efficient vectors transmit several animal disease arboviruses including re-emerging vesicular stomatitis virus (VSV) bluetongue virus, and epizootic hemorrhagic disease virus, Schmallenberg, African horse sickness, and bovine ephemeral fever viruses. Understanding interactions between the midge immune system and these arboviruses is critical to developing effective disease control strategies. Exploiting innate vector responses, such as RNA interference (RNAi), specifically exogenous-small interfering RNAs (exo-siRNAs), has shown promising results in generating arbovirus-refractory mosquito vectors. Recent preliminary evidence that midges use RNAi to regulate arbovirus replication suggests exo-siRNAs may work as a molecular mechanism to reduce viral proliferation and block arboviral transmission.

The Research Associate will develop and optimize RNAi techniques in midges and determine effects of VSV-specific exo-siRNAs on infection dynamics and transmission rates. Transcriptomics and bioinformatics (e.g., Gene Ontology enrichment, KEGG pathway mapping) will be used to identify VSV-targeted defense mechanisms and identify additional innate responses differentially expressed during virus infection (e.g., Toll, IMD, Jak/Stat). The research goals are to block VSV replication and transmission in midges and identify overall innate immune responses of midges to VSV that may lead to additional molecular targets. These goals will be key for the long-term translational goal of using endosymbionts to deliver targeted dsRNA, rendering midges resistant to infection, and blocking transmission of VSV and other arboviruses.

Successful applicants should have received a Ph.D. within the last 4 years in microbiology, virology, molecular biology, or entomology. Preferences will be given to candidates with research experience in molecular entomology, arbovirology, and transcriptomics/bioinformatics. Potential candidates should be able to work both independently and collaboratively in a research group, must be a U.S. citizen, and pass a minimal security background check. Funding provides salary plus benefits for two years. Interested applicants should email a cover letter, CV, and contact information for 2-3 references to Dr. Barbara Drolet at mailto:barbara.drolet@usda.gov.

The Gnatwork 2021 Conference will be held online on Monday 24th May 2021

Featuring online presentations from our 8 funded projects, along with targeted sessions by our directors, our preliminary conference programme is as follows:

09:45 - 10:00 Welcome and Introduction
10:00 - 11:00 Call 1: Validation
11:00 - 11:30 Tea break
11:30 - 12:30 Call 2: Transformative Science
12:30 - 13:30 Lunch break
13:30 - 14:30 Call 3: Community Call
14:30 - Close Achievements of the Gnatwork

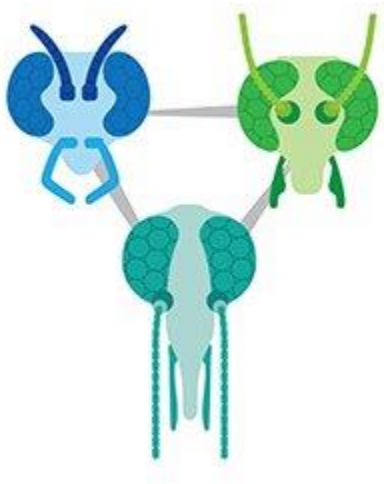
Please note all times are BST (GMT/UTC+1hour)

Registration and attendance at this event is free for all Gnatwork members. We will also be hosting a poster session for all Gnatwork members to demonstrate their research. This will be hosted on both the Gnatwork website and Twitter.

If you would like to attend and/or present a poster please email enquiries@gnatwork.ac.uk so we can register your email address and you will receive the online webinar link and full agenda in due course.

Contributions/Requests from Scientists:

From: Jessica Stokes and Simon Carpenter, The Pirbright Institute, Surrey, UK



The Gnatwork, a network that aims to bring together workers on biting midges, sandflies and blackflies, is continuing to increase in membership and has a range of resources that may be of interest to CIE members. We have held three grant calls for catalyst projects funding collaborative research. Along with protocols spanning taxonomy, field work methodologies and molecular techniques we will also be hosting PhD and Masters level theses of interest on our site. We hope that by collecting these bodies of work it will both simultaneously increase awareness and build on the fantastic research already completed on these neglected vector groups. We are also looking to increase our non-published resource section, including everything from recorded talks, to field identification keys and news articles.

Here is where we need your help. If you have completed, or know of PhD and Masters theses on biting midges, blackflies or sandflies we would be very happy to help get them into the public domain. We would also like to hear from you if you have any other protocols or resources on Ceratopogonids that you would be happy to share on our website.

Please contact us at: enquiries@gnatwork.ac.uk

All the current protocols and resources can be found at:
https://www.gnatwork.ac.uk/resources
Membership to the Gnatwork is free, with the option of signing up to our monthly newsletter:
https://www.gnatwork.ac.uk/members/join-the-gnatwork

Thank you,
Jess Stokes & Simon Carpenter

From: Surajit Kar, Entomology Research Unit, University of Burdwan, India

Spiders belonging to the family Araneidae and Salticidae as natural predators of adult *Culicoides* spp.

Surajit Kar, Biswajit Mondal, Ayan Mondal[1], Abhijit Mazumdar*
Entomology Research Unit, Department of Zoology, University of Burdwan, Burdwan 713104, WB, India and [1]Ecology and Environmental Modelling Lab, Department of Environmental Science, University of Burdwan, Burdwan 713104, WB, India
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Introduction

Information on natural predators of *Culicoides* spp. is very scant. However, Marsh (1986) and Downes (1978) reported predators of *Culicoides*, although spiders were not mentioned in the lists. Predatory behaviour of spiders on engorged adult *Culicoides* spp. was recorded through digital photography and video. This article is primarily based on the observations made during resting biology experiments.

Study sites, Materials and Methods

Three study sites were selected 1.Deshbandh [23°06'58.2"N, 87°14'03.9"E], shed- open type, date of collection 14 & 15 August,2019; 2. Dharan [23°02'57.7"N, 87°51'47.5"E], shed-open type, date of collection 9 - 11 and 18-20 September, 2019; 3.Sodepur [22°42'21.4"N, 88°22'55.8"E], shed type- open cattle shed, date of collection -16 - 18 October, 2019 . Within the animal sheds, spiders including the prey were collected and subsequently preserved in 70% ethyl alcohol for further identification. The collected spiders were identified after Tikader and Biswas 1981; Tikader 1987 and adult *Culicoides* spp. were identified by following Wirth and Hubert 1989. This report is based on direct observation and activities were recorded through photographs and videography by using a mobile camera with 20x macro lens (Skyvik 20x).

Results

It was found that the *Neoscona* sp. (family: Araneidae) (n=11) juveniles preferred small sized insects which included engorged females *Culicoides* spp. (Fig-1) from their orb web; whereas adults selected large sized insects but excluded adult *Culicoides*. The adults of *Menemerus* sp. (n=9) (Fig-2) and juveniles of *Marpissa* sp. (n=6) belonging to the family Salticidae preyed upon adult *Culicoides* spp. (Fig-3) resting on walls of the animal sheds harbouring cattle and goats.

Besides, the predatory behaviour of the spiders viz, orientation, pursuit and attack were recorded within the shed. Laboratory based studies on this aspect are underway.

References

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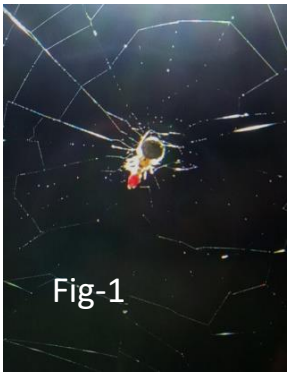
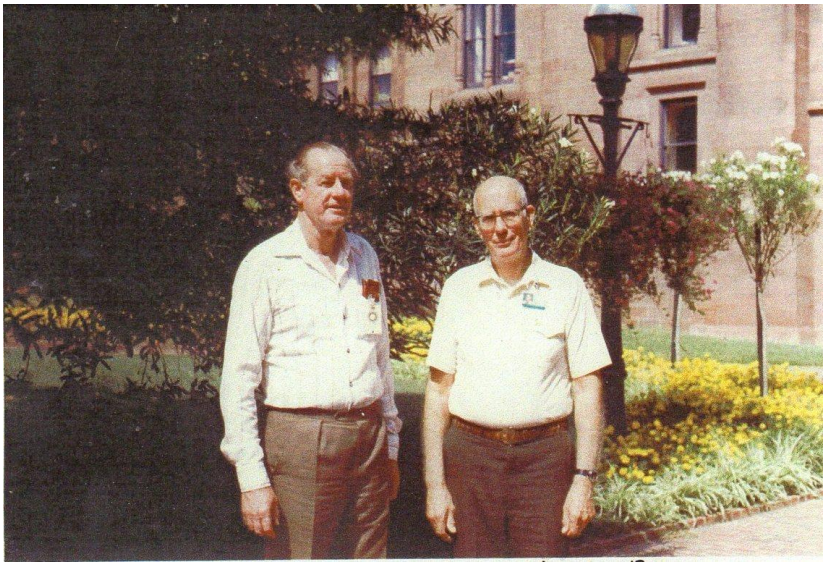


Figure legends- Predation of adult engorged *Culicoides* sp. by (**1**) Juvenile *Neoscona* sp. (**2**) Adult *Menemerus* sp. and (**3**) Juvenile *Marpissa* sp.

To the right is a photograph I received from Shahin Nawai in recent years. For readers who are new to studies of the Ceratopogonidae, these individuals are Alan L. Dyce and Willis W. 'Bill' Wirth, two giants in the study of biting midges. The photograph was taken at Washington, D.C., U.S.A. in 1982. – Ed.



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Recent Literature:

Taxonomy and Morphology

Carvalho, L. P. C., A. M. Pereira Júnior, F. A. C. Pessoa, and J. F. Medeiros. **2021**. Biting Midges in Jamari National Forest, in the Brazilian Amazon, With 12 New Records of *Culicoides* Species (Diptera: Ceratopogonidae) for the State of Rondônia. *Journal of Medical Entomology* 58(1):465-470 [Read Abstract].

Diaz, F., Spinelli, G.R., Ferreira-Keppler, R., Donato, M. and M.M. Ronderos. **2021**. First description of larvae of *Paryphoconus* Enderlein with a new species from Brazilian Amazonia and phylogenetic placement of the genus based on immature stages (Diptera: Ceratopogonidae). *Zoologischer Anzeiger* 291:79-102 [Read Abstract].

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Hadj-Henni, L., Djerada, Z., Millot, C. and D. Augot. **2021**. Comprehensive characterisation of *Culicoides clastrieri* and *C. festivipennis* (Diptera: Ceratopogonidae) according to morphological and morphometric characters using a multivariate approach and DNA barcode. *Scientific Reports* 11(1):521.

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Jomkumsing, P., Surapinit, A., Saengpara, T. and P. Pramual. **2021**. Genetic variation, DNA barcoding and blood meal identification of *Culicoides* Latreille biting midges (Diptera: Ceratopogonidae) in Thailand. *Acta Tropica* 217:105866 [Read Abstract].

Milián-García, Y., Janke, L.A.A., Young, R.G., Ambagala, A. and R.H. Hanner. **2021**. Validation of an effective protocol for *Culicoides* Latreille (Diptera: Ceratopogonidae) detection using eDNA metabarcoding. *Insects* 12(5):401.

Muñoz-Muñoz, F., Pagès, N., Durao, A.F., England, M., Werner, D. and S. Talavera. **2021**. Narrow versus broad: Sexual dimorphism in the wing form of western European species of the subgenus *Avaritia* (*Culicoides*, Ceratopogonidae). *Integrative Zoology* [Early View – Read Abstract].

Pilgrim, J., Siozios, S., Baylis, M., Venter, G., Garros, C. and G.D.D. Hurst. **2021**. *Cardinium* symbiosis as a potential confounder of mtDNA based phylogeographic inference in *Culicoides imicola* (Diptera: Ceratopogonidae), a vector of veterinary viruses. *Parasites & Vectors* 14(1):100.

Pilgrim, J., Siozios, S., Baylis, M., Venter, G., Garros, C. and G.D.D. Hurst. **2021**. CORRECTION to: *Cardinium* symbiosis as a potential confounder of mtDNA based phylogeographic inference in *Culicoides imicola* (Diptera: Ceratopogonidae), a vector of veterinary viruses (vol 14, 100, 2021). *Parasites & Vectors* 14(1):128.

Pramual, P., Jomkumsing, P., Piraonapicha, K. and W. Jumpato. **2021**. Integrative taxonomy uncovers a new *Culicoides* (Diptera: Ceratopogonidae) biting midge species from Thailand. *Acta Tropica* 105941 [In Press – Read Abstract].

Rios, R.R.S., Santarém, M.C.A., Ribeiro Júnior, K.A.L., de Melo, B.A., da Silva, S.G.M., da Silva, N.C., Dos Santos, V.R.V., Dos Santos, J.M., Santana, A.E.G. and A.B. Fraga. **2021**. *Culicoides insignis* Lutz, 1913 (Diptera: Ceratopogonidae) biting midges in northeast of Brazil. *Insects* 12(4):366.

Saha, P., Brahma, S. and N. Hazra. **2020**. Three new species of predaceous midges *Brachypogon* Kieffer from northern plains of west Bengal, India (Diptera: Ceratopogonidae*). Oriental Insects* 54(2):241-258 [Read Abstract].

Sontag, E., Pielowska-Ceranowska, A., Kentzer, B., Gwizdalska-Kentzer, M. and J. Szwedo. **2020**. The biting midges rule(s) - Professor Ryszard Szadziewski. *Palaeoentomology* 3(5):445-460.

Spinelli, G.R. **2020**. Synonymy in Neotropical Ceratopogonidae (Diptera: Culicomorpha) (78(3):38-39, 2019). *Revista de la Sociedad Entomologica Argentina* Erratum:79(2):1.

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Szadziewski, R. and M. Gwizdalska-Kentzer. **2020**. New records of biting midges (Diptera: Ceratopogonidae) from the United Arab Emirates, with a description of a new species. *Zootaxa* 4894(4):594-597 [Read Abstract].

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Bakhoum, M.T., Fall, A.G., Seck, M.T., Fall, M., Ciss, M., Garros, C., Bouyer, J., Gimonneau, G. and T. Baldet. **2021**. Physicochemical factors affecting the diversity and abundance of Afrotropical *Culicoides* species in larval habitats in Senegal. *Acta Tropica* 105932 [Read Abstract].

Barceló, C., Purse, B., Estrada, R., Lucientes, J., Miranda, M.A. and K.R. Searle. **2021**. Environmental drivers of adult seasonality and abundance of biting midges *Culicoides* (Diptera: Ceratopogonidae), bluetongue vector species in Spain. *Journal of Medical Entomology* 58(1):350-364 [Read Abstract].

Barceló. C. and M.A. Miranda. **2021**. Development and lifespan of *Culicoides obsoletus* s.S. (Meigen) and other livestock-associated species reared at different temperatures under laboratory conditions. *Medical and Veterinary Entomology* 35(2):187-201 [Read Abstract].

Bernotienė, R., Bartkevičienė, G. and D. Bukauskaitė. **2021**. The flying activity of biting midges (Ceratopogonidae: *Culicoides*) in Verkiai Regional Park, southeastern Lithuania. *Parasitology Research* [Read Abstract].

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González, M. A., F. Goiri, J. F. Barandika, and A. L. García-Pérez. **2021**. *Culicoides* biting midges and mosquito fauna at three dog and cat shelters in rural and periurban areas in Northern Spain. *Medical and Veterinary Entomology* 35(1):79-87.

Hadj-Henni, L., Djerada, Z., Millot, C. and D. Augot. **2021**. Comprehensive characterisation of *Culicoides clastrieri* and *C. festivipennis* (Diptera: Ceratopogonidae) according to morphological and morphometric characters using a multivariate approach and DNA barcode. *Scientific Reports* 11(1):521.

Jomkumsing, P., Surapinit, A., Saengpara, T. and P. Pramual. **2021**. Genetic variation, DNA barcoding and blood meal identification of *Culicoides* Latreille biting midges (Diptera: Ceratopogonidae) in Thailand. *Acta Tropica* 217:105866 [Read Abstract].

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Lakew, B.T., Nicholas, A.H. and S.W. Walkden-Brown. **2021**. Spatial and temporal distribution of *Culicoides* species in the New England region of New South Wales, Australia between 1990 and 2018. *PLoS One* 16(4):e0249468.

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McGregor, B. L., J. K. Blackburn, S. M. Wisely, and N. D. Burkett-Cadena. **2020**. *Culicoides* (Diptera: Ceratopogonidae) Communities Differ Between a Game Preserve and Nearby Natural Areas in Northern Florida. *Journal of Medical Entomology* 58(1):450-457.

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Figure 1 *Cladoxerus cryphaleus*. **A.** Adult female in a branch of *Calliandra* sp., inside a box, illustrating how the specimens were kept in captivity. **B–C.** Male in pre-imaginal instar parasitized by a specimen of *Forcipomyia* (*Microhelea*) sp. (Ceratopogonidae), whole body (**B**) and detail of the parasite attached to the head (**C**).

From: Chiquetto-Machado et al. 2020

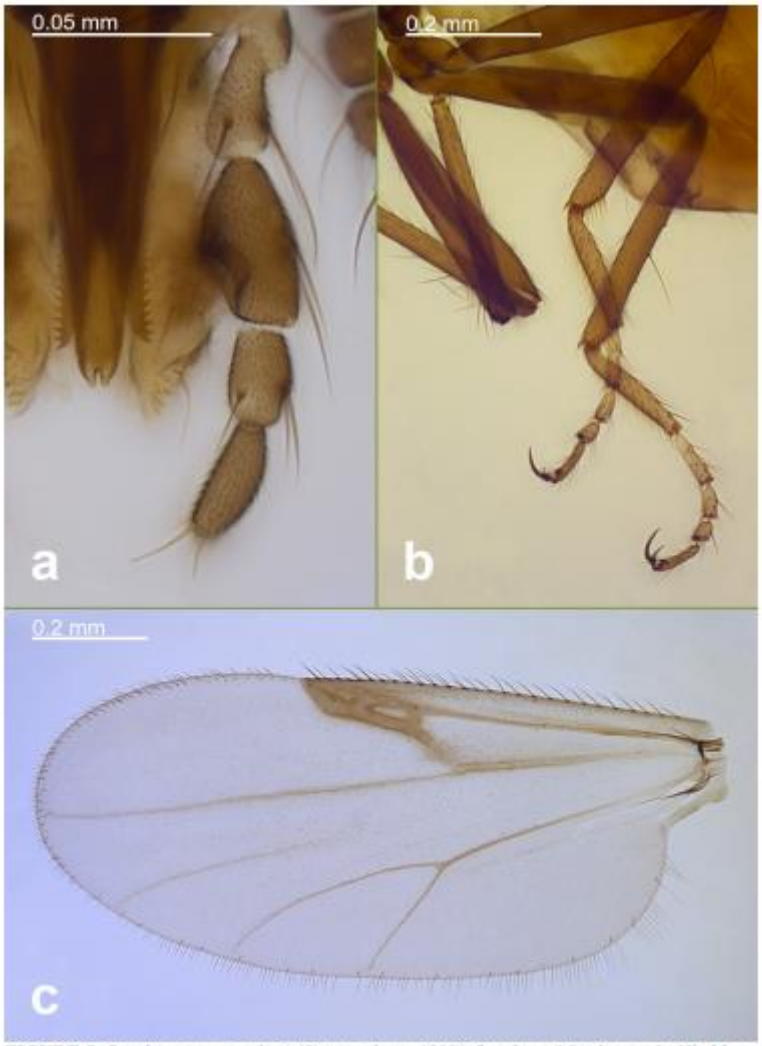

FIGURE 5. *Brachypogon singularis* (Santos Abreu, 1918), female. **a**. Mouthparts, **b**. Hind legs, **c**. Wing.

From: Dominiak et al. 2020

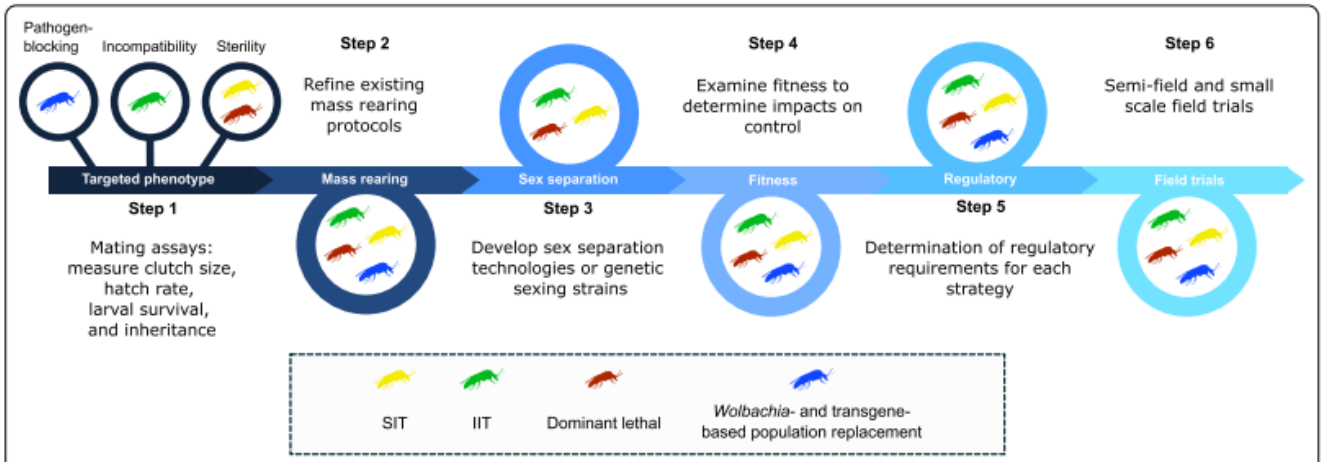

Fig. 2. Systematic steps for future research to address hurdles for the development of IIT, population replacement, genetically-based and/or SIT approaches

From: Shults et al. 2021

FIGURE 1. Professor Ryszard Szadziewski in amber forest—exhibition of Museum of Amber Inclusions, Faculty of Biology, University of Gdańsk (2013). Photo: Elżbieta Sontag.

From: Sontag et al. 2020

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