Funded PhD and MSc scholarship opportunities in South Africa on

DIPoDIP2: The Diversity of Pollinating Diptera in Afrotropical Biodiversity Hotspots

The DIPoDIP2 project (from April 1, 2024, to March 31, 2029) is the continuation of the DIPoDIP project (2019–2024) and is the result of a framework agreement in partnership with the Directorate-General for Development Cooperation and Humanitarian Aid (DGD) in Belgium and the AfricaMuseum (Royal Museum for Central Africa; RMCA) in Tervuren, Belgium. The DIPoDIP2 project offers **three PhD scholarships** (3 years, R200000 per year) and **three MSc scholarships** (2 years, R180000 per year) starting in 2025 in the Republic of South Africa.

The overall objective of the DIPoDIP2 project is the development of research activities and the promotion of training and educational activities, in partnership (among others) with Stellenbosch University (SU), the University of Pretoria (UP), and the KwaZulu-Natal Museum (KZNM).

The DIPoDIP2 project will study the biodiversity of true fly families (Diptera) in Biodiversity Hotspots of the Afrotropical Region (AR). The project will improve the taxonomy and identification of these families and provide basic data on their distribution and (pollination) ecology. This will be achieved through training of entomologists, conservationists and officials from the AR, including PhD and MSc students of the project partners, as well as joint research. Workshops with local partners and stakeholders will translate the results for policy making, Citizen Science and education. This will result in Red List assessments and improved conservation strategies for Diptera biodiversity in the AR, and Citizen Science and education activities will raise awareness on the importance of Diptera in pollination, food security and nature conservation.

We offer the following PhD and MSc scholarships (If you require further information about this opportunity, please contact us via the email addresses on the last page):

Reference: PhD-1-DIPoDIP2

Title: Taxonomic revision, biogeography and distribution modeling of the hover fly genus *Monoceromyia* (Syrphidae, Eristalinae) (host institute: KZNM, registered at UP, primary supervisor: Dr John Midgley)

Project description: The primary goal of taxonomy is to identify, describe, name, and classify all living organisms. It plays a central role in understanding biodiversity and serves as a foundation for many scientific disciplines, including the conservation of Earth's biodiversity. However, the taxonomy of many animal groups remains unclear, particularly in the case of two-winged insects (Diptera) in the Afrotropical Region. A notable example is the family Syrphidae (hoverflies or flower flies), which includes over 650 species in this region, many of which are frequently found on flowers. As such, they may represent an important group of pollinators, contributing to food security and the rich diversity of flowering plants in South Africa. Unfortunately, our understanding of the ecology of these species is limited, primarily due to the difficulty in identifying them. Existing identification keys are either outdated or unavailable. This PhD project aims to revise the taxonomy of the Afrotropical representatives of the wasp-mimicking genus, *Monoceromyia*. This is an enigmatic genus of hover flies since the larvae develop in sap streams of trees where they feed on the bacteria. The taxonomic revision will be the basis for further research in the PhD, focusing on the ecology, distribution and systematics of *Monoceromyia*.

More specifically, the PhD research will involve

- a comprehensive morphological taxonomic revision of the genus;
- the testing of DNA barcoding as a tool for species identification;
- the reconstruction of the phylogeny and biogeography of the genus in the Afrotropical Region;
- the production of an updated identification key for the Afrotropical species; and
- an assessment of the conservation status of the genus by compiling a Red List for the Afrotropical Region.

New material will be collected in South Africa, and the basic ecology of several species will be studied. The research tools will include microscopy, species distribution modelling, Red List assessments, and molecular techniques (DNA isolation, PCR, DNA sequencing), including the statistical analysis of DNA sequence data.

Reference: PhD-2-DIPoDIP2

Title: Taxonomic revision, biogeography and distribution modeling of the nose fly genus *Rhyncomyia* (Calliphoridae, Rhiniinae) (host institute: KZNM, registered at UP, primary supervisor: Dr John Midgley)

Project description: Rhiniinae, or nose flies, are a subfamily of blow flies (Diptera: Calliphoridae). Globally, there are approximately 50 genera and around 370 species. About 160 valid species in 16 genera are found in the Afrotropical region, with over 60 of these species occurring in South Africa. The taxonomy of this group is outdated, as most studies of the South African taxa were conducted 40 to 70 years ago. Although an annotated checklist of species for South Africa has been developed, many of these species remain challenging to identify. This is unfortunate because many nose flies can be found on flowers, suggesting they may represent an important, yet understudied, group of flies. Moreover, many species seem to be associated with termites but basic data on their life-cycle and ecology are missing. This project aims to enhance the taxonomy of one of the nose flies genera in the Afrotropical Region, facilitating more accurate identification of these species. Consequently, this PhD will improve the study of plant-pollinator networks.

This PhD project aims to revise the taxonomy of the Afrotropical representatives of the genus *Rhyncomyia*. More specifically, the research will involve

- a comprehensive morphological taxonomic revision of the genus;
- the testing of DNA barcoding as a tool for species identification;
- the reconstruction of the phylogeny and biogeography of the genus in the Afrotropical Region;
- the production of an updated identification key for the Afrotropical species; and
- an assessment of the conservation status of the genus by compiling a Red List for the Afrotropical Region.

New material will be collected in South Africa, and routes to study the ecology of species in this genus will be explored. The research tools will include microscopy, species distribution modelling, Red List assessments, and molecular techniques (DNA isolation, PCR, DNA sequencing), including the statistical analysis of DNA sequence data.

Reference: PhD-3-DIPoDIP2

Title: The influence of visual system evolution in fly pollinators on flower visiting behaviour and floral evolution in Cape daisies (host institute: SU, primary supervisor: Prof. Allan Ellis)

Project description: Cape daisies are unusual globally in frequently exhibiting complex flower colour patterns and unusual three-dimensional glossy appendages on the ray or disk florets. These floral markings are thought to have evolved in response to selection imposed by aggregation and mating responses of flies and beetles, the most important pollinating groups. Interestingly, our observations suggest that the bee fly and horse fly species associated with the most elaborately marked flowers have unusual eye structures marked by a loss of facet dimorphism in males, a trait that is associated with female detection and mating in many fly groups. This project will use comparative phylogenetic approaches to investigate the timing and pattern of evolution of eye structure across relevant fly lineages in relation to the evolution of floral markings. Field observations and experimentation will be used to understand the influence of eye structure evolution on mating and flower visiting behaviour in the flies and the patterns of selection they impose on floral evolution.

Reference: MSc-1-DIPoDIP2

Title: Taxonomic revision of the hover fly genus *Metadon* (Syrphidae, Microdontinae) (host institute: KZNM, registered at UP, primary supervisor: Dr John Midgley)

Project description: Microdontinae is a subfamily within the Syrphidae family, commonly known as hover flies or flower flies. Hover flies in the Afrotropical Region include over 650 species, many of which are frequently found on flowers, making them potentially important pollinators. However, species in the Microdontinae subfamily are unique in that their adult forms have reduced mouthparts, suggesting they may not feed at all. As a result, these species are not typically associated with flowers. Interestingly, the larvae of Microdontinae exhibit a close relationship with ants, with females laying eggs in or near ant nests. This suggests that the larvae may feed on ant larvae, the food stores within the colony, or possibly even on waste products or bacteria present in the nests. Before we can fully explore this fascinating ecological relationship, it is essential to refine the taxonomy of this subfamily to accurately identify species. This MSc project focuses on revising the taxonomy of *Metadon*, a genus within Microdontinae. The research will encompass a comprehensive morphological and molecular taxonomic study, including DNA barcoding, and will result in the creation of an identification key for species of this genus in the Afrotropical Region. The study will utilize various research tools, including microscopy, DNA isolation, PCR, DNA sequencing, and statistical analysis of DNA barcode data.

Reference: MSc-2-DIPoDIP2

Title: Geographical variation in true fly (Insecta: Diptera) diversity and abundance in backyards across South Africa (host institute: UP, primary supervisor: Prof. Catherine Sole)

Project description:

Most long-term studies on insect biodiversity and information regarding insect declines exists for the Global North, however, only anecdotal evidence of this trend is apparent in Southern Africa. Urbanisation has been one of the leading causes of habitat loss and consequently biodiversity loss for insects. However, losses in biodiversity can be counteracted by providing refugia and microhabitats within the urban environment. Insects are crucial members of ecosystems, thus their presence in our built-up environments serves as a great indication of the quality of the environment and surrounding biodiversity. This study will be a comparative study assessing pollinating Diptera diversity across three locations in South Africa (Future Africa UP campus biodiversity gardens, gardens in KwaZulu-Natal that have both natural vegetation; and ornamental and commercial plants; and the Ingcungcu sunbird restoration project Western Cape Province.

The student will be required to identify the fly species, DNA barcode them, determine degree of biodiversity and statistically analyse the data (i.e. species richness and abundance).

Reference: MSc-3-DIPoDIP2

Title: Diversity and ecology of horse-fly pollinators (*Rhigioglossa*, Tabanidae) in the Cape (host institute: SU, primary supervisor: Prof. Allan Ellis)

Project description: Horse flies in the genus *Rhigioglossa* are frequent visitors on daisy mass flowering displays in the winter rainfall regions of South Africa. They are likely important pollinators, critical to maintenance of this economically and ecologically important biodiversity spectacle in the Western and Northern Cape provinces. Despite their potential importance we know little about their diversity, distributions and contribution to pollination. This project will focus on *Rhigioglossa* subgenus *Rhigioglossa*, which contains the most important pollinating species. The student will employ molecular (barcoding), morphological and distributional data to evaluate the diversity in the group, and establish relationships between species. In addition a combination of field-based observations and experiments, and literature surveys, will be used to investigate the pollination interactions of these flies.

Host Framework

- The DIPoDIP2 project is managed by Dr Kurt Jordaens, work leader in the Invertebrates Unit of the Department of Biology of the AfricaMuseum.
- The scholarships are managed, and supervised, by Prof. Allan Ellis, professor at the Botany and Zoology Department at Stellenbosch University (SU), Prof. Catherine Sole, principal investigator at the Department of Zoology and Entomology of the University of Pretoria (UP), Dr John Midgley, Assistant Director, Natural Science at the KwaZulu-Natal Museum, and Dr Kurt Jordaens (AfricaMuseum), under the framework of a Memorandum of Understanding (MoU) and annual agreements between the AfricaMuseum, SU, UP, and KZNM.
- The PhD/MSc candidate/s will conduct fieldwork in South Africa and will be based at the KwaZulu-Natal Museum (**PhD-1-DIPoDIP2, MSc-1-DIPoDIP2**), the University of Pretoria (**PhD-2-DIPoDIP2, MSc-2-DIPoDIP2**), or Stellenbosch University (**PhD-3-DIPoDIP2, MSc-3-DIPoDIP2**), with regular short exchanges among the three institutions.
- For the PhD candidates, a one-month training session in entomology and molecular biology is foreseen at the Invertebrates Section of the AfricaMuseum during the first year of the PhD.

Finally, the candidate will contribute to forming a growing team of young entomologists trained by the project to identify Afrotropical Diptera. They will become part of a team that will strongly interact with Citizen Scientists who submit pictures for identification requests on iNaturalist.

PhD research conditions, eligibility, and target profile

Research conditions

The three PhDs will be funded at R200.000 per year for a period of 3 years starting in the first quarter of 2025.

The dissertation will be conducted in a "local" mode, whereby the researcher will spend the duration of the project at the partner institution in South Africa, where they are affiliated, with a one-month internship at the AfricaMuseum in Belgium during the first year of the PhD.

The candidate will be subject to the regulations of the host institution in South Africa, which includes monitoring their progress by their South African and Belgian supervisors. Supervisors will meet with students several times a year and provide binding advice. A condition of the scholarships is that candidates need to demonstrate adequate progress to the satisfaction of the advisory team after 12 months of registration. Lack of progress will result in immediate termination of funding.

The selected candidate will work in collaboration with the other PhD/MSc candidates selected under the DIPoDIP2 project, as well as with various northern and southern partners (e.g.,

technicians) involved in the DIPoDIP2 project and other projects conducted by the AfricaMuseum and its collaborators.

Eligibility Criteria

- The candidate must hold a recognized second-cycle university degree (Master's level) in a relevant field (*e.g.*; Entomology, Zoology, Ecology, Botany, Biodiversity Science, Agriculture) or an equivalent qualification granting access to doctoral research, preferably with a strong background in entomology.
- Applications from students in their final year of a Master's program will also be accepted if they can demonstrate that the MSc degree will be completed before a Jan-March 2025 start date.
- The candidate must hold citizenship from one of the following countries: South Africa, Bénin, Burundi, Kenya, Mozambique, Uganda, DR Congo, Rwanda, Sénégal, or Tanzania.
- The candidate must be under 45 years of age as of September 1, 2024.
- The host institutions are committed to equality, employment equity and diversity.
- In accordance with the Employment Equity Plan of the University and its Employment Equity goals and targets, preference may be given, but is not limited to candidates from under-represented designated groups.
- All candidates who comply with the requirements for appointment are invited to apply.
- The host institution reserves the right not to fill the advertised positions.

Target Profile

- The candidate must have a strong command of spoken and written English.
- Must be highly motivated to undertake academic research in an international context.
- Must be able to manage a project independently, take initiative, and meet deadlines.
- Must demonstrate creativity, particularly when facing potential problems during research.
- Must be collaborative and willing to share the results of their work for the benefit of the project and the scientific community in general.
- Must be sincere, honest, and willing to adhere to research ethics (ensuring respect for confidentiality, intellectual property, etc.).
- Must have excellent personal skills and good organizational skills, with attention to detail to interact with other partners and stakeholders of the project.
- Candidates must be able and willing to conduct fieldwork for extended periods, sometimes under challenging logistical and climatic conditions.
- Must demonstrate strong analytical and writing skills.
- The candidate should be capable of independently conducting phylogenetic analyses (in R or specific software).
- Must be able to stay in Belgium for one month during the first year of the PhD.

- A good knowledge of zoology (especially on general entomology or on the identification of Afrotropical Diptera) is a significant asset.
- Familiarity with field work conditions in South Africa and with the various study systems is desirable.
- Attainment of the MSc with distinction is an advantage
- Authorship of scientific publications is an advantage
- Possession of a valid drivers license is an advantage

MSc research conditions, eligibility, and target profile

Research conditions

The three MSc's will be funded at R180.000 per year for a period of 2 years during the project period. The thesis will be conducted in a "local" mode, whereby the researcher will spend the project duration at the partner institution in South Africa, where they are affiliated.

The candidate will be subject to the regulations of the host institution in South Africa, which includes monitoring their progress by their South African and Belgian supervisors. Supervisors will meet several times a year and provide binding advice. Lack of progress will result in immediate termination of funding.

Eligibility Criteria

- The candidate must hold an Honours degree or an equivalent qualification preferably, with a strong background in entomology.
- The candidate must be of South African nationality.
- During the MSc, the candidate must be affiliated with an academic or research institution that is a partner of DIPoDIP2.
- Except for duly justified exceptions, the candidate must be under 45 years of age as of September 1, 2024; candidates over 50 years of age on that date will not be considered.
- The host institutions are committed to equality, employment equity and diversity. In accordance with the Employment Equity Plan of the University and its Employment Equity goals and targets, preference may be given, but is not limited to candidates from under-represented designated groups.
- All candidates who comply with the requirements for appointment are invited to apply.
- The host institution reserves the right not to fill the advertised positions.

Target Profile

- The candidate must have a BSc Honours degree or equivalent.

- Must have a strong command of spoken and written English.
- Must be highly motivated to undertake academic research in an international context.
- Must be able to manage a project independently, take initiatives, and meet deadlines.
- Must demonstrate creativity, particularly when facing potential problems during research.
- Must be collaborative and willing to share the results of their work for the benefit of the project and the scientific community in general.
- Must be sincere, honest, and willing to adhere to research ethics (ensuring respect for confidentiality, intellectual property, etc.).
- Must have excellent personal skills and good organizational skills, with attention to detail to interact with other partners and stakeholders of the project.
- Must have good aptitude for fieldwork.
- Candidates must be able and willing to conduct fieldwork for extended periods, sometimes under challenging logistical and climatic conditions.
- Must demonstrate strong analytical and writing skills.
- A good knowledge of zoology (especially on general entomology or on the identification of Afrotropical Diptera) is a significant asset.
- Familiarity with field working conditions South Africa is desirable.
- Drivers license is an advantage.
- Honours with distinction is an advantage.

Application Submission Procedure for MSc and PhD scholarships

The deadline for submitting applications is **November 1, 2024**. The application file must include:

- A motivation letter (maximum 1 page). The letter should indicate which of the available projects is preferred and how the project aligns with the candidate's professional or academic career plans.
- A detailed curriculum vitae (maximum 2 pages), including a list of publications (if relevant).
- Certified copies of degrees and university transcripts.
- The names and email addresses of two referees (academic staff from the candidate's home scientific institution) and a letter of recommendation from at least one of them.
- For PhD candidates: A summary of the final MSc thesis, and, if possible, a copy (PDF) of the thesis.
- A copy (PDF) of key publications (if relevant).

The application file should be sent as a single PDF file named after the candidate and emailed to four recipients simultaneously:

- Dr Kurt Jordaens, project promoter for DIPoDIP (AfricaMuseum) (kurt.jordaens@africamuseum.be)
- Prof. Allan Ellis, local co-promotor of the DIPoDIP2 project and professor at Stellenbosch University (SU) (agellis@sun.ac.za)
- Prof. Catherine Sole, local co-promotor of the DIPoDIP2 project and professor at the University of Pretoria (UP) (catherine.sole@up.ac.za)
- Dr John Midgley, local co-promotor of the DIPoDIP2 project and Assistant Director, Natural Science at the KwaZulu-Natal Museum (KZNM) (jmidgley@nmsa.org.za)

Selection procedure

- A preliminary selection will be carried out in partnership with the relevant partner institution(s) based on the application files.
- Candidates shortlisted for an interview will be informed by the first of December 2024, at the latest; the nature and location of the interviews will be communicated on the same date.
- Interviews will take place during December 2024.
- Candidates will receive a response shortly after the interviews, following deliberations with the various southern and northern supervisors.
- The PhD and MSc positions will start in the first quarter of 2025.