# CURRICULUM VITAE Diego S. Porto

Finnish Museum of Natural History
University of Helsinki
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Google Scholar: https://scholar.google.com/citations?user=hRTdDu4AAAAJ&hl

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### ACADEMIC EMPLOYMENT

2022 - preser	nt Postdoctoral Researcher	Finnish Museum of Natural History, University of Helsinki, Helsinki, Finland. Supervisor: Sergei Tarasov			
2020 - 2022	2 Postdoctoral Associate	Department of Biological Sciences, Virginia Tech, Blacksburg, VA, USA. Supervisor: Josef C. Uyeda			
EDUCATION					
2015-2019	Ph.D. in Entomology	Universidade de São Paulo, FFCLRP, Ribeirão Preto, SP, Brazil Dissertation title: <i>Phylogenetic relationships and comparative internal morphology of bees (Hymenoptera: Apoidea: Anthophila)</i> Dissertation advisor: Eduardo A. B. Almeida			
2013-2015	M.Sc. in Entomology	Universidade de São Paulo, FFCLRP, Ribeirão Preto, SP, Brazil Thesis title: <i>Phylogenetic relationships of corbiculate bees</i> ( <i>Hymenoptera: Apidae: Apini</i> ) Thesis advisor: Eduardo A. B. Almeida			
2008-2013	<b>Teaching Degree</b> in Biological Sciences	Universidade de São Paulo, FFCLRP, Ribeirão Preto, SP, Brazil			
2008-2012	<b>B.A.</b> in Biological Sciences	Universidade de São Paulo, FFCLRP, Ribeirão Preto, SP, Brazil Dissertation title: <i>Comparative morphology of species from the genus Pyrogaster Motschulsky, 1853 (Coleoptera: Lampyridae: Photurinae)</i> Dissertation advisors: Simone P. Rosa and Dalton S. Amorim			

# RESEARCH & TEACHING INTERESTS

Systematics, taxonomy, entomology, invertebrate zoology, comparative morphology, morphological evolution, evolutionary biology, phylogenetic comparative methods, computational ontologies, phenomics, cybertaxonomy.

### **PUBLICATIONS**

- **Porto, D. S.**, Uyeda, J., Mikó, I., & Tarasov, S. (2024). ontophylo: Reconstructing the evolutionary dynamics of phenomes using new ontology-informed phylogenetic methods. *Methods in Ecology and Evolution*, 00, 1-11. DOI: https://doi.org/10.1111/2041-210X.14283
- Porto, D. S., Tarasov, S., Charpentier, C., Lapp, H., Balhoff, J. P., Vision, T. J., Dahdul, W. M., Mabee, P. M., & Uyeda, J. (2023). rphenoscate: An R package for semantics-aware evolutionary analyses of anatomical traits. *Methods in Ecology and Evolution*, 14(10), 2531-2540.
   DOI: https://doi.org/10.1111/2041-210X.14210
- Almeida, E. A. B., Bossert, S., Danforth, B. N., **Porto, D. S.**, Freitas, F. V., Davis, C. C., Murray, E. A., Blaimer, B. B., Spasojevic, T., Ströher, P. R., Orr, M. C., Packer, L. P., Brady, S. G., Kuhlmann, M., Branstetter, M. G., & Pie, M. R. (2023). The evolutionary history of bees in time and space. *Current Biology*, 33(16), 3409-3422. DOI: https://doi.org/10.1016/j.cub.2023.07.005
- Porto, D. S., Dahdul, W. M., Lapp, H., Balhoff, J. P., Vision, T. J., Mabee, P. M., & Uyeda, J. (2022).
  Assessing Bayesian phylogenetic information content of morphological data using knowledge from anatomy ontologies. *Systematic Biology*, 71(6), 1290-1306. DOI: https://doi.org/10.1093/sysbio/syac022
- Porto, D. S., & Almeida, E. A. B. (2021). Corbiculate bees (Hymenoptera: Apidae): Exploring the limits of morphological data to solve a hard phylogenetic problem. *Insect Systematics and Diversity*, 5(3), 2. DOI: https://doi.org/10.1093/isd/ixab008
- **Porto, D. S.**, Almeida, E. A. B., & Pennell, M. W. (2021). Investigating morphological complexes using informational dissonance and Bayes factors: A case study in corbiculate bees. *Systematic Biology*, 70(2), 295-306. DOI: https://doi.org/10.1093/sysbio/syaa059
- **Porto, D. S.**, & Almeida, E. A. B. (2019). A comparative study of the pharyngeal plate of Apoidea (Hymenoptera: Aculeata), with implications for the understanding of phylogenetic relationships of bees. *Arthropod Structure & Development*, 50, 64-77. DOI: https://doi.org/10.1016/j.asd.2019.04.002
- Porto, D. S., Almeida, E. A. B., & Vilhelmsen, L. (2017). Comparative morphology of internal structures of the mesosoma of bees with an emphasis on the corbiculate clade (Apidae: Apini). *Zoological Journal of the Linnean Society*, 179(2), 303–337. DOI: https://doi.org/10.1111/zoj.12466
- **Porto, D. S.**, Vilhelmsen, L., & Almeida, E. A. B. (2016). Comparative morphology of the mandibles and head structures of corbiculate bees (Hymenoptera: Apidae: Apini). *Systematic Entomology*, 41(2), 339-368. DOI: https://doi.org/10.1111/syen.12156
- **Porto, D. S.**, Melo, G. A., & Almeida, E. A. B. (2016). Clearing and dissecting insects for internal skeletal morphological research with particular reference to bees. *Revista Brasileira de Entomologia*, 60(1), 109-113. DOI: https://doi.org/10.1016/j.rbe.2015.11.007
- Almeida, E. A. B., & **Porto**, **D. S.** (2014). Investigating eusociality in bees while trusting the uncertainty. *Sociobiology*, 61(4), 355-368. DOI: https://doi.org/10.13102/sociobiology.v61i4.355-368

### GRANTS, FELLOWSHIPS AND AWARDS

- Travel Award, Society of Systematic Biologists (US\$1,000 USD)
- 2019-2021 Research grant, São Paulo Research Foundation (FAPESP)

  Title: *Phylogenomic systematics, comparative morphology and biogeography of bees*(Hymenoptera: Anthophila)

  Institution: Universidade de São Paulo, FFCLRP, Ribeirão Preto, SP, Brazil

  Researchers: Eduardo A. B. Almeida (PI), Diego S. Porto (co-PI), Marcio R. Pie (co-PI)

Ph.D. international internship grant, São Paulo Research Foundation (FAPESP) (~US\$10,000)
Title: Phenotypic Evolution and Patterns of Bee Diversification (Hymenoptera: Apoidea: Anthophila)
Host institution: University of British Columbia, British Columbia, Vancouver, Canada Internship supervisor: Matthew W. Pennell

2016 Marie Stopes Travel Award, Willi Hennig Society (US\$600 USD)

Ph.D. scholarship, São Paulo Research Foundation (FAPESP) (~US\$32,000)
Title: Phylogenetic relationships and comparative internal morphology of bees (Hymenoptera: Apoidea: Anthophila)
Institution: Universidade de São Paulo, FFCLRP, Ribeirão Preto, SP, Brazil

2015-2016 Ph.D. scholarship, Brazilian National Council for Scientific and Technological Development (~US\$6,500)

Title: Phylogenetic relationships and comparative internal morphology of bees (Hymenoptera: Apoidea: Anthophila)
Institution: Universidade de São Paulo, FFCLRP, Ribeirão Preto, SP, Brazil

2014 Masters international internship grant, São Paulo Research Foundation (FAPESP) (~US\$6,000)
Title: Comparative Morphology of Internal Skeletal Structures of the Head of Corbiculate Bees
(Apidae: Apini)
Host institution: University of Copenhagen, Copenhagen, Denmark

Internship supervisor: Lars B. Vilhelmsen

2013-2015 Masters scholarship, São Paulo Research Foundation (FAPESP) (~US\$10,000)
Title: *Phylogenetic Relationships of Corbiculate Bees (Hymenoptera: Apidae: Apini)*Institution: Universidade de São Paulo, FFCLRP, Ribeirão Preto, SP, Brazil

### **INVITED PRESENTATIONS**

2023 Evolution Meeting, Albuquerque, NM, USA. **Porto. D. S..** & Tarasov, S. *The Key Role of Ontologies in the Era of I* 

**Porto, D. S.**, & Tarasov, S. The Key Role of Ontologies in the Era of Phenomics: Integrating Organismal Anatomy and Phylogenetics.

Joint ESA, ESC, and ESBC Annual Meeting, Vancouver, BC, Canada.

**Porto, D. S.**, Almeida, E. A. B., & Tarasov, S. *Phylogeny and evolutionary dynamics of bee phenomes: An integrative approach to semantic-aware morphological phylogenetics.* 

2015 XI Encontro Sobre Abelhas, Ribeirão Preto, SP, Brazil.

**Porto, D. S.** Phylogenetic relationships of corbiculate bees (Apidae: Apini) inferred from new data from internal structures of exoskeleton.

### TALKS AND POSTERS

2023 10th Congress of the International Society of Hymenopterists, Iasi, Romania **Porto, D. S.**, Tarasov, S., & Almeida, E. A. B. *The evolutionary dynamics of the labiomaxillary complex of bees (Hymenoptera: Apoidea: Anthophila)*. (talk)

2023 10th Congress of the International Society of Hymenopterists, Iasi, Romania Tarasov, S., Montanaro, G., Losacco, F., **Porto, D. S.**, & Mikó, I. From words to data: using phenoscript to unleash the potential of taxonomic descriptions for phenomic research. (talk)

- Evolution Meeting, Albuquerque, NM, USA. **Porto, D. S.**, Uyeda, J., Mikó, I., & Tarasov, S. *ontophylo: reconstructing evolutionary dynamics of phenomes by integrating anatomy ontologies and phylogenetics.* (poster)
- Evolution Meeting, Albuquerque, NM, USA.
  Tarasov, S., Losacco, F., Montanaro, G., & **Porto, D. S.** Unlocking the Power of Taxonomic Descriptions: Introducing Phenoscript, a New Computer Language for Phenomic-scale Research in Biology. (talk)
- 5th Standalone Meeting of the Society of Systematic Biologists, Mexico City, Mexico. **Porto, D. S.**, Tarasov, S., Charpentier, C., Dahdul, W. M., Lapp, H., Balhoff, J. P., Vision, T. J., Mabee, P. M., & Uyeda, J. *Integrating Anatomy Ontologies and Phylogenetics in the Era of Phenomics*. (poster)
- 2022 XXXIX Annual Meeting of the Willi Hennig Society, Helsinki, Finland. **Porto, D. S.**, Tarasov, S., Charpentier, C., Dahdul, W. M., Lapp, H., Balhoff, J. P., Vision, T. J., Mabee, P. M., & Uyeda, J. rphenoscate: An R package for semantic-aware comparative analyses of organismal phenotypes. (talk)
- 2022 XXXIX Annual Meeting of the Willi Hennig Society, Helsinki, Finland.
  Tarasov, S., & **Porto, D. S.** *Paving the way: from traditional taxonomy to comparative phenomics.* (talk)
- 2022 XXVI International Congress of Entomology, Helsinki, Finland. **Porto, D. S.**, & Tarasov, S. Reconstructing Evolutionary Dynamics of Phenomes: Integrating Phylogenetic Models and Ontologies. (talk)
- 2021 Entomology Annual Meeting, Denver, CO, USA. **Porto, D. S.**, & Almeida, E. A. B. *Phylogenetic comparative skeletal morphology of bees*(*Hymenoptera: Apoidea: Anthophila*). (online talk)
- Evolution Meeting, Virtual Conference, USA.
   Porto, D. S., Dahdul, W. M., Lapp, H., Balhoff, J. P., Vision, T. J., Mabee, P. M., & Uyeda, J.
   Phylogenetic information content of anatomy ontologies. (online talk)
- 2020 XXXIII Congresso Brasileiro de Zoologia, Águas de Lindóia, SP, Brazil.
  Almeida, E. A. B., Bossert, S., & **Porto, D. S.** Evolução das abelhas: Biogeografia em 120 milhões de anos do planeta em transformação. (talk)
- 2019 2nd Australian Native Bee Conference, Brisbane, QLD, Australia.
  Almeida, E. A. B., **Porto, D. S.**, Bossert, S., Danforth, B. N., & Pie, M. R. *Australian bees: Ancient or young, but very attractive.* (talk)
- 2019 Evolution Meeting, Providence, RI, USA. **Porto, D. S.**, Almeida, E. A. B., & Pennell, M. W. *Investigating morphological complexes using phylogenetic dissonance and Bayes factors: A case study in corbiculate bees.* (poster)
- 2016 XXXV Annual Meeting of the Willi Hennig Society, Buenos Aires, Argentina. **Porto, D. S.**, & Almeida, E. A. B. *Phylogeny and comparative morphology of internal structures of corbiculate bees (Apidae: Apinae: Apini)*. (poster)
- 2014 XXX Congresso Brasileiro de Zoologia, Porto Alegre, RS, Brazil. **Porto, D. S.**, & Almeida, E. A. B. *Morfologia comparada do propecto em abelhas corbiculadas* (*Apidae: Apini*). (poster)

- 2012 Grupo de Apoio Pedagógico de Ribeirão Preto (GAPRP), Universidade de São Paulo, FFCLRP, Ribeirão Preto, SP, Brazil. Mancini, G. V., Porto, D. S., Fachin, D. A., & Kawasaki, C. S. Estágio Supervisionado: Uma Experiência de Interação entre Universidade e Escola. (poster)
- 2012 III Encontro de Estágios Obrigatórios e Experiências de Ensino: Compartilhando experiências de estágios, Universidade de São Paulo, EACH, São Paulo, SP, Brazil. Mancini, G. V., Fachin, D. A., Porto, D. S., Kawasaki, C. S., Pires, M. R., Guesso, M., & Castro, F. Estágio supervisionado: integração entre escola e universidade. (poster)
- 19th International Symposium of Scientific Initiation, Universidade de São Paulo, Ribeirão 2011 Preto, SP, Brazil. Porto, D. S., Rosa, S. P., & Amorim, D. S. Comparative morphology of three species of the genus Pyrogaster Motschulsky, 1853 (Coleoptera: Lampyridae: Photurinae). (poster)

### TEACHING EXPERIENCE

# **Teaching Assistance**

## **Undergraduate level**

- 2017 Invertebrate Zoology II (5920838), Universidade de São Paulo, Ribeirão Preto, SP, Brazil. 2016 Invertebrate Zoology II (5920838), Universidade de São Paulo, Ribeirão Preto, SP, Brazil. 2012 Invertebrate Zoology II (5920229), Universidade de São Paulo, Ribeirão Preto, SP, Brazil. 2011 Invertebrate Zoology II (5920229), Universidade de São Paulo, Ribeirão Preto, SP, Brazil. Lectures 2022 XX Curso de Verão em Entomologia, Universidade de São Paulo, Ribeirão Preto, SP. Brazil.
  - Comparative morphology of Hexapoda: A study model for understanding biological diversity. (online)
  - 2021 XIX Curso de Verão em Entomologia, Universidade de São Paulo, Ribeirão Preto, SP, Brazil. Comparative morphology of Hexapoda: A study model for understanding biological diversity. (online)
  - 2021 Café com Ciência, Universidade de São Paulo, Ribeirão Preto, SP, Brazil. Modeling morphological evolution: What do we really learn from coins and dice? (online)
  - 2020 Invertebrate Zoology II (5920838), Universidade de São Paulo, Ribeirão Preto, SP, Brazil. Metazoan diversification during the Cambrian and fossil groups of Panarthropoda. (online)
  - 2020 Special Topics in Evolutionary Biology: Macroevolution & Phylogenetics (BIOL 5984), Virginia Tech, Blacksburg, VA, USA. Advanced Topics in Morphological Evolution. (online)
  - 2019 Invertebrate Zoology II (5920838), Universidade de São Paulo, Ribeirão Preto, SP, Brazil. Metazoan diversification during the Cambrian and fossil groups of Panarthropoda.
  - 2018 Invertebrate Zoology II (5920838), Universidade de São Paulo, Ribeirão Preto, SP, Brazil. Metazoan diversification during the Cambrian and fossil groups of Panarthropoda.

2018 XVI Curso de Verão em Entomologia, Universidade de São Paulo, Ribeirão Preto, SP, Brazil. Scientific Collections, Curatorship, and Collecting Methods. 2017 Invertebrate Zoology II (5920838), Universidade de São Paulo, Ribeirão Preto, SP, Brazil. Metazoan diversification during the Cambrian and fossil groups of Panarthropoda. 2017 XV Curso de Verão em Entomologia, Universidade de São Paulo, Ribeirão Preto, SP, Brazil. Scientific Collections, Curatorship, and Collecting Methods. 2016 XIV Curso de Verão em Entomologia, Universidade de São Paulo, Ribeirão Preto, SP, Brazil. Scientific Collections, Curatorship, and Collecting Methods. 2016 XIV Curso de Verão em Entomologia, Universidade de São Paulo, Ribeirão Preto, SP, Brazil. Diversity and Taxonomy of Bees. 2014 XII Curso de Verão em Entomologia, Universidade de São Paulo, Ribeirão Preto, SP, Brazil. Diversity and Systematics of Bees. Workshops 2023 10th Congress of the International Society of Hymenopterists, Iasi, Romania An introduction to computable phenotype descriptions of Hymenoptera. (https://github.com/diegosasso/workshop\_ISH2023) 2023 Evolution Meeting, Albuquerque, NM, USA. Reconstructing evolutionary dynamics of phenomes using new ontology-informed phylogenetic methods. (https://github.com/diegosasso/workshop\_evolution2023) 2018 XVI Curso de Verão em Entomologia, Universidade de São Paulo, Ribeirão Preto, SP, Brazil. External Morphology of Hexapoda. 2017 XV Curso de Verão em Entomologia, Universidade de São Paulo, Ribeirão Preto, SP, Brazil. External Morphology of Hexapoda. 2016 XIV Curso de Verão em Entomologia, Universidade de São Paulo, Ribeirão Preto, SP, Brazil. Collecting Methods in Entomology. 2016 XIV Curso de Verão em Entomologia, Universidade de São Paulo, Ribeirão Preto, SP, Brazil. External Morphology of Hexapoda. 2015 XIII Curso de Verão em Entomologia, Universidade de São Paulo, Ribeirão Preto, SP, Brazil. Fundamentals of Hymenoptera Taxonomy. 2015 XIII Curso de Verão em Entomologia, Universidade de São Paulo, Ribeirão Preto, SP, Brazil. External Morphology of Hexapoda. 2015 XIII SECIBIO, Faculdade de Filosofia, Ciências e Letras de Ituverava, Ituverava, SP, Brazil. Studying Insects: Taxonomy, Morphology, and Diversity. 2014 XII Curso de Verão em Entomologia, Universidade de São Paulo, Ribeirão Preto, SP, Brazil. Collecting Methods in Entomology. 2014 XII Curso de Verão em Entomologia, Universidade de São Paulo, Ribeirão Preto, SP, Brazil.

External Morphology of Hexapoda.

# **OUTREACH EXPERIENCE**

2018	Biological Sciences exhibition. Bio na Rua – Ribeirão Preto 2018 Universidade de São Paulo, FFCLRP, Ribeirão Preto, Brazil.
2017	Biological Sciences exhibition. Bio na Rua – Ribeirão Preto 2017 Universidade de São Paulo, FFCLRP, Ribeirão Preto, Brazil.
2013	Biological Sciences exhibition. VIII Mostra da Biologia Universidade de São Paulo, FFCLRP, Ribeirão Preto, Brazil.
2012	Biological Sciences exhibition. VII Mostra da Biologia Universidade de São Paulo, FFCLRP, Ribeirão Preto, Brazil.
2009	Guide in 'Nocturnal Educational Tour' at Zoo and 'Penguin's Exhibition' Parque Ecológico São Carlos, São Carlos, SP, Brazil.

# **SERVICE**

2021	Undergraduate Dissertation Committee	Dissertation: Selection of priors for the calibration of the morphological clock in estimating divergence times of the family Scolebythidae (Hymenoptera: Aculeata).  Institution: Universidade Federal do Paraná, Curitiba, PR, Brazil. Candidate: Anderson Lepeco
2021	Master Thesis Committee	Thesis: Comparative anatomy and phylogenetic implications of the skeletal musculature of the head of the family Apidae sensu latu (Hymenoptera: Apoidea).  Institution: Universidade Federal do Paraná, Curitiba, PR, Brazil. Candidate: Odair Milioni de Meira
2019	Undergraduate Dissertation Committee	Dissertation: Genetic and morphological variability of the crab Cyclograpsus integer H. Milne Edwards, 1837 along its distribution in the Western Atlantic Ocean.  Institution: Universidade de São Paulo, Ribeirão Preto, SP, Brazil. Candidate: Beatriz Heloisa Valézio
2016	Organizing Committee	XIV Curso de Verão em Entomologia, Universidade de São Paulo, Ribeirão Preto, Brazil.
2015	Poster Reviewer	23º Simpósio Internacional de Iniciação Científica e Tecnológica da USP (SIICUSP), Ribeirão Preto, SP, Brazil.
2015	Organizing Committee	XI Encontro Sobre Abelhas, Ribeirão Preto, Brazil.
2015	Organizing Committee	XIII Curso de Verão em Entomologia, Universidade de São Paulo, Ribeirão Preto, Brazil.
2014	Poster Reviewer	22º Simpósio Internacional de Iniciação Científica e Tecnológica da USP (SIICUSP), Ribeirão Preto, SP, Brazil.
2014	Organizing Committee	XII Curso de Verão em Entomologia, Universidade de São Paulo, Ribeirão Preto, Brazil.

### **JOURNAL REVIEWER**

Apidologie, Arthropod Structure & Development, Arthropod Systematics & Phylogeny, Insectes Sociaux, Neotropical Entomology, Zookeys.

### **MENTORSHIP**

## **Undergraduates**

2020-2023 Kaine Lovill

Institution: Virginia Tech, Blacksburg, VA, USA

### **MUSEUM & COLLETION EXPERIENCE**

2013-2019 Entomological Collection "Prof. J.M.F. Camargo" (RPSP), Ribeirão Preto, SP, Brazil.

### FIELD EXPERIENCE

2016-2017	Monthly field expeditions to Estação Ecológica de Itirapina, Itirapina, SP, Brazil.
2016-2017	Monthly field expeditions to Estação Ecológica Jataí, Luiz Antônio, SP, Brazil.
2015	Field expedition to Parque Estadual Morro do Diabo, Teodoro Sampaio, SP, Brazil.

### **HACKATHONS**

2023 TraitFest, RENCI, University of North Carolina, Chapel Hill, NC, USA.

Products: PhenoNet: A pipeline to generate networks representing trait dependencies from a

character matrices and ontology annotations.

https://github.com/phenoscape/TraitFest-2023/blob/main/PhenoNet.R (coauthor)

#### **SOFTWARE**

ontophylo Reconstruction of evolutionary dynamics of phenomes using ontology-informed phylogenetic

methods. (coauthor)

R package: https://github.com/diegosasso/ontophylo

rphenoscate Semantics-aware evolutionary analyses incorporating morphological knowledge represented in

anatomy ontologies. (coauthor)

R package: https://github.com/diegosasso/rphenoscate

ontobayes Exploratory analyses of phylogenetic data integrating knowledge from anatomy ontologies and

information theory metrics. (author)

R package: https://github.com/diegosasso/ontobayes

## ADDITIONAL SKILLS

Certificate in scientific illustration (80h)

# **LANGUAGES**

Portuguese: native

English: speaking, reading and writing – fluent

Spanish: speaking, reading and writing – intermediary