

Internship Focus: Species boundaries among Indomalayan Pencil-Tailed Tree Mice (Rodentia, Muridae) from Southeast Asia

Collaborating Institutions:

- **Yale Peabody Museum of Natural History (YPM)**
- **U.S. National Museum of Natural History, Smithsonian Institution (USNM-SI)**

Advisors:

- **Dr. Eric Sargis, Professor of Anthropology, Curator of Mammalogy, YPM**
- **Dr. Melissa Hawkins, Curator of Mammals, USNM-SI**
- **Dr. Neal Woodman, Research Biologist at USGS, Research Associate in Vertebrate Zoology, USNM-SI**

Description:

Undergraduates are invited to participate in museum research during the summer of 2020 (8 weeks) to work with researchers from the Yale Peabody Museum of Natural History (YPM) in New Haven, CT, and the U.S. National Museum of Natural History (USNM), Smithsonian Institution in Washington, DC. This project focuses on the Indomalayan Pencil-Tailed Tree Mouse (*Chiropodomys gliroides*), an arboreal species that mostly inhabits rainforests in mainland Southeast Asia, including the Malay Peninsula, Sumatra, Java, and several smaller islands in the Malay Archipelago. *Chiropodomys gliroides* has a complicated taxonomic history, with five subspecies having been recognized within this species. Previous studies have focused on pelage and cranial variation, but *C. gliroides* has never been analyzed with a modern, integrative approach that synthesizes morphometric and molecular data. Hence, the subspecific geographic variation may, in some cases, represent species-level diversity that would have conservation implications for this poorly-studied taxon, particularly given the impact of deforestation in many parts of its range. This project will build on our previous study of Southeast Asian mammals like the Common Treeshrew (*Tupaia glis*), a species complex in which we recognized four additional species based on our morphometric and molecular analyses. Here we will address questions such as: 1) Does *C. gliroides* include multiple lineages that should be recognized as distinct species? 2) How did biogeographic variables affect the divergence of populations in this taxon?

The undergraduate researcher will be involved in multiple aspects of this project. At the USNM, the intern will learn how to x-ray museum study skins and measure taxonomically informative features of hand morphology from the x-rays. At the YPM, the student will georeference and map specimen localities and learn how to statistically analyze the morphometric dataset. Hence, the intern will have the opportunity to learn georeferencing and scanning techniques as well as methods of morphometric data collection and analysis. This project could lead to an expanded senior thesis project, a professional presentation at the annual meeting of the American Society of Mammalogists (ASM), a peer-reviewed publication in a zoological journal, and an IUCN Red List conservation status reassessment and/or several additional species assessments.

Learning Objectives:

Over the course of eight weeks, the student will learn to:

- Conduct collections-based scientific research focused on the poorly-studied *Chiropodomys gliroides*;
- Georeference and map specimen localities;
- X-ray museum study skins;
- Measure taxonomically informative features of hand morphology from the x-rays;
- Statistically analyze the completed dataset; and
- Prepare an oral presentation.

Length: 8 weeks in the summer

Stipend: \$5,000

To Apply:

<https://peabody.yale.edu/yale-students/species-boundaries-among-indomalayan-pencil-tailed-tree-mice-2020-internship>

Collaborative publications and presentations with previous summer interns (in bold):

Articles

2013: Sargis, EJ, Woodman, N, **Reese, AT**, and Olson, LE. Using hand proportions to test taxonomic boundaries within the *Tupaia glis* species complex (Scandentia, Tupaiidae). *Journal of Mammalogy* 94: 183-201. (Cover Article)

2013: Sargis, EJ, Woodman, N, **Morningstar, NC, Reese, AT**, and Olson, LE. Morphological distinctiveness of Javan *Tupaia hypochrysa* (Scandentia, Tupaiidae). *Journal of Mammalogy* 94: 938-947.

2014: Sargis, EJ, Woodman, N, **Morningstar, NC, Reese, AT**, and Olson, LE. Island history affects faunal composition: the treeshrews (Mammalia: Scandentia: Tupaiidae) from the Mentawai and Batu Islands, Indonesia. *Biological Journal of the Linnean Society* 111: 290-304.

2017: Sargis, EJ, Woodman, N, **Morningstar, NC, Bell, TN**, and Olson, LE. Skeletal variation and taxonomic boundaries among mainland and island populations of the common treeshrew (Mammalia: Scandentia: Tupaiidae). *Biological Journal of the Linnean Society* 120: 286-312.

In preparation: Woodman, N, **Miller-Murthy, A**, Olson, LE, and Sargis, EJ. Coming of age: morphometric variation in the hand skeletons of juvenile and adult Lesser Treeshrews (Scandentia: Tupaiidae: *Tupaia minor* Günther, 1876).

Presentations

2011: Sargis, EJ, Woodman, N, **Reese, AT**, and Olson, LE. Hand proportions in treeshrews (Scandentia, Tupaiidae) and taxonomic boundaries within the *Tupaia glis-belangeri* species complex. Presented at the Meeting of the American Society of Mammalogists.

2013: Sargis, EJ, Woodman, N, **Morningstar, NC, Reese, AT**, and Olson, LE. Morphological distinctiveness of Javan *Tupaia hypochrysa* (Scandentia, Tupaiidae). Presented at the Meeting of the American Society of Mammalogists.

2016: Sargis, EJ, Millien, V, Woodman, N, **Morningstar, NC, Bell, TN**, and Olson, LE. Rule reversals: patterns of body size variation in the common treeshrew (Scandentia, Tupaiidae). Presented at the Meeting of the American Society of Mammalogists.

2019: **Juman, MM**, Woodman, N, Olson, LE, and Sargis, EJ. Skeletal variation among island populations of Large Treeshrews (Scandentia: Tupaiidae: *Tupaia tana*). Presented at the Meeting of the American Society of Mammalogists. Received the ASM Undergraduate Honoraria Award.