

Report on travel to Ecuador during May 11-25, 2011 by Prof. Scott R. Shaw

Two UW faculty members (Scott Shaw and Greg Brown), thirteen UW undergraduate students, three graduate students, and one post-doctoral researcher studied for two weeks in mid-May 2011 at the Yanayacu Biological Research Station on the eastern slopes of the Ecuadorian Andes. Yanayacu Station is at 7,100 feet elevation and encompasses nearly 5,000 acres of primary cloud forest situated at one of the world's most biologically diverse sites. Shaw and Brown's travel on this expedition was funded partly by a 2010 Global Perspectives Grant and partly by a UW International Programs Faculty Travel Grants. The Global Perspectives Grant is also partly funding Shaw's participation in the upcoming May 2012 Ecuador expedition. Other funding for students on the May 2011 expedition was provided by the UW Honors Program, UW Environment and Natural Resources Program, Wyoming NASA Space Consortium, UW International Programs, and the National Science Foundation.

Led by entomology Professor Scott Shaw, the 2011 research and teaching expedition to Ecuador continued his National Science Foundation funded study of tropical plants, plant-feeding caterpillars and their interactions with parasitic wasps that kill the caterpillars (the CAPEA project: Caterpillars and Parasitoids of the Eastern Andes). CAPEA is an ongoing, long-term biodiversity research project dedicated to the inventory of caterpillars, and discovery of information about their life history, food plants and their associated parasitoids (mostly wasps and flies). Our study site is the Yanayacu Biological Station (YBS), located at 2200 meters elevation in the Quijos Valley of Napo Province, in the Andes Mountains of northeastern Ecuador. Yanayacu is situated just

barely south of the equator in one of the world's last remaining unexplored swathes of high-elevation cloud forest. Situated at the edge of the Amazon basin, Yanayacu is one of the world's "biodiversity hot-spots" for moth and butterfly species. The CAPEA research project explores the ecological roles played by insects in tropical cloud forests and is working to discover previously unknown organisms (new wasp species). The CAPEA research project is currently funded through 2013 by the US National Science Foundation's Biodiversity Discovery and Analysis program. During 2011, the NSF CAPEA grant supported the participation of one PhD graduate student, Miranda Bryant, and three undergraduate student researchers funded by an REU supplemental grant (Research Experience for Undergraduates). During this expedition, Dr. Shaw continued field studies of a new wasp genus and species discovered by him on previous expeditions. The specimens and data sampled in May 2011 were essential to completing the research manuscript, cited below as Shaw (2012, in press).

In the May 2011 group were Shaw, botany Professor Greg Brown, one post-doctoral researcher (Nina Zitani), two entomology graduate students (Miranda Bryant and Megan Wilson), three undergraduate NSF-REU researchers, ten undergraduate UW honors students, and one visiting MS graduate student researcher, Helmuth Aguirre Fernandez, from Bogota, Colombia. The trip proved to be valuable for student recruitment, as Helmuth has applied to the University of Wyoming to start his PhD studies next August, funded for two years by a study abroad scholarship from the Colombian Ministry of the Environment. Ten UW students were enrolled in the Cloud Forest Ecology class (HP 4152) successfully taught by Shaw and Brown for the third

time. The UW Honors Program is very pleased with the results, and has generously offered to support the class, for the fourth time, during the summer of 2012.

Shaw's graduate student, Miranda Bryant, is conducting her PhD dissertation research at Yanayacu, which has so far resulted in the discovery of five new species in the beneficial wasp genus *Aleiodes* (parasites of forest caterpillars). Miranda's work is focusing on discovering parasites of caterpillars feeding on Andean bamboo, a keystone plant species at Yanayacu. Ms. Bryant was recently selected as the 2012 winner of the University of Wyoming's U.S. Graduate Student Award for Excellence in Internationalization by a U.S. graduate student.

Shaw and Bryant were assisted with their forest research by a team of three outstanding UW undergraduate students (Selena Hammer, Judith Herreid, Jennifer Bell), funded by Shaw's supplemental NSF REU grant, Research Experience for Undergraduates. Ms. Bryant served as graduate mentor for the REU team as well as graduate teaching assistant and mentor for the honors Cloud Forest Ecology class.

Another graduate student on the expedition was Megan Wilson, a new MS student co-advised by Shaw and Brown. Megan will be earning a double major in Entomology and Botany, and she is studying the diversity of insects inhabiting the water tanks of epiphytic bromeliads at Yanayacu. This was Ms. Wilson's first research expedition to Ecuador, but she is returning for four weeks next May to continue her studies. Drs. Shaw and Brown worked closely with Megan during the May 2011 expedition to develop her field research protocols for sampling bromeliads and bromeliad-associated insects.

During May 2012 Megan will be the graduate student mentor for the next honors Cloud Forest Ecology class.

The May 2011 Ecuador expedition was a success all around. Most importantly, all 18 people made it there and back again safely. Two graduate students generated data for thesis and dissertation research and the REU research team helped us gather research specimens, GPS data, and photographs for the research project. Our export permit was approved, and we returned to UW with hundreds of preserved research-grade specimens, which we are continuing to study, including additional species of new insect species that we will be describing. During our ten days at the research station the students collected hundreds of living caterpillars, which were photographed, bagged, and left with the resident staff at the station for rearing. So the expedition's field work continues to produce new data and specimens for the project, months after our visit. Two of the REU students are continuing to work with Dr. Shaw in the UW Insect Museum on related research projects. The Cloud Forest Ecology class (HP 4152) was successfully taught by Shaw and Brown, with Ms. Bryant assisting, and all the students had exceptional learning experiences in the forest. We have received funding from the UW Honors Program to teach the class again next summer, and we are making plans to visit Ecuador again during the middle two weeks of May 2012. The next expedition in May 2012 will include Dr. Shaw, two graduate students, four REU undergraduate researchers, one postdoctoral researcher, one collaborating faculty researcher from Casper College, eight honors Cloud Forest Ecology students, and two undergraduate researchers from Casper College.

Recent manuscripts resulting from this research project include:

- Kula, R.R., O. Dix-Luna, and S.R. Shaw. 2012. Review of *Ilatha* Fischer (Hymenoptera: Braconidae: Alysiinae) including descriptions of six new species and a key to species. *Proceedings of the Entomological Society of Washington* (submitted for publication).
- Shaw, S.R. 2012. A new genus and new species of Dinocampini (Hymenoptera: Braconidae: Euphorinae) from Napo province in Ecuador. *International Journal of Tropical Insect Science* (in press).
- Zaldívar-Riverón, A., J.J. Martínez, S.F. Ceccarelli and S.R. Shaw. 2012. Five new species of doryctine parasitoid wasps of the genera *Lissopsius* Marsh, *Heerz* Marsh and *Ondigus* Braet, Barbalho and van Achterberg (Braconidae) from the Chamela-Cuixmala Biosphere Reserve in Jalisco, Mexico. *Zookeys* 164: 1-23. doi: 10.3897/zookeys.164.2201
- Jones, G.Z. and S.R. Shaw. 2012. Ten new species of *Meteorus* (Hymenoptera: Braconidae) from Ecuador reared at the Yanayacu Biological Research Center for Creative Studies. *Zootaxa* (submitted for publication).
- Quicke, D., Smith, A., Janzen, D., Hallwachs, W., Fernandez, J., Laurene, N., Zaldívar-Riveron, A., Shaw, M., Broad, G., Klopstein, S., Shaw, S.R., Hreck, J., Rodriguez, J., Whitfield, J., Sharkey, M., Sharanowski, B., Jussila, R., Chesters, D., and Vogler, A. 2012. Utility of the DNA barcoding gene fragment for parasitic wasp phylogeny (Hymenoptera: Ichneumonoidea): data release and new measure of taxonomic congruence. *Molecular Ecology Resources* (accepted for publication).
- Barrantes, G., E. Triana, S. R. Shaw and G. Z. Jones. 2011. Characteristics of the cocoon and natural history of the gregarious *Meteorus restionis* sp. n. (Hymenoptera, Braconidae, Meteorinae) from Costa Rica. *Journal of Hymenoptera Research* 20: 9-21.
- Aguirre Fernandez, H., C.E. Sarmiento, and S.R. Shaw. 2011. Taxonomic revision and morphometric analysis of *Meteorus* Haliday 1835 (Hymenoptera: Braconidae: Meteorinae) from Colombia. *Zootaxa* 2938: 1-68.
- Shaw, S.R. 2010. Sampling wasps in the cloud forests of Ecuador: where the wild things are. *Hamuli, The Newsletter of the International Society of Hymenopterists* 2(1): 14-15, 32.
- Aguirre Fernandez, H., S.R. Shaw, and G.Z. Jones. 2010. A new *Meteorus* species from Colombia and Ecuador (Hymenoptera: Braconidae). *Zootaxa* 2453: 55-61.
- Centrella, M. and S.R. Shaw. 2010. A new species of phytophagous braconid, *Allorhogas minimus* (Hymenoptera: Braconidae: Doryctinae) reared from fruit galls on *Miconia longifolia* (Melastomataceae) in Costa Rica. *International Journal of Tropical Insect Science* 30(2): 1-6.
- Shaw, S.R. 2010. Into the cloud forests of Ecuador: where the wild things are. *Reflections magazine* 2010: 6-11.
- Jones, G.Z. 2010. Ten new species of parasitoid wasps (Hymenoptera: Braconidae: Meteorus) from the eastern Andes of Ecuador and their host utilization patterns. Masters Thesis, UW, August 2010.
- Shaw, S.R., E. Triana, and G. Barrantes. 2010. Characteristics of the cocoon and natural history of a gregarious *Meteorus* species (Hymenoptera: Braconidae: Meteorinae) from Costa Rica. *Journal of Hymenoptera Research* (submitted).

- Achterberg, C. van and S.R. Shaw. A new species of the genus *Homolobus* from Ecuador (Hymenoptera: Braconidae: Homolobinae). *Zoologische Med. Leiden* 83(24): 805-810. 2009.
- Shaw, S.R. and G.Z. Jones. 2009. A new species of solitary *Meteorus* (Hymenoptera: Braconidae) reared from caterpillars of toxic butterflies (Lepidoptera: Nymphalidae) in Ecuador. *Journal of Insect Science*, volume 9, article 34, pages 1-8. Available on-line: insectscience.org/9.34
- Townsend, A. and S.R. Shaw. 2009. Nine new species of *Aleiodes* reared from caterpillars in the northeastern Andes of Ecuador (Hymenoptera: Braconidae: Rogadinae). *Journal of Insect Science* 9, Article 33, pages 1-21. Available on-line: insectscience.org/9.33
- Townsend, A. and S.R. Shaw. 2009. A new species of *Andesipolis* from the eastern Andes of Ecuador with notes on biology and classification (Hymenoptera: Braconidae). *Journal of Insect Science*, volume 9, article 36, pages 1-7. Available on-line: insectscience.org/9.36
- Zaldivar-Riverón, A., M.R. Shaw, A.G. Sáez, M. Mori, S.A. Belokoblylskij, S.R. Shaw, and D.L.J. Quicke. 2008. Evolution of the parasitic wasp subfamily Rogadinae (Braconidae): phylogeny and evolution of lepidopteran host ranges and mummy characteristics. *BMC (BioMed Central) Evolutionary Biology*, volume 8, article 329, pages 1-20. Available on-line at: <http://www.biomedcentral.com/1471-2148/8/329>
Rated as “highly accessed” by the journal.