

**THE CTFS-FORESTGEO ARTHROPOD INITIATIVE
ANNUAL REPORT 2015 & EXECUTIVE SUMMARY**

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Background. The Arthropod Initiative of the Center for Tropical Forest Science (CTFS) aims at monitoring key arthropod assemblages over long-term and studying insect-plant interactions over the network of the Forest Global Earth Observatories (ForestGEO, <http://www.ctfs.si.edu/group/arthropod%20monitoring/>). The Initiative integrates with ongoing monitoring of plant dynamics within the ForestGEO network, causes minimum possible impact to the plots and focus on a priority set of assemblages chosen for their ecological relevance, taxonomic tractability and ease of sampling. At each participating ForestGEO site, the first years of the program are usually devoted to a baseline survey. The baseline survey is followed by longer-term programs of field work and analysis, organized into two main sub-programs: monitoring, and key interaction studies. The monitoring sub-program is directed to detecting long-term changes, as reflected in priority assemblages, driven by climatic cycles, climatic change and landscape scale habitat alteration. Monitoring protocols are derived from those used during the baseline survey. The food web approach of interaction studies targets interactions between plants and specific insect assemblages, with different protocols than those used for monitoring. So far, the Arthropod Initiative involves nine ForestGEO sites: Yasuni in Ecuador, Barro Colorado Island (BCI) in Panama, Rabi in Gabon, Khao Chong (KHC) in Thailand, Tai Po Kau (Hong Kong), Dinghushan and Xishuangbanna in China, Bukit Timah in Singapore and Wanang (WAN) in Papua New Guinea.

Monitoring of BCI, KHC and WAN. Year 2015 represented the seventh year of insect monitoring at BCI. So far, the BCI database contains data on 378,728 arthropods, including 1,952 species (1,634 of which with pictures, 84%) and 39,321 pinned specimens in our collections. Instead of detailing statistics for each protocol performed on BCI during 2015, as we did for previous years, we present in the long version of this report a draft of a manuscript on the Reduviidae of BCI. The abstract is detailed below. Year 2015 represented the fifth and third years of insect monitoring at KHC and WAN, respectively. At KHC our database includes 143,180 specimens (29,061 pinned specimens in collections) and 2,244 focal species. At WAN the ForestGEO insect database contains data on 18,181 specimens, but apart from butterflies, few of these specimens are yet identified.

Interaction studies. The field component of the insect seed predator project at BCI, KHC and WAN is finished. The overall aims are to test whether interaction networks composed of host plants, insect seed/fruit predators and their insect parasitoids at three rainforest locations within different biogeographical regions converge towards predictable patterns based on plant relatedness (plant families) and/or plant functional traits (seed predation syndromes). In total, at the three sites, 1,680 kg of seeds/fruits were reared, which yielded 80,104 insects reared from 1,093 plant species. We look forward to analyzing this exciting data set.

Scientific output. In 2015, the ForestGEO Arthropod Initiative trained 17 assistants, two interns, one volunteer, two MSc and one PhD students at BCI, KHC and WAN. We published 5 papers in 2015 and are looking forward to a productive year 2016, as insect data are accumulating fast. In particular, we will implement next year the new ForestGEO Arthropod database, which will consist on both a standalone desktop interface and a web interface, the later dedicated to data storing and fostering scientific collaboration via a better visibility of the ForestGEO Arthropod Initiative on the internet.

The Reduviidae (Hemiptera) of Barro Colorado Island, Panama: a first checklist and recent population trends

Abstract. In tropical rainforests, the assassin bugs (Reduviidae, Hemiptera) represent important predators preying on other arthropods. Hence, they play a significant role in maintaining insect populations and changes in their own populations may reflect alterations in the integrity of the forest system resulting from global climate change. However, apart from Triatominae species of medical importance, Reduviidae remain poorly known. Here, we address the meaningfulness of Reduviidae for long-term monitoring of secondary consumers in tropical rainforests, using data from Barro Colorado Island (BCI), Panama. First, we demonstrate that light traps allow catching a wide and representative diversity of Reduviidae, and are more efficient in this regard, and therefore better suited for long-term monitoring, than other collecting methods tested: Malaise and pitfall traps, beating, hand collecting and extraction of litter. Second, we present one of the very first checklists of Reduviidae for a tropical locality, including 115 species. These baseline data will be necessary for interpreting any long-term changes in reduviid populations on BCI. Last, we show that the low abundance of Reduviidae collected at light remains challenging for statistical analyses of long-term population trends. During a seven-year period (2009-2015), we observed no significant changes in the short-term population dynamics of most reduviid taxa, although these results do not account for the complexity of the intra-annual population dynamics of each species. In particular, the population of the rather abundant *Panstrongylus geniculatus*, which is a known vector of Chagas disease, appears to be fluctuating but so far is stable, as for other species. Still, daily maximum temperature and rainfall were negatively correlated with the overall abundance of Reduviidae during light traps surveys. Since climate change in Panama has induced an increase in annual mean temperature and rainfall, we conclude that reduviid populations on BCI may be vulnerable in the long term to these global effects.

Plate I. Representative activities/items for the ForestGEO Arthropod Initiative in 2015. (1) *Plecticus* sp., a stratiomyid fly reared from the fruits of *Gluta elegans* at KHC. (2) Color categories of butterflies at BCI, published in Basset *et al.* (2015). (3) Malaise trap at BCI, part of the University of Guelph's Global Malaise Program, surveyed by C. DeLeon (insect). (4) Home page of the future ForestGEO Arthropod database, scheduled to go live in 2016. (5) Details of the Coley and Kursar collection from BCI, in need of curation. (6) Visit of STRI Director M. Larsen (3rd from right) at the Arthropod lab in Panama, April 2015. (7) Extraction of litter ants at Yasuni. (8) Aki Nakamura looking for termites near the Xishunangbanna plot. (9) Bi- and tritrophic food webs including seeds/fruits, different seed/pulp eating species and their braconid parasitoids at BCI, KHC and WAN. (10)-(12) Representative pictures of Reduviidae, as detailed in the Abstract of this report: *Acanthischium* sp., *Rhiginia bimaculata* and *Beharus cylindripes*.

