MAPPING THE INSECT BIODIVERSITY OF HISPANIOLA

ENTOMOLOGY RESEARCH PROJECT | MUSEUM OF COMPARATIVE ZOOLOGY

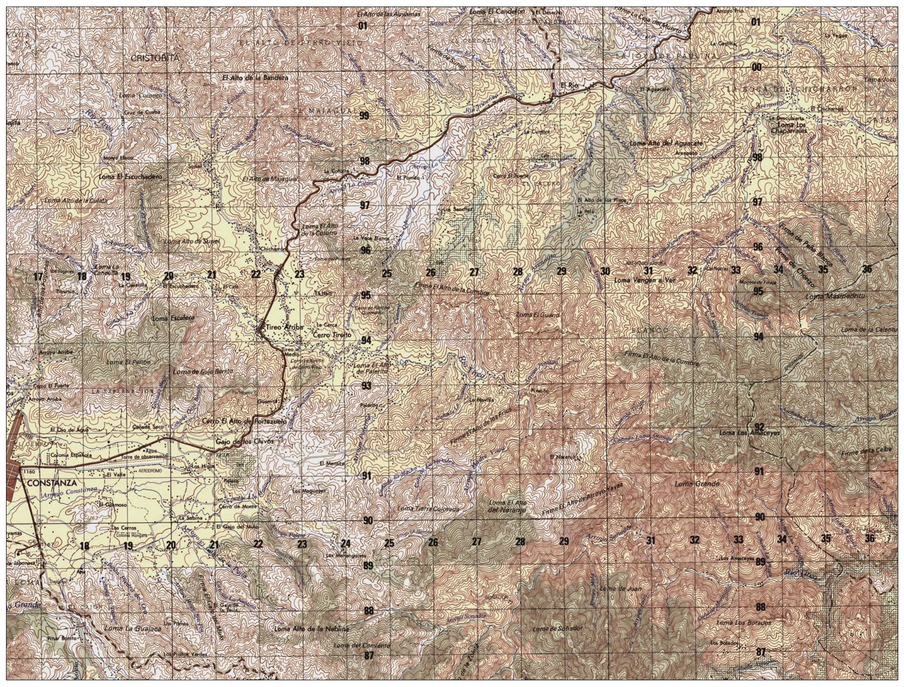
BRIAN FARRELL, EDWARD O. WILSON, GARY ALPERT & DAVID TURELL

ABSTRACT

The authors propose an Entomology Research Project with a goal to map the insect biodiversity of the Dominican Republic. Distribution patterns of ants, beetles and other insects can be superimposed on high resolution base maps containing information on geology, botany and geography. Analysis of insect patterns of distributions can inform scientists, policy makers and the public on areas rich in biodiversity and endemism.

The Museum of Comparative Zoology at Harvard University under the research direction of Dr. Brian Farrell and Edward O. Wilson has established a long term research study of the insect biodiversity of the Dominican Republic. So far, thousands of specimens of ants, beetles and other insects have been collected, identified and, geo-referenced. An NSF supported digital imaging initiative has successfully imaged thousands of species of insect types at the Museum of Comparative Zoology and an effort is underway to image the insect diversity of the Dominican Republic.

Insects, especially ants and beetles are the focal point for measuring biodiversity in tropical and subtropical countries around the world. Students working in the DR can obtain references, images, classification information and now distribution patterns of insects from their home country. This data can by analyzed and used to map important areas of endemism, conservation priorities, refugia and habitat destruction. This existing research and teaching collaboration project in the field of biodiversity is a model system for bridging technology between countries.



INTRODUCTION

HARVARD IN THE CARIBBEAN

The long history of scientific exchange between the Caribbean and the Museum of Comparative Zoology (MCZ) at Harvard and neighboring institutions places Harvard University in a position to foster research in this important biogeographic region. The Caribbean ranks in the top

4 of 25 biodiversity hotspots designated by Conservation International for their high proportions of endemic species. Because the Caribbean is small relative to other hotspots, a digital encyclopedia of the species found there is within reach, complete with web pages on each species containing high resolution photos, distribution maps and information on the biology and practical importance to humans.

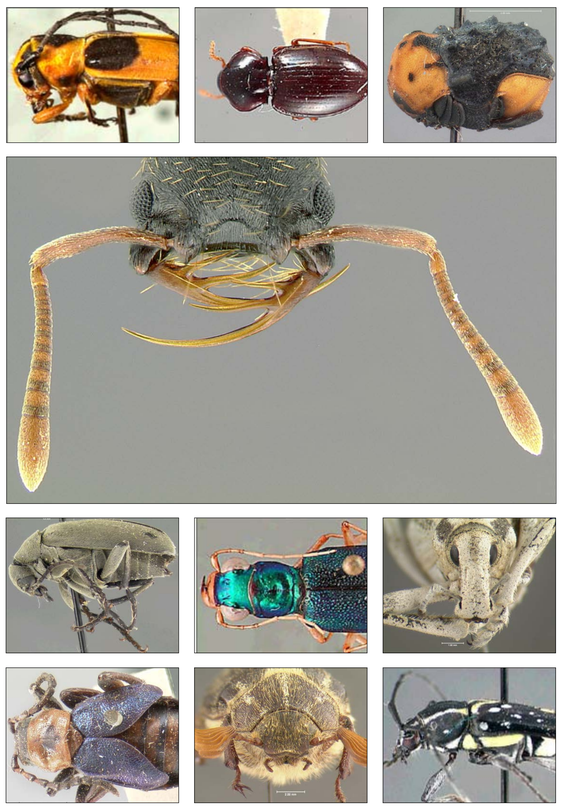
Professor Brian D. Farrell and Professor E. O. Wilson pursue Caribbean insect studies in the Entomology Department. Farrell focuses on the evolution of plant-feeding beetles in the superfamilies Curculionoidea and Chrysomeloidea with their hostplants. Of particular interest is the bark beetle family Scolytidae, well known for the intricate galleries they produce in forest trees. While some bark beetles are symbiotic with pathogenic fungi that help in their attacks on plants, other bark beetles have become agriculturalists, cultivating particular strains of fungi deep inside trees for their own food and the often pathogenic fungi they transport. Because they often attack trees with resins, bark beetles are also among he very most abundant insects represented in Dominican amber, the fossil resin of an extinct species of tree (Hymenaea) in the bean family Fabacaeae. Professor E. O. Wilson pursues research on the ants of the West Indies, also well represented in amber. Farrell and Wilson contribute images of the type specimens of Caribbean bark beetles and ants to the Caribbean Type Initiative, an online database complementing the more comprehensive Entomology Type Database. While the MCZ-administered Ernst Mayr grants provide support for researchers from each corner of the globe to visit important collections for examination of type specimens, these databases bring the types from our collection to researchers worldwide.

THE CONSORTIUM FOR BIODIVERSITY OF THE CARIBBEAN

The Consortium for Biodiversity of the Caribbean (CBC) is an informal consortium of scientists and institutions committed to furthering knowledge of the insects and plants of Hispaniola and the Caribbean and building the capacity of Caribbean scientists to contribute to that knowledge. The CBC consists of the following organizations or institutions: the Departmento Botanica at the Jardin Botanico Nacional (JBN), the Department de Entomologia at the Museo Nacional de Historia Natural (MNHN), the

Fundación Ecológica Punta Cana / Punta Cana Center for Sustainable Tourism and Biodiversity Laboratory (PCSB), the Department de Biologia at the Universidad Autonoma de Santo Domingo, the Department of Invertebrate Systematics at the Carnegie Museum of Natural History in Pittsburgh (CMNH), the Department of Entomology at the Museum of Comparative Zoology at Harvard University (MCZ), the Department of Systematic Biology at the Smithsonian Institution (SI), and Conservation International (CI).

Professor Brian D. Farrell of the MCZ serves as acting supervisor and liaison. The CBC provides an assembly of personnel and equipment in three database/imaging centers in the Dominican Republic (at JBN, MNHN, PCSB), and assists these centers in achieving the common goals: 1) Complete documentation of native and invasive insect and plant species diversity in Hispaniola via barcoding and imaging specimens in the Dominican National Collections and specimens newly sampled from the National Parks for the database served on the internet at present by the MCZ; and 2) Continually improving the standard of georeferencing and the accuracy in taxonomy and coverage of diversity in the database in a way consistent with the grants that initiated and maintain the centers.



The American centers (CMNH, MCZ, SI) accomplish imaging and databasing of their collections of Caribbean specimens as well as digitizing relevant literature. The CBC has begun with a focus on the Dominican Republic, with a goal of developing materials, protocols and inter-institutional relationships that facilitate expansion to other countries in the Caribbean and elsewhere, as well as to other components of biodiversity.

OBJECTIVE

The initial objective of the Entomology Research Project is to map all of the specimen level GIS information associated with specimens collected in the Dominican Republic and Haiti. To date, there are over 28,000 specimens in our online database (biocaribe.org), including insects and plants, representing several hundred localities. An equal number of insect specimens and associated data are in process now and more will come as our research on Hispaniola continues.

The GIS map will then use the collected coordinates to pinpoint localities on a map. Additional attributes to be associated with these points will include an image of the specimen, habitat and elevation information and notes.

The ultimate goals for the CBC centers are to provide a complete database of insects and plants of Hispaniola via mechanisms that strengthen Dominican scientists and institutions, and provide documentation of best practices for use in other countries. These practices provide the mechanism for simultaneous digitization of historical and new collections in the DR, with the goal of reaching an eventual equilibrium with new acquisitions and collections. At the same time, each of the CBC centers contributes to this effort in a way that strengthens the personnel and institution via production of deliverable products, such as field guides and posters, based on specimens entered into the database. While the Dominican database and supporting centers are currently managed by the MCZ, the goal is to eventually establish the information technology infrastructure for serving the database on the web from the Dominican Republic, and encourage substantial participation of additional partners or members with the establishment of additional CBC centers in the DR and in Haiti, Jamaica, Puerto Rico and Cuba.

FUTURE

Over the next five years, it is anticipated that this project will result in the first near-complete online searchable atlas, together with maps and images, of the insect fauna of any country, especially timely with today's focus on biodiversity hotspots and inventory of the planet's biota.