The History of Entomology in Ecuador

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Abstract. This work is not intended to be a complete review of all publications about entomology in Ecuador. It compiles the history of entomology in Ecuador in a chronological order. It first provides observations about the influence of pre-Columbian cultures and the cultural heritage of indigenous populations. It then presents the contribution of the Spanish conquest and colonization chroniclers, the specialists that described American species during the Renaissance period and the great scientific expeditions. Finally the birth of Ecuadorian entomology as a science is described with the creation of institutes for applied research and the Ecuadorian museums of entomology.

Résumé. Histoire de l'entomologie en Equateur. Cette étude n'a pas pour objectif de faire une révision complète de toutes les publications sur le thème en Equateur, mais de présenter les grandes étapes de l'évolution de l'entomologie dans ce pays dans un ordre chronologique. Il présente tout d'abord des informations sur l'influence des cultures pré-colombiennes et de l'héritage culturel légué par les populations indigènes. Il présente ensuite la contribution des chroniqueurs de la conquête espagnole et de la colonisation, des specialistes qui ont décrit les espèces américaines pendant la période de la Renaissance et des grandes expéditions scientifiques. Finalement, la naissance de l'entomologie en tant que science est décrite avec la création des instituts de recherche appliquée et des muséums équatoriens d'entomologie.

Keywords: Pre-columbian, Conquest of America, The great expeditions, The beginning of the 20th century.

Pre-Columbian Ecuador

Pre-hispanic cultures had extensive knowledge of the insects of Ecuador and incorporated insects into mythology, art, cuisine and geography. For instance, insect motifs were used in different ceramic pieces implying that these creatures were involved in the every day lives of people from different cultures that inhabited these lands (Cummins *et al.* 1996; Melic 2003). There are a variety of ceramic pieces deposited at the Museo Antropológico del Banco Central del Ecuador that incorporate insects in their design (Fig. 1). This cultural heritage has been manifested in the use of insects as a food source by a variety cultures. Onore (1997) mentioned 82 species of insects that have been used as food in several indigenous cultures currently and historically. One of the most important examples is the beetle, *Platyicoelia lutescens* Blanchard 1850 (Coleoptera: Scarabaeidae: Rutelinae), commonly called "catzo blanco" that is used in a seasonal dish during October and November in Quito's valleys (Smith & Paucar 2000). Another example of insects used as food is the beetle larva known as "chontacuro", *Rhynchophorus palmarum* (L. 1758) (Coleoptera: Curculionidae). This larva is sold and cooked in various regions in the Amazon basin (Onore 1997; Barragán & Carpio 2008).

Within the American Indian cosmovision insects occupy an important role. Numerous prehispanic cultures considered certain insects as terrestrial incarnations of divine forces (Beutelspacher 1989). Butterflies are frequently represented in the art of various prehispanic cultures. In Mexican mythology, especially the Mayan culture, butterflies were considered to represent the souls of dead warriors killed in battles or sacrifices (Beutelspacher 1989). In other prehispanic cultures, butterflies were a sign of high rank and images were used to decorate pectorals, hair pins (tocados) and nose pieces (narigueras).

The use of insect names to designate particular localities also demonstrates the importance of these animals. There is an area near Quito named Cuzubamba, from the Kichwa roots: "cuzo" meaning worm or grub, and "pampa" meaning valley, implying the "valley of the grubs." Other insects represented bad fortune. Even today the moth, *Ascalapha odorata* L.

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1758 (Lepidoptera Noctuidae), commonly called "tandacuchi" (Fig. 2) is considered, by the people living in the central Ecuadorian Sierra (Andean region), as a messenger of death every time this moth gets inside their houses. Another example is the hemipteran, *Fulgora laternaria* L. 1758 (Hemiptera: Fulgoridae), commonly known as "machaca" (Fig. 3), that symbolizes lust. The belief is that if a person unintentionally comes in contact with this insect, this person must have sex otherwise he or she will die within a few hours (Medeiros Costa-Neto 2007). Before the arrival of the European conquistadors, the insect *Dactylopius* spp. Costa 1835 (Hemiptera: Coccidae), known as "cochinilla del nopal," was used to dye the fabrics of the Incas throughout South America. After the conquest, this industry was an important business within the Spanish colony. The dye extracted from this insect was the second most valuable product exported from Nueva España in the 18th century, only after silver (Barragán & Carpio 2008).

The Colonial Era in America

With the arrival of the Europeans, knowledge about the New World started to focus on nature with the first identification of specimens that numerous Spanish conquistadors brought back to Europe, together with gold and spices (Rodas 2003). One of the first reports, written in the conquest period, was the *Historia General y Natural de la Indias, Islas y Tierra firme del Mar Océano*, by Gonzalo Fernández de Oviedo and Valdez in 1535. This work is divided into 50 books. *Libro XV*: *El cual trata de los animales insectos* (Acosta- Solís 1977) described certain entomological curiosities such as beetles with lights known as "cucuyos", *Pyrophorus* spp. (Coleoptera: Elateridae), "cochinillas del nopal", *Dactylopius* spp. (Coccidae: Hemiptera), and stingless bees (Hymenoptera: Meliponiinae) (Hogue 1993).

Father Juan de Velasco (1727–1792) in his *Historia del Reino de Quito en la América Meridional* in 1789 and Mario Cicala (1718–17..) and *Descripción Histórico Físca de la Provincia de Quito de la Compañía de Jesus* the first to report details about the ancestral knowledge of the land that now constitutes Ecuador. He described certain aspects of Ecuadorian entomology (Velasco 1946; Cicala 2004). However, these reports were far from the centers of advanced science in Europe and were not consistent with the developing Linnean binomial classification system. Many of these initial reports from Nueva España were fantasies and exaggerated observations (Acosta Solis 1977).

Figure 1
Tuza Culture (Carchi) Ceramic pieces deposited at the Reserva Arqueológica de la Dirección Cultural del Banco Central del Ecuador. Regional Quito. (A.Janeta).

The Great Expeditions

De La Condamine, Humboldt, Darwin, Whymper and others

As a result of the Enlightenment in Europe, scientific academies mounted a series of expeditions to the colonies overseas. The French Geodesic Mission worked in Ecuador from 1735 to 1746 measuring the roundness of the Earth (Rodas 2003). The mission was directed by the French naturalist Charles Marie de La Condamine (1701–1774) and included the botanist Joseph de Jussieu (1704–1779) and the Spanish captain Antonio de Ulloa (1716–1795). Captain Ulloa represented the Spanish military before the French Academy of Sciences for this expedition to South America. The report *Noticias Americanas* (1772) contains specific statements about several Ecuadorian insects including a grasshopper plague that could have involved one of the species of *Schistocerca* (Orthoptera: Acrididae) (Hogue 1993).

One of the monumental expeditions conducted from 1799 to 1804 and without doubt the most impressive was the one carried out by Alexander Von Humboldt (Fig. 4) and Aimé Bonpland throughout

Figure 2
Ascalapha odorata L. 1758 (A. Janeta).

Figure 3
Fulgora laternaria L. 1758 (A. Janeta).

America (Papavero *et al.* 1995). They made numerous and important observations concerning the biological aspects of insects and gathered an extensive collection of insects that later were described by Pierre André Latreille (Papavero 1971). Today, a great number of these specimens are deposited in the Muséum National d'Histoire Naturelle de Paris. Numerous scientists consider Humboldt as the father of biogeographic and ecological studies based on his narratives of his studies in South America. One of his most detailed illustrations was of the Ecuadorian Andes, where he illustrated the diversity and distribution of plants according to altitude (Fig. 5). The influence of altitude is reflected in his manuscripts that described Ecuadorian species. One of his numerous publications is the Collection of Observations on Zoology and Comparative Anatomy (1805–1833) where he described in detail several observations on Ecuadorian insects. Humboldt's

Figure 4
Alexander Von Humboldt by Friedrich Georg Weitsch 1806

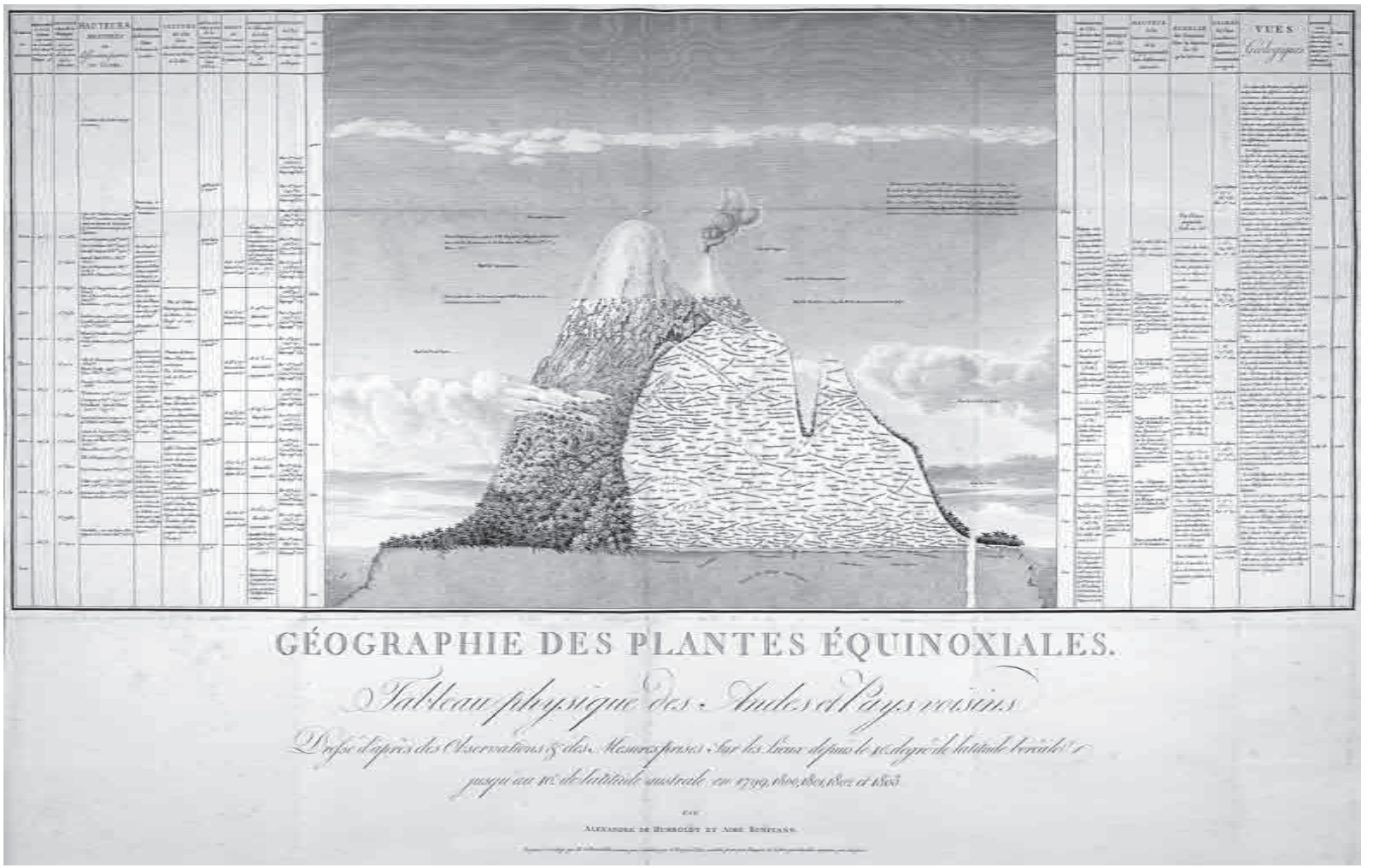

Figure 5
Original from A. von Humboldt 1807. *Essai sur la géographie des plantes*. Courtesy Rare Book Collection, Missouri Botanical Garden Library. (C. Ulloa).

work in the New World was so important that he is considered as the first American scientist and discoverer. Von Humboldt met Simón Bolívar in Paris when Bolívar was still very young (Acosta Solis 1977).

Another great naturalists of the 19th century was Jean-Baptiste Boussingault (1802–1887) who acquired fame in Europe as a result of his ten-year trip through equatorial America. He was an impresive scientist and naturalist, an eminent agronomist, and an active chemist. Simón Bolívar, the liberator of Latin America and head of the government of Gran Colombia invited Boussingault to develop scientific research in the new republics (Acosta – Solís 1977; Boulaine 1995). In Ecuador, he was the first to notice the existence of a peculiar entomological fauna in the high Andes. In his attempt to reach the summit of Chimborazo (6268 m) and before arriving at the glacier of this mountain, he collected several insects that Moret (2005) stated could have been carabid beetles (Coleoptera: Carabidae).

Figure 6
Edward Whymper. Museo Nazionale della Montagna "Duca degli Abruzzi". Centro Documentazione - Torino.

In the 19th century, one of the most outstanding visits to Ecuador was the one by Charles Darwin (1809–1882) on board the Beagle. In his book published in 1845, *Voyage of the Beagle,* Darwin (1989) cited the following on his arrival to the Galápagos Archipelago: "*I took great pains in collecting insects* [of the Galápagos Islands]*, but excepting, Tierra del Fuego, I never saw in this respect so poor a country…*". However, he emphasized that the few species he collected turned out to be new species. Darwin was always fond of entomology and his observations and collections of beetles helped him to clarify his ideas concerning the distribution of insects and sexual selection. His entomological observations strengthened his ideas in his monumental work , *The Origin of Species* in 1859 (Darwin 1985).

The Spanish Scientific Commission of the Pacific, in December 1864 and January 1865, went into the Ecuadorian Andes after travelling along the American coast (Cabodevilla 1998). Francisco de Paula Martínez, chronicler of the expedition, made excursions to two volcanos near Quito, Guagua Pichincha and Antisana. He collected numerous insects that are housed today in the Madrid Museum of Natural History (Santos Mazorra 1994; López-Ocón 2003).

One of the most important surveys was the one by Edward Whymper (1840–1911) who arrived to Ecuador in 1879 and returned to London in 1880 (Fig. 6). He described his scientific observations in his work "*Travels amongts the great Andes of the Equator".* Its first edition came out in 1891 and contained excellent descriptions of hundreds of insects that were collected in his journey. It also included a supplement that compiled species descriptions by contemporary scientists like Henry Walter Bates (1825–1892). Bates (1891) felt that the research done by Humboldt and Bonpland was unsatisfactory and that the observations done by Whymper had been superior in quantity and quality as he described hundreds of high altitude insects that were new to science (Moret 2005). Whymper not only gathered information about Ecuadorian mountains and volcanoes but also collected a great variety of insects. Several of these insects have been described in his honor, for example the scarab species, *Heterogomphus whymperi* Bates 1861 (Coleoptera: Scarabeidae). Ecuadorian biodiversity was reflected in an illustration by Whymper of the insects he found one night in his hotel room in Guayaquil (Fig 7). Whymper also suggested that diversity decreases in relation to higher altitude confirming Von Humboldt's observations. This observation was also made in the

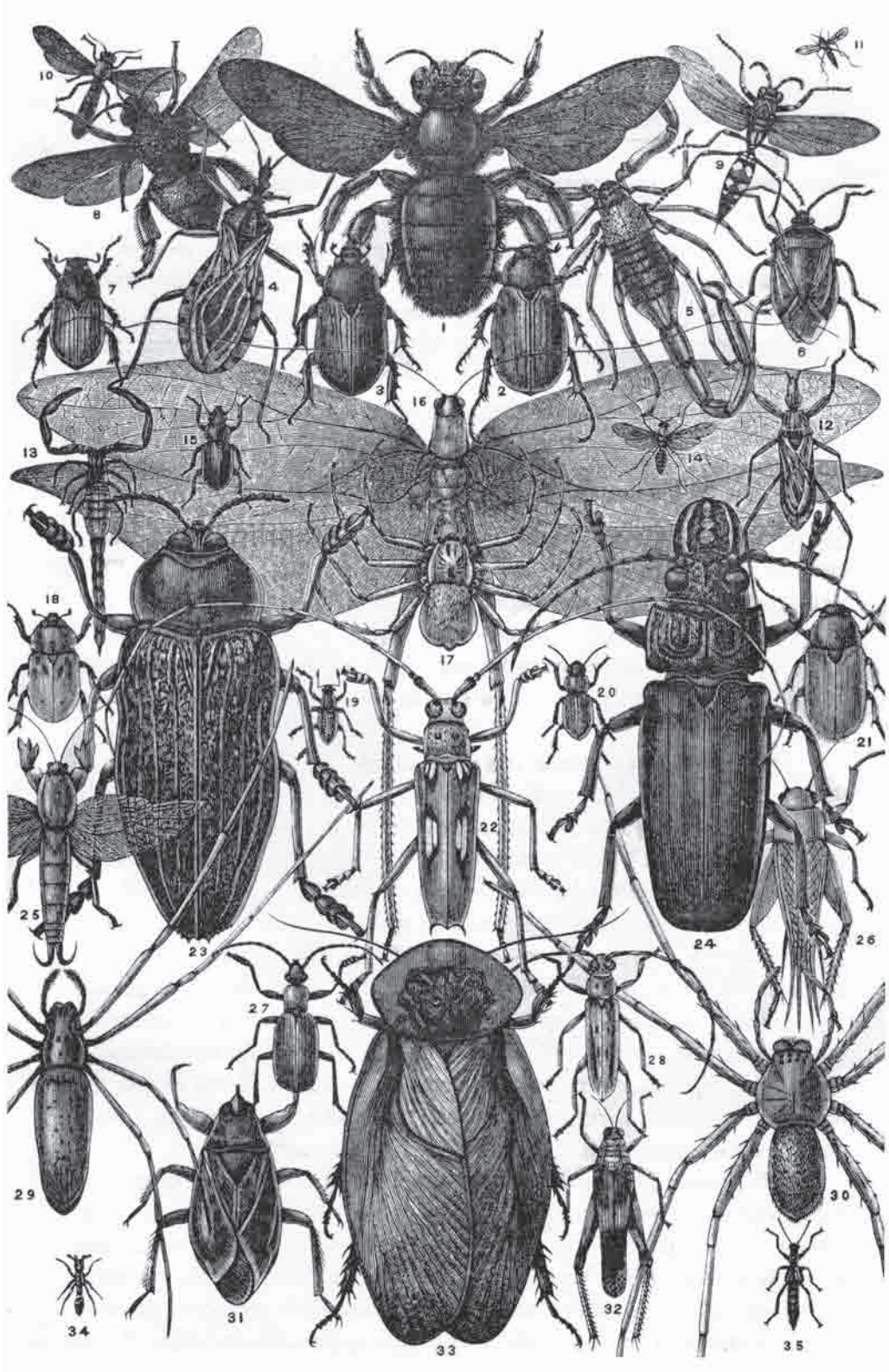

Figure 7
Insects in Whymper bedroom in Guayaquil. (Whymper 1892).

preface table in the supplementary appendix written by Bates (Whymper 1892). Whymper's collections were noteworthy in that he noted with precision the date, locality, and altitude of each specimen. This practice was uncommon even for professional naturalists at that time (Moret 2005). Whymper's altitude measurements are exact in almost all instances even though he obtained those numbers using a heavy and fragile mercury barometer. This instrument was baptized as "baby" because one of his companions, Alpinist Jean-Antoine Carrel, had to carry it on his back to the peak of the volcano Chimborazo (Whymper 1892).

The Italian zoologist Enrico Festa visited Ecuador and collected numerous specimens that are now deposited at the Museo Regionale di Scienze Naturali Di Torino. Festa left Italy in mid-1895 to head a historic expedition to Ecuador, but a revolution and fighting between liberals and conservatives forced Festa to stop in Panama in the Darien jungles. While waiting several months until the political situation calmed down, Festa collected information and specimens from the Panamenian Chocó forest. He arrived in Guayaquil in September 1895, where he started his journey through Ecuador collecting every specimen he came across, from insects to large mammals. He ended his expedition in February 1898 when he returned to Europe. Much of his work was conducted in the Ecuadorian Andean region. He traveled from Cuenca in the south to Tulcán, the northern limit of Ecuador on the Colombian border (Festa 1909). He extensively collected specimens from all zoological taxa, however, much of the material collected by Festa was not published due to the vast size of his collections.

Many insect collections were made by important naturalists and men of science who travelled around Ecuador. Hugh Cuming (1791–1865) was an English naturalist and conchologist who has been described as the "Prince of Collectors" (Lovell 1864). Cuming travelled around South America from 1821 to 1830. His vast assemblage of materials were immediately distributed to museums and included 130,000 specimens of dried plant material, 30,000 shells, large numbers of birds, reptiles, quadrupeds and insects, and numerous living orchids (Lovell 1864). Herman Karsten (1817–1908) was a German geologist, botanist and naturalist who followed the example of Humboldt and travelled from North and to South America in 1844–1856. In Ecuador, he worked in the vicinity of the Pichincha and Sangay volcanoes and collected both plants and insects (Acosta Solís 1977). Another naturalist, Marc de Matham, also made entomological collections between 1887 and 1893 (Onore 2003), which were later studied by Vaurie (1969) and Duckworth & Eichlin (1978). The German geologist, Alphons Stübel (1835–1904) travelled throughout the Ecuadorian Andes from 1870 to 1874. He focused on volcanism studies but also collected many insect specimens that were sent to the entomologist, Theodor Kirsch. Krisch published the descriptions of many new insect species belonging to the families Chrysomelidae, Tenebrionidae, Scarabaeidae, and Carabidae among others (Moret 2005, Acosta-Solís 1977).

The Beginning of the 20th Century

At the beginning of the 20th century, the Mission Géodésique de l´Equateur (1901–1906) organized by the military geographic service with the support of the Académie des Sciences de Paris came to Ecuador to measure the Equatorial meridian. They also collected insects that are now deposited at the Muséum National d'Histoire Naturelle de Paris and the British Museum. The French expedition collected a large number of specimens that were described in a series of volumes. Volume 10 deals with Entomology and Botany; Chapter 2 is devoted to Diptera, where 34 Nematocera species and 145 Barchycera species were reported. One of the described species was *Dicladocera riveti* (Tabanidae) (Surcouf 1919) that was originally described as part of the genus *Tabanus* and was named in honor of Paul Rivet (1876–1958). Rivet was part of the expedition as a medical doctor and anthropologist but also dedicated himself to collect insects during his journey. Lieutenant colonel Robert Bourgeois, chief of the mission, was the brother of the coleopterist Jules Bourgeois (Moret 2005). For this reason, the insect specimens collected by his colleagues were well studied.

In the Galápagos Islands, the most significant work after Darwin was the expedition of the California Academy of Science in 1905 and 1906) with F.X. Williams as the entomologist (Peck 2001). The next most significant expedition was that of the Galápagos International Scientific Project (GISP) of 1964 organized by the University of California (Usinger 1972)

It is important to emphasize that from the beginning, natural history expeditions traveled the country collecting animals and plants using mainly the same roads and routes (Whymper 1892; Festa 1909; Onore 2003). Many of the collecting localities are named repeatedly. Benalcazar, Cieza de León, La Condamine, Bonpland, Ulloa, Humboldt, Whymper, and Festa followed routes used since pre-Columbian times and elaborated and improved by the Incas. These roads were named "Qhapac Ñan" (Inca road) and later the Spaniards used those roads as conections between

Guayaquil (the main port) and Quito, the Ecuadorian capital (Onore 2003).

The first Ecuadorian that dedicated himself to the study of insects was Francisco Campos Ribadeneira (1878–1943). He was an intelectual from Guayaquil and was considered as the zoologist of the country. He was a biology teacher at the Colegio Vicente Rocafuerte and a medical zoology professor at the University of Guayaquil, where he conducted studies in medical entomology. Campos collected numerous insects and created the first entomological collection in Ecuador (Moret 2005). Periodically, he also wrote important publications for the Revista del Colegio Vicente Rocafuerte and the Sociedad Médica Ecuatoriana that published the only scientific journal related to natural sciences. In 1926, he published *Contribución al estudio de los insectos del Callejón Interandino*. One of the surveys he presented at the second medical entomology congress was the *Contribución al Estudio de los Esfíngidos* where he presented 56 species from Ecuador (Campos 1930).

The Development of Entomology as a Science in Ecuador

Medical entomology

The relationship between insects and humans has been documented throughout history, from the mythical biblical plagues and the first observations of malaria by Hipocrates about 400 BC, through the miasmatic theory of disease and the devastating pests that caused high mortality to human populations. Many chroniclers commented on the nuisance of mosquitos and how plagues attacked crops. However, it was only at the end of the 19th century that insects were recognized as possible vectors of diseases such as malaria (Machado-Allison 2004).

The Ecuadorian government started programs to control tropical diseases in 1940 with creation of the Instituto Nacional de Higiene y Medicina Tropical (INHMT) "Leopoldo Izquieta Perez". This institute has the mission to identify vectors of tropical and infectious diseases and to establish an insectary to test insecticides (http://www.inh.gov.ec/). Another institution devoted to the control of insect vector of human disease is the Servicio Nacional de Erradicación de la Malaria (SNEM). This institute studies and controls populations of *Aedes aegypti* (L. 1762) (Diptera: Culicidae) and the Chagas Disease vectors *Panstrogylus rufotuberculatus* (Champion 1883), *Rhodnius ecuadoriensis* Lent & León 1958, *Triatoma dimidiata* (Latreille 1811) (Hemiptera: Triatominae), and other species.

In 1950, José Rodriguez started the first taxonomic study of Phlebotominae sandflies in Ecuador. He described a new vector species of Leishmaniasis, *Phlebotomus camposi* Rodriguez 1950 (Diptera: Psychodidae), (Rodriguez 1950, Rodriguez 1952a, 1952b, Rodríguez 1953a, 1953b; Rodríguez1956). Luis León (1957) continued this research on Leishmaniasis in Ecuador, looking for other vectors and reservoirs of this disease.

Roberto Leví Castillo

One of the most influent scientists in the development of medical entomology in Ecuador was a multi-talented man, Roberto Levi Castillo. He was a passionate stamp collector, historian, physician, chemist, professor and pilot in the Ecuadorian and US Armies. He was born in January 29 of 1921 in Guayaquil (Ecuador) and did post graduate swork in Europe (1929-1931) and in the United States (1932-1937). In 1937, he was commissioned as a Second Lieutenant in the US Army with a specialization in military aviation. He fought with the Ecuadorian Army during the Peruvian invasion of the Ecuadorian territory in 1941. He returned to the United States in1942, studied at the Cornell University Medical School and graduated as a physician with a specialization in Family Medicine in 1943. For one year, he worked with the allied military command during the Second World War controlling malaria outbreaks in Greece and France (Perez Pimentel 1994).

One of the most important results of Levi-Castillo's research was the discovery that varieties of a single *Anopheles* species are geographically specific (Leví-Castillo 1944a). This publication can be considered as an early insight to ideas concerning ecological speciation (Schluter, 2001) and vicariance biogeography (Wiley 1988). In 1945, he joined the Inter-American Cooperative Service for Public Health of the United States as epidemiologist and sanitary entomologist. He fought against Andean malaria caused by the mosquito *Anopheles pseudopunctipennis*. Returning to Ecuador, he was posted as professor of Chemistry at the Vicente Rocafuerte National School in 1947. Perez-Pimentel (1994) states that he had passionate scientific discussions with Dr. Francisco Campos suggesting they did not get along with each other and had different research viewpoints. In 1951, he was awarded a PhD in chemistry and pharmaceuticals from Guayaquil University. His doctoral research was an investigation of *Culex* resistance to insecticides, one of the first studies of this type.

Levi-Castillo's major contribution as entomologist was the detailed study of South American Anophelinae. His worked in the areas of taxonomy, systematics, biology, zoogeography, ecology, and control of this group of mosquitoes (Leví-Castillo 1953, Leví-Castillo 1949, Leví-Castillo 1947, Levi-Castillo 1945, Levi-Castillo 1944d). He experimented on the possible natural control of malaria vectors and published in highly rated international research journals (Levi-Castillo 1944c). His publications have been cited worldwide and in recognition, Dr. João Lane (University of São Paulo) named a *Culex* species in his honor (*C. levicastillo* Lane 1945). He also wrote about environmental problems and consequences caused by human perturbation of the environment. He was a pioneer in conservation thinking. In 1962 he renounced entomological research because of a strike at the University of Guayaquil which destroyed his hopes of training young entomologists. He said "*I understood that my intellect was in advance compared to the Ecuadorian academic environment, and that entomology could not be my way of life in a country where there were not the economic resources to finance so many diversified study-fields […] I sold my laboratory equipment and burned my books to definitely abandon what sometime filled me with joy and illusions to give the chance to other challenges; looking for these, I found in stamp collecting, a new horizon*". Since then he has stood out as one of the best Ecuadorian stamp-collectors (Perez Pimentel 1994).

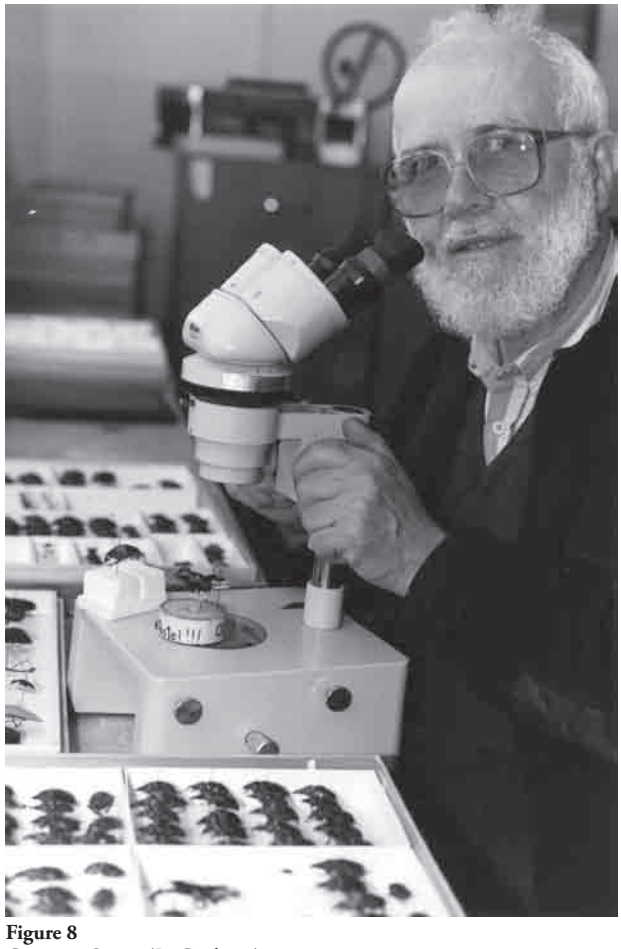

Figure 8
Giovanni Onore (R. Cárdenas).

Agricultural entomology

In 1959, the government of Ecuador created INIAP (Instituto Autónomo de Investigaciones Agropecuarias). This institution prioritized scientific research as the foundation of agricultural development in Ecuador (www.iniap-ecuador.gov.ec). Many agricultural engineers that work there studied agricultural entomology in Europe, United States, and other Latin American countries. The collaboration of countries such as the United States assisted the development of agricultural entomology in Ecuador.

The agricultural engineer, Gualberto Merino, was one of the pioneers of agricultural entomology research (Merino & Vázquez 1959). He started his work at the Ministerio de Agricultura in an effort to control the pest grasshopper *Schistocerca* sp. (Orthoptera: Acrididae) in the provinces of Loja and El Oro in southern Ecuador in 1945 and 1946. He used flame throwers at night to try to destroy the grasshoppers in their noctural refuges. This work was continued for two years without results until an undetermined pathogen reduced the population of grasshoppers, causing foul odors due to the decomposition of millions of dead insects (Merino, *pers. com.*).

Merino and his collaborators published more than 47 papers about different crop pests in Ecuador (Merino 2003). In the late 1940's, Ecuador started to import synthetic insecticides for pest control, including DDT. These insecticides were broadly used in erradication programs for agricultural pests, diseases vectors, and in schools to eliminate head lice on children. That period is known as the "green revolution" [The term "Green Revolution" generally referes to the use of improved varieties, fertilizer, irrigation and pesticides, but not pesticides in particular, that resulted in dramatic increasing in agricultural productivity. This most evident in Ecuador in the production of rice which benefited from improved varieties from IRRI] (Merino & Hernandez 1959; Merino & Vázquez 1960; Edwards 2004). It is important to emphasize the support of the Servicio Cooperativo Interamericano de Agricultura and the scientist, Harold Yust (1958) who made the

first inventory of Ecuadorian agricultural pests.

The control of pests with IPM techniques arrived late in Ecuador with replicas of experiences of other countries. Julio Molineros was a pioneer in research on fruit flies (Diptera:Tephritidae) (Molineros *et al.* 1992) and was responsible for the introduction of *Rodolia cardinalis* (Muslant 1850) (Coleoptera: Coccinellidae) for control of *Icerya purchasi* (Maskel 1878), (Hemiptera: Margarodidae), a major pest of [crop] in Ecuador.

Museums of Natural History

The Museo Nacional de Ciencias Naturales was created in 1978 and was initially directed by the engineer Moreno who gave to the Museum his collection of Molusca and Lepidoptera. The objectives of the National Museum are the inventory and classification of the fauna and flora and the exhibition and diffusion of knowledge of Ecuador's biodiversity (see www.mecn.gov.ec). The collections at this museum have been acquired from national or foreign collectors. One of the important collection is the moths (Lepidoptera) that belonged to Thierry Porion. Today the museum collaborates in research with several museums and universities overseas, and generates its own projects in several entomological taxa (Venedictoff & Herbulot 1980).

The Museo de la Escuela Politécnica Nacional, directed by the Ecuadorian zoologist Professor Gustavo Orcés, created a section devoted to entomology at the end of the 1980's. This museum has an important collection that is available to the public. One of the outstanding researchers that have increased the number of specimens in that collection is Terry Erwin of the Smithsonian Institution who works with the personnel from that museum. Erwin and his collaborators have deposited a large number of insects collected from the canopy of trees of the Ecuadorian Amazon (Shpeley & Araujo 1997; Erwin 2000; Lucky *et al*. 2002). The collection has more than 10,000 dry invertebrate specimens and 1,600 invertebrate specimens in alcohol. The majority of these specimens has been collected by pesticide fogging of tree canopies.

Creation of the Museum of Zoology at the Pontifical Catholic University of Ecuador

Giovanni Onore arrived in Ecuador from Italy in 1980 (Fig. 8). Onore is a Marianist missionary who worked in the Popular Republic of Congo for a decade strengthening agricultural production systems where insect pests were one of his priorities (Onore 1980, Fabres *et al.* 1981) His fondness for insects was evident since he was very young, so Africa unveiled a world full of possibilities for research for him. He was a zoology professor at Brazzaville University (Jácome 2008).

When he arrived in Ecuador he worked in the Cotopaxi province in education. In 1981, he started to teach invertebrate zoology at the Pontificia Universidad Católica del Ecuador (PUCE). At PUCE he made one of the greatest contributions to entomology in Ecuador. He has published nearly 50 articles about Ecuadorian

Figure 9
Onorelucanus onorei Lacroix & Bartolozzi 1989 (A. Janeta).

insects in forest entomology (Gara & Onore 1989, Onore & Maza 2003), agriculture entomology (Onore 1986), biodiversity (Onore & Davidson 1990, Somme *et al.* 1996), ethnozoology (Onore 1997), history of entomology (Onore 2003), and taxonomic descriptions of new species (Bartolozzi *et al.* 1991, Onore 1993, Bartolozzi & Onore 1993, Pampligioni *et al.* 2002, Onore & Morón 2004, Bartolozzi & Onore 2006). During his time as a university professor, he supervised more than 60 bachelors thesis, all related to insects (see Dangles *et al*. this issue). In recognition of his work, more than 150 insects have been named in his honor such as *Onorelucanus onorei* Lacroix & Bartolozzi 1989 (Coleoptera: Lucanidae) (Fig. 9).

One of the most important contributions of Onore has been the creation of the, Invertebrate Division within the Zoology Museum (QCAZ) at PUCE. This is a scientific collection that is the largest and most organized collection in Ecuador. It contains close to 2 million specimens from all regions of Ecuador (see Donoso *et al*. this issue). A large number of those specimens were collected by Onore in his travels throughout Ecuador. A great number of specimens were collected by his students that were assigned to prepare a scientific insect collection for the entomology class. This Museum is recognized internationally and has contact with the most important museums world-wide such as Staatliches Museum für Tierkunde Dresden (SMTD), Museum für Naturkunde der Humbolt Universitat Berlin (ZMHB), Universidad Nacional de La Plata (MLPA), Institut Royal des Sciences Naturelles de Belgique (ISNB), Canadian National Collection of Insects Ottawa (CNCI), Muséum National d`Histoire Naturelle, Paris (MNHN), Museo Zoologico La Specola Florencia (MZUF), Museo Regionale Scienze Naturali Torino (MRSN), Museum d`Histoire Naturelle Genève (MHNG), The Natural History Museum London (BMNH), Los Angeles County Museum of Natural History Los Angeles (LACM), California Academy of Sciences San Francisco (CASC), Florida State Collection of Arthropods Gainesville (FSCA), Carnegie Museum of Natral History Pittsburg (CMNH), University of Nebraska Lincoln (UNSM), American Museum of Natural History New York (AMNH), Smithsonian Institution Washington (USNM) (Onore 2003). The active exchange of specimens and information that has contributed to increase the knowledge of entomology in the country. Onore currently is the director of the Fundación Otonga, a private reserve in the cloud forest of Ecuador dedicated to conservation of this important habitat.

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