BIOTROP

Report on

BIODIVERSITY

at

CUZCO AMAZONICO
PERU

Compiled by
William E. Duellman
October 1991

BIOTROP

BIOLOGICAL INVESTIGATIONS

AT THE

RESERVA CUZCO AMAZONICO, PERU

Compiled by

WILLIAM E. DUELLMAN

OCTOBER 1991

CENTER FOR NEOTROPICAL BIOLOGICAL DIVERSITY

MUSEUM OF NATURAL HISTORY

THE UNIVERSITY OF KANSAS

PREFACE

This report summarizes the activities of field parties at the Reserva Cuzco Amazónico, Peru in 1989 and 1990, during which times integrated inventories of woody plants, terrestrial vertebrates, and selected groups of invertebrates were undertaken by personnel from The University of Kansas, Harvard University, and the Missouri Botanical Garden in the United States of America in collaboration with personnel from the Museo de Historia Natural, Universidad Nacional Mayor San Marcos in Peru. The report is a compilation of preliminary results prepared by various investigators who worked on the project.

The project was made possible by major funding from the National Geographic Society (USA) (Grant No. 4016-89; William E. Duellman, principal investigator). Additional funds were made available from the Consejo Nacional de Ciencia y Tecnología (CONCYTEC) to the Asociación de Ecología y Conservación (ECCO) for travel by Peruvian personnel. We are grateful to B. Anthony Luscombe, Vice-President of ECCO, for his effective logistic services, and to Gerardo Lamas M., Director of the Museo de Historia Natural, Universidad de San Marcos, for arrangements for interinstitutional collaboration. Sincere thanks are extended to Enrique Forero and Peter H. Raven of the Missouri Botanical Garden and to Edward O. Wilson of Harvard University for their intellectual contributions in conceptualizing the Neotropical Biological Diversity Program. We especially thank Philip S. Humphrey, Director of the Museum of Natural History, The University of Kansas, for his considerable intellectual and financial support of the project.

We are especially indebted to José E. Koechlin, President of Albergue Lodge Cuzco Amazónico, for his generous cooperation in making the facilities of the lodge available for biological investigations. Anibal Clavijo, General Manager of Cuzco Amazónico, arranged with AEROPERU for free transportation of large quantities of baggage. At the lodge, José Dominguez, César Naquiche, Ernestina Sánchez, and Máximo Villano aided the biologists in innumerable ways that made their stay not only enjoyable but allowed them to use their time there most effectively. Finally, the many workers at the lodge helped immensely by providing good cheer, physical labor, and specimens.

Permits were issued by Blgo. José Purisaca of the Dirección General Forestal y de Fauna, Ministerio de Agricultura, Lima. Climatic data for Puerto Maldonado were provided by the Servicio Nacional de Meteorologia y Hidrologia, and soils were analyzed by the Laboratorio de Análisis, Departamento de Suelos y Fertilizantes, Universidad Nacional Agraria La Molina, Lima.

Duellman is grateful to Rina Ramírez Mesías for translating text provided in Spanish.

William E. Duellman
Project Director
October 1991

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1.—THE NEOTROPICAL BIOLOGICAL DIVERSITY PROGRAM

WILLIAM E. DUELLMAN

Center for Neotropical Biodiversity, Dyche Hall, The University of Kansas, Lawrence, Kansas 66045-2454, USA

The Neotropical Biological Diversity Program (BIOTROP) was conceived during a series of meetings in 1988 and is now administered by the Center for Neotropical Biological Diversity at The University of Kansas. Conceptually, the program is designed to aid in strengthening existing policies for wise management and use of the biosphere, as well as creation and implementation of effective new measures, which depend on improving our detailed knowledge of the composition of the biosphere. Preservation and enlightened use of the world's biological diversity require far more precise knowledge about the living components of the biosphere, their distributions, and the factors affecting their occurrence, relative abundances, and interactions than is now available.

The BIOTROP strategy for surveying Neotropical biological diversity represents a major cooperative effort by U. S. and Latin American institutions. The project will require many years; its duration depends on availability of resources, both in costs and personnel. The proposed strategy is to: (1) acquire data on the occurrence and abundance of terrestrial organisms that are relatively well known taxonomically (i.e., woody plants, vertebrates, ants, and butterflies) at numerous sites during a relatively short period of time; (2) select study sites in diverse environments, including protected areas and nonprotected areas in immediate danger of destruction, with initial emphasis on tropical forests that are being decimated at a rapid rate; and (3) collect data in a manner that is comparable among sites.

The strategy is designed to develop data bases that characterize the biotas of diverse terrestrial environments in tropical America. Field-sampling protocols are designed to provide comparable data describing the spatial and temporal associations of groups of organisms that are relatively well known taxonomically along with selected physical environmental variables at diverse sites. The objectives of the strategy are to: (1) characterize the taxonomic composition and species associations of terrestrial environments in the American tropics; (2) elucidate physical environmental and other factors that are presumed to affect the taxonomic composition and distribution of terrestrial tropical species associations; (3) establish taxonomic and ecological baselines for tropical terrestrial environments that can be used to assess future change in relation to human population growth, economic development, and climatic change; (4) identify specific areas urgently requiring preservation and more intensive study; (5) strengthen technical training and graduate education programs designed to increase the numbers of Latin American and U. S. scientists and technicians who are trained in systematic biology and thereby able to participate in the strategy; and (6) use the research results for interpreting patterns of speciation and biogeography and in support of enlightened conservation.

The implementation of the strategy involves: (1) selection (in collaboration with institutions and personnel in Latin America) of sites that represent all major terrestrial habitats in Latin America; (2) establishment of one or more systems of quadrats at each site, depending on the diversity of habitats; (3) initiation of sampling protocols for woody plants, terrestrial vertebrates, and selected groups of invertebrates; (4) prescribed collection of data on physical and environmental variables; (5) creation of centers of data management designed to control the input and quality of data and to provide responsible access to the data base by the international community (qualified scientists and governmental and nongovernmental agencies) for research purposes and conservation; and (6) timely production of descriptive reports that present the results of preliminary investigations.

Initial implementation of the program necessitated a field site for which some prior biological knowledge was available and which provided as few logistic problems as possible. Thanks to the enthusiastic cooperation of José E. Koechlin, the Reserva Cuzco Amazónico was chosen for the initial site study. Application for research support was made to the National Geographic Society, Washington, D.C., USA, in September 1988 (funded in the amount of $80,000 US in February 1989).

In October 1988, with significant cooperation from the Asociación de Ecología y Conservación (ECCO), which negotiated additional funding from the Consejo Nacional de Ciencia y Tecnología (CONCYTEC) in Lima, Peru, agreements were negotiated between the Museo de Historia Natural of the Universidad Nacional Mayor San Marcos in Lima, Peru and the institutions in the United States of America

INITIAL SITE STUDY: RESERVA CUZCO AMAZONICO, PERU

The study zones were selected by William E. Duellman, Gerardo Lamas, and Percy Nuñez in November 1988. In March 1989, William E. Duellman and Linda Trueb worked with surveyors from Cuzco to lay out the quadrats in the study zones. Two field seasons of six weeks each were undertaken at the study site. The first was in the dry season, 6 June–19 July 1989, and the second in the rainy season, 20 January–3 March 1990. Prior to each field season, all participants (Table 1.1) met in Lima for indoctrination.

DESCRIPTION OF STUDY SITE

The Cuzco Amazónico Lodge is located in the southwestern corner of the Reserva Cuzco Amazónico, which consists of 10,000 ha at an elevation of about 200 m above sea level on an alluvial plain on the north bank of the Río Madre de Dios, about 15 km east-northeast of the town of Puerto Maldonado, Provincia de Tambopata, Departamento de Madre de Dios, in the southern part of Amazonian Peru (Fig. 1.1). Biological studies were concentrated on the southwestern part of the reserve, the southwestern corner of which is at 69°05'W, 12°35'S. With the exception of the steep banks of the Río Madre de Dios and lower Quebrada Madama (= Q. Mariposa), the terrain is generally flat with the total relief no more than 5 m.

TABLE 1.1. LIST OF PARTICIPANTS.

Individuals are identified to institution by the following abbreviations: HU = Harvard University, KU = University of Kansas, MBG = Missouri Botanical Garden, MHNSM = Museo de Historia Natural, Universidad Nacional Mayor San Marcos; 1 = first field season, 2 = second field season. Not all individuals spent the entire field season at the site.

Rosa Arana C., MHNSM, Mammalogy (1, 2)
Cesár Arana, MHNSM, Ornithology (2)
James S. Ashe, KU, Entomology
Gabriel Ballón, MHNSM, Entomology (1)
Luis A. Coloma, KU, Herpetology (2)
Stefan P. Cover, HU, Entomology (1)
Fernando M. Cuadros, MHNSM, Herpetology (2)
Tristan J. Davis, KU, Ornithology (1)
Terry J. Doonan, KU, Ecology (1)
William E. Duellman, KU, Herpetology (1, 2)
Cecilia Fox, MHNSM, Ornithology (1)
Darrel R. Frost, KU, Herpetology (2)
Alwyn H. Gentry, MBG, Botany (2)
Robert D. Holt, KU, Ecology (2)
Errol D. Hooper, KU, Mammalogy (2)
Javier Icochea, MHNSM, Herpetology (2)
Nestor Jaramillo, MBG, Botany (1)
David A. Kizirian, KU, Herpetology (1)
Gerardo Lamas, MHNSM, Entomology (1)
Richard A. Leschen, KU, Entomology (1)
Pedro Lozada, MHNSM, Entomology (2)
Mirian Medina, MHNSM, Entomology (2)
Víctor R. Morales, MHNSM, Herpetology (1)
Percy Nuñez, MBG, Botany (1, 2)
Cecilia Pacheco, MHNSM, Mammalogy (2)
Víctor Pacheco, MHNSM, Mammalogy (1)
Oliver Phillips, MBG, Botany (1)
Rina L. Ramírez M., MHNSM, Malacology (1, 2)
Antonio W. Salas, MHNSM, Herpetology (2)
Letty Salinas, MHNSM, Ornithology (2)
Cheryl A. Schmidt, KU, Mammalogy (1)
Diana Silva D.,MHNSM, Arachnology (1, 2)
Helena R. Sisniegas, MHNSM, Herpetology (1)
Rubén Tejada, MHNSM, Entomology (2)
Robert M. Timm, KU, Mammalogy (2)
John E. Tobin, HU, Entomology (1)
Linda Trueb, KU, Herpetology (1)
John J. Wiens, KU, Herpetology (2)
Erik R. Wild, KU, Herpetology (1)
Neal Woodman, KU, Mammalogy (1, 2)

Studies of the terrestrial biota were essentially confined to areas reached by a system of about 10 km of trails (A–D) with concentration of effort in two study zones (Fig. 1.2). In each of the study zones, two trails designated "E" and "U" each bisect 25 contiguous quadrats of 20 X 20 m (Fig. 1.3). Zone 1 is in terra firma forest , whereas Zone 2 is in forest that is inundated in the rainy season by accumulated rainfall and runoff.

Soils.—Samples taken from quadrats in the study zones reveal a texture of loam commonly mixed with silt and/or clay. Superficial soils (top 2 cm) contain 14–48% ($\bar{x}$= 24.2) sand, 38–60% ($\bar{x}$= 49.8) silt, and 10–40% ($\bar{x}$= 26.0) clay, with a pH of 4.2–7.2 ($\bar{x}$ = 5.25). Subsurface soils (depth of ca 30 cm) contain 12–32% ($\bar{x}$= 18.0) sand, 32–54% ($\bar{x}$= 43.8) silt, and 26–50% ($\bar{x}$= 38.2) clay, with a pH of 4.2–6.6 ($\bar{x}$= 4.9).

Climate.—The nearest continuously operating weather station is at Puerto Maldonado, about 15 km west-southwest of Cuzco Amazónico. Data from there for 1971–1988 reveal that total annual rainfall is highly variable, with annual extremes of 1836–3418 mm ($\bar{x}$ = 2387). The rainy season extends from October through March with the heaviest rainfall in January and February; the least amount of rain falls in June and July. However, the amount of rain in a given month varies greatly from year to year . Temperature data are available for 1978–1989. October is the hottest month with a mean monthly maximum of 32.25°C. The mean monthly maxima and minima for other selected months are: January 30.7 and 21.6°C, February 30.8 and 21.3°C, June 28.5 and 17.2°C, and July 29.9 and 17.3°C.

A continuously recording hygrothermograph was maintained in the thatched-roofed, screened laboratory at Cuzco Amazónico during the study periods—dry season (6 June–18 July 1989) and rainy season (19 January–1 March 1990). Rainfall was sporadic during the dry season; the heaviest rain of 25 mm occurred on 6 July, whereas rainfall was frequent in the rainy season with the heaviest rainfall of 127.6 mm on 10 February. Moderately strong southerly winds in the dry season resulted in precipitous temperature declines on two occasions. One of these cold spells lasted three days, when temperatures dropped to 9°on three consecutive nights. At night the relative humidity reached 92–99% in both seasons. The lowest humidities were recorded near midday; in the dry season these were 32–90% ($\bar{x}$=62.2.) and in the rainy season, 51–92% ($\bar{x}$ =66.4). Annual differences in rainfall patterns are evident in comparison of data taken at Cuzco Amazónico in February 1986 and February 1990. In 1986, 351.8 mm of rain fell on 23 days; 10 mm or more fell on each of 14 days, and the heaviest daily rainfall was 67.0 mm. In 1990, 266.7 mm of rain fell on 20 days, but 10 mm or more fell on each of only 5 days; however, the heaviest daily rainfall was 127.6 mm.

Vegetation.—Cuzco Amazónico is located near the transition between humid tropical forest and dry tropical forest; although Puerto Maldonado receives an annual average of only 2387 mm of rainfall, the region is mapped as humid tropical forest under the Holdridge system by Tosi in1960. The mostly evergreen tropical forest on alluvial soil in the reserve contains perhaps 400 species of trees (A. H.

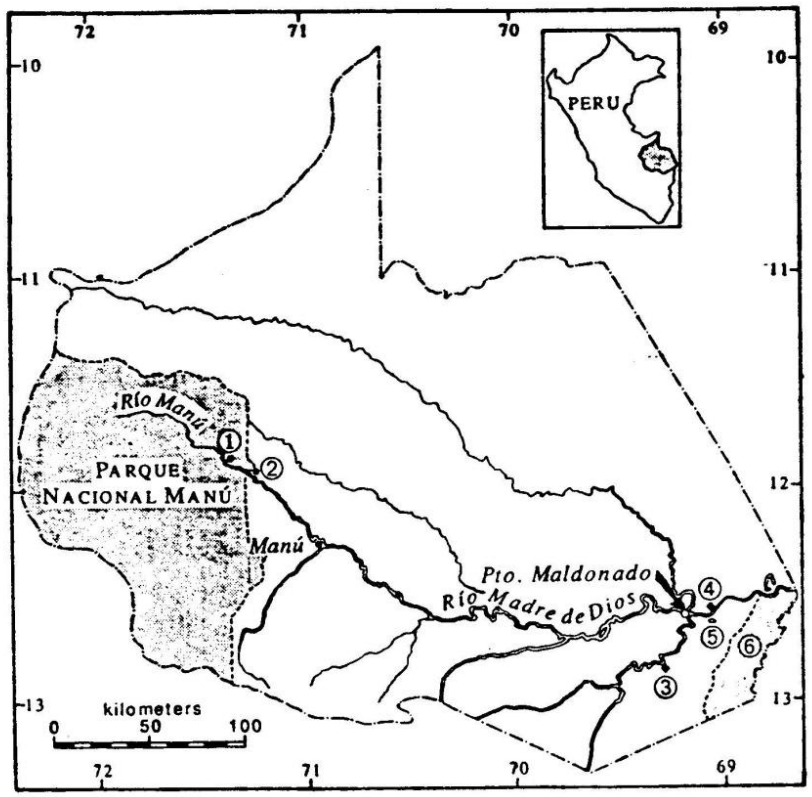

Fig. 1.1. Map of Departamento de Madre de Dios, Perú, showing the location of ecological reserves (Cuzco Amazónico and Tambopata), Parque Nacional del Manú, Santuario Nacional del Heath, and principal rivers and towns. 1 = Cocha Cashu, 2 = Pakitza, 3 = Reserva Tambopata, 4 = Cuzco Amazónico, 5 = Lago Sandoval, 6 = Santuario Nacional del Heath. Based on Mapa Físico Político, Departamento de Madre de Dios, Atlas del Perú, Instituto Geográfico Nacional, Lima, 1989.

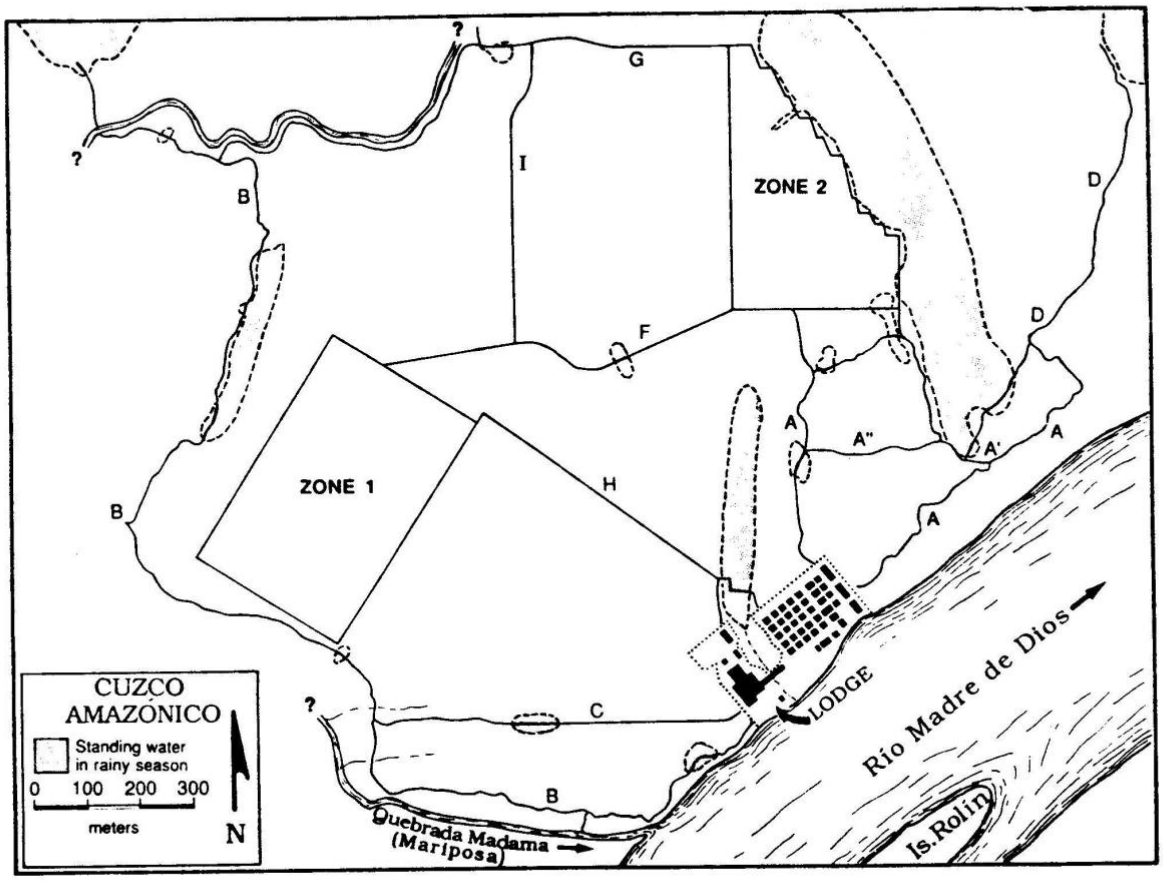

Fig. 1.2. Map of southwestern part of Reserva Cuzco Amazónico showing location of tourist lodge, trails, and study zones. Stippled areas are inundated in the rainy season. Trail are indicated by letters A–I. Based on surveys by W. E. Duellman and B. W. Buchanan.

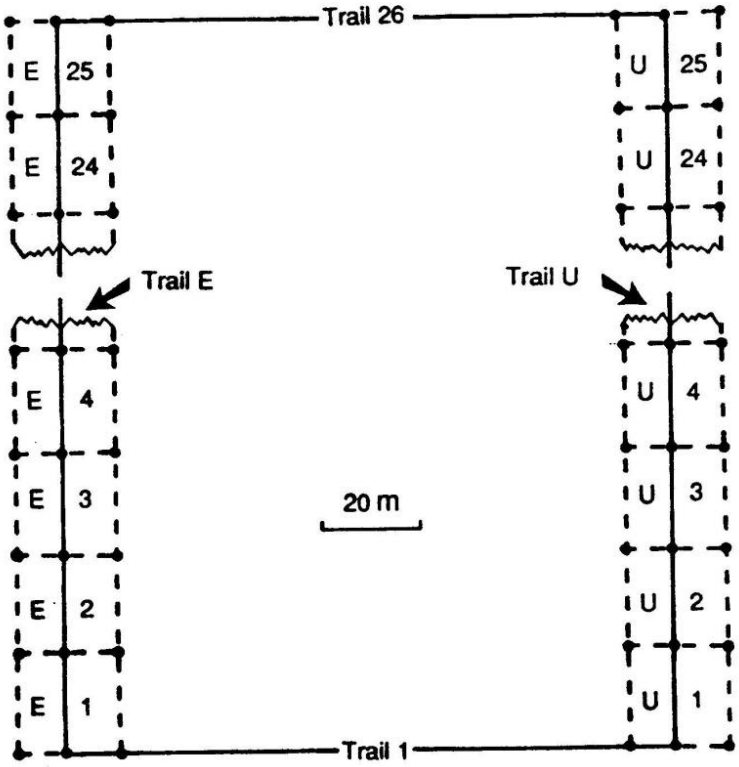

Fig. 1.3. Layout of study zones showing positions of trails and numbering of quadrats. Dashed lines indicate boundaries of quadrats (20 X 20 m); dots at the corners of quadrats and along trails indicate presence of rot-resistant wooden stakes, about 1 m of which are above ground.

Gentry, pers. comm.). Most of the large trees attain heights of about 30 m and form an incomplete forest canopy. Emergents (including *Ceiba*, *Chorisia*, *Dipteryx*, and *Ficus*) reach heights of 40 m or more. In the midlevel and understory of the forest, the vegetation is rather dense with many woody vines ; the nearly 40 lianas (>10 cm diam.) per ha is nearly twice the average for Amazonian forests (A. H. Gentry, pers. comm.). Consequently, except in areas of treefalls, little sunlight reaches the forest floor . In only 10 of the 100 quadrats in the two study zones does more than 25% of the forest floor receive direct solar exposure at midday in the dry season. Palms are common components of the understory.

These include the small solitary *Phytelephas macrocarpa*, and *Oenocarpus* sp., the small colonial *Bactris* sp., and young of two larger palms---*Iriartea deltoidea* and *Scheelea* sp. Throughout the forest the most conspicuous ground cover is ferns, of which *Adiantum* sp. is the most common. In the 100 quadrats, ferns cover as much as 70% of the ground in the terra firma forest and 45% in the inundated forest. In areas of poor drainage, especially in the inundated forest, *Heliconia* (Musaceae) and *Calathea* (Marantaceae) are conspicuous; in one poorly drained area, there is a dense growth of the large, terrestrial bromeliad *Aechmea magdalenae*. Bamboos have not been found on the reserve. Arboreal bromeliads are scarce, but epiphytic ferns and orchids are moderately common.

Terra firma and seasonally inundated forests differ floristically and physiognomically. There are fewer ferns and less herbaceous ground cover in inundated forest than in terra firma forest but more *Heliconia* and *Calathea*. Except in areas of dense growths of these plants, the understory is more open in inundated forest than in terra firma forest.

Isla Rolín in the Río Madre de Dios is about 1 km long; the eastern part of the island is opposite the lodge in the southwestern corner of the reserve. The island supports a dense *Cecropia* forest with stands of caña brava (*Gynerium saggitum*) and the treelike composite *Tessaria integrifolia*. At times of high water, much of the island is flooded, whereas at times of low water, extensive sand beaches are exposed.

PROCEDURE

All trees and woody vines (2196 individuals) having diameters at breast height (dbh) of 10 cm or greater in the 100 quadrats were marked with numbered aluminum tags, measured, and identified. The distances of each marked tree and vine were measured from adjacent corners of the quadrat. Using the TREEMAP Program provided by the Smithsonian Institution, maps of the trees in each quadrat were generated (Fig. 1.4). Trees and vines are more numerous in terra firma forest than in inundated forest. Each of the transects in the study zones encompasses 1 ha (25 adjacent quadrats 20 X 20 m). The numbers of individual trees and vines are 534/ha in Transect E in Zone 1 and 541/ha in Transect U in Zone 1, both of which are in terra firma forest. The numbers are 511/ha in Transect E in Zone 2, which is only partly inundated. These numbers contrast with 610/ha in Transect U in Zone 2, which is nearly entirely inundated after heavy rains.

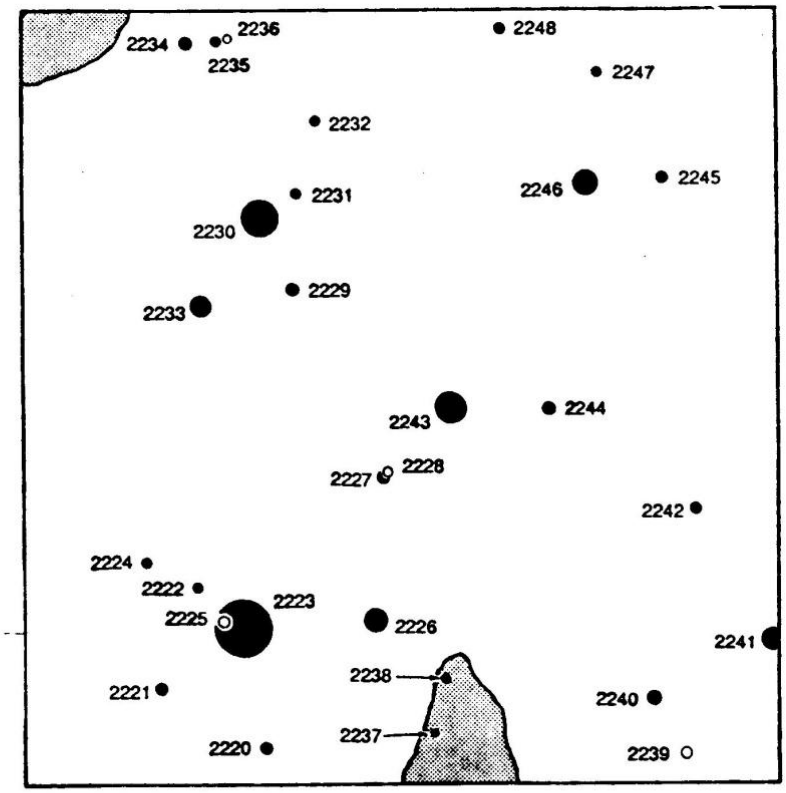

Fig. 1.4. Map of trees and vines with DBH>10 cm in Quadrat U19 in Zone 2. Quadrat is 20 X 20 m; top of diagram is north. Shaded areas are above water at height of rainy season. Diameters of symbols in diagram indicate relative diameters; numbers are numbered tags on trees. Identifications and diameters [in cm] are: 2220 Unidentified [10.0], 2221 Rheedia *sp. (Guttiferae) [14.7], 2222* Lecointea peruviana *(Fabaceaea) [11.3], 2223* Inga *sp. A (Leguminosae) [60.7], 2224* Lunania parviflora *(Flacourtiaceae) [11.2], 2225* Machaerium *sp. (Leguminosae) [13.0], 2226* Scheelea *sp. (Palmae) [26.0], 2227* Licania *sp. (Chrysobalanaceae) [16.0], 2228* Dicranostyles *sp. (Convolvulaceae) [10.8], 2229* Neea *sp. A (Nyctaginaceae) [16.5], 2230* Sorocea *sp. (Moraceae) [38.6], 2231* Celtis schippii *(Ulmaceae) [12.0], 2232* Pseudolmedia *sp. (Moraceae) [12.5], 2233* Clarisia racemosa *(Moraceae) [22.7], 2234* Malmea *sp. (Annonaceae) [15.8], 2235* Pseudolmedia laevis *(Moraceae) [12.0], 2236* Combretum *sp. (Combretaceae) [10.0], 2237* Neea *sp. B. (Nyctaginaceae) [10.3], 2238* Guarea *sp. (Meliaceae) [11.9], 2239* Hippocráten volubilis *(Hippocrataceae) [12.8], 2240* Sorocea *sp. (Moraceae) [18.0], 2241 Quararibea ochrocalyx (Bombacaceae) [24.2], 2242* Triplaris *sp. (Polygonaceae) [14.0], 2243* Licania *sp. (Chrysobalanaceae) [36.2], 2244* Coccoloba *sp. (Polygonaceae) [16.7], 2245 Unidentified (Annonaceae) [14.9], 2246* Coccoloba *sp. (Polygonaceae) [27.0], 2247* Tapura *sp. (Dichapetalaceae) [11.6], 2248* Euterpe precatoria *(Palmae) [15.1].*

Herbarium specimens were prepared of all numbered trees, except for a few common, easily identified species which were sampled (as voucher specimens) only once in each zone. Also, herbs, grasses, ferns, and epiphytes were collected and prepared; these were noted as to quadrat of origin.

An attempt was made to sample animals evenly throughout the quadrat system. For example, small mammals were sampled by means of a series of trap stations. One station was located in each quadrat and consisted of four traps two on the ground and two at 0.2–2.0 m above the ground in order to sample both terrestrial and arboreal species. Traplines were run for 12 days in each field season. Likewise, mist nets were erected to catch birds and bats at specific places in the quadrats during both seasons. Two systems of drift fences with pitfall traps were set up in quadrats in each study zone. Amphibians and reptiles were collected mainly by personnel moving through the quadrat system by day and night; approximately equal effort was devoted to each study zone in both seasons. The songs of birds were recorded in both seasons, and certain birds and mammals were shot opportunistically. Ants, lepidopterans, spiders, and mollusks were collected systematically throughout the quadrat system. Although collecting efforts were directed at the quadrats, some material was collected or observed along the trails between the camp and the study zones and variously along the other trails on the reserve. This material augmented the numbers of specimens and species from the quadrats and provided a more nearly complete assessment of diversity in the area. Threatened and endangered species were not collected; they were recorded by observation only.

All animals collected and/or observed were noted with respect to quadrat, association with a numbered tree (if any), height above ground, date, hour, and activity. Data were either recorded in the field on pocket recorders and later transcribed to standardized Field Data Sheets or entered directly onto these sheets. Subsequently, all data were entered into a menu-driven data-management system written in (DBASE IV) on portable computers in camp (Fig. 1.5). In addition to the data entered into the computerized system, individual field catalogues of vertebrates were maintained that contained weights of each individual preserved (also of individuals subsequently released) and notes on reproductive condition; for mammals and birds, all standard data also were recorded. In addition, tissue samples were collected for subsequent molecular studies, and ectoparasites of birds and mammals were preserved for studies of host/parasite associations.

RESULTS

Some plants and insects still are being sorted and identified. Although some taxa have been identified only as morphospecies, the numbers of taxa of some invertebrates and all vertebrates are available (Table 1.2). With the exception of birds, monkeys, tree squirrels, and some marsupials, these numbers represent taxa only found on the ground and in the understory. Consequently, the samples do not include many species of arboreal insects and possibly spiders, some arboreal lizards and snakes, and bats that are active only in the canopy.

One major problem confronting biologists undertaking inventories in lowland tropical rainforest is determining the diversity of any group of organisms. Although it

CATEGORY *QS*
CLASS *AMPH*
FAMILY *Leptodactylidae*
GENUS *Ceratophrys*
SPECIES *cornuta*
N *1*
SITE *1*
ZONE *1*
QUADRAT *E12*
DATE *23Jan1990*
TIME *1935*
HEIGHT *0.0*
TREE NO. *151*
COLLECTOR *WEDUE*
FIELD NUMBER *WEDUE 57965*
PHOTO *WEDUE 414:25-27*
DATA ENTRY *WEDUE*
ENTRY DATE *24Jan1990*
REMARKS *In leaf litter 2 m SW Tree 151.*

Fig. 1.5. BIOTROP data base menu with sample.

TABLE 1.2. NUMBERS OF TAXA OF SELECTED GROUPS OF INVERTEBRATES AND OF TERRESTRIAL VERTEBRATES RECORDED AT CUZCO AMAZONICO DURING THE BIOTROP PROJECT.

TAXONOMIC GROUP	FAMILIES	GENERA	SPECIES
Ants	1	64	262
Butterflies	6	65	314
Flies	28	29	116
Homopterans	13	—	322
Spiders	42	264	457
Mollusks	17	24	30
Amphibians	7	23	53
Reptiles	16	49	63
Birds	51	233	341
Mammals	28	74	97

is possible to sample all of the species of plants in a given system of quadrats, sampling all of the species of a given group of animals (e.g., butterflies or lizards) in a reasonable period of time is nearly impossible. This is due to the vagility, seasonality, or cryptic behavior of many species of animals. In order to ascertain the effectiveness of sampling techniques, species-discovery rates were determined for some groups of animals. The curves for reptiles and mammals have not reached their asymptotes; most of the species of reptiles added toward the end of the sampling period were snakes, whereas bats accounted for most of the additions among the mammals. These data suggest that additional sampling is required in order to have a reasonably complete inventory of these organisms.

COMMENTS

Most conservationists and some biologists do not condone the collecting of plants and animals (especially vertebrates) in protected areas. This attitude is appropriate in the case of large, well-known species, such as macaws, eagles, cats, monkeys, crocodilians, and tortoises, most of which can be identified easily by sight. Adequate field guides, some with excellent color illlustrations, are available for the identification of many species of birds and mammals. However, such is not always the case. Identifications of most insects, spiders, amphibians, and reptiles need to be made by taxonomic specialists. Even these specialists sometimes must spend hours preparing specimens and comparing them with other specimens, including types, before proper identifications can be made. For example, although a field guide exists for mammals, many species of rodents cannot be identified until the skulls have been cleaned and dentition and other characters examined in detail.

Inventorying the rich biota in lowland tropical rainforests necessitates the documentation of the occurrence of species at many sites. Except for sight records of well-known species (and acoustic recordings of birds identified by a few qualified specialists), occurrence must be documented by specimens. Lack of sufficient specimens leads to incomplete or incorrect assessment of occurrence.

New species of all taxonomic groups, even birds, continue to be found in the Amazon Basin, as well as elsewhere in tropical America. Likewise, the distributions of species continue to be refined, sometimes by notable range extensions. For example, the field studies at Cuzco Amazónico produced six species of frogs (nearly 10% of those collected) that were new to science. Two species of frogs were recorded for the first time from Peru; two lizards, one snake, and seven mammals were recorded for the first time from southern Peru. Had collecting been prohibited, the new species and most of the significant range extensions would not have been documented.

Concern has been expressed that collecting decimates populations. To the uninitiated, the collection of 20 or 30 individuals of a species from one locality may seem to be extravagant. However, such numbers are necessary in order to document sexual and ontogenetic differences, reproductive activity, and food habits in many taxa. We are unaware of any notable declines in populations because of collecting by responsible biologists. For example, in January 1986, a new species of tree frog, *Hyla koechlini,* was discovered at Cuzco Amazónico; 82 specimens were collected at temporary ponds. During subsequent field work in the rainy seasons (November

1986, December 1989, January-February 1990), this frog was observed to be as abundant at the same ponds as it was in January 1986.

Persons expressing concern about numbers of specimens collected must take into account the sparseness of sampling procedures expressed as a fraction of the landscape. For example, the Reserva Cuzco Amazónico consists of 10,000 ha (100,000,000 m^2 of surface area). The sampling by the BIOTROP field parties was along approximately 10,000 m of trails; most sampling was done within 5 m of a trail, so the maximum sampling area can be calculated as 10,000 m by 10 m, or 100,000 m^2 of surface area. This amounts to 0.1% of the surface area in the reserve. Assuming an average canopy height of 30 m, the reserve contains 3,000,000,000 m^3 of habitat. With only a few exceptions (some birds and mammals that were shot), the effective sampling height was 2 m; thus, the volume of area sampled was only 0.0067% of the reserve. Thus, despite intensive collecting, only a miniscule part of the reserve was in fact sampled.

These data underscore the fact that biotic inventories and other kinds of scientific collecting are likely to have no significant negative impact on the biota in lowland rainforests, other than, of course, large, mobile, low-density animals such as macaws and monkeys. The collection of relatively few specimens to answer important scientific questions has a minimal effect on the biota, in contrast to the destruction of plant and animal life with no scientific benefits by the clearing of a few hectares of forest, a practice that occurs hundreds of times daily in the Amazon Basin.

The collaborative arrangements between the management of the Albergue Lodge Cuzco Amazónico and biologists from institutions in Peru and the United States illustrate well that such collaboration can be mutually beneficial. This collaboration was instrumental in the initiation of the Neotropical Biological Diversity Program. Biologists have benefited immensely from the logistic support provided by the reserve, and the reserve has benefited by the training of guides for increased enlightenment of tourists and by biological data pertinent to the development of potential commercial ventures.

The Cuzco Amazónico model can be adopted for use throughout Latin America to the benefit of biology, conservation, and tourism. It is beneficial for managers of private reserves and government officials responsible for national parks and reserves to encourage biological investigations by creating adequate facilities for biological research and making these facilities available to biologists on a nonprofit basis. Biologists can plan effective research programs to be carried out at one or more reserves that will provide data pertinent to our better understanding and potential sustainable use of tropical environments. Furthermore, managers and biologists working together can provide a realistic interpretation of the environment to local inhabitants and to tourists. Once local people have an understanding and appreciation of the environment and observe tourists coming from throughout the world to visit reserves, they will take pride in their environment and strive to maintain it. The ever-increasing number of tourists will gain an appreciation of tropical environments, which may influence legislation in their own countries that can have an impact on the tropics; moreover, ecotourism has the potential to provide the finances necessary for

maintaining reserves and parks, supporting biological research and conservation, and improving local economies.

Fundamental to the preservation of tropical rainforests and the sustainable use of these forests is a knowledge of the biota. Accurate and comparable data, such as that obtained at Cuzco Amazónico by the BIOTROP project, are essential if biologists are to provide conservationists, foresters, agriculturalists, and politicians with the information necessary for innovative, sustainable use of rainforests. Integration of the diverse expertise represented by these disciplines must occur in the immediate future if future generations of humans are to inherit a living planet.

2.—THE FLORA OF CUZCO AMAZONICO

ALWYN H. GENTRY

Missouri Botanical Garden, P. O. Box 299, St. Louis, Missouri 63166-0299, USA.

Although processing and identification of the botanical collections has not been completed, 600 species of plants have been identified and the collections probably contain about 1,000 species. It is evident that the flora of Cuzco Amazónico is similar to that of the flood plain at Cocha Cashu and even more like the restricted patch of mature floodplain forest at Tambopata. For example, *Iriartea deltoidea* is the commonest tree species at both Cuzco Amazónico and in the Tambopata alluvial plot and the second commonest species at Cocha Cashu. All of the commonest species at Cuzco Amazónico are present (and usually common) at both of these sites. However, there are also some notable intersite differences. For example, *Otoba parvifolia,* by far the commonest tree species at Cocha Cashu, is rare at Cuzco Amazónico and Tambopata, whereas *Socratea exorrhiz,* the second commonest alluvial forest tree species at Tambopata, is absent in the Cocha Cashu plot and rare at Cuzco Amazónico. *Quararibea witti,* the second commonest species at Cuzco Amazónico, is the fourth commonest species at Cocha Cashu, but rare at Tambopata, whereas *Pseudolmedia laevis,* the third commonest species at Cuzco Amazónico, is uncommon at both of the other sites (but is common on lateritic soil at Tambopata). Cuzco Amazóncio also has a number of tree and liana species not known from either of the other sites, including several species new to science.

TABLE 2.1. PLANTS COLLECTED AT CUZCO AMAZONICO.

FERNS
Psilotaceae
Adiantum latifolium
Adiantum pectinatum
Asplenium auritum
Asplenium cuspidatum
Asplenium serratum
Bolbiltis lindigii
Bolbitils nicotianaefolia
Campyloneurum phyllitidis
Campyloneurum repens
Cyclopeltis semicordata
Danaea nodosa
Dennstaedtia bipinnatata
Didymochlaena truncatula
Diplazium cristatum
Diplazium lindbergii
Microgramma percussa
Microgramma reptans
Microgramma sp.
Nephrolepis biserrata
Pecluma dispersa
Pecluma plumula
Phlebodium decumanum
Polybotrya caudata
Pityrogramma calomelanos
Psilotum sp.
Pteris sp.
Tectaria sp.
Thelypteris
Thelypteris hispidula
Thelypteris juruensis
Vittaria costata

MONOCOTYLEDONS
Amaryllidaceae
Bomarea dolichocarpa
Araceae
Anthurium brevispadix
Anthurium clavigerum
Anthurium gracile
Heteropsis sp.
Monstera adansonii
Monstera dubia
Monstera obliqua
Monstera cf. *spruceana*
Philodendron camposportoanum

TABLE 2.1 continued

Philodendron cf. *megalophyllum*
Philodendron krukovii
Rhodospatha latifolia
Stenospermation sp.
Syngonium podophyllum
Xanthosoma sp.

Arecaceae
Bactris concinna
Bactris monticola
Chamaedorea angustisecta
Desmoncus polyacanthos
Euterpe sp.
Geonoma acaulis
Geonoma brongniartii
Iriartea deltoides
Oenocarpus bataua
Oenocarpus cf. *mapora*
Oenocarpus sp.
Scheelea sp.
Socratea exorrhiza

Bromeliaceae
Aechmea angustifolia
Billbergia cf. *rupestris*
Streptocalyx arenarius
Tillandsia sp.
Vriesia sp.

Cannaceae
Canna

Commelinaceae
Dichorisandra sp.
Geogenanthus poeppigii
Tradescantia zebrina

Cyclanthaceae
Asplundia
Thoracocarpus bissectus

Cyperaceae
Calyptrocarya poeppigiana
Fimbristylis annua
Rhynchospora kuntzei
Scleria melaleuca

Dioscoreaceae
Genus sp.

Dioscorea
Genus sp.

Lemnaceae
Lemna sp.

TABLE 2.1 continued

Liliaceae
Dracaena
Smilax
Smilax
Marantaceae
Calathea loeseneri
Monotagma
Musaceae
Heliconia sp.
Orchidaceae
Campylocentrum hondurense
Cattleya luteola
cf. *Chondrorhyncha* sp.
Cochleanthes sp.
Cryptarrhena lunata
Diadenium sp.
Encyclia pygmaea
Epidendrum anceps
Epidendrum coronatum
Epidendrum aff.
Epidendrum strobiliferum
Masdevallia sp.
Maxillaria sp.
Maxillaria friedrichsthalii
Oncidium nanum
Oncidium sp.
Ornithidium confertum
Ornithocephalus sp.
Plectrophora cultrifolia
Pleurothallis sp.
Polystachya foliosa
Polystachya sp.
Psygmorchis glossomystax
Scaphyglottis stellata
Trizeuxis falcata
Trichocentrum panduratum
Vanilla sp.
Poaceae
Guadua sp.
Lasiacis scabrior
Lasiacis sp.
Olyra latifolia
Orthoclada laxa
Panicum stoloniferum
Pariana sp.
Paspalum conjugatum
Pharus virescens

TABLE 2.1 continued

Pharus sp.
Phyllostachys sp.
Sorgum sp.
Harlan sp.
Zingiberaceae
Costus sp.
Renealmia sp.
DICOTS
Acanthaceae
Dicliptera sp.
Fittonia albivenis
Justicia iochila
Mendoncia aspera
Mendoncia sp.
Pachystachys sp.
Ruellia sp.
Amaranthaceae
Genus sp.
Anacardiaceae
Anacardium occidentale
Astronium sp.
Spondias mombin
Spondias sp.
Annonaceae
Annona sp.
Cremastosperma
Duguetia spixiana
Duguetia sp.
Guatteria sp.
Malmea sp.
Oxandra mediocris
Oxandra sp.
Rollinia pittieri
Rollinia sp.
Ruizodendron ovale
Unonopsis sp.
Xylopia cuspidata
Xylopia frutescens
Xylopia
Apocynaceae
Aspidosperma tambopatense
Aspidosperma sp.
Forsteronia sp.
Pacouria boliviensis
Rauvolifa sp.
Stenosolen sp.
Tabernaemontana tetrastachya

TABLE 2.1 continued

Tabernaemonta sp.
Araliaceae
Dendropanax sp.
Didymopanax morototoni
Polyscias fruticosus
Aristolochiaceae
Aristolochia cauliflora
Aristolochia pilosa
Aristolochia sp.
Asclepiadaceae
Genus sp.
Asteraceae
Mikania sp.
Senecio sp.
Tessaria integrifolia
Wulffia sp.
Balonophoraceae
Genus sp.
Ombrophytum
Genus sp.
Bignoniaceae
Adenocalymna bracteatum
Adenocalymna impressum
Adenocalymna inundatum
Adenocalymna uleanum
Arrabidaea affinis
Arrabidaea bilabiata
Arrabidaea brachypoda
Arrabidaea chica
Arrabidaea cf. *chica*
Arrabidaea corallina
Arrabidaea nicotianiflora
Arrabidaea patellifera
Arrabidaea pearcei
Arrabidaea cf. *pearcei*
Arrabidaea platyphylla
Arrabidaea poeppigii
Arrabidaea verrucosa
Arrabidaea cf. *verrucosa*
Callichlamys latifolia
Ceratophytum tetragonolobum
Clytostoma sciuripabulum
Clytostoma uleanum
Cuspidaria floribunda
Cuspidaria lateriflora
Cydista lilacina
Distictis occidentalis

TABLE 2.1 continued

Distictis sp.
Jacaranda glabra
Lundia spruceana
Macfadyena uncata
Mansoa alliacea
Mansoa kerere
Mansoa parvifolia
Mansoa verrucifera
Mussatia hyacinthina
Paragonia pyramidata
Pithecoctenium crucigerum
Pleonotoma melioides
Roentgenia bracteomana
Spathicalyx xanthophylla
Stizophyllum riparium
Tabebuia impetiginosa
Tabebuia roseoalba
Tabebuia serratifolia
Tannaecium nocturnum
Tynanthus polyanthus
Tynanthus schumannianus
Tynanthus sp.
Xylophragma pratense
Xylophragma seemannianum
Bombacaceae
Ceiba pentandra
Chorisia sp.
Pachira sp.
Quararibea rhombifolia
Quararibea wittii
Quararibea sp.
Boraginaceae
Cordia alliodora
Cordia buddleoides
Cordia nodosa
Cordia sp.
Tournefortia angustiflora
Burseraceae
Crespidium sp.
Protium apiculatum
Protium insignis
Protium puncticulatum
Protium sagotiana
Protium aff. *sagotianum*
Capparidaceae
Capparis sola
Crataeva tapia

TABLE 2.1 continued

Morisonia sp.
Caricaceae
Carica sp.
Celastraceae
Gymnosporia magnifolia
Maytenus
Chrysobalanaceae
Hirtella bullata
Hirtella excelsa
Hirtella racemosa
Hirtella triandra
Licania apetala
Licania paraensis
Licania sp.
Parinari occidentalis
Clusiaceae
Calophyllum
Chrysochlamys
Clusia sp.
Garcinia madruno
Vismia sp.
Combretaceae
Buchenavia sp.
Combretum sp.
Terminalia amazonia
Terminalia oblonga
Terminalia sp.
Connaraceae
Connarus punctatus
Connarus sp.
Convolvulaceae
cf. *Dicranostyles* sp.
Ipomoea cf. *reticulata*
Ipomoea phillomega
Ipomoea ramosissima
Maripa sp.
Merremia umbellata
Crassulaceae
Genus sp.
Cucurbitaceae
Cayaponia sp.
Gurania sp.
Luffa cylindrica
Siolmatra sp.
Dichapetalaceae
Tapura coriacea
Tapura juruana

TABLE 2.1 continued

Tapura sp.
Dilleniaceae
Davilla nitida
Davilla sp.
Doliocarpus dentatus
Doliocarpus major
Tetracera parviflora
Ebenaceae
Diospyros sp.
Elaeocarpaceae
Sloanea sp.
Sloanea aff. *obtusifolia*
Sloanea picapica
Erythroxylaceae
Erythroxylum sp.
Euphorbiaceae
Acalypha benenensis
Acalypha sp.
Alchornea sp.
Codiaeum variegatum
Drypetes sp.
Euphorbia sp.
Hevea sp.
Hyeronima sp.
Manihot sp.
Margaritaria nobilis
Omphalaea diandra
Pausandra sp.
Sapium sp.
Fabaceae
Acacia sp.
Albizia caribaea
Andira sp.
Bauhinia sp.
Cassia sp.
Copaifera sp.
Dalbergia frutescens
Dalbergia sp.
Desmodium adscendens
Dioclea sp.
Dipteryx sp.
Entada sp.
Hymenaea sp.
Inga alba
Inga auristellae
Inga laurina
Inga lopadadenia

TABLE 2.1 continued

Inga pilosula
Inga punctata
Inga quaternata
Inga ruiziana
Inga semialata
Inga strigillosa
Inga striata
Lecointea sp.
Machaerium sp.
Mimosa sp.
Myroxylon sp.
Ormosia sp.
Phyllocarpus riedelii
Piptadenia sp.
Pithecolobium cauliflora
Poulsenia armata
Pterocarpus? sp.
Stizolobium sp.
Swartzia myrtifolia
Swartzia sp.
Tachigalia sp.

Flacourtiaceae
Banara guianensis
Casearia sp.
Hasseltia floribunda
Homalium racemosum
Lindackeria paludosa
Luanania parviflora
Mayna odorata
Mayna parvifolia
Prockia crucis

Gesneriaceae
Codonanthe sp.
Drymonia sp.

Hernandiaceae
Sparattanthelium sp.

Hippocrateaceae
Anthodon sp.
Hippocratea volubilis
Peritassa sp.
Salacia ? sp.

Lacistemataceae
Lacistemma sp.

Lauraceae
Aniba guianensis
Aniba taubertiana
Aniba sp.

TABLE 2.1 continued

Endlicheria formosa
Endlicheria sericea
Endlicheria cf. *sericea*
Endlicheria sp.
Nectandra sp.
Nectandra membranacea
Nectandra pulverulenta
Octoea parviflora
Lecythidaceae
Cariniana sp.
Gustavia hexapetala
Loganiaceae
Potalia amara
Strychonos tarapotensis
Strychnos sp.
Loranthaceae
Oryctanthus florulentus
Phoradendron crassifolium
Phoradendron sp.
Malpighiuaceae
Bunchosia sp.
Hiraea sp.
Mascagnia divaricata
Stigmaphyllon florosum
Malvaceae
Hibiscus sp.
Malva sp.
Malvaviscus ulei
Pavonia sp.
Marcgraviaceae
Marcgravia cf. *coriacea*
Marcgravia sp.
Melastomataceae
Bellucia sp.
Clidemia capitellata
Miconia calvescens
Miconia nervosa
Miconia punctata
Mouriri sp.
Tibouchina longifolia
Meliaceae
Cedrela
Guarea kunthiana
Guarea macrophylla
Guarea macrophylla subsp. *pachycarpa*
Guarea macrophylla subsp. *tuberculata*
Trichilia cf. *areolata*

TABLE 2.1 continued

Trichilia elegans ssp. *elegans*
Trichilia pallida
Trichilia quadrijuga subsp. *quadrijuga*
Trichilia septentrionalis
Trichilia solitudinis
Menispermaceae
Abuta sp.
Anomospermumgrandifolium
Chondodendron sp.
Disciphania sp.
Odontocarya arifolia
Sciadotenia eichleriana
Monimiaceae
Mollinedia racemosa
Mollinedia sp.
Siparuna decipiens
Siparuna sp.
Moraceae
Batocarpus costaricensis
Batocarpus sp.
Brosimum alicastrum
Brosimum guianense
Brosimum lactescens
Brosimum sp.
Castilla ulei
Castilla sp.
Cecropia sp.
Clarisia bifloria
Clarisia racemosa
Clarisia sp.
Coussapoa sp.
Ficus killippii
Ficus insipida
Ficus matthewsii
Ficus maxima
Ficus obtusifolia
Ficus phanerophlebia
Ficus trigona
Ficus sp.
Maclura tinctoria
Naucleopsis ternstroemiiflora
Naucleopsis sp.
Perebea guianensis
Perebea sp.
Perebea cf. *tessmannii*
Poulsenia armata
Pourouma cecropiifolia

TABLE 2.1 continued

Pourouma sp.
Pseudolmedia laevis
Pseudolmedia macrophylla
Pseudolmedia sp.
Sorocea sp.
Myristicaceae
Iryanthera sp.
Virola calophylla
Virola sp.
Myrsinaceae
Ardisia guianensis
Ardisia sp.
Stylogyne cauliflora
Stylogyne micrantha
Stylogyne sp.
Myrtaceae
Calyptranthes
Calyptranthes aff. *forsteri*
Eugenia florida
Eugenia sp.
Eugenia sp.
Eugenia uniflora
Myrciaria floribunda
Psidium sp.
Nyctaginaceae
Bougainvillea
Neea divaricata
Neea hirsuta
Neea spruceana
Neea aff. *virens*
Neea sp.
Ochnaceae
Ouratea discosphora
Ouratea sp.
Olacaceae
Heisteria scandens
Heisteria sp.
Minquartia guianensis
Onagraceae
Ludwigia nervosa
Passifloraceae
Passiflora coriacea
Passiflora sp.
Phytolaccaceae
Gallesia integrifolia
Phytolacca rivinoides
Trichostigma octandrum

TABLE 2.1 continued

Piperaceae
Peperomia macrostachya
Peperomia sp.
Piper laevigatum
Piper reticulatum
Piper sp.
Pothomorphe peltata
Polygonaceae
Coccoloba acuminata
Coccoloba densifrons
Coccoloba lepidota
Coccoloba peruviana
Coccoloba sp.
Triplaris poeppigiana
Triplaris sp.
Rhamnaceae
Gouania sp.
Rhizophoraceae
Cassipourea sp.
Rosaceae
Prunus rotunda
Prunus sp.
Rubiaceae
Alibertia sp.
Chomelia spinosa
Chomelia tenuiflora
Chomelia sp.
Coffea sp.
Coussarea sp.
Faramea maynensis
Faramea sp.
Genipa spruceana
Genipa sp.
Geophila herbacea
Hamelia patens
Manettia cordifolia
Posoqueria latifolia
Posoqueria sp.
Psychotria cf. *remota*
Psychotria officinalis
Psychotria racemosa
Psychotria remota
Psychotria trichotoma
Psychotria trivialis
Psychotria viridis
Randia armata
Randia sp.

TABLE 2.1 continued

Rudgea lorentensis
Rudgea sp.
Sabicea sp.
Uncaria sp.
Rutaceae
Dictyoloma peruvianum
Zanthoxylum sp.
Sapindaceae
Allophylus amazonicus
Allophylus floribundus
Allophylus loretensis
Cupania sp.
Matayba sp.
Paullinia elegans ssp. *neglecta*
Paullinia aff. *hemiptera*
Paullinia itayensis
Paullinia sp.
Serjania elongata
Sapotaceae
Manilkara sp.
Micropholis sp.
Pouteria sp.
Simaroubaceae
Simaba sp.
Solanaceae
Brunfelsia sp.
Capsicum coccineum
Capsicum frutescens
Cestrum auriculatum
Cestrummegalophyllum
Cestrum reflexum
Cestrum sp.
Cyphomandra sp.
Juanulloa mexicana
Lycianthes asarifolia
Lycianthes sp.
Solanum anceps
Solanum goodspeedii
Solanum lepidotum
Solanum sp.
Witheringia solanacea
Sterculiaceae
Byttneria culeata
Byttneria sp.
Herrania sp.
Sterculia apetala
Sterculia sp.

TABLE 2.1 continued

Theobroma cacao
Theobroma speciosa
Theophrastaceae
Clavija reflexiflora
Clavija sp.
Tiliaceae
Apeiba membranacea
Apeiba sp.
Apeiba tibourbou
Luehea sp.
Ulmaceae
Ampelocera ruizii
Ampelocera sp.
Celtis iguaneus
Celtis schippii
Trema micrantha
Urticaceae
Urera sp.
Verbenaceae
Citharexylum sp.
Gmelina sp.
Lantana trilfoliata
Petrea sp.
Priva lappulacea
Vitex sp.
Violaceae
Leonia glycycarpa
Leonia sp.
Rinorea pubiflora
Rinorea viridifolia
Rinorea sp.
Vitaceae
Cissus cf. *neei*
Cissus sicyoides
Cissus sp.

3.—THE ANT COMMUNITY AT CUZCO AMAZONICO

STEPHAN P. COVER, JOHN E. TOBIN, AND EDWARD O. WILSON

Museum of Comparative Zoology, Harvard University, Cambride, Massachusetts 02138, USA.

Although ants are known to be diverse and extremely abundant in lowland tropical forests, there have been few detailed studies of restricted area. This is a preliminary report of the ant fauna in lowland rainforest at Cuzco Amazónico. During June 1989, ants were collected primarily in the quadrats in the two study zones, as well as in the immediate vicinity of the camp. All major microhabitats for ants were sampled through intensive collecting and litter sifting. Although we collected at fresh treefalls, it is likely that the canopy ants are under-represented in our samples. We did not collect all possible series of several of the more common taxa; thus, they also are under-represented in our material. These include several species of *Crematogaster, Dolichoderus, Camponotus, Mycoceperus,* and *Azteca.*

The analysis thus far of our 926 collections has yielded 262 species belonging to 64 genera of ants, representing all six families and nearly 50% of genera known from the neotropics (Hölldobler and Wilson, 1990, *The Ants,* Belknap Press of Harvard University Press, Cambridge, Massachusetts) (Table 3.1). Despite the large numbers of genera and species at this site, the fauna is clearly dominated by a small minority of genera. By far the most diverse and abundant genus is *Pheidole,* which comprises 52 (20%) of the total number of species collected and 23% of all collections. Of the 52 species of *Pheidole,* as many as 30 are undescribed. *Pheidole* is more than twice as diverse as its nearest rival, *Camponotus* (23 species). Together the five most species-rich genera (*Pheidole, Camponotus, Pachycondyla, Gnamptogenys,* and *Strumigenys*) contain 115 (44%) of the species. Moreover, 21 of the 64 genera were collected only once and are represented by only a single species. Thus, in Amazonian lowland rainforest high generic and species-level richness may not be inconsistent with pronounced ecological dominance.

We have calculated precise species accumulation curves for two important microhabitats (rotten branches and sticks on the forest floor, and dead hanging branches in understory trees), and a less precise curve for the fauna as a whole. From these data we are able to derive estimates of faunal size and compare them to other such data from the literature. Notable features of the myrmecofauna of Cuzco Amazónico include the nearly complete absence of large leafcutting ants (*Atta* and *Acromyrmex*) and of *Paraponera clavata.* Ant gardens containing *Camponotus femoratus* and *Crematogaster parabiotica* (broadly defined) are very abundant. Some of the more unusual finds include the second known species of *Protalaridis* and the discovery that land snails are an important prey of *Basiceros conjugans.*

TABLE 3.1. GENERA OF ANTS (INSECTA: FORMICIDAE) FOUND AT CUZCO AMAZONICO.
NUMBERS ARE NUMBERS OF SPECIES.

Acanthognathus	2
Acanthoponera	1
Acanthostichus	1
Acromyrmex	1
Acropyga	3
Allomerus	1
Amblyopone	1
Anochetus	3
Apterostigma	10
Azteca	2
Basiceros	1
Brachymyrmex	2
Camponotus	23
Carebarella	1
Cephalotes	1
Crematogaster	10
Cyphomyrmex	3
Daceton	1
Dendromyrmex	1
Discothyrea	1
Dolichoderus	7
Ectatomma	4
Eciton	3
Erebomyrma	1
Eucryptocerus	1
Eurhopalothrix	1
Gigantiops	1
Gnamtogenys	14
Hylomyrma	1
Hypoclinea	1
Hypoponera	5
Iridomyrmex	1
Labidus	1
Lachnomyrmex	1
Leptogenys	2
Megalomyrmex	5
Monacis	4
Mycocepurs	1
Myrmelachista	1
Myrmicocrypta	5
Neostruma	1
Octostruma	1
Ochetomyrmex	2
Odontomachus	6

TABLE 3.1 continued

Oxyepoecus	1
Pachycondyla	13
Paraponera	1
Paratrechina	7
Pheidole	52
Prionopelta	2
Probolomyrmex	1
Protalaridris	1
Pseudomyrmex	6
Rogeria	4
Sericomyrmex	3
Solenopsis	5
Strumigenys	12
Tapinoma	1
Thaumatomyrmex	1
Tranopelta	1
Trachymyrmex	2
Typhlomyrmex	1
Wasmannia	2
Zacryptocerus	5

4.—DIVERSITY OF BUTTERFLIES IN THE RESERVA CUZCO AMAZONICO

GERARDO LAMAS AND MIRIAN MEDINA

Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Apartado 14-0434, Lima 14 Peru

During 13 days in in June 1989 (dry season) and 15 days in February 1990 (rainy season) intensive collections of lepidopterans, especially butterflies (610 specimens), were made in the Reserva Cuzco Amazónico. Conventional collecting methods were used—insect nets and Van Someran-Rydon traps baited with bananas (*Musa paradisiaca,* Musaceae) and dried *Heliotropium* (Boraginaceae) for diurnal lepidopterans; for nocturnal species we used a system of traps with UV and mercury vapor lamps.

In June the highest percentage of species was found, as expected, because of the high number of flowers and therefore nectar, the principal food of adults. Flowers are less frequent in the rainy season when larval lepidopterans predominate because the rains favor the greatest production of leaves, the principal food resource of larval lepidopterans.

The area sampled consisted of terra firma and seasonally inundated forests, the camp, and the river bank. The vast majority of specimens were collected along trails outside of the study zones because lepidopterans seemed to be scarce in the study zones.

The list of species (Table 4.1) contains not only those collected during the BIOTROP project. Also included are those collected during 10 days in November 1988 and material collected by other investigators between 1987 and 1990. A total of 315 species of butterflies is reported; the taxonomic distribution in decreasing order of richness is as follows: Nymphalidae 44.6% (140 species), Hesperiidae 24.2% (76 species), Rodinidae 17.5% (55 species), Lycaenidae 6.4% (21 species), Pieridae 4.1% (13 species), and Papilionidae 3.2% (10 species).

We find that the diversity of butterflies at Cuzco Amazónico is approximately 26% of that reported at Tambopata (1210 species) and 35% of that reported at Pakitza (894 species). These comparisons indicate that the diversity at Cuzco Amazónico is much less than at the other sites, One of the reasons for the paucity of specimens and species is the unfavorable weather during the periods of collecting,

Some of the interesting data on butterflies at Cuzco Amazónico are summarized below.

SPECIES NOT REPORTED FROM OTHER LOCALITIES

Various species that have not been reported from Tambopata and/or Pakitza were found at Cuzco Amazónico, for example: *Caeruleuptychia* sp. (new ?),

Magneuptychia sp. n. 2, *Danaus gilippus gilippus, D. plexippus erippus, Hypothyris anastasia* ssp. n., *H. leprieuri catilla, Eumaeus minijas* ssp., *Eusalasia fabia fabia, Mesosemia subtilis, Melanis smithiae aurolimbata, Synargis tytia* ssp., *Pyrrhopyge infantilis agala, Typhedanus galbula, Astraptes alardus alardus, Nisoniades ephora, Gorgopas chlorocephala chlorocephala,* and *Phanes abaris*. These species represent approximately 5% (17 species) of those reported from Cuzco Amazónico.

SPECIES OF PARTICULAR TAXONOMIC INTEREST

Caeruleuptychia sp. (new ?) is the first specimen in the collection of the Museo de Historia Natural, UNMSM, and *Hypothyris anastasia* ssp. n. is known only from the reserve. *Melanis smithiae aurolimbata, Synargis tytia* ssp., *Eurema arbela* ssp. n., and *Typhedanus galbula* are the first records from the Departamento de Madre de Dios. On the other hand, *Eumaeus minijas* ssp. that is listed in the table as one species really includes two crytic species, as verified by a specialist on this family.

RARE SPECIES

Very few specimens of *Typhedanus galbula, Astraptes alardus alardus,* and *Paititia neglecta* are known; the latter, in spite of having been collected also at Pakitza and Tambopta, is a rather rare species, so much so that only three specimens exist in other museums in the world. *Magneuptychia* sp. n. 2 generally is a rare species, but apparently is is locally common at Cuzco Amazónico.

RANGE EXTENSIONS

Two new geographical range extensions can be verified—*Magnauptygia* sp. n. 2 whose geographic range was known from the departments of Junín and Loreto, and *Hypothyris leprieuri catilla* that was known only from western Bolivia.

TABLE 4.1. BUTTERFLIES OF CUZCO AMAZONICO.

The list of butterflies is arranged by families, subfamilies, tribes, and species. Abundance is coded for each taxon as follows: A = abundant, C = common, U = uncommon, R = rare. * = observation only.

TAXON	ABUNDANCE
PAPILIONIDAE	
Protesilaus agesilaus autosilaus (Bates, 1861)*	C
P. ariarathes gayi (Lucas, 1852)	C
P. glaucolaus leucas (Rothchild & Jordan, 1906)	C
P. molops hetaerius (Rothchild & Jordan, 1906)	C
P. pausanias pausanias (Hewitson, 1852)	C
Battus belus cochabamba Weeks, 1901)	U
Parides neophilus olivencius (Bates, 1861)	C
P. sesostris sesostris (Cramer, 1780)	C
Heraclides thoas cinyras (Ménétriès, 1857)	C
H. torquatus torquatus Cramer, 1777)*	C
PIERIDAE	
Coliadinae	
Aphrissa statira statira (Cramer, 1777)	A
Eurema agave agave (Cramer, 1777)	U
E. albula espinosae (Fernández, 1928)	A
E. arbela ssp. n. (?boliviensis Röber, 1909)	R
Pyrisitia nise ssp. n. *	C
Phoebis argante larra (Fabricius, 1798)	A
P. sennae marcellina (Cramer, 1777)	A
Rhabdodryas trite trite (Linnaeus, 1758)	C
Pierinae	
Glutophrissa drusilla drusilla (Cramer, 1777)	A
Ganyra phaloe sublineata (Schaus, 1902)	U
Itaballia demophile lucania (Fruhstorfer, 1907)	A
I. pandosia pisonis (Hewitson, 1861)	A
Perrhybris pamela mazuka Lamas, 1981	C
NYMPHALIDAE	
Heliconiinae	
Acraeini	
Actinote pellenea hyalina Jordan, 1913	A
Heliconiini	
Philaethria dido (Linnaeus, 1763)	C
Agraulis vanillae lucina C. & R. Felder, 1862*	U
Dryas iulia alcionea (Cramer, 1780)	C
Eueides isabella hippolinus Butler, 1873*	U

TABLE 4.1 continued

TAXON	ABUNDANCE
Laparus doris doris (Linnaeus, 1771)	C
Neruda aoede manu (Lamas, 1976)	U
Heliconius burneyi ada Neustetter, 1925	U
H. erato luscombei Lamas, 1976	C
H. melpomene schunkei Lamas, 1976	C
H. numata lyrcaeus Weymer, 1891	A
H. sara thamar (Hübner, 1806)	C
H. wallacei flavescens Weymer, 1891	C
Nymphalinae	
Kallimini	
Anartia jatrophae jatrophae (Linnaeus, 1763)	C
Hypanartia lethe (Fabricius, 1793)*	U
Metamorpha elissa elissa Hübner, 1819	C
Siproeta stelenes meridionalis (Fruhstorfer, 1909)	C
Junonia genoveva occidentalis C. & R. Felder, 1862	C
Melitaeini	
Telenassa burchelli (Moulton, 1909)	C
Ortilia gentina Higgins, 1981	C
Tegosa similis Higgins, 1981	C
Eresia clara clara Bates, 1864	C
E. eunice ssp.	C
E. nauplius plagiata (Röber, 1914)	C
Castilia angusta (Hewitson, 1866)	C
Limenitidinae	
Coloburini	
Historis acheronta acheronta (Fabricius, 1775)*	A
Baeotus amazonicus (Riley, 1919)	C
Colobura dirce dirce (Linnaeus, 1758)	C
Biblidini	
Biblis hyperia laticlavia (Thieme, 1904)*	C
Vila azeca azeca (Doubleday, 1848)	C
Eunica pusilla Bates, 1864	C
Hamadryas feronia feronia (Linnaeus, 1758)	U
Panacea prola amazonica Fruhstorfer, 1915	A
Pyrrhogyra crameri hagnodorus Fruhstorfer, 1908	C
P. edocla cuparina Bates, 1865	C
Nica flavilla sylvestris Bates, 1864	U
Peria lamis (Cramer, 1780)*	C

TABLE 4.1 continued

TAXON	ABUNDANCE
Dynamine aerata aerata (Butler, 1877)	C
D. athemon barreiroi Fernández, 1928	C
D. racidula racidula (Hewitson, 1852)	C
Diaethria clymena peruviana (Guenée, 1872)	A
Catacore kolyma pasithea (Hewitson, 1864)	C
Callicore eunomia carmen (Oberthür, 1916)	C
Limenitidini	
Adelpha cytherea lanilla Fruhstorfer, 1913	C
A. jordani Fruhstorfer, 1913	C
A. phylaca davisii (Butler, 1877)	C
Cyrestidini	
Marpesia berania berania (Hewitson, 1852)	C
M. chiron marius (Cramer, 1780)	A
M. crethon (Fabricius, 1776)	C
M. egina (Bates, 1865)	C
M. furcula oechalia (Westwood, 1850)	C
M. petreus petreus (Cramer, 1776)	C
M. themistocles norica (Hewitson, 1852)	C
Charaxinae	
Consul fabius divisus (Butler, 1874)	C
Memphis moruus mephis (C. & R. Felder, 1867)	C
Archaeoprepona amphimachus symaithus Fruhstorfer, 1916	C
A. demophon muson (Fruhstorfer, 1905)	C
A. demophoon andicola (Fruhstorfer, 1904)	C
Apaturinae	
Doxocopa agathina agathina (Cramer, 1777)	C
D. pavon pavon (latreille, 1809)	C
D. laure griseldis (C. & R. Felder, 1862)	C
D. lavinia (Butler, 1866)	U
D. linda linda (C. & R. Felder, 1862)	C
Morphinae	
Antirrhea philoctetes avernus Hopffer, 1874	U
A. taygetina taygetina (Butler, 1868)	C
Morpho achilles felipensis LeMoult & Réal, 1962	C
M. deidamia grambergi Weber, 1944	U
M. menelaus ssp.	C

TABLE 4.1 continued

TAXON	ABUNDANCE
Brassolinae	
Brassolis sophorae ardens Stichel, 1903	C
Opsiphanes quiteria bolivianus Stichel, 1902	C
Catoblepia berecynthia adjecta Stichel, 1906	C
Caligo idomeneus idomenides Fruhstorfer, 1904	C
C. placidianus Staudinger, 1887	U
Satyrinae	
Cithaerias pireta ssp. n.	C
Haetera piera ssp. n.	C
Pierella hortona albofasciata Rosenberg & Talbot, 1914	C
P. lamia chalybaea Godman, 1905*	C
P. lena brasiliensis (C. & R. Felder, 1862)	C
Bia actorion rebeli Bryk, 1953	C
Taygetis echo koepckei Forster, 1964	R
T. thamyra (Cramer, 1780)	C
Caeruleuptychia sp. (n.?)	R
Cepheuptychia cephus cephus (Fabricius, 1775)	U
Chloreuptychia arnaca (Fabricius, 1776)	C
C. chlorimene (Hübner, 1819)	C
C. herseis (Godart, 1824)	C
C. tolumnia (Cramer, 1777)	U
Cissia myncea (Cramer, 1782)	C
C. proba (Weymer, 1911)	C
C. terrestris (Butler, 1867)	U
Euptychia enyo Butler, 1867	U
Hermeuptychia hermes (Fabricius, 1775)	A
Magneuptychia analis (Godman, 1905)	U
M. "helle" (Cramer, 1780) [homonym]	C
M. libye (linnaeus, 1767)	C
M. ocypete (Fabricius, 1776)	C
Magneuptychia sp. n. 1	R
Magneuptychia sp. n. 2	R
Pareuptychia interjecta hesionides Forster, 1964	C
Danainae	
Lycorea halia pales C. & R. Felder, 1862	C
Danaus gilippus gilippus (Cramer, 1776)	U
D. plexippus erippus (Cramer, 1776)*	U
Ithomiinae	
Tithorea harmonia brunnea Haensch, 1905	C

TABLE 4.1 continued

TAXON	ABUNDANCE
Melinaea maelus lamasi Brown, 1977	C
M. marsaeus clara Rosenberg & Talbot, 1914	C
M. menophilus orestes Salvin, 1871	C
Paititia neglecta Lamas, 1979	R
Forbestra olivencia aeneola Fox, 1967	C
Sais rosalia badia Haensch, 1905	U
Mechanitis lysimnia menecles Hewitson, 1860	C
M. mazaeus mazaeus Hewitson, 1860	A
M. polymnia angustifascia Talbot, 1928	A
Scada reckia labyrintha Lamas, 1985	A
Methona confusa psamathe Godman & Salvin, 1898	C
M. curvifascia Weymer, 1883	C
Napeogenes inachia patientia Lamas, 1985	A
N. pharo pharo (C. & R. Felder, 1862)	C
Hypotyris anastasia ssp. n.	U
H. euclea ssp. n.	U
H. leprieuri catilla (Hewitson, 1876)	R
Oleria ilerda lentita Lamas, 1985	C
O. ramona calatha Lamas, 1985	C
O. victorine victorine (Guérin, 1844)	C
Ithomia agnosia agnosia Hewitson, 1855	C
I. lichyi neivai d'Almeida, 1940	C
I. salapia ardea Hewitson, 1855	U
Callithomia alexirrhoe thornax Bates, 1862	R
C. lenea zelie (Guérin, 1844)	C
Dircenna dero ssp. n.	U
D. loreta acreana d'Almeida, 1950	U
Ceratinia neso peruensis (Haensch, 1905)	C
Ceratiscada hymen hymen (Haensch, 1905)	U
Pteronymia antisao guntheri Lamas, 1985	C
P. vestilla ucaya Haensch, 1909	U
Godyris zavaleta ssp.	U
Hypoleria virginia vitiosa Lamas, 1985	C
"Hypoleria" orolina arzalia (Hewitson, 1876)	U
Heterosais nephele nephele (Bates, 1862)	C
Pseudoscada timna timna (Hewitson, 1855)	A
Libytheinae	
Libytheana carinenta carinenta (Cramer, 1777)	U
LYCAENIDAE	
Eumaeus minijas ssp.	U
"Thecla" hemon (Cramer, 1776)	U
"Thecla" phegeus (Hewitson, 1865)	U

TABLE 4.1 continued

TAXON	ABUNDANCE
Arawacus separatus (Lathy, 1926)	A
Calycopis calus (Godart, 1824)	C
C. centoripa (Hewitson, 1868)	C
C. cerata (Hewitson, 1877)	C
Calycopis sp. 1	U
Calycopis sp. 2	U
Calycopis sp. 3	U
Calycopis sp. 4	U
Calycopis sp. 5	U
Calycopis sp. 6	U
Michaelus ira (Hewitson, 1867)	U
Panthiades bitias (Cramer, 1777)	C
"Thecla" sista (Hewitson, 1867)	U
"Thecla" celmus (Cramer, 1776)	A
"Thecla" hesperitis (Butler & Druce, 1872)	C
"Thecla" occidentalis (Lathy, 1926)	U
Erora gabina (Godman & Salvin, 1887)	R
RIODINIDAE	
Euselasia fabia fabia (Godman, 1903)	C
E. arbas ssp.	U
E. praecipua Stichel, 1924	U
E. orba spectralis Stichel, 1919	U
E. crinon crinon Stichel, 1919	U
E. geon Seitz, 1913	U
E. uria angustifascia Lathy, 1926	U
Leucochimona hyphea pallida (Lathy, 1932)	U
Semomesia capanea sodalis Stichel, 1919	U
S. croesus siccata Stichel, 1919	U
Hyphilaria parthenis tigrinella Stichel, 1909	U
Mesosemia subtilis Stichel, 1909	U
M. luperca Stichel, 1910	U
M. naiadella naiadella Stichel, 1909	C
M. tenebricosa anica Druce, 1904	U
M. sirenia sirenia Stichel, 1909	C
M. judicialis judicialis Butler, 1874	C
M. ulrica ulrica (Cramer, 1777)	C
Mesosemia sp.	R
Eurybia caerulescens ssp.	C
E. nicaea ssp.	C
E. promota Stichel, 1910	R
E. rubeolata rubeolata Stichel, 1910	U
Alesa amesis (Cramer, 1777)	C
Alesa sp. n.	U
Ithomeis lauronia Schaus, 1902	R

TABLE 4.1 continued

TAXON	ABUNDANCE
Metacharis lucius (Fabricius, 1793)	U
M. regalis regalis Butler, 1867	U
Chamaelimnas tircis iaeris Bates, 1868	R
Parcella amarynthina (C. & R. Felder, 1865)	C
Charis anius (Cramer, 1776)	C
C. cadytis ssp.	C
Caria mantinea amazonica (Bates, 1868)	C
C. trochilus arete (C. & R. Felder, 1861)	C
Lasaia agesilas agesilas (Latreille, 1809)	C
Melanis smithiae aurolimbata (Thieme, 1907)	R
Amarynthis meneria (Cramer, 1776)	A
Exoplisia cadmeis (Hewitson, 1866)	U
Sarota sp.	U
Calydna punctata C. & R. Felder, 1861	C
Emesis castigata castigata Stichel, 1910	U
E. spreta Bates, 1868	U
Calospila emylius smyliana (Stichel, 1911)	C
Adelotypa balista (Hewitson, 1863) (?)	U
Adelotypa sp.	U
Synargis tytia ssp.	R
Nymphidium mantus (Cramer, 1776)	U
N. baeotia Hewitson, 1853	C
N. ascolia augea Druce, 1904	C
N. minuta Druce, 1904	C
N. acherois erymanthus Ménétriès, 1855	C
N. caricae parthenium Stichel, 1924	C
N. lisimon lisimon (Stoll, 1791)	C
N. hesperinum Stichel, 1911	R
Stalachtis calliope ssp. n.	C
HESPERIIDAE	
Pyrrhopyginae	
Pyrrhopyge infantilis agala Evans, 1951	U
Myscelus amystis mysus Evans, 1951	U
Pyrginae	
Phocides distans distans (Herrich-Schäffer, 1869)	R
Entheus gentius (Cramer, 1777)	C
Polygonus manueli manueli Bell & Comstock, 1948	U
Aguna aurunce (Hewitson, 1867)	U
Typhedanus galbula (Plötz, 1881)	R
Polythrix octomaculata octomaculata (Sepp, 1844)	U
Urbanus teleus (Hübner, 1821)	C
U. doryssus doryssus (Swainson, 1831)	C

TABLE 4.1 continued

TAXON	ABUNDANCE
Astraptes fulgerator fulgerator (Walch, 1775)	A
A. alardus alardus (Stoll, 1791)	R
A. cretatus cretatus (Hayward, 1939)	C
Nascus paulliniae (Sepp, 1842)	U
Telemiades delalande (Latreille, 1824)	C
T. antiope tosca Evans, 1953	U
Nisoniades ephora (Herrich-Schäffer, 1870)	C
N. rimana (Bell, 1942)	C
Myrinia binocula (Möschler, 1877)	R
Gorgopas trochilus (Hopffer, 1874)	U
G. chlorocephala chlorocephala (Herrich-Schäffer, 1870)	U
Staphylus lizeri lizeri (Hayward, 1938)	C
S. astra (Williams & Bell, 1940)	C
Gorgythion begga pyralina (Möschler, 1877)	C
Ouleus fridericus fridericus (Geyer, 1832)	A
Quadrus contubernalis contubernalis (Mabille, 1883)	C
Pythonides jovianus fabricii Kirby, 1871	C
P. grandis assecla Mabille, 1883	C
Sostrata pusilla pusilla Godman & Salvin, 1895	U
Mylon jason (Ehrmann, 1907)	C
Carhenes canescens leada (Butler, 1870)	C
Xenophanes trixus (Cramer, 1782)	A
Antigonus nearchus (Latreille, 1817)	C
A. erosus (Hübner, 1812)	C
A. decens (Butler, 1874)	C
Achlyodes busirus heros Ehrmann, 1909	C
Anastrus tolimus robigus (Plötz, 1884)	C
A. obscurus narva Evans, 1953	C
Ebrietas anacreon anacreon (Staudinger, 1876)	C
Cycloglypha tisias (Godman & Salvin, 1896)	C
Helias phalaenoides phalaenoides (Hübner, 1812)	U
Camptopleura auxo (Möschler, 1879)	C
Pyrgus oileus orcus (Cramer, 1782)	A
Hesperiinae	
Synapte silius (Latreille, 1824)	C
Anthoptus epictetus (Fabricius, 1793)	C
Phanes abaris (Mabille, 1891)	U
Methionopsis ina (Plötz, 1882)	C
Artines aquilina (Plötz, 1883)	U
Thargella caura caaura (Plötz, 1882)	C
Venas evans (Butler, 1877)	C
Cymaenes tripunctus theogenis (Captronnier, 1874)	C
C. tripunctata alumna (Butler, 1877)	A
Vehilius stictomenes stictomenes (Butler, 1877)	C

TABLE 4.1 continued

TAXON	ABUNDANCE
V. vetula (Mabille, 1878)	C
Mnasilus allubita (Butler, 1877)	C
Parphorus storax storax (Mabille, 1891)	C
Papias proximus (Bell, 1934)	C
Morys compta compta (Butler, 1877)	U
Vettius phyllus phyllus (Cramer, 1777)	C
Turesis lucas (Fabricius, 1793)	U
Talides sinois sinois Hübner, 1819	U
Damas clavus (Herrich-Schäffer, 1869)	C
Orphe vatinius Godman, 1901	U
Carystoides maroma (Möschler, 1877)	U
Perichares philetes philetes (Gmelin, 1791)	C
Orses cynisca (Swainson, 1821)	U
Cynea popla Evans, 1955	U
C. bistrigula (Herrich-Schäffer, 1869)	C
Pompeius pompeius (Latreille, 1924)	C
Mellana villa Evans, 1955	U
Propertius propertius (Fabricius, 1793)	C
Panoquina sp. *	U
Saliana esperi Evans, 1955	C
S. salius (Cramer, 1776)	C
Pyrrhopygopsis socrates orasus (Druce, 1876)	U
Genus and species unknown	R

5.—THE HOMOPTERA-AUCHENORRHYNCHA OF CUZCO AMAZONICO

PEDRO W. LOZADA

Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Apartado 14-0434, Lima 14, Peru.

This report summarizes the collecting activities during the rainy season (January–February) 1990 in the Reserva Cuzco Amazónico. The species richness of Homoptera-Auchenorrhyncha during the two months of collecting was 632 specimens representing 322 species in 12 families. (Table 5.1). The family Cicadellidae with 408 specimens of 179 species constitutes the most diverse group, followed by Membracidae, Achilidae, and Cixiidae with 37, 23, and 18 species, respectively.

Of this total number of species, new or probably new species were found in the following genera of Cicadellidae: *Ladoffa, Hortensia, Jakrama, Cardioscarta, Oragua, Iragua, Pseudometopia, Amblyscarta* and *Pachitea*

TABLE 5.1. NUMBERS OF SPECIMENS AND SPECIES OF HOMOPTERA-AUCHENORRHYNCHA COLLECTED AT CUZCO AMAZONICO, PERU.

Family	Species	Specimens
Cicadellidae	179	408
Membracidae	37	53
Fulgoridae	9	13
Achilidae	23	36
Cixiidae	18	23
Delphacidae	4	4
Nogodinidae	1	1
Cicadidae	12	37
Flatidae	3	3
Derbidae	8	12
Dictyopharidae	7	10
Fulgoroidea*	12	15
Cercopidae	9	17
TOTAL	322	632

* Families not identified.

6.—ARACHNOFAUNA OF CUZCO AMAZONICO

DIANA SILVA DAVILA

Museo de Historia Natural, Apartado 14-0434, Lima 14, Peru

A preliminary report on the arachnofauna of Cuzco Amazonico is presented herein. Surveys were done during 6 weeks in the dry season (June-July '89) and two weeks in the rainy season (February-March '90). The data were used to determine the diversity in this area. Data for the dry season indicate approximately 440 species of spiders. Other arachnids are 15 species of Opilions, 1 of Amblipigy, 10 of Acari, and 2 of Scorpions. Five species of Chilopoda and 10 of Diplopoda also were recorded.

Considerable differences in the composition and abundance of species between the dry and rainy season were found . During the dry season 1748 adults of 39 families were collected; the percentages of new species and uncommon ones were relatively high. Reasons for these results could be that extensive samplings were carried out in some randomly selected quadrants. The survey during this season gave a wider scope of the richness of spiders in the area of study, as well as an opportunity to get several rare or uncommon species.

The number of adult spiders collected during the rainy season was nearly the same as those collected during the dry season, although the 1644 individuals were collected in only two weeks. Species composition and species abundance differed from those in the dry season. For example, the family Sparassidae, containing eight species was well represented during the dry season, but only a few individuals of two species were found in the rainy season. Likewise, species of the genus *Cuppenius* (Ctenidae) showed high population densities in June and only one adult specimen was found in February. Additionally, *Amazonepira herrera* had an ostensible diminution of its populations. Examples of the reverse situation are displayed by the araneids; *Micrathena kirbyi* and *M. miles*, common species in this kind of forest, had a great increase in numbers of adults. In particular, *M. miles* was so abundant that it was possible to count 15 individuals in a transect of 50 meters. In general, the diminution of populations was found in those species inhabiting areas mainly close to the ground, as exhibited by some species of *Theridiosoma, Plato, Anapisona, Thymoites,* and *Lygromma*, among others. The following are species not recorded in the previous season: 2 *Tama* (Hersiliidae), 1 *?Architis* (Pisauridae), 3 Araneidae, 2 Sciotidae and 1 *Uloborus* (Uloboridae), among others. This number is probably going to increase with the complete analysis of the material.

The preliminary data suggest that the composition of species in Cuzco Amazónico is associated with the type of forest. Species composition increases from terra firme toward flooded forests. There are at least 10 new species and several new records. Among the new species are *Parawixia maldonado* (Araneidae), which is already described (the type is in the MHNSM); almost all the species of *Alpaida* (Araneidae); *Maymena* (Mysmenidae) and of the anapids. The known distributions of several genera, including those of the family Anapidae, were increased. *Pseudanapis* was known previously only from Ecuador and *Anapisoma*

only in the northern part of South America to Ecuador. Another interesting case is that related to mysmenids and symphitognathids. *Maymena* was represented in Peru by one new species recorded in Loreto, and in Cuzco Amazónico at least two species were recorded. The presence of a new genus in this group is possible. In the family Oxyopidae, the genus *Tapinullus* was recorded in Costa Rica, Venezuela and in Peru only in Loreto. Likewise, some of the theridiosomatids collected, such as the genera *Plato* (with possibly three species), were known only from Trinidad, Venezuela, Ecuador and Colombia, and those of *Baalsebub* from Colombia and Brazil. Prior to being found in Cuzco Amazónico, *Cthonos pectorosa* was known only from the type which was described from "Amazon" in 1882.

It is difficult to establish comparisons of the fauna of Cuzco Amazonico with other areas of the neotropics. This is mainly because there are no similar studies on spiders, and the methodology applied in recent studies in other forests of Peru are not the same. However, a rough extrapolation of data from well studied areas of Panama and Costa Rica reveals that Cuzco Amazónico, along with Tambopata, shares a high index of diversity of spiders, perhaps the highest in the neotropical region. The diversity of spiders recorded in Cuzco Amazónico is probably only a small sample of the actual number of species. It is necessary to survey the entire year, using standarized techniques, in order to discover species with temporal distribution and to improve the position of species in status inquerenda.

TABLE 6.1. SPIDERS COLLECTED AT CUZCO AMAZONICO.

Categories of abundance: C = common; R = rare; U = uncommon.

TAXON	ABUNDANCE
Anapidae:	
Anapisona sp. A	U
Anapisona sp. B	U
Anapisona sp. C	U
Pseudanapsis sp. A	R
Anyphaenidae:	
Genus A, sp. A	C
Genus B, sp. A.	U
Genus C, sp. A	U
Genus D, sp. A	U
Genus E, sp. A	U
Araneidae:	
Acacesia sp. A	U
Acanthepeira sp. A	R
Alpaida cf. *bicornuta*	U
Alpaida delicata	C
Alpaida cf. *itauba*	U
Alpaida truncata	C
Alpaida sp. A	C
Alpaida sp. B	R
Alpaida sp. C	R
Alpaida sp. D	R
Alpaida sp. E	U
Alpaida sp. F	R
Amazonepeira herrera	C
Araneus cf. *guttatus*	C
Araneus cf. horizonte*	U
Araneus tambopata	U
*Araneus venatrix**	C
Araneus (?) sp. A	U
Araneus (?) sp. B	U
Bertrana elinguis	U
Chaetacis cornuta	C
Cyclosa sp. G	C
Cyclosa sp. H	U
Cyclosa sp. I	C
Cyclosa sp. J	R
Cyclosa sp. K	U
Cyclosa sp. L	U
Cyclosa sp. M	U
Cyrtophora sp. A	U
Dubiepeira dubita	C
Dubiepeira sp. A	U

TABLE 6.1 continued

TAXON	ABUNDANCE
Dubiepeira B*	U
Enacrosoma sp. N	R
Enacrosoma sp. O	R
Encyosaccus sp. A*	U
Epeiroides sp. A*	R
Eriophora fuliginea	C
Eriophora nephiloides	C
Eustala cf. *keyserlingii*	C
Eustala sp. N	R
Eustala sp. P	U
Eustala sp. Q	U
Eustala sp. R	U
Eustala sp. S	U
Eustala sp. T	U
Eustala sp. U	U
Eustala sp. V	U
Eustala sp. W	U
Eustala sp. X	U
Gasteracantha cancriformis	C
Hypognatha sp. Y	U
Hypognatha sp. Z	U
Mangora sp. AA	C
Mangora sp. AB	U
Mangora sp. AC	C
Mangora sp. AD	C
Mangora sp. AE	C
Mecynogea guianensis	C
Metazygia sp. AF	C
Metazygia sp. AG	U
Metazygia sp. AH	U
Micrathena acuta	U
Micrathena clypeata	C
Micrathena exlinae	C
Micrathena kirbyi	C
Micrathena cf. *lata*	R
Micrathena milesi	C
Micrathena pungens	C
Micrathena schreibersi	C
Micrathena triangularis	U
Micrathena triangularispinosa	C
Parawixia kochi	C
Parawixia maldonado	R
Parawixia velutina	U
Spilasma cf. *tubulofasciens*	C
Verrucosa sp. A*	U
Wagneriana sp. AJ	U

TABLE 6.1 continued

TAXON	ABUNDANCE
Wagneriana sp. AK	C
Wagneriana sp. AL	U
Wagneriana sp. AM	U
Wagneriana (?) sp. A	U
Xylethrus cf. *perlatus**	U
Xylethrus cf. *scupeus*	U
Xylethrus superbus	U
Genus A, sp. A	U
Araneoidea:	
Genus A, sp. A.	R
Genus B, sp. A	R
Genus C, sp. A	R
Genus D, sp. A	R
Genus E, sp. A	R
Genus F, sp. A	R
Genus G, sp. A	R
Genus H sp. A	R
Genus I, sp. A	U
Genus J, sp. A	R
Caponiidae:	
Nops (?) sp. A	R
Corinnidae:	
Castianeira sp. A	C
Corinna (?) sp. H	U
Corinna (?) sp. I	U
Corinna (?) sp. J	R
Megalostrata (?) sp. K	U
Megalostrata (?) sp. L	R
Myrmecium sp. C	U
Myrmecium sp. D	R
Myrmecium sp. E	C
Myrmecium sp. F	R
Sphecotypus sp. G	U
Trachelas (?) sp. M	U
Trachelas (?) sp. N	R
Trachelas (?) sp. O	R
Genus A, sp. A	R
Ctenidae:	
Acanthoctenus sp. A	U
Acanthoctenus sp. B	U
Acanthoctenus sp. C	U
Ancylometes cf. *bogotensis*	C
Ancylometes sp. D	U
Ctenus cf. *jaminauensis*	C
Ctenus cf. ornatus	C
Ctenus villasboasi	C

TABLE 6.1 continued

TAXON	ABUNDANCE
Ctenus sp. E	C
Ctenus sp. F	C
Ctenus sp. G	U
Cupiennius sp. A	C
Enoploctenus semiornatus (?)	C
Enoploctenus cf. *semiornatus*	C
Isoctenus sp. H	U
Isoctenus (?) sp. I	U
Isoctenus (?) sp. J	U
Nothroctenus sp. A	U
Phoneutria fera	U
Phoneutria sp. A	C
Ctenizidae:	
Genus A, sp. A	U
Dipluridae:	
Ischnothele (?) sp. A	C
Deinipidae:	
Deinopis sp. A	U
Drymusidae:	
Drymusa sp. A	U
Drymusa sp. B	R
Drymusa sp. C	R
Drymusa sp. D	U
Gnaphosidae:	
Lygroma sp. A	U
Lygroma sp. B	R
Lygroma sp. C	U
Genus A, sp. A	U
Hahniidae:	
Genus A, sp. A	U
Genus B, sp. A	R
Hersiliidae:	
Tama sp. A	U
Tama sp. A*	U
Tama sp. B*	U
Linyphiidae:	
Genus A, sp. A	C
Genus B, sp. A	C
Genus C, sp. A	C
Genus D, sp. A	C
Genus E, sp. A	R
Genus F, sp. A	U
Genus G, sp. A	C
Genus H, sp. A	U
Genus I, sp. A	U
Genus J, sp. A	U

TABLE 6.1 continued

TAXON	ABUNDANCE
Liocranidae:	
Genus A, sp. O	U
Genus A, sp. P	U
Lycosidae:	
Lycosa (?) sp. A	C
Lycosa (?) sp. B	C
Lycosa (?) sp. C	U
Lycosa (?) sp. D	U
Porrimosa cf. *diversa*	C
Mimetidae:	
Ero sp. A	U
Ero sp. B	U
Ero sp. C	U
Ero sp. D	U
Ero sp. E	U
Gelanor sp. A	U
Gelanor (?) sp. B*	U
Gelanor (?) sp. F	U
Genus A, sp. A	R
Mysmenidae:	
Maymena (?) sp. A	U
Maymena (?) sp. B	U
Mysmena sp. A	C
Mysmenopsis sp. B	U
Nemesiidae:	
Genus A, sp. A	U
Ochyroceratidae:	
Ochryocera sp. A	R
Theotyma (?) sp. A	R
Oonopidae:	
Dysderina (?) sp. B	U
Dysderina (?) sp. C	R
Oonops sp. A	R
Orchestina (?) sp. D	R
Orchestina (?) sp. E	R
Triaeris (?) sp. F	U
Triaeris (?) sp. G	U
Triaeris (?) sp. H	U
Triaeris (?) sp. I	C
Genus A, sp. A	U
Oxyopidae:	
Oxyopes sp. A	U
Oxyopes (?) sp. B	U
Oxyopes(?) sp. C	U
Peucetia sp. A	U
Tapinillus sp. A	U

TABLE 6.1 continued

TAXON	ABUNDANCE
Genus B, sp. A	R
Palpimanidae:	
Genus A, sp. A	R
Pholcidae:	
Blechroscelis sp. A	U
Blechroscelis sp. B	C
Blechroscelis sp. C	U
Micromerys (?) sp. A	C
Modisimus (?) sp. D	C
Modisimus (?) sp. E	U
Modisimus (?) sp. F	U
Genus A, sp. A	C
Genus B, sp. A	C
Genus C, sp. A	R
Genus D, sp. A	R
Genus E, sp. A	C
Genus F, sp. A	U
Genus G, sp. A	R
Genus H, sp. A	U
Genus I, sp. A	U
Pisauridae:	
Architis capricorna (?)	R
Architis sp. A.*	U
Architis sp. B*	U
Architis n. sp. *	R
Hesydrus sp. A*	U
Thaumasia sp. A	C
Thaumasia (?) sp. B	U
Genus A, sp. A	U
Genus B, sp. A*	U
Genus C, sp. A	R
Scytodidae:	
Scytodes sp. A	U
Salticidae:	
Peckhamia sp. A.	U
Peckhamia sp. B	U
Peckhamia (?) sp. D	R
Lyssomanes sp. A	C
Synemosina sp. C	U
Synemosina sp. D	U
Genus A, sp. A	C
Genus B, sp. A	U
Genus C, sp. A	R
Genus D, sp. A	U
Genus E, sp. A	R
Genus F, sp. A	R

TABLE 6.1 continued

TAXON	ABUNDANCE
Genus G, sp. A	R
Genus H, sp. A	U
Genus I, sp. A	R
Genus J, sp. A	R
Genus K, sp. A	R
Genus L, sp. A	R
Genus M, sp. A	R
Genus N, sp. A	R
Genus O, sp. A	R
Genus P, sp. A	R
Genus Q, sp. A	R
Genus R, sp. A	R
Genus S, sp. A	R
Genus T, sp. A	R
Genus U, sp. A	R
Genus V, sp. A	R
Genus W, sp. A	R
Genus X, sp. A	R
Genus Y, sp. A	R
Genus Z, sp. A	R
Genus AA, sp. A	R
Genus AB, sp. A	R
Genus AC, sp. A	R
Genus AD, sp. A	U
Genus AE, sp. A	R
Genus AF, sp. A	R
Genus AG, sp. A	C
Genus AH, sp. A	C
Genus AI, sp. A	U
Genus AJ, sp. A	U
Genus AK, sp. A	R
Genus AL, sp. A	R
Genus AM, sp. A	R
Genus AN, sp. A	R
Genus AO, sp. A	R
Genus AP, sp. A	R
Genus AQ, sp. A	U
Genus AR, sp. A	R
Genus AS, sp. A	U
Genus AT, sp. A	U
Genus AU, sp. A	U
Genus AV, sp. A	U
Genus AW, sp. A	U
Genus AX, sp. A	U
Genus AY, sp. A	U
Genus AZ, sp. A	U

TABLE 6.1 continued

TAXON	ABUNDANCE
Genus BA, sp. A	U
Genus BB, sp. A	R
Genus BC, sp. A	U
Senoculiidae:	
Senoculus sp. A	U
Senoculus sp. B	U
Senoculus sp. C	U
Sparassidae:	
Diestus (?) sp. A	R
Heteropoda so. A	C
Olios (?) sp. A	C
Olios (?) sp. B	R
Olios (?) sp. C	U
Olios (?) sp. D	U
Pseudosperianthis (?) sp. A	U
Genus A, sp. A	U
Genus B, sp. A	U
Genus C, sp. A	R
Symphytognathidae:	
Genus A, sp. A	R
Theraphosidae:	
Avicularia sp. A	C
Xenesthis sp. C	C
Genus A, sp. B	R
Tetragnathidae:	
Azilia (?) sp. a	C
Azilia (?) sp. J	C
Chrysometa guttata	C
Dolichognatha sp. A	C
Glenognatha sp. A	C
Glenognatha sp. B	R
Leucauge sp. C	C
Leucauge sp. D	U
Leucauge sp. E	U
Leucauge sp. F	U
Leucauge sp. G	U
Leucauge sp. H	U
Leucauge sp. I	C
Mecynometa sp. A	U
Nephila clavipes	C
Tetragnatha sp. A	C
Theridiisae:	
Achaearanea migrans	C
Achaearanea cf. *nigrovittata*	U
Achaearanea cf. *pentagona*	U
Achaearanea cf. *tingo*	C

TABLE 6.1 continued

TAXON	ABUNDANCE
Achaearanea trapezoidalis	C
Achaearanea sp. A	U
Achaearanea sp. B	U
Achaearanea (?) sp. C	U
Anelosimus cf. *domingo*	C
Anelosimus eximius	C
Argyrodes amplifrons	C
Argyrodes attenuatus	C
Argyrodes caudatus	C
Argyrodes cf. *convolutus*	U
Argyrodes cf. *drasus*	R
Argyrodes elevatus	U
Argyrodes metaltissimus	U
Argyrodes cf. *obscurus*	U
Argyrodes cf. *peruensis*	U
Argyrodes cf. *projiciens*	U
Argyrodes sp. C	U
Argyrodes sp. D	U
Argyrodes sp. E	U
Argyrodes sp. F	U
Argyrodes sp. G	C
Cerocida strigosa	R
Chrosiothes sp. A	U
Chrysso cf. *arima*	U
Chrysso sp. A	U
Dipoena cf. *atlantica*	U
Dipoena duodecimpunctata	U
Dipoena cf. *kuyuwini*	U
Dipoena cf. *nigra*	C
Dipoena sp. H	U
Dipoena sp. I	U
Dipoena sp. J	U
Dipoena sp. K	U
Dipoena sp. L	U
Dipoena sp. M	U
Dipoena sp. N	U
Dipoena sp. O	U
Dipoena sp. P	U
Dipoena sp. Q	U
Dipoena sp. R	U
Dipoena sp. S	U
Dipoena sp. T	U
Dipoena sp. U	U
Dipoena sp. V	U
Dipoena sp. W	U
Dipoena sp. X	U

TABLE 6.1 continued

TAXON	ABUNDANCE
Dipoena sp. Y	U
Echintheridion sp. Z	U
Echintheridion sp. AA	U
Echintheridion sp. AB	U
Episinus albostriatus	U
Episinus cognatus	C
Episinus erithrophthalmus	C
Episinus sp. AC	U
Episinus sp. AD	U
Episinus sp. AE	U
Episinus sp. AF	U
Euryopis taczanowskii	U
Helvibis cf. *germanini*	U
Helvibis thorelli	C
Spintharus flavidus	C
Stemmops cf. *bicolor*	U
Stemmops cf. *cryptus*	O
Stemmops cf. *servus*	U
Stemmops sp. A	–
Styposis sp. A	R
Synotaxus cf. *turbinatus*	U
Theridion sp. A	U
Thwaitesia bracteata	C
Thymoites sp. AG	U
Thymoites sp. AH	U
Tidarren cf. *haemorroidale*	C
Tidarren sp. AI	U
Wirada cf. *punctata*	R
Theridiosomatidae:	
Baalzebub sp. A	U
Chthonos cf. *pectorosa*	R
Chthonos cf. *peruana*	R
Naatlo splendida	C
Naatlo cf. *sylvicola*	C
Ogulnius sp. A	U
Ogulnius sp. B	R
Ogulnius (?) sp. C	U
Plato (?) sp. A	U
Theridiosoma sp. C	U
Theridiosoma sp. D	U
Theridiosoma sp. E	C
Theridiosoma sp. F	C
Theridiosoma sp. G	U
Theridiosoma sp. H	U
Theridiosoma sp. I	R
Theridiosoma sp. J	R

TABLE 6.1 continued

TAXON	ABUNDANCE
Thomisidae:	
Genus A, sp. A	C
Genus B, sp. A	U
Genus C, sp. A	C
Genus D, sp. A	U
Genus E, sp. A	R
Genus F, sp. A	U
Genus G, sp. A	R
Genus H, sp. A	R
Genus I, sp. A	R
Genus J, sp. A	R
Genus K, sp. A	R
Genus L, sp. A	R
Trechaleidae:	
Trechalea sp. A	C
Uloboridae:	
Miagrammopes sp. A	C
Miagrammopes sp. B	U
Philoponella republicana	C
Philoponella vittata	C
Philoponella (?) sp. A	U
Uloborus cf. *metae*	U
Uloborus sp. C	U
Uloborus sp. D	U
Uloborus n. sp.*	R
Zosis peruvianus	C
Zosis (?) sp. A	U
Zoridae:	
Odo sp. A	U
Family A:	
Genus A, sp. A	R

7.—MOLLUSKS OF CUZCO AMAZONICO

RINA RAMIREZ MESIAS

Museo de Historia Natural, Apartado 14-0434, Lima 14, Peru

Forty-three species of mollusks were found at Cuzco Amazonico. Individuals were collected through direct observation and by sieving soil and aquatic vegetation. Among them there are species new to science and first records of genera for Peru. Of the species recorded (Table 7.1), 34 (79.07%) are terrestrial and 9 (20.93%) aquatic species. Within the BIOTROP Zones two land mollusks (*Corona regina* and the veronicellid) and three aquatic snails (*Pomacea gigas, Pomacea* sp. D and *Physa* sp. A) were not recorded.

The diversity of mollusks in Zones 1 and 2 was not the same. The greatest number of species was found in Zone 2, with 36 species, whereas in Zone 1, 28 species were recorded. The composition of species among trails was as follows: 22 and 23 on Trails E and U, respectively in Zone 1, and 28 (Trail E) and 30 (Trail U) in Zone 2. Of the 38 species found in these zones, 13 (34.21%) occurred on both trails E and U of Zone 1 as well as in Zone 2. A maximum of 15 and a minimum of two species were found per square meter by quantitative sampling carried out in one square-meters within Quadrants 1, 13 and 25 of Trails E and U of Zones 1 and 2. The greatest diversity in Trail U of Zone 2 is explained by the presence of 6 aquatic species, compared with only one in Zone 1. During the dry season individuals of such species were found in the leaf litter, and others (*Pomacea* sp.) were buried superficially in places flooded during the rainy season.

The composition of species between seasons was different, with a higher diversity during the rainy season. Live specimens of 31 species were observed during the rainy season, but only 18 species during the dry season. Live specimens of 9 species of the total known have not yet been found; they were recorded on the bases of the presence of dry shells.

Among the mollusks recorded for Cuzco Amazonico during the two surveys of the BIOTROP Program, there are species new to science (e.g. *Helicina* n. sp. and *Solaropsis* n. sp.) and first records of genera (*Adelopoma, Cecilioides* and *Stephanoda*) for Peru. Likewise, the first data about the natural history of several species were gathered. Examples are the feeding behavior of the carnivorous land snail *Euglandina striata*, the habitat of *Plekocheilus floccosus* (on emergent portions of *Heliconia* sp. in flooded areas) and some aspects of the reproductive behavior of *Pomacea* sp.

Knowledge of the diversity and ecology of mollusks of the tropical rain forest is very scarce, so it is not possible to make equivalent comparisons or inferences of what was found in Cuzco Amazonico with other places in tropical forests; but, from my experience in other areas of the Amazon basin, I believe that Cuzco Amazonico has a good richness of species , and that it is a propitious place for natural history studies.

TABLE 7.1. MOLLUSKS OF CUZCO AMAZONICO

Abbreviations: C = common, R = rare, U = uncommon.

TAXON	ABUNDANCE
GASTROPODA	
MEGAGASTROPODA	
Ampullaridae:*	
Pomacea aff. *scalaris*	C
Pomacea sp. A	C
Pomacea sp. C	U
Pomacea sp. D	C
PROSOBRANCHIA	
Cyclophoridae:	
Adelopoma tutma	R
Adelopoma n. sp.	R
Helicinidae:	
Helicina n. sp. (?)	C
PULMONATA	
Ancylidae*	
Ancyclastrum sp. A	C
Bulimulidae:	
Bulimulus sp. A	R
Corona regina	U
Drymaeus aurantiostomus	C
Drymaeus sp. A	U
Drymaeus sp. B	U
Plekocheilus floccosus	C
Sultana sultana	C
Camaenidae:	
Labyrinthus pronus	C
Clausiliidae:	
Columbinia marshali	C
Endodontidae:	
Austrodiscus sp. A	C
Austrodiscus sp. B	U
Stephanoda sp. A	R
Ferussacidae:	
Ceciliodes sonsobrina	U
Helicarionidae:	
Habroconus sp. A	C
Megalobulimindae:	
Megalobulimus maximus	C
Megalobulimus popelairianus	C
Oleancinidae:	
Euglandina cf. *dactylus*	C
Physidae:*	
Physa sp. A	U

TABLE 7.1 continued

TAXON	ABUNDANCE
Planoribidae:*	
Biomphalaria sp. A	R
Drepanotrema sp. A	C
Solaropsidae:	
Solaropsis n. sp.	U
Subulinidae:	
Beckianum beckianum	C
Lamellaxis sp. A	U
Lamellaxis sp. B	U
Leptinaris sp. A	U
Obeliscis sp. A	U
Obeliscus sp. B	U
Systrophiidae:	
Happia cuzcana	C
H. (Drepanostomella) cf. *lyzarzaburni*	C
Systrophis cf. *florezi*	C
Systrophis sp. A	C
Vertiginidae:	
Botriopupa sp. A	C
Gastrocopa sp. A	U
Vertigo sp. A	C
SYSTELOMMATOPHORA	
Veronicellidae:	
Genus A, sp. A	U
PELECYPODA	
Sphaeridae:*	
Sphaerium sp. A	C

* Aquatic

8.—AMPHIBIANS AND REPTILES OF CUZCO AMAZONICO

WILLIAM E. DUELLMAN

Museum of Natural History, University of Kansas, Lawrence, Kansas 66045-2454, USA.

Amphibians and reptiles were collected and observed principally by walking trails by day and night. Some specimens were captured in pitfall traps associated with drift fences. Most anuran amphibians and most snakes were more abundant in the rainy season, whereas lizards were more commonly observed in the dry season.

This summary of the herpetofauna at Cuzco Amazónico includes species recorded there by the BIOTROP project and from earlier collections. One hundred and forty-five species of amphibians and reptiles (64 anurans, 3 crocodilians, 5 turtles, 1 amphisbaenian, 23 lizards, and 49 snakes) are known from the Reserva Cuzco Amazónico (Table 8.1). *Hyla schubarti* and *Pseudis paradoxa* are reported from Peru for the first time; *Pseudogonatodes guianensis, Ptychoglossus brevifrontalis,* and *Leptotyphlops diaplocius* are reported for the first time from southern Peru. Three unnamed species of frogs are included in the fauna. The herpetofauna at Cuzco Amazónico has many species in common with the Reserva Tambopata and sites (Cocha Cashu and Pakitza) in the Parque Nacional Manú; however, some species are known from only one or two of the sites.

Undoubtedly, several other species occur in the reserve. For example, three other species of frogs (*Hyla geographica, Hyla lanciformis,* and *Phyllomedusa bicolor*) have been found at Lago Sandoval, about 5 km southwest of Cuzco Amazónico, and a caecilian (*Siphonops annulatus*) was found at Puerto Maldonado, 15 km west-southwest of Cuzco Amazónico. Probably snakes are the least well-sampled group of the herpetofauna; species such as *Micrurus spixii* and *Bothriopsis bilineata* certainly occur there. Despite intensive field work at Cuzco Amazónico in 1986–1990, four species (*Bufo glaberrimus, Hyla sarayacuensis, Osteocephalus leprieuri, Pseustes sulphureus*), each represented by one or two specimens that were collected in 1979–1983, have not been retaken.

TABLE 8.1. AMPHIBIANS AND REPTILES OF CUZCO AMAZONICO

Abbreviations: ABUNDANCE: C = Common; species usually encountered within first 100 person/hours of field work (for amphibians this measure is applicable only in the rainy season). R = Rare; species represented by five or fewer specimens and/or observations. U = Uncommon; species usually encountered within first 200 person/hours of field work. DIEL ACTIVITY: DH = Diurnal and heliophylic; DS = Diurnal shade; N = Nocturnal; ND = Nocturnal and diurnal. HABITAT UTILIZATION: A = Aquatic; AM = Aquatic margin; B = Bushes (<1.5 m); E = Edificarian; F = Fossorial; G = Ground; L = Logs; LL = Leaf litter; TB = Tree buttresses; TL = Tree limbs; TT = Tree trunks. * = observation only.

TAXON	ABUNDANCE	DIEL	HABITAT
AMPHIBIA			
Bufonidae:			
Bufo glaberrimus	R	N	G
Bufo marinus	C	N	G
Bufo typhonius	C	DS	LL
Dendrobatidae:			
Colostethus marchesianus	C	DS	LL
Epipedobates femoralis	U	DS	L,LL
Epipedobates pictus	C	DS	L,LL
Hylidae:			
Hyla allenorum	R	N	B,TL
Hyla boans	U	N	TL
Hyla brevifrons	C	N	B,TL
Hyla calcarata	U	N	B,TL
Hyla fasciata	C	N	B
Hyla granosa	C	N	B,TL
Hyla koechlini	C	N	B
Hyla leali	C	N	B
Hyla leucophyllata	C	N	B
Hyla marmorata	R	N	TL
Hyla parviceps	C	N	B
Hyla punctata	R	N	B
Hyla rhodopepla	C	N	B
Hyla sarayacuensis	R	N	B
Hyla schubarti	U	N	B,TL
Hyla sp. A.	R	N	B
Ololygon chiquitana	R	N	B
Ololygon garbei	U	N	B,TT
Ololygon pedromedinae	C	DS,N	B
Ololygon rubra	U	N	B,E,G
Ololygon sp. A.	C	N	B
Osteocephalus leprieuri	R	N	TL
Osteocephalus taurinus	C	N	TT
Phrynohyas coriacea	C	N	TL
Phrynohyas venulosa	U	N	E,TT
Phyllomedusa atelopoides	U	N	G

TABLE 8.1 continued

TAXON	ABUNDANCE	DIEL	HABITAT
Phyllomedusa palliata	U	N	B
Phyllomedusa tomopterna	C	N	TL
Phyllomedusa vaillanti	C	N	B,TL
Phyllomedusa sp. A.	U	N	TL
Scarthyla ostinodactyla	C	DS,N	B,TB
Sphaenorhynchus lacteus	U	N	B
Leptodactylidae:			
Adenomera andreae	C	DS,N	G,LL
Adenomera hylaedactyla	C	DS,N	G,LL
Ceratophrys cornuta	C	N	LL
Edalorhina perezi	C	DS	L,LL
Eleutherodactylus altamazonicus	R	N	B
Eleutherodactylus cruralis	R	N	G
Eleutherodactylus fenestratus	C	N	B,E,G
Eleutherodactylus imitatrix	U	DS,N	B,LL
Eleutherodactylus ockendeni	R	N	B
Eleutherodactylus peruvianus	U	DS,N	B,LL
Eleutherodactylus toftae	C	DS,N	B,LL
Leptodactylus bolivianus	U	N	G
Leptodactylus knudseni	R	N	G
Leptodactylus mystaceus	C	N	G
Leptodactylus pentadactylus	R	N	G
Leptodactylus podicipinus	C	N	AM
Leptodactylus rhodomystax	C	N	G
Leptodactylus wagneri	U	DS,N	AM
Lithodytes lineatus	R	N	G
Physalaemus petersi	R	N	LL
Microhylidae:			
Chiasmocleis ventrimaculata	U	N	B,LL
Ctenophryne geayi	R	N	F,LL
Elachistocleis ovalis	U	N	G,LL
Hamptophryne boliviana	C	N	B,G,LL
Pipidae:			
Pipa pipa	U	DS,N	A
Pseudidae:			
Pseudis paradoxa	R	N	A
REPTILIA			
AMPHISBAENIA			
Amphisbaenidae:			
Amphisbaena alba	R	?	F,G
CROCODYLIA			
Alligatoridae:			
*Caiman crocodilus**	C	N	A
Melanosuchus niger	R	N	A
*Paleosuchus trigonatus**	U	N	A

TABLE 8.1 continued

TAXON	ABUNDANCE	DIEL	HABITAT
SQUAMATA: SAURIA			
Gekkonidae:			
Gonatodes humeralis	C	DS	B,E,TT
Pseudogonatodes guianensis	R	DS	LL
Thecadactylus rapicauda	U	N	E,TT
Polychridae:			
Anolis fuscoauratus	C	DS	B,G
Anolis ortonii	R	DS	G,TB
Anolis punctatus	U	DH	B,TL,TT
Polychrus marmoratus	R	DH	TL
Scincidae:			
Mabuya bistriata	C	DH	G,L
Teiidae:			
Ameiva ameiva	C	DH	G,L
Bachia trisanale	U	DS	G,LL
Cercosaura ocellata	U	DH	LL
Dracaena guianensis	R	DH	AM,TL
*Iphisa elegans**	R	DS	L,LL
Kentropyx altamazonicus	U	DH	G
Kentropyx pelviceps	C	DH	G,L
Prionodactylus eigenmanni	U	DS	LL
Prionodactylus oshaugnessyi	U	DS	LL
Ptychoglossus brevifrontalis	R	DS	LL
*Tupinambis nigropunctatus**	U	DS	G
Tropiduridae:			
Plica plica	U	DH	TB,TT
Plica umbra	C	DH	TT
Stenocercus roseiventris	C	DH	G,L
Uracentron flaviceps	R	DH	TL,TT
SQUAMATA: SERPENTES			
Aniliidae:			
Anilius scytale	R	N	F
Boidae:			
Boa constrictor	R	DH,N	G
Corallus enydris	U	N	TL
Epicrates cenchria	U	DH,N	B,G
Eunectes murinus	R	DH,N	A
Colubridae:			
Atractus elaps	R	N	F
Atractus flammigerus	R	N	G
Atractus major	C	N	B,G
Chironius carinatus	U	DH	G
Chironius fuscus	C	DH	G
Chironius multiventris	R	DH	G
Chironius scurrulus	R	DH	G
Clelia clelia	R	N	G

TABLE 8.1 continued

TAXON	ABUNDANCE	DIEL	HABITAT
Dipsas catesbyi	C	N	B
Dipsas indica	U	N	B,TL
Dipsas variegata	R	N	TL
Drepanoides anomalus	U	N	G
Drymarchon corais	R	DH	G
Drymobius rhombifer	U	DH	G
Drymoluber dichrous	U	DH	G
Helicops angulatus	U	N	A
Helicops polylepis	R	N	A
Imantodes cenchoa	C	N	B,TL
Imantodes lentiferus	U	N	B
Leptodeira annulata	U	N	B,TL
Leptophis ahuetulla	U	DH	B,E
Liophis cobella	R	DH	AM
Liophis reginae	C	DH,N	AM,B
Liophis typhlus	R	N	B
Oxybelis aeneus	R	DH	B
Oxybelis boulengeri	C	DH	B,TL
Oxyrhopus formosus	R	N	G
Oxyrhopus melanogenys	U	N	G
Oxyrhopus petola	U	N	G
Philodryas viridissimus	R	DH	G
Pseudoboa coronata	R	N	G
Pseudoeryx plicatilis	R	DH	A
Pseustes sulphureus	R	DH	G
Rhadinaea occipitalis	U	DH	G
Siphlopis cervinus	U	N	G,L
Tantilla melanocephala	R	DS	G
Xenodon severus	R	N	G
Xenopholis scalaris	U	N	G
Elapidae:			
Micrurus annulatus	R	DS	G
Micrurus lemniscatus	R	N	G
Micrurus surinamensis	R	N	A
Leptotyphlopidae:			
Leptotyphlops diaplocius	R	DS	LL
Viperidae:			
Bothrops atrox	U	DS,N	B,G
Lachesis muta	U	DS,N	G
TESTUDINES			
Chelidae:			
Phrynops gibbus	R	DS,N	A
Platemys platycephala	U	DH,N	A,G
Pelomedusidae:			
*Podocnemis unifilis**	U	DH	A

TABLE 8.1 continued

TAXON	ABUNDANCE	DIEL	HABITAT
Kinosternidae:			
Kinosternon scorpioides	R	N	A
Testudinidae:			
Geochelone denticulata	U	DH,DS	G

9.—BIRDS OF CUZCO AMAZONICO

Tristan J. Davis

Museum of Natural History, The University of Kansas, Lawrence, Kansas 66045-2454, USA

During June–July 1989 and January–March 1990, a total of five ornithologists collected data on the birds of Cuzco Amazónico. Data were collected on identification, abundance, and other natural history characteristics for as many species as possible. A representative collection of skins, skeletons, and alcoholic specimens were preserved from the site for as many species as possible. Collecting was done primarily with mist nets. A few species not normally captured in nets were shot. Mist nets were set up primarily within the study zones, although some were placed in different habitats along the trail system to ensure a higher probability of discovering the true avian diversity in the area. As many as 35 nets were up at any one time. All nets were placed at ground level. Nets were closed at night because of the abundance of bats in the area and were opened before dawn.

During the course of the BIOTROP investigations 342 species of birds were recorded (Table 9.1). This represents about 94% of the total of 366 species currently known from the site. Specimens were obtained for 143 species or 42% of the species recorded during the BIOTROP project. Our surveys reveal that most of the larger birds (e.g., eagles, currasows, guans, macaws, etc.) are either not recorded from the site or are currently extremely scarce. This is undoubtedly caused by a combination of hunting pressures and habitat destruction by a growing human population in the area. The vast majority of species known from Cuzco Amazónico are extremely poorly known. A large number of birds are extremely sensitive to habitat alterations and are threatened in their current range, although we still know little or nothing of their population structures. Although the reserve is protected, hunting still occurs within the reserve, and many species have home ranges that are still affected by habitat alterations from adjoining lands.

The avian diversity at Cuzco Amazónico is extremely similar to better known localities in southeastern Peru (Tambopata, Manú), but a few distributional enigmas are present. One species *(Coniptilon mclhennyi)* is fairly common at both Cuzco Amazónico and Manú, but inexplicably absent from Tambopata. Also, there are several notable absences from the Cuzco Amazónico list when compared to sites nearby; primarily, the absences of species reflect the absence of certain habitats (e.g., bamboo and lake–margin vegetation) at Cuzco Amazónico that usually contain a specific avifauna. Because little ornithological work has been conducted on the reserve in comparison with that of other sites in southeastern Peru, the number of species known from the reserve certainly will increase substantially with further work.

TABLE 9.1. BIRDS OF CUZCO AMAZONICO

Abbreviations--ABUNDANCE: C = Common; seen or heard daily in large numbers. F = Fairly common; seen or heard daily in small numbers. U = Uncommon; seen or heard on about one of every three days. R = Rare; seen or heard at most once a week, mostly less often. HABITAT: F = Forest; includes low–lying, seasonally inundated forest, terra firme forest, as well as river–edge forest. S = Second–growth; for the most part includes the area of and surrounding the lodge grounds. R = River; includes river banks and sandbars immediately along the Río Madre de Dios. B = Bamboo; a species designated with this code was recorded only from a large stand of river–edge bamboo about 8 km downriver from the Cuzco Amazónico Lodge on the south bank of the Río Madre de Dios. Although not actually known to occur on the reserve, these species probably will be found there if any patches of bamboo are located within the boundary of the reserve. A = Aerial; a species recorded only flying over the area, not being restricted to any habitat type. "+" = a species recorded in almost all habitat types. OTHER: m = migrant; includes both nearctic and austral migrants; this symbol precedes the designation of abundance. "-" = abundance/habitat not known; not recorded in 1989–1990. * = a species known from the reserve only on the basis of a sight or sound record—no specimen known from the reserve.

TAXON	ABUNDANCE	HABITAT
Tinamidae:		
Tinamus major	U	F
*Crypturellus soui**	U	F
*C. undulatus**	C	F
C. cinereus	F	F
C. bartletti	F	F
Podicipedidae:		
*Podilymbus podiceps**	R	R
Ardeidae:		
*Ardea cocoi**	U	R
*Egretta alba**	F	R,L
Threskiornithidae:		
*Mesembrinius cayannensis**	U	R
Anatidae:		
*Cairina moschata**	U	R
Ciconiidae:		
*Jabiru mycteria**	R	R
Charadriidae:		
Charadrius collaris	F	R
Cathartidae:		
*Sarcoramphus papa**	U	A
*Coragyps atratus**	U	S
*Cathartes aura**	U	S
C. melambrotus	F	A,S
Accipitridae:		
*Harpagus bidentatus**	R	F
*Helicolestes hamatus**	R	F

TABLE 9.1 continued

TAXON	ABUNDANCE	HABITAT
*Ictinia plumbea**	U	A
*Elanoides forficatus**	U	A
Buteo magnirostris	C	S
B. nitidis	R	F
*B. platypterus**	mR	S
*Leucopternis schistacea**	U	F
*Busarellus nigricollis**	U	R,F
*Buteogallus urubutinga**	R	R
*Geranospiza caerulescens**	R	S,F
Pandionidae:		
*Pandion haliaetus**	mR	R
Falconidae:		
Daptrius ater	F	R,S
D. americanus	F	S,F
*Micrastur ruficollis**	U	F
*M. gilvicollis**	F	F
*M. mirandollei**	R	F
*Falco rufigularis**	F	R,S
Cracidae:		
*Ortalis guttata**	F	S
*Penelope jacquacu**	U	F
*Pipile pipile**	R	F
Rallidae:		
*Aramides cajanea**	F	F
Eurypigidae:		
*Eurypyga helias**	R	R
Phasianidae:		
*Odontophorus stellatus**	U	F
Laridae:		
*Phaetusa simplex**	U	R
*Sterna superciliaris**	F	R
Rhyncophidae:		
*Rhynchops niger**	F	R
Columbidae:		
*Columba cayannensis**	U	R
*C. subvinacea**	U	F
*C. plumbea**	F	F
*Columbina talpacoti**	U	S
*C. picui**	R	S
Leptotila rufaxilla	F	F
Geotrygon montana	U	F
Psittacidae:		
*Ara manilata**	U	A
*A. ararauna**	U	A,F
*A. macao**	R	A,F
A. severa	F	A

TABLE 9.1 continued

TAXON	ABUNDANCE	HABITAT
*Aratinga leucophthalma**	F	+
A. weddellii	F	+
Brotogeris cyanoptera	C	+
*Touit huetii**	R	F
Pyrrhura rupicola	F	F
*Pionites leucogaster**	U	F
Pionus menstruus	C	+
*Amazona farinosa**	F	A
*A. ochrocephala**	U	+
Cuculidae:		
*Crotophaga ani**	F	S
*C. major**	R	S
Piaya cayana	F	S,F
*P. melanogaster**	R	F
*P. minuta**	U	S,R
*Dromococcyx phasianellus**	–	–
*Neomorphus geoffroyi**	R	F
Strigidae:		
Otus choliba	R	S
O. watsonii	F	F
*Lophostrix cristata**	U	F
*Pulsatrix perspicillata**	F	F,S
Glaucidium minutissimum	C	F,S
G. brasilianum	F	R,S
Ciccaba virgata	R	R,F
Nyctibiidae:		
*Nyctibius grandis**	U	F
*N. griseus**	R	S,F
Caprimulgidae:		
*Chordeiles rupestris**	F	R
Nyctidromus albicollis	C	S,F
Nyctiphrynus ocellatus	R	F
Caprimulgus sericocaudatus	R	F
Apodidae:		
*Streptoprocne zonaris**	R	A
*Chaetura brachyura**	F	A
*Chaetura egregia**	F	A
Chaetura sp.(*cinereiventris*?)*	U	A
*Reinarda squamata**	U	A
*Panyptila cayannensis**	R	A
Trochilidae:		
Glaucis hirsuta	F	F
Threnetes leucurus	F	F
Phaethornis hispidus	C	F,S
*P. superciliosus**	–	–
*P. ruber**	U	F

TABLE 9.1 continued

TAXON	ABUNDANCE	HABITAT
Florisuga mellivora	U	F,S
Lophornis sp.*	–	–
Thalurania furcata	F	F,S
Hylocharis cyanus	F	S
Amazilia lactea	R	S
*Heliomaster longirostris**	–	–
Trogonidae:		
Trogon melanurus	F	F
*T. viridis**	C	F,S
T. collaris	F	F
T. curucui	U	F,S
Alcedinidae:		
*Ceryle torquata**	F	R
C. aenea	R	F
C. inda	R	F
Momotidae:		
Electron platyrhynchum	U	F
Baryphthengus ruficapillus	R	F
Momotus momota	F	F,S
Galbulidae:		
Galbula cyanescens	F	F,S
Bucconidae:		
*Notharcus macrorhynchus**	–	–
Bucco capensis	R	F
B. macrodactylus	–	–
Malacoptila semicincta	R	F
Nystalus striolatus	U	F
*Nonnula ruficapilla**	R	F
N. sclateri	–	–
Monasa nigrifrons	C	F,S
M. morphoeus	U	F
Chelidoptera tenebrosa	C	R
Capitonidae:		
Capito niger	F	F,S
*Eubucco richardsoni**	F	F
*E. tucinkae**	R	R,F
Ramphastidae:		
Pteroglossus castanotis	U	F,S
P. inscriptus	U	F
P. mariae	U	F
*P. beauharneasii**	R	F
Selenidera reinwardtii	U	F
*Ramphastos cuvieri**	C	F
*R. culminatus**	C	F
Picidae:		
Picumnus borbae	F	F,S

TABLE 9.1 continued

TAXON	ABUNDANCE	HABITAT
Chrysoptilus punctigula	U	S
Melanerpes cruentatus	C	S,F
Piculus leucolaemus	U	F
*P. chrysochlorus**	R	F
Celeus elegans	U	F
C. spectabilis	–	–
C. torquatus	R	F
C. flavus	U	S,F
Dryocopus lineatus	U	F
Veniliornis affinis	F	F
*V. passerinus**	R	S
Phloeoceastes rubricollis	F	F
Dendrocolaptidae:		
Dendrocincla merula	C	F
D. fuliginosa	F	F
Dendrocolaptes picumnus	R	F
D. certhia	U	F
Deconychura longicauda	R	F
*Nasica longirostris**	–	–
Dendrexetastes rufigula	U	F
Glyphorhynchus spirurus	U	F
Sittasomus griseicapillus	C	F
Xiphorhynchus picus	U	F
X. ocellatus	C	F
X. guttatus	F	F
Lepidocolaptes albolineatus	U	F
Hylexetastes stresemanni	R	F
Furnariidae		
Thripophaga fusciceps	U	F
Philydor erythrocercus	U	F
P. pyrrodes	U	F
P. ruficaudatus	R	F
P. erythropterus	R	F
P. rufus	U	F
*Metapothrix aurantiacus**	U	F,S
Synallaxis gujanensis	F	S,F
*S. albigularis**	–	–
*Cranioleuca gutturata**	U	F
Furnarius leucopus	U	S,R
*Ancistrops strigilatus**	U	F
Automolus infuscatus	U	F
A. ochrolaemus	U	F
A. rufipileatus	F	F
*Xenops milleri**	F	F
X. minutus	F	F
*X. rutilans/tenuirostris**	R	F

TABLE 9.1 continued

TAXON	ABUNDANCE	HABITAT
Sclerurus caudacutus	R	F
Formicariidae:		
Cymbilaimus lineatus	F	F
C. sanctaemariae	F	F,S
*Taraba major**	U	S
*Thamnophilus doliatus**	U	S
T. schistaceus	C	F
T. aethiops ? (one juv. specimen)	R	F
Pygiptila stellaris	U	F
Thamnomanes ardesiacus	F	F
T. schistogynus	F	F
*Myrmotherula brachyura**	C	F,S
*M. sclateri**	U	F
*M. surinamensis**	–	–
M. hauxwelli	C	F
M. haematonota	F	F
M. ornata	U	F
M. axillaris	C	F
M. longipennis	F	F
M. iheringi	U	F
M. menetriesii	F	F
*Terenura humeralis**	U	F
*Cercomacra cinerascens**	C	F
Myrmoborus leucophrys	F	F,S
M. myotherinus	U	F
*Hypocnemis cantator**	F	F,S
Hypocnemoides maculicauda	F	F
*Dichrozona cincta**	U	F
Sclateria naevia	U	F
Myrmeciza hemimelaena	F	F
M. atrothorax	U	F
M. hyperythra	F	F
M. goeldii	R	F
Gymnopithys salvini	F	F
Hylophylax poecilonota	U	F
*Percnostola lophotes**	–	B
P. leucostigma	R	F
Phlegopsis nigromaculata	U	F
Formicarius analis	C	F
F. colma	–	–
*Hylopezus berlepschi**	R	F
*Myrmothera campanisona**	U	F
Conopophaga peruviana	U	F
Rhinocryptidae:		
*Liosceles thoracicus**	R	F

TABLE 9.1 continued

TAXON	ABUNDANCE	HABITAT
Cotingidae:		
*Iodopleura isabellae**	R	F
Lipaugus vociferans	C	F
Porphyrolaema porphyrolaema	–	–
*Cotinga cayana**	U	F
*C. maynana**	R	F
Conioptilon mcilhennyi	F	F
Querula purpurata	F	F
Cephalopterus ornatus	R	F
Pipridae:		
Schiffornis major	U	F
*Tyranneutes stolzmanni**	R	F
Piprites chloris	F	F
Pipra fasciicauda	C	F
P. chloromeros	R	F
P. rubrocapilla	R	F
P. coronata	–	–
Machaeropterus pyrocephalus	U	F
Tyrannidae:		
*Ornithion inerme**	F	F,S
*Camptostoma obsoletum**	U	F,S
Sublegatus sp. (*obscurior*)*	–	–
*Tyrannulus elatus**	U	S
*Myiopagis gaimardii**	F	F
M. viridicata	U	F,S
*Inezia inornata**	R	F,S
Elaenia sp.*	U	S
*Hemitriccus iohannis**	R	F,S
H. zosterops	U	F
*Myiornis ecaudatus**	F	F,S
*Todirostrum maculatum**	–	B
*T. chrysocrotaphum**	U	S
*Ramphotrigon fuscicauda**	–	–
*R. ruficauda**	R	F
Tolmomyias assimilis	F	F,S
*T. poliocephalus**	U	S,F
T. flaviventris	R	S
Platyrinchus coronatus	F	F
P. platyrhynchos	R	F
Onychorhynchus coronatus	R	F
Terenotriccus erythrurus	U	F
Mionectes olivaceus	–	–
M. oleagineus	U	F
*M. macconnelli**	–	–
Leptopogon amaurocephalus	U	F,S
*Contopus cinereus**	R	S

TABLE 9.1 continued

TAXON	ABUNDANCE	HABITAT
*C. virens**	m	–
Ochthornis littoralis	C	R
*Pyrocephalus rubinus**	F	S
*Fluvicola pica**	–	–
Cnemotriccus fuscatus	U	S
*Satrapa icterophrys**	–	–
Attila bolivianus	U	F
A. spadiceus	F	F,S
Rhytipterna simplex	U	F
Laniocera hypopyrra	U	F
*Myiarchus swainsoni**	R	F
*M. ferox**	U	S
*M. tyrannulus**	–	–
Pitangus sulphuratus	F	S
Megarynchus pitangua	F	F
Myiozetetes similis	U	F
M. granadensis	U	F,S
Myiodynastes maculatus	U	F,S
*Empidonomus varius**	R	F
*E. aurantioatrocristatus**	R	F
*Legatus leucophaius**	R	S
*Muscisaxicola fluviatilis**	F	R
*Tyrannus melancholicus**	C	S,F
*T. savanna**	mC	S
*Pachyrhamphus marginatus**	F	F
P. polychopterus	F	S,F
*P. minor**	U	F
Tityra semifasciata	U	F
T. cayana	R	F
*T. inquisitor**	U	F
Corythopis torquata	F	F
Hirundinidae:		
*Atticora fasciata**	C	R
Tachycineta albiventer	C	R
*Phaeoprogne tapera**	F	R,S
*Stelgidopteryx ruficollis**	F	R,S
Corvidae:		
Cyanocorax violaceus	U	F
Troglodytidae:		
Campylorhynchus turdinus	C	S,F
*Thryothorus genibarbis**	U	F
Troglodytes aedon	C	S,F
Microcerculus marginatus	F	F
Cyphorhinus arada	F	F
Turdidae:		
Turdus hauxwelli	U	F

TABLE 9.1 continued

TAXON	ABUNDANCE	HABITAT
T. albicollis	F	F
T. amaurochalinus	mR	F
Catharus ustulatus	m–	–
Sylviidae:		
Ramphocaenus melanurus	F	S,F
Vireonidae:		
Vireo chivi	F	S,F
*Hylophilus thoracicus**	R	F
*H. hypoxanthus**	C	F,S
Icteridae:		
*Scaphidura oryzivora**	U	F
Psarocolius decumanus	F	F
*P. oseryi**	U	F
*P. angustifrons**	F	F
*Gymnostinops yuracares**	R	F
Cacicus cela	C	+
C. haemorrhous	R	F
*Icterus c. cayannensis**	R	S
*I. icterus**	–	–
*Molothrus bonariensis**	R	S
Coerebidae:		
*Cyanerpes caeruleus**	U	F
Chlorophanes spiza	F	F
*Dacnis cayana**	F	F
D. lineata	C	F,S
*D. flaviventer**	U	F,S
*Conirostrum speciosum**	–	B
Parulidae:		
*Dendroica striata**	mR	S
Thraupidae:		
Euphonia xanthogaster	F	S,F
*E. rufiventris**	R	F
E. chrysopasta	R	F
*E. cyanocephala**	U	S
E. minuta	U	S,F
*E. laniirostris**	R	S,F
Tangara chilensis	C	F,S
*T. calophrys**	U	F
*T. gyrola**	R	F
T. schrankii	C	F,S
T. mexicana	U	S
*Thraupis palmarum**	F	S,F
T. episcopus	F	S
Piranga olivacea	m–	–
*P. rubra**	m–	–
Ramphocelus carbo	C	S

TABLE 9.1 continued

TAXON	ABUNDANCE	HABITAT
*R. nigrogularis**	R	F
Lanio versicolor	U	F
*Thlypopsis sordida**	U	S
Tachyphonus luctuosus	C	F,S
*T. cristatus**	U	F
*Hemithraupis guira**	U	F
*H. flavicollis**	U	F
*Cissopis leveriana**	R	S
*Lamprospiza melanoleuca**	R	F
Habia rubica	C	F
Emberizidae:		
Saltator maximus	U	S,F
*S. coerolescens**	R	F
*Pitylus grossus**	U	F
*Paroaria gularis**	U	R,S
*Sporophila caerulescens**	–	–
S. (lineola)	–	–
Volatinia jacarina	U	S
Oryzoborus angolensis	U	F
Arremon taciturnus	U	F
Myiospiza aurifrons	C	R,S
*Caryothraustes humeralis**	R	F
Cyanocompsa cyanoides	R	S,F

TABLE 9.1 continued

TAXON	ABUNDANCE	HABITAT
T. albicollis	F	F
T. amaurochalinus	mR	F
Catharus ustulatus	m–	–
Sylviidae:		
Ramphocaenus melanurus	F	S,F
Vireonidae:		
Vireo chivi	F	S,F
*Hylophilus thoracicus**	R	F
*H. hypoxanthus**	C	F,S
Icteridae:		
*Scaphidura oryzivora**	U	F
Psarocolius decumanus	F	F
*P. oseryi**	U	F
*P. angustifrons**	F	F
*Gymnostinops yuracares**	R	F
Cacicus cela	C	+
C. haemorrhous	R	F
*Icterus c. cayannensis**	R	S
*I. icterus**	–	–
*Molothrus bonariensis**	R	S
Coerebidae:		
*Cyanerpes caeruleus**	U	F
Chlorophanes spiza	F	F
*Dacnis cayana**	F	F
D. lineata	C	F,S
*D. flaviventer**	U	F,S
*Conirostrum speciosum**	–	B
Parulidae:		
*Dendroica striata**	mR	S
Thraupidae:		
Euphonia xanthogaster	F	S,F
*E. rufiventris**	R	F
E. chrysopasta	R	F
*E. cyanocephala**	U	S
E. minuta	U	S,F
*E. laniirostris**	R	S,F
Tangara chilensis	C	F,S
*T. calophrys**	U	F
*T. gyrola**	R	F
T. schrankii	C	F,S
T. mexicana	U	S
*Thraupis palmarum**	F	S,F
T. episcopus	F	S
Piranga olivacea	m–	–
*P. rubra**	m–	–
Ramphocelus carbo	C	S

TABLE 9.1 continued

TAXON	ABUNDANCE	HABITAT
*R. nigrogularis**	R	F
Lanio versicolor	U	F
*Thlypopsis sordida**	U	S
Tachyphonus luctuosus	C	F,S
*T. cristatus**	U	F
*Hemithraupis guira**	U	F
*H. flavicollis**	U	F
*Cissopis leveriana**	R	S
*Lamprospiza melanoleuca**	R	F
Habia rubica	C	F
Emberizidae:		
Saltator maximus	U	S,F
*S. coerolescens**	R	F
*Pitylus grossus**	U	F
*Paroaria gularis**	U	R,S
*Sporophila caerulescens**	–	–
S. (lineola)	–	–
Volatinia jacarina	U	S
Oryzoborus angolensis	U	F
Arremon taciturnus	U	F
Myiospiza aurifrons	C	R,S
*Caryothraustes humeralis**	R	F
Cyanocompsa cyanoides	R	S,F

10.—MAMMALS OF CUZCO AMAZONICO

Robert M. Timm and Neal Woodman

Museum of Natural History, The University of Kansas, Lawrence, Kansas 66045-2454, USA

Small terrestrial and arboreal mammals were surveyed primarily by trapping along the four 500 m-long trails in the two study zones. Trap stations were located at approximately 20 m intervals along each trail. Each station consisted of two Sherman live traps and two Victor rat traps, with one of each placed on the ground and one of each located above the ground on branches, lianas, fallen trees, or in shrubs. Trapping was carried out on each trail for twelve consecutive days, using two different baits for six days each. Trapping was conducted in the zones once during the dry season (June–July) and once in the wet season (January–March), for a total of 9,600 trapnights. This was augmented by further trapping in areas containing habitat types not represented in the two zones. Tomahawk live traps were used to sample medium sized mammals too large for Sherman or Victor traps. Mist nets were used to capture bats along forest trails, in clearings, and over streams. Larger mammals were censused by recording sightings of the animals themselves or by identifiable tracks.

Our studies indicate that Reserva Cuzco Amazónico supports a mammalian fauna of at least 97 species, including 9 marsupials, 42 bats, 7 primates, 5 xenarthrans, 1 rabbit, 22 rodents, 8 carnivores, 1 tapir, and 2 artiodactyls (Table 10). These estimates represent the minimum total numbers of species based on voucher specimens and direct observations. In addition, at least 5 bats, 1 monkey, 2 rodents, 5 carnivores, and 2 artiodactyls probably are occasional or scarce members of the fauna. Small terrestrial rodents and marsupials at Cuzco Amazónico are extremely abundant and diverse in comparison to other lowland tropical sites. However, bats, generally abundant at lowland tropical sites, were much less common at Cuzco Amazónico. White-tailed deer, peccaries, tapirs, larger monkeys and other large "game" animals were uncommon to rare. Although wildlife at Reserva Cuzco Amazónico has protected status, there are no full-time game wardens, and poaching still occurs. For example, on February 5, 1990, we discovered the corpse of a collared peccary, that had been shot by a hunter within the reserve.

Our survey indicates that Reserva Cuzco Amazónico is home to a number of endangered and and threatened species of mammals, including the seven and probably eight species of primates, two species of sloths, giant anteater, bush dog, jaguar, ocelot, and tapir. This alone justifies continuing efforts to preserve and protect this land in its current, nearly unblemished state, and makes it vital to further reduce illegal hunting here.

In addition, our survey resulted in significant range extensions of three species of mammals—*Marmosops parvidens, Monodelphis adusta,* and *Peropteryx leucoptera,* and six additional species—*Molossus coibensis, Choeroniscus minor, Micronycteris minuta, Mimon crenulatum, Rhinophylla pumilio,* and *Choloepus hoffmanni* are the first records of the species for Departamento de Madre de Dios.

TABLE 10.1. MAMMALS OF CUZCO AMAZONICO

Abbreviations--ABUNDANCE: A = Abundant; often observed and/or captured in appropriate habitats; small terrestrial/arboreal animals represented by more than 15 captures in zones. C = Common; frequently observed and/or captured in appropriate habitats; 10–15 captures in zones. U = Uncommon; occasionally observed and/or captured in appropriate habitats; 5-10 captures in zones. R = Rare; few sightings/captures in appropriate habitats; <5 captures in zones. P = Probable; likely to occur in this area, but not observed or captured; in some cases, this may be due to seasonal movements, rarity, or difficulty in discovery due to habits and/or size. An asterisk (*) after a name signifies that the species was observed, but is not represented by voucher specimens. MACROHABITATS: A = Arboreal; C = Commensal with human habitations; T = Terrestrial; V = Volant; W = Aquatic or aquatic margin.

TAXON	ABUNDANCE	MACROHABITAT
MARSUPICARNIVORA		
Didelphidae:		
Caluromys lanatus	R	A,T,W
Didelphis marsupialis	A	A,T,W
Marmosa murina	R	A,T
Marmosops noctivagus	A	A,T
M. parvidens	U	A,T
Metachirus nudicaudatus	U	T
Micoureus regina	A	A,T
Monodelphis adusta	R	T
Philander opossum	U	W,T
CHIROPTERA		
Emballonuridae:		
Peropteryx leucoptera	U	V
Rhynchonycteris naso	P	V
Saccopteryx bilineata	U	V
S. leptura	U	V
Molossidae:		
Molossus coibensis	U	V
Noctilionidae:		
Noctilio albiventris	C	V
N. leporinus	P	V
Phyllostomidae:		
Artibeus jamaicensis planirostris	A	V
A. lituratus	A	V
A. obscurus	A	V
Carollia brevicauda	A	V
C. castanea	A	V
C. perspicillata	C	V
Chiroderma salvini	R	V
C. villosum	R	V
Choeroniscus minor	R	V

TABLE 10 continued

TAXON	ABUNDANCE	MACROHABITAT
Chrotopterus auritus	R	V
Dermanura anderseni	U	V
Desmodus rotundus	R	V
Glossophaga soricina	U	V
Lionycteris spurrelli	P	V
Lonchophylla thomasi	R	V
Micronycteris megalotis	R	V
M. minuta	R	V
Mimon crenulatum	R	V
Phyllostomus elongatus	U	V
P. hastatus	C	V
Platyrrhinus brachycephalus	U	V
P. infuscus	R	V
Rhinophylla pumilio	C	V
Sturnira lilium	C	V
S. tildae	R	V
Tonatia silvicola	R	V
Trachops cirrhosus	R	V
Uroderma bilobatum	C	V
U. magnirostrum	R	V
Vampyressa macconnelli	C	V
V. pusilla	C	V
Vampyrodes caraccioli	P	V
Vampyrum spectrum	R	V
Thyropteridae:		
Thyroptera tricolor	R	V
Vespertilionidae:		
Eptesicus brasiliensis	R	V
Lasiurus ega	R	V
Myotis albescens	R	V
M. keaysi	P	V
M. nigricans	U	V
M. riparius	R	V
PRIMATES		
Callithrichidae:		
Saguinus fuscicollis *	C	A
Cebidae:		
Alouatta seniculus *	R	A
*Aotus nigriceps**	C	A
Ateles paniscus	P	A
Cebus albifrons *	R	A
C. apella *	R	A
Lagothrix lagothricha *	R	A
Saimiri boliviensis *	C	A

TABLE 10 continued

TAXON	ABUNDANCE	MACROHABITAT
XENARTHRA		
Bradypodidae:		
Bradypus variegatus	U	A
Dasypodidae:		
Dasypus novemcinctus	U	T
Megalonychidae:		
Choloepus hoffmanni	U	A
Myrmecophagidae:		
Myrmecophaga tridactyla *	R	T
*Tamandua tetradactyla**	U	A/T
LAGOMORPHA		
Leporidae:		
Sylvilagus brasiliensis *	U	T
RODENTIA		
Agoutidae:		
Agouti paca *	U	T
Cricetidae:		
Neacomys spinosus	U	T
Nectomys squamipes	R	W
Oecomys bicolor	A	A
O. tapajinus	U	A
O. superans	R	A
Oligoryzomys microtis	U	C
Oryzomys capito	A	T
O. niditus	A	T
O. yunganus	U	T
Rhipidomys couesi	C	A
Dasyproctidae:		
Dasyprocta variegata	A	T
Myoprocta pratti	R	T
Echimyidae:		
Isothrix bistriata	R	A
Mesomys hispidus	A	A
Proechimys brevicauda	C	T
P. simonsi	U	T
P. steerei	C	T
Erethizontidae:		
Coendou bicolor	R	A,T
Muridae:		
Rattus rattus	U	C
Sciuridae:		
Sciurus ignitus	C	A
S. spadiceus	A	A

TABLE 10 continued

TAXON	ABUNDANCE	MACROHABITAT
CARNIVORA		
Canidae:		
Atelocynus microtis *	R	T
Felidae:		
Felis concolor	P	T
F. pardalis	R	T
F. wiedii	P	T
F. yagouaroundi *	R	T
Panthera onca *	R	T
Mustelidae:		
Galictis vittata *	R	T,W
Eira barbara *	R	T,A
Lutra longicaudis	P	W
Mustela sp.*	R	T
Pteronura brasiliensis	P	W
Procyonidae:		
Nasua nasua	P	T,A
Potos flavus *	R	A
PERISSODACTYLA		
Tapiridae:		
Tapirus terrestris *	R	W
ARTIODACTYLA		
Cervidae:		
Mazama americana	P	T
Odocoileus virginianus *	R	T
Tayassuidae:		
Tayassu pecari	P	T
T. tajacu *	U	T