

**Vegetation of the Greater Maya Mountains, Belize**  
**Malcolm G. Penn<sup>alcl</sup>, David A. Sutton<sup>al</sup> and Alex Monro<sup>al</sup>**

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**Abstract**

This paper describes a new vegetation classification for the Greater Maya Mountains of Belize, focusing primarily on the Chiquibul Forest Reserve. Extensive use is made of GIS, remote sensing, botanical collections and field visits to provide a macro- and meso-scale overview of the vegetation of this region. A total of 32 vegetation classes have been defined, both geographically and structurally, including 11 new classes. Where possible, classes have been compared with earlier classifications. A dominant scaling technique has been used to enable direct comparison between ground truthing data and a supervised Maximum Likelihood Classifier image-based vegetation classification. The merits of such classifications and the effect of scale are discussed.

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**SENSITIVE ECOLOGICAL AREAS AND SPECIES  
INVENTORY OF ACTUN CHAPAT CAVE,  
VACA PLATEAU, BELIZE**

J. JUDSON WYNNE<sup>1</sup> WILLIAM PLEYTEZ

Belize. *Journal of Cave and Karst*

*Studies*, v. 67, no. 3, p. 148–157.

Cave ecosystems are considered one of the most poorly studied and fragile systems on Earth. Belize caves are no exception. This paper represents the first effort to synthesize information on both invertebrate and vertebrate observations from a Belize cave. Based on limited field research and a review of literature, we identified two ecologically sensitive areas, and developed a species inventory list containing 41 vertebrate and invertebrate morphospecies in Actun Chapat, Vaca Plateau, west-central Belize. Actun Chapat contains two ecologically sensitive areas: (1) a large multiple species bat roost, and (2) a subterranean pool containing troglobites and stygobites. The inventory list is a product of sporadic research conducted between 1973 and 2001. Ecological research in this cave system remains incomplete. An intensive systematic ecological survey of Actun Chapat with data collection over multiple seasons using a suite of survey techniques will provide a more complete inventory list. To minimize human disturbance to the ecologically sensitive areas, associated with ecotourism, we recommend limited to no access in the areas identified as “sensitive.”

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**Resource use in the tropical karstlands of central Belize**

**M. Day<sup>1</sup>**

**Environmental Geology**

Abstract Rural tropical ecosystems are subject to many traditional land uses that employ the indigenous karst resources: rock, water, soil, vegetation, and wildlife. Individual resource pressures often are subtle, but their combined impact can precipitate instability in the tropical karst environment, potentially resulting in disruption of food, water, and fuel supplies. The karst of central Belize was used intensively for some six centuries by Maya farmers, but between the 10th and 19th centuries AD most of it reverted to secondary forest. Commercial logging dominated the 19th and early 20th centuries, followed by the expansion of subsistence and commercial agriculture after 1945. In the 1980s resource use has accelerated as population and other pressures increase. Much karst remains forested, but there is increasing clearance for agricultural uses, particularly for citrus cultivation and small-scale mixed agriculture. Soil depletion has begun to occur, water resources are increasingly taxed, and some wildlife is threatened by habitat destruction and increased hunting. Lime production for the citrus industry has promoted quarrying, water extraction, and fuelwood use. Environmental stresses currently do not exceed the threshold of instability, but the rapidly developing rural economy warrants careful monitoring of resource pressures.

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Estimating global biodiversity: tropical beetles and wasps send different signals

**Authors:** BARTLETT R.; PICKERING J.; GAULD I.; WINDSOR D.

**Source:** Ecological Entomology, Volume 24, Number 1, February 1999, pp. 118-121(4)

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**Preliminary assessment of the flagship species concept at a small scale**

**Tim Caro**<sup>a1a2c1</sup>, **Andrew Engilis Jr**<sup>a1a2</sup>, **Emily Fitzherbert**<sup>a1a3</sup> and **Toby Gardner**<sup>a1a3</sup>

Animal Conservation (2004), 7: 63-70 Cambridge University Press

## **Abstract**

Flagship species are charismatic species that serve as a symbol and rallying point to stimulate conservation awareness and action but are often used synonymously as *de facto* umbrella species to delineate reserve boundaries. We tested the extent to which the presence of a flagship species would protect other 'background species' at the local scale at which practical decisions about small reserves are often made. Using long term sightings, we identified four 1 km<sup>2</sup> sites that are frequently visited by jaguars and by tapirs (flagship species), and by white-lipped peccaries and spider monkeys (non-flagship species) in neotropical rainforest in Belize. We then made inventories of five vertebrate taxonomic groups at each site. We found no consistent differences in species richness or abundances of frogs, phyllostomid bats, terrestrial mammals, scansorial mammals or birds across the four sites, except that frog diversity and abundance was higher close to a river at the flagship site where tapirs were found. Since these classic Latin American flagship species fail to encompass particularly high numbers or abundances of vertebrate species at a local scale, they appear to be a poor conservation tool when co-opted as umbrella species for delineating the location of very small reserves in the neotropics.

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**Resource Diversity in Belize and Its Implications for Models of Lowland Trade**

Elizabeth Graham

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OCELOT DENSITY AND HOME RANGE IN BELIZE, CENTRAL AMERICA: CAMERA-TRAPPING AND RADIO TELEMETRY

Dillon, Adam

**Abstract**

Historically, ocelots (*Leopardus pardalis*) were hunted in large numbers for their fur, causing declines in population abundance across their range. In recent decades protection measures (e.g. CITES) and decreased public demand for ocelot fur resulted in declines in hunting pressure. Do to their elusive nature there is little known about ocelot population size, structure or general ecology. This lack of information hampers our ability to provide protection for this endangered species.

Remote cameras were deployed in 7 grids across the landscape to estimate the density of ocelots in 2 habitat types; the broadleaf rainforest and pine forest of western Belize. Camera trapping combined with mark-recapture statistics resulted in densities of 18.91 – 20.75 ocelots per 100 km<sup>2</sup> in the rainforest and 2.31 – 3.81 ocelots per 100 km<sup>2</sup> in the pine forest habitat. This study examined the issues of camera spacing and animals with zero distance moved and their effect on density estimation. Increased camera spacing resulted in larger buffer sizes (increasing the effective trap area) and decreased density estimates. Inclusion of zero distance animals decreased buffer sizes and increased density estimates. Regardless of these effects, ocelot density was higher in the broadleaf rainforest than the pine forest. The ocelot density estimates in Belizean forests were lower than those in other portions of their range. The camera trapping technique demonstrated ocelots to be mostly active at night, with peaks of activity after sunset and before sunrise, and to travel low-use roads in the wet season and high-use roads in the dry season.

Radio telemetry was used in this study to estimate the home range size and density of ocelots in the broadleaf rainforest of western Belize. Six collared ocelots (3 male, 3 female) were collared and tracked from September 2003 – August 2004. Male ocelots had an average home range size of 33.01 km<sup>2</sup> (95% fixed kernel) and 29.00 km<sup>2</sup> (100% MCP), and female ocelots had an average home range size of 21.05 km<sup>2</sup> (95% fixed kernel) and 29.58 km<sup>2</sup> (100% MCP). Most ocelots had larger home ranges in the dry season than the wet season. Ocelots showed a large amount of same sex home range overlap; with male-male overlap averaging 25% (100% MCP) and female-female overlap averaging 16% (100% MCP). Ocelot density determined using radio telemetry was 7.79 – 10.91 ocelots per 100 km<sup>2</sup>. The radio telemetry ocelot densities were lower and their home ranges larger in the Belizean broadleaf rainforests than those in other portions of their range.

The camera trapping and radio telemetry techniques were compared against one another and combined in order to test which technique may be more successful in studying certain aspects of feline behavior. Activity budgets and density estimates determined from camera trapping were superior to radio telemetry, whereas camera trapping home ranges showed higher variation and lower resolution than radio telemetry. However, home range estimates determined from camera trapping captured long distance movements, a larger percent of territory overlap, and displayed potential for estimating an animal's core use area. When radio telemetry data were used to create a buffer around camera traps based on the average radius of an ocelots' home range size, the

resulting density estimates were smaller than those determined using the current camera trapping methodology.

This study provided much needed baseline information on ocelot abundance, home range size, activity patterns, and trail use. While sample sizes were small, this study had the largest number of ocelots captured in Central America to date. Although camera trapping is already a useful tool in felid research, this study highlights the importance of further standardization of the camera trapping methodology, increasing its potential for monitoring and conservation across habitats and study sites.

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### **An Ancient Maya Dam in the Cayo District, Belize**

Paul F. Healy

*Journal of Field Archaeology*, Vol. 10, No. 2 (Summer, 1983), pp. 147-154

#### **Abstract**

Management of water systems is often considered by anthropologists and archaeologists as a catalytic force in the rise of prehistoric, highly developed societies. Recent studies of the hydraulic engineering skills of the ancient lowland Maya have shown some of their remarkable capabilities for controlling water, including the construction of stone dams. This paper examines new evidence of one such Maya construction located in western Belize, Central America, and discusses the size, form, probable age, and function of this feature.

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### **Caracol, Belize: Evidence of Ancient Maya Agricultural Terraces**

Paul F. Healy, John D. H. Lambert, J. T. Arnason, Richard J. Hebda

*Journal of Field Archaeology*, Vol. 10, No. 4 (Winter, 1983), pp. 397-410

#### **Abstract**

Recent studies of ancient Maya settlement and demography indicate population densities exceeding those achievable using traditional swidden farming techniques, and suggest that more intensive farming methodologies such as terracing were employed. This paper describes recent archaeological investigations at the major Maya ceremonial center of Caracol, Cayo District, Belize, a poorly known region of the southern Maya lowlands. Research concentrated upon a six-hectare zone of terraced hillslope and included detailed mapping and excavations. An examination of the terraces and associated residential units is made, with discussion of the antiquity of these structures, their distribution, terrace size, form, and probable function. The first radiocarbon dates for Caracol, as well as data on terrace soils and pollen, are presented.

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### **Three New Species of *Epigomphus* from Belize and Mexico (Odonata: Gomphidae)**

Thomas W. Donnelly

*The Florida Entomologist*, Vol. 72, No. 3 (Sep., 1989), pp. 428-435

## Abstract

The genus *Epigomphus* Selys 1854 in Mexico and northern Central America contains six described and three new species. *E. maya* n. sp. from the Maya Mountains of Belize is closest to *E. quadracies* from western Guatemala, Costa Rica, and Panama. *E. flinti* n. sp. from Oaxaca and *E. sulcatistyla* n. sp. (originally placed with *E. paulsoni* from Veracruz) are closest to *E. paulsoni*, which is limited to Chiapas. Males of *Epigomphus* are separated most reliably by the form of their abdominal appendages. /// El genero *Epigomphus* Selys 1854 en Mexico y la parte norte de Centro America contiene seis especies descritas y tres nuevas. *E. maya* n. sp. de las "Maya Mountains" de Belize esta relacionada con *E. quadracies* de la parte occidental de Guatemala, Costa Rica, y Panama. *E. flinti* n. sp. de Oaxaca y *E. sulcatistyla* n. sp. (originalmente puesta con *E. paulsoni*) de Veracruz estan relacionadas con *E. paulsoni*, que esta limitada a Chiapas. Machos de *Epigomphus* se diferencian con mas seguridad por la forma de los apendices abdominales.

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## **A new genus of Neotropical whitefly, secreting blue-iridescent wax (Sternorrhyncha, Aleyrodidae, Aleurodicinae), and its parasitoids (Hymenoptera, Aphelinidae)**

**Authors:** J. H. Martin; A. Polaszek

Journal of Natural History, Volume 33, Issue 10 October 1999 , pages 1545 – 1559

## Abstract

*Azuraleurodicus pentarthrus* Martin gen. and sp. n. is described from three different host plant families in Central and northern South America. Adults of both sexes were reared in culture and adult characters are discussed in addition to those of puparia. The systematic position of *Azuraleurodicus* within the Aleurodicinae is discussed. One new combination, *Aleuronudus ferrisi* (Sampson and Drews) comb. n., is here proposed in the course of discussion. The secretion of blue wax by whiteflies is discussed and illustrated by colour photographs. Two species of hymenopterous parasitoids, *Dirphys aphania* Polaszek sp. n. and *Encarsiella pithecura*, Polaszek sp. n. emerged from puparia of *Azuraleurodicus pentarthrus* and are here described.

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## **THE MACAL RIVER: A FLORISTIC AND PHYTOSOCIOLOGICAL STUDY OF A THREATENED RIVERINE VEGETATION COMMUNITY IN BELIZE**

**L. URBAN** <sup>a1p1</sup>, **S. G. M. BRIDGEWATER** <sup>a2</sup> and **D. J. HARRIS** <sup>a1</sup>

Edinburgh Journal of Botany (2006), 63: 95-118 Cambridge University Press

## Abstract

A species checklist is presented for a stretch of the seasonally flooded Macal River in the Cayo District of Belize, together with preliminary phytosociological data for the primary riverine communities. A total of 229 species were recorded in the seasonally flooded riparian zone, representing 7% of the flora of Belize. Results of quantitative sampling indicate that *Inga vera* subsp. *vera* dominates the river corridor. Other important woody associates include *Cuphea*

*calophylla*, *C. utriculosa*, *Calyptanthes bartlettii*, *C. lindeniana*, *Lindenia rivalis*, *Pleuranthodendron lindenii*, *Calliandra tergemina* and *Nectandra salicifolia*. One of the most significant threats to riparian vegetation in the region is the Chalillo Dam upstream of the study site. The current work provides baseline floristic and ecological data for this threatened riparian habitat and documents the structure and composition of vegetation that exists downstream from the dam before its construction.

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**Hurricanes and the Forests of Belize**  
**Forest Department April 1993**  
Jon Friesner

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**Notes on the Psychodidae (Diptera) of Belize: Subfamilies Bruchomyiinae and Phlebotominae**

**Sergio Ibáñez-bernal**

*Annals of the Entomological Society of America*  
Article: pp. 367–385

This work is a contribution to the Psychodidae fauna of Belize, in the subfamilies Bruchomyiinae and Phlebotominae. *Nemapalpus mopani* De León was recorded and represents the first record of a Bruchomyiinae in Belize. The subfamily Phlebotominae is represented by 22 nominated species, but *Lutzomyia serrana* (Damasceno & Arouck) and *L. aclydifera* (Fairchild & Hertig) are recorded for the first time in this country. *Lutzomyia manciola*, a new species, is described, bringing the number of phlebotomine species in Belize to 25, including the three previously recorded species of *Brumptomyia* França & Parrot. Keys for the identification of males and females of all 22 Belizean species of *Lutzomyia* are included

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**Excavations in Footprint Cave, Caves Branch, Belize**  
Elizabeth Graham, Logan McNatt, Mark A. Gutchen  
*Journal of Field Archaeology*, Vol. 7, No. 2 (Summer, 1980), pp. 153-172

### **Abstract**

The use of caves by the ancient Maya has been previously documented, but the nature of artifact preservation in these caves presents unique problems not encountered in surface sites of the region. The absence of stratigraphy, though it means that we can view objects as they were left by the Maya, also means that perspective can be distorted, for actions that may have taken place over a long period of time result in an arrangement of objects that appears to us to be synchronic. The nature of artifact preservation in caves presents another, more pressing problem: artifacts are accessible and therefore easily stolen. Although all surface sites in Belize are endangered, cave sites are especially so, and in recent years theft of artifacts and attendant destruction of sites has

increased. The following is a report of excavations in a cave that is one of many in an area that has begun to experience the destructive effects of looting within the last decade. We hope that this report will heighten the awareness of archaeologists of the significance of cave sites and stimulate interest in the reconnaissance and recording of such sites before the looters prevail.

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**A New Species of *Tantilla* (Serpentes; Colubridae) of the *Taeniata* Group from Southern Belize**

**Peter J. Stafford**

*Journal of Herpetology*

Article: pp. 43–52

**Abstract**

ABSTRACT.—A new snake of the genus *Tantilla* is described from southern Belize. This species, a member of the *taeniata* group, is characterized by a dark gray-brown, almost black ground color; a narrow pale middorsal stripe confined to the vertebral scale row; a narrow pale lateral stripe on adjacent thirds of the third and fourth scale rows; a broad pale nape band that is complete medially; dark mottling on the lateral edges of the ventrals; and 153 ventrals + 64 subcaudals in the single known specimen, a female. It is most similar to *Tantilla impensa* of southern Chiapas, the central Guatemalan ranges and western Honduras but differs from this species in its darker overall color pattern, the presence of dark mottling on the lateral edges of the ventrals, and in having a lower number of ventrals.

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**Rapid Ethnobotanical Survey of the Maya Mountains Range in Southern Belize, Central America: A Pilot Study**

**Todd Pesek<sup>1, 2, \*</sup>, Marvin Cal<sup>2</sup>, Victor Cal<sup>3</sup>, Nick Fini<sup>2</sup>, Chris Minty<sup>4</sup>, Peter Dunham<sup>5</sup>, Pablo Sanchez<sup>6</sup>, Luis Poveda<sup>6</sup>, John Arnason<sup>7</sup>**

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**New Perspectives**

**Estimating global biodiversity: tropical beetles and wasps send different signals**

*R. Bartlett, J. Pickering, I. Gauld<sup>2</sup> and D. Windsor*

**Ecological Entomology**

Volume 24 Issue 1 Page 118 - February 1999

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**MOSQUITO STUDIES IN BELIZE, CENTRAL AMERICA: RECORDS, TAXONOMIC NOTES, AND A CHECKLIST OF SPECIES**

**JAMES E. PECOR, 2 RALPH E. HARBACH, • E. L. PEYTON, TM DONALD R. ROBERTS, 5 ELISKA REJMANKOVA, • SYLVIE MANGUIN •.7 ^ND JORGE PALANKO s**  
**Journal of the American Mosquito Control Association, 18(4):241-276, 2002**

ABSTRACT Data from mosquito collections made in Belize, Central America, between September 1990 and April 1993 are presented. A total of 537 collections yielding 15,139 specimens are summarized. One genus, 4 subgenera, and 31 species are recorded from Belize for the 1st time. A checklist of the 111 mosquito species now known to occur in Belize is presented

**The Prehistory of Belize**

Norman Hammond

*Journal of Field Archaeology*, Vol. 9, No. 3 (Autumn, 1982), pp. 349-362

**Abstract**

Belize, Central America, has been the location of many innovative research projects in Maya archaeology. Over the past generation several problem-oriented projects have contributed significantly to a new understanding of ancient Maya subsistence and settlement, and increased the known time span of Maya culture. An historical review of research in Belize is followed by a resume of the current state of knowledge and an indication of future research potential

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**New Listserver for Galliform researchers is launched.**

**Philip McGowan, Conservation Director of the World Pheasant Association writes:**

**WORLD PHEASANT ASSOCIATION ASSOCIATION/ SPECIES SURVIVAL COMMISSION – IUCN/ BIRDLIFE INTERNATIONAL SPECIALIST GROUP**

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**The natural history of reproduction in *Solanum* and *Lycianthes* (Solanaceae) in a subtropical moist forest**

**STACEY D. SMITH<sup>a1</sup> and SANDRA KNAPP<sup>a2</sup>**

Bulletin of The Natural History Museum. Botany Series (2002), 32: 125-136

The phenology and pollination of seven understory species of buzz-pollinated Solanaceae (*Solanum erythrotrichum*, *S. lanceifolium*, *S. rudepannum*, *S. cordovense*, *S. nudum*, *Lycianthes hypoleuca* and *L. gorgonea*) were investigated at the end of the dry season in the subtropical moist forest at the Las Cuevas Research Station, Chiquibul Forest Reserve, Cayo District, western Belize. Three phenological phenomena were tracked: the opening and closing of flowers, flower production and fruit production. The large short-lived white flowers of *S. lanceifolium*, *S. rudepannum*, *Lycianthes hypoleuca* and *L. gorgonea* opened around sunrise and closed at sunset. The purple flowers of *S. erythrotrichum* and the small white flowers of *S. nudum* and *S.*



*cordovense* opened more or less randomly. All seven study species flowered at least once during the months of May, June and July; there was substantial overlap in the flowering of some species. Four species, *S. rudepannum*, *S. cordovense*, *S. lanceifolium* and *S. erythrotrichum*, developed mature fruit during the monitoring period while the remaining species possessed immature fruit at the termination of the study. Thus, it appeared that these seven solanaceous species would provide a fairly constant supply of mature fruit during the rainy season. During observations of pollinators, 17 different bees in the families Colletidae, Halictidae and Apidae were found to visit the buzz-pollinated flowers of *Solanum* and *Lycianthes*. Analysis of the pollen loads revealed that bees were highly constant to Solanaceae although it was not possible to determine their constancy to particular species. Very few visits were observed to *S. cordovense* and *L. gorgonea*.