



BIOLOGICAL DIVERSITY



A Study of Variation in Chicozapote (*Manilkara zapota*)

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The chicozapote is an abundant and frequently dominant species of tree found in different types of tropical forests of the Maya region of Mesoamerica. The tree has been cultivated or semi-cultivated in the Yucatan Peninsula region of Mexico since prehistoric times.

It provides many useful products, including timber, chicle gum (sap), edible fruits, and medicine. In northern Yucatan and Quintana Roo this tree is found in a wide range of vegetation types, from semi-deciduous tropical forest to periodically inundated savanna and tintales.

Over this distribution, the life form of the tree varies widely. Forest forms are taller and have straight trunks, large fruits and large seeds. The savanna form is generally shorter, with a twisted primary trunk that splits into branches very close to the ground. This form also has smaller leaves, fruits and seeds.

We are studying the genomic DNA of 4 populations of chicozapote to determine if the phenotypic variation between the different populations is accompanied by genotypic variation. Genomic DNA has been



extracted from desiccated leaf material of these populations. In order to remove individual variation and only compare differences between populations, the technique of bulked segregant analysis is used. In this method, DNA from each member of a population is combined into a single sample. This results in four samples representing the total DNA of the four populations. These bulks are amplified using PCR (polymerase chain reaction) and random primers. When a band difference is observed between populations with a given primer, DNA from each individual in the populations is amplified using that primer. Polymorphic loci are identified and scored for each individual. When a sufficient number of polymorphic loci have been identified, the data will be statistically analyzed to determine if there is a significant genetic difference between the four populations.

Vegetation and Birds of the El Edén Ecological Reserve, Quintana Roo, México

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From July 10th to August 10th, 1995, the vegetation and some bird species were sampled at El Edén field station. The aim was to relate the composition and structure of vegetation with the spatial distribution of the bird community during this period of time. Bird populations were sampled by transects and vegetation with quadrants.

Tropical dry forest height is about 9 to 11 m, and 5 to 11 m for the savanna, basal area values were 17.05 m²/ha and 7.7 m²/ha respectively. Most bird species belong to fragmented habitats, richness and diversity (Shannon index) were higher in the savanna.

They differ in composition and in their spatial and temporal niches, showing their ecological and ethiological differences. Since stability of bird communities depend on its habitat, it is important to characterize vegetation, its changes and the consequences of these changes on bird communities. It is important to continue this pilot study through the coordinated effort with other researchers by setting a system of permanent plots to monitor not just the vegetation and bird communities, but also other ecological groups.



Flora Diatomológica de una Zona de Humedales Ubicada en la Reserva Ecológica "El Edén" Quintana Roo, México

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Al interior de los humedales la presencia de perifiton, marca una importante fuente de diversidad; en la que las diatomeas son un componente conspicuo.

Este grupo ha sido caracterizado como uno de los más eficientes indicadores de condiciones ambientales, y una herramienta muy útil sobre todo en sistemas tandinámicos como estos.





En una revisión prospectiva de 20 muestras tomadas en distintos puntos de la reserva en temporada de secas, se observaron 21 géneros y aproximadamente 60 especies del grupo de las *Bacillariophyceae*, de las cuales las más abundantes corresponden a *Cymbella*, *Navicula*, *Caloneis*, *Gomphonema* y *Nitzschia*.

Por la variación morfológica de algunos de los ejemplares, se hace necesario el uso de la microscopía electrónica, así como el registro de la ditomoflora presente en temporada de lluvias y la vinculación de su presencia y abundancia con los factores bióticos y abióticos que las rodean.





Current Research Projects Being Conducted on Insects at El Edén Reserve, Quintana Roo, Mexico

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Research presently being conducted on the insects of El Edén Reserve in Quintana Roo, Mexico has been focused on faunistic studies of some of the better known taxonomic groups.



These groups include butterflies, hawk moths, ants, and specific groups of parasitic Hymenoptera and anthonomine weevils.



Lists of identified species of these groups are being prepared and illustrated field guides for the reserve are proposed for butterflies and ants to aid future research projects. The majority of collected material will be stored at the insect collections at El Colegio de la Frontera Sur in Chetumal, Quintana Roo, and San Cristóbal de las Casas, Chiapas.

Nematode Survey at El Edén

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During the spring of 1996 a nematode survey was conducted at the Ecological reserve "El Eden" in Quintana Roo, Mexico. Soil samples were collected from several plants species endemic to the Savanna's ecosystems. Plant species endemic to these habitats included trees such as: *Eritroxylum* sp., *Crecentia allata*, Palm trees (*Paurotis* sp.) "Nance". In addition, other aquatic plants were selected.



Soil samples were processed at UCR-Nematode Systematics Lab. for nematode extraction, Identification and estimation of population density.

Preliminary results indicate presence of diverse taxonomic groups of nematodes including: *Tylenchida*, *Rhabditida*, *Chromodorina*, *Dorylaimida*, *Monhyst erida*, *Diplogasterida*, *Cephalobidae*, *Mononchida*. Identification to genera and species level is in progress. Information on the ecological implications of some of these groups will be discussed at the workshop. Future research plans will be also proposed.





Systematics and Ecology of Myxomycetes of the El Edén Ecological Reserve

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We are presenting the preliminary results on the systematics and ecology of Myxomycetes in the ecological reserve "El Edén".

Richness, abundance and diversity of Myxomycetes were determined on fallen leaves and logs in an area of 300 m² of selva mediana subperennifolia during two consecutive years. The growth of



Myxomycetes was evaluated on barks of twelve species of living trees (two palms) and moist chamber conditions.

The tree species chosen were: *Acoelorrhaphe wrightii*, *Annona glabra*, *Bursera simaruba*, *Brosimum alicastrum*, *Byrsonima bucidaefolia*, *Guettarda combsii*, *Haematoxylon campechianum*, *Erythroxylum areolatum.*, *Lysiloma latisiliquum*, *Manilkara sapota*, *Metopium brownei*, *Thrinax radiata* y *Vitex gaumeri*.

To date, 22 species of Myxomycetes, in 222 collections, have been determined. From these, 18 species, in 133 collections, were found in the 300 m² fragment of selva mediana subperennifolia. Seven species, in 89 collections, were found growing in the barks under moist chamber conditions.

From the 18 species of Myxomycetes found in the quadrant, the most abundant were:



Arcyria cinerea



Dictydium cancellatum



Ceratiomyxa fruticulosa



Hemitrichia calyculata

and



Arcyria denudata with 31, 27, 20, 12 y 11 collections respectively. The rest of the species were represented by less than ten collections.

The barks in moist chamber with the higher number of species of Myxomycetes were: *V. gaumeri* (5), *M. zapota* (3), *M. brownei* (3), *G. elliptica* (3), *B. alicastrum* (2), *B. crassifolia*(1), *E. sp.* (1), *H. campechianum* (1). In *Annona glabra*, *B. simaruba* y *T. radiata* no species were recorded.

The most abundant species of Myxomycetes found in the barks were:



Lamproderma arcyrionema



Cribraria violacea y *Arcyria cinerea* con 28, 25 y 17 collections.
The rest of the species were represented by less than ten collections.

Comparación de Índices y Modelos de Diversidad para Abundancias y Biomasa Arborea en un Acahual de la Reserva Ecológica "El Edén", Quintana Roo, México

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El concepto de diversidad está relacionado con la complejidad, nivel de perturbación, velocidad de regeneración y con la sucesión de un ecosistema. En este trabajo se comparan varios índices y modelos de diversidad para datos de abundancia y biomasa. Se evalúa la sensibilidad de los mismos sobre los atributos de la comunidad y características del muestreo. El muestreo se realizó en agosto de 1995 en la reserva ecológica El Edén, Quintana Roo, México, a partir de una muestra destructiva de vegetación arbórea de un acahual de 10-12 años. Se realizaron cuatro transectos dentro de los cuales se ubicaron 12 cuadrantes, se cosechó la vegetación arbustiva y arbórea, y se estimó abundancia y biomasa por especie. Posteriormente se aplicaron y compararon varios índices y modelos de diversidad para los valores de abundancia y biomasa. En todos los índices y modelos utilizados se observó que los valores más altos correspondían a los datos de abundancia. Únicamente el modelo de Fisher (α) y los índices de Shannon (H') y equitabilidad (E') fueron significativamente mayores, reflejando la sensibilidad de los mismos sobre los atributos que reflejan la dinámica y funcionamiento de la comunidad. En base a los resultados anteriores, se enfatiza en la importancia que representa el aplicar índices y modelos de diversidad a valores de biomasa y el desarrollar metodologías de muestreo adecuados, mediante el establecimiento de un sistema de parcelas permanentes para el seguimiento y monitoreo de la diversidad.



Freshwater Gastropods from the El Edén Ecological Reserve, and their Bearing in the Use of Periphyton by Ancient Maya

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Preliminary systematic studies of the freshwater gastropods collected at the water bodies of El Edén ecological reserve, gave as result the recognition of four genera, from which one belongs to the subclass *Prosobranchia*, and the other three are pulmonate snails (subclass *Pulmonata*).



Despite the name of the subclass of these gastropods, they are completely dependent of the water. Some are in fact air breathers, but do not need to get out from the water, and frequently show a mantle

fusion called the siphon, which they extend to reach the air they breath. However, their bodies are not designed to live out of the water, as they do not have the morphologic and physiological modifications of the terrestrial gastropods, which include more mucous glands, a thick epidermis, an uricolteic excretory system, a more complicated nervous system and sense organs, a complex hermaphroditic reproductive system, and a modified digestive tract to feed on terrestrial plants and organic debris.

Freshwater genera of gastropods recognized for the area of study, include *Pomacea* (Prosobranchia: Mesogastropoda), *Pseudosuccinea*, *Stenophysa*, and a still unidentified member of the family *Planorbidae* (*Pulmonata*).



From these, *Pomacea* is the largest gastropod, reaching as much as 5.0 cm (width of shell). Populations of this genus grow just after the rain season at the studied area, and represent a significant amount of biomass of the freshwater biota. They are grazers, and feed on the [periphyton](#), and other algae developing in the local ponds.

Hermaphroditic individuals ovoposit on the aerial exposure of ciperaceans, in order to avoid predation on their eggs. Today, members of this genus are eaten in several states of Mexico, mainly by Indian communities. Therefore, it seems probable that ancient Maya fed on these gastropods, although no formal archaeological evidence has yet been found by this author.

This leads directly to the potential use of freshwater gastropods, as an evidence of the use of the associated [periphyton](#) as fertilizer in the high lands by ancient Maya. Although presence of pomacean gastropods in archaeological sites would be related to their use as food, existence of their other species of freshwater gastropods might be an overwhelming evidence of transportation along with the [periphyton](#), as





such species are too small to be used as food, and they are also grazers, feeding on the **periphyton**.



This **preliminary** contribution is presented in hope that possible findings of freshwater gastropod shells, related to archaeological sites in the highlands of the Maya domain might be a clue to the potential use of **periphyton** as fertilizer during prehispanic times.

Monitoring Bird Diversity at El Edén Ecological Reserve, Quintana Roo

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In October of 1995, I began preliminary investigations at El Edén to establish and verify a definitive bird species list for the reserve and to lay the groundwork for a long-term bird diversity, population monitoring,

and longevity study. In July 1996, I returned to the reserve for a few days to continue work on this project. My results to date are based on those two visits, a total of about 10 days in the field.



Assisted by the Souhegan (New Hampshire) High School BioSwat Team, Jared Wilson and I conducted a rapid survey of the avifauna of Reserva Ecológica El Edén on 21-26 October 1995. Despite adverse weather and meter-deep inundation of savanna and tinal habitats resulting from [hurricanes](#) Opal and Roxanne, we managed to record a total of 128 definitively identified bird species, 44 of which were new additions to the evolving El Edén list begun by Hernandez et al. (1995).

We mist-netted birds on three mornings in two locations: along a trail in medium-height semideciduous tropical forest west of the station and in an area of disturbed scrub and low secondary forest east of the station. We captured a total of 119 individuals of 39 species, and 102 of these were ringed with uniquely numbered metal leg bands. More than half of these (55%) were long-distance nearctic migrants originating in North America. We caught four times as many birds per net-hour Data, summarized results, and a brief discussion are available in Will and Wilson (1995).



My work in July 1996 was conducted in association with the establishment of permanent biodiversity sampling plots under the [HabitatNet](#) program coordinated by Dan Bisaccio. The HabitatNet team members and I definitively identified 87 bird species, 9 of which were new to the El Edén list. No nearctic migrants were present. We mist-netted birds in the same two locations used in October 1995 and captured 44 individuals of 21 species, 30 of which were newly banded. We recaptured four individuals which had been banded the previous



year. Once again, we captured more than twice as many individuals per net-hour in the disturbed scrub habitat than we did in the forest.

I plan to continue making visits to El Edén to observe and capture birds in the same locations. The mist-netting component can easily be coupled with other workshops as a demonstration of biodiversity sampling technique. In addition, I would be happy to cooperate with other ornithologists or students in the development of a more intensive bird monitoring project. Specific objectives might include:

- * long term migrant and resident bird monitoring (as part of a program for biodiversity monitoring and conservation in the region);
- * quantitative determination of specific habitat configurations used by migratory birds;
- * a study of changes in physiological condition of residents, transients, and resident migrants at El Edén;
- * resolution of the local variation, introgression, and systematics of *Arremonops rufivirgatus* and *A. chloronotus*;
- * long-term population dynamics of selected species in different habitats based on capture/recapture methods.

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RESERVA ECOLÓGICA EL EDEN A.C.