CHIQUIBUL CAVE SYSTEM

Quest Tunkul Expedition Technical Report

December 13 – 16, 2011

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Introduction

Carbonate bedrock underlies over 50% of Belize's land but not all is well karstified (Day 1996). The area where karst topography is more pronounced is on the cretaceous limestone found on the north and west flanks of the Maya Mountains (Day 1993). It is because of this geological feature that numerous caves can be found in Belize.

The Chiquibul Cave System (CCS) is the longest and largest presently known cave system in the Central American Region. To date a total of 65 km of cave passages have been mapped (Czaplewski *et al.* 2003). It is situated in the jungles of the Vaca Plateau in west central Belize (most of the cave's network is found within the Chiquibul National Park (CNP) but ends in Guatemalan territory. The CCS consists of four hydrological linked caves, namely Kabal, Tunkul, Cebada and Xibalba [found in Guatemalan territory], plus numerous sinkholes, that based on uranium isotopes decay measurements the CCS began to form at least 800,000 years ago (Miller 2000).

The two largest rooms of the CCS are the Chiquibul Chamber (found in Actun Kabal) and the Belize Chamber (found in Actun Tunkul) with approximate measured dimensions of 250 by 150 meters with a ceiling height of about 40-60 meters placing them among the world's largest cave chambers. Actun Tunkul is a former conduit for the Chiquibul River and is seasonally flooded. Primarily the cave is a single 12 km passage (Reddell & Veni 1996), averaging 40-50 m wide by 20 m in height, enlarging to the Belize Chamber to more than 200 m in diameter. A perennial stream that originates from a side passage is found about 1 km from the cave entrance. Most of the cave's floor substrate is highly variable with thick deposit of sand and silt laden with organic debris (Reddell & Veni 1996), cobbles, gravel and or sand plus collapsed cave material.

Most of the work conducted in CCS has been achieved by T.E Miller and L. McNatt who have focused mainly in exploring and mapping of the cave system while obtaining limited biological information.

Objectives

The objectives of this 4 day expedition to Actun Tunkul were to:

- ✓ Conduct a rapid biological assessment of the area.

[1] All photographs in this report were taken by Boris Arevalo unless indicated, during the course of the expedition

- ✓ Identify species of conservation concern.
- ✓ Identify present threats to native biodiversity.

Methodology

The four day expedition to Actun Tunkul conducted from the 13 to 16 of December, 2011 is the first of three expeditions funded by the Rufford Foundation with the aim to explore the biological diversity of the CCS and monitor potential threats to both biodiversity, archeological and geological features due to anthropogenic activities. The team consisted of nine (9) members of which five were FCD personnel and 4 were members of the Belize Defense Force, who were responsible for providing security. FCD personnel included: Derric Chan (expedition team leader), Lenny Gentle (cave specialist), Boris Arevalo (Wildlife Biologist), Michael Burton (CCS Chief Ranger) and Zair Pott (Ranger). Actual activities to achieve the set objectives were conducted during two days of the expedition as it took the remainder of the time in travelling (hike) to and from the cave.

Site description

The CCS is found within the Chiquibul Forest (Figure 1 and Figure 2). The Chiquibul Forest (CF), located within the Cayo District, covers an area of 176,999 ha (437,376 acres) comprised of three protected areas being the Chiquibul National Park (106,838 ha), Chiquibul Forest Reserve (59,822 ha) and the Caracol Archeological Reserve (10,339 ha), with central UTM coordinates 1,878,200 – 1,871,800 North and 265,600 – 322,600 East. Meerman and Sabido (2001) identified 17 different ecosystems within the area, all being variants of Tropical Broadleaf Forests, except for a pine forest category. This dense rainforest was lightly logged in the late 1960's and 70's (Miller 1996). The climate is tropical-humid with mean annual temperatures of 22^{o}C and with a precipitation of 2000 mm/ yr; with a marked dry season between February to June and a rainy season coinciding with the hurricane season which starts from July to November (Salas & Meerman 2008). The soils are generally derived from limestone and are regarded fertile in comparison to other tropical areas but on the steeper limestone slopes Wright *et al.*(1959) classifies the soils as skeletal where the bedrock tends to protrude out as a consequence of the soil layer being a few centimeters thick. Parent rock is a highly brecciated limestone of Cretaceous age upon which a mature karst landscape developed. According to Czaplewski *et al.* (2003), the constant 100% humidity and 22^{o}C temperatures inside the CCS allow high biological activity, such as the alluvial-silt banks are perpetually covered in worm castings.

Data collection

Due to time constraints and unfavorable weather conditions (rainy) no standard biodiversity data collection protocol was used. Biodiversity data was collected in an approximate radius of 500 m from the entrance of Tunkul as well as in the perennial stream found inside the cave. Bird and amphibian species seen and or heard were recorded, while most mammal species were recorded based on tracks, on the other hand all recorded cavernicoles were only those directly observed while exploring the cave. Little emphasis was paid in flora identification.

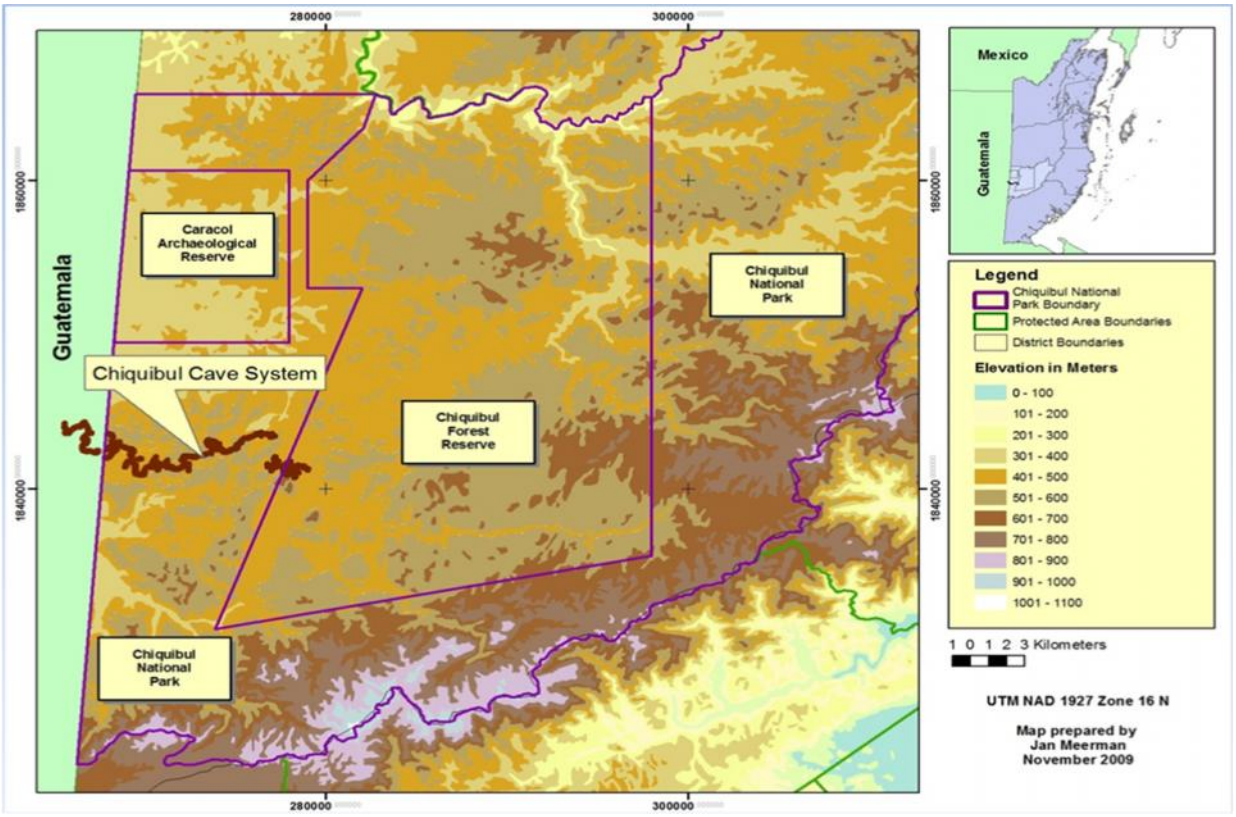

***Figure 1**: Geographical location of the CCS in respect to the Chiquibul Forest.*

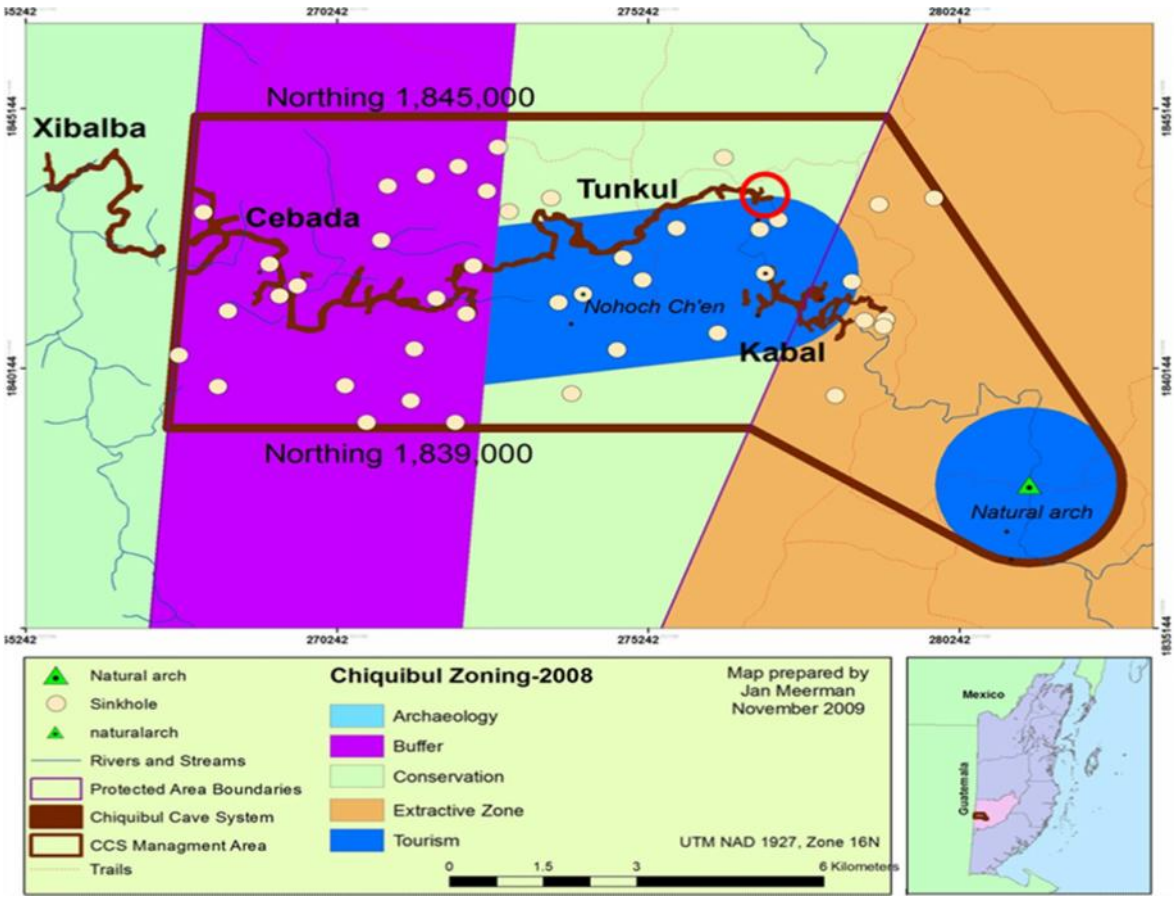

***Figure 2**: Detailed map of the CCS (red circle indicates area surveyed during the expedition)*

Results

Ecosystems

The general ecosystem of the CCS is classified as broadleaved forest (Figure 3) with the exception of a small section impacted by agricultural encroachments (along the western border) and some riparian shrublands. A total of six broadleaved forest ecosystem variants have been identified along the CCS based on geology, elevation and slope; providing gradual but very difficult to identify ecotones.

Figure 3*: Broadleaved forest found around the entrance of Actun Tunkul (UTM coordinates: northing: 1843369; easting: 277174).*

Riparian Shrublands

This is a broadleaved forest type sporadically being disturbed by flash floods causing the present tree and shrub stems to grow in the direction of the water flow (Figure 4). Due to flooding events this ecosystem is very dynamic and energy rich, becoming key zones for many species such as *Tapirus bairdii* (Figure 6) and amphibians. The riparian shrubland identified just 50 m from the entrance of Actun Tunkul was dominated by three tree species being: *Cojoba graciliflora*, *Ardisia sp.* and a species awaiting identification. All of these tree species had a stem diameter of no more than 10 cm and a height less than 3 m. High evidence was found that this section of the Chiquibul River is sub-terrain but an evident river bed is present. The river bed substrate is composed of limestone boulders. Flooding events appear to be few but severe as evidence of flood debris was observed about 30 m high on crevices of Tunkul's entrance. It is safe to conclude that flooding events in this area are rare due to the fact that trees are covered with mosses and a well developed understory composed of ferns is present (Figure 4).

***Figure 4**: Riparian shrubland found on and along the dry riverbed leading to Tunkul. Note small diameter size and height of trees covered with mosses and an understory of ferns (UTM coordinates: northing: 1843368; easting: 277229)*

The only presence of water observed on this river bed was a stagnant pool about 4 m wide, 10 m in length with an average depth of 0.5m (Figure 5) located about 70 meters from the entrance of Tunkul. This pool serves as a major source of water for a wide diversity of terrestrial mammals, especially for the tapir, white-tailed and red-brocket deer; as evidenced by the frequently used network of animal trails leading to the pool (Figure 6).

Figure 5*: Pool of water found about 70 m away from Tunkul entrance (UTM coordinates: northing:1843368; easting: 277229)*

Figure 6: *Frequently used Tapir and White-tailed Deer trail leading to pool, about 2 m away from the water mark (UTM coordinates: northing: 1843368; easting: 277229)*

Subterranean Biological Communities

The subterranean (cave) biological communities can be subdivided based on light penetration into the cave system.

- Light zone community: this zone is found at the entrance of the cave where it has abundant direct sunlight and often with particular precipitation/humidity regimes where it falls under cave overhang (Figure 7). Faunal species inhabiting this area are called trogloxenes.

- Penumbral zone community: refers to the area without direct sunlight but with enough stray light allowing some degree of visibility within the cave (Figure 7).

- Dark zone community: is the cave zone located in total darkness. The biological communities found here are highly adapted to live in total darkness. Such faunal assemblage can be divided into troglophiles (cavernicoles that have adapted to their dark surroundings but leave the cave to forage outside) and troglobites (cavernicoles that permanently live inside caves and cannot survive outside of the cave environment).

Figure 7*: The light and penumbral zones of Actun Tunkul*

Subterranean aquatic system

Actun Tunkul was formed by a subterranean aquatic system that can presently be appreciated. The first permanent pool of water is about 70 m from the entrance of the cave and is about 2 m wide, 10 m in length and 1 m in depth; about 40 m further into the cave there is a second permanent pool about 3 times the length of the first. One kilometer into the cave there is a permanent stream that varies in width and depth. This aquatic system harbors a unique assemblage of aquatic fauna some of them being troglobites. During this expedition four aquatic species were recorded being: the crab *Typhlopseudothelphusa acanthochela* Hobbs 1986 (Figure 8 A; first collected in the CCS in 1984); the shrimp *Macrobrachium cantonium* Hobbs and Hobbs 1995 (Figure 8 B); an unidentified catfish *Rhamdia sp.* (Figure 8 C) and an unidentified eel species (Figure 8 D), which was first collected from the CCS (Tunkul) in 1998 by biologist Jean Krejca. The only recorded aquatic troglobites was *T. acanthochela*, which is completely pigmentless and lack vestiges of eyes. All catfishes, shrimps (even though these two species are classified as troglobites by Reddell & Veni (1996) and eel observed had well developed eyes and produced an eye-shine when light was directed at them, indicating that these species have functional eyes and were well pigmented, except for the shrimp, indicating that these are able to migrate to stream areas under direct sunlight; categorizing them as troglophiles.

(**A**) Crab: *Typhlopseudothelphusa acanthochela*

(**B**) Shrimp: *Macrobrachium cantonium*

(**C**) Catfish: *Rhamdia sp.*

(**D**) Unidentified eel

Figure 8*: Aquatic cavernicoles recorded at the perennial stream located inside Actun Tunkul*

Biodiversity

Even though limited effort was dedicated for the actual collection of biodiversity data using standard protocols due to time constraints and severe weather conditions, the area around the CCS appears to harbor healthy flora and fauna species assemblage, typical of well conserved tropical broadleaved forests. A total of 86 species were recorded representing 52 families. Table 1 shows the observed species richness by taxon and the number of families represented in each. A high percentage of the observed biodiversity is considered to be of great conservation concern (at the national, regional and or international level) due to their endemism, economic value and or low population densities throughout their range. Three birds species; five mammals; five plant; all amphibians and aquatic fauna species recorded are considered to be of great conservation concern (Table 2).

Table 1: *Species richness and number of species per taxon recorded at Actun Tunkul*

Taxon	Species Richness	No. of species per Family
Amphibians	4	4
Birds	47	26
Terrestrial Mammals	13	10
Aquatic Fauna (cavernicoles)	4	4
Insects (cavernicoles)	1	1
Plants	17	8

***Table 2**: Species of conservation concern recorded at Actun Tunkul*

Group	Colloquial Name	Family	Species	IUCN Class	Status in Belize
Amphibian	Rio Grande Leopard Frog	Ranidae	Rana berlandieri		
Amphibian	Valliant's Frog	Ranidae	Rana vaillanti		
Amphibian	Red-eye Treefrog	Hylidae	Agalychnis callidryas		
Amphibian	Fleischmann's Glass Frog	Centrolenidae	Hyalinobatrachium fleischmanni		
Bird	Crested Guan	Cracidae	Penelope purpurascens		VU
Bird	Great Curassow	Cracidae	Crax rubra	NT	VU
Bird	Mealy Parrot	Psittacidae	Amazona farinosa	NT	VU
Fish	Blind Crab	Pseudothelphusidae	Typhlopseudothelphusa acanthochela		
Fish	Freshwater Shrimp	Palaemonidae	Macrobrachium catonium		
Fish	Catfish	Pimelodidae	Rhamdia sp.		
Fish	eel	unknown	sp. sp.		
Insect	Pseudoscorpion	Bochicidae	Mexobisium goodnighti		
Mammal	Black Howler Monkey	Cebidae	Alouatta pigra pigra	EN	VU
Mammal	Jaguar	Felidae	Panthera onca goldmani	NT	NT
Mammal	Ocelot	Felidae	Leopardus pardalis pardalis	VU	VU
Mammal	Margay	Felidae	Leopardus wiedii yucatanica	VU	VU
Mammal	Baird's Tapir	Tapiridae	Tapirus bairdii	EN	VU
Plant	Fishtail Palm	Arecaceae	Chamaedorea ernesti-augustii		
Plant	Mahogany	Meliaceae	Swietenia macrophylla	VU	VU
Plant	Cedar	Meliaceae	Cedrela odorata		
Plant	ceratozamia	Zamiaceae	Ceratozamia robusta	VU	VU
Plant	Zamia	Zamiaceae	Zamia decumbens	CR	VU

Threats

Within the Chiquibul Forest there are no human settlements but an estimated 65 Guatemalan communities are found in a 45 km stretch along the Belize-Guatemala border of which 11 are buffering the CF and are highly dependent on the natural resources found in this forest. Guatemalans from these communities are the major agents causing threats to the native

biodiversity and ecosystem functions around Tunkul. Identified threats include illegal logging (Figure 9), Xaté extraction (Figure 10) and hunting/ poaching. Illegal loggers have been primarily targeting two highly valuable hardwood species being mahogany and cedar. This activity is causing severe impact on targeted population densities and is contributing to deforestation and forest degradation. Extraction of a chamaedorean palm known as *xate* is believed to be leading to target species population decline and forest degradation. Both illegal loggers and xateros (people engaged in cutting xaté) while conducting their activities are engaged in illegal hunting of game species and poaching of parrot species nests and other wildlife for the illegal pet trade. All these illegal activities are evident around Actun Tunkul.

Figure 9*: A freshly illegally logged cedar tree about 400 m east of Actun Tunkul (UTM coordinates: northing: 1843810; easting: 277746).*

***Figure 10**: Xaté bundles containing some of the 12,000 Xaté leaves confiscated by Chiquibul Forest Joint Enforcement Unit on November 18, 2011 around Actun Tunkul area (UTM coordinates: northing: 1844767; easting: 279335). © FCD archives*

Of special note was the recording of seedlings of unidentified species about 30 cm in height located 1 km inside the cave. All seedlings had a slender, pigmentless and succulent stem with attached cotyledons, in addition to two undeveloped apical leaves (Figure 11). A slightly fossilized bone measuring about 20 cm in length and 4 cm in diameter was recorded located among cobbles on the banks of the cave stream (Figure 12)

***Figure 11**: Seedlings of unidentified species found 1 km inside Actun Tunkul*

***Figure 12**: Bone of an unidentified species recorded inside Actun Tunkul*

Discussion

Even though time and weather prevented me from conducting a more robust biological assessment of Actun Tunkul and vicinity; the results indicate a rich assemblage of both flora and fauna species. Most of the species recorded are good indicators of a healthy broadleaf forest; as evidenced by the occurrences of large predatory mammals and forest specialist birds. The most interesting findings were the recording of the four aquatic cavernicoles which indicate evidence of high cave specialization and must be considered in further biological research.

Cave ecosystems are one of the most fragile ecosystems on earth (Elliott 2000; Krajick 2001). The high sensitivity to human disturbances by cavernicoles poses a great challenge to their conservation; this is further complicated due to the fact that most troglobites (obligated cavernicoles) are endemic to a single cave, have low population densities (Krajick 2001) and are k-selected species (Huppop 2005). Based on the evidence collected during the expedition it was observed that no human activity has been occurring within the cave, which assures almost no impact to cave species assemblages. Although only five cavernicoles were recorded, these are considered to be unique to cave systems and their conservation is important. No attempt was made to collect cave invertebrate data, but one species of pseudoscorpion (*Mexobisium goodnighti* Muchmore 1973) was recorded. According to Redell & Veni (1996) a minimum of 70 invertebrate species have been found in the CCS but much of these are still awaiting proper identification.

Considering the nature of the CCS which is a flood cave (massive amounts of water flushing in and out) from the Chiquibul River, cave specialization by faunal (aquatic) species is limited (Meerman & Moore 2009). These events transport daylight aquatic fauna and may flush out specie that might establish themselves as troglodyte but since there is the existence of almost no biological data on the CCS it is important to conduct a robust biological inventory in order to state with certainty the true conservation value of the cave system. Although Reddell & Veni (1996) categorized all aquatic cavernicoles as troglobites, except the eel that was not reported by the authors, only the crab completely lacks eyes and is pigmentless with well elongated appendages, indicating true total darkness adaptation characteristics.

The same cannot be said about the terrestrial fauna found around Actun Tunkul which is experiencing high threats due to illegal logging, xaté extraction and hunting. All these activities are being conducted by Guatemalans living in communities along the western border. Regardless of these pressures large mammal communities are still relatively healthy as indicated by the high presence of large predatory mammals (large cats), herbivores (tapir) and forest specialist birds but studies need to be conducted in order to determine their population status and monitor population trends over time.

Despite the limitations of this assessment a wealth of biological information was collected from Actun Tunkul and vicinity. The species assemblage recorded are typical of well conserved broadleaved forest but are under threat by anthropogenic activities that are causing deforestation and forest degradation; therefore interventions are needed to counter attack such activities and assure the conservation of existing terrestrial and cavernicole species.

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ANNEX 1: *Quest Tunkul Expedition diary of activities*

Date/ Time	ACTIVITY
13th December	
10:00	Arrival from FCD central base to CNP Rangers' Base at Tapir Camp.
11:25	Briefing of expedition to all expedition team by Derric Chan.
11:40	Departed from Tapir Camp enroute to Actun Tunkul.
12:15	Arrived at junction with of Resumidero Track and Las Cuevas Road.
13:40	Arrived drop off point and started hiking (northing 278604; easting: 1844175)
15:28	Reached xatero trail that leads to Actun Tunkul vicinity (northing: 278604, easting: 18433811).
16:45	Reached day one camp site; established camp (northing: 277746; easting: 1843810).
14th December	
6:00	Conducted a bird point survey, prepared meal and packed to leave camp site.
7:30	Left camp site enroute to Actun Tunkul.
8:18	Arrived at Actun Tunkul entrance (northing: 277174; easting: 1843369).
9:00 – 14:00	Conducted terrestrial biodiversity surveys and ecosystem identification.
15:00	Established camp (northing: 277553; easting: 1843536).
15th December	
6:30	Preparations for cave trip.
8:30	Initiated cave exploration, recorded aquatic life observed and other sightings of interest.
10:30	Reached perennial stream.
11:15	Reached turning point (estimated walked distance inside cave = 2 km), reached a break down.
12:30	Back at entrance of cave.
	Rested for the remainder of the day.
16th December	
6:00	Prepared meal, packed camping and expedition gear.
7:30	Initiated hiking enroute to Cuevas Road.
12:11	Arrived at Cuevas Road.
13:10	Expedition team was pick off by vehicles and travelled to tapir Base.

ANNEX 2: *Biodiversity species list recorded at Actun Tunkul and vicinity*

Colloquial Name	Group	Family	Species
Rio Grande Leopard Frog	Amphibian	Ranidae	Rana berlandieri
Valliant's Frog	Amphibian	Ranidae	Rana vaillanti
Red-eye Treefrog	Amphibian	Hylidae	Agalychnis callidryas
Fleischmann's Glass Frog	Amphibian	Centrolenidae	Hyalinobatrachium fleischmanni
Mottled Owl	Bird	Strigidae	Ciccaba virgata
White-breasted Wood-wren	Bird	Troglodytidae	Henicorhina leucosticta
Rufous Piha	Bird	Incerta Sedis	Lipaugus unirufus
Northern Barred Woodcreeper	Bird	Dendrocolaptidae	Dendrocolaptes sanctithomae
Spot-breasted Wren	Bird	Troglodytidae	Thryothorus maculipectus
Collared Forest Falcon	Bird	Falconidae	Micrastur semitorquatus
Blue-crown Motmot	Bird	Motmotidae	Momotus momota
Great Tinamou	Bird	Tinamidae	Tinamus major
Rufous -tailed Jacamar	Bird	Gabulidae	Galbula ruficauda
Mealy Parrot	Bird	Psittacidae	Amazona farinosa
Squirrel Cukoo	Bird	Cuculidae	Piaya cayana
Boat-billed Flycatcher	Bird	Tyrannidae	Megarynchus pitangua
Magnolia Warbler	Bird	Parulidae	Dendroica magnolia
Wood Thrush	Bird	Turdidae	Catharus mustelinus
Gray Catbird	Bird	Mimidae	Dumetella carolinensis
Mottled Owl	Bird	Strigidae	Ciccaba virgata
Blue-ground dove	Bird	Columbidae	Claravis pretiosa
Rufous tailed Jacamar	Bird	Gabulidae	Galbula ruficauda
Rufous-tailed Hummingbird	Bird	Trochilidae	Amazilia tzacatl
Barred Antshrike	Bird	Thamnophilidae	Thamnophilus doliatus
Orange-billed Sparrow	Bird	Emberizidae	Arremon aurantiirostris
Spot-breasted Wren	Bird	Troglodytidae	Thryothorus maculipectus
Dot-winged Antwren	Bird	Thamnophilidae	Microrhopias quixensis
Golden Crown Warbler	Bird	Parulidae	Basileuterus culicivorus
Keel-billed Toucan	Bird	Ramphastidae	Ramphastos sulfuratus
Squirrel Cukoo	Bird	Cuculidae	Piaya cayana
Red-throated Ant-Tanager	Bird	Thraupidae	Habia fuscicauda
Northern Bentbill	Bird	Tyrannidae	Oncostoma cinereigulare
Lousiana Waterthrush	Bird	Parulidae	Seiurus motacilla
Green-back Sparrow	Bird	Emberizidae	Arremonops chloronotus

Brown Jay	Bird	Corvidae	Cyanocorax morio
Stripe-tailed Hummingbird	Bird	Trochilidae	Eupherusa eximia
Ovenbird	Bird	Parulidae	Seiurus aurocapillus
Dusky-capped Flycatcher	Bird	Tyrannidae	Myiarchus tuberculifer
Least Flycatcher	Bird	Tyrannidae	Empidonax minimus
Black-throated Green Warbler	Bird	Parulidae	Dendroica virens
Nightingale Wren	Bird	Mimidae	Mimus gilvus
Summer Tanager	Bird	Thraupidae	Piranga rubra
Rufous Breasted Spinetail	Bird	Furnariidae	Synallaxis erythrothorax
Slaty-tail Trogon	Bird	Trogonidae	Trogon massena
Tropical Kingbird	Bird	Tyrannidae	Tyrannus melancholicus
Blue-back Grosbeak	Bird	Cardinalidae	Caryothraustes poliogaster
Hooded Warbler	Bird	Parulidae	Wilsonia citrina
Crested Guan	Bird	Cracidae	Penelope purpurascens
Spectacle Owl	Bird	Strigidae	Ciccaba virgata
Northern Barred-Woodcreeper	Bird	Dendrocolaptidae	Dendrocolaptes sanctithomae
Ivory-billed Woodcreeper	Bird	Dendrocolaptidae	Xiphorhynchus flavigaster
Black-faced Antthrush	Bird	Formicariidae	Formicarius analis
Long-tailed Hermit	Bird	Trochilidae	Phaethornis longirostris
Great Curassow	Bird	Cracidae	Crax rubra
Blind Crab	Fish	Pseudothelphusidae	Typhlopseudothelphusa acanthochela
Freshwater Shrimp	Fish	Palaemonidae	Macrobrachium catonium
Catfish	Fish	Pimelodidae	Rhamdia sp.
eel	Fish	Unknown	sp. sp.
Pseudoscorpion	Insect	Bochicidae	Mexobisium goodnighti
Red-brocket Deer	Mammal	Cervidae	Mazama americana
Baird's Tapir	Mammal	Tapiridae	Tapirs Tapirus
Jaguar	Mammal	Felidae	Panthera onca goldmani
Ocelot	Mammal	Felidae	Leopardus pardalis pardalis
Kinkajou	Mammal	Procyonidae	Potos flavus chiriquensis
White-tailed Deer	Mammal	Cervidae	Odocoileus virginianus truei
Baird's Tapir	Mammal	Tapiridae	Tapirs Tapirus
Ocelot	Mammal	Felidae	Leopardus pardalis pardalis
Striped Hog-nose Skunk	Mammal	Mephitidae	Conepatus semistriatus yucatanesis
Nine-banded Armadillo	Mammal	Dasypodidae	Dasypus novemcinctus mexicanus
Red-brocket Deer	Mammal	Cervidae	Mazama americana

Paca	Mammal	Agoutidae	Agouti paca nelson
Agouti	Mammal	Dasyproctidae	Dasyprocta punctata
Black Howler Monkey	Mammal	Cebidae	Alouatta pigra pigra
Margay	Mammal	Felidae	Leopardus wiedii yucatanica
Hispid pocket Gopher	Mammal	Geomyidae	Orthogeomys hispidus
Mahogany	Plant	Meliaceae	Swietenia macrophylla
Cedar	Plant	Meliaceae	Cedrela odorata
Fishtail Palm	Plant	Arecaceae	Chamaedorea ernesti-augustii
Pacaya	Plant	Arecaceae	Chamaedorea tepejilote
Xaté (Jade)	Plant	Arecaceae	Chamaedorea oblongata
Ramon	Plant	Moraceae	Brosimum alicastrum alicastrum
White Poisonwood	Plant	Euphorbiaceae	Sebastiania tuerckheimiana
Canna	Plant	Cannaceae	Canna indica
Ceratozamia	Plant	Zamiaceae	Ceratozamia robusta
Zamia	Plant	Zamiaceae	Zamia decumbens
Bay leaf	Plant	Arecaceae	Sabal mauritiiformis
Give-n-Take	Plant	Arecaceae	Cryosophila stauracantha
Basket Tie-Tie	Plant	Arecaceae	Desmoncus orthacanthos
Jobillio	Plant	Anacardiaceae	Astronium graveolens
Copal	Plant	Burseraceae	Protium copal
Wild Cherry	Plant	Moraceae	Pseudolmedia glabrata
Bastard Mahogany	Plant	Meliaceae	Carapa guianensis

ANNEX 3: *Quest Tunkul Expedition Team (December 13 – 16, 2011). Front row: Boris Arevalo, middle row from left to right: Zair Pott, Meachel Burton, Lenny Gentle; back row: Derric Chan*