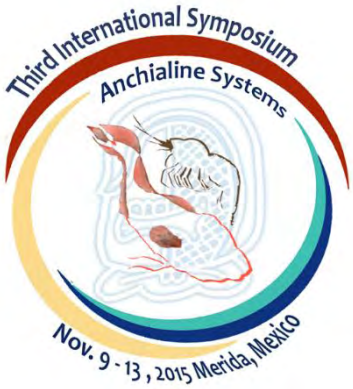
Abstracts



Fundación UADY

TOPIC: TROPHIC DYNAMICS AND ECOSYSTEM FUNCTIONING

Fri 13 November 2015 - "Manuel Cepeda Peraza" Auditorium *9:55 – 10:20*

Modelling the trophic web of the Ox Bel Ha anchialine system, Yucatan Peninsula

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The variations in the trophic web structure of the Ox Bel Ha system are analyzed based on data collected in 2013. Due to the observed variation in the isotopic signature of some species, two trophic models were used: one with low and one with high trophic specialization. Each trophic web obtained was analyzed considering: number of nodes and interactions, connectance, modularity, robustness (taken as the proportion of removed species needed to eliminate 50% of the observed diveristy), and resistance (robustness x species richness). These variables allowed to compare the two models. Data on number of trophic levels, size and number of trophic chains and centrality indices were used to identify keystone species. Robustness and resistance showed similar values (0.45 - 0.41), suggesting that the functionality of the web is not compromised by the level of specialization. In contrast to robustness, the resistance increases with number of species, showing that the web can be unstable at low diversity values. In other words, in this case the number of species is a better defense against local extinction than web structure. Trophic levels ranged between 2 and 3.48, so the trophic webs were established with 3 levels. Several scenarios of trophic web disturbance within the Ox Bel Ha system are discussed.

Keywords: robustness, resistance, modularity, keystone species, trophic levels, trophic chain.

TOPIC: BIOTIC COMMUNITY ASSEMBLAGES

Wed 11 November 2015 - "Manuel Cepeda Peraza" Auditorium *10:00 – 10:25*

Distribution and composition of the anchialine fauna in the Ox Bel Ha anchialine system, Yucatan Peninsula

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Along the eastern shore of the Yucatan Peninsula develop inmense flooded cave systems. Typically cenotes represent the entrances to these systems that form from the shore to 15 km or more inland. In the passages two water masses co-occur, divided by a sharp halocline that becomes deeper as distance from the coast increases. In this study we considered the vertical (depth) and horizontal (distance from the coast) dimensions to characterize the fauna present in the system, in order to find out if different sections of the system could be isolated from each other. A 12 km transect was established perpendicular to the coastline and four sampling points were chosen; three samples from each section were obtained over a year (February, August and December 2013). The water column at each of the sites was profiled with a Hydrolab sonde. A total of 368 crustaceans were collected, belonging to 15 of the 45 species of macro-crustaceans reported for the Yucatan Peninsula; the termosbaenacean *T. unidens* was the most abundant species. The relatively similar faunal composition along the transect suggests a high connectivity between sections, although there is an increase in diversity with increasing distance from the coast. The system shows a high degree of connectivity in February and August, and some changes in the distribution patterns are observed in December possibly due to the influence of the rainy season that seems to create a disruption in the water masses.

Key words: diversity, connectivity, fauna, cenotes, Yucatan.

TOPIC: PHYSIOLOGY, MORPHOLOGY AND DEVELOPMENT

Mon 9 November 2015 - "Manuel Cepeda Peraza" Auditorium *15:20 – 15:55*

Assessment and Impact of Mercury on Anchialine Ecosystems

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Anchialine systems are particularly susceptible to elevated heavy metal concentrations due to water stratification, very low exchange rate of water and long residence times, as well as the isolation of the endemic populations. In an effort to determine the physiological and ecological impacts of elevated mercury levels on anchialine ecosystems, we examined four cave systems on the Adriatic coast, Croatia: Bjejajka, Mandalina, Bičina and Čapljina. Cave water samples and crustacean specimens were sampled at the surface, above the halocline, below the halocline and at the bottom. To determine the impact of mercury upon the physiology of the organisms within the anchialine systems, we examined oxygen consumption rate of 120 individual crustaceans from the four systems using microcathode, polarographic oxygen electrodes. In addition to oxygen consumption, metabolism was measured indirectly by determining activities of enzymes in the electron transport system (ETS). Total mercury levels (THg) within the Bjejajka cave water were greatest below the halocline (110.0 ng L^{-1}), but lower than previous reported highest collections (920 ng L^{-1}). *Niphargus* sp. collected from Bjejajaka cave ranged from 156.0 to 450.0 ng g^{-1} of THg. Mandalina THg levels were greatest at the bottom (50.0 ng L^{-1}), but THg levels in the amphipods ranged from 109.0 to 538.0 ng L^{-1}. Bičina and Čapljina THg levels were <3 ng L^{-1} and specimen tissue THg levels ranged from 49.0 to 74.5 ng g^{-1}. Across caves with the same species, mass varied inversely with increasing THg levels resulting in Bičina and Čapljina cave crustaceans having significantly greater mass. Although it is difficult to compare the organisms between the four systems due to the diversity of species collected, there were no significant differences determined between the mass-specific oxygen consumption rates or the ETS rates between the four caves systems.

Keywords: anchialine, mercury, metabolism, crustaceans, Croatia

TOPIC: HYDROGEOCHEMISTRY

Wed 11 November 2015 - "Manuel Cepeda Peraza" Auditorium *9:35 – 10:00*

Linking Water Chemistry Records to Ecosystem Function in an Anchialine Cave of the Yucatan Peninsula, Mexico

Brankovits, David [1]*, John W. Pohlman [2], Helge Niemann [3], Moritz F. Lehmann [3], Laura Lapham [4], Michael Casso [2], Erich Roth [5], Nick Lowell [6], Fernando Alvarez Noguera [7], Thomas M. Iliffe [1]

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The Caribbean coast of Mexico's Yucatan Peninsula contains the world's densest known accumulation of anchialine caves where, despite of the energy and food limitations, a surprising diversity of invertebrates (mainly Crustaceans) thrives. A decades-old study based on the simple observation of ^{13}C-depleted biomass in the cave-adapted fauna suggested biogeochemical processes related to methane-linked carbon cycling and/or other chemoautotrophic pathways as a source of energy and carbon, but was unable to identify the exact source of this material.
(1) To identify major biogeochemical processes that sustain life, we measured the distribution, concentration and isotopic composition of biotic and abiotic components of the ecosystem in an anchialine cave system (within Ox Bel Ha) ~8 km from the coastline. Water samples were collected along a vertical profile manually and with a high-resolution water sampling device (Octopipi) that allowed sampling the undisturbed water. Elevated concentration and ^{13}C-depleted Dissolved Organic Carbon (DOC) suggest terrestrial organic matter input from overlying soils. High concentrations of methane (7 □M) and evidence for methane oxidation in the fresh water portion of the water column suggest methane availability and consumption. Moreover, the presence of ^{13}C-depleted fatty acid biomarkers (e.g., C16:1□7c with □^{13}C-values as low as -54.1‰) from tissues of atyid shrimps indicate that methanotrophic bacteria were a substantial fraction of their diet. Our findings suggest that methane and DOC are ecologically important components of the carbon cycle within the subterranean ecosystem.
(2) To investigate environmental factors that control methane availability in the cave over time, we deployed two osmotically-driven pumps (OsmoSamplers) for 6 months. Simultaneously, data loggers recorded dissolved oxygen, salinity, temperature and current velocities in the cave environment, and a rain gauge recorded precipitation on the surface. The results suggest that rain influences the delivery and distribution of methane in the cave. These data provide novel insight into the interconnections between external climate forcing and subterranean anchialine ecosystems.

TOPIC: BIOTIC COMMUNITY ASSEMBLAGES

Wed 11 November 2015 - "Manuel Cepeda Peraza" Auditorium *12:25 – 12:50*

Which is the macrofauna population size in the anchialine caves of Cozumel Island?

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We made a quantitative ecological monitoring in four anchialine caves on Cozumel Island, Quintana Roo, Mexico, two of them with direct connection to the sea. We evaluated the richness (Chao 2 index), the community structure, and the population size. We found differences within and between caves in both richness and density, with only few or any shared species between caves, having the two caves with direct connection to the sea (El Aerolito and La Quebrada) the highest amounts. An nMDS with nine abiotic factors showed us that higher densities and species number are at the sites further to the entrance of the cave and closer to the halocline, and at bigger and shallower the caves. We calculated that exist 808,651+/-385,103 organisms of the conspicuous species in the anchialine caves of Cozumel, 84.99% of them in El Aerolito and 14.95% in La Quebrada, and the population's sizes per species of each cave were between 102 and 269,994 organism. El Aerolito is the system of the biggest concern in Cozumel because it has the biggest biodiversity with almost four times the richness of the other three caves together and the highest density, including endemic species with a small population size, as the sea star *Copidaster cavernicola* with an estimate of only 369 individuals. This information is a strong evidence of the vulnerability of the fauna inhabiting anchialine cave ecosystems, urging the necessity to protect these habitats.

Key words: Density, Ecology, Richness, Stygobite, Troglobite

TOPIC: TROPHIC DYNAMICS AND ECOSYSTEM FUNCTIONING

Fri 13 November 2015 - "Manuel Cepeda Peraza" Auditorium *9:30 – 9:55*

Spatial and temporal distribution of stygobitic shrimps: *Creaseria morleyi*, *Typhlatya mitchelli* and *T. pearsei* in Yucatan cenotes.

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Studying the distribution, population dynamics and behavior of stygofauna in their natural habitat may be difficult, technically challenging and involves cave diving risks. Nevertheless, many new species have been found, described and studied. Most of these studies focus on taxonomy, biogeography, evolutionary and genetic processes, leaving behavioral and ecological questions to remain unanswered. The Palaemonid *Creaseria morleyi* and the Atyids *Typhlatya mitchelli* and *T pearsei* were monitored to evaluate the depth distribution inside the twilight zone during day and night of two cenotes: Kankirixché and Tza-Itzá. The monitoring was repeated every two months in a period of a year to study seasonal changes in population size. The trophic interaction between these species was video-recorded with infrared devices in the laboratory to confirm predator prey relationships.
Results indicate: 1) Higher densities of all species are found in cenote Tza Itzá; 2) *C. morleyi* is more frequent during night and is found only in this time at shallow areas that are, otherwise illuminated during the day; 3) Beyond the open water surface of the cenotes where *Typhlatya* species are not found, it exhibits a decreasing density as the depth increases 4) *Typhlatya* spp. maintains its densities similar during day and night at each corresponding depth; 5) Population size of *C. morleyi* increases at the beginning of the rainy season while the populations of *Typhlatya mitchelli* and *T. pearsei* exhibit no significant change; 6) *C. morleyi* is capable of capturing and feeding on live *Typhlatya*.
The observed distribution pattern in *Typhlatya mitchelli* and *T. pearsei* could be explained by the greater availability of allochtonous and photosynthetic material at the entrance of the cenote. The migration to the cenote entrance of *C. morleyi* could be explained by the trophic interactions with *Typhlatya* species and other feeding sources such as *Mysidae* and allochtonous material.

Keywords: underground estuary; cave shrimps; behavior; cenote.

TOPIC: GEOLOGY, PALEONTOLOGY AND SPELEOLOGY

Mon 9 November 2015 - "Manuel Cepeda Peraza" Auditorium *15:55 – 16:20*

The recovery of benthic foraminifera in a submarine cave following an anthropogenic disturbance in 1941 CE

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Submarine caves are circum-global coastal environments that host diverse endemic fauna and unique ecosystems. However, little is known about their response to coastal anthropogenic activity and urbanization. In 1941 CE, sedimentary dredge spoils from a nearby marine lagoon was pumped into a flooded sinkhole that was connected to Bermuda's Green Bay Cave System, polluting the submarine cave with foreign sediment, chemicals, and organisms. Influx of these materials changed the physical and biological conditions in the underwater cave environment, leading to a potential alteration in the benthic foraminiferal community. Benthic foraminifera are environmentally sensitive microfossils, which have an established reputation for documenting anthropogenic effects in coastal environments. Given the preservation potential of benthic foraminifera in the sediment record, the focus of our objective was to examine how the 1941 CE disturbance impacted cave benthic foraminifera. Sediment cores were collected in Green Bay Cave and examined with X-radiography, granulometry, radiocarbon dating, and foraminiferal paleoecology. The X-radiograph reveals fine-grained carbonate mud that has been accumulating in the submarine cave over the last ~1600 years, a transition to coarse-grained lagoonal sand and organic matter, and finally a reversion back to carbonate mud. This sedimentary lithofacies succession is atypical for submarine caves, and unprecedented in the Holocene sedimentary history of Green Bay Cave. The benthic foraminiferal community before the 1941 CE event were similar to other modern well-circulated and oxygenated benthic habitats in Green Bay Cave. In the 1941 CE sediment layer, lagoonal taxa dramatically increase, while cave-dwelling foraminiferal species decrease. Sixty-four years later, the modern core-top benthic foraminifera in the tunnel impacted by the sediment injection event are indistinguishable from core-top assemblages in non-impacted cave tunnels with similar microhabitat environments. These results suggest some resiliency in the submarine cave benthos to minor disturbance.

Keywords: Micropaleontology, foraminifera, anthropogenic, submarine, cave

TOPIC: ECOSYSTEM PROTECTION AND EDUCATION

Mon 9 November 2015 - "Manuel Cepeda Peraza" Auditorium *12:15 – 12:40*

Baseline Assessment and Conservation Priorities of Anchialine Ponds in Eleuthera, The Bahamas

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The Bahamas has an abundance of anchialine ecosystems that are under threat, poorly studied and in need of protection. The island of Eleuthera has over 200 of these inland water sites that have little to no baseline data. The purpose of this study was to evaluate the anchialine ponds of Eleuthera. Specifically, to identify sites with endemic species and to determine the extent of human disturbance to prioritize sites for conservation. The ponds were assessed in terms of their biota, physical characteristics, water quality and the level of human disturbance.

The results indicate a number of endemic species inhabit ponds on Eleuthera. Sweetings Pond in North Eleuthera was found to have an unusually high abundance of seahorses, 0.18±0.13 fish per m^2. The seahorse species of Sweetings Pond are undergoing genetic investigation. At three different sites, cave shrimp were found which have not previously been reported on Eleuthera. These shrimp may be a new species or the critically endangered *Barbouria cubensis*. The water quality data did not indicate pollution in any of the sites. However, human disturbance was present in all but one site in the form of fly tipping or/and the introduction of species. Based on the data, each anchialine pond was given a score to determine the ponds in need of restoration and conservation management.

This study highlights the need to conserve ponds with endemic species and restoration of sites that have been impacted by humans. To achieve conservation of these ecosystems will require raising public awareness, improving community stewardship and gaining government level protection. The Bahamas National Trust estimates that less than one percent of the tourists that come to The Bahamas each year visit anchialine ponds, highlighting the huge opportunity for ecotourism development. The next step for this study is to evaluate the remaining ponds on Eleuthera.

Keywords: Bahamas, seahorse, cave shrimp, conservation, ecotourism.

TOPIC: PHYLOGENETICS AND HISTORICAL BIOGEOGRAPHY

Wed 11 November 2015 - "Manuel Cepeda Peraza" Auditorium *15:30 – 15:55*

Subterranean connectivity and distribution in the anchialine scale worm *Pelagomacellicephala iliffei* from the Bahamas Archipelago

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Anchialine caves are circum-tropically distributed, being especially numerous on islands and peninsulas within the Caribbean Sea and adjacent North Atlantic Ocean. Examination of fauna in these habitats reveals extraordinary distribution patterns; inhabiting isolated anchialine caves on opposite sides of the Atlantic and Pacific. Initially these distributions were explained as the result of relict marine populations originally inhabiting the Tethys Sea during the Mesozoic, later dispersing by vicariant processes related to plate tectonics and/or marine regressions and transgressions. Alternative dispersal theories hinted towards the possibility of a 'continous spelean corridor from the deep-sea', but were dismissed; to be later revisited in terms of a crevicular dispersal mode. Scientific diving investigations over the last decade revealed a wide distribution of the stygobitic polynoid *Pelagomacellicephala iliffei* throughout the Bahamas. These findings represent the first record of non-crustacean anchialine taxa within the Bahamas to display such a wide distribution within one of the largest anchialine environments in the Caribbean and North Atlantic. Our phylogenetic investigations recovered five separate entities of *Pelagomacellicephala iliffei* corresponding to four islands of the Great Bahama Bank. Given the results of our association tests, each entity is isolated to where it was collected, showing only intraisland dispersal potential. These findings suggest a unique evolutionary history for each entity, representing separate and independent colonization events into anchialine caves, diversifying after each event with little to no morphological changes. Given our results of *P. iliffei*, the potential for a 'continuous spelean corridor' is only evident within individual islands/landmasses within the Bahamas. While it is plausible that ancient subterranean corridors once existed between larger geographic areas, it appears that the oceanic barriers surrounding the four Bahamian islands on the Great Bahama Bank have not been crossed for at least the last 5.07 – 25.51 Mya^{-1}.

Keywords: anchialine, GMYC, species delineation, ecological speciation, Polynoidae

TOPIC: ECOSYSTEM PROTECTION AND EDUCATION

Mon 9 November 2015 - "Manuel Cepeda Peraza" Auditorium *14:30 – 14:55*

World Register of Marine Cave Species (WoRCS): establishing a new thematic species database for marine cave biodiversity

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Scientific exploration of underwater cave environments (including anchialine caves) over recent decades has led to outstanding discoveries of novel taxa, increasing our knowledge on marine biodiversity. Nevertheless, biological research on marine caves has taken place only in a few areas of the world and relevant information remains fragmented in isolated publications and databases. This fragmentation makes assessing the conservation status of marine cave species especially problematic, and this issue should be addressed urgently given the stresses resulting from rampant development in the coastal zone worldwide. The goal of the World Register of Marine Cave Species (WoRCS) initiative is to create a comprehensive taxonomic and ecological database of known marine cave species worldwide and to present this as a Thematic Species Database (TSD) of the World Register of Marine Species (WoRMS). WoRCS will incorporate ecological data (e.g., type of cave environment, salinity regimes, and cave zone) as well as geographical information on the distribution of species in cave environments. Biodiversity data will be progressively assembled from individual database sources of regional, national or local levels, as well as from literature sources (estimation: >20,000 existing records of cave-dwelling species scattered in several databases). Information will be organized in the WoRCS database following a standard glossary based on existing terminology. Cave-related information will be managed by the WoRCS thematic editors with all data dynamically linked to WoRMS and its team of taxonomic editors. In order to mobilize data into global biogeographic databases, a gazetteer for the marine caves of the world will be established. The presence records of species could be eventually georeferenced for submission to the Ocean Biogeographic Information System (OBIS) and constitute an important dataset for biogeographical and climate change studies on marine caves.

Keywords: marine caves, anchialine caves, biodiversity, global species databases, biodiversity management

TOPIC: PHYLOGENETICS AND HISTORICAL BIOGEOGRAPHY

Wed 11 November 2015 - "Manuel Cepeda Peraza" Auditorium *15:55 – 16:20*

Phylogenetic and biogeographic relationships of the genus *Halosbaena* (Thermosbaenacea)

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Thermosbaenaceans are a small and little known order of stygobitic crustaceans found in anchialine environments in areas influenced by the Tethys Sea. The only described Southern Hemisphere Thermosbaenacean is *Halosbaena tulki* from northwestern Australia. We explored the large and small scale phylogenetic and biogeographic relationships of the genus *Halosbaena,* and estimate ages of divergence, by sequencing mitochondrial (COI) and nuclear genes (H3, 28S, 18S) from many specimens of *Halosbaena tulki* from across its range in Western Australia and compared these with sequences from two other described *Halosbaena* species (Okinawa, Canary Islands) and an undescribed specimen from Christmas Island in the Indian Ocean. *H. daitoensis* (Minamidaito-jima, Okinawa) and *H. fortunata* (Canary Islands) are sister species relative to *H. tulki* (Australia) and Christmas Island. The Daito islands and Christmas Island are isolated seamounts of post Cretaceous age indicating oceanic dispersal at some stage within the greater Tethyan province. The Christmas Island specimen is a distinct species and is sister to the Australian specimens. Although the Australian *H. tulki* specimens form a single phylogenetic lineage, they are likely to constitute a number of distinct species. There are five lineages within *H. tulki* that reflect geographic areas: Barrow Island, Cape Range East Side, Cape Range West Side, Pilbara High Altitude, Pilbara Low Altitude. This pattern is inferred from both mitochondrial (15-22% COI distances between lineages) and nuclear sequences. The two Cape Range lineages are sister taxa, but the relationship between the other lineages is unclear, although the two Pilbara lineages do not appear to be sisters. Within the Cape Range West lineage, there are clear phylogeographic groupings that equate to the northern, central and southern parts of the western Cape Range, which agrees with patterns from a number of other subterranean species from the same areas, implying a common geological cause.

Keywords: Tethys, dispersal, vicariance, Australia, speciation

TOPIC: ECOSYSTEM PROTECTION AND EDUCATION

Mon 9 November 2015 - "Manuel Cepeda Peraza" Auditorium *12:40 – 13:05*

Recovery Plan for Bermuda's Critically Endangered Cave Fauna

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A recovery plan has been recently instituted by the Bermuda Government's Department of Conservation Services to conserve 22 endemic, cave-adapted, aquatic species from Bermuda's anchialine caves that are now classified on the IUCN Red List as Critically Endangered. Although many of these cave-dwelling species appear to be restricted in their distribution, having only been found in a single cave system or in some instances in just one cave within a system, the level of connectivity known to exist between the submerged underwater passages of the Island's caves suggests that an effective recovery plan must address the cave system in its entirety and the species collectively. The primary goal of this recovery plan is to promote and enhance self-sustainability of Bermuda's unique cave-adapted fauna by ensuring adequate protection of the entire cave habitat. This recovery plan discusses threats and conservation efforts for Bermuda's cave habitat and critically endangered species within, following a summary of our current knowledge of their status. The primary recommendation of this plan is that given the diversity of species, their erratic distribution patterns, extremely low recorded numbers and the logistical challenges inherent in learning more about their biology and ecology, there is a need for immediate legislative protection for the entire cave habitat. The plan also calls for the prioritized mapping of the various cave systems with integration of the data into the Island's GIS, and it focuses on the actions needed to broaden our understanding of the biology, ecology and general habitat requirements of Bermuda's cave fauna and focuses on the actions needed to broaden our understanding of these. Bermuda's caves are already afforded protection from development under the Planning Act of 1974.

TOPIC: BIOTIC COMMUNITY ASSEMBLAGES

Wed 11 November 2015 - "Manuel Cepeda Peraza" Auditorium *17:00 – 17:25*

The Anchialine Caves in the Kornati National Park

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The Kornati National Park was established in 1980 due the extraordinary landscape patterns, interesting geomorphology, highly indented coast and very rich fauna of marine ecosystems. It is located in the eastern coast of the Adriatic Sea , Republic of Croatia,. The Kornati archipelago includes 89 islands. All of them are made of carbonate rocks (limestone and dolomites). The oldest rocks are from Upper Cretaceous. During speleological and biospeleological researches 30 caves were discovered and 16 of them were anchialine caves. Almost all of them are pits. All speleological objects in the Kornati archipelago are relatively small. The deepest cave is 70 m deep. However, speleothems are often present in great variations of shape and size. Some of them are of significant size. That is the evidence that the submerged (phreatic) parts of caves in geological past were not actually submerged. All explored caves are partly submerged as a consequence of the sea level rise after Würm Glaciation.
In the couple of pits, which served as a source of potable water for local people, fragments of terracotta (ceramic) pots were found. The oldest fragments are belonging to the Roman period.
Systematic research of the aquatic fauna, and particularly *Crustacea* in the Kornati National Park was initialized by Slovenian biospeleologist Boris Sket in 1980s. Intensive speleological and biospeleological researches have continued in last decade. Recently, cave fauna has been especially explored and includes records on amphipod crustacean genus *Niphargus* and T*ermosbenacea*, as well as *Copepoda* species in the genus *Acantocyphops*, *Diacyclops*, *Badijella*, *Stygocyclopia* and *Stephos*.

Keywords: National Park, Anchialine Caves, aquatic fauna

TOPIC: ECOSYSTEM PROTECTION AND EDUCATION

Mon 9 November 2015 - "Manuel Cepeda Peraza" Auditorium *14:55 – 15:20*

Anchialine pool restoration work in Waiʻōhinu, Hawaiʻi Island

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Coastal development and introductions of invasive plant and animal species have significantly reduced both the quantity and quality of anchialine pools throughout Hawaiʻi. Hawaiʻi Wildlife Fund worked with government agencies to designate a 1,330-acre coastal property on Hawaiʻi Island into Forest Reserve to enable conservation of its anchialine ecosystems, native plants, and cultural resources. The two largest pool perimeters were heavily laden with invasive christmasberry (*Schinus terebinthifolius*), sourbush (*Pluchea carolinensis*) and kiawe (*Prosopis pallida*). Both pools had a deep sediment layer, one with impenetrable growth of seashore paspalum (*Paspalum vaginatum*) and the other with tilapia (*Oreochromis mossambicus*).

Native pool shrimp were never seen in the pool with tilapia, but were previously observed in the pool choked with paspalum, and smaller pools within the complex. Species inhabiting this region include *Halocaridina rubra, Metabetaeus lohena,* and *Palaemon debilis*. The *H. rubra* in this anchialine complex exhibit unique haplotypes and are genetically distinct from other nearby pools.

Restoration of anchialine ecosystems began in 2009 with the hand removal of the non-native vegetation around the pools followed by selective stump treatment with herbicide. Sediment removal was accomplished with a trash pump. The discharge line carried sediment into lava fields at least 25m from the pools. Certain water quality parameters and relative shrimp abundance were monitored before, during and after the restoration work.

Currently, the invasive vegetation is gone and pool peripheries abound with native plants. The sediment sites are also supporting native vegetation. A low level of effort is being expended to prevent paspalum from reinvading the pools. Pool shrimp are now abundant in the pool where paspalum was removed. Tilapia removal with rotenone is planned for the second pool in 2016.

TOPIC: BIODIVERSITY AND EVOLUTION

Wed 11 November 2015 - "Manuel Cepeda Peraza" Auditorium *14:05 – 15:30*

Comparative methods shed light on the origin of anchialine fauna: Do any anchialine species have a deep sea origin?

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Anchialine environments are circum tropical land-locked water bodies communicating with the sea through crevices. They represent isolated habitats, younger than the ocean susceptible for independent colonization events by marine biota, affected by the particular geological and ecological characteristics of each system, such as age, distance from the sea or habitat heterogeneity. In biogeographic terms, anchialine habitats represent insular habitats, existing as numerous discrete and varied environments that provide independent replicates of comparable evolutionary processes. Most of anchialine habitats harbor high endemism, disharmonic communities, species with unique sets of troglomorphic features, as well as potentially ancient animal lineages interpreted as living fossils. Several hypotheses has been suggested to explain these observations, but none of them have been tested explicitly using large data sets, nor included in a broader conceptual frame that would allow a comparison of anchialine habitats with other marine environments. By using all available information and comparative phylogenetic methods, we investigated in detail the putative deep-sea origin attributed to several anchialine exclusive taxa nested into groups otherwise dominated by deep sea species, such as bresioloid shrimp, galatheid squat lobsters, and polynoid, hesionid, and scalibregmatid annelids. Ecological parameters including depth and habitat preferences were reconstructed on dated phylogenies using ancestral character estimation methods. Despite of the conspicuous deep sea affinities of these lineages, our analyses show that a deep sea origin can only be unambiguously attributed to the cave endemic squat lobster *Munidopsis polymorpha*.. In summary, our analysis highlight the complexity of the origin of anchialine fauna, which is better explained by a combination of events and processes linked to the diverse evolutionary scenarios specific to each group in question.

Keywords: origin anchialine fauna, comparative methods, phylogenetics, deep sea

TOPIC: PHYLOGENETICS AND HISTORICAL BIOGEOGRAPHY

Wed 11 November 2015 - "Manuel Cepeda Peraza" Auditorium *12:00 – 12:25*

New Records of Anchialine Crustaceans from Cozumel Island

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In Cozumel Island has been recorded several cave species (*Barbouria yanezi, Procaris mexicana, Agostocaris bozanici, Yagerocaris cozumel, Parahippolite sterri, Calliasmata nohochi*), in the anchialine environment from four systems mainly (Aerolito, Xcan-ha, Chankanaab and Tres Potrillos). Recently were made new several surveys in other underground systems Chem-Pita, Tres Potrillos, and Chankanaab and recorded new crustaceans from the genus *Xibalbanus* sp., *Typhlaty*a sp., *Agostocaris* sp., and a new shrimp from the Superfamily Bresilioidea. The underground diversity in the Island is increase and probably there are still species to discover. On the Remipedia *Xibalbanus* sp. in two different cenotes from Cozumel show that this populations have an important separation with those populations reported to mainland in Yucatan Peninsula. Whilst about the *Typhlatya* sp. the closet species are those reported to Bahamas. However, the others populations from *Agostocaris* sp. reported here shown a very nearest to *Agostocaris bozanici*. In contrast the new shrimp from Superfamily Bresilioidea is more close to those genera from deep sea like Alvinocarididae, due the wider of the scaphocerite.

Keywords: Cozumel; Atyidae; Remipedia, Agostocarididae; Bresilioidea.

TOPIC: HYDROGEOCHEMISTRY

Wed 11 November 2015 - "Manuel Cepeda Peraza" Auditorium *9:00 – 09:35*

Biological changes of an anchialine influenced karst estuary are driven by aquifer discharge rates.

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The Double Keyhole Spring system discharges up to 1500 L/s of brackish water into the Gulf of Mexico, forming a karst estuary. The spring conduit contains at least one anchialine room with a clear boundary between brackish and freshwater. We previously described geochemical gradients that formed because of interactions between the Gulf of Mexico and inland hydrological conditions. We have now examined changes in the microbial communities within the spring conduit, discharge pond, and two estuary sites over a two year period while also monitoring hydrological and geochemical changes. We found that the volume of aquifer discharge and physical gradients formed by aquifer discharge are more important in shaping the microbial communities than geochemical fluctuations of the spring and estuary system.

TOPIC: ECOSYSTEM PROTECTION AND EDUCATION

Mon 9 November 2015 - "Manuel Cepeda Peraza" Auditorium *11:25 – 11:50*

Temporal variation of the biomarker Acetylcholinesterase in *Gambusia yucatana* (Regan 1914) in three cenotes of the Yucatan Peninsula, Mexico

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The physico-chemical properties of some pesticides used in agricultural practices in the north of the Yucatan Peninsula, along with the karstic nature of the soils in the area, are the main causes of the long-distance transport of those compounds. Runoff and infiltration of pesticides in the aquifer explain the contamination of the water-bodies (cenotes) in the area. The effect of pesticides on the fauna present in the cenotes can be assessed by means of biomarkers thus, the objective of this research was to quantify the activity levels of the Acetylcholinesterase (AChE) in the mosquito fish *Gambusia yucatana*, collected in three cenotes of Northern Yucatan in a region known as the Ring of Cenotes. AChe quantification pursued to evaluate whether the fish in the sampled cenotes had been exposed to anticholinesterasic pesticides, e.g. organophosphorous compounds and carbamates. Fish sampling was carried out in the dry and the rainy seasons, 2011. The results reveal the presence of organophosphorous compounds and carbamates in the water of cenotes with variable seasonal levels. In particular, the lowest mean level of AChe was found during the rainy season in a cenote located in Celestún (Northwest of the Yucatan Peninsula).

Keywords: Biomarkers, Acetylcholinesterase, *Gambusia yucatana*, Ring of Cenotes, Yucatán

TOPIC: ARCHAEOLOGY

Fri 13 November 2015 - "Manuel Cepeda Peraza" Auditorium *12:00 – 12:25*

Anchialine caves as a fresh water resource on the Eastern Adriatic seafaring route

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The karst area covers more than 50% of the overall territory of Croatia, and, up to the present day, holds the evidence of over 9000 caves. As far as we know, more than a hundred, situated along the coast and on the numerous islands, belong to the group of the anchialine caves, and are partially explored and/or described. As a specific speleological phenomenon, containing a freshwater layer at the top of the water body in their interior, they are extremely important sources of potable water in the dry karstic areas. Seafaring along the eastern Adriatic coast, for either local needs, or following the most suitable seafaring route (linking the southern and northern parts of the Adriatic basin), demanded safe anchorages, and food and water supply. In that context, we can presume that the anchialine caves played an important role for renewing the marine supplies, especially when distant from well-organized ports. Whether utilized as simple water resources, cave sanctuaries, or medical posts, they certainly played an important role in the everyday life of the inhabitants of the Adriatic region. The paper presents recently recovered archaeological evidence from the achialine caves, in relation to the well-known land and underwater archaeological sites. The lack of awareness of the archaeological potential of such places has already resulted in the disturbance and destruction of the archaeological context in some of the more frequently visited caves.

Keywords: fresh water, caves, seafaring, Adriatic Sea, archaeology

TOPIC: ECOSYSTEM PROTECTION AND EDUCATION

Mon 9 November 2015 - "Manuel Cepeda Peraza" Auditorium *11:50 – 12:15*

Sinkholes visitor carrying capacity: preliminary data on how many people visit the Yucatan "cenotes" and the need of baseline information to implement a management plan

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The resilience level of the cave fauna communities to disturbance in an otherwise profoundly stable and slow-changing environment is unknown. The reproductive biology, demography and tolerance to shifts in different physic-chemical variables of most Yucatan cave species is also unknown. What is known is that due to its unique scenic beauty, the "cenotes" have become a source of economic benefits that impact the wellbeing of local populations and contribute to the preservation of the local forest and aquifer. The development of tourism services related to "cenotes" within the Yucatan State is a relatively recent activity that has steadily increased over the last 15 years, given the growth of the city of Merida and implementation of public funds and policies supporting advertising and shared development of touristic infrastructures. The number of cenotes with direct economic use has increased, as has increased the number of users who visit these water bodies per year. This situation has led to some legal battles between municipalities, quarreling to earn the right to exploit a particular cenote or ended in absurd and desperate government management initiatives such as chlorination of the cenotes to control balneary water quality. Most users look for leisure and recreation through swimming and diving activities. Such activities, although controlled in a much-reduced number of cenotes, remain unmanaged in the rest. Most cenotes already have increased tourism impact signs, such as inorganic garbage accumulation, presence of specific chemicals, and increased organic matter input, that together could affect estigobitic species communities of flooded caves of Yucatan State.
In an attempt to provide much-needed baseline metrics in cave fauna, water variables and user intensity, frequency and timing, we present preliminary information on:

- spatially explicit cave fauna diversity/abundance and cave descriptors data base
- water level and temperature long-term monitoring
- user attendance metrics long-term monitoring

Keywords: long-term monitoring, cave fauna abundance, cave fauna diversity, sinkhole descriptors, tourism

TOPIC: BIOTIC COMMUNITY ASSEMBLAGES

Wed 11 November 2015 - "Manuel Cepeda Peraza" Auditorium *17:25 – 17:50*

The Barbouridae: Color and Classification

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Anchialine caridean shrimps of the family Barbouridae live in sea caves and pools in tropical or warm temperate seas. Previously, they were placed in the family Hippolytidae, now considered to be polyphyletic. The family placement has been changed due to morphological and genetic evidence. The taxonomy of both the genera and species also has been revised, and an eastern Pacific species was described in 1996. Molecular and morphological evidence suggests that the barbouriids are mostly closely related to the family Lysmatidae. Like barbouriids, lysmatids prefer low light habitats and often are nocturnal. Both lysmatids and barbouriids often are colored red or have red markings, seemingly characteristic of shrimps living in sea caves, but the functional significance of the pigment is unknown. Much more study of the distribution, larvae, and natural history of these shrimps is needed before one can speculate on why they are confined to anchialine habitats.

TOPIC: BIODIVERSITY AND EVOLUTION

Wed 11 November 2015 - "Manuel Cepeda Peraza" Auditorium *14:30 – 14:05*

Tracing the cave history of Nerillidae (Annelida) – the meiofaunal conquistadores of anchialine caves

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Anchialine caves are often regarded as hotspots of endemism, harbouring highly adapted stygomorphic lineages such as the crustacean remipedes. However, whereas most studies account for macrofaunal lineages, only few have addressed the diversity and origin of anchialine microscopic animals (meiofauna). Meiofauna living between the sand grains in coastal waters (interstitial fauna) generally show direct development and lack of a pelagic larval dispersal stage; enhancing the probabilities for long-term isolation and relictualization. Furthermore, the coastal meiofauna relatives are generally infaunal and negative phototrophic, and may actively have been seeking crevicular entrances to the caves, or due to their small size accidently become dragged into the caves by tidal currents, flushing through the underground. The evolutionary patterns of meiofaunal cave colonization may therefore give new input to the debated hypotheses on stygofauna origin. Over the last decade, an intense anchialine exploration of the family Nerillidae (Annelida) has generated a vast number of new records and undescribed species. Even though the main collecting efforts have been addressing the tidal and subtidal coastal habitats, no less than 29 species (out of totally 111 sequenced species) have been found solely in anchialine caves of Mexico, the Bahamas, Cuba, Bermuda, the Canary Islands and the Mediterranean. These 29 cave endemics are found phylogenetically nested within 10 different genera, generally representing separate colonization events. Despite the diversity, only one genus, *Longipalpa*, is endemic to caves, also being the single genus within the family adapted to 'cave pelagicism' through extended palps and ciliation used for swimming and food collection. Correlation analyses of these and other morphological traits against geographical and ecological parameters will be explored, in order to distinguish putative morphological adaptations to the environment. With these results we wish to discuss general patterns for meiofaunal cave colonization, as well as possible reasons behind the success of Nerillidae in the anchialine environment.

Keywords: Interstitial, phylogeny, evolution, adaptations, Annelida

TOPIC: ECOSYSTEM PROTECTION AND EDUCATION

Mon 9 November 2015 - "Manuel Cepeda Peraza" Auditorium *11:00 – 11:25*

The Speleological Circle from Mayab: Their contribution to knowledge from Yucatan Anchialine Systems.

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The Speleological Circle of Mayab is a civil group dedicated to the exploration, mapping, surveying and biological and archaeological research of the underground systems of the Yucatan Peninsula. This group is comprised of explorers, archaeologists, biologists, surveyors and conservationists keep track of different systems have explored. This group has made significant contributions to biological science as it has been participated in different collections of organisms both anchialine caves like freshwater. Has also kept records and archaeological survey in different parts of the Peninsula, Therefore of the geo-referenced data of each enter mostly of the underground cavities in the three states. It also has activities monthly, with lectures given by different researchers, explorers and people involved with these ecosystems. In addition to this, the group teaches courses in different subjects (Biospeleology, Safety, First aid, Cave Diving and Rappel). The purpose of this paper is to show the many activities of this group of conservation with the aim of publicizing its impacts on the community.

Key words: Anchialine explore; Yucatan Peninsula; Conservation.

Posters

TOPIC: GEOLOGY, PALEONTOLOGY AND SPELEOLOGY

01 Submarine springs (vrulja) Modrič and Zečica - geomorphological and hydrological phenomena of submerged karst in Adriatic Sea (Croatia)

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Vrulja is a local term for submarine spring in the coastal karst aquifer. Vruljas occur along the karstic Adriatic coast in Croatia and represents form of the submarine groundwater discharge (SGD) interesting from geomorphological, hydrogeological, ecological and biological point of view. According to morphology there are sieve-like vruljas where groundwater emerges from one or network of small fissures on the sea bottom (in bare rock or covered with sediments), and cave type vruljas with passages penetrable for the cave divers. The last allows direct observation and measurement in the dynamic interaction zone between the sea and karst groundwater. According to activity there are periodic (more often) and permanent (less often) vruljas. Their discharge is highly dependent on the precipitation of the catchment area and the the water table level toward sea level. In a cave type vruljas there are evidences that they developed in different geomorphological and hydrogeological conditions, ie. during continental phase when the sea level was lower than today. There are speleothems and microerosional forms typical for vadose, phreatic and epiphreatic stages in speleogenesis. Their present-day position below the sea level is a result of tectonic movements, older base-level variations during the geological past, and Post-Pleistocene sea level rise. The water circulation from the karst aquifer towards sea is determined by local and regional geological settings, hydrogeological conditions, geomorphological processes and climate. Croatian Adriatic costal aquifers are developed in Mesozoic and Tertiary carbonate beds (limestones, dolomites, breccia) characterized by high level of tertiary porosity. It is a result of intense karstification during lower sea level and characterized by the network of fissures, conduits and cave passages. Unlike most of other submarine springs, Vrulja Modrič and Vrulja Zečica are caves with large passages, thick clastic sediments, numerous stalactites and stalagmites that were submerged after last transgression during Late Pleistocene – Early Holocene. They are situated in central Dalmatia, near Starigrad Paklenica and Modrič, only 870 m of air distance from each other. Caves were developed in breccias and limestone of Cretaceous and Tertiary age with general direction NE-SW predisposed by local faults. Morphology and morphometry of passages in these caves as well as the size of speleothems indicates very long active and vadose phase. The length of Vrulja Zečica is more than 600 m and continues, and the lenght of Vrulja Modrič is more than 500 m. The dimensions of the largest part of the main passage in Zečica are 12 x 5 m, where more than 2.5 m high and more than 1 m in diameter speleothems were observed. The most recent continental phase due to the low sea level was 26 ka BP when it could have been 135 m lower than today. In Late Pleistocene (11 ka – 10 ka BP) due to sea level rise they became submerged parts of coastal karst aquifers. During Holocene and today they are periodically springs which activity is connected with higher precipitation and snow melting in higher and mountainous catchment area.

During activity they transport high quantities of fresh water and sediments from the karst hinterland towards sea. This periods cause denudation in cave passages by high pressure and erosional activity of transported sediments (sand and gravel). The sediment deposits are visible not only in caves but also hundreds of meters around their entrances at the bottom of the bays where they are located. The intensity of mechanical erosion was observed in a form of scratches and abrasion marks on the outer layer of speleothems. During hydrological inactivity or low activity sea penetrates vruljas passages and forms saline or brackish environment. Due to the absence of light, episodes of intense groundwater and suspended sediment outflow, sea intrusion and occasional brackish environment vruljas are interesting habitats. Large colonies of mussels (Mytilus galloprovincialis) and occurence of eels in Zečica are known. In Modrič freshwater troglobiontic species were observed, such as Troglocaris sp. and Niphargus sp. that live in freshwater zones in the caves and obviously tolerate brackish (anchialine) environments.

Keywords: Vruljas, submerged karst,speleogenisis, brackish enviroment

02 Sea-level changes recorded in littoral caves from Mallorca, Spain

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Evidence of past sea levels comes in many forms, each with certain strengths and weaknesses. Caves and their deposits are important contributors to sea-level studies. Proxies for cave-based sea-level reconstructions include mineralogical (sediments, speleothems), biological (worm tubes, gastropod boring), and archeological records. Along the coast of Mallorca, dissolution triggered by the interaction between freshwater and seawater produces a geochemical environment that allows caves to develop. All these caves are highly decorated with speleothems that formed in early Quaternary time when the caves were air-filled chambers. Over the past 500 kyr, the caves were repeatedly flooded due to sea level oscillations. Of significant importance in deciphering these fluctuations are the so-called phreatic overgrowths on speleothems (POS). The precipitation mechanism of POS arguably provides the most precise and less ambiguous indicator of the timing and the absolute elevation of the sea level position, as illustrated by our poster. In this study we present results from 3 littoral caves (Àrta, Dimoni, Genovesa) in which up to 6 well-defined overgrowth horizons, below and above the present-day sea level (corresponding to older sea-level high and low stands) have been recognized. By means of U-Th dating we demonstrate that POS growth can extend for 1000s of years providing that sea level is stable for that length of time, and that growth precisely indicates sea level elevation over that period. The growth histories of several POS overlap and cover the entire MIS 5e, 5a, and late Holocene highstands, thus providing a good evidence for remarkably stable sea levels, contrary to other studies. Our research also points out some very rapid sea level fluctuations (15 to 25 m) bounding both MIS 5e and 5a and lasting between 1000 and 3000 years.

Keywords: littoral caves, phreatic overgrowths, speleothems, brackish water, Mallorca

TOPIC: BIOTIC COMMUNITY ASSEMBLAGES

03 Water mites from cenotes of the Ox Bel Ha anchialine system, Quintana Roo, Mexico

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The records of five species of water mites from cenotes and associated anchialine system in the Yucatan Peninsula, Mexico, are presented. The samples come from Cenotes Jail House and Bang of the Ox Bel Ha cave system near Tulum, Quintana Roo, Mexico. For the hydracarid Centrolimnesia motasi Cook, 1980, the record presented constitutes the second time the species has been reported since its original description from a pond in Chiapas, Mexico. One of the mites found in Cenote Bang belongs to the family Halacaridae. These mites are primarily marine but about 60 species have adapted to live in freshwater. The spread of these mites into continental waters has taken place independently in various epochs. Most of the halacarid genera presumably invaded continental waters via surface water habitats rich in interstices. The record of this mite expands its known distribution to the southern part of the Mexican-Caribbean shore. This finding represents the first record of Limnohalacarinae from Mexico, and the first record of this species in an anchialine cave. The records for the species of Limnesia, Unionicola and Neumania are also new for the Yucatan Peninsula. We discuss the role of anchialine systems as dispersal corridors for this fauna.

Key words: water mites, hydracarid, Halacaridae, Limnohalacarinae.

04 Adrift in the Xibalba: zooplancton of the Ox Bel Xa anchialine system, Quintana Roo, Mexico

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In the aquatic habitat most biotic interactions depend on the organisms that drift in the water column, that is the plankton. In some ecosystems these interactions are shaped by the diversity of microhabitats and thus by the different types of planktonic species found in each one, this is the case of anchialine systems. Many anchialine systems have formed in the Yucatan Peninsula due to its calcareous nature, specially in the peripheral coastal areas. The aim of this study is to describe the horizontal and vertical variation of the zooplankton along a transect of four cenotes in the Ox Bel Ha system, near Tulum, Quintana Roo, Mexico. Samples of each of the four cenotes were obtained from the open pool, from inside the cave above the halocline and from below the halocline when this was possible. The preliminary results register the dominance of crustaceans in the cave environment: copepods (Calanoida and Cyclopoida), ostracods (Halocypridea), mysids (Mysidacea), isopods (Cirolanidae), amphipods (Hadziidae) and decapods (Atyidae and Palaemonidae). From the open pools and at the interface between the superficial and cave water masses the diversity increases to include Foraminifera, Rotifera, Mollusca, Insecta (Diptera, Coleoptera), Acari, Collembola and Mollusca. A trend of increasing diversity with distance from the coast is identified, as well as a higher diversity above the halocine than below it.

Key words: plankton, diversity, cenotes, Yucatan.

05 Distribution of stygobitic decapods from Cenotes in Riviera Maya (Yucatan Peninsula)

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In this work the study of cave crustaceans is shown to Yucatan Peninsula specifically in the Riviera Maya, Quintana Roo, Mexico, in order to know the distribution of stygobitic decapod shrimp in 22 caves, from Tulum, Solidaridad and Benito Juarez Municipalities. Stygobitic caridean specimens are distributed hazardly in different habitat types within caves and caverns ecosystems, as there are species that occur only in freshwater Typhlatya mitchelli and Creaseria morleyi and others from saltwater habitats as: Yagerocaris cozumel, Calliasmata nohochi, Barbouria sp., and Tricantoneus akumalensis and those can share and have tolerance in both environments as Macrobrachium carcinus, Macrobrachium acanthurus and Typhlatya pearsei. So three habitats were identified: The first is within the semi-dry caves that have ponds formed by filtration or streams by rain which represent those freshwater environments completely isolated to underground caves; The second habitats are water bodies that are usually found in depths greater than 6 m in the majority are marine water environments; The third habitat type occurred in the water column where fresh and salt water mixed and the decapods are facultative to move in the halocline.

06 Distribution and population structure of the isopod Creaseriella anops (Creaser, 1936), in the Yucatan Peninsula

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The anchialine fauna of the Yucatan Peninsula is composed mainly of crustacean species. Up to now 45 species have been recognized, grouped in the orders Nectiopoda, Calanoida, Cyclopoida, Halocyprida, Thermosbaenacea, Mysida, Amphipoda, Isopoda, and Decapoda. Only seven species out of this total are considered to have a wide distribution throughout the subterranean systems of the Peninsula, the isopod Creaseriella anops is one of them being also abundant in most places. In this study all the available records of C. anops were compiled, recording site information and size and fecundity data. The aim of the study is to determine if size, body proportions and fecundity vary throughout the range of the species, and if so, if type of cave and location can explain this variation. The analysis included records coming from graduate theses and from ca. 800 specimens deposited in the National Crustacean Collection of the Institute of Biology, UNAM. Preliminary results show non-significant variation in size throughout the range, and a 1:1 sex ratio in most samples. New results on fecundity and size classes of mancas and juveniles were mapped showing a slight influence of distance from the coast. The life history traits that could contribute to make C. anops a widely distributed species are discussed.

Key words: isopod, size distribution, fecundity, geographic variation.

07 Sponges community of the anchialine caves of Cozumel Island: The forgotten fauna

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The anchialine caves of Cozumel Island, especially El Aerolito system, have been frequently studied, mainly in terms of its fauna biodiversity. However, the marine sponges community had been ignored in most of the studies despite it being the richest group, and the second in density. The present work exhibits 34 sponge species corresponding to two different anchialine caves, El Aerolito with 28 spp. and La Quebrada with 6 spp., whereas the anchialine caves Tres Potrillos and Bambu had no sponge populations inhabiting there. Thirteen of the recorded sponge species are new to science and its description is in process, we are also reporting for first time in Mexico the sponges Discodermia adhaerens and Plakinastrella onkodes. With these findings Porifera is now the group with more endemic species in the anchialine caves of Cozumel Island.

Key words: Porifera, El Aerolito system, La Quebrada system, Stygobite, New species

08 Biodiversity and distribution of the macro-and meiobenthic fauna in two anchialine systems in Quintana Roo, Mexico.

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The aim of this study was to analyze the macro and meiobenthos community structure in the caverns and caves of two Quintana Roo anchialine systems: Nohoch-Nah-Chich, (Casa Cenote) and Aktun-Ha (Cenote Carwash) in order to increase the knowledge of this practically unknown fauna (exploratory and descriptive phase) but also to establish how their structure changed or not in the their cavern and cave zones and to compare the fauna of both systems. Sampling was carried out in April 2008 with scuba diving and the sediment was sieved through a 0.063 mm mesh. Three samples were taken in each system with four replicas. As a result, 7,548 organisms were collected: 6,664 from Nohoch-Nah-Chich, located at 70 m from the coast line and 884 from Aktun-Ha, located at 8 km from the sea. In Nohoch-Nah-Chich, 90 genera and 5 taxonomic operational units were identified, distributed in six taxonomic groups (Foraminifera, Nematoda, Amphipoda, Copepoda, Oligochaeta and Polychaeta); by contrast, in Aktun-Ha, only 18 genera were detected with the same operational units. A total of 87 new records are reported for the fauna in Nohoch-Nah-Chich (counting all taxonomic units) and only 15 for Aktun-Ha. The benthic foraminifera dominate in both systems (76 and 99% of the total fauna respectively) and represent the highest density values by replica compared to the other taxonomic groups. Species richness, Diversity and Equity values were evaluated and found to be relatively low in both systems, decreasing with increasing distance from the coast. Similitude among stations was calculated and three groups emerged, related to environmental factors. The fauna distribution was heterogeneous and spatially discontinuous, particularly in Nohoch-Nah-Chich, where it was patchy. In Aktun-Ha no pattern could be detected.

Keywords: cenotes, Nohoch-Nah-Chich, Aktun-Ha, Quintana Roo, community structure.

09 Diversity and conservation of hypogean/anchialine copepods from the Yucatan Peninsula, Mexico.

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There are 60 species of continental copepods recorded in the Yucatan Peninsula. The figure includes representatives of the orders Calanoida (8), Cyclopoida (39), Harpacticoida (12), and Misophrioida (1). The YP has also a remarkably high number of endemic species of copepods (18, about 30% of the regional fauna), of these, 6 are epigean and 12 are hypogean/anchialine. They are part of one of the most diverse hypogean crustacean fauna in the planet. An updated list of the endemic and hypogean/ anchialine copepods of the YP is presented together with an assessment of their distribution and status of conservation. Recent records of harpacticoid genera from an anchialine system suggest that the number of endemic/anchialine copepods is underestimated in the YP. A general overview of the coverage of governmental and private protected natural areas (PNAs) in the YP reveals that only three of these hypogean/anchialine species are protected: Acanthocyclops rebecae, Diacyclops ecabensis, Halicyclops caneki; most of this unique copepod fauna remains unprotected.

TOPIC: ECOSYSTEM PROTECTION AND EDUCATION

10 World Register of Marine Cave Species (WoRCS): establishing a new thematic species database for marine cave biodiversity

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Scientific exploration of underwater cave environments (including anchialine caves) over recent decades has led to outstanding discoveries of novel taxa, increasing our knowledge on marine biodiversity. Nevertheless, biological research on marine caves has taken place only in a few areas of the world and relevant information remains fragmented in isolated publications and databases. This fragmentation makes assessing the conservation status of marine cave species especially problematic, and this issue should be addressed urgently given the stresses resulting from rampant development in the coastal zone worldwide. The goal of the World Register of Marine Cave Species (WoRCS) initiative is to create a comprehensive taxonomic and ecological database of known marine cave species worldwide and to present this as a Thematic Species Database (TSD) of the World Register of Marine Species (WoRMS). WoRCS will incorporate ecological data (e.g., type of cave environment, salinity regimes, and cave zone) as well as geographical information on the distribution of species in cave environments. Biodiversity data will be progressively assembled from individual database sources of regional, national or local levels, as well as from literature sources (estimation: >20,000 existing records of cave-dwelling species scattered in several databases). Information will be organized in the WoRCS database following a standard glossary based on existing terminology. Cave-related information will be managed by the WoRCS thematic editors with all data dynamically linked to WoRMS and its team of taxonomic editors. In order to mobilize data into global biogeographic databases, a gazetteer for the marine caves of the world will be established. The presence records of species could be eventually georeferenced for submission to the Ocean Biogeographic Information System (OBIS) and constitute an important dataset for biogeographical and climate change studies on marine caves.

Keywords: marine caves, anchialine caves, biodiversity, global species databases, biodiversity management

11 Stygobionts in UADY's zoological collections

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Because of the karstic nature of the geological substrate and their proximity to marine waters, anchialine systems are common in the Yucatan peninsula. Cenotes are their superficial expression and although they had been studied since the beginning of the past century, they remain relatively unexplored regarding their functioning and dynamic as ecosystems. Nevertheless their fauna have received more attention and as a result it is known an important faunal diversity, most of them endemic. With the increasingly interest on these systems and the access possibilities, the knowledge of the faunal diversity is growing as well as the evidence of the impacts that affect them and their habitats. At the Universidad Autónoma de Yucatán (UADY) the studies about biodiversity had contributed to the creation of Zoological Collections (CZOO) which includes an important number of stygobiont species. We report the current status of the stygobiont collection at UADY, a taxonomic list, the location of the collecting sites and their general conditions. There are records of 37 species (34 crustaceans and 3 fishes), 7 from freshwaters and 30 from anquihaline systems, all of them in 324 sets from 30 localities of the Yucatan State. The situation of type localities in the city is discussed as well as the conditions of those subjected to touristic management. Emphasis is done on the importance of scientific collections to contribute on the knowledge and conservation of these systems and their fauna.

Key words: stygobionts, cenotes, Yucatan, zoological collections