

The 2008 Win-Timdouine project: An International Expedition in the Longest Cave of Africa

The 2008 Win-Timdouine project (Website in French - <http://wittamdoun.free.fr/>) is an international expedition devoted to the exploration and subterranean biodiversity assessment of Africa's longest karstic network: Win-Timdouine Cave in Morocco.

This huge cave is located in the western High-Atlas, 70 km northeast of Agadir, below the Tasroukht plateau culminating at 1789 m. Explored since the 1950s on ca. 20 kilometers (Camus & Lamoureux 1981), the Win-Timdouine subterranean network is considered to be the largest aquifer system in the Agadir region (Angelova et al. 2003, Bouchaou et al. 2002, Qurtobi 1996). However, for biologists and geologists, this famous cave has not revealed all its secrets. Indeed, we hardly know anything about its subterranean fauna, nor the real extension of the explorable network (20, 30, 40 km or more?).

Previous biospeleological explorations have highlighted a diversified hypogean ecosystem, most organisms of which are still unknown to science (Prof. M. Messouli, member of this project, unpublished data). Those preliminary data indicated that major taxonomical groups strictly linked to hypogean habitats are represented: Beetles (Insecta), Amphipoda (Crustacea), Collembola, Myriapoda and Hydrobioid snails. In addition, this gigantic network must harbour various species of Bats, the only mammals reaching deep subterranean networks and playing a major role in hypogean food-networks by providing extrinsic organic matter (guano or corpses) (Gibert & Deharveng 2002).

To study such a gigantic network, it is necessary to combine diversified skills and heavy logistics, both human and material. The 2008 Win-Timdouine project thus proposes to set up large, multi-disciplinary program in order to supplement knowledge on this exceptional environment. To summarize, the main purposes of this expedition are:

1. to carry on the exploration of Win-Timdouine Cave and to draw up maps of newly explored areas. Explorations by the cavers, use of a sonar at low frequencies (Bedford 1993) and of electronic topography tools will allow to build a 3D digital model of this subterranean network. This model will allow an investigation of the hydrogeological connections between Win-Timdouine and neighbouring caves (Camus & Lamoureux 1981) or with other

geological formations (e.g. wells, faults) located on the Tasroukht plateau, in order to better understand the spatial structure of this underground catchment area.

2. to perform an exhaustive inventory of the hypogean fauna and to assess the conservation status of the species and, by extension, of the whole Win-Timdouine ecosystem. This will most probably include descriptions of new taxa for science, which will contribute to a better knowledge on the precious biodiversity heritage of the poorly known subterranean area.

Indeed, the deep parts of the subterranean environments are difficult to reach and consequently these ecosystems remain poorly studied (Culver & Holsinger 1992), similarly to tropical forests or deep seas. Cave ecosystems are still the last "*Terra Incognita*" on Earth. This expedition is original by the sampling effort (great number of participants with various skills mobilized) brought in the study of an underground ecosystem. All implicated biologists in this project are internationally reknown specialists in their respective fields. Given that the exceptional size of the Win-Timdouine subterranean network imposes prolonged stays in order to reach the deep parts of the cave, it is thus necessary for biologists to be accompanied by experienced cavers.

3. to perform an exhaustive inventory of Bat species and investigate their behaviour in the deep parts of the cave, a poorly documented aspect of their biology.

Captures and biometry of living specimens, database of pictures, recording of sound waves and DNA sampling will allow the elaboration of a new data corpus on the bats of this biogeographical area (Dobson 2003, Panouse 1951, 1954, 1956, 1958, 1959).

4. to identify the anthropic threats and to propose global conservation plans to protect this ecosystem. Indeed, analyses of the water quality should detect origin(s) of putative pollution and thus allow us to propose procedures to limit future deteriorations and to protect this fragile habitat.

In addition, Win-Timdouine could be a teaching model for local karstic studies, by coupling these informations (biology, hydrology, topology, water quality) in a global database that would be a reference point for future studies.

On the whole, at the time of the biodiversity crisis (Eldregde 2001), about twenty scientists and speleologists from Morocco and France (Annexe 1) will join their skills to reach the same

goal: investigate and protect the subterranean biodiversity and its habitat in a major Moroccan karstic area.

The 2008 Win-Timdouine project is placed under the aegis of the Muséum National d'Histoire Naturelle of Paris (France) and the Muséum d'Histoire Naturelle of Marrakech (Morocco), with the collaboration of the French Federation of Speleology. It will take place in July-August 2008 during 30 days (from 10 July to 10 August, Annexe 2), including several days in a row inside the Win-Timdouine Cave. All participants are experienced speleologists or researchers belonging to major scientific institutions from France and Morocco. The other partners of this project are: the Biotope society (<http://www.biotope.fr/> - Environment, sustainable development, flora and fauna consulting), the Speleological Association of Agadir, the Club Alpin Français, the Association of the Friends of the Muséum national d'Histoire naturelle of Paris, the University of Agadir, the International Congress of Speleology (Agadir, April 2008) and Faouzi-Vision from Agadir (society of audio-visual production and realization). In addition, we are currently in contact with the Moroccan delegation of the UNESCO.

We expect to discover numerous new organisms for science and to map new parts of this gigantic network. Research, exploration and spreading of knowledge will be the three main axis of the 2008 Win-Timdouine project, which will provide a new insight on a poorly-known world: subterranean networks and their biodiversity.

Annexe I. Organization chart

1. Project Leaders

BICHAIN Jean-Michel / France / Biologist / jean-michel.bichain@educagri.fr

GHAMIZI Mohamed / Morocco / Biologist / ghamizi@ucam.ac.ma

2. “Biodiversity” Team

BICHAIN Jean-Michel / France / Biologist (Mollusca) / jean-michel.bichain@educagri.fr

FAILLE Arnaud / France / Caver (Insecta) / faille@mnhn.fr

GHAMIZI Mohamed / Morocco / Biologist (Mollusca) / ghamizi@ucam.ac.ma

MESSOULI Mohamed / Morocco / Biologist (Crustacea) / messouli@ucam.ac.ma

PERREAU Michel / France / Biologist (Insecta) / michel.perreau@univ-paris-diderot.fr

3. “Bats” Team

ALLEGRIINI Benjamin / France / Biologist / benjallegrini@wanadoo.fr

HAQUART Alexandre / France / Biologist / ahaquart@biotope.fr

DISCA Thierry / France / Biologist / tdisca@biotope.fr

PHILIPPE Laurent / France / Biologist / lphilippe@biotope.fr

PRIE Vincent / France / Biologist / vprie@biotope.fr

RUFRAY Vincent / France / Biologist / vrufray@biotope.fr

TRANCHARD Julien / France / Biologist / jtranchard@biotope.fr

4. “Exploration and Karst” Team

BOUCHAOU Lhaoussaine / Morocco / Hydrogeologist / lbouchaou@yahoo.fr

BOUDSOCQ Christian / France / Caver / plein-vide@cegetel.net

CHABERT Jacques / France / Caver / jacques.chabert@noos.fr

CHAILLOUX Daniel / France / Sonar specialist / dchaillo@club-internet.fr

DELFOUR Laurent / Morocco / Caver / ldelfour@yahoo.fr

FABRIOL Jean-François / France / Caver / jf.fabriol@wanadoo.fr

FAOUZI Lahoucine / Morocco / Caver / faouzivision@menara.ma

IGHOUSS Aziz / Morocco / Caver / faouzivision@menara.ma

ISBECQUE Jean / Morocco / Caver / jisbecque@hotmail.com

ISBECQUE Jonathan / Morocco / Climber / john16eym@hotmail.com

LARGO M'barek / Morocco / Caver / faouzivision@menara.ma

5. “Data Base” Team

THONNEL Audrey / France / Computer scientist / athonnel@biotope.fr

Annexe II. Schedule

Part 1. From 10 to 20 July 2008. “Bats” Team and a part of the “Exploration and Karst” Team to install the subterranean bivouac. About 10 participants.

Part 2. From 20 to 30 July 2008. “Exploration and Karst” Team. About 16 participants.

Part 3. From 1 to 10 August. A part of the “Exploration and Karst” Team to train students of the Marrakech's University and, in addition, to inform media, populations and local authorities. About 10 participants.

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