EXPLORERS CLUB FLAG EXPEDITION REPORT, APRIL, 2007

EAST LIBYA NEOGENE RESEARCH PROJECT
FLAG #93

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Winter fieldwork of the East Libya Neogene Research Project was carried out in two separate expeditions. The first field expedition took place in Sahabi, Libya, from February 1st to March 6th 2007. The second field expedition took place between April 17th and 25th, 2007. Fieldwork of the East Libya Neogene Research Project was supported by National Science Foundation grants BNS-0515591 (to B. Benefit, M. McCrossin, and N. Boaz) and RHOI program BCS-0321893 (to N. Boaz). Support was also provided by Ross University School of Medicine, University of Athens, the Great Manmade River Project (Ajdabya), Condrill (Benghazi), and Shell Oil (Libya). Mr. George Sayannos, Mrs. Lena Nilsson, Mr. Mujeeb Uddin, and Mr. Anders Nilsson of Condrill are thanked for their invaluable logistical assistance in the field and their hospitality to the team in Benghazi. The assistance of Dr. Paris Pavlakis, Dr. Ahmed El-Hawat, Mr. Ahmed Muftah, and Mr. Dimitris Michaelidis in writing this report is gratefully acknowledged. Prof. Giuma Anag, Director of the Department of Archaeology, National Museum of Libya, and Dr. Mustafa Salem, Al-Fatah University, are thanked for their important support and facilitation of the museum research on Sahabi collections in Tripoli.

Field Team #1 at Sahabi base camp, Libyan Sahara, February, 2007. ELNRP Libyan Co-directors Ahmed Muftah (center, standing) and Muftah Al-Shawaidhi (left center, standing) and paleontological field director Paris Pavlakis (right)

Field Team #2, with drilling team, at Sahabi base camp, April, 2007. International ELNRP Director Noel Boaz (center, standing) and paleontologist Mohammed Al-Faitouri (left center, standing)

GEOLOGY

Goals of the geological fieldwork were to refine assessments of age of the Sahabi Formation, especially as the fossiliferous horizons relate to the Messinian desiccatory event of the Mediterranean basin (5.2. – 7.0 million years ago), to improve stratigraphic understanding of the relationship of the Eo-Sahabi channels to the main deposits of the Sahabi Formation, and to research the micropaleontology, sedimentology, and stratigraphy of the Sahabi Formation and underlying beds via a drilling program through the entire thickness of deposits.

A site high in the sedimentary sequence in the Sahabi Formation was chosen on the western side of the old Italian airfield ("Campo d'Aviazione") for the location of a borehole (30º01'59"N, 20º46'15"). Downhole hammer drilling (diameter 70 mm) with an Atlas Copco R50 Rotamec rig was begun on Wednesday, April 18, 2007. The sediments were U-2 sands of the Sahabi Formation. At 3.6 meters of depth, coring with core barrel was begun using an Atlas Copco 742 HC Roc rig (diameter 62 mm). A depth of 6.56 m was reached on Day 1, but much of the sediment was unconsolidated sands and clays which yielded samples but no solid core. On Days 2 and 3 (20 April, 2007), slow progress was made through still unconsolidated sediments. A decision was made to open a second borehole (Borehole #2) some 10 meters to the south of the first borehole with the R50 driller. The depth reached in Borehole #2 on 20 April was 23 meters. Samples of alternating sands and clays were collected. A static water level was discovered at 59 meters. On 21 April a sandstone admixed with greenish clay was encountered at 59.4 meters and a decision was made to resume coring. A core of aggregate depth of about 1 meter was obtained before more sand was encountered and hammer drilling was resumed. On 22 April a depth of 86 meters had been reached, but neither a gypsiferous layer (Formation P) nor the limestone basement (Formation M) had been reached. The last day of drilling (23 April) reached a level of 100 meters and encountered the limestone bioclastite of Formation M at this level.

The R50 Rotamec hammer drilling rig at Sahabi Borehole #2.

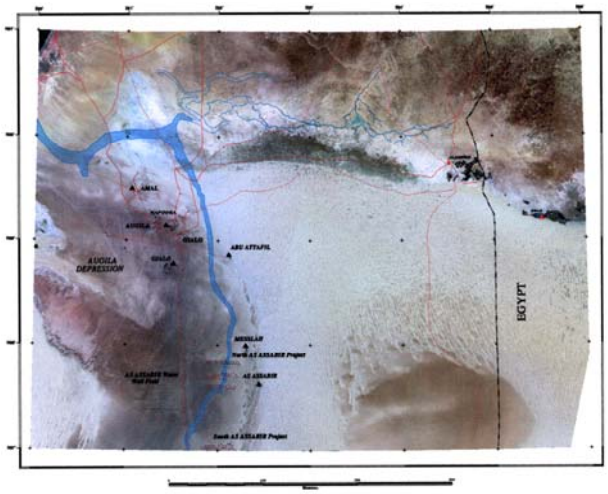
Both rigs at work, Borehole #1 in background, and Borehole #2 in foreground (left). Recording the levels of the recovered core from Sahabi Borehole #1 (right)

Preliminary observations from this inaugural drilling program include the following:

1. The lack of a clearly defined gypsiferous formation below the Sahabi Formation at Borehole #2, located some 5 km to the west of the mapped outcrops of the massively gypsiferous Formation P, strongly suggests that Formation P represents a localized deposit. Formation P thus may not be correlative in age to generalized and widespread gypsiferous deposits of the Messinian Event, as previously hypothesized.

2. The Sahabi Formation sediments are at least 20 meters thicker in the western boreholes than they have been observed in the eastern mapped sections of outcrop. This observation is important in demonstrating significant lateral facies variations in the Sahabi Formation.

Further geological conclusions must await detailed microscopic, mineralogical, and micropaleonological analyses of the sediments recovered in the drilling program. Trenching of sediments in the lower Sahabi Formation and Formations P and M will be undertaken during May, 2007, along with a program of sampling for paleomagnetic dating analysis of these sediments. A major goal of this work is correlating geophysical and remote sensing data of the Sahabi area and the subterranean Eo-Sahabi river channels (below), incorporating the detailed stratigraphy of the sediments.

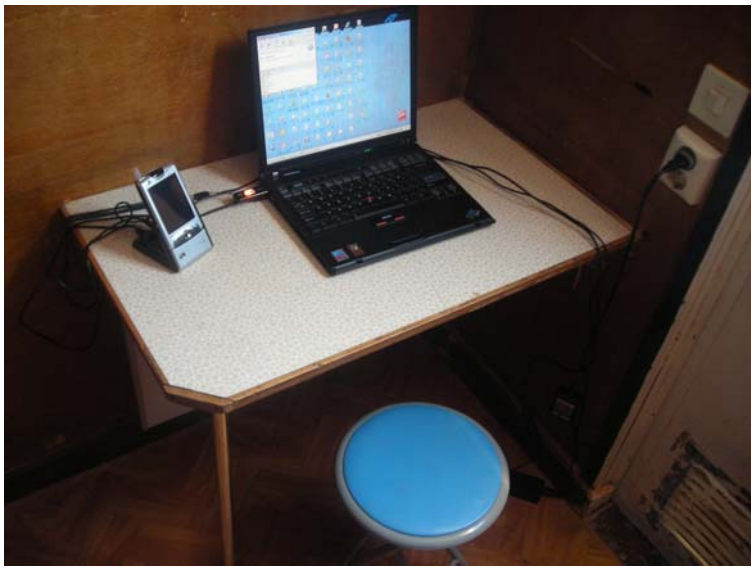


Reconstruction of late Miocene Eo-Sahabi river channels (A. El-Hawat and N. Drake, unpubl.)

PALEONTOLOGY

The primary goals of the paleontological field season were 1) recollection of all fossil localities previously established by our earlier field teams, which had not been re-collected systematically since the early 1980's; 2) identification and accurate recording of the GPS coordinates of the Italian fossil localities from the 1930's, and 3) assessment of which localities should be targeted for more intensive investigation in upcoming field seasons.

The entire Sahabi Formation was surveyed on foot, and over 55 paleontological localities were collected, mainly in the fossiliferous U-1 stratigraphic unit. Fossils discovered were catalogued electronicallly in the field (below) with written record backup. The entire Sahabi fossil catalog, dating back to 1978, is now fully updated in this new electronic format. These data will be added to the NSF-sponsored "Revealing Human Origins Initiative" (RHOI) database maintained at the University of California, Berkeley. After export of some specimens for international comparative study and identification, all fossil collections are housed at the Earth Sciences Museum of Garyounis University, Benghazi, Libya, where the master catalog of the collection is maintained.



Computer cataloguing of fossils using an HP iPac handheld computer downloading to an IBM Thinkpad laptop computer at Sahabi base camp, April, 2007.

Localities reported by Petrocchi (1943, 1952) were visited and re-surveyed. Many of these localities were in the western low outcrops of the exposures and some areas had not been surveyed previously.

GPS coordinates were measured and recorded for all 55 P localities as well as the 62 relocated old Petrocchi localities. This was an important achievement, because now the great majority of the Sahabi fossil localities can be mapped with accuracy, and can be easily reinvestigated. Both mapping and accurate navigation to the fossil localities is the foundation for further paleontological research in Sahabi planned by the ELNRP.

A total of over 400 vertebrate fossils were collected. Most were surface collections. There were about 10 fossils, however, consisting of major skeletal parts, such as partial skulls or complete long bones of mammals, partial jaws of crocodiles, and almost complete fish and turtle skeletons, which were collected after partially excavating them. We collected five specimens by using the plastering removal method. The process was recorded for education purposes. Among major specimens under study and description now by ELNRP specialists are a new cercopithecoid mandible with teeth (cf. *Parapapio* sp.; see below), a new skull with dentition of a juvenile anthracothere (*Libycosaurus pettocchii*, see below), a skull and articulated jaw of a crocodilid, a number of new important discoveries of antelopes (see below), including a nearly complete skeleton, a new find of a rhinocerotid, a number of new hipparion horses, and many isolated finds of carnivores, birds, and other vertebrates.

Two appropriate places, one flat and the other on a slope (GPS recorded) at locality P17, were swept of surface sand and left "clean" for 10 days, in order to test the effect of wind on exposing fresh and unweathered fossils. Despite relatively high winds from the east and south during this time, a minimum of exposure of enclosing sands occurred. The conclusion from this experiment was that this method of collection at know fossiliferous sites is less desirable than the more labor-intensive excavation.

Five areas across the sabkhat, with facies similar to Member U-1 exposures as observed in the Sahabi Formation, were explored and their GPS coordinates were recorded. No fossiliferous sites were discovered.

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A well-preserved ungulate tibia *in situ* at P99A.

Mohammed Al-Faitouri with a fossil bovid mandible at P99A

A right hemi-mandible of the fossil monkey cf. *Parapapio* sp., found at Sahabi during the February-March, 2007 field season.

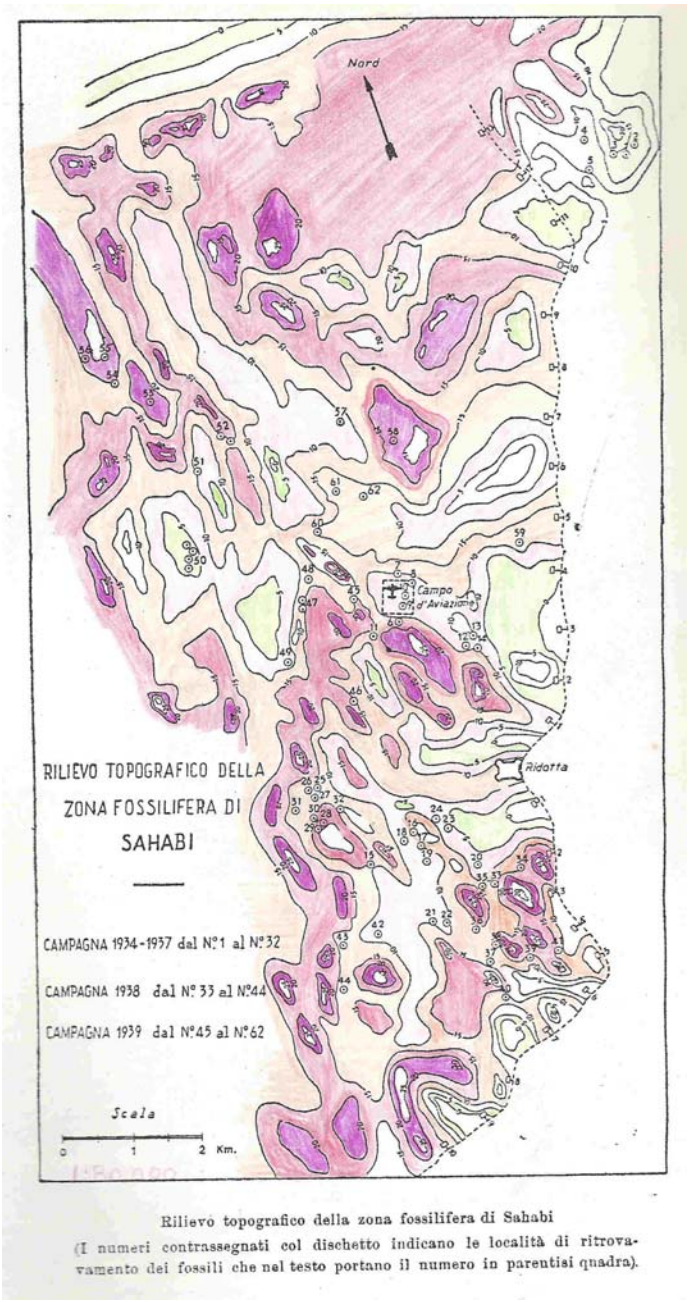
An anthracothere skull (*Libycosaurus petrocchii*)

Work was also accomplished on old fossil collections from Sahabi housed at the National Museum in Tripoli. Previously undescribed anthracothere, hippopotamid, and proboscidean fossils were located, cleaned, repaired, studied, and photographed. These specimens will be included in reports to be published this year in a special issue of the *Garyounis Scientific Bulletin* (Benghazi), with support from the Garyounis University Research Centre. Publications in specialist journals are also planned based on the significant discoveries made this field season.

Repairing proboscidean fossils in the National Museum, Tripoli. At right is the type specimen of *Stegotetrabelodon syrticus*, a unique four-tusked proboscidean discovered at Sahabi (Petrocchi locality 7, in 1934).

The fossil whale from Sahabi (Petrocchi locality 12, discovered in 1937) and a 3/4-sized reconstruction (above) in National Museum of Libya, Tripoli

Library research in the National Museum in Tripoli revealed a 1943 publication by Carlo Petrocchi, former Director of the Libya Natural History, now subsumed into the National Museum of Libya. This reference along with a 1952 Italian publication already in hand allowed the re-localization in the field of all of the 62 early Italian localities at Sahabi. However, only one instance of a locality number was found labeled on a specimen ("Sahabi Proboscidean #5," a partial mandible with molar labeled with "14"). Correlating some of the old collections with their field localities and stratigraphic positions within the Sahabi Formation will thus be a challenge for the future. Nevertheless, results from this field season constrained the stratigraphic position of the majority of the old Italian collecting localities to upper Member U (unit U-2), overturning previous suggestions that there was a significant stratigraphic and temporal difference between these collections and those made by our collecting teams in more recent years.



Rilievo topografico della zona fossilifera di Sahabi
(I numeri contrassegnati col dischetto indicano le località di ritrovamento dei fossili che nel testo portano il numero in parentisi quadra).

A map of collecting localities from Carlo Petrocchi (1952), used in the field to re-locate these localities and record their GPS positions. Petrocchi (1943) also provided valuable detail used in this fieldwork.

Five fossiliferous P localities were identified as future excavation sites based on completeness of remains, fossiliferous productivity, and variety of stratigraphic coverage. These are: P4A, P12/13A, P25C, P99A, and P19A. There is very little overburden at these localities and their areas of exposure are extensive.

The writer at Sahabi Locality P4A, the site of a controversial discovery in 1979 of a mammalian long bone initially identified as a hominoid clavicle but later maintained by other researchers to be a cetacean posterior rib. Mammalian postcranial fossils matching the fossilization of the original discovery were located here during the April, 2007 field season and this locality is one of five targeted for excavation in the next field season.

REFERENCES CITED

Petrocchi, C. 1943 Il giacimento fossilifero di Sahabi. Collezione Scientifica e Documentaria. A Cura del Ministero dell'Africa Italiana. IX. Verbania: A. Airoldi Editore.

Petrocchi, C. 1952 Paleontologia de Sahabi (Cirenaica). Rendiconti Accademia Nazionale dei Quaranta. Ser. IV, Vol. III. Notizie generale sul giacimento fossilifero di Sahabi. Storia degli scavi – Risultati, pp. 9-33.