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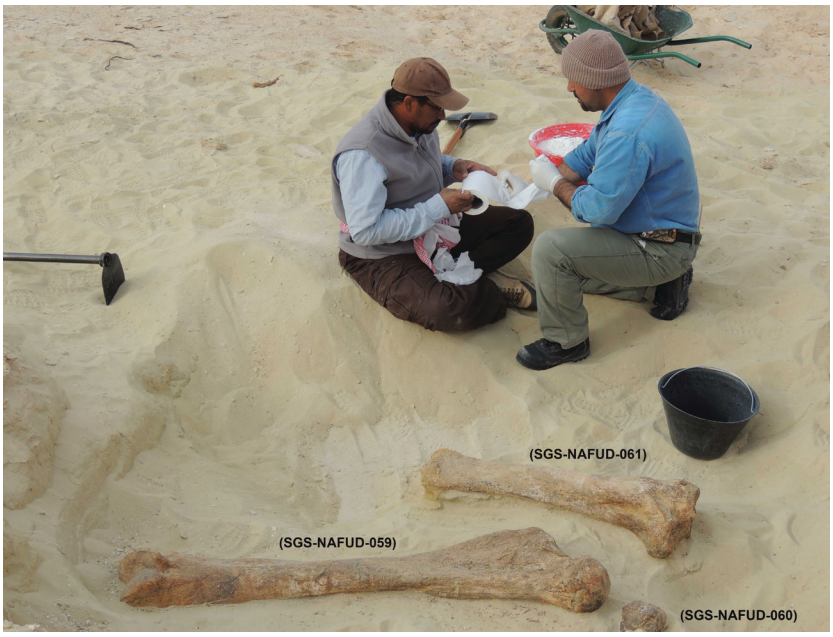
هيئة المساحة الجيولوجية السعودية
SAUDI GEOLOGICAL SURVEY

PLEISTOCENE VERTEBRATE FOSSILS OF THE NAFUD DESERT (AN NAFŪD AL KABIR) IN NORTHWESTERN SAUDI ARABIA (PHASE I)

The Middle Pleistocene vertebrate fossils from the Tis al Ghadha locality near the southwestern edge of the An Nafūd al Kabir (Nafud Desert) in northwestern Saudi Arabia represent a land vertebrate assemblage, preserved in the fine sands of a palaeolake system. This assemblage was dated, using the advanced methods of OSL and U-series, to be between 318 and 550 ka. This palaeolake system has one of the many palaeolake deposits of the different depositional events (polychronic) that was left with notable and isolated sedimentary bodies, mainly of fine and coarse sandstones, capped with diatomaceous marls of freshwater origin. This faunal assemblage includes diverse Eurasian, African, and Levantine mammals, such as the following mammalian families: Perissodactyla, Proboscidea, Bovidae, Hippopotamidae, Suidae, Camelidae, Hystricidae, Felidae, Canidae, Hyaenidae, and Mustelidae. In addition to the mammals, remains of fishes, reptiles, and aves fauna were collected and documented. These include the Arapaimidae, Squamata, Varanidae, Testudinidae (turtle carapaces, plastra, and shells), Struthionidae (ostrich eggshells), Podicipedidae (grebes), Accipitridae (diurnal birds of prey), Pteroclididae (sandgrouse), Anatidae (ducks and geese), and Motacillidae (wagtails). Most materials are disarticulated and dispersed, but in 2014, numerous elements that appeared to have come from a single elephant were found, and all were excavated in an area covering <700 m^2. These bones comprise ca. 60 percent of a complete skeleton, with the elements consistent in their sizes, left-right identity, and the states of their epiphysis fusion, which point to a large, adult male. The elements that have been recovered to date include more than two-thirds of the presacral vertebral column, about 90 percent of the ribs, limb girdle, and long-bone elements, and almost one-quarter of the manus and the pes elements, although all four feet are represented. Based on the lengths of the main forelimb elements, i.e., scapula, 100.1 cm; humerus, 118.4 cm; radius, 99.5 cm; lunar, 8.1 cm; and metacarpal III, 25.4 cm, we estimate the shoulder height of this individual to be nearly 4 m. The only dental remains are a complete left tusk that is 225 cm long, an incomplete right tusk, and most of the mandible, retaining both m_{3s} (third lower molars) in a moderate state of wear. However, up to the writing of this report, the skull or pelvis of this elephant individual has not been recovered yet. Morphologically, these molars support the identification of this individual as *Elephas recki (Palaeoloxodon recki)*, and the thin sections of the tusk dentin show that the appositional increments are well preserved to recover significant data on its life history. We observed a few breakages on this skeleton, and no post-mortem damages were present that we could interpret as evidence of human association. Nevertheless, other discoveries in this region show that, by this time, humans had coexisted with the proboscideans in the Arabian Peninsula. The most outstanding observation that came out of the Tis al Ghadha vertebrate collection is that the elephant specimen is complete enough to serve as an osteological reference that can help in the interpretation of the less complete and possibly fragmentary remains that may be recovered in the future in the context that can be more suggestive to the human association *(**SGS-TR-2022-1, Zalmout and others**)*.



Field photos of *Elephas recki* remain that were excavated in the Tis al Ghadha fossil locality. The right femur (SGS-NAFUD-059), left tibia (SGS-NAFUD-061), and left patella (SGS-NAFUD-060) are exposed here.

SAUDI ARABIA IS ON THE GLOBAL MAP OF GEOHERITAGE

Karoly Nemeth

Saudi Arabia received a great honor recently for having its two globally significant geological heritage sites listed on the highly prestigious International Union of Geological Sciences [https://www.iugs.org/history] (IUGS) Geological Heritage Sites lists.

The Jabal Qidr volcanic cone (Fig. 1) has been listed on the First 100 IUGS Geological Heritage Sites in 2022, and just right now, in January 2024, Al Wahbah dry maar volcano (Fig. 2) made it on the Second 100 IUGS Geological Heritage Site list.

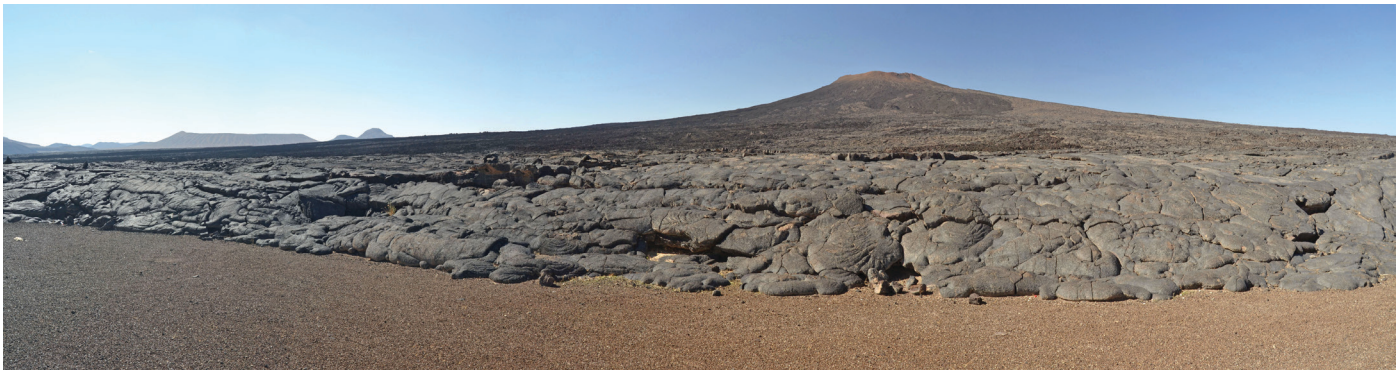


Figure 1. Jabal Qidr (25°43'10.97"N.; 39°56'38.33"E.), as an IUGS First 100 Geological Heritage Site listed in 2022 with its majestic cone and pahoehoe lava flow emplaced on its early ash plain dominating the volcanic landscape of Harrat Khaybar.

IUGS is the leading expert body, a learned geology society with dedicated sections such as the Commission on Geoheritage [https://iugs-geoheritage.org] to oversee the quality and global value of the geoheritage of Earth. IUGS is also the primary advisory body for UNESCO concerning collecting desktop and site reviews on proposals submitted for the UNESCO World Heritage Sites [https://whc.unesco.org/en/list/] on outstanding natural values and for applications to join the UNESCO Global Geopark Network [https://www.unesco.org/en/iggp/geoparks/about]. The International Union of Geological Sciences (IUGS) is one of the World's most prominent scientific organizations, with 121 national members representing over a million geoscientists.

The IUGS Commission on Geoheritage has three sub-commissions: Commission on Geological Heritage Sites, Heritage Stones, and Geo-collections. It is also a great honor that SGS Expert Prof Karoly Nemeth has been elected to chair the Commission on Geological Heritage Sites from 2024 until 2028.

The IUGS Geological Heritage Sites list program started in 2018 to develop a global geological heritage property list for the Earth's scientifically most valuable and aesthetically outstanding locations to promote their conservation and utilization within geoeducation and geotourism. An IUGS Geological Heritage Site is a key place with geological elements and processes of scientific international relevance, used as a reference, and/or with a substantial contribution to the development of geological sciences through history. This program initially started to select 100 sites globally, based on a response to a global call that reached geological societies, surveys, conservation groups, and individual geoheritae experts. This call triggered an unprecedented response from the worldwide community to submit 181 candidate sites from 56 proposed countries, then evaluated by 33 international experts. The result of this challenging and collaborative process is the list of the First 100 IUGS Geological Heritage Sites that has been announced on the 60th Anniversary of the IUGS Conference on 23-25 October 2022 in Zumaia in the Basque Coast UNESCO Global Geopark. The complete list of these 100 geological heritage sites has also been

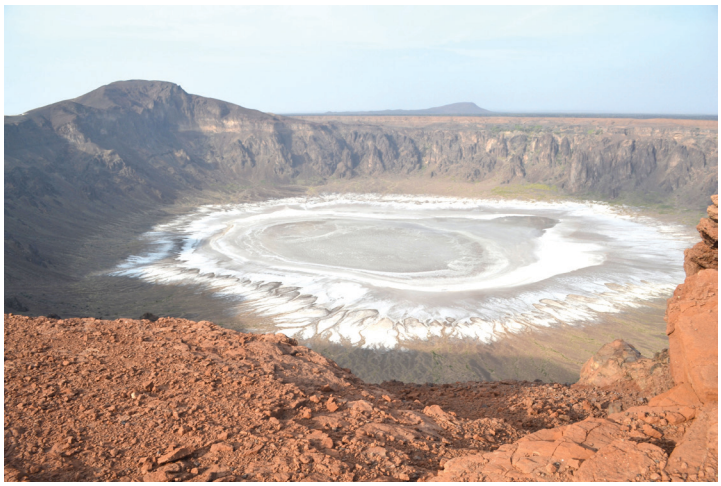
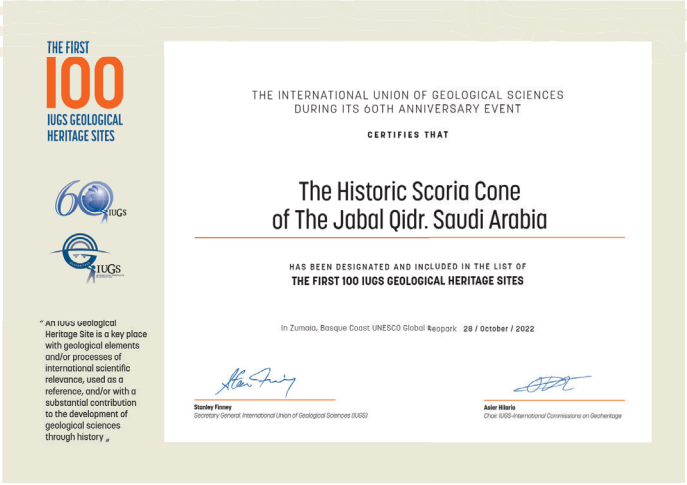


Figure 2. Newly listed Second 100 IUGS Geological Heritage (2024) site of Al Wahbah dry maar volcano (22°54'2.32"N.; 41° 8'22.29"E.). The enormous maar crater is among the largest and deepest on Earth. Its dramatic landscape element makes the location a natural landscape aesthetic marvel.

published in a book [you can download it free from https://iugs-geoheritage.org/videos-pdfs/iugs_first_100_book_v2.pdf]

Some of the oldest rocks on Earth from South Africa, traces of primitive life from Australia and China, some of the best dinosaur fossil remains from Canada, the first pieces of evidence of early hominin development from Tanzania, the marine rocks of the top of the World from Mount Everest and iconic sites like the impressive Grand Canyon (USA), Perito Moreno glacier (Argentina), Santorini Caldera (Greece) or Uluru in Australia are only a few examples of this impressive list. The presentation of The First 100 IUG Geological Heritage Sites aimed to designate geological sites from around the world that are iconic and recognized by all geoscience communities for their impact on understanding the Earth and its history. Now, "***The historic scoria cone of the Jabal Qidr***" has been on this list since 2022 (Fig. 3). Jabal Qidr received an official certificate on its listing and some official promotion material that can help to facilitate putting the location high on the geoheritage sites of Saudi Arabia (Figs 4 and 5).


THE FIRST 100 IUGS GEOLOGICAL HERITAGE SITES

THE INTERNATIONAL UNION OF GEOLOGICAL SCIENCES
DURING ITS 60TH ANNIVERSARY EVENT

CERTIFIES THAT

The Historic Scoria Cone
of The Jabal Qidr. Saudi Arabia

HAS BEEN DESIGNATED AND INCLUDED IN THE LIST OF
THE FIRST 100 IUGS GEOLOGICAL HERITAGE SITES

In Zumaia, Basque Coast UNESCO Global Geopark 28 / October / 2022

"An IUGS Geological Heritage Site is a key place with geological elements and/or processes of international scientific relevance, used as a reference, and/or with a substantial contribution to the development of geological sciences through history"

Stanley Finney
Secretary General, International Union of Geological Sciences (IUGS)

Asier Hilario
Chair, IUGS-International Commissions on Geoheritage

Figure 3. IUGS Certificate of Jabal Qidr as listed among the First 100 IUGS Geological Heritage Sites.

The final list of The Second 100 has been completed and unanimously approved by the Selection Committee of the IUGS in January 2024. The IUGS Commission forms this Committee on Geoheritage representatives, and one representative from each of the 17 international organizations participated in the program. The IUGS Executive Committee has ratified the Second 100 IUGS Geological Heritage Sites list during the 79th IUGS Executive Committee meeting and IUGS Geosciences for Africa Event in Nairobi, Kenya, on 19-23 February 2024.

The evaluation process of the Second 100 proposals was a success. One hundred seventy-four (174) candidate sites from 64 countries were received at the end of August 2023. Eighty-nine experts from all around the globe have evaluated all these sites. Seven hundred fourteen (714) evaluations were received in time at the end of December 2023. All the evaluations have been put together and checked again by the IUGS Team for a detailed analysis and discussion. The evaluation method has been clearly improved from the First 100 system. It can be stated that it is now a coherent, strong, and transparent method reflecting the accepted 100 sites to be the best representatives of the principles of the program. The accepted sites will be presented in a scientific forum on 25/31 August 2024 in Busan (South Korea) during the 7th IGC - International Geological Congress [http://www.igc2024korea.org/]. A book describing the listed sites will be published in this event, just like the First 100 list.

Most importantly for us, another site from Saudi Arabia, the Al Wahbah Dry Maar Volcano, has been accepted and included in this prestigious list. Just to put the significance of this inclusion, consider that **Al Wahbah** is in the same recognition level as the iconic sites such as the ***Fiordland glacier-carved fjords and towering sea cliffs*** of New Zealand, ***Ries Meteorite Crater*** of Germany, ***Yosemite Valley*** in the USA, ***Late Cretaceous Samail Ophiolite*** in Oman***, Latemar Triassic carbonate platform***, Italy, or the ***Vesuvius volcano*** in Italy just mentioning few from the list.

Any site accepted on these IUGS Geological Heritage Site lists enjoys global recognition at the highest level. Hence, now Saudi Arabia is represented by two sites and potentially can gain another 3-5 by 2026 if SGS Experts work on preparing nomination dossiers for the Third 100 IUGS Geological Heritage Sites list, expected to be completed by 2026. Saudi Arabia is a natural laboratory of geological heritage studies and geodiversity research. The Kingdom already shows strong scientific approach behind this new research field and represented by several high-quality research outputs (Elassal, 2020; Abd El-Aal and others, 2023; Al Mohaya and Elassal, 2023; Şen and others, 2024a; Şen and others, 2024b), many associated with SGS (Moufti and Németh, 2013; Moufti and others, 2013, 2015; Moufti and Németh, 2016; Németh and Moufti, 2017; Németh and others, 2023a; Németh and others, 2023b).

The acceptance of the Saudi sites on these two lists can be considered a significant landmark achievement for the Kingdom, showing its national aim to become a global leader in protecting abiotic

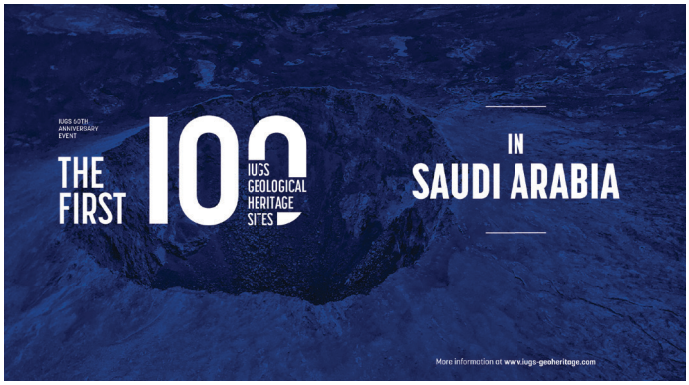


Figure 4. Saudi Arabia entered the highly prestigious IUGS Geological Heritage Sites list.

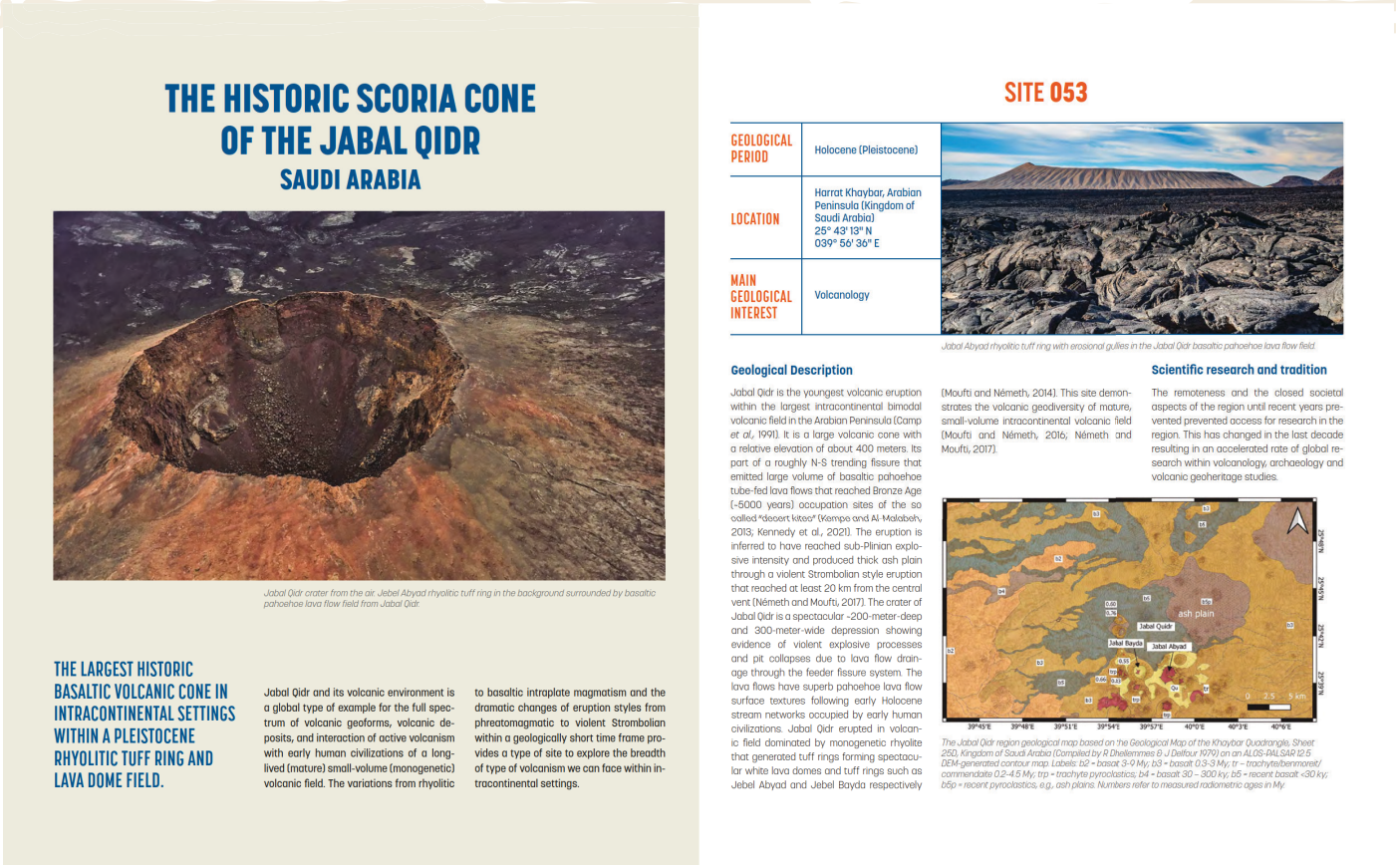


Figure 5. The documentation of Jabal Qidr as one of the Earth's First 100 IUGS Geological Heritage Sites.

nature and, within SGS, claim its national role. Within this new research arena now, SGS can claim its role as a national custodian of the geosite inventories, leading organizations to develop nomination dossiers for globally significant site listings and lead national geosite inventory building programs in the next decade. This progress will make SGS a natural leader in research on sustainable development and transformative economy where understanding and living with the abiotic natural heritage and geosystem services are the pillars of society.

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