

ARAB STATES

WADI AL-HITAN (WHALE VALLEY)

EGYPT



WADI AL-HITAN (WHALE VALLEY) (EGYPT) ID N° 1186

1. DOCUMENTATION

- i) **Date nomination received by IUCN:** April 2004
- ii) **Dates on which any additional information was officially requested from and provided by the State Party:** IUCN requested supplementary information on the 11 August 2004, prior to the field mission, 4 October 2004, after the field mission, and 10 January 2005, after the IUCN WH Panel. State Party responses were received on 1 December 2004 and 29 March 2005 respectively.
- iii) **IUCN/WCMC Data Sheet:** 1 (the nomination which contains 30 references)
- iv) **Additional Documentation Consulted:** Wells, R.T. 1996. Earth's Geological History – a contextual framework for World Heritage fossil site nominations in **Global Theme Study of World Heritage Natural Sites**, IUCN, Switzerland, 43pp. Uhen, M.D. (2004) **Form, Function and Anatomy of *Dorudon atrox* (Mammalia, Cetacea): An archaeocete from the Middle to Late Eocene of Egypt**, University of Michigan, USA, 222pp. Matravers-Messana, G.H. (2002) **Wadi el-Rayan: Gateway to the Western Desert**, Wadi el Rayan Protection Project, Egypt, 99pp. Dolson, J., El-Barkooky, A., Wehr, F., Gingerich, P.D., Prochazka, N., and Shann, M. (2002) **The Eocene and Oligocene Palaeo-Ecology and Palaeo-Geography of Whale Valley and Fayoum Basins**, AAPG/EPEX/SEG/EGS/EAGE Field Trip No. 7. Rising Star Energy Publication Ltd, Egypt, 79pp. Gingerich, P.D. (1992) **Marine Mammals (Cetacea and Sirenia) from the Eocene of Gebel Mokattam and Fayum, Egypt: Stratigraphy, age and Palaeoenvironments**, University of Michigan, USA, 84pp. Zimmer, C. (1998) **At the water's edge: macroevolution and the transformation of life** The Free Press, New York, USA, 290pp. Kamel, H et al. (2002) **Wadi El-Rayan Protected Area Management Plan**, EEAA, Egypt, 54pp. Storemyr, P (2003) **Widan el-Faras Ancient Quarry Landscape, North Faiyum Desert, Egypt: Site Description, historical Significance and Current Destruction**, Expert Centre for Conservation of Monuments and Sites, Switzerland, 22pp. Redfern, R. (2002) **Origins: The evolution of continents, oceans and life**, Weidenfeld and Nicholson, 360pp.
- v) **Consultations:** 7 external reviewers. The mission met with the Governor of Faiyum Province, officials of the Egyptian National Commission for UNESCO, officials and site management staff of the Egyptian Environmental Affairs Agency, representatives of the Egyptian National Geological Museum, and geologists from Cairo and Mansoura Universities.
- vi) **Field Visit:** Tim Badman. September 2004
- vii) **Date of IUCN approval of this report:** April 2005

2. SUMMARY OF NATURAL VALUES

Wadi Al-Hitan (Whale Valley) lies within the Faiyum¹ province, and forms part of the Wadi El-Rayan Protected Area (WRPA). It is located within the Western Desert of Egypt, 150 km south-southwest of Cairo and 80 km west of Faiyum City. WRPA is centred around a series of natural springs, and two brackish lakes created in the 1970s from excess agricultural water channelled from nearby Lake Qarun. The totally dry Wadi Al-Hitan is a distinct area within the WRPA, and lies c.40 km west of the lakes among an attractive and distinctive desert landscape of wind-eroded pillars of rock, surrounded by sand dunes, hills, cliffs and escarpment-bounded plateaux. The nominated property comprises a rectangular core area of c.20,015ha, (c. 12km x 16km square) defined by latitude/longitude co-ordinates, with a 5,885ha buffer zone.

The property is nominated for its fossil values, which are centred on the fossils of ancient whales from the earliest, and now extinct, suborder of whales, the Archaeoceti (or archaeocetes). These are the ancestors of the two modern suborders of cetaceans (Mysticeti and Odontoceti). The whale fossils of Wadi Al-Hitan represent one of the iconic stories of evolution: the emergence of the whales as modern ocean-going mammals from a previous life as land-based animals. The whales of Wadi Al-Hitan, in evolutionary terms are amongst the youngest archaeocetes, and are in the last stages of losing their hind limbs and have taken on the typical streamlined body form of modern whales, whilst retaining certain primitive aspects of skull and tooth structure. This represents a transition from living only in shallow coastal waters to being ocean-going animals, able to spread worldwide.

1. IUCN Adopts the recently announced official spelling of Faiyum, except where referring to alternative spelling used in older literature

The fossils are found within a horizontally-bedded rock succession of marine sandstones, shales, marls and limestones, often associated with evaporite minerals. The rocks are very extensively displayed in the field in natural exposures on the desert floor, and in a series of field exposures ranging from small cliffs to large escarpments. In addition to the fossil whales, the succession contains a range of other fossil values, and other geological evidence enabling a robust palaeogeographic and palaeoenvironmental reconstruction of the area through Eocene times to be made.

Over 40 million years ago the so-called Tethys Sea reached far south of the existing Mediterranean. This sea gradually retreated north depositing thick sediments of sandstone, limestone and shale, visible in three named rock formations which are visible in Wadi Al-Hitan. The oldest rocks are the Eocene Gehannam Formation, about 40-41 million years old, consisting of white marly limestone and gypseous clay and yielding many skeletons of whales, sirenians (sea-cows), shark teeth, turtles, and crocodilians. A middle layer, the Birket Qarun formation, of sandstone, clays and hard limestone, also yields whale skeletons. The youngest formation is the Qasr El-Sagha formation of late Eocene age, about 39 million years old. It is rich in marine invertebrate fauna, indicating a shallow marine environment. These formations were uplifted from the southwest, creating drainage systems, now buried beneath the sand, which emptied into the sea through mangrove-fringed estuaries and coastal lagoons when the coast was near what is now the Faiyum oasis, c. 37 million years ago.

The fossil beds of Wadi El-Hitan were first discovered during the winter of 1902-03. Large skulls and other remains of archaic fossil whales were first reported by H. J. L. Beadnell of the Geological Survey of Egypt. *Basilosaurus isis* and *Dorudon atrox* were named as new species by Charles Andrews of the Natural History Museum, London, UK in 1905. Other than two brief unpublished visits by the University of California, USA in 1947-48 and Yale University, USA in the late 1960s, the nominated property was not researched further until 1983 when it was visited by researchers from the University of Michigan, USA. Michigan carried out five further six-week expeditions in 1985, 1987, 1989, 1991 and 1993. Their research has been the main contribution to revealing the significance of Wadi Al-Hitan, and was responsible for the discovery in 1989 of the world's first evidence of an early whale displaying the remains of hind feet.

Three different species of Eocene whales have been identified with certainty at Wadi Al-Hitan. All are basilosaurids, the latest surviving group of archaeocete whales, and the group which are thought to have given rise to modern cetaceans. The largest was *Basilosaurus isis*, which was up to 21 meters long, with well developed five-fingered flippers on the forelimbs and with hind legs, feet, and toes, not known previously in any archaeocete. Their form was serpentine and they were carnivorous. Another species, *Dorudon atrox*, is also found with vestigial hind limb bones. It was a small whale with a more compact dolphin-like body, the presence of calving females of which may have attracted the larger predator whales. A third species, *Ancalocetus simonsi*, was

described in 1996. Besides whales, 19 other vertebrate species are known from the nominated property. They include three species of early sirenians (sea-cows), one partial skeleton of the primitive proboscidian *Moeritherium*, crocodiles, sharks, sawfish, rays, bony fishes, turtles (including a sea turtle), and sea snake. There is also a rich invertebrate fauna, including nummulites, molluscs including gastropods, bivalves and nautiloids, echinoids and crabs. Plant fossils include mangroves and sea-grasses. Given adequate protection, management and research, further discoveries of archaeocetes and other species, and of the biology and palaeoecology of early whales and the Eocene marine world are regarded as a certainty.

The whale fossils are present in an exceptional concentration, and are of a very high quality. Many whale and sirenian skeletons are very well-preserved: virtually complete, articulated specimens are found in-situ in their death positions, some with associated preservation of features such as stomach contents. In addition the many skeletons represent an ontogenetic series (i.e. a range of individuals from young to old) giving an added dimension to their study in terms of investigating life histories and development, and thus a deeper understanding of their evolution and ecology. The latest audited figures record a total of 379 whale fossils, of which 179 are catalogued, and a further 40 catalogued vertebrate fossils. 89 of the catalogued vertebrates are in the collection of the University of Michigan. 59 specimens, including the type specimens of the species first described from this site are in the collection of the Cairo Geological Museum, with the remainder of the catalogued species currently in the field. Earlier sirenian and cetacean material collected from the Faiyum is held in Cairo, London, Berlin and Stuttgart.

The nominated property adjoins an area with important fossil values; the rock succession exposed within Wadi Al-Hitan is overlain unconformably, outside the boundaries of the nominated property, by the Eocene – Oligocene Gebel Qatrani Formation. These rocks have been studied extensively at sites to the north of Lake Qarun, within the Qarun Protected Area, although they are also exposed over a wider area. Excavations in this formation have yielded internationally significant fossil remains of terrestrial mammals, including the fossil remains of eight primate lineages, including the earliest known hominoids (Redfern, 2002). The fauna also includes the unique twin-horned mammal *Arsinotherium*, as well as elephant ancestors. Gebel Qatrani is included on Egypt's current Tentative List as a potential mixed property. A request for international assistance from the World Heritage Fund to assist with the preparation of a management plan for Gebel Qatrani was submitted in early 2005. Furthermore Gebel Qatrani was identified by IUCN as a potential fossil World Heritage property in the IUCN contextual framework for fossil World Heritage (Wells, 1996), where it is described as: '*The most complete record of Palaeogene mammals for all Africa. The diverse fauna (40 genera, 75 species) which includes two hominoid genera is critical to understanding the evolution of many mammal groups on the continent, particularly hominids.*'

3. COMPARISONS WITH OTHER AREAS

The original nomination document presents an incomplete comparative analysis. However, the State Party subsequently provided a comparative analysis prepared by a world expert on whale fossils, who has worked extensively on the nominated property and at other key sites world-wide. IUCN's comparative analysis has also benefited from the expert reviews of leading scientists with expertise in this area.

The primary claim of the nominated property for outstanding universal value is its demonstration of the early stages of whale evolution, and the evolution of the archaeocetes from land mammals to marine animals. Its claim to importance is based on it being the only known site in the world where large numbers of complete, high-quality archaeocete fossils can be seen in their original geological and geographical setting, and its 'iconic' status as the place where evidence of legs on whales was first discovered. These values are added to significantly by the additional geological context described above, and are drawn out in relation to IUCN's standard checklist for fossil site nominations in the Appendix to this report.

IUCN set out carefully in its contextual study (Wells, 1996) recommendations for the selection of fossil World Heritage properties. It stressed a number of key recommendations, including the central concept of the selection of properties that represent key events in the tree of life. It recommended the prioritisation of properties that represent community structures, but focussing on higher taxonomic levels, and vertebrates in particular, to maintain a manageable list of properties, and to focus on the most universally important properties. IUCN considers that the evolution of whales is a clearly defined aspect of the record of life that can be considered to fully meet these principles. It is an illustration of the process of evolution that is exceptionally vivid and accessible to the public, portraying a transition of land mammals returning to the sea, and gradually losing their legs in the process. Furthermore, it is a transition that is now well rooted in science and relates to an animal group that is both of modern conservation importance and widespread public appeal. IUCN considers it can justly be described as 'iconic'.

Other vivid illustrations of important fossil values that are represented on the World Heritage List include the diversity of the early explosion of life on Earth [the Burgess Shale within the Canadian Rocky Mountain Parks], the Age of the Fishes [Miguasha (Canada)], the Age of the Dinosaurs [Ischigualasto-Talampaya (Argentina), Monte San Giorgio (Switzerland), Dorset and East Devon Coast (UK), Dinosaur Provincial Park (Canada)], and the evolution of early man [Lake Turkana National Parks (Kenya)]. The rise of the mammals is a further example, and represents an important area of comparison in relation to the nominated property. In this case, terrestrial mammal evolution is represented on the World Heritage List by the exceptional fossil site of Messel Fossil Pit (Germany), which is considered the world's richest site for understanding the living environment of the Eocene, and the Australian Fossil Mammal Sites, whose values represent the evolution of the distinctive modern land mammal fauna of Australia

(from Miocene and younger sediments). Neither of these properties records marine values nor whale evolution. The World Heritage List also provides ample evidence of the outstanding universal value attached to cetacea and sirenia, as these species provide the basis for the selection of natural properties such as Peninsula Valdez (Argentina), Whale Sanctuary of El Vizcaino (Mexico) and Shark Bay (Australia). Relative to the values of other World Heritage properties, IUCN considers that the demonstration of whale evolution is justifiable as a sound claim to outstanding universal value in portraying the record of life.

There are thousands of fossil sites throughout the world that have yielded one or more whale specimens. A number of these are significant in relation to the illustration of the earliest stages of evolution of whales over 20 million years earlier than those at Wadi Al-Hitan. Important Eocene whale fossil sites are known in Egypt from Gebel Mokattam in Cairo, but are mostly lost to development. It is anticipated that much of the evidence from these sites could be replicated within the nominated property through further study. Older and more primitive archaeocete whales come primarily from India and Pakistan, from forested foothills of the Himalaya, from desert areas in Kutch, and from the desert in tribal parts of the Punjab, Balochistan and the North West Frontier Province. These sites illustrate earlier stages of the history of whale evolution, and demonstrate features that are different from and complementary to those of the nominated property. Many, however, are inaccessible, and none are even closely comparable to Wadi Al-Hitan in terms of the number and concentration of fossils.

A substantial number of partial skeletons of archaeocete whales, more or less contemporary with those of Wadi Al-Hitan, have been found on the Atlantic and Gulf coastal plain of eastern North America over the last 150 years. However, none of these skeletons is complete, and the sites where they are found are scattered and generally covered in vegetation with difficult access.

Fossil whales of the suborders Mysticeti and Odontoceti are known in abundance from Miocene and Pliocene sites such as 12-15 million year old Shark Tooth Hill, California, USA and the 5-6 million year old Cerro Blanco in the Pisco Formation, Peru. However, these whales are essentially modern and do not illustrate the evolutionary story in the same way as the values represented in the nominated property.

In discussing the comparative value of the nominated property, IUCN notes the important context for Wadi Al-Hitan provided by the adjacent interests of the Gebel Qatrani Formation within the Lake Qarun Protected Area. In the view of IUCN the values of the nominated property and the Gebel Qatrani Formation represent different aspects of an intimately related story. Although the comparative analysis for the nominated property must of necessity be based on its values alone, IUCN believes that there is significant evidence (including the IUCN contextual study) to suggest that Gebel Qatrani has important values which cannot be logically separated from the interests within Wadi Al-Hitan in relation to a claim for World Heritage status. The exposures in Lake Qarun have produced some whale fossils, but their values for demonstrating cetacean evolution are however greatly surpassed by the nominated property.

In summary the nominated property is the most significant site in the world to demonstrate the evolution of whales. This assessment is made in terms of the completeness, quality, concentration and accessibility of the fossils, and the abundant additional evidence enabling a robust construction of the palaeogeography and palaeoecology of the Eocene marine and coastal environment where they are found.

4. INTEGRITY

4.1 Boundaries

The boundaries of the nominated property are a rectangle defined by latitude and longitude coordinates, with a buffer zone based on a slightly larger and similarly defined rectangle. These boundaries have been selected to encompass the key features of interest, and a wider part of the WRPA. They are, therefore, sufficient to meet the conditions of integrity under the Convention, at least for administrative purposes. The boundaries are not optimal, however, for management purposes, in particular as they can only be traced in the field through use of a global positioning system. IUCN considers that topographic features visible in the landscape, specifically the tops of the escarpments within the protected area, would form a more operational boundary.

IUCN heard from scientists during the evaluation mission that the protected area within the property would be strengthened by the addition of a further area of outcrop to the west of the WRPA at Gebel Abiad. This area provides exposures of rock from the topmost Eocene rocks. IUCN considers that this area would add to the values of the nominated property in the future, but is not sufficiently critical to the core features of interest to be regarded as an essential addition to the nomination.

The buffer zone is also a rectangular area, running close to the proposed boundary of the nominated property, and like the nominated property lies entirely within the boundary of the WRPA. As proposed it appears to serve no functional purpose, and has no practical value in enhancing the protection of the nominated property over and above that provided by the property's boundary itself. During the evaluation mission the Egyptian parties identified that it was desirable that the buffer zone be extended westwards outside the existing protected area to the Bahariya Road, and southwards to provide a larger buffer area. As these areas are not currently within protected areas, such a proposal would require a ministerial declaration, which IUCN was advised was a relatively simple and quick process. IUCN considers that the extension of the buffer zone would be desirable, and in particular would strengthen the ability to manage access to the site from the Bahariya Road. However, in view of the extent of the defined boundary of the nominated property, the wider protection of the WRPA and the absence of substantial threats from the west and south of the property, IUCN does not consider that the absence of a formally declared buffer zone creates an immediate issue in relation to integrity.

4.2. Legal Status

The property has strong legal protection under Egyptian Law No. 102 of 1983 for Nature Protectorates. This provides strong and unequivocal legal protection for the property, forbidding actions that would lead to destruction or deterioration of the natural environment. The law commendably mentions geological features as specific elements receiving protection. WRPA was declared a protected area in 1989 according to Prime Ministerial Decree 943. Wadi Al-Hitan was added to WRPA in 1997 by Prime Minister's Decree 2954. The overall management goal of the protected area is the protection of natural resources, in accordance with the declaration decree.

4.3. Ownership

The nominated property is owned by the Egyptian State, and is managed by the Nature Conservation Sector of the Environmental Affairs Agency (EEAA).

4.4. Management

The nominated property and buffer zone are managed as part of a strict nature protection area within the WRPA. A management plan for the WRPA exists for the period 2002-2006, which was prepared through the EEAA, under the supervision of IUCN in 2002. Under the plan, the nominated property is identified as one of two Special Protection Zones, and the plan makes provision for strict protection of the fossil remains, and the development of well-controlled ecotourism. WRPA has also benefited from support under the Egyptian - Italian Environmental Co-operation Programme, providing for expenditure of c.6 million Egyptian pounds over the coming three years.

WRPA benefits from the services of a dedicated team of rangers, community guards, and other staff, with a total complement of 28 people. Some further enhancement of the staff team is envisaged. IUCN considers that support and training of what is still a relatively new staff team will be an essential part of the establishment of the management of the nominated property, and welcomes the attention to this aspect demonstrated by the EEAA, and the Egyptian-Italian Co-operation Programme.

The management and staffing arrangements are potentially sufficient to meet the needs of the nominated property. It is clear, however, that resources remain an issue, and that increased priority will need to be given in the short and medium term to the provision of adequate vehicles and equipment to the property's management team. The nominated property is also remote from the main staff base, and inhospitable, so the provision of on-site staffing requires careful consideration of logistical issues. The staff team is reliant to some extent on the provision of external assistance, and the development of adequate long-term funding to support the management of the property requires a strong central commitment by the State Party. IUCN is reassured that these matters are being accorded significant attention by the Egyptian authorities.

IUCN considers the operational aspects of a number of elements of the management plan still require further

consideration and detailed planning. Of particular importance will be the detail of how the plans for eco-tourism are developed, and how interpretation and educational opportunities are provided within the nominated property. The interests of the nominated property are currently presented and interpreted at the main visitor centre for the WRPA, situated adjacent to the lakes. In addition, knowledgeable ranger staff are available to assist visitors and there is an audio-visual theatre and video presentation. This provides a good introduction to the interests of the nominated property at the most accessible location for visitors, and there is scope to increase and develop this further. IUCN considers that the primary emphasis should be placed on experiencing the property with trained guides, as an alternative to the provision of signs and infrastructure, and notes the need for collaboration with private sector trekking companies who currently visit the property, and are expected to arrive in greater numbers in the future.

The monitoring arrangements for establishing and reporting on the condition of the fossil remains require further elaboration, in conjunction with a small scientific panel.

Beyond the nominated property, there is a range of challenging management issues within the WRPA. These do not impact on the nominated property, but are significant for its wider setting, and include the reclamation of desert land for agriculture, water management within the lakes, and the interaction with the village that lies within the protected area. Some activities appear to be carried out without adequate pre-planning and consultation in relation to the protected status and importance of the area. The management plan for the WRPA reports that there is weak collaboration between the different agencies, and IUCN considers that the integration of the activities of the different Egyptian ministries could be strengthened. Active involvement of the local community in the management of the WRPA could be strengthened, and there is an important opportunity to seek greater social and economic benefits for local communities through the presence and management of the protected area, and possible World Heritage status, particularly from sustainable tourism. It is important to note that a number of initiatives are underway to develop and implement sustainable tourism initiatives in the property.

4.5. Human Impact

The fossil remains at Wadi Al-Hitan are potentially vulnerable to visitor pressure through collecting and, in the longer term, to natural erosion by the wind if not conserved in museums or in the field. The whale fossils are large and relatively difficult to extract. Some of the obviously exposed skeletons, and features such as a worm bored tree-trunk, show the evidence of the removal of pieces as souvenirs. It is not feasible to completely prevent such removal without damaging the character of the property. Low level fencing and educational material appear to be effective in restricting damage to a low level, but require continued attention. Some natural erosion of the fossil remains is inevitable, but operates on a timescale that is not threatening to the integrity and value of the nominated property. Localised in-situ restoration and consolidation of some exposed

specimens through the application of polymers has been carried out under the supervision of the Egyptian Geological Museum. It is accepted however that there will be a gradual loss of some fossil material through natural exposure, but that such processes are both slow (so the impacts are gradual and can be mitigated by active management, research and responsible collection of fossils) and result in the maintenance of interest in the nominated property as new fossils are brought to light.

Palaeontological study is extractive in nature. The large size of the fossil skeletons and their remoteness means that the unauthorised removal of large specimens is unlikely, however regulated extraction, study and curation is an ongoing requirement. This issue is being tackled in an exemplary way in relation to the nominated property, through a tripartite memorandum of understanding between the University of Michigan, EEAA and the Egyptian Geological Survey and Mining Authority (EGSMA). This agreement is currently awaiting signature by EGSMA and sets out a well-developed research plan for the property over the period 2005-2008, which provides for regulated scientific exploration and specimen collection. It makes provision for curation of new discoveries within the Egyptian Geological Museum, research and study at Michigan, and the transfer of skills to Egyptian site staff through a training programme. There appears to be excellent and effective collaboration and support for site management from Egyptian geologists in both the national museum and universities. Such collaboration is leading to wider research on the geology of the area, helping to create a complete and robust picture of the palaeogeography and palaeoecology of the area.

The natural values of Wadi Al-Hitan as an unspoilt and beautiful desert landscape are fragile. The property is already heavily visited by visitors in 4-wheel drive vehicles, and there is noticeable evidence of vehicle tracks across the desert surface. Vehicular traffic is the greatest potential threat to both the physical character of Wadi Al-Hitan, and also the experience of visitors. Additional information provided by the State Party notes that design and implementation of a management programme for vehicular traffic, and provisions for visitor management and interpretation infrastructure is considered as part of the management plan being developed at present for the property. IUCN stresses the need to develop a holistic and sensitive approach to interpreting the property, which would ensure that its natural values are explained to visitors but would protect the remote and unspoilt character of the landscape and visitor experience.

5. ADDITIONAL COMMENTS

The relationship between Wadi Al-Hitan and the adjoining site of Gebel Qatrani is a key issue in relation to the consideration of this nomination by the World Heritage Committee. The Egyptian State Party currently conceives that the two properties of Wadi Al-Hitan and Gebel Qatrani are seen as self-contained. The reasons for this are firstly a view in relation to outstanding universal value, in that the distinctive elements of whale evolution that are only demonstrated at Wadi Al-Hitan,

and the fact that Gebel Qatrani is seen as potentially having mixed valued – Eocene/Oligocene terrestrial fossil values that would be nominated under natural criterion (i), and the cultural values of the Widan Al-Faras basalt quarry landscape. Secondly in operational terms the State Party considers that Wadi Al-Hitan is administered separately, and benefits from a management capability that makes it ‘ready’ for nomination, whereas management measures for Gebel Qatrani are not sufficient at present to meet the conditions of integrity.

IUCN notes that:

- The fossils of Wadi Al-Hitan and Gebel Qatrani are found in rock formations that are geologically contiguous;
- The fossil values of both properties have the same core values – the evolution of mammals in the Eocene-Oligocene;
- The properties are essentially adjacent to each other, and the boundaries of the protected areas are almost contiguous;
- The two properties are managed by the same EEAA management team;
- The natural and cultural values of Gebel Qatrani are not intellectually related to each other, and the intention to nominate as a mixed property cannot provide a justification for viewing the interests separately; and
- The impact and benefits of World Heritage status for the Faiyum area would be enhanced by a wider area being nominated.

IUCN therefore considers that the fossil values of Gebel Qatrani cannot be separated from the values of Wadi Al-Hitan in two separate nominations. Whilst Wadi Al-Hitan provides a convincing demonstration of outstanding universal value in its own right, it is essential that a future nomination of the fossil values of Gebel Qatrani should be seen as an extension of the values of Wadi Al-Hitan, and not as a separate, stand-alone nomination.

IUCN recognises that an option for the Committee would be to defer the nomination of Wadi Al-Hitan pending a further integrated nomination of both properties. IUCN does not recommend this approach for the following reasons:

- Wadi Al-Hitan, on its own, demonstrates outstanding universal value and is able to meet the conditions of integrity. If Gebel Qatrani did not exist, the nominated property would be an acceptable nomination;
- Wadi Al-Hitan is a fragile property under current pressure, and World Heritage status provides impetus to ensure its protection; and
- With appropriate monitoring, the nomination of Wadi Al-Hitan provides the most effective starting point for developing a cohesive nomination for the wider fossil interests, in relation to the capacity of the State Party. The nomination recognises the extensive investment which the Egyptian State Party has made in the management of the WRPA, and its plans to develop similar capacity for the Lake Qarun PA.

On another issue, IUCN notes that sites elsewhere in the world, and in particular in Pakistan and India, display

different aspects of the earlier evolution of whales, and encourages the relevant States Parties to seek to link, as far as possible, research and promotion programmes in relation to these sites.

6. APPLICATION OF CRITERIA/STATEMENT OF SIGNIFICANCE

Wadi al-Hitan is nominated for inscription under natural criterion (i)

Criterion (i): Earth’s history and geological features

Wadi Al-Hitan is the most important site in the world to demonstrate one of the iconic changes that make up the record of life on Earth: the evolution of the whales. It portrays vividly their form and mode of life during their transition from land animals to a marine existence. It exceeds the values of other comparable sites in terms of the number, concentration and quality of its fossils, and their accessibility and setting in an attractive and protected landscape. It accords with key principles of the IUCN study on fossil World Heritage Sites, and represents significant values that are currently absent from the World Heritage List. IUCN considers that the nominated property meets this criterion.

7. DRAFT DECISION

IUCN recommends that the Committee adopt the following draft decision:

The World Heritage Committee,

1. Having examined Document **WHC-05/29.COM/8B**
2. Inscribes Wadi Al-Hitan, Egypt, on the World Heritage List on the basis of natural criterion (i):

Criterion (i): *Wadi Al-Hitan is the most important site in the world to demonstrate one of the iconic changes that make up the record of life on Earth: the evolution of the whales. It portrays vividly their form and mode of life during their transition from land animals to a marine existence. It exceeds the values of other comparable sites in terms of the number, concentration and quality of its fossils, and their accessibility and setting in an attractive and protected landscape. It accords with key principles of the IUCN study on fossil World Heritage Sites, and represents significant values that are currently absent from the World Heritage List.*

3. Recommends the State Party to further develop the management plan for the property, which should consider:

- (i) *Revising the boundary to use topographic features visible in the landscape, primarily the tops of the escarpments within the protected area, to ensure that they are clearly identifiable on the ground, and more useful for site management;*
- (ii) *further explore the feasibility of extending the buffer zone of the property to the Bahariya Road,*

and across the desert to the south, in order to ensure effective management and control of vehicular traffic;

- (iii) carefully designing and implementing a management programme for vehicular traffic;*
 - (iv) provision of essential management infrastructure within the nominated property that minimises intrusion and damage to its natural values; and*
 - (v) make full use of the results and recommendations from programmes and studies that are underway in relation to the development of sustainable tourism, including visitors management and interpretation.*
4. Welcomes the support provided by the State Party of Italy for the management of this property and recommends the State Party of Egypt, in conjunction with Italy, identify measures to maintain and enhance this support in future to ensure the effective implementation of the management plan and protection of the values of the property in the long term.
5. Urges the State Party to consider any future nomination of the Gebel Qatrani Formation for natural fossil values as an extension of Wadi Al-Hitan.

APPENDIX 1: IUCN FOSSIL SITE EVALUATION CHECKLIST

Coverage of an extended time period

The rocks within the nominated property were deposited over a period of 3-4 million years covering the time period of the Middle to Late Eocene transition (40 – 37 Ma). The rocks containing the main whale remains are aged between 37-38 million years, and record gradual changes in conditions with a series of different stratigraphic levels preserving fossil remains. The feature of prime interest, the evolution of whales, took place through the Eocene period as a whole, with the earliest evidence from the early Eocene at c. 55 million years, and the presence of essentially modern forms at 33 million years ago. The fossils from the nominated property vividly illustrate the critical morphological changes that took place over this longer period, and particularly the gradual loss of hind legs as a fully marine mode of life was adopted. Beyond the nominated property, the stratigraphic section is exceptionally exposed and continuously extends northwards in the surrounding escarpments over a wider geological window including also the Oligocene and Lower Miocene Deposits as young as 15 Ma.

Richness of species diversity

The nominated property contains a diverse marine fauna, including 25 genera of more than 14 families, 10 orders and 4 classes of vertebrates. The fauna includes cartilaginous and bony fish, reptiles (including crocodiles, turtles and sea snake, and mammals (whales and sirenians). In addition there is a well developed invertebrate fauna and plant remains in the form of fossilised mangroves and sea-grass. The diversity is high in relation to the known diversity of Eocene whales, and is expected to be increased through further study, although in absolute numbers the vertebrate diversity is at the low end of the scale in relation to existing fossil WH properties. Taken with the adjacent area within the Gebel Qatrani Formation, the total number of vertebrates is greatly increased to over 90 species.

Uniquely representative of a geological time period

There are countless Eocene fossil sites world-wide, and thousands of sites that have produced whale fossils of some kind. The property is not uniquely representative of the Eocene marine environment, or of the iconic story of whale evolution during the Eocene. It is however considered to be the best site for illustrating whale evolution. Messel Fossil Pit World Heritage property is also of Eocene Age and preserves a fossil fauna that is, relatively speaking, much richer than the nominated property. It is however a terrestrial record, and provides no record of Eocene whales or other marine species.

Existence of other comparable sites

Amongst the many sites where remains of Eocene archaeocete whale fossils have been discovered, a number are also of international significance. These include sites that represent the earliest stages of evolution of whales over 20 million years earlier than Wadi Al-Hitan. Older and more primitive archaeocete

whales come primarily from India and Pakistan, from forested foothills of the Himalaya, from desert areas in Kutch, and from desert in tribal parts of the Punjab, Balochistan and the North West Frontier Province. A substantial number of partial skeletons of archaeocete whales more or less contemporary with those of Wadi Al-Hitan have been found on the Atlantic and Gulf coastal plain of eastern North America. None of these are even closely comparable to Wadi Al-Hitan in terms of the number and concentration of fossils, and in most cases access is very difficult. Other world fossil whales sites record essentially modern species.

Contribution to the understanding of life on earth

Whale evolution is an iconic story of the record of life on Earth. Whales evolved from land mammals, so in terms of a tree of life the property represents a vivid picture of mammals 'returning to the sea' from the land-based mode of life they had evolved. Wadi Al-Hitan has the best and most vivid fossil record that illustrates this change through the extinct group of archaeocete whales, and its value is added to greatly by its accessibility. Although not the earliest known whales, they represent a very important state in the evolution of this group of mammals. In evolutionary terms, they are in the last stages of losing their hind limbs and have taken on the typical streamlined body form of modern whales. This marks their transition from living only in shallow coastal waters, to being ocean-going mammals, with a world-wide distribution. The many skeletons provide an ontogenetic series with young and old individuals, giving additional dimensions to the study of their life history and a deeper understanding of their evolution. The extent of other fossil material mean it is possible to reconstruct the surrounding environmental and ecological conditions.

Prospects for ongoing discoveries

The nominated property has already produced the exceptional first discovery of direct evidence of vestigial feet on a fossil whale. However it still offers considerable scope for further study. Arrangements for a further phase of study are currently being put in place, and further discoveries are regarded as a virtual certainty. Beyond the vertebrate fossil remains, the property is particularly valuable in allowing study of an associated fossil fauna of invertebrates and plants, allowing a robust interpretation of Eocene marine environments, and the reconstruction of ecological interactions and past geography. Further study of the extensively exposed geology is likely to lead to further refinements and reinterpretations.

International level of interest

The nominated property is of established international interest, as the best and most complete record of Eocene whale evolution. This is evidenced by the level of international interest in the property over the last 20 years, and its recognition in the international media, including widely syndicated television programmes, and articles in popular magazines and books, as well as the scientific literature.

The nominated property is intimately linked, in a geological sense, with the adjacent exposures of the Gebel Qatrani Formation. These sites have produced an exceptionally rich, mainly terrestrial, fossil record including the earliest hominoids, and is of critical international importance in the development of knowledge of hominid evolution in Africa.

Associated features of natural value

The nominated property is a very attractive and distinctive desert landscape of conical hills, and various sculpted landforms, created in substantial part from wind erosion by sand, and demonstrating a range of interesting and attractive features. The cliffs of Gebel Gohannam provide a dramatic entrance to the property, and a landscape feature visible from far around. The nominated property is a key feature of the wider WRPA, which is centred on two artificially created lakes forming an important habitat, and a dramatic and attractive contrast to the surrounding desert landscape. The WRPA also includes an unusual area of natural springs, supporting indigenous vegetation and a range of species, including rarities such as the Dorcas Gazelle.

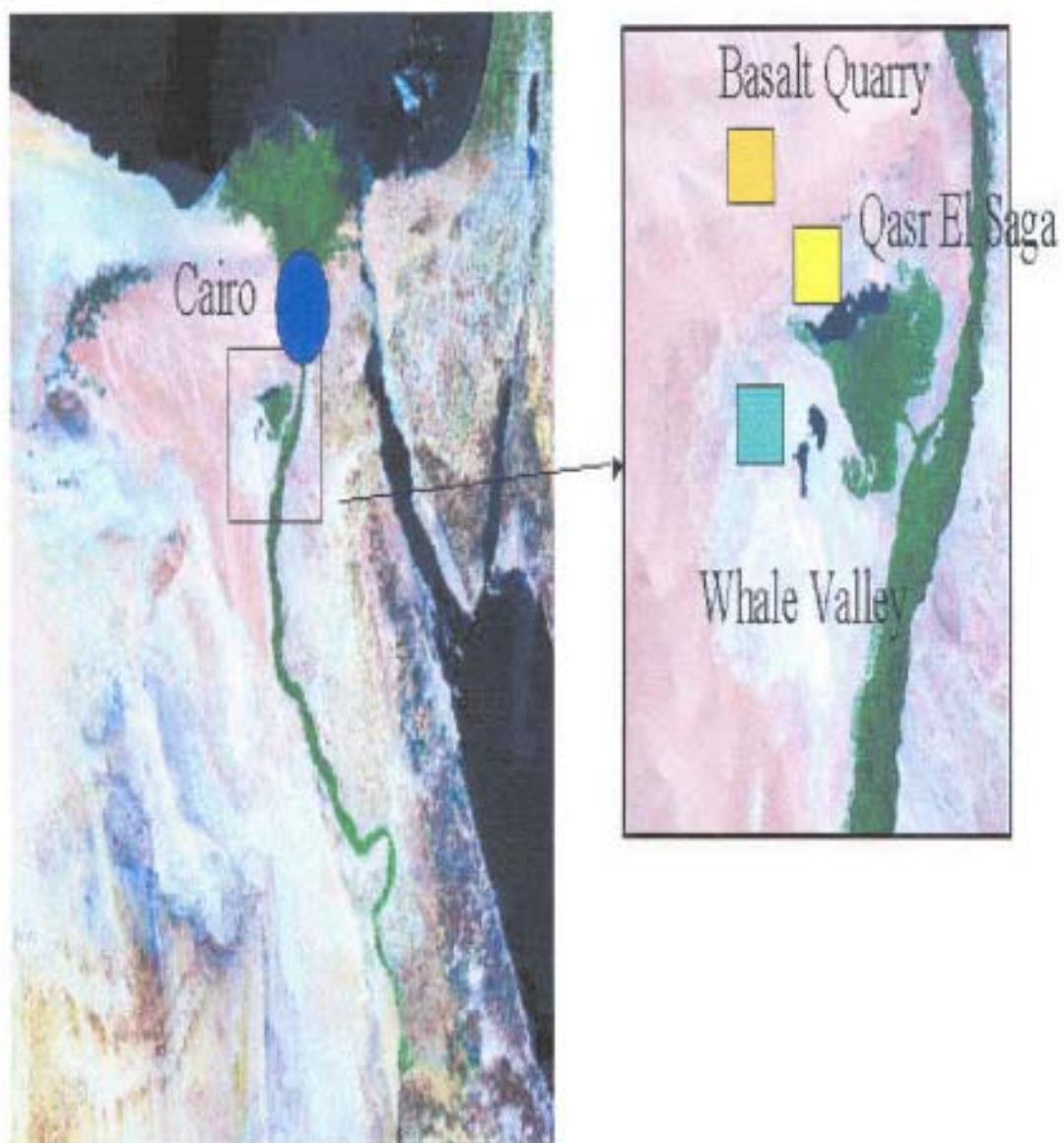
State of preservation of specimens

The state of preservation of the fossil specimens is excellent. The fossils are found in an exceptional concentration, with c.400 identified to date. Many specimens are near-complete specimens preserved in-situ in their death position, with a few to date having preserved features such as stomach contents.

Curation, study and display of fossils

There are well-developed arrangements developed over the last 20 years through the collaboration between the Egyptian authorities and the University of Michigan. Fossils are curated in both Cairo and Michigan, and displayed in museum collections in both places. Fossils are also displayed in-situ within the nominated property, and one skeleton and representative fossil material are also on display at the main visitor centre of the WRPA.

Map 1: General Location of nominated property



Map 2: Boundaries of nominated property

