

Chapter Six

FLORA AND FAUNA

6.1 Biodiversity in Wadi Wurayah

The Eastern Coast Region is the most fertile of the UAE possessing spectacular and varied scenery which encompasses mountains, alluvial plans and coastal habitats. Some areas contain rare species of flora and fauna of the Arabian wildlife as well as a rich and diverse bird population with many migratory species (Tourenq et al., 2006). Other areas are rich in archaeology and cultural heritage.

In 2005, an initiative took place by the EWS, the WWF in the UAE and the Fujairah Municipality to start targeting terrestrial area between Khor Fakkan and Dibba for protection, with special emphasis on the Wadi Wurayah and Wadi Zikt catchments. The study indicated that Wadi Wurayah catchment area hosts a unique ecosystem in the UAE of perennial freshwater habitats, in the form of succession of pools, riffles/streams and water falls. This ecosystem supports a rich biodiversity of flora and fauna in an area of outstanding natural beauty which is already an established popular tourist attraction.

6.1.1 Aquatic Habitat

As a result of the particular geomorphologic features of the catchment area, surface water occurs as continuous streams above saturated gravels downstream of the contact waterfall. Sixty nine freshwater habitats have been recorded in the whole area (Tourenq et al., 2006). Nine Different freshwater habitats types in Wadi Wurayah were identified according to the classification illustrated below.

A. Temporary Rainwater Pool

Rainwater collects in depressions in the rock/wadi bed creating ephemeral pools. Depending on size, depth and exposure to sunlight, pools exist for varying lengths of time before they dry up completely.

Quickly colonized by algae and inhabited by invertebrate aquatic larval stages e.g. mosquitoes, and used by toads as a spawning site. Tadpoles and invertebrate larvae metamorphose before the pool dries up.



Picture 6.1 Giant reed (*Arundo donax*) and *Saccharum ravennae* nearby a permanent freshwater source.

B. Bedrock Riffle

Water is generally fast-flowing habitats that is usually shallow and of varying lengths. Habitat can be located in any part of the wadi bed, but is most commonly encountered exposed in narrow stretches of the wadi.

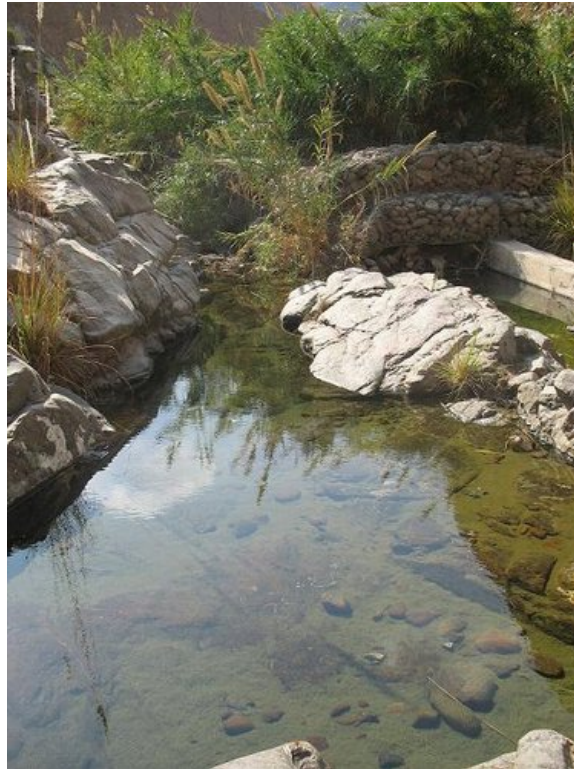
C. Rock /Grave Riffle

Depth varies, but shallow sections are generally faster flowing. Substrate size also varies, from fine gravel and pebbles to larger rocks and boulders. Algae are often present in static/slower flow sections or in parallel side pools. Habitat varies in length, typically located in central sections of the wadi bed.

D. Extensive Reed bed Riffle

Reed and riffle are very extensive habitats (>30 m) in Wadi Wurayah. Most of wadis base flow occurs through dense reed bed. Shallow seasonal stream flow can also be extensive, depending on climatic conditions and rainfall intensity. Substrate type varies often fine sediments/still due to trapping of small particles by reeds and vegetation roots.

Normally deep, static habitats; occasionally have small inlet or outlet flow. Mainly located along edge of wadi bed, adjacent to wall or partly sheltered by bedrock/rock overhangs.



Picture 6.2 *Typha domingensis* found in one pool of Wadi Wurayah.

E. Waterfall Plunge pool

Habitat varies in size, depending on height of fall and velocity of water. Typically deep habitats with larger substrate types are common in areas occupied by gravel and pebbles to rocks and boulders.

F. Deep, Static Boulder Pool

Habitat may be left after flooding events but remain annually due to depth, size and sheltered location. Habitat may also be spring fed from subterranean water supplies. Typically found located in narrow, gorge-like section of wadi where there is maximum protection from sun exposure and deep, rock scorning from flooding.

G. Series of Isolated, Static pools.

Habitat typically found in more sheltered sections of the wadi bed, for example sldges or under overhangs. Pools are often small in size. Water source either from slow flowing inlet underground or from water seepage from the surrounding rock faces.



Picture 6.3 A permanent fresh water source at the area of the study.

H. Series of pools connected by small falls

Habitat comprises of several pools, usually over a fairly short distance. Pools are generally small in width and length but can be relatively deep. Continuous flow occurs between connected pools, which are small falls and narrow fast-flowing sections.

6.1.1.1 Aquatic Flora

There are no aquatic macrophytes recorded in Wadi Wurayah. The only aquatic vegetation present was algae. Algae species and percentage cover appears to be habitat specific, with certain types preferring static water bodies and those with high exposure to sunlight. Presence of algae is extremely important in aquatic habitats both as a source of food for grazing fish invertebrates and as a refuge for juvenile and smaller organisms. The type of algae present in the Wadi ranges from thin films of epilithic algae growing on rocks and gravel grazed on by Wadi Fish (*Garra sp.*) to fine filamentous, green algae species in the riffles and floating mats of brown algae in the static pool environments (Tourenq et al., 2006).



Picture 6.4 Aquatic vegetation of the study area.

6.1.1.2 Aquatic Fauna

Fish

There are sixteen native species of primary freshwater fishes found throughout the entire Arabian Peninsula-primary being completely dependant on the presence of permanent freshwater. Two of these species are found in Eastern and Southern parts of the UAE and Northern Oman the *Garra barreimiae* and *Cyprinion microphthalmum uscatensis*. The Northern limit for *Cyprinion microphthalmum muscatensis* is in the locality of the UAE/Oman border (Aspinall, 1995).

Garra barreimiae is the only fish species present in Wadi Wurayah. Fortunately there are no introduced non-native species which is an increasing problem throughout of the UAE and neighboring countries. Cichlid species such as *Tilapia* and *Oreochromis* are frequently introduced throughout the Arabian Peninsula for food, sport and mosquito control. *Tilapia* directly affects native species via competition for habitat and food resources and complex predator-prey relationships. There may also be potential effects from introduced diseases and parasites.



Picture 6.5 *Garra* species are the only native primary freshwater fish species found in the study area (Tourenq et al., 2006).

The majority of *Garra* species are thought to be opportunistic feeders, with detritus forming a large proportion of their diet. The species are primarily bottom feeders, feeding by facilities grazing over gravel or rock surfaces.

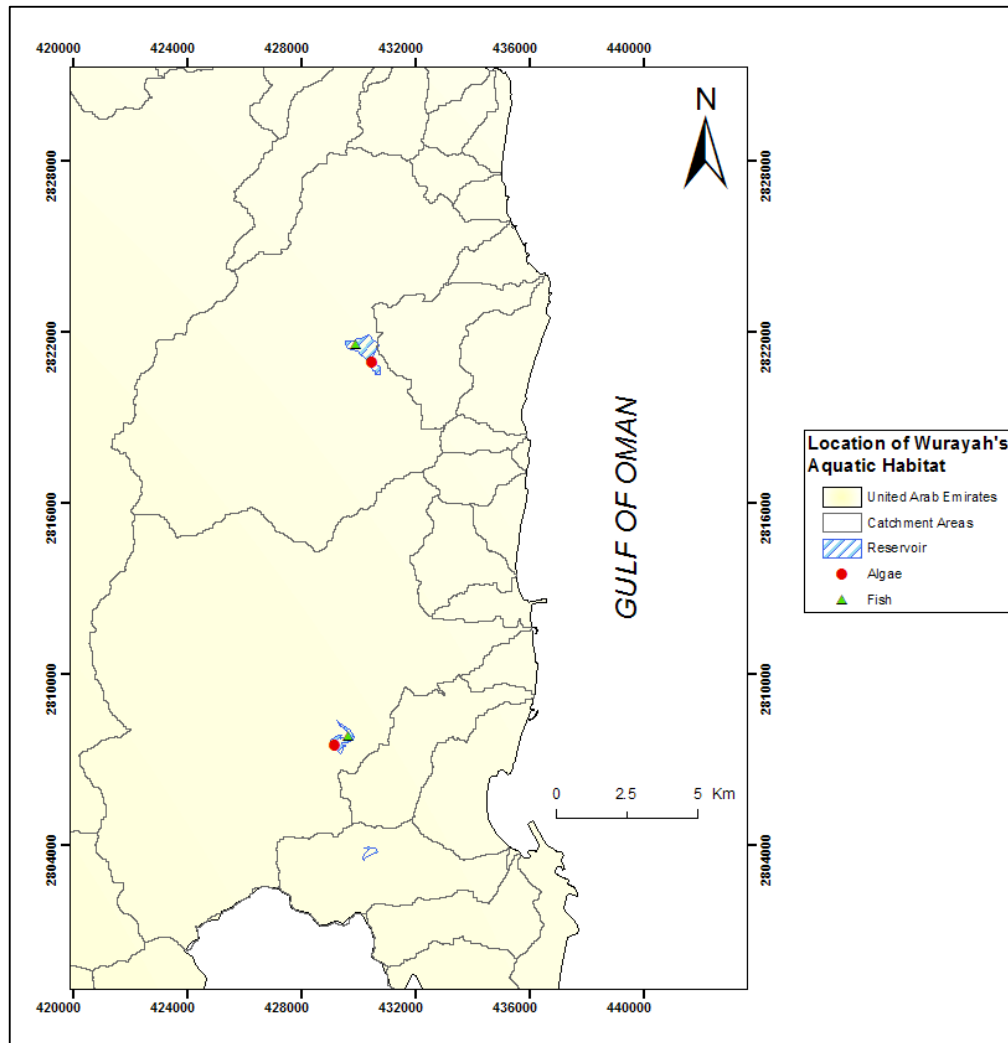


Figure 6.1 Map showing the distribution of the Aquatic Habitat in the area of the study (ALHOGARATY).

Garra barreimiae colonized all available aquatic habitats throughout the Wadi course; this small isolated pool contained a small group of juveniles and occasionally two adults. All age classes of *Garra* were found in Wadi Wurayah where adults display

bright red to orange ‘dipped’ areas on both tips of the caudal fin and also on the anal fin and a white fleck was present between the first and second dorsal fin rays on all adults. Juveniles less than 2.5 cm did not display any tail or fin markings or coloration. Breeding tubercles were presented in several large adults caught, although they were not particularly prominent. There are adults of a similar size which did not show any signs of tubercles (Figure 6.1).

6.1.1.3 Aquatic Invertebrates

Aquatic invertebrates in wadi Wurayah are represented by beetles (*Coleoptera*), bugs (*Hemiptera*), dragonflies (*Odonata*), caddisflies (*Trichoptera*), flatworms (*Platyhelminthes*), roundworms (*Nematodes*), segmented worms (*Annelids*) and molluscs (*Gastropoda*) (Tourenq et al., 2006).

Insects are the most commonly seen creatures in the wadi pool environment, although it is usually the flying adult forms which are most obvious—dragonflies, mosquitoes and midges. These winged insects lay their developing young. Diving beetles are important members of the wadi pool community, although normally only seen when they dash to the surface to breathe, trapping air between hairs underneath their wing cases to enable them to stay underwater longer. Aquatic beetles are fiercely carnivorous, catching passing prey even bigger than themselves including other insects, fish larvae and tadpoles. In turn, they are preyed upon by fish, frogs and birds (Tourenq et al., 2006).

6.1.2 Terrestrial Habitat

6.1.2.1 Terrestrial Flora

The most prevalent plant species in Wadi Wurayah are the woody perennial, namely *Convolvulus virgatus*, *Lycium shawii*, *Boerhaavia elegans* and *Heliotropium* spp. A characteristic of woody perennials is their deep roots in order to seek out a permanent water layer. The major trees identified are *Acacia tortilis*, *Moringa peregrina*, *Ficus cordata* (wild fig tree) and *Ziziphus spina-christi* (Tourenq et al., 2006).

The characteristic flora of higher elevation plateaus and slopes are *Acacia tortillis*, *Lycium shawii*, in combination with several woody perennials such as *Euphorbia larica* and *Tephrosia appolinea*, which constitutes a common plant association. The orchid *Epipactis veratrifolia* which usually lives in association with the fern *Onychium divaricatum* is of particular interest, being the unique Orchidaceae found in the UAE. *Tamarix aphylla*, *Moringa peregrine*, *Typha domingensis* were also recorded and are considered rare in UAE (Tourenq et al., 2006).



Picture 6.6 Natural vegetation at the downstream of the study area.

During the current field survey a distinct vegetation habitats and associations have been easily recognized, such as the species present in the deep shaded wadi gorges or nearby temporary and/or permanent fresh water sources (*Arundo donax*, *Nerium oleander*, *Saccharum ravennae*).



Picture 6.7 The unique orchid species of UAE, *Epipactis veratrifolia* was found in Wadi Wurayah (Tourenq et al., 2006).



Picture 6.8 *Acacia tortillis* is another type of terrestrial flora in the study area.

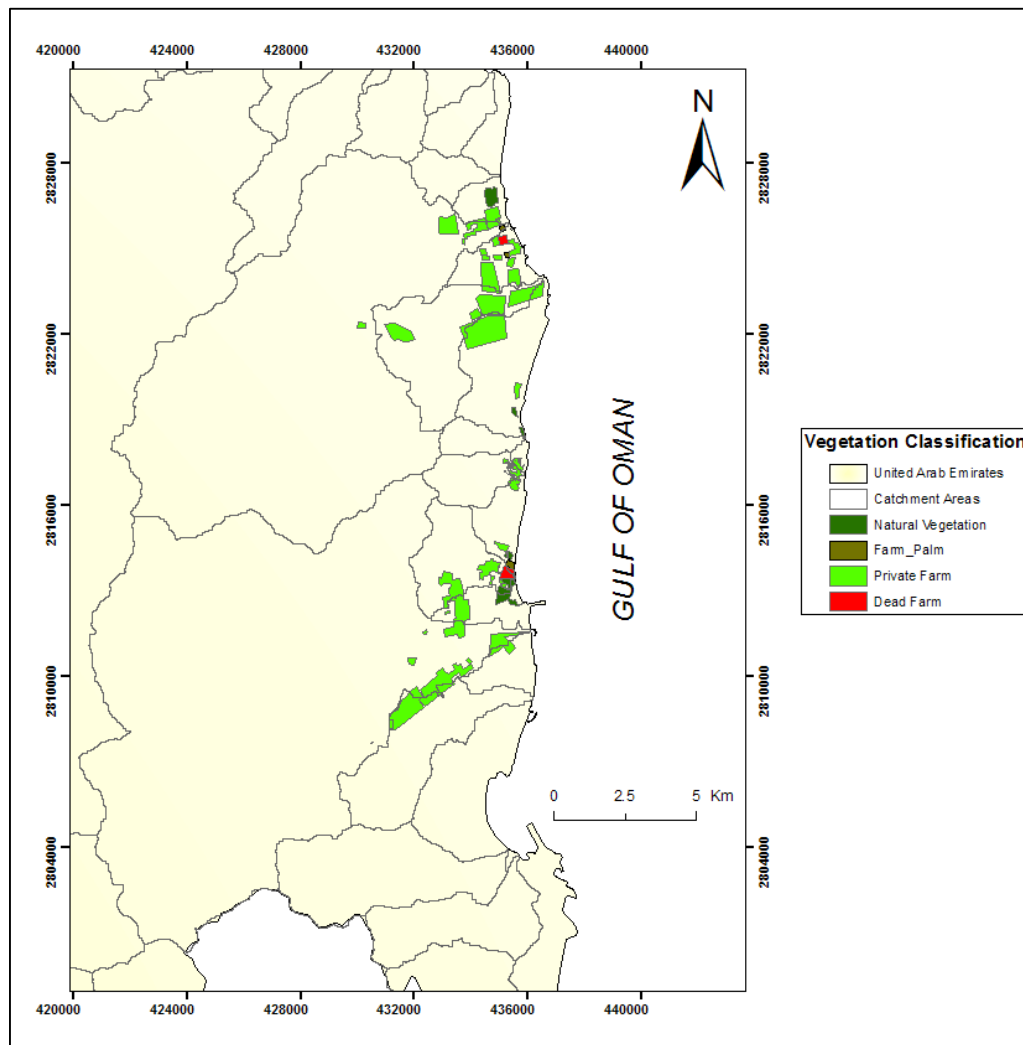


Figure 6.2 Map showing the type of vegetation in the area of the study (ALHOGARATY).

Abandoned date palms (*Phoenix dactilifera*) are located in the lowest wadi elevations as signs of old settlements. The wild fig tree, *Ficus cordata* could be observed in some low areas.

Finally, another example of vegetation but the non natural one has been recorded in the area. It is an established oasis down stream of the Wadi Wurayah catchment area constitutes areas of intensive cultivation of economically important dates, mangos, guavas, citrus, vegetables and a number of crops (Figure 6.2).

6.1.2.2 Terrestrial Fauna

Mammals

A total of 10 species of wild mammals in the region were recorded during the WWF's survey within the Wadi Wurayah (Tourenq et al., 2006). Similar to the presence of permanent water pools, another important feature of the area is its mammalian fauna (Figure 6.3).

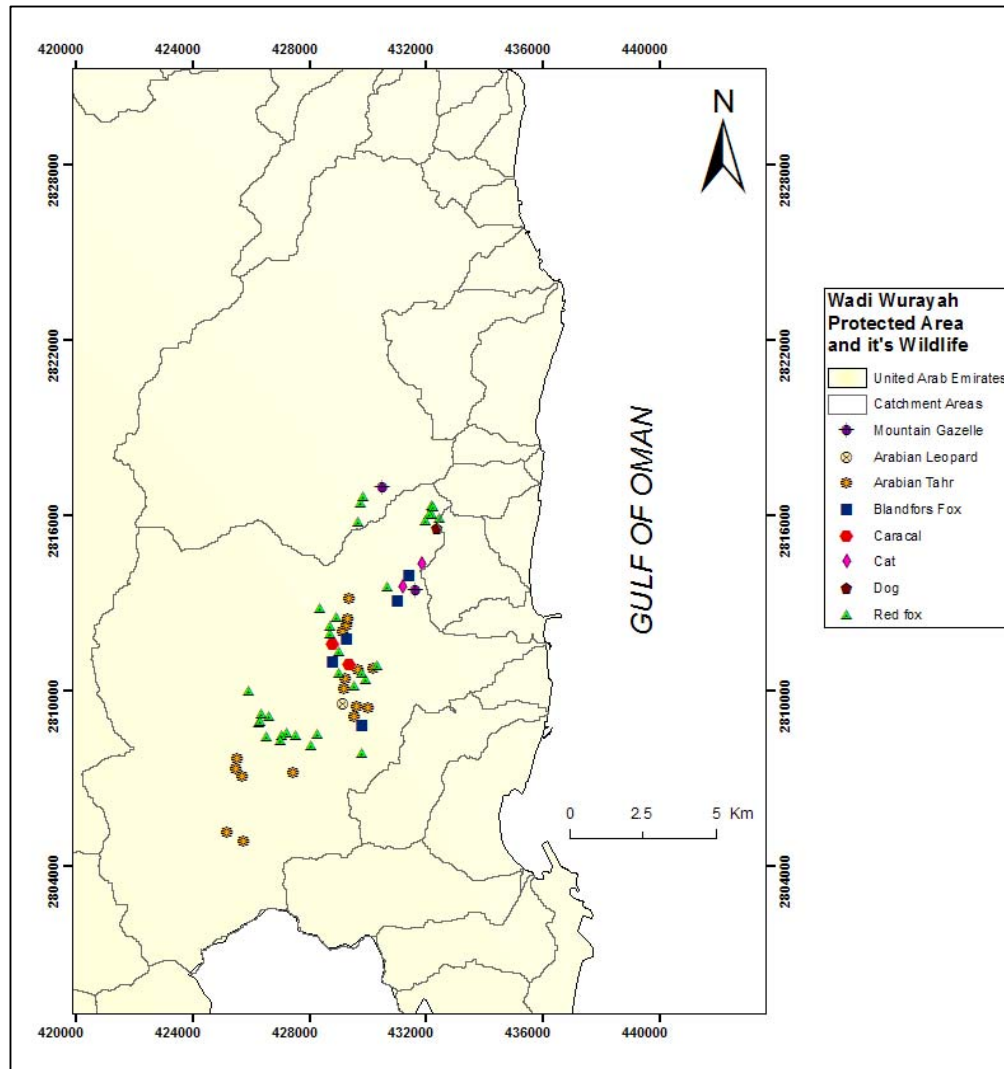


Figure 6.3 Map showing the Mammal distribution in the study area (modified from Tourenq et al., 2006).

Several rare species having been lost in the Wadi Wurayah area, including animals such as the Arabian Wolf (*Canis lupus arabis*) and the Striped Hyena (*Hyaena hyaena*) which was of conservation interest because of their unique presence in the area (endemism) and their small distribution range (Tourenq et al., 2006).

At international level, species like the Arabian Tahr (*Hemitragus jayakarl*) and the Arabian Leopard are considered Endangered according to the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (IUCN, 2004). The Caracal Lynx, the Mountain Gazelle (*Gazella gazelle cora*) and the Blandford's fox (*Vulpes cana*) present in Wadi Wurayah are classified as Vulnerable according to the IUCN Red List. The Red Fox (*Vulpes vulpes arabica*) seems to be common throughout the area. Mostly insectivorous or scavenger, signs of the presence of Blandford's Fox were also recorded in the area. This species suffers directly from human persecution (trapping and poisoning) and indirectly through competition with Red Fox that has expanded its range into the Emirate, benefiting from expansion of urbanization, agricultural plantations, afforested areas, and domestic livestock farms. Red Fox expansion into Wadi Wurayah is facilitated by the presence of litter and picnic left-overs by tourists. Dropping contents of Blandford's Fox consisted mainly of birds, goats, rodents, insects, fruits: Dates and jujubes (*Zizyphus spina-cristi*).

Like previous cited species, the wildcat is mostly nocturnal and rarely seen during the day. However, this species suffers indirectly from Foxes' and Caracals' poisoning and trapping.

Endemic to the south eastern corner of the Arabian Peninsula, the Arabian Tahr once occurred throughout the Musandam Peninsula of northern Oman, south along the Hajar mountain range through the UAE to Sur and Jebel Aswad and into north eastern Oman. Nowadays, with Jebel Hafeet (Al Ain), Wadi Wurayah is one of only two places in the UAE where a small population of Arabian Tahr still survives (Tourenq et al., 2006). Its survival is closely linked with the presence of permanent water holes where it can drink regularly during the hot season.

Permanent water throughout the year could also permit the survival of other rare species such as the Arabian Leopard and the Caracal Lynx. Mountain Gazelle and

Arabian Leopard droppings are also existing but in occasions only and is critically low in Wadi Wurayah.

The rodent population in Wadi Wurayah is still healthy. Being part of the diet of predators (cat, foxes) and feeding on the vegetation, rodents constitute an important part of the food web of Wadi Wurayah's ecosystem. Due to their nocturnal habits, Chiroptera (bats) were recorded but not identified (Tourenq et al., 2006).

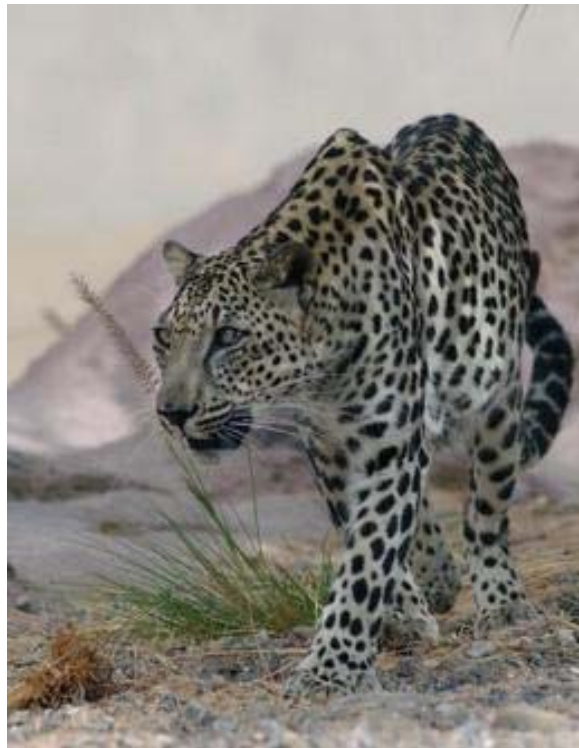
Feral Cats (*Felis cattus*) and Feral Dogs (*Canis canis*) are common near human settlements where there is an abundance of food and water resources such as the areas near the waterfall where they feed on the on the litter and picnic left-overs by tourists. These species constitute a threat to wild animal populations, as direct predators, but also by genetic pollution and introduction of disease such as feline immunodeficiency lentivirus and leukaemia (Nowell & Jackson, 1996; Ostrowski et al., 2003).



Picture 6.9 Blanford's Fox (up) and Mountain Gazelle (down) (Tourenq et al., 2006).



Picture 6.10 The Caracal Lynx is the super-predator of the study area (Tourenq et al., 2006).



Picture 6.11 Arabian Leopard may still be found in the study area (Tourenq et al., 2006).

Feral domestic Goats (*Capra aegagrus hircus*) and Feral Donkeys (*Equus africanus*) were recorded. These species survive in Wadi Wurayah's hostile environment only because of the presence of permanent water and the litter and picnic by tourists. Feral goats are predated by Arabian Leopards and Caracals and its populations might have reached an equilibrium in relation with predators, climate and water availability. However, the decline of predators due to human persecution allowed the population of feral goats to increase and the problem of overgrazing to arise. Feral donkeys in Wadi Wurayah are considered a natural threat since their numbers are low and estimated to be one to two individuals in this area.

Birds

A total of sixty-three species of birds exist within the Wadi Wurayah area, the WWF and EWS survey added 15 new species to the list proposed by Stuart and Stuart (Hornby, 1996).

Wadi Wurayah's bird species include the typical mountain resident birds; for example Hume's Wheatear (*Oenanthe alboniger*), Sand partridge (*Ammoperdix heyi*), Desert Lark (*Ammomanes deserti*) and Northern Palearctic migrant species such as Sparrowhawk (*Accipiter nisus*), Blue Rock Thrush (*Monticola solitarius*), Kingfisher (*Alcedo atthis*), Grey Wagtail (*Motacilla cinerea*), and Red-tailed Wheatear (*Oenanthe xanthopyrna*) to name a few (Tourenq et al., 2006). These are attracted by permanent water holes and their luxurious vegetation.

Fifty-nine percent of the species (37) recorder in Wadi Wurayah area are known or are thought to be present during the breeding season, including species of national conservation interest such as the Egyptian Vulture (*Neophron percnopterus*), Bonelli's Eagle (*Hieraaetus fasciatus*), and the Barbary Falcon (*Falco pelegrinoides*) which are native and declining. Paris of brown-necked ravens (*Corvus ruficollis*) was particularly active in March. Kestrels (*Falco tinnunculus*) are present all year round in Wadi Wurayah. Nests of Rock Dove (*Columba livia*), Laughing Dove (*Streptoplia senegalensis*), Yellow-vented Bulbul (*Pycnonnotus xanthopygos*), Purple Sunbird

(*Nectarinia asiatica*) and Hume's Wheatear also exist in the Wadi (Tourenq et al., 2006).

Down-stream near the coast, House Sparrows (*Passer domesticus*), Laughing Doves, Grey Francolins (*Francolinus pondicerianus*), Little Green Bee-eaters (*Merops orientalis*), Indian Roller (*Coracias benghalensis*), Purple Sunbirds, and Southern Grey Shrikes (*Lanius meridionalis*) are breeding in and around farms and gardens that also attract many migrant species during the spring and autumn (Tourenq et al., 2006). Since their Introduction from Iran in the 16th century by the Portuguese, Chukar (*Alectoris chukar*) populations have remained in the mountains of UAE and are reinforced by continuous introductions, especially during the last decades (Aspinall, 1996). They have been reported in the Masafi area and may occur occasionally on the western side of the Wadi Wurayah. This species and the most common Sand Partridge are part of the diet of the Arabian Leopard and Caracal.

Partridges are hunted by locals and their numbers have declined drastically during the last decade due to over hunting. Drought and overgrazing by goats may be responsible for the suggested decline.

The rare, and of conservation interest, Striated Scops Owl (*Otus brucei*), Spotted Eagle Owl (*Bubo africanus*) and the Desert Eagle Owl (*Bubo ascalaphus*) have been spotted by previous authors in the area (Tourenq et al., 2006).

Mixed flocks of Rock Dove and Feral Dove are regularly coming to drink and to feed on refuse litter near the tourist sport sites.

Reptiles and Amphibians

A total of 12 species of reptiles and amphibians have been recorded by the WWF and EWS in the Wadi Wurayah (Tourenq et al., 2006).

The most common species of reptiles found in the region were the Sinai Agama (*Pseudotrapelus sinaitus*), the Rock semaphore Gecko (*Prissturus rupestris*), the Wadi Racer (*Platyceps rhodorhacis*) and the Omani Carpet Viper (*Echis omanensis*).

The two species of amphibians found in the UAE are: the Arabian Toad (*Bufo arabicus*) and the Dhofar Toad (*Bufo dhufarensis*), with a new confirmed record for

this species in the area. The two species occupy distinct niches, with *B. arabicus* requiring water to be present during all stages of its life history. *B. dhuufarensis*, in comparison, is able to survive lengthy periods in purely terrestrial environments.

Despite their bad reputation, reptiles and amphibians are a vital part of the food web in these arid mountains, where small mammals are relatively scarce. They provide the principal food recourse for foxes, caracals and wild cats. It is worthy to note that Wadi Wurayah hosts four species that are endemic to mountains of the UAE and northern Oman: Blue-tailed Lizard (*Omanosaura cyanura*), Bar-tailed Semaphore Gecko, Rock semaphore Gecko and Arabian Toad.

6.1.2.3. Terrestrial Invertebrates

A total number of 74 terrestrial invertebrate families have been identified so far by the WWF and EWS, belonging to 12 different orders (Tourenq et al., 2006).

Many more species have been collected and remain to be identified, such as Dragonflies (*Obonata*) and butterflies and moths (*Lepidoptera*). So far, flies (*Diptera*) and wasp, bees (*Hymenoptera*) represent the most diverse order of invertebrates in Wadi Wurayah with 25 and 21 families, respectively.

Worms (*Platy helminthes*, *Nematodes*, *Annelids*) form an essential part of any wadi ecosystem they break down and facilitate the mineralization of organic matter in water bodies. Situated at the bottom of the food web, they are a valuable source of nutrition for variety of organisms including juvenile fish, tadpoles and larger invertebrates.

Two families of *Gastropod* were recorded: *Prosobranchs* and *Pulmonares* (Tourenq et al., 2006). Both are characterized by single shell and an asymmetric body. *Gastropods* are an important part of the wadi food chain, whether as herbivores, carnivores or omnivores. Some are parasites and many specialize by feeding on unusual poorly digestible materials. They are also an important source of food for other freshwater animals.

It is important to mention that different species have different life-cycles. For example adult's ant lions (*Neuropterae*) are active from April throughout the summer, whereas

butterflies (*Lepidoptera*) are more visible after the winter–spring rains when flowers bloom and some migrating dragonflies (*Odonatae*) can be observed in autumn and spring only.

Due to its habitat diversity and the presence of permanent water, Wadi Wurayah can be considered a stronghold for the invertebrate fauna in the UAE.

6.2 The Protected Area Led to a Biosphere Reserve in the Eastern Coast Region (Wadi Wurayah as an example)

According to what have been explained regarding the biodiversity, Wadi Wurayah is a remarkable candidate for the establishment of a protected area that would become a model of existing and projected biosphere reserve management and effective protection of the only natural freshwater habitats in the UAE.

As a result and on the 23rd of April 2009, the wadi as a part of Fujairah Emirate has officially been declared the UAE's first protected mountain area by the Decree of His Highness Shaikh Hamad Bin Mohammad Al Sharqi, Member of the Supreme Council and Ruler of Fujairah (Figure 6.4).

On the other hand, some of natural or human factors like: overgrazing, habitat fragmentation, wildlife poaching and persecution, habitat degradation and urbanization could affect the wadi's biodiversity system causing a declination in species (Figure 6.5).

That is why this study will deal with establishing and managing Wadi Wurayah as a biosphere reserve for restoration and protection within the Emirate of Fujairah. This increases the institutional capacity of the local government to effectively manage a protected area by integrating a strong human component. The outcome of the study can be a suite of potential projects in the UAE and the region that will, if implemented, contribute as much to sustainable rural development as to environmental protection of key habitats and species.

In order to fulfill this, this study surveyed this area in the light of the work done by the EWS-WWF and the Fujairah Municipality, to identify the current stresses on the ecosystem found in the Wadi Wurayah and its hinterland due to the existing human

activities and its expansion trends at the area and seek the potentiality and the feasibility of the establishment of a Biosphere Reserve in Wadi Wurayah.

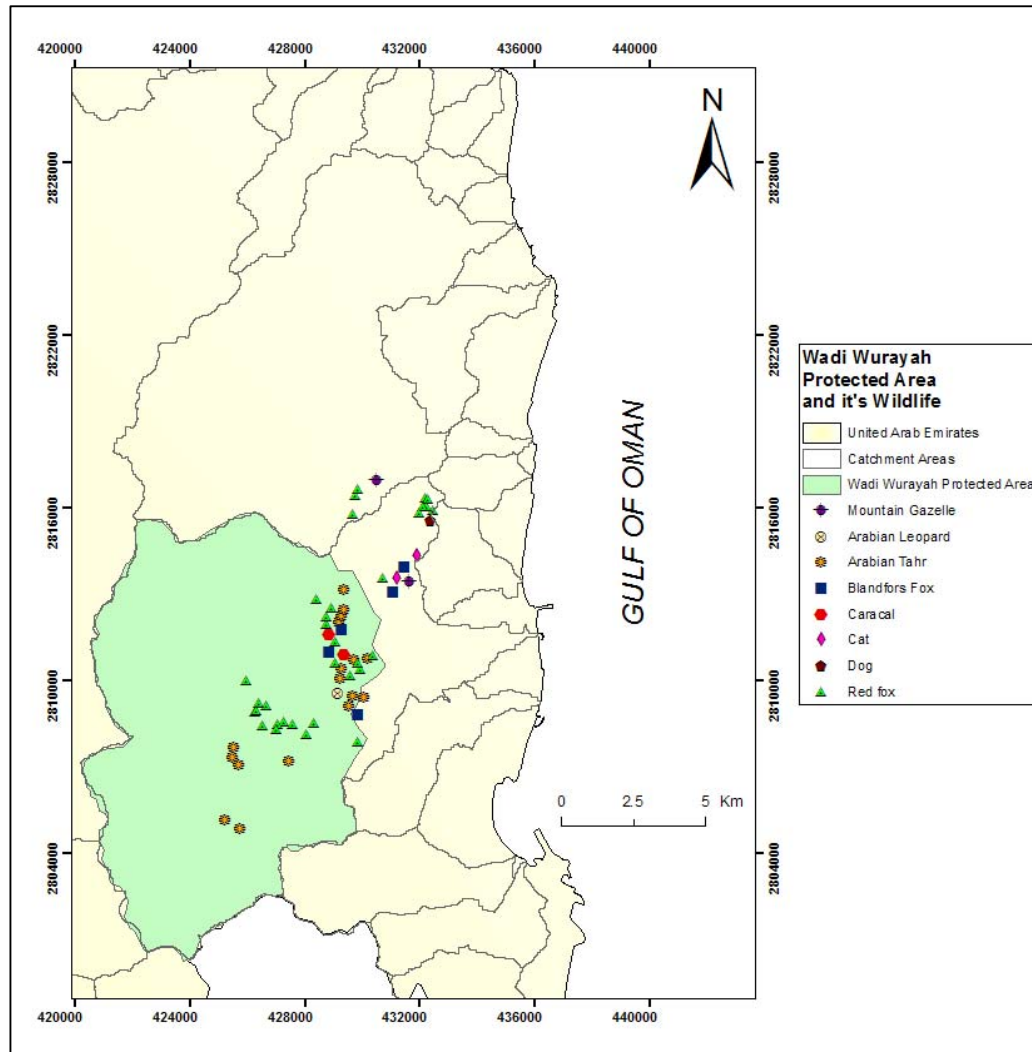


Figure 6.4 The Wadi Wurayah protected area after the Amiri Decree (modified from Tourenq et al., 2006).

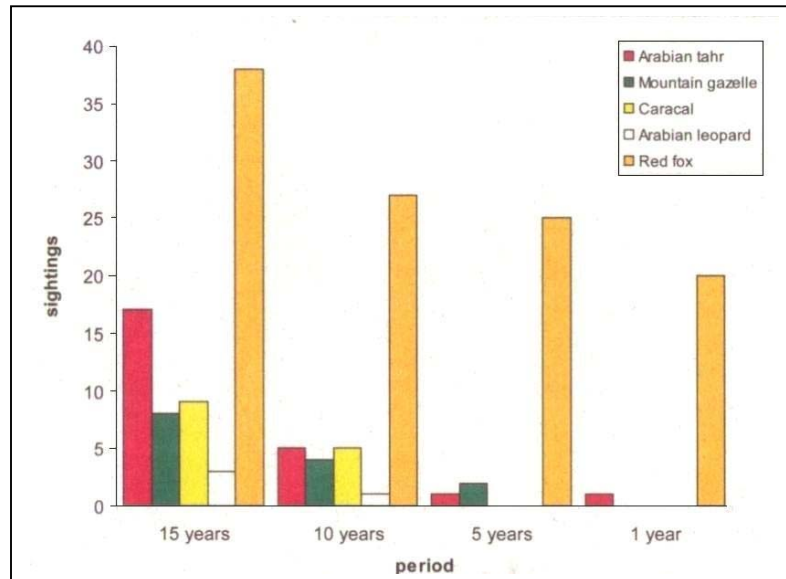


Figure 6.5 Sighting of wildlife in Wadi Wurayah during the last 15 years period since 2006 (Tourenq, et al. 2006)