

**FLORA, FAUNA AND NATURAL HABITATS RECORDED
DURING FIELD OBSERVATIONS ALONG THE SHABAB 1
PIPELINE (ABQAIQ TO RUB AL KHALI) AND IN THE SHAYBAH
OILFIELD, RUB AL KHALI, EASTERN PROVINCE, SAUDI
ARABIA: 24 MAY - 1 JUNE 2010 (ABBA SURVEY 41)**



**By Michael C. Jennings
December 2010**

ABBA Survey Reports

A summary of the results of ABBA Surveys appears in *The Phoenix*, the newsletter of the ABBA Project. A full report has been prepared of some surveys which includes details of censuses and other observations, sites visited etc., these have been published as follows:

Survey 4. JENNINGS, M. C., M. I. AL SALAMA & H. S. FELEMBAN. 1988. ***Report on an ornithological survey of the Asir National Park, Saudi Arabia 29 June to 18 July 1987.*** N.C.W.C.D., Riyadh Report 4. (Pp 76).

Survey 5. JENNINGS, M. C., M. O. AL TOUM & A. A. A. AL ISSA. 1988. ***Atlas of the Breeding Birds of Arabia: Survey 5, Results of an Ornithological Survey of Northern Saudi Arabia: 27 February - 26 March 1988.*** N.C.W.C.D. Technical Report 10. (Pp 65).

Survey 6. JENNINGS, M. C. & M. I. AL SALAMA. 1989. ***Results of an ornithological survey of the northern Asir & southern Hedjaz region of Saudi Arabia, 25 June - 16 July 1988.*** N.C.W.C.D. Riyadh Tech. Report No.14. (Pp 65).

Survey 7. JENNINGS, M. C., S. A. AL SHODOUKHI, T. M. AL ABASS & S. COLLENETTE. 1990. ***Results of an ornithological survey of central & north western Saudi Arabia; 12 March - 8 April 1989.*** N.C.W.C.D. Riyadh Tech. Report No.19. (Pp 82).

Survey 8. JENNINGS, M. C., I. A. ABDULLA & N. K. MOHAMMED. 1991. ***Results of an ornithological survey of South Yemen 23 October - 9 November 1989.*** N.C.W.C.D. Technical Report 25: Riyadh, South Arabia. (Pp 63).

Surveys 9 & 10. JENNINGS, M. C., A. AL KRAIRY & R. AL HARBI. 1992. ***Results of two ornithological surveys to Central Saudi Arabia, May 1990 and April- May 1991.*** N.C.W.C.D., Riyadh Technical Report 28. (Pp 60).

Surveys 11 & 12. JENNINGS, M. C., M. I. AL SALAMA & C. T. RICHARDSON. 1994. ***Results of two ornithological surveys to UAE and Oman and Northern Saudi Arabia, February-May 1992.*** N.C.W.C.D. Tech. Report No 35. (Pp.75).

Surveys 13-16. JENNINGS, M. C., M. I. AL SALAMA, A. H. AL SUHAIBANI, H. S. A. YAHYA & C. E. QIRREH. 1996. ***Results of four ornithological surveys to the southern Tihama of Saudi Arabia, north eastern Saudi Arabia, northern Oman and north western Saudi Arabia, during the period December 1992 to April 1994.*** N.C.W.C.D. Riyadh Tech. Report No.36. (Pp.65).

Surveys 17-22. JENNINGS, M. C. 2004. ***The birds of the Rub al Khali periphery: Results of six ornithological surveys to Saudi Arabia, Oman, Yemen & the UAE, March 1995-July 1997.*** ABBA Report Somersham, Cambridgeshire, UK. (Pp.87).

Survey 35. JENNINGS, M. C. 2005. ***Birds observed at Ghubrah Bowl, Saiq Plateau & Jabal Shams, Northern Oman 19 March-26 April 2005 with comments on status & population.*** Report, Sultan Qaboos University, Al Khoud. (Pp16).

Survey 40. JENNINGS, M. C., M. I. AL SALAMAH, B. ABU QABOUS & H. N. AL SUBAIE. 2009. ***Wintering Birds in Northern Saudi Arabia: February 2009.*** Report to SWC Riyadh. (Pp 53).

Flora, fauna and natural habitats recorded during field observations along the Shabab 1 Pipeline (Abqaiq to Rub al Khali) and in the Shaybah Oilfield, Rub al Khali, Eastern Province, Saudi Arabia: 24 May - 1 June 2010 (ABBA Survey 41)

**By Michael C Jennings¹
December 2010**

Introduction

1. During the period 24 May to 1 June 2010 observations were made of the flora, fauna and habitats of two study areas in the Rub al Khali in the Eastern Province of Saudi Arabia. Firstly the route of an existing pipeline, known as Shabab 1, which runs from the Jafurah desert south of Abqaiq to a point 211 km west of the Shaybah oil field, a distance of 422 km. Secondly the Shaybah oilfield area (administered by Saudi ARAMCO), paying particular attention to the sites listed at paragraph 6. (See also the map at Fig. 1.) In the following paragraphs the two sites are often identified simply as Shabab and Shaybah.

2. The terrain of the Shabab study area changes from deep white sand dunes (of limestone/gypsum origin) in the Jafurah desert near Abqaiq, which gives way to harder more permanent sand and gravel substrates in the region of the base of the Qatar Peninsula, then passing through a zone of low broken limestone/gypsum outcrops before turning eastwards to the high dunes of wind blown sand of the Rub al Khali proper. Here the landscape is of sabkhas, flat areas swept of sand alternating with high yellowish sand dunes which are comprised of larger more quartz-like grains than noted previously. Sabkhas usually have a damp, highly saline, sandy soil which forms a crusty and sterile biotope. Approaching Shaybah the sabkhas become flat 'islands' surrounded on all sides by high dunes. Shaybah oilfield is elongated and orientated south-west to north-east, approximately 39 km long and 18 km wide, an area of approximately 550 sq km. The semi mobile dunes in the region rise to about 200 m above sea level, between about 50 -100 m above the level of the sabkhas. Oil industry activity and infrastructure is almost entirely confined to the inter-dune sabkhas (which are numbered by ARAMCO). Gas and oil pipelines run over the dunes between extraction and processing sites. The dunes have a sparse covering of plants but the sterile sabkhas are devoid of plant growth, except where blown sands have settled and created a slightly less saline environment.

3. A limited diversity of plants and wildlife was noted throughout the study area. A listing of all plants and animals recorded is to be found at Appendix 1.

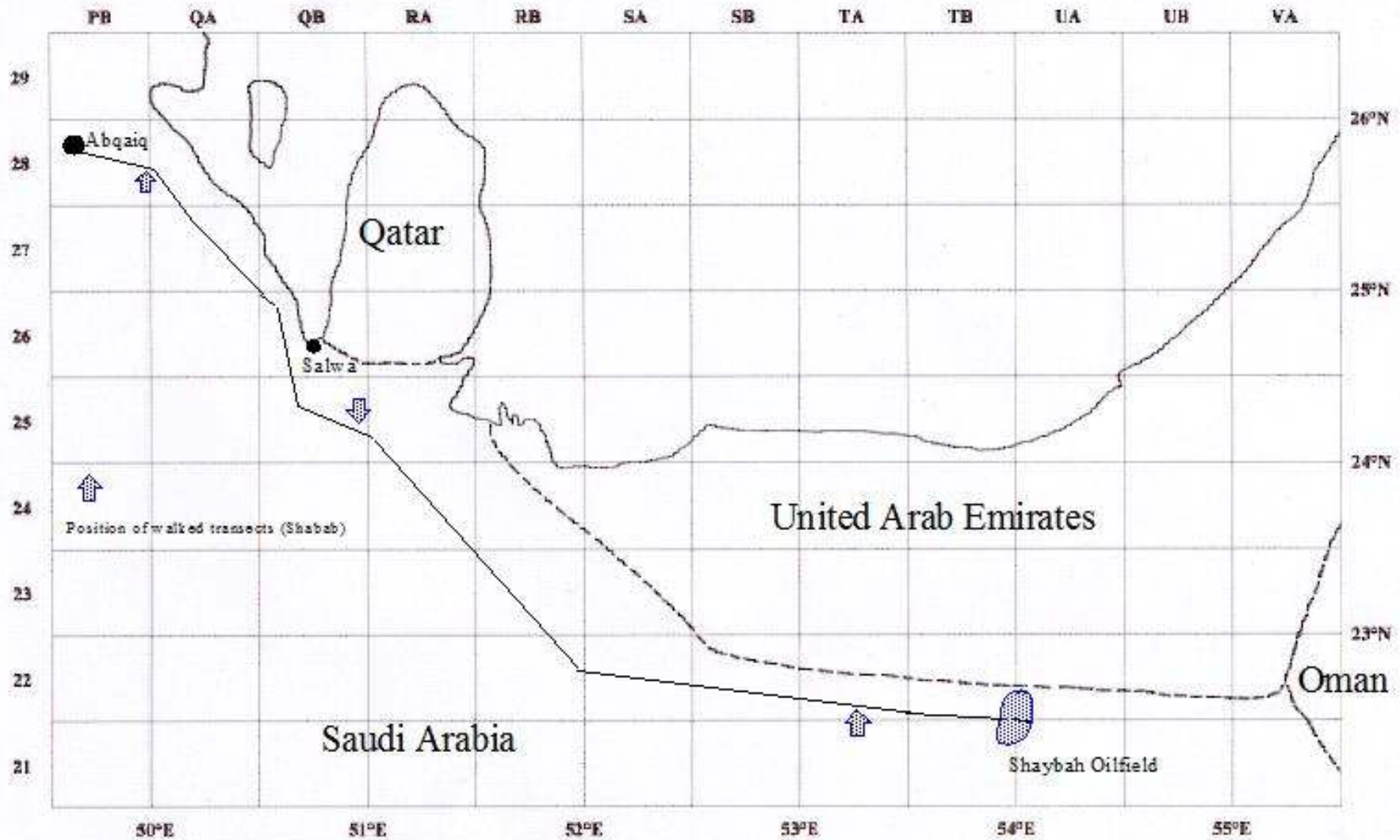
4. Separate reports are being compiled by other survey members in respect of plant community transects (30 m), historical/archeological aspects of the route and human interest issues.

Methods

5. The entire length of the Shabab 1 Pipeline (633 km) was driven along with particular attention paid to the first 422 km south-east from Abqaiq. Distances were precise and easily recorded as

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Fig 1: The Route of the Shabab pipeline and the position of the Shaybah oilfield



there were distance markers on the pipeline at each kilometer, with Abqaiq being km 633 and Shaybah being km 1. For each kilometer vegetation, fauna and habitats were recorded, as well as human sites; such as bedouin camps/herds, oil industry installations such as valves, telecommunication towers, roads adjacent to the pipeline or crossing it, and natural sites of interest. Plants were noted (within 250 m of pipeline route) in terms of their commonality in each sector and sometimes where dominant. In the time available it was not possible to compile DAFOR scale assessments² for each km traveled. Nil records of plants recorded refer to the 500 m wide corridor of the survey. Only a few detours of more than a kilometer were made from the pipeline route, usually to obtain petrol and supplies or visit sites of special interest. (Detours are generally not included in the results).

6. At Shaybah activity was directed to ten separate sites of interest, comprised of four Gas Oil Separation Plants (GOSPs, Nos 1- 4); Sabkhas 40 (an accommodation unit), 111, 112 (currently untouched but both due for development) and 113 which is the main ARAMCO administrative area and airport; and the routes of power-lines and pipelines related to the proposed Natural Gas Liquidisation (NGL) complex running from GOSPs 3 and 4 to Sabkha 112.

7. Concomitant with the Shabab survey a series of six driven transects covering a total of 507 km were carried out to census birds present in each part of the pipeline route.

8. Six, early morning, walked censuses were carried out at different sites, aimed at establishing bird communities in the Rub al Khali in early summer, these also recorded habitats and other wildlife in the region. (Three surveys each for Shabab and Shaybah).

9. Rodent live traps and a passive infra-red camera trap were set up at night at five sites in order to identify mammals present overnight. (Three Shabab and two Shaybah).

10. Birds were recorded on all occasions with particular sites examined in detail. Records were also maintained following the spatial distribution recording units of the Atlas of the Breeding Birds of Arabia (ABBA) project. ABBA half degree grid square designators (e.g. PB29 and UA22) are used in the text on occasions as spatial references and are shown on the map at Fig 1. Changes to status and range were noted against the few previous records of birds for the region.

11. Waypoints were recorded at important sites in both Shabab and Shaybah and a full photographic record of flora, fauna and habitats was maintained.

Results

Shabab 1 Pipeline (24-27 May 2010)

12. The table at Appendix 2 shows for each kilometer the plants and animals noted, human usage, and other aspects of the pipeline route. This was not a detailed botanical survey but a total of 17 species of plants were recorded along the length of the pipeline, diversity decreasing with the increasing aridity and uniformity of the sands of the Rub al Khali. There were 16 species recorded in the sector from Abqaiq to the point where the pipeline turns almost due east (RB23) and only six species between RB23 and Shaybah. (One further species was found in the Shaybah area only). See report elsewhere for results of 30 m plant community transects.

² D = Dominant; A = Abundant, F = Frequent, O = Occasional, R = Rare.

13. Driven bird transects are summarised at Appendix 3, these show a low species diversity and low populations for each species with, generally speaking, increasingly less birds in each square km going further into the Rub al Khali. In all only ten species of birds (including three migrants) were recorded during the 633 km of the Shabab study.

14. The results of the three walked early morning transects of birds and birds habitats are shown at Appendix 4. These transects further illustrate the extremely low populations of birds in the study area, with only one bird being found in total on the three desert transects. (No human sites were censused).

15. No success was achieved with the rodent and camera traps at the three Shabab sites where they were deployed. However other wildlife recorded included two species of reptile; Spiny-tailed Lizard *Uromastix aegyptius* and Spotted Toad-headed Agama *Phrynocephalus maculatus* and tracks/signs of snake and skink (probably *Scincus mitranus*) and of Lesser Jerboa *Jaculus jaculus*, a *Gerbillus* sp. Red Fox *Vulpes vulpes*, Cape Hare *Lepus capensis* and possibly Sand Cat *Felis margarita*.

Shaybah Oilfield (27 May - 1 June 2010)

16. Ten sites were studied within the Shaybah Oilfield for flora and fauna , Appendix 5 lists the results by each site. Selected waypoints of censuses, transects and installations are at Appendix 6.

17. Only seven species of naturally occurring plants were found in this region. Including *Cyperus conglomeratus*, *Cornulaca arabica*, *Calligonum crinitum*, *Zygophyllum mandavillei*, *Tribulus arabicus* all of which were common and widespread on the dunes and around sabkhas and *Phragmites australis* which was noted on wet ground, mainly near human sites. In addition a few examples of *Dipterydium glaucum* (Capparaceae) was found at two sand dune habitats. Further details of all plants recorded can be found at Appendix 1. There were a number of exotics noticed around buildings and living quarters at various sites, but particularly Sabkha 113, these included planted date palms *Phoenix dactylifera* and exotic palms, shrubs used as windbreaks and hedges and at least two species of grass. (There was no species of indigenous grass in the Shaybah area).

18. Of the animal life recorded, large noticeable arthropods were scarce. Surprisingly no scorpions were found despite several searches under ground debris which elsewhere in Arabia are usually much favoured daytime roost sites. Some small insects such as ants, flies and hymenopterans were common, termites were also observed on a few occasions. Large arthropods recorded included two species of grasshopper *Sphingonotus savignyi* and *S. rubescens*, several examples of a large dragonfly, almost certainly a migrant species, possibly *Pantala flavescens*, a solifugid, and a large spider.

19. Vertebrates recorded included an unidentified introduced fish at evaporation pools at GOSP 4 and Sabkha 40 which may have been placed there to control mosquitoes.

20. Identified reptiles included Arabian Toad-headed Agama *Phrynocephalus arabicus* and Grey Monitor *Varanus griseus*, and the tracks of a skinks (*Scincus* sp) were also recorded. Snake tracks were also seen on more than one occasion.

21. Indigenous desert birds were at a very low population levels and of limited diversity however human commensal and species able to utilise habitats changed by humans were more numerous. Most migrant birds were seen at sewage evaporation pools at Sabkha 40. Three walked transects

were made in the Shaybah area, see Appendix 4. One human site census recorded 20 birds of two species but two censuses at or near Sabkha 112, recorded no birds at all.

22. Birds were the most diverse of the observed vertebrates. Birds species fitted into three clear categories; indigenous residents, human commensal breeding species and migrants. These are listed by site at Appendix 5. Of the potentially 14 breeding species occurring in the area only three were indigenous species which occurred as resident breeding birds in the region before the oilfield was established. The other 11 were all species that breed or potentially breed in the area because of human sites created in the oilfield and human altered habitats. Because of the timing of the survey in May/June it is likely that all the species breeding in this part of the Rub al Khali were present and recorded. The three indigenous species were Long-legged Buzzard *Buteo rufinus*, Brown-necked Raven *Corvus ruficollis* and Greater Hoopoe Lark *Alaemon alaudipes*. However it is expected that at least part of each species' population will leave the region in mid to late summer. Conversely the human commensal species are almost certainly permanent residents in the oilfield except for the two breeding summer visitors noted, Eurasian Turtle Dove *Streptopelia turtur* and Rufous-tailed Scrub Robin *Cercotrichas galactotes*. The human commensal species include some interesting additions to the previously known avifauna of this part of the Rub al Khali. The Kentish Plover *Charadrius alexandrinus* was confirmed to breed in Sabkha 40, this is an extension to the known range of that species, also the Red-wattled Lapwing *Vanellus indicus*, present as pairs in late May is highly indicative of breeding at the site this year, or in the near future. This species has spread westwards in the UAE in recent decades and the record at Sabkha 40 could result in a considerable extension to the Arabian breeding range and the first breeding record of this species anywhere in Saudi Arabia. The Eurasian Turtle Dove is a breeding summer visitor to eastern Arabia but has not been previously recorded in this part of the Rub al Khali, this also applies to the Rufous-tailed Scrub Robin, although both are known from the Liwa Oasis in nearby UAE. In addition to breeding birds a small number of migrant species were recorded notably a flock of 13 Red-necked Phalarope *Phalaropus lobatus* a rare migrant wader that breeds in the high arctic and Striated Heron *Butorides striatus* a resident coastal species only rarely recorded inland, indeed this is probably the furthest inland one has been recorded in Arabia. It has also not previously been recorded anywhere in eastern Saudi Arabia.

23. No success was had at the two sites where rodent live traps and the passive camera trap set to record nocturnal mammals.

24. Mammals, which are mostly nocturnal, were mainly recorded by their tracks, faeces and other signs. Eight mammals species are suggested to be present, these include three carnivores, Red Fox *Vulpes vulpes*, Blanford's Sand Fox *Vulpes rueppellii*, and Sand Cat *Felis margarita*. Rodents include the House Mouse *Mus musculus* (one found dead), Lesser Jerboa *Jaculus jaculus* and unidentified tracks suggest a gerbil *Gerbillus* sp is present. Larger tracks of a jird *Meriones* sp, possibly *M. crassus* were also seen. The cape Hare *Lepus capensis* is also present, confirmed by one sight record and another by its tracks. There were several feral dogs present at some camps and evidence noted of domestic cat.

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Appendices

Appendix 1: Annotated list of flora and fauna recorded in the Shabab and Shaybah study areas.

Appendix 2: Shabab 1 Pipeline: Flora and fauna noted with notes on human usage, conditions and the terrain

Appendix 3: Birds observed during driven transects: Shabab 1 Pipeline (24-27 May 2010)

Appendix 4: Details of early morning walked transect censuses

Appendix 5: Flora and fauna recorded at sites in the Shaybah Oilfield

Appendix 6: Selected Waypoints



Plants of the Shaybah region - see Appendix 1

- 1 *Zygophyllum mandavillei*
- 3 *Tribulus arabicus*
- 5 *Cornulaca arabica*

- 2 *Cyperus conglomeratus*
- 4 *Calligonum crinitum*
- 6 *Dipterygium glaucum*



Locations of the six early morning walked transect censuses. See Appendix 4 for more details of location, habitat and fauna and flora noted

- | | | | |
|---|--|---|----------------------------------|
| 1 | Jafurah desert | 2 | Base of Qatar Peninsula |
| 3 | Shubaytah | 4 | Camp Subkha 40, Shaybah |
| 5 | Eastern Rub al Khali, west of Subkha 112 | 6 | Eastern Rub al Khali, Subkha 112 |



Fauna of the Rub al Khali

- 1 *Phrynocephalus maculatus*
- 3 *Sphingonotus savignyi*
- 5 Unidentified darkling beetle

- 2 *Phrynocephalus arabicus*
- 4 *Sphingonotus rubescens*
- 6 Tracks and droppings of *Lepus capensis*



Human sites in the Rub al Khali

- | | | | |
|---|------------------------------------|---|-------------------------|
| 1 | The Shebab pipeline | 2 | A pipeline 'valve' |
| 3 | Main administrative centre Shaybah | 6 | Gas flare-off at a GOSP |
| 4 | A gas oil separation plant | | |
| 5 | Rubbish at a sub-contractors camp | | |

Appendix 1

Annotated list of Flora and Fauna recorded in the Shabab and Shaybah Study Areas

NB: Appendix 2 provides information on locations (including km posts) and dates visited. Note that the journey along the Shabab Pipeline was north to south with the km posts decreasing towards Shaybah.

Flora

Arranged by families in alphabetical order. Nomenclature follows Mandaville, 1990.

Asclepiadaceae

Calotropis procera Woody perennial sometimes forming a small tree, not recorded south of km 577.

Leptadenia pyrotechnica A widespread Arabian perennial, which was only recorded in a few areas north of km 572.

Apocynaceae

Rhazya stricta A low growing evergreen shrub, poisonous to cattle and said to be an indicator species of rangeland overgrazing. One clump only seen at km 630.

Capparaceae

Dipterygium glaucum A fleshy leaved plant with a yellowish 'cruciform' flower, recorded on two occasions in the Shaybah Oilfield.

Chenopodiaceae

Haloxylon salicornicum A woody perennial important for grazing. Due to confusion with the similar next species an exact record was not made of its southernmost limit within the study area, but records to km 308 are all probably outside the range of the next species according to Mandaville (1990).

Cornulaca arabica A drought resistance succulent species, valuable as a grazing plant for stock animals and noted as a food plant of the Cape Hare *Lepus capensis* at Shaybah. Not recorded with certainty west of Shubaytah (km 111).

Cyperaceae

Cyperus conglomeratus A widespread sedge growing on deep sand at all levels, especially on the windward side of dunes or sandy plains.

Gramineae

Panicum turgidum One of the two grasses found during the survey but not south of km 565.

Stipagrostis drarii The second grass species recorded but not found south of km 608.

Phragmites australis This common reed of the Eastern Province occurred intermittently at the northern part of Shabab and also at Shaybah wherever there was damp soil which was not too saline, at natural sites and at human ones, particularly sewage and wastewater sites. (Possibly introduced).

Aeluropus lagopoides A low growing prickly grass found in subkha/saline depressions in the northern part of the pipeline.

Orobanchaceae

Cistanche tubulosa Parasitic plant with an eye-catching hyacinth-like leafless flower spike, it is parasitic on the roots of other plants. It is known to parasitize *Zygophyllum qatarense* however the two observations for Shabab were associated with *Tribulus* and *Cyperus* on one occasion and *Haloxylon*, *Cyperus* and *Zygophyllum mandavillei* on another.

Polygonaceae

Calligonum comosum A woody perennial important for grazing only recorded in the Abqaiq region (PB28). It is not generally known south of 25°N in the study area according to Mandaville, 1990.

Calligonum crinitum A woody perennial important for grazing, grows in deep sand often towards the summit on the windward sides of dunes. Only recorded in the Shaybah area.

Palmae

Phoenix dactylifera The date palm grows ferally in a number of places along the pipeline, especially near old bedouin camps but none appeared to have been recently tended and would not therefore produce a useful date crop. Some have been introduced to domestic/recreational areas at Shaybah.

Tamaricaceae

Tamarix sp Low growing evergreen bush (at least five species are known in the area), often present in salty low-lying areas, not present south of km 570.

Zygophyllaceae

Tribulus arabicus Perennial low shrub, often recumbent, with a yellow flower, an important grazing plant.

Zygophyllum qatarense Low growing fleshy leafed herb of salty habitats and sandy plains between Abqaiq and Salwa. It is assumed that *Zygophyllum* sp. records south from Abqaiq to km 498 (QB27) were this species (or possibly *Z. simplex*). No further *Zygophyllum* sp. plants were seen until km 399 (QB25) which generally accords with the westernmost distribution of *Z. mandavillei* (Mandaville, 1990)

Zygophyllum mandavillei Low growing herb in salt rich habitats, with fleshy leaves, most frequently found on the lower edges of sand dunes in the Rub al Khali, where they meet sabkhas. See *Z. qatarense* above. The distribution of these two *Zygophyllum* species appears to be linked to the different types of sand dunes noted at paragraph 2.

Fauna

Invertebrates

Nomenclature follows Walker & Pittaway (1987).

Large arthropods recorded at Shaybah

A camel 'spider' solifugid was recorded on one occasion and various spiders were present in vegetation and under ground debris.

Insects - Grasshoppers

Sphingonotus savignyi

Sphingonotus rubescens

At least two specimens of each were noted in open dune habitat in the vicinity of *Cyperus conglomeratus* and *Cornulaca arabica*.

Insects - Dragonfly

Several example were noted of a large dragonfly, these were most likely to have been a migratory species, possibly *Pantala flavescens*.

Vertebrates

Fish

A probable *Tilapia* sp. fish was present in evaporation ponds at GOSP 4 (two or more large >30 cm specimens) and at Sabkha 40 (many small specimens).

Reptiles

Nomenclature follows Leviton et al. (1992).

Sand Skink *Scincus mitranus*: Several tracks at various localities were observed which were thought to belong to this species but the animal was never observed. Recent photographic evidence has confirmed the species presence in the Shaybah area.

Spotted Toad-headed Agama *Phrynocephalus maculatus*: Two, one photographed Shabab.

Arabian Toad-headed Agama *Phrynocephalus arabicus*: At least two observed and photographed (Shaybah).

Spiny-tailed Lizard *Uromastyx aegyptius*: Two only on the Shabab Pipeline (last going south at km 480).

Grey Monitor *Varanus griseus*: Tracks and faeces identified as this species at Sabkha 111 (Shaybah).

Snake species: Tracks of unidentified snakes observed on a number of occasions (Shabab and Shaybah).

Birds

Order and nomenclature follows Dickinson (2003).

Each species is allocated a status code in the study area as follow: RI = Indigenous resident; RH = Resident because of human altered habitat; M = Migrant; MO = A migrant that is also an opportunist breeding species which might one day breed at the site mentioned; BS = Breeding summer visitor.

Squacco Heron *Ardeola ralloides* (M): One or two present on three occasions at Sabkha 40. These were most likely to be migrants but occurrence at this period in suitable habitat suggests breeding could occur.

Striated Heron *Butorides striatus* (M): One at Sabkha 40 on 30 May. This is a remarkable inland record of a species usually associated with the coast of Arabia. It has never been recorded this far inland before in Arabia and this is the first record for eastern Saudi Arabia. It would have been a migrant, but its position at Shaybah raises the interesting possibility that it had travelled across eastern Arabia from the Arabian Sea en route to the Arabian Gulf.

Long-legged Buzzard *Buteo rufinus* (RI): One record of a bird coming to drink at an irrigation pipe at GOSP 2. This is an indigenous resident of the Rub al Khali.

Black-winged Stilt *Himantopus himantopus* (MO): One on two days at Sabkha 40. This individual may have been a migrant but it is potentially a breeding bird in the suitable breeding habitat where it occurred.

Red-wattled Lapwing *Vanellus indicus* (MO): Up to five birds on three days at Sabkha 40 where there was suitable breeding habitat present. This species is resident at wetlands in eastern Arabia, and is gradually colonising westwards. Although the minimum of two pairs did not appear to be breeding (which would have been indicated by extreme agitation and mobbing of intruders, the timing of this record suggests that it might

breed later in 2010 or in a future year. (The species tends to be present in breeding areas for two or more years before attempting breeding). It has not yet been recorded to breed in Saudi Arabia.

Kentish Plover *Charadrius alexandrinus* (BH): Two or more pairs were present at Sabkha 40 and one pair has small chicks. This is a breeding range extension in Saudi Arabia.

Wood Sandpiper *Tringa glareola* (M): One record Sabkha 40.

Terek Sandpiper *Xenus cinereus* (M): One record GOSP 4.

Little Stint *Calidris minuta* (M): Two present Sabkha 40.

Red-necked Phalarope *Phalaropus lobatus* (M): Flock of 13 Sabkha 40 on 29 May reducing to two on 30 May.

Rock Dove *Columba livia* (BH): A few present on the Shabab pipeline and a group of five, Sabkha 40. Not previously recorded in this part of the Rub al Khali.

European Turtle Dove *Streptopelia turtur* (BS): A mated pair Sabkha 113 and a single bird Sabkha 112. Not previously recorded in this part of the Rub al Khali.

Eurasian Collared Dove *Streptopelia decaocto* (BH): Few Sabkha 113. Not previously recorded in this part of the Rub al Khali.

Laughing Dove *Streptopelia senegalensis* (BH): Common at human sites Shabab and Shaybah.

Swift sp. *Apus* sp.(M): Three Shabab 25 May, they were probably migrant Common Swifts *Apus apus*.

Brown-necked Raven *Corvus ruficollis* (RI): A scarce resident along the length of the Shabab pipeline and at Shaybah.

Barn Swallow *Hirundo rustica* (M): One migrant Shabab, 25 May.

Greater Hoopoe Lark *Alaemon alaudipes* (RI): A scarce resident along the route of the Shabab pipeline and at Shaybah.

Crested Lark *Galerida cristata* (RI): One heard just south of Abqaiq.

Black-crowned Sparrow-Lark *Eremopterix nigriceps* (RI): A small group at the beginning of Shabab near Abqaiq.

Eurasian Reed Warbler *Acrocephalus scirpaceus* (MO): One at Sabkha 40 in suitable breeding habitat although this individual was more likely to have been a migrant as no song was heard.

Willow Warbler *Phylloscopus trochilus* (M): Individual migrants at two places, Shabab and also at Shaybah.

Rufous-tailed Scrub Robin *Cercotrichas galactotes* (MO): One at Sabkha 40 on two days in suitable breeding habitat although this individual was more likely to have been a migrant as no song was heard. Not previously recorded in this part of the Rub al Khali.

Spotted Flycatcher *Muscicapa striata* (M): One migrant, Sabkha 40.

House Sparrow *Passer domesticus* (BH): Common at human sites along the Shabab pipeline and at Shaybah. This species has colonised the area in the last decade or so.

Mammals

Nomenclature follows Harrison & Bates (1991).

Red Fox *Vulpes vulpes*: Tracks of this species were present at most sites visited in the study area. It is clearly a common predator in the region.

Blanford's Sand Fox *Vulpes rueppellii*: Small canid tracks observed at various sites were almost certainly this species.

Sand Cat *Felis margarita*: The distinctive tracks of this species were observed on the Shabab Pipeline and at Shaybah. The tracks of a domestic cat were present Sabkha 40.

Lesser Jerboa *Jaculus jaculus* : The distinctive tracks of this species were observed at a number of sites, it appears to be common in the study area.

House Mouse *Mus musculus*: One dead specimen was found near an accommodation building at Subkha 40. It has probably been introduced to the region by man.

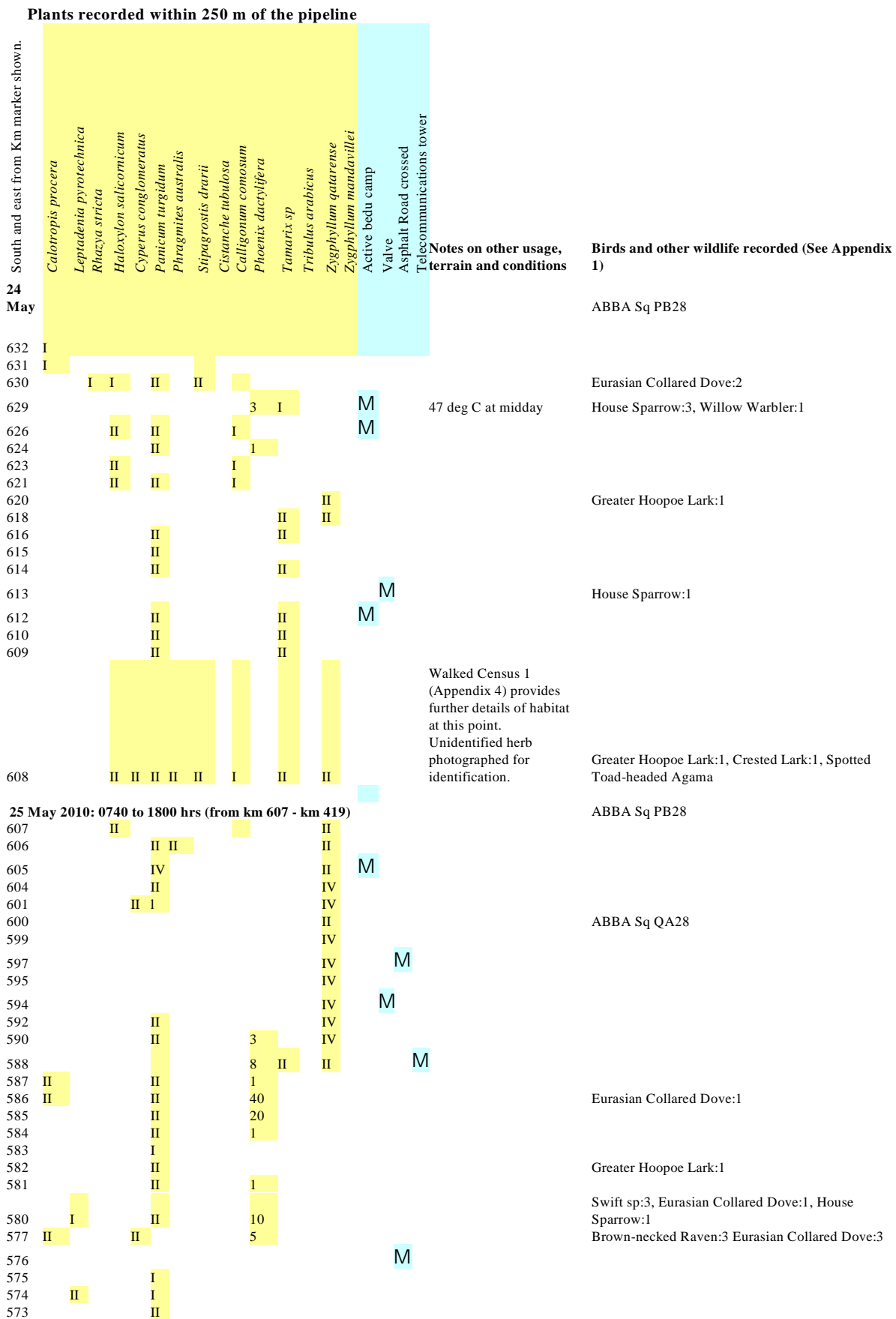
Gerbil sp *Gerbillus* sp.: Tracks were present in the dunes along the Shabab pipeline and at Shaybah of a small rodent which was most likely to have been a *Gerbillus* sp. There are two likely candidates known to inhabit remote areas of the Rub al Khali, Cheesman's Gerbil *G. cheesmani* and the Baluchistan Gerbil *G. nanus*.

Jird sp *Meriones* sp.: Tracks of a larger rodent were in open dunes are likely to have been a member of the genus *Meriones* of which several species are found in Arabia. Only two are known to occur in the region the Rub al Khali and these are the Libyan Jird *M. libycus* and Sundevall's Jird *M. crassus*.

Cape Hare *Lepus capensis*: One was observed at Sabkha 111, the tracks of another at Subkha 112 and tracks along the Shabab pipeline at km111. This species has become increasingly rare in Arabia in the last 30 years and in most localities is now extinct as a result of hunting. Its occurrence in the study area is important for the survival of the species as it is not thought to be under any threat there.

Appendix 2

Shabab 1 Pipeline: Flora and fauna with notes on human usage, conditions and the terrain (See commonality key and notes at page 23)



Plants recorded within 250 m of the pipeline

South and east from Km marker shown.	Plants recorded within 250 m of the pipeline	Notes on other usage, terrain and conditions	Birds and other wildlife recorded (See Appendix 1)
572	II		
571		8	
570		20	II
569	II	1	IV
568	II		
567	II	3	
566	II	20	M
565	II		
564		IV	Rubbish dump
563		IV	
561		IV	
560	II	IV	Greater Hoopoe Lark:1 ABBA Sq QA27
559	II	IV	
557	II	II	
556	II		M
555	II		
553		M	Archaeological site on rocky outcrop House Sparrow:3, Greater Hoopoe Lark2
552	II		
550	II		Archaeological site
548	IV	II	
546	II		
545	II		
543	II		
542	II		
541	II		M
540	II	II	
539	IV	II	
538	II	IV	
537	II	II	M
535	II		Greater Hoopoe Lark:1
534	II		
533	II		
532	II	II	
531	II		
530	II		
529	II		
526	II	II	
525	II	II	
523	II		M
522	II		M
521	II		
520	II		
518	II		
517	I		
516	II		
515	II		
514	II		M
513	I		Two mesquit trees
512	I		House Sparrow:6, Eurasian Collared Dove2
511	I		
510	I		
509	I		M
508	I		M
507	I		
506	I		
505	II		Sandstone outcrop
504	II		
503	II		
502	II		
501	II		ABBA Sq QB27
500	II		
499	II	II	
498	II	II	

Plants recorded within 250 m of the pipeline

South and east from Km marker shown.	Plants recorded within 250 m of the pipeline	Notes on other usage, terrain and conditions	Birds and other wildlife recorded (See Appendix 1)
497	<i>Calotropis procera</i>	M	
496	<i>Leptadenia pyrotechnica</i>	II	ABBA Sq QB26
495	<i>Rhazya stricta</i>	II	
494	<i>Haloxylon salicornicum</i>	II	
493	<i>Cyperus conglomeratus</i>	II	
492	<i>Panicum turgidum</i>	II	
491	<i>Phragmites australis</i>	II	
490	<i>Stipagrostis drarii</i>	II	
489	<i>Cistanche tubulosa</i>	II	
488	<i>Calligonum comosum</i>	II	
487	<i>Phoenix dactylifera</i>	M	
484	<i>Tamarix sp</i>	M	
483	<i>Tribulus arabicus</i>	M	
482	<i>Zygophyllum qatarense</i>	M	
481	<i>Zygophyllum mandavillei</i>	M	
480	Active bedu camp		
477	Valve		Small power line
476	Asphalt Road crossed		Spiny-tailed Lizard
475	Telecommunications tower	M	
474			
473			
472			
471			
470			
469			
468			
467			
466			
465			
464		Limestone depression	
463			
462		Small power line	
461			
460			
459		Pipeline turns	
458			
457			
456			
455			
454			
453			
452		M	
451			
450			
449		Small power line	
448			
447		M	
446			
445			
444			
443			
442		Small power line	
441		M	Rock Dove:10
440		Pipeline runs through rock cutting	
438		M	
437		Nil plants subkha	
434		Nil plants subkha	
434	II	M	Eurasian Collared Dove:4, Rock Dove:3
432	II	M	Eurasian Collared Dove:2
431	II	M	
429	II	M	Monument like outcrops
426	I		ABBA Sq QB25
425	I		
423	III		

Plants recorded within 250 m of the pipeline

South and east from Km marker shown.	Plants recorded within 250 m of the pipeline	Notes on other usage, terrain and conditions	Birds and other wildlife recorded (See Appendix 1)
422	<i>Calotropis procera</i>		
	<i>Leptadenia pyrotechnica</i>		
	<i>Rhazya stricta</i>		
	<i>Haloxylon salicornicum</i>		
	<i>Cyperus conglomeratus</i>		
	<i>Panicum turgidum</i>		
	<i>Phragmites australis</i>		
	<i>Stipagrostis drarii</i>		
	<i>Cistanche tubulosa</i>		
	<i>Calligonum comosum</i>		
	<i>Phoenix dactylifera</i>		
	<i>Tamarix sp</i>		
	<i>Tribulus arabicus</i>		
	<i>Zygphyllum qatarse</i>		
	<i>Zygphyllum mandavillei</i>		
	Active bedu camp		
	Valve		
	Asphalt Road crossed		
	Telecommunications tower		
420		Nil plants subkha	
		Walked Census 2 (Appendix 4) provides further details of habitat at this point.	No birds on walked census. Spotted Toad-headed Agama
419			

26 May 2010: 0731 to 1510 hrs (from km 418- km 211 and then to Shubaytah at km 111)

418			
417			
416	II		
415	II	M	
414	I		
413	I		
412	I		
411	I		
410	I		
409	I		
408	I	M	
407	I		
406	I		
405	I		
404	I		Subkha
403	I		Subkha
			II
401		M	
400			Nil plants - subkha
			II
399		M	
398			II
397	I		IV
396	I		II
395			IV
393			IV
392			II
391	I		
390			II II
389			II II
388	I II		II II
386			II
385			II
384			II
383			I
381	I	MM	
380	I II		II
379	I	M	II
378			II
377			II
			Nil plants, cutting made through limestone
376			Nil plants
375			Nil plants
374			Nil plants
373			Nil plants
372			II
371			II
370			II
369			II
368			III
367	I		II
366			I
365	II		II
364	II		II
363			II
362	II		II
361			II
			ABBA Sq RA25
			ABBA Sq RA24

Plants recorded within 250 m of the pipeline

South and east from Km marker shown.	<i>Calotropis procera</i>	<i>Leptadenia pyrotechnica</i>	<i>Rhazya stricta</i>	<i>Haloxylon salicornicum</i>	<i>Cyperus conglomeratus</i>	<i>Panicum turgidum</i>	<i>Phragmites australis</i>	<i>Stipagrostis drarii</i>	<i>Cistanche tubulosa</i>	<i>Calligonum comosum</i>	<i>Phoenix dactylifera</i>	<i>Tamarix sp</i>	<i>Tribulus arabicus</i>	<i>Zysphyllum qatarense</i>	<i>Zysphyllum mandavillei</i>	Active bedu camp	Valve	Asphalt Road crossed	Telecommunications tower	Notes on other usage, Terrain and conditions	Birds and other wildlife recorded (See Appendix 1)
360																					
359																					
358																				M	
356																					
355																					
354																					
353																					
352																					
351																					Approx position of Wadi Sahba
350																					
349																					
348				I																	
345				I																	
344																					From this point eastwards the asphalt road to Shaybah was always within one or two km of the pipeline
342																					
340																				M	
339																					Nil plants
338				I																	
337				I																	
336																				M	Nil plants
335				I	III																
334				II	III																
333				I																	
332				III																	
331				III																	
330				III																	
329				II																	
328				I																	
327				I																	
326																					
325				I																	
324				I																	
323				I																	
322				I																	
321																					
320																					
319				I																	
318				I																	
317				I																	
316				I																	
315				I																	
313				I																	
311				I																	
310				I																	
309				I																	
308				I																	
307																					Nil plants
306																					Nil plants
305																					ABBA Sq RB23
304																					Nil plants, subkha
303																				M	Nil plants
302																					Nil plants
301																					Nil plants
300				I																	
299																					Nil plants
298																				M	Nil plants
297																					Nil plants
296				I																	
295				I	II																
294				I	II																
292																					Nil plants, subkha
291				I																	Subkha

Plants recorded within 250 m of the pipeline

South and east from Km marker shown.

Distance	Plant Species	Notes on other usage, terrain and conditions	Birds and other wildlife recorded (See Appendix 1)
290	<i>Calotropis procera</i>		
289	<i>Leptadenia pyrotechnica</i>		
288	<i>Rhazya stricta</i>		
287	<i>Haloxylon salicornicum</i>		
286	<i>Cyperus conglomeratus</i>		
285	<i>Panicum turgidum</i>		
284	<i>Phragmites australis</i>		
283	<i>Stipagrostis drarii</i>		
282	<i>Cistanche tubulosa</i>		
281	<i>Calligonum comosum</i>		
280	<i>Phoenix dactylifera</i>		
279	<i>Tamarix sp</i>		
278	<i>Tribulus arabicus</i>		
277	<i>Zygophyllum qatarense</i>		
276	<i>Zygophyllum mandavillei</i>		
275	Active bedu camp		
274	Valve		
273	Asphalt Road crossed		
272	Telecommunications tower		
271		Nil plants	
270		Nil plants, subkha	
269		Nil plants, subkha	
268		Nil plants	
267		Nil plants	
266		Nil plants	
265		Nil plants	
264		Nil plants	
263		Nil plants	
262		Nil plants	
261		Nil plants, subkha	
260		Nil plants, subkha	
259		Nil plants, subkha	
258		Nil plants, subkha	
257		Nil plants, subkha	
256		Nil plants, subkha	
255		Nil plants	
254		Nil plants	
253		Nil plants	
252		Nil plants	
251		Nil plants	
250		Nil plants	
249		Nil plants	
248		Nil plants	
247		Nil plants	
246		Nil plants	
245		Nil plants	
244		Nil plants	
243		Nil plants	
242		Nil plants	
241		Landing strip, nil plants	
240		Nil plants	
239		Nil plants	
238		Nil plants	
237		Nil plants	
236		Nil plants	
235		Nil plants	
234		Nil plants	
233		Nil plants	ABBA Sq RB22
232		Nil plants	
231		Nil plants	
230		Nil plants	
229		Nil plants	
228		Nil plants	
227		Nil plants	
226		Nil plants	
225		Nil plants	
224		Nil plants	
223		Nil plants	

Plants recorded within 250 m of the pipeline

South and east from Km marker shown.	Plants recorded within 250 m of the pipeline	Notes on other usage, terrain and conditions	Birds and other wildlife recorded (See Appendix 1)
222	Calotropis procera	Nil plants	
221	Leptadenia pyrotechnica	Nil plants	
220	Rhazya stricta	Nil plants	
219	Haloxylon salicornicum	Nil plants	
218	Cyperus conglomeratus	Nil plants	
217	Panicum turgidum	Nil plants	ABBA Sq SA22
216	Phragmites australis	Nil plants	
215	Stipagrostis drarii	Nil plants	
214	Cistanche tubulosa	Nil plants	
213	Calligonum comosum	Nil plants	
212	Phoenix dactylifera	Nil plants	
211	Tamarix sp	Nil plants	
	Tribulus arabicus		
	Zygophyllum qatarense		
	Zygophyllum mandavillei		
	Active bedu camp		
	Valve		
	Asphalt Road crossed		
	Telecommunications tower		
111	I	Walked Census 3 (Appendix 4) provides further details of habitat at this point. <i>Cornulaca arabica</i> present.	ABBA Sq TA22. No birds on walked census. Tracks seen of Lesser Jerboa, Red Fox, and probably Cape Hare and Sand Cat.

Commonality Key

- I Few specimens observed
- II Observed
- III Many specimens observed (but species not recorded as dominant)
- IV Observations suggested species is dominant over all other plants but not necessarily frequent

NB For date palms the actual number counted are recorded

Notes

Gaps on the km scale occur for a variety of reasons, e.g. signposts missing or unavoidable detours etc. It should not be assumed that there were no plants in the gaps. Recorded segments with no plants are annotated in the column second from the right.

Appendix 3

Birds Observed During Driven Transects : Shabab 1 Pipeline (24-27 May 2010)

Tran	Date	Times	Waypoints (App 6)		ABBA Square No		Width M	Total Area (KM ²)	Bird species	No of birds		Breeding pairs		
			From	To	From	To				No	per KM ²	per KM ²	per ABBA Square	
1	24/05/10	1554-1825	P632	Camp24	PB28	PB28	29	50	1.5	Eurasian Collared Dove	2	1.4	0.5	1379
1	24/05/10	1554-1825	P632	Camp24	PB28	PB28	29	50	1.5	House Sparrow	4	2.8	0.9	2759
1	24/05/10	1554-1825	P632	Camp24	PB28	PB28	29	50	1.5	Willow Warbler	1	0.7	0.2	690
1	24/05/10	1554-1825	P632	Camp24	PB28	PB28	29	50	1.5	Greater Hoopoe Lark	1	0.7	0.2	690
2	25/05/10	0740-0908	Camp24	Trend2	PB28	QA28	34	50	1.7	Eurasian Collared Dove	4	2.4	0.8	2353
2	25/05/10	0740-0908	Camp24	Trend2	PB28	QA28	34	50	1.7	Greater Hoopoe Lark	1	0.6	0.2	588
2	25/05/10	0740-0908	Camp24	Trend2	PB28	QA28	34	50	1.7	Swift sp.	3	1.8	0.6	1765
2	25/05/10	0740-0908	Camp24	Trend2	PB28	QA28	34	50	1.7	House Sparrow	3	1.8	0.6	1765
2	25/05/10	0740-0908	Camp24	Trend2	PB28	QA28	34	200	6.8	Brown-necked Raven	4	0.6	0.2	588
3	25/05/10	0939-1422	Trend2	Trend3	QA28	QB26	110	50	5.5	Barn Swallow	1	0.2	0.1	182
3	25/05/10	0939-1422	Trend2	Trend3	QA28	QB26	110	50	5.5	Greater Hoopoe Lark	4	0.7	0.2	727
3	25/05/10	0939-1422	Trend2	Trend3	QA28	QB26	110	50	5.5	House Sparrow	5	0.9	0.3	909
3	25/05/10	0939-1422	Trend2	Trend3	QA28	QB26	110	50	5.5	Eurasian Collared Dove	2	0.4	0.1	364
4	25/05/10	1540-1800	Trend3	Camp25	QB26	QB25	67	200	13.4	Rock Dove	13	1.0	0.3	970
4	25/05/10	1540-1800	Trend3	Camp25	QB26	QB25	67	50	3.4	Eurasian Collared Dove	5	1.5	0.5	1493
5	26/05/10	0731-1510	Camp25	Endtr5	QB25	SA22	206	50	10.3	Greater Hoopoe Lark	1	0.1	0.0	97
6	27/05/10	0703-0914	Camp26	Camp26	TA22	TA21	61	50	3.1	Greater Hoopoe Lark	1	0.3	0.1	328
								Linear distance	507	Total birds		55		

Notes

1. There are slight differences between birds observed on the pipeline and transect data as the transects sometimes included detours from the pipeline.
2. A breeding pair is assumed for every three birds present.
3. Transect 6 was a circular 'transect' round dunes and inter-dune plains at Shubahtah (Plants noted = *Cornulaca*, *Tribulus*, *Cyperus*, *Zygophyllum* sp)
4. Because larger birds, such as Rock Dove and Brown-necked Raven, are more easily observed the nominal transect width is increased for those species to firm up density calculations

Resident species recorded on more than one transect. Population density indicated in above transects; birds per Km² over the 507 km total.

	Tr1	Tr2	Tr3	Tr4	Tr5	Tr6
Eurasian Collared Dove	1.4	2.4	0.4	1.5	0	0
House Sparrow	2.8	1.8	0.9	0	0	0
Greater Hoopoe Lark	0.7	0.6	0.7	0	0.1	0.3
Total	4.9	4.8	2.0	1.5	0.1	0.3

Appendix 4:

Details of Early Morning Walked Transect Censuses

No	Date	ABBA Sq Ref	Coordinates (degs, mins and decimal mins)	Alt (M)	Habitat description and flora (In all cases the transect length was about 1 km)	Fauna
1	40322	PB28	25°50.598'N 49°57.738'E	26 m	Jafurah Desert - Shabab Pipeline at km 608. 0459-0529 hrs. Windy with hazy sun. Subkha hollows surrounded by sand dunes. Sparse vegetation comprised <i>Tamarix</i> sp (1% ground cover), <i>Calligonum comosum</i> (1%), <i>Cyperus conglomeratus</i> (2%), <i>Panicum turgidum</i> (3%), <i>Stipagrostis drarii</i> (3%), <i>Zygophyllum qatarense</i> (4%), <i>Phragmites australis</i> (<1%), <i>Aeluropus lagopoides</i> (5%). Most plants were alive and some green from spring rains. There were signs of grazing but no camels observed in the vicinity.	Greater Hoopoe Lark 1, Lesser Jerboa <i>Jaculus jaculus</i> (tracks), smaller rodent poss <i>Gerbillus</i> sp. (tracks), snake sp (tracks), skink sp prob <i>Scincus mitranus</i> (tracks).
2	40323	QB25	24°24.788'N 50°55.857'E	Sea level	Base of Qatar Peninsula - Shabab Pipeline at km 417. 0507-0537 hrs. Windy but clear. Sandy plain with gravel beds and small rocky (limestone) hillock. Vegetation was restricted to mainly dead <i>Haloxylon salicornicum</i> bushes with a few stunted plants sprouting from recent rain. Bedouin camp approximately 2 km distance.	No birds recorded. Spotted Toad-headed Agama <i>Phrynocephalus maculatus</i> photographed.
3	40324	TA22	22°40.182'N 55°15.628'E	90 m	Eastern Rub al Khali - Shabab Pipeline km 111(Shubaytah). 0457-0527 hrs. Still bright and clear. Inter-dune plain with hummocks of dormant <i>Cornulaca arabica</i> . None were green or sprouting. Contractors camp, road and pipeline 2 km distant. Much disturbance of the ground and old bedouin camps nearby. (The <i>Cornulaca</i> was sprouting on nearby dunes as was <i>Tribulus arabica</i> , <i>Zygophyllum mandavillei</i> , and <i>Cyperus conglomeratus</i>).	No birds seen. Tracks of Lesser Jerboa <i>Jaculus jaculus</i> , Red Fox <i>Vulpes vulpes</i> , probably Cape Hare <i>Lepus capensis</i> and Sand Cat <i>Felis margarita</i> .

4	40325	UA22	22°35.550'N 54°06.024'E	86 m	Eastern Rub al Khali, Shaybah oilfield NESMA camp, Sabkha 40. 0455-0525 hrs. Clear and still. Accommodation and administration block with workshops and industrial installations. No vegetation present within census area however on surrounding dunes there were <i>Cornulaca arabica</i> and <i>Zygophyllum mandavillei</i> .	16 House Sparrow <i>Passer domesticus</i> and four Laughing Dove <i>Streptopelia senegalensis</i> . Also four feral dogs. A dead House Mouse <i>Mus musculus</i> found later.
5	40327	TB22	22°32.456'N 53°54.595'E	116 m	Eastern Rub al Khali, Shaybah oilfield, small sabkha west of Sabkha 112. 0450-0520 hrs. Breeze from east, clear. Sabkha surrounded by dunes. Sparse vegetation cover included <i>Tribulus arabicus</i> , <i>Cyperus conglomeratus</i> and <i>Dipterygium glaucum</i> . (In all less than 1% ground cover). There were also many dead <i>Zygophyllum mandavillei</i> . No evidence of grazing. This site is scheduled for development.	No birds seen. Unidentified mammal tracks and two species of grasshopper recorded.
6	40329	TB22	22°31.687'N 53°57.225'E	127	Eastern Rub al Khali, Shaybah oilfield, Sabkha 112. 0451-0521 hrs. Clear but sun slightly overcast. Large sabkha surrounded by sand dunes. <i>Calligonum crinitum</i> , <i>Cornulaca arabica</i> , <i>Cyperus conglomeratus</i> , about 1% ground cover each (with similar amounts of dead specimens. There were no signs of grazing. This site is to be developed.	No birds seen. Various tracks including skink prob. <i>Scincus mitranus</i> , Hare <i>Lepus capensis</i> , jird, small rodent and snake.

Appendix 5

Flora and Fauna Recorded at sites in the Shaybah Oilfield

Taxa observed/recorded 27 May - 1 June 2010

See Appendix 1 for further details of taxa.

	GOSP 1	GOSP 2	GOSP 3	GOSP 4	Subkha 40	Subkha 111	Subkha 112	Subkha 113	New Pipeline & Powerline G4 - S112	New pipeline G 3 - S112
Flora										
<i>Cyperus conglomeratus</i>	#	#				#	#	#	#	#
<i>Cornulaca arabica</i>	#	#	#		#	#	#	#	#	#
<i>Calligonum crinitum</i>	#	#		#	#	#	#	#	#	#
<i>Zygophyllum mandavillei</i>	#		#	#	#	#	#	#	#	#
<i>Tribulus arabicus</i>	#		#		#	#	#	#	#	#
<i>Phragmites australis</i>		#			#			#	#	
<i>Dipterygium glaucum</i>							#		#	
Exotic shrub	#	#	#	#	#					
Other exotics								#		
Invertebrates										
Dragonfly					#				#	
Grasshopper <i>Sphingonotus savignyi</i>				#			#			
Grasshopper <i>Sphingonotus rubescens</i>				#		#	#			
Solifugid sp							#			
Large spider					#					
Vertebrates										
Fish sp										
				#	#					
Reptiles										
Sand Skink <i>Scincus mitranus</i>						#	#	#		
Arabian Toad-headed Agama <i>Phrynocephalus arabicus</i>				#			#			
Grey Monitor <i>Varanus griseus</i>						#				
Snake species							#			
Birds										
Squacco Heron <i>Ardeola ralloides</i>					#					
Striated Heron <i>Butorides striatus</i>										
Long-legged Buzzard <i>Buteo rufinus</i>		#								
Black-winged Stilt <i>Himantopus himantopus</i>					#					
Red-wattled Lapwing <i>Vanellus indicus</i>					#					
Kentish Plover <i>Charadrius alexandrinus</i>					#					
Wood Sandpiper <i>Tringa glareola</i>					#					
Terek Sandpiper <i>Xenus cinereus</i>				#						
Little Stint <i>Calidris minuta</i>					#					
Red-necked Phalarope <i>Phalaropus lobatus</i>					#					
Rock Dove <i>Columba livia</i>					#					
European Turtle Dove <i>Streptopelia turtur</i>							#	#		
Eurasian Collared Dove <i>Streptopelia decaocto</i>								#		
Laughing Dove <i>Streptopelia senegalensis</i>		#	#	#	#			#		#
Brown-necked Raven <i>Corvus ruficollis</i>		#	#		#			#		#
Greater Hoopoe Lark <i>Alaemon alaudipes</i>					#	#				
Eurasian Reed Warbler <i>Acrocephalus scirpaceus</i>					#					
Willow Warbler <i>Phylloscopus trochilus</i>								#		
Rufous-tailed Scrub Robin <i>Cercotrichas galactotes</i>					#					
Spotted Flycatcher <i>Muscicapa striata</i>					#					
House Sparrow <i>Passer domesticus</i>	#	#	#	#	#			#		#
Mammals										
Red Fox <i>Vulpes vulpes</i>	#		#		#		#		#	
Blanford's Sand Fox <i>Vulpes ruepellii</i>						#	#			
Sand Cat <i>Felis margarita</i>						#	#			
Lesser Jerboa <i>Jaculus jaculus</i>							#			
House Mouse <i>Mus musculus</i>					#					
Gerbil sp <i>Gerbillus</i> sp							#			
Jird sp <i>Meriones</i> sp							#			
Cape Hare <i>Lepus capensis</i>						#	#			

Notes on Sites

1. Sabkha 40: This sabkha holds a large accommodation area, a vehicle/maintenance area and a domestic sewage evaporation area.
2. Sabkhas 111 & 112: Undeveloped sabkhas which are to be developed. At S112 the first temporary road was being put in during our visit. There is a small sabkha to the west of S112 shown elsewhere as 'Subkha 112 Jnr'.
3. Sabkha 113: The main ARAMCO residential and administrative area and airport facility. Site includes the Sewage Treatment Plant and the rubbish dump. Site contains much exotic vegetation and tended gardens.

Appendix 6

Selected Waypoints

Date	ABBA Square	Waypoint Name	Description	North	East	Approx Alt (m) from GPS
24 May 2010	PB28	P632	Driven transect pt	25°N 53.898	49°E 44.347	51
24 May 2010	PB28	Camp 24 (KM608)	Driven transect pt	25°N 50.598	49°E 57.738	26
24 May 2010	PB28	Camp24MA	Morning census 1	25°N 50.598	49°E 57.738	26
25 May 2010	QA28	Trend2 (KM576)	Driven transect pt	25°N 36.873	50°E 09.453	50
25 May 2010	QB26	Trend3 (KM479)	Driven transect pt	24°N 53.236	50°E 34.819	?
25 May 2010	QB25	Camp25 (KM419)	Driven transect pt	24°N 24.788	50°E 55.857	0
26 May 2010	SA22	EndTr5 (KM211)	Driven transect pt	22°N 57.956	52°E 04.236	61
26 May 2010	QB25	Camp25NEW	Morning census 2	24°N 24.788	50°E 55.857	-7
26 May 2010	TA22	Camp26	Morning census 3	22°N 40.182	53°E 15.628	90
27 May 2010	TA22	Camp26	Driven transect pt	22°N 40.182	53°E 15.628	87
27 May 2010	UA22	GOSP2	GOSP	22°N 31.733	54°E 01.785	110
27 May 2010	UA22	Hut B16	Morning census 4	22°N 35.550	54°E 06.024	66
28 May 2010	UA22	GOSP4	GOSP	22°N 36.572	54°E 04.063	81
28 May 2010	UA22	GOSP1	GOSP	22°N 40.960	54°E 07.655	75
28 May 2010	TB21	GOSP3	GOSP	22°N 26.291	53°E 58.186	77
29 May 2010	TB22	Camp29	Morning census 5	22°N 32.456	53°E 54.595	116
31 May 2010	TB22	Camp31 S112	Morning census 6	22°N 31.687	53°E 57.225	127