TRIBULUS

Journal of the Emirates Natural History Group

Vol. 15.1 Spring/Summer 2005

TRIBULUS

NOTES FOR CONTRIBUTORS

TRIBULUS is the Journal of the Emirates Natural History Group and was launched in 1991. The Group was founded in 1976, and over the next fourteen years, 42 issues of a duplicated Bulletin were published.

TRIBULUS is published twice a year. The aim of the publication is to create and maintain in standard form a collection of recordings, articles and analysis on topics of regional natural history, heritage, geology, palaeontology and archaeology, with the emphasis on the United Arab Emirates and adjacent areas. Papers, short notes and other contributions are welcomed from anyone but should not have been published elsewhere. Guidelines are set out below. The information carried is as accurate as can be determined, in consultation with the Journal's Advisory Panel and referees, but opinions expressed are those of the authors alone.

All manuscripts received are reviewed by the Editorial Board and appropriate Advisory Panel members and, where appropriate, are also submitted to blind peer review.

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The plant motif above is of the genus Tribulus, of which there are six species in the UAE. They all have pinnate leaves, yellow flowers with free petals and distinctive five-segmented fruits. They are found throughout the country, except in coastal sabkha.

The animal motif above is of a tiny golden bull, excavated from the early Second Millennium grave at Qattarah, Al Ain. The original is on display in Al Ain Museum, and measures above 5 cm by 4 cm.

Manuscripts should be submitted in electronic form, with a printed copy, typed on one side only, and double-spaced. A short abstract should precede the article, with the address(es) of the author(s) at the end. Photographs may be submitted and should be clearly captioned. Line drawings and maps, if not submitted in electronic form, should be in black ink on strong white or translucent paper. References should give the author's name, with the year of publication in brackets, and with the list of articles, showing title and publisher, in date order. Scientific names should follow customary nomenclature in Latin, while the English and, if appropriate, available local Arabic names should also be supplied.

International Standard Serial Number (ISSN): 1019 - 6919.

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Cover Illustrations:

Front: *Tribulus arabicus* s.l. near Al Wathba - *Picture by Dr. Gary Brown*

Back: *Hyocyamus muticus* - *Picture by Dr. Gary Brown*

The Editorial Board of TRIBULUS and the Committee of the Emirates Natural History Group acknowledge, with thanks, the support of the Group's Corporate members, a full list of whom can be found on Page 2, and without whom publication would be impossible. We also acknowledge the support and encouragement of our Patron, H.E. Sheikh Nahayan bin Mubarak Al Nahayan, UAE Minister of Education.

TRIBULUS is published for circulation to members of the Group, and is also available at selected outlets in the UAE and on subscription inside and outside the UAE. Subscription in the UAE & the Arabian Gulf states: Dh 50 per year. Overseas details on request.

The Group is a non-governmental member of IUCN, the World Conservation Union.

Published by the Emirates Natural History Group,
P.O. Box 45553, Abu Dhabi, United Arab Emirates

Designed by Genedine dela Fuente

Printed by Dar Al Fajr Press, Printing, Publishing and Advertising, P.O. Box 505, Abu Dhabi, UAE

EDITORIAL

It has been little noticed as yet, but over the past couple of years or so, there has been a marked change in the way in which development planning in the largest of the UAE's seven constituent emirates, Abu Dhabi, is being carried out.

Although there has been legislation for several years requiring the carrying out of environmental baseline studies and impact assessments prior to any development, in many sectors, the existence of that legislation has been acknowledged more in its breach than in its firm implementation. That, to a large extent, has been due to the fact that many sectors of Government involved with development were older, and stronger, than the authority charged with the implementation of the legislation, the Environmental Research and Wildlife Development Agency, ERWDA. While the Agency sought to perform its functions, others, with interests to preserve, were by no means always ready to surrender those, or to permit any diminution of their own authority.

Gradually, however, ERWDA has proved its abilities in some of the areas with which it was entrusted, particularly in two fields. One is that of research, protection and management of marine resources, the establishment of the Marawah Marine Protected Area being one example, and the licencing and supervision of the local fishing industry being another. A second field has been that of drawing up proper guidelines for the review of development applications and the issuing of development permits.

Rather than challenging the established procedures and approaches of sectors of Government much larger and much older than itself, the Agency, with the appropriate political support, also set out first to prove its own capabilities and, second, to build relationships based upon collaboration, rather than confrontation. That has paid off, particularly in the period of restructuring since the death of the late President, HH Sheikh Zayed bin Sultan Al Nahyan, at the end of last year.

A couple of examples make the point. The dozens of bulldozers levelling land for development and the hundreds of lorries clogging up the roads to bring sand from the deep deserts to pile upon the salt flats, to raise them for development purposes, have ground to a halt.

Secondly, one of the most characteristic features of Abu Dhabi's deserts, the planting of million after million of trees, is under review. A re-examination of the whole rationale of the afforestation programme is under way, looking at the techniques of planting and their sustainability. Limits are being defined and these, today, are much narrower than they were a year or so ago. ERWDA's hand can be seen in both of these developments.

Another area in which there has been change has been the wider acceptance not only of the obligation to carry out Environmental Baseline Studies, but also of the conditions being placed by ERWDA on the permits that they issue. If further studies are required, they're now being properly carried out, with checks to make sure that they have been done before the next phase of a permit is issued. And, a significant step forward, there have been cases where managers of development projects, finding that aspects of environmental importance have been identified during baseline studies, have come forward themselves with proposals for further work. One such case is the Abu Dhabi Airport expansion project. An important population of 'dhubs' (the spiny-tailed agamid *Uromastyxaegyptia microlepis)* was identified on the site. In the past, they would probably just have been buried under the bulldozing. Not now, though – the authorities responsible for the project took advice, developed a capture and re-location programme, and then asked ERWDA for help in carrying it out.

All very positive – and we look forward to seeing this kind of approach spreading more widely.

Out of the baseline studies, previously unrecorded information about the country's fauna and flora may emerge.

Such is the case with the first paper in this issue, by Richard Hornby. The large spoon worm population at Taweela that is the subject of his contribution was only identified as a result of an environmental baseline study for a power & desalination plant expansion, while further studies are now to be carried out as a condition of the ERWDA permit. The paper shows, once again, that there is much still be be discovered about the natural history of the Emirates.

Other contributions cover, as usual, a fairly broad range of topics, such as a newly-recorded subspecies of bird for the Emirates, a follow-up on a recent paper on World War Two plane crashes (providing summary details of two more), and short notes on butterflies, weevils, archaeology and a new species of breeding bird for the Emirates. A rather eclectic collection, perhaps, but that is, after all, the objective of your Editors: to provide material on a range of topics relating to geology, archaeology, history and natural history that should provide something of interest to anyone with anything more than a passing interest in these aspects of the Emirates.

Corporate Members of the ENHG

Production of ***Tribulus,*** and many of the other activities of the Emirates Natural History Group, including the grant programme of the Group's Conservation Fund, would not be possible without the generous support of the the Group's Corporate Members, many of whom have provided consistent assistance over many years. The Editorial Board and the Group Committee acknowledge, with thanks, the invaluable support of the following companies and bodies, currently Corporate members of the Group, and all past Corporate sponsors:

Abu Dhabi Company for Onshore Oil Operation, ADCO; Al Fahim Group; Al Nasser Holdings; BP; Environmental Research and Wildlife Development Agency, ERWDA; Kanoo Group; Al Masaood; Intercontinental Hotels; Jashanmal National Company; METCO; Motivate Publishing; Nama Development; National Bank of Abu Dhabi; Omeir Travel Agency; Richards Butler; Rotana Beach Hotel; URS Dames and Moore.

An Intertidal Spoon Worm (Phylum Echiura) in the United Arab Emirates: Occurrence, Distribution, Taxonomy and Ecology

by Richard J. Hornby

Introduction

"Spoon Worm" is the common name for the little-known Phylum, Echiura. These are exclusively marine invertebrates and many of them are deep-sea bottom creatures, but at least one species can be found in the intertidal zone of the Arabian Gulf coast of the United Arab Emirates. They are unsegmented, bilaterally symmetrical, coelomate marine invertebrates with a long proboscis, or, more correctly, prostomium, that is used for both feeding and respiration. Some experts believe that echiurans are related to the annelids, partly on account of the structure of the planktonic larvae.

Figure 1. A prostomium partly extended.

Taxonomy and Known Distribution in Arabia

There are now considered to be only two orders within the Echiura—the Echiuroinea and the Xenopneusta (Nishikawa 2002). The Xenopneusta only contains four species. The Echiuroinea contains the families Bonellidae, with about 35 species, and the Echiuridae, with more than 70 species. At least one species of echiurid is known to occur in the intertidal zone of the Arabian Gulf. Hughes and Crisp (1976) provided information on the occurrence, ecology and anatomy of a Spoon Worm that they identified as *Prashadus pirotansis,* in Damman, Saudi Arabia and Khadmah, Kuwait.

Jones' Field Guide to the Sea Shores of Kuwait and the Arabian Gulf (1986) also describes and illustrates *Prashadus pirotansis.* Basson et al (1977), in their ground-breaking work on biotopes of the western Arabian Gulf, contains long lists of marine invertebrates present in the region, but only includes one Spoon Worm, the echiurid, *Ikeda taenioides.* The book includes a photograph of the prostomium of this species, looking indistinguishable from the Spoon Worms observed by the author in the UAE. *Ikeda taenioides* is described by Basson as "abundant...lower down the sand flat, especially where some water is retained in tide pools or shallow depressions". Hughes and Crisp had also reported that they observed the echiurid to be most abundant between about mid-tide level and the low tide line. In the UAE, the author has observed echiurids only around the mid-tide level, i.e. they apparently do not extend into the low shore.

There is no reason to suppose that Basson had found a different species from that reported by Hughes and Crisp (and Jones). They had used different names because of the somewhat confusing taxonomic situation (see below) and the shortage of described specimens.

The author has been unable to find any published record of the presence of echiurids (and indeed the phylum Echiura) in the United Arab Emirates, but he has been aware of an echiurid species in the intertidal zone of the UAE since 1996, when he first noticed specimens, or more precisely, their prostomia, in a very sheltered open mudflat within Khor al-Beida, in the Emirate of Umm al-Qaiwain. They were present at a low density over an area of a few hectares. A small number of prostomia were seen to be feeding, i.e. collecting material from the surface of the sediment, during the ebb tide, after the echiurid holes had been exposed to the air. The exposed part of the prostomia averaged about 60 cm.

Shortly after that, the author observed echiurids, apparently of the same species, in a very sheltered intertidal sandy shore on the south-eastern side of Futaisi Island, 10 km south-west of Abu Dhabi island. Here the area containing echiurids is somewhat larger, perhaps 10 ha, and, as at March 2005, this population was still doing well.

In November 2004 the author discovered a very large population of echiurids within a stand of fairly young mangroves Avicennia marina at Ra's Hanjurah, about 5 km south-west of the power and desalination plant at Al Taweela, in the emirate of Abu Dhabi. The prostomia are very similar at all three sites, but the manifestations on the surface of the sediment at Ra's Hanjurah are different from those at Khor al-Beida and Futaisi Island. The holes are quite small, no more than 5 mm diameter, but they are in the middle of a conical mound with a typical basal diameter of about 20 cm, and a height that can vary from 2 to 10 cm. At Ra's Hanjurah the mounds are quite steep- sided, like a small volcano, whereas at Khor al-Beida and Futaisi Island they are more gently raised, more like an upturned saucer. This is likely to be a consequence of difference in the sediments—at Ra's Hanjurah it is fairly firm pale grey mud, whereas at the other two sites the sediment is primarily of sand.

Confirmation is currently lacking, but it would seem to be a reasonable assumption that the animals at all the UAE sites, as well as the animals described by Basson et al and by Hughes and Crisp in the western part of the Arabian Gulf (in Saudi Arabia and Kuwait), are all the same species. Unfortunately, to date, the only specimens of intact animals from the Gulf were those obtained by Hughes and Crisp.

Only a few other people seem to have observed or reported sightings of echiurids in Arabia. Gary Feulner reports having seen prostomia in June 1998 in what he called "Watchtower Khor", immediately south-west of Jazirat al-Hamra, in the emirate of Ra's al-Khaimah (Feulner, pers. comm.). This was also in pale grey mud, in the mid-tide range. This khor has since been infilled. He believes he also saw prostomia in Khor Madfaq.

Dr. David George, of the Natural History Museum in London, reporting on his studies of marine life of Abu Dhabi emirate from March 1996 to February 2001, sponsored by ADCO, did not mention echiurids, but he did notice mounds with holes which he assumed to be made by this group (George, pers. comm.). These were in at least one unspecified part of the intertidal zone in the western part of Abu Dhabi emirate. Similarly, the author has heard reports of echiurid holes being seen at one or two sites in Oman, although there have been no reports of the animals themselves having been seen.

The presence of the large population of echiurids at Ra's Hanjurah suggested that there may be other populations within the very large area of sheltered intertidal flats, much of it supporting mangroves, between Ra's Hanjurah and the Eastern Lagoon of Abu Dhabi island. Access to most of this area is difficult, and it remains largely unsurveyed by marine biologists, but recently (June 2005) two more sites have been discovered. On Saadiyat Island (the large island immediately to the north-east of Abu Dhabi island) the author found a low density of echiurid mounds, both in mangroves and on open intertidal flats, and, in one very sheltered area on the landward side of a mangrove stand, a very high density. Another site was discovered by Joanna Buckee on the small island of Abu Shuum (on the north-eastern margin of Abu Dhabi island), the identification being confirmed by the author from photographs.

The discovery, within a period of only seven months, of three sites with echiurid mounds within a relatively short distance from Abu Dhabi, and the very high density in two of the sites, raises the possibility that this intertidal echiurid may have undergone a recent population increase, or even a population explosion. It is possible that the species might undergo cyclical population changes, but it is also possible that the population has responded positively to the high seawater temperatures that have prevailed in the Indian Ocean over recent years (George and John, 2004).

Taxonomy

An intertidal echiurid was collected in Japan in 1901 and described in 1904, using the name Thalassema taenioides Ikeda 1904. Then Wharton, in 1913, created the genus Ikeda, with Thalassema taenioides as the type species, by monotypy. This was assigned to the family Echiuridae (order Echiuroinea) but Fisher (1946) later constructed the family Ikedidae, in a new order, Heteromyota, for the single species Ikeda taenioides, the correct synonym for Thalassema taenioides. The justification for this was the unique arrangement of the muscle blocks (Stephen and Edmonds, 1972). More recently, however, re-examination of type specimens by Nishikawa (2002) weakened the case for this family, which has now ceased to exist.

Thus Thalassema taenioides was reclassified, combined with the genus Prashadus, and later replaced by the genus Ikeda (Nishikawa, 2002). Prashadus pirotansis was the name originally used to describe an echiurid found on the Indian island of Pirotan (Menon and Dattagupta, 1962). Nishikawa examined the relevant Indian specimens in the National Museum of Scotland and concluded that there is not sufficient justification for the status of Prashadus as a genus. Those specimens therefore became Ikeda pirotansis. The distinction between I. pirotansis and I. taenioides depends on the number of gonoducts (200 to 400 in the latter, and up to 30 on either side in the former), as well as on the thickenings of the non-fasciculate longitudinal muscle layer recognisable as longitudinal lines on the outer surface of the trunk, which are present in the latter, but absent in the former (Nishikawa, 2002). It should be emphasised, however, that all of this taxonomy is based on extremely few specimens, and the number of gonoducts may also depend on size and age. Professor Teruaki Nishikawa, who is a world authority, has never seen the body of a live echiurid, partly because "its previous habitats in Japan have been destroyed by human impacts" (pers. comm.). This raises questions about the global status of the group, and may suggest that the Arabian Gulf is a major stronghold.

Until the body of the echiurids present in the UAE can be examined, positive identification will be impossible. They cannot be identified from the prostomium alone. It seems reasonable to work on the assumption that the UAE populations are of a species of Ikeda, but whether it is I. taenioides or I. pirotansis, or another species altogether, currently remains unknown. It is also possible that after examination of specimens from more populations, I. taenioides and I. pirotansis will

be found to be the same species.

According to Nishikawa, there are nine known genera within the family Echiuridae, namely Echiurus, Arhynchite, Anelassorhynchus, Thalassema, Lissomyema, Listriolobus, Ochetostoma, Ikedosoma and Ikeda. The great majority of the species live subtidally, and some are abyssal. Some live in association with sipunculan and at least one lives within dead sand dollars. Free-living intertidal echiurids seem to be rather localised in tropical and subtropical regions, but where they do occur, they can be abundant.

Ecology

The echiurid species discussed here lives well buried within intertidal sediments in sheltered locations and feeds by sending up a prostomium to collect material from the surface. The prostomia at Ra's Hanjurah can be fully exposed for up to one metre in length. They are both ciliate and muscular, and appear to project themselves outwards from the hole by cilia No muscular action is visible, and it has been reported elsewhere that the prostomium is ciliate. They then collect surface sediment by muscular rippling of the margin, gradually accumulating a cylinder of sandy material until it is present continuously along the exposed prostomium. The cylinder has an average diameter of 2 to 3 mm, so the average volume of a full good-sized prostomium must be approaching 20,000 mm^3, or 20 cm^3 (i.e. 20 ml).

This material is then carried by the prostomium as it retreats back into the burrow, using both ciliary and muscular action. It is assumed that the material is then conveyed down to the mouth of the animal, which is at the base of the prostomiurn. The prostomium cannot be introverted into the body cavity, so it must remain within the burrow linking the animal to the outside world. The organic matter in the fine sand collected by the prostomium is then digested within the alimentary system. The surface part of the feeding operation, i.e. extending the prostornium, collecting the material and conveying it into the burrow, has been observed to take about five minutes.

The number of actively feeding prostomia that one can observe at any time is clearly heavily dependent on the tidal cycle. Feeding has been observed in shallow water (c10 cm) and on bare sand shortly after the tide has receded, but not on drying sand a long time after the tide has fallen below the level of the sediment. Hughes and Crisp (1976) reported that all feeding had stopped before the flood tide. The optimum time for feeding may well be just as the tide is dropping below the level of each occupied hole, and for a short time thereafter. The prostomium is a very weak and flaccid organ and it may not be possible for the animal to feed under conditions of strongly flowing or turbulent water. Neither would it be able to feed when the sediment begins to dry. It must be very heat-tolerant, as the author has seen active prostomia when the air temperature was approaching **40°C,** and the temperature of shallow intertidal pools can exceed 60°C in the summer months. When the water temperature is very high, however, the animal might opt not to feed.

During periods of low tide at Ra's Hanjurah it is possible to find many holes but far fewer active prostomia. The highest proportion of echiurid burrows observed with a feeding prostornium is about 1 in 20, although usually it is much lower than this. It is not known how many times Ikeda taenioides will feed during each tidal cycle, but the author suggests that only a few times are likely. As it must take quite a long time (at least several minutes and possibly up to one hour) to convey the sand down to the mouth and into the body, and time is then required for digestion and ejection of the waste material, it is possible that there is normally only one feeding foray per tidal cycle (or one per day under unfavourable conditions). It is also possible that they might not need to feed every day.

The mangrove stand at Ra's Hanjurah contains a high density of echiurid holes over an area of about 30 ha. In places the density is extremely high—several per square metre—but elsewhere it drops to perhaps only one per 100 m^2. The area also has many holes made by the crab Macrophthalmus depressus, but these are larger (about 10 mm diameter) and are not surrounded by raised mounds.

The holes and surrounding mounds made by echiurids are, therefore, very easy to identify. Without activity on the part of the animal, it seems probable the hole would be filled in during each tidal cycle by movement of the water, small-scale erosion and deposition of fine sediment. Virtually every mound at Ra's Hanjurah contains a hole, demonstrating that the burrow beneath is occupied. Even if very few or no prostomia are seen on a particular visit, it is still clear that there must be a live echiurid at the bottom of every hole.

Figure 2. The inter-tidal area at Ra's Hanjurah, showing spoon worm mounds.

Table 1. Numbers of spoon worm mounds in randomly selected 10 x 10 metre quadrats at Ra's Hanjurah on 29 April 2005.

Quadrat no.	Active spoon worm mounds	Percentage cover of mangroves	Percentage cover of filamentous algae
1	61	40	1
2	59	30	1
3	37	15	1
4	22	10	60
5	29	5	75
6	92	1	5
7	26	1	1
8	15	15	30
9	10	10	40
10	53	50	25

Density and population at Ra's Hanjurah

Counts of spoon worm mounds in randomly selected 10 x 10 metre quadrats at Ra's Hanjurah are presented in Table 1, along with percentage cover estimates of mangroves and filamentous algae. Spoon worms were not found in the densest areas of mangroves but neither were they found in areas with no mangroves. Areas with filamentous algae lying on the surface were quite well populated by spoon worms, although prostomia were observed to be apparently seeking open sand and avoiding the covering of algae.

Counting of active spoon worm holes presented several problems. In some, but not all quadrats, mounds had merged to form a raised complex with several holes. It is possible that one spoon worm might use more than one hole. It is also possible that some of the holes were made by crabs. This difficulty does not arise with single mounds with a single hole at the top, which is the usual situation. Table 1 contains conservative data. For example, quadrat no. 1 had a minimum of 61 active spoon worms but the possible maximum, if every spoon-worm-type hole was occupied by a single spoon worm, was 85.

Elevation is clearly a critical parameter for spoon worms. They occupy a strip through the mid-tide level, coinciding with the distribution of mangroves. Above this level much of the area has large numbers of a small cerith or "mud snail" Potamides conicus (up to 75 per square metre) on the surface. Below the spoon worm and mangrove strip, the surface supports a high density of a larger mud snail Cerithidea cingulata, mostly around 22 mm long. The average density of these ceriths was found to be 46 per square metre. Only small numbers of either species of cerith occurred in areas with spoon worm mounds. The intertidal flats are very extensive at Ra's Hanjurah. During a very low tide the open sea is more than 1 km away from the spoon worms.

The distribution of spoon worms within the site is rather patchy, without any obvious explanation. For example there can be a high density of spoon worms on one side of a shallow channel and none on the other, despite the habitat conditions appearing to be the same.

The length of the accessible area that contains spoon worms at Ra's Hanjurah is 1100 metres. The full length could be nearly double this figure. Trying to take account of the patchiness of the distribution, it was estimated that the average width of the strip was 125 metres. The total area occupied by spoon worms is therefore a minimum of 137,500 square metres. If we take an average density of 30 spoon worms per 100 square metres (see Table 1) the estimated total population would be 41,250. In the opinion of the author, it would be fair to say that in 2005 the population of adult spoon worms (i.e. recognisable active spoon worm holes) was somewhere between 30,000 and 60,000. (This figure might almost be doubled if the density continues at a similar level well into the inaccessible area).

In January 2005, two attempts were made to expose and remove the body of an echiurid at Ra's Hanjurah. A circular trench was dug around the selected mound, leaving the mound undisturbed for as long as possible. The sediment became progressively coarser with depth until, at about 40 cm, most of it was composed of bivalve shells 2 to 4 cm in diameter. At this depth water was flowing into the trench at a rate that necessitated continuous baling. It therefore became difficult to make the trench much deeper. The sediment in the middle, containing the echiurid burrow, was then carefully broken away by hand, allowing the material to break along natural planes of weakness. By doing this, it was possible to establish that the burrow was vertical and that, with depth, it became progressively more clearly defined, with a 'polished' fine-grained inner surface, lined with mucus. This part of the hole presumably contains the prostomium at all times, and it has sufficient structural strength to prevent collapse. The prostomium is thus able to extend or contract up and down the burrow with very little frictional resistance. Both attempts at excavation revealed that the body was below the level to which it was possible to lower the water by hand-baling. An attempt was then made to dig up the body, but this only resulted in the prostomium breaking off, without any sign of having reached the body.

Figure 3. An extended prostomium, with a mangrove pneumataphore (centre).

This experience demonstrated that the body must be at a depth of at least 60 cm, and Hughes and Crisp report that it could be more than 1 metre. The maximum length of an extended prostomium is, therefore, more than 1.5 metres. As the body is up to 60 cm long (Hughes and Crisp, 1976), the length of a mature animal is therefore, more than 2 metres long. Further efforts will be made to excavate intact animals for anatomical and genetic examination.

The animal's only apparent means of respiration is through the prostomium. The body of the animal is deeply buried in anoxic sediment, which had a clear smell of hydrogen sulphide. The prostomium is thus likely to fulfil an important role in gaseous exchange, absorbing oxygen and releasing carbon dioxide.

There can be little doubt that the mound surrounding each echiurid hole must be made by the animal living down the burrow. A lot of sediment is taken into each hole, presumably every day, and clearly most of it—the indigestible part—must be returned to the surface. The author is not aware of any observations to ascertain how or when this happens. The body of an echiurid is known to be quite muscular, and it would be feasible for the unwanted sand, the 'pseudofaeces', material to be forcibly ejected up the hole onto the surface, presumably after the hole has been covered by the flood tide. Emissions of pseudofaeces waste material must occur frequently enough for the mounds not to be washed away by the tide and currents.

At first sight, this would appear to be a simple process, i.e. ejecting the sediment from the body cavity after a suitable period of digestion. There are two physical problems to this, however. Firstly, damage must be avoided to the very delicate prostomium, and, secondly, echiurids have a discrete alimentary canal with a posterior anus, i.e. at the lower end of the animal, at the bottom of the burrow. Somehow the waste material must be moved past the body and upwards to the hole that connects with the surface. The author feels that, logically, that the material must be transported to the surface by the prostomium, i.e. gradually by ciliary action rather than suddenly by the body musculature. One can speculate that the material must be raised from the anus to the prostomiurn, outside the body, by a form of peristalsis. It would appear that the prostomium plays a key role not just in feeding and respiration, but also in excretion of physical waste. It was observed on a few occasions that a flow of clear water would emanate from spoon worm holes for a period of about five seconds. On some of such occasions, towards the end of the flow, the water would contain little pieces of sediment with some apparent structure little cylinders about 1 mm wide and 3 mm long. These particles are different from the general nature of the material comprising the mound, at least when they are produced. These are presumed to be packets of faeces and they must lose their physical structure soon after expulsion from the burrow.

Life History

Some echiurid larvae are known to be planktonic and potentially able to develop into either sex, but nobody has ever knowingly seen an adult male of the genus ***Ikeda*** (Nishikawa pers. comm.). It is believed that when a larva settles in a suitable site, it establishes itself by burrowing into the sediment. As it grows there, it matures and forces its way further into the sediment while maintaining a burrow which acts as both a feeding tube and a breathing tube. At some point in their development the buried animals become sexually mature.,

Very little is known about the life history of echiurids that live as adults in inter-tidal sediments. Several questions need to be resolved, including the form, behaviour and distribution of adult males, the spatial and temporal harmonization of fertilisation and the importance of the planktonic phase in both males and females, in particular with relation to dispersal and geographic distribution. The question of longevity also needs to be examined.

Peculiarities of Ra's Hanjurah

The site at Ra's Hanjurah seems to be exceptional in that only one species of crab is present in significant numbers—Macropthalmus depressus. Most mangrove sites in Abu Dhabi emirate, however, contain a high biomass of crabs, particularly of the species Metapograpsus messor and, in some sites, also Eurycarcinus orientalis. In many mangrove sites the former is commonly seen well up into the mangroves, at a height of up to 2 metres above the sediment. A few small specimens were seen of Portunus pelagicus, but this swimming crab typically moves in and out of the intertidal zone with the ebbing and flowing of the tide, and has wider feeding opportunities.

Ra's Hanjurah also appears to support very limited diversity and biomass of gastropod molluscs. Most mangrove sites in Abu Dhabi emirate display large numbers of gastropods, particularly Cerithidea cingulata, Planaxis sulcatus, Oscilinus kotschyi, Clypeomorus bifasciatus and Echinolittorina (Nodilittorina) arabica, along with the predatory Thais savignyi. At Ra's Hanjurah, within the echiurid area, there were only moderate numbers of Cerithidea cingulata, some Oscilinus kotschyi and no predatory species.

The epibenthic fauna of Ra's Hanjurah, therefore, seems to be unusual in the scarcity of crabs and gastropod molluscs. It is suggested that this may be attributable to competition from the echiurids. Over a large proportion of the site, most of the surface of the sediment would be 'cleaned' by the echiurid prostomia. This must remove a high proportion of the microscopic algae and photosynthesising bacteria, which would constitute the base of a food web and probably a high proportion of the food of the crabs and gastropods. It is suggested, therefore, that within the mangroves at Ra's Hanjurah, the Spoon Worm is acting as a 'keystone species', i.e. exerting sufficient ecological influence to affect the invertebrate community structure. This competition would impact any animal that feeds on the surface of the sediment, but would probably have no significant impact on filter feeders such as bivalve molluscs and barnacles, as their food supply is replenished twice per day by the tidal cycle.

Discussion

This paper is inevitably of a provisional nature as it has not yet proved possible to examine the body of, or to positively identify, the echiurid species. with which we are concerned. Much of the paper is speculative, but written with the objective of stimulating interest in this little studied group.

Further efforts will be made to excavate a whole animal and the anatomical and DNA structure of this will then be investigated in Japan by Professor Nishikawa. As far as the taxonomy is concerned, there would appear to be three possibilities, i.e. that the species in UAE:

- is Ikeda pirotansis (formerly Prashadus pirotansis) as reported from India, Saudi Arabia and Kuwait;
- is Ikeda taenioides, i.e. the species described from Japan, which would have an extremely wide distribution from the Pacific to the Arabian Gulf and possibly including the populations referred to as Ikeda pirotansis, or
- is a species that has not previously been described.

Whichever of these possible outcomes, there is no doubt that Spoon Worms merit more attention in the Indo-Pacific, and, in particular the Arabian Gulf. Ra's Hanjurah would appear to be a key site for conservation of the species and for discovering answers to some of the many mysteries that concern the life history, ecology and distribution of the group.

Acknowledgements

The author would like to thank Teruaki Nishikawa, and Gary Feulner and David George for offering very constructive comments on a draft of this paper.

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Marine mollusc shells from two archaeological sites near Al Ain

by Andrew S. Gardner

The presence of marine mollusc shells on archaeological sites is well documented in the Arabian peninsula (Beech 2004; Boucharlat 1992; Hellyer 1998; Potts 1997), and, of course, elsewhere. Shell middens have been discovered at numerous coastal sites in Oman and the UAE, including the Arabian Gulf islands (Beech 2004; Hellyer 1998; Phillips and Western 1979). The species composition of many of these middens clearly indicates that the primary reason for shell collection was as a food resource, with large, edible species dominating the middens (Durante and Tosi 1977). Other coastal middens on the coast and islands of the UAE are composed primarily of pearl oysters, from the extensive Gulf pearling industry (e.g. Hellyer and Hull 2002). Less attention has been paid to the presence of marine mollusc shells found as surface scatters on inland archaeological sites, although such finds are relatively common (see Prieur 1999). 144 species of marine mollusc have been attested at the inland archaeological sites at Mleiha, dating to the late Pre-Islamic period (Prieur 1999). This note documents and analyses the marine mollusc species composition at two inland sites, north of the UAE city of Al Ain, lying just across the border with the Sultanate of Oman, one on the outwash plains to the east of the Hajar Mountains and the other in the mountains. Identification and nomenclature follows Bosch et al (1995).

Qarn Safwan

The site (about 340 m asl) is in the vicinity of Qarn Safwan (24° 33' N, 55° E), an isolated nummulitic limestone outcrop in the otherwise broad and sandy Wadi Safwan. This is a wadi flowing, after rainfall, westwards from the Hajar Mountains into the sands of eastern Abu Dhabi. The Arabian Gulf coast is 92 km from the site and the Gulf of Oman is 68 km away, though direct access is blocked by the mountains. A small fort was formerly present at the site, although only a few stones outlining the foundations are still visible today. Surface scattered artifacts, including Late Stone Age flint tools and debitage, fragments of Iron Age softstone vessels and bronze items, pottery sherds dating from the early and Late Islamic periods, glass, and 17th and 18th century coins suggest that the site has been used from the Late Stone Age to recent times. The scatter covers an area of at least one square kilometre.

During two visits on 4th-5th October 2002 and 24th-25th October 2002, a total of 470 shells were identified and examined from among the surface scatter of material. The methodology employed involved walking across the site and identifying all shells that were complete enough for species determination. Shells were collected by hand and no sieving was carried out. The sample should be approximately representative of the shell scatter, though it is not comprehensive. Small shell fragments were not examined. A minimum of 44 species were found, of which 22 were gastropods from 15 families, and 22 were bivalves from 10 families (Table 1).

Of the total number of individual shells, 14.9 % were gastropods and 85.1 % were bivalves. The most common species are the bivalves Glycymeris cf arabica (19.6%), Anadara uropigimelana (18.7%), Acrosterigma lacunosa (10.6%), Mactra liliacea (7.4%) and Tivela ponderosa (6.6%), with these species accounting for 63% of the shells studied. All these species are probably edible. The most common gastropod species are Strombus persicus (4.3%), Cypraea turdus winckworthi (2.1%) and Hexaplex kuesterianus (1.7%), the latter also a major source of food in historic and prehistoric periods. Additionally, 4 small pieces of stony corals were noted.

A surprising observation is that a significant proportion of the shells (21.5%) - see Table 1 - were clearly originally collected as dead, beached shells, containing calcareous tube encrustations on the inner surfaces, with heavily pitted shells or displaying the holes drilled by boring, carnivorous species.

Khudayrah

The site is an abandoned and extensive field system centred on (24° 29.5' N, 56° 02' E, 550 m asl) about 3 km west of Khudayrah village and 22 km ESE of Qarn Safwan. The system lies on a plateau above the Wadi Khudayrah, and consists of small fields and circular areas cleared of stones. The stones have been built into substantial walls up to 3 m thick and 1.5 m high around the fields. Due to the removal of stones, the level of the fields is below the surrounding plateau, and so the fields hold rain water, which may have allowed for rain-fed agriculture. Remains of irrigation channels (aflaj) are also visible along the edge of the wadi, though the level of these is below the majority of the fields. The site does not have obvious house remains or graves, and only a very sparse scatter of potsherds and shell remains were noted. No worked flint tools were found. The age of this field system has not been determined, but some, at least, of the potsherds are of Late Islamic date.

A total of 31 identifiable shells and shell fragments were noted on 7th-8th November 2002. These were from 15 species (6 gastropods from 6 families, 9 bivalve species from 6 families) - Table 2. The shells were mainly broken and all were bleached of any colour or pattern. At least two were beach shells; one Cypraea turdus fragment being heavily pitted and a large Callista erycina having calcareous tube concretions.

Table 1 Marine mollusc shells from Qarn Safwan

CLASS	FAMILY	SPECIES	TOTAL	Beach Shells
Gastropda	Fissurellidae	*Diodera rueppellii (Sowerby, 1834)*	8	7
Gastropoda	Xenophoridae	*Xenophora corrugata (Reeve, 1842)*	1	1
Gastropoda	Cypraeidae	*Cypraea turdus winckworthi* Schilder & Schilder, 1938	10	1
Gastropoda	Cypraeidae	*Cypraea grayana* Schilder, 1930	1	0
Gastropoda	Murlcidae	*Hexaplex kuesterianus* (Tapparone-Canefri, 1875)	8	1
Gastropoda	Muricidae	*Murex scolopax* Dillwyn, 1817	1	0
Gastropoda	Muricidae	*Thais lacera* (Born, 1778)	2	0
Gastropoda	Trochidae	*Trochus erithreus* Brocchi, 1823	2	0
Gastropoda	Naticidae	*Polinices mammilla* (Linnaeus, 1758)	2	0
Gastropoda	Naticidae	*Neverita didyma* (Roedlng, 1798)	3	0
Gastropoda	Natictdae	*Eunathicina papilla* (Gmelin, 1791)	1	0
Gastropoda	Potamididae	*Terebralia palustris* (Linnaeus, 1767)	2	0
Gastropoda	Potamididae	*Potamides cornicus* (Blainville, 1826)	1	0
Gastropoda	Ficidae	*Ficus gracilis* (Sowerby, 1825)	1	0
Gastropoda	Vermetldae	*Serpulorbis variabilis* Hadfield & Kay, 1972	3	1
Gastropoda	Strombidae	*Strombus persicus* Swainson, 1821	19	5
Gastropoda	Nentidae	*Nerita albicilla* Linnaeus, 1758	1	0
Gastropoda	Nassariidae	*Nassarius persicus* (Martens, 1874)	1	0
Gastropoda	Nassariidae	*Bullia mauritiana* Gray, 1839	3	0
Gastropoda	Olividae	*Oliva bulbosa* (Roedlng, 1798)	2	0
Gastropoda	Architectonicide	*Architectonica perspectiva* (Linnaeus, 1758)	1	0
Gastropoda	Costellariidae	*Costellaria diaconalis* (Mellvill & Standen, 1903)	1	0
Bivalvia	Veneridae	*Dosinia histrio* (Grnelin, 1791)	1	0
Bivalvia	Veneridae	*Marcia flammea* (Gmelin, 1791)	2	0
Bivalvia	Veneridae	*Callista florida* (Lamarck, 1818)	23	7
Bivalvia	Veneridae	*Tivela ponderosa* (Koch, 1844)	31	0
Bivalvia	Veneridae	*Sunetta donacina* (Gmelin, 1871)	7	2
Bivalvia	Veneridae	*Circe rugifera* (Lamarck, 1818)	4	0
Bivalvia	Glycymeridldae	*Glycymeris pectunculus* (Linnaeus, 1758)	11	8
Bivalvia	Glycymeridldae	*Glycymeris livida* (Reeve, 1843)	1	0
Blvalvla	Glycyrneridldae	*Glycymeris* cf *arabica* (H Adams, 1871)	92	12
Bivalvia	Arcidae	*Andara uropigimelana* (Bory de St Vincent, 1824)	87	40
Bivalvia	Arcidae	*Scapharca inflata* (Reeve, 1844)	2	0
Bivalvia	Arcidae	*Acar plicata* (Dillwyn, 1817)	2	0
Bivalvia	Arcidae	*Barbatia obliquata* (Wood, 1828)	11	2
Bivalvia	Pectinidae	*Chlamys livida* (Lamarck, 1819)	4	0
Bivalvia	Carditoidea	*Cardites bicolor* (Lamarck, 1819)	6	0
Bivalvia	Carditoidea	*Carditacrassicosta* Lamarck, 1819	1	0
Bivalvia	Cariidae	*Acrosterigma lacunosa* (Reeve, 1845)	50	15
Bivalvia	Matricidae	*Mactra liliacea* Lamarck, 1818	35	1
Bivalvia	Pteriidae	*Pinctada radiata* (Leach, 1814)	17	0
Bivalvia	Pteriidae	*Pinctada margaritifera* (Linnaeus, 1758)	1	0
Bivalvia	Spondylidae	*Spondylus marisrubri* Roeding, 1798	4	1
Bivalvia	Ostreidae	unidentlified oysters	7	2

Table 2. *Marine mollusc shells* from *the abandoned* field *system at* Khudayrah

CLASS	FAMILY	SPECIES	TOTAL	Beach Shells
Gastropoda	Cypraeidae	*Cypraea turdus winckworthi* Schilder & Schilder, 1938	2	1
Gastropoda	Muricidae	*Hexaplex kuesterianus* (Tapparone-Canefri, 1875)	2	0
Gastropoda	Potamididae	*Terebralia palustris* (Linnaeus, 1767)	5	0
Gastropoda	Strombidae	*Strombus persicus* Swainson, 1821	5	0
Gastropoda	Olividae	*Oliva bulbosa* (Roeding, 1798)	2	0
Gastropoda	Nassariidae	*Bullia melanoides* (Deshayes in Belanger, 1832)	1	0
Bivalvia	Veneridae	*Callista erycina* (Linnaeus, 1758)	1	1
Bivalvia	Veneridae	*Callista florida* (Lamarck, 1818)	1	0
Bivalvia	Veneridae	*Circenita callipyga* (Born, 1780)	1	0
Bivalvia	Veneridae	*Tivela ponderosa* (Koch, 1844)	1	0
Bivalvia	Glycymerididae	*Glycymeris* cf *arabica* (H. Adams, 1871)	1	0
Bivalvia	Arcidae	***Andara uropigimelana*** (Bory de St Vincent, 1824)	**5**	1
Bivalvia	Cariiidae	***Acrosterigma lacunosa*** (Reeve, 1845)	2	0
Bivalvia	Pteriidae	***Pinctada radiata*** (Leach, 1814)	1	0
Bivalvia	**Arcidae**	***Barbatia obiiquata*** (Wood, 1828)	1	0

Discussion

One striking aspect of these observations, especially from Qarn Safwan, is the great diversity of mollusc species in the latter. Unexpected finds were small keyhole limpets *(Diodora rueppellii),* a carrier shell *(Xenophora* corrugata), a fig shell *(Ficus gracilis)* and worm shells *(Saputis variabilis).* According to Bosch *et al.* (1995), the mollusc species present are from a range of habitats, Including sand, sandy mud, mangroves, rocky *shores* and offshore. *As* most species are common to the Gulf of Oman and the south-eastern *Arabian* Gulf, it is not possible to determine the provenance of the shells. The shells from Khudayrah were mainly of *the* same species, though there were two *species* not encountered at Qarn Safwan *(Callista erycina* and *Bullia melanoides).*

Although the age of the shells has not been determined, it seems likely that most are relatively recent (Late Islamic Period). The majority of the pottery sherds at Safwan are Late Islamic (such as 'Julfar ware' and 'manganese purple ware') and the excellent preservation of the shells suggests a relatively recent origin. Some even retain some of their colour and pattern *(especially Spondylus marisrubri* and *Cardites laingi).* Shells from Khudayrah were more fragmented and bleached. *Although* this may indicate an older date, the stone and gravel substrate is likely to be harder on the shelfs than the sand at Safwan, while the pottery present at Khudayrah also appears to be of Late Islamic date.

The obvious question arising from these shell finds is what are they doing so far from the sea. They are not fossilised, and are present well above present sea level and *any* Pleistocene sea level, and are also clearly associated with archaeological *sites.* It *can,* therefore, be assumed that they were transported to the sites by Man. Both sites are at least five days journey from the Arabian Gulf or Gulf of Oman using animal (camel or donkey) transport. The most obvious explanation is that they were transported inland for food, and certainly the majority of the shells found are of species which are potentially edible.

However there are some rather curious anomalies which do not sit entirely comfortably with this explanation. First, given the long and arduous nature of the trek inland, one might have expected the transport to be as efficient as possible. Given that molluscs are heavy in relation to their food value, and have a tendency to die and spoil, one wonders why they were not transported salted and dried, as abalones are in southern Oman today (ElMahi 1998). Moreover, a high proportion of the shells found were clearly dead beach-collected shells of no food value at all. Similarly the coral pieces have no food value.

Secondly* the great diversity amongst the shells requires some discussion. Some of the species recorded are not species normally associated with

human food, such as *Xenophora, Serpulorbis, Cypraea,* and other small gastropods. Monospecific concentrations of shell are a characteristic product of human dietary practice, resulting from collection of a few preferred target species for consumption (Edens 1988). Coastal middens in eastern Arabia are normally made up of large numbers of a few species of shells such as *Anadara, Terebralia and Hexaplex,* yet the latter two species are relatively uncommon on these inland sites. *Terebralia* is considered to have been a dietary staple of early human populations in some coastal areas of the Emirates and Oman (Feulner 2000).

A second explanation for the presence of some of the shells is that they were used for decorative purposes rather than as a component of diet. The gastropod *Engina mendicaria* and scaphopod *Dentalium* were widely used as beads, and have been found from the early Bronze Age tombs at Jebel al-Emalah, some 55 km north of Safwan (Benton 1994), and elsewhere. Neither of these species was represented in the collections from Qarn Safwan or Khudayrah. Cowries are well known as decorative items, used in necklaces and other jewellery and as currency. Indeed cowries are still used as talismans today against the 'eye' with the shiny dorsum of the shell removed. Of the 10 cowrie shells found at Qarn Safwan, four have the dorsum removed, though it is not possible to tell whether this has been done deliberately or is simply breakage due to trampling. Shell beads have recently been found at Sayh Jabjab, a lithic site 7 km NE of Qarn Safwan. These include small pierced shell discs and small gastropods with the ends of the spire removed to enable stringing. Material collected from the Late Stone Age site at Jebel Mahajir, an outcrop west of the Al Ain to Dubai road, by the late J.N.B. 'Bish' Brown in the 1980s also included small pierced discs (P. Hellyer, *pers. comm.)*

Perhaps the most mundane explanation for the presence of so many species is while some may have been collected for use in decoration, many may have been collected as by-catch along with the edible species. There is, clearly, scope for further research on the presence of marine mollusc shells on inland archaeological sites, both in the United Arab Emirates and in neighbouring areas of Oman. Where archaeological sites are examined in detail, through excavation, as at, for example, Jebel Buhais and Mileiha, in Sharjah, or in and around Al Ain, the study of the environmental remains that may be present, both on the surface and in stratified contexts, is an integral part of the investigations and detailed reports are produced as part of the excavation publication programme.

In the case of sites where excavations are not carried out, however, recording of archaeological material, including material of environmental origin such as marine mollusc shells, is generally much less detailed. Many other surface sites with marine mollusc shells present are known to exist throughout the Emirates, one such being at Gabat Rukhna, near Bida bint Saud, north of Al Ain, where six species of marine mollusc have been identified (Hellyer & Aspinall, 2005). An important point to consider, however, is determining the date of surface shell material. This is sometimes difficult to ascertain when other cultural material found on the surface indicates multi-period occupation.

Further research is required, and this note is intended, in part, to stimulate further study and analysis of the presence of, and the uses of, marine mollusc shells at inland sites in the Emirates and adjacent areas of Oman. Interviews with older inhabitants of the UAE and adjacent areas of Oman may also shed further light on the mollusc species used for dietary and other purposes.

Acknowledgements

I would like to thank Peter Hellyer and Mark Beech for useful discussion, comments and suggestions on an earlier draft of this note, and Peter Rothfels and Marjorie Estivill for assistance and companionship in the field.

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The first confirmed records of Jerdon's Orphean Warbler *Sylvia hortensis jerdoni* in the United Arab Emirates

by Stephen C Votier, Helen & Tony Mainwood, Brydon Thomason & Simon Aspinall

Plate **1.** Adult male 'Jerdon's' Orphean Warbler Sylvia hortensisjerdoni. Ghantut, United Arab Emirates 5th March 2004 (S C Votier). The clean white underparts and undertail covert markings distinguish this from nominate form and the long, babbler-like bill support the identification as S. hortensisjerdoni.

As part of an investigation into Lesser Whitethroats Sylvia curruca spp. wintering in the United Arab Emirates during February and March 2004, birds were caught in mist-nets set at a range of man-made wooded sites in Abu Dhabi emirate. Capture rates were typically very slow; this was due to low densities of wintering migrants and only the presence of only a few birds on passage. One of the most productive areas proved to be in an Acacia and Zizyphus plantation alongside the sea inlet at Ghantut (24° 52'N, 54° 53'E), in north-east Abu Dhabi.

As well as over-wintering passerines, a trickle of migrants was also evident by the beginning of March. Apart from good numbers of 'Desert' Lesser Whitethroats S.curruca minula, Menetries's Warblers S. mystacea and Chiffchaffs Phylloscopus collybita abietinus, we also encountered singles of Upcher's Warbler Hippolaislanguida, Hume's Lesser Whitethroat S.curruca althaea and Lesser Whitethroat S.curruca curruca/blythi, as well as two Orphean Warblers S.hortensis.

The first Orphean Warbler was a male trapped on 5th March. This individual was strikingly pale grey above and white below, with a pronounced black hood extending onto the nape and a very long bill. It had a largely pale iris and uniform, relatively fresh remiges and retrices, suggesting that it was an adult (an immature bird should show contrast between some moulted and some unmoulted remiges as a result of an extensive first pre-breeding moult, Shirihai et al. 2001). Prior to release we gathered a detailed set of biometrics and a series of photographs. A second male Orphean Warbler trapped in the same area on 11th March showed a very similar set of morphological characteristics. This second bird was less easy to age with confidence. Uniform remiges suggested an adult, but the presence of two generations of greater coverts and grey feathering in the crown strongly suggest a young bird and the eye colour was an inconclusive dirty yellow-brown. Neither bird was seen before or after capture and we assume they were on passage rather than wintering in the area.

Both birds were easily identifiable as male Orphean Warblers. A combination of pale grey upperparts contrasting well with black head, rather clean white underparts, extensive white in the outer tail feathers and dark grey sub-terminal chevrons on the undertail coverts are all characteristic of one of the 'Eastern' Orphean Warbler group. This group is sub-divided into two or three taxa; S.h.crassirostris, S.h.balchanica and S.h.jerdoni by, e.g., Shirihai et al. (2001), and S.h.crassirostris and S.h.jerdoni by, e.g., Cramp (1992), with differences between the taxa largely explained by head pattern and bill structure. The following characters identified both birds as belonging to the sub-species S.h.jerdoni:

- Underparts largely pure white, except for greyish buff wash along the flanks (Plate 1).
- Black hood extending onto the nape and uneven lower border contrasting markedly with the pale grey
- upperparts (Plate 2).
  Bill length outside the range of both S.h.crassirostris and S.h.balchanica, being at the upper end of the
- S.h.jerdoni (Table 1, Figure 2).
- Bill depth narrower than S.h.crassirostris (Table 1).
  Bill width narrower than S.h.crassirostris (Table 1).

These two birds represent the first documented records of this taxon in the UAE. Future study will hopefully reveal whether the small number of wintering and larger number of passage Orphean Warblers (Richardson 2003) in the country also consist of this potentially overlooked subspecies, or whether they are actually scarce. The most recent and, to date, most comprehensive treatise on *Sylvia* warblers, Shirihai *et al.* (2001) states that *S.h.jerdoni* winters mostly in south west India and breeds in Afghanistan, Pakistan and north to Kazakhstan. On this basis, records in the UAE would seem likely to represent vagrants. In the same volume the authors state that *S.h.balchanica* winters in Oman, S Iran and Pakistan, but, given the similarity between *S.h.balchanica* and *S.h.jerdoni,* the status of *S.h.jerdoni* in the Arabian Gulf may need to be reassessed.

Plate 2. Adult male 'Jerdon's' Orphean Warbler *Sylvia hortensis jerdoni,* Ghantut, United Arab Emirates March 2004 (S C Votier). Note the extensive black crown extending on to the nape, which contrasts well with the pale grey upperparts. From above the bill looks strikingly slender.

Table 1. Biometric data of 'Eastern' Orphean Warblers. Data for the three taxa within the eastern group are from Shirihai et al. (2001) and represent mean, ±1 standard deviation, (range) and sample size. Primaries are numbered ascendantly from the outermost inwards (i.e. the outermost primary is P1).

	UAE Bird 1	UAE Bird 2	*S.h.crassirostris* [1]	*S.h.balchanica* [2]	*S.h.jerdoni* [2]
Wing	76	79	79.9 ± 1.64 (76-83) 47	82.66.95 (80-85) 14	80.8 ± 1.49 (79-83) 8
Tail	67	68	67.46.98 (64-70.5) 47	65.2i2.67 (62-69) 14	68.2 ± 1.83 (65-70) 8
Tail/Wing ratio	0.88	0.86	0.84 ± 2.36 (0.80-0.90) 47	0.79 (-)	0.84 (-)
Bill length[3]	22.4	23.1	19.8 ± 0.88 (18-22.1) 46	19.0 ± 0.75 (18-20.5) 14	21.5 ± 0.78 (20.5-23) 8
Bill depth[4]	4.5	4.4	4.7 ± 0.22 (4.5-5) 4	.	-
Bill width[4]	5.1	5.1	5.4 ± 0.21 (5.2-5.7) 4	.	
Wing Point	3,4	3,4	3,4,5	-	-
Emarginations	3,4,5	3,4,5	3,4,5	-	-
P2=	5.6	5.6	5,6 (4,5-6,7)	-	-

[1] Sexes combined
[2] Males only
[3] Bill to skull
4 Measured at the proximal tip of the nostrils

Appendix 1. Additional features noted to differentiate between two S.h.jerdoni recorded in the UAE and typical S.h.crassirostris as described in Shirihai et al. (2001).

- Bill extensively dark, with pale (pinky) flesh, reduced to the base of the lower mandible.
- Extensive white to all tail feathers.
- Dark tail contrasting with rather pale grey upperparts.

Appendix 2. Additional biometrics of two jerdoni Orphean Warblers trapped in the UAE March 2004. WP=wing point.

	Bird 1	Bird 2
P1 (.primary converts)	2.0	4.2
P1 to WP	40.2	38.6
P2 to WP	4.6	3.1
P3 to WP	=	=
P4 to WP	=	=
P5 to WP	2.4	1.9
P6 to WP	4.8	5.6
P7 to WP	7.4	8.7
P8 to WP	9.7	11.5
P9 to WP	11.7	13.4
P10 to WP	13.4	15.3
Longest tertial to WP	12.7	15.3
Head + bill	39.0	41.1
Exposed culmen	16.1	16.6
Tarsus	25.2	26.6

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Two more World War Two plane crashes

by Jim Ward

I read with interest the paper by Peter Hellyer and Laurence Garey in **Tribulus Vol.14.1** ('World War Two plane crashes in the UAE', pp. 9-11) on Second World War plane crashes in the UAE. I was fairly sure I knew of one and was disappointed to find it was not mentioned in the paper.

In 1980, I was stationed at the Control Tower at Dubai InternationalAirport. While talking with colleagues in the Tower about old plane wrecks, one of the assistant controllers, a UAE national, who was also a fisherman in his spare time, told us about a wreck just off the beach between Hamriya port and Khan creek. He had caught his nets in it once and said it was easy to find as it was opposite a large metal pipe, which was at the top of the beach. The wreck was only about 100m offshore in fairly shallow water. A friend in the local branch of the British Sub-Aqua Club, BSAC, – then based in the old Sharjah fort just below the control tower - also knew about it but club members were not really interested as it was in such shallow water.

My wife and I went snorkelling and found it easily. At low water, the tips of the propellers were just visible above the water. Most of the wreck was in the sand with just the top of the lower fuselage (the top of the fuselage was missing) and two radial engines visible above the spinners. The propellers were still attached but bent back over the cowling. The wings, outboard of the engines, were missing and the fuselage survived only from the front of the cockpit to just behind the trailing edge. Of interest at the back of the remaining fuselage was a circle, which suggested the mount for a top gun turret. We made several more dives on the site – mainly because it attracted lots of fish – and even took some pictures on a basic Minolta, although these are in store in Britain and I have not been able to refer to them.

We, therefore, thought we were looking at a twin radial engined aircraft, which would have been present in the Middle East and either operating from or through Sharjah. Its position and the fact that it was pointing north-east suggested it was on right base for the old

Sharjah runway. The only aircraft that fitted the bill were the Bristol Blenheim, Beaufort and Beaufighter. From memory, we initially elected for the Blenheim as we thought it had an odd number of cylinders − the Blenheim had a 9 cylinder Taurus engine, whereas the Beaufort and Beaufighter had a 14 cylinder Hercules engine.

I wondered at first why the pilot had elected to ditch so close to shore, but then realised he had made the right decision as a forced landing on the dunes would have been far riskier. It also struck me that he was flying an unusual pattern as normally the RAF fly a left hand pattern, but again, if he knew he had a problem, he might well have elected to make a straight in approach.

In 1994, I returned to work again in Dubai, and took my sons for a snorkelling trip to the plane, only to find that the beach had gone and a Corniche had been built in its place. Research suggests that the wreck site is beyond the line of reclamation, but I have not yet been able to discover whether the wreck itself has withstood the ravages of reclamation and of time.

After reading the paper by Hellyer and Garey, (and the lengthy extracts carried in Gulf News), I contacted PH and told him of what I knew and he encouraged me to research further. Searching on the Internet (a source of snippets with no further details), I found a report that a Beaufighter had been involved on 26th April 1944 in a crash while flying from Bahrain to the Trucial States as part of a ferry flight from Britain to India.

A request for further information to the Bristol Aircraft Historical Society has yet to be answered.

Another Internet 'find' was a report of Liberator tail number AL550 "Ditched off Sharjah Sept 8 1944. The Liberator had a 14-cylinder radial engine, so perhaps my memory of the number of cylinders of the aircraft on which I snorkelled 24 years ago was wrong, but it had a powered mid-upper turret which required a rail to operate. The Liberator was a 4 engined aircraft. However, on the crashed aircraft between Hamriya and Khan, the outer wings were missing. The RAF were adept at salvaging what they could, as shown by the fact that they salvaged the engines from the Wellington that crash-landed on Abu Musa, cited by Hellyer and Garey.

The second author of the original paper, LG, has been kind enough to comment on a first draft of this Note, and has written as follows:

"I think that the theory that it (the Sharjah wreck) might be the Liberator is the most likely. The Bristols are possible, but the engines will not help much. The Beaufort did not have a round dorsal turret, but rather a faired-in turret at the rear of the deeper forward fuselage. So it is not likely.

AL550 was one of a batch of Liberator Mark II (B24C). They went mainly to 159 and 160 Squadrons from June 1942 for Middle East service. They had a British Boulton-Paul turret just at the level of the wing trailing edge (the earlier Mark I had no turret, and the later marks had a turret further forward, just behind the cockpit). So that fits with the finding of the fuselage surviving only to the trailing edge. The Bristols and the Liberator had 3-prop engines so, even if that had been noted, it would not help. (Author's note:- The wreck had a 3-bladed propeller, but as all the aircraft being considered had the same, it could not be used for identification)

AL550 was sent overseas from Britain in mid-1942, and served in Palestine and North Africa with 159 Squadron, then went soon after to South East Asia, where it was absorbed into 160 Squadron. It may have been on its way back to Britain in 1944 (160 Squadron gave up their Liberator Mark IIs in 1943) as it was assigned to Ferry Command after squadron service. I have found an interesting photo of a crashed Lib III (main difference is the turret further forward), in which the outer wings have separated, and the aft fuselage has broken off just aft of the trailing edge, just as Jim Ward describes."

As yet, I have no further details on the Liberator crash, but I will continue searching. Neither the Beaufighter crash nor the Liberator crash can be satisfactorily documented on the basis of single scraps of information, and further research is required – any suggestions would be gratefully received.

Finally, it should be noted that neither of these crashes is mentioned in the published British records from the Gulf for the period, including the Bushire Intelligence Summary, the Kuwait Intelligence Summary, the Muscat Intelligence Summary and the Bahrain Intelligence Summary. However, the published records for 1944 do not include the monthly 'Trucial Coast News Report', for April, when the Beaufighter crashed, or for September, when the Liberator ditched, or, indeed for any month that year (Hellyer, pers. comm.). The original reports sent from the Trucial Coast to the Political Resident for the Gulf, based in Bahrain, may have been lost. It would certainly be interesting to see whether, if they can be traced, they include any reference to these two incidents.

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Acknowledgement

I am grateful to Peter Hellyer for prompting me to place the Hamriya/Khan plane on record and for encouraging me to embark on further research, and to Laurence Garey for providing details of the Liberator crash and for sharing details of his own research.

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Uncommon Butterflies of the Ru'us al-Jibal: Baton Blue and Loew's Blue

by Gary R. Feulner

Fig. 1: Baton Blue *Pseudophilotes vicrama.*

Fig. 2: Loew's Blue *Agrodiaetus loewii.*

Two uncommon Blue butterflies (Family Lycaenidae: Subfamily Polyommatinae), the Baton Blue Pseudophilotes vicrama and Loew's Blue Agrodiaetus loewii were observed in modest numbers at several locations in the central and northern-Ru'usal-Jibal (the mountains of the Musandam Peninsula) on successive weekends throughout April 2005. The sites in question were: 'Aini, north of Wadi Bih near the UAE/Oman border, at ca. 450-750m; Aqabat Oso in Oman (the area of the high pass from Wadi Bih to Wadi Khabb Shamsi), at ca. 850-1050m; and the area north-west and south-west of Jebel Harim in Oman, at ca. 1200-1600m. Loew's Blue was also seen in mid-April on the northerly ascent of Jebel Qiwi in Oman, up to ca. 1250m (B. Couldrey, pers. comm.).

Those sightings are noteworthy because both species are restricted in range locally and have seldom been reported. Loew's Blue eluded even Torben Larsen, the author of **Butterflies of Oman and Butterflies of Saudi Arabia and its Neighbours,** as well as a number of scientific papers on the butterflies of Arabia. No specimens of either species are yet present in the Oman Natural History Museum in Muscat (T.J.D. Roberts, pers, comm.).

Range, Habitat and Ecology

The **Baton Blue** is a Palaearctic species that ranges from eastern Europe through Afghanistan to NW India, but in Arabia it is known only from the Ru'us al-Jibal, the mountains of the Musandarn Peninsula (Larsen & Larsen 1980; Larsen 1983, 1984). Specimens were independently collected in the 1970s by K.M. Guichard (in April 1976) and Torben Larsen (in March 1979) from near the high fertile plain at As-Sayh (also As-Sii or As-Saye), west of Jebel Harirn, where Larsen described "small colonies . . . located at several places on the rough shrub clad mountain sides surrounding the bowl" and concluded that they were "obviously well established" (Larsen & Larsen 1980). He indicated that the range of this species might be restricted to higher elevations (Larsen 1984).

I had not previously observed the Baton Blue, despite more than a decade of hiking throughout the Ru'us al-Jibal, and despite specific attention to butterflies since 1998. However, the period from mid-1998 until November 2004 has been an extended dry period in the Ru'us al-Jibal, as in the UAE and northern Oman generally. It now appears that in a favourable year, the range of this species may extend over much, if not all, of the Ru'us al-Jibal, including moderate elevations.

Larsen (1983) speculated that in the Musandam area the Baton Blue might breed only once annually (whereas in Lebanon there are three broods), perhaps due to larval food plant availability. The March-April timing of all reported observations to date supports this hypothesis, although the food plant remains unknown.

At 'Aini on April 1, the Baton Blue was active in sunlight at midday, feeding on rampant Erucaria hispanica, an annual Crucifer, growing on waste ground among abandoned dwellings (Fig. 1). I also encountered it in late afternoon on rubble slopes in the shade of a deep gorge, where I may have disturbed it from an overnight perch among low, erect stalks of E. hispanica and the flowering lily Asphodelus tenuifolius.

At Aqabat Oso on April 8, I visited on a windy day and had to descend into a sheltered wadi before I found the Baton Blue. There on a steep hillside a single male specimen was feeding on the flowers of the local dodder Cuscuta planifora, growing on stunted Desert Thorn Lycium shawii. Later in the month, near Jebel Harim on April 21, specimens were few and one female observed well while feeding on A. tenuifolius was distinctly tattered.

Loew's Blue is recognised as an Eremic zone species, i.e., one that inhabits the desert and subdesert regions from northern Egypt and Jordan, across northern Saudi Arabia to Iran and Afghanistan (Larsen & Larsen 1980; Larsen 1984).

I first observed Loew's Blue in late March 2001 (following the wettest winter of the dry period) in a rugged wadi on the east flank of Jebel Yibir in the southwest of the Ru'us al-Jibal, where it was feeding on Leucas inflata at an elevation of about 900 metres (Fig. 2). I saw this species again, twice, in late March of 2003, on more open slopes at elevations of about 800-900m above Wadi Kida'ah, a few kilometres south of Wadi Bih. In April 2005 Loew's Blue was much more

common. I observed numerous specimens at all of the sites mentioned except Jebel Harim, where all but one of the specimens were found in a single vegetated wadi. It fed at all sites on the spiny shrub *Astragalus fasciculifolius,* but also, at Aqabat Oso, on the more common pea family member, *Tephrosia apollinea,* and in the Jebel Harim area, on the abundant, flowering *Convolvulus acanthocladus.*

Although my own sightings of Loew's Blue have all been at higher elevations, Guichard collected it from the base of cliffs near Khasab, therefore probably at elevations no more than about 100m. Guichard's collections were made in early April, but Larsen failed to find the species in February 1979 or May 1981. These observations, coupled with my own, suggest a relatively consistent brood timing in March and April, consistent with the observations of Pittaway for central Saudi Arabia (see Larsen 1983).

Astragalus fasciculifolius is reckoned to be the larval food plant of Loew's Blue in the Ru'us al-Jibal, and it is worth noting that this spiny perennial shrub has suffered more than many other plant species during the recent drought, because it has been singled out for the special attention of goats. Beginning in 2000 I began regularly to encounter specimens from which the animals had detached the spiny crown of the plant and stripped the bark from the central stems, exposing the pale yellow-orange interior (Fig. 3). Presumably this was done for either dietary or medicinal reasons, to take advantage of some substance concentrated in or under the bark of the plant. One result is that in many areas *A. fasciculifolius* does not appear to be as common, nor are its shrubs as large, as they were formerly. This has apparently not greatly affected the recent fortunes of Loew's Blue, however, if we can judge from the numbers in flight in comparison to prior years.

Identification Tips

Like most of the so-called "Blues", the Baton Blue and Loew's Blue can be determined most reliably in the field by inspection of the underside. The Baton Blue is distinguished by having a line of five orange spots on the underside of the hind wing, parallel to the rear margin. Many Blues have one or two orange spots at the interior corner of the hind wing (which are generally interpreted as false eye spots, intended to decoy predators away from more vital parts), but only the Baton Blue has so many.

In addition, when I saw it under calm weather conditions, the Baton Blue exhibited distinctive flight. Moving among low vegetation, it tended to hover before perching, with the body held relatively vertical and the wings flapping rapidly about an axis perpendicular, not parallel, to the ground, so that the wing colour did not show well to an observer standing above. Seeing the rapid vibration and no obvious colour, I wondered at first if perhaps I was looking at a ribbonwing.

Loew's Blue is more distinctive by virtue of its relatively large size and the vivid royal blue colour of the male upper side. These allow it in many cases to be determined in flight. As Larsen noted, it can often be found at or near the spiny shrub *Astragalus fasciculifolius,* which is its larval foodplant.

Fig. 3: The spiny shrub Astragalus fasciculifolius, the larval foodplant of Loew's Blue, was regularly found "de-barked" by goats during the dry years of 1999-2004, presumably for dietary or medicinal reasons.

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A recent sighting of the Pomegranate Playboy butterfly, Deudorix livia, at Khutwah, Oman (Lepidoptera: Lycaenidae)

by Omar Naseer

The Pomegranate Playboy is an Afrotropical species distributed across the dry Sahel zone of Africa and into Arabia and, though common in many parts of its range, it is never abundant in Arabia (Larsen 1984). Although recorded once in the early 1990s from Al Ain in the United Arab Emirates (Gillett 1995), no recent recordings have been made from that region.

However, on 23 April, 2004 on a visit by a party from the Emirates Natural History Group (Al Ain) to Khutwah in Oman, a single female was photographed feeding at flowers of Ochradenus aucheri on the outskirts of the main plantation (Fig 1).

The irregular occurrence of this butterfly has previously been noted by Larsen (1984), but it seems strange that a species known to have a remarkably catholic choice of food-plants should be absent from or at least unnoticed in the region over long periods. The larva of Deudorix livia develops inside flowers and fruits, including dates, pomegranate, other fruits and Acacia species, all of which are plentiful at Khutwa, Al Ain and throughout the region.

Figure 1. A female specimen of *Deudorix livia* feeding on flowers of *Ochradenus aucheri*, photographed at Khutwa on April 23,2004. The other insects are ant-like Flower Beetles *(Anthicidae).*

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An aberrant Caper White butterfly, *Anaphaeis aurota,* at Khutwah, Oman (Lepidoptera: Pieridae)

by Michael P. T. Gillett and Omar Naseer

Figure 1. Two female specimens of the Caper White butterfly from Khutwah, Oman. The specimen on the right was found dead and shows the normal colouration of this species. The example on the left is an aberrant specimen with much of the undersurface background suffused with bright yellow.

The Caper White butterfly, sometimes called the Brown-Veined White, is at times one of the commonest butterflies in the Al Ain region of the United Arab Emirates and adjacent areas of the Sultanate of Oman. The species is a noted migrant that usually appears in the region in spring, breeds, often in massive numbers, on caper bushes and *Maerua* trees (Capparidaceae) and then disappears until the next spring. Often hundreds or even thousands of butterflies are present at favourable localities where the food-plants occur and larvae are known to strip all available leaves from *Maerua* trees in the Mahdah area of Oman before pupating, leaving many lesser developed larvae to starve to death. With so many individual butterflies, it is not surprising that, occasionally, aberrations occur, which have different colours or markings to the normal. Such aberrations are, however, very rare and one such is recorded by Larsen (1977) for *Anaphaeis aurota* in Northern Oman. In the female specimen in question, the whole of the white ground colour was replaced by dark chocolate brown, almost as dark as the normal wing markings.

At Khutwah, Oman, on April 23, 2004, small numbers of female Caper Whites were present and laying eggs on caper bushes in the old village and on nearby hillsides. One specimen caught our interest and was netted. It is shown in Figure 1 together with a normal specimen found dead next to a caper bush. The female in question has a normal upperside, but on the underside much of the white ground colour is replaced by bright yellow especially in the cells that are delimited by the black markings, but also at the base of the wings. In appearance, the butterfly closely resembles a specimen of the Arabian subspecies of the African Caper White, *Anaphaeis creona leucogyne.* This subspecies is non-migratory and resident only in SW Arabia and is not expected to fly in Northern Oman or the UAE.

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A first breeding record of the Purple Gallinule *Porphyrio porphyrio* for *UAE*

by David Diskin

The Purple Gallinule Porphyrio porphrio (also commonly known as Purple Swamphen) occurs in Southern Europe, Africa, the Middle East, across Southern and South-east Asia to South China, and Australasia (Taylor and van Perlo 1998). Six subspecies groups are generally recognised. The one that concerns us here is the poliocephalus group, members of which are characterised by their cerulean-blue or grey head (Sangster 1998).

The poliocephalus subspecies has a disjunct distribution in the Middle East, breeding in Southern Turkey, around the Caspian Sea, in' Southern Iraq and in South-eastern Iran. It is distributed throughout the Indian subcontinent. Although it is regarded as being a rather sedentary bird and is not known to migrate long distances on a regular basis, there is evidence of seasonal movements in response to changing habitat conditions (Taylor and van Perlo 1998). It is regarded as a vagrant to Cyprus, the Near East (e.g. Syria), the Arabian Gulf (e.g. Saudi Arabia; UAE) and Oman (Porter et al, 1996; Eriksen et al. 2003). Breeding has been confirmed at least once in Kuwait, at Al Jahra pools in 1996 (Jennings 1996).

Richardson and Aspinall (1998) cite six occurrences of Purple Gallinule in the UAE between 1984 and 1996. All reports were of single birds and all occurred between September and January.

The first in a series of recent records of this species at Al Warsen Lake (commonly known as Wimpey Pits) in Dubai came on 30 March 2001, when a single bird was seen. This bird remained until at least 21 May 2001. There were no further sightings at Al Warsen until spring 2002, when one (possibly two) was seen on 19 April. Sporadic sightings of single birds occurred until 27 September 2002. In 2003, single birds were seen on 2 January and intermittently between 11 April and 31 July.

Surprisingly, on 10 October 2003, three birds were seen feeding in the same general area as the original observations had been made. This was the first time that more than a solitary bird had been definitely recorded in the UAE. These three birds were seen until November Ist, and sightings of single birds continued until 21 December 2003. There was then a gap in the reports until one was again seen on **4** March 2004, being followed thereafter by regular sightings into April.

On April 22, Otto Samwald and Renate Riegerbauer, visiting Austrian birdwatchers, saw a half-grown juvenile feeding on the edge of reeds in the company of an adult and the two birds were seen again on 30 April. This is the first breeding record for the UAE and the second for the Arabian peninsula as a whole.

Analysis of the pattern of Purple Gallinule sightings at Al Warsen since the first record there in March 2001 is difficult because of the skulking nature of the species, although birds are occasionally vocal but often still remain unseen. It is probable, however, that breeding took place in 2003 and that the three birds seen in October 2003 represented a family party of two adults and an immature. Two of the birds had complete, red frontal shields, while the third had a brownish, less well-developed shield something which tends to support this hypothesis.

It should also be pointed out that Purple Gallinules are involved in the local cagebird trade. At least twenty birds of the poliocephalus-group were caged in mid-2004 in an aviary in Mushrif Park, Dubai; while as many as 25 full-grown birds were released in 1997 into mangroves on the island of Abu al-Abyadh, Abu Dhabi (Aspinall 2004). Some of the latter individuals survive but do not breed there, although others may have dispersed to, and be those now recorded in, more typical habitats in the UAE, as at Al Warsen. However, there remains nothing to indicate that the birds seen at this breeding site may have escaped from captivity or been otherwise deliberately released.

(Editors' Note: Purple gallinules continued to be seen at Al Warsen Lakes (Wimpey Pits) into summer 2005).

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An Islamic Religious Token found in Al Ain

by Andrew S. Gardner

The object illustrated here was shown to me by Rauda Mosallam Saeed Al Qubaisi, who was interested to know more about this 'coin'. However all is not as it seems, and this object is actually not a true coin but a religious token or tanka. The token was found by Rauda's aunt while digging on family land in the Oud Al Touba neighbourhood of Al Ain in 1985.

The token is made from silver washed brass or copper, is 28mm in diameter, and has script based on early Mughal silver coins. The undated token has the Kalima in the centre with the names of the four Sunni Caliphs around (top: Abu Bakr; left: Umar; below: Ali; right: Uthman). The reverse side shows a mosque with six minarets and a text "Medinat Sharif". Similar tokens have been published by Brotman (1970) and Mitchiner (1979; 1998). In design, it is quite similar to Brotman's type T, nos 1 and 2, although these are silver pieces. However Ali, Umar and Uthman are in different positions on this token and there are added dots in the spandrels of the mosque arches. Other similar pieces are illustrated as nos 4745 and 4746 in Mitchiner (1979) and as the mosque series on pages 119 and 120 in Mitchiner (1998).

Mitchiner (1998) suggests that these tokens were manufactured in Calcutta and issued from around the middle of the 19th century until the Second World War. The tokens were manufactured on a commercial basis. How they were actually marketed is not very clear, but they were probably sold at fairs and festivals, as well as at pilgrim sites (Jan Lingen, *pers. comm.* 2004). Lingen suggests that the tokens were used as religious amulets and were probably brought to Arabia either by Muslim traders or pilgrims en route to the Haj.

Acknowledgements

I am very grateful to Rauda al Qubaisi for bringing this interesting item into Zayed University, and to Lutz Illisch (Tuebingen), Jan Lingen and Heinz Bons for their insights and for sending me information on Indian tokens.

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Mitchiner, M. (1998). *Indian Tokens: Popular Religious & Secular Art.* Hawkins Publications, London. pp 240.

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The Red Palm Weevil *Rhynchophorus ferrugineus* at Khutwah, Oman (Coleoptera: Curculionidae)

by Michael P. T. Gillett and Omar Naseer

Figure 1. The red palm weevil, *Rhynchophorus ferrugineus.*

The Red Palm Weevil is native to South Asia and has long been noted as a serious pest of coconuts and other palms. In the last few decades, the beetle has spread westwards with human help to reach Iran, Arabia, Egypt and even Spain (Ferry and Gomez, 2002). In Arabia, the beetle was apparently introduced in imported date palms and by the early 1990s it had become common in many parts of the United Arab Emirates. Expensive control measures are in operation to limit the damage done by these beetles. The beetle has also spread into the Hajar Mountains of the Northern Emirates and Oman. In mountain oases, such as Khutwah, simple traps baited with a chemical attractant (pheromone) have been employed over the last few years to catch the weevil. From an examination of the traps at Khutwah, the beetles are not present in vast numbers. One trap examined in late March, 2004 contained the remains of two weevils together with four live weevils with no new captures evident on April 23, 2004. A second trap examined on the same day contained only a solitary live weevil (Fig. 1). Many date palms have been cut down recently at Khutwah to make way for horticultural development. This provided an opportunity to examine the damage done to the interior of the palm by the weevil and its larvae. Out of about 30 recently-felled palms, all were undamaged except for a single log, (Fig. 2) which showed extensive galleries caused by tunnelling weevils. Given the small numbers of weevils trapped at Khutwah and the sound nature of the majority of the palms being cut down, it seems that the Red Palm Weevil is not currently a significant problem and that the relatively simple traps have probably managed to control it. It will be interesting to see in the future what effects the reduction in palm numbers at Khutwah will have on the status of this beetle.

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Ferry, M and Gomez, S. 2002. The red palm weevil in the Mediterranean area.

http://www.palms.org/palmsjournal/2002/redweevil.htm

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Figure 2. *Weevil - damaged palm trunk*

News, Conferences and Publications

(compiled by Peter Hellyer, Simon Aspinall & Mark Beech)

New Patron for Dubai Natural History Group

UAE Minister of Education Sheikh Nahayan bin Mubarak Al Nahayan has agreed to become Patron of the Dubai Natural History Group, DNHG. He has already been, for many years, the Patron of the ENHG, publishers of Tribulus, and of the Al Ain chapter of the ENHG.

The three Groups are planning to strengthen their collaboration in terms of joint field excursions, meetings and research and publication. They already have a jointly-organised weekend outing each year, the most recent of which was held at Mafraq, just outside Abu Dhabi, in March. (Source: DNHG).

Fossil Display

The first-ever display in the United Arab Emirates of Late Miocene fossils from Abu Dhabi's Western Region opened in the headquarters of the Environmental Research and Wildlife Development Agency, ERWDA, in June. Put together by the Abu Dhabi Islands Archaeological Survey, ADIAS, under the direction of ADIAS Senior Resident Archaeologist Dr. Mark Beech, the display, accompanied by a short book (see Publications), is sponsored by Takreer, the Abu Dhabi Company for Onshore Oil Operations, ADCO, and BP, all of whom have been generous sponsors of fossil research in the Western Region over the years, as well as by ADIAS and ERWDA.

The centrepieces of the display are a skull and a **2.5** metre long tusk from the primitive elephant Stegotetrabeladon syrticus, the former excavated at Shuweihat and the latter near Ruwais, along with a scale model of the elephant itself, a four-tusked animal, which was made by the Taxidermy Section of the Private Department of HH the President of the UAE. Other animals represented by fossils in the display include early crocodiles, gazelles, turtles and ostriches.

An on-line view of the display can be found at http://www.adias-uae.com/fossils.html

Labels and other material associated with the exhibition are in both English and Arabic, and the display is intended to provide an introduction to students, and to others, about this important aspect of Abu Dhabi's heritage. (Source: ADIAS website).

Soil Survey

The Environmental Research and Wildlife Development Agency, ERWDA, is to carry out a soil survey of Abu Dhabi Emirate for the Abu Dhabi Executive Council. It is intended to provide an inventory of soil resources and to provide a GIS-based soil database. Geomorphological features of Abu Dhabi Emirate indicate that there may be a huge diversity of soils with different physical, chemical and biological properties.

The soil survey project will provide baseline information for understanding, managing, conserving and sustaining the Emirate's soil resources. It will also assist decision makers for future land use planning on scientific grounds, transfer technology for the rational utilisation of the soil resources, valuable soil databases for future research and development projects and capacity building of UAE nationals.

Soils will be mapped and classified using the latest satellite images, and norms and standards of the United States Department of Agriculture (USDA). Soil and land use maps will be published at scales **1:50,000,** 1:**100,000** and 1**:500,000.**

A soil survey of the coastal zone of Abu Dhabi has already been completed. This highlights areas where minerals such as halite (NaCl), anhydrite (CaSO4) and gypsum ($CaSO4.\ ^2H^2O$) occur. The survey report presents an introduction to the surveyed area, the methods used for field soil mapping and laboratory investigation of soils, description and classification of soils, map units and their description, and a soils database. The coastline of Abu Dhabi Emirate is divided into **220** soil polygons covering an area of **377,045** hectares. General soil maps have been prepared at a scale of 1**:50,000** (Source: ERWDA press release).

Symposium on Integrated Coastal Zone Management, ICZM

ERWDA hosted in June a Symposium on Integrated Coastal Zone Management, ICZM, for the UAE, attended by government and private sector representatives from throughout the Emirates, as well as a number of leading overseas specialists.

The objective of the Symposium was to prepare a strategy for the promotion of the sustainable development and conservation of the UAE's coastal and marine environment as well as the protection of critical habitats including beaches, mangroves, coral reefs and seagrass beds.

Recommendations included: optimisation of the compatible use of resources; management of the conflicting use of coastal and marine resources; adoption of an eco-system based system of management; and ensuring widespread participation by all stakeholders, including those in both the public and private sectors.

It was also recommended that the UAE should enact federal legislation for ICZM and that a review should be conducted on all components of the existing coastal and marine management systems in the UAE, including the present capacity of human resources and current scientific knowledge.

Participants included representatives of the federal Ministry of Agriculture and Fisheries, the Federal Environment Agency, Municipalities, the Abu Dhabi Marine Police and the Abu Dhabi Islands Archaeological Survey, ADIAS, as well as ERWDA. (Source: ERWDA press release).

Success for UAE's Crab Plovers

A protection programme managed by the Environmental Research and Wildlife Development Agency, ERWDA, has helped the country's breeding population of Crab Plovers, Dromas ardeola, to enjoy a successful season in summer 2005. The UAE's population is of national and international importance.

A colony of the species was found on the island of Abu al-Abyadh in the mid-1990s, and was afforded protection by the island's owner, UAE President HH Sheikh Khalifa bin Zayed Al Nahyan. A much smaller colony was also found on the nearby island of Umm Amim. In 2004, it was noted that the Abu al-Abyadh colony had split into two, and ERWDA's Terrestrial Environment Research Centre, TERC, put forward a series of protection measures for the new colony, close to temporary residential facilities. The removal of these facilities was then ordered by Sheikh Khalifa.

In 2004, 311 active nest burrows were counted at the new site. In May 2005, there were 588 occupied nests, with a further 145 at the original colony site, where more burrows were being dug. On Umm Amim, there were 77 active nest burrows in 2004, with 85 being counted in May 2005. (Source: ERWDA press release).

Kentish plover study

As part of a joint project with the Environmental Research and Wildlife Development Agency, ERWDA, a team from Britain's University of Bath have been carrying out a study of the breeding ecology of Kentish plovers Charadrius alexandrinus at the Al Wathba Lake and marsh (formerly known as Al Ghar Lake). The project, headed by Dr. Tamas Szekely, has identified a breeding population of up to 200 pairs.

Adult birds are being ringed with a combination of colour rings – metal + colour on the left leg and colour + colour on the right leg.

Any sighting of ringed Kentish plovers, particularly away from the breeding site, would be welcomed.

A brief report on the first year of the study will be published in a future issue. Bath University is also discussing another joint project with ERWDA on the Crab Plover Dromas ardeola colonies on Abu al-Abyadh. (Source: Tamas Szekely).

CITES implementation

Implementation of the regulations of the Convention in International trade in Endangered Species of Flora and Fauna, CITES, in the United Arab Emirates is being stepped up. The local CITES Management Authorities are the Federal Environmental Agency in Abu Dhabi and the Ministry of Agriculture and Fisheries for the northern emirates, while the Scientific Authority is the Environmental Research and Wildlife Development Agency, ERWDA.

In June 2005, a pet-shop in Al Ain was raided, and a rhesus monkey Macata mulatta, on sale without the proper documentatation, was seized. Rhesus monkeys are classified as Lower Risk by the 2000 Red List of the World Conservation Union, IUCN.

The pet shop attendants were handed a letter declaring that they had violated Article No. 27 of Federal Law No. 11 for the year 2002 on Regulating and Controlling International Trade in Endangered Species of Wild Fauna and Flora, by displaying to the public an endangered species with no accompanying CITES certificate or registration by the FEA. Article No. 27 of the law states that any person having in their possession or under their control, or selling or offering for sale or display to the public, any specimen of species listed in the Appendices without carrying out the necessary registration provided by assigned authorities, shall be liable to imprisonment for a term not exceeding three months, and/or a fine of not less than five thousand dirhams but not to exceed thirty thousand dirhams. (Source: ERWDA press release)

'Dhub' re-location project

During May 2005, a project to re-locate a population of up to 300 spiny-tailed agamids Uromastyx microlepis aegyptia (or 'dhub' in local Arabic), got under way on the site allocated for the expansion of the Abu Dhabi Airport expansion. The project is jointly managed by the Environmental Research and Wildlife Development Agency, ERWDA, the Supervision Committee for the Expansion of Abu Dhabi International Airport, SCADIA, and SCADIA's project management consultants, Parsons International.

The presence of the 'dhubs' was first recorded during fieldwork carried out by members of the Emirates Natural History Group in 2003. During an environmental baseline study carried out in April 2005, it was recognised that up to 300 'dhubs' might be resident on the site, a significant population, and the largest known close to the UAE capital of Abu Dhabi. While the species, one of two 'dhub' species in the UAE, is not classified as being endangered internationally, rapid development of its main habitats in Abu Dhabi is believed to be putting the local population under pressure.

In accordance with Abu Dhabi's environmental protection legislation, SCADIA arranged with ERWDA, Arabian reptile specialist Professor Drew Gardner, of Zayed University, (and ENHG Chairman), and the Breeding Centre for Endangered Arabian Wildlife, in Sharjah, for the carrying out of a capture programme.

The captured animals were initially housed in the Sharjah Breeding Centre, pending identification of suitable areas for their release. A pilot release programme near Rumaitha, south-west of Abu Dhabi City, yielded promising results.

As ***Tribulus*** went to press, nearly 180 animals had been captured.

This programme is believed to the first of its kind ever carried out with spiny-tailed agamids. (Source: SCADIA press release, Drew Gardner).

Conferences

The 3rd Annual Symposium on Recent Archaeological Discoveries in the United Arab Emirates took place in Al Ain on 6th-7th April 2005, organised by the Zayed Centre for History and Heritage and the Abu Dhabi

Islands Archaeological Survey, ADIAS.
Papers presented were as follows:

Archaeology in Arabia's Deserts - Recent fieldwork at Khor Al Manahil, Abu Dhabi Emirate, UAE (Heiko Kallweit, ADIAS & Freiburg; Mark Beech, ADIAS; Walid Yasin al-Tikriti, Department of Antiquities and Tourism, Al Ain) ***(Flint raw materials in the interior of the Northern Emirates - sources, exploitation and procurement*** (Margarethe Uerpmann, Hans-Peter Uerpmann, Marc Haendel and Johanned Schmidt, all Tubingen).

Hafit cairns of the UAE and Oman - an archaeological travelogue (Gary Feulner, Dubai)

Results of the 7th season of excavation at Hili N pit-grave and a new study of the monumental circular graves at Hili by the joint Emirati-French team (Sophie Mery, CNRS, Paris, and Walid Yasin al-Tikriti, Department of Antiquities and Tourism, Al Ain)

The Development of Tomb Architecture in the Wadi Suq period in Shimal, Ra's al-Khaimah (Christian Velde, Ra's al-Khaimah).

The past in the future - Millennia-old beaches and ecosystems in Dubai Internet City (Helmut Bruckner, Marburg; Anja Zander, Marburg; Gary Feulner, Dubai; Claudia Gruber, Munich; Henriette Manhart, Marburg; and Hussein Qandil, Dubai).

The future of the past - The Al Sufouh 2 excavation and the fate of site and results (Claudia Gruber, Munich; Angela von den Driesch and Henriette Manhart, both Marburg).

Excavations at Meraishid, Fujairah Salah Ali, Fujairah).

Recent excavations at Muweilah, Sharjah, (Peter Magee, Bryn Mawr).

Al-Najdi - a mound in Al-Ghubb, Ra's al-Khaimah (Ahmed Hilal, Ra's al-Khaimah)

Cultural practices during Iron Age in the United Arab Emirates : new data from Bithnah-44 / 50 (Anne Benoist, CNRS, France)

A Portuguese account of Dibba: a 17th C. description and map of the town (Geoffrey King, SOAS).

Publications

Books

Marine Atlas of Abu Dhabi. Loughland, R.A., Al Muhairi, F.S., Fadel, S.S. Almehdi, A.M. & Hellyer, P. [eds.] 2004. ISBN 1-904566-40-5. Emirates Heritage Club, Abu Dhabi.

The long-awaited results of detailed surveys carried out between 1999-2001 by a team recruited by the Emirates Heritage Club, covering the marine habitats as well as the coastal zone and the sabkhas, with chapters by many of the usual contributors on such topics, including many regular contributors to ***Tribulus*** (e.g. Mark Beech, on fish, Simon Aspinall, on birds, and Peter Hellyer on archaeology, as well as leading overseas experts David John and David George, on coral reefs and the benthic fauna & flora, Tony Preen, on marine mammals, and Charles Sheppard, on shallow water habitats, Peter Saenger, on mangroves, and Ron Phillips on seagrasses. Somewhat unusually, the Club have hidden the names of the editors away in the Acknowledgements (P. 278) – Ron Loughland, in particular, deserves more credit for having co-ordinated this whole project and bringing it to publication. Copies have not been made available for review – nonetheless, this book is an impressive piece of work that provides crucially-important baseline data on which all future planning for conservation should be based.

Jebel Hafit – **A**Natural History. Aspinall, S. & Hellyer, P. [eds.] 2004. ISBN 9948-03-143-1. Published by the Emirates Natural History Group, PO Box 45553, Abu Dhabi, UAE. Sponsored by the Abu Dhabi Company for Onshore Oil Operations, ADCO, PO Box 370, Abu Dhabi, UAE.

The first fully-fledged book to be published by the ENHG, this is also the most detailed scientific study yet published of a particular location in the UAE, focussing on the highest, indeed the only real, mountain in the Emirate of Abu Dhabi.

It covers not only natural history, but also archaeology and geology, and includes chapters by the leading experts in the field, including Tony Kirkham (geology), Walid Yasin al-Tikriti & Rob Carter (archaeology), Invertebrates (Mike Gillett & Brigitte Howarth), Chris Drew (mammals), Simon Aspinall (birds), Drew Gardner (reptiles), and Gary Brown (flora), along with shorter contributions by Mark Beech et al. (cave fauna) and Richard Hornby (clam shrimps). An important study and, like the Marine Atlas of Abu Dhabi (see above), a valuable contribution to scientific knowledge of the Emirates, as well as laying down a baseline for future conservation plans of the mountain. ADCO, a long-time supporter of the Emirates Natural History Group, deserves much credit not only for supporting the research but for sponsoring its publication – in sufficient copies to make it easily accessible.

Abu Dhabi **8** Million Years Ago **–** Late Miocene Fossils from the Western Region. Beech, M. & Hellyer, P. [eds]. 2005. ISBN 9948-03-188-1. Abu Dhabi Islands Archaeological Survey, ADIAS, PO Box 45553, Abu Dhabi, U.A.E.

A slim book of 68 pages, designed as a companion to the small display of the same name (see News). It contains a detailed catalogue of the items in the exhibition, but is, usefully, prefaced by several short chapters outlining the history of Miocene fossil research in Abu Dhabi, including details of a key site at Ruwais that has produced many major fossils of the Late Miocene elephant Stegotetrabeladon syrticus. With a Foreword by Abu Dhabi Crown Prince and ADIAS Patron HH Sheikh Mohammed bin Zayed Al Nahyan, it is dedicated to the late Peter Whybrow, a founder of fossil research in the Emirates (see Tribulus Vol. 14.1, p.24).

The following papers and journals dealing with the UAE and adjacent areas have been noted. Where no journal addresses are given, the papers have been found only on the Web, and have not been seen.

Archaeology

Arabian Archaeology & **Epigraphy Vol** 15.1 (May 2004).
ISSN 0905-7196, print; 1600-0471, on-line. Blackwell Publishing, 9600 Garsington Road, Oxford OX4 2DQ, U.K.

Charpentier, V., Mery, S. & Phillips C. *Des coquillages… outillages des Ichthyophages? Mise en evidence d'industries sur Veneridae, du Neolothique a l'age du fer (Yemen, Oman, E.A.U.).*

Blau, S. *Out of anonymity – A central location for 'peripheral places through people: the contributions made by Karen Frifelt and Beatrice de Cardi to an understanding of the archaeology of the United Arab Emirates.*

Barker, D. *Notes on four miscellaneous shell and organic objects from Sharm.*

Magee P. *The impact of south-east Arabian intra-regional trade on settlement location and organisation during the Iron Age II period.*

Daems, A. *The terracotta figurines from ed-Dur (Umm al-Qaiwain, UAE): The human representations.*

Zutterman, C. *The softstone vessels from Qarn bint Sa'ud, Abu Dhabi, U.A.E.*

Barker, D. *Miniature shells and bone 'hilts' or 'pulleys' from Sharm.*

Arabian Archaeology & **Epigraphy Vol. No.** 15.2 (November 2004).

Brass, L. & Britton, G. *An archaeological survey of northern Fujairah, United Arab Emirates.*

Daems, A. *The terracotta figurines from ed-Dur (Umm al-Qaiwain, UAE): the animal representations.*

Weeks, L.R. *An analysis of Late Pre-Islamic copper-base artifacts from Ed Dur, U.A.E.*

Bulletin of the Society for Arabian Studies, No. 10 (2005). SAS, c/o The British Academy, 10, Carlton House Terrace, London, SW1Y 5AH UK. ISSN 1361-9144. www.societyforarabianstudies.org

Mery, S. and al-Tikriti, W. *Preliminary results of the 7th season of excavations at Hili Tomb N.* pp. 21-24.

Review (by Robert Carter) of: Kennet, D. (2004). **Sasanian and Islamic Pottery from Ras al-Khaimah.** Society for Arabian Studies Monograph No. 1,BAR International Series 1248, Archaeopress, Oxford. ISBN 1841716081. pp. 57-59.

The news and research pages have a very extensive section on the UAE, pp.49-53.

Current World Archaeology, 9, Nassington Road, London NW3 2TX, UK. www.archaeology.co.uk

No. 10. 'DNA revelations from UAE's oldest person'. p. 10; 'Beatrice de Cardi', pp. 47-54 (an anonymous, lengthy and excellent profile of the doyenne of UAE archaeology)

No. 11. Durrani, N. (2005). 'A postcard from the United Arab Emirates'. pp. 34-38.

Paleorient 3011 (2004). CNRS Editions, 15, rue Malebranche, 75005, Paris, France. editions@editions.cnrs.fr

Mery, S., McSweeney, J., Van der Leeuw, S. & Al-Tikriti, W.Y. *New approaches to a collective grave from the Umm An-Nar period from Hili (UAE).* pp. 163-178.

Others

Carter, R. (2005). 'The History and Prehistory of Pearling in the Persian Gulf.' **Journal of the Economic and Social History of the Orient** 48(2): 139-209.

Frazier, J. (2004). 'Marine Turtles of the Past: A Vision for the Future?' Pages 103-116, in: R.C.G.M. Lauwerier and I. Plug (eds.), **The Future from the Past − Archaeozoology in wildlife conservation and heritage management.** 9th ICAZ Conference, Durham 2002. Oxbow.

Petersen, A. (2005). 'What is "Islamic Archaeology"?' **Antiquity** 79: 100-106.

Potts, D.T. (2004). 'Camel hybridization and the role of *Camelus bactrianus* in the Ancient Near East.' **Journal of the Economic and Social History of the Orient 47(2):** 143-165.

Radies, D., Hasiotis, S.T., Preusser, F., Neubert, E. and Matter, A. (2005). 'Paleoclimatic significance of Early Holocene faunal assemblages in wet interdune deposits of the Wahiba Sand Sea, Sultanate of Oman.' **Journal of Arid Environments** 62(1): 109-125.

Siebert, S., Haeser, J., Nagieb, M., Korn, L. and Buerkert, A. (2005). 'Agricultural, architectural and archaeological evidence for the role and ecological adaptation of a scattered mountain oasis in Oman.' **Journal of Arid Environments** 62(1): 177-197.

Natural History

Botany

Al-Burtamani, S.K.S., Fatope, M.O., Marwah, R.G., Onifade, A.K. and Al-Saidi, S.H. (2005). 'Chemical composition, antibacterial and antifungal activities of the essential oil of *Haplophyllum tuberculatum* from Oman.' **Journal of Ethnopharmacology** 96(1-2): 107-112.

Almehdi, A., Maraqa, M. and Abdulkhalik, S. (2005). 'Aerobiological studies and low allerginicity of Date-Palm pollen in the UAE.' **International Journal of Environmental Health Research** 15(3): 217-224.

El-Keblawy, A. and A. Al-Rawai. (2005). 'Effects of salinity, temperature and light on germination of invasive *Prosopis juliflora* (Sw.) D.C.' **Journal of Arid Environments** 61(4): 555-565.

Fisheries and Marine

Berthe-Corti, L. and Thomas Hoepner. (2005). 'Geo-biological aspects of coastal oil pollution.' **Palaeogeography, Palaeoclimatology, Palaeoecology 219 (1-2):** 171-189.

Claereboudt, M.R., Mcllwain, J.L., Al-Oufi, H.S. and Ambu-Ali, A.A. (2005). 'Patterns of reproduction and spawning of the kingfish (Scomberomorus commerson, Lacepede) in the coastal waters of the Sultanate of Oman.' **Fisheries Research 73(3):** 273-282.

Mcllwain, J.L., Claereboudt, M.R., Al-Oufi, H.S., Zaki, S. and Goddard, J.S. (2005). 'Spatial variation in age and growth of the kingfish (Scomberomorus commerson) in the coastal waters of the Sultanate of Oman.' **Fisheries Research 73(3):** 283-298.

Grandcourt, E.M., Al Abdessalaam, T.Z., Francis, F. and Al Shamsi, A.T. (2005). Population biology and assessment of the orange-spotted grouper, Epinephelus coioides (Hamilton, 1822), in the southern Arabian Gulf. **Fisheries Research 74 (1-3):** 55-68.

Preen, A. 2004. Distribution, abundance and conservation status of dugongs and dolphins in the southern and western Arabian Gulf. **Biol. Cons. 118:** 205-218.

Abstract: The marine mammals of Saudi Arabia, Bahrain, Qatar and the United Arab Emirates were censussed by three stripe-transect aerial surveys. The Arabian Gulf supports a population of ca. 5800 dugongs (Dugong dugon), which is the largest known outside Australia. The most important habitats occur (1) around Marawah Island (UAE), (2) between Qatar and Bahrain and (3) between Qatar and the UAE. Surveys of the UAE were repeated thirteen years apart. The two estimates of the dugong population were not significantly different, suggesting a stable population of ca. 3000 between 1986 and 1999. In the region between Kuwait and Oman, the Indian Ocean bottle-nose dolphin (Tursiops aduncus) is the most common cetacean (71% of groups and individuals), followed by the Indo-Pacific humpback dolphin (Sousa chinensis, 27%) and finless porpoise (Neophocaena phocaenoides, 2%). The estimates of cetacean abundance in the UAE differed significantly between 1986 and 1999 and indicate a population decline of 71%. At least two die-offs of marine mammals occurred between these surveys. The countries of the southern Gulf are developed and affluent and are well positioned to take a lead in marine conservation in the region. A coordinated series of protected areas could greatly enhance the long-term prospects for marine mammals and other components of the biodiversity in the region.

Geology and Palaeontology

Dill, H.G., Botz, R., Berner, Z., Stüben, D., Nasir, S. and Al-Saad, H. (2005). 'Sedimentary facies, mineralogy, and geochemistry of the sulphate-bearing Miocene Dam Formation in Qatar.' **Sedimentary Geology 174 (1-2):** 63-96.

Al-Farraj, A. (in press). 'An evolutionary model for sabkha development on the north coast of the UAE'. **Journal of Arid Environments.**

Rabinowicz, M. and G. Ceuleneer. (2005). 'The effect of sloped isotherms on melt migration in the shallow mantle: a physical and numerical model based on observations in the Oman ophiolite.' **Earth and Planetary Science Letters 229(3-4):** 231-246.

Wood, W.W., Sanford, W.E. and Frape, S.K. (2005). 'Chemical openness and potential for misinterpretation of the solute environment of coastal sabkhat.' **Chemical Geology 215(1-4):** 361-372.

Ornithology

The Phoenix No. 21. (2004). Published for contributors to the Atlas of Breeding Birds of Arabia. ISSN 0268-487X. c/o Michael Jennings, Warners Farm House, Warners Drove, Somersham, Cambridgeshire, PE28 3WD, UK. http://dspace.dial.pipex.com/Arabian.birds/

Aspinall, S. The mysterious status of Gulf Pallid Swifts. pp. 5-6.

Diskin, D.A. The Breeding Birds of Al Warsen Lake, Dubai, UAE (the Lake is better known to local birdwatchers as the 'Wimpey Pits'). pp. 18-20

Richardson, C. White-tailedplover – now an established resident in the UAE. p. 27

A useful bibliography of Arabian ornithology has been compiled as part of the ABBA project, and can be obtained from Michael Jennings.

Sandgrouse Vol. 27(1). (2005). Ornithological Society of the Middle East, Caucasus and Central Asia, c/o The Lodge, Sandy, Bedfordshire, SG19 2DL. ISSN 0260-4736. www.osme.org

(The lead item in the News & Information section, p. 4, is an Obituary of former UAE President HH Sheikh Zayed bin Sultan Al Nahyan, written by Simon Aspinall & Peter Hellyer, while, as usual, there is a lengthy review of recent UAE records).

Castell, P. & Kirwan, G.M. Will the real Sykes's Warbler please stand up? Breeding data support specific status for Hippolais rama and H. caligata, with comments on the Arabian population of 'booted warbler'. pp. 30-36. (An important studying relating to the 'Sykes's warblers' at Khor Kalba.)

Others

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تريبيلوس

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المجلد ١٥، ١

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