TRIBULUS

Bulletin of the Emirates Natural History Group

Vol. 8.1 SPRING 1998

NOTES FOR CONTRIBUTORS

TRIBULUS is the name of the Bulletin of the Emirates Natural History Group. The Group was founded in 1976, and over the next fourteen years, 42 issues of a duplicated Bulletin were published. The revised format of TRIBULUS, introduced in 1991, permits the inclusion of black and white and colour photographs, not previously possible.

TRIBULUS is published twice a year, in April and October. The aim of the publication is to create and maintain in standard form a collection of recordings, articles and analysis on topics of regional archaeology and natural history, with the emphasis focussing on the United Arab Emirates and adjacent areas. Articles are welcomed from Group members and others, and guidelines are set out below. The information carried is as accurate as the Editorial Committee can determine, but opinions expressed are those of the authors alone.

Correspondence and enquires should be sent to:

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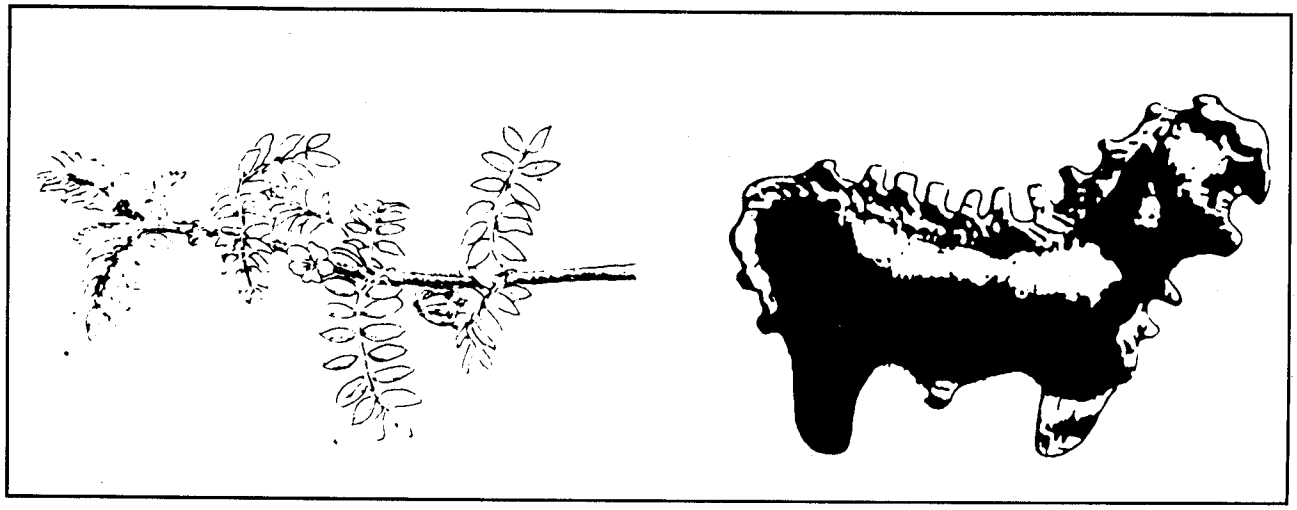

The plant motif above is of the genus Tribulus, of which there are six species in the UAE. They all have pinnate leaves, yellow flowers with free petals and distinctive five-segmented fruits. They are found throughout the country, except in coastal sabkha.

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 typed, on one side only, and double-spaced, and may be submitted in either English or Arabic. A short abstract should precede the article, with the address(es) of the author(s) at the end. For Arabic contributions, a short summary in English, of not more than 200 words, should also be supplied.

Photographs may be submitted and should be either glossy black-and-white prints or colour slides, which should be clearly captioned. Line drawings and maps 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 Arabic names should also be supplied.

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Cover illustrations:

English: Eastern Death's Head Hawk Moth on marigold ..... ***Picture by Simon Aspinall***

Arabic: Striated Scops Owl at its daytime roost ..... ***Picture by Phil Brett***

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 41, without whom publication in this format would be impossible.

We also acknowledge the support and encouragement of our Patron, H.E. Sheikh Nahayan bin Mubarak Al Nahayan, the U.A.E. Minister of Higher Education and Scientific Research.

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Apologies: The front cover photograph of Tribulus 7.1 and that on page 20 were wrongly credited. The photographer in both instances was Ashok Prasad.

Editorial

There has been a lot of disappointment following the Earth Summit in July 1992 as Agenda 21, the all embracing plan of action for the 21st century agreed at Rio de Janeiro, failed to come about. Described as an "unimplementable encyclopaedia", the international community failed to act on the blueprint. A follow up meeting in New York in July 1997 closed with virtually no new commitments. The excuse was, as President Bill Clinton put it, lack of political and public support. Perhaps Rio had been oversold as an earth-saving event, for since 1992 it has been clear that putting the world's environmental and development ills to right all in one go was never on. The basic deal was that if all countries addressed issues like climate change, loss of biodiversity and deforestation, then the industrial North would help the South with cash and technology transfer to speed up its development. Since then, global trade has become more liberalised, the South has lost out and pressure on the environment has increased substantially. Now non-governmental organisations (NGOs) like IUCN and WWF among others have decided that enough is enough and the time has come to act on behalf of the international community before it is too late. The onus now is on local communities, far-sighted private companies and individuals to try to halt the slide. Environmentalists are beginning to perceive the future in terms of self help.

Admittedly, there was intergovernmental action at Kyoto in December 1997 when nations agreed on unexpectedly tough targets for reducing emissions of greenhouse gases. But in many ways it will be a business-as-usual scenario. Some countries will be tempted to clear old growth forests in order to claim carbon credits for new fast growing monoculture plantations on the same land. Such policies, along with slash and burn for forest clearance, will inevitably reduce and degrade natural ecosystems, contradicting the very principles of the Convention on Biological Diversity signed at Rio. That Kyoto encouraged nations with large land masses relative to population, such as the U.S., Russia, Australia and New Zealand, to plant more trees to create carbon sinks in order to benefit from a flexible approach to reducing emissions is a mere counter-balancing act. Extraordinarily, it is estimated that Australia's carbon emissions from fossil fuel burning could actually increase by 15% over the coming 15 years.

So, where does all this leave our part of Arabia? There are certainly a lot of activities concerning environmental issues. Every week the media report on meeting, seminars and conventions all purportedly aimed at protecting the environment. The Government insists, rightly, that the oil and gas industry should act as responsible leaders in this field. Yet whatever is done in the way of reducing greenhouse emissions in the UAE, the fact remains that global warming is a reality and computer models predict some fairly dramatic scenarios for the coming century. Forecasts of present day tropical weather patterns shifting north and south of the equator by as much as 300 kilometres implies increasing aridity in this part of the world and hence greater pressure on water resources in particular. Storms could become more erratic and severe than has hitherto been the norm, resulting in greater wind and water erosion of soils that are thin and poor in nutrients to begin with. And of course the projected rise in mean sea levels will stretch the resources of our coastal cities, where the bulk of the population lives.

All of which means pressure on the natural resources of the UAE. Per capita spending is amongst the highest in the world and already this has created strains on natural ecosystems with a rash of new road networks, ribbon development and private building. Combined with a future in the hands of global warming and shifting climate patterns, the UAE's ecosystems, already stretched, could be pushed to the brink of disaster.

All the more reason, therefore, for NGOs like the ENHG to lobby for environmental protection. Very little of the UAE's land and marine area enjoys the status of protected reserves, and development continues apace. While the UN Environmental Programme debates a possible world heritage site or a biosphere reserve in the UAE, the time is approaching when there will be little biodiversity left to conserve. At the end of the 20th century too little is known about the country's fauna and flora — there is no consensus on the exact number of animal species, let alone the marine environment.

The ENHG has always concentrated on natural history to record wildlife diversity, mostly the flagship higher species, and natural history remains our forte, as this issue demonstrates. Dr. Michael Gillett and Dr. Edward Awad and Fabienne Saade, all of the UAE University, present articles on the Plain Tiger butterfly and Eastern Death's Head Hawk Moth respectively, while insects as a topic gets a further boost with Murray Eiland's article on the behaviour of praying mantids. Twenty years ago we could only record basic sightings of animals or plants — now we have progressed to developing some scientific expertise among our readership, thanks mainly to TRIBULUS contributors.

The ENHG has, more than ever, an important part to play in the ongoing debate within and without the government about the future of natural history and the environment in this country. Over the years the Group has become an open forum disseminating scientific research to as wider audience. From its parochial beginnings over 20 years ago, the Group is now in a position to be a factor in formulating the kind of future that members would like to see, of progress with caution, of development that does not mean walking all over important aspects of wildlife, landscape and biodiversity.

The six years since Rio have shown, however, that the best approach may yet be the grassroots one and the ENHG can contribute substantially through its reputation, experience and knowledge of natural history issues in the UAE and region.

Rob Western
May 1998

ERWDA ESTABLISHMENT LAW

Recognising the need for scientific research and strategic planning to reflect His Highness Sheikh Zayed's elaborate efforts and the concerns expressed by him on the protection of the environment and the conservation of wildlife, the Government of Abu Dhabi established the Environmental Research and Wildlife Development Agency, ERWDA, under Law No. 4 for 1996, as amended by Law No. 1 for 1997 issued by His Highness Sheikh Khalifa bin Zayed Al Nahyan, Crown Prince and Deputy Ruler of Abu Dhabi.

Law No. 4 for 1996 as amended reads as follows:

ESTABLISHMENT OF THE AGENCY

Article No. 1

The Environmental Research and Wildlife Development Agency (the "Agency") is hereby established as an independent juridical entity with full capacity and financial and administrative independence in all aspects.

HEAD OFFICE AND BRANCHES

Article No. 2

The Agency shall be based in Abu Dhabi. The Governing Board may establish branches or offices inside the State or abroad.

OBJECTIVES AND ACTIVITIES

Article No. 3

The main objective of the Agency is to protect the natural environment, its wildlife and its biological diversity through monitoring and submitting of proposals and recommendations and by carrying out studies and research required for the protection of the environment and its wildlife. All Abu Dhabi Government Departments and agencies are required to co-ordinate with the Agency in relation to research, studies and programmes concerning environmental matters and wildlife. The Agency's approval is required for the issuing of any regulations, policies and decrees related to environmental and wildlife affairs. To fulfil the above objectives, the Agency has the following responsibilities:

1. To conduct studies, scientific research and comprehensive surveys of the environment and wildlife in order to prepare strategies and priorities.
2. To assess water and land resources in order to propose the most appropriate means for the exploitation and utilisation of these resources in order to protect and develop the environment and wildlife.
3. To evaluate the effect of treatment of household sewage water projects, and other industrial liquid wastes on the environment and wildlife and recommend the establishment of projects to treat and control these liquid wastes.
4. To evaluate the effect of oil wastes on the environment and wildlife and offer suggestions and solutions for the resolving of related problems.
5. To assess the impact of industrial gases and household air pollutants on the environment and wildlife, and recommend solutions for air pollution problems and recommend projects to clear and control gas emissions, in co-ordination with the authorities concerned.
6. To evaluate the success of existing projects and the operation of recycling programmes for household and solid wastes, to access their impact on the environment and wildlife and to introduce ideas to improve these projects or to establish new ones.
7. To recommend the establishment of projects to treat, control and eliminate toxic medical wastes.
8. To evaluate the effects of chemicals used in agriculture on the environment and wildlife to classify materials according to their harmful effects and to propose projects to control their use in Abu Dhabi Emirate.
9. To evaluate the effect of existing and future industrial and economic projects and investments in Abu Dhabi Emirate in co-ordination with the Federal Environmental Agency and other concerned bodies, to prescribe the studies that should be conducted and the required precautions which should be taken and to forward recommendations and solutions for the environmental problems of these projects to the Executive Council.
10. To assess the impact of population growth and infrastructure projects of town planning on the environment and wildlife. In coordination with other concerned bodies, the Agency shall plan, recommend and establish suitable projects to minimise the negative impact on the environment and wildlife.
11. To recommend projects to treat or eliminate negative effects of industrial and economic schemes on the environment and its wildlife.
12. To prepare plans required to introduce and develop a balanced environmental strategy and implement it on industrial, agricultural and economic projects within Abu Dhabi Emirate. The said plans shall be submitted to the Executive Council for approval.
13. To evaluate the impact of hunting and fishing in Abu Dhabi Emirate on wildlife and to recommend solutions to prevent extinction of wildlife, to recommend management plans and to establish protected zones.
14. To evaluate the effect of recreation and leisure on the environment and wildlife to introduce proposals and solutions regarding any unfavourable impact and to recommend projects to organise these activities.
15. To establish and run parks, reserved and protected areas, and implement rules and regulations to protect these areas.

16. To establish and run specialised centres for the breeding and development of endangered species of wildlife.
17. To establish veterinary centres to take care of wildlife species and re-habilitate them to live in their natural habitat.
18. To establish specialised centres to carry out studies and scientific research related to the environment and wildlife and to develop techniques to collect information about the natural constituents of the environment and wildlife.
19. To co-ordinate and co-operate with government bodies, scientific establishments and research centres within Abu Dhabi Emirate and abroad.
20. To recruit and train qualified national staff capable of planning and implementing strategies to protect the environment and wildlife.
21. To provide the public and private sector with information related to the environment and wildlife.
22. To enhance public awareness of the importance of protecting and restoring the environment and wildlife and to familiarise the general public with the Agency and its objectives through educational and cultural programmes.
23. To inspect and approve any licence applications submitted to the appropriate authorities for the establishment of industrial and agricultural projects and to express views regarding their impact on the environment and wildlife.

GOVERNING BOARD

Article No. 4

The Agency has a Governing Board chaired by the Crown Prince. Members shall not exceed eight and shall not be less than four, including the Deputy Chairman, and Secretary General.

The members are appointed by Emiri Decree.

The membership is for a renewable period of five years and the members' remuneration is to be determined by an Executive Council Decree.

AUTHORITIES AND RESPONSIBILITIES OF THE GOVERNING BOARD

Article No. 5

The Governing Board has full authority over the Agency's affairs, policy implementation, annual work plans and the approval of the means of their execution. The Governing Board takes appropriate decisions to fulfil the objectives of the Agency within the provisions of this Law and without prejudice to the provisions of other laws. The Board is particularly responsible for the following:

1. Preparing the required work plans, determining the priorities to fulfil the Agency's goals and approving the required plans for implementation.
2. Determining policies required to restore, protect and develop the environment and wildlife, as well as approving programmes and plans for their implementation.
3. Fixing suitable fees by law or Emiri Decree.
4. Drafting and advising with relation to Laws, Emiri Decrees and regulations to protect and develop the environment and wildlife in its natural habitat. The said drafts shall be forwarded to the Executive Council.
5. Forming an advisory committee from international experts in the area of environment and wildlife protection in the natural habitat.
6. Forming *ad hoc* and standing committees, from its members and elsewhere, to study the specified duties and responsibilities.
7. Approving the Agency's organisational structure, including the limits of authority and responsibilities of departments, sections and administrative units.
8. Adopting and implementing financial and administrative regulations to govern the affairs of the Agency.
9. Adopting and implementing personnel policies related to recruitment, promotion, salaries and allowances, discipline and termination of services, as well as other rules related to staff.
10. Reviewing periodical reports related to the implementation of the work of the Agency.
11. Approving the proposed annual budget and the final annual audited accounts.
12. Reviewing and approving the final annual report at the end of each calendar year.
13. Approving training programmes to ensure the presence of sufficiently qualified staff.
14. Looking into all matters referred to the Agency, as well as any other issues arising in the areas of the Agency's activities.
15. Determining levels of fees and remuneration applicable for the services rendered by the Agency.
16. Investing the assets, money and possessions of the Agency to promote and develop its resources.
17. Determining the authority and responsibilities of the Board Designate in co-ordination with the authority and responsibilities of the Secretary General.

GOVERNING BOARD MEETINGS

Article No. 6

The Governing Board shall regularly meet every six months. The Chairman can call other meetings as and when necessary.

Article No. 7

The Governing Board meetings are to be conducted with the attendance of the majority of its members. The Chairman or the Deputy Chairman should be among those attending.

Resolutions of the Governing Board are to be adopted by a simple majority of the attending members. If a tied vote occurs, the Chairman of the meeting shall have a casting vote.

SECRETARY GENERAL

Article No. 8

The Secretary General is responsible for the

administration and policy implementation of the Agency in accordance with the provisions of this Law, other applicable laws, and the decisions of the Governing Board. The Secretary General shall be particularly responsible for the following:

1. Proposing work plans and schemes and prioritising and identifying projects required for their implementation.
2. Preparing the proposed annual budget and forwarding it for approval to the Governing Board.
3. Representing the Agency before and to government departments, judicial entities, scientific institutions and other concerned bodies.
4. Approving programmes and symposiums within the annual budget of the Agency.
5. Drafting the financial and administrative regulations, personnel policy and training programmes required for the progression of the Agency's work and forwarding them for approval to the Governing Board.
6. Approving expenditure from the Agency's budget in accordance with the approved financial and administrative regulations of the Agency.
7. Guiding and controlling the work of the Agency in accordance with its approved regulations.
8. Preparing reports on implementation of the plans and programmes of the Agency and presenting them to the Governing Board.
9. Contacting research centres, universities, museums and local, regional, Arabian and international organisations concerned with research and studies for cooperation and exchange of information and expertise in respect of various activities.

AGENCY'S BUDGET

Article No. 9

The Agency shall have an independent budget. It shall be empowered to receive funds advanced to it and to utilise its financial resources including investment of the same, opening and operation of bank accounts, and spending there from in accordance with its budgets and its objectives. The Agency shall be funded by:

1. Funds advanced by the Abu Dhabi Government.
2. The money and possessions of the National Avian Research Centre, "the Centre." A committee shall be formed by the Executive Council to audit the Centre's existing finance and assets.
3. Revenues generated from the implementation of its activities.
4. Donations, subsidies, grants and legacies accepted by the Governing Board in accordance with the regulations stipulated.
5. Other resources decreed by the Executive Council.

EXEMPTIONS

Article No. 10*

The Agency, its establishments, departments, and sections, partially or completely owned by the Agency, are exempted from all types of taxes and duties including customs and import duties on materials, equipment, instruments and spare parts imported for the Agency's activities.

RETIREMENT

Article No. 11

The Agency shall follow the civil retirement, benefits laws and regulations implemented by the Abu Dhabi Government for UAE Nationals employed by the Agency.

AUDITING

Article No. 12

The Governing Board shall appoint one or more Chartered Accountants licensed in the Emirate of Abu Dhabi to audit the Agency's accounts. The Governing Board shall fix the remuneration of such Chartered Accountants.

FINAL ACCOUNT

Article No. 13

The Secretary General shall submit the final accounts and annual report of the Agency's business within three months, at the most, of the end of each financial year.

NATIONAL AVIAN RESEARCH CENTRE

Article No. 14

The Centre is now considered to be one of the Agency's units. The Centre's administrative organs shall continue their activity in accordance with the applicable regulations until the approval of the Agency's organisational structure and the establishment of the Agency's regulations.

Article No. 15

The staff of the Centre are now to be regarded as employed by the Agency. Their employment conditions remain in force and they shall continue to receive their salaries and other facilities provided to them until such time as the Agency's personnel policies are prepared and approved.

Article No. 16

This Law cancels Law No. 4 of 1989 for the establishment of the Centre. In addition, it cancels the Executive Council Decree No. 29T, Section 14/94, regarding the formation of the Environment Protection Committee.

Article No. 17

This Law is to be published in the Official Gazette and shall come into effect from the date of its publication.

**This Article has been amended of Law No. 1 of 1997 by His Highness Sheikh Khalifa bin Zayed Al Nahyan, Crown Prince of Abu Dhabi.*

Butterflies of the UAE and neighbouring areas of northern Oman – the polymorphic status and phyto-chemical associations of the Plain Tiger, *Danaus chrysippus chrysippus* (Linnaeus), in the region (Lepidoptera: Rhopalocera)

Dr. Michael P. T. Gillett

Abstract

Although the Plain Tiger butterfly, ***Danaus chrysippus chrysippus****, is one of the commonest and almost certainly the most easily recognisable butterfly in the UAE and northern Oman, there seems to be very little detailed information available about the status of the species in this region. In this report, biological variation in the Plain Tiger is described and in particular the species' polymorphic status within the region is discussed and illustrated. Plain Tiger - plant associations within the region are also examined, especially the larval foodplant preferences in different biotopes.*

* واحدة من أكثر الفراشات الموجودة في العين وعُمان هي فراشة النمر الأملس. هذه الورقة توضح الاختلافات البيولوجية الموجودة وتنظر في علاقة الانواع الموجودة بالنباتات المحلية.

Introduction

One of the commonest and also one of the largest butterflies found in the UAE and throughout Arabia is the **Plain Tiger** *Danaus chrysippus chrysippus* (Linnaeus) (Larsen, 1983, 1984; Gillett, 1995, 1997). It can be found throughout the year virtually everywhere – in gardens and farms, along coastal beaches, in the mountains, in both sandy and rocky desert and on gravel plains. This bright orange-brown butterfly is usually extensively marked with black and white and is easily recognised, although there is one other Arabian species that shares this colour scheme. The Plain Tiger belongs to the family **Nymphalidae** and is placed in the subfamily **Danainae**, which was once regarded as a separate family.

Although the Plain Tiger is a powerful butterfly and quite capable of strong flight, it is normally seen gently floating or gliding through the air around its favourite flowers. Evasive flight is not really necessary for this butterfly since its bright warning colours advertise to many predators that it is a distasteful or poisonous species, a property which it shares with other danaid butterflies. The poisonous compounds found in the body fluids of the Plain Tiger are cardiac steroid glycosides (cardenolides) derived from the larval foodplants which are always some species of the milkweed family (**Asclepiadaceae**). Many other danaids are also poisonous and share milkweeds as their larval food plant; others utilise plants of the family **Apocynaceae** which contains genera such as *Nerium* and *Strophanthus*, both of which contain potent cardenolides.

No other members of the Danainae occur naturally in the UAE or elsewhere in Arabia, but several species have from time to time been blown to the UAE and Oman from NW India by freak tropical storms (Larsen & Pedgley, 1985). One such is *Danaus genuita genuita* Cramer, which resembles the Plain Tiger: it has, however, never established itself in Arabia. The only native Arabian butterfy which can be mistaken for the Plain Tiger is the non-poisonous female of the **Diadem**, *Hypolimnas misippus Linnaeus*, (family Nymphalidae, subfamily Nymphalinae). Whilst the male Diadem is a black butterfly with a large egg-shaped white spot bordered by a vivid violet sheen on each wing, the female is a very close copy of the Plain Tiger in size, colour and flight pattern. This mimicry serves to protect the female Diadem, since she is often mistaken by predacious birds and reptiles for the truly poisonous Plain Tiger and is thus avoided.

Despite the fact that the Plain Tiger is so common and widespread in the UAE and neighbouring countries, little detailed information is available locally about this butterfly. There is indeed very much more still to be learned about all of the UAE butterflies, both the common and the rarer species, if they are to be understood and conserved for the enjoyment of future generations. In this report, new information regarding the polymorphic status of the Plain Tiger and its mimic, the Diadem, is presented together with some observations of Plain Tiger - plant associations within the region.

Biological variation in the Plain Tiger

Sex difference

Externally the males and females of different species of butterflies may be very similar or so different that, in the past some were even described as belonging to different species. An example of a UAE species with externally similar males and females is the **Painted Lady**, *Vanessa cardui cardui* (Linnaeus), whilst the Diadem has already been given as an example where the two sexes are completely different (Figure 1). However, most butterflies are somewhere between these two extremes, so that although the sexes are different, they are still recognisable as belonging to the same species. The Plain Tiger male and female are very similar, but the male has a series of four black spots on the disc of the hindwing, whereas the female has only three spots (Figure 1). The black spots in question can be seen on both the upper- and under-surfaces of the wings and on the latter, the male-specific spots have white centres. The Plain Tiger was one of four UAE butterflies that featured on impressive postage stamps issued by the General Postal Authority in 1997, but unfortunately the arrangement of the black spots on the hindwing has been misinterpreted so that the illustration depicts correctly neither the male nor the female form of the butterfly.

Environmental factors and variation

The morphology of butterflies can be influenced by envi-

ronmental factors in a number of ways, both on a populational and an individual basis.

It is quite common for species that have more than one generation per year to show seasonal forms; in certain species, generations which have developed during the dry season tend to have much lighter markings than the corresponding wet season generation(s). A good example of this in the UAE fauna is the **Desert White**, *Pontia glaucome* (Klug). The effect of aridity as an environmental factor promoting variation is obvious in this case, but genetic factors may also be involved. For the Plain Tiger, no seasonal variation in colour, pattern or extent of markings is readily apparent.

Other environmental effects that influence butterfly markings are extremes of heat and cold, especially frosts, during the pupal period. These tend to lead to non-symmetrical distortion of the markings on the wings of affected butterflies, although no example of this type of variation is known in the UAE or Oman for *D. chrysippus*.

Finally, shortages of larval food, which may be caused by drought or by overcrowding of the available foodplants, often lead to butterflies emerging that are morphologically unaltered except that they show greatly decreased body size and may have a darker colouration than normal. These are often described as hunger forms and one such specimen of a female Plain Tiger is shown in Figure 1.

Individual variation

When examined carefully, no two examples of the same butterfly are ever exactly alike. Each individual shows small variations and in the Plain Tiger, one obvious example of this is in the size, extent and number of white markings on the tip of the forewing and along the margins of both wings. There is also some degree of variation in the orange-red background colour which may range from nut-brown to a honey-brown colour, this variation having perhaps both genetic and age-related causes.

Freaks or Sports

In many species of Lepidoptera, individuals occur which are dramatically different from the norm. These are known as freaks or sports or, more correctly, as aberrations and they probably usually arise from genetic mutations. Although they are rare, they are not easily overlooked since the alterations most often affect the colour of the insects. One example of this has been described for the Plain Tiger in N. Oman, where a female was captured in which the ground colour was pale pink (Larsen, 1977). No other such examples of marked aberrations are known for this butterfly in the area under review.

Genetically based polymorphisms

The natural range of the Plain Tiger butterfly is very extensive in the tropical and subtropical parts of the Old World ranging from the Canary Islands, across Africa to Arabia, South Asia, China and Japan and into the East Indies and Australasia. Only in the extreme south-east of this range does the butterfly show well differentiated subspecies, whereas across the bulk of its range, Larsen (1983) and other authors believe that it is best to treat all populations as the nominate subspecies *chrysippus* despite marked variations between different populations; a status that has been described as *vicariant polymorphism* (Pierre, 1980). Thus all Plain Tigers from West Africa have the upper surface of the hindwings white, but in Egypt the population is all of the typical form with nut-brown background colour and well differentiated black tips and white band on the forewings. Both of these forms, together with two others, are known from SW Arabia and all are regarded as being true polymorphs of *D. chrysippus chrysippus* since intermediates between the four forms are unknown (Larsen, 1983, 1984). The four forms are named as follows:

i] *f. chrysippus* Linnaeus - the typical and usually the commonest form in Arabia with well differentiated black tips and white band on the forewings and overall orange-brown colouration.

ii] *f. dorippus* Klug - a form which lacks all but traces of the black tips and white markings on the forewing and which occasionally is common in parts of S. Oman and Yemen.

iii] *f. alcippus* Cramer - this form retains the typical forewing markings, but has the greater part of the upper-surface of the hindwings white and is common in Africa although scarce in Arabia.

iv] *f. albinus* Lanz - a form which combines the white hindwings of *alcippus* with the orange-brown forewing tips of *dorippus* and which is very uncommon in Arabia.

In eastern Arabia, all forms other than *chrysippus* appear to be very rare or absent and were never found by Pittaway (1979, 1980, 1981) during an extended period of collecting. However, in the Al Ain area of the UAE and in nearby parts of Oman both *dorippus* and *alcippus* do occur, but they are rare and occasional compared to *chrysippus*. I have recorded *dorippus* on about half a dozen occasions both around Buraimi and in the nearby mountains. The example shown in Figure 2 is from Aboule (April 1997). On the other hand, there is only one confirmed record of *alcippus*, the butterfly shown in Figure 2 having been captured at Khutwa (May 1996), although there was a probable sighting of another example of this form in Al Ain in 1994. To date, no records exist of *f. albinus* from the region.

Finally a further form, not previously described, at least from Arabia, appears to occur regularly in the Al Ain region. This form occurs only in the male insect and is characterised by an infusion of the normally black fourth spot with pale or cream coloured scales. An example from Al Ain (February 1996) is shown in Figure 2.

Lack of polymorphism in UAE and N. Oman populations of the Diadem

As already mentioned, the only butterfly that resembles the Plain Tiger in Arabia is the female Diadem which benefits from the protection bestowed on it by its mimicry. It is the only true mimic amongst the Arabian butterflies, but many others are known elsewhere, including several dozen other mimics of the Plain Tiger from Africa and to a lesser extent Asia. As befits mimicry, the Diadem is much more scarce in the Al Ain region than is the case for the model. Examination of the female Diadem from Khutwa which is typical for the region (Figure 1) shows that this form mimics *f. chrysippus* of the Plain Tiger and differs from it mainly by having only one black spot, not three or four, on the hindwing. This is the typical form of *H. misippus*. Forms of the Diadem which accurately mimic *dorippus, alcippus* and *albinus* are also known from Africa (Pierre, 1980) and the first two of these, *H. misippus f. inaria* Cramer and *f. alcippoides*

Fig 1. Butterflies from the Al Ain region. Top row (from left to right: Male and female of the Plain Tiger, *Danaus chrysippus chrysippus*, typical form *chrysippus* (upperside). Middle row: Underside of male Plain Tiger *f. chrysippus* and upperside of a female *'hunger form'* of the same butterfly. Bottom row: uppersides of male and female of Diadem, *Hypolimnas misippus*, typical form.

Photo: Paul Tipping

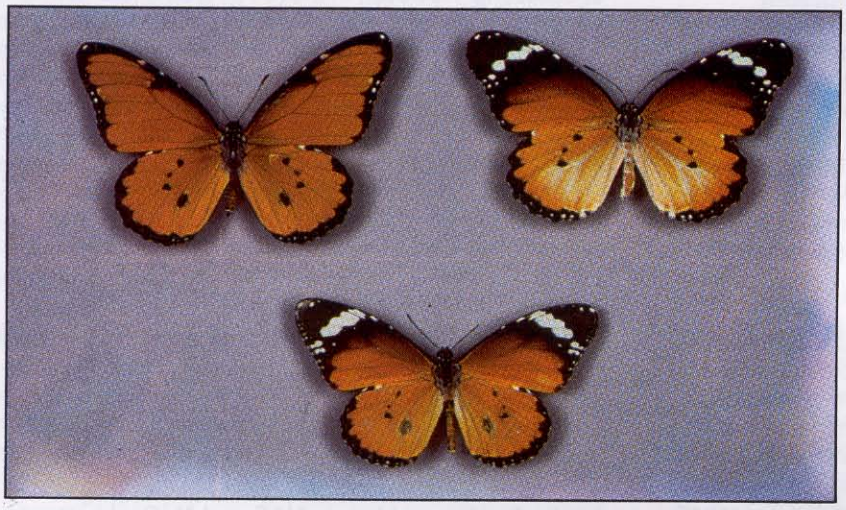


Fig 2. Butterflies from the Al Ain region. Top row: uppersides of Plain Tiger, male *f. dorippus* and female *f. alcippus*. Bottom: upperside of male Plain Tiger *f. chrysippus*, but with pale infuscation of the fourth discal spot of the hindwing.

Photo: Paul Tipping

Fig 3. A Plain Tiger 'Paradise' near Mahdah (Oman). The small basin drainage area shown supports nearly all of the significant plants which are associated with the biology of this butterfly in Arabia. These include the larval foodplants *Calotropis procera, Pergularia tomentosa* and *Leptadenia pyrotechnica* (family Asclepiadaceae) also *Heliotropium kotschyi* and *H. calcareum* as well as as a variety of the flowering plants favoured by the adult butterflies. *Photo: Mike Gillett*

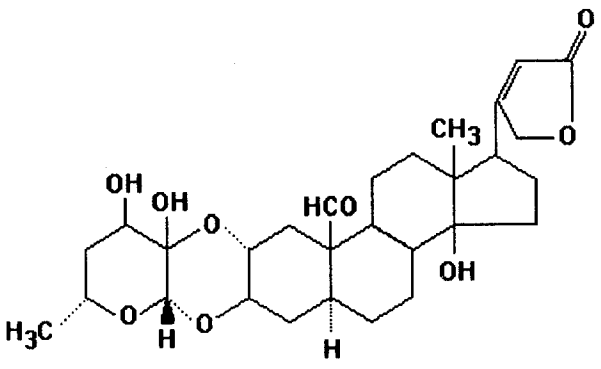
Butler respectively, have been recorded from SW Arabia. Neither of these have so far been found in the UAE or N. Oman and, given the scarcity of their respective models, it is most unlikely that they will be found in the future.

Plain Tiger - plant associations in the UAE and Oman

The affinity of a particular insect for a given plant species or group of species is largely a question of chemistry. Many insects, especially butterflies, are well equipped to detect specific phyto-chemicals and to chose the right plant on which to lay their eggs. The Plain Tiger adds a twist to this otherwise straightforward tale - it requires at different stages of its life cycle, not one, but two different groups of chemicals which are obtained from two different families of plants and used for two different physiological processes. These associations are discussed at length below. A third association of the Plain Tiger with plants also exists of course; this is the feeding behaviour of the adult butterflies at flowers. In this respect, the species like many other butterflies, shows a much more catholic taste and feeds from many different flowers representing a variety of families. Around Al Ain, particular favourites are *Rhazya stricta* (Apocynaceae), *Chrozophora oblongifolia* (Euphorbiaceae), *Ochradenus aucheri* (Resedaceae), *Acacia sp* (Leguminosae) and the cultivated lucerne (*Medicago sativa* - Leguminosae) and onion (*Alium cepa* - Liliaceae), but there are many others.

Choice of larval foodplant in different biotopes

As already mentioned, the reported foodplants of the Plain Tiger throughout its vast range are always species of milkweeds of the family **Asclepiadaceae**, a group that contains very variable plants, most of which are poisonous and ooze white latex when damaged or grazed. The poisons are a series of cardiac steroid glycosides or cardenolides of which calotropin (below) is a typical example. These compounds are toxic to vertebrate animals including man, but not to invertebrates. Even so, very few invertebrates seem to utilise milkweeds as foodplants, perhaps because of the latex that is released if the leaves or stems are chewed. Danaid caterpillars are notable exceptions and do not appear to suffer from the effects of the sticky latex, whilst on the



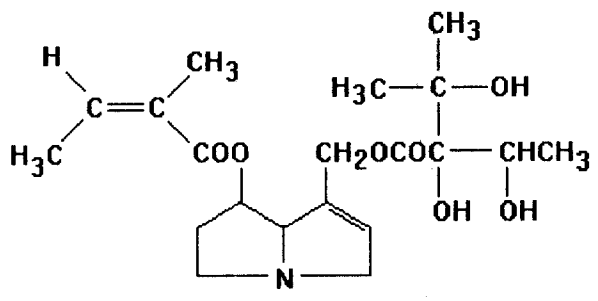
Calotropin

other hand they can absorb and store the poisonous glycosides for protection not just during the larval stage, but also into adult life. In Arabia as a whole, there are numerous members of the family Asclepiadaceae including many exotic species (Collenette, 1985), but in the UAE and N. Oman, the number of species is small. Nevertheless, the following do occur in the region: *Glossonema varians, Pentatropis spiralis, Periploca asphylla, Pergularia tomentosa, Calotropis procera, Leptadenia pyrotechnica* and *Calluma sp* (Western, 1989). Most of these, together with many others that do not occur in the Al Ain region, are recorded as being used as larval foodplants of the Plain Tiger, but according to Larsen (1983), *Calotropis* is clearly supposed to be the favourite. Certainly there is photographic evidence showing the gaudy black, white and yellow caterpillars of the Plain Tiger feeding on this plant in Saudi Arabia (Larsen, 1984) and Kuwait (Al-Houty, 1995). Interestingly, whilst in Brazil I have often seen the very similar caterpillars of *Danaus plexaure* (Godt.) feeding on introduced African *C. procera*, I have never once, despite many searches, found Plain Tiger larvae on this common plant in the Al Ain region. This is surprising, since the larvae are well known to me from other plants including *P. tomentosa* in the mountains and *L. pyrotechnica* in sandy desert and gravel plains. I have on two occasions found numerous larvae on a solitary example of the leafless *L. pyrotechnica* at Jebel Huwayyah (Oman) in an area dominated by stands of large mature *C. procera* with abundant fleshy leaves, but with no signs of caterpillars or damage caused by feeding. At other localities, the species seems to prefer the leathery leaves of *P. tomentosa* to nearby lush growths of *C. procera*. It, therefore, appears unlikely that *C. procera* is the preferred larval foodplant everywhere and certainly not in the Al Ain region, where it is uncertain whether it is used at all. With a butterfly that has such a vast range as the Plain Tiger, it is to be expected that a variety of larval foodplants will be used and that the favourites will be different in different regions. Thus in eastern Arabia, the following records may be significant with *Asclepias curassavica* recorded by Wiltshire (1964) from Bahrain (the same plant is used in the Canary Islands - Higgins & Hargreaves, 1983; Carter, 1992 - and Lebanon - Larsen, 1974), *P. tomentosa* at Riyadh and *L. pyrotechnica* at Manifa (Pittaway, 1979). Irrespective of the foodplant chosen in a given area, it must satisfy two distinct larval requirements. It must provide adequate nutrition so that the larva can grow to the stage of pupation and it must provide a source of cardiac glycosides to maintain the protective cloak of both larva and adult. On this basis, *C. procera* would appear to be a better candidate than either *P. tomentosa* or *L. pyrotechnica*, yet in the Al Ain region the former seems to be rejected in favour of the latter two plants. Clearly factors other than the quality of the food must be important. Since Plain Tiger larvae are protected from vertebrate predators by being poisonous, foodplant choice may revolve around protection from invertebrate predators. Again on first examination, *C. procera* would appear to offer a better substrate upon which larva could escape detection when compared with the bare green shoots of *L. pyrotechnica*, but this may only be true if the predators search visually for caterpillars. There is some evidence that not all predators do this. Two of the commonest and most important caterpillar predators in the Al Ain region are the potter wasps *Delta dimidiatipenne* (Sassure) and *D. campaniforme* (Fabricius) (Hymenoptera: Eumenidae). My personal observations of these wasps is that on the wing, they do not search directly for caterpillars, but instead

search for areas where foliage has been damaged by feeding and then alight to find the caterpillars responsible. The wasps are easily decoyed to plants by other damage such as that caused by leaf-cutting bees or in some cases by the natural shape of the foliage, as by some fig trees which have invaginated leaves. This might mean that a Plain Tiger larva seemingly exposed on *L. pyrotechnica* is missed by the wasps because signs of larval feeding are not apparent, whereas on *C. procera*, larval feeding might well leave clear signs of the presence of the caterpillars. Clearly there is much still to learn about the larval foodplant requirements and preferences of the Plain Tiger in Arabia.

Role of *Heliotropium kotschyi* in the sexual chemistry of the male Plain Tiger

The mating behaviour of most species of butterflies is complex and is designed to ensure that the female accepts advances only from males of the same species and not from other species. Although it has been supposed that differences in the structure of the genitalia between species are important safeguards preventing interspecies copulation, it is also known that behaviour and chemistry play important roles in the attraction of the opposite sexes. In the Plain Tiger, before a female will mate with a male, she has to be sprinkled with the male pheromone specific to the species. This is desseminated from special brush-like organs in the abdomen of the male which can be inflated and fitted into special pouches on the hindwing containing the pheromone (Larsen, 1984). The chemical basis of this pheromone are pyrrolizidine alkaloids, very different compounds to the cardenolides used for protection, but which incidently are also toxic to vertebrates. Such compounds cannot be built up from simple precursors by the butterfly's own metabolism, but it is able to modify pre-existing compounds obtained from plants. However, compounds of this type are not found in the larval foodplants of the Plain Tiger, which as mentioned above are members of the family Asclepiadaceae. Such compounds are available from other families including in Arabia the Boraginaceae, the commonest representatives of which are plants of the genus *Heliotropium*. A typical example of these compounds is heliosupine or cynoglossophine (see below), a pyrrolizidine diester isolated from *Heliotropium supinum.*



Heliosupine (cynoglossophine)

In the Al Ain region, there are four species of *Heliotropium*, of which *H. kotschyi* is one of the commonest, being found in a great many habitats. At suitable times of the year, clumps of this untidy-looking plant appear to be thronged by Plain Tiger butterflies, which if closely observed, will be seen to be all males. It, therefore, seems most likely that the freshly emerged male Plain Tiger has, as its first priority, to visit the flowers of this plant and that it imbibes from the nectar a stock of the pyrrolizidine precursors of its pheromone. It is possible that other plants may also be utilised and *H. calcareum* which is also common may be one of these, although I have never seen male Plain Tigers thronging to this plant as they do to *H. kotschyi*. The biotope shown in Figure 3 is a small depression where rain water collects in a normally dry wadi system near to Mahdah (Oman). It contains a wide range of plants, including almost all of the ones thought to be important to the biology and life cycle of the Plain Tiger. At the time that the photograph was taken (mid-October, 1997) only one example of the butterfly was present, but in the spring of the same year, several hundreds were present breeding on *P. tomentosa* and *L. pyrotechnica* whilst ignoring *C. procera*, all of which can be seen on the photograph. Similarly, in the same spot, males frequent flowers of *H. kotschyi* in numbers, but ignore *H. calcareum*, although both are numerous at this locality.

Discussion

This report has attempted to focus attention on just one of the commonest butterflies found in the UAE and nearby parts of Oman and to show that, despite its abundance and familiarity, there is still much that is mysterious about its natural history. The article has concentrated on just two major aspects of the species in the Al Ain region, namely morphological variation and the butterfly's relationships with certain plants. Even these issues have not yet been conclusively resolved, but there are many other ones which have not yet even been addressed.

Particularly interesting questions which remain unanswered about the Plain Tiger include the issue of fluctuating seasonal abundance of the butterfly and why, although present all year round as an adult in the Al Ain area, the species is generally scarce in the period August - December and yet very plentiful the following spring. Foodplant availability does not seem to be an important factor, but there are many other possible explanations including the species' migratory activities and the activities of parasitic wasps and flies about which there is little regional information. It is to be hoped that the present article which discusses and illustrates the different forms of the butterfly and details which plant species are apparently important to its life cycle may help to lay the foundation both for further studies and for conservational awareness.

Acknowledgements

I wish to thank Mr. Paul Tipping for helpful advice and especially for providing the photographs of the butterflies shown in Figures 1 and 2.

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Natural History of the Eastern Death's Head Hawk Moth *Acherontia styx* (Lepidoptera: Sphingidae)

by Edward W. Awad &
Fabienne E. Saadé

Abstract

*The polyphagous insect **Acherontia styx** (Lepidoptera; Sphingidae), a native species of the Indian Peninsula, is a serious pest of sesame and mung beans. Reports over the last 20 years have pointed to the spread of this moth to Eastern Arabia. In the United Arab Emirates, **A. styx** larvae feed on garden hedges, e.g. wild jasmine **Clerodendrum inerme** and Arabian lilac **Vitex agnus-castus** and can cause considerable defoliation when unchecked. This sphingid moth is multivotine, flying in 5-6 generations per year. Life history studies at laboratory temperature (25-30°C) revealed that the insect completes its development in 50-60 days (from egg to adult). The incubation period of eggs ranged between 2-5 days. The larval stage comprises 5 instars, lasting 18-22 days, with the last instar being the longest one (8-10 days). Pupal stage duration was 20-25 days and was spent entirely in a subterranean cell. Adult longevity was 3-5 days for males and 7-10 days for females. They are characterised by the presence of a skull-like marking on the dorsum of the thorax. Preliminary field work suggested the occurrence of all stages of the insect year round. Finally, the defensive behaviour of the insect is typical of a sphingid species.*

* هذه الورقة تنظر في التاريخ الطبيعي لفراشة رأس الموت، إحدى أكبر الحشرات الموجودة في الإمارات

Introduction

The genus *Acherontia* Laspeyres, 1809, belongs to the order Lepidoptera, family Sphingidae, subfamily Asemanophorinae. This order includes such common insects as moths and butterflies. They are readily recognised by the scales that cover the wings as well as the body and legs. This insect order is a large one with more than 140,000 species distributed worldwide (Elzinga, 1987). The family Sphingidae, commonly known as Sphinx or Hawk Moths, or Hornworms, comprises a group of moths famous for their flight activity. They are strong fliers, flying with rapid wing beats. Most hawk moths feed much like hummingbirds, hovering in front of a flower and extending their proboscis into its deep narrow tube. The name "hornworm" is drived from the fact that caterpillars of most species have a conspicuous horn or spine on the dorsal side of their eighth abdominal segment (Fig. 1A, B, C and D). The name "sphinx" refers to the sphinx-like position that some sphingid larvae assume when disturbed (Borror, *et al.*, 1989) (Fig. 1B)

Distribution of Acherontia genus

Acherontia comprises a total of 5 species and is widely distributed in Africa, Europe and Asia (Bell and Scott, 1976; Watson and Whalley, 1983). The Eastern Death's Head Hawk Moth, *A.styx* Westwood, was formerly confined to the Indian Peninsula including the Himalayas, Myanmar (formerly Burma) and Sri Lanka (Bell and Scott, 1976). However, reports over the last 20 years have pointed to the spread of this moth to the eastern parts of the Arabian Peninsula and to Iraq (Wiltshire, 1975; 1980). In 1979, Wiltshire reported the rare presence of *A. styx* in the east of Saudi Arabia (Hofuf area), flying in 4 generations and larvae feeding solely on *Withania somnifera* of the nightshade family Solanaceae. More recently, Wiltshire (1986; 1990) reported the spread of this migrant species to the western parts of Saudi Arabia. Nowadays, this moth is quite common in most major towns, cities and oases in coastal areas between Qatif in Saudi Arabia and Muscat in the Sultanate of Oman, passing through the major cities of the United Arab Emirates.

Pest status of *Acherontia styx*

Although the larvae of *A. styx* are generally considered to be a minor pest, serious damage to crops such as sesame, *Sesamum indicum,* and mung bean, *Vigna radiata,* has repeatedly occurred in India (Bell and Scott, 1976; Chhabra and Kooner, 1985; Vora *et al.,* 1985). In addition, hornworms of this species are known to be polyphagous, feeding on a wide variety of wild and cultivated crop plants including Solanaceae (potato, tomato and *Withania somnifera)* (Walker and Pittaway, 1987) and the medicinal plant Sarapgandha, *Rauvolfia serpentina* (Harvir *et al.,* 1984). In Eastern Arabia, *A. styx* larvae are reported to feed on garden hedges such as *Clerodendrum inerme* and *Vitex agnus-castus* (Walker and Pittaway, 1987) of the family Verbenaceae, and they often exist in such great numbers as to defoliate entire hedges (Pittaway, 1987). In view of the increasing importance of the pest status of this insect and the lack of information regarding its biology and adaptation to its new habitat, we were interested in studying the life cycle and behaviour of this sphingid moth.

Life history

In Eastern Arabia, *A. Styx* is multivoltine, flying in 5-6 generations per year. The ornamental wild jasmine hedges, *C. inerme,* seem to constitute a major and important source of food and shelter for *A. styx.* The life cycle of this insect revolves around this plant.

The eggs are sperical in shape and green in colour when freshly laid, turning yellow with the development of the larve inside the egg shell (Fig. 1a). Eggs measure 1.5-2.0mm in diameter and are laid singly, preferably on the upper side of young soft leaves (Fig. 1A). After an incubation period of 2 to 5 days (depending on the temperature), a pale, cream-coloured larva, not exceeding 1cm in length, with a black horn, similarly sized, hatches and devours the egg shell which serves as its first meal (Fig. 1B). After day, the body turns green, and gradually, the horn changes to yellow.

A. styx caterpillars are cruciform, with a well developed head and a cylindrical body of 13 segments (3 thoracic and 10 abdominal) (Fig. 1D). The head bears a pair of strong mandibles and a pair of very short antennae. Each thoracie segment bears a pair of legs (Fig. 1F). In addition, abdominal segments 3-6, and 10 bear a bar of fleshy prolegs (Fig. 1D). During the immature stage, larvae feed constantly on the leaves and pass through 5 developmental phases known as instars. At the end of each instar, the larva moults, increases in size and weight and synthesises a new cuticle (skin of insects). The general morphological features of the first 4 larval instars do not change with metamorphosis. The 4th instar larva, however, is a darker shade of green than the preceding instars. During the 5th instar, the body colour turns bluish green with diagonal blue-green stripes in the abdomen and black oblique marks in the genal region of the green coloured head (Fig. 1D and F). The characteristic horn on the last body segment of 5th instar larvae is of the same colour as the body and is distinctly hooked dorsally at the tip (Fig. 1D). In the final instar (fifth instar), the larva reaches a size ranging between 10 to 15cm in length and a weight ranging between 9 to 12 g. Fifth instar larvae feed voraciously on foliage and are responsible for the greatest damage to plants. The duration of the fifth instar is the longest, lasting for 8-10 days. Interestingly, about 20% of fourth instar larvae population change colour from green to dark brown upon moulting (Fig. 1E).

At the end of their development, fifth instar larvae stop feeding and seek a place in the soil to pupate. At this stage, a brown tan will appear on the dorsum of caterpillars, a sure sign that the insect has entered a short-lived phase known as the wandering stage. The caterpillars burrow in the soil to a desirable depth (15-20cm) and build a subterranean cell whose walls are formed from saliva-glued sand particles (Fig. 2B). The prepupal larvae lose a lot of water, shrink in size, and prepare their body for metamorphosing into the adult form (Fig. 2A). This will last for 3-5 days. Upon moulting the prepupa forms a dark brown cuticle known as the pupal case. The insect will undergo a transition period known as the pupal phase for 20-25 days (depending again on the temperature). *A styx* pupae are obtect, with the appendages firmly attached to the body and measuring about 4-5cm (Fig. 2C).

At the end of the pupal period, the fully formed adult (imago) eclodes, pierces the wall of the cell and emerges from the soil. It hangs to a leaf, expands its wings and dries its body in the open air. This takes the adult 2-3 hours. Afterwards, the moth is ready to fly in search of a mate. *A. styx* adult is a large stout-bodied moth of striking appearance with long, dark forewings and short, yellow hindwings with black barring. The dorsum of the thorax bears a skull-like marking from which it derives its common name, "Death's Head" (Fig. 2D). The death's head marking and the ability of the insect to emit squeaking sounds give the adult of the Death's Head Moth an awesome appearance. The abdomen is banded yellow and black. The total body length of the adult is 5-6cm with a wings span of 8-12cm.

There are obvious gross morphological differences between the male and the female. The female is larger in size with a broad and blunt-ended abdomen, compared

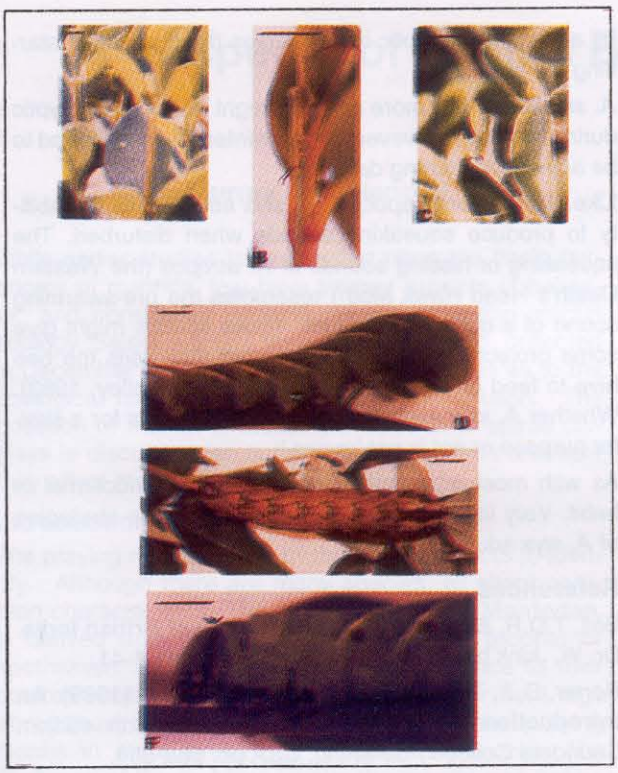

Fig 1. Egg and larval stages of *Acherontia styx.* (A) An egg laid on the upper side of a *Clerodendrum inerme* leaf; scale: 1mm. (B) One day-old first instar larva, about 1 hour after hatching, seen feeding on young *C. inerme* leaves. The dark colouration in the anterior part of the insect body represents the movement of the insect's first meal in the gut (arrow head). Notice the black horn on the last abdominal segment; scale: 1cm (C) A second instar larva displaying countershading; scale: 1cm. (D) Fifth instar larva displaying the sphinx position. Notice the fleshy prolegs on the ventral part of the abdominal segments; scale: 1cm (E) The brown form of 5th instar larvae; scale: 1cm. (F) The anterior part of a 5th instar larva showing the head with the black marks in the genal region (arrow head), the 3 pairs of thoracic legs and the diagonal blue-green stripes on the dorsum of the abdomenal segments; scale: 5mm.

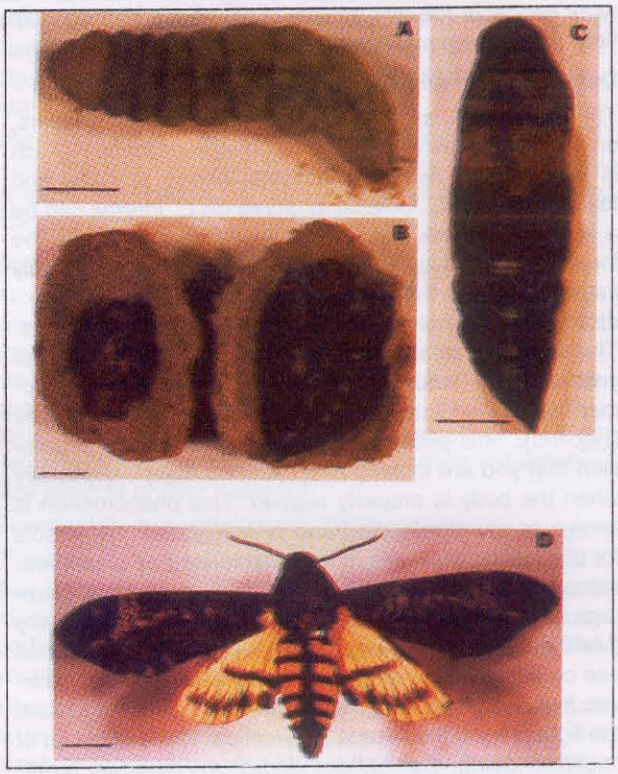

Fig 2. Prepupal, pupal and adult stages of *Acherontia styx.* (A) Transformation of the 5th instar larva into a prepupa; scale: 1 cm. (B) A pupa with the exuviae of the last instar larva inside the subterranean cell; scale: 1 cm (C) *A. styx* pupa; scale: 1cm. (D) A male adult showing the skull-like marking on the dorsum of the thorax; scale: 1cm.

(All photos by the authors)

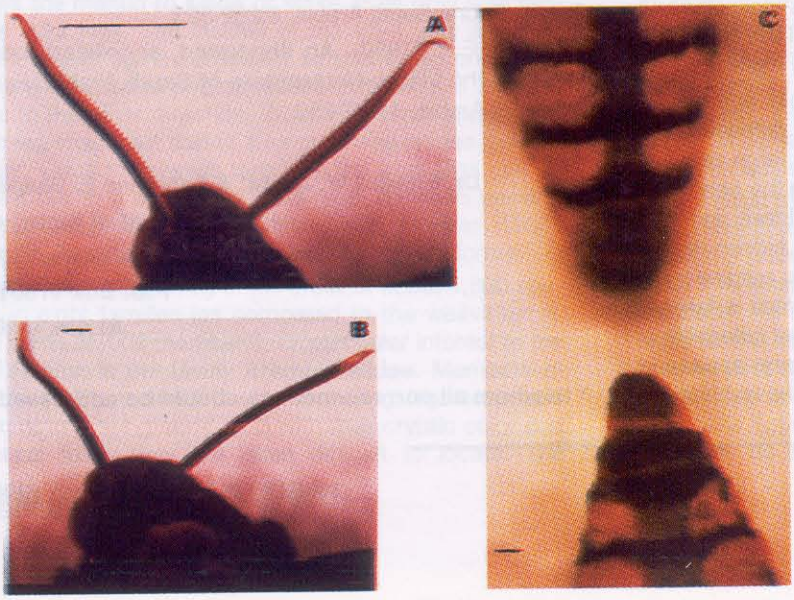

Fig 3. Morphological differences between the male and the female of *Acherontia styx.* (A) and (B) A male and a female adult heads showing the difference in the antennae, respectively; scale: (A) 1cm, (B) 5mm. (C) Abdominal differences between the male and the female. The male has a narrow and pointed abdomen compared to a broad and blunt-ended abdomen in the female; scale: 5mm.

to a narrow and pointed abdomen in the male (Fig. 3C). The female has 6 abdominal black transverse bands, whereas the male has 7. The antennae of the male are longer than those of the female (about double the length) with hair-like structures that are absent in the antennae of the female (Fig. 3A and B). Both male and female adults developing from brown larvae do not look different in shape or size from those developing from green larvae.

Seasonal history

In India, *A. styx* appears in 3 to 4 overlapping generations during the crop season with the third generation being the most destructive during July-August. Adults usually appear in early May with the onset of pre-monsoon rains. Larvae appear in considerable numbers and a peak is attained during July-August. The population of larvae is abruptly reduced starting September (Paul and Ghosh, 1987).

In Eastern Arabia, little information is available regarding seasonal changes of *A. styx*. However, preliminary field work suggests the occurrence of all stages of the insect year round (personal observations).

Defensive behaviour of *Acherontia styx*

The larvae of *A. styx* feed, sometimes in large numbers, on the wild jasmine hedge *Clerodendrum inerme* which is widely used as an ornamental hedge in cities and towns of the UAE. Collecting larvae on *C. inerme* can be a very difficult task and sometimes nerve wracking to the inexperienced eye, since the hornworms are superbly camouflaged by their colouration which render them indistinguishable from the colour and shape of the leaves. The stout larvae are characterised by the presence of yellowish-blue striations on the dorsal side of the abdomen which simulate the appearance of veins of leaves (Fig. 1C). This pattern of colouration gives the impression that you are looking at a flattened object, especially when the body is properly aligned. This phenomenon is known as countershading and is widely used by insects for eliminating shadows. It is characterised by a compensatory deepening or lightening of body colours to counteract for apparent colour changes due to light intensity (Matthews and Matthews, 1978). As do all insects that use countershading as a concealing strategy, *A. styx* larvae invariably rest with their darker side directed toward the light. This behaviour is very critical to the success of countershading. Camouflage and countershading represent two types of defensive mechanisms collectively known as concealing or cryptic colouration. They help insects go unnoticed by predators, unless they move.

Crypsis (disguise) is a useful mean against enemies. However, once discovered, a second line of defence becomes advantageous. When disturbed, the large caterpillars assume the "sphinx" position by lifting the anterior part of the body with the head partially withdrawn underneath the swollen thorax, thus revealing hidden eye spots (black circles) surrounding the thoracic respiratory openings) which cause the larvae to resemble a large head with big eyes, giving the huge fifth instar caterpillar (often reaching 12-15cm in length) a fearsome appearance (Fig. 1D). The sudden display of eye-like markings by a previously cryptic insect serves the purpose of startling the enemy.

A. styx larvae are more active at night and remain cryptic during the day. However, during winter, they are found to be active even during day time.

Like all *Acherontia* species, *A. styx* adults have the ability to produce squeaking sounds when disturbed. The squeaking or hissing sounds of *A. atropos* (the Western Death's Head Hawk Moth) resembles the pre-swarming sound of a queen honey bee. These sounds might give some projection to the intruder moth that visits the bee hive to feed on the honey (Watson and Whalley, 1983). Whether *A. styx* exploits its squeaking sounds for a similar purpose or not is not known.

As with most other sphingids, the adult is nocturnal in habit. Very little is known about the defensive strategies of *A. styx* adults.

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Aspects of Mantid Behaviour and Ecology

by Murray Lee Eiland III

While earlier studies have focused upon the basic taxonomy of mantids, few have treated aspects of behavior, and considered wider questions regarding mantid ecology. Select mantids from Ras Al Khaimah, collected in December and early January, provide clues as to the ecological factors that effect mantid distribution. The question of mantid territoriality in relation to startle displays is discussed, as is the role of predators and how they affect mantid populations.

* بناء على بحث في رأس الخيمة، تفحص هذه الورقة جوانب من سلوك وتطور حشرة فرس النبى.

Introduction

The praying mantis is one of the easiest insects to identify. Although there are many species, all share common characteristics. The name of the order **Mantodea,** is derived from the Greek word meaning prophet or soothsayer. This name was given in reference to their common habit of waiting for prey with their front legs about their head. The common name of the praying mantis in many areas has recognized this trait. The Bushmen of South Africa invoke the mantid-god before each hunt. China in particular has reserved affection for mantids. During the Confucian era of the fifth century B.C., mantid egg cases were prescribed for a variety of ailments, and the mantis itself came to represent ferocity. Oriental markets today provide small bamboo cages to keep mantids "for good luck." In many Muslim countries the mantis is believed to face towards Mecca during prayer, and in Turkey the insect is considered by some as sacred. French peasants also revere the common mantid, **Mantis religiosa**; and one legend of St. Francis Xavier relates that he asked a mantid to sing a praise to God (Shoeman, n.d.).

This "attitude of prayer" is the most indicative of the order, as mantids are otherwise much like their relatives the stick insects but for the fact that mantids are designed to be predators. Although like all orthopteroid insects there is great variation within this group, the head of the insect – similar to a raptorial bird - is distinctly triangular, with large compound eyes to locate prey with binocular vision. Because of their visual targeting method, mantids are diurnal. The head is extremely mobile, as it is the hub of the information gathering system that allows the mantid to lunge or strike at its prey with raptorial front legs. The insides of the front legs are lined with a row of spines arranged so that those on the femur are oriented in one direction, and those of the tibia point to the other direction. When the femur and tibia of each leg snap shut during a lunge, these spines lock together. Once the prey is targeted, the front legs can be lashed out in a strike that lasts from between ten and thirty milliseconds (Rilling, Mittelstaedt, Roeder, 1959). Mantids, like other insects, exhibit a variety of forms.

Mantodea is a relatively small order of about 1,800 species in eight families (as compared to the weevil family with some 35,000 members). Of particular interest to the Gulf Region is the family **Eremiaphilidae**. Members of this family have short bodies and long legs to propel them across the ground, and with their cryptic color and physical form, they are often difficult to locate. The **Amorphoscelididae** are small mantids native to Africa and the Mediterranean. The **Hymenopodidae** boast perhaps the most beautiful species of mantis, such as **Pseudocrebotra ocellata**, the so-called orchid mantis. This species, beautifully coloured like a flower, uses its cryptic form to lure prey. The **Empusidae** are very slender mantids, the males of which have long antennae with comb-like projections. The running legs usually have leaf-like projections at the femora. They are distributed across Africa, Asia and the Mediterranean (Preston-Mafham, 1990).

The Mantidae contain the majority of genera - some 263 - and the species within this family show great diversity of form. They can range from the typical green or brown mantids to cryptically coloured species.

Species

All specimens were recovered from the archaeological site of Kush in Ras Al Khaimah. Due to the rigours of travel many specimens have lost their antennae. Thanks are due to Phil Bragg for drawing and matching the specimens with labeled examples in the British Museum. Because these insects have received detailed taxonomic treatment elsewhere, this section will emphasize aspects of their behavior.

Eremiaphila braueri, Krauss, 1902.

(Figures1 & 2)

Twenty specimens, ranging in age, were collected and maintained in captivity. This mantis is well adapted by both form and behaviour to life on the ground. The young of the species are very ant-like.

Their abdomens are held aloft, and their antennae twitch in an ant-like manner. Their raptorial front legs are held close to the body, giving little away as to their identity. In colour the young are noticeably darker than the adults, which are light brown. Unlike the majority of orthopteroid insects that outgrow ant-like locomotor patterns, mantids of this species continue their mimicry into adulthood. Both juveniles and adults move with short bursts of speed (lasting for up to several seconds) followed by quiescence.

As the adult mantid is many times larger than an ant its protective colouration serves a useful purpose here, as when the animal is not moving it can be difficult to locate. The wings of this species are reduced in relation to the body. In many mantid species the female is flightless, as the large abdomen is difficult to reconcile with the needs of light weight for flight. In addition, there may be considerable advantages in disguising wings. By altering the typical outline of a "winged insect" this species may be able to confuse predators who rely upon

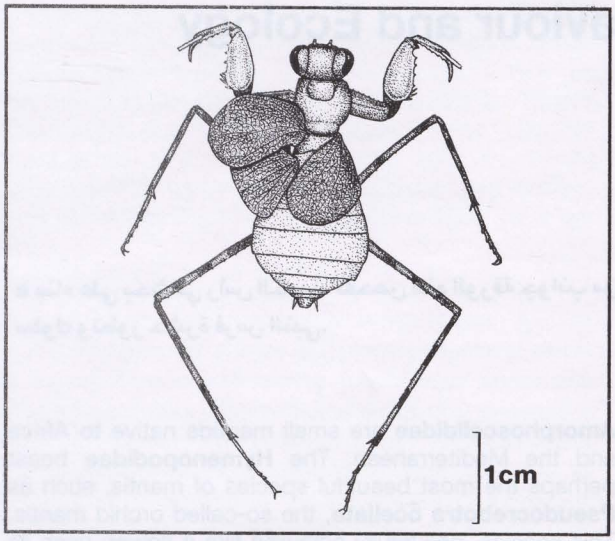
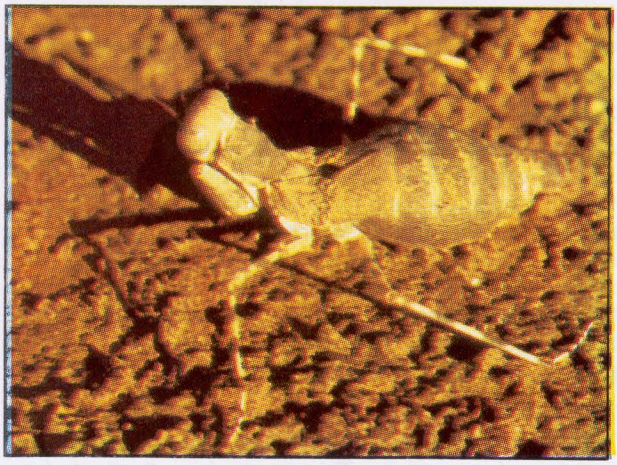


Fig. 1 - *Eremiaphila braueri*

identifying particular outlines. This trait is clearly demonstrated in the bands of black on the legs of the insect, which serve to disrupt what would otherwise be the straight lines of the legs. Birds in particular appear to



Female *Eremiaphila braueri*. The abdomen is clearly distended with eggs.

have distinct images of potential prey. Gillon and Roy (1968) examined the stomach contents of 11 black kites and 1 grasshopper buzzard. Out of a total of 44 adult mantids found in the stomachs, 37 were of species that have full wings (20 male and 17 female); of species with reduced wings there were 7 males and no females. This demonstrates that these birds were capturing far more winged females than flightless females, and, as the majority of their hunting would be on the ground, this must indicate selective predation. This observation may explain the small number of males in species with flightless females, as, if both sexes were placed in similar environments, females are at a considerable advantage. Out of 20 **E. braueri** specimens collected at Kush, only five could be reliably identified as male.

While adults can ascend short plants in search of food, the long and stiff legs of this species are not suitable for arboreal life. A common territory for an adult appears to be centred about a short bush. It is interesting to note that the distribution of this mantis appears limited to hard ground with sufficient cover. When these mantids are placed upon loose sand, they have difficulty moving on an ever-shifting substrate, as their long legs are mechanically unsuitable.

Adult mantids of this species demonstrate a frightening display upon direct confrontation (Fig. 2). Noted in a number of mantid species, this reaction is termed a "startle display." In order to fully activate this behaviour in this species, one must present a threat within several centimetres of the animal. A frightened specimen will rear up so that it is vertical to the substrate, and the hind legs will be fully extended so that the mantid is the largest possible size. It will unfold its wings and often partially extend its raptorial legs. The body of the animal remains rigid, and any attempt to move will be similarly countered by the mantid; they are particularly sensitive to "flanking" movements. Young mantids of the first to third instars did not demonstrate this behavior, instead

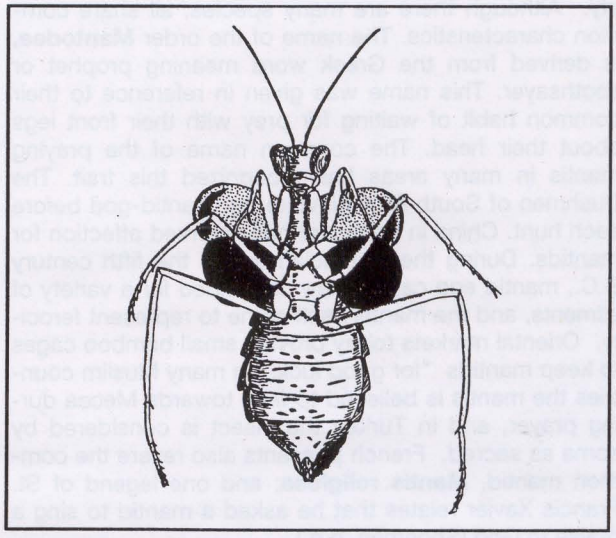


Fig. 2 - "Startle-display" of *Eremiaphila braueri*,

relying upon their cryptic colour to confuse a predator. The outstretched wings, in many species brightly coloured, present a daunting aspect, and it is clear that the small wings of the female are not suitable for flight. While the male's wings can offer the possibility of gliding after a display, it appears that this is not the preferred method of locomotion. Besides dissuading predation, displays may also serve other functions. Regarding territoriality, two captive female mantids - placed in a container 5 cm. x 25 cm. long - displayed at one another for six minutes. The exact nature of territoriality in mantids has never been satisfactorily addressed, but it would seem field studies are in order to determine the exact triggers of the startle display (Edmunds, 1976). It appears that these mantids are primarily threatened by lizards and birds, which as a rule do not eat ants. As a result when the mantid is directly threatened there is little use in continuing to rely upon ant-mimicry. When a lizard was placed into a small enclosure with a mantid, the latter immediately assumed a threatening display that quickly convinced the small (4 cm.) lizard to look elsewhere. It would appear that the mantids' ant-like movements would discourage birds, although examining the stomach contents of local birds is perhaps the

best way forward.

Regarding the principal food of the mantids, a number of specimens were offered a variety of insects. While they easily handled soft-bodied insects and young grasshoppers, all the adults had great difficulty in eating larger grasshoppers and more robust insects. Roonwal (1938) noted that the stomach contents of the same species from Pakistan consisted almost entirely of ants. Individuals from Kush certainly do not feed on the more robust ant species, as several large ants are sufficient to kill an adult. Smaller ants, while consumed, were clearly not the food of choice. Gelperin (1968) noted that the Chinese mantid, **Paratenodera sinensis**, and the European mantis, **Mantis religiosa**, could be made to avoid flies if conditions were arranged so that if presented with food on a coloured background an electric shock

Juvenile *Eremiaphila braueri*. The black stripes across the legs and thorax disrupt the outline of this species so as to make detection difficult.

was received. **E. braueri** may not have a "hard wired" aversion to ants in general. This species may be reacting to the distasteful nature of local ants.

A total of three copulations were observed, and in each case neither the male nor the female displayed. One longer sequence, lasting 40 minutes, was particularly informative. The prelude for mantid copulation in this species involves a long sequence of events. The male cautiously approached, rocking back and forth. At various intervals towards the end of the performance, the male stroked the female with his long antennae. The female responded by pumping her abdomen. Apparently assured by the prelude, the female offered no resistance to copulation.

One of the most "characteristic," and oft-repeated, behaviours of mantids is that the male is eaten during copulation. While there have been a number of reports of such behaviour in captivity, there have been few studies that focus upon the behavior of mantids in the field. It has been noted by a number of breeders that a factor in the female's eating of the male in captivity may be due to improper diet. Where mantids have been kept in captivity for a long period of time, due to cost constraints, the diet tends to concentrate upon food-species that are easy to produce in large quantities, such as flies (Fye and Carranza, 1979). Due to a diet limited in variability, the mantids may therefore suffer from a lack of trace nutrients. It is certain, however, that males are eaten by females in the field, as the male of the species has undergone selection for size. Male mantids are considerably shorter than the female. While this may at first appear to be counterproductive, as it may leave the male susceptible to being easily overpowered by the female, the head of the male is in fact so far back from the female as to give the male a margin of safety. At the same time it should be noted that if the male does lose his head, mating will proceed with unusual vigour; a trait well known to breeders of many butterfly species.

Three specimens laid ootheca shortly after capture. The egg-masses had a cryptic color and form: a light grey colour, matching perfectly the substrate. In addition, a number of small pebbles adhered to the surface of the egg masses, which made them appear to be no more than muddy conglomerates. One egg-case proved viable, and four young emerged, one deformed. Three hatchlings survived into the later instars.

Ameles wadisirhani, Kaltenbach, 1982.

(Figure 3)

Only one previously mated female was kept in captivity. The most striking behavioural aspect of this otherwise nondescript species is its display. When first captured it posed with wings held together projecting vertically over its body. The raptorial legs were held in front of the head, and the insect was rocking back and forth, with its abdomen moving along its upheld wings. The sound of the abdomen against the wings was audible as a rasping noise, but I was not able to elicit this behaviour again, even though the insect was held for several weeks. While there have been few studies on the effects of defensive sounds of insects on potential predators, many have focused on vertebrate predators. Not surprisingly, vertebrate predators from mice to birds are prone to error more often when prey emits noise. Also surprising is the reaction of invertebrate predators – in this case Lycosid spiders – to various species of stridulating beetle. Not only were the spiders hesitant to attack a stridulating insect, but they were also less successful in pursuing the insect once an attack had begun (Masters, 1979). The stridulating display of this mantid

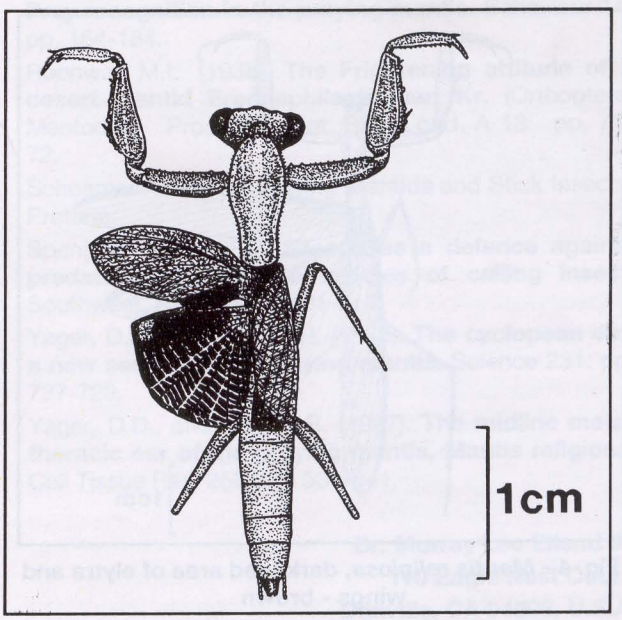


Fig. 3 - *Ameles wadisirhani*

species, then, operates on many levels to discourage predators of all types.

This insect shortly laid a clutch of eggs. The weakened female died several days later and made no attempt to guard the eggs. This ootheca, firmly attached to the upper surface of the container, was clearly designed in colour and form to be attached to a wooden surface. Unlike the eggs of mantid species that are designed to weather low temperatures, this egg case had little thermal protection. Also unlike many other mantid ootheca, this example did not have a clear set of apertures on the surface to facilitate the escape of newly hatched young; this may be a defence against parasitic wasps. A total of nineteen young hatched from this egg-case, and it is notable that several of these small nymphs were drowned by large droplets of water. Many reached the second instar but all subsequently died for an unknown reasons.

Mantis religiosa, Linnaeus, 1758.

(Figure 4)

Six specimens were collected, and brown appears to be the typical colour morph of those found in the region. This difference in colour is in no way limited to this species and is not permanent. As in many insect species, some mantids have the ability to alter their colour at every moult. In many mantids their colour tends to resemble their surroundings. The triggers for this response appear to differ. Brown in some species is triggered by higher incidence of light (due to less leaf cover); and in other species brown is apparently triggered by lower humidity. Cesnola (1904) noted that in Italy this mantid occurs in two forms, one green and one brown. Almost invariably the green form was found upon green vegetation, while the brown form (also noted as more active than the latter form) was found upon sun-scorched grass. He found that by placing restrained specimens upon the opposite substrate there was a high rate of attrition. The experiment lasted 19 days, of the 45 brown individuals on green grass, ten were left at the end of the experiment; but by 11 days all 25 green mantids on brown herbage were killed, five by ants.

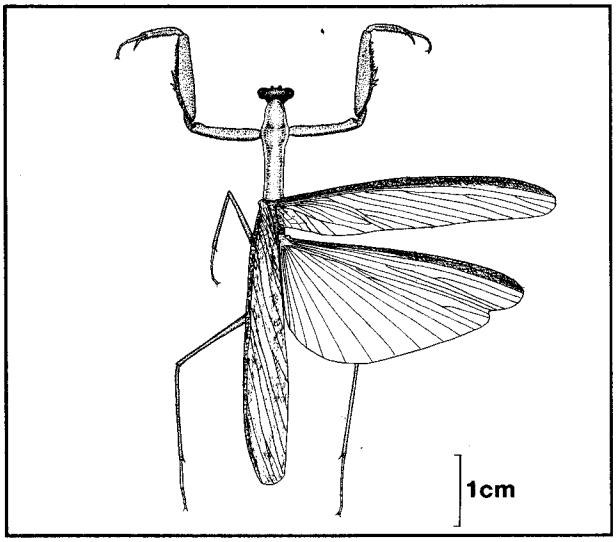


Fig. 4 - *Mantis religiosa*, darkened area of elytra and wings - brown

One of t most significant results of this experiment was th the two forms, the brown form is clearly the most adaptable. While birds were clearly a major factor, it was interesting to note that five green mantids were killed by ants. If these (unidentified) Italian ants were anything like the rapacious fungus-growing ants of Kush - that seek out green vegetal material – one has another cogent reason for the lack of green forms of **Mantis religiosa** in the region. It is interesting to note that all the **M. religiosa** individuals observed were of the brown form; particularly when one considers the heavy rain of December 1995 and consequent amount of green vegetative growth.

Another significant observation is that, along with **Eremiaphila braueri**, this mantid was one of the most common. This could be due to a peculiarity of **M. religiosa**, in that it has a midline metathoracic ear. This organ provides a broad range of sensitivity, including ultrasound. Such "true ears" have evolved many times among insects, but are patchily distributed. From the anatomical and physiological evidence, this ear appears to be a non-directional sound receiver. A number of mantid species are now known to react to bat-like ultrasonic sounds by an abrupt deviation in flight path and defensive position (Yager and Hoy, 1986;1987).

The evidence is clearly mounting for the complexity of mantid behaviour, particularly regarding bats. Could the presence of bats have factored for the success of this species (along with a ground dwelling species that would not be susceptible to the predations of bats) ? While a few bat species are known to hunt in daylight, it is unclear just how successful bats are in capturing mantids in particular; but one may assume that if a defensive organ has been developed then the threat was sufficient enough to warrant the reaction. It is well known that many moths within the Arciidae and Ctenuchidae are avoided by bats, and that these families use an ear to detect the sounds of echo-locating bats and subsequently alter their flight patterns to make capture more difficult. In addition, the wax moth **Achroia grisella** - along with at least one tettigoniid (American "katydid" and British "bush-cricket") - cease their ultrasonic calls to avoid bats (Spangler, 1984).

Although this species is known to give a startle display involving the erection of colourless wings and the flexing of the abdomen against the raised wings to make a sound, none of the captured specimens could be induced to make such a display. When confronted this species demonstrated its ability for flight. Not surprisingly this trait would make this species susceptible to bats.

Hierodula (Sphodromantis) trimacula, Saussure, 1870.

(Figure 5)

Three specimens were observed, one was kept in captivity. All were green, which is all the more interesting when one considers that all **M. religiosa** were of the brown form. Either these two mantids inhabit very different environments so that the same trigger is affected differently (eg: light, humidity), or these two species inhabit different ecological niches.

Summary

Perhaps one of the most interesting elements of mantid behaviour, the startle display, may be one of the most difficult to study. Although it is clear that the display plays an effective role in discouraging predation, it may also play a role to regulate territory within the species.

As this aspect is one that requires a detailed programme of research in the field, it is therefore an issue that has received little attention. Long term observational studies of insects in the field are notoriously difficult. Further questions arise when one considers mantids in relation to other species. Although a number of factors

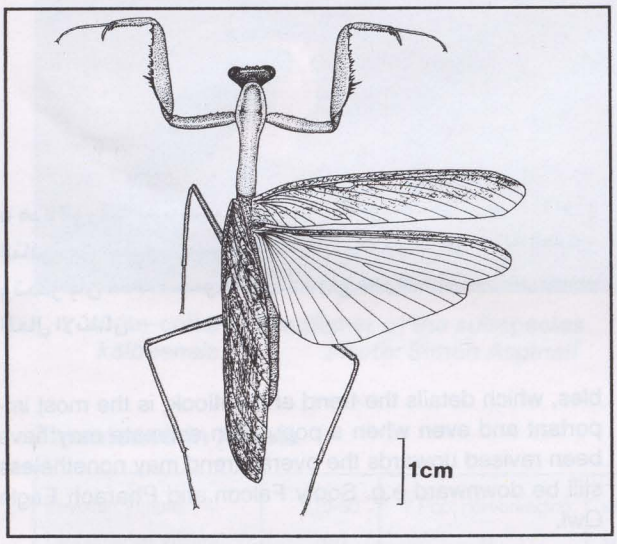


Fig. 5 - *Hierodula (Sphodromantis) trimacula*, darkened area of elytra and wings - green

influence the distribution of mantid species – notably birds – it appears that the unusual success of **E. braueri** and **M. religiosa** can be related to their success in dealing with bat predators. A ground-dwelling species may face less predation from bats, if not birds, and **M. religiosa** has developed a particularly effective way of reacting to bat echo-location.

If bats were indeed effective predators of mantids, this may place the diurnal behavior of the latter into greater perspective, particularly when one considers that most stick insects are nocturnal. Also interesting is the brown form of **M. religiosa** when compared to the green *Sphodromantis* specimens.

Do both species inhabit such different zones that their colour morphs do not need to coincide ?

Whatever the case, it appears that further field work needs to be directed towards this, and the former, problem. Although mantid behaviour has been a subject of interest since pioneering studies in the middle nineteenth century, larger questions about how mantids relate to their environment remain unanswered.

***Hierodula (Sphodromantis) trimacula.* This individual is well camouflaged when on a green plant. It is waiting in a typical "praying mantis" posture.**

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I would like to thank the Government of Ras Al Khaimah and Derek Kennet for providing me with the opportunity to visit this region in order to participate in the archaeological excavation of the mound of Kush in 1995.

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The UAE's Rarer Breeding Birds

by Simon Aspinall

Introduction

The Atlas of the Breeding Birds of Arabia project (Jennings 1995) has catalysed an increased national surveying effort and a reasonably large amount of fresh information has been collected, such that, two-three years on from when population estimates were first made for the UAE's breeding species (Aspinall 1996), the provision of something of an update a useful exercise. The UAE's rarer breeders have been specifically targetted and the results given here engender little reason for optimism.

Although, for example, the population size of Sooty Falcon has been upwardly revised, it is actually under imminent risk of becoming extinct as a breeding species and the UAE holds 70% of the Arabian Gulf's breeding population; Bonelli's Eagle also seems likely to follow; Red-billed Tropicbird may still lose two of its three UAE breeding sites despite predators (in the process of) being removed from those two islands; Pharaoh Eagle Owl suffers from persecution and from development of formerly undisturbed desert areas and so on and so forth. The outlook for many species as described here is certainly not good, despite calls for adequate protection to be given to them and their breeding haunts.

As stated above, only those species recognised as rare UAE breeders are treated here. Introduced species have deliberately been excluded.These are defined as those species with an established breeding population of less than 100 pairs and for which there may be some degree of conservation concern whether by intrinsic virtue of their small number alone or for other reasons. The Red Data categories allocated to each breeding species by Hornby & Aspinall (1996) has been followed here; in descending order of importance: small world range; threatened in Arabia; threatened in the UAE and rare UAE breeder. These do not necessarily imply that the threat to a species is greater if it occupies a higher category, although greater international significance or 'importance' is of course attached to some species or endemic subspecies for example. Deliberately omitted are pioneers/ opportunists (*see* **Appendix**) and edge of range species which are adjudged to be naturally rare here. The latter could be considered a somewhat arbitrary or subjective assessment and it is acknowledged that some species included below may also actually be on the edge of their range. An attempt has nonetheless been made to remain impartial and objective. Red Data categories are dynamic and it is quite clear that that some fresh assessments and reordering of species is necessary (particularly some of those presently classified as 'rare UAE breeders' which need moving up to 'threatened in the UAE'), but only so that we can then see clearly what our conservation and management priorities should be.

For some species a revised population size may be the result of improved survey coverage and not due to a genuine change. The third column of the following tables, which details the trend and outlook, is the most important and even when a population estimate may have been revised upwards the overall trend may nonetheless still be downward e.g. Sooty Falcon.and Pharaoh Eagle Owl.

* هذه الورقة تتحدث عن أحدث المعلومات في تربية الانواع النادرة من الطيور، فهي تتحدث عن تغييرات في حالة الطيور وتحذر بأن هناك مجموعة من الأنواع معرضة للانقراض بسبب افعال الانسان.

Key

N/C = No Count; data defic. = Data Deficient

TREND: ? unknown or uncertain trend; = no apparent change; ↓ decline; ↑ increase.

OUTLOOK: E - endangered (being at higher risk than); T - threatened; N - No immediate threat foreseen or change likely.

Small World Range

Species	Previous Estimate (Pairs)	Revised Estimate	Trend & Outlook
Red-billed Tropicbird	70-90	90-110+	↓/E
White-collared Kingfisher	44-55	N/C	?/T

Red-billed Tropicbird *Phaethon aethereus*

Red-billed Tropicbird is seemingly secure on Qarnein, the Arabian Gulf's main station; recent estimates are of 80-100+ pairs. The populations on Zirku (<10 pairs) and Arzanah (1+ pairs) remain critically endangered. Cats are being removed and rats controlled by ADNOC on both islands in an attempt to allow the populations (and those of other seabirds) to recover. No predators exist on Qarnein. The relatively restricted range subspecies *indicus* is that involved.

White-collared Kingfisher *Halcyon chloris*

Khor Kalba, which is the type locality and world's only breeding station for the *kalbaensis* subspecies of White-collared Kingfisher, is about to be declared a nature reserve by the Ruler of Sharjah, H.H Sheikh Sultan bin Mohammed al Qassimi, although parallel developments on part of the area have necessitated an EIA being undertaken. Hopefully this will negate any possible adverse effects. Management and expansion of the existing mangrove woodland should be facilitated to maintain its suitability and increase the available area for the kingfishers.

White-collared Kingfisher of the subspecies *kalbaensis* ***Photo: Simon Aspinall***

Threatened in Arabia

Egyptian Vulture	?10-50	? Pop. non-breeding	=/N
Lappet-faced Vulture	?0-1	0	=/N
Houbara Bustard	?0	?0	=/N
Booted Warbler	5-20	5-15	=/T

Egyptian Vulture *Neophron percnopterus*

Egyptian Vulture has still not been proven to breed on Jebel Hafeet, Abu Dhabi, this species' main haunt in the UAE. Current thinking is that the mountain simply serves as a nursery area for juveniles and immatures and roost site for other non-breeders. Further investigation of the situation is necessary.

Lappet-faced Vulture *Torgos tracheliotus*

Lappet-faced Vulture is still recorded periodically (but decreasingly) in the UAE, primarily in the Al Ain area. Those that are seen are possibly breeding but over the border in Omani territory, notably around Jebel Qatar and Jebel Sumayni, even so, no historical or current nests are known. (See account in Aspinall 1996).

Houbara Bustard *Chlamydotis undulata (macqueeni)*

Houbara Bustard is recorded into the early summer in some years in western Abu Dhabi (including in fenced exclosures where the habitat might be suitable for nesting) but display or other evidence of breeding is completely lacking. Departure of Houbara from the UAE in spring seems to be a protracted affair with late records being of no significance. 'Reintroduction' proposals are probably rather hopeful.

Booted Warbler *Hippolais caligata*

The marginally revised estimate for Booted Warbler changes little else; six to ten males recorded singing is typical on any single visit to Khor Kalba, which is the only regular breeding site in the Arabian peninsula for this species. The comments given under White-collared Kingfisher also apply here too. Management work at Khor Kalba should be considered to help sustain and expand this relict or pioneering population. The subspecies concerned is *rama*, and is considered a full species by some authorities - **Syke's Warbler**.

Threatened in the UAE

Osprey	70+	55-70	↓/T
Sooty Falcon	14-25	35-40	↓/E
Cream-coloured Courser	?10-100s	20-50+	↓/T
Pharaoh Eagle Owl	10-50	20-35	↓/T
Lesser Short-toed Lark	10-100	20-100+	?/T

Osprey *Pandion haliaetus*

The western Abu Dhabi islands are the Gulf's stronghold for Osprey. Abandonment of nests continues, largely through disturbance. Artificial eyries should be built in safe situations, but the main solution rather than prescription would be less development taking place on the islands. Some islands need to be left undeveloped.

Sooty Falcon *Falco concolor*

Sooty Falcon is under the gravest threat of all UAE breeding species even if the population is higher than previously thought; one colony of 20-25 pairs is under considerable immediate threat and the three others with the remaining 15 pairs are all similarly in jeopardy.

Cream-coloured Courser *Cursorius cursor*

Some breeding sites of Cream-coloured Courser are now known with precision although the population estimate remains a vague range and still conceivably numbers hundreds of pairs. Some known sites and many other apparently suitable sites are under siege from agricultural and silvicultural expansion. Only one area, with perhaps five pairs, is incidentally protected, by virtue of falling within a hunting preserve. Some desert protected areas are planned in Abu Dhabi emirate.

Lappet-faced Vulture, adult and young in nest on Jebel Hafit, 1981. ***Photo: Rob Western***

Pharaoh Eagle Owl *Bubo (bubo) ascalaphus*

Desert surveys have located more pairs of Pharaoh Eagle Owl than was the previously given minimum. Nonetheless there is no doubt that the population is depressed and, furthermore, still under considerable and increasing threat. Accidental deaths (casualties from fencing, powerline and vehicle collision) are not helped by continued persecution (including trapping and caging individuals) and from development and disturbance, especially in areas of *ghaf* woodland.

Lesser Short-toed Lark *Calandrella rufescens*

Lesser Short-toed Lark seems to be a perennially scarce

breeding species, but more comprehensive breeding season surveys are required. Even if at least two sites are consistently occupied, there seems to be ecological and perhaps climatological limitations to their breeding or expansion in the UAE. The 'site' in Abu Dhabi appears to encompass the entire coastal strip from Ras Ghanadha to Taweela (20km). Despite this, however, with just the two regular breeding sites, it must, in view of rapid coastal development, remain considered a nationally threatened breeder (although otherwise of no concern regionally). The littoral zone in both areas named above are also important in winter for flocks of immigrant birds.

Rare UAE Breeder

Long-legged Buzzard	1-5	?1-3	-/N
Bonelli's Eagle	10-50+	5-20	↓/E
European Kestrel	50-100	30-70	=/N
Barbary Falcon	10-100	10-20	?↓/T
Caspian Tern	1+	N/C	Data Defic./T
Eurasian Cuckoo	10+	Data Deficient	?/N
Striated Scops Owl	10-100	50-100+	=/N
Blue-cheeked Bee-eater	20-100	100+	=/T
European Bee-eater	10-50	50+	=/T
Hoopoe	10-100	100+	↑/+
Bar-tailed Desert Lark	5-10	?10+	Data Defic./N
Rufous Bush Robin	50-100	50-100+	↑/+
Hooded Wheatear	10-50	6-20	=/N
Pale Rock Sparrow	10-100	?10+/100+	?/T
Trumpeter Finch	10-100	?<10	Data Defic./N

Long-legged Buzzard *Buteo rufinus*

Long-legged Buzzard is undoubtedly part of the typical native avifauna of the Arabian peninsula's arid zone. Breeding is distinctly sporadic in the UAE and likely to remain as such due not to any food limitation but more probably to disturbance and persecution. Breeding in the UAE desert may ordinarily only take place following one or more good breeding seasons in other parts of the peninsula i.e. when the population is naturally elevated and these sites may in any case be marginal. Only one site in the UAE might be considered of optimal quality but disturbance and persecution (two birds, one a juvenile, were shot at Al Hayer in the spring of 1996 for example) elsewhere almost certainly puts paid to regular breeding by even just one or two pairs.

Bonelli's Eagle *Hieraaetus fasciatus*

Along with Sooty Falcon, Bonelli's Eagle is under serious threat of becoming nationally extinct. The upper end of the original order 10-50+ was certainly over-optimistic. Certainly less than 20 pairs and probably less than 10 pairs now breed in the UAE. Persecution is a problem but there are probably unknown other reasons for the apparent decline. The situation appears to be quite critical.

European Kestrel *Falco tinnunculus*

European Kestrel presents no real cause for concern, although the use of pesticides on fodder producing fields could be having unsure effects on the breeding success of resident and migrant individuals, as well as on the large numbers of passage globally 'threatened' Lesser Kestrels which also feed on invertebrates in the same fields annually each spring. Some pairs of Kestrel are colonising urban settings.

Barbary Falcon *Falco pelegrinoides*

Barbary Falcon, as with the other raptors discussed thus far, excepting Kestrel, has an uncertain fate awaiting it. Some individuals are trapped and its earlier status may have been incorrectly assessed. Although being labelled threatened it may be of the higher category 'endangered'. The precautionary principle should certainly apply.

Caspian Tern *Sterna caspia*

Caspian Tern suffers from data deficiency. Ongoing development of islands reduces the likelihood of this, the largest of the terns, continuing to breed (being more susceptible to disturbance than the smaller species) or of colonising new sites.

Eurasian Cuckoo *Cuculus canorus*

Similarly data deficient is Eurasian Cuckoo. Although calling birds are heard annually in Ras al Khaimah and Fujairah in March, April and May, no greater evidence of breeding has yet been obtained and certainly early birds will be in the UAE before any suitable host has laid. The great challenge is to prove if breeding takes place at all and to identify any host species. Breeding may only be sporadic within the UAE.

Striated Scops Owl *Otus brucei*

Striated Scops Owl is now known not to be as scarce as was previously thought, but thorough census work is still required (most recording remains opportunistic). The plentiful amount of apparently suitable habitat presently available is probably capable of supporting several hundred pairs.

Blue-cheeked Bee-eater *Merops superciliosus*

Some new colonies of Blue-cheeked Bee-eater, albeit all with pairs in single figures, have recently been located. The Batinah of Oman population might well expand northward into UAE territory and there is certainly room for absorption of more pairs here. Pesticide usage on fodder fields which are used extensively for feeding by both Bee-eater species could be a problem (cf by reducing fertility).

European Bee-eater *Merops europaeus*

The population in Ras Al Khaimah alone was estimated at 50+ pairs in 1997 (Brett *pers. comm.*), but whether there has been a genuine population increase or not is unsure. More probably the apparent 'change' is due to increased census effort. Richardson (*pers. comm.*) considers the breeding numbers of both Bee-eater species to fluctuate annually.

Hoopoe *Upupa epops*

At last we have a species adjudged to be on the increase, due largely to the proliferation of watered lawns and grassy parklands ideal for feeding, although a lack of nest holes is probably a limiting factor. Nonetheless, Hoopoe is extremely widespread worldwide and the increase here has little conservation significance.

[Much the same applies to that delightful bardster the Rufous Bush Robin, which is certainly gaining ground, as is the pioneering population of Olivaceous Warbler].

Bar-tailed Desert Lark *Ammomanes cincturus*

Bar-tailed Desert Lark remains almost as unknown as before, although it is now possible to locate it with confidence on the Abu Dhabi-Dubai border and in extreme western Abu Dhabi near Shuweihat at certain times of year. These populations are probably secure, failing the arrival of large scale forestry plantations.

Hooded Wheatear *Oenanthe monacha*

Jebel Hafeet remains the UAE's Hooded Wheatear

stronghold with upward of six pairs. The entire jebel (including the Omani portion) may support more than twenty pairs (on the basis of recent surveys by the author). It is only very rarely recorded elsewhere and certainly seldomly on a regular basis in any other UAE site, which is surprising as much of the mountain area of the Northern Emirates would appear to offer suitable terrain. It often appears relatively secretive and is thus perhaps overlooked. Strangely, most sightings are of males. There are no apparent manmade threats.

Pale Rock Sparrow *Petronia quadrimaculata*

Pale Rock Sparrow, as with Cuckoo, is data deficient. The wetness of the spring may determine whether territories are established and breeding feasible. Singing birds continue to be noted in one or two former sites (between Hatta and Kalba and at Wadi Ghayl) and, in April 1997, around Masafi (Richardson *pers. comm.*). Note that passage birds may sing during a stopover in otherwise suitable terrain. Breeding pairs are probably not at risk, other perhaps than from excessive water abstraction drying out wadi drinking pools.

Large flocks feed in fallow fields on spring migration, which is a habitat in decline. The liberal use of pesticides is an unquantified, potentially rather serious, threat to the species.

Trumpeter Finch *Bucanetes githagineus*

The status of Trumpeter Finch remains a complete unknown. A singing male has never knowingly been recorded in UAE territory. It appears to be a somewhat nomadic species but is at least semi-resident in favoured haunts along the west side of the Hajar in Omani territory (e.g. Fossil Valley, Hanging Gardens & Jebel Qatar) but records from Jebel Hafeet have become much less frequent in recent years. Until firm evidence is received,Trumpeter Finch can only be regarded rather tenuously as an annually breeding species in the UAE.

Conclusion

Certain of the UAE's scarcer breeding birds are under serious threat. These can be categorised as belonging to a) specific groups, notably raptors and seabirds, and/or b) specific habitats, notably islands and one unique mature mangrove woodland (Khor Kalba). Many separate islands need be managed sympathetically for wildlife or, preferably, recognised officially (and legally) as nature reserves. This would go a long way to protecting the national avifaunal biodiversity. Removal of mammalian predators from islands is still vitally necessary. Khor Kalba, which is to become a reserve, still needs to be expertly managed and could well develop as a showpiece reserve.

Diurnal raptors and owls will apparently always suffer at the hands of man, unless, in this instance, the law can be adequately enforced and areas of mountain and desert be left undisturbed or, alternatively, restored. Whether this is possible or not remains to be seen. Environmental education may bring benefits in time.

Although only species with estimated national populations of less than 100 pairs have been treated in this article, there are still concerns for some other species with larger known or estimated breeding populations (including numerous other island dwellers), due, for example, to insidious, if inevitable, creeping development, particularly along the coastal strip. Saunders' Little Tern and Chestnut-bellied Sandgrouse with respective estimated populations of 500-1000 and ?500-1000 pairs are examples of two species of 'conservation concern'. Close attention needs to be paid to all of those species identified here as being in decline or threatened for whatever reason.

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APPENDIX — A NOTE ON PIONEER SPECIES

SPECIES	PAIRS	COMMENTS
Little Bittern	1	Summering records from Ruwais (bred 1995), Ayn al Faydah & Ramtha since 1995.
Night Heron	1-2	Breeding probably annual at Zabeel. No other sites known.
Grey Heron	?0	No new evidence.
Greater Flamingo	22+	Attempts to encourage breeding at Khor Dubai & Al Ghar ongoing.
Ruddy Shelduck	1	Pair at Ramtha, Sharjah summer 1997, possibly bred; again present spring 1998
Shikra	1	A pair bred in the Safa Park/Jumeirah area, Dubai in 1997; first recorded in the country in only 1996 having perhaps been deliberately released.
Quail	?10-50+	Data deficient; many large fodder fields hold calling birds in winter & spring.
Water Rail	1-2	Ruwais site probably not now suitable for nesting. No other known sites.
Moorhen	50-100	Population increasing.
Avocet	1	Pair bred at Al Ghar lakes, Abu Dhabi in 1996, now resident at site (?).
White-tailed Plover	1	Pair bred at Ramtha, Sharjah in1996.
Namaqua Dove	1	Breeding confirmed Ghiyathi July 1997; records increasing.
European Roller	3-5	Foothold established & recent increase; pairs not under any obvious threat.
Short-toed Lark	?5-50	Winter and spring rains may determine whether sporadic breeding occurs.
Reed Warbler	25-50+	Ephemeral habitats rapidly colonised; population remains very restricted.
Olivaceous Warbler	20-100+	Continued increase on Abu Dhabi island, not apparently elsewhere.
Starling	1-10+	Tenuous foothold maintained at Digdaga fields, Ras al Khaimah.
Spanish Sparrow	10-100	No change detected, hybridisation seems inevitable.
Corn Bunting	2-10+	Status unchanged; no fresh breeding information.

The Relevance of Archaeology to Coastal Zone Management

by Peter Hellyer

* هذه الورقة تؤكد بأن المناطق الساحلية لدولة الإمارات ذات اهمية قصوى لفهم التراث الموجود في المنطقة وان المحافظة على المناطق الاثرية جزء من المحافظة على البيئة.

Introduction

With the increasing focus by Government agencies in the United Arab Emirates, as well as para-statal companies, such as those in the Abu Dhabi National Oil Company, ADNOC, Group on the necessity to study and conserve the country's coastal zone (including islands, the inter-tidal zone and shallow inshore waters), the concept of an integrated plan for coastal zone management is being developed. This was the subject of a workshop organised in November 1997 by the Environmental Research and Wildlife Development Agency, ERWDA, of Abu Dhabi, in association with the regional office of the United Nations Development Programme, UNDP. The paper that follows is a slightly revised version of a short submission prepared as a contribution to that workshop.

The purpose of this paper is to contend that the coastal zone, or rather the land areas contained therein, including islands, are of very substantial importance for an understanding of the cultural heritage of the people of the United Arab Emirates. Any planning for coastal zone management should take this factor into account.

Further, through investigations of the evidence of human cultural heritage, as identified through archaeological surveys and excavation, it is also possible to obtain data which is of direct or potential significance in terms of both present and past environments and wildlife.

Archaeology and Coastal Zone Management

Archaeology in the United Arab Emirates began as recently as 1959, when a team of Danish archaeologists were invited to investigate reports of ancient burial mounds at Umm Al Nar, adjacent to Abu Dhabi. The site, it should be noted, was on an island which falls within the coastal zone of the Emirate of Abu Dhabi.

From excavations at this site, which continued intermittently until the early 1980s, substantial information was recovered about the Bronze Age inhabitants of the United Arab Emirates during a period from around 2,500 BC (4,500 Before Present, BP), until 2,200 BC (4,200 BP). This information included not only that deriving from human skeletal remains, pottery and other artefacts as well as from domestic and funerary architecture, but also items of environmental significance.

The consensus among archaeologists is that the camel bones excavated at the site represent the earliest evidence yet found of the domestication of the camel, which has in the subsequent millennia been a crucial factor in permitting man to survive in the deserts of the Arabian peninsula.

Other bones have provided evidence of species of marine mammals not yet scientifically recorded live in the waters of the United Arab Emirates, such as members of the rorqual family, probably either the Sei Whale, *Balaeonoptera borealis*, or the Bryde's Whale, *B. edeni.*

An analysis of bird bones from the tombs has provided other useful information. One of the species identified is the Giant Heron, *Ardea bennuides*, is extinct, which was described from and is only known from the Umm Al Nar excavations. Two other species identified from the excavations are also of importance, the Darter, *Anhinga melanogaster*, and Bruce's Green Pigeon, *Treron bicincta*. The former is now found no nearer than the marshes of the Tigris/Euphrates Delta and the latter no nearer than the woodlands of Dhofar in the Sultanate of Oman. Their presence at Umm Al Nar is suggestive of a different habitat existing in this part of the UAE's coastal zone in the past **(1)**.

Other archaeological excavations on the coast and islands of the United Arab Emirates, including Abu Dhabi, have produced further environmentally-related information. Thus from a 6,000 year old settlement on Dalma, fish bones have been recovered from the grouper family, probably that of the Brown-spotted Grouper, *Epinephilus tauvina*, Hamour, which suggest the fish were of a length of a metre or more. Hamour of such a size are rare, if not unknown, today. Does the archaeological information suggest that human exploitation of the hamour over thousands of years has led to a decline in the maximum size reached by the species? **(2)**.

Similarly, a collection of marine molluscs from a recently discovered Late Islamic Bedu camping site inland of Abu Dhabi, but close to the edge of the *sabkha* and, therefore, on the fringe of the coastal zone, includes shells of the Pearl Oyster *Pinctada radiata*, which are noticeably large. Some fragments suggest that the intact shells may have been between 80 mm and 120 mm in diameter, significantly larger than the maximum size of 65 mm of live or recently dead specimens to be found on the shoreline or in coastal waters today. Does this suggest that the maximum size of Pearl Oysters has declined, and, if so, has this been as a result of human exploitation? **(3)**.

A substantial amount of other data relevant to a full understanding of the coastal and inshore marine environment may also become available from a study of archaeological sites. One group of sites likely to yield such information is the middens to be found along the country's coastline.

Thus excavation of a shell midden in Umm Al Qaiwain in 1993 uncovered a cemetery of 42 burials that have been dated to the 'Ubaid period, probably 6,000 - 7,000 years BP. Artefacts from the graves included part of a shell bracelet, and a single pearl, suggesting that the human inhabitants of the Emirates at this period had already commenced harvesting pearls, while associated pottery has been shown by thin section analysis to have been imported from Iraq, one of the earliest indications yet of the involvement of the people of the Emirates in maritime trade **(4)**.

Other examples of information from middens can also be cited. Thus many middens are largely comprised of shells of the large mangrove-dwelling gastropod *Terebralia palustris*. Some of these middens are found in areas today which are far from the present-day coastline and from surviving stands of mangroves. A detailed plotting of the location of such sites may be able to supplement geomorphological and other data relating to earlier coastlines, and may also be of assistance in studies on the former extent of mangroves *Avicennia marina* in the United Arab Emirates. This is clearly of relevance in understanding current mangrove distribution and in assessing areas for future mangrove plantation.

Moreover, the composition of shell middens varies. Adjacent to the village of Ghubbah on Merawah, for example, some middens of Late Islamic date are comprised primarily of the gastropod *Hexaplex kuesterianus* while others include both this species and *Pinctada radiata*, although at different levels **(5)**.

A plotting of middens on the coast and islands of the Emirates, as well as sampling and dating of such middens, may be able to provide indications not only of changing patterns of human consumption but also of the previous distribution of the molluscs concerned. If co-related to information on the present distribution of these molluscs, this may, in turn, provide data on the way in which the distribution of molluscs today coincides with, or is different from, the distribution in the past.

The above relates primarily to the data on the wildlife of the coastal zone that may be gained from archaeological studies. Such data from the past may well be of significance in helping to comprehend that of today, and, consequently, in the drawing up of any plans for coastal zone management.

More generally, however, the coast and islands of the United Arab Emirates have been shown, both through excavation and through preliminary survey to contain a very large number of archaeological sites, dating back to the Late Stone Age. In the Emirate of Abu Dhabi and of particular relevance to the Environmental Research and Wildlife Development Agency, ERWDA, many of the most significant sites have been identified on the offshore islands, such as Balghelam, Dalma, Ghagha', Liffiyah, Merawah, Yasat al-Sufla, Yasat al-Ulya and so on **(6)**. These include the oldest settlement yet identified in the Emirate of Abu Dhabi, on Dalma, and the best preserved site from the Late Stone Age yet found in the Emirate, on Merawah.

Preservation of these sites, and of others as yet unidentified, and of the cultural heritage of which they are a part, is clearly of importance within the framework of the management of the Emirate's coastal zone.

While a substantial amount of information on the evidence of human settlement within the coastal zone has already been collected, there is much more work yet to be done. Less than 30 of the Emirate's offshore islands have yet been the subject of archaeological survey, with many more yet to be visited. With the rapid pace of development on many islands, archaeological data may be lost before it is ever found. Thus a survey of the islands of Arzanah and Zirku in 1995 found only one single site remaining on Arzanah, a Late Islamic shell midden, and none on Zirku **(7)**. Both islands, however, were certainly known as far back as 1590, when they appear in a list of islands mentioned in a book by the Court Jeweller of the Serene Republic of Venice, Gasparo Balbi **(8)**. Any sites that may have dated from that period, or earlier, have now evidently been destroyed as a result of recent oil-related industrial development, although, fortunately, the recent introduction by the Abu Dhabi National Oil Company, ADNOC, of a much tougher environmental policy, (also covering archaeological sites), should help to ensure that such losses do not continue within the area of operations of the ADNOC Group of companies.

Any policy for coastal zone management should take into consideration the need to ensure that archaeological sites are, at least, identified before construction work takes place, and, preferably, that they are fully recorded and either protected or drawn and excavated, as appropriate.

Another conclusion that can be drawn from archaeological survey on the coast and islands of the Emirate of Abu Dhabi is that patterns of human use, whether occasional, seasonal or permanent, varied considerably. In general, the islands appear to have been used more. A conclusion has thus far been tentatively drawn that this may have been because of the fact that movement by sea was easier than crossing the often water-logged *sabkha* salt flats **(9)**. Further research will help to elucidate this point. Furthermore, it is clear from recent work that on the coast itself, patterns of use varied, even in areas that are relatively close to each other.

Thus on the coastline of the Dabb'iya peninsula, approachable by land only across *sabkha*, and with extensive inter-tidal flats that would have made access by boat difficult, there is little evidence of human occupation **(10)**. In contrast, on the nearby island of Qusabi, to the west, where the intertidal flats are less extensive, and thus boat-borne access is easier, evidence of previous human settlement is more easily identified **(11)**.

Further archaeological research, coupled, perhaps, with ethnographic studies into the now-vanishing patterns of human exploitation of the resources of the coastal and inshore marine environment of Abu Dhabi, may well be able to add significantly to understanding of the heritage of the people of Abu Dhabi and of the United Arab Emirates as a whole.

In the process of determining the appropriate methods for and purpose of the management of the coastal zone, it is important that the human factor, as exemplified by the results of archaeological research, is not overlooked. It represents an integral part of the significance of the coastal zone.

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Recent publications/Reviews

Breeding Bird Atlas of Oman

The Oman Bird Group published in January this year a 32 page softback Breeding Bird Atlas for the country. The Oman Birds Records Committee, on behalf of OBG, undertook during a rapid transition to computerised record-keeping, the inordinately time-consuming task of entering over 160,000 records of a total of 441 different species to a user-friendly database. The breeding atlas, compiled by Jens Eriksen, recorded of the OBRC from 1987-1997, marks the culmination of those well-worthwhile efforts.

Some one hundred and twenty five species are suspected or proven to have bred in Oman (compared to the UAE's 107) and for each of these a conventional gridded atlas map appears in this handy publication. Three sizes of symbol are used to denote possible, probably and confirmed breeding records in all but 11 of the 144 half degree grid squares which ornithologists have been able to visit up until the end of 1997. The publication contains only maps and no accompanying text.

Ibn Battuta credited with recording breeding bird data in Oman as early as the 12th century AD, although whether his data have been admitted to the atlas is not stated. The OBRC cooperates with international and regional studies such as the Atlas of Breeding Birds of Arabia project and with records committees in neighbouring countries, including that of the UAE, namely the Emirates Bird Records Committee. Checking closely through the atlas, however it is embarassing to note that data is missing for some species or for some squares about which birdwatchers int he UAE have ample data to the contrary (admittedly mostly overspilling introduced species). The introduction to the Atlas includes a request from the OBRC for readers to submit to it data on breeding birds or any other bird observations made in Oman and this can only be reiterated here.

The Atlas is an impressive piece of work by any standards and your fun in scrutinising it will not be spoiled by drawing comparisons with the UAE's avifauna, although it is irresistible to note how close, yet far, we are from recording our first Spotted Dikkop (recorded in a square share with the UAE no less). Aside from this esoteric observation, it is the many squares with confirmed and probable breeding records of houbara and golden eagle which immediately stood out to the present reviewer, musing on the former natural state of the UAE's now much altered and diminished desert.

The Atlas of the Breeding Birds of Arabia will be the major beneficiary from this enormously valuable piece of work. At the price of Atlas works out at more than 13,000 records a dirham — its a veritable bargain, so buy it — and then contribute your own records.

The *Breeding Bird Atlas of Oman* is available from the Hon. Secretary, OBRC, P.O. Box 246, Muscat 113, Sultanate of Oman. Price: RO1; 2 pounds sterling or 4US$, Cash or RO/sterling cheque made payable to I. Harrison.

NOTES AND QUERIES

Carpenter moths from the Al Ain region (Lepidoptera: Cossidae)

Within the Lepidoptera, members of the family Cossidae are considered to be relatively primitive moths, most of them being medium- to large-sized insects and dull brown or grey in colour. Worldwide, the family contains over 500 species, of which only 14 species are known from Arabia (Wiltshire, 1990). Unlike most other lepidopterans, the grub-like caterpillars of cossids do not feed openly on foliage, but instead are wood-feeders which bore tunnels in the trunks and branches of broad-leaved trees or else in the stems of grasses and other plants. This habit has earned them the name carpenter worms. The European Goat Moth (*Cossus cossus L.*) is the founding species for the family and its host trees include elm, ash and willows. In warmer climates, acacia trees are the favoured hosts for many cossids and this is likely to be the case for at least some of the Arabian species.

In the UAE and N. Oman, just 7 species of the family have been recorded and of these only 4 are so far known from the Al Ain region:

***Lamellocossus aries* (Püngeler, 1902)**

***Eremocossus vaulogeri baloutchistanensis* (Daniel, 1949)**

***Meharia semilactea* (Warren & Rothschild, 1905)**

***Meharia acuta* (Wiltshire, 1982)**

Representative specimens of these moths are shown in the accompanying photograph. All except *M. semilactea* have been taken in Al Ain city, whilst the former seems to be associated with nearby mountains. None of the moths listed is apparently common in the region. The most remarkable of them is *M. acuta* of which only a single specimen from Al Muwaiji district of Al Ain (February 1996) has so far turned up. Previously, this moth has only been recorded once before when the types from western Saudi Arabia were first described (Wiltshire, 1982). Thus the specimen of *M. acuta* from Al Ain represents not just a newly recognised element in the UAE fauna, but also a considerable extension to the recorded range of this moth.

The following species, not yet recorded from the Al Ain region, are quite likely to be found there eventually:

***Holocercus gloriosus* (Ershoff, 1874)** - known from Sweihan (NARC), Ajman and the Hatta region (Legrain, Liste provisoire des Macro-Hétérocres observés aux UAE et N. Oman de 1988 a 1995 - unpublished);

***Eremocossus rebellii* (Oberthur, 1876)** - known from the Northern Emirates (Legrain);

***Azygoplebs inclusa* (Walker, 1856)** - reported as common in N. Oman (Wiltshire, 1977, 1982) and also known from Hatta (Legrain).

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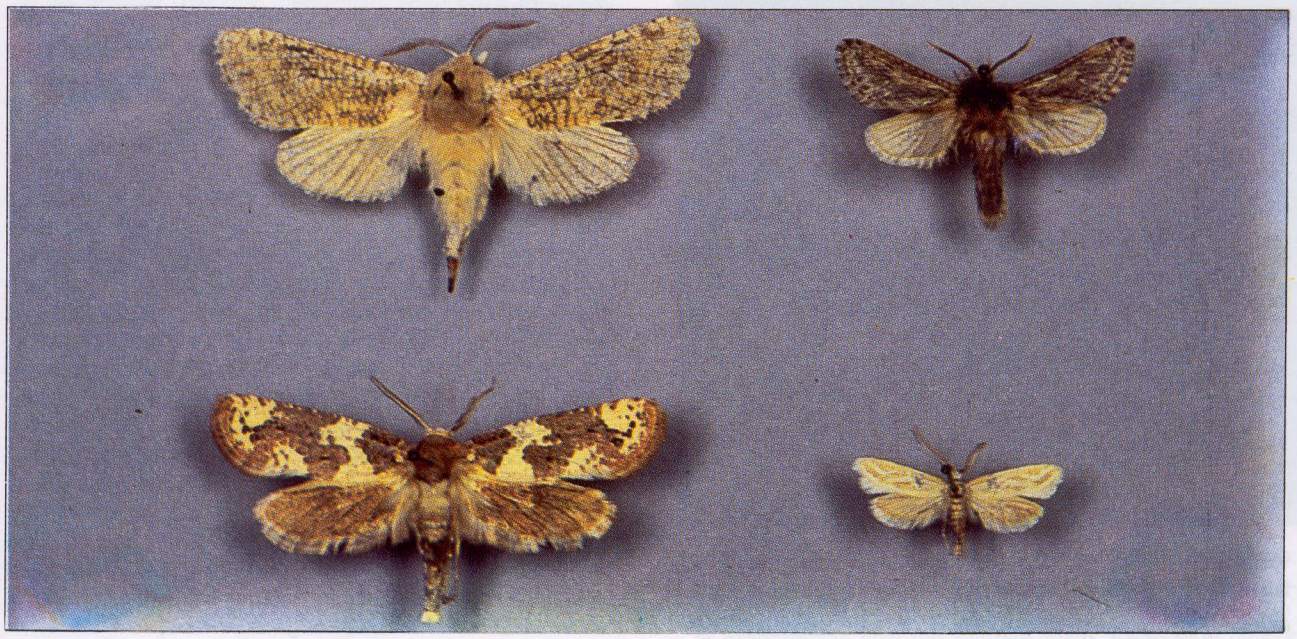
MICHAEL P.T. GILLETT



Carpenter moths from Al Ain. Top, left to right: *Lamellocossus aries* and *Eremocossus vaugeri baloutchistanensis*; bottom, left to right: *Meharia semilactea* and *M. acuta*. ***Photo: Paul Tipping***

The Silver Y moth, *Autographa gamma* (Linnaeus, 1758) and *Ctenoplusia limbirena* (Guenée, 1852), unexpected winter visitors to Al Ain (Lepidoptera: Noctuidae: Plusiinae)

The Silver Y moth, ***Autographa gamma*** **(Linnaeus, 1758)**, is a well known member of the very large family of owlet moths, Noctuidae, and belongs to the subfamily Plusiinae. Many members of this subfamily have a silvery-white mark on their forewings that resembles an alphabetical character, that of the Silver Y being like the Greek letter gamma. This moth is unusual for a noctuid, in that it flies both by day and at night. It has a Palaearctic distribution and is resident in much of temperate Asia, N. Africa and southern Europe, from where it vigorously migrates northwards in the spring to beyond the Arctic Circle. In Britain these spring migrants give rise to a second generation of moths in late summer and autumn and at times population explosions occur. As recently as August 1995, I recall seeing thousands and thousands of Silver Y moths flying by afternoon amongst roadside herbage in the Lake District of N. England. It is doubtful whether any of these moths or their offspring survive the winter so far north, nor are there any records of reverse migrations southwards. In the Middle East, however, there is some evidence that the Silver Y does wander southwards at the end of autumn and in winter. The moth is not resident in Arabia, but individual insects have been recorded as occasional visitors to northern provinces of Saudi Arabia in March and November 1977 (Wiltshire, 1980), but not in the intervening years to 1990 (Wiltshire, 1990).

Owlet moths of the subfamily Plusiinae (Noctuidae) from Al Ain. Top (left to right): ***Chrysodeixis chalcites, Trichoplusia ni;*** **middle:** ***T. daubei, Ctenoplusia limbirena*** **(new record); bottom:** ***Cornutiplusia circumflexa, Autographa gamma*** **(new record).**

Photo: Paul Tipping

It now seems that the migrant's winter wanderings may take it much further southwards in the Arabian Peninsula than has hitherto been realised, as an example of this moth has now been taken at Al Ain in the UAE. This capture was made at light in the early hours of 11 December 1997 in the Al Muwaiji district. Because of its close resemblance to other more common noctuids, the moth was almost overlooked and was not recognised until the following day. One month later, another unusual moth belonging to this subfamily was also taken at light at the same house in Al Muwaiji. This proved to be ***Ctenoplusia limbirena*** **(Guenée, 1852)**, otherwise only known in Arabia from central and northeastern Saudi Arabia, and, therefore, also a new record for the UAE. The two moths are shown in Figure 1, together with examples of four other species from the same subfamily that occur in Al Ain. The six species belong to two different tribes and a full listing is as follows:

Tribe: **Argyrgrammatini**

Chrysodeixis chalcites **(Esper, 1789)** - an uncommon moth in Al Ain;

Trichoplusia ni **(Hübner, 1802)** - very common winter visitor;

Trichplusia daubei **(Boisduval, 1840)** - common in Al Ain, winter and spring;

Ctenoplusia limbirena **(Guenée, 1852)** - first record for the UAE;

Tribe: **Plusiini**

Cornutiplusia circumflexa **(Linnaeus, 1767)** - a very common moth in Al Ain:

Autographa gamma **(Linnaeus, 1758)** - first record for the UAE.

The figure shows that both *T. ni* and *T. daubei* resemble the Silver Y, but are a little smaller and paler and have the white markings differently formed. Although darker, *Ctenoplusia limbirena* is also very similar although again the white markings are distinct. In terms of size and general colour, *C. circumflexa* is also very similar to *A. gamma*, but again the white markings are quite different. The similarities are, however, sufficient to make identification in the field uncertain and it is quite possible that further specimens of the Silver Y and of *Ctenoplusia limbirena* could easily be overlooked unless a detailed examination is made.

Elsewhere in Arabia, some 10 other species of the tribe Argyrgrammatini have been recorded (Wiltshire, 1990) and some of these may turn up in the Al Ain region or elsewhere in the UAE, although the most probable is *Trichoplusia exquisita* (Felder, 1874) which is known from the Hajar Mountains of N. Oman.

MICHAEL P.T. GILLETT

ROUND UP

Archaeology Review

ABU DHABI
UAE's oldest houses discovered

A short season of work in March on the island of Dalma by Mark Beech and Dr. Joseph Elders of the Abu Dhabi Islands Archaeological Survey, ADIAS, revealed traces of Late Stone Age houses. The site was first identified in 1992. The presence of imported 'Ubaid pottery from Mesopotamia and flint tools suggested that the houses date back to over 6,000 years Before Present, BP, the first time that houses dating to this period have been identified in the Emirates. At least one round house, 7 metres in diameter, was identified. The cobbled floor and traces of the wooden posts which supported the walls and roof could be clearly seen.

The quality of the construction suggested that the people may have lived on Dalma for most of the year, rather than just being occasional visitors, the first evidence of permanent Late Stone Age settlement in the UAE. Since by that time Dalma was already an island, the pottery is the earliest evidence yet discovered of the UAE's maritime trade.

A large amount of sherds from broken cooking and storage vessels was found in and around the house, including a small amount of fine imported pottery from southern Mesopotamia. The greater part of the sherds found during the excavations consisted, however, of 'white wares.' These were locally-produced pots made of plaster (gypsum), with simple black-stripe decoration, copying ' Ubaid designs from Mesopotamia, but using locally-available material. Stone tools found during the excavation included knives, drills, scrapers, chisels and arrowheads. A large number of waste flint flakes were also found, indicating that the tools were made locally. Other finds included beads and stone disks, some of which were perforated, suggesting that they might have been used as net or loom weights.

The greatest number of finds consisted of the refuse of food consumed in the settlement. Bones and shells indicated that fishing, the gathering of shellfish and hunting, as well as animal husbandry, formed the basis for the economy. Fish provided the bulk of the diet. Important species included the grouper (*hamour*), needlefish, seabreams and tuna. Sharks and rays were also regularly consumed, some being very large. Work being carried out by Mark Beech as part of his doctoral thesis at York University in the UK suggests that some of the *hamour* were up to a metre in length.

Other resources exploited included sea urchins, crabs, marine turtle, dolphin and dugong. Gazelle and Socotra Cormorant also appear to have been occasionally exploited, while some bones from domesticated sheep and goat were also recovered. Large amounts of shells, representing refuse from shellfish consumption, were also found, consisting mostly of pearl oysters, turban shells and clams.

The excavations, supported by Minister of Information and Culture Sheikh Abdulla bin Zayed Al Nahyan, revealed for the first time a detailed picture of life in Abu Dhabi around 6,000 years ago. Further studies will be carried out on the finds, while samples will be submitted for radiocarbon dating to try to establish a more exact date.

This year's work shows that the Dalma site is one of the most important of its kind in Eastern Arabia. Much remains to be done. The whole site covers an area of at least 100 metres by 80 metres, and it will take several years to excavate it fully and to study the remains.

Mark Beech & Dr. Joseph Elders, ADIAS

A Late Islamic site on Merawah

Site MR-9 on the island of Merawah, west of Abu Dhabi, is an open camp site of probably Late Islamic date, consisting of clusters of stone-lined hearths, situated south west of the village of Ghubbah. A season of survey and recording on the site was undertaken in January and February 1998. The site contains 160 hearths in all. Most are polygonal, although there is a distinct cluster of rectangular hearths.

The hearths average around 0.75 metres in diameter. At least four, however, are considerably more than a metre in diameter, and these are probably 'roasting pits,' presumably used in the past for specialised food preparation.

In all likelihood, the hearths represent camp sites which were probably occupied on a seasonal basis. They cluster in groups overlooking what is now a *sabkha*-filled embayment on the southwest side of the site, and an area of beach ridges, also with a shallow embayment which only floods at high tide, along the eastern side of the site. The hearths are also clearly situated on areas where limestone bedrock is present.

The fieldwork also provided an opportunity to study the life-cycle of the hearths, yielding a basic understanding of the way in which the hearths were constructed, used and re-used over time, and to understand better how hearths degrade through wind erosion and deflation.

To the north, approximately one km. away, is Site MR-8, a well site of more than six wells, previously provisionally recorded by ADIAS. The wells were partially fed by water which collected on the plateau to the west along a channel lined with stone rubble and then, later, with low earthen banks. The plateau is up to 3 metres higher than the well site, but on top of it are shallow, natural basins, which show evidence of feeding one into the other. Water from these basins used to flow through gravity into two channels, one of which shows evidence of being cleared by people in the past. These then led to the lower earth and stone-lined channel which directed the water to the well-site. This site is of very considerable interest since it shows how rainwater could have been collected in the past.

Salvatore Garfi, ADIAS

SHARJAH
Earliest writing found

The earliest writing known in the UAE has been found during excavations of a site at Muwailah, near Sharjah Airport. The excavation was a joint project of Sydney University, Australia, and Belgium's Ghent University, directed by Dr. Peter Magee of Sydney,under the auspices of the Sharjah Directorate of Antiquities and Museums. A pottery sherd found on the site and dated to the Iron Age II period, between 1100 BC and 600 BC, carried three letters tentatively identified as the South Arabian letters B, M and L. The find predates the earliest use of South Arabian in the area by over 500 years, and is a very early manifestation of the language outside its centre. *(A detailed report will appear in a subsequent issue).*

More Iron Age discoveries have been made by a team from the Autonomous University of Madrid at Al Thuqaibah, on the Madam Plain south of Dhaid. The team, working in association with the Sharjah Archaeological Museum, carried out a month-long season of excavation and survey, during which more evidence was uncovered of houses from the Iron Age, which began around 1,300 BC and lasted until shortly before 300 BC.

Nearby, on the slopes of Jebel Buhays, a team from Germany's University of Tubingen, directed by Professor Hans-Peter Uerpmann, continued work on a Late Stone Age site. In collaboration with the Sharjah team, excavation continued of a mass grave in which over one hundred skeletons have been found. C14 dating has shown that the site dates

back to the Fifth Millennium BC, one of the oldest sites excavated in the UAE. Some individuals were buried with necklaces of stone, carnelian, shells and pearls.
Also nearby, at Mileiha, evidence of Third Millennium BC occupation was identified by the Sharjah team. The site, a circular tomb from the Umm Al Nar period around 14 metres in diameter has been dated to around 2,100 BC. In typical Umm Al Nar style, the tomb is divided into a number of individual chambers. Remains of around five individuals were found in the severely disturbed grave. Also recovered were ceramics, including grey pottery from Baluchistan.
A major campaign of excavation was also undertaken by Sydney University on the western flanks of the mound of Tell Abraq, on the border between Sharjah and Umm Al Qaiwain. Directed by Professor Dan Potts, the season completed examination of a small Umm Al Nar period grave on the edge of the 'tell,' making a number of major finds, including several ivory combs, probably imported from Bactria, weaponry and ceramics.

Peter Hellyer

RAS AL KHAIMAH
Rare coin found at Kush

A 1,000-year old gold coin found during excavations in November and December 1997 of an 'tell' at Kush is one of only two of its type known. The coin, weighing one gramme and around one centimetre in diameter, is a 'fractional dinar' of Omani ruler Omar bin Yousuf Al Wajihi, who began his reign in 961 AD, (340 AH). The only other known coin of the same type is in the collection of the American Numismatic Society. The inscription, in Kufi script, reads on one side: "there is no God but God - God is the only one (?). He has no associate. Omar bin Yousuf," and on the other: "To God. Mohammed is the prophet of God. Al Muti' lillah. Wajih. "
During the excavations, further evidence was found of successive occupation of the mound, which seems to have been largely abandoned around the end of the 13th century. Parts of a large wall surrounding the settlement were cleared. Pottery and other finds associated with the wall, 2.5 metres thick and still standing nearly 3 metres high, show that it can be dated to the very end of the pre-Islamic period or the beginning of the Islamic era. It might even have been a fortress of the late pre-Islamic Sassanian Empire, which controlled the fertile plains of the northern Emirates before being driven out at the coming of Islam. It seems probable that there was a major settlement at Kush from these early times, associated with the large wall. After a period of abandonment, the ruined structure was then re-occupied and new houses were built inside its walls.
From the 8th to the 13th century, the settlement gradually grew, with growing prosperity shown by the increasing number of imported Chinese porcelain fragments found, evidence of extensive maritime commercial links.The Kush excavations are a joint project of the National Museum of Ras Al Khaimah, under its director, Deputy Ruler Sheikh Sultan bin Saqr Al Qassimi, and the British Museum and Oxford University. Work was funded by Shell Markets Middle East.
A second season of work on a 4,000 year old tomb in the Shimal area, a few kilometres north of Ras Al Khaimah was also carried out during the winter. Originally discovered in late 1996, the tomb dates to the Umm Al Nar period, and is believed to have been built around 2,100 BC. 14.5 metres in diameter, the tomb is the largest of its type yet found.
A first season of work took place in February 1997, showing that the tomb was divided into twelve compartments, with an unusual plinth around the outside. Preliminary estimates suggest that over 300 individuals may have been buried in the tomb. Two skeletons were found still ***in situ***, both with flexed legs, as in other Umm Al Nar tombs. One skeleton was associated with a typical vessel of that period, and a ***Terebralia*** shell was near its mouth. Surprisingly, this body was buried with a dog just above its head, a very rare find. This may have parallels in Bahrain and Mesopotamia.
Archaeologists have been puzzled by the fact that one often finds in such tombs burnt and unburnt bones together. This time, better preserved areas provided further insight into burial customs. It seems that the bodies were originally buried in a flexed position, lying on their right side, on the floor of the chambers. After a chamber was full, the remains of all burials were taken out and burned, the burnt bones then being deposited again inside the tomb, on shelves, which may have formed a second store. The bones will be analysed and compared with skeletons from other sites of the same period elsewhere in the UAE. Besides human remains in the tomb, other finds also included imported pottery vessels, including items from south-east Iran, the Indus Valley and Bahrain. The excavation was sponsored by Serco IAL Limited.
Other activity during the season included a detailed survey by Dr. Robert Carter on sites on the northern half of the island of Hulayla, ahead of scheduled development work, as well as further surveys, also involving Beatrice De Cardi, during which a number of previously unrecorded burial and settlement sites from several periods were found. A number of scholars worked during the season in the Museum, including De Cardi, who helped to catalogue softstone vessels and small finds from excavations in the Wadi Al Qawr, and Mark Beech, who studied animal remains from Kush and British and Japanese excavations at Julfar. Support was also gien to a team of geomorphologists from Oxford University, directed by Professor Andrew Goudie, which studied dune formations and coastline changes in the vicinity of Ras Al Khaimah.

Christian Velde,
Resident Archaeologist,
National Museum of Ras Al Khaimah

FUJAIRAH
Studies at al-Hayl

A season of work was undertaken at the late Islamic site of al-Hayl, Fujairah, by a small team from the University of Sydney, Australia. The fieldwork, undertaken between January and March, was made possible due to the continued support of the Department of Antiquities and Heritage, Fujairah, and Professor Dan Potts of the University of Sydney. The aim was to combine architectural, archaeological and ethnographic data to obtain an understanding of life in a traditional village in the pre-oil era. The main focus was architectural, and focussed on the palace of Sheikh Abdullah bin Hamdan al-Sharqi, and the associated watchtower and mosque. These monuments, important in themselves, needed to be considered in their settlement context, and the surrounding village was also briefly examined.
The analytical fieldwork included the creation of ground plans for the Palace, watchtower and mosque using an Electronic Distance Metre (EDM), which was also used to create a map of the layout of the village in relation to these monuments. A full photographic and written record was completed, documenting the main architectural features and their construction.
Pottery and other small finds were collected from around the main monuments. Two small soundings were dug, to examine certain architectural features which were obscured by debris, such as wall foundations and floor constructions. Local community members, many of whom lived at al-Hayl before it was abandoned in the 1970's, were consulted concerning the history of the site.
Research continues in Sydney where scientific analysis will be done on plaster fragments from the site, to obtain a greater understanding of the construction processes and the durability of the materials used at al-Hayl. When all the material is combined, the site will have made a valuable contribution to the understanding and appreciation of the UAE's traditional architecture.

Melissa Riley,
University of Sydney

BIRD REPORT

October 1997 — March 1998

The winter of 1997/98 was exceptional. A violent storm in October, accompanied by gale force winds and heavy rain, opened one of the wettest winters since local records began. Blamed on the phenomenon known as El Nino, this forced a large proportion of our passerine winter visitors to simply move on, presumably south, at the critical time of their arrival. As a result it was a very lean winter and following spring for insect-eating species such as pipits, wheatears and warblers (and their attendant harriers). Nonetheless, those records received tell an exciting story, with many extreme rarities being noted.

OCTOBER 1997

Fairly average conditions prevailed until mid-month, with dry, calm weather and temperatures hovering around the 35°C mark. It became hot (40°C) and blustery on the 14th, followed by a violent storm in the Dubai area at 0430 on the 15th which blew down 300 trees at the Emirates Golf Course (EGC). The weather appeared to resettle immediately after the storm, though thunder clouds built up locally on the 17th and widespread unsettled conditions returned at the end of the month, with intermittent rain falling from the 28th.

There was good passage of interesting migrants on Das Island in early October with up to six **Scarlet Rosefinches** from 3-19th, a **Short-eared Owl** on the 7th, a **Long-billed Pipit** on the 7th & 10th (the first there for 10 years) (and another at Umm an Nar Golf Course on 31st), a **Rufous Turtle Dove** from the 8-12th (the first on Das Island for 11 years and only the 5th UAE record), up to two (male & female) **Namaqua Doves** from the 9-21st and 10 **Hobbys** on the 9th. An **Indian Roller** was on Das for most of the month. On the mainland a **Wood Warbler** was at Khalidiyah on the 10th, while a **Barred Warbler** made an appearance on Das the same day. A **Corncrake** was found in Abu Dhabi on the 11th, while a juvenile **Little Crake** was on Das from 12-18th. A patchily black male **Indian Koel** at Al Manhal nursery in Abu Dhabi on the 15th was probably the immature first seen there in July. In the north, a **Great Knot** was at Khor al Beidah on 16th (the first of the winter) and two **Great Reed Warblers** were at Ramtha the same day, (with one on Das Island on the 27th). A peak of three **Red-breasted Flycatchers** were on Das on the 17th, while in Abu Dhabi a **Masked Shrike** arrived at Bateen Gardens on the 17th, seemingly to overwinter. Two **Blyth's Pipits** were at Al Habab on the 18th, while two **Crag Martins** were on Das on the 20th, the same day as the first **Plain Leaf Warbler** of the season was found at the E.G.C. A **Red Turtle Dove** was found near Ras al Khaimah airport on the 21st, the 1st UAE record of this species (& 2nd for Arabia). A **Finsch's Wheatear** (c15th record) was near the E.G.C. on the 27th. A **Golden Plover** was at Khor Dubai from at least the 28th, the 5th record in recent years. A **Small Skylark** was at the Fujairah National Dairy Farm on the 30th, with a dark-phase **Honey Buzzard** reported at Mushrif Park, Dubai, (but see later) also on the 30th. On the last day of the month Khalidiyah produced a **Red-breasted Flycatcher** and two **Wood Warblers**.

NOVEMBER 1997

The month started off clear and fairly settled, with temperatures reaching 30°C, slightly above average, on the Gulf coast and 33- 35°C inland. Further storms hit the northern Emirates on the 12th and it remained unsettled as fronts passed over the country from the north-west. More heavy rain fell on the 17th and showers set in from the 23-25th, finally bringing temperatures down to a more normal 25°C, but with accompanying high humidity.

On the 1st, a **Red-breasted Flycatcher** (which stayed until the 9th) and a **Squacco Heron** were at the E.G.C., while a **Golden Plover** was found at Ramtha pools (6th recent record). A **Hypocolius** was reported at Al Jazeerah, the first record for the site. A **White-tailed Plover** was at Al Ghar on the 2nd, with two more arriving in the following days. At Kalba 12 **Indian Pond Herons** were located, with three **Caspian Plovers** nearby and 150 **Common Terns** and three late **Bridled Terns** flying southward off the beach. Further north, on the same day, two **Great Reed Warblers** were found at the Fujairah National Dairy Farm. The winter's first **Great Black-headed Gull** was at Khor Dubai on the 5th, while a **Forest Wagtail** (9th record) arrived in Abu Dhabi on the 7th (one of two birds which stayed well into April, a remarkable first overwintering record for Arabia). The Mussafah mudflats emerged as one of the country's top wader sites, with 20,000 waterfowl being counted on the 7th. including - 320 **Western Reef Herons,** 15,000 **Dunlins,** 210 **Broad-billed Sandpipers** and 120 **Terek Sandpipers.** Al Ghar lake was attracting record numbers of birds too, including 19 **Avocets** and 24 **Red-necked Phalaropes** in the early part of the month. Sixteen **Hypocolius** were at Ghantoot on the 8th, the first sign of an autumn (and winter?) build-up, along with another **Red-breasted Flycatcher** in what was becoming a record autumn for the species. Yet another **Golden Plover** was reported, this time at Khor Dubai from the 9th, where it probably overwintered, judging from a number of subsequent reports. Ten **Bimaculated Larks** were at Al Ain camel track on the 11th and 12 were at Al Wathba on the 13th. Also on the 13th, a **Little Gull** flew along the beach at Kalba (3rd record). A **Blyth's Pipit** and a **Small Skylark** were at Al Wathba on the same day. A remarkable brace of potential UAE firsts, coincidentally both occurring on the 14th, were **South Polar Skua** on Fujairah's Qurrayah mudflats and 4 short-staying **slender-billed curlews** at Al Ghar lakes. Also seen that day were 5 **Small Skylarks** at the Fujairah National Dairy Farm and two **Hume's Lesser Whitethroats** at Safa Park. Single **Goshawks** were at Hamraniyah on the 14th and Al Wathba in the week ending the 22nd (3rd & 4th records).

Five **Ruddy Shelducks**, two **Ferruginous Ducks** and a **Little Bittern** were at Ramtha on the 17th, while an exceptionally late **Golden Oriole** flew by Qarn Nazwa later the same day. A **Honey Buzzard** was in Abu Dhabi on the 20th with two from the 25th. On the 26th a **Pied Kingfisher** (the UAE's 12th) turned up at the Eastern Lagoon in Abu Dhabi again (as last winter). A count of species roosting there that evening turned up 84 **Cattle Egrets,** 2000 **Common Mynahs**, 163 **Bank Mynahs** and 20+ **Starlings.** A **Barred Warbler** was in Mushref Palace Gardens the same day.
Out-of-range arrivals included 5 **Little Green Bee-eaters** and an **Indian Roller** in the capital during the month.

DECEMBER 1997

The first few days of December gave no indication of the further stormy weather to come. After four days of clear skies with temperatures around 25°C, the skies opened up on the morning of the 5th, to give two days of heavy rain, followed by nearly three weeks of unsettled weather, accompanied by overcast skies. It was exceptionally cool on the 18th and the 24th when the temperature barely rose above 18°C. Rain fell again on the 26th and the desert then began to bloom.

An active day by the country's birders on the 2nd (National Day) turned up the season's first **Greylag Goose** at Ramtha (last seen on 2nd February), a **Lanner Falcon** and 40 **Lesser Short-toed Larks** at Khor al Beidah and the UAE's 2nd **Calandra Lark** at the race track in Abu Dhabi, where it remained until the 18th. The UAE's 3rd **Red-breasted Merganser** was discovered in the channel off Al Rifaa at Umm al Qaiwain on the 7th. On the same day a **White-breasted Waterhen** (6th record) was found at the E.G.C., where it stayed until early April. Waterfowl occurred in exceptional numbers at Al Ghar lake, with, on the 7th: 204 **Black-necked Grebes**, 6 **Shelduck**, 34 **Pochard,** 210 **Shoveler,** 6 **White-tailed Plovers** and 26 **Marsh Sandpipers** being worthy of mention. Nearby Al Wathba camel racetrack had its first two **Northern Lapwings** of the season on the same day, at least one of which stayed until 28th January. The next surprise was a **White-eyed Buzzard** at Nadd al Sheba on the 8th & 9th. Believed at first to be a genuine wild bird, it later proved to be an escape. Meanwhile on the East Coast a **European Nightjar** was discovered on Kalba beach on the 8th. A **Black-shouldered Kite** (6th record) was seen near Umm al Qaiwain on the 10th. Some 32 **Great Knot** were at Khor al Beidah on the 12th, the same day a second **Forest Wagtail** turned up in Abu Dhabi (11th record) and two **Common Cranes** (8th record) arrived at the Al Ain camel racetrack. A **Black Drongo** was reported from Khor Kalba on the 12th (4th record), while two **Moustached Warblers** were at Ain al Faydah on the 13th (9th record). Two **Merlins** were reported in the same week; at Al Ghar Lake on the 14th and at Khor Fakkan on 14 or 15th. A **Little Pratincole** (8th record) was at the E.G.C. from the 16th, remaining a star attraction until 3rd February. For 'splitters', five **'Siberian' Stonechats** and four **'Steppe' Grey Shrikes**

were at Al Wathba on the 17th with, next day, Al Ghar lake sporting its first ever **Ferruginous Duck.** Another **White-breasted Waterhen** (7th record) turned up, in Safa Park this-time, on the 24th, with a **Namaqua Dove** (<20 records) being seen on wires near Dhaid. The month ended with more surprises -another **Black-shouldered Kite** (7th record) at the Fujairah National Dairy Farm on the 29th, which stayed at least until the 4th January and a **Buff-bellied Pipit** (no accepted records yet) there on the same day.

JANUARY 1998

January was a very unsettled month. The year broke with heavy rain on the 3rd, followed by more unsettled conditions until the 5th. Cooler weather followed, with temperatures remaining around the 20°C mark for a further 3 weeks. There were days of cool north-westerly winds when afternoon temperatures barely reached 17°C. It became more settled from the 17th, with clear skies raising daytime temperatures to 24°C. Further heavy rainfall was experienced throughout the country from 25-28th. A *shamal* blew on the 29th, bringing temperatures down once more until the end of the month.

It was a lean month for the country's big puller, **Hypocolius,** with a maximum of only four found at Ghantoot on any visit, starting from New Year's Day. Also on this day, 104 **Cattle Egrets** were at the Eastern Lagoon, while in Bateen Gardens a **Rufous Bush Chat** was an unusual winter record (still there on 18th). A **Crested Honey Buzzard** was reported at Mushrif Park on the 2nd. Though unsubstantiated at the time, two birds were subsequently found there in March, having presumably overwintered, making this the 4th UAE record. A **Slavonian Grebe**, another first for the UAE, was found at the E.G.C. on the 2nd, disappointingly vanishing overnight. Khalidiyah spit turned up an **Orphean Warbler** and a **Scarlet Rosefinch** on the 4th, good winter records, especially with the long-staying **Forest Wagtails** to enjoy nearby. Also on the 4th, seven **Ruddy Shelducks** were noted at Ramtha, a record number. Back at the Eastern Lagoon the following day, 1,800 **Common Mynahs** (a potential nuisance alien) came in to roost. On the 6th an **Egyptian Nightjar** was found at Ain al Faydah, with three **Ferruginous Ducks** discovered there the next day. **Blyth's Pipits** were reported on most visits to Al Wathba camel track (2 on the 7th and 3 on the 16th) as were **Small Skylarks** (3 on the 16th). A peak of three **Eastern Pied Wheatears** were found at Qarn Nazwa on the 8th and the **Pied Kingfisher** continued to delight at the Eastern Corniche through the month. Two **Scarlet Rosefinches** were on Qarnein island on the 12th, with the breeding population of **Red-billed Tropicbirds** stable. After the oil spill at Umm al Qaiwain, it was a pleasant surprise to find some species in record numbers, with 250 **Greater Sand Plovers** on the beach (just above the oil line) and 842 **Greater Flamingos** and 49 **Great Knot** at Khor al Beidah. A **Wire-tailed Swallow** (2nd UAE record) was found at the E.G.C. on the 14th, where it stayed (in the company of two other vagrants, **Little Pratincole** and **White-breasted Waterhen**) for several weeks! A record 239 **Black-necked Grebes** were at Al Ghar Lake on the 16th, along with 20 **Avocets,** 3 **White-tailed Plovers** and 10 **Red-necked Phalaropes.** An early **Cuckoo** was seen on the plain near Wadi Bih on the 16th. Another rarity turned up on the 17th, a **White-breasted Kingfisher** (4th record) at Dhayah, seen again only once, on the 23rd. A **Ruddy Shelduck** was at the E.G.C. on the 26th, a **Namaqua Dove** was seen on wires near Dhaid on the 24th, while northbound migration was heralded by four **Northern Wheatears** at Liwa on the 29th.

The Asian Waterfowl Census took place this month, helped by over 15 observers, and was the most thorough ever. 27 sites were surveyed, revealing a grand total of 117,783 birds. Mussafah has taken over this year as the country's top wetland site, with 29,078 birds counted, of which 16,949 were Palearctic shorebirds. A sample of what was seen country-wide: 4388 **Kentish Plovers,** 6160 **Lesser Sand Plovers,** 8330 **Dunlins** and 6485 **Redshanks,** plus huge gull numbers: 19,200 **Black-headed Gulls** and 27,613 **Yellow-legged Gulls.** This was a great team effort - with sincere thanks going to all who contributed.

FEBRUARY 1998

As January ended, so February started off, cool and calm, with near average temperatures (22-25°C). South winds blew from the 8th, raising temperatures to 30+°C, followed by very cool (20°C) and severe *shamal* conditions from 12-14th although no measurable rain was recorded. It was ideal birding weather from 21- 23rd, after which rain showers broke the calm, and particularly cool and dry conditions prevailed to the month end.

Interesting reports at the beginning of the month included three **Shelducks** at Khor Dubai on the 2nd, a **Stone Curlew** and a **White-tailed Plover** at Dhayah and a wintering **Black Kite** at Rams dump all on the 3rd. Also on the 3rd, a respectable 17 **Bimaculated Larks** were counted at Al Wathba camel track, plus 25 **Red-throated Pipits** and the usual selection of other pipits, larks and wheatears. A pair of **Long-billed Pipits** was displaying at Qarn Nazwa on the 2nd. with a *capistrata* race **Eastern Pied Wheatear** reported at the same site. A **Robin** was in Safa Park on the 5th, a **Little Green Bee-eater** at Al Wathba on the 6th, unusual so far south, and a **Ferruginous Duck** and a **Water Rail** at Al Ghar on the 6th. On the same day two **Siskins** flew over Bateen Gardens. Competing for rarity of the month prize were a **Wire-tailed Swallow** at Al Ain on 7th (3rd record) and the **Brown Booby** which passed Ras Diba on the 9th (4th record). A **Manchurian Red-footed Falcon** (2nd record) was claimed by visiting birders in Abu Dhabi on the 11th. A **Sociable Plover** was on the shoreline at Khor al Beidah on the 12th. with a second individual at Kalba (11 & 12th records) and a **Long-toed Stint** at Umm an Nar G.C. also on the 12th (13th record). A **Lappet-faced Vulture** was over Hatta lake (all UAE records of this species are of great interest) and a **Moustached Warbler** (9th record) was in the Dhayah mangroves, both on the 13th. On the same day a third **Forest Wagtail** was claimed in Abu Dhabi. Details are awaited of a **Red Knot** at Umm al Qaiwain on the 14th with possibly another on the 23rd (5th and 6th records). Up to two **Honey Buzzards** were seen over Abu Dhabi from 13-15th. Noteworthy records from Ras al Khaimah were 85 **Great Black-headed Gulls** at Rams and an immature **Imperial Eagle** and 10 early **Pale Rock Sparrows** near the airport on the 18th. On Das Island a **Yellow-browed Warbler** of the nominate race *inornatus* was present from the 19th (1st or 2nd record). Three **Common Cranes** (up from two on 12th December) were at Al Ain camel track from the 23rd (staying until at least the 8th March). Another **Ruddy Shelduck** was at the E.G.C. on the 24th, with a **Crested Honey Buzzard** reported over the Eastern Lagoon on the 26th (5th record) and nine **Hypocolius** at the Al Ain camel track on the 27th. Three **Small Skylarks** were at Al Habab on the 28th.

MARCH 1998

Extreme weather was experienced again in March, with a very hot 30°C south wind on the 1st, in advance of a very cold, wet and stormy day on the 2nd (this had the advantage of at last bringing in a fall of migrants!). It was calm and fairly cool (c22°C) with occasional overcast skies until the 7th, but rain came again on the 8th and unsettled weather continued, with blustery conditions on the 10-11th, 18th and 27th. It became hot on several days, reaching 35°C on the 18th and a record 39°C on the 27th. A southerly air stream started up on the 30th which boded well for spring migrants.

The month saw a selection of quality rarities appearing. A **Little Gull** was at Umm al Qaiwain rubbish dump on 8-9th (3rd or 4th record), with a **Mediterranean Gull** (c5th record) on Sir Bani Yas island, also on the 8th. A **Bay-backed Shrike** was at Dibba on the 11th (7th record) and later in the day a **Black-shouldered Kite** was found at Hamraniyah (8th record) while the next day two **Crested Honey Buzzards** were finally confirmed in Dubai, at Mushrif Park, after several unconfirmed reports throughout the winter (c.5th record). A first ever **Dusky Thrush**, reported second hand (by Norwegian birders) in Safa Park in December 1997 was finally confirmed by German birders on the 12th. It remained until at least the 24th. Two **Short-eared Owls** were seen flying over Khor Dubai on the 15th and a **Woodpigeon** at the Dubai Creek Park from the 16-19th, was only the country's 4th record. In Abu Dhabi, a **Hume's Yellow-browed Warbler** was on Khalidiyah spit from the 19-29th.

In addition to our regular contributors, the following visiting birdwatchers and groups submitted sightings and rarity reports: Bjorn Arvidsson, Ralf Aumueller, *Avifauna, Avian Adventures, BirdQuest,* Hans Bister, David Cottridge, Peter Clements, Adrian Dally, Alan Dean, Hanne and Jens Eriksen, Phil Hansbro, Andrew Harrop, Simon Harrop, Daniel Kratzer, *Naturetrek, Ornitholidays,* David Rosair, Dave Sargeant, Derek Scott, Chris and Tilde Stuart, Magnus Ullman and Steve Young.

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Mammal Report

The editorial board has decided to reinstate the mammal report and will act as a clearing house for records received, thereby ensuring a. that valuable records are documented and b. that they can be passed to the appropriate national organisations concerned with environmental research and conservation matters.

ENHG members are a major source of information on the wildlife of the UAE and adjacent areas of Oman and it is hoped that now there will be a place to store them, records will come flooding in. Reptile records will be gratefully received too.

Please try to record the exact position of your observation, (if you possess a GPS please take down the coordinates). If this is not possible, even a general area would do. Otherwise other than the date, identity and numbers of animals seen, only the observer's name and contact numbers are required, although any details of e.g. behaviour could be valuable.

During the winter period fieldwork is possible in remote areas and was pleasing to hear therefore of yet another sighting of **Arabian Tahr** *Hemitragus jayakari*. For security reasons the exact site is not being revealed at present, although we can tell you it was a new area, away from an earlier sighting made in Fujairah, also by the Arabian Leopard Trust.

Unfortunately a survey on Jebel Hafit by Chris & Tilde Stuart and Moaz Sawaf, on behalf of ENHG (on a specially commissioned survey funded by ADCO) failed to find any sign of this animal, despite a sighting there just over a year ago, the first sighting on the mountain since 1983 (as reported in *Tribulus* 7.1). However, the team did record **Blanford's Fox** *Vulpes cana* (one being trapped) as well as **Red Fox** *Vulpes vulpes*, and **Brandt's Hedgehog** *Paraechinus hypomelas* and (**Egyptian**) **Spiny Mouse** *Acomys cahirinus*. The last named was found first on the mountain only just over a year ago by ecologists employed by ERWDA. It seems that both **Blanford's Fox** and **Spiny Mouse** are quite widely distributed throughout the Hajar so their presence on Jebel Hafit whilst not coming as a complete surprise was good to confirm. Interestingly, a further record of the latter concerned a recently mummfied individual found on Jebel Bu Hays, Sharjah in March.

A **Blanford's Fox** as reported dead by the roadside near Masafi in January, with a **Gordon's Wildcat** *Felis sylvestris gordoni*, also a casualty, near Tayyibah on 21/2.

Other records of predators are very few, although **Caracal lynx** *Felis caracal schmitzi* did feature in the news during the period. A pest individual was tracked and trapped alive in Ras Al Khaimah, after local people reported losing their goats, its picture duly appearing in *Al Khaleej* in February. One young man claimed, along with his four brothers, to have killed 15 **caracal** in the immediate area (the environs of Wadi Bih) during the past four years.

Several **White-tailed Mongoose** *Ichneumia albicauda* were captured near Siji for the Sharjah Breeding Centre (see page 32). These will be released once they have bred and several litters have been raised. This animal is rarely sighted in the UAE and is classified as nationally endangered (*Tribulus* 6.1:13-14).

The distribution of even our commonest hedgehog, the **Ethiopian Hedgehog** *Paraechinus aethiopicus* remains quite poorly mapped and all records should be submitted. A single individual was sighted at the entrance to Wadi Bih on 20/2, where there is perhaps some overlap with the more montane-dwelling **Brandt's Hedgehog**. The two species can be told apart with ease: the latter is larger and darker overall with only the insides of its ears pale, whereas **Ethiopian Hedgehog** has a pale underside, with spines that are light at both their tips and bases.

Finally, a group of 30+ **Bottle-nosed Dolphins** *Tursiops truncatus* including young moved slowly northwards past Ras Dibba on 21/2 and a long dead **Bryde's Whale** *Balaenoptera edeni* was found beached at Taweela near the end of March (*Emirates News* 29/3/98).

Please send any mammal or reptile records to: ENHG, P.O. Box 2380, Abu Dhabi.

ENHG Meetings - Oct. '97 to March '98

1997	7 October	:	Archaeology Discoveries in Abu Dhabi, by Peter Hellyer
	21 October	:	History of Oil in the UAE, by David Heard
	28 October	:	Natural History Quiz (at The Club), by Simon Aspinall
	4 November	:	Traditional Uses of Plants, by Marijcke Jongbloed
	18 November	:	The Year of the Reef, by Jorgen Grotsch
	9 December	:	Ancient Marine Trade with the Arabian Gulf, by Dr. Tatsuo Sasaki
	16 December	:	A Journey through the Universe, by Sakher Saif
1998	6 January	:	Wild South Africa, by Steve James
	20 January	:	ICARDA - Sustainable Agriculture Development, by John Peacock
	3 February	:	Recent Excavations at Tel Abraq, Sharjah/UAQ, by Professor Dan Potts
	17 February	:	AGM. Around the World in Eighty Slides, by Simon Aspinall
	3 March	:	Fish in UAE - Over the Last 4000 Years, by Mark Beech
	17 March	:	Raptors and Waders, by Mark Rafish

تريبيلوس

جمعية الإمارات للتاريخ الطبيعي

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