Domestication, Rehabilitation and Disease: Challenges for Houbara Bustard Projects in the Middle East

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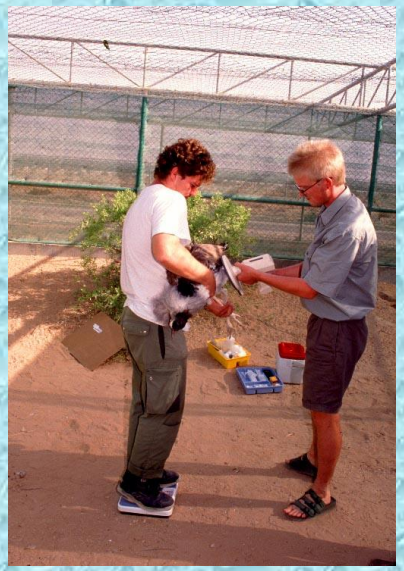
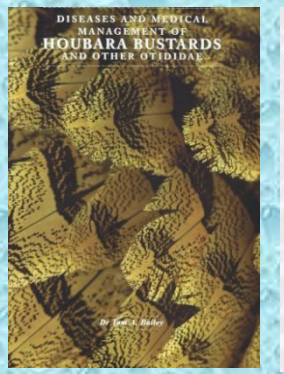
Who am I?

- Head of Aviculture and Health, International Wildlife Consultants, Wales.
  - Falcon & Wildlife Veterinarian, Dubai Falcon Hospital.
  - Worked on wildlife projects in Zimbabwe, Hawaii, Mauritius, Mongolia, Pakistan, UAE & UK.
  - Established vet department at National Avian Research Center (1993) & Abu Dhabi Falcon Hospital (1999)
  - Published scientific papers on wildlife health & conservation & a book on bustard medicine.
  - Editor of ***Falco*** & WME News newsletters.





Wildlife Middle East News - A New Initiative To Raise The Awareness Of Environmental And Conservation Issues Affecting Wildlife In The Middle East

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Summary

There are great pressures on the environment and wildlife throughout the Middle East. The rapid pace of economic development, the fragility of the natural ecosystems and low population densities are factors making many indigenous species vulnerable to extinction. The authors describe an information newsletter they have established in the Middle East which is contributing to the development of a network between zoo and wildlife professionals working in the Middle East and aims to be the premier source of regional information on zoo and wildlife management, husbandry and care.




Introduction

Wildlife Middle East News is a high quality information resource on the wildlife and environment of the Middle East and surrounding region. Our printed newsletter and on-line resources are not only available for professionals working with wildlife, they are for anyone who is interested in or concerned about the wildlife and environment of the Middle East. We believe that our newsletter will contribute to the development of a network between wildlife professionals and enthusiasts throughout the Middle East region.

Objectives of Wildlife Middle East News:

- **Raise awareness of environmental and conservation issues affecting wildlife in the Middle East.**
- **Distribute information to enable better management and welfare of wildlife.**
- **Provide a central contact point for practical advice and information on wildlife management in the region.**

When Was Wildlife Middle East News Established?

In March 2006 after attending a regional conservation workshop it became apparent to the four editors that there was a real and urgent need for an independent source of technical information on wildlife management in the Middle East. It was also clear that any information should be distributed in Arabic and English.

Why Was Wildlife Middle East News Established?

We want to show that it is possible for people with an interest and passion for wildlife to make a small difference, even in their spare time. In so many countries it is often grassroots organisations that make a real difference with respect to social and environmental issues. This is because the power of human enthusiasm is such an important, but often overlooked resource. The danger of waiting for government agencies to 'do something' is that we could still be waiting long after the wildlife has disappeared from the deserts of the Arabian peninsula.

Images showing recent newspaper headlines in the UAE, a leopard skin on sale (Yemen), a lion dying of a preventable viral disease in a regional zoo, a pile of dead smuggled houbara bustards, and an oil tanker and oiled cormorant.

What Issues Affect Wildlife In The Middle East (1) ?

There are great pressures on the environment and wildlife throughout the Middle East. The rapid pace of economic development, the fragility of the natural ecosystems and low population densities are factors making many indigenous species vulnerable to extinction. The expansion of human populations and the increasing contact between domestic and wild animals has also increased disease transmission between wild and domestic species, including humans. Some governments have recognized the need to tackle these conservation issues and over the last 10-15 years a number of projects working with both captive and free-living wildlife have been established in the region. In addition to these publicly funded projects there are many privately funded zoological collections, large commercial breeding projects for falcons and houbara bustards and an ever-increasing number of 'exotic' animals kept as pets by the rapidly expanding population of the region.

What Issues Affect Wildlife In The Middle East (2) ?

The Middle East also has great importance as a migration route and wintering area for a large proportion of northern Palearctic birds. In this sensitive area, habitat degradation, oil spills, pesticide use, and infectious disease outbreaks have the potential to cause immense impacts on free-living and captive wildlife populations. In some cases wildlife species, e.g. waterfowl, may carry diseases such as the highly pathogenic avian influenza virus that can cause great economic impact to domestic poultry industries, cause disease in other birds such as falcons, as well as being highly dangerous to humans. There are a number of factors that hinder the ability of the veterinarians, biologists and wildlife managers working in the region to improve the care and husbandry of the species that they look after. Some factors are presented in Table 1.

Table 1. Factors hindering the husbandry and care of wildlife in the Middle East.

1. No easily available sources of practical and relevant information on the husbandry, capture and handling techniques, preventive medicine and nutrition for many species that is relevant to the region.
2. Poor communication and interaction between organizations and personnel such as wildlife managers and veterinary professionals working in the region.
3. Insufficient regional training opportunities for veterinarians and wildlife managers who are often working in isolated situations in a specialist field.
4. Poor awareness of wildlife management and health issues by regional government departments and agencies charged with the management of reserves and captive collections.
5. No central contact point for advice, references, recruitment, equipment and food sourcing.



About Wildlife Middle East News

Wildlife Middle East News is produced as a dual language (English-Arabic) quality newsletter and is published quarterly. Wildlife Middle East News contains papers, reports, letters and announcements submitted by veterinarians, biologists, and other animal care professionals working with captive and free-living wildlife in the Middle East region. The newsletter is distributed to biology departments and libraries of institutes of higher education, agricultural and environmental agencies, conservation groups, wildlife projects, zoos, zoologists, vets working with wild animals, vet hospitals involved in wildlife medicine, municipality vets, and pet shops. A PDF format newsletter is e-mailed to a wider circulation of interested readers within and beyond the region. We have a circulation of over 6,000 individuals and institutions in the region and throughout the world.

Where to Find us on the World-Wide-Web

A WME News website (www.wmenews.com) has been developed where previous issues of the newsletter and technical resources and information can be downloaded.

Contact Us and Contribute to Wildlife Middle East News

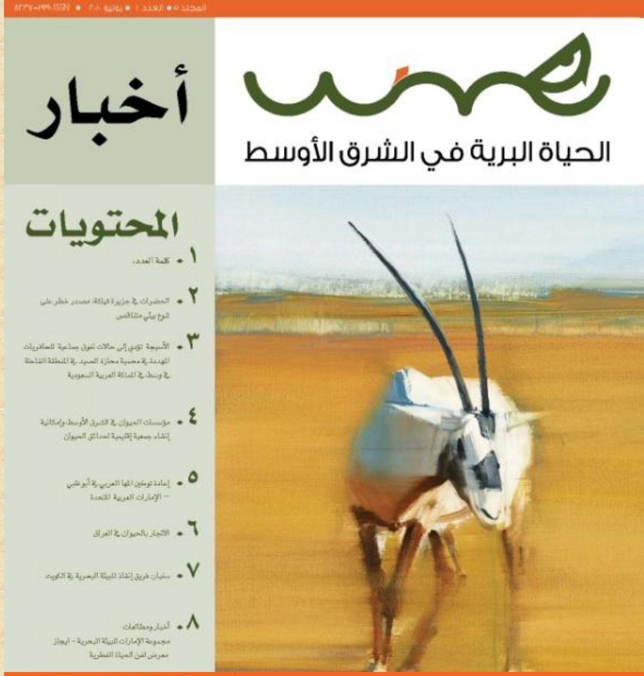
We are interested to hear from individuals, institutions, zoos and conservation projects working with wildlife within the Middle East region or with wildlife species from the Middle East managed outside the region. Newsletter article categories are listed in Table 2. To request further information from the editors contact us at: http://www.wmenews.com and Editors@wmenews.com.

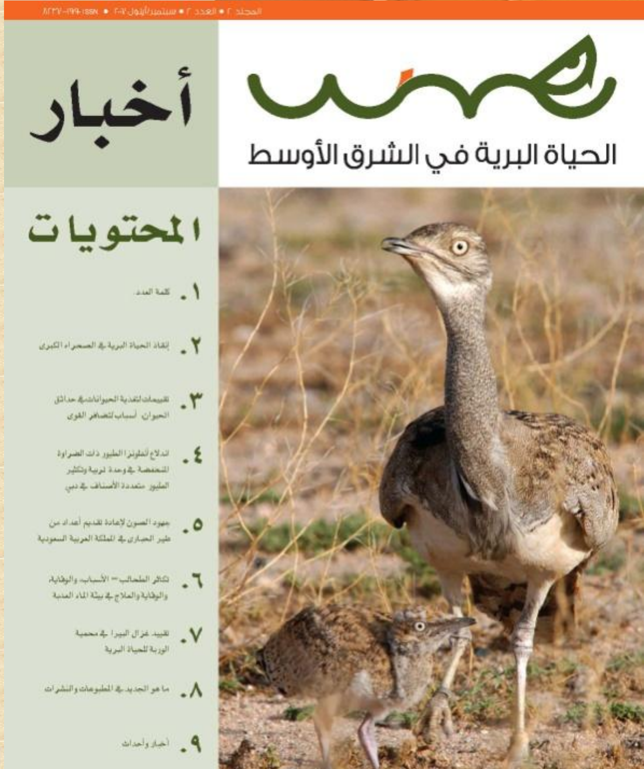
Table 2. Wildlife Middle East News article categories.

- Conservation education & environmental awareness.
- Husbandry & nutrition.
- Design of zoological facilities.
- Capture and translocation techniques.
- Wildlife diseases and preventive medicine.
- Products, book reviews & research.
- Summaries of recent literature on Arabian animals.
- Letters, news and events.

Who sponsors Wildlife Middle East News?

Our cover sponsor who supports the translation, printing and distribution of the newsletter is RAKBank. Wadi Al Safa Wildlife Centre and Dubai Falcon Hospital have supported the development of this website.





The Houbara Bustard

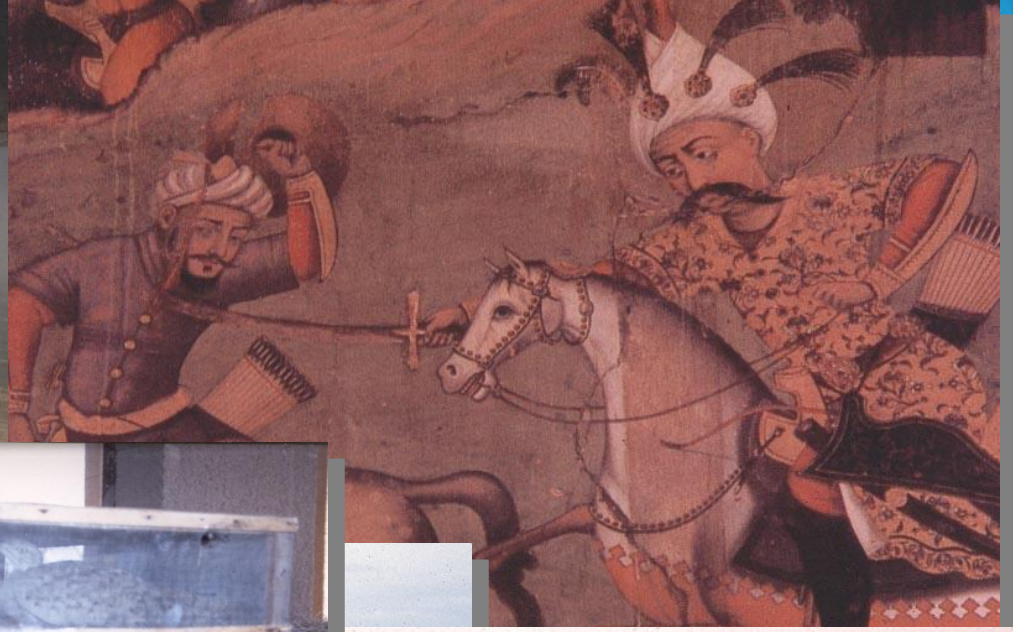
- Previously considered 3 distinct subspecies:
  - *Chlamydotis undulata fuertaventurae*
  - *C. u. undulata* (N. African subspecies)
  - *C. u. macqueenii* (Asian subspecies)

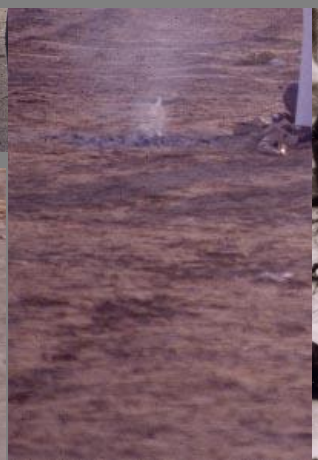
Asian species:

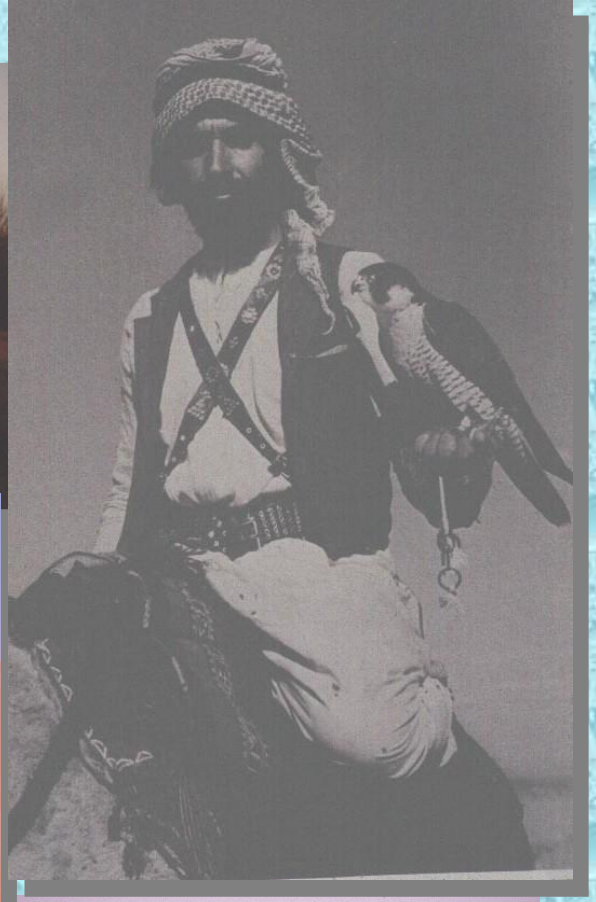
Migratory.
Breeds in central Asia, China.
Overwinters from Pakistan to Arabia.
Some overlap with local breeding populations.
Wintering birds quarry for traditional Arab falconry.

North Africa species:

Morocco, Algeria, Tunisia, Egypt.
Non-migratory, short-range movements in response to food supply and rainfall.
Quarry for Arab falconry in winter months.








PATROL
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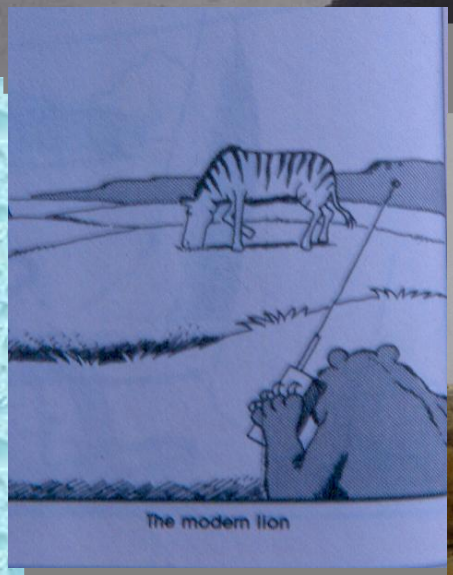
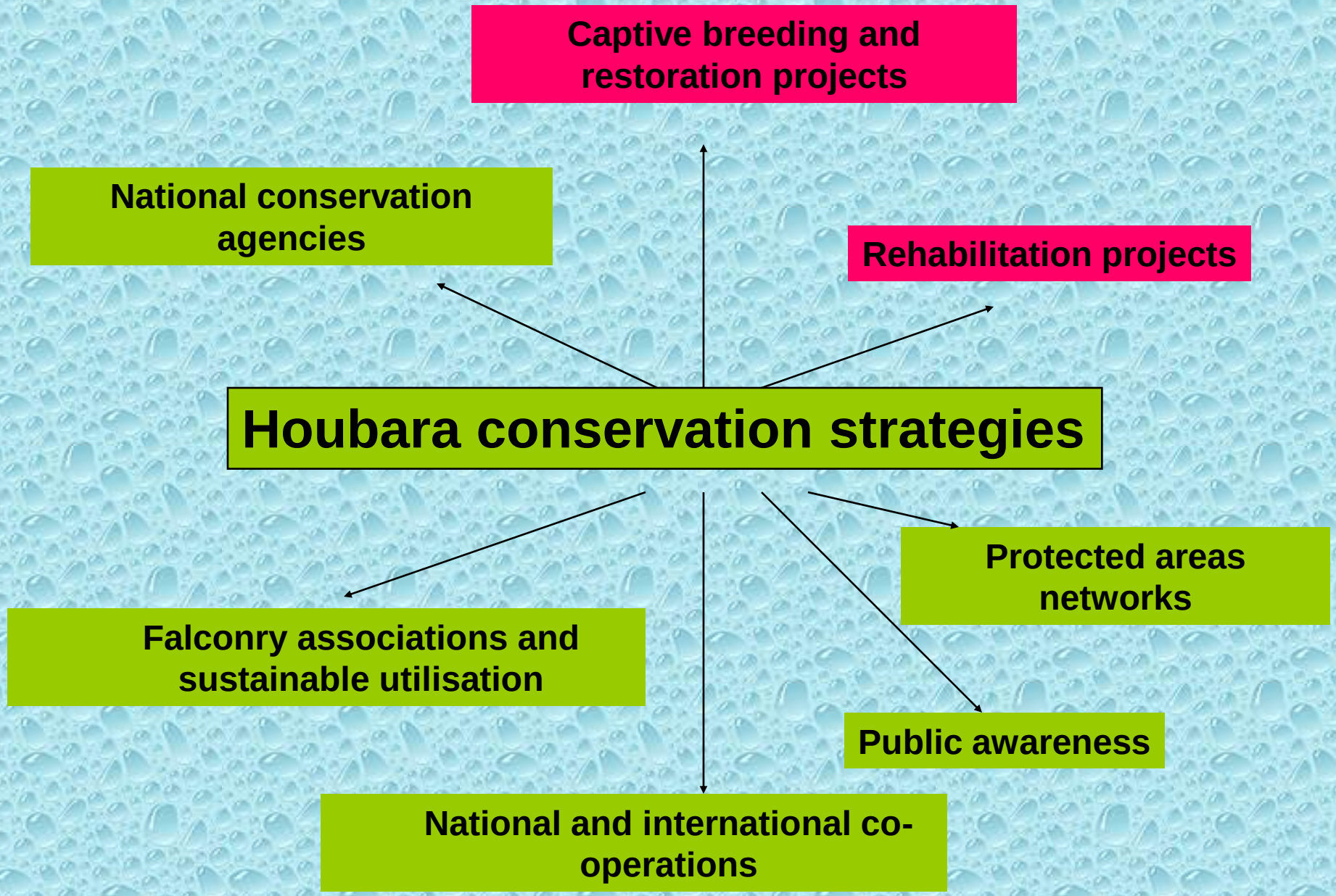

The modern lion


Captive breeding and restoration projects
National conservation agencies
Rehabilitation projects
Houbara conservation strategies
Protected areas networks
Falconry associations and sustainable utilisation
Public awareness
National and international co-operations

Houbara Bustard Breeding Projects in the Middle East and N. Africa

The Emirates Center for Wildlife Propagation, Morocco.

The International Foundation for Conservation and Development of Wildlife, Morocco.

The National Wildlife Research Center, KSA.

National Avian Research Center, UAE.

The Houbara Center, Dubai, UAE.

- Objectives of houbara breeding programmes are to produce a surplus of birds to be:

- 1) Used by falconers to train falcons.
- 2) Released into hunting areas as part of ‘put and take’ falconry activities.
- 3) Released to reinforce wild populations of houbara.

ubara Breeding Centre-Kazakhstan

ubara Breeding Centre (Abu Dhabi)

Houbara Bustard Rehabilitation Projects

The UAE and Pakistan initiated programmes for confiscated houbara in the 1990's.

Attempts were made to release these birds and re-integrate them with free-living populations.

Airlines urged to adhere to rules on carrying animals

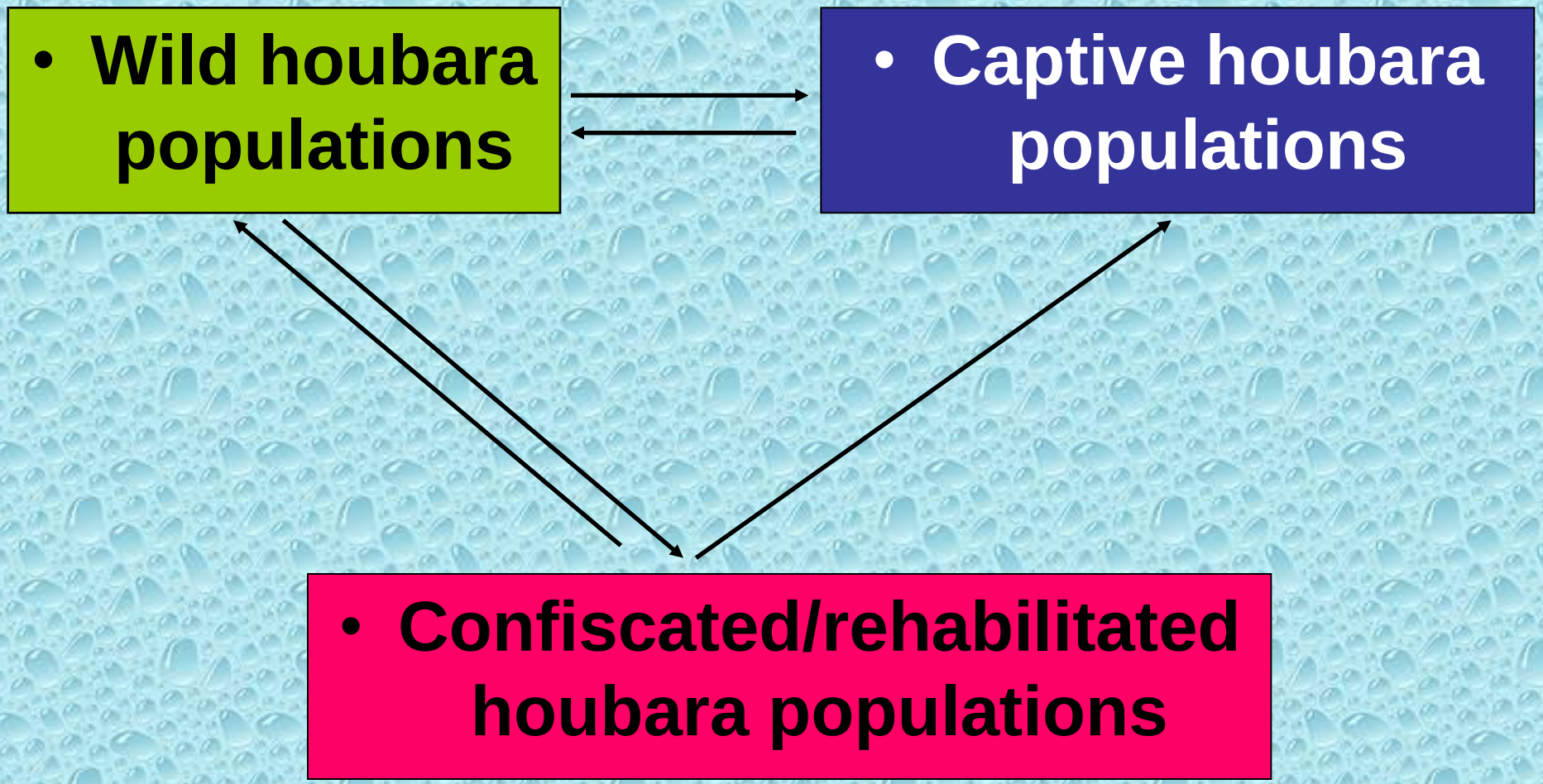
By a staff reporter

TWO demoiselle cranes, listed

Fisheries, according to Ministerial Decision No. 93 of 2001 on the

were passed on to the National Avian Research Centre (NARC) of ERWDA, as it was the official

Health Concerns



Addressing Health Concerns

- The larger houbara projects have started to address health issues by initiating veterinary programmes and following IUCN guidelines including;

1) Investigating the health of wild populations.

2) Considering health when founder stock are selected.

3) Managing the health of stock during the breeding programme.

4) Health screening during the release stages.

Presentation Objectives

The purpose of this presentation is to review health surveys conducted in the region on:

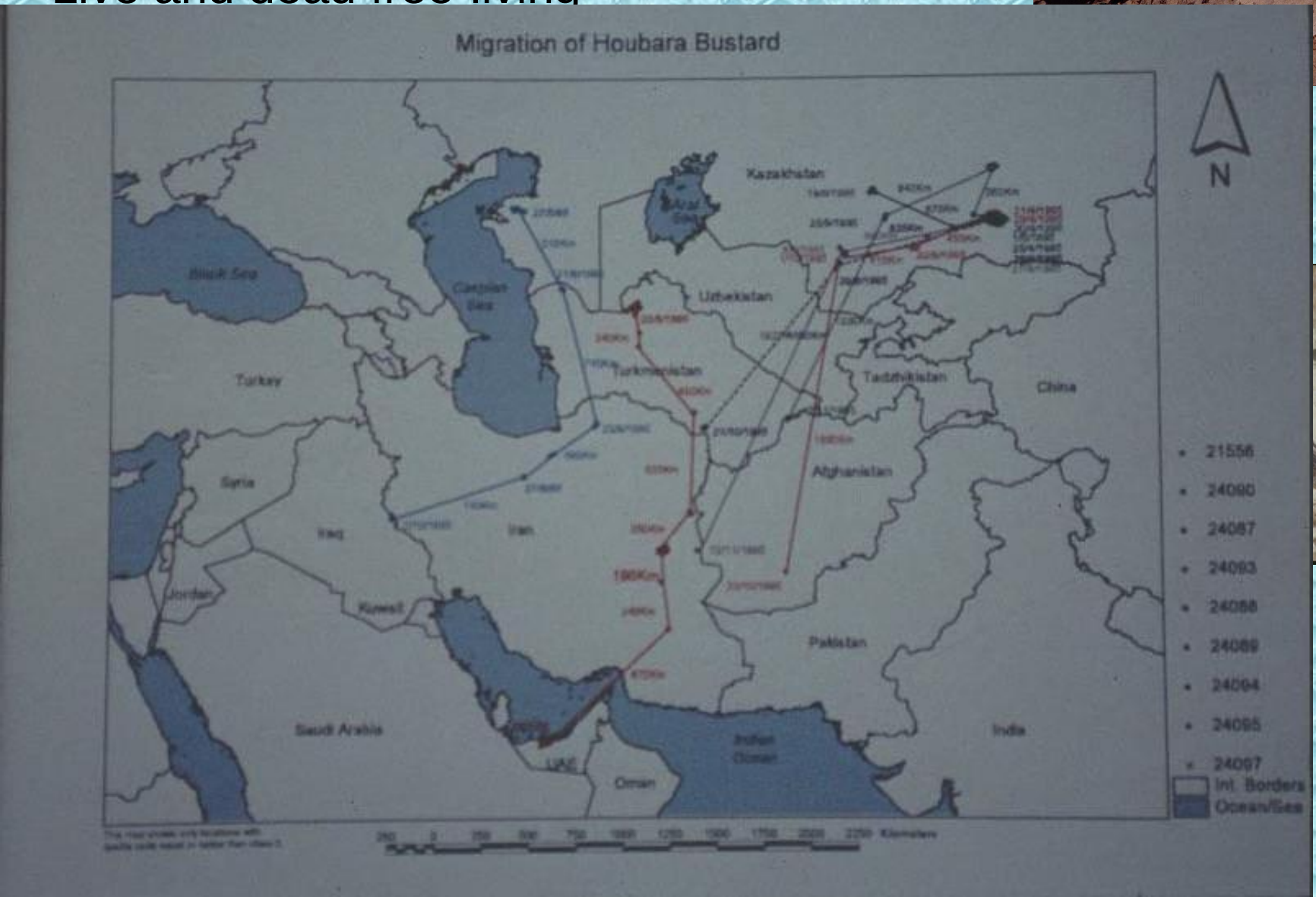
- 1) Free-living houbara.
- 2) Rehabilitated houbara.
- 3) Captive houbara bustards.

- In the context of this information the health challenges posed by domestication are assessed.

- Veterinary recommendations for what has become a new regional industry, houbara bustard farming, are presented.

Free-Living Bustards

Live and dead free-living



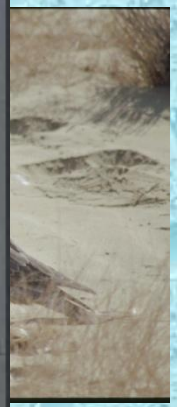
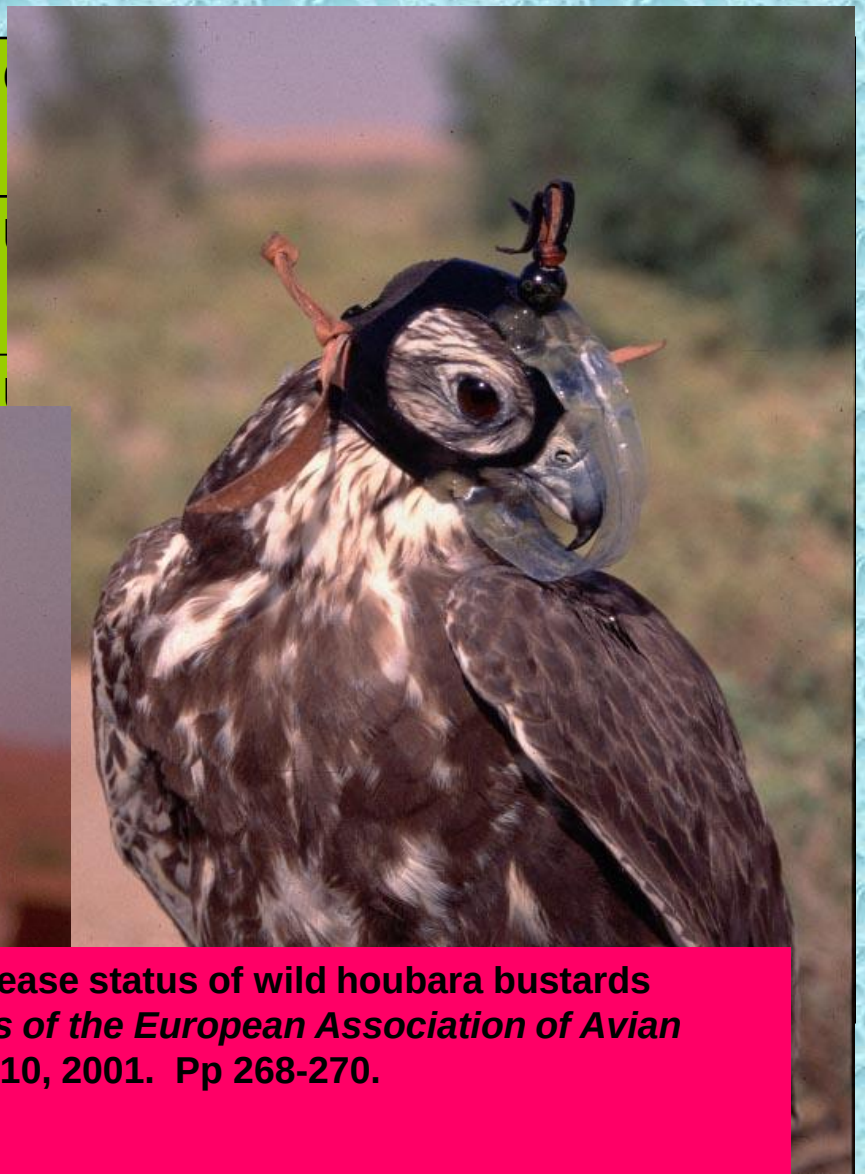


Table 1. Information (sample population, capture date, number, location, capture method) on free-living houbara bustards from which health monitoring samples were obtained. [* Wernery et al 2001a]

Sample population	Capture date	No.	
Wintering grounds	1993 to 1997	16	
Wintering	1996	5	



***Wernery, U., Molnar, L., & Hunt, K. 2001a. Disease status of wild houbara bustards (*Chlamydotis undulata macqueenii*). *Proceedings of the European Association of Avian Veterinarians.* Munich, March 6-10, 2001. Pp 268-270.**

Table 2. Serology and virus isolation results from live and dead free-living houbara bustards.

Disease or organism	Country	Age	Live or dead	Analysis	No.	No. positive (%)
PMV-1	UAE	Ad	Live	Ab	6	1 (16.6)
PMV-1	China	Ad + Ch	Live	Ab	16	0
PMV-1	Pakistan	Ad	Dead	Ab	11	0
PMV-1	Pakistan	Ad	Dead	Ab	27	0
Avipox	UAE	Ad	Live	Ab	6	1 (16.6)
Houbara pox	China	Ad + Ch	Live	Ab	16	0
Chlamydophila sp.	China	Ad + Ch	Live	PCR	43	0
Chlamydophila sp.	China	Ad +Ch	Live	Ag in field	13	0
Chlamydophila sp.	China	Ad +Ch	Live	Ab ELISA	22	2 (9.1)
Chlamydophila sp.	Pakistan	Ad	Dead	Ag ELISA	13	2* (15.4)

Free-Living Bustards

- Houbara from UAE, China and Pakistan seronegative for:
  - PMV-2
  - PMV-3
  - Infectious bronchitis
  - Avian pneumovirus
  - Avian influenza virus
  - Reovirus
  - Adenovirus

  - Additionally viruses were not isolated from cloacal, choanal or feather samples

Free-Living Bustards

Low prevalence of PMV-1 and pox antibodies in birds captured in the UAE could indicate:

1. Low level of natural exposure to these diseases.
2. Or that the birds were not really wild?
    1. Previously captured and released for hunting, or rehabilitated and released birds.

- The prevalence of free-living houbara bustards seropositive (China 2/22) and ELISA Ag + (Pakistan 2/13) to *Chlamydophila* sp. is low.
- ELISA Ag test may not be reliable?
- All samples (43) from China submitted for *Chlamydophila* PCR were negative.

Free-Living Bustards

The data indicates that wild houbara do not represent a virus reservoir for domestic birds:

1. This is probably a result of the biology and behaviour of the species:
    1. Houbara are a migratory species, inhabiting arid lands with a rainfall <200mm/year.
    2. Adults birds of both sexes tend to be solitary during the breeding season and during migration adults and subadults form small flocks (<10).
    – Thus, wild houbara do not normally tend to come into direct contact with other avian species or significant numbers of other houbara and the chances of disease transmission are low.

- It may be useful to add influenza virus, *Mycoplasma* sp and *Salmonella* sp. to future serological surveys of houbara.

The Houbara Trade

- Illegal trade in free-living houbara bustards
- Trapped in Pakistan, Iran, Afganistan, Uzbekistan (?)
- Exported to Middle East (plane, dhow)
- Used as ‘bagged’ quarry to train falcons
- 4-7,000 birds traded from Pakistan annually
- ? traded from other countries

Rehabilitated Bustards

- Reviewed of health status of 596 live and 179 dead confiscated houbara between 1992 and 1999.
- Reviewed mortality for 9 imported flocks of houbara (586) and for 2,900 birds from a rehabilitation centre in Pakistan, where multiple flocks were admitted from 2001.

Bailey, T.A., Silvanose, C.D., Naldo J., Combreau, O., Launay, F., Wernery, U., Kinne, J., Gough, R., & Manvell, R. 2000. Health considerations of the rehabilitation of illegally traded houbara bustards *Chlamydotis undulata macqueenii* in the Middle East. *Oryx*. 34: 325-334.

Table 3. Results of health monitoring on live and dead smuggled houbara bustards.

Disease or organism	Live or Dead	Analysis	No. tested	No. positive (%)
Chlamydophila sp.	Live	ELISA swab	194	49 (25.3)
Chlamydophila sp.	Live	ELISA serum	132	67 (50.8)
Salmonella	Dead	Cloacal swab	41	11 (26.8)
Salmonella	Live	Cloacal swab	93	2 (2.2)
Aspergillosis	Dead	PME	163	55 (33.7)
Paramyxovirus 1	Live + dead	Virus isolation	121	5 (4.1)
Paramyxovirus 1	Live	HI serum	270	151 (55.9)
Paramyxovirus 2	Live	HI serum	126	5 (3.9)
Paramyxovirus 3	Live	HI serum	126	0 (0)
Avian pox	Live	Clinical exam	585	139 (23.7)
Avian pox	Dead	PME	161	19 (11.8)
Avian pox	Live	AGP serum	146	11 (7.5)
Avian pneumovirus	Live	ELISA serum	24	0 (0)
Avian reovirus	Live + dead	Virus isolation*	Nd	Nd
Avian adenovirus	Dead	Virus isolation*	Nd	Nd
Endoparasites	Dead	PME	93	34 (36.5)

*reovirus and adenovirus were isolated from pooled samples submitted for virological screening from two flocks of birds in 1999, but no data exists on the prevalence in individual birds.

Table 4. Known causes of mortality of smuggled houbara bustard flocks in the Middle East and Pakistan.

Year	Country	No. birds	% mortality	Cause
1986	UAE	30	100	PMV-1
1993	Bahrain	123	100	Avian pox
1993	UAE	36	33	PMV-1
1994	UAE	22	77	Aspergillosis
1995	UAE	200	50	PMV-1
1996	Pakistan	1,400	25	Multiple
1997	Pakistan	1,500	22	Multiple
1998	UAE	34	59	Avian pox
1998	UAE	24	25	PMV-1
1998	UAE	95	49	Multiple
2001	UAE	22	95.5	*Avian influenza

*Wernery et al. *Influenza virus infection in houbara bustards in the UAE. Proc EAAV.* 2001.

Rehabilitated Bustards

- Generally no single disease entity is responsible for the majority of morbidity or mortality seen in smuggled birds
- Birds succumb to a “cocktail’ of diseases.
- The susceptibility of imported houbara bustards under conditions of stress to viral diseases concurs with investigations on other imported wild avian species

Rehabilitated Bustards

- The illegal trade should be considered by those interested in the conservation and sustainable use of this species because it represents;

  - A wastage of free-living houbara bustard populations.
  - A disease risk to falcons when these birds are used as ‘bagged’ quarry.
  - A potential disease risk to free-living houbara populations when confiscated birds are released without health monitoring and medical treatment.
  - A disease risk to captive-breeding bustard populations when confiscated birds are incorporated without medical screening.
  - A threat to human health from pathogens such as salmonellae and *Chlamydophila* sp.
  - An important health risk to poultry production in the Middle East.

Health Issues for Bustards Maintained in Captivity

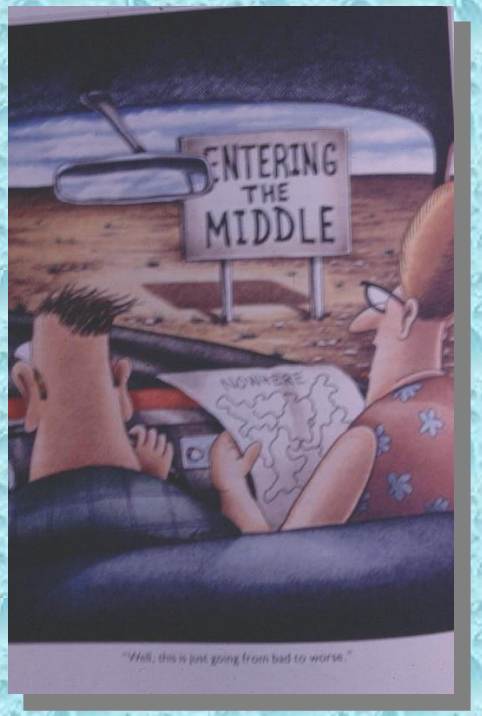
Source of bustards for captive breeding projects

- 1) Wild caught birds smuggled directly into collections in the region.
- 2) Confiscated ‘smuggled’ wild-caught birds that have come through an official rehabilitation programme and are placed in captivity.
- 3) Officially sanctioned projects collecting eggs from wild populations.
- 4) Exchanges of breeding stock between the larger captive breeding projects.

Why are some Houbara Breeding Projects Successful?

- Four projects consistently breed houbara in captivity in significant numbers:
  1. National Avian Research Center, UAE.
  2. The Emirates Center for Wildlife Propagation, Morocco.
  3. The National Wildlife Research Center, KSA.
  4. The International Foundation for Conservation and Development of Wildlife, Morocco.

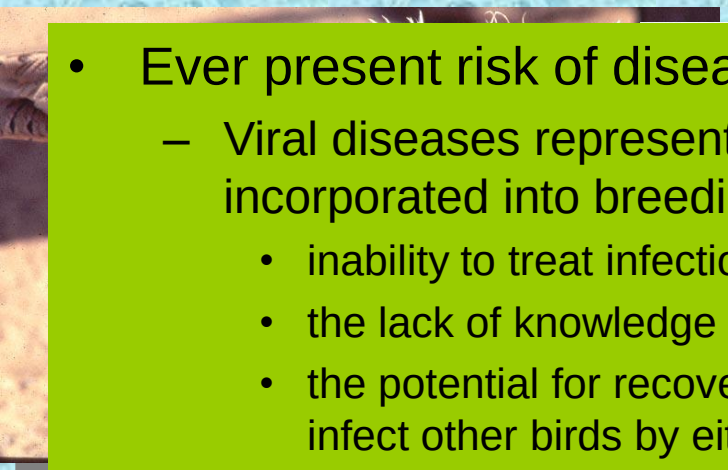
- Common features of these projects include an:
  1. Production of large numbers of birds by intensive avicultural methods including artificial insemination in tame/imprinted hand-reared birds.
  2. Investment in avicultural, ecological and veterinary research.
  3. Enforcing strict standard biosecurity and preventive medicine protocols.

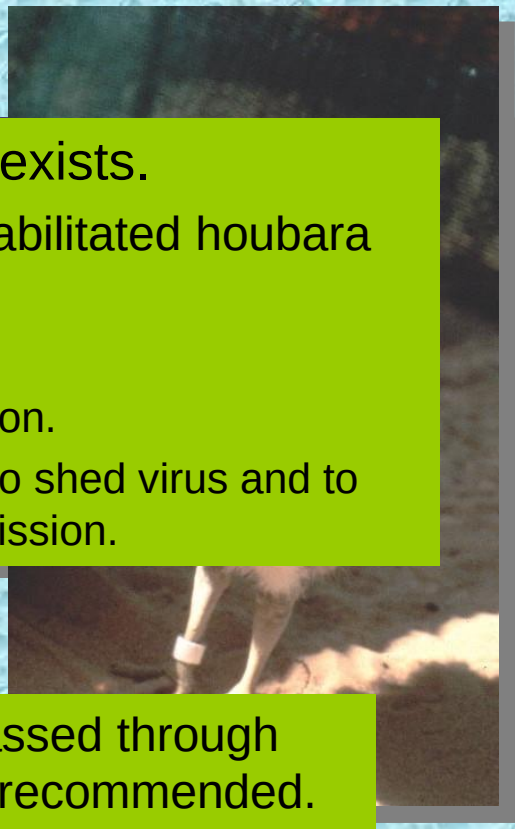


- Projects like the ECWP produce in excess of 12,000 chicks a year.

Problems of Using Wild-caught Birds in Breeding Projects

- Wild adult males do not adapt to captivity;
  - too nervous to become good sperm donors for AI programmes.
- Wild adult female birds occasionally produce young;
  - but the productivity of rehabilitated birds is poor.





- Ever present risk of disease, in spite of quarantine exists.
  - Viral diseases represent the clearest threat from rehabilitated houbara incorporated into breeding programmes, because of:
    - inability to treat infections.
    - the lack of knowledge concerning recovery from infection.
    - the potential for recovered, but latently infected birds, to shed virus and to infect other birds by either vertical or horizontal transmission.

Consequently, the integration of any birds that have passed through the illegal trade into large breeding projects cannot be recommended.

The Best Source of Healthy Birds for Breeding Projects

- Founder breeding stock of the large breeding projects derived from eggs collected from the wild, hatched in captivity and hand-reared.
- It is hard to obtain eggs from the wild, because wild populations are declining and obtaining permission to conduct responsible egg collection in range states (e.g. central Asia) is logistically complicated and controversial.
- Projects need to initiate genetic management to manage their founders and to investigate new ways of collecting new genetic material.
- As sources 1 and 2 have been eliminated and the availability of eggs from source 3 is unlikely to be great, there will be reliance on source 4 (birds from existing collections) to either found new projects or to bring in new blood lines to existing projects.
- Once the existing projects start having a surplus of birds they should use these to ‘seed’ new projects in the Gulf.

Development of Health Screening Protocols

Test	Sample	Acceptable criteria for release
Essential database		
Virus isolation	Choanal + cloacal swabs	Negative
Haematology	Whole blood (EDTA)	Within normal ranges
Chlamydia detection	Choanal swab	Negative antigen ELISA
Bacteriology	Cloacal swab	Negative for pathogens
Optional (if compatible with time/resources)		
Endoscopy	Internal examination	No abnormalities observed
Blood chemistry	Whole blood (Heparin)	Within normal ranges

Table 6. Recommended health-screening protocols for smuggled houbara bustards surviving quarantine and before release (source: Bailey et al, 2000).

Genetic Management

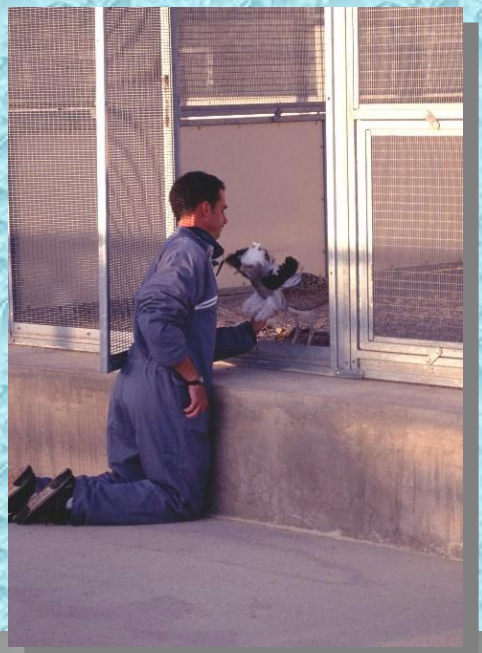
- In a clinical setting it can be hard to prove that some conditions have a genetic basis.
- Van Heezik et al (1999c) assessed the level of inbreeding at NWRC. They estimated that from 1995 to 1999 inbreeding in the breeding flock increased from 0% to 15% of females and at least 33% of chicks hatched were inbred.

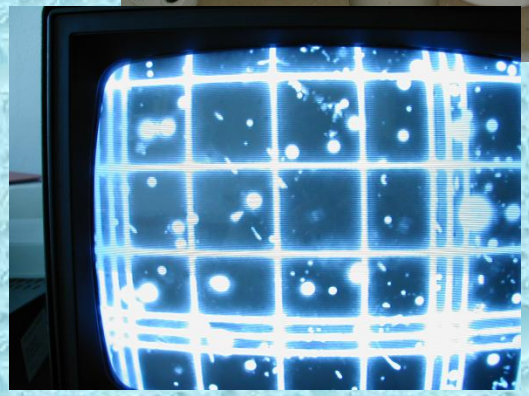
At NARC a genetic involvement has been considered in;

1) higher levels of mortality in buff-crested bustard chicks compared with other species reared at NARC and the finding that some pairs produced consistently strong and healthy chicks, while other pairs consistently produced frailer chicks.
2) chondrodystrophy (shortened and deformed tarsometatarsi) in some blood lines of houbara (Naldo and Bailey, 2001).

Genetic Management

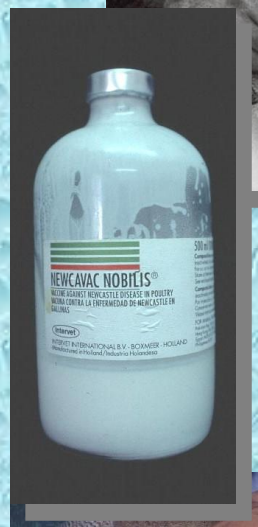
- In the long term, sustaining healthy populations of bustards in captivity will require careful assessment and manipulation of genetics and demographics.
- Studbooks contain records of the history in captivity of a species and are an important tool in the management of breeding projects. A studbook for houbara is being developed at NARC (Combreau, pers comm.).
- Genetic resource banks (GRBs) using cryopreserved semen may also be important and may lead to movement of frozen semen between projects.
- A number of diseases can be transmitted in semen, so GRBs should incorporate health protocols.





Maintaining High Standards of Biosecurity and Preventive Medicine Programmes

- Exclusion of disease is always more cost effective than dealing with the consequences of a disease that has gained entry to a collection.
- Veterinary care provided to large breeding collections of bustards is generally framed around a comprehensive preventive medicine programme.
- Currently bustard projects use vaccines developed for poultry (PMV-1, reovirus) or other species (canary pox) and in the future vaccines may need to be developed specifically for the species.



Conclusions

- The health issues surrounding the production, utilisation and ultimately domestication of houbara bustards in the Middle East are complex and challenging.

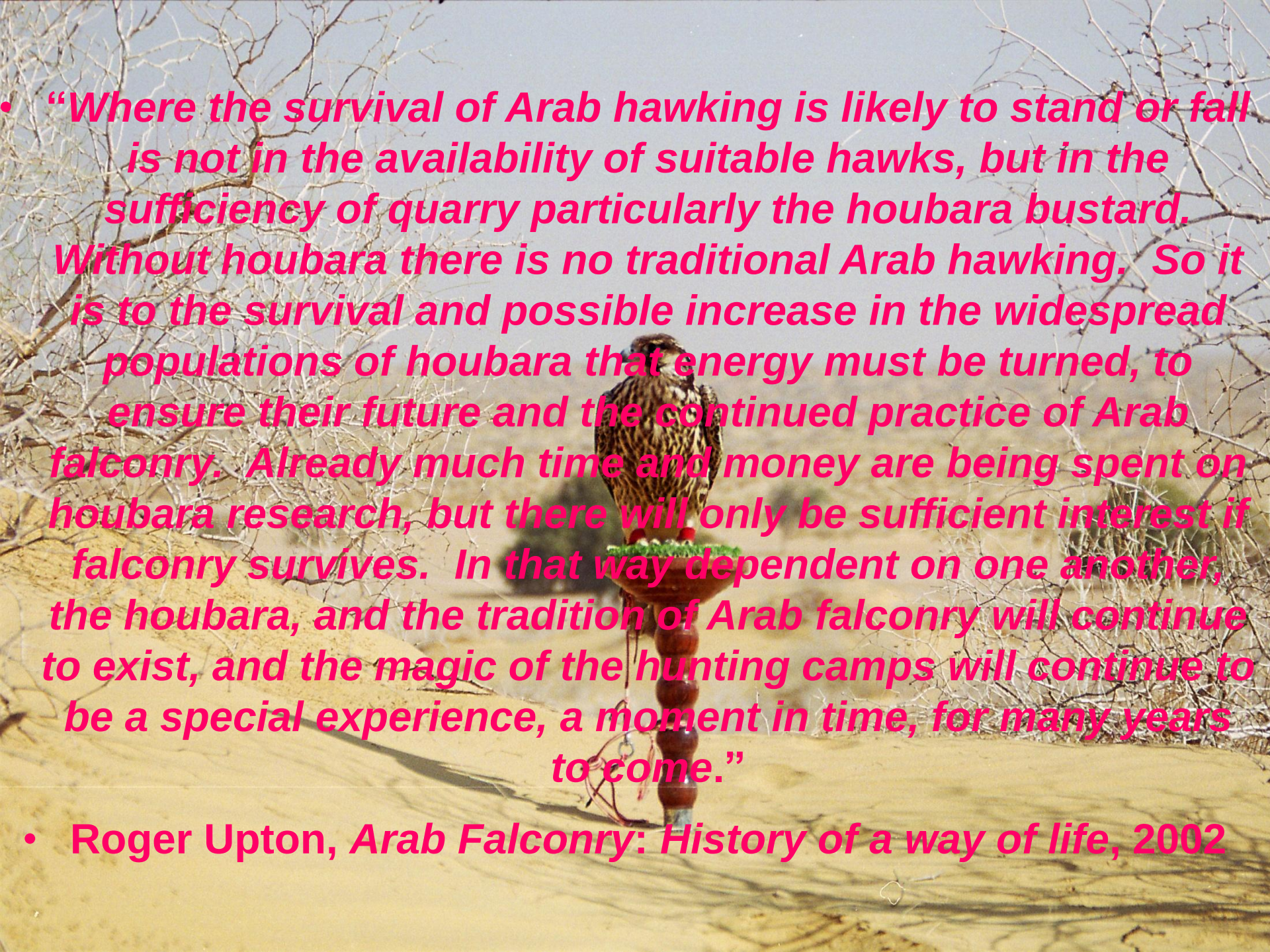
- The research requirements of the young houbara bustard ‘industry’ are large, considering the low level of productivity to high level of investment that has taken place.

- The larger breeding centres will need to improve co-operation and develop common research goals, so that research funding is prioritised and existing and new problems are solved.

Acknowledgements

- **Dubai Falcon Hospital**
  - H.H. Sh. Hamdan bin Rashid al Maktoum
  - Mr Humaid Obaid al Muhairi
  - Mr Declan O'Donovan

- **National Avian Research Center**
  - H.H. Sh. Khalifa bin Zayed Al Nahyan,
  - H.H. Sh. Hamdan bin Zayed Al Nahyan,
  - Mr M. Al Bowardi
  - Mark Lawrence and Mohammed Salah
  - Olivier Combreau



- *“Where the survival of Arab hawking is likely to stand or fall is not in the availability of suitable hawks, but in the sufficiency of quarry particularly the houbara bustard. Without houbara there is no traditional Arab hawking. So it is to the survival and possible increase in the widespread populations of houbara that energy must be turned, to ensure their future and the continued practice of Arab falconry. Already much time and money are being spent on houbara research, but there will only be sufficient interest if falconry survives. In that way dependent on one another, the houbara, and the tradition of Arab falconry will continue to exist, and the magic of the hunting camps will continue to be a special experience, a moment in time, for many years to come.”*

- **Roger Upton, *Arab Falconry*: *History of a way of life*, 2002**