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## The quarantine station at the National Avian Research Center, Abu Dhabi

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The National Avian Research Center is a scientific and conservation organization based in Abu Dhabi. The flagship species for the organization are the Houbara bustard *Chlamydotis undulata macqueenii* and the Saker falcon *Falco cherrug*. To minimize the risk of infectious diseases being introduced into the Center a quarantine station was built to facilitate the screening of all incoming birds. This paper describes the design of the quarantine station, technical systems, water supply and drainage, and the maintenance and husbandry practices implemented at the station.

*Key-words:* avian, building design, bustard, captive breeding, quarantine

The National Avian Research Center aims, through scientific understanding, captive breeding, habitat restoration and public education, to increase the numbers of Houbara bustards *Chlamydotis undulata macqueenii* wintering in Abu Dhabi and to reduce the threat to the species in the rest of its range (Hornby, 1993). The Veterinary Science Department is responsible for maintaining the health of Houbara bustards at the Center and conducting research into diseases which affect the species (Samour & Bailey, 1993). In the Gulf region the most commonly encountered infectious diseases which affect bustards are avian pox, Newcastle disease, chlamydiosis, trichomoni-

asis, aspergillosis and cestodiasis (Bailey, 1992; Greth *et al.*, 1993; Bailey *et al.*, 1996). Opened in 1993, the quarantine station has facilitated the screening of all birds entering the Center for a panel of diseases before they are included in the captive-breeding programme. In the future, birds hatched at the Center will be quarantined at the station before they are sent to other collections or are released into the wild as part of a restoration programme.

### PHILOSOPHY

The quarantine station was designed with the following specifications in mind: (1) it should be located at a safe distance from the Center and from neighbouring residential or agricultural areas; (2) it should be protected from stray animals and predators at all times; (3) it should have a central unit fully equipped to carry out clinical, laboratory and post-mortem work; (4) it should have two separate wards so that up to two groups of birds can be accommodated at the same time; (5) it should have a buffer zone between the central unit and the wards; (6) it should have facilities for personal hygiene; (7) it should have facilities to disinfect car

tyres and rubber boots; (8) it should be able to be maintained at a required temperature and humidity; (9) the enclosures should get the maximum benefit of sunlight, be spacious and easy to clean; (10) it should be possible to observe the birds from the corridor without causing disturbance; (11) birds should be able to move into the adjacent area to avoid contact with personnel inside the enclosure; (12) it should be possible to separate a bird from the group to facilitate catching or handling.

#### LOCATION

The National Avian Research Center and laboratories are situated 10 km south-east of Sweihan town and 60 km from Al Ain. The quarantine station lies 4 km outside the main complex and 2 km away from the main road.

#### THE BUILDING

The total fenced area is 6300 m<sup>2</sup>. To keep out camels and predators a 2.4 m high, 7.5 cm diameter PVC-coated chain-link fence surrounds the entire station. The fence is buried 91 cm below ground and the steel posts are reinforced with 60 × 60 cm concrete bases 121 cm below the surface. Located at the main gate is a 600 × 200 × 20 cm deep wheel bath for vehicles, filled with an appropriate disinfectant (Kem White).

The building occupies an area of 1934 m<sup>2</sup> and is shaped like a letter 'Y' with a central unit, a buffer area and two identical bird wards (Fig. 1). The building is constructed of concrete masonry units and the roof is a sloped, insulated aluminium sandwich panel. The structural steel elements on the roof were welded, sand blasted, primed and protected with epoxy coating.

#### THE CENTRAL UNIT

The central unit is divided into clean, intermediate and dirty areas. The clean area comprises the bedroom, kitchenette, office and storeroom. From the clean area

personnel enter through a door into the intermediate area or the wash room. This area has two marble wash-basins, utility room, two toilets, a shower, lockers, a washing machine and a tumble drier. To go into the dirty area, personnel pass through a foot bath lined with ceramic tiles and filled with disinfectant (Kem White). The dirty area comprises the laboratory, post-mortem room, electrical control room and a service area, which includes a food preparation room and food store. From the food preparation room personnel pass through the same foot bath to enter the other dirty areas. All food and supplies are brought into the food preparation room through an external door.

The main entrance consists of a set of double swing doors made of aluminium and toughened clear glass (2.2 × 1.8 m). All rooms in the central unit have wooden doors which measure 2.2 × 1.2 m. In between the post-mortem and electrical control rooms there is an aluminium door with toughened clear glass (2.2 × 1.2 m) which opens onto a pathway leading to the incineration unit. The floors in the clean area, with the exception of the kitchenette, are 30 × 30 cm Terrazzo tiles and the gypsum board false ceilings are painted with emulsion paint. The walls of the entrance corridor are covered with Terrazzo tiles, while in the office, store-room and bedroom the concrete walls are painted with emulsion paint. The floors of the kitchenette, intermediate and dirty areas, except the corridor, are 20 × 20 cm ceramic tiles. The gypsum board false ceilings are painted with anti-microbial, anti-fungal paint (Jotun). The concrete walls are finished with the same paint. The floor and walls of the corridor are Terrazzo tiles and the gypsum board false ceiling is likewise painted with Jotun. The food preparation room has a 120 × 75 cm aluminium/glass window with an air extractor. The intermediate area has five 60 × 60 cm and one 280 × 35 cm aluminium/glass windows. All other



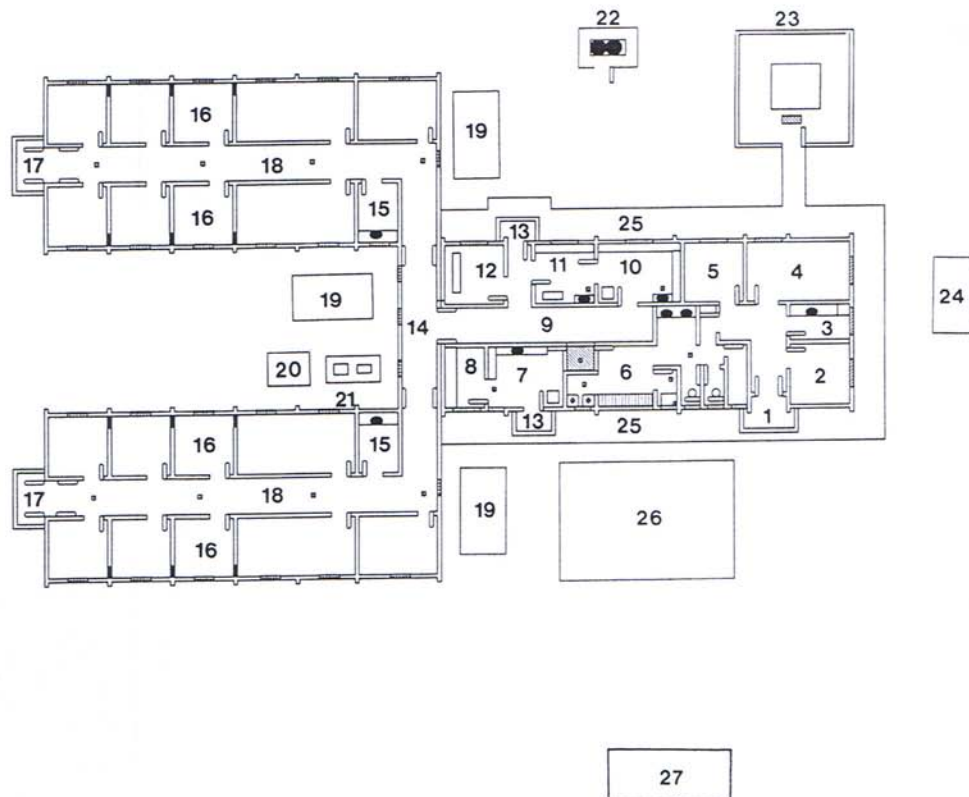


Fig. 1. Ground plan of the quarantine station at the National Avian Research Center, Abu Dhabi: 1. main entrance; 2. bedroom ( $3 \times 3$  m); 3. kitchenette ( $3 \times 1.8$  m); 4. office ( $5.2 \times 3$  m); 5. storeroom ( $3 \times 3$  m); 6. intermediate area/wash room ( $5.45 \times 3$  m and  $3 \times 2.2$  m); 7. food preparation area ( $3.8 \times 3$  m); 8. food store ( $3 \times 2$  m); 9. foot bath ( $110 \times 110 \times 15$  cm deep); 10. laboratory ( $4.3 \times 3$  m); 11. post-mortem room ( $3 \times 3$  m); 12. electrical control room ( $3 \times 3$  m); 13. service doors ( $2.175 \times 1.8$  m); 14. buffer zone corridor ( $8.2 \times 1.8$  m); 15. utility rooms ( $3 \times 2$  m); 16. bird rooms (in each ward six rooms measure  $3 \times 3$  m, two rooms measure  $6.1 \times 3$  m and one room measures  $4 \times 3$  m); 17. loading/unloading bay; 18. floor drains; 19. air-conditioners; 20. water storage tank ( $2 \times 2 \times 1.5$  m high) with a total capacity of  $4.5 \text{ m}^3$  and a reserve capacity of  $2 \text{ m}^3$  for fire-fighting equipment; 21. cold water and fire-pump set; 22. gas cylinders; 23. incinerator; 24. diesel generator; 25. walkway; 26. car park; 27. car tyre wash.

rooms in the clean and dirty areas have aluminium/glass windows measuring  $120 \times 120$  cm.

#### THE BUFFER AREA

From the dirty area staff enter through a set of wooden double swing doors ( $2.2 \times 1.8$  m) with a  $70 \times 60$  cm clear toughened glass window into the buffer zone corridor which separates the two wards. Doors with similar specifications are found at

both ends of the corridor just before entering a ward. The floors and walls are finished with Terrazzo tiles. Sections of the wall are comprised of  $20 \times 20 \times 10$  cm wide glass blocks which allow penetration of sunlight. The gypsum board false ceilings are painted with anti-microbial, anti-fungal paint. The design of the buffer area means that any outbreak of infectious disease within one ward is likely to be contained and its spread minimized.

### THE BIRD WARDS

The provision of two separate wards enables two groups of birds to be accommodated at the same time. Both wards are identical, comprised of one utility room and nine bird enclosures. The corridor (19.9 × 1.8 m) has floors and walls of Terrazzo tiles and a gypsum board false ceiling painted with anti-microbial, anti-fungal paint. Each enclosure has an inward-opening wooden door (2.2 × 1.2 m), made air-tight with a rubber seal gasket, with a 70 × 60 cm one-way observation glass 10 cm from the top. The floors slope towards the door and are finished with steel trowel concrete screed with FEB glazed paint. The gypsum board false ceiling and the inside walls are painted with anti-microbial, anti-fungal paint. The centre of the back wall is made of 20 × 20 × 10 cm wide glass blocks which measure 100 cm wide and 130 cm high. In the two bigger enclosures two sets of glass blocks allow for good penetration of natural light. All enclosures, except the first which measures 4 × 3 m, are connected to each other through an aluminium vertical sliding door (1.4 × 0.5 m) which can be opened or closed using a rope pulley located outside the enclosure. This is useful when separating one bird from the group or when moving all birds to the next enclosure to facilitate cleaning or other maintenance work. All enclosures have a 5 cm deep desert sand substrate which is replaced for each new batch of birds. No additional plants, rocks or furnishings are used.

At the end of each ward two double-sided aluminium toughened glass doors (2.2 × 1.8 m), with a foot bath between them, open into a loading bay where a van can be parked. All birds entering or being transferred from the Center are moved through these doors.

### WATER SUPPLY AND DRAINAGE SYSTEM

Water is stored in a 2 × 2 × 1.5 m high storage tank with a total capacity of 4.5 m<sup>3</sup>. The tank has a reserved capacity

of 2 m<sup>3</sup> for fire-fighting equipment. Water is pumped into the building by a cold-water booster pumpset with duty/standby/pressure vessel pump duty of 1.5 litres. Cold water is supplied to the central unit through 20, 25, 32 and 40 mm diameter UPVC pipes. Water heaters with a capacity of 15 and 50 litres are located in the kitchenette, intermediate area and the food preparation, laboratory and ward utility rooms. Hot water is supplied through thermally insulated copper pipe. In each ward and loading bay cold water is obtained from a flexible hose mounted on the wall and connected by 20 mm diameter UPVC pipes.

The kitchenette, intermediate area and the food preparation, post-mortem, laboratory and ward utility rooms have 75 mm diameter floor drains. The floors slope four ways toward the drains which are connected by 75 mm diameter UPVC pipes to a 10 cm diameter gully. Excess water flows into manholes (0.6–0.8 × 0.6–0.8 × 0.7–1 m deep) which carry it through 15 cm diameter UPVC class 16 pipes to a septic tank (3 × 1.1 × 1.5 m deep). Beside the tank is a 1.5 m diameter soakaway.

In both bird wards the enclosure floors slope towards the door. During cleaning excess water is directed to four 75 mm diameter floor drains in the corridor which are connected by 100 mm diameter UPVC pipes to a manhole (0.6 × 0.6 × 0.6 m deep) a few meters away from the loading bay. Water is carried through a 150 mm diameter UPVC pipe to a 1.5 m diameter soakaway 12 m from the manhole.

### TECHNICAL SYSTEMS

The building is protected by fire and burglar alarm systems. These are monitored in the guardhouse at the entrance of the National Avian Research Center.

Three centralized air-conditioning units (each with maximum ampere of 71 and full load ampere of 6.2) service the central unit and the two wards, thus ensuring that the air is kept separate within the three



sections. This, together with the double-door system separating the dirty area from the two wards, creates a positive/negative pressure within the buffer area ensuring that the air from the dirty area is never mixed with the air within the wards. Temperature throughout the facility is maintained at 23–25°C and humidity at 30–45%.

Supplemental lighting in the small bird enclosures is provided by two sets of double fluorescent lamps (60 cm long) and four sets are used in the bigger enclosures. Light switches are mounted on the corridor wall beside the door. A standby generator (400 kVA; 8 kW cos  $\phi$ ; 722 amperes) provides electricity in the event of power failure.

#### MAINTENANCE, PREDATOR AND PEST CONTROL

Bird enclosures are cleaned daily to remove faeces, feathers and uneaten food, and fresh food and water are provided in separate bowls. Empty areas are cleaned thoroughly; sand is removed and discarded; walls and floors are scrubbed with a solution of Virkon and rinsed with water. Fresh desert sand is added to clean, dry enclosures. The corridors in both wards and all enclosures in the central unit are cleaned using a solution of Virkon.

The disinfectants in the tyre wash and foot baths are changed regularly. Because sand is often blown into the tyre wash during storms we have erected a wind break. However, the sand must still be brushed out on a regular basis. All waste collected from the wards, central area and the research station is incinerated in the gas incinerator.

Possible incursions of foxes and other predators are controlled using mechanical traps placed outside the fence. Ants and other insects are controlled using Pifpaf powder sprinkled on the floor inside the exterior doors.

#### DISCUSSION

Since it was opened on 9 December 1993 the quarantine station has proved to be a successful facility for screening Houbara bustards against various diseases. A total of 100 Houbara bustards have passed the strict quarantine protocol and have been incorporated into the captive-breeding programme. The division of the station into central unit (clean, intermediate and dirty areas), buffer area and bird wards minimizes the risk of infectious diseases being introduced and spread throughout the facility. Because the three access doors to the post-mortem room open inward it reduces the total working space. We have solved this by permanently closing the door facing the corridor. The glass blocks supplemented with fluorescent lights provide adequate lighting. However, a disadvantage of the glass blocks is that they reduce the scope for photoperiod control. The design of the wards provides the birds with spacious enclosures that can be easily maintained. Birds can be observed without being disturbed and nervous birds can move to an adjacent area to avoid contact with personnel inside the enclosure. In addition, catching a bird by moving it through the sliding door into an adjacent enclosure causes minimal stress to the other birds.

#### ACKNOWLEDGEMENTS

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#### PRODUCTS MENTIONED IN THE TEXT

- FEB glazed paint:** manufactured by F. E. B. Co., Great Britain.  
**Jotun:** gloss anti-microbial, anti-fungal paint, manufactured by Jotun Abu Dhabi (LLC), PO Box 3714, Abu Dhabi, United Arab Emirates.  
**Kem White 10/12 Liquid:** broad spectrum phenolic disinfectant, manufactured by Kemin UK Ltd, Rochdale, Lancashire OL16 1RH, Great Britain.