of captive Houbara has also increased, from 66% in 1992 to 93% in 1999. In 11 years of captive chick production, more than 1300 chicks have hatched at the NWRC, and of these more than 310 have been released into the Mahazat as-Sayd protected area. Ten years after the production of the first chicks, the NWRC breeding unit is now able to produce relatively large numbers of Houbara, both for restocking the breeding flock and for releases into the wild.

Reintroduction of Houbara bustard in central Saudi Arabia

JI AS

National Wildlife Research Center, PO Box 1086, Taif, Saudi Arabia

Captive-reared Houbara bustards (Chlamydotis undulata/ macqueenii) were reintroduced in the wild for the first time in 1991 in Mahazat as-Said, a 2200 km² fenced protected area of central Saudi Arabia. Different techniques of release are tested each year to determine factors affecting survival. Predation has been identified as the main cause of mortality. From 1993 to 1997, the mean survival rate after 3 months was 47.5%, whereas it was as high as 85.9% for the release of January 1999. Several factors could explain this higher survival, such as older age at release, enhanced captivity conditions before release, enhanced body conditions with better food availability and lower or delayed predation risks. Since 1991, 360 birds have been released, resulting in an established breeding population close to 110 individuals. All of them were equipped with radio transmitters, allowing accurate assessment of breeding parameters and population trends, and to enable studies on the still poorly known ecology of this species.

Estimation of age in wild birds

H. KLANDORF, M. IQBAL AND J. BONNER

Small population management (most zoo programs) attempts to pair not just the most genetically compatible, but the most completely compatible animals. This often requires sending animals across the country to be paired or re-paired. If this technique could be applied to living birds, it could play a critical role in Species Survival Plans and the pairing of endangered species. Many observations can be made regarding the age of an individual of any species, from the amount of skin wrinkling in humans to the amount of graying or whitening of the muzzle in many other mammalian species. Yet, with birds, there are few such reliable indicators. We are using a biomarker of ageing, pentosidine (Ps), a product of non-enzymatic glycation (the attachment of glucose to proteins without the aid of enzymes), validated in numerous mammalian studies (Brownlee et al., 1986) and in domestic poultry (Iqbal et al., 1997), and which accumulates over the lifespan of an animal. The intent of this study was to determine if a comparable change in Ps concentrations could be established in wild birds. We obtained skin samples from previously frozen birds of both known and unknown ages. The samples were analyzed for Ps concentration. The preparation of the skin digest for Ps was described by Iqbal et al. (1997). Briefly, this involves removal of the epidermal and adipose layers from skin samples, homogeniza-