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THE BEHAVIOUR OF *Struthio camelus australis* AT BELO HORIZONTE ZOO, BRAZIL: EVALUATING CAUSES OF BREEDING FAILURE

by Herlandes Penha Tinoco and Ângela Bernadete Faggioli

Introduction

Standing up to 2.7m (approx. 9ft) tall and weighing 100kg-130kg (approx. 220lbs-280lbs) and sometimes up to 150kg (approx. 330lbs) (del Hoyo, 1991), the Ostrich *Struthio camelus* (Aves, Struthionidae) is the largest and heaviest living bird. The Struthioniformes together with the Tinamiformes, Rheiformes, Casuariiformes and Apterygiformes have a flat, raft-like sternum without a keel and are known as ratites (*ratis* - a raft) (Sick, 1997).

The Ostrich is distributed over much of the African continent and is among the common inhabitants of the great African plains. Generally, it lives in open, semi-arid areas with short grass, where it can find an adequate food supply and has good all-round visibility to facilitate it seeing predators. The Ostrich is omnivorous, its diet consists mainly of plant matter (roots, leaves, flowers and seeds) and it also eats insects and small vertebrates such as lizards and even small tortoises (del Hoyo, 1991). Most of the water it needs is obtained from succulent plants.

Ostrich farming can be a profitable practice, producing feathers (used in carnival costumes, hats and to produce domestic utensils), eggs (providing food, necklaces and other artefacts), fat (for cosmetics, pharmaceutical products and the electronics industry), leather (for shoes and purses) and meat (similar to bovine meat but with less cholesterol, fat and calories (Carrer and Kornfeld, 1999).

The Ostrich has been kept in captivity for millennia and breeds regularly in zoos (del Hoyo, 1991). At Belo Horizonte Zoo breeding was common until a few years ago, when it became a rare event following the arrival of the new male. Nowadays, the female lays only infertile eggs.

Behavioural studies of Ostriches in the wild are common in scientific literature, but studies that describe its habits in captivity are rare. Due to its economic importance, such studies are necessary to improve the bird's

welfare and, consequently, increase its productivity. It is known that captive environments cause significant changes in the behavioural repertoire of the birds, causing reproductive losses and the non-expression of other natural and important behaviours.

The aim of the study was to describe the kinds and frequencies of behaviour displayed by the Ostriches at Belo Horizonte Zoo and attempt to correlate the reproductive failure to behavioural factors.

Materials and methods

Subjects and maintenance

The female, named Savana, was hatched at the zoo in 1998, and the male, named Zumbi, came from an ostrich farm in 2000, when he was approximately three years of age.

They were usually fed dog ration (0.8kg (1lb 12oz)), bird ration (3kg (6lbs 10oz)), horse ration (0.8kg (1lb 12oz)) and pickled cabbage (0.2kg (7oz)), twice a day at 8.00am and 2.00pm. The birds also ate flowers, leaves and fruits that fell from the trees in their enclosure.

Enclosure

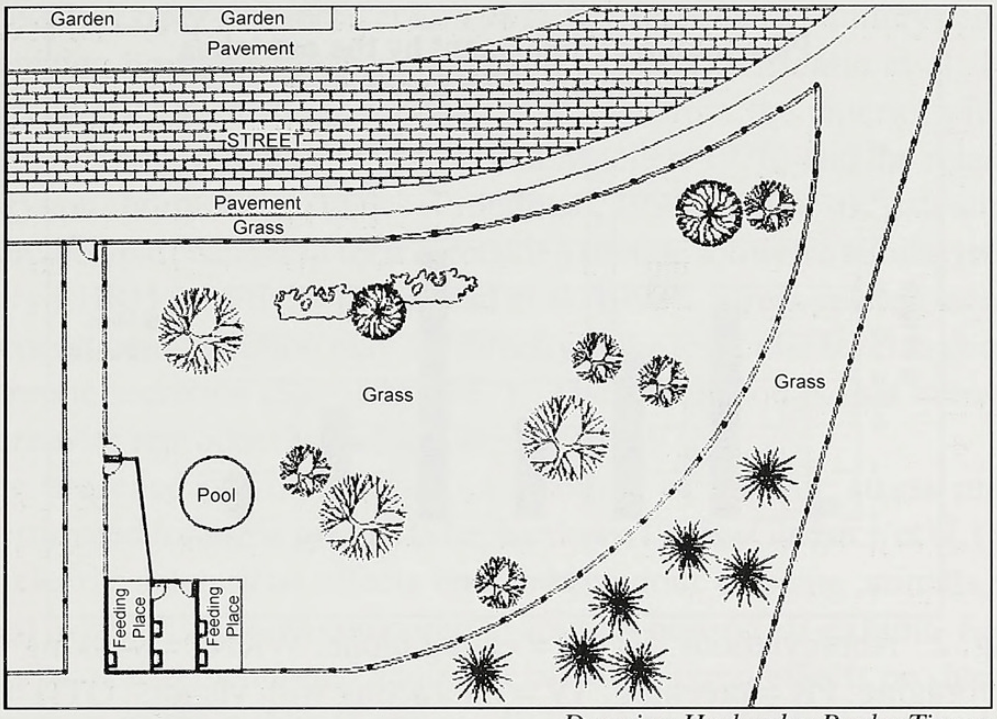
The Ostriches were displayed in a 2,042sq m (approx. 22,000sq ft) open enclosure, confined by a 2m (approx. 6ft 6in) high wire fence, supported by wooden poles. The enclosure was planted with trees, shrubs and grass and had a 3.1m (approx. 10ft) wide freshwater pool. The birds could be viewed from three sides and there was no place that allowed them to hide if they wished to. A small handling area provided shelter (see Fig.1).

Preliminary observations

Six hours of preliminary observations, both in the mornings and afternoons, were made during the last week of September and the first week of October 2001. The behaviours were recorded using the ad libitum method and the results were used to compile an ethogram (Table 1).

Data recording

Twenty hours of observations were made between October and November 2001. They were made three times a week (on Monday, Wednesday and Friday). The scan method was chosen because it allowed the recording of all behaviours of the birds at pre-selected times during the sampling period (Veado and Leite, 1999). The birds were rapidly observed at regular intervals (recording intervals were of one minute) and the behaviour of each individual was recorded. The behaviour of each Ostrich was necessarily recorded by instantaneous sample (Martin and Bateson, 1993). The observations were made from a distance of approximately 20m (65ft), to avoid the possibility of the observer's presence interfering with the birds' behaviour.



Drawing Herlandes Penha Tinoco

Fig. 1. Plan of Ostrich enclosure at Belo Horizonte Zoo.

Statistical analysis

The mean number of observations of all behaviours was calculated for the two Ostriches. Significant differences between the sexes were analysed using the Mann-Whitney U-Test. This is a non-parametric test that compares two independent samples of the same or different sizes, whose scores have been measured on the same ordinal level (Ayres et al. 1998).

Results

The mean number of behaviours displayed by the Ostriches is shown in Table 2. A significant difference was found between the sexes in the number of scans for the behavioural category ETNa ($Z=2.08;p<0.04$); the female spent more time eating alone than the male. Similarly, the behaviour FO showed a statistically significant difference ($Z=2.03;p<0.02$), being recorded 451 times for the female and 288 times for the male.

The behavioural category OTH was displayed more often by the female, with 150 occurrences recorded, against 106 occurrences recorded for the male. This difference was significant ($Z=1.90;p<0.05$). The IV and SW behaviours also differed significantly ($Z=3.46;p<0.0005;Z=2.04;p<0.04$, respectively). These behaviours were recorded 343/13 times for the male and 9/1 times for the female.

The percentage of behaviours displayed by both of the Ostriches is shown in Fig. 2. The birds ate and walked alone more often than together. The male spent more time interacting with people than displaying reproductive behaviours.

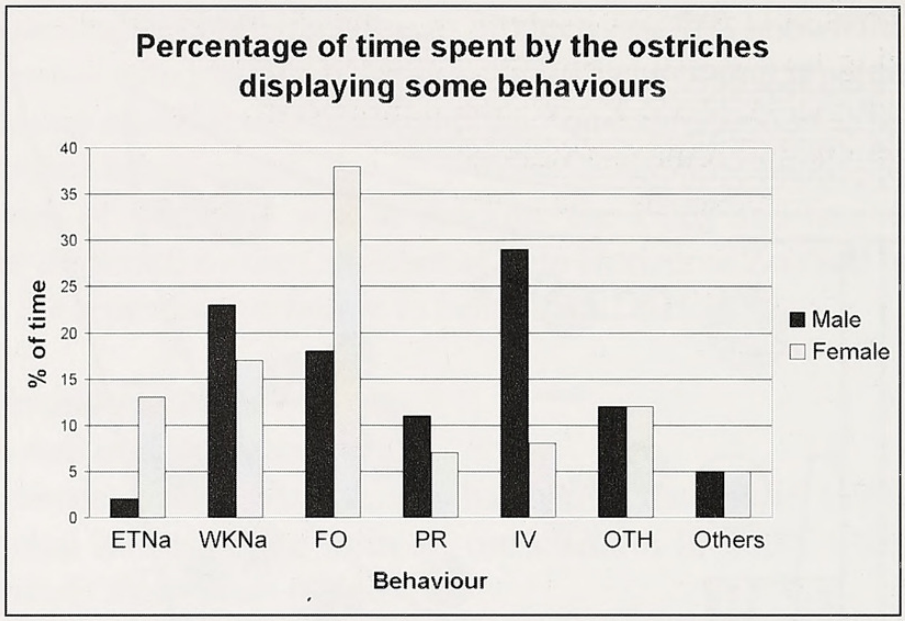


Fig. 2. Abbreviations: ETNa = eating alone; WKNa = walking alone; FO = foraging; PR = preening; IV = interacting with visitors; OTH = other behaviours.

Discussion

Ostriches are very curious birds, easily attracted by objects, especially shining ones. The Ostriches at BH Zoo were also attracted by people and animals walking past their enclosure, which explains why the behaviour 'interacting with visitors' was so high (Fig.3). The male Ostrich spent more time interacting with visitors and keepers than with the female. The male would stop what he was doing, walk towards the person and stand watching them, shaking his wings and sometimes vocalizing (courtship behaviour). According to McKeegan and Deeming (1997) courtship behaviours occupy only a small portion of the Ostrich's time. Human-induced courtship behaviour is a widespread phenomenon (Deeming, 1996). Observations by Bubier et al. (1998) showed that out of 200 adult Ostriches 136 (68%) displayed to humans. This did not occur in this study at BH Zoo. It is not surprising that zoo keeper-directed behaviours increased in frequency when zoo keepers were inside the enclosure because the removal of the physical barrier (i.e. the enclosure fence) facilitated greater interaction. Bubier et al. (1998) observed a male Ostrich apparently taking advantage of female courtship behaviour directed towards humans to mount the female each time she dropped to the ground in response to a human standing nearby. Similar abnormal behaviour was observed at BH Zoo, where the male tried to mount the female and copulate with her when she was displaying to humans and even when she was taking a sand bath.

Chronic stress can have deleterious effects on the levels of a number of hormones and other parameters essential to reproduction. For example, chronic restraint stress in rats results in reduced plasma lutenizing hormone

(LH) levels (Lopez-Calderon et al. 1987) and decreasing pituitary sensitive to lutenizing hormone releasing hormone (LHRH) (Armario et al. 1988). The cyclic release of the lutenizing hormone from the anterior pituitary causes ovulation in females (Sturkie and Mueller, 1976) and the release of androgynous hormones in males (Proudman, 1994). Domestic cats stressed by unpredictable changes in their caretaking routine showed a similar reduced pituitary LHRH sensitivity (Carlstead et al. 1993). Stress-related increases in glucocorticoid secretion may act directly at the testicular level to decrease testosterone secretion (Sapolsky,1987). The conclusion is that stress may interfere with reproductive behaviours (Ward,1972).

The presence of zoo visitors as a source of chronic stress may be underestimated for some species (Shepherdson, 1995). Gladston et al. (1984) found clearly deleterious effects on the behaviour of some animals when exposed to zoo visitors, as compared to animals housed off-exhibit. Several authors have also mentioned a number of behavioural effects produced by the presence of the public (Conway, 1977; Denke, 1977; Yaninek, 1977). The sounds of machinery may also be a chronic stressor. This could explain the lack of successful reproduction by the Ostriches at BH Zoo, whose enclosure is next to a busy street. The birds might be so stressed that they are simply not indulging in courtship behaviours.

The main purpose of a zoological garden is to help make the public more conscious of wild and exotic animals and the importance of their conservation for mankind (IUDZG/CBSG(IUCN/SSC), 1993). With this in mind, it would be counterproductive to impede the viewing of the animals by the public. To minimise the deleterious effects of stress caused by human presence, many zoos provide the animals with places to hide. In the case of BH Zoo, where there are few visual barriers in the Ostrich enclosure and a suitable hiding place does not exist, the birds are in almost permanent contact with people. Shrubs such as *Eugenia spregelii* should be planted in the enclosure to provide cover for the birds. The presence of guides and keepers to avoid disturbances (e.g. members of the public shouting) in front of the Ostrich enclosure may also help reduce stress.

The reproductive failure of the Ostriches at BH Zoo could be a result of incompatibility between the two birds (see Fig.2). In this study we did not find any signs of behavioural problems but did find high levels of individual behaviours (there had been fights between the two birds, mainly at the time of the introduction of the male Ostrich into the enclosure). Copulation failure due to behavioural problems is the most obvious cause of infertility in Ostriches. Although Ostriches are gregarious birds, they show certain individual preferences. Incompatibility is common when birds have been unable to select their own mates. Environmental conditions also can result in infertility. High stress levels, the sounds of heavy machinery or equipment,

Table 1. Ethogram of the behaviours observed by *Struthio camelus australis* at BH Zoo.

Behaviour	Abbreviation	Description
Escaping from male	EM	Female escaping from male.
Chasing after female	CF	Male chasing after the female with the wings and tail up.
Eating Together	ETNt	Ostriches eating fruits or vegetables at the feeder together.
Alone	ETNa	Ostrich eating ration, fruits or vegetables at the feeder alone.
Courting* Human	CORh	Bird courts humans (visitors, keepers).
Bird	CORb	Male courts female or female courts male.
Walking Together	WKNt	Birds walk through the enclosure, one beside the other or one behind the other.
Alone	WKNa	Bird walks through the enclosure alone.
Shaking wings	SW	Bird shakes its wings alternately.
Preening	PR	Bird standing arranging its feathers with its beak.
Sand bath	SNB	Bird sits on its heel and starts to shake its wings and drop sand over its body.
Foraging	FO	Bird eats grass, leaves, flowers, fruits, seeds and small stones from the ground.
Interacting with visitors	IV	When one or both birds notes someone in front of the enclosure, and they approach the visitor or keeper and start to walk, chase and even vocalising to the person.
Fighting	FGT	The birds positioned in front of each other, with their necks puffed and the wing-tips and tails raised skywards, start to kick and peck each other.
Copulating	COP	The female sits and places its neck on the ground; the male mounts the female. The male begins to grunt and groan and repeat his neck and wing movements.
Others	OTH	Other behaviours noted such as standing observing the area or pecking the wire.

Courting* Male: flops down on the ground, opens his wings and tail and begin to shake each wing alternately and move his tail up and down, his head and neck sway from side to side and beat rhythmically against his flanks (del Hoyo, 1991). Female: holds her wings forward and down, flapping them backwards and forwards whilst holding her head close to the ground and opening her beak repeatedly to make a clapping sound (del Hoyo, 1991).

Table 2. Mean number of behavioural observations of the Ostriches at BH Zoo, shown by sex (± standard error, a=0.05).

Behaviour	Sex		χ^2 n=20, gl=1	p-value
	Male	Female		
Escaping from male (EM)	0.60 ± 0.24	-	0.00	1.00
Chasing after the female (CF)	-	0.60 ± 0.24	0.00	1.00
Eating together (ETNt)	1.45 ± 0.52	1.45 ± 0.52	0.00	1.00
Eating alone (ETNa)*	1.55 ± 0.60	7.80 ± 2.02	2.08	0.04
Courting humans (CORh)	0.25 ±0.16	0.10 ±0.10	0.53	0.60
Courting bird (CORb)	-	0.05 ± 0.05	0.27	0.79
Walking together (WKNt)	0.45 ±0.16	0.45 ±0.16	0.00	1.00
Walking alone (WKNa)	14.35 ±2.69	9.95 ±1.75	0.87	0.39
Shaking wings (SW)*	0.65 ± 0.18	0.15 ±0.15	2.04	0.04
Preening (PR)	7.00 ±1.94	4.35 ±1.23	0.78	0.44
Sand bathing (SB)	-	0.40 ± 0.21	1.08	0.28
Foraging (FO)*	11.15 ±1.49	22.45 ± 3.46	2.03	0.02
Interacting with visitors (IV)*	17.15±3.18	4.75 ±1.33	3.46	0.0005
Fighting (FGT)	-	-	-	-
Copulating (COP)	0.05 ± 0.05	0.05 ± 0.05	0.00	1.00
Others (OTH)*	5.30 ± 2.27	7.50 ±1.67	1.90	0.05

*Indicates behaviours significantly different between the sexes.

predator presence and the transfer of birds from one enclosure to another can also interfere with normal sexual behaviour (Tully and Shane, 1996).

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References

Armario, A., Restrepo, C. and Lopez-Calderon, A. C. 1988. Effect of a chronic stress model of depression on basal and acute stress levels of LH and prolactic in adult male rats. *Biological Psychiatry* 24:447-450.

Ayres, M., Ayres Jr., M., Ayres, D. L. and Dos Santos, A. S. 1998. *BioEstat - Aplicações Estatísticas nas Áreas de Ciências Biológicas e Médicas*. Sociedade Civil Mamirauá, Manaus.

Bubier, N.B., Paxton, C. G. M., Bowers, P. and Deeming, D. C. 1998. Courtship behaviour of ostriches (*Struthio camelus*) towards humans under farming conditions in Britain. *British Poultry Science* 39:447-481.

Carlstead, K., Brown, J. L. and Strawn, W. 1993. Behavioural and physiological correlates of stress in laboratory cats. *Applied Animal Behavioural Science* 38:143-158.

Carrer, C. C. and Kornfeld, M. E. 1999. *A Criação de Avestruzes no Brasil*. Brasil Ostrich Comercial Ltda, São Paulo.
Conway, K., Shaw, L., Michleson, S., Crouse, D. 1977. Activity rhythms of ten species of nocturnal animals as a function of light intensity. Pp.102-140 in *Applied Behavioural Research*. Crockettt C., Hutchins, M. (eds.), Pika Press, Seattle.
Deeming, D. C. 1996. Production, fertility and hatchability of ostriches (*Struthio camelus*) eggs on a farm in the United Kingdom. *Animal Science* 67:329-336.
del Hoyo, J., Elliott A. and Sargatal, J. A. (eds.). 1991. *Handbook of the Birds of the World*. Vol.l. Lynx Edicions, Barcelona.
Denke, R. 1997. Enclosure utilization and social behaviour of the vampire bat (*Desmodus rotundus murinus*). Pp.157-180 in *Applied Behavioural Research*. Crockett, C., Hutchins, M. (eds.). Pika Press, Seattle.
Gladston, A. R., Geilvoet-Soeteman, E., Hora-Pecek, E. and van Hoof, J. A. R. A. M. 1984. The influence of the zoo environment on social behaviour of groups of cotton-topped tamarins (*Saguinus oedipus oedipus*). *Zoo Biology* 3:241-253.
IUDZG/CBSG (IUCN/SSC). 1993. *The world zoo conservation strategy: the role of the zoos and aquaria of the world in global conservation*.
Lopez-Calderon, A. C., Ariznavarreta, M. D. and Calderon-Tresguerres, J. A. F. 1987. Gonadotropin inhibition during chronic stress: role of the adrenal gland. *Journal of Steroid Biochemistry* 27:609-614.
Martin, P. and Bateson, P. 1993. *Measuring behaviour*, 2nd Edition. Cambridge University Press.
McKeegan, D. E F. and Deeming, D. C. 1997. Effect of gender and group size on the time-activity budgets of adult breeding ostriches (*Struthio camelus*) in a farming environment. *Applied Animal Behavioural Science* 51:159-177.
Proudman, J. A. 1994. Hormônios reprodutivos das aves. In: Rinheiro, M.R. (ed). *Fisiologia da Reprodução das Aves*. Fundação APINCO de Ciência e Tecnologia Avícolas, Campinas.
Sapolsky, R. M. 1987. Stress, social status and reproductive physiology in free living baboons. In: Crews, D. (ed.). *Psychobiology of Reproductive Behaviour: An Evolutionary Perspective*. Prentice-Hall, New Jersey.
Shepherdson, D. and Carlstead, K. 1995. Understanding the relationship between environment and reproduction in captive animals: the role of environmental enrichment. *Proceedings of the Second International Conference on Environmental Enrichment*, 21-25 August. Copenhagen.
Sick, H. 1997. *Ornitologia Brasileira*. Nova Fronteira, Rio de Janeiro.
Sturkie, R. P. and Mueller, W. J. 1976. Reproduction in the female and egg production. In: Sturkie, P. D. (ed.). *Avian Physiology*. Springer-Verlag, New York.
Tully, Jr. T. N., Shane, S. M. 1996. *Ratite Management, Medicine, and Surgery*. Kreiger Publishing Company, Florida.
Veado, B. V. and Leite, M. T. V. 1999. *Comportamento e Bem-estar de animais em cativeiro*. In: *XII Jornada de Biologia da PUC/MG*. Belo Horizonte. Mini-curso, p.38.
Ward, I. L. 1972. Prenatal stress feminises and desmaculinizes the behaviour of males. *Science* 175:82-84.
Yaninek, J. S. 1977. Daily behavior activities of Kenya impala (*Aepyceros melampus rendilis*) and Thomson gazelle (*Gazella thomsoni thomsoni*) in a mixed exhibit. Unpublished manuscript. San Diego Zoo, San Diego Zoo, California.

Herlandes Penha Tinoco and Ângela Bernadete Faggioli (Bird Section), Fundação Zoo-Botânica de Belo Horizonte, Av. Otacílio Negrão de Lima, 8000 Pampulha, CEP 31365-450, Belo Horizonte, Brazil. E-mail: fzbzoo@pbh.gov.br and c/o cristianoroxette@yahoo.com

A HISTORY OF THE GENUS *Picathartes* IN CAPTIVITY, 1948-2002

by Marvin L. Jones

Picathartes gymnocephalus (continued from Vol.109, No.4, pp.167-173 (2003))

0.0.2 hatched 24 Sep 1971 Amsterdam Zoo
Dekker *IZY* 13, pp. 120-121
0.0.2 disposition unknown Amsterdam Zoo
still living 2 May 1972

0.0.1 recd ? Busch Gardens, Tampa
recd 20 Oct 1971 NZP-Washington
died 8 Nov 1972 NZP-Washington

0.0.2 hatched 31 Dec 1971 Amsterdam Zoo
Dekker *IZY* 13, pp. 120-121
0.0.2 disposition unknown Amsterdam Zoo
still living 2 May 1972

IZY census 1972: Amsterdam Zoo 1.1.5 (cb 0.0.4); Antwerp Zoo 0.0.1; Bronx Zoo 0.0.3; Brookfield 1.1.0; Cincinnati Zoo 0.0.2 (there is no record of these birds at Cincinnati today); Copenhagen Zoo 0.0.8; Frankfurt Zoo 1.0.3; Los Angeles Zoo 0.0.1; Memphis Zoo 0.0.3; Philadelphia Zoo 0.0.4; Rotterdam Zoo 0.01; San Antonio Zoo 0.0.6; Walsrode Bird Park 0.0.9; NZP-Washington 0.0.7; Wassenaar Zoo 0.0.2

0.0.8 recd Jan 1972 Copenhagen Zoo
wb, from Borglum
0.0.1 died 5 Jul 1973 Copenhagen Zoo
cd intestinal inflammation
0.0.1 died 11 Aug 1973 Copenhagen Zoo
cd intestinal inflammation
0.0.1 died 4 Nov 1973 Copenhagen Zoo
cd unknown
0.0.1 died 19 Jan 1974 Copenhagen Zoo
cd tuberculosis
0.0.1 died 15 Jul 1974 Copenhagen Zoo
cd unknown
0.0.3 disposition unknown, still living 23 Dec 1975

*2.2.1 recd 12 Jul 1972 San Antonio Zoo
wb, est. 1971, Kumasi, Ghana, from Zeehandelaar
0.0.1 died 15 Jul 1972 San Antonio Zoo
cd unknown
1.0.0 died 26 Mar 1981 San Antonio Zoo
1.0.0 died 24 Oct 1984 San Antonio Zoo
cd unknown
0.1.0 died 17 Mar 1988 San Antonio Zoo
0.1.0 died 23 Jun 1988 San Antonio Zoo

*0.0.1 hatched 9 Aug 1972 Frankfurt Zoo
0.0.1 died 18 Aug 1972 Frankfurt Zoo
cd unknown

*0.0.1 hatched 10 Aug 1972 Frankfurt Zoo
0.0.1 died 15 Aug 1972 Frankfurt Zoo
cd infection associated

0.0.2 recd 31 Oct 1972 Wassenaar Zoo
wb, West Africa, from van den Bijl, Busum
0.0.1 died 27 Dec 1972 Wassenaar Zoo
0.0.1 died 10 Jan 1973 Wassenaar Zoo

0.0.1 recd 2 Nov 1972 Rotterdam Zoo
wb, from van Dijk, Tilburg, note on file card says it was kept in the Bird House from 1978-1982 date of removal from collection unknown

2.3.1 recd 16 Dec 1972 Antwerp Zoo
wb, from Borglum, Farum, Denmark
0.1.0 died 24 Dec 1972 Antwerp Zoo
cd aspergillosis
1.0.0 died 26 May 1973 Antwerp Zoo
cd inflammation of intestine, microfilaria
0.1.0 died 19 Oct 1973 Antwerp Zoo
cd inflammation of intestine
1.0.0 died 9 Nov 1973 Antwerp Zoo
cd inflammation of intestine
0.1.0 died 5 Aug 1976 Antwerp Zoo
cd unknown
0.0.1 died 15 Mar 1977 Antwerp Zoo
cd degeneration of heart and bleeding in heart

0.0.2 recd ? 1972 Rotterdam Zoo
Possibly arrived with the 2 Nov specimen, zoo inventory shows 0.0.3 recd in 1972, but no file card for these two currently in zoo. Inventory also shows that 0.0.2 died but which two is unknown. Inventory shows 0.0.2 living Dec 1972.

IZY census 1973 (effective from 1973 the census was supposed to reflect data as of 1 Jan of the cited year): Amsterdam Zoo 1.1.4 (cb 0.0.3); Antwerp Zoo 0.0.6; Baltimore Zoo 0.0.1; Bronx Zoo 0.0.3; Brookfield Zoo 1.1.0; Copenhagen Zoo 0.0.8; Frankfurt Zoo 1.1.1 (but also said two were captive hatched; but not which two); Memphis Zoo 0.0.3; Philadelphia Zoo 0.0.3 (Inventory for 1 Jul 1973 showed 1.0.2); Rotterdam Zoo 0.0.2; San Antonio Zoo 0.0.11; NZP-Washington 0.0.6 (0.0.1 on loan from Los Angeles); Wassenaar Zoo 0.0.3

0.0.2 hatched 14 Sep 1973 Memphis Zoo
0.0.2 died 18 Sep 1973 Memphis Zoo

0.0.1 recd ? Rotterdam Zoo
Inventory for 31 Dec 1973 shows one died that year, but not which one.

IZY census 1974: Amsterdam Zoo 1.1.4 (cb 0.0.3); Antwerp Zoo 0.0.2; Bronx Zoo 0.0.2; Brookfield Zoo 0.0.2; Copenhagen Zoo 0.0.4 (if this list was as of 1 Jan the correct number would be five, but if as of 19 Jan the correct number was four); Fort Worth Zoo 1.1.0 (none were ever kept at Fort Worth, this was an error); Frankfurt Zoo 1.1.0; Koln Zoo 0.0.1; Memphis Zoo 1.2.0; Philadephia Zoo 1.0.2; Rotterdam Zoo 0.0.1; San Antonio Zoo 0.0.11; Walsrode Bird Park 0.0.8; NPZ-Washington 2.2.0 (one on loan from Los Angeles)

*0.0.2 hatched 29 Apr 1974 Frankfurt Zoo
0.0.1 died 4 Jul 1982 Frankfurt Zoo
0.0.1 recd 23 Aug 1984 Vienna Zoo
died 28 Sep 1987 Vienna Zoo

A series of applications to import up to 30 specimens for US zoos were made in 1975. The birds were at the compound of Mr Borglum in Liberia and were to be distributed in the USA by the firm of George Kroesen of Schaumburg (outside Chicago), Illinois. The birds were initially offered in Feb 1975 and it was indicated that if the US zoos did not expedite their permits the birds might be sent to other collections, e.g. in Europe. Two pairs were to go to Philadephia Zoo, two pairs to San Diego, two pairs to NZP-Washington, two pairs to Denver Zoo, two pairs to Los Angeles Zoo and two pairs to St Louis Zoo, and four pairs to Audubon Park Zoo, New Orleans. The AAZPA Conservation of Wildlife Committee (of which I was a committee member at the time) was alerted to this. It was decided that NZP would put in for one permit and when the birds arrived they would be transferred to the appropriate collections.

A permit was granted by the US Department of the Interior Fish and Wildlife Service (which called the birds White-winged or White-headed Rockfowl) to the NZP to import 28 birds 23 Jul 1975, and Philadephia Zoo was given one on the same date for four birds. St Louis Zoo was given permission, in a permit dated 6 Oct 1975, to take 2.2 from NZP but to take possession of them in Illinois. New Orleans was given permission to acquire eight birds from NZP on 20 Nov 1975 and San Diego to take 2.2 in interstate commerce.

However, as all of this was far past the deadline that was given earlier in the year none of the birds were imported into the USA.

IZY census 1975: Amsterdam Zoo 1.1.3 (cb 0.0.2); Antwerp Zoo 0.0.2; Brookfield Zoo 0.0.1; Copenhagen Zoo 0.0.3; Frankfurt Zoo 0.1.2 (cb 0.0.2); Koln Zoo 0.0.1; Memphis Zoo 1.2.0; Philadephia Zoo 0.1.2 (Philadephia Zoo Inventory 1 Jan 1975 & 31 Dec 1975 showed 1.0.2); Rotterdam Zoo 1.0.0 (Rotterdam Zoo Inventory 1 Jan 1975 & 31 Dec 1975 showed 0.0.1); San Antonio Zoo 0.0.11; Walsrode Bird Park 0.0.11; NZP-Washington 0.1.1

0.0.7 recd 11 Dec 1975 Copenhagen Zoo
from Borglum
0.0.1 died 11 Dec 1975 Copenhagen Zoo
0.0.6 exact disposition unknown. These birds were mixed with the three remaining from Jan 1972 (see p. 9) and as none were banded it was impossible to determine which was which.

*0.0.3 recd 16 Dec 1975 Koln Zoo
wb, from G van den Brink, Soest
0.0.3 loan 23 Feb 1982 Rambouillet Zoo
0.0.3 1 Dec 1996 Rambouillet Zoo
changed from loan to donation, trade or sale from Koln
0.0.3 final disposition unknown

1.1.2 recd ? 1975 Vienna Zoo
wb, source unknown
0.1.0 died ? 1975 Vienna Zoo
0.1.0 recd 18 Dec 1975 Vienna Nat. Hist. Museum
*1.0.0 sent 31 Aug 1984 Frankfurt Zoo
died 1 Sep 1986 Frankfurt Zoo
cd infection associated
0.0.1 died ? 1985 Vienna Zoo
0.0.1 recd 7 Feb 1985 Vienna Nat. Hist. Museum
0.0.1 died ? 1986 Vienna Zoo
0.0.1 recd 22 Dec 1986 Vienna Nat. Hist. Museum
(see note overleaf (p. 12))

(Dr Herbert Schifter, retired Curator of Birds at the Museum of Natural History, Vienna, Austria, (in a letter dated 31 Mar 2004) has provided the following information: Vienna Zoo (Wien-Schönbrunn) received four *P. gymnocephalus* 16 Dec 1975, from the dealer Gebrium (according to Schönbrunn data bank). One had died before or on arrival and therefore was not entered on the Schönbrunn data bank. This bird (sex unknown) was given to the museum 18 Dec 1975. Of the remaining birds (all males), one lived until 4 Jan 1985 and on its death was given to the museum. Another was given to the museum 18 Dec 1986. 1.0.0 was sent to Frankfurt Zoo 31 Aug 1984 and in exchange Schönbrunn Zoo received 0.1.0 14 Aug 1984 which lived until 28 Sep 1987 and was the last specimen kept there. Although the birds lived in quite a large planted aviary, no breeding activity occurred. Ed.)

IZY census 1976: Amsterdam Zoo 1.1.2 (cb 0.0.2); Antwerp Zoo 0.0.2; Brookfield Zoo 0.0.1; Copenhagen Zoo 0.0.8; Denver Zoo 1.1.0; Frankfurt Zoo 0.1.2 (cb 0.0.2); Koln Zoo 0.0.4; Philadephia Zoo 1.1.0; Rotterdam Zoo 1.0.0; San Antonio Zoo 0.0.8; Vienna Zoo 0.0.3; NZP-Washington 0.0.2

0.0.1 recd ? Copenhagen Zoo
0.0.1 died 10 Jan 1976 Copenhagen Zoo
cd aspergillosis

0.0.1 recd ? Copenhagen Zoo
0.0.1 died 30 Mar 1976 Copenhagen Zoo
cd unknown

0.0.1 recd ? Copenhagen Zoo
0.0.1 died 2 Apr 1976 Copenhagen Zoo
cd diagnosis impossible

0.0.1 recd ? Copenhagen Zoo
0.0.1 died 22 Jun 1976 Copenhagen Zoo
cd unknown

There did not appear to have been a *IZY* census for 1977

0.0.1 recd ? Copenhagen Zoo
0.0.1 died 7 Apr 1977 Copenhagen Zoo
weak for a long period, cd unknown

0.0.1 recd ? Copenhagen Zoo
0.0.1 died 7 Sep 1977 Copenhagen Zoo
cd intestinal inflammation/tapeworms

IZY census 1978: Amsterdam Zoo (cb 1.1.0); Antwerp Zoo 0.0.8; Copenhagen Zoo 0.0.2; Denver Zoo 1.1.0; Frankfurt Zoo 0.1.2 (cb 0.0.2); Koln Zoo 0.0.4; Memphis Zoo 1.1.0; Philadephia Zoo 1.0.0; Rotterdam Zoo 0.0.1; San Antonio Zoo 2.2.4; Vienna Zoo 0.0.3; Walsrode Bird Park 0.0.1

0.0.6 recd 10 Jan 1978 Copenhagen Zoo
from Borglum, mixed with two remaining specimens, exact disposition unknown

0.0.1 recd ? Copenhagen Zoo
0.0.1 died 12 Mar 1978 Copenhagen Zoo
cd pneumonia

1.0.12 recd 14 Mar 1978 Antwerp Zoo
wb, from Borglum, Monrovia, Liberia
0.0.1 died 17 Mar 1978 Antwerp Zoo

fair amount of sand in intestine
0.0.1 died 22 Mar 1978 Antwerp Zoo
cd unknown
1.0.0 died 6 Jul 1978 Antwerp Zoo
cd unknown
0.0.1 died 16 Jul 1979 Antwerp Zoo
cd unknown
0.0.1 died 23 Sep 1982 Antwerp Zoo
vestodes infestation
0.0.1 died 28 Sep 1982 Antwerp Zoo
degeneration of kidneys
0.0.1 died 11 Nov 1985 Antwerp Zoo
gout and degeneration of kidneys

0.0.5 recd 11 Apr 1978 Rotterdam Zoo
from Antwerp, Rotterdam said they were from Senegal (this species does not occur there) and were very young on arrival and had been hand-reared
0.0.1 died 11 Dec 1979 Rotterdam Zoo
0.0.1 died 4 Sep 1980 Rotterdam Zoo
0.0.1 died 19 Aug 1981 Rotterdam Zoo
0.0.1 died 20 Aug 1981 Rotterdam Zoo
despite the fact that the remaining bird from Antwerp laid an egg 15 Jul 1982, Rotterdam never changed its listing from sex unknown to female. The disposition of this bird is unknown

0.0.1 recd ? Copenhagen Zoo
0.0.1 died 31 Mar 1978 Copenhagen Zoo
inflammation of intestine/oviduct

1.0.4 recd 18 Apr 1978 Antwerp Zoo
wb, from Borglum, Monrovia, Liberia
0.0.1 died 10 Nov 1978 Antwerp Zoo
intestine filled with sand, inflammation of intestine
0.0.1 died 12 Nov 1978 Antwerp Zoo
cd unknown
0.0.1 died 26 May 1979 Antwerp Zoo
massive e.coli culture in intestine
1.0.1 recd 19 May 1978 Rotterdam Zoo
from Antwerp, Rotterdam said they were from Senegal (this species does not occur there) and were very young on arrival and had been hand-reared
0.0.1 died 19 May 1980 Rotterdam Zoo
1.0.0 loan 23 Aug 1984 Frankfurt Zoo
1.0.0 5 Mar 1991 Frankfurt Zoo
changed to donation or trade?
1.0.0 died 22 Jan 1995 Frankfurt Zoo
cd unknown

0.0.1 recd ? Copenhagen Zoo
died 16 Nov 1978 Copenhagen Zoo
suspected pseudotuberculosis

IZY census 1979: Amsterdam Zoo (cb 0.0.1); Antwerp Zoo 0.0.5; Copenhagen Zoo 0.0.5; Denver Zoo 1.1.0; Frankfurt Zoo 0.1.2 (cb 0.0.2); Koln Zoo 0.0.4; Memphis Zoo 1.0.0; Rotterdam Zoo 0.0.8; San Antonio Zoo 2.3.0; Vienna Zoo 0.0.3; Walsrode Bird Park 0.0.1; NZP-Washington 0.0.1

0.0.1 recd ? Copenhagen Zoo
0.0.1 died 19 Aug 1979 Copenhagen Zoo
proventricular worms

*0.1.0 hatched	12 Sep 1979	San Antonio Zoo
0.1.0 died	25 Jan 1988	San Antonio Zoo

cd unknown

IZY census 1980: Amsterdam Zoo 0.0.1; Antwerp Zoo 0.0.3; Copenhagen Zoo 0.0.4; Denver Zoo 1.1.0; Frankfurt Zoo (cb 0.0.2); Koln Zoo 0.0.4; Memphis Zoo 1.0.0; Rotterdam Zoo 0.0.7; San Antonio Zoo 2.4.0 (cb 0.1.0); Vienna Zoo 0.0.3; Walsrode Bird Park 0.0.1; NZP-Washington 1.0.0

0.1.0 recd/hatched	?	Amsterdam Zoo
*0.1.0 loan	30 May 1980	Frankfurt Zoo
died	4 Sep 1987	Frankfurt Zoo

cd unknown (Frankfurt indicated it thought it was a wild-hatched specimen, but made no estimate of its age)

0.0.1 recd	?	Copenhagen Zoo
0.0.1 died	6 Aug 1980	Copenhagen Zoo

inflammation of the oral cavity and intestine

0.0.1 recd	?	Copenhagen Zoo
0.0.1 died	6 Nov 1980	Copenhagen Zoo

cd unknown

IZY census 1981: Antwerp Zoo 0.0.3; Copenhagen Zoo 0.0.2; Frankfurt Zoo 0.0.3 (cb 0.0.2) (0.0.1 loan from Amsterdam Zoo); Rotterdam Zoo 0.0.5; San Antonio Zoo 3.4.0 (cb 0.1.0); Vienna Zoo 0.0.3; NZP-Washington 1.0.1 (loans from Memphis and San Antonio Zoos)

0.0.1 recd	?	Copenhagen Zoo
0.0.1 died	30 May 1981	Copenhagen Zoo

inflammation of the intestine

*0.0.2 hatched	2 Nov 1981	San Antonio Zoo
0.0.1 died	29 Nov 1981	San Antonio Zoo

cd unknown

0.0.1 died	8 Apr 1984	San Antonio Zoo

cd unknown

IZY census 1982: Antwerp Zoo 0.0.3; Copenhagen Zoo 0.0.1; Frankfurt Zoo 0..0.3 (cb 0.0.2) (0.0.1 loan from Amsterdam Zoo); Rotterdam Zoo 0.0.3; San Antonio Zoo 1.4.1 (cb 1.1.0); Vienna Zoo 0.0.3; NZP-Washington 1.0.1 (loans from Memphis and San Antonio Zoos)

1.0.0 recd	? Jan 1972	
	or 11 Dec 1975	
	or 10 Jan 1978	Copenhagen Zoo
1.0.0 loan	30 Jun 1982	Frankfurt Zoo

reported to ISIS by Frankfurt as being a female, but shown later as having sired a chick at Frankfurt

1.0.0 died	31 Mar 1993	Frankfurt Zoo

cd unknown

IZY census 1983: Antwerp Zoo 0.0.1; Frankfurt Zoo 0.0.3 (cb 0.0.1); Rotterdam Zoo 1.1.1 (Rotterdam Zoo Inventory 1 Jan 1983 showed 0.0.3, during the year 0.0.1 died, leaving 31 Dec 1983 1.1.0); San Antonio Zoo 2.5.0 (cb 0.2.0); Vienna Zoo 0.0.3; Walsrode Bird Park 0.0.1

*0.0.1 hatched	6 Aug 1983	San Antonio Zoo
0.0.1 died	3 Sep 1983	San Antonio Zoo

cd unknown

*0.0.1 hatched 6 Oct 1983 San Antonio Zoo
0.0.1 died 7 Oct 1983 San Antonio Zoo
cd unknown

*0.0.1 hatched 7 Oct 1983 San Antonio Zoo
0.0.1 died 7 Oct 1983 San Antonio Zoo
cd unknown

*0.0.1 hatched 11 Nov 1983 San Antonio Zoo
0.0.1 died 16 Nov 1983 San Antonio Zoo
cd unknown

IZY census 1984: Antwerp Zoo 0.0.1; Frankfurt Zoo 0.0.3 (cb 0.0.1); Rotterdam Zoo 1.1.0; San Antonio Zoo 2.5.0 (cb 0.2.0)

0.1.0 recd ? Rotterdam Zoo
0.1.0 died 1984 Rotterdam Zoo

*0.0.1 hatched 26 Jun 1984 San Antonio Zoo
0.0.1 died 29 Jul 1984 San Antonio Zoo
cd unknown

*0.1.0 hatched 13 Jul 1984 San Antonio Zoo
0.1.0 died 11 Mar 1998 San Antonio Zoo
cd unknown
This was probably the last *Picathartes gymnocephalus* in captivity

*0.0.1 hatched 15 Jul 1984 San Antonio Zoo
0.0.1 died 23 Jul 1984 San Antonio Zoo
cd unknown

*0.0.1 hatched 2 Aug 1984 San Antonio Zoo
0.0.1 died 7 Aug 1984 San Antonio Zoo
cd unknown

*0.0.1 hatched 28 Oct 1984 San Antonio Zoo
0.0.1 died 9 Dec 1984 San Antonio Zoo
cd unknown

*0.0.1 hatched 29 Oct 1984 San Antonio Zoo
0.0.1 died 16 Nov 1984 San Antonio Zoo
cd unknown

IZY census 1985: Antwerp Zoo 0.0.1; Frankfurt Zoo 1.1.1 (loans from Amsterdam, Copenhagen and Rotterdam Zoos); Koln Zoo 1.1.1; San Antonio Zoo 1.4.0 (cb 0.2.0); Vienna Zoo 0.0.3

*0.0.1 hatched 9 Aug 1985 San Antonio Zoo
0.0.1 died 6 Sep 1985 San Antonio Zoo
cd unknown

*0.0.1 hatched 3 Oct 1985 Frankfurt Zoo
the parents were birds on loan from Copenhagen and Amsterdam Zoos
0.0.1 died 9 Oct 1985 Frankfurt Zoo
cd environmental or behavioural conditions

IZY census 1986: Frankfurt Zoo 1.1.2 (cb 0.1.0) (loans from Amsterdam, Copenhagen and Rotterdam Zoos); San Antonio Zoo 1.4.0 (cb 0.2.0); Vienna Zoo 0.0.2

IZY census 1987: Frankfurt Zoo 0.0.2; San Antonio Zoo 1.3.0 (cb 0.2.0); Vienna Zoo 0.0.1

*0.1.0 hatched	10 Mar 1987	San Antonio Zoo
0.1.0 died	1 Jan 1989	San Antonio Zoo
cd infection associated		

IZY census 1988: Frankfurt Zoo 1.1.0 (loans from Amsterdam and Copenhagen Zoos); San Antonio Zoo 0.4.0 (cb 0. 2 . 0)

IZY censuses for 1989, 1990, 1991 (last *IZY* censuses):
Frankfurt Zoo 1.1.0; San Antonio Zoo (cb 0.1.0)

References

Webb, C. S. 1949. Some notes on the Grey-necked Picathartes *Avicultural Magazine* 55:149-155.

Webb, C. S. 1953. *A Wanderer in the Wind The Odyssey of an Animal Collector*. Hutchinson, London.

Marvin L. Jones, Registrar Emeritus, Zoological Society of San Diego, last November celebrated his 75th birthday. He wrote his first article for the magazine in early 1954. It was about Köln Zoo and was written when he was serving with the US Army in Germany.

UNDER THREAT

As a result of loss and degradation of its forest habitat, it is estimated that fewer than 10,000 *Picathartes gymnocephalus* remain in the wild, confined to Guinea, Sierra Leone, Liberia, Côte d'Ivoire and Ghana. A five-year action plan aims to more accurately estimate the size of the population, its distribution and trends, and stabilise or increase the number of birds by reducing human activities at the main breeding sites.

Similar objectives have been set for *P. oreas*, which is confined to Nigeria, Cameroon, Equatorial Guinea and Gabon. It is similarly threatened and, like its congener, has an estimated current population of fewer than 10,000 birds.

BREEDING THE WHITE-EARED BULBUL

by Gary Bralsford

Having in the past bred the Red-whiskered Bulbul *Pycnonotus jocosus* and had near misses with the Chestnut *Hypsipetes castanotus* and White-headed *H.leucocephalus*, I decided to have a pair of bulbuls in my collection again for the 2003 breeding season. I looked around for a few weeks until I saw that a dealer in nearby Doncaster had a few different species for sale: Red-whiskered, Finchbill *Spizixos semitorques*, White-headed, Chinese *P. sinensis* and White-eared *P. leucogenys leucotis* or *P. leucotis* (see below). I watched the White-eared and they were very graceful in their flight patterns, very much like butterflies and glided a lot in flight. There were about a dozen (12) of them all together in the flight and trying to sex them was nearly impossible. I decided to pick three birds; one with large white cheek patches and two with a little less white on the cheeks.

My birds have hardly any crest to speak of, white cheek patches and an otherwise black head (see photo). Whistler (1941) and Woodcock (1980) treated this bird as a subspecies of the White-cheeked, calling both the White-cheeked Bulbul, *P. l. leucogenys* and *P. l. leucotis*. The latter is described as being found in light woodland, gardens, the neighbourhood of towns and villages, scrub and mangrove. Grewal, Harvey, Pfister (2002), however, treat it as a full species, calling it the White-eared Bulbul (White-cheeked Bulbul) *P. leucotis*, a common breeding resident of the plains of Pakistan and north-west India, that also occurs in western Asia. It eats berries and other fruits and will take insects and nectar, and in captivity will take a coarse softbill food such as Bogena or Nutriluxe Red.

My birds were put in a flight in my shed. The flight measures 8ft long x 4ft wide x 6ft high (approx. 2.4m long x 1.2m wide x 1.8m high) and all three birds were released into it at the beginning of March. I had fixed up several nest-boxes and wicker baskets, and hung up two wallflower baskets and two hanging baskets all of which were filled with indoor plants. I had also put wicker nest pans in each basket. The bulbuls settled down and came into breeding condition fairly quickly. Soon afterwards I noticed a few feathers scattered on the floor and on watching the three bulbuls, noticed two had paired-up, isolating the other one. I removed the odd one, which proved to be a male, that as soon as it was caged began to have singing contests with the male in the flight.

Having decided that the two in the flight were a true pair, I provided lots of coconut fibre and horse hair in salad racks hung on the flight walls. The female started carrying nest material to one of the wicker baskets and within three days had finished making a nest. No eggs were laid in it, instead the