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**Chromosomes of two rare species of neotropical mammals:  
Southern pudu (*Pudu puda*) and Bush dog (*Speothos venaticus*)**

By A. SCHREIBER and R. DMOCH

*Zoologisches Institut I der Universität Heidelberg and Zoologischer Garten, Frankfurt, FRG*

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For several years European zoos (Europäisches Erhaltungszuchtprogramm) have coordinated captive breeding projects for two neotropical mammals, the southern pudu (*Pudu puda*) and bush dog (*Speothos venaticus*), including specimens imported from various, mostly unknown geographic origins. Mammalian species are frequently comprised of chromosomally polymorphic or polytypic populations, thus cytogenetic investigations are a useful tool when establishing breeding populations in zoos (e.g. RYDER et al. 1989; DATHE et al. 1989; SCHREIBER et al. 1993). Since both pudus and bush dogs are fairly delicate mammals to handle for blood sampling, we profited from rare occasions of blood sampling to check whether the initial phase of the captive conservation breeding project had led to a hybridization of unrecognized cytotypes.

The southern pudus kept in European zoos descended from wild captured founders imported in 1966, 1970, and 1972 from unidentified areas of the comparatively small native range of this species. The exact genealogy of the four investigated pudus kept at the Cologne Zoo is unknown. Of the six karyotyped bush dogs kept at the Frankfurt Zoo, one male is a first-generation offspring of wild captured parents imported from French Guiana. The other five investigated specimens descended from seven imported animals (with varying percentages of founder representation): They possessed individuals from Paraguay (two wild captured founders) and French Guiana (three wild captured founders) in their ancestry, plus two ancestors acquired from the animal trade without proper information as to their origins. Three-day cultures of peripheral lymphocytes from heparinized blood samples were grown in Chromosomen-Medium B (Seromed, Berlin). After 3–12 hours incubation with colcemide, the preparation of chromosomes was performed as previously described (SCHREIBER et al. 1993). Per specimen, 10–20 metaphases were photographed and analysed.

The one female and three male karyotyped southern pudus contained a complement of  $2n = 70$  (NF = 74). The X chromosomes were large metacentrics, whereas all autosomes, with the exception of one pair, were acrocentrics. The largest acrocentric pair of autosomes possessed conspicuous satellite appendages (Fig. 1).

The three female and three male investigated bush dogs showed an identical karyotype of  $2n = 74$  (NF = 76). Other than the relatively large female sex chromosomes, all autosomes were acrocentrics (Fig. 2). The Y chromosome was a small metacentric.

The karyotype monomorphism found in both sample series does not indicate hybridization of cytotypes during the breeding project. Previous investigations reported karyotypes from one male (KOULISCHER et al. 1972), and from one male and one female southern pudus to be comprised of 70 chromosomes each (NF = 74) (SPOTORNO and FERNANDEZ-



Fig. 1. G-stained karyotype of a male southern pudu (*P. puda*)



Fig. 2. G-stained chromosomes of a female bush dog (*Speothos venaticus*)

DONOSO 1975), findings that are extended to a sample size of seven pudus by the present report. However, cervids, including neotropical species, are notorious for their cytogenetic variability (NEITZEL 1982, 1987). A single northern pudu (*Pudu mephistophiles*) contained 69 chromosomes, including two acrocentrics corresponding to a metacentric, and presumably represented the heterozygote of a translocation polymorphism (NEITZEL 1979). Some authorities include pudus in the genus *Mazama*, the brocket deer (HERSHKOVITZ 1982; CZERNY 1987), whose species display elevated cytogenetic variation, the taxonomic background of which remains to be clarified. In single individual deer classified as *Mazama americana*, the following karyotypes were found:  $2n = 68$ ,  $NF = 74$  (TAYLOR et al. 1969; unknown geographic origin of specimen),  $2n = 49/50$ ,  $NF = 72$  (JORGE and BENIRSCHKE 1977, *M. americana temana*),  $2n = 54$  plus two B-chromosomes (NEITZEL 1982, hybrid zoo specimen with parents imported from two regions in Paraguay), and  $2n = 52$  ( $NF = 56$ ) plus 4–5 B-chromosomes (NEITZEL 1987, female originating from Paraguay). Interbreeding of the latter cytotype with a male *Mazama gouazoubira* ( $2n = 70$ ) resulted in presumably infertile offspring with  $2n = 61$  (plus two B-chromosomes) (NEITZEL 1987). While *M. americana* is so polymorphic, *M. gouazoubira* retains a very conservative karyotype of  $2n = 70$  ( $NF = 70$ ), considered to be ancestral for Cervidae (NEITZEL 1982). The bewildering chromosomal variation in the closely related “species” *Mazama americana*, which appears to have evolved within only 2 million years since the presumed colonization of South America (NEITZEL 1987), and the odd-numbered karyotype of the only *Pudu mephistophiles* investigated to date (NEITZEL 1979), suggest that the present sample size of seven karyotyped southern pudus is insufficient to exclude the existence of local chromosomal populations in this species. Pudus are solitary, sedentary deer (HERSHKOVITZ 1982; CZERNY 1987) with probably quite limited interbreeding between regional stocks. Cervids with similar lifestyles, e.g. muntjacs (*Muntiacus*), have fixed so many chromosomal mutations between populations that they represent the ungulates with the most extensive cytological variation (NEITZEL 1982). In Bovidae, dik-diks (*Rhynchotragus*) provide another example of extensive regional chromosomal diversity in a philopatric, territorial ruminant with obviously limited gene flow between stocks (DATHE et al. 1989; RYDER et al. 1989).

Bush dogs are a rare species which avoid human settlements and are not frequently observed (THORNBACK and JENKINS 1982; GINSBERG and MACDONALD 1990). Details of their taxonomy are not well known. CABRERA (1957) recognized three subspecies, *S. v. venaticus*, *S. v. wingei* and *S. v. panamensis*, which range widely, though sparsely through evergreen rain forests of tropical South America. However, there is no revision of these subspecies, and their exact distributional ranges are unknown. *S. v. venaticus* is believed to inhabit both Guiana and Paraguay, the two countries from where the documented founder animals of the zoo population originated. WURSTER-HILL and CENTERWALL (1982) karyotyped one bush dog of unknown geographic origin and found  $2n = 74$ . Canidae, like deer, include species with microchromosomes or B-chromosomes (e.g. *Nyctereutes*, *Vulpes*), and in *Nyctereutes procyonides*, the racoon dog, chromosome numbers range from  $2n = 42$  to  $2n = 56/57$ , the species including chromosomal mosaic individuals, and B-chromosomal polymorphism (WURSTER-HILL et al. 1986). WURSTER-HILL et al. (1988) encountered as many as eight Robertsonian translocation differences between *N. p. procyonides* from China ( $2n = 54$  plus B-chromosomes), and *N. p. viverrinus* from Japan ( $2n = 38$  plus B-chromosomes). YOSIDA and WADA (1985) reported numerous variable chromosomal fissions from the racoon dog population living in Central Honshu, Japan. We have no evidence for B-chromosomes in bush dogs.

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*Anschriften der Verfasser:* Dr. ARND SCHREIBER, Zoologisches Institut I der Universität, Im Neuenheimer Feld 230, D-69120 Heidelberg, FRG; Dr. RÜDIGER DMOCH, Zoologischer Garten Frankfurt, Alfred-Brehm-Platz 16, D-60316 Frankfurt, FRG



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Autor(en)/Author(s): Schreiber Arnd, Dmoch Rüdiger

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