First report of a chinchilla phenotype in Viverridae (Carnivora)

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Abstract

We report on the first case of a chinchilla phenotype in Viverridae (Carnivora), on the basis of a skin of Hausa Genet Genetta thierryi originating from Réserve de Faune de Kankan, Republic of Guinea. The specimen exhibits pale rufous brown spots likely to have been caused by eumelanin degradation, and uniform pale creamy orange background coloration probably due to lower concentration of phaeomelanin.

Keywords: coat colour, genet, Genetta thierryi, Republic of Guinea, West Africa

Première mention d’un phénotype chinchilla chez les Viverridae

Résumé

Nous mentionnons le premier cas de phénotype chinchilla chez les Viverridae (Carnivora), sur la base d’une peau de Genette de Villiers Genetta thierryi provenant de la Réserve de Faune de Kankan, en République de Guinée. Le spécimen montre des taches marron-roux pâle vraisemblablement causées par une dégradation de l’eumélanine, et une couleur de pelage orange crème pâle probablement diagnostique d’une concentration plus faible de phéomélanine.

Mots clés: Afrique de l’Ouest, couleur du pelage, genet, Genetta thierryi, République de Guinée

In mammals, the colour of hairs, skin and eyes stems from the biosynthesis of a range of melanin pigments occurring in melanocytes. Such pigments arise from a common metabolic pathway where a series of enzymes is involved in different oxidation steps catalysed by tyrosinase. Thus, mutations that affect melanin biosynthesis have a global impact on the organism, including on retinal pigments. Probably the best-known mutation of this type is albino, where the loss of the oxidative function of tyrosinase results in a white phenotype with red eyes. Melanocytes synthesise two types of melanins, namely eumelanin (brown/black) and phaeomelanin (red/yellow), both requiring the action of tyrosinase (Hearing & Tsukamoto 1991, Barsh 2001, Ito & Wakamatsu 2003). Melanocytes from hair follicles may switch between eumelanin and phaeomelanin (or both at the same time) synthesis, a mechanism responsible for the great coat colour polymorphism observed in natural populations of mammals (Furumura et al. 1996, Barsh 2001) and which is likely to be involved in adaptive cryptic colorations (Singaravelan et al. 2010).

The large extent of gradual variation in coat pattern and colour in carnivores (order Carnivora) is well documented, both in domestic stocks (Kaelin & Barsh 2013) and wild populations (Little 1958, Robinson 1976). The most common of the ‘aberrant’, genetically-determined coat colour mutants in wild carnivores is melanism (prevalence of black pigmentation), including albino individuals in Common Genets Genetta genetta, the wide variation observed in coat pattern and colour has been responsible for some long-standing taxonomic confusions (Gaubert 2003, 2013, Gaubert et al. 2005, 2008). Aberrant phenotypes do also occur at various (but low) frequencies, including albino individuals in Common Genets Genetta genetta from Europe (Delibes et al. 2013) and melanistic specimens observed in 11 out of the 37 species as well as chinchilla mutants such as ‘white’ Lions Panthera leo, Tigers P. tigris and Ocelots Leopardus pardalis (Robinson 1976, McBride & Giordano 2010). Recent studies have shown the complexity of aberrant coat colour acquisition in cats, suggesting at least five independent mutational pathways encoding melanism (Eizirik et al. 2003, Schneider et al. 2012).

Civets and allies (Viverridae) exhibit a wide range of coat pattern and colour variation, also including mutants such as albino, melanistic and erythristic phenotypes (Webb 1947, Sharma 2004, Veron et al. 2004, Eaton et al. 2010, Gaubert & Mézan-Muxart 2010, Delibes et al. 2013). In the genets Genetta, the wide variation observed in coat pattern and colour has been responsible for some long-standing taxonomic confusions (Gaubert 2003, 2013, Gaubert et al. 2005, 2008). Aberrant phenotypes do also occur at various (but low) frequencies, including albino individuals in Common Genets Genetta genetta from Europe (Delibes et al. 2013) and melanistic specimens of Miombo Genet G. angolensis, Servaline Genet G. servalina, Rusty-spotted Genet G. maculata (Africa) and G. genetta (Europe) (Webb 1947, Gaubert & Mézan-Muxart 2010, Barrull & Mate 2012). We here add to the list of phenotypic aberrations within the Viverridae by reporting the first case of a chinchilla mutant, on the basis of a skin of Hausa Genet G. thierryi collected in the Réserve de Faune de Kankan, Republic of Guinea (West Africa).

Four sun-dried skins of genets, including an aberrant ‘creamy-rufous’ specimen, were collected from Nalankoni (10°05’N, 8°35’W), in the Réserve de Faune de Kankan, Republic of Guinea, between 26 March and 6 June 2009, during a participatory community management conservation project conducted by SYLVATROP. The Réserve de Faune de Kankan is located east in the Republic of Guinea, at the border with Côte d’Ivoire, in the Guinean savanna belt. Mean annual rainfall, temperature and relative humidity reach 1,673 mm, 26 °C and...
66%, respectively. The vegetation is a mix of periodically flood-
ed grassy plain (consisting mainly of grasses on waterlogged 
soils), wooded savannas with scattered trees and shrubs, and 
forest galleries along permanent streams. The exact habitat(s) 
from which the genets were taken is/are unknown.

We used the computer-assisted identification key of 
Gautert et al. (2008) and PCR-amplified short fragments of 
cytochrome b (DNA extraction protocol from Gautert & Ze-
natello [2009]; specific primers from Gautert et al. [2011]; 
data not shown) to reach species identification of the four 
skins collected. The specimens were deposited at the mam-
mals and birds (Mammifères et Oiseaux) collections, Muséum 

Two skins were identified as West African Large-spotted 
Genets G. pardina (MNHN 2010-1260 and -1263), while the 
two others were Hausa Genets G. thierryi (MNHN 2010-1261 
and -1262), including the aberrant ‘creamy-rufous’ specimen 
(MNHN 2010-1261; Fig. 1). The latter exhibits pale rufous 
brown spots and uniform pale creamy orange background col-
oration. We could not observe any black hairs, whereas a fair 
proportion of white hairs occurs over the entire skin (i.e. spots 
and background). The other specimen of G. thierryi (MNHN 
2010-1262) collected at the same period and coming from 
the same general locality has dark brown spots and brown 
(back) to yellow (belly) ash-grey ground coloration. Such a 
colour pattern is included in the phenotypic range of the 
species (Gautert & Dunham 2013a). The two individuals of 
G. pardina collected from the same area exhibited standard 
phenotypic characters of West African Large-spotted Genets 
from the Guinean savannah (Gautert 2003, Gautert & Dun-
ham 2013b).

Loss-of-function in genes involved in the synthesis of 
eumelanin can result in black coat markings turning to red. 
Such alterations of eumelanin synthesis have variable effects 
on coat colour depending on whether or not phaeomelanin is 
synthesised (Barsh 2001). The aberrant specimen of G. thierr-
ryi that we describe here refers clearly to a chinchilla mutant, 
a phenotype already observed in carnivores such as white Lions 
and white Tigers. In those cats, the chinchilla mutants show a 
reduced amount of all the melanin pigments, with more view-
able effects on the yellow (phaeomelanin) than on the brown 
or black (eumelanin) pigmented areas (Robinson 1976). 
In white Lions, spots turn pale sepia brown (degradation of 
eumelanin) while the background coat colour becomes light 
fawn (low concentration of phaeomelanin) (Robinson & Vos 
1982). Similarly, in white Tigers phaeomelanin is expressed 
as pale beige and eumelanin is degraded to sepia brown (Rob-
inson & Vos 1982), in such a way that markings and spots are 
still visible but appear less clearly. We can also relate the chin-
chilla phenotype observed in the Hausa Genet to the “amber 
light silver mackerel tabby” Norwegian Forest Cat (a breed 
of domestic cat Felis catus) represented in Peterschmitt et al. 
(2009: 549: Fig. 2e): the individual has a light pinkish-beige 
colour with a toned down tabby pattern. It is unfortunate that 
we could not observe the genet specimen alive to reinforce our 
diagnosis, because chinchilla phenotypes should have bluish 
or whitish irides with reddish pupils (Robinson 1976).

The chinchilla phenotype is linked to the specific allele C^{	ext{th}} 
of the full color (Robinson 1976) or albino/tyrosinase (Lamor-
eux et al. 2001) locus C. The chinchilla allele encodes a partly 
functional tyrosinase, with the consequence of drastically re-
straining the synthesis of phaeomelanin and degrading the
Acknowledgements

We are grateful to Aboubacar Oularé (Office Guinéen de la Biodiversité et des Aires Protégées) and Christine Sagno Kourouma (Direction Nationale des Eaux et Forêts) for administrative and logistic support during field work. We thank the Zoo d’Amnéville for field work financial support. Christophe Voisin (SPOT, MNHN) prepared the skins of genets, and Géraldine Veron (UMR OSEB, MNHN) gave us access to the “Mammifères & Oiseaux” collections. Laboratory work was done at the Service de Systématique Moléculaire (MNHN).

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