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Short notes and reviews

Taxonomic uniqueness of the Javan Leopard; an opportunity for zoos to save it

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Abstract

The Javan leopard *(Panthera pardus melas)* is a distinct subspecies, basal to the phylogenetic tree of Asian leopards. At present this taxon is not specifically managed in captive breeding programs in America and Europe. As it is endangered in the wild, and represents a genetically and morphologically unique and distinct taxon we recommend a more concerted effort to target this species for captive breeding.

Captive breeding of leopards

Captive breeding programmes of endangered species aim to prevent their extinction and provide a potential captive stock for reintroducing species into their natural habitats. Until recently *ex situ* captive breeding programmes mostly lacked direct links to *in situ* conservation, but now interest for active collaboration between *ex situ* breeding programmes and *in situ* conservation programmes has rapidly increased (WAZA, 2005). The creation of coordinated breeding programmes has often been opportunistic, with the presence of sizeable populations of a particular taxon in captivity being a justification for a conservation program. In the case of the leopard *Panthera pardus*, a number of coordinated breeding programs have been established for subspecies which were sufficiently represented in zoological collections. It should be noted that subspecific taxonomy of *Panthera pardus* was, and still is, controversial. Presently, three nominal taxa are managed in Europe as EEP's (European Breeding Programmes); *saxicolor*, *orientalis* and *kotiya*. In North America, the only managed subspecies is *orientalis*, while *saxicolor*, *japonensis* and "hybrids, other races and colour morpho-types will be managed to extinction" (Swanson *et al.*, 2003). In Europe, other subspecies are represented by a few individuals for which no coordinated breeding programs have been established. There is a high number of leopards of unknown origin, including the so-called black panther, a melanistic, but taxonomically undifferentiated form of leopard, that is considered to occupy space needed for the managed subspecies (Richardson, 2001).

The unique Javan leopard

The Javan leopard (*Panthera pardus melas*) is a morphologically distinct subspecies with a very limited distribution range (Meijaard, 2004; Santiapillai and Ramono, 1992). Recent research on variation in mitochondrial DNA confirms that the Javan subspecies is genetically quite distinctive from the other subspecies (Miththapala *et al.*, 1995; Uphyrkina *et al.*, 2001, see Fig. 1). Remarkably, according to the latter authors,

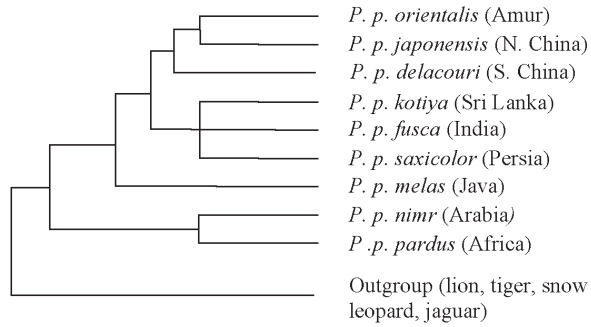

Fig. 1. Phylogram based on a combination of a molecular (Uphyrkina *et al.*, 2001) and morphometric analysis (Meijaard, 2004).

melas is the sister group to all Asian leopards. Meijaard (2004) provided a palaeoecological hypothesis for the apparent distinctiveness of the Javan subspecies. Compared with the Javan leopard, some other subspecies are not so clearly differentiated by molecular and craniometric data. The Sri Lankan subspecies *kotija*, for instance, is clearly associated to the Indian subspecies *fusca* from which it probably originated (Meijaard, 2004; Uphyrkina *et al.*, 2001).

Based on the distinctiveness of the Javan leopard, a captive breeding programs for this taxon – which is listed as Endangered in the IUCN Red List (IUCN 2006) – should make a much greater contribution to the conservation of *Panthera pardus* diversity than that of many nominal subspecies currently included in EEPs and other coordinated breeding programs elsewhere. Outside of Indonesian zoos, the only pure animals of Javan Leopard that we know are in European zoos. According to Richardson (2001), there were 14 *P. p. melas* in Europe in 1997, destined to extinction, but ISIS currently only lists 2 males in Europe. The Indonesian zoos of Ragunan, Surabaya, and Taman Safari in Bogor also have Javan leopards (Richardson, pers. comm.). Currently there are 17 Javan leopards with 7 males and 10 females in Taman Safari, of which four breeding pairs (Prastiti, pers. comm.).

However, it is possible that many more pure Javan specimens exist as 'black panthers', as this colour form is particularly common on Java (Pocock, 1930). These black leopards in captivity are mostly of small size (pers. obs.), which is characteristic for the Javan leopard (see Meijaard 2004; Pocock, 1930), and although breeding with other leopard subspecies in zoos certainly occurred, it is probable that most of the captive populations are still composed of pure *melas*. Thus zoos in Europe and America could greatly augment the genetic variability of the captive population of Javan leopard.

Recommendations for captive breeding and research

The uncertain taxonomic status of 'black leopard' in zoos precludes an accurate estimate of the size of the captive *melas* population and the extent of hybridization with other subspecies. Research utilising nuclear DNA should help to identify pure Javan black leopards to add to the founders of a captive managed population of *melas*. Coordinated breeding programs for the Javan leopard should not only save important genetic material, but may represent a first step to increase conservation activities on Java to protect a unique leopard and, indirectly, other endemic species (Meijaard, 2004). We thus propose to include Javan leopards as a focal taxon in European and American captive breeding programs, and closely collaborate with Asian collections of this taxon. Leopards are among the most adaptive cat species (Nowell and Jackson, 1996), and reintroducing them should be considered a realistic option to re-establish extinct populations once effective conservation measures are in place.

Conclusions

The case of the Javan leopard suggests the usefulness of a palaeocological perspective in conservation prioritization especially when modern taxonomic revisions are lacking. Interestingly, the same approach may identify apparently endemic island taxa which in fact originated through ancient human introductions and thus do not deserve much conservation efforts (Gippoliti and Amori, 2002). Finally, as our taxonomic knowledge appears poor or biased (for example, nothing is known about the subspecific taxonomy of African leopards, yet this does not mean that there are no subspecies), it is necessary that conservation recommendations, and particularly those of *ex-situ* programs, maintain a degree of flexibility to account for changes in species' taxonomy as our knowledge increases.

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