A New Approach to Cheetah Identification

by E.V.Chelysheva[1]

The cheetah (*Acinonyx jubatus*) is considered to be one of the most threatened cat species in Africa (IUCN Red List status: C2a(i); CITES: Appendix I). The total number in sub-Saharan Africa has been estimated at 9,000-12,000 (Nowell & Jackson 1996). The two largest meta-populations are now believed to occur in eastern Africa (Kenya and Tanzania) and southern Africa (Namibia, Botswana, Zimbabwe and Zambia). (Nowell & Jackson 1996).

It is due to imprecise counting techniques that the current conservation status of the cheetah in Africa is a controversial issue. Questionnaires can provide general population numbers. Only field investigations can provide the essential and precise data on current populations in the wild. Increasing world interest in endangered species conservation, including the cheetah, requires a sharing of knowledge to provide better understanding and more importantly, to react.

The identification of individuals provides researchers with important information on population, distribution, home ranges/territories, composition, and dynamics of populations which is necessary to develop conservation strategies.

Photographic identification is a simple, non-invasive technique for identifying individuals, using distinctive features such as coloration, stripe or spot patterns and other unique characteristics, depending on the species.

After working closely with cheetahs for 17 years in Moscow Zoo (Russia), White Oak Conservation Center of Endangered Species (Florida, USA), Cheetah Conservation Fund (Namibia), I received a position as an assistant researcher at the Masai-Mara Cheetah Conservation project (Kenya). One of my duties was to identify cheetahs we had seen and photographed during field work. Images of standing, sitting, lying and moving cheetahs were taken from both sides with a digital camera (Canon EOS D30 with lenses Sigma 28-300mm F 3.5-6.3) and/or 35 mm film photo camera (OLYMPUS IS 3000), allowing the tail from the base to the tip, as well as the inner and upper side of limbs, to be clearly seen (Fig. 1). In addition, 8 mm video film camera (SONY E 730) was used. After our first 15 days, we had 20 sightings of 37 individuals, and I had more than 100 photos, as well as hours of video to work with. With those, I then had to identify precisely how many individuals were present.

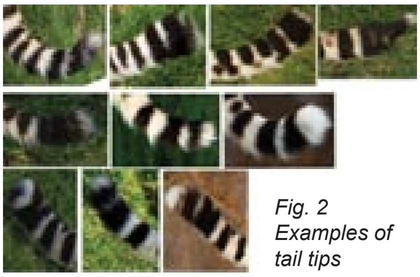


Fig. 2 Examples of tail tips

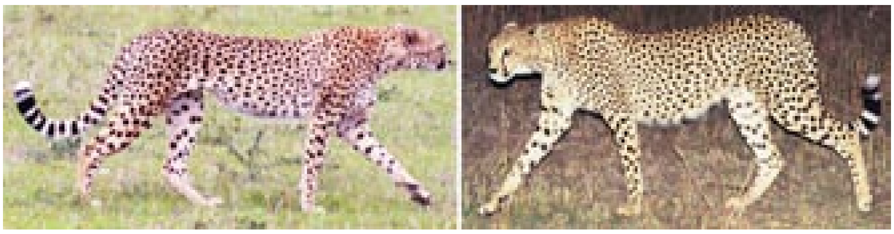
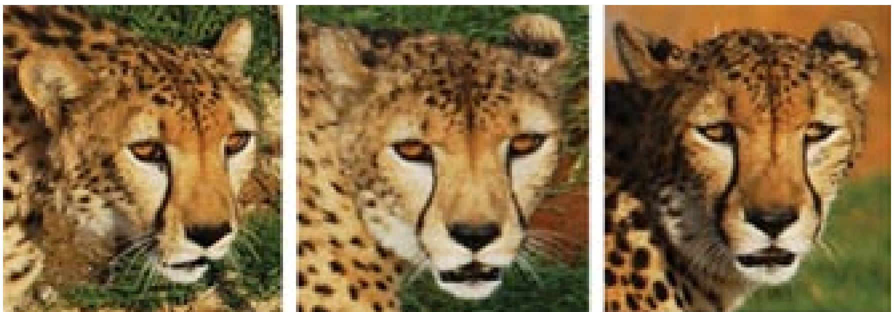


Fig. 1 Profiles. The images best for identification.



a b c

Fig. 3 Faces. a,b – same cheetah; c – different cheetah; b,c – similar expression in different cheetahs

The tail rings, spot patterns on the face, chest, body and limbs are unique in the cheetah and therefore are used for identification. The tip of the tail can be white, black or plain, and with or without spots. The tail can also have up to six rings, followed by half-broken rings which appear as different patterns on both its sides and thus can be used as a prime identification pattern (Fig. 2).

The spots on the cheetah's face and chest are relatively small and are only seen well from a short distance (Fig. 3). In captivity, the method of recognition of a cheetah by face marks is obviously more common, for the animals are of limited number and are always close to an observer. However, in the field, the animal is often too far from the observer and even with high-resolution equipment, it may be difficult to spot the details. The body spots, their brightness and position are larger, and more useful, but as we shall see later, there can be problems with this method as well. I have found limbs and tail are the most useful for identification.

There are two basic ways of making comparisons between sightings to check if they refer to the same individual. The most common one is based on the visual examination of the photos and the alternative represents a three-dimensional (3-D) computer-matching system. The latter, for instance, is used in the Serengeti Cheetah project (Kelly, 2001).

The computer-aided matching system is based on an examination of distinctive features (spot patterns) in the middle part of the cheetah body.

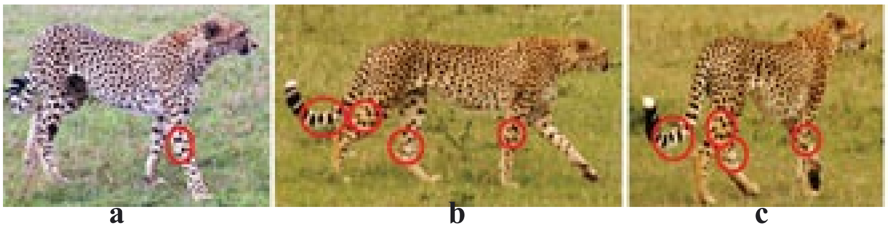


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Fig. 4 Images of the same cheetah, taken from different angles. a,b,c – distinctive patterns are outlined

This program has both advantages and disadvantages over visual comparison of photos. The software turns the picture taken from a certain angle into the frontal plane, matching it to the database to identify individuals. However, computer-made comparisons of photographs at skewed camera angles have a tendency to reduce the coefficients of similarity (Kelly, 2001). As the angle distorts the whole pattern of the skin it might be difficult to use such a picture for visual comparison with one taken from the straight side, even of the same individual.

Without the computer program, a simpler method based on visual analysis of the images of only the cheetah's leg and tail photos can be suggested. I used two main ways of obtaining images to create the database:

1. capturing still frames from a video recording or film picture; and
2. digitizing process: digital photo cameras were used to take still pictures from film images or from TV screens. Scanned film photos were also used as a base material to be downloaded to the computer.

The first step of identification included zooming in all cheetah images to fit the standard A4 size page to be printed. In the beginning, I used tail and sex as a base. As the animals we observed were mostly shy, we could take pictures only from a long distance, which affected the quality of the pictures. I decided not to use cheetah faces because it was difficult to use small spots and distinctive tear marks from unclear pictures. In addition, facial expression affects the position of spots and tear marks. Pictures of one animal either hissing or relaxing can look different, while two images of different hissing animals can look very similar (Fig. 3).

I tried to use only the torso, but I found that on the pictures taken from an angle the whole pattern of the skin was distorted, and it was difficult to compare them with those taken perpendicularly to the axis of the body (Fig. 4). Looking through the images, I realized that the only parts of the body that had almost stable pattern visibility were the tail and limbs (Fig. 5, 6 and 7). With this realization, I used computer photo-manipulation programs (Zoom-Browser and FotoStation) to isolate the necessary parts of the body: tail, front limbs (from the toes to shoulders) and hind limbs (from toes to the hip). This method was successfully used for identification of all individuals in the study area. Having this database (photo album) with us in the field, allowed us almost instant identification of known and unknown individuals.

This method has two main advantages: first, it allows the use of a certain variety of field photo and video equipment, including film and/or digital cameras. However, usage of a digital camera is preferable. Second, as I found out, there were no visible changes in the patterns of the tail rings and limbs spots seen on pictures taken even up to an angle of 45 degrees, and therefore they did not affect the accuracy of comparison.

The photo library (catalogue) is meant to build up a database/catalogue of individuals for the further use in field work. It helps to compare already identified individuals with new ones, even if new pictures have been taken only from one side of its body, or the cat is sitting, or only part of its tail and/or front/hind leg is visible.

It is important to point out that photographing/video-recording of animals in the wild, especially in unprotected areas can be a very challenging process. If the animal is very shy, it might be extremely difficult to take a clear picture from the side. It is sometimes necessary to give the animal enough time to get used to the presence of the observer before a clear shot is possible. Our experience suggests up to 120 minutes are needed for a wild cheetah to get used to a vehicle and display natural behaviour. If the animal is resting, it could take an average 30 min. for the animal to start moving. It is always better not to approach a wild animal closely, but to keep at a distance of 20-30m. In the case of fast running cheetah, which can instantly escape into thick bush, a video camera with a fast shutter might be of great use.

The method described above is economically and technically affordable and has been used successfully for the identification of all observed individuals in the study area.

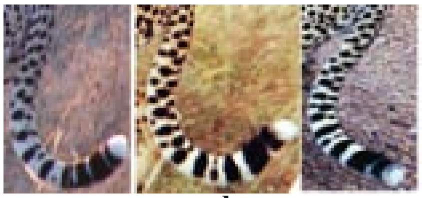

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Fig. 5 Tails. b,c – same cheetah; a – different cheetah

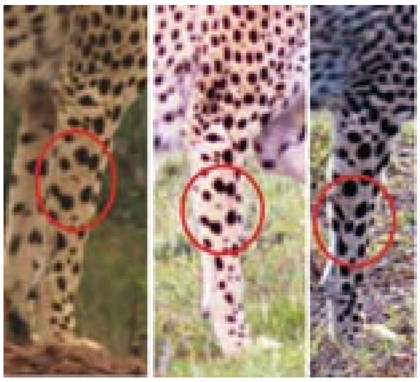

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Fig. 6 Front limbs. a,b – same cheetah; c – different cheetah. Distinctive patterns are outlined.

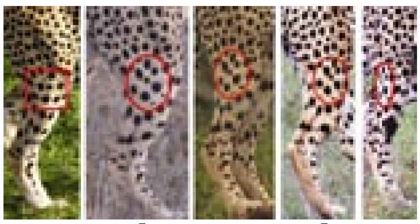

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Fig. 7 Hind limbs. b,c,d,e – images from different sightings of the same cheetah (distinctive patterns are outlined); a – different cheetah

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