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Evidence of the existence of the wild tiger *Panthera tigris amoyensis* (Hilzheimer, 1905) in South China (Mammalia, Felidae)

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ABSTRACT Wild South China Tigers, *Panthera tigris amoyensis* (Hilzheimer, 1905), with no authenticated sighting since more than twenty-five years, are generally considered extinct. On October 3rd 2007 a villager from Zhenping County in Shaanxi Province of China, claimed to have taken a set of photos of a wild tiger in the Daba Mountain. However, the photos aroused suspicion. We already published a paper to prove that in those photos the tiger was a 3-dimensional, animate object. In the present paper further analyses are reported to support the authenticity of such a photos. A short "video" had been recorded in a photo by the digital camera, in which the tiger was lowering its head and raising its tail while the photo had been taken. The tiger always turned its head following the photographer. Special bunches of glisten from the forehead of the tiger resulted to be formed by the light of camera's flash reflected from the eyeball of the animal. Many collected evidences suggested that there are about eight tigers living in the Daba Mountain. Although tigers appeared frequently in the neighborhood of Daba Mountain this year, unfortunately, these animals have not been protected at all. We hope that confirming the authenticity of the photos will promote a national complete conservation program to save this important subspecies from extinction.

KEY WORDS Wild South China tiger, Authenticity of the photos, Footprint.

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INTRODUCTION

On November 23rd 2010, the International Tiger Conservation Forum (also known as the "Tiger Summit") signed the "St. Petersburg Declaration on Tiger Conservation" to save wild tigers from extinction (Goodrich, 2010). The South China tiger, *Panthera tigris amoyensis* (Hilzheimer, 1905), was estimated to number 4,000 individuals in the early 1950s. Approximately 3,000 tigers were killed over 30 years as the subspecies was officially hunted as a pest. These animals have not been officially sighted since more than 25 years and have been listed as one of the world's ten most endangered animals.

On October 12th 2007, an excellent hunter, Mr. Zheng-Long Zhou, published a set of photographs of a young South China tiger claiming that on October 3rd 2007 he nearly risked his life in the Daba Mountain to take these photos after more than one month of search in the forest [Holden (ed.), 2007a]. Although the Daba Mountain in Zhenping County, Shaanxi Province of China is the native habitat of South China tiger, a controversy over the authenticity of photographs aroused. A month later, a tiger-picture poster appeared in the public domain and the manufacturer claimed that it was a six-year-old product [Holden (ed.), 2007b]. The authorities announced that the photos were copied from the poster and the photographer was arrested for fraud [Holden (ed.), 2008]. But many people, on the contrary, believed that Zhou found the evidence of a live South China tiger. The controversy over the authenticity of the photographs is still ongoing in China. Previously, we have published a paper to prove that the tiger in the photos is a 3-dimensional, animate object whereas the poster tiger is a forged artificial monster (Liu, 2010). Here further analyses are reported to support the authenticity of the photos.

Moreover, we talked to many eyewitnesses, observed some preying scenes and collected footprints and scrached traces of claws that could have been made only by the tiger. Recently, evidences indicated that tigers appeared in Shenlongjia, nearby Daba Mountain.

MATERIALS

Mr. Zhou took forty photos by a digital camera (Canon 400D) and thirty–one photos by a film camera, but most of the photos were poorly focused and only about ten could be used for analyses. When taking the pictures, Mr. Zhou hid himself behind a large stone 9.4 m away from the tiger, at 1,800 m above sea level. The poster was obtained from the manufacturer. Moreover, eyewitnesses were interviewed, a local officer supplied us with some photos showing preying scenes and footprints and an exploratory team of Shenlongjia provided some pictures of footprints.

RESULTS

Doubts on the authenticity of photos were expressed since the tiger appeared always lying there without a movement - something not expected from an animate object. Zhou stated that the tiger raised or lowered its head and erected its ears while he was taking the photos. Fortunately, the movement was recorded in photo no. 31 (Fig. 1). Since images, in digital cameras, are formed by repeatedly reading data from the CCD (or CMOS), movements of the object are recorded as discontinuous shadows. Comparing photo no. 31 to the clearer one no. 29, the tree branches and leaves beside the tiger and the strips on the hip and hind limb of the tiger are highly identical and, still, without obvious movement or double shadow. In photo no. 29, the tail is immediately behind the hind limb, but in photo no. 31, the tail of the tiger departed from the hind limb and a very light tail shadow appeared between the hind limb and the tail, thus making a double tail in the photo. Amazedly, there is one more strip under the right ear of the tiger, which is the double shadow of the right eyebrow and there is a big distance between the two shadows. Also there is a double shadow of pupils and upper eyelids appear broken. All these features indicate that eyes as well as eyebrows of the tiger moved from upper right to lower left. Compared to photo no. 6, in photo no. 31 the strips on the left side of face changed prominently. The fine, curved strips on the side of the face of the tiger in photo no. 6 became a thick bar in photo no. 31, which is also the result of movement of the tiger head. Therefore, photo no. 31 recorded the moving process of the head of the lying tiger which suggests that the tiger in Zhou's photos is an alive object, not a "paper-tiger".

The camera's flash went off in digital photos nos. 9 and film photo 31A. In these two photos, the most curious thing is the bunch of light discs on the forehead of the tiger (Fig. 2). In both photos, the brightest light disc is on the left eye of the tiger and seems to overlap on the eye pupil. In photo no. 9, there are two bunches of light discs with a horseshoe-like shadow. In photo no. 31A, there are three bunches of light discs showing a diameter gradually decreasing. These light discs have puzzled us for a long time. Apparently, they are not due to the light reflected from a sheet of paper by the camera's flash because all of them have regular shape and the overlapped light discs indicate that they were formed according to a time sequence but did not occur simultaneously. They should be related to the eye because they seem to begin from the eye and overlap on the eye pupil. We are familiar with the bright glisten of eyes of felids in the night, but, notably, here the glisten are bunches of light discs.

How's that these curious light discs were formed? Many hypotheses were assumed and, thereafter, ruled out. The final answer came from the 100 m-sprint in the Olympic games, in which the top speed is smaller than 10 secs. It really surprised me that the athletes can run 10 m in one second. Generally, the camera-flash continues for 1/1000 sec, during which the athlete can run 1 cm. If the tiger's eyeball turns fast while the camera's flash is working, a moving track of the glisten of the eye bottom will appear. A moving distance of one centimeter is too big for the tiger's eye, but one millimeter, or even a smaller distance, is enough for the eye to produce a track of moving glisten in one photo-camera that is 9 m far. Because of the mechanism of image-

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Figure 1. Photo no. 31 compared to photos nos. 6 and 29. Blue arrows indicate still objects; white, red and yellow arrows represent the moving tail, eyebrow, eye pupil and strips on the face of the tiger, respectively.

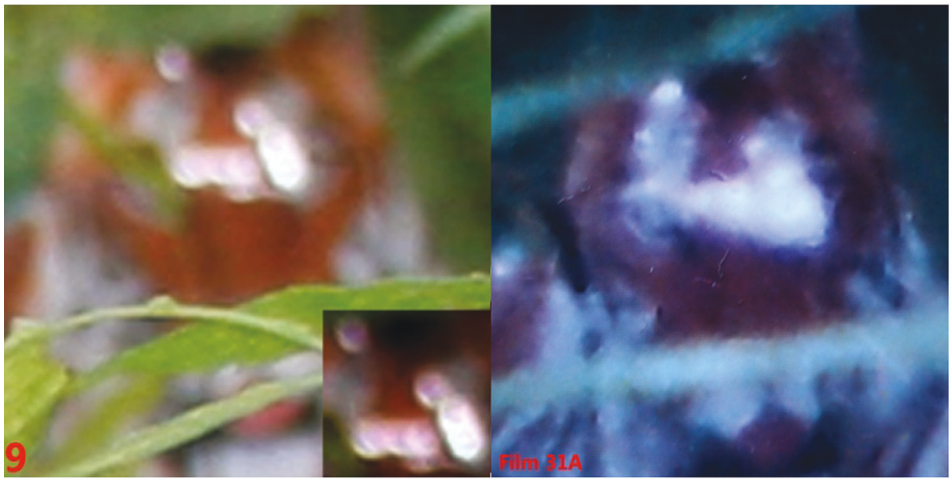

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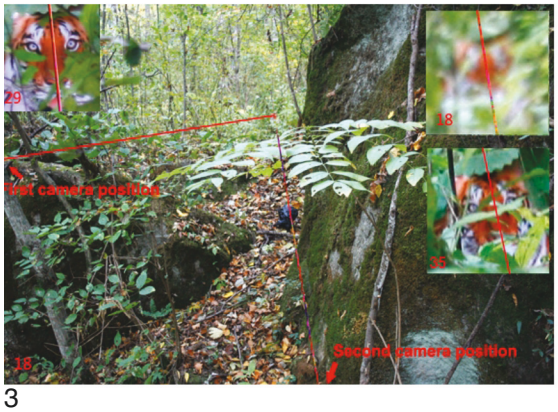
Figure 2 - The glisten in the forehead of the tiger in photos nos. 9 and 31A. In both pictures the camera's flash went off. The insert shows the horseshoe-like shadow more clearly.



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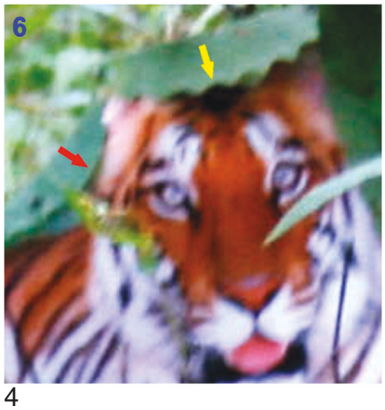

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Figure 3 - Photos nos. 29, 18 and 35 showing the direction of the midline of the face of the tiger pointing towards the two camera positions.

Figure 4. Two big leaves covered the tiger's top head and the right side of the face respectively, indicating, with their shadows, a 3-D tiger head.

forming in digital cameras, the continuous movement of glisten results in a series of discontinuous light discs. The image in the film camera is formed by chemical reaction, and then the track of movement of glisten is relatively continuous.

It is possible that the sensitive eye of the wild tiger was stimulated by the strong gleam and the eyeball appeared as a reflex. Hence different directions of light tracks could have determined the bunch of light discs in Zhou's photos. In photo no. 9, the right eye was covered by a leaf, and then the two bunches of light discs were formed only by the left eye. It seems as if the eyeball began to move to the upper left forming four discs, then moved down and back forming the horizontal bunch of another four overlapped light discs. Similar movements occurred in the left eye in photo no. 31A where the pupil seems to have contracted during the movement, making the diameter of the light discs gradually smaller. The bunch of light tracks above the right eye should have been formed by the moving glisten of the right eye, because - contrary to photo no. 9 - the eye was exposed to the camera as well.

Photos were taken from two different places (Fig. 3). The first one was just behind a large stone, from where the tiger was photographed in a lateral right posture (Fig. 1 photos nos. 29 and 31); in photo no. 29, the tiger gazed at the camera. The second place was on the right side of the tiger, about 2-5 m from the first camera position. Only in a few photos, the tiger head appeared relatively clear (photos nos. 18 and 35). In such a photos, the tiger looks at the camera and the midline of its head points towards the second camera. Therefore, the tiger must have turned its head to stare at the photographer, as Zhou stated. The angle between the two camera positions is about 30 degrees. Note that in photos nos. 29 and 35 eye pupils are quite different in position and shape, as described in a previous paper (Liu, 2010).

In photo no. 6 a big leaf covers the top of the tiger's head creating a shadow on its forehead as in all other photos (Fig. 4). But there is also another big leaf that extended from the left side covering the right side of the face, which can be seen only in this photo. Under this leaf a shadow can be seen.

In the Zhenping County (which is located in the Daba Mountain) many villagers claimed to have encountered the tiger in the last decade. For instance, only in the Xiang-Yang village, three farmers claimed to have seen the tiger four times in the last ten years. Particularly, in an afternoon of 2008, an old man who was searching for three cattle in the mountainside, claimed that a tiger, about 1.7 m in length, tried to attack a calf, and after he moved the cattle away, the tiger turned back to the mountain. In a night of 2003, an old man was on his way back home. At first, he heard a strange cry similar to the sound of a wild boar; when he arrived to an alley, a big tiger stood on a platform only 2 meters away from him staring at him. Recently, in Daba Mountain a few big ungulates were killed and eaten by big carnivores and the killer was supposed to be the tiger. In June 2004, a horse was killed; in October 2007, a cow was killed and eaten (Fig. 5A) and deep scratches were found in a tree near the cow body. In May 2007, a wild boar, about 100 Kg of weight, was killed and mostly eaten (Fig. 5B). In the scene, some footprints of a large cat were found and the width of the footprints was estimated as about 15 cm. A villager showed a white tiger claw, which seemed strong and sharp (Fig. 5C), but it was not possible to date it.

The present author investigated tiger traces in Daba Mountain for three times, from 2008 to 2010. During the first three-day investigation, two sets of footprints of large cats were found. In one of them, the forefoot was 10.5 cm and the hindfoot 8.5 cm in width, the toe print was as wide as 4 cm (Fig. 6). In another place, the forefoot was 13.5 cm and the hindfoot 10.5 cm wide. In the course of the second investigation a big tree pierced by large canines and scratched by claws (Fig. 7) was observed. During the last investigation, many footprints and tree wounds were found in the mountainside at about 1,400-1,600 m above sea level. Apparently, the tiger likes to live in a lower and planar place, where its food sources, expecially wild boards, are abundant.

Shennongjia is a National Natural Reserve, just in the south-east of Daba Mountain, broader and higher than Daba Mountain. Notably, many people claimed to have seen tigers there in December 2010, and in March, May and June

Figure 5. Remnants of a cow (A) and a wild boar (B) supposed to be killed by the tiger, and a tiger claw in a villager's hand (C). Photos provided by Qian Li.

Figure 6. Footprints of a large cat or a tiger. (A) The hind footprint with an intact heart–shaped foot pad and three toes clearly visible and one unclear toe on the leaf. (B) The fore footprint with a half foot pad and four toes. (C) A wide toe print. Red arrows: toes; Blue arrows: foot pad. Insert in B is a schematic footprint of the tiger.

Figure 7. (A) Scratched traces of claws on a tree bark, the distances between traces is ca 3-5 cm (Re-photographed in March 2009). (B) Gnawing traces of canines in the same tree (photographed in May 2008). The upper right insert is the detail of a gnawing trace. The upper left insert shows a tiger gnawing a tree.

2011. In June 2011, an exploratory team found many footprints of large cats. The footprints were as large as 15 cm in width, hence probably due to a tiger (Fig. 8).

DISCUSSION

As described in our previous paper, when Zhou took the photos, the eye, the tail and the mouth of the tiger were moving, and the shadow under the tiger's nose and the glisten on the tip of the tiger's nose were always different. On the other hand, the tiger in the poster is a monster, created from Zhou's photos with poor resolution, by adding a pair of bat-like large ears, a pair of inverse canines and some beard and hairs around the face; moreover, the poster tiger has a non nakle-jointed hindlimb and blue eyes (Fig. 9). These features are seriously in conflict with the manufacturer's story that their tiger was rented from a German photographer as a 12*6 cm positive film, with high resolution (Liu, 2010). In our opinion, movements of the head, tail and eye of the tiger and, above all, the leaf on its face, strongly support the conclusion that the tiger in Zhou's set of photos is an animate object.

Since the focus in photo no. 31 is not good and the image is not clear, we always avoided (up to now) using such a photo as evidence. But when we noticed that there was a double image of the eyebrows with a big distance from the tiger head, and that there were also double eye pupils and a double tail, it became very clear to us that the tiger moved its head and tail during the photo shot. A similar phenomenon occurred in the tiger's eye when the camera's flash went off. Because the turning of the eyeball, light reflected from the eye bottom resulted in light tracks. This is not only a strong evidence to support that the tiger in Zhou's photos is animate, but also it revealed to be an useful method for analyzing active animals or moving object in digital photos.

Many doubts on photos authenticity were expressed since, in the images published by Zhou, the tiger is always lying there without large movements. Generally speaking, a lying tiger can move its head, eyes, ears and tail. Actually, as described in our previous paper, in the photos tail and eye's pupil appeared in different positions, and the tail was erected above the hip; in this paper the tiger lowered its head and turned its eyeball while the photos were taken; finally, a more evident movement occurred when the tiger turned its head towards the photographer and I do regret that such a feature was neglected before. All evidences reported and discussed seem to suggest that the tiger in Zhou's set of photos is a three-dimensional, animate object, that is, a true wild animal.

Although the villagers' tales cannot be accepted as evidences, nevertheless they are important clues to guide the investigation. In fact, nearly all footprints and tree-scratches were found in the mountain where tigers can attract and kill big animals (i.e. a cattle or a horse), although wild boars remain the main food source. Footprints of cats consist of a heart-shaped foot pad and four toes around the front of the pad, also called "plum blossom-like" form. With the exception of the Indian cheetah, the claws of all other felids are, in rest condition, contracted, and there are not claws' trace in their footprints. Therefore, footprints of cats are easy to recognize. Cats' fore-foot is larger than the hind one. Among felids, differences in footprints are due to their size. For example, for a leopard, the width of the fore footprint is usually smaller than 8 cm. The width of a tiger's fore footprint is always more than 10 cm and may be as large as 18 cm. South China tigers are smaller than other tigers, and their footprint is accordingly smaller. Since observed footprints were larger than 10 cm, it is reasonable to presume they belonged to the tiger.

Tigers generally sharpen their claws and teeth on trees, especially those of the Pinaceae family, because of their thick scaly bark. When a tiger is angry, it may gnaw a tree and even break it and this could justify the wide and deep scratches observed during our investigations in the field. Although bears have similar behavior, they always look for insects hidden in the dead trees and rarely attack a healthy and living tree. Moreover, bears' claws are wider and less sharp than tigers' ones. Based on author's investigation and other data, it was estimated that currently there are about six to ten tigers in Daba Mountain. It's an exciting news that the South China tigers are still surviving in the wild,

Figure 8. Fore footprints of a big tiger. Both footprints show a part of foot pad and four toes (arrows). Insert represents a schematic footprint of the tiger. Photos provided by Liao QS.

Figure 9. The poster-tiger compared to a real tiger (upper right) and to a tiger head (upper left), Please note bat-like ears (blue arrow), downwards canines (yellow arrow), blue iris (white arrow) and a non ankle- jointed hind limb (red arrow). Moreover in the poster image ears are very clear but the body is blurry.

particularly in Shennongjia and Daba Mountain (both belonging to the same cordillera).

Nevertheless, unfortunately up to now the area of Daba Mountain has not been protected and poaching took place every winter without any control and/or limitation. Unproved news, about two tigers were reported to have been killed by knots of steel wire in the last three years. Hence, we hope that the present report will contribute to promote a national conservation program to save such an important subspecies from extinction.

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