In Search of Rare Carnivorous Marsupials

An Examination of the Evidence for Their Survival.

Introduction

In the half decade since the turn of the century, Australia has experienced some exciting developments in the sighting of extinct, locally extinct and rare carnivorous marsupials.

As exciting as these developments are, they sadly contrast against this nation holding the world's "worst mammal extinction rate in the world". Already 22 mammal species have become extinct since European settlement, just over 200 years ago. A full 20 percent of the remaining mammals and nearly 15 percent of the remaining bird species are also threatened with extinction. Australia has more threatened reptile species than any other nation in the world and over 500 vascular plants are listed as endangered or vulnerable (Australian Wildlife Conservancy, n.d.).

These are astonishing percentages given that over 80 percent of Australia's mammals, reptiles and flowering plants are not found anywhere else in the world (Australian Wildlife Conservancy, n.d.).

Rare fauna and cryptozoology

What place does the search for rare fauna hold within the sphere of cryptozoology?

In cryptozoological circles, there is often debate as to which areas of research should, or should not be termed cryptozoological. The field seems to encompass (to varying degrees) several areas including:

- the search for entities which may border on paranormal – not fitting within our conceptions of normal physical existence for a living thing; sasquatch (bigfoot) is sometimes suggested as having a supernatural origin,
- the search for "hidden" animals – in this sense, very real biological entities which have not yet been captured (dead or alive) for the purpose of close examination. In some cases, traditional land occupants are familiar with the species long before its description in scientific literature; the Laotian rock rat is one example, and
- the search for animals which are known to the scientific literature but now commonly accepted as extinct. Two prominent examples include the ivory billed woodpecker, and the Australian thylacine.[1]

Whilst rediscovery of the thylacine for example, would certainly gain worldwide attention, less conspicuous species seem to hold less sway with those interested in cryptozoology. At the same time, the conservation of less conspicuous species – if indeed there is hope of such – is in every way as important as the preservation of more popular or notorious species.

Ironically, precisely because the thylacine *is* listed as extinct, conservation funds are (rightfully) directed elsewhere, and its association with the "cryptozoology" label means that those in a position to direct conservation funds may be disinclined to believe any suggestion the species is extant.

In this author's opinion, those with an interest in cryptozoology would do well to support the conservation of less glamorous species, and those with authority to direct conservation funds might do well not to write the thylacine (and comparably "extinct" animals) off just yet.

The Thylacine

Without doubt, the thylacine (Tasmanian tiger) is the single extinct Australian species which evokes more passionate response amongst those considering it today, than any other. The history of its interaction with European settlers – and ultimate extinction - is well documented (e.g. Paddle, 2000).

However, one 21st century sighting has found its way into public discussion and mainstream media news reports: the alleged photographs of an adult thylacine in Tasmania taken by German tourist Klaus Emmerichs in February 2005.

A second recent sighting which was not reported in mainstream media, but which nonetheless generated debate on the internet, is the alleged photograph of a thylacine

[1] Each of the three areas mentioned easily deserves full-article discussion which is out of the scope of this article. Other research areas, such as anomalous instances of well known species, also fit in this list but are not of relevance to the present discussion.

pup in Tasmania taken by an unknown tourist in September 2006 (and published online by "Chaotika", a friend of the photographer in the United States).

In addition, new perspectives have been explored with regard to interpretation of the alleged thylacine footage filmed in South Australia in 1973 by Liz and Gary Doyle.

Emmerichs thylacine

Background

On 1 February 2005, Klaus Emmerichs arrived in Tasmania with his partner Birgit Jansen. They were planning to walk the Overland Track at Cradle Mountain. Realising they were ill-prepared for the task, they abandoned the walk and arranged for a hire car on 2 February. On 3 February they began their impromptu driving tour of the west coast (Picture Pair, 2005; Bailey, 2006A; K. Emmerichs, personal communication, 25 August 2006).

As evening arrived, the couple "decided to pull off the road at around 7.30pm and set up camp at an un-named location north west of Derwent Bridge" (Bailey, 2006A; Picture Pair, 2005).

What happened next has had thylacine researchers talking ever since. Birgit asked if Klaus could fetch water from a nearby creek. As Klaus descended towards the creek, he noticed an animal on the other side of a large log. The animal hadn't noticed him, but was making a "snuffling" sound and sniffing at the ground. A similar sound was also coming from behind the log, further along, but Klaus only ever saw the one animal. As he turned on his camera, it emitted a noise and the animal looked in his direction, standing stationary. Klaus took one photo, and then moved forward and to the left a small distance and took a second photo (Macey, 2005A; Picture Pair, 2005; Bailey, 2006A; K Emmerichs, personal communication, 25 August 2006).

At the time the couple was aware that the creature was unusual, but they did not know that it was listed as extinct. Later during their holiday they saw the thylacine depicted on beer bottle labels and learned of its status. Returning to Melbourne they met with Klaus' brother who confirmed both that the photos showed a thylacine, and that the thylacine is listed as extinct (Picture Pair, 2005; K. Emmerichs, personal communication, 25 August 2006).

Having already arranged their return flight to Germany - and given Klaus' weaker command of English - they left copies of the photos with Klaus' brother to work out what to do with them (Picture Pair, 2005; K. Emmerichs, personal communication, 25 August 2006). The brother was soon flown to Tasmania in order for the photos to be examined by Tasmanian wildlife officer Nick Mooney and Tasmanian Museum and Art Gallery director Bill Bleathman (Macey, 2005A).

Mr Mooney, who had received hundreds of sightings reports during the previous 20 years described one of Mr Emmerichs' images as "very much like a thylacine" (Macey, 2005A; Grace, 2005; Tourist Claims, 2005). He was "convinced of their veracity" (Lang, 2005) saying "in the picture we can see some features of a thylacine,

enough that the image is to me quite clearly a thylacine" (Mooney, interviewed by Guest, 2005).

Mr Mooney continued, "whether the picture is authentic or not is a completely different issue" (Mooney, interviewed by Guest, 2005).

The photos[2]

When I first heard about Mr Emmerichs' photos in early 2005, I was excited - in particular because reports stated he had taken two photos. Immediately I wondered whether the scene he photographed could be reconstructed in three-dimensional space based on the relative positions of visual elements in the images.

Although Paddle claims "the criterion for establishing the existence of the thylacine beyond 1936 can only be met through the production of a body, either dead, or, preferably, alive." (2000), Tigerman, Bailey and Terry recommend that if a thylacine were to be captured, those present should "start filming with two video cameras at different angles; one up close, the other further away [for the reason that] it is very difficult or impossible to hoax two different camera angles of the same thing." (2004).

In my opinion, creating two photorealistic images of a single scene, from different perspectives, using image-editing software, although not impossible, would take considerable skill and effort. In any case, what the critical audience is presented with, are two digital photographs as evidence of Mr Emmerichs' sighting.

However, during the weeks, and then months which followed, no photos were forthcoming. Speculation arose amongst various online discussion groups as to why Mr Emmerichs had returned to Germany and was not approving the images for publication. Media reports cast further doubt over the veracity of Mr Emmerichs' story by noting several facts such as

- the timestamp recorded on the image files differed in format from photos taken earlier during the trip
- the thylacine itself very much resembled (in terms of stripe pattern and body posture) a well known photograph taken by David Fleay in 1930[3]

In addition, one newspaper demonstrated how easy it might be to feign an image by photographing a printed enlargement which was cut-out and positioned in a lush garden (see Macey, 2005).

Combined with rewards of A$1.25m and A$1.75m which were offered shortly after Emmerichs' news by Bulletin Magazine and a Tasmanian businessman respectively, the whole saga became unbelievable in the eyes of many (Macey, 2005).

In April 2006, the story picked up momentum again: Klaus and Birgit returned to Tasmania armed with a video camera in order to produce more convincing evidence

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[2] At this point the narrative turns to first person as it relays my personal experience.

[3] Bailey (2006A) refers to "a vintage thylacine photograph taken by zoologist David Fleay in 1934." The photograph used in online comparisons – which may not be the same one referred to by Bailey - appears on the cover of Paddle's book where it is dated 1933 (2000). The photo on the cover of Paddle's book is dated 1930 by the Archives Office of Tasmania (2005).

and vindicate their earlier claims. Although they were unsuccessful in capturing a thylacine on film, their visit led them to the book "Tiger Tales" written by author and thylacine researcher Col Bailey. They decided to contact Mr Bailey and then entrust him with information about their sighting which had to this point remained confidential. In particular, they took Mr Bailey to the very spot where the photographs had been taken (Bailey, 2005B).

At about the same time, Mr Emmerichs allowed the newspaper "Sunday Tasmanian" to publish the photos in print (Bailey, 2006A). It was only a matter of time before scans of the images were made and then published online, and then finally, I had some images with which to test out my theories.

The analysis

The logic behind my approach to analysing the images is that if a camera shoots the same scene from two different angles (within a short space of time) then the elements in the resulting images will change position relative to each other. Evaluating the images using this theory does not require high resolution, providing that each visual element is reasonably identifiable in each image.

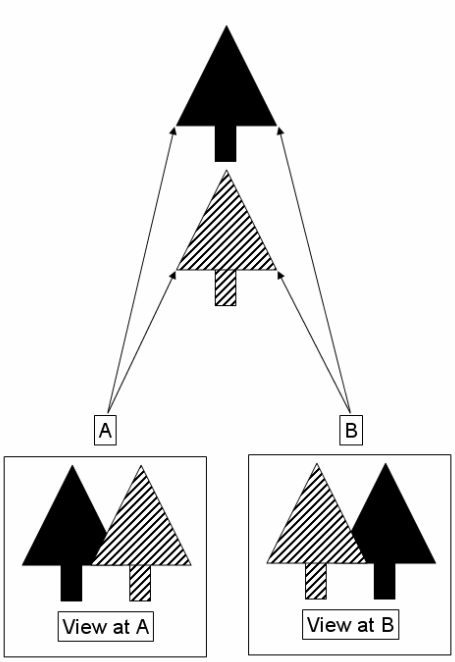

Figure 1

Figure 1 demonstrates how the relative positions of visual elements change as the camera's perspective changes: if the two trees are on the ground and the scene is observed from position 'A', then the striped tree will appear to the right of the black tree. If the viewer then moves themselves (right) to position 'B', then the striped tree will appear to have moved to the left side of the black tree in the field of view. The tree which is in the foreground (the striped tree) appears to move further across the field of view than the tree in the background.

Therefore, beginning with the two photographs Mr Emmerichs took, it is possible to identify visual elements which appear in both photographs and then by measuring the distance each has moved across the images, to calculate which elements are in the foreground and which are in the background.

What is the purpose of making these calculations? If it can be established that some element is further away from the camera than the thylacine, and some other element is nearer to the camera than the thylacine, then the distances these objects have moved give us a range within which the thylacine's own movement should fall – providing the animal is stationary. If the distance the thylacine has moved falls outside this range, it would indicate the animal did not remain stationary and did in fact move

between the two photographs. This, of course, would lend weight to the notion that Mr Emmerichs' photographs are of a real, live thylacine.

Although this effect could be achieved by meticulous planning, the reader would be forced to decide whether the most elaborate thylacine hoax had just been presented for consideration, or whether, in fact, Mr Emmerichs should go down in the history books as being the first person to photograph a thylacine in the wild, nearly 70 years after the accepted extinction date.

Figures 2A and 3A illustrate the two photographs taken by Mr Emmerichs. These are not accurate transcriptions of the photographs, but serve the purpose of facilitating discussion.

Figures 2B and 3B contain labels for the main features of the thylacine for ease of interpretation.

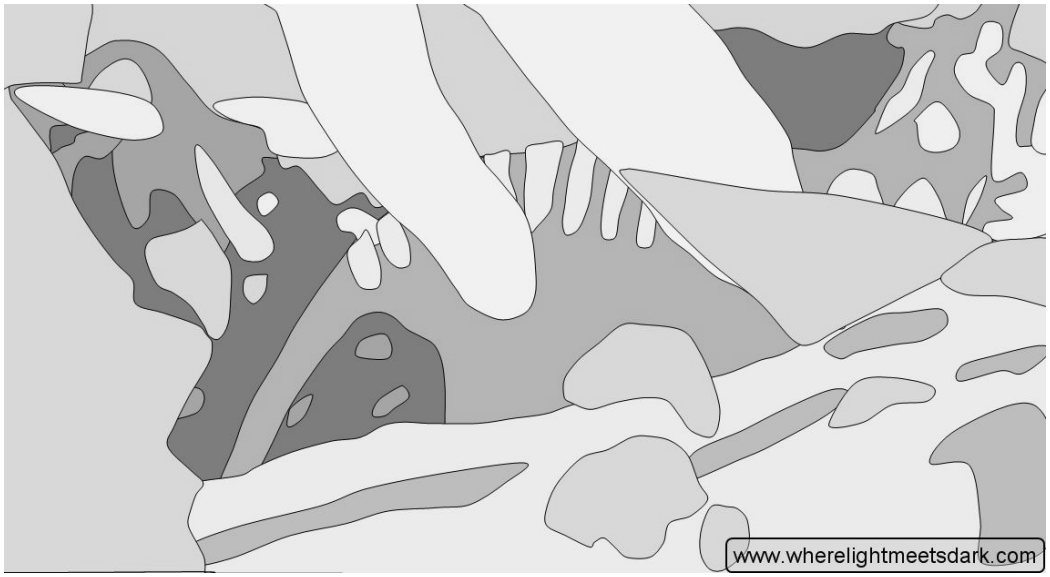

Figure 2A

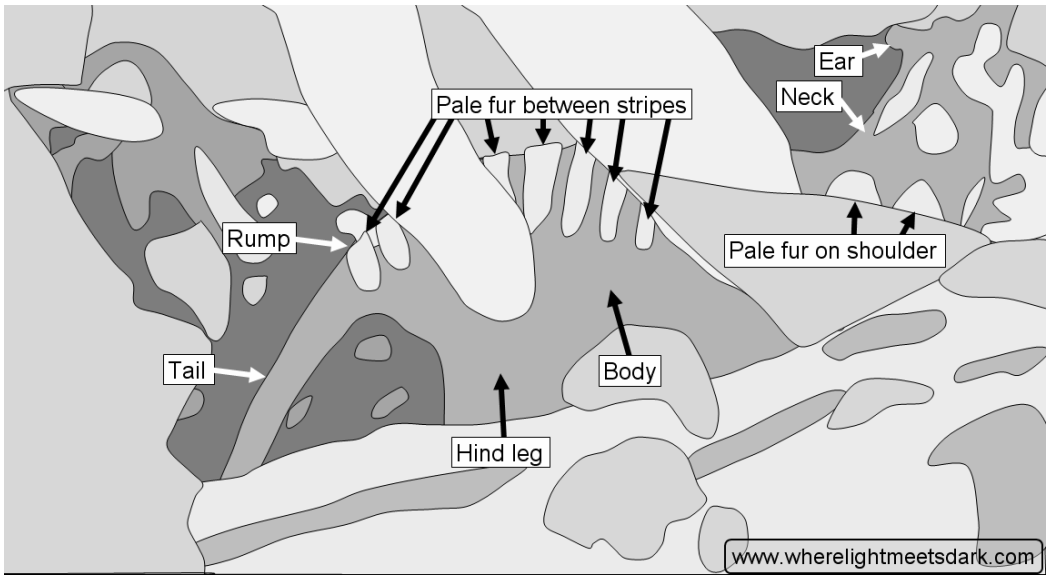

Figure 2B

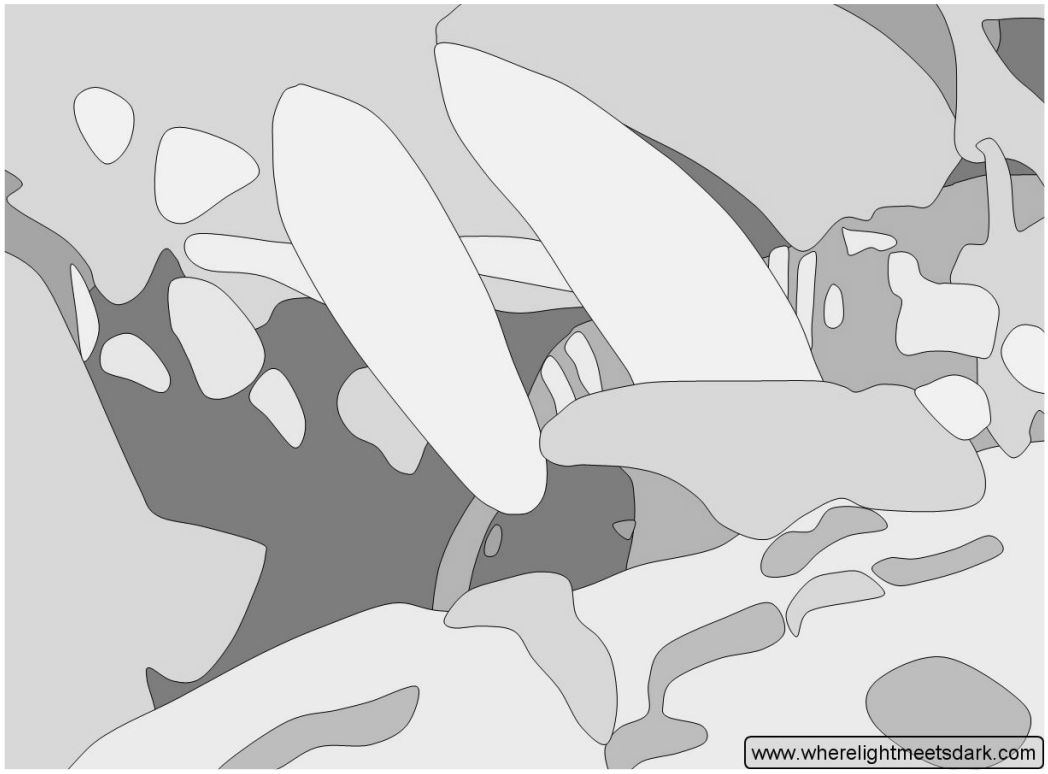

Figure 3A

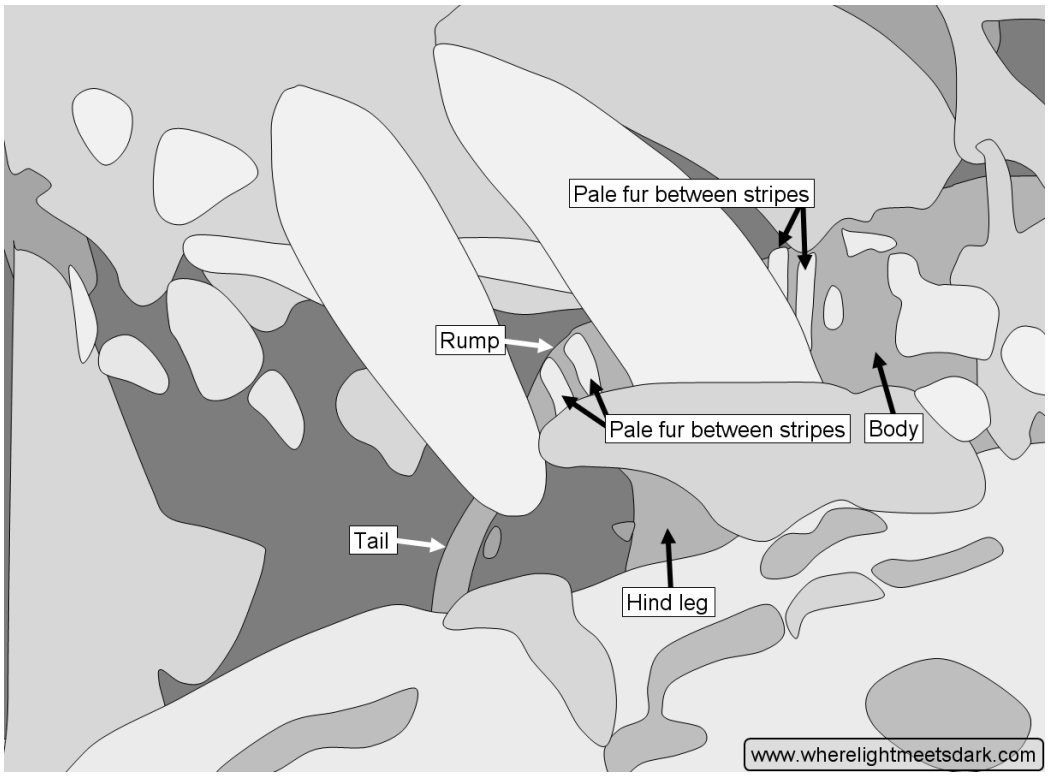

Figure 3B

The photographs were taken in the order presented (Figure 2A then Figure 3A). The timestamp shown by the camera was identical for each image, to the nearest minute: 3 February 2005, 19:28 (K Emmerichs, personal communication, 10 September 2006). The exact number of seconds that transpired between photographs should be calculable with access to the original image files. In the absence of such access, the best estimate is that between 1 and 59 seconds transpired.

Note that the pale “stripes” actually represent the paler fur found between the darker stripes; the prints in The Sunday Tasmanian showed an unusual yellowish-green colouration in these regions, making them appear to be incorrectly coloured stripes.

Figures 4 and 5 show the same photographs with data points overlaid. The data points were chosen because they appear in both photographs with reasonable certainty.

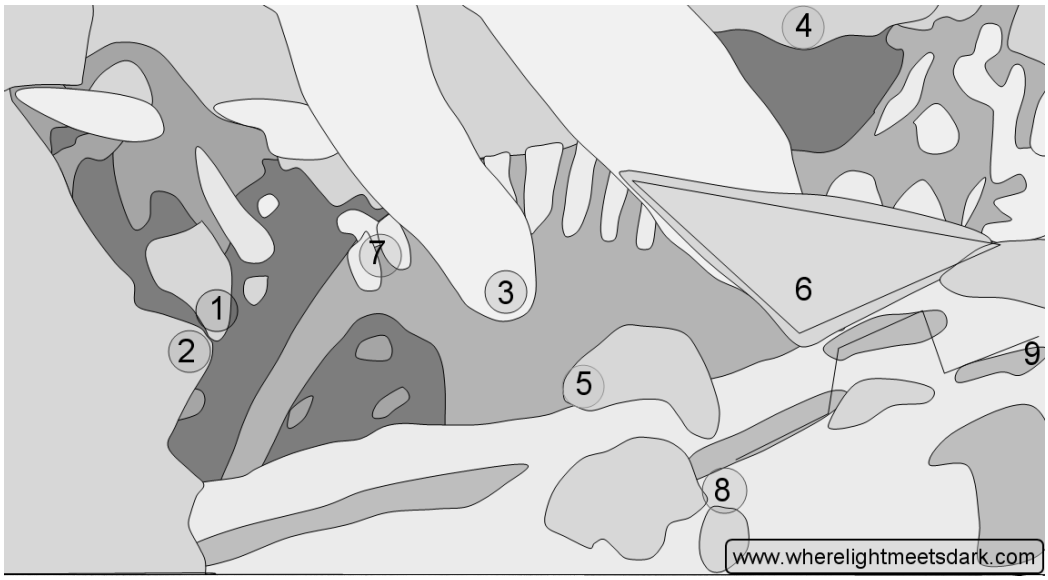

Figure 4

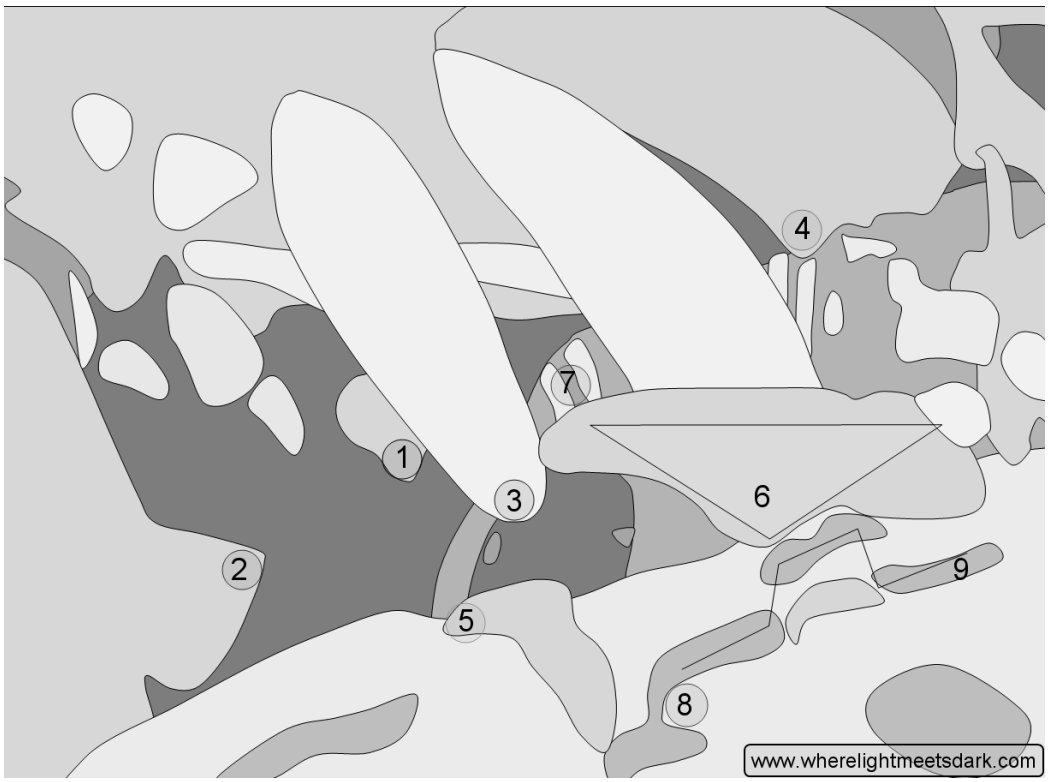

Figure 5

Following is a description of the data points in figures 4 and 5:

1. The tip of a triangularly shaped leaf

2. The right-most point of a leaf (similar colour to leaf 1)
3. The tip of a large leaf which is clearly nearer to the camera than the thylacine
4. The lower-most point on the leaf
5. The tip of the leaf which is clearly nearer to the camera than the log (and the log is clearly nearer to the camera than the thylacine)
6. A large triangular leaf which is nearer to the camera than leaf 3, however this leaf (6) was excluded from the analysis as it rotated between the two photos
7. Two pale areas between stripes on the rump of the thylacine, just before the tail
8. A pale region on the log, bounded above and below by darker regions
9. This data point shows darker regions on the log which can be clearly seen in both photos.

It should be noted that the newspaper printed each photo to a different scale, therefore this analysis was conducted only after the second photo was scaled up to the same size as the first. Data point 7 (the pale areas between stripes on the thylacine) was used as a point of reference to ensure the thylacine appeared at the same size in both images after scaling.

Figure 6 lists the relative distances[4] between data point 1 and every other data point except that data point 6 was excluded.

Data point	Distance to datapoint 1 in 1st photo	Distance to datapoint 1 in 2nd photo	Change in distance between photos	Order (front to back)
2	-0.9	-5.45	4.55	5
3	11.35	4.18	7.17	4
4	22.83	14.1	8.73	3
5	14.47	2.49	11.98	1
6	0	0	0	0
7	6.51	6.14	0.37	6
8	22.41	10.82	11.59	1
9	24.98	13.76	11.22	2

[4] Here the unit of measurement is irrelevant; it is the ordering of the data points which is important.

Based on the fact that objects nearer the camera will move further across the image than those which are further away, the calculated order of objects from foreground to background is as follows. (This chart is best read from bottom to top):

	Data point	Description
Background	1	the triangular leaf
	7	the thylacine
	2	the leftmost data point leaf, to the rear of the thylacine
	3	another leaf hanging at the top - probably from the same plant
	4	the leaf hanging at the top of the image
	9	another point further along the log
Foreground	5, 8 (equal distance)	the log
		Camera

What do these data tell us?

Firstly, the ordering of objects *as measured by their displacement between photos* is *as might be expected* for the scene: the log is clearly in the foreground as it blocks the view of the thylacine's legs. The large leaves hanging from above are clearly in the foreground as they too block the view of the thylacine. Data point 9 is ever so slightly further from the camera than data points 5 and 8 – as would be expected for a point just a little further along the log. Data points 3 and 4 are reasonably close together – as would be expected for leaves on the same branch.

It seems reasonable to conclude that the two images are photographs of a real three dimensional scene.

Secondly, assuming the thylacine stood stationary, we can identify one object which is further away from the camera than the thylacine (the triangular leaf, data point 1), and numerous objects which are nearer to the camera. If it can be separately established by viewing the original images and examining overlapping elements that the thylacine is in fact further from the camera than data point 1, or nearer than any of the other data points, this would suggest that the animal itself moved between photos.[5] Mr Emmerichs is not certain whether the thylacine moved or remained stationary between the two photos as they were taken only seconds apart, but the animal was definitely moving both before and after the photos were taken, and it paused to stare in Mr Emmerichs' direction on hearing the sound of Mr Emmerichs' camera (personal communication, 25 August 2006).

[5] This is because the measured range of left-right movement for the thylacine correlates to a distance from the camera between data point 1 and data point 2. If the thylacine is clearly not in this range, then the measured range of left-right movement can no longer be explained by camera movement alone, and must have occurred due to the animal's own movement within the scene (assuming the plants remained stationary).

Establishing whether the thylacine moved is of course of no additional benefit to establishing whether the photos are genuine. In a most elaborate hoax, one could photograph a model in situ, move the model slightly, change the position of the camera and take a second photograph. If purposely creating a hoax, all this could be done with the luxury of taking as much time as required, and as many attempts as desired until the requisite images are produced. Whilst this scenario is conceivable, there are other elements at play in the Emmerichs sighting.

Authenticity of Mr Emmerichs' story

Col Bailey has spent "almost 40 years researching and chasing the thylacine around the countryside" during which he has "spoken with and interviewed a great many people claiming to have seen the thylacine post 1936. In addition, [he] was fortunate to be able to speak with trappers and hunters conversant with the animal in the early part of last century before they passed on." (Bailey, 2006A)

Regarding Mr Emmerichs' photographs, Mr Bailey writes "These photos are as good as any tangible evidence I have so far come across … They cannot and must not be discounted lightly" (Bailey, 2006A).

Regarding Mr Emmerichs himself, Mr Bailey writes "I am of the opinion he is an honourable man and is telling the truth about this matter" (Bailey, 2006B) and "To [Mr Emmerichs'] credit, his account of the event, which I must surely have heard a dozen times over in recent weeks, never varied" (Bailey, 2006A). In this last regard, this author concurs.

A tourist to Tasmania who doesn't know the thylacine is extinct?

Across various media and online discussions, one key question recurs: how could a tourist flying all the way from Europe arrive in Tasmania without knowing that the iconic thylacine is extinct?

The answer to this lies in the fact that Klaus and Birgit had not planned to travel to Tasmania until only a few hours before their arrival. Their original holiday plans for late December 2004 were to travel to Sri Lanka. These were disrupted when on December 26 the most destructive earthquake ever recorded in modern times triggered numerous tsunamis which devastated that country, killing over 35,000 people and displacing more than half a million. They cancelled the trip and eventually decided to travel instead to Melbourne, Australia, where Mr Emmerichs' brother resides and whom they hadn't visited in many years. Whilst in Melbourne a decision was made to tour Tasmania and within hours they boarded their flight. As might be expected, they had not the time to research this fateful destination on their holiday itinerary. (K Emmerichs, personal communication, September 2006).

A copy of David Fleay's photo?

Perhaps even more common is the observation that the thylacine in Mr Emmerichs' photos maintains a posture, pattern and colouration almost identical to that in a photograph taken by David Fleay in 1930. The correlation seems so close – especially

in respect of those stripes which are visible - that many suspect the Emmerichs images to be digital manipulations of Fleay's photograph.

Robert Paddle (2000) observes that "enormous variability existed between banding patterns [in thylacines], concerning the total number of stripes, how far down the body and thighs they extended, and whether they were straight or curved, tapering to a single point or ending in a fork."

However, inspired by Emmerichs' photos, Professor Alton Higgins of Mid-America Christian University investigated the correlation in stripe placement (spacing) along the spine between different thylacines. He rotated and scaled images of seven different individuals (one being the pelt only) and aligned them back to back. In each of six comparisons he found that "the spacing and positioning of thylacine stripes appeared to be quite consistent" (Higgins as cited in Where Light Meets Dark, 2006E).

His conclusions led this author to concur "that [considered alone,] Emmerichs' photos can not be dismissed on the basis that the striping pattern … matches (in terms of spacing and relative stripe positioning) any other photographed thylacine" (Where Light Meets Dark, 2006E).

Features in addition to the stripes need to be considered. The photographs published in the Sunday Tasmanian were cropped versions of the originals (K Emmerichs, personal communication, 2006; N Mooney, personal communication, 14 August 2006). Wildlife biologist Nick Mooney of Tasmania's Department of Primary Industries and Water, who briefly viewed the original uncropped images, points out that "you can … see the open mouth and outline of the neck posture – in **both** photos" (personal communication, 14 August 2006). "To have an animal hold such a posture for so long or repeat it coincidentally … would in my experience be extraordinary" (personal communication, 11 April, 2006). Still, "such mouth opening is similar in other dasyurides and is almost certainly a stress-related displacement activity – and just might be repeated." (personal communication, 12 April, 2006).

According to Mooney, a digital forensics expert appointed by Melbourne newspaper The Age "would not vouch for [the photos'] authenticity… [for] several substantial technical reasons" (personal communication, 7 August 2006) … "but neither would he say they are a hoax" (personal communication, 11 April 2007).

A comparison between Emmerichs' photos and that of David Fleay shows "a good but not perfect match" (N Mooney, personal communication, 11 April 2007). By close inspection of the low quality Emmerichs photos, this author found that "the [hind] leg is depicted at a different angle in each image and the tail is further from the leg in [one of the images]" (Where Light Meets Dark, 2006F). The hind leg also differs in angle marginally when compared to that in the Fleay photograph. The one (left) ear that is visible in the Emmerichs photos is in a very similar, but not identical, position to that in David Fleay's photo. Mr Emmerichs claimed that in the original images the second ear can be seen lying flat, whilst in Fleay's photograph it stands erect (personal communication, 25 August 2006).

Unfortunately, the limitations in resolution of the available images make any discussion about discrepancies between the Fleay and Emmerichs photos inconclusive.

Ambiguous timestamp

Some media reports suggested that the timestamp on the thylacine photographs was recorded using a different format to the photos which preceded them: "The photograph before the first thylacine image uses the abbreviation JAN for January. But the thylacine image uses the numeral 2 instead of FEB for February. Mr Emmerichs said the discrepancy was caused by Birgit changing the format while on the plane to Tasmania." (Picture Pair, 2005). Despite this, Mr Emmerichs has explained that they had taken several photos during their drive (two days after the flight), just prior to the sighting, resulting in the additional (not internal) memory card being filled (personal communication, 2006).

The camera's manual states that photographs cannot be recorded on the internal memory (which is the location of the thylacine photographs) without the additional memory card being removed. Thus, in order for the thylacine photographs to have been recorded on internal memory subsequent to their taking of photos during the drive, the card would have been removed and it is possible the camera settings were engaged at this time. This is speculation, however.

In addition, it may be possible that the camera uses a different timestamp for internal memory regardless of the format chosen by the user. The camera manual does not include enough detail to determine this, and at time of writing a camera unit was not available for testing this theory.

Conclusion

Without doubt, the Emmerichs thylacine is one of the most intriguing sightings recorded to date. Those who are serious enough to consider searching for the thylacine themselves would do well to note that thylacines may have been (or may still be) migratory animals. It is conceivable that Emmerichs' thylacine may show up in the same location again, although it has now been over two years since the sighting.

Although the concerns discussed here do not immediately dismiss Emmerichs' evidence as worthless, further consideration should be given to resolving how these details fit. A first hand examination of the photographs would almost certainly be essential. In addition to *not* being a forensics expert, this author has not (yet?) had the opportunity to inspect the original images first hand.

While the similarity between Emmerichs' photos and the photo taken by David Fleay is, for many critics, far too compelling, Col Bailey disagrees and adds, "I ask you, just how many varying images can you take of a thylacine full square side on[?]" (Bailey, 2006C).

Chaotika thylacine

Background

Those following the story of Emmerichs' sighting could be forgiven for wondering whether tigers were a dime a dozen in Tasmania; just over a year later the unthinkable happened – a second tourist claimed to have photographed a thylacine in the wild.

This story begins with a post to an online discussion forum by a person using the penname "Chaotika". In October 2006 Chaotika wrote that a friend visiting Tasmania, was startled by the appearance of two thylacines. The friend managed to take one close-up photo of a pup which showed the side of its body and upper part of one limb, although tall grass in the foreground obscured part of the animal. The photo was taken in the dark, or near-dark, using a flash and Chaotika reported that the flash caused the pup to run away towards a larger thylacine after which both ran into the "brush". A second photograph was taken, but "you can't see anything in it except bushes and the night sky" (Chaotika, 2006; Where Light Meets Dark, 2006B).

Within Chaotika's few short paragraphs, the story seemed to take on the classic conspiracy elements of all previous thylacine sightings combined: the animals quickly ran away, the photographer was warned that authorities might confiscate the photos, a policeman threatened the photographer with having staged a hoax and then threatened that the photographer should act as if he saw nothing, the photographer hides his identity and the nearby "factories and mining operations" get labelled "horrible" and "disgusting" (Chaotika, 2006; Where Light Meets Dark, 2006B).

To cap it all off, the photo does not show either of the most convincing diagnostic features (being the head or tail), and commentators can't even agree which direction the animal is facing, or whether it is a fore or hind leg that is visible.

Mixed opinions

Over the next few weeks, much debate ensued in online forums as to the identity of the animal now referred to as the "Chaotika thylacine". Many noted that the original story accompanying the image lacked any substantial information regarding the location or exact date of the photograph.

This author contacted Chaotika to offer to examine the original photographs (if available) and to hear the story first-hand from the photographer.

In private correspondence (4 November 2006) Chaotika informed this author that she only received the one photo and that quite likely the second photo had been deleted. Commenting on a part of the analysis published by this author which compared the pup with a platypus (viz. Where Light Meets Dark, 2006A) Chaotika felt the comparison unwarranted. In addition, she wondered whether the appearance of a thylacine's stripes might change as it grows from being a young pup to becoming a full-grown adult.

Based on examination of a number of photographs of thylacine pups, it is this author's contention that thylacine stripes do not alter in appearance as a thylacine grows. However, in contrast Lord & Scott (1924, as cited in Paddle, 2000) noted "The young have more pronounced stripes", whilst Cotton (interview, 1980, as cited in Paddle,

2000) “considered that the contrast in markings on his cubs [reared by hand] was much fainter than that usually present in adults”.

A small number of individuals claiming to be professionals working with animals contacted this author to support the idea that the photograph depicted a dog with stripes added.

Other species were also suggested in discussion forums; notably the pig and the Eastern barred bandicoot, both of which can have prominent stripe patterns at various life stages.

Dr Stephen Sleightholme, Project Director of the International Thylacine Specimen Database (ITSD) is "strongly of the opinion that it is not a thylacine" (personal communication, November 11, 2006). The International Thylacine Specimen Database, published by Dr Sleightholme, is “the culmination of a four year research project to catalogue and digitally photograph (*where possible*) all known surviving specimen material held within museum, university and private collections of the thylacine” (Sleightholme as cited in Campbell, 2006).

Professor Mike Archer, Dean of Science at the University of New South Wales says of the ITSD that it “is by far the most thorough compilation focused on an extinct or endangered animal ever produced” (Archer as cited by Sleightholme as cited by Campbell, 2006) and the database won the Royal Zoological Society of New South Wale’s 2005 Whitley Certificate of Commendation for “Best electronic database” (Royal Zoological Society of New South Wales, 2006A). Whitley Awards are “presented for outstanding publications (in printed or electronic form) that contain a significant amount of information relating to the fauna of the Australasian region” (Royal Zoological Society of New South Wales, 2006B). As such, Dr Sleightholme’s opinion should not be discounted lightly.

Conclusion

Ultimately, the Chaotika photograph is inconclusive. Key thylacine diagnostic features are absent. Those features which are visible, apart from the stripes, may pertain to any of a number of animals, and the stripes themselves are not within expected norms for the thylacine.

Whilst elements of the background story sounded implausible to some (notably the anonymity of the photographer and the threats he received), they are not unique amongst post-extinction thylacine sighting reports (cf. Bailey, 2001; Konkes, 2003 as cited in tasmanian-tiger.com, n.d.). In any event, they play no part in establishing whether the photo depicts a modern day thylacine which, it seems, is unlikely.

Doyle thylacine

Background

In 1973, Liz and Gary Doyle shot approximately six to ten seconds of 8 millimetre film footage in South Australia, depicting a thylacine-like animal racing across the road in front of them (Campbell, n.d. A; Hall 2007).

Although the footage has been available for viewing for many years, this author has recently engaged in a detailed frame by frame analysis which he feels contributes new insights into some of the animal's identifying features.

South Australia – likely modern day thylacine habitat?

Although the general consensus is that the thylacine became extinct on mainland Australia prior to European settlement in the late 1700s[6], Paddle presents considerable evidence that this is a misconception. He writes that Cambrian, a Victorian naturalist, in the mid 1800s personally examined the remains of a thylacine killed in the Blue Mountains, east of Sydney, and those of a second thylacine which likely came from the Flinders Ranges / Lake Torres region of South Australia. Additionally, in 1839, Dr John Palmer Litchfield commented during a lecture that in South Australia it was "found necessary to offer a reward for destroying [thylacines]". Thirdly, Paddle quotes Tunbridge as saying a centenarian[7], "who died in 1919, was the last [of the] Adnyamathanhan [people group] who claimed to have seen a live thylacine, having done so in his childhood" (Paddle, 2000).

Thylacine researcher and author Col Bailey, believes he saw a thylacine in the Coorang in south-east South Australia in 1967. His sighting followed a series of reports from south-east South Australia (Bailey, 2001) and the experience has led him to more than forty years of investigations - interviewing pre-extinction trappers as well as post-extinction sighting claimants (Bailey, 2006B).

Two "striped, dog-like animal" sightings from South Australia were reported in the press in January 1973, and following inquiries the total number of independent sightings rose to four – all between December 1972 and January 1973 and within a half mile radius (Campbell, n.d. A). Although it is not clear whether the Doyle footage is counted amongst these four sightings, the stage had been set for evidence of extant mainland thylacines.

Analysis of the footage

Numerous digital versions of the Doyle footage exist. In the original footage the camera shakes considerably - presumably due to the cameraperson filming from a moving vehicle - but a slow-motion, stabilised version has also been produced. In all cases the video sequence exists in MPEG file format.

Campbell concludes that "the image quality is simply too poor … [to] conclusively identify the animal as a thylacine". He goes on to observe that "the manner in which

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[6] See for example Archer, Hand & Godthelp (1991, p236) who report a mainland extinction of "at least 4000 years BP", and 3000 years BP for the "southern half of the mainland" but "perhaps 80 years ago in the Kimberly region [Western Australia]" (p92). Guiler and Godard (1998) mention the Kimberly specimen as being 0 +/- 80 years before 1950.

[7] This person's name has been intentionally excluded.

the animal runs is indeed quite interesting, and in several frames, stripes appear to be vaguely visible in hindquarters" (Campbell, n.d. A).

Tigerman (cited by Campbell, n.d. A) – who himself claims to have seen two thylacines in 2002 – concludes "the footage seems convincing to [him] – consistent with the running juvenile thylacine [he] saw". He also notes that "the tail seems to be longer and certainly straighter than that of a fox or dog".

In the summaries of these two people, three key observations arise regarding the Doyle thylacine:

- That the animal has a peculiar (and arguably thylacine-like) running style,
- That the animal's tail is straighter and possibly longer than that of a fox or dog, and
- That the animal appears striped in some frames.

During two separate frame by frame analyses, this author investigated each of these observations (viz. Where Light Meets Dark, 2006C, 2006D).

Running style

Nearly all known footage of living thylacines is available for viewing on the internet (Campbell, n.d. B). None shows a thylacine running at the pace of the animal in the Doyle footage. Of the 69 frames captured during the first analysis, this author found five showed the Doyle animal (mid stride) in a posture resembling a seated kangaroo. Although a comparable analysis was carried out using greyhound footage, it was clear that in this "kangaroo stance", the Doyle animal maintained an almost uniformly straight spine whilst the greyhound's back was very much more curved (Where Light Meets Dark, 2006C)..

This seemingly unique running style may be what led Tigerman to comment that the animal seemed to "grab and pull at the ground with its front feet" in the same way as the juvenile thylacine he saw in 2002 (Campbell, n.d. A). Joel Little who has personally been involved in breeding over three hundred Eastern quolls, on first seeing the Doyle footage was immediately struck by how similar the animal's gait was to that of an Eastern quoll (J Little, personal communication, 10 April 2007), yet the Doyle animal is clearly dog-sized.

Although establishing that the Doyle animal is not a greyhound is a very long way from establishing whether it is a thylacine, another interesting observation was made when still frames of the Doyle animal were aligned with still frames of a 1930s thylacine rearing up on its hind legs. By general inspection the overall dimensions of the animal, the curvature of the spine and the positioning, size and angle of the forelimbs are similar (Where Light Meets Dark, 2006C).

The tail

In sixteen of the 69 frames, the animal's tail is clearly visible. In all but one of these the tail is held in a straight line, angled downwards. In the other frame the tail is still straight, but held horizontally behind the animal. In contrast, the greyhound's tail appears very much more flexible (Where Light Meets Dark, 2006C).

Paddle writes (2000) that “common in the literature is the idea that the thylacine's tail was a fixed, straight, relatively immovable extension of the backbone ... Generations of zoologists and comparative psychologists, with fixed, primitive tails in mind, have looked at photographs of thylacines and seen just what they wanted to see ... in no sense was the positioning of the tail fixed.”

As noted in the analysis, “Paddle goes on to cite numerous examples of tail flexibility in the thylacine. [However] it is this author's contention that in general, the thylacine carried its tail in a manner very similar to that observed in the 1973 footage. This reasoning is based on observation of those thylacines depicted in the seven films presented by the online Thylacine Museum. Whilst it is true that even in that footage the thylacines did lift their tails at times, it would seem that for the majority of the time, a standing, relaxed thylacine would have its tail pointed downwards in a straight, or very slightly curved line” (Where Light Meets Dark, 2006C). Again we are left in the position of not having any known imagery of a thylacine running at the pace of the Doyle animal.

Stripes

In some respects, that the Doyle animal should be striped is most appealing to those wishing the thylacine were extant. Several frames appear to show stripes, but their appearance is somewhat erratic; disappearing in other frames. The second analysis conducted by this author used higher resolution footage than the first, and focussed on the animal’s striping. In total, 63 frames were captured and evaluated. In two of these the animal’s rump is obscured by a tree in the foreground. Of the remaining 61 frames, 26 (43%) showed some measure of unusually contrasted markings along the animal’s back (Where Light Meets Dark, 2006D).

However, even before all the frames were captured it became obvious that there were visual artefacts in areas of the frames away from the animal. Two kinds were apparent: marks seemingly originating with the source film, such as caused by dust; and apparent artefacts caused by limitations of the MPEG file format (Where Light Meets Dark, 2006D).

At this point it is worth noting some aspects of the MPEG file technology. PixelTools (2004) explains how sequential frames are stored using the MPEG file format: “Two adjacent frames in a motion picture sequence are usually very nearly identical. Often the only difference is that some parts of the picture have shifted slightly between the frames. MPEG compression exploits this temporal redundancy by carving each new frame into convenient pieces and searching the previous frame to determine where each piece came from. If the content of the current frame was mostly sent in the previous frame, why send it all again? Just send the instructions for shifting pieces of the previous frame to their new positions in the current frame”.

If the reader can imagine cutting up a film frame and moving the parts to their new position, ready for rendering the next frame, the question arises – how to fill in the blanks which were created in the process? The answer is in duplicating the moved portion which, of course, leads to the rendering of apparent artefacts. Further, these

are *most* likely to occur in regions of the frame which are undergoing significant movement; in this case – on the running thylacine.

Conclusion

Prior to the analysis of the stripes, this author concluded that he "too cannot conclusively state that the animal can *only* be a thylacine, [but] that all observable features of the 1973 animal *remain consistent* with the morphology of a thylacine" (Where Light Meets Dark, 2006C).

In particular, "the overall body proportions of the 1973 animal - including the dimensions of the trunk of the body, the head shape, ear shape, ear position, tail thickness, base of the rump, tail posture, forepaw position, forepaw proportion and curvature of the spine - are consistent with that of a thylacine" (Where Light Meets Dark, 2006C).

Regarding the stripes, "it is most likely that [they] are the result of artefacts introduced by the MPEG delivery format" (Where Light Meets Dark, 2006D).

Having no observable stripes does not discount the animal being a thylacine. Ultimately, procurement of the original film would seem the best course of action for evaluating this evidence further. Whilst acknowledging that these analyses were in consideration of "34 year old evidence", one commentator retorted "but it is a thylacine 37 years younger than Benjamin[8]!" (Miguel, 2007)

Mainland Tasmanian Devils

[8] "Benjamin" is the name applied to the last known surviving thylacine even though it is unlikely it was ever called by that name during its lifetime.


Tasmanian devil (*Sarcophilus harrisii*) photographed by the author at Trowunna Wildlife Park, Tasmania in 2004.

The Tasmanian devil is the "world's largest surviving carnivorous marsupial" (Parks and Wildlife Service, Tasmania, 2007A). It is a stocky animal, comparable in stature to the common wombat, although the Tasmanian devil is smaller. Despite its fearsome reputation and demeaning name, the Tasmanian devil plays an important ecological role in devouring carrion. In addition, the devil is an able hunter.

Devil Facial Tumour Disease (DFTD)

In 1996 Tasmanian devils were discovered in north-eastern Tasmania to have large facial tumours (Department of Primary Industries and Water, 2007A; 2007B). The tumours were subsequently discovered to be cancerous and contagious (Department of Primary Industries and Water, 2007B). Infected devil cells are transmitted "directly between animals through bites they inflict on one another" (Pearce & Swift, 2006). Unfortunately, the receiving devil's immune system does not recognise the infected cell as foreign, providing evidence that a lack of genetic diversity contributes to the

cancer being infectious (Department of Primary Industries and Water, 2007B). Additionally, the tumours are debilitating and prevent the animal from feeding properly. Most devils die within three to six months of infection (Parks and Wildlife Service, Tasmania, 2007A; 2007B).

The disease has spread from its point of origin to 56% of Tasmania in the ten years since its discovery. In this infected region there has been a 90% reduction in the average number of devils located by spotlighting, and a 41% reduction across the state overall (Department of Primary Industries and Water, 2007A; 2007B; Parks and Wildlife Service, Tasmania, 2007B).

With estimates as low as 20,000 to 75,000 devils left in the wild (down from 150,000 ten years ago), Professor Hamish McCallum of the University of Tasmania has suggested an extinction [in the wild] in as soon as 10 to 15 years' time. (Byrnes, 2007).

Although the devil is still abundant in the wild, it can be seen that without radical intervention it may well soon join the list of extinct animals for which cryptozoologists search.

Mainland devils

It is generally accepted that the Tasmanian devil is extinct on mainland Australia. Paddle (2000) cites all of the following authors as claiming the most recently dated sub-fossil devil material at 430 years before present: "Brazenor, 1905; Le Souef and Burrell, 1926; Lucas and Le Souef, 1909; Menkhorst, 1995; Ride, 1970; Strahan, 1983; and Triggs, 1984". Parks and Wildlife Service, Tasmania (2007B) claims devils "probably became extinct on mainland Australia at least several thousand years ago". Elsewhere (2007A) it suggests "it is believed the devil became extinct on the mainland some 600 years ago".

Despite this sway of testimony, Paddle (2000) cites other sources which report the presence of the devil on mainland Australia as likely (Troughton, 1941) or certain (Wood Jones 1923). He goes on to mention Cambrian who in 1855 recorded both live and dead specimens (though uncommon) in New South Wales, Victoria and South Australia. Additionally, the Adelaide Observer reported "'a colony of Tasmanian bears' … living around Lake Albert" in 1896 (Paddle, 2000).

Most startlingly however, a live devil was captured in Tooborac, Vicrtoria, in 1912. Its remains were preserved by the National Museum of Victoria (Kershaw as cited by Paddle, 2000).

If one devil wasn't surprising enough, four further specimens were collected; most recently two road kill specimens in 1991, from localities 150 kilometres apart (Paddle, 2000).

One World Wildlife (n.d.) lists the Victorian specimens as being collected from Melbourne (1903), Tooborac (1912), Ballarat (1971, 1974), Yellingbo (1991) and

Harcourt (1991) and notes footprints at Harcourt (1991) and Healesville (date not supplied).

Although the number of specimens and distance between the 1991 road kills contradicts Paddle, it is clear that at least five Tasmanian devils have indeed been collected (dead or alive) from Victoria during the past 100 years.

Origin and significance of mainland devils

The first obvious question to be asked of any mainland devil population is "where did it come from?" With sub-fossil material being dated at 430 years before present, it is not inconceivable that such a population would be a continuation of mainland stock.

The possibility that a mainland population established itself from the re-introduction of Tasmanian stock must also be considered. Nick Mooney, wildlife biologist with the Tasmanian Department of Primary Industries and Water has said that "we don't think there are any populations of wild devils [persisting from pre European times] on mainland Australia … There has been an enormous amount of trapping on mainland Australia using techniques that should easily catch devils but to my knowledge none have been caught aside from a few immediate escapees" (N Mooney, personal communication, 10 May 2006).

Regardless of origin, their existence begs a question: is there a possibility that mainland devils are somehow more resistant to devil facial tumour disease than their Tasmanian counterparts?

The notion is not too far fetched. It has been reported that Tasmania's platypus population appears susceptible to developing chronic skin ulcers in response to a viral infection while the mainland platypus populations do not succumb to such ulcerations (Obendorf & Connolly, 2006). "All platypus including Tasmanian and [mainland] south-eastern coastal animals are recognized as the same subspecies", yet there is in fact a "genetic difference between mainland and Tasmania [at] possibly … sub-species level" (Akiyama as cited in Munks & Nicol, n.d.).

With the devil, in contrast, it is believed that those devils found as road kill on the mainland, that could be examined, had DNA typical of those in Tasmania. The reason for Tasmanian platypus susceptibility to viral infection may however not be genetic and clearly viral ulcerations and cancerous tumours are two different things.

Despite the difference, there may be further reason to entertain the question: cancer researchers in the United States have discovered an individual mouse which is in fact cancer resistant. According to Dr Zheng Cui of Wake Forest University in Winston-Salem, North Carolina, "in some cases [the] spontaneous regression of cancer [in this mouse] was dramatic. A very large tumour mass disappeared overnight" and the cancer-resistance trait was inherited by about half of the mouse's offspring (Smith, 2006).

Although not yet identified, researchers believe a genetic mutation is responsible for making the mouse's "white blood cells extremely good at finding and destroying cancer cells" (Smith, 2006). In contrast, devil researchers have demonstrated that

facial tumour cells are *not* recognised by the Tasmanian devil's immune system. Further, "devils failed to recognise cells from other devils as different" (Department of Primary Industries and Water, 2007B).

To understate the point, it is incredibly ambitious to hope that mainland devils – if they persist – might have some mechanism by which their immune system recognises and destroys DFTD cells, especially as this appears to be a new disease which appeared less than 20 years ago.

At the same time, who is to say DFTD did not play a major role in the demise of the species on mainland Australia with the remaining mainland populations (regardless of origin) being the survivors? According to Holtcamp (2007), "biologists still cannot even detect DFTD before tumors appear"; therefore it cannot be known whether DFTD exists on mainland Australia unless a captive devil succumbs to it.

Regardless of the effectiveness of the immune system in mainland devils, their very existence would still play an important role in the species' conservation.

Searching for mainland devils

Excepting amateur naturalists, the only team actively searching for evidence of Tasmanian devils on mainland Australia appears to be that of One World Wildlife, also known as The Biodiversity Trust. This organisation has a project titled "Marsupial carnivore research in Tasmania & Victoria, Australia" which "aims to collect [Tasmanian devil] droppings in likely parts of both the mainland of Australia as well as Tasmania and to test them for DNA" (One World Wildlife, n.d.). It claims "overall feasibility has been proven" although it is unclear whether this refers to the analysis of DNA acquired from droppings, or the collection of said droppings from the mainland itself.

The present author noted this devil project in May 2006 and despite contacting One World Wildlife on two occasions to learn more about it, received no reply. It is unclear, therefore, whether this project began, continues or has been completed.

Conclusion

Tasmanian devil (*Sarcophilus harrisii*) photographed by the author at Trowunna Wildlife Park, Tasmania in 2004.

The evidence for mainland devils *appears* mixed. However, at least five specimens from Victoria – the majority, if not all road kill - have entered museum collections.

Feasible explanations for the mainland specimens include:

- That at least one mainland devil population does exist
- That some or all of the specimens were brought to Victoria, from Tasmania, for reasons unknown
- That some or all of the specimens were escapees from captivity.

In considering the possibilities, the reader should keep in mind the time span in which these specimens were collected (1903 to 1991). Further, Paddle's suggestion that any escapee would have to be from an illegal collection implies that he could not find (amongst his 400+ sources) any evidence for a known escapee not being otherwise accounted for.

Either five devils have been brought to Victoria over 88 years, discarded on roadways and subsequently discovered and identified by unsuspecting individuals, or five illegally kept specimens escaped during those 88 years only to be killed on the road and subsequently collected, or one or two mainland populations do exist, or some other scenario not yet considered has prevailed.

It is this author's opinion the most likely scenario is that the Tasmanian devil persisted on the Australian mainland until 1991 at least, and may well do so today. Locating such a population, although difficult, may prove to be invaluable in the conservation of the species.

Mainland Eastern Quolls

Eastern quoll (*Dasyurus viverrinus*) at Mt Rothwell, Victoria. Photo by Andrea Little.

Australia has four species of quoll. The spotted-tailed (or tiger) quoll is the largest of these and "mainland Australia's largest carnivorous marsupial" (Wikipedia, 2007).

The Eastern quoll (pictured above) on the other hand, is somewhat smaller and appears in two colour forms: light (i.e. fawn), and dark brown (i.e. black). Its last mainland Australian sighting was the collection of a road kill specimen in the Sydney suburb of Vaucluse on 31 January 1963 (Australian Museum, 2002; 2003).

In the words of the Australian Museum, "fortunately Eastern Quolls are still present in Tasmania but the last mainland population disappeared from Sydney without much notice" (2003).

Long before the Eastern quoll was suspected to be extinct on the mainland, Troughton (1968) wrote that "the powerful *tiger* [(spotted-tailed) quoll] is in more danger of ultimate extermination than the [Eastern quoll] because of its insistence on its warm-blooded kills and its suicidal habit of returning to clear up poultry roosts [and because] it may be caught in a nest of rabbit traps not even concealed in the ground" (italics added). Despite the prediction, it seems the *Eastern* quoll – not the spotted-tailed quoll - may have met this fate.

Nevertheless, the spotted-tailed quoll fares only marginally better. It is listed as threatened in New South Wales and the Department of Environment and

Conservation (NSW) is appealing to the general public for sightings information (2004).

Numerous "post-extinction" sightings

Most authorities accept the Eastern quoll as extinct on the mainland, yet numerous sightings have been reported. The following table summarises a number of the post-extinction mainland Eastern quoll sightings[9].

Location	Details	Sighting Date	Publication Date	Source
Wyong district, NSW	"unconfirmed sighting"	n/a	1983	Godsell as cited in NSW National Parks and Wildlife Service (1999)
Cessnock district, NSW	"unconfirmed sighting"	n/a	1983	Godsell as cited in NSW National Parks and Wildlife Service (1999)
Inland of Kempsey, NSW	"unconfirmed sighting"	n/a	1992	Scotts as cited in NSW National Parks and Wildlife Service (1999)
Approx 100km west of Bega, NSW	"post 1980 sighting"	Post 1980	1999	NSW National Parks and Wildlife Service (1999)
Approx 150km west of Bega, NSW	"post 1980 sighting" (x2)	Post 1980	1999	NSW National Parks and Wildlife Service (1999)
Approx 50km south west of Wollongong, NSW	"post 1980 sighting"	Post 1980	1999	NSW National Parks and Wildlife Service (1999)
Approx 100km north north west of Sydney, NSW	"post 1980 sighting"	Post 1980	1999	NSW National Parks and Wildlife Service (1999)
Approx 100km north west of Newcastle, NSW	"post 1980 sighting"	Post 1980	1999	NSW National Parks and Wildlife Service (1999)
Approx 50km west north west of Port	"post 1980 sighting"	Post 1980	1999	NSW National Parks and Wildlife Service (1999)

[9] This list includes nearly all sightings known to the author but is almost certainly not comprehensive, especially as all reported sightings occur only in New South Wales while the species' former distribution extended into Victoria and South Australia (NSW National Parks and Wildlife Service, 1999).

Macquarie, NSW				
Approx 150km west north west of Grafton, NSW	"post 1980 sighting"	Post 1980	1999	NSW National Parks and Wildlife Service (1999)
Approx 50km north of Lismore, NSW	"post 1980 sighting"	Post 1980	1999	NSW National Parks and Wildlife Service (1999)
Approx 100km north west of Newcastle, NSW	"pre 1980 sighting" (x3)	Pre 1980	1999	NSW National Parks and Wildlife Service (1999)
Approx 50km north of Sydney, NSW	"pre 1980 sighting"	Pre 1980	1999	NSW National Parks and Wildlife Service (1999)
Sydney, NSW	"pre 1980 sighting" (x2)	Pre 1980	1999	NSW National Parks and Wildlife Service (1999)
Approx 50km south south west of Wollongong, NSW	"pre 1980 sighting"	Pre 1980	1999	NSW National Parks and Wildlife Service (1999)
Approx 150km west north west of Bega, NSW	"pre 1980 sighting" (x2)	Pre 1980	1999	NSW National Parks and Wildlife Service (1999)
Colo, near Sydney, NSW	Trapped in a chicken coup; misidentified as tiger quoll at the time, later (2006) learned it was an Eastern quoll	2001 or 2002	n/a	Anonymous, personal communication (2006)
Dungog, Barrington Tops area, NSW	Trapped and released	Approx 1997	n/a	Anonymous, personal communication (2006)
National Park near Nowra, NSW	Came looking for food scraps under tables in main picnic area in the middle of the day with hundreds of people present	1986	n/a	Anonymous, personal communication (2006)
East	Witness	October	1 November	Lang (2006)

Kurrajong, Sydney, NSW	Nicole Palmer was driving along Roberts Creek Road when two dark quolls hopped in front of her car.	2006	2006	

The majority of these descriptions are this author's interpretations of a map on the NSW National Parks and Wildlife Service fact sheet for the Eastern quoll (1999). Neither raw data nor better descriptions were available at the time of writing.

The fact sheet goes on to report that "extensive surveys have not found any evidence of the species and its current distribution in NSW remains uncertain" (Maxwell et al as cited in NSW National Parks and Wildlife Service, 1999).

East Kurrajong sighting, 2006

Eastern quoll (*Dasyurus viverrinus*) at Mt Rothwell, Victoria. Photo by Andrea Little.

The most recently reported sighting - in Sydney at East Kurrajong – is considerably encouraging. Witness Nicole Palmer saw two quolls; one smaller than the other. The larger one kept hopping in front of her car to the point where she had to reverse and honk the horn. She noted a white tip on its tail and that it appeared smaller and lighter than a tiger quoll (Lang, 2006).

On first reporting the sighting to the National Parks and Wildlife Service (NPWS) Ms Palmer learned that it was most likely a tiger quoll which she saw. She then researched quolls and came to the realisation it was in fact the Eastern quoll. Relaying this insight back to the NPWS led to the media report cited (NPWS, personal communication, 4 December 2006).

The original media report named the street in which the sighting took place and I^2 visited the location just prior to 05:00AM on 18 November 2006. The short narrow street winds steeply down to a creek crossing and just as steeply up the other side of the gully. Although residential premises line the street there is a considerable amount of bushland. Outside of this bushland gully the area is surrounded by farming paddocks supporting livestock.

Citing Maxwell et al, the National Parks and Wildlife Service fact sheet for the Eastern quoll (1999) says "in Tasmania [Eastern quoll] individuals occur most commonly where there are ecotones between cleared pastures and eucalyptus forest." And citing Scotts, "[this reflects] the availability of prey along forest edges". Thus, the location of Ms Palmer's sighting is prime Eastern quoll habitat.

Shortly after the sighting, the residential land blocks above and below the sighting location were cleared for development (NPWS, personal communication, 4 December 2006).

Colo sighting, 2006

In the process of investigating Ms Palmer's sighting, I learned of a nearby sighting made in 2001 or 2002. At that time an anonymous witness encountered a quoll in their chicken coup near Colo, north of East Kurrajong. The animal was originally assumed to be a spotted-tailed quoll, but having read Ms Palmer's 2006 account in media reports, the Colo witness came to realise that they had in fact seen an Eastern quoll (Anonymous third party, personal communication, 2007).

Mainland breeding programs

Eastern quolls (*Dasyurus viverrinus*) at Mt Rothwell, Victoria. Photo by Andrea Little.

Numerous facilities have actively bred the Eastern quoll on mainland Australia in recent times.

The Australian Ecosystems Foundation, initiated by Trevor Evans, has a 100 hectare property near Lithgow, 2 ½ hours' drive east of Sydney, New South Wales. In 2002 the foundation bought four female and two male Eastern quolls from interstate sanctuaries. These were being housed in "large aviary-like breeding cages" and were scheduled for release into a 4 hectare enclosure, surrounded by feral (and quoll) proof fencing (Thomas, 2003). By September 2004, at least 18 young had been produced (Australian Ecosystems Foundation Inc, 2004). The foundation's breeding program is the only one based in New South Wales (Thomas, 2003).

Pearcedale Conservation Park (otherwise known as Moonlit Sanctuary Wildlife Conservation Park) in Victoria received quolls from Perth zoo in late 2000 (Johnson, 2000) and kittens emerged from their nest in November 2002 (Johnson, 2002). By late 2005, three generations of quolls had been bred (Moonlit Sanctuary, n.d.).

Mount Rothwell Conservation and Research Centre, also in Victoria, has bred the Eastern quoll along with numerous other Australian animals. These can be seen in their natural habitat on guided tours within the feral-proofed property (Kizilos, 2007).

While this list is not comprehensive, it can be seen that the Eastern quoll has been successfully bred in captivity on a number of occasions.

Conclusion

Eastern quoll (*Dasyurus viverrinus*) at Mt Rothwell, Victoria. Photo by Andrea Little.

Although the Eastern quoll is possibly extinct on mainland Australia, there is a realistic chance that it survives there in the wild. The East Kurrajong and Colo sighting locations are well within the species' predicted and accepted former ranges (NSW National Parks and Wildlife Service, 1999) and the probability of an accurate identification is good.

The fact that two sightings within five years originate from locations which are about 8 kilometres (5 miles) apart and separated only by National Park land, is even more encouraging.

At the same time, it needs to be acknowledged that the spotted-tailed quoll – and especially a juvenile - may easily be confused with the Eastern quoll. In the absence of additional information, many of the sighted animals listed

above may actually have been spotted-tailed quolls. However, in the cases of East Kurrajong and Colo, both witnesses came forward with their sighting information only after independently establishing (as far as they believed) that what they saw was actually the Eastern quoll.

Troughton recommended in 1968 that "with the Dasyures [family], as with the koala and other remarkable marsupials, the paramount need is for adequate faunal sanctuaries. Strategically placed throughout Australia, these would enable a maximum representation of the unique wildlife to be conserved for future generations and the animals would not be forced into acts of depredation, for which natural 'crimes' the sentence becomes extermination" (Troughton, 1968).

Thankfully, these animals are now all protected and there is more hope for the quolls than for many other Australian marsupials not discussed here.

"There can be no doubt that as consumers of grasshoppers, mice, rats, and young rabbits the dasyures, especially the [Eastern quoll] and its marsupial mouse cousins, have played an extremely useful part in the rural economy of Australia." (Troughton, 1968).

It would be most interesting to see what effect Eastern (and spotted-tailed) quolls might have on Australia's feral rabbit populations when the quolls are introduced into an environment devoid of foxes, as is the case in some of the sanctuaries which have bred the quoll. I look forward to the day when the Eastern quoll is again embraced as an "extremely useful" player in the rural Australian economy!

Eastern quoll (*Dasyurus viverrinus*) with juvenile in the Mt Rothwell Conservation and Research Centre breeding program. Photo copyright Paul Mervin. Used with permission.

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