

**The developmental basis of the stripes
of the zebra and their ecological
Significance**

By

David Bermingham

Introduction

The zebra of Africa are divided up into three distinct species, *Equus africanus*, *Equus burchelli* and *Equus grevyi*. The black and white stripes of all three species are the characteristic that gains them their worldwide recognition on sight. The patterns of these stripes vary not only from individual to individual, but also depending on the species being looked at.. Many authors have questioned this colouration over the years, and there have been a few opinions put forward as to their significance.

One must wonder as to what possible benefit the dazzling stripes of can The zebra be, given that it is a prey animal. So why were these stripes developed? It appears that the first of the zebra populations were a slate-grey colour, and to transform their coat into the dazzling black and white ensemble that we see today is a huge difference. Such a difference must have come about due to very real benefits for the zebra. What is it about the stripes of the zebra that make it more likely to survive?

To date there have been quite a few answers posed to the questions above. These answers can be divided up into some general categories, and could be looked at under the following titles, (i) Predator avoidance, (ii) Social benefits, and (iii) Lifestyle benefits.

Predator avoidance:

I. Stripes increase the size of the zebra:

The stripes of the zebra create an optical illusion, which makes the Zebra look bigger. This optical illusion affords the zebra an advantage over its predator because it could lead the predator to attack at a time before which it is in a position to do so. Having a lion pounce before it is close enough to gain contact with the zebra. This in turn would of course alert the rest of the individuals in the group to the presence of a predator, and would allow them extra time in which to try escape. Those whose stripes were not as effective at creating this illusion would have been captured and slaughtered, Thus not being able to pass on their less effective genetics to the next generation.

II. Moving stripes create confusion:

The stripes present on the zebra are dazzling, even while the animal is Standing quite still grazing and on its own. The dazzling qualities of the zebra are then increased when one sees a herd of them grazing together. But to see an entire herd of zebra stampeding is in a different league.

It is hard to tell individuals apart, with the flashing of the black and white limbs in full action. The sight of twenty striped animals

running and scattering in different directions must be a confusing sight for the attacking predator.

III. Stripes are hard to pick out in poor light:

While it is accepted that the stripes of zebra are clearly visible during the day, there are questions arising as to their appearance during dusk, night and dawn. Does the low lighting and stripes act as an effective camouflage during these periods? However one must take into account the olfactory senses of the human cannot be compare to those of predatory felines.

Social benefits:

Many authors have concluded that the stripes of the zebra have a lot to do with the social interactions of the zebra. It is thought that the Stripes have an influence in quite a few of the spheres in the social behaviour of this striped animal.

I. Individual identification:

One theory is that the stripes of the zebra are a device by which they can identify one another however in equid societies, their tends to be an order ranging from alpha mare, her foal, and then to other members of the group in descending order, and it is through this order that recognition comes about. So while the stripes of a zebra are as individual as a fingerprint, it is highly unlikely that their stripes are used a means of identification.

II. Group bonding:

As this cannot really be proven or disproved, we must further examine the interactions of the groups of zebras, and look for anomalies. A paper by Mathews in 1971 tells us of a zebra who looked as though he was black, with white spots. The interesting thing about this zebra is that he was accepted into a group of zebras, despite its unusual colouring

Lifestyle benefits:

Living in such warm weather, one can pose the question, of what Advantage are stripes to the zebra in connection with the conditions of the country it lives in. There are two theories proposed to this question, and they are as follows.

I. Stripes act as a thermoregulatory device:

It seem that the stripes of the zebra play a role in keeping the zebra at a rather constant temperature during the fluctuating heat changes that take place in the wilds of Africa. The exact mechanism by which this may occur is not understood.

II. A different hypothesis (Waage, 1981) contends that the stripes serve to obliterate a large single-colored region that is favored by biting insects such as the tsetse fly. These flies prefer large, dark, moving animals (Vale, 1974).

Conclusion

On the subject of predator avoidance, there seems to be a lack of hard fact and a surplus of personal opinion and experience. While it is indeed these types of curiosities and questions that hypothesis are based on, it is not enough to say that something was seen first hand, and expect that to be taken in a scientific context.

The social benefits as listed above seem to be a little less believable than the predatory ones however the lifestyle benefit that black and white stripes could help maintain a certain thermoregulatory level, as one colour absorbs heat and the other one reflects it seems to be very feasible.

The exact cause of the development of stripes is not known.

Literature Cited

Bard, J. B. L. 1977. A unity underlying the different zebra striping patterns. *J. Zool.* (London) 183: 527-539.

Bard, J. B. L. 1981. A model for generating aspects of zebra and other mammalian coat patterns. *J. Theoret. Biol.* 19: 363-385.

Marler, P. and Hamilton, W. J. 1968. *Mechanisms of Animal Behavior*. Wiley, New York.

Murray, J. D. 1981. A pre-pattern formation mechanism for animal coat markings. *J. Theoret. Biol.* 88: 161-199.

Thayer, A. H. 1909. *Concealing Coloration in the Animal Kingdom*. Macmillan, New York.

Vale, G. A. 1974. The response of tsetse flies (Diptera, Glossinidae) to mobile and stationary baits. *Bull. Entom. Res.* 64: 545 - 588.

Waage, J. K. 1981. How the zebra got its stripes: biting flies as selective agents in the evolution of zebra coloration. *J. Entom. Soc. South Afric.* 44: 351 - 358.

<http://en.wikipedia.org/wiki/Zebra>

http://www.hhmi.org/askascientist/answers/what_is_the_molecular_mechanism_for_stripes_in_zebras.html

The Encyclopedia of World Wildlife by mike and Peggy Briggs

<http://www.zebras-zebras.com/zebras-links.htm>

<http://alumnus.caltech.edu/~kantner/zebras/zebralinks.html>