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# Letters to the Editor

Dear Sir,

I refer to Lindsay's criticisms of my article in *Pachyderm*<sup>1</sup> in his contribution "Elephants and habitats:

the need for clear objectives."<sup>2</sup> While it is all very well to play the autocrat at the breakfast table, Lindsay should apply the same rigour to his criticism of others that he would have others apply to their utterances upon elephants and management. He states: "...his (Spinage's) only reference to habitat was the suggestion that by reaching K on the curve, the elephants would have reduced the Chobe woodlands to bare sand, leaving the definition of K (which should be "ecological carrying capacity") in a theoretical muddle." What I actually wrote was: "Even if left to increase to 135,000 (the value of K given in the model) or more there is little likelihood of a disaster..." And later, "But the unstable Kalahari sands which occur in the area, will not have the same resilience to vegetative loss as the fertile soils of, for example, Uganda's Queen Elizabeth National Park with its similar rainfall. The consequences to this habitat of uncontrolled, or even inadequately controlled, growth in elephant numbers could be catastrophic". Which is somewhat different to stating that the woodlands would be reduced to bare sand, and furthermore "could" is not the same as "would". Clearly it is Lindsay himself who sees that as a possible outcome otherwise he would have not said so.

K of course is never "reached" as Lindsay states, only approached, but I did not state that if numbers approach K in the model the results could be catastrophic. I wrote if numbers are "uncontrolled or even inadequately controlled", which could be interpreted to mean a cybernetic loop. To analyse articles with the rigour of scientific papers is didactic in the extreme, but it does fill up space at plenary sessions.

We can change the term "carrying capacity" to "temporally limit of sustainable growth" or some other term for the sake of epeolatry; but like "climax vegetation" I suspect that it will be with us for a long time yet. "Absolute preemptory facts are bullies, and those who keep company with them are apt to get a bullying habit in mind." As the autocrat asked, did a logical mind ever find out anything with its logic? While

Lindsay labours to build his pons *asinorum* I suspect that shrewd people can bestride the chasm with ease.

Yours faithfully,

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1. Spinage, C.A. 1990. Bostwana's problem elephants. *Pachyderm*, 13:14-19.
2. Lindsay, K. 1993. Elephants and habitats: the need for clear objectives. *Pachyderm*, 16:34- 40.

## RESPONSE TO SPINAGE'S LETTER

I must admit surprise at Spinage's response, extensively embellished with metaphor and allusion, to a few lines in my paper on elephant-habitat interactions (Lindsay, 1993). I can only conclude from the ferocity of his attack that I injured his feelings when I suggested that his use of the logistic equation and "carrying capacity" (Spinage, 1990) was muddled. I did not and do not feel that it is didactic, autocratic, bullying or hurtful to do an author the service of trying to understand the logic behind his arguments in an article he has submitted for publication by a technical Specialist Group of IUCN. If I am mistaken in this belief or if my fault is a failure to understand, then I am genuinely sorry.

However, far from labouring on a Bridge of Asses at my breakfast table (?), I was attempting to clear away some of the clutter which has surrounded the issues of elephant - habitat interaction and has, I believe, prevented progress in approaching the subject. The use and abuse of the term "carrying capacity", with its many definitions and its invocation of an idealised stable equilibrium, symbolises the value-laden thinking about ecosystem dynamics perpetuated by many wildlife researchers and managers. In taking issue with its still common currency, I was merely standing on the shoulders of giants (e.g. Macnab, 19853).

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I actually liked much of Spinage's article, but I had a problem in understanding his somewhat convoluted modelling of elephant population dynamics in northern Botswana. It was in my review of models used to explore habitat interaction that I commented on Spinage's efforts, among several others. At one stage in his article, he used the logistic population growth curve - there could be a book written on arguments over its application to large mammal populations - to extrapolate beyond recent aerial survey estimates fitted to the linear section of the curve and predict an equilibrium population density for elephants at K in the middle of the next century. The logistic curve, being a mathematical abstraction, requires a density dependent deceleration in population growth but says nothing about its mechanism. He went on to suggest that the woodlands along the Chobe and Linyanti river fronts - at a distance of up to 30km away? (it is not clear) - would be destroyed if elephant density was not reduced by management intervention to a much lower level, but that the elephants would probably be supported by floodplain grasses; competition over this limited resource would result in slower population growth, implying the negative feedback of the logistic model. "Disaster" on the scale of Tsavo was unlikely for the elephants, although the woodlands would take a beating.

Fine so far, I think. However, in his conclusion he stated that "limitations of habitat will eventually come to bear on this rate of increase", but that the unstable Kalahari sands are not as resilient to vegetative loss as are more fertile soils such as those in Uganda, and "the consequences to this habitat of uncontrolled, or even inadequately controlled, growth in elephant numbers could be catastrophic". These statements were unfortunately phrased in ambiguity, leaving open the question of whether the necessary control mechanism should be ballistic or a natural "cybernetic loop". If there is a natural limitation on population by habitat (is this still the floodplain or are we now talking about the Kalahari sand woodlands?), this implied his logistic model approaching K; how then could "uncontrolled" growth have catastrophic consequences for woodlands on Kalahari sands, away from the riverine? I must admit that by this stage I was seeing bare sand, where I now learn it was not intended.

To me this discussion seemed contradictory and well, muddled, and it appeared to typify the difficulties of trying to apply superficially simple concepts such as the logistic model and carrying capacity to describe the complex and still imperfectly understood effects

of elephants on habitats and the parallel effects of habitat on elephants, against a background of other widely varying environmental factors such as rainfall, fire and frost. However, old shibboleths die hard and Spinage is probably right in predicting that "carrying capacity" and its related misleading, muddle-generating notions will linger on for some time to come.

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1. Lindsay, K. (1993) Elephants and habitats: the need for clear objectives. *Pachyderm*, 16:34-40.
2. Spinage, C.A. (1990) Botswana's problem elephants. *Pachyderm*, 13:14-19.
3. Macnab, J. (1985) Carrying capacity and related slippery shibboleths. *Wildlife Society Bulletin*, 13:403-410.

## Errata

Please note the following corrections to the last issue (No.16) of *Pachyderm*:

1. Pages 1 and 14  
The date of the African Elephant Specialist Group meeting was November 1992, not 1993.
2. Page 36  
The paragraph under the heading "Carrying capacity" in the article by Keith Lindsay should read:

"Many managers of elephant populations continue to use the term "carrying capacity" as if it has an objective meaning grounded in ecological reality. The view that there is a self-defined carrying capacity for an area which is "ecologically correct", the one animal density which will avoid habitat "degradation", which allows for "healthy" wildlife populations and habitats and represents "sound management" has been expounded most recently in a book by Thomson (1992). If the reviews are to be believed, it is a popular account of wildlife management principles, yet it blandly assumes a single value system when in fact there is a great variety, each of which sets its own limits of acceptability for the density of plants and animals."