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## Correspondence

### Does the taxonomy of the quagga really need to be reconsidered?

A news item in these pages (ref. 1 in Eisenmann below), on the subject of quaggas and zebras, drawing attention to a contribution to a recently published memorial volume (ref. 1 of Rau), has attracted the following correspondence.

Sir, — The report by Professor Skinner<sup>1</sup> has greatly surprised me. I do not think that quaggas can in any way be considered closer to mountain zebras than to plains zebras.

It can be very difficult to distinguish two taxa at the specific or subspecific level when one criterion — unfertile or fertile offspring — cannot be tested because a taxon is extinct. I am certainly not able to state whether the extant plains zebras and the extinct quaggas should be considered as distinct species or subspecies, and I doubt that the dilemma will ever be solved. But the allegation that the quagga is more closely related to mountain zebras than to plains zebras contradicts all I know about equids in general and zebras in particular.

According to my craniological observations on 350 modern equids (including 45 mountain zebras, a dozen quaggas, and 170 plains zebras) and various multivariate analyses,<sup>1–3</sup> there can be no doubt that quaggas and plains zebras are closely related and distinct from mountain zebras

(Fig. 1). It is indeed true that quaggas have some characters in common with horses, as already remarked by Cabrera.<sup>4</sup> Mountain zebras, in contrast, have several craniological similarities with asses (see also the observations of Bourdelle<sup>5</sup> on the skeleton and soft tissues). My craniological studies support the observations on skins by Rau,<sup>6</sup> agree with the observations by Groves and Willoughby,<sup>7</sup> and are supported by DNA<sup>8</sup> and immunological studies.<sup>9</sup> Even if quaggas are specifically distinct from plains zebras,<sup>7,10</sup> I fail to see why they should be closer to mountain zebras.

I have not yet had the chance to study the five Koffiefontein subfossil skulls

purported to be those of quaggas,<sup>1,11</sup> but if they resemble skulls of donkeys, it may be that they belong to *E. lylei* recently revised by Brink.<sup>12</sup> It would be consistent with the *E. hydruntinus*-like characters of this South African species.<sup>13</sup>

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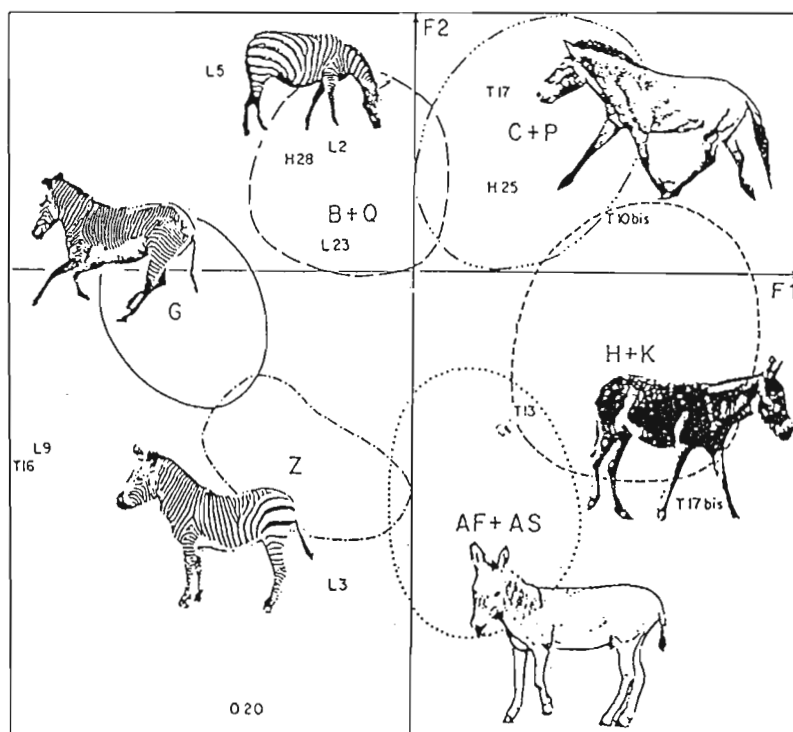


Fig. 1. Schematic representation of the first plane of projection of multivariate analysis on 349 skulls of *Equus* and 21 measurements.<sup>13</sup> C+P, *E. caballus* and *E. przewalskii*; H+K, *E. hemionus* and *E. kiang*; AF+AS, *E. africanus* and *E. asinus*; Z, *E. zebra*; G, *E. grevyi*; B+Q, *E. burchelli* and *E. quagga*. The palate (L2), the muzzle (L5), and the anterior ocular line (L23) are long and the cranium is high (H28) in quaggas and plains zebras. Mountain zebras have a very large external auditory meatus (O20), and a very long distance between the posterior borders of palate and vomer (L3) — both are asinine features. Quaggas may overlap with horses, especially because of the great breadth of their muzzle (T17) but are distinct from mountain zebras.

material of the extinct Cape Colony quagga, *Equus quagga quagga* (Gmelin). *Ann. S. Afr. Mus.* 65, 41–87.

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Sir, — Skinner's article is based mainly on some measurements taken of three alleged quagga skulls,<sup>1</sup> which proved to be very similar to equivalent measurements of mountain zebra skulls. We agree with Skinner that the Koffiefontein equid skulls (see ref. 1) would have been a valuable addition to the preserved material of the quagga had they proved to be of quaggas, but we disagree on other points. Meester *et al.*<sup>2</sup> indeed mentioned that the relationship between the quagga and Burchell's zebra is a problem, but we cannot find any mention of a close relationship between quagga and mountain zebra, as stated by Skinner.<sup>3</sup>

Skinner also discusses former distribution of the quagga. As in earlier publications by various authors, the observations of Captain Cornwallis Harris during his 1836–7 journey into the interior of southern Africa are mentioned in support of the view that quagga and Burchell's zebra were two distinct species. The article, in referring to Harris (1840), failed to take into account Groves'<sup>4</sup> interpretation of Harris's map, which indicates the route of the journey. Groves discovered that Harris had, in fact, not encountered groups of quaggas and Burchell's zebras co-existing in the same area, but rather had found the



Fig. 1. Ventral view of dry zebra hoofs. Top row, forelegs; bottom row, hind legs. Left to right, three plains zebras, casts of Mainz quagga stallion, Hartmann mountain zebra, and two Cape mountain zebras.

two forms 'some 200 miles apart'.

Skinner also discusses the coloration of the quagga and states that the 1820 painting of a quagga by Jacques-Laurent Agasse is said to be the closest resemblance to the colour pattern of the quagga in existence, and indicates a distinct difference from *E. burchelli*. This is simply not true! The stripe pattern of Agasse's quagga, as in other quagga paintings that are based on live quaggas, and indeed the stripe patterns of the preserved quagga skins, are in agreement with the underlying principle of the plains zebra stripe pattern, but in disagreement with that of the mountain zebra. The Agasse painting portrays an individual with broad stripes and narrow interspaces (never found in the corresponding body portions of the mountain zebra). There are other quagga individuals that, despite an even more advanced reduction of the striped area, have narrow stripes, coupled with broader interspaces. This degree of variation is found in other plains zebras as well.<sup>5</sup> The Agasse quagga is more brown than extant plains zebras. However, other illustrations portraying live quaggas and the preserved quagga skins demonstrate that the basic colour of quaggas was as variable as the striping.

Other external characters, such as the presence or lack of a dewlap, the so-called

grid-iron pattern, and the relative length of the ears, are ignored in the report. The quagga resembles other plains zebras in these characters but differs from the mountain zebra.

The name 'quagga' alone, which is based on the animal's call, points to the close relationship between the quagga and other plains zebra subspecies. All share the same call, which is different from the call of the mountain zebra.

How can these characteristics be ignored in favour of measurements of skulls, which may or may not be of quagga? Due to the indiscriminate use of the term quagga, the labelling of skulls as 'quagga' alone does not mean much. A skull labelled 'quagga' after it had been taken out of a stuffed quagga in Berlin during the last century, was later identified as that of a pony!

Previous authors, such as Azzaroli & Stanyon,<sup>6</sup> expressed the view that the hoofs of the quagga were more like those of the mountain zebra than the plains zebra. The appearance of equid hoofs can be very variable within a species, depending on the substrate on which the animals live and the resulting wear. As can be seen from Figs 1–4, there seems to be no justification for considering the quagga's hoofs as being more like those of the mountain zebra. The fact that the hoofs of some of

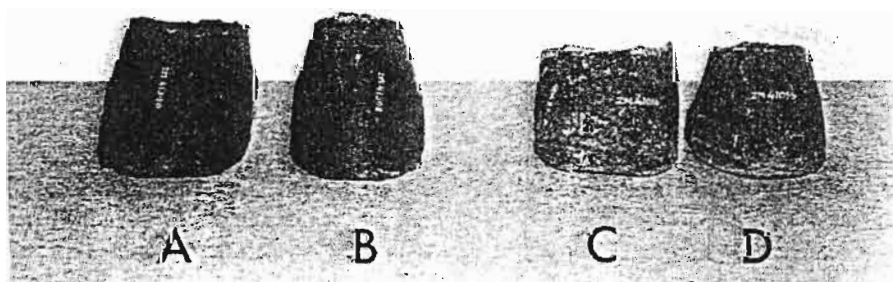


Fig. 2. Anterior views of dry hoofs of two plains zebras. A and C, foreleg; B and D, hind leg.