

BELL UNHINGES AN ENIGMA

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INTRODUCTION

Bell's Hinged tortoise, *Kinixys belliana*, remains as much of an enigma today as when first discovered by Thomas Bell over one hundred years ago (Adler, 1989). It belongs to the only genus of the Order Chelonia that has a hinge in the carapace, rather than in the plastron.

THOMAS BELL: NATURAL HISTORIAN OF UNIQUE QUALITIES

Bell, born on 11th October 1792 at Poole, Dorset, entered medical college at Guy's and St. Thomas's hospitals, London, in 1813, and The Royal College of Surgeons of England in 1815. He followed a distinguished career, practising dental surgery at Guy's Hospital between 1817 and 1861, and concurrently holding the Chair of Zoology at King's College, London, beginning in 1836. It is in the field of herpetology that Bell is most remembered by zoologists, producing a "Monograph of the Testudinata", a magnificent work in which he described many of the species of the Order Testudinata. (This Order has since been renamed the Chelonia). This work, never completed because of the bankruptcy of the publishing company, contained 40 folio size, hand-coloured plates. One of the species he so described was *Kinixys belliana*.

BIOLOGY OF BELL'S HINGED TORTOISE

The taxonomy of *K. belliana* has been widely debated in recent years, but it is generally accepted that three subspecies exist, namely *K. b. nogueyi*, *K. b. zombensis* and *K. b. belliana* (Swingland and Klemens, 1989). These are distinguished from one another by differences in the pattern of the carapace and plastron, and differences in the outline of the marginal scutes.

K. belliana is found throughout the continent of Africa and in Madagascar. The sub-species *nogueyi* ranges from Senegal to northern Cameroon, where it meets the sub-species *belliana*, which extends through north-eastern Zaire to western Kenya, Ethiopia and north-western Somalia. The subspecies *zombensis* is found along the East African coastal plain from Tanzania to Zululand, and has been introduced into north-western Madagascar (Swingland and Klemens, 1989) (Fig. 1).

Bell's Hinged Tortoise inhabits moist savanna woodland and thicket, becoming active with the onset of the rains and aestivating during the dry season. When conditions become dry, it takes shelter in animal burrows and holes in termitaria, and, interestingly, has also been observed to bury itself under soil at the base of trees. The animal feeds in the early morning and evening, avoiding the mid-day sun by taking cover under herbage.

Nesting and oviposition occur during the wet season. Clutches are small, typically numbering from one to three eggs, with a maximum of ten. The eggs hatch after about a year, producing hatchlings which measure some 40mm from one end of the carapace to the other.

K. belliana eats a wide range of vegetation and fruit, especially succulents and fungi. In addition, millipedes are voraciously taken, and snails of the genus *Achatina* are eaten after the shells have been broken. This species also scavenges on the corpses of amphibians and other small animals.

Of the various threats to its survival, perhaps the greatest are presented by man and the Ground Hornbill (*Bucorvus cafer*): man eats the tortoise throughout most of its range, and the Ground Hornbill is able to knock a hole through the thick bone of the carapace with its strong bill.

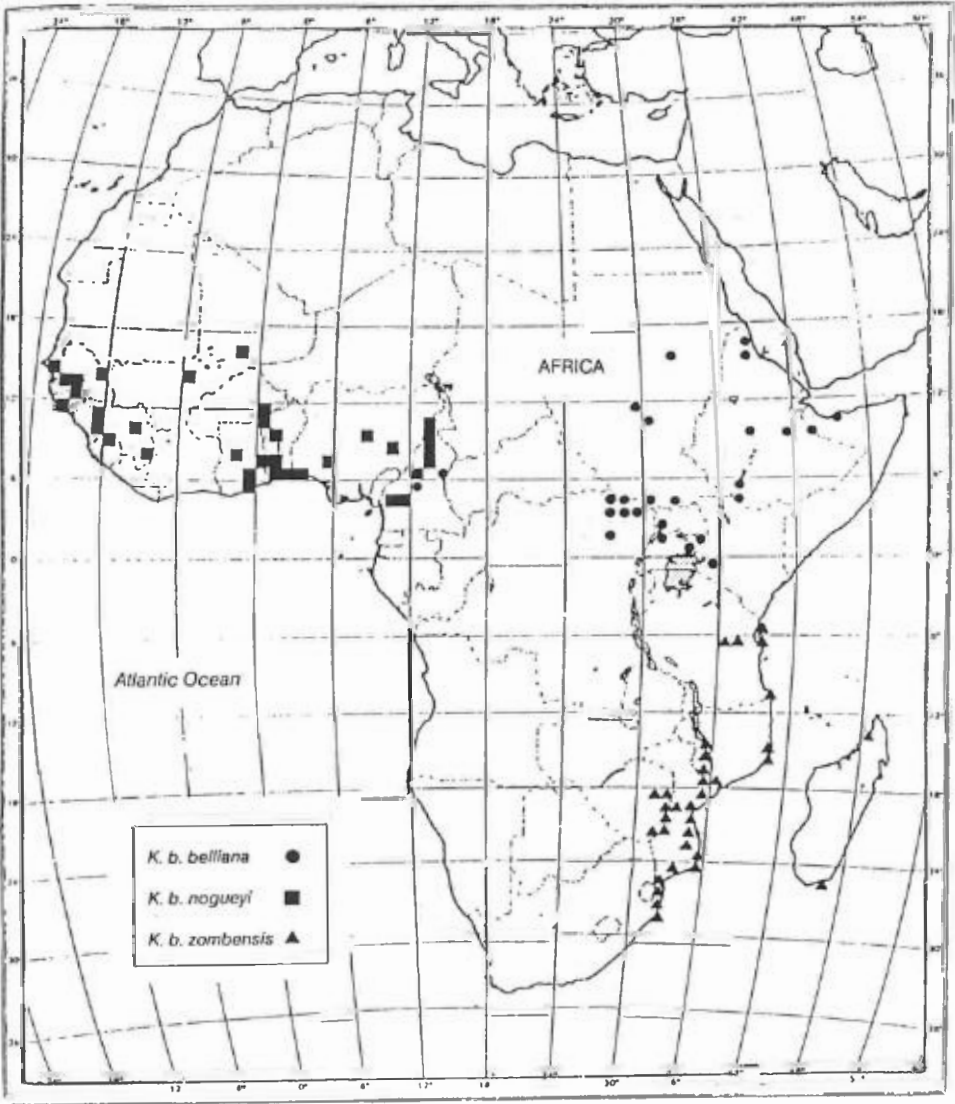


Fig. 1 Distribution of *K. belliana*

THE UNIQUE DORSAL HINGE

Perhaps the most interesting feature of Bell's Hinged Tortoise – unique to the genus *Kinixys* – is its dorsal hinge (Pritchard, 1979). Many other tortoises, terrapins and turtles have a hinge in the plastron, giving the caudal part of the plastron a degree of dorso-ventral mobility. Such mobility allows sufficient pelvic space for the oviposition of hard, calcified eggs, while retaining the ability to effect full “closure” of the shell – thought to have an important protective function if the tortoise is threatened by other animals.

The hinge of *K. belliana*, however, is located in the carapace. The name “hinge” is perhaps a misnomer when applied to this species, since it gives one the impression of a continuous joint extending from one side of the carapace to the other: the hinge in fact comprises two flexible inter-scutal joints (and their bony counterparts) on the lateral aspects of the carapace, interrupted dorsally by the more familiar unjointed pattern of scutes. The flexible nature of the dorsal scutes between the lateral joints would accommodate the slight movement that would have to occur in the upper part of the carapace when the lateral walls move up or down (Fig. 2).

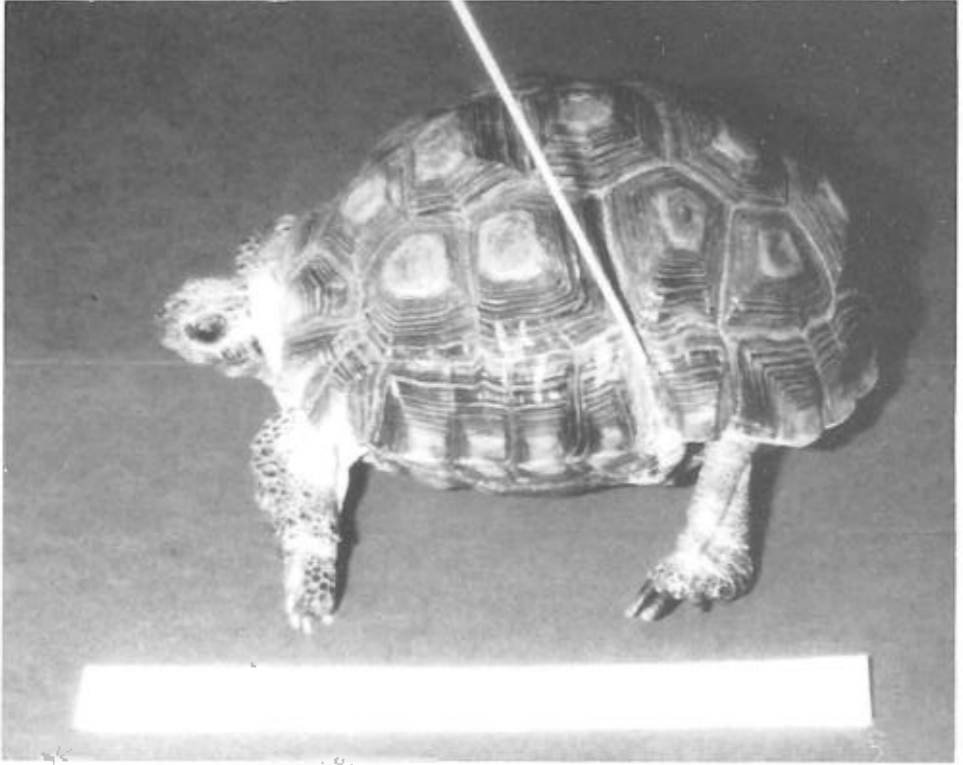


Plate 1. *K. belliana* showing the dorsal hinge

The hinge is situated between the fourth and fifth pleural bones, and the seventh and eighth peripheral bones; a position corresponding to the junction of the second and third costal scutes, and seventh and eighth marginal scutes. It allows the caudal part of the carapace to be lowered if the tortoise is threatened, affording protection to the hindfeet and perineal region, and is also thought to assist in ventilation and oviposition.

SOME VETERINARY ASPECTS OF *K. BELLIANA*

It is important for veterinary surgeons to be aware of the genus *Kinixys*, since it is increasingly likely to be presented for veterinary attention as its popularity grows. This is a consequence of the potentially free access of *Kinixys* spp. into this country, in contrast to the restrictions placed on the importation of the Mediterranean species by the EEC Regulation 3626/82, as amended (Cooper and Cooper, 1987). It is possible that the gap created by the restriction on importation of the latter species may be filled by an influx, and increase in popularity, of the former, a trend which has already been seen with North American Box Turtles (*Terrapene* spp.).

The unexpected presentation of a tortoise with a dorsal hinge may lead to erroneous diagnoses of shell fractures or dystrophies, underlying the importance of promoting awareness of this genus among veterinary surgeons. However, it is interesting to note that young specimens of *K. belliana* do not possess a hinge, but that it develops with age, beginning peripherally and extending dorsally between the scutes.

One of the most valuable ways of assessing the body condition of a Mediterranean tortoise (*Testudo* sp.) is to calculate the Jackson's ratio, a ratio of body mass (g): carapace length (mm), devised by the late Dr. Oliphant Jackson MRCVS (Jackson, 1980): "fit" examples fall between certain maximum and minimum values. *K. belliana* - like several other non-Mediterranean species - does not conform to this relationship, probably because its shell is disproportionately long in relation to its bodyweight.

In common with certain other genera, *Kinixys* does not hibernate, and should not therefore be confined to a dark enclosed space in the winter months.

CONCLUSIONS

K. belliana is an interesting species with several unusual features, especially its unique hinge. The present restrictions on the importation of Mediterranean species of tortoises, and the possible increase in popularity of *Kinixys*, underline the importance of promoting awareness of this genus among veterinarians and herpetologists alike.

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