

TAXONOMIC DIAGNOSTIC CHARACTERS OF TORTOISES (1): OBSERVATIONS ON THE TAXONOMIC SIGNIFICANCE OF THE DIVISION OF THE SUPRACAUDAL SCUTE IN *TESTUDO*

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INTRODUCTION

Reference is frequently made to taxonomic diagnosis within the genus *Testudo* on the basis of a divided or undivided supracaudal scute. One common misconception is that *Testudo hermanni* invariably possess a divided supracaudal whilst the supracaudal of *T. graeca* is always single. This view is unfortunately propagated by several popular works of reference likely to be consulted by field workers, e.g. "The Mediterranean spur-thighed tortoise (*Testudo graeca*) may appear superficially similar to Hermann's (*T. hermanni*), but in terms of its shell structure it does not have a divided supracaudal scute" (Alderton, 1988). See also p.22 fig. 1 (Devaux, 1988) and p. 403 (Pritchard, 1979). Earlier, Wermuth noted this character in relation to the diagnosis of *T. hermanni hermanni* GMELIN 1789 and his proposed *T. hermanni robertmertensi* WERMUTH 1952. It should be noted that under recent revision *T.h. robertmertensi* WERMUTH 1952 has been revised to *T. hermanni hermanni* GMELIN 1789 and Wermuth's *T. hermanni hermanni* GMELIN 1789 to *T. hermanni boettgeri* MOJSISOVICS 1889 (Bour, 1987).

The following observations by the present author cast serious doubt upon the value of this character to differentiate species, but indicate that it may be useful as an indicator of zoogeographic distribution and of local origin within species.

T. graeca LINNAEUS 1758

A divided supracaudal scute is rare but not entirely unknown within this species (terra typica Oran, Algeria). In one instance a clutch of eggs from a pair of Moroccan *T. graeca* was incubated and of the resultant young exactly half had a divided supracaudal, and half a single supracaudal. In another instance a different pair of Moroccan *T. graeca* (the male of which has been in captivity in the U.K. for 68 years at the time of writing) this year produced a clutch of 5 eggs of which two were fertile. Neither parent possessed a divided supracaudal but this character was present on both hatchlings.

T. ibera PALLAS 1814

Although not often seen, a divided supracaudal scute is sometimes encountered within this species which has a very extensive zoogeographic distribution (from the USSR, through Turkey and western Iran to Syria). It is found equally in males and females, particularly those from Turkey. Of a clutch of 4 *T. ibera* hatched by the author in 1988 3 juveniles had a single supracaudal and on the other it was divided. Neither parent possessed the character.

T. hermanni hermanni GMELIN 1789

The population of France, Corsica and Corfu appear to possess a divided supracaudal scute almost exclusively. Of 300 tortoises recently examined by the author in various locations in southern France every specimen had a clearly divided supracaudal. A similar situation appears to apply to the populations of Spain and the Balearic islands.

T. hermanni boettgeri MOJSISOVICS 1889

Of the population of Romania and Yugoslavia some localised populations appear to possess a divided supracaudal and others an undivided one. Each population seems to be restricted to a very localised distribution, and within that group the character may be almost exclusively either present or absent, or mixed. Petzold (1966) reported approximately 8-10% of individuals within some eastern Adriatic populations lacked the feature whilst the majority featured it. Windolf (1982) however reported finding only 1 example without the character in a survey



Plate 1. Eastern *T.h. boettgeri* with division of supracaudal

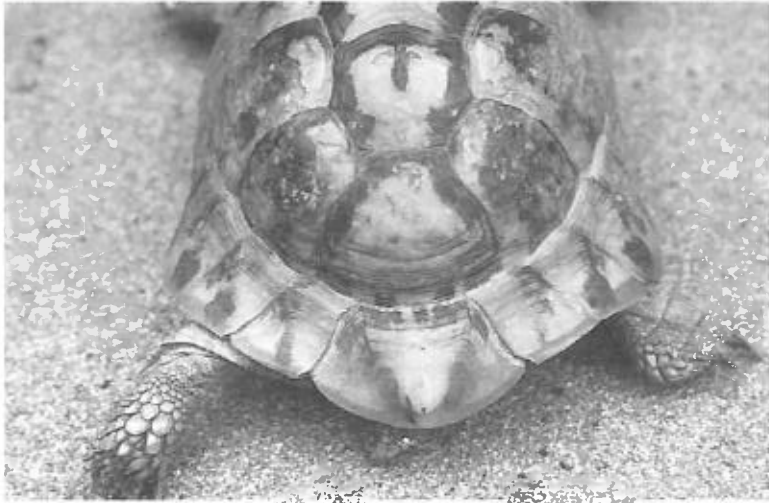


Plate 2. Eastern *T.h. boettgeri* without division of supracaudal

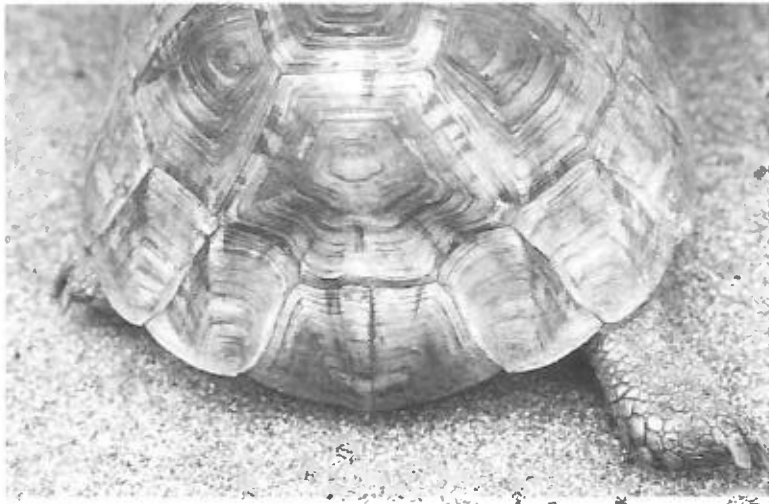


Plate 3. Algerian *T. whitei* BENNETT 1836 with divided supracaudal

of the same locality in a sample of 30 specimens examined. One of the largest specimens of *T. hermanni* ever recorded (264mm/3,420g and of eastern racial origins) also possessed this feature in addition to a perfect set of 4 claws both anteriorly and posteriorly (Highfield, 1988).

***T. whitei* BENNETT 1836**

This is the largest member of the north African *Testudo* (up to 280mm long and 4.366 Kg)

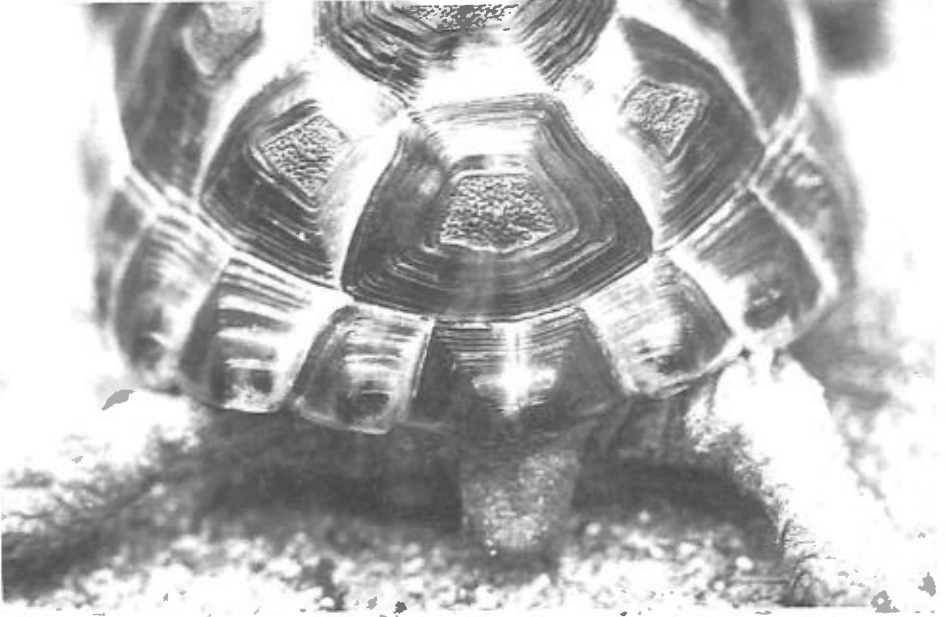


Plate 4. Juvenile *T. ibera* PALLAS 1814 with divided supracaudal

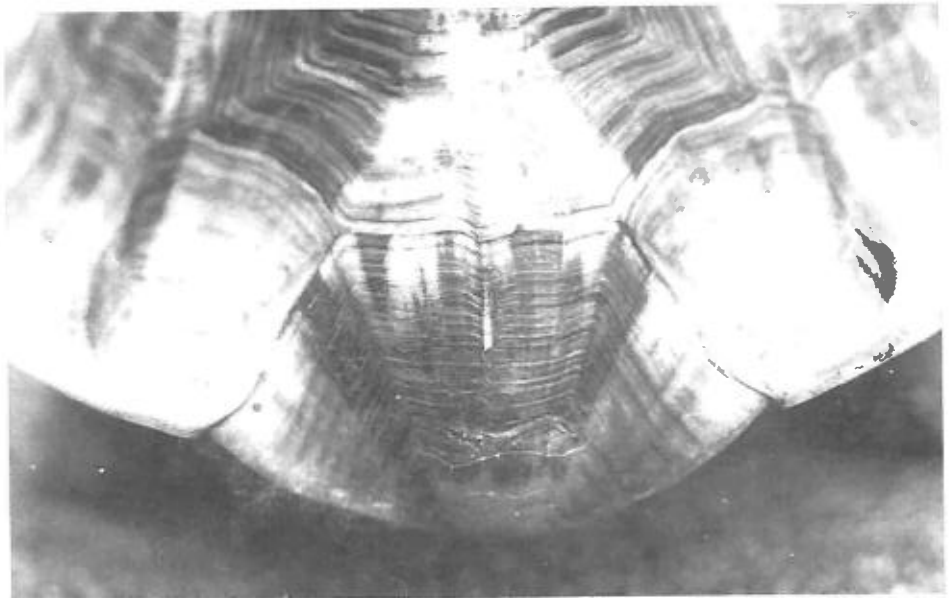


Plate 5. Adult Moroccan *T. graeca* L. 1758 with divided supracaudal

and a divided supracaudal is relatively commonplace although still only possessed by a minority of the population. This species' distribution is not wide, being centered upon Algiers (Highfield & Martin, 1989a). It does not appear to exist sympatrically with *T. graeca* L. 1758.

It has been suggested that the absence of a divided supracaudal in some specimens of *T. hermanni boettgeri* MOJSISOVICS 1889 may indicate hybridisation with *T. ibera* PALLAS 1814. This appears extremely unlikely in the complete absence of any other characters indicating hybridisation and also considering that entire localised populations of individuals without the character can be located. It is much more likely that this is an inherited genetic character independent of species which may become either suppressed or dominant within particular populations. The author's experiments with captive breeding appear to support this hypothesis, particularly the result where offspring with the character were produced from parents without it clearly indicating transmission in such instances by recessive gene. To date, no evidence has emerged of an instance where both parents with the feature have produced young lacking it. Where one parent has the character and the other lacks it, there appears an approximately 50/50 chance of inheritance. Neo (1978) reports that heterozygous values tend to be higher in reptiles than in birds or mammals, however island populations are more generally homogenous (Frankel and Soule', 1981). Because of their highly specific biotypic requirements and generally isolated habitats with minimal transit of individuals between populations a high degree of genetic convergence is often found within groups. Where a greater exchange of individuals occurs, in more easily traversed and larger habitat areas, then a state of balanced polymorphism may occur between homozygous, dominant homozygous and recessive individuals (Croudace, 1989). This occurs due to the phenomena of "heterozygous advantage" described by Strickenberger (1968) where the heterozygous individual has greater reproductive fitness.

Readers of this 'Bulletin' with long memories may recall that the usefulness of the division or otherwise of the supracaudal scute as diagnostic evidence of speciation has been questioned before (Gardiner, 1978). The present author concurs entirely with the views expressed then, and also notes the similarity of breeding result obtained where a pair of *T. hermanni*, one with and one without a supracaudal division produced offspring with a division.

Those who are accustomed mainly to encountering tortoises in captivity, most of which will have originated from widely disparate locations in the wild, or as first generation captive bred specimens from such collections, often express the view that considerable random specialisation of characters exists, particularly in carapace pattern and colouring within a species. In fact this view is misleading and most in-situ localised populations display a remarkable similarity of characters between individuals. With practice, it becomes possible in many instances to identify tortoises taken from individual hillsides with considerable accuracy once the specific characters typical of that particular location are understood and recognised – much as occurs in an extreme example on Isla Isabela, Galapagos where each volcano's inhabitants have been accorded sub-specific status (despite the highly questionable validity of this practice in at least one instance, *Chelonoidis (Geochelone) elephantopus becki* ROTHSCILD 1901).

CONCLUSIONS

Divided supracaudal scutes are found not only within *T. hermanni* but also within the general 'spur-thighed' complex comprising *T. ibera*, *T. graeca* and *T. whitei* where the trait is recessive to a greater or lesser extent. No data exists for the level of incidence in *Testudo zarudnyi* NIKOLSKI 1896 (Highfield & Martin, 1989b). Division of the supracaudal has not been reported in *T. marginata* SCHOEPFF 1792. The division of the supracaudal is not universal within *T. hermanni* although it is dominant within western populations of *T.h. hermanni* GMELIN 1789. Many eastern examples of the sub-species *T.h. boettgeri* MOJSISOVICS 1889 lack the character however. This character should therefore not be used to differentiate between *T. hermanni* and other species.

The presence or absence of a divided supracaudal may however be extremely useful in identifying certain local populations of the same species or sub-species within a comparatively restricted geographical area, and possibly in some limited instances in distinguishing sub-species from one another. In order to preserve the individual locality-identity of wild populations and thus the genetic diversity of a taxon as a whole care must always be exercised in conservation

captive breeding programs where re-introductions occur, even to the preservation of specific character traits at infrasubspecific rank.

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