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Record-Sized Tortoises, *Testudo graeca ibera* and *Testudo hermanni boettgeri*, from Bulgaria

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There is disagreement within the literature as to the maximum sizes reached by the Palearctic tortoises *Testudo graeca* and *Testudo hermanni*. Table 1 lists various published upper limits or records of carapace length (CL) of *T. graeca*. The taxonomy of the *T. graeca* complex remaining controversial, I have tried to cite sources which refer to Eurasian rather than North African tortoises, most of which would today be classified as *T. g. ibera*, the subspecies recognized as inhabiting Bulgaria. In earlier literature, this tortoise was often classified as *Testudo ibera*. Table 2 provides corresponding figures for maximum CL of *T. hermanni boettgeri*. Following each record is its geographic origin and literature citation for the largest reported specimen, if known.

In addition to the figures cited in Table 1, the following writers have indicated 300 mm as the maximum CL achieved by *T. graeca*: Wermuth and Mertens, 1961; Obst and Meusel, 1965; Bannikov and Drozdov, 1969; Fuhn, 1969; Bannikov et al., 1971; Grzimek, 1971; Hrabe et al., 1973; Basoglu and Baran, 1977. A difficulty in interpreting any of the records which lack supporting geographic data is that of knowing to which of the widely recognized regional subspecies the record refers. Even when a locality is provided, it is not clear whether in all cases there exists an actual specimen corresponding to the given maximum dimension. Stubbs (1989a) provided no maximum CL nor size range for *T. graeca* as a species, nor for any of the six subspecies for which he provided descriptive accounts.

The records in Table 2 refer only to the eastern or Balkan subspecies of *T. hermanni* presently recognized as *T. h. boettgeri* (Bour, 1987). Since the description of the western Mediterranean race (*T. h. hermanni*, described initially *as T. h. robertmertensi* Wermuth, 1952), most writers have concurred that it is of smaller adult size than the more widely distributed eastern race (see Guyot and Devaux, 1997). Aside from this, there are certain inherent problems with these data: 1) both the preponderance of round figures and near absence of locality data underscore the lack of precise record-keeping with regard to this otherwise very well known and exploited species, and 2) until the nomenclatural insights of Siebenrock (1913) and Flower (1925), the binomial *Testudo graeca* was widely used to refer to the species now universally recognized as *Testudo hermanni*. Consequently, in some museums confusion persists due to some specimens of *T. hermanni* still bearing tags identifying them as *T. graeca*, further confounding the contemporary researcher, especially if the accompanying locality data refer to an area of sympatry between the species. A case in point is discussed below.

The largest preserved *T. graeca ibera* in the collection of the National Natural History Museum in Sofia (NNHM) is a dry-mounted specimen (111-58/18) (Fig. 1). The original label bearing locality data and date of collection has been lost, but taxidermic evidence indicates that the specimen was prepared in the NNHM and is almost certainly of Bulgarian origin. Its maximum straight CL is 364 mm, measured from the first to the eleventh marginal. Other significant dimensions are as follows: midline straight CL (nuchal to mid-supracaudal), 335 mm; midline curved CL, 430 mm; carapace width (CW) at third vertebral, 227 mm; maximum CW at ninth marginals, 273 mm; and maximum carapace depth (CD), 163 mm.

Table 1. Maximum carapace length (CL, in mm) recorded for Eurasian *Testudo graeca*.

CL	Locality	Citation
ca. 389	Bulgaria	Present study
364	Bulgaria	Present study
350	Not given	Nikol'skii, 1915
305	Romania	Boulenger, 1902
> 300	Not given	Bour, 1984
≥ 300	Not given	Engelmann et al., 1986
290	USSR	Bannikov et al., 1977
285	Bulgaria	Beshkov, 1984
280	USSR	Terent'ev, 1961
280	Georgia	Ckhikvadze, V.M., *pers. comm.*
278	USSR	Terent'ev and Chernov, 1949
270	Not given	Capula, 1989
270	Romania	Fuhn and Vancea, 1961
260	Georgia	Muskhelishvili, 1970
257	Syria	Siebenrock, 1913
252	Turkey	Eiselt and Spitzenberger, 1966
≥ 250	Not given	Arnold and Burton, 1985
230	Black Sea coast	Inozemtsev and Pereshkolnik, 1994

Table 2. Maximum carapace length (CL, in mm) recorded for *Testudo hermanni boettgeri*.

CL	Locality	Citation
ca. 357	Bulgaria	Present study
346	Bulgaria	Beshkov, 1984
314	Bulgaria	Present study
300	Not given	Obst and Meusel, 1965
300	Not given	Engelmann et al., 1986
280	Not given	Bour, 1984
264	Albania	Haxhiu, 1985
260	Not given	Capula, 1989
250	Not given	Schreiber, 1912
250	Not given	Radovanovic, 1951
250	Not given	Frommhold, 1959
250	Not given	Bannikov and Drozdov, 1969
250	Not given	Hrabe et al., 1973
240	Romania	Fuhn and Vancea, 1961
≤ 230	Balkan Peninsula	Stubbs, 1989b
≥ 200	Not given	Arnold and Burton, 1985
200	Not given	Grzimek, 1971
≤ 200	Not given	Wermuth and Mertens, 1961
≤ 200	Not given	Basoglu and Baran, 1977
≤ 200	Not given	Obst et al., 1984

Map. Bulgarian localities mentioned in the text. 1 = Maleshevska Planina, 2 = Kotel, 3 = Gorno Urutzi, 4 = Sakar Mountains, 5 = Golyam Dervent.

Of note is the remarkably protruding and downward-curving supracaudal scute of this specimen. Another very large dry-mounted *T. g. ibera* exists in the NNHM (111-50/21; Fig. 2), collected by Ivan Buresch on 10 July 1933 in the Sakar Mountains of southeastern Bulgaria (see map). Like the preceding specimen, it bears well-developed thigh tubercles and has no caudal spur. Its dimensions are as follows: maximum straight CL, 303 mm; midline straight CL, 298 mm; midline curved CL, 359 mm; maximum CW at ninth marginals, 233 mm; and maximum CD, 141 mm.

In addition to these preserved specimens, an even larger living male *T. g. ibera* has been examined by the author. On 19 June 1987, forestry workers in the vicinity of Gorno Urutzi village, Krumovgrad District, in the eastern Rhodopes near the Greek frontier, southern Bulgaria (see map), found an exceptionally large tortoise. The habitat was predominantly young oak forest on siliceous substrate. The tortoise was brought to Sofia and exhibited on Bulgarian television and in other media to publicize chelonian conservation. It was maintained for two months and then released at the exact site of capture. While the maximum CL was not recorded, I documented the following dimensions: midline straight CL, 358 mm; CW at third vertebral, 272 mm; maximum CW between third and fourth vertebrals, 290 mm; and maximum CD, 171 mm.

The midline CL of this specimen (358 mm) exceeds by 23 mm the previously largest known specimen discussed above (335 mm). If the maximum length from the first to eleventh marginals was similarly proportioned, this larger specimen probably had a maximum CL of nearly 389 mm. Its weight following a week-long fast was 5860 g, which increased to about 7000 g after feeding copiously on succulent fruits. I believe that this is the largest known specimen of *T. g. ibera* and that its weight also exceeds that of any known conspecific. The greatest weight reported for a living non-captive *T. g. ibera* is 3629 g for a Romanian specimen (Boulenger, 1902).

Giant specimens of *T. hermanni boettgeri* are also known from Bulgaria. Buresch and Zonkow (1933) recorded (as "*Testudo ibera*") an exceptional specimen now dry-mounted as NNHM 111-49/15 (Fig. 3). When alive, this specimen weighed 6500 g. The tortoise was collected in 1915 by a school teacher, Vasil Georgiev, north of the town of Kotel in limestone terrain at a site called Urushkite Steni, at an elevation of 1050 m (see map). I measured its dimensions as: maximum straight CL, 314 mm; midline straight CL, 304 mm; curved CL, 363 mm; CW at third vertebral, 232 mm; maximum CW between fourth and fifth vertebrals, 251 mm; and maximum CD, 138 mm.

While this tortoise is the largest known specimen of *T. hermanni* in any museum collection, I found and measured

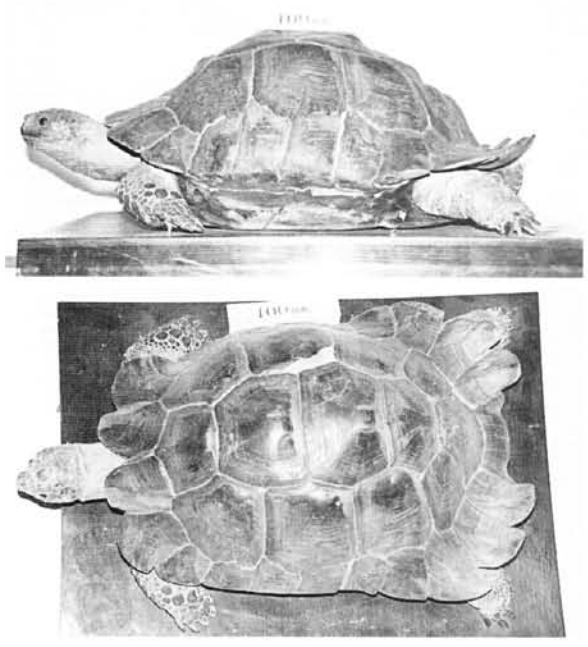

Figure 1. *Testudo graeca ibera* (NNHM 111-58/18) from Bulgaria, with maximum straight CL of 364 mm.

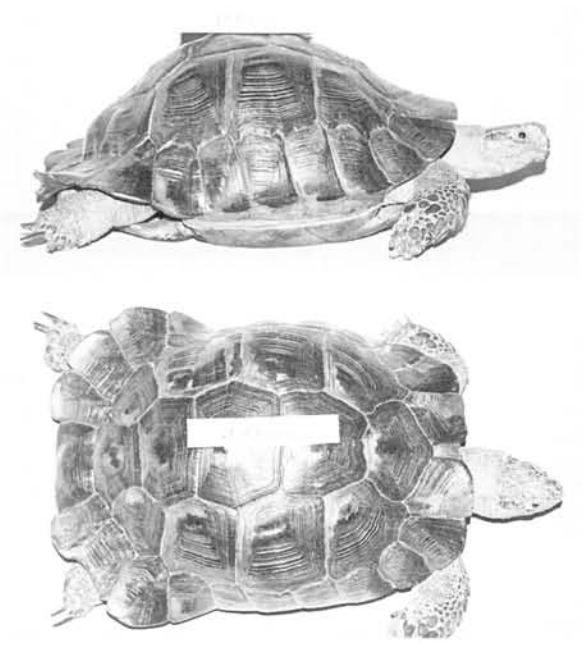

Figure 2. *Testudo graeca ibera* (NNHM 111-50/21) from Sakar Mountains, Bulgaria, with maximum straight CL of 303 mm.

an even larger live *T. h. boettgeri* on 5 July 1973 in the Malashevska Planina in southwestern Bulgaria at an elevation of over 1000 m (see map). I did not have a camera with me and was unable to transport the huge female tortoise, which I released after having measured its midline straight CL as 346 mm. I reported this find rather casually (Beshkov, 1984) and in the subsequent translation of this work (Beshkov, 1993) the correctly rendered dimension was editorially questioned as possibly erroneously representing *T. graeca*. Both species occur in the Malashevska Planina, though rarely at such an altitude.

The midline CL of this specimen (346 mm) exceeds by 42 mm the other large specimen discussed above (304 mm). If the maximum length from the first to eleventh marginals was similarly proportioned, this larger specimen probably had a maximum CL of about 357 mm.

The earliest literature record of an exceptionally large Bulgarian tortoise (Shkorpil, 1897) leaves its identity in question. Near the village of Golyam Dervent, Elhovo County, near the Turkish frontier (see map), Shkorpil observed a tortoise with the following approximate dimensions: CL, 370 mm; CW, 240 mm; and CD, 170 mm. He used "*Testudo graeca*" in reference to all Bulgarian tortoises, believing this was the only species inhabiting the country. Like his contemporaries elsewhere, he did not mention *T. hermanni*. Kovachev (1912) accepted this specimen as a *T. graeca*, but from the relevant passage of his book it is clear that he used this designation for all tortoises possessing a terminal caudal spur and undivided supracaudal scute. Buresch and Zonkow (1933), however, considered the tortoise to be a *T. hermanni*. Unfortunately, no figure, detailed description, or any portion of the specimen itself remain. Both species of tortoises occur in the vicinity of Golyam Dervent.

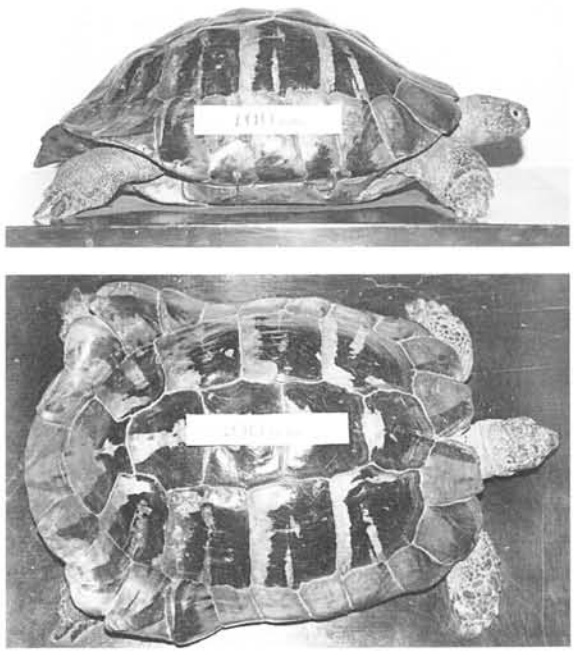

Figure 3. *Testudo hermanni boettgeri* (NNHM 111-49/15) from Kotel, Bulgaria, with maximum straight CL of 314 mm.

It is worth noting that while the three largest known specimens of *T. g. ibera* from Bulgaria have all appeared to be males, the oldest (and therefore, probably the largest) females of *T. g. graeca* found in southwestern Spain are noteworthy in having strongly downcurved supracaudal scutes, thus being easily misidentified as males (Sanchez et al., 1986). As the dry-mounted Bulgarian specimens are firmly anchored to pieces of wood, the plastrons cannot easily be examined, and the viscera have been discarded. The largest preserved *T. hermanni* (NNHM 111-49/15) appears to have been a male while the larger unphotographed specimen I found in the Malashevska Planina appeared to be a female. Guyot and Devaux (1997) have shown that geographic variation occurs in sexual dimorphism of *T. hermanni*, with females significantly larger than males in western populations (Spain, France, and Corsica), and males slightly, but not significantly, larger than females in eastern populations (Greece).

The confirmation of gigantic specimens of both *Testudo* species in Bulgaria supports the declaration of Schreiber (1912) that the Balkan Peninsula is where the largest specimens of each occur.

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Reproductive Biology and Demography of Gopher Tortoises (*Gopherus polyphemus*) from the Western Portion of their Range

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The gopher tortoise (*Gopherus polyphemus*) was once widespread and abundant in the southeastern USA. However, recent data indicate that the species is being extirpated rapidly, mainly due to habitat destruction, human predation, and lack of recruitment (Auffenberg and Franz, 1982; Diemer, 1986; Diemer et al., 1989; Ernst et al., 1994; Diemer and Moore, 1994). Populations in the western portion of the range (Alabama, Mississippi, and Louisiana) have declined to the point where they have been listed as Threatened under the Endangered Species Act (U.S. Fish and Wildlife Service, 1990). However, most ecological data on *G. polyphemus* are based on populations from Florida and Georgia (e.g., McRae et al., 1981a,b; Auffenberg and Franz, 1982; Landers et al, 1982; Diemer et al., 1989; Smith, 1995). Field data from the western populations are almost completely absent, with the exception of two unpublished reports from Mississippi (Tuma, 1996) and Alabama (Marshall, 1987).

The need for more complete data from the western portion of the range is heightened by the apparent differences in habitat utilization between eastern and western populations. In Georgia and Florida, tortoise habitat largely consists of coastal dunes or xeric uplands, i.e., mainly sandy, well-drained soils dominated by wiregrass (*Aristida stricta*) and longleaf pine-turkey oak (*Quercus laevis*) or scrub communities (Landers et al., 1980; Diemer, 1986). Conversely, most tortoise habitat in Mississippi and Louisiana consists of soils with a low sand content and a more substantial clay component, and plant communities also differ from eastern populations (Wahlenberg, 1946). In Mississippi and Louisiana, there is virtually no upland wiregrass, and the predominant trees are typically loblolly pine (*Pinus taeda*) and slash pine (*P. elliotii*) planted for commercial pine production in place of the original longleaf pine (*P. palustris*) (Wahlenberg, 1946; Ware et al., 1993).

Increasing destruction and loss of habitat in response to human population growth is resulting in rapid declines of tortoise populations in Florida (Diemer, 1986). In addition, increased mortality of tortoises throughout the range due to the recently identified Upper Respiratory Tract Disease