

## Long term observations on the alimentation of wild Eastern Greek Tortoises *Testudo graeca iberica* (Reptilia: Testudines: Testudinidae) in Dobrogea, Romania

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**Abstract.** The wild diet of *Testudo graeca iberica* in Dobrogea, Romania is investigated by direct observation. A clear predominance (over 95%) of plant matter is noticed, with 25 plant species consumed. Moreover the ingestion of animal matter (carrion) as well as calcareous earth was observed.

**Keywords.** *Testudo graeca*, alimentation, long term observations

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The Spur-thighed Tortoise, *Testudo graeca*, including its eastern subspecies, *T. g. iberica*, is well known as a terrarium companion and also as a protected species. Thus, numerous recommendation for the captive diet of *T. graeca* are available, and also data showing it as a generalist vegetarian that also takes occasional small quantities of animal food, i.e. invertebrates and carrion (Buskirk et al., 2001). There are, however, few data about the feeding habits of the wild *T. graeca iberica* populations in the Balkans and Romania (beyond general data such as those of, e.g., Fuhn and Vancea, 1961). There is greater knowledge on the populations in Spain (e.g. Cobo and Andreu, 1988; Andreu et al., 2000; Díaz-Paniagua and Andreu, 2009), the Caucasus (Bannikov et al., 1977) or North Africa (El Mouden et al., 2006; Rouag et al., 2008). The similar species *T. hermanni* is also better known, especially as regards the Western populations (e.g. Nougarede, 1998; Soler et al., 2007; Mazzotti et al., 2007; Muñoz et al., 2009; Budó et al., 2009). Greater knowledge on the type of food consumed is an additive value for the conservation policies concerning this vulnerable species. This knowledge allows to adjust the care of captive bred populations to the natural condition of the species (cf. Willemsen et al., 2002) and to manage wild populations.

The natural diet of *Testudo* spp. can be investigated into by two methods: direct observation (e.g. Lagarde et al., 2003) and/or the analysis of faecal matter (e.g. Cobo and Andreu, 1988; El Mouden et al., 2006, Díaz-Paniagua and Andreu, 2009; Munoz et

al., 2009). We have chosen the first method. More than 500 specimens of *T. graeca* were observed in the wild, from March to October, in Dobrogea (Romania), over a period of 10 years (2000-2010). Most of these were observed in a forest-steppe biotope, composed of open, mainly oak and hornbeam forest, with an understory of dogwood (*Cornus*), hawthorn (*Crataegus*) dog rose (*Rosa*) etc., and steppe patches dominated by *Stipa*. When the tortoises were observed feeding, notes and pictures what they consumed were taken, allowing, in most cases, identification of the food articles.

The alimentation appears to be predominantly vegetarian; 96,5% of the cases in which *T. graeca* was observed feeding involved vegetal matter. The 25 plant species observed to be consumed are presented in Table 1.

We noticed a predilection for the ingestion of young leaves, especially those of *Ficaria*, *Taraxacum*, *Lotus*, *Trifolium*, *Medicago*, *Fragaria*, *Polygonum*, Poaceae, *Sonchus*, *Teucrium*,

**Table 1.** Plants consumed by *T. graeca*, with note of the ingested part.

Class	Order	Family	Species	Consumed part	Frequency of consumption
Magnoliopsida	Ranunculales	Ranunculaceae	<i>Ranunculus ficaria</i>	Leaves, flowers	Low (1-5 %)
	Asterales	Asteraceae	<i>Taraxacum officinale</i>	Leaves, flowers	Moderate (5-10%)
			<i>Sonchus</i> sp.	Leaves	Low (1-5 %)
			<i>Crepis</i> sp.	Leaves	Low (1-5 %)
			<i>Artemisia</i> sp. ( <i>A. pontica</i> ?)	Leaves	Low (1-5 %)
			<i>Lotus corniculatus</i>	Leaves	High (>10%)
	Fabales	Fabaceae	<i>Trifolium</i> sp.	Leaves, flowers	High (>10%)
			<i>Medicago</i> sp.	Leaves	Moderate (5-10%)
	Vitales	Vitaceae	<i>Vitis vinifera</i>	Leaves	Low (1-5 %)
	Rosales	Rosaceae	<i>Fragaria</i> sp.	Leaves	Moderate (5-10%)
			<i>Rosa</i> sp.	Leaves	Low (1-5 %)
			<i>Pyrus</i> sp.	Fruit	Low (1-5 %)
			<i>Prunus</i> sp.	Fruit	Low (1-5 %)
			<i>Teucrium polium</i>	Leaves	Moderate (5-10%)
	Gentianales	Rubiaceae	<i>Galium</i> sp.	Leaves	Low (1-5 %)
	Caryophyllales	Amaranthaceae	<i>Atriplex</i> sp.	Leaves	Low (1-5 %)
			<i>Amaranthus</i> sp.	Leaves	Low (1-5 %)
<i>Polygonum</i> sp.			Leaves	Low (1-5 %)	
<i>Cornus mas</i>			Fruit	Low (1-5 %)	
Cornales	Cornaceae	<i>Cornus mas</i>	Fruit	Low (1-5 %)	
Liliopsida	Poales	Poaceae	<i>Festuca arundinacea</i> , F. sp.	Leaves	Low (1-5 %)
			<i>Poa</i> sp.	Leaves	Moderate (5-10%)
			<i>Dactylis glomerata</i>	Leaves	Low (1-5 %)
			<i>Dichanthium</i> sp.	Leaves	Low (1-5 %)
			.	Leaves	Moderate (5-10%)

and less commonly those of *Artemisia*, *Rosa*, Rubiaceae, Chenopodiaceae; very young plants of Lamiaceae and Apiaceae were also consumed. Fruit consumption is sporadic: *Cornus mas*, *Pyrus* sp. (Fig. 1), *Prunus* sp. Flowers/inflorescences (*Taraxacum*, Fabaceae, Ranunculaceae) are generally ingested together with leaves of the same plant.

As compared to the diet observed for *T. graeca* in other regions, we can notice that plants pertaining to the families Asteraceae, Fabaceae and Poaceae are frequently consumed, which is in accord with the data of Bannikov et al. (1977), Cobo and Andreu (1988), El Mouden et al. (2006) and Díaz-Paniagua and Andreu (2009). Even at the genus level, we can notice that *Lotus* and *Medicago*, staples in the alimentation of Spanish *T. graeca* (Díaz-Paniagua and Andreu, 2009) are also frequently consumed by Romanian specimens. The recurrence of these plant families as the favourite food of *T. graeca* – despite the quite different environment in which the observations took place, especially from the Iberian and North African data – supports the idea that this species is selective as regards the plant species it consumes (cf. El Mouden et al., 2006). Lamiaceae and Rosaceae are also consumed with moderate frequency, whereas plants pertaining to other families are less commonly taken.

*T. graeca* and other chelonians may ingest toxic plants species as anti-helminthics, (see the discussion in El Mouden et al., 2006). On the basis of our observations, among the plants ingested, only *Artemisia* cf. *pontica* (the Roman Wormwood, containing thujone



**Fig. 1.** *T. graeca* consuming *Pyrus* fruit (wild pear). Greci, Tulcea county, Romania. Photo by Oana Iftime.



**Fig. 2.** *T. graeca* trying to eat from dead wild cat. Cheia, Constanța county, Romania. Photo by Alexandru Iftime.



**Fig. 3.** *T. graeca* having consumed friable limestone, with limestone dust around snout, Urluia, Constanța county, Romania. Photo by Alexandru Iftime.

and sometimes used by herbalists as a vermifuge – hence its name – despite its toxicity to man in large doses) could fit into the category of anti-helminthics (Table 1).

Occasional intake of animal food, i.e. carrion, was also noticed. Specimens were observed feeding on a dead wild cat (Fig. 2), as well as on remains of dead birds, bovines and ovines, leftovers from the prey of jackals and/or feral dogs. Overall, the carrion (and generally animal food) intake seems far less marked than in other studies (e.g. Andreu et al., 2000), but we cannot exclude that this could be due to a method bias since through direct observation it is more difficult to find animals feeding upon carrion.

Geophagy in *T. graeca* is mentioned by Fuhn (1969); Török (2001) records the ingestion of kaolin (china clay). We have also noticed the ingestion of earth, especially clays containing limestone, or even degraded, friable limestone rock (Fig. 3). This behaviour was mostly noticed in juveniles and sub-adults and should probably be connected to their special mineral needs (mostly calcium) – cf. Liesegang et al. (2007). Ingestion of non-calcareous pebbles (cf. Gagno and Alotto, 2010) was not observed by us. Coprophagy, which is mentioned by Fuhn and Vancea (1961), was not observed by us.

Our data allows the conclusion that *T. graeca* is, as previously known, mainly a herbivore, quite selective in its choice of plant food, but it supplements its vegetal diet with animal protein and mineral intake, in minimal but probably necessary quantities.

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