

THE GRASSLANDS AND SHRUBLANDS FROM THE CORCOVA HILLS, MEHEDINTI COUNTY, ROMANIA: OPTIMAL HABITATS FOR THE TESTUDO HERMANNI SPECIES

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ABSTRACT

The studies were conducted in the hills located within the Corcova commune, an area with a significant *Testudo hermanni* population. The climate, with subtle sub-Mediterranean influences, along with a food source comprising wild shrub fruits and other vegetative organs, provided favourable conditions for the reproduction and survival of this species.

The meadows in this region are predominantly characterized by plant associations such as *Festuco-Brometea* and *Danthonio-Brachypodion*. In some areas, the meadows are invaded by shrubs like *Prunus spinosa* and species from the *Crataegus*, *Rosa* and *Rubus* genera.

One advantage for this species is the sandy substrate in the higher hills, which facilitates egg laying. As a result, approximately 100 young turtles begin their lives in this area each year.

Recent climate changes, marked by very dry summers and autumns, the negative influence of zoo anthropogenic factors in the area, etc. have determined the degradation of habitats. This resulted in the movement of turtles to other regions, including household areas and the Motru river meadow. Currently, the future distribution area of the *Testudo hermanni* species is uncertain, but it is expected that a reduction in the number of individuals in the population will be reached.

Key words: *Testudo hermanni*, habitat, vegetation, Corcova

INTRODUCTION

Testudo hermanni is a Palearctic, polytypical species found in the Mediterranean and Sub-mediterranean regions of Europe; it is widespread in the Balkan Peninsula, the Italian Peninsula, the Spanish and French Mediterranean coasts, as well as in the islands of Sicily, Corsica, Sardinia and Balearic Islands (Cheylan, 2001). The taxonomy of the species is controversial; two subspecies are distinguished: *Testudo h. hermanni* Gmelin, 1789 (Western Hermann's Tortoise) in Western Europe and *T. h. boettgeri* in Eastern Europe (Fritz et al., 2006; Fritz & Havas, 2007). The subspecies *Testudo h. boettgeri* Mojsisovics 1889 (Eastern Hermann's Tortoise) (Cheylan, 2001, Fritz & Havas, 2007) is found in Romania and is representative of its south-western area. A

small population is also located in the south-east of the country, in Dobrogea (Iftime, 2002; Sos et al., 2008, etc.).

Many works approach the distribution of this species in the south-west of the country (Fuhn & Vancea 1961; Covaciu-Marcov et al. 2005, 2009a; Iftime 2005a, Iftime et al, 2008, Iftime & Iftime, 2016; Rozyłowicz, 2008, etc.) etc. Data related to the biology and ecology of the species (biometric characteristics, feeding, reproduction, structure, and population dynamics, etc.) also come from other works (Cruce & Șerban 1971; Cruce & Răducan 1975a, b, 1976, Cruce 1978; Rozyłowicz & Pătroescu, 2004; Rozyłowicz, 2008 etc.); and the list doesn't stop there.

Testudo hermanni boettgeri lives in various habitats; it prefers the mosaic type: open areas (grass meadows,

pastures, meadows) near forested areas (forests, bushes, tree plantations, etc.), ecotone areas (forest-meadows), vineyards, orchards, arable land, non-productive land, etc (Rozyłowicz & al., 2003; Rozyłowicz 2008; Rozyłowicz & Dobre, 2010; Rozyłowicz & Popescu, 2013, etc.).

Deterioration or loss of habitats through irrational deforestation and deforestation, forest fires, fragmentation of natural habitats, replacement of habitat forest species with other species unfit for turtle feeding and shelter, expansion of agricultural areas, uncontrolled grazing, use of pesticides on wintered land, illegal collections, irresponsible tourism, viral infections that cause mortality among populations, consumption of eggs and juveniles by predators: crows, dogs, foxes, wild boars, etc., are some of the causes that have led to numerical changes in the population of this species and depopulation in some areas, which previously had a high density of tortoises (Iftime, 2005b, 2010; Rozyłowicz & al., 2003, Rozyłowicz, 2008, Rozyłowicz & Dobre, 2010). Climate change, extreme temperatures, prolonged drought are also indirect threats to the tortoise population (Rozyłowicz & Dobre, 2010).

The tortoises are sensitive to high temperatures. In hot weather, the tortoises take refuge among bushes, thistles or bury themselves in the soil to defend themselves (Rozyłowicz, 2008; Rozyłowicz & Dobre, 2010).

Testudo hermanni is protected at European and national level by various conventions, directives and laws. It is listed in Annex II and IV of the Habitats Directive, Annex II of the Bern Convention, Annex 3 and 4 A of Emergency Ordinance 57/2007, etc. It is protected in many Natura 2000 sites. In Romania it has the status of endangered species (Iftime, 2005).

On the IUCN Red list it has almost threatened species status (<https://www.iucnredlist.org/es/species/21648/176604335>)

The study area is given by the Corcova commune (figure1), located in the north-east of the Mehedinți county, on the Motru valley, in the confluence area of the Cosustea River with the Motru River. It is in the eastern area of the Coșuștei Piedmont, having a predominantly hilly relief (Ghinea, 1992). The hills have a low altitude with an average of about 280-300 m, with a maximum elevation about 360 m.

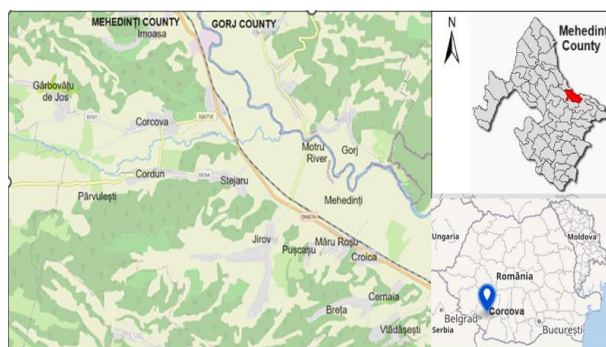


Figure 1. Study area: Corcova commune: (<https://orasultau.ro/harta/corcova-o>); its location in Mehedinți county and Romania ([https://ro.wikipedia.org/wiki/Comuna_Corcova,_Mehedin %C8%9Bi](https://ro.wikipedia.org/wiki/Comuna_Corcova,_Mehedin%C8%9Bi)) (processed map)

The climate is moderately temperate continental with sub-Mediterranean influences, characterized by sunny and warm summers, and milder winters with invasions of humid and warm air masses of Mediterranean and oceanic origin (Cucu & Popova-Cucu, 1980). The annual number of precipitations varies in the region, ranging from 550 to 800 mm (Cucu & Popova-Cucu, 1980). The Coșuștea river, the main water stream, tributary of the Motru river, flows on the territory of the commune. The groundwater appears in the form of springs arranged as public fountains. The soil has a diverse lithological structure and rich minerality; it is the result of the interaction of few pedogenetic factors (rock, climate, relief, vegetation and fauna, groundwater, time, and anthropogenic activity) (<https://www.comunacorcova.ro/geografia/>).

The presence of sandy soil on the hills is a favourable habitat for laying eggs (figure 2). Cruce & Răducan (1976) mention the presence in sandy, loose, and sunny biotopes of 2-3 tortoise nests per 1m².



Figure 2. Eggs laying area

The flora and vegetation of the commune (which is the subject of this work) is very varied, with species of sub-Mediterranean origin, and belong to numerous vegetable associations (Cucu & Popova-Cucu, 1980).

A stable population of *Testudo hermanni boettgeri* is found in all 13 villages of the commune (Breța, Cernaia, Corcova (the commune's residence), Cordun, Croica, Gârbovățu de Jos, Imoasa, Jirov, Măru Roșu, Pârvulești, Pușcașu, Stejaru and Vlădășești). This is evident from the frequency of the alerts, although we do not have sufficient information on the size and structure of the population. In Corcova, they prefer the areas of deciduous forests on the hills (rare forests, clearings), edge of the forests, paths, meadows, pasture, areas with bushes, shrubs, vineyards, orchards, other forest areas, cultivated land, gardens, etc.

Various plant organs (except the roots) make up the food of Hermann's tortoise. The species has an almost exclusively vegetarian diet. It consumes a wide range of plants; about 134 species belonging to 46 families (Bertolero et al., 2011). Besides, they also eat mushrooms (*Boletus* sp.), mosses, lichens, various

invertebrates: worms (less frequently), gastropods (snails), arthropods (Coleoptera, Diplopoda); sometimes excrements from different mammals (dogs, foxes), dung, feathers and bones, etc. (Cheylan, 2001; Bertolero et al., 2011). Rozyłowicz (2008) listed for tortoise feed several taxa, belonging to several families (e.g.: Caryophyllaceae, Asteraceae, Brassicaceae, Betulaceae, Celastraceae, Cyperaceae, Oxalidaceae, Rosaceae, Plantaginaceae, Fabaceae, Fagaceae, Urticaceae, etc).

In the studied area, Corcova, it prefers various fruits, especially wild shrubs, but also other vegetative organs of plants (leaves, flowers). It was seen eating: hawthorn, blackthorn, cornelian cherries, blackberries, rosehip, raspberries, berries, but also fruit from fruit trees (apples, mulberries) and grapes, etc.; especially different herbaceous plants: *Convolvulus arvensis*, *Hieracium racemosum*, *H. murorum*, *H. bauhini*, *Inula* sp., *Leucanthemum vulgare*, *Matricaria perforata*, *Medicago arabica*, *M. falcata*, *M. sativa*, *Taraxacum officinale*, *Trifolium repens*, *T. pratense*, *Potentilla argentea*, *P. micrantha*, *Plantago cornuti*, *P. lanceolata*, *Veronica arvensis*, *V. alba*, *Viola canina*, etc.; various vegetables from households: cabbage, pumpkin, cucumber, beans, carrot leaves; it also consumes moss (*Syntrichia ruralis*, *Brachythecium glareosum*, *B. rivulare*, *B. velutinum*, *Eurhynchium hians*, *Hypnum cuppresiforme*, *Ceratodon purpureus*, etc.); mushrooms, including poisonous ones to get rid of intestinal parasites (Longeperre & Grenot –cited by Bertolero et al., 2011). The diet of turtles is widely diverse and remains to be studied.

The deterioration of habitats in the area, annual deforestations, poor quality food, climatic variations, record droughts and temperatures, natural fires (unintentional), etc. contributed to the movement of the species to other areas of the commune: household land, agricultural land,

vegetation along the railway, in the meadow of the Motru River, etc.

From the past years, we have no reliable data on the size of the population. However, from the discussions with the locals, a numerical reduction is seen in the population year after year.

Several protection measures have been outlined on a national level to limit the decline of the species, such as: stopping deforestation and forest degradation, grazing control, prohibition of tortoise trade, population assessment, spatial distribution, breeding programme in captivity with subsequent repopulation, etc. (Rozylovicz, 2003, 2008, Iftime, 2005b). The species is vulnerable, especially during egg laying and hatching (Iftime 2010).

For the conservation of this species in the commune of Corcova, certain measures are required, especially those related to the correct management of forest forests, agricultural areas, limiting the extension of the built areas, reducing the zooanthropogenic impact in the species habitats, raising the locals' awareness about the importance of the species in the studied area, etc. All the measures that are applied must consider both the further development of economic and agricultural activities in the area and the maintenance of a habitat conducive to biodiversity, thus also for the subspecies *Testudo hermanni boettgeri*. These are complemented by annual inventories on population numbers, on the frequency of waterfalls, on the egg-laying areas, on the plant species they feed on, as well as on other biological and ecological data.

The purpose of this paper is to present the main types of vegetation associations (herbaceous and woody plants) that make up the habitat of this subspecies; an important habitat in which *Testudo hermanni boettgeri* carry out their main life cycles: feeding, breeding, protection, hibernation.

MATERIALS AND METHODS

The study on the flora and vegetation of Corcova and on the Hermann's tortoise (figure 3) was conducted between March and October 2022 and April-September 2023.



Figure 3. *Testudo hermanni boettgeri*

For land tortoises, the classical methodology was used: the method of active transects, observation, photography.

Field studies for the identification and inventory of taxa in Corcova have been carried out at different stages of vegetation.

We have little scientific information about the flora of the Corcova commune. Costache (2011) in the paper "The Flora and vegetation of the lower river basin of the Motru River" notes some taxa from the studied area.

Information about flora and vegetation in the Iron Gates Natural Park: (Roman 1966, Matacă, 2001, 2002 a,b, 2005), from the Mehedinți plateau (Roman, 1974), from the Botanical reservation from Ponoare (Popova-Cuc &, Nedelcu, 1975), helped us in the recognition and interpretation of the species from Corcova. The synthesis works concerning the Oltenia region were used, which provided sporadic data on the plants in the area (Buia & Păun, 1960, 1964; Buia et al., 1961; Păun & Cârțu, 1980; Păun & Popescu, 1983; Păun et al., 1971; from

other works: Maloș, 1977, 1978; Cârțu, 1968, 1970; Cârțu & Cârțu, 1972, 1975; Boșcaiu et al., 1994; Popescu & Sanda, 1998; Popescu & al., 2001a, 2001b); Sanda et al., 2008; Doniță et al, 2005 a, 2005 b, etc.

Scientific literature has been used: The floras of Romania: Beldie, 1977, 1979; Beldie & Chiriță, 1967; Roman, 1974; Ciocârlan, 1988, 1990, 2000, 2009; Zanolovski et al., 1996, 2000a, 2000b, 2004; guide for determination: Ciocârlan & Chirilă, 1982; dendrofloristic dictionary: Preda, 1989; PhD dissertation: Maloș, 1977 (very helpful in our study).

RESULTS AND DISCUSSION

The vegetation consisting of trees, shrubs and herbaceous species is spread according to the geomorphological structure, the geological structure, the pedological structure, the climatic characteristics and altitude.

The landscape is characterized by a mosaic of fields, *Vitis vinifera* plantations, secondary grasslands and deciduous forests.

The Peripannonical subcontinental scrublands stretches across open hill platforms (figure 4).



Figure 4. Shrublands on the hills of Corcova

The phytocoenosis with this type of habitat are represented by continental shrubs with deciduous leaves, with sub-Mediterranean affinities. The substrate is calcareous and forms a mosaical vegetation composed of

steppe meadows and floristic elements of silvosteppe or plant species of the Pannonian rupicolous meadows along the edges of the forest.

The habitat also includes very different associated species: *Prunetum fruticosae* Dziubaltowski 1926 (syn.: *Crataego-Prunetum fruticosae* Sóo 1951), *Calamagrostio-Spiraeetum ulmifoliae* Resmeriță et Csűrös 1966, *Corno-Fraxinetum orn* Pop et Hodișan 1964 (Sanda et al, 2008).

The characteristic species are: *Rosa spinosissima*, *R. gallica*, *R. pimpinellifolia*, *Cornus mas*, *Crataegus monogyna*, *Acer tataricum*, *Cotoneaster integerrimus*, *C. tomentosus*, *C. niger*, *Allium sphaerocephalon*, *Anemone sylvestris*, *Asparagus officinalis*, *Buglossoides purpureocaerulea*, *Geranium sanguineum*, *Peucedanum carvifolia*, *Teucrium chamaedrys*, *Aster linosyris*, *Inula ensifolia*, *I. hirta*, *Melica picta*, *Nepeta pannonica*, *Peucedanum cervaria*, *Phlomis tuberosa*, *Jurinea mollis*, *Vinca herbacea*, *Verbascum austriacum*, *Salvia austriaca*, *Stipa dasyphylla*, *Aconitum anthora*, *Chrysanthemum corymbosum*, *Vincetoxicum hirundinaria*, *Viburnum lantana*, *Spiraea chamaedryfolia*, *Fraxinus ornus*, *Genista radiata*, *Sorbus dacica*, *Teucrium polium*.

These bushes are located on abandoned land, at the edge of forests or are installed secondarily in place of forests. They can also be installed on other categories of land with low seasonal potential, and which are exposed to dryness.

The phytocoenosis of the type of forest habitat in the area are represented by xero-thermophilic forests, pure or mixed, of *Quercus cerris*, *Q. petraea* or *Q. frainetto* and, locally, forests of *Q. pedunculiflora*, from the hill area (figure 5,6).

They are distributed at altitudes between 200 and 300 m in the area on brown-reddish soils.



Figure 5. Forest habitat for *Testudo hermanni boettgeri*



Figure 6. Forest habitat for *Testudo hermanni boettgeri*

Characteristic species: *Quercus petraea*, *Q. dalechampii*, *Q. polycarpa*, *Q. cerris*, *Q. frainetto*, *Acer tataricum*, *Carpinus orientalis*, *Fraxinus ornus*, *Tilia tomentosa*, *Ligustrum vulgare*, *Euonymus europaeus*, *Festuca heterophylla*, *Poa nemoralis*, *Potentilla alba*, *P. micrantha*, *Tanacetum corymbosum*, *Campanula persicifolia*, *Digitalis grandiflora*, *Vicia cassubica*, *Viscaria vulgaris*, *Lychnis coronaria*, *Achillea distans*, *A. nobilis*, *Silene nutans*, *S. viridiflora*, *Hieracium racemosum*, *H. sabaudum*, *Galium schultesii*, *Lathyrus niger*, *Veratrum nigrum*, *Peucedanum oreoselinum*, *Helleborus odoratus*, *Luzula forsteri*, *Carex praecox*, *Pulmonaria mollis*, *Melittis melissophyllum*, *Glechoma hirsuta*, *Geum urbanum*, *Genista tinctoria*, *Lithospermum purpureocaeruleum* (syn. *Buglossoides purpureocaerulea*), *Calluna*

vulgaris, *Primula acaulis* subsp. *rubra*, *Nectaroscordum siculum*, *Galanthus plicatus*.

Plant associations: *Quercetum petraeae-cerris* Soó (1957) 1969, *Quercetum cerris* Georgescu 1941; *Quercetum frainetto-cerris* (Georgescu 1945) Rudski 1949; *Carpino-Quercetum cerris* Klika 1938 (Boșcaiu et al. 1969); *Quercetum frainetto* Păun 1964 (cited by Sanda et al, 2008).

On small areas, in the wetter areas of the valleys, the Balkan beech (*Fagus sylvatica* ssp. *moesiaca*) is established (Roman N, 1974).

Populus tremula, *Robinia pseudoacacia* and sporadically *Quercus cerris*, as well as shrub species of the genera *Rosa*, *Crataegus*, *Prunus* grow on land with abandoned vine plantations.

The vegetation of xeric grasslands (figure 7) is relatively well compacted and consists of annual and perennial grasses. The main plant species that make up the upper layer of vegetation are: *Trifolium incarnatum* ssp. *molinerii*, *Ventenata dubia*, *Xeranthemum cylindraceum*, *Dasypyrum villosum*, *Aegilops cylindrica*, *Poa compressa*, *Festuca valesiaca*, *F. ovina*, *Hypericum perforatum*, *Scleranthus perennis*, *Trifolium arvense*, *Erysimum cuspidatum*. The short species that make up the second layer are: *Scleranthus annuus*, *Thymus comosus*, *Vulpia myuros*, *Aira capillaris*. The edifying species are: *Dasypyrum villosum*, *Trifolium incarnatum* ssp. *molinerii*, *Ventenata dubia*.



Figure 7. Vegetation of xeric grasslands

Characteristic species: *Aira capillaris*, *Trifolium incarnatum* ssp. *molinerii*, *Dasypyrum villosum*, *Vulpia myuros*, *Ventenata dubia*.

Other important species: *Rumex acetosella*, *Trifolium arvense*, *Medicago minima*, *Poa bulbosa*, *Achillea collina*, *Melica ciliata*, *Poa compressa*, *Filago arvensis*, *Sedum acre* (Roman 1974).

CONCLUSIONS

The results of the study show a diversity of both flora and the main plant groups existing in the territory of Corcova, because of several factors: physical, geographical, phytogeographical, pedological and climatic (subtle Mediterranean climate).

Between March and October 2022, April and September 2023, several types of associations and numerous taxa were identified.

In the area under investigation, Hermann's turtle population is stable. However, in recent years, there has been a decline in population numbers as a result of the interaction of a number of climatic and zoo anthropogenic factors. They mostly impact the habitat in the area.

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