

## Distribution and ecology of *Emys orbicularis* in Daghestan, Russia

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The European pond turtle, *Emys orbicularis*, is widely distributed in the plains and foothills of Daghestan (southernmost Russia). Recent distribution records for different zones of Daghestan as well as several population characteristics (biotope preferences, population densities, seasonal activity, reproduction) are presented, obtained during herpetological studies in 1991–2002. The conservational state of populations and the main threats are discussed. *Biologia, Bratislava*, 59/Suppl. 14: 47–53, 2004; ISSN 0006-3088.

Key words: *Emys orbicularis*, distribution, ecology, population status, Daghestan, Russia.

### Introduction

Within the territory of the former USSR, the European pond turtle, *Emys orbicularis* (L., 1758) is distributed in the central and southern regions of the European part, in the Crimea, Caucasus, Middle Asia, and Kazakhstan (in the Aral Sea region eastward to the town Kzyl-Orda on the Syr-Darya river, and to the Irgiz and Turgaï rivers). In Russia, this species reaches its northern distribution limit in the province of Smolensk, in the catchment area of the upper Don river, in the Mariï El Republic and along the middle course of the Volga river (Samarskaya province), in Bashkortostan, and on the left-bank of the Ural river near to the Kazakh Kustanaïskaya province. Moreover, an occurrence in the Chuvash Republic is likely (ANAN'eva et al., 1998).

Two of 13 known subspecies (FRITZ, 1998; ANAN'eva et al., 1998; KUZMIN, 2002) occur in

Russia: the nominotypical one, *Emys orbicularis orbicularis* (L., 1758), and the Kurian turtle, *Emys orbicularis iberica* Eichwald, 1831. The former inhabits the larger part of the distribution area in the north and east, the second one occurs in the Caucasus in the Kura river basin from its mouth to Gori in the west and along the Caspian shore as far north as Makhachkala in Daghestan. An intergradation zone with the nominotypical subspecies is located in the eastern and central Precaucasus (basins of Terek, Kuma, and Sal rivers) (FRITZ, 1994).

By the end of 19<sup>th</sup> century only three reliable records of *E. orbicularis* in Daghestan were known, mentioned by NIKOLSKIÏ (1905, 1913, 1915): one specimen from Kyzlyar (in the Zoological Museum of the Academy of Sciences, St. Petersburg) and two specimens from Khasav-Yurt (Caucasian Museum). GEORGI (1800) noted this species for the Terek river in the former Terskaya province. PAL-

LAS (1814) wrote that it lived in all rivers that flow into the Black and Caspian Seas. New records for Daghestan were published during the first half of 20<sup>th</sup> century (MORITZ, 1916; KRASOVSKY, 1929; TUROV & KRASOVSKY, 1933; SHIBANOV, 1935; KRASAVTSEV, 1941; and others). MORITZ (1916) found *E. orbicularis* frequently along the shore of Agrakhanskii bay and at the mouth of the Terek and Sulak rivers. KRASOVSKY (1929) noted its wide distribution in the lowlands of the Khasanyurtovskii region ('Khasav-Uyrtovskiy district'), where it was locally rather numerous and ascended the foothill zone to Endreiaul ('Andreiaul'). SHIBANOV (1935) sighted great numbers of turtles in the environs of the town Kyzlyar, in reservoirs along the Terek riverbed near the village of Tushilovka and along the seacoast, and near Karabudakhkent on the banks of fast running, cool streams. According to FORMOZOV (in SHIBANOV, 1935), this species was abundant around Temirgog railroad station near Makhachkala and at the mouth of the Rubas river in the south of Daghestan, and occurred in the Sulak riverbed near the villages of Nechaevka and Adzhidada (TUROV & KRASOVSKY, 1933). Later, in the 1970s–80s, only anecdotal data on distribution and population density were published for Daghestan (ALIEV & SPASSKAYA, 1979; SPASSKAYA, 1985; etc.). Only two particular works (BANNIKOV, 1951, 1954) can be mentioned that dealt with ecological aspects of *E. orbicularis* in southern Daghestan, along with two other species, the Caspian turtle, *Mauremys caspica* (Gmelin, 1774) and the spur-thighed tortoise, *Testudo graeca* L., 1758. Thus, obviously *E. orbicularis* is insufficiently studied in Daghestan and most publications provide no quantitative estimates for population densities.

Here we present data on the recent distribution, population densities, and ecology of the European pond turtle in Daghestan obtained 1991–2002 during a study of that region's herpetofauna.

Daghestan, the most southerly Russian province, lies in the southeast of the northern Caucasus region. Its southern border with Azerbaijan and Georgia follows the great dividing range of the Caucasus mountains. It borders on Chechen republic and Stavropol' territory on the west, adjoins Kalmykia on the north, and is washed by the Caspian Sea on the east. Its territory has well-pronounced lowland and mountain parts, with various landscapes and a wide range of altitudes (from 28 m b.s.l. to snowy peaks, reaching more than 4000 m a.s.l.).

Lowland parts (steppes and deserts, sea shore dunes and salt marshes, floodplains and

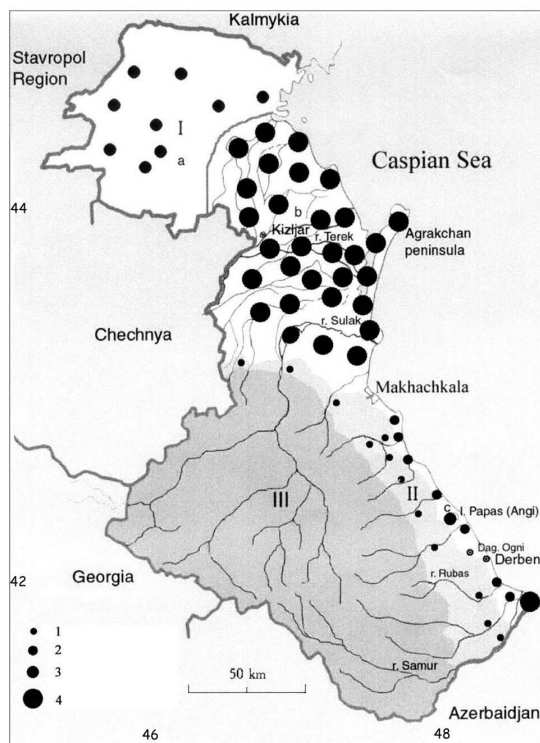


Fig. 1. Natural zones of Daghestan and population density of *Emys orbicularis* (number of turtles per 100 m coastline). (I) Lowlands: (a) Tersko-Kumskaya, (b) Tersko-Sulakskaya, (c) Primorskaya; (II) Foothills; (III) Mountains; (1) 1–5 turtles, (2) 5–10 turtles, (3) 10–20 turtles, and (4) 20–30 turtles.

delta forests) occupy 46% of the territory. It is divided into the Tersko-Kumskaya, Tersko-Sulakskaya, and Primorskaya subzones and includes the bay of Agrakhan and the Chechenskii archipelago (Fig. 1).

Three chelonian species (*E. orbicularis*, *M. caspica*, *T. graeca*) inhabit Daghestan. *M. caspica* is distributed in southern Daghestan while the European pond turtle is the most common turtle species.

#### Material and methods

Data were collected in 1991–2001 in the lowlands and foothills of Daghestan. We investigated various reservoirs of the Tersko-Kumskaya, Tersko-Sulakskaya, and Primorskaya lowlands, Agrakhanskii peninsula, Chechen' island, and foothill reservoirs up to an altitude of 1000 m a.s.l.

Counts of turtles were made on transects (routes following the coastline, 100 m in length and 2 m in

width) during the peak activity of turtles in the reproductive season from the second half of April to the end of May 1994–2001. Additional counts were occasionally made 1992–2001 in the period of April to October. Study sites were distributed all over Daghestan. Regular counts were carried out in the Babayurtovskii region, Terek basin and Agrakhanskiĭ bay, and also in the Primorskaya lowland, in the basins of the Rubas and Samur rivers. Overall, 181 adult turtles were measured in the field and 37 nest chambers were studied. Air and water thermometers were used to record temperatures.

## Results and discussion

### *Distribution and biotopes*

The European pond turtle is widely distributed in Daghestan. It occurs along the coast of the Caspian Sea from the Azerbaijani border in the south to Kalmykia and the province of Stavropol' in the north (Fig. 1). It inhabits almost all fresh-water and brackish reservoirs of the lowland and foothill zones, reaching altitudes of 800–900 m a.s.l.

The abundance of *Emys orbicularis* varies significantly by habitat and region. In Astrakhanskaya province (south of European Russia), the pond turtle is common and lives in almost all aquatic habitats. A high individual density is reported in the Volga delta at the Tigach river (BOZHANSKY & ORLOVA, 1998) and for some lakes of the Stavropolskii district, i. e., 75–125 specimens/ha (TERTYSHNIKOV & VYSOTIN, 1987). In some places in Azerbaijan, *E. orbicularis* often occurs in large groups of 70–80 individuals (ALEKPEROV, 1978). Population density differs also in the study regions in Daghestan (Fig. 1).

The Tersko-Kumskaya comprises the catchment areas of Kuma and Terek rivers (including Nogaĭskaya steppe) with many salt lakes, temporary reservoirs, and perennial freshwater reservoirs of artesian origin (Fig. 2). Although the system of numerous irrigation canals, framed during the last decades, facilitates dispersal of turtles, their distribution has here a patchy character. In spring, turtles occur in all temporary and perennial reservoirs. The population density reaches 10–20 specimens per 100 m coastline.

The Tersko-Sulakskaya lowland includes the delta of the Terek river, the Kumskaya and Prislakskaya plains, the Agrakhanskiĭ peninsula, and the Chechenskiĭ archipelago. The major part of this territory (delta of the Terek river, Prislakskaya plain, and Agrakhanskiĭ peninsula) is swampy. Agrakhanskiĭ bay, with a water depth of 2–5 m, is overgrown with reeds and other vegeta-



Fig. 2. Lake of artesian origin in the Nogaĭskaya steppe (Tersko-Kumskaya lowlands).

tion. The large area of the coastland and of the banks of the Terek river, covered with tamarisk and oleaster shrubs, is ideal for egg-laying. Due to this and a rich food supply, this area has favourable conditions for pond turtles. Based on visual observations, the populations inhabiting this area presumably have the highest numbers of turtles in Daghestan. However, the nature of the biotopes does not allow for precisely counting turtles. Therefore our data are surely underestimates. Along accessible areas of the Terek delta and Agrakhanskiĭ bay, 20–30 specimens per 100 m coastline were observed. In other parts of the lowlands, pond turtles also occur in fresh-water and brackish lakes, ponds, ditches, irrigation canals, paddy-fields, water collectors, bottomland water bodies, and near artesian wells and springs. Here the average turtle numbers are 10–15 specimens per 100 m coastline.

The Primorskaya lowland stretches for 160–170 km in a narrow strip between the highlands and the Caspian Sea. It is traversed by the valleys of rivers Manas, Ulluchaĭ, Rubas, Gyul'gerichaĭ, Samur and some others, with erosive combs and networks of irrigation canals. There are lagoons with desalinized water along the coast and at the river mouths. A considerable part of the territory of the Primorskaya lowland is urbanized and turtles live here in close neighbourhood of man. They occur in coastal lagoons, in irrigation canals, in small reservoirs of river valleys, ditches, ponds, lakes, in springs and artesian wells in cities and villages (Figs 3–4). In urbanized landscapes, turtles even live in heavily polluted water bodies (Vonyaĭka river near the city of Makhachkala, waste water of sewage works in the vicinity of the city of Kaspĭsk, and others).

In the Primorskaya lowlands, turtles have a



Fig. 3. Perennial reservoir between the mouths of the Samur and Malý Samur rivers (southern Daghestan).



Fig. 4. Temporary reservoir in the Samur delta.



Fig. 5. Nesting site of *Emys orbicularis* near freshwater lagoon, seacoast of Primorskaya lowlands.

fragmentary distribution and their numbers are low. The largest concentrations (5–10 individuals per 100 m coastline) were found in the basins of the rivers Ulluchaĭ, Rubas, Gyul'gerichaĭ, and Samur. At the mouth of Samur river, in water bodies earlier used for fish-farming, turtle density is highest and equal to that observed in reservoirs of the Tersko-Sulakskaya lowlands.

To the south of Makhachkala, the European

pond turtle occurs sympatrically with the Caspian turtle *Mauremys caspica*, but the latter prefers deeper water bodies with flowing water.

In the foothills, turtles are distributed up to altitudes of 500–600 m a.s.l. in steppe, forest-steppe, and forest zones. They occur in small natural fresh-water reservoirs and in larger artificial ones, in swampy areas of forests, in mountain and forest brooks, near springs and in other sites. The food base is here much poorer than in the lowlands, and there are few sites suitable for breeding. The distribution of turtles is here patchy and their density low, on average 1–5 individuals per 100 m coastline.

In late May to early June we observed overland migrations of *E. orbicularis* from temporary water bodies to permanent reservoirs in the environs of Papas lake, in the lower Rubas river, and in the foothills near the village of Arak, Tabasaran-skii region. Similar observations were made by KRASOVSKY (1929). He described that European pond turtles left dried out temporary pools and found individuals in the steppe in distances of 500–750 m from the nearest pool. Such overland migrations have also been recorded in late spring and early summer for southern Daghestan and Kalmykia (BANNIKOV, 1954; KIREEV, 1983).

#### *Seasonal and daily activity*

Seasonal activity depends on annual climatic and local conditions. In the lowlands, turtles usually become active in the period of late March to early April, in the foothills one or two weeks later. Mass emergence is observed in mid-April. In southern Daghestan (lowland parts of Derbentskiĭ and Magaramkentskiĭ regions) turtles appear two weeks earlier. In warm years, the active season can start at earlier dates. The earliest records of active turtles were made at the end of February (environs of Kyzlyar) and the beginning of March (near the village of Avadan, Derbentskiĭ region). In relatively mild winters, a few active individuals can be found on land and in the water at temperatures of 12°C and 8°C, respectively. Hibernation starts in the second half of October to the beginning of November. Most turtles disappear in the second November decade when air temperature drops to 6–7°C, and water temperature to 3–4°C. Turtles hibernate in groups of 20–30 individuals in small water reservoirs at a depth of 60–80 cm, digging overwintering pits in the sand and silt among the rhizomes of reeds. We observed such hibernation pits, for example, in the shallow tributaries (creeks) of the Terek river. Turtles become active when water temperatures rise to 6–9°C.

In the south of European Russia hibernation usually takes place from late October to the second March decade (BOZHANSKY & ORLOVA, 1998). Mass emergence from hibernacula occurs in early April, when the average daily temperature increases from 15 to 20°C. In Kalmykia, hibernation takes place from September or the first half of October to late March or mid-April (KIREEV, 1983). In northern Daghestan and Chechnya, turtles overwinter from late September to early April (KRASOVSKY, 1929). In southern Daghestan, the European pond turtle disappears 8–10 days earlier than syntopic *M. caspica*, around mid-October (BANNIKOV, 1951).

Daily activity depends on the season and biotope characteristics. In summer two activity peaks are observed. In spring and autumn, turtles are active from 10–11 h to 15–17 h. Foraging mostly happens before midday. On cloudy and rainy days turtles seldom leave the water. According to BANNIKOV (1951), activity peaks shift in water bodies in the steppe zone towards earlier morning and later evening hours, when compared with water bodies in forests. By this, the hottest daytime is avoided. Within a habitat the same shift occurs in the warmest months, i. e., June – August.

#### Reproduction

The mating season lasts from the second half of April to the end of May, depending on the region and weather conditions. Mating turtles were observed from May to mid-June in the foothills. Based on our multi-year studies, mass copulations occur from 22 April to 19–20 May in the southern lowlands and from 26 April to 30 May in northern Daghestan. As a rule, turtles copulate in groups, females being submerged and males above water level. Usually males are smaller than the females they pair with. During the mating period courtship between males is abundant. BANNIKOV (1951) noted that no increased male aggression occurs during the mating period.

Females produce three clutches per season in southern Daghestan: the first one in the second half of May – early June, the second at the end of June – beginning of July, and the third at the end of July. The first clutch contains 3–10 eggs, the second 2–9, and the third 2–8 eggs (BANNIKOV, 1951). However, in the foothills obviously only two clutches are laid. Females prefer for oviposition sites with sandy soil, with silt and fine-grained gravel admixtures located within a few metres from the coastline. The female digs a pit, often under tamarisk bushes or near other

vegetation in shaded but well heated places (with sun exposure of not less than 5–6 hours a day). In southern Daghestan and in the foothills there are few suitable nesting sites. There, turtles often lay eggs in relatively dense soil at the very coast of reservoirs within 0.5–2 m from the water (Fig. 5). The depth of nest chambers is 80–120 mm, depending on soil density. In hard substrate, chambers are shallower than in sandy soil. Egg-laying usually occurs in the afternoon or evening and lasts about 1.5–2 hours.

Over several years we studied 37 nest chambers in the period of late June to early July. They contained from 2 ( $n = 12$ ) to 11 ( $n = 3$ ) eggs. In 15 chambers were 6 eggs, and in 7 were 8 eggs, resulting in an average number of 5.5 eggs per nest. In the lowlands, clutches contain 2–11 eggs, in the foothills 2–8 eggs. Eggs measured 28.9–33.8 mm x 18.1–19.8 mm.

Body weight of hatchlings in nature ( $n = 12$ ) was 5.53 (4.88–6.75) g (mean, minimum, maximum), and of those incubated in the lab ( $n = 12$ ) 3.05 (2.71–3.41) g. Hatchlings emerge from the nests from July to September. Their carapace length is about 27 mm. The external yolk sack disappears at day 18–21. Most young turtles spend their first winter in hibernation burrows 200 mm long and 30–40 mm wide that they excavate during the second week after hatching. Only newborns of the first clutch surface regularly in the year of hatching. In the following spring young that have overwintered on land move to water bodies.

In the central Precaucasus (Stavropol'e), *E. orbicularis* produce two clutches: the first of 9–12 eggs, the second of 3–13 eggs. The incubation period is here 90–110 days. Young turtles emerge in August–September and migrate to reservoirs where they hibernate. Their carapace length is about 25 mm, body weight up to 4 g (TERTYSHNIKOV, 2002).

The Kurian turtle (*E. o. iberica*) starts in Daghestan breeding when its carapace length is 80–100 mm in males and 90–110 mm in females. The approximate age of mature individuals (according to annual rings on the plastron) is 6–9 years. Maximum carapace length of adults is 143 mm in males and 164 mm in females. We recorded for two populations the following carapacial lengths (mean  $\pm$  standard error, minimum, maximum): Samur river basin (Magaramkentskiĭ region, Primorskaya lowlands)  $102 \pm 1.5$  (88.2–124.8) mm in males ( $n = 37$ ) and  $110 \pm 2.3$  (77–164) mm in females ( $n = 63$ ); Papas island (Kayakentskiĭ region, Primorskaya lowlands, 100–120 km south of Samur)  $103 \pm 1.9$  (93–136) mm in males

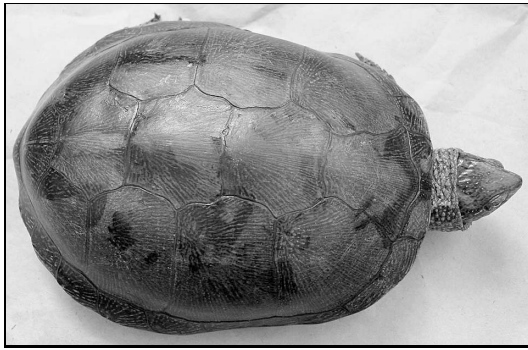


Fig. 6. *Emys orbicularis*, Staryĭ Terek river, Tersko-Sulakskaya lowlands.

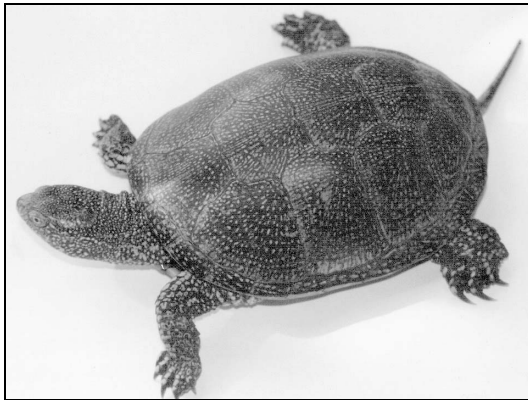


Fig. 7. *Emys orbicularis*, environs of Makhachkala, Primorskaya lowlands.

( $n = 25$ ) and  $117 \pm 1.5$  (90–144) mm in females ( $n = 56$ ). Perhaps the smallest turtles were not sexually mature in the first sample. Maximum body weight is 320 g in males ( $n = 7$ ) and 731 g in females ( $n = 29$ ).

European pond turtles from southern Daghestan are smaller than those from the northern part of the republic (Figs 6–7). BANNIKOV (1954) noted that two “ecotypes” of *E. orbicularis* occur in Daghestan, differing in morphology and preferred habitats. Morphological features of these forms coincide well with the characteristics of the two subspecies *E. o. orbicularis* and *E. o. iberica*. Both subspecies intergrade widely in the Precaucasus, so BANNIKOV’s “ecotypes” might represent intermediates resembling one subspecies more than the other (FRITZ, 1994, 2003). Obviously, ecological differences exist. Turtles resembling the nominotypical subspecies inhabit permanent wa-

ter bodies (rivers, streams, ponds, and lakes with high banks) all-year, while those morphologically close to *E. o. iberica* spend the spring and early summer in temporary water bodies that dry out in late summer. Consequently, the latter turtles move to the habitats of the other form and spend there the rest of the activity season together with the *E. o. orbicularis*-like individuals (BANNIKOV, 1954).

### Conclusions

Our data indicate that the European pond turtle is common in the lowlands and foothills of Daghestan. The greatest abundance was found in reservoirs of the Tersko-Sulakskaya lowlands, and the lowest one in the foothills, where the turtles occur up to an altitude of 600 m a.s.l.

The state of *Emys orbicularis* populations in Daghestan is generally not a cause of concern. However, during recent decades there has been a considerable decline in the Primorskaya lowlands due to poaching, urbanization of landscape, drainage of water bodies, and general climatic aridification of the region. Pond turtles inhabit even heavily polluted reservoirs. The main factors influencing population decrease in the Tersko-Sulakskaya lowlands are commercial catching of turtles and mass death in fishnets and traps of poachers. In the foothills, where population density is initially low, anthropogenic pressure is much higher than in the lowlands. Many fresh water bodies – the main habitat of the pond turtle in the foothills – have been drained there. In some places turtles have become victims of poachers and have disappeared after being harvested commercially in easily accessible shallow waters.

Besides man, some other predators influence turtle populations in Daghestan. Their clutches are often destroyed by gerbils (*Meriones tamariscinus* Pallas, 1773), crows (*Corvus cornix* L., 1758) and others. Hatchlings and young are eaten by herons (*Ardea* sp., *Egretta* sp.) and other birds and adults are hunted by dogs and wolves (*Canis lupus* L., 1758), foxes (*Vulpes vulpes* L., 1758), racoons (*Procyon lotor* L., 1758), and jackals (*Canis aureus* L., 1758).

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