TRANSLATIONS

Editorial Introduction

The following paper on tortoises inhabiting the Russian Black Sea coast of the Caucasus was originally published in Russian in 1985. The authors note that the local population of the subspecies being studied, identified here as *Testudo graeca ibera*, is isolated from the rest of the range of *T. graeca* and demonstrates significant morphometric and habitat differences which distinguish it from other tortoise populations. These differences were later formally recognized by Ckhikvadze and Tunijev, who in 1986 described this population as the new subspecies *Testudo graeca nikolskii*. The authors of the present paper suggest that this tortoise population is under significant stress, with declining numbers and decreasing survival capability. They document aspects of the range, habitat preferences, natural history, and demography of the population. They discuss survival threats and make conservation recommendations for the population, which they believe is at risk for local extirpation within the near future.

This translation was prepared by Marina Proutkina through the arrangement of Dewey Wallace, with further editorial reworking by John Behler, Deborah Behler, and Anders Rhodin.

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Status and Conservation Prospects of *Testudo graeca* L. Inhabiting the Black Sea Coast of the Caucasus

ALEXANDER A. INOZEMTSEV[1,3] AND SOLOMON L. PERESHKOLNIK[2]

[1]*Kalinin State University, Kalinin, Russia;*
[2]*Moscow Zoological Park, Bolshaya Gruzinskaya ul. 1, Moscow 123242, Russia*

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Translation by MARINA PROUTKINA, arranged by DEWEY I. WALLACE

Most authors (Wermuth and Mertens, 1961; Fuhn and Vancea, 1961; Obst and Meusel, 1972; Honegger, 1978; Pritchard, 1979) consider the range of *Testudo graeca ibera* to be within the limits of the eastern Balkans (the regions to the south and east of the Danube: Romania, Bulgaria, Macedonia in Yugoslavia, northeastern Greece, the European part of Turkey, a large part of Asia Minor, the southeastern Transcaucasus, the eastern Caucasus, and adjacent Iran). This range is continuous; only a narrow strip of the Black Sea coast of the Caucasus, inhabited by a sparse population of the Mediterranean tortoise is separated from the major part of the range by considerable areas unsuitable for the habitation of this species. These areas are represented by vast sea spaces, wide valleys with major rivers, vast marshy areas, and mountain ridges to over 1000 m altitude, which represent insurmountable obstacles for this population of land tortoises, at least in historic times. At the same time, the origin of the population in the isolated part of the range is still not clear. The most probable theory is that tectonic processes in the Quaternary led to a breakup of the land bridges between the Balkans, the Crimea, and the Caucasus (or the submerging of the Iontide into the Black Sea) that previously existed in the Neogene (Puzanov, 1927a, 1929, 1949; Maleev, 1940; Kovalevsky, 1966; Rubtsov, 1980). This theory is in accord with the more recent concept of the formation of the Black Sea hollow (Gerasimov, 1980). Palaeontological data testify to the fact that tortoises of the genus *Testudo* were broadly represented in the fauna of the Crimea but became extinct in the first half of the Quaternary period (Khosatzky, 1947, 1948, 1957; Sherbak, 1966). However, one species of the genus has been preserved along the Black Sea coast of the Caucasus under natural conditions close to those of the southern Crimea.

Under conditions of prolonged isolation on the Black Sea coast of the Caucasus a special form has emerged that is not genetically connected to the populations of the eastern Caucasus and the southeastern Transcaucasus. Thus, the "Black Sea population" of the Mediterranean tortoise is geographically isolated and clearly differs phenotypically from *T. g. ibera* specimens from other parts of the range. Our observations and analysis of the literature show that the tortoises inhabiting the Black Sea coast live exclusively in forests, and only during breeding season do they move into sparsely forested areas, clearings, and forest edges. In the Transcaucasus and eastern Caucasus *T. g. ibera* occurs mostly in open spaces (steppes, semideserts, sparsely forested areas) and in lowland forests (Kessler, 1878; Nikol'skii, 1913; Puzanov, 1927b; Sobolevsky, 1929; Bannikov, 1951; Dal, 1954; Vereshagin, 1958; Terentev, 1961; Fuhn and Vancea, 1961; Muskhelishvili, 1970; Bogdanov et al., 1973; Bannikov et al., 1977; Alekperov, 1978). Adult Black Sea tortoises show a considerable predominance of yellow and dark brown-green in the carapace and a flatter shape. Com-

[3]Present Address: Department of Biology and Ecology, Moscow Pedagogical University, 10a Radio St., 107005 Moscow, Russia

Table 1. Comparison of body proportions of Mediterranean tortoises.

Ratio	Mil Steppe, Azerbaijan (n = 21) Arithmetical mean	Variation coefficient	Variation limits	Novorossiysk region of Krasnodar area (n = 65) Arithmetical mean	Variation coefficient	Variation limits	Reliability criteria
Width to length of carapace	0.75±0.008	4.5	0.70-0.82	0.77±0.006	5.8	0.66-0.85	2.0
Height to length of carapace	0.54±0.009	7.2	0.48-0.60	0.48±0.005	7.6	0.42-0.57	5.8
Height to width of carapace	0.72±0.020	12.8	0.46-0.84	0.65±0.005	6.7	0.56-0.75	3.4
Plastron length to carapace length	0.82±0.015	8.1	0.66-0.93	0.83±0.008	7.3	0.71-0.94	0.6

Note: Data on the body proportions of tortoises from the Mil Steppe were taken from Bogdanov et al. (1973); for Novorossiysk region the only body proportions given were those of adult specimens (with carapace length 17 cm and over) that had uninjured carapaces. The statistical analyses were calculated by the usual methods (Plokhinsky, 1961).

parison of external characteristics of the Black Sea form with tortoises from other parts of the range of *T. graeca* within the Soviet Union testifies to the presence of statistically reliable differences in their body proportions (Table 1). However, it is impossible to discuss what taxonomic status these differences indicate for the Black Sea form without considering additional data (which are beyond the scope of the present paper). Considering the above, we are not going to pursue this matter here, but will only stress that the Black Sea form cannot obviously be considered *T. g. ibera*. [Ed. comment: This Black Sea coast population has subsequently been described as the new subspecies *Testudo graeca nikolskii* by Ckhikvadze and Tunijev in 1986.]

While clarifying the present distribution of the Mediterranean tortoise on the Black Sea coast of the Caucasus[1] we have come to the conclusion that no report accurately defines the true range limits (Nikol'skii, 1913; Terentev and Chernov, 1949; Vereshagin, 1958; Bannikov, Darevsky, and Rustamov, 1971; Bannikov, Darevsky, et al., 1977; Red Data Book of the USSR, 1978). Our own observations, as well as interviews with the local population, mostly forestry staff - from foresters and rangers to executives of various levels - show that the range limit in the north and west has changed little since the journey of I.I. Puzanov in 1926 (Puzanov, 1927b). It stretches from Anapa to the northeast toward the settlement of Varenikovskaja without reaching it and turns toward the settlements of Nizhnebakansky and Novoukrainsky, but does not reach Abinsk and turns south without reaching the northern slope of the foothills of the main Caucasus ridge. There is information on tortoise records in the preserved forest areas between the Varnavinsky and Kryukovsky water reservoirs up to the left bank of the Kuban river. Farther on, the range limit runs along the macroslope facing the sea without rising above 800 m, and beyond Gelenjik descends still lower (and closer to the shoreline) and includes the slopes with virgin forests of oak, beech, and hornbeam. There and farther south, tortoises are mainly encountered among sparse trees and bushes, in large clearings, meadows, and steppe slopes, as well as around developed areas. There are also records of tortoises found on the slopes of declining forests around Tuapse in the Lazarevsky and Sochi-Khosta area (Fig. 1). Still unclear at this time is the question of the southernmost limit of the range of these reptiles in Abkhazia. The data kindly provided by L.I. Khosatzky indicates that in 1937 tortoises occurred in the areas of Pitsunda and Sukhumi. I.K. Vereshagin (1958) and then A.G. Bannikov, I.S. Darevsky, et al. (1977) indicate Pitsunda as the southern limit. There are data on tortoises at the Pitsunda-Myussersky reserve, but they occur there very rarely (B.S. Tuniev, *pers. comm.*). One of the authors visited Pitsunda twice in September in the late 1970's and explored its surroundings, but did not discover any evidence of tortoises. Interviews at the Gudautsky forestry in September 1981 also produced negative results.

In spring and early summer, during the period of the tortoises' highest activity, we conducted research on the biotopical distribution of the population and the determination of its numbers in the various habitats. During that time (courtship and mating season) tortoises are most numerous in large forest clearings, sparse forests, and bushes from 50 to 300 m above sea level. The vegetation in these areas is composed of short oaks, three species of juniper (*Juniperus sabina*, *J. excelsa*, *J. foetidissima*), wormwood, sumac, pistachio-trees, and *Jasminum fruticans*, which serves most often as shelter for the tortoises during this time of the year. In grassy habitats, mountain steppe and meadow vegetation prevails, which in certain areas reaches a considerable thickness and height (up to the waist), and in others is sparse and low; finally, the vegetation can yield to eroded areas with outcrops of bedrock and rocky scree. Habitats such as these are usually located on slopes of 15 to 20 degrees, facing the sea. They are cut by ravines with dried-out beds of spring torrents. Ravine slopes are as a rule covered with a thicker forest with prevailing grabinnik trees and vines. In the spring the average tortoise density here is 5 specimens per 10 ha (min. 1 to 3, max. 7 to 9). In forest habitats, where the vegetation is composed of grabinnik and oak with ash trees, cornel, sumac, and juniper brush, ivy vines, and sparse grass cover of mountain meadow vegetation with elements of oak

[1]Collection of data used in this article was obtained systematically from March to October 1981, and intermittently from May to October in 1973, 1974, and 1975. The research was performed mostly in Novorossiysk, as well as in Gelenjik and Anapa counties of the Krasnodar region. The authors express their sincere gratitude to G.I. Frenkina and V.I. Pavlenkov, researchers of the Problem Biology Laboratory of the Moscow State Teachers' Institute, who have also taken part in the collection of data.

Table 2. Level of correspondence of some morphological characteristics to the age of *Testudo graeca*.

T. graeca Animals bred in captivity (Jackson, 1980)			*T. graeca* Black Sea form		
Carapace length (mm)	Body weight (g)	Age (approx.)	Carapace length (mm)	Body weight (g)	Number of "year rings"
31-39	10-19	1 d	36-39	11.7-16.6	1
40-49	16-27	1-2 mo	40-46	18.9-24	1
50-69	29-78	3-4 mo	47-52	21-38	2-3
70-89	80-153	5-6 mo	55-60	39-56	3-4
110	250-350	ca. 1 yr	90-120	200-900	5-9
130-139	450-650	2-7 yr	130-139	---	---
140-149	617-730	8-12 yr	140-149	---	---
150-159	700-900	13-18 yr	150-159	800	10
160-169	785-1070	19-21 yr	160-169	900-1000	11-15
170-179	907-1250	25-30 yr	170-179	1200-1600	12-17
180-189	973-1550	30-35 yr	180-189	1200-1800	15-19
190-199	1210-1750	36-40 yr	190-199	1300-2200	14-20
200+	1320-2050	40+ yr	200-209	1300-2300	16-20
			210-219	1600-2500	18-21
			220-229	1800-2700	18-23
			230+	2200-2900	19-25

Note: Numbers above the broken line show the average results of measurements of four young tortoises kept in a heated terrarium (hatched in the fall of 1981 at the Moscow Zoo and not hibernating). Data refer to the same age groups that are given by Jackson.

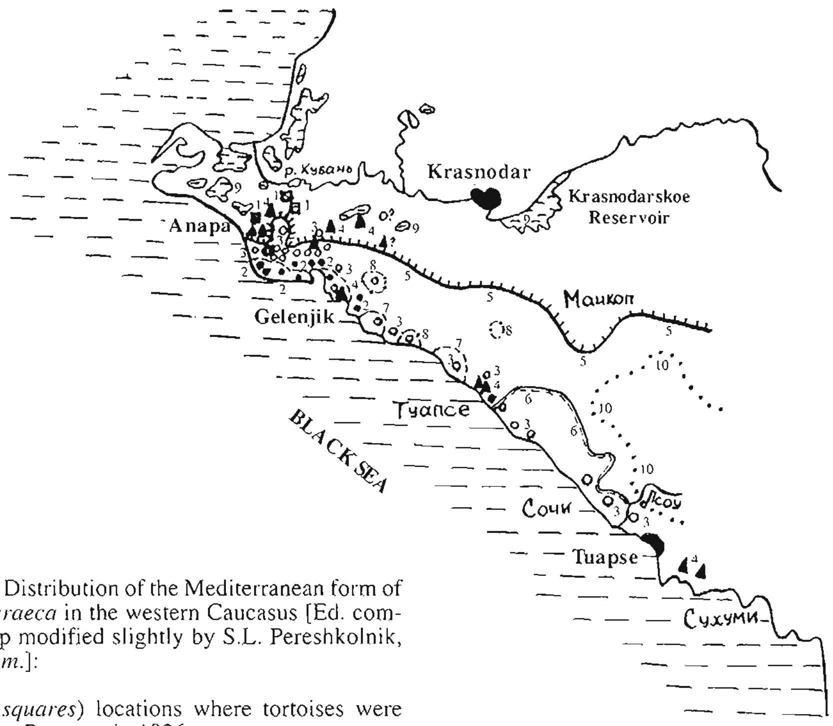

Figure 1. Distribution of the Mediterranean form of *Testudo graeca* in the western Caucasus [Ed. comment: map modified slightly by S.L. Pereshkolnik, *pers. comm.*]:

1. (*open squares*) locations where tortoises were found by Puzanov in 1926,
2. (*solid dots*) areas of tortoise habitation discovered by the authors,
3. (*open dots*) areas of tortoise habitation determined by interviews,
4. (*solid triangles*) areas where tortoises are absent according to interview data
5. (*line with cross-hatching*) broad-leaved forests of oak and beech, with semixerophilous brush,
6. (*line with parallel dashed line*) broad-leaved forests of oak, alder, and chestnut, with evergreen bushes,
7. (*dashed line*) sparse juniper with xerophilous bushes,
8. (*dashes and dots line*) pine forests,
9. (*dashed*) water reservoirs,
10. (*dotted line*) fir forests and subalpine meadows.

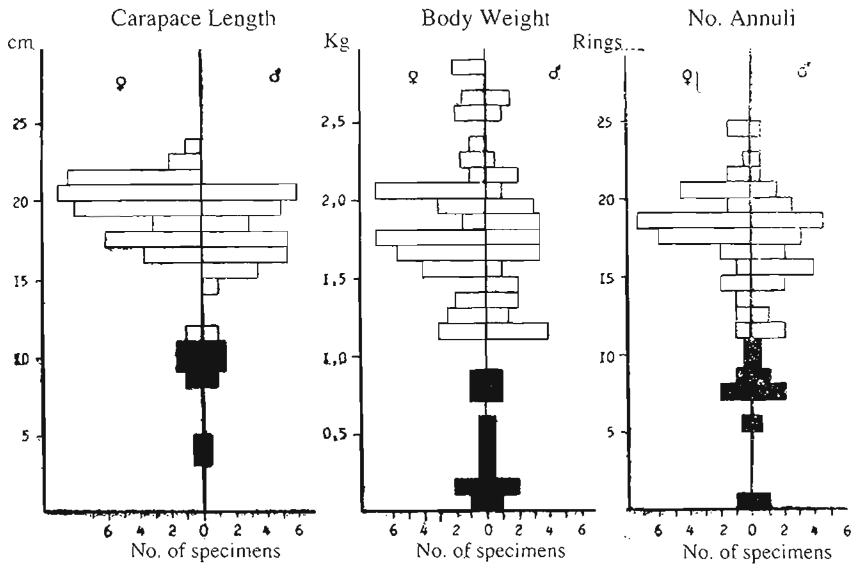

Figure 2. Demographic structure of the Mediterranean tortoise population (according to data from the Novorossiysk region).

forest and primrose, the average tortoise density constitutes 2 to 4 specimens per 10 ha. Though the distribution here is not as uniform as in the previous habitat, tortoises occur mostly on the southwestern slope, preferring small clearings and forest paths. Sometimes in the spring they concentrate in considerable numbers: 3 to 4 specimens each in a widening of a forest path with an area of 0.1 ha, or in a clearing on rocky substratum and thickly grown with scattered clover, where from 5 to 12 specimens could be counted along a 3 km route, depending on the time of day. Tortoises were also encountered near villages and settlements, but were never noted in vineyards. They are also absent from clearings and meadows often used by cattle. Considering all of the above and extrapolating our data, it can be stated with a high degree of assurance that in the triangle from Anapa to Nizhnebakansky and Gelenjik (with a base along the sea coast), i.e., where the above described habitat is the most widespread, tortoise density ranges between 6 and 12 specimens per sq. km. Provided forestry maps of the given area are available, an approximate evaluation of numbers of these reptiles can be presented for the areas where most of the population is concentrated. Considering also that in the region described above, where our data are extrapolated, that there are also areas where no tortoises can be encountered for a variety of reasons, a density of 5 to 8 specimens per sq. km can be assumed. Thus, 12,000 to 14,000 tortoises inhabit the above area of 2,000 sq. km. As it has already been noted, that area is the largest and most favorable in the Black Sea part of the range, so the approximate evaluation of the numbers of the whole Black Sea tortoise form constitutes about 25,000 to 30,000[2].

The structure of the population is important for maintaining a sufficiently high number of specimens and an optimum population density. The demographic structure of the tortoise population we studied in the Novorossiysk area is rather peculiar (Fig. 2). The size, weight, and number of

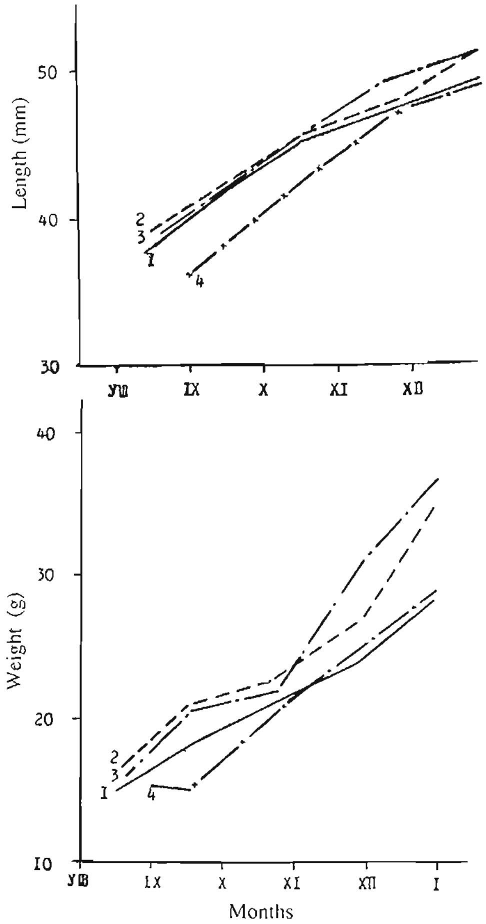

Figure 3. Growth dynamics (carapace length and body weight) of tortoises in the first year of life in captivity.

[2]Since the surveys were conducted mostly in the spring, when the active specimens encountered were only those that were breeding, these numbers refer only to the sexually mature portion of the population.

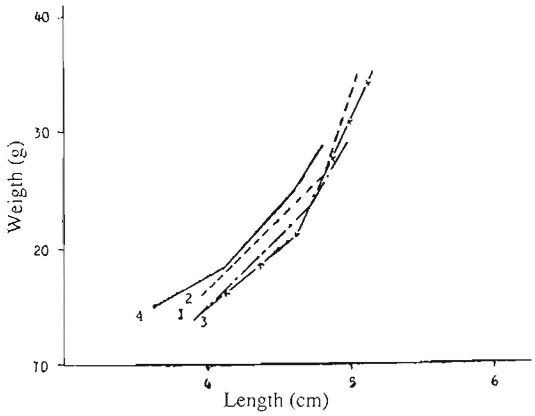

Figure 4. Changes of the ratio between body weight and carapace length during growth in tortoises hatched in captivity.

annuli seen on the carapace scutes (according to which the measured tortoises were referred to one or another age group with a certain degree of accuracy) have definitely proved that the overwhelming majority of tortoises encountered from April through September are adults (Table 2). The sex ratio of mature specimens is close to 1:1. Minimum and maximum biometric characteristics of various specimens were in the following range: 3 to 24 cm, 0.02 to 2.9 kg, 1 to 25 "year rings".

An insignificant number of young specimens in the sample usually suggests that the population dynamics trend is unfavorable. Therefore we tried to clarify the factors affecting the population dynamics of the tortoises under observation, as far as the collected data allowed.

Direct observations, interview data, literature, and meteorological data analyses show that tortoises inhabiting the area between Anapa and Gelenjik usually emerge from hibernation in late March to early April and go back into hibernation in late September to October. Thus, the annual activity period constitutes about 180 to 200 days. Immediately after hibernation the tortoises begin to mate, which in some pairs may last till middle or late June. The first clutches were noted in late May to early June, and the last occur in late June to July. Incubation lasts about 80 days, being somewhat longer or shorter depending on the weather. Hatchlings first

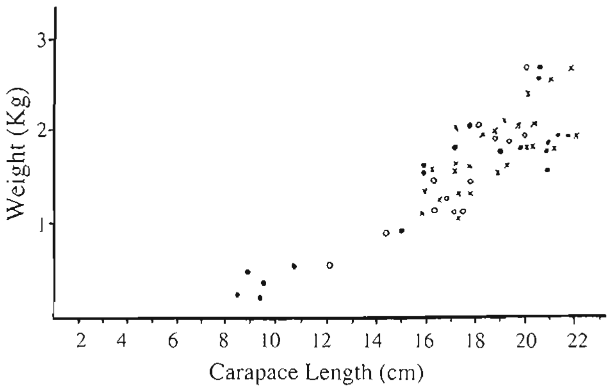

Figure 5. Correlation between body weight and carapace length in *T. graeca* (according to data from the Novorossiysk region).

appear on the surface in late July, and emergence continues through August and the first half of September. Some of the young tortoises may hibernate under ground and not appear until the second half of May of the next year, judging from their size and weight (L-33 mm, S-44 mm, P-21 g). To verify this data it would be necessary to dissect a few dozen tortoises. However, considering the extreme scarcity of the population and that the species is included in the Red Data Book of the USSR, we consider this method unacceptable.

We do not have any data on the growth of tortoises in the wild during their first months of life. The following data are therefore from the Moscow Zoo. Two females (L-228 mm, P-2300 g; L-208 mm, P-1729 g) which were captured on 25 May 1981 in the Novorossiysk area, laid 10 eggs in June (8, 11, and 21) of the same year. The eggs were 34.3 to 39 mm long, 29 to 32.2 mm wide and weighed 19 to 21 g. They were placed in a plastic box on a bedding of styrofoam, which was constantly moistened. The box was covered with glass with just a small opening for ventilation. The humidity in the box was maintained at about 90%. The eggs were incubated at a thermostatically-controlled temperature of 28 to 30°C for 66 to 93 days. Four tortoises hatched, and the rest of the eggs were infertile. Hatching started with the appearance of a small opening in the egg, after which the tortoise broke the shell along about a third of the circumference of the egg; the feet appeared from the opening thus made, and the tortoise remained in this posture for about 8 hours. Finally the tortoise emerged from the egg, completely breaking the shell.

Immediately after hatching, the tortoises had a deep transverse fold in the plastron at the junction of the pectoral and abdominal scutes, and a longitudinal umbilical slit measuring 11 x 7 mm. Over three or four hours the fold flattened out and the tortoises were placed in a terrarium measuring 40 x 50 x 40 cm, the bottom of which was covered with a 4 cm layer of sawdust. The temperature under the heater was 30-32°C, and in the cool corner, 27-28°C. During the first six days the tortoises constantly buried themselves in the sawdust and were not active. In the following days the activity of the young tortoises increased and in a month it reached six hours (from 0800 to 1400 hrs). From the first day the tortoises were offered a mixture of fruit and vegetables, but they refused the food. The animals began to feed after they had been offered dandelion leaves, which was when the young tortoises reached 4, 5, and 6 days of age, respectively. The tortoises eagerly drank water. Once a week they received minced newborn mice with an addition of 0.25 g calcium glycerophosphate per tortoise. Once a week the tortoises were irradiated with an 850 watt quartz lamp from a distance of 1 m for 10 minutes. The egg caruncles of the young tortoises were lost after 40 to 50 days[3]. They must have been developing according to the normal pattern (Fig. 3, Table 2).

[3]Observations on the development of the tortoises in the first year of life in captivity were carried out and described by V.E. Frolov of the Moscow Zoo, whom the authors sincerely thank for the data provided.

Growth dynamics of young and adult tortoises are rather similar, which is characteristic of poikilothermic animals in general (Table 2, Figs. 4-5). Comparing these characteristics with weight and size ratios in adult tortoises, it can be seen that a certain correlation tendency is preserved throughout their lifetime (Fig. 5). The weight and size ratios in our tortoises in the first year of life coincide more or less with the data for *Testudo graeca* in captivity in England (Jackson, 1980), but adult specimens of the Black Sea form surpass them considerably in size.

The tortoises demonstrate exclusively diurnal activity, which fluctuates in time depending on the season and the weather. In general, in the spring and fall the tortoises are most active in the middle of the day (from 0800 to 1500 hrs), and in the summer, in the morning (from 0600 to 1030 hrs) and in the evening (from 1430 to 1700 hrs). However, both active and inactive specimens are encountered almost anytime during daylight hours. The daily activity cycle of tortoises in the spring consists of multiple phases; depending on energy requirements an animal can spend the middle of the day basking in the sun in a clearing, half-buried in the substrate near a bush, or crawl, feeding in the thick grass on an abandoned forest path, or sleep, buried in the previous year's dry leaves in the depths of the forest.

Thus, the total daily activity period for each animal (when the tortoise feeds, moves, burrows in the leaves, etc.) constitutes not more than 10 hours. Tortoises living in the mountain slope forests facing the sea (i.e., southern slopes) start and end their activity period depending on the direct sunlight on the slope. As night approaches, and under unfavorable weather conditions (rain, hot temperatures, etc.) tortoises hide in thick bushes, holes, clefts, hollows under rocks, and in the thick forest substrate. In these inactive tortoises the body temperature is only slightly higher than the temperature of the substrate in which they are buried. In the middle of the summer when the air temperature in the southern edge of the forest was 31°C, the cloacal temperature of a tortoise buried in the forest substrate under an oak tree several meters away from the forest edge was 28.5°C (the temperature in the substrate was 25.5°, and on the surface of the substrate, 26.8°C). On another occasion, the respective temperatures were: in the air, 32.8°C, of the tortoise's body, 31.3°C, of the substrate under a bush where the tortoise was buried, 24°C, and on the surface of the substrate, 26.5°C.

Usually the temperature in the tortoise cloaca is slightly higher than the temperature on the surface of the soil, and during the period of activity lies in the range of 20 to 32°C (Fig. 6). It should be noted that cooling of the body at the end of the activity period is a more uniform process in all specimens than the beginning of the warming up, which is determined by the onset of moving activity.

According to our observations, 45% of the food (based on encounters) consists of legumes - *Lathyrus aphaca*, *Trifolium* sp., *Coronilla* sp., *Astragalus* sp.; composites are also used (16%), especially dandelion (*Taraxacum* sp.), and

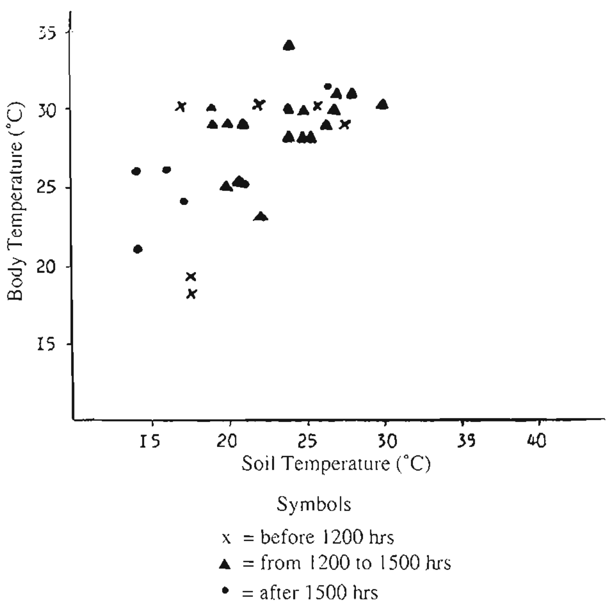

Figure 6. Changes of body temperature in active tortoises (sexually mature).

more rarely chicory (*Cichorium intybus*); the rest of the plants eaten by the tortoises include *Galium* sp., *Melampirum caucasicum*, and *Orobanche* sp. Quite often tortoises eat the leaves off the lower branches of bushes - *Paliurus* Mill., and sometimes, *Jasminum fruticans*. We have not noted tortoises eating animal food, though the composition of feces and the eager acceptance of animal food by tortoises brought to the zoo confirms the indication of many authors that food of animal origin forms a certain part of tortoise diet. Fluid deficiencies can be compensated by the tortoises not only through food, but also by direct use of fresh water. Thus in late July 1981 when the temperature in the daytime in the shade was 30 to 33°C, a certain concentration of tortoises was noted near water reservoirs that had not dried out, i.e., in those places where they were practically never encountered at other times. One large specimen that was collected near a stream during drinking discharged about 50 ml of water from its mouth when turned over for measuring.

The anatomical characteristics, shape, and coloration of the carapace, the considerable body weight as compared to its carapace length, the behavior, diet, activity periods, thermoregulation, and reproductive strategies of the Mediterranean tortoise, all enable us to assume that such an adaptation complex allows it to minimize body energy requirements and to use considerable resources for reproduction, which is only possible under narrowly defined and stable environmental conditions (Bannikov, 1951; Pianka, 1981).

The interview data and our observations enable us to conclude that despite the general maintenance of its previous range limits, the total population of tortoises inhabiting the Black Sea coast of the Caucasus is declining quite rapidly. Its age and size composition described above testifies to the same effect. Even assuming that specimens of younger age groups lead a cryptic life, which is hardly probable, and are therefore not observed, and that the natural mortality from various causes is rather high in this age category, in that case the complete absence, in our random collection, of specimens with carapace lengths from 120 to 149 mm and the fact that the next two age groups (from 150 to 169 mm) are only represented by three specimens, remains unexplained (Table 2). We believe that this is caused by a complex reason - the anthropogenic effect. The anthropogenic factor will obviously extirpate this local tortoise form in a short period of time, about 10 or 15 years. Without doubt, the anthropogenic factors are interrelated, and we will consider them based on their assumed importance.

1. The chemical effects of various kinds of insecticides and other preparations that are being used now and in the past, the accumulation of which in the plants and soil has reached a critical phase for the tortoises. Besides direct mortality, they can influence the reproductive organs of adult specimens in various negative ways, causing fluctuations of mutation rate, egg shell thickness, etc. (It should be remembered that of 10 eggs laid at the Zoo that had been fertilized in the wild, 6 appeared infertile).

2. Multiple mechanical effects on the soil during agricultural periods in vineyards and gardens obviously causes death of adult specimens found there and completely destroys egg clutches, which before the use of commercial mechanized techniques in these areas succeeded perfectly in hatching. Special searches for tortoises in commercial vineyards demonstrated their complete absence there, though many authors who wrote about the Mediterranean tortoise even 15 years ago usually indicated gardens and vineyards among its habitats.

3. Considerable areas still inhabited by tortoises are located in an intensive recreation zone. At the same time, this zone is being developed in such a way and on such a scale that nothing remains of the original environment. The littering of adjacent areas, the dense network of roads and paths, abandoned construction equipment, and the increase of the temporary population in the summer by tens and hundreds as compared to the usual, are undoubtedly powerful factors that influence those tortoises which still survive in adjacent areas. The animals have low mobility, are unable to move long distances, and probably for this reason cannot produce offspring. It is known that by artificially creating unfavorable conditions for the tortoises it is possible to cause resorption of ovarian follicles (Bannikov, 1951).

4. Poaching of tortoises for sale (even Moscow children sometimes have small Mediterranean tortoises "bought in the market") and for live and prepared "souvenirs", of exactly the same size groups that were the least represented in our surveys, also affects numbers of animals in a most direct way. Undoubtedly animals consuming tortoises with the carapace still not hard enough (from raccoon-dogs to crows) exercise considerable pressure on younger age groups (with carapace lengths of up to 80 mm). For each live tortoise of this size group we found two carapaces emptied by carnivores. Adult tortoises obviously do not have any serious enemies; they are directly exterminated probably only by people. Of 74 specimens carefully studied, 7 had clear signs of severe carapacial injuries in the past (in four cases easily identified as injuries inflicted by a cutting weapon). On the contrary, external parasites (mites, *Hyaloma plumbeum*) obviously do not have any significant effect – they were found on some tortoises and usually the number was 2 to 7 mites per animal (localized in the armpit and groin hollows, rarely at the base of the neck).

5. All the above mentioned factors must have already led to the situation that the tortoises inhabiting the Black Sea coast of the Caucasus represent not a biologically integrated population, but a series of genetically isolated groupings of uneven numbers of animals that may have been discontinuous for a long time, where inbreeding is taking place without any prospects for refreshing the gene pool. This may lead to unforeseen consequences. It should be added that the sparsity of the population causes some adult females capable of breeding to remain infertile due to the lack of partners.

The present situation of the Black Sea form of the Mediterranean tortoise urges us to insistently recommend a series of urgent measures which, in our opinion, can stop these unfavorable developments.

1. Urgent establishment of a reserve at some specific site within the larger area of the Anapa, Novorossiysk, and Gelenjik forests, for the preservation of the unique local flora and fauna that no longer occupy territories as vast as these anywhere within the USSR (thus the largest part of the Mediterranean tortoise population would also be taken under secure protection).

2. Setting up a breeding station for the breeding of tortoises under controlled conditions to increase the population density in the reserve.

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