THE THREATENED EGYPTIAN TORTOISE *(TESTUDO KLEINMANNI)*: PROPOSAL FOR A RESERVE AT HOLOT AGUR (WESTERN NEGEV, ISRAEL)

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SUMMARY OF A TALK GIVEN TO THE BHS ON APRIL 19th 1990

The Egyptian tortoise *(Testudo kleinmanni)* is a small terrestrial form which is found over a very limited range, from east Libya through northern Egypt and Sinai up to the northern Negev in Israel (Flower, 1933; Iverson, 1986; Loveridge & Williams, 1957; Lortet, 1887). It is the smallest of the Mediterranean species and is in danger of extinction throughout its range, mainly because of commercial collecting in Egypt and habitat destruction in Israel (Buskirk, 1985; Mendelssohn, 1982). The main aim of the study was to obtain knowledge on distribution of the Egyptian tortoise in Israel, its spatial organization, activity pattern, population dynamics, feeding habits and reproduction, in order that necessary measures may be taken to ensure its continued survival (Geffen & Mendelssohn, 1988, 1989).

In Israel the distribution of the Egyptian tortoise is limited to sandy areas and dunes in the western Negev and to two isolated sandy valleys (Mishor Yamin and Mishor Rotem) (Fig. 1). These areas have an average yearly air temperature of 20°C, with a mean maximum of 30°C and a mean minimum of 12°C. Precipitation range is 50-200 mm annually and falls between October and March. This area is part of the Saharo-Arabian region, but milder climatic conditions occur towards the Mediterranean coast. The *Artemisia monosperma* plant association constitutes the main vegetation.

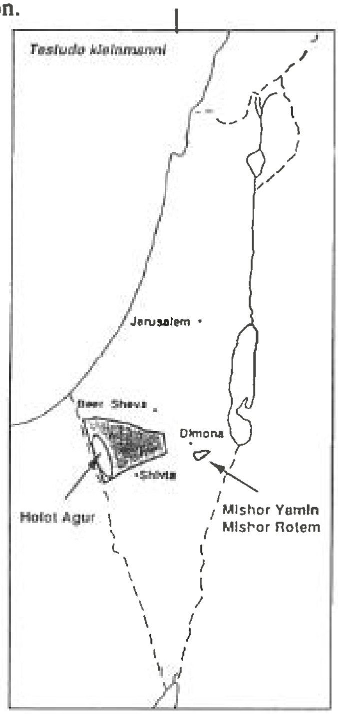

Fig. 1: Distribution map of the Egyptian tortoise in Israel. Stippled areas represent locations where individuals were observed.

Nine Egyptian tortoises were fitted with radio-transmitters and fixes from these individuals were collected 2-3 times daily. Egyptian tortoises have a well defined home range whose size varies connsiderably between individuals and sexes. Average home range size of males was 34.9 ha and of females 15.7 ha, but these were not significantly different. No correlation was found between body size or weight and size of home range. Home ranges overlapped considerably. Tortoises visited most parts of their home range during the year, but each used a much smaller area in its home range intensively. A large proportion of the home range was visited during winter and spring while in summer a very small area was used. A similar pattern was apparent in daily travel distances during the year, with largest distances travelled during winter and the shortest during summer. The daily distances travelled by males and females were significantly different; on average males travelled larger distances than females (Geffen & Mendelssohn, 1988).

Active individuals were observed mainly during winter and spring, while in summer activity was recorded only on a few occasions. Unimodal activity was observed during midwinter (December-February), and changed to a bimodal pattern towards the spring (March-April). During summer the tortoises were rarely active and only for short periods early in the morning. Active individuals at night were never observed. Most active tortoises were found at air temperatures of 21-24°C, but in much wider range of surface temperatures. Body temperature of most active individuals was within 28-32°C. In active tortoises, the correlations between air or surface temperatures and body temperatures were significant. Inactive tortoises were found all year round even under optimal activity conditions during winter and spring, when they were usually located under bushes. In summer, the tortoises were mainly found in rodent burrows. During summer, all tortoises in burrows were located at a mean distance (± SD) of 43.8±22.5 cm from the entrance and at mean depth (± SD) of 18.4±7.1 cm from the surface. Mean burrow diameter (± SD) was 10.0±9 cm. The mean burrow temperature during summer was 29.5°C±3.2. Burrow temperature and the body temperature of the occupying tortoise were significantly correlated (Geffen & Mendelssohn, 1989).

The population of tortoises in the study area consisted of 58.2% males, 26.8% females and 14.9% juveniles. Body length and weight distributions showed two main groups, one of males and the other mainly of females. The observed male female ratio was 2:1. The density of tortoises in the study area was estimated as 27 km^{-2}.

The main food of the Egyptian tortoise is annual vegetation; a few perennials are also eaten. Food items included leaves, stems and flowers. Feeding took place mainly during winter and spring (Geffen, 1985).

Mating was observed during March. Eggs were observed in the oviduct of females between March and June. Each female laid two to three clutches annually, each containing one to three eggs (usually two). The internesting period was between 20 and 30 days. Significant correlation was found between female body size and the width of eggs she was carrying. Nests were located under bushes in a shady spot. The eggs were buried 2-4 cm below the surface. The range of temperature in the nest during the incubation was 24.3-38.2°C. The water content of the sand around the eggs was low. In one nest two juveniles hatched after 70-90 days (Geffen & Mendelssohn, 1990). This type of reproduction is similar to other small and highly specialized tortoises.

The Egyptian tortoise is highly specialized for living in arid, sandy regions. Its main adaptations are small body size and ability to aestivate during the dry and hot season. Small body size not only enables this species to reach optimal body temperature rapidly during the winter (while food plants are abundant), but also allows the species to utilize available rodent burrows, thus saving energy that otherwise would have to be invested in digging its own burrows. Feeding during winter and spring has the advantage that tortoises can feed on nutritious and succulent plants, which are not available during the summer. This strategy facilitates sufficient storage of fat and water to allow aestivation through the summer, when food and water are scarce. Rodent burrows are not only the coolest place available during midday in summer, but also maintain a relatively high and stable level of humidity. This is possibly the reason why most tortoises aestivate in burrows. It appears that the drying up of the annual vegetation and the increase in ambient temperature in late spring are the main triggers for aestivation in the Egyptian tortoise.

The Egyptian tortoise in Israel, although legally protected, is threatened by habitat destruction resulting from agriculture, overgrazing and army manoeuvres. Ravens proved to be an effective predator of the Egyptian tortoise (Mendelssohn, 1982). Ravens cannot breed in a flat and treeless habitat; however, human settlements with buildings allow various predators, such as ravens, to breed in the sandy areas. Change in the status of Holot Agur (western Negev desert) from a restricted military zone to a nature reserve or a national park has been suggested. At present, this area is undisturbed due to its proximity to the Egyptian border but future plans for settlements are already in process. It is essential to make every effort to conserve this site, which is the only known location in the entire Egyptian tortoise range where a relatively dense population still occurs. Destruction of Holot Agur would probably contribute to the species' eventual extinction.

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