

# A field experiment on the selection of basking sites by *Emys orbicularis* (LINNAEUS, 1758) (Testudines: Emydidae)

Ein Feldexperiment zur Sonnentplatzwahl von *Emys orbicularis* (LINNAEUS, 1758)  
(Testudines: Emydidae)

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## KURZFASSUNG

Die Europäische Sumpfschildkröte, *Emys orbicularis* (LINNAEUS, 1758), ist eine semiaquatische Emydide, die einen beträchtlichen Anteil des Tages mit Sonnen verbringt. Sumpfschildkröten sonnen sich gewöhnlich an den Ufern von Wasserkörpern oder auf kleinen Inseln, wie sie von großen Steinen oder Baumstämmen etc. gebildet werden. Wir untersuchten, ob *E. orbicularis* einen der beiden Sonnentplatz-Typen (Ufer oder kleine Insel) bevorzugt.

Die Untersuchung erfolgte an einem künstlichen Kanal, etwa 70 km südlich von Rom (Latium, Mittelitalien). In diesem Untersuchungsgebiet zwingt das Fehlen von derartigen Inselstrukturen die Schildkröten, sich ausschließlich an den Kanalufern zu sonnen. Gemeinschaftliche Sonnentplätze wurden an einigen gut besonnten Stellen festgestellt.

Im Verlauf des Experimentes wurden drei künstliche Inseln in der Nähe dieser Gemeinschafts-Sonntplätze installiert. Die Sumpfschildkröten bevorzugten deutlich diese kleinen Inseln gegenüber dem Kanalufer als Sonnentplatz. Wir vermuten, daß das Sonnen auf kleinen Inseln den Sicherheitsansprüchen der Schildkröten in bezug auf Freßfeinde vom Lande (z. B. Wanderratte - *Rattus norvegicus*) besser genügt als das Sonnen am Gewässerufer. Doch können andere Hypothesen beim derzeitigen Wissensstand nicht verworfen werden.

## ABSTRACT

The European Pond Terrapin, *Emys orbicularis* (LINNAEUS, 1758), is a semi-aquatic emydid that spends a considerable part of its time basking. Pond terrapins usually bask on the banks of water bodies or on small 'islets' like large stones, tree trunks etc., emerging from the water. We tested whether a certain type of basking site (bank or 'islet') is preferred significantly by this terrapin species.

The study was performed at an artificial channel situated about 70 km south of Rome (Latium, central Italy). In this study area lack of emerging 'islets' constrains the animals to bask exclusively on the channel shores. Communal basking was observed in some spots well exposed to the sun.

In the course of the experiment, three artificial 'islets' were installed close to these communal basking sites. The pond terrapins clearly preferred these 'islets' as basking sites rather than the channel shores. We suggest that basking on 'islets' may better meet the terrapins' need of security from predators on the banks, such as the Brown Rat (*Rattus norvegicus*). Other hypotheses, however, cannot be rejected at the actual state of knowledge.

## KEYWORDS

*Emys orbicularis*; ethology, behaviour, thermoregulation, basking site selection; Italy

## INTRODUCTION

Most emydid terrapins are semi-aquatic and spend a considerable part of their active period on land (GIBBONS 1970; GIBBONS & al. 1983; MORREALE & al. 1984). The European Pond Terrapin, *Emys orbicularis* (LINNAEUS, 1758), shows long periods of terrestrial activity, e. g. when its aquatic habitats are dried out in summer (NAULLEAU 1991, 1992). In places where they are not affec-

ted by aestival desiccation, most of the European Pond Terrapins do not aestivate, but maintain their primarily aquatic life.

In its aquatic phase, *E. orbicularis* spends much time basking, predominantly in the morning (BRUNO 1981). Aggregations of thermoregulating turtles on communal basking sites are typical. These basking sites are well insulated open spots in close vicinity to the water body inhabited.

Basking individuals can be found on the banks as well as on 'islets' emerging from the water (e. g. large stones and trunks of trees). Field observations made us suspect that these semi-aquatic chelonians prefer

structures emerging from the water for basking rather than suitable spots on the banks. The goal of the present study was to test this hypothesis.

## MATERIALS AND METHODS

The study was carried out at an artificial channel situated near Latina, about 70 km south of Rome ('Canale Cicerchia', Latium, central Italy, about 10 m a. s. l., 41°25' N, 12°56' E). In this area the European Pond Terrapins are common along the artificial channels and ponds originating from extensive land drainage.

A transect along the channel, 250 m long, was selected because of the abundance of *Emys*, and the favourable structural characteristics permitting easy observation. In this section the mean water depth of the channel is about 120 cm and the mean width of its bed is between 8 and 10 m. The channel is characterized by its muddy bottom and rich vegetation (reeds and *Rubus ulmifolius* bushes) along the banks. On both sides of the channel, observation tracks through the vegetation were established in a way that the terrapins were not disturbed by the researchers' ob-

servations. In the year 1994 the transect was inspected three times per day on March 21st and 22nd when no basking 'islets' were present, and again on April 24th, 26th, and 30th, about one month after the installation of basking 'islets'. The first inspection (period I in the following text and in table 1) began at 09.30 a. m., the second (period II) at 0.30 p. m., and the third (period III) at 3.30 p. m. (European standard time). The total number of observations of adult and juvenile terrapins respectively was recorded for each observation day and period.

The statistical analyses (see chapter 'Results and Discussion' were performed by a microcomputer package (SAS - Statistical Analysis System, version 6.0, SAS Institute, 1985), all tests being two tailed with  $\alpha = 0.05$ . For the choice of the statistical tests, we generally followed recommendations of SOKAL & ROHLF (1969).

## RESULTS AND DISCUSSION

The numbers of observations of basking turtles are summarized in table 1. During the study period, a total of 222 observations was made, 39 (17.5%) in observation period I, 153 (68.9%) in period II, and 30 (13.6%) in period III. The number of observations was significantly higher in period II (0.30 p. m.) than in period I ( $\chi^2 = 33.84$ ,  $df = 1$ ,  $p < 0.0001$ ), and period III ( $\chi^2 = 62.72$ ,  $df = 1$ ,  $p < 0.00001$ ), respectively. On the other hand, there were no significant numerical differences between periods I and III ( $\chi^2 = 0.58$ ,  $df = 1$ ,  $p > 0.5$ ).

On March 21st and 22nd, basking was restricted to the river banks since there were no 'islets' available for basking. Forty-four observations of basking adults

and four of young terrapins were made on March 21st, and 34 of adults on March 22nd. Three communal basking sites were formed in which more than 90% of the observations of basking terrapins were made on both days.

After this, three artificial basking spots were placed in the midline of the channel, close to the three communal basking sites. These artificial basking spots (a large trunk, a pile of dried reed, and a tyre) were anchored in a way that they could not be removed by the slow channel current. The study transect was visited again on April 24th, 26th, and 30th, and the number of observations of terrapins found in the artificial basking spots as well as on the channel shores was recorded in

Table 1: Number of observations of adult and juvenile *Emys orbicularis* (LINNAEUS, 1758) basking on the channel shores and on the artificial 'islets' respectively, during the research period.

Tab. 1: Anzahl der Beobachtungen von sich am Kanalufer bzw. auf künstlichen Inseln sonnenden adulten und juvenilen *Emys orbicularis* (LINNAEUS, 1758) an den Untersuchungstagen.

Date/ Datum	Period/ Periode	Channel shores/ Kanalufer		artificial 'islets'/ künstliche Inseln	
		Adults/ Adulte	Juveniles/ Juvenile	Adults/ Adulte	Juveniles/ Juvenile
21. 03. 94	I	6	0	-	-
	II	26	3	-	-
	III	8	1	-	-
22. 03. 94	I	4	0	-	-
	II	28	0	-	-
	III	2	0	-	-
24. 04. 94	I	0	0	7	0
	II	3	1	24	2
	III	0	0	3	0
26. 04. 94	I	1	0	9	0
	II	1	0	21	2
	III	0	0	8	0
30. 04. 94	I	0	0	12	0
	II	3	2	31	6
	III	0	0	8	0

the same way as it was done in March (table 1).

When the 'islets' were installed, the tortoises selected these artificial sites for basking rather than the channel shores. This type of basking site selection did not vary significantly in the three days of observation: the proportion of observations of basking turtles on the 'islets' was 90% on April 24th, 95.2% on April 26th, and 91.9% on April 30th. In all these days, the number of observations of basking terrapins on the channel shores was significantly lower than that on the 'islets' ( $\chi^2$  test, 2 x 2 contingency tables;  $p < 0.0001$  to  $p < 0.00001$ ), though only about 30 days had elapsed since the introduction of the artificial basking places. The small number of observations of young specimens ( $n = 13$ ) impedes to draw firm conclusions on the basking site selection of juvenile terrapins. However, it is notable that, when the 'islet' was optional, about 84% of the observations of juveniles fell to the 'islets'. Considering all data obtained in April, the proportion of observations of terrapins basking on the 'islets' was 96.5% ( $n = 29$ ) in period I, 89.6% ( $n = 96$ ) in period II, and 100% ( $n = 19$ ) in period III. Thus, the preference of *E. orbicularis* for bask-

ing off the channel banks was clearly expressed in all three periods of the day, demonstrating that the terrapins' choice was independent from the day-time.

This preliminary study provides evidence (1) of a unimodal daily basking pattern in *E. orbicularis* (with the single peak in the central day-light hours), and (2) of a strong preference of 'islets' rather than channel shores by the basking terrapins.

Regarding item (1), this pattern may change depending on the season, since the circadian activity of many Mediterranean reptiles tends to be two-peaked in summer (CAPULA & al. 1993). Regarding item (2), it must be stressed that the preference of 'islets' may change depending on season but also on developmental stage of vegetation (comp. SNIESHKUS 1994).

As far as item (2) is concerned, we cannot prove whether this mode of basking site selection is widespread in natural populations of this species, or if it is influenced by local factors. We formulate two hypotheses (not excluding one another) about the reasons causing this type of basking site selection in the studied population of *E. orbicularis*. First, we suggest that the strong preference of 'islets' better meets the need of security

from predators on the channel banks, namely the Brown Rat (*Rattus norvegicus*) which is known as a natural predator of *E. orbicularis* (BRUNO 1981; MAZZOTTI & STAGNI 1993; LUISELLI & RUGIERO unpublished), and is extremely common in the study area. As an alternative hypothesis, we suggest that 'islets' are better exposed to the sun than the channel shores, permitting a longer daily basking period. Both hypotheses need to be tested before one can draw firm con-

clusions. A rather similar pattern of basking site selection can be seen also in the Red-eared Slider Turtle (*Trachemys scripta*) introduced to artificial ponds of urban parks of Rome ('Villa Borghese' and 'Villa Pamphilj'). Thus, it is likely that such behaviour is rather widespread among semi-aquatic emydids. However, if further studies will confirm our preliminary results, it is to be hoped that they will be taken into account in conservation measures for these and closely related chelonians.

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