

*Chelonian Conservation and Biology*, 2001, 4(1):160–161  
© 2001 by Chelonian Research Foundation

## Surface Ultrastructure and Retention of the Egg Caruncle in the European Pond Turtle, *Emys orbicularis*

SŁAWOMIR MITRUS<sup>1,2</sup>

<sup>1</sup>Department of Comparative Anatomy, Institute of Zoology,  
Jagiellonian University, Ingardena 6, 30-060 Kraków, Poland;

<sup>2</sup>Present Address: Department of Ecosystem Studies,  
Institute of Environmental Sciences, Jagiellonian University,  
Gronostajowa 3, 30-387 Kraków, Poland  
[E-mail: mitrus@eko.uj.edu.pl]

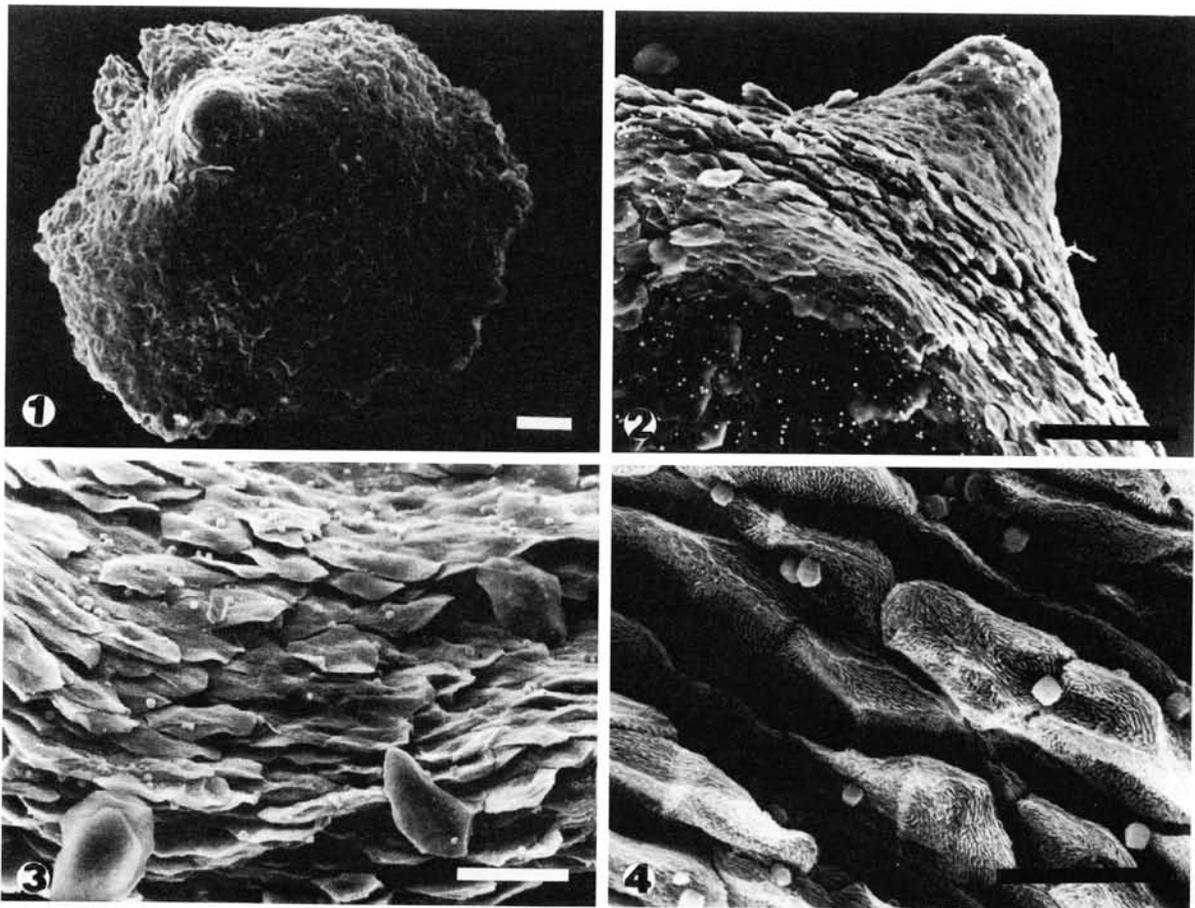
The egg caruncle is a structure characteristic of turtles, crocodylians, and tuataras (Edmund, 1969; Moll and Legler, 1971). It is analogous but not homologous to the egg tooth of lizards and snakes (Edmund, 1969; Moll and Legler, 1971). The caruncle is a sharp tubercle on the tip of the upper tomium, which serves to rupture embryonic membranes and the eggshell during hatching (Edmund, 1969; Márquez, 1990). Different species of turtles may or may not use the

caruncle during the hatching process (Moll and Legler, 1971). The European pond turtle, *Emys orbicularis*, opens the eggshell using both the forelimbs and the caruncle (Obst, 1986; *pers. obs.*). In cheloniid turtles the egg caruncle usually falls off 4–6 weeks after hatching (Márquez, 1990).

In spite of the well-known presence of the caruncle, little information is available on its structure and duration. The following observations on the egg caruncle on *Emys orbicularis* provide some details on these aspects.

**Methods.** — Hatchlings and eggs of the European pond turtle were collected on 5–6 September 1997 and 11 September 1998 after natural incubation. Neonates were raised in aquariums (water at 20°C, filtered without chemicals, fed ad libitum). In 1997 I filtered water from the aquariums every 2–3 days and searched for shed caruncles using a magnifying glass. The caruncles were air-dried, coated with carbon and gold, and examined under a JSM-5410 scanning electron microscope operated at accelerating voltages of 20 kV.

**Results and Discussion.** — The egg caruncle of the European pond turtle is composed of well differentiated cells (Figs. 1–4). The cells are flat and their surface is covered with long, low wrinkles in microdermatoglyphic



**Figure 1.** Scanning electronmicrograph (SEM) of the surface ultrastructure of the egg caruncle of *Emys orbicularis*; bar 100  $\mu$ m. **Figure 2.** General view of the top of an egg caruncle of *Emys orbicularis*; bar 100  $\mu$ m. **Figure 3.** Delaminating cells on the lower part of the caruncle; bar 50  $\mu$ m. **Figure 4.** Close-up of cells on the caruncle surface showing coating of cubic crystallites; bar 10  $\mu$ m.

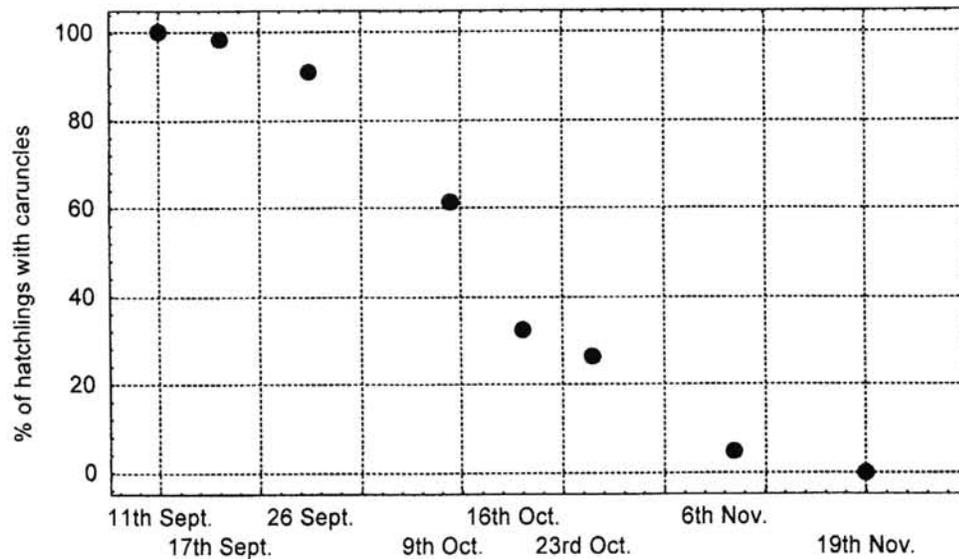


Figure 5. Per cent of *Emys orbicularis* hatchlings with retained egg caruncles (48 hatched 11 September 1998, 17 hatched 23 September).

patterns. On the surface of the caruncle there are numerous cubic crystallites (Fig. 4). These may be residuals of the gelatinous sheath that Ewert (1989) noted covering the caruncle and other sharp-tipped features of hatchlings just prior to hatching.

Delamination of cells is easily visible (Fig. 3), and this may be a stage in the natural process of shedding of the caruncle. However, it could also be an artefact caused by the air-drying preparation technique or the effect of exposure to the water – some of caruncles were in water as long as 3 days after falling off.

In *Emys*, the caruncles fall off several weeks after hatching. In 1997, turtles hatched from 5 September to 2 October, and 62 of 202 turtles had lost their caruncles by 15 October; on 12 November only 35 still had caruncles. By December 13 only one turtle retained its caruncle and this was lost some days later.

On 11 September 1998, 48 hatchlings and 89 eggs were collected from 9 nest chambers. From the collected eggs 17 turtles hatched by 23 September. On 17 September, 62 of 63 turtles had their caruncles; on 26 September, 59 of 65; on 9 October, 40 of 65; on 23 October, 17 of 65; and on 6 November, only 3 of 65 still had caruncles. By 19 November all caruncles had been lost (Fig. 5).

Thus, at about 20°C, the turtle may retain its caruncle for 10 weeks or more. If hatchlings spend their first winter on land, the caruncle is still present the following spring; two dead individuals found in the field on 25 April and 1 May 1995, after overwintering on land (Mitrus and Zemanek, 1998) still had their caruncles. Four live hatchlings found emerging from their nest 28 March 1999 (oviposition 31 May 1998), and 8 dead hatchlings in the nest, had intact caruncles. Two of the four hatchlings died. Both of the surviving turtles were placed in the aquarium and lost their caruncles by 7 April. Eight of 9 live hatchlings found 2–16 April 1999 (after overwintering) also had intact caruncles (*pers. obs.*; M. Zemanek, *pers. comm.*).

In captivity the turtles immediately started to eat and grow (Mitrus and Zemanek, 2000). The ones overwintering in nest chambers do not grow, so I hypothesize that the loss of caruncles is a result of growth of the underlying normal skin cells.

*Acknowledgments.* — I wish to thank J. Faber for technical help in the SEM laboratory and K. Zuwala for her assistance. I would like to thank the reviewers for helpful suggestions to the manuscript.

#### LITERATURE CITED

- EDMUND, A.G. 1969. Dentition. In: Gans, C., Bellairs, A.d'A., and Parsons, T.S. (Eds.). *Biology of the Reptilia*. Vol. 1, London and New York: Academic Press, pp. 117-200.
- EWERT, M.A. 1989. The embryo and its egg: development and natural history. In: Harless, M. and Morlock, H. (Eds.). *Turtles: Perspectives and Research*. Malabar, Florida: John Wiley and Sons, pp. 333-413.
- MÁRQUEZ M., R. 1990. Sea turtles of the world. An annotated and illustrated catalogue of sea turtle species known to date. FAO Fish. Synops. 11(125):1-81.
- MITRUS, S. AND ZEMANEK, M. 1998. Reproduction of *Emys orbicularis* (L.) in central Poland. In: Fritz, U., Joger, U., Podlousky, R., and Servan, J. (Eds.). *Proceedings of the EMYS Symposium Dresden 96*. Mertensiella 10:187-192.
- MITRUS, S. AND ZEMANEK, M. 2000. The growth rate of the turtle *Emys orbicularis* (L.) juvenile in breeding. *Proceedings of 2nd International Symposium on Emys orbicularis*. Editions Soptom. Chelonii 2:41-45.
- MOLL, E.O. AND LEGLER, J.M. 1971. The life history of a neotropical slider turtle, *Pseudemys scripta* (Schoepff) in Panama. *Bull. Los Angeles Co. Mus. Nat. Hist. (Sci.)* 11:1-102.
- OBST, F.J. 1986. *Turtles, Tortoises and Terrapins*. Druckerei Fortschritt Erfurt, Leipzig, 231 pp.

Received: 30 July 1999

Reviewed: 7 February 2001

Revised and Accepted: 4 April 2001