

Embryonic staging of the Green Turtle, *Chelonia mydas* (Linnaeus, 1758)

(Reptilia: Cheloniidae)

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Abstract. Nineteen embryonic stages of the Green Turtle, *Chelonia mydas* (Linnaeus, 1758), were described between day 6 and hatching (52 days). Eggs were collected at random from fresh nests approximately 10-12 hours post oviposition. The eggs were placed in a precision incubator adjusted to a narrow temperature range ($30\pm 0.05^{\circ}\text{C}$). Fundamental development occurred between stages 1-4 with the appearance of the optic cup, otic vesicle, heart, pharyngeal clefts, tail bud and rapid differentiation of the brain. In stages 5-9, there was a significant increase in body size and further differentiation of the brain regions. The carapace and plastron began to appear with plates and scutes. The lens of each eye was large with a pigmented iris; eyelids were present. The paddle-shaped limbs appeared with further development of digits. Pigmentation gradually began to spread over the entire body. In stages 10-19, there was a gradual increase in the size and form of different areas in the head region. The pigmentation was more intense, particularly in the head, neck, carapace and limbs. There was a steady increase in skin thickness with wrinkling and folding, especially in the head, neck and limbs. The limbs exhibited rapid differentiation leading to the formation of flippers with claws. The carapace and plastron, with their plates and scutes, were rapidly taking their final form. The yolk sac began to recede into the abdominal cavity. At hatching, the embryo still maintained an umbilical swelling which disappeared 48 hours later. The pipping stage lasted over 30 hours, with the embryo leaving the egg afterwards. The staging patterns from this investigation will be used as a model to be compared with the staging pattern under natural incubation for the Green Turtle at Ras Al-Hadd.

Key words. *Chelonia mydas*, Green Turtle, Arabian sea, staging, embryos, Ras Al-Hadd, Oman.

Introduction

Green Turtles (*Chelonia mydas* (Linnaeus, 1758)) are widespread in tropical and temperate waters of the world (HIRTH 1997). The coastal regions of Oman, Arabian Gulf and Yemen host one of the largest populations of Green Turtles in the world (ROSS & BARWANI 1982, GASPERETTI et al 1993).

At oviposition, the embryos of turtles are generally at middle gastrulation (MILLER 1985, EWERT 1985, ANDREWS et al. 2008, HEWAVISENTHI & PARMENTER 2002) to late gastrula (YNTEMA 1968, MAHMOUD et al. 1973, RISLEY 1933, 1944, GOODE & RUSSELL 1968). The embryos resume their development after oviposition. Successful embryonic development under natural conditions requires proper temperature, humidity, loose sand, low salinity and sufficient exchange of respiratory gases (MILLER 1985, 1997).

Laboratory incubators function as a microclimate for natural nest conditions, which depend on the interaction among the physical characteristics such as the required temperature,