Embryological development of sea turtles
(*Chelonia mydas*, *Caretta caretta*) in the Mediterranean

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Abstract: Simple embryonic staging of Mediterranean sea turtles was developed after measuring a set of selected morphological characteristics. The frequency of gross abnormalities among the samples was also calculated. The most common abnormalities were supernumerary and subnumerary scutes, albinos, head and jaw abnormalities and twinning.

Kurzfassung: Die Stadien der Embryonalentwicklung von mediterranen Meeresschildkröten wurden mit einem Set ausgewählter morphologischer Merkmale erfasst. Die Häufigkeit von morphologischen Abnormalitäten wurde in den Stichproben ermittelt: überzählige bzw. fehlende Schilder, Albinismus, Unregelmäßigkeiten an den Krallen und Zwillinge waren die häufigsten Abnormalitäten.

Key words: Marine turtles, Mediterranean, *Chelonia mydas*, *Caretta caretta*, embryonic development, Loggerhead Turtle, Green Turtle.

Introduction

Few studies are available on the embryonic development of sea turtles (AGASSIZ 1857, PARKER 1880, DERENIYAGALA 1939, PENYAPOL 1958, FUJIWARA 1966, DOMANTAY 1968, CRASTZ 1982). More recently the study of MILLER (1985) gave a stage-by-stage description of sea turtle development using samples from Australia. Although marine turtles have been considered to a certain extent in most studies of turtle development, the emphasis has always been on more accessible non-marine turtles. In 1857, AGASSIZ compared the development of several species of turtles including terrestrial, freshwater and one marine species. This work has remained definitive because embryonic descriptions are complete for only two species, *Chelydra s. serpentina* (YNTEMA 1968) and *Chrysemys picta belli* (MAHMOUD et al. 1973), both of which were studied by AGASSIZ. CRASTZ (1982) described 31 stages for *Lepidochelys olivacea*, and MILLER (1985) described the embryonic development of six marine turtle species. Embryonic staging alone contributes little to the understanding of a species or to its survival, but in the context of other studies on management problems and the effects of human intervention, basic embryological information can remove some of the guesswork from decision making.

   The success of a clutch of turtle eggs depends upon the interaction of a number of factors, such as salinity, humidity, temperature, gas flow, rainfall, tidal inundation, erosion and predation (HENDRICKSON 1958, BUSTARD & GREENHAM 1968, PRANGE & ACKERMAN 1974, ACKERMAN 1980, MROSOVSKY 1980). In conservation efforts, improper handling of eggs during movement to hatcheries may increase mortality (LIMPUS et al. 1979, BLANCK & SAWYER 1981).