Female-biased primary sex ratio of the Green Turtle, C*helonia mydas*, estimated through sand temperatures at Akyatan, Turkey

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Abstract: Subsurface sand temperatures were recorded at nest depth at Akyatan, the main nesting beach of *Chelonia mydas* in the Mediterranean Sea, and correlated with spatio-temporal nest distribution. This was to estimate primary sex ratio, which is dependent on the temperature of the environment of the eggs. On the basis of these data, the likelihood of metabolic warming during the thermosensitive period, and the pivotal temperature of *C. mydas* estimated from another Mediterranean nesting site (Cyprus), it is concluded that a majority of females is produced in the study area. This conclusion is also supported by data on incubation periods.

Kurzfassung: In Akyatan, dem bedeutendsten Niststrand der Suppenschildkröte, *Chelonia mydas*, im Mittelmeer, wurde die Temperatur des Sandes unter der Oberfläche in Tiefe der Nester untersucht, und mit der räumlich-zeitlichen Nestverteilung korreliert. Damit sollte das primäre Geschlechtsverhältnis ermittelt werden, das von der Umgebungstemperatur der Eier abhängt. Aufgrund dieser Daten sowie aufgrund der Wahrscheinlichkeit der Erwärmung in der thermosensitiven Phase und aufgrund des kritischen Temperaturpunktes von *C. mydas*, der in einem anderen Nistgebiet im Mittelmeer (Zypern) ermittelt wurde, wird geschlossen, dass im Untersuchungsgebiet überwiegend Weibchen produziert werden. Diese Schlussfolgerung wird auch durch Daten zur Inkubationszeit weiter unterstützt.

Key words: *Chelonia mydas,* sea turtle, Turkey, primary sex ratio, sand temperature, Middle East.

Introduction

Sea turtles are threatened worldwide by several human activities, of which reduction of nesting sites, accidental fishing, pollution, and trade are the most significant. However, an additional, less obvious factor may become an important threat as well: the possible human impact on sex ratio. In fact, the sex of sea turtles, like that of many other reptiles, depends on incubation temperature (DALRYMPLE et al. 1985, MCCOY et al. 1983, MILLER & LIMPUS 1981, RIMBLOT et al. 1985, SHAVER et al. 1988, YNTEMA & MROSOVSKY 1980). Our limited knowledge of sex ratio dynamics in these species makes it difficult at present to understand the effects of sex ratio manipulation (LOVICH 1996). It is therefore impossible to assess the consequences of possible accidental sex ratio manipulations or intentionally to produce a certain sex ratio as a conservation tool.

Because the sand temperature of a nesting beach varies spatially and temporally during the nesting season, different sex ratios are produced in different zones and periods (MROSOVSKY et al. 1984, SPOTILA et al. 1987). Hence, the transplantation of nests into one or a few hatch-

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