Naturalista sicil., S. IV, XLVI (1), 2022, pp. 449-452

DOI: https://doi.org/10.5281/zenodo.6790691

Marco A.L. Zuffi, Luna Bollaro, Cecilia Mancusi, Letizia Marsili, Toni Mingozzi, Giovanni Raimondi, Giuliana Terracciano, Chiara Caruso, Laura Tonelli & Lucia Venturi

BIOMETRICAL VARIABILITY AND FLIPPERS ASYMMETRIES IN EMBRYOS OF THE LOGGERHEAD TURTLE *CARETTA CARETTA* FROM TUSCANIAN AND CALABRIAN NESTS

SUMMARY

We analyzed 532 dead embryos, sampled in Tuscany and Calabria (from eight and 107 nests, respectively). Carapace data were used to estimate the developing stage. Embryos stages ranged from 26 to 31b in both regions, stages 29-31b were more abundant in Calabria. Calabrian embryos were significantly larger than Tuscanian ones. Left *vs* right fore flippers length varied significantly, left flipper being longer than right flipper. Asymmetry did not differ between the two regions.

Key-words: *Caretta caretta*, embryo size, flippers asymmetry, Tuscany, Calabria.

RIASSUNTO

Variabilità dimensionale e asimmetrie delle pinne anteriori in embrioni di tartaruga marina Caretta caretta *di nidi toscani e calabresi.* Abbiamo analizzato 532 embrioni morti (relativi a otto nidi di Toscana e 107 di Calabria). Le misure del carapace sono state utilizzate per stimare lo stadio di sviluppo. Gli stadi variano da 26 a 31b in entrambe le regioni, ma gli stadi 29-31b appaiono più abbondanti in Calabria. Gli embrioni calabresi sono significativamente più grandi di quelli toscani. Le pinne anteriori sinistra e destra differiscono, le sinistre in media di maggiori dimensioni. Le asimmetrie non variano tra le due regioni.

Parole-chiave: *Caretta caretta*, dimensioni embrioni, asimmetrie pinne, Toscana, Calabria.

Introduction

Loggerhead sea turtle *Caretta caretta* nesting in Calabria (Southern Italy)

has long been documented (MINGOZZI *et al.*, 2007), while nesting along the Northern Tyrrhenian coast (Tuscany) has started in recent years (MANCUSI *et al.*, 2018).

Analysis of nests, after emergence, provided the opportunity to measure embryos of unhatched eggs, dead pipped and dead hatchlings, stages little studied in this species (see MILLER *et al.*, 2017). This research has been aimed at providing first descriptive data on some Italian nests.

MATERIALS AND METHODS

We analyzed unhatched eggs, dead hatchlings, dead pipped. Nests were from Tuscany (2018-2020, n=8), and from Calabria (2004-2014, n=168). We used standard measurements as those found in MILLER *et al.* (2017). We also estimated the embryo stage with carapace length (n=532 embryos). Flippers of dead Calabrian embryos were often lacking, due to previous cut for DNA sampling, thus sample size is reduced to specimens bearing both fore flippers (98 from Tuscany, 176 from Calabria). We used an analogical caliper at 0.1 mm precision. Non parametric and parametric statistics were used (SPSS 20.0 release).

RESULTS

The average carapace length of embryos was 28.7 ± 7.03 mm (n=102, Tuscany) and 35.43±3.77mm (n=430, Calabria), and significantly different between the areas (Student t test=-13.345, df 530, p<0.0001). Estimated embryo stages ranged from 26 to 31b in both areas. Frequency distribution was similar in Tuscany, while older stages (e.g.:29-31b) were more frequent in Calabria (^{2}=147.021, df 6, p<0.0001). Asymmetry was significant (Student t test=-0.495, df 269, p=0.621), with left flippers longer than right ones, but with no region effect (Tuscany 54 *vs* 42; Calabria 104 vs 67).

DISCUSSION

Data on embryonic size of natural (not incubated) nests are quite rare, and information are still particularly scarce especially in the Mediterranean region. Larger difference in size of Calabrian embryos correlate with the recorded advanced developing stage. It is logical to hypothesize an earlier mortality in Tuscany and a different developing success, higher in Calabria,

despite a in depth thermal profile of each nest is not still available. Recorded front flipper asymmetry is a pattern already found in adult marine turtles (CASALE *et al.*, 2017).

REFERENCES

CASALE P., FREGGI D., RIGOLI A., CICCOCIOPPO A. & LUSCHI P., 2017. Geometric morphometrics, scute patterns and biometrics of loggerhead turtles (*Caretta caretta*) in the central Mediterranean. *Amphibia-Reptilia*, 38: 145–156.

MANCUSI C., BAINI M., CARUSO C., CIANCHI F., D'APOLITO N., MAGLIOCCO T., MARSILI L., PAPETTI L., MANCINO C., SENESE M., SOMMER M., TERRACCIANO G., VENTRELLA S. & VENTURI L., 2018. First documented nestings of *Caretta caretta* in Tuscany area (North Western Mediterranean sea), the northern site in Italy. Pp. 297–301 in: Benincasa F. (ed.), 7th International Symposium: monitoring of Mediterranean coastal areas. Problems and measurement techniques. Firenze University Press.

MILLER J.D., MORTIMER J.A. & LIMPUS, C.J., 2017. A Field Key to the developmental stages of marine turtles (Cheloniidae) with notes on the development of *Dermochelys*. *Chelonian Conserv. & Biology*, 16: 111–122.

MINGOZZI A., MASCIARI G., PAOLILLO G., PISANI B., RUSSO M. & MASSOLO A., 2007. Discovery of a regular nesting area of loggerhead turtle *Caretta caretta* in southern Italy: a new perspective for national conservation. *Biodiversity and Conserv. Europe*, 16: 3519–3541.

Address of authors. – M. ZUFFI, L. BOLLARO, Museo di Storia Naturale, Università di Pisa, via Roma, 79 - 56011 Calci (Pisa, I); C. MANCUSI, ARPAT - Settore Mare Via Marradi, 114 - 57126 Livorno (I); C. MANCUSI, L. MARSILI, Dipartimento di Scienze Fisiche, della Terra e dell'Ambiente, Università di Siena, via Mattioli, 4 - 53100 Siena (I); T. MINGOZZI, Dipartimento di Biologia, Ecologia e Scienze della Terra, Università della Calabria, P.te P. Bucci, Cubo 4/B - 87030 Rende (Cosenza, I); G. RAIMONDI, Acquario di Livorno, Costa Edutainment, piazza Mascagni, 1 - 57127 Livorno (I); G. TERRACCIANO, Istituto Zooprofilattico Sperimentale Lazio Toscana, S.S. dell'Abetone e del Brennero, 4 - 56123 Pisa (I); C. CARUSO, Acquario di Talamone (Parco Regionale della Maremma), via Nizza, 20 - 58010 Talamone (Grosseto, I); L. TONELLI, L. VENTURI, Parco Regionale della Maremma, via del Bersagliere, 7/9 - 58100 Alberese (Grosseto, I).