



CARETTA CARETTA (Loggerhead Sea Turtle). HYBRIDIZATION IN THE MEDITERRANEAN. Hybridization among marine turtle species was first suggested by Garman 1888 (Bull. Essex Inst. 20:1–13) between *Caretta caretta* and *Eretmochelys imbricata* (Hawksbill Sea Turtle) in the Caribbean. Almost one century later, hybrids between *C. caretta* and *E. imbricata* were described, based on morphological features, in Japan and

FIG. 1. Photos of putative hybrid specimen (*Caretta caretta* × *Eretmochelys imbricata*) showing: (a) general appearance, carapace outline, number of carapace scutes, anterior costal scutes not in contact with nuchal scute, serration of marginal scutes; (b) prefrontal scales; (c) inframarginal scutes, color of plastron, serration of marginal scutes.

TABLE 1. Main morphological characters of *Caretta caretta*, putative hybrid, and *Chelonia mydas*.

Character	<i>Ca. caretta</i>	Hybrid	<i>Ch. mydas</i>
Prefrontal scales	2 pairs	2 pairs	1 pair
Costal scutes (left-right)	5-5	4-4	4-4
Inframarginal scutes (left-right)	3-3	4-4	4-4
Anterior costal scutes in contact with nuchal scute?	yes	no	no
Second claw on front flippers?	yes	no	no
Carapace outline	heart-shaped	heart-shaped	oval
Serration of marginal scutes	yes	yes	no
Plastron color	yellow	creamy-white	creamy-white

China (Kamezaki 1983. *Jpn. J. Herpetol* 10:52–53; Frazier 1988. *Sanctuary [Asia]* 8:15–23). Natural hybridization between *C. caretta* and *E. imbricata* as well as between *Chelonia mydas* (Green Sea Turtle) and *E. imbricata* were identified in the southwestern Atlantic using protein electrophoresis (Wood et al. 1983. *Copeia* 1983:839–842; Conceição et al. 1990. *Comp. Biochem. Physiol.* 98B:275–278). With the advent of genetic assays, hybridization among various genera of Cheloniidae was confirmed in the Atlantic (Karl et al. 1995. *J. Hered.* 86:262–268; James et al. 2004. *Can. Field. Nat.* 118:579–582) as well as in the Pacific (Kamezaki et al. 1996. *Umigame Newsl.* 30:7–9; Seminoff et al. 2003. *Bull. Mar. Sci.* 73:643–652). The highest reported frequency of interspecific hybrid combinations in marine turtles occurs between *C. caretta* and *E. imbricata* in Brazil where about 42% of nesting females with *E. imbricata* phenotype are actually hybrids with *C. caretta* (Lara-Ruiz et al. 2006. *Conserv. Genet.* 7:773–781). Nevertheless, outside Brazil, reports of natural hybridization are very limited. As far as it can be ascertained no marine turtle hybrids have been recorded in the Mediterranean, although in this virtually enclosed basin breeding populations of *C. caretta* and *Chelonia mydas* are numerous and present restricted gene flow with those in the Atlantic (Casale and Margaritoulis 2010. *Sea Turtles in the Mediterranean: Distribution, Threats and Conservation Priorities*. IUCN, Gland, Switzerland. 294 pp.).

ARCHELON, the Sea Turtle Protection Society of Greece, has operated since 1992 a nationwide Sea Turtle Stranding Network, which reports injured and dead turtles found along the Greek coastline. Members of the network are Coast Guard officers, local NGOs, and concerned citizens. In case of a stranded dead turtle, network members visit the stranding location, observe the condition of the turtle, record carapace measurements, undertake a basic external examination to determine cause of death, photograph the specimen, and organize its disposal. In case of an injured turtle, network members arrange for its transportation to ARCHELON Sea Turtle Rescue Centre in Glyfada, close to Athens.

On 12 September 2013, a recently dead juvenile sea turtle was reported to the Stranding Network from Paros Island, Cyclades, Greece (precise location: Chryssi Akti 37.0103°, 25.2400°; WGS 84). The specimen was measured (straight carapace length [SCL] of 28 cm, straight carapace width [SCW] of 24 cm) and photographed by the local Coast Guard officers and taken for burial by the local municipality. The exact site of burial was

not recorded and tissue samples for genetic analysis were not collected. However, from the acquired photographs (Fig. 1), although superficially resembling a *C. caretta*, the turtle exhibits several morphological characters belonging to *C. mydas* (Table 1). Furthermore, although the size of the head in comparison to body size resembles *C. mydas*, its shape is more similar to that of *C. caretta*.

The intermediate morphological characters of the examined juvenile specimen suggest that it could be a hybrid between a *C. caretta* and a *C. mydas*, and would thus be the first hybrid sea turtle recorded in the Mediterranean.

Both species reproduce in the eastern Mediterranean, featuring the same breeding seasonality and same nesting beaches in the Levantine Basin (e.g., Turkey, Cyprus, Syria, Israel, Lebanon) (Casale and Margaritoulis 2010, *op. cit.*), with ample opportunities for inter-specific mating. In the Mediterranean, it is estimated that annually about 7200 *C. caretta* and 1600 *C. mydas* nests are laid (Casale and Margaritoulis 2010, *op. cit.*). Further, severe exploitation most of *C. mydas* occurred in the Levantine Basin, where both species coexist, from about the 1920s until the 1970s (Sella 1982. *In* Bjorndal [ed.], *Biology and Conservation of Sea Turtles*, pp. 417–423. Smithsonian Institution Press, Washington, DC). The above differences and decreases in population sizes may imply potential hybridization.

In Greece, although *C. caretta* is the most abundant sea turtle species, *C. mydas* are not uncommon. From a total of 226 injured turtles admitted to the ARCHELON Sea Turtle Rescue Centre from Greek coasts, 3.5% have been identified as *C. mydas* (Panagopoulos et al. 2003. *In* Margaritoulis and Demetropoulos [eds.], *Proceedings of the First Mediterranean Conference on Marine Turtles*, pp. 202–206. Barcelona Convention - Bern Convention - Bonn Convention [CMS], Nicosia, Cyprus).

The lack of records of hybrid specimens in the Mediterranean is probably a result of non-reporting or of inability of observers to distinguish among species because of the inherent phenotypic plasticity of morphological characters. It is therefore important that marine turtle workers in the region report any “unusual” specimens and, whenever possible, collect tissue samples. Genetic analysis would validate potential hybridization events identified by morphology and contribute to quantifying the extent of this phenomenon in the Mediterranean.

We thank George Balazs, Daniela Freggi, Sally Murphy, Polymnia Nestoridou, Robin Snape, and Kostas Teneketzis for their respected opinions upon seeing the photographs.

DIMITRIS MARGARITOULIS (e-mail: margaritoulis@archelon.gr),
ALAN F. REES, PAVLOS TSAROS, ARCHELON, the Sea Turtle Protection
Society of Greece, Solomou 57, GR-10432 Athens, Greece.

Erratum:

*The caption for Figure 1 contains an error introduced during journal production. The turtle shown is a *Caretta caretta* x *Chelonia mydas* hybrid, not a *Caretta caretta* x *Eretmochelys imbricata* hybrid as stated.*