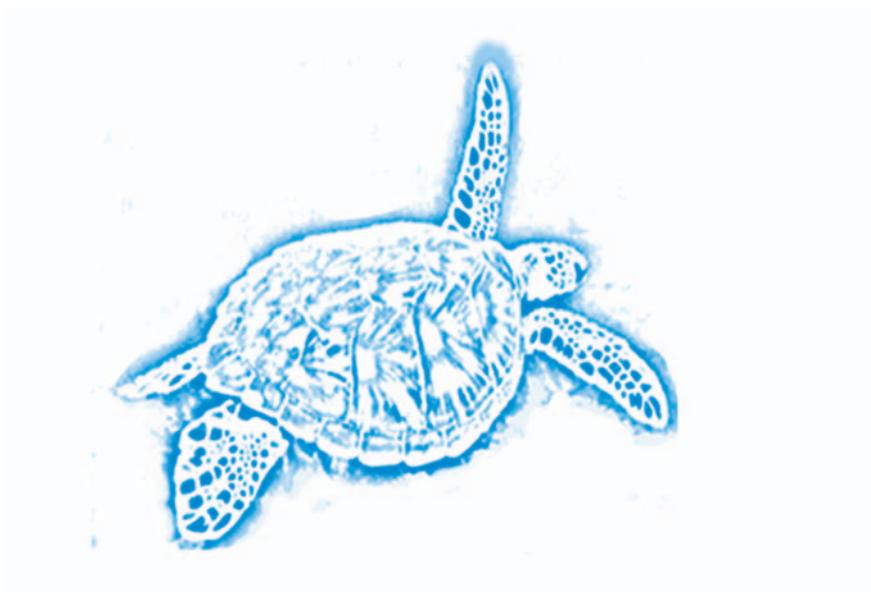


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STRANDING DATA AS AN INDICATOR OF FISHERIES INDUCED MORTALITY OF SEA TURTLES IN GREECE

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INTRODUCTION

Over the past decades, sea turtles in the Mediterranean are faced with increasing threats to their survival. Most of the threats at sea originate from fisheries interaction (Margaritoulis et al. 2003). Despite the ample national and international legislation inadequate enforcement hampers protection measures. Loggerhead (*Caretta caretta*), green (*Chelonia mydas*) and leatherback (*Dermochelys coriacea*) turtles inhabit the Greek seas and these species are protected since 1980. The foundation of ARCHELON, in 1983, was essential in promoting sea turtle conservation. The Stranding Network was initiated in 1988, but it took more than 4 years to become a reliable tool for systematic recording of turtle strandings nationwide. This paper presents sea turtle stranding data reported during the period 1992-2000 throughout Greece in order to draw preliminary conclusions as to the at-sea related mortality.

METHODOLOGY

Stranding reports, in the context of the nationwide Stranding Network, reached ARCHELON from the Coast Guard, Fisheries Authorities, other non-governmental organisations, public institutions, on-site members and concerned individuals. Stranding reports were completed by the person who examined the turtle. The stranding report included: name of observer(s), date, species, sex, condition of the turtle at the time of finding, external injuries, tag information, carapace measurements (length, width), plus any other relevant information. On the back of the report there were instructions and diagrams to facilitate correct determination of the species, sex and measurements. Dead animals were buried on site, either by local communities or project members. Most of injured turtles, found stranded, were transported to the ARCHELON Rescue Centre in Glyfada, Athens. There, the cause of injury was determined by external inspection, radiography and, if the animal died, by necropsy.

In order to study more comprehensively the geographical distribution of the

strandings, the Greek coastline has been divided into 8 sectors: NW (Ionian Sea), PE (Peloponnesus incl. Zakynthos island), KY (Cyclades islands), CR (Crete island), DK (Dodecanese islands), AN (Eastern Aegean islands), NE (Northern Aegean) and EA (Central Aegean) (Fig. 1).

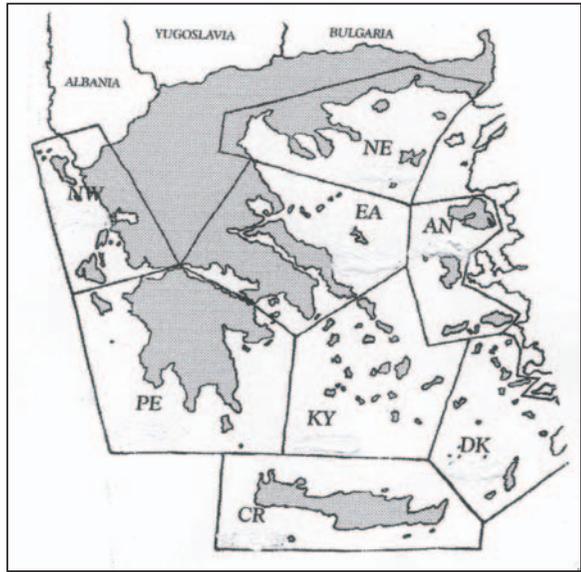


Fig. 1. Sectors along the Greek coastline for the localisation of strandings.

RESULTS

From 1992 to 2000, the total number of turtle strandings reported all over Greece were 1,080. Of these, 957 were reportedly loggerheads, 74 green turtles, 5 leatherbacks and in 44 cases the species was not determined. Taking into account only the identified loggerheads and green turtles (1,031 animals), we see that 92.8% of these were loggerheads and 7.2% green turtles.

With the exception of leatherbacks which had a rather occasional appearance, the other two species were reported with continuity. For those five cases of leatherback turtles, one case was reported in 1992 (NE zone, September), one in 1996 (EA zone, June) and three cases in 1997 (twice at PE zone and once at NE zone, between August and September).

Of the 1,080 strandings reported in the period 1992-2000, 821 (76.0% of the total) were collected during the period 1996 to 2000. The improved efficiency of the Stranding Network during this period provided the opportunity to obtain more and better data. Of the 821 turtles recorded within the period 1996-2000, 728 were loggerheads, 66 green turtles, 4 leatherbacks, and 23 were not identified. If we take into account only the identified loggerheads and green turtles (794 strandings) we see that 728 (91.7%) were loggerheads and 66 (8.3%) green turtles. The annual occurrence of strandings shows an increasing trend in time (Fig. 2). However, this does not necessarily reflect an actual increase in stranded turtles, because the effectiveness of the Stranding Network was improved year by year.

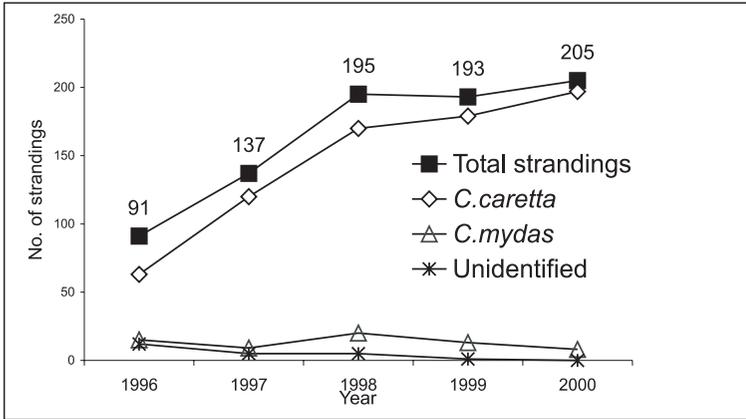


Fig. 2. Turtle strandings per species and year for the period 1996-2000 (N=821).

The geographical distribution of strandings, in the period 1996-2000, is shown per species in Fig. 3. Most strandings of both species were reported from sector PE (where 36.0% of all loggerheads and 53.0% of all green turtles were reported). Then follow sector EA (15.9% of all loggerheads and 15.2% of all green turtles), and sectors CR (13.2% of all loggerheads) and DK (12.1% of all green turtles). However, the greatest proportion of green turtles in relation to total strandings per sector came from sector DK, where 19.5% of all strandings were classified as green turtles, and sector PE with 11.8% of all strandings being green turtles.

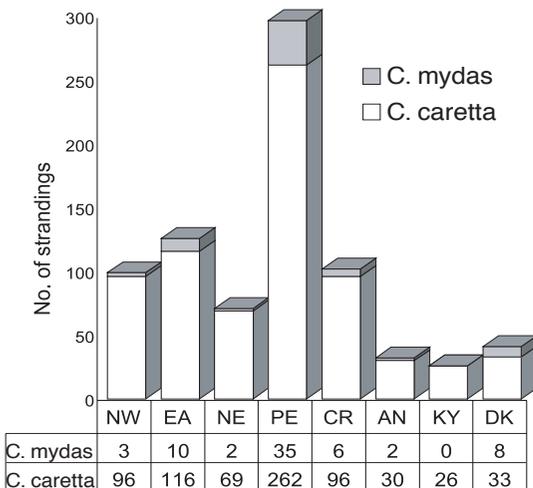


Fig. 3. Geographical distribution for stranded sea turtles in the period 1996-2000 (N=794).

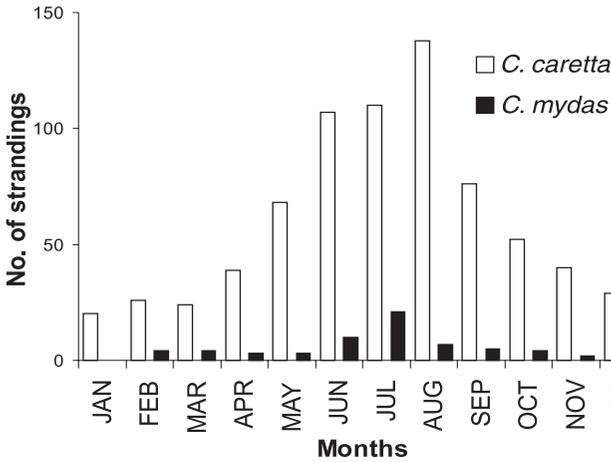


Fig. 4. Monthly distribution of sea turtle strandings in the period 1996-2000 (N=794).

Most of the 794 stranded loggerheads and green turtles in the period 1996-2000 (68.6%) occurred from June through October (Fig. 4).

In the period 1994-2000, 226 turtles, found stranded alive, were admitted to the ARCHELON Rescue Centre in Glyfada. Of these, 218 (96.5%) were loggerheads and 8 (3.5%) green turtles. The causes of the injuries, as deduced from the examination at the Rescue Centre, were classified as follows: 34% with head trauma, 24% with hook ingestion, 22% with injuries from entanglement in fishing nets and lines, and 20% from other causes (boat strikes, diseases, coverage with tar, various mutilations not accounted by fishing interactions, etc.) (Fig. 5). Most head traumas are thought to originate by intentional hits after capture in fishing gear. Net and line entanglement were determined by relevant scars or pieces of the material found on the animal. Overall, it is estimated that

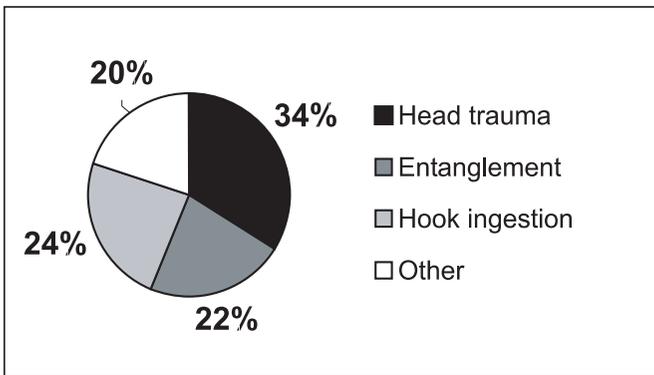


Fig. 5. Causes of injuries on turtles found stranded in the period 1994-2000 (N=226).

about 80% of the stranded turtles, which were admitted to the Centre, were injured because of fisheries interaction.

DISCUSSION

The data suggest that loggerhead and green turtles inhabit the Greek waters throughout the year. The loggerhead is the most common species and can be mostly located around the major nesting regions of Greece during the nesting season. *Chelonia mydas* observed in Greece could originate from populations nesting in Turkey and Cyprus. Most of the green turtles were found stranded in Lakonikos Bay, southern Peloponnesus, where a feeding ground for juvenile green turtles was recently reported (Margaritoulis and Teneketzis 2003). The five leatherback turtles complement a previous study which collected existing records in Greece until 1984 (Margaritoulis 1986). Taking into account only the animals that were transported to the Rescue Centre, and which were properly identified, the overall percentage of green turtles in Greece becomes 3.5%.

Nearly all fishing activities pose a threat to both adult and juvenile sea turtles though more research is needed to determine the relation of the mortality rate and the type of fisheries interaction. Incidental capture in fishing gear seems to affect at least 80% of the turtles found stranded and injured. Of these, 46% concern turtles with hook ingestion and injuries attributed to entanglement; the remaining 34% are turtles intentionally hit on the head, presumably after incidental capture in fishing gear. The latter may arise primarily as a result of the damage caused by turtles to fishing gear, especially in artisanal gill nets and bottom longlines, as well as to other factors like competitive attitudes, prejudice and superstition.

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