

Mass strandings of cold-stunned loggerhead turtles in the south Iberian Peninsula: ethological implications

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The loggerhead *Caretta caretta* is the most frequent marine turtle in the Mediterranean Sea and adjacent waters (MARGARITOU^{LIS} et al. 2003). In the Mediterranean Sea strandings of cold-stunned loggerheads have been rarely recorded (BEN^{TIVEGN}A et al. 2002). However, similar events are frequent in others regions, e.g. the Atlantic Ocean and the Gulf of Mexico (BRON^{GER}SMA 1982, MEY^{LAN} 1986, MOR^{RE}ALE et al. 1992, WITH^{eRING}TOn & ERHART 1989). A recent report of a group of cold-stunned loggerheads stranded in the Adriatic Sea was related to a temperature decrease of 6 °C (BEN^{TIVEGN}A et al. 2002).

We report three new cases of groups of loggerheads stranded with symptoms of cold-stunning on the Andalusia coast (South of Spain), which is an outstanding area for the loggerhead in the North Atlantic-Mediterranean region, as it connects the Western Mediterranean Sea with the Atlantic Ocean (e.g. CAMI^{ÑAS} & De LA Se^{Rn}A 1995, CAMI^{ÑAS} 1997).

The aim of this work was to analyze the temporal variation of loggerheads stranded with symptoms of cold-stunning along the Andalusian coastline, from 2001 to 2007. For this purpose, we tested the relationship between the stranding events and oceanographic factors. The ecological and ethological implications are discussed.

The symptoms of cold-stunning loggerheads

Cold-stunning symptoms may be present when sea turtles occur in waters with temperatures lower than 15 °C (MIL^{TOn} & LUTZ 2003). The adult individuals could resist this temperature, because sea turtles possess an endothermic capacity because of their internal muscular activity (Fe^{RR}I 2001). However, sub-adult individuals are more drastically affected by this temperature reduction (MIL^{TOn} & LUTZ 2003). The common symptoms are: debilitation, lethargic movement, lack of hunger, scarce mobility in head and flippers, and feeble attempts to dive.

Do loggerheads use beaches for eco-physiological warming?

We here report data from 23 cold-stunned loggerheads stranded on the Andalusian coastline, from 2001 to 2007 (Table 1). The total lengths of the stranded individuals were lower than 40 cm SSL (Straight-line Standard Length) (\bar{x} = 21.56 cm; SD = 6.39), and for this reason they were considered to be sub-adults (see KAME^{ZAKI} 2003). It was evident that these stranded turtles were affected by the cold waters, as in the case reported by BEN^{TIVEGN}A et al. (2002), as they showed the above-mentioned symptoms.

Table 1.

The lengths of cold-stunned loggerheads stranded in Andalusia from 2001 to 2007 (SSL, Straight-line Standard Length).

Specimen	(Locality, Province)	Date	SSL
1	Bolonia, Cádiz	10/01/2001	26
2	Cádiz	29/01/2001	28
3	Barbate, Cádiz	07/02/2001	17
4	Estepona, Málaga	22/02/2001	26
5	Cádiz	04/03/2001	18
6	Rota, Cádiz	04/03/2001	17
7	Chiclana, Cádiz	04/03/2001	18
8	Conil, Cádiz	05/03/2001	13
9	San Fernando, Cádiz	05/03/2001	19
10	Puerto de Santamaría, Cádiz	06/03/2001	16
11	Puerto de Santamaría, Cádiz	09/03/2001	13
12	Parque Nacional de Doñana, Huelva	10/03/2001	19
13	Estepona, Málaga	22/03/2001	23
14	Barbate, Cádiz	23/03/2001	16
15	Almería	22/05/2001	23
16	Playa de la Araña, Málaga	25/05/2002	38
17	Algeciras, Cádiz	26/03/2003	16
18	Puerto de Santa María, Cádiz	22/04/2003	20
19	Cádiz	25/04/2003	20
20	Málaga	30/05/2003	34
21	Mijas, Málaga	11/07/2003	24
22	San Pedro de Alcántara, Málaga	19/01/2007	29
23	Motril, Granada	18/02/2007	23

We observed three mass episodes of stranded cold-stunned loggerheads, and 11 episodes each involving one individual. The mass stranded sets with cold-stunning symptoms usually involved a mean of 4 individuals and occurred during 4 days in the Gulf of Cadiz, and were preceded by high south-western winds that caused temperature to fall between 6.5 and 4.5 °C (Figs 1-2). In these conditions, the turtles have to swim to avoid drowning, and consequently they consume their internal muscular energy. This consumption of energy accelerates the cold-stunning. For this reason, we suggest that loggerhead turtles may use a beach for eco-physiologic warming. In previous surveys of artisan fishermen in the Gulf of Cadiz area completed during 2004 (see Báez et al. 2006 for details) there were reports that turtles sometimes stayed on the beach for a period during daytime (unpublished data).

Behavioural experiments have revealed that sea turtles can detect chemicals dissolved in water (LOHMANN et al. 1999, and references therein). Thus, the chemical cues emanating from epi-continental basins could help the sea turtles to find the shore when needed.

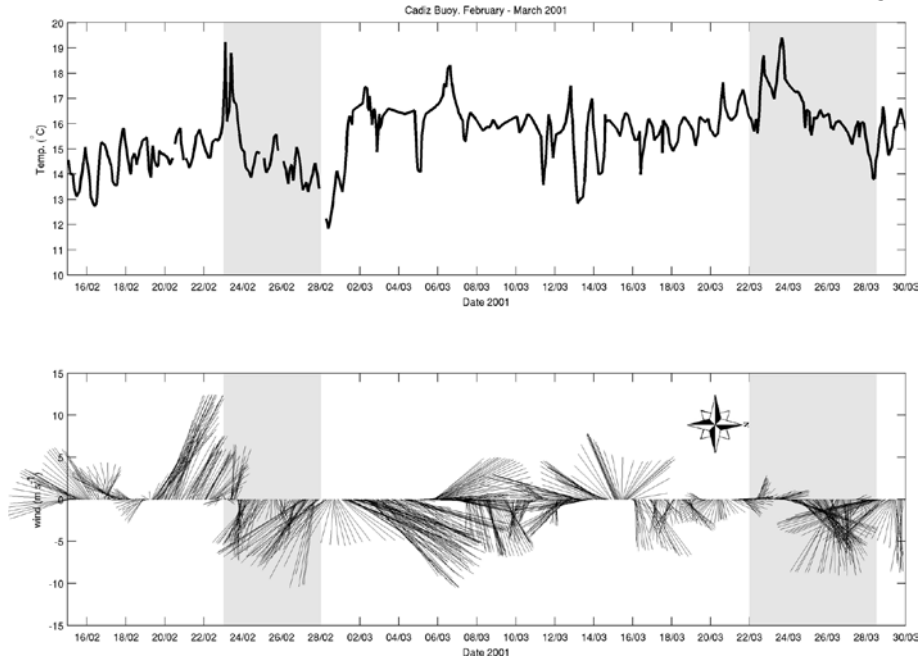


Fig. 1. — Data from the Cadiz Buoy during February and March 2001, showing the water temperature plus wind direction and intensity each day. The days when groups of loggerheads stranded with cold-stunned symptoms were observed are highlighted in grey. All the groups of loggerheads were stranded in days of high intensity, South-eastern winds coupled with a decrease in water temperature.

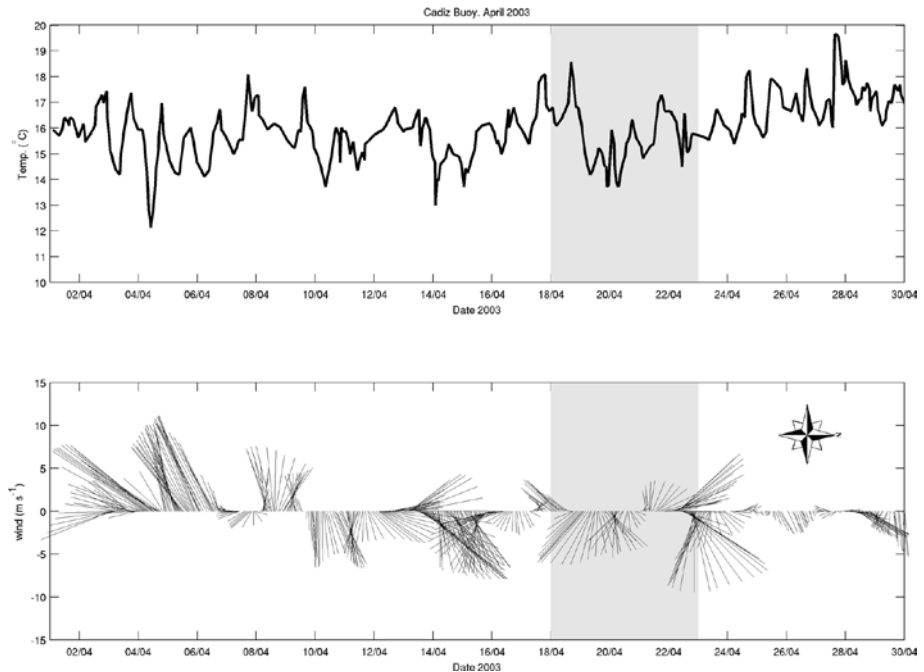


Fig. 2. — Data from the Cadiz Buoy during April 2003, showing the water temperature plus wind direction and intensity each day (otherwise, as in Fig. 1).

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