

ARTÍCULO ORIGINAL

IMPACTO DE LA ACUMULACIÓN DE SARGAZO DEL VERANO DEL 2015 SOBRE LAS TORTUGAS MARINAS DE PLAYA LA BARCA, PENÍNSULA DE GUANAHACABIBES

Impact of sargassum influx during 2015 summer on marine turtles of Playa la Barca, Peninsula de Guanahacabibes

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RESUMEN

En la última década se ha registrado un incremento en la afluencia de sargazo en la región del Caribe. En el año 2015 hubo serias afectaciones en las áreas de anidación y alimentación de tortugas marinas, incluida la Península de Guanahacabibes. Por este motivo el presente trabajo está dirigido a documentar el impacto causado por el influjo de *Sargassum fluitans* en las áreas de anidación de tortugas marinas en la Península de Guanahacabibes ubicada en el extremo occidental de Cuba. Para ello se colectó evidencia fotográfica de la distribución en la playa y la magnitud de la mancha de sargazo. Por otro lado se monitoreó el proceso de anidación y eclosión de las tortugas marinas. Como resultado se encontró que las hembras de caguama eran más afectadas a la hora de atravesar la acumulación de sargazo lo que determinó que su éxito de anidación fuera menor al 50 %. En general, ocurrió un desplazamiento de la anidación casi exclusivamente para el sector de la playa comprendido entre los transectos 12 y 15 y aumentaron los intentos de anidación fallidos durante el período de mayor arribazón. Las crías se vieron menos afectadas ya que comenzaron a nacer cuando la acumulación de sargazo comenzó a disminuir, sin embargo, del mismo modo que las adultas, les resultó difícil atravesar el sargazo para llegar al mar. Es importante dar seguimiento a la trayectoria y abundancia de las manchas de sargazo para prevenir futuros impactos en la zona costera, en particular, en las áreas de anidación de tortugas marinas y evitar así que se convierta en una seria amenaza para las hembras anidadoras y sus crías.

PALABRAS CLAVES: Tortugas marinas, sargazo, amenazas, conducta, éxito reproductivo

ABSTRACT

In the last decade an increase in the accumulation of Sargassum has been reported throughout the Caribbean region. In 2015 these influx-

es caused serious impacts to marine turtles nesting and feeding areas, including Guanahacabibes Peninsula. This paper will focus on documenting all of the impacts caused by the influx of *Sargassum fluitans* in nesting beaches of marine turtles in Guanahacabibes Peninsula, located on the western most tip of Cuba. To do so, photographic evidence about *Sargassum* distribution at the beach and the magnitude was gathered. At the same time nesting processes and hatching success were monitored. As a result, we found that loggerhead females were more affected than greens when they moved through the sargassum. In general, there was a displacement of nesting activity almost exclusively to the sector of the beach between transects 12 and 15. Hatchlings were less affected since they began to hatch after the sargassum influx began to decrease. However, they had still had difficulties navigating the sargassum on their way to the open ocean. It is important to follow the trajectory and abundance of the sargassum masses to prevent future impacts on the coastal zone, especially, on marine turtle nesting areas and prevent it becoming a serious threat to nesting females and their hatchlings.

KEY WORDS: Marine turtles, sargassum, threats, behavior, reproductive success

INTRODUCTION

The summer of 2015 brought attention to scientists around the Caribbean because of the massive influx of sargassum that affected several nesting and feeding areas in the region. According to Maurer *et al.* (2015) sargassum has been proliferating outside the Sargasso Sea, especially in the Gulf of Mexico (Gower *et al.* 2006). The source of nutrients for this massive amount of seaweeds seems to be associated with the Amazon River (Gower *et al.* 2013).

Previous sargassum blooms have been reported in 2011 and 2014 impacting aquatic resources, fisheries, shorelines, waterways, and tourism in the Caribbean (Doyle

and Frank 2015) Cuba included (Moreira and Alfonso 2013). During 2015 information about potential and real impacts on sea turtles started to appear in places such as Antigua where 10 % to 15 % of certain parts of the shoreline were covered (Maurer *et al.* 2015) and Barbados where 37 juvenile green and hawksbill turtles were found dead on a single beach in one week (Eckert pers. com.).

Guanahacabibes Peninsula is the second most important green turtle nesting site in the Cuban Archipelago (Azanza *et al.* 2013) and, to a lesser extent, hosts some loggerhead nesting activity (Azanza *et al.* in prep.). This is the first record of sargassum impacting nesting and hatchling activity in Cuba. Therefore, this paper focuses on documenting all the impacts caused by the influx of *Sargassum fluitans* on turtle nesting beaches along Guanahacabibes Peninsula.

MATERIALS AND METHODS

Study area. The study was carried out at La Barca, a beach located on the Southern coast of the Guanahacabibes Peninsula. This location was selected because this beach has the highest nesting activity and the most intense monitoring frequency in the area according to Azanza *et al.* (2015).

Sampling design. Data were collected from June to August, 2015 corresponding to the time laps when sargassum was at the beach. Photographic evidence was collected since the first signs that sargassum amounting at the nesting beach could affect nesting activity. On the other hand, turtles monitoring was performed following the Cuban National Marine Turtle Protocol for the monitoring of nesting areas (Moncada *et al.* 2013). The beach was divided in six sectors of 75 m following an East to West

direction. Variables number of nests and number of false crawls were determined in each sector. Females and hatchling ability to return to the sea was evaluated qualitatively. Historical nesting activity was determined as the absolute frequency of nests per day considering nesting seasons from 1998 to 2014. On the other hand, historical nesting success per month was calculated as the average monthly success (total nests divided by total nesting activity per month) for all the seasons since 1998 until 2014. Finally, monthly number of nest per sector in 2013 was calculated for discussion purpose. This is the only previous information available since sector divisions and recording started in 2013 and 2014 was a low nesting season with different behavior of nesting females.

To assist with monitoring, the location of each nest was marked by inserting a thin rope into the nest chamber, which was then attached to a labelled stake placed 0.5-1.0m from the nest. The rope was inserted after the female finished laying, or when the nest was found during diurnal monitoring. When the estimated hatching date was close, nests

were monitored daily until evidence of emergence was observed.

Sargassum identification was made using photography (Fig.1) following the Littler and Littler (2000) criteria based on the absence of a spike in the air bladders and the shape of the blades.

Data Analysis. Frequency analyses were performed to determine temporal variation of nesting activity by sectors of the beach and nesting success during the nesting season. Three descriptors of the population characteristics were used to compare nesting success (number of nests over total nesting attempts multiplied by 100) in 2015 with the historical values: the arithmetic mean for central tendency, standard deviation as measure of dispersion and the confidence interval to predict the populations mean using a 95 % of probability.

RESULTS AND DISCUSSION

The influx of *Sargassum fluitans* (Borgesén) Borgesén became massive in La Barca after June 26th, 2015. Nevertheless, critical mass was achieved in the first half of July when an accumulation of 1.5 m high of the seaweeds were deposited in the shore and around 10



Fig. 1. *Sargassum fluitans* in the shore of playa La Barca.



Fig. 2. Evidence of *Sargassum fluitans* accumulation in the shore of playa La Barca between July 10th and July 20th, 2015.

meters from the shore were covered with floating material (Fig.2). As in Moreira and Alfonso (2013) this phenomenon occurred during the rainy period. These authors

state that in the southern Cuban archipelago, sargassum arrives during the summer while in northern areas it is observed during the winter, depending on the prevailing



Fig. 3. Interaction of green turtle (*Chelonia mydas*) and loggerhead (*Caretta caretta*) turtles with the sargassum accumulation.

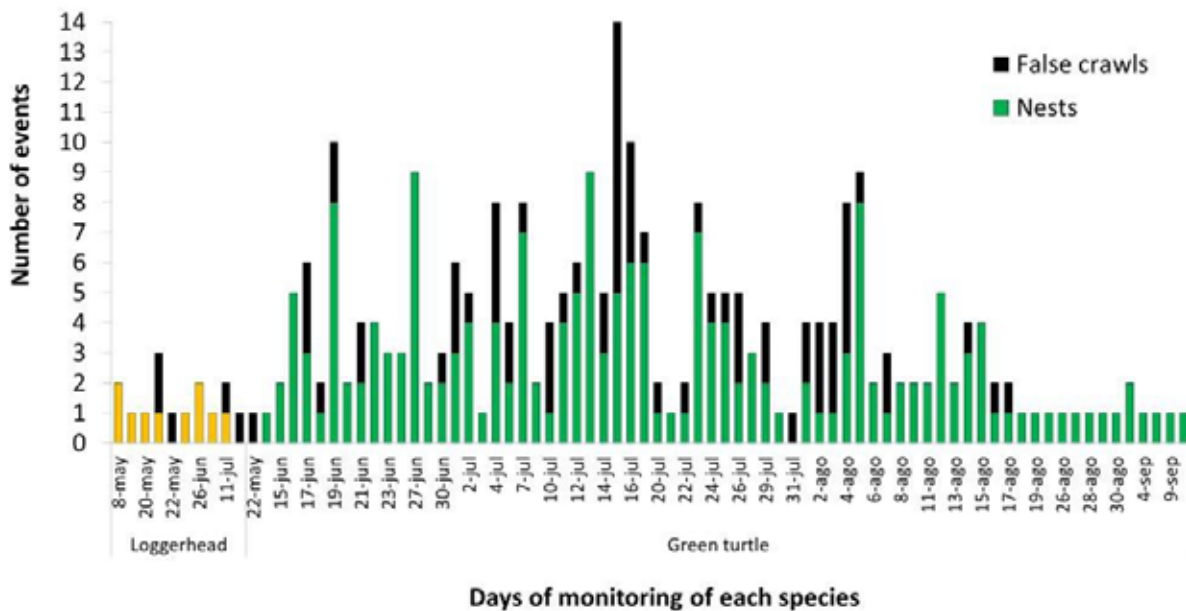


Fig. 4A. Number of daily nesting activities from loggerhead and green turtles' females in La Barca during 2015 nesting season.

winds. They report the arrival of sargassum masses to some areas of the southwestern archipelago such as Isla de la Juventud and Cayo Largo, however, Guanahacabibes Peninsula is not mentioned.

Nesting behavior of both, green and loggerhead turtles were affected in several ways. First, and most obvious, turtles had to struggle to come out to the beach and after laying to return to the sea (Fig. 3). For

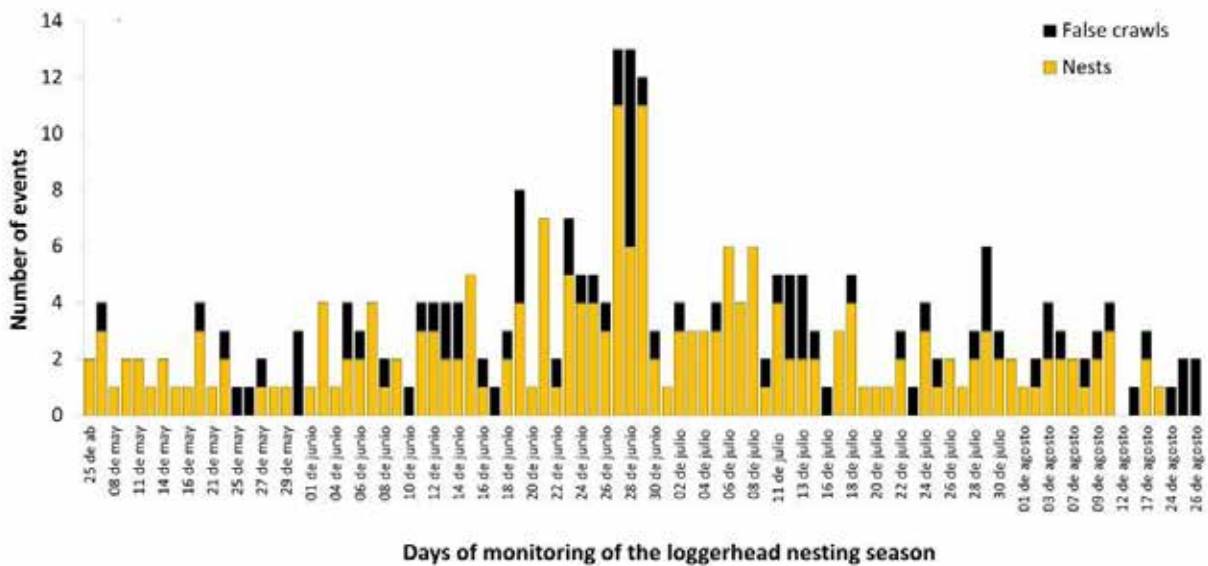


Fig. 4B. Number of daily nesting activities B: for loggerhead historically

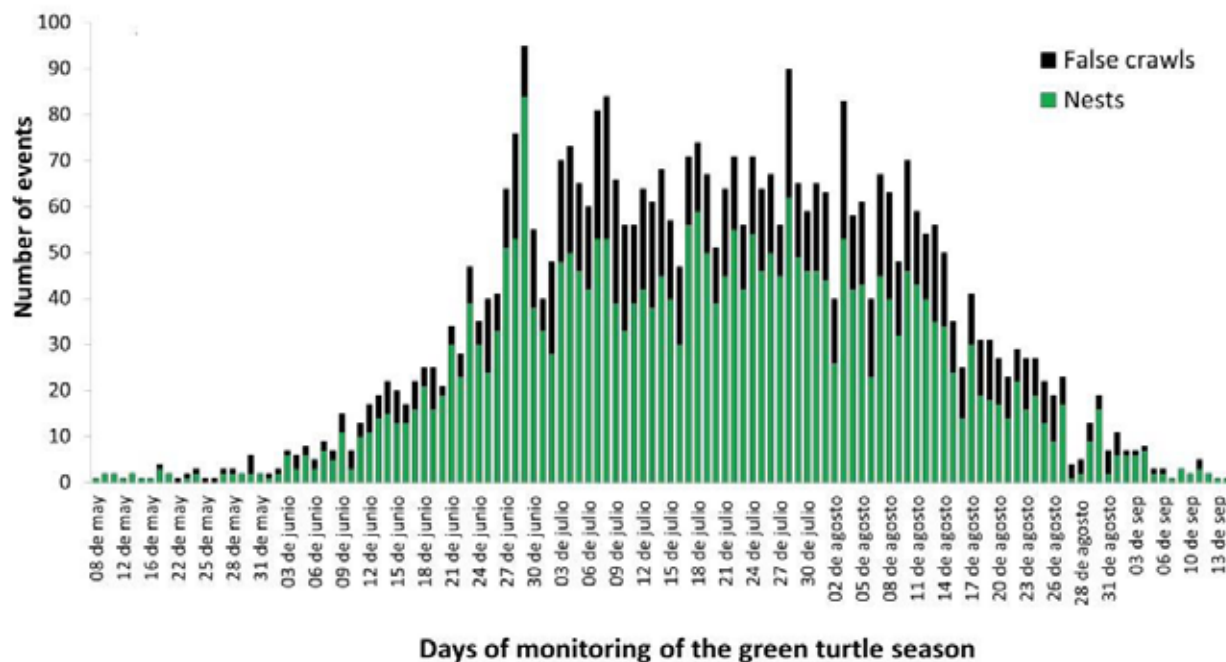


Fig. 4C. Number of daily nesting activities for green turtles, in Guanahacabibes Peninsula.

loggerheads this was especially difficult because they are smaller and weaker than green turtles, which appears to explain why they got stuck easier than greens.

Secondly, the number of failures in nesting increased by the end of June with a peak around July 14th to 16th (Fig. 4A) precisely when the highest amount of seaweeds was on shore although some days like July 12th had only nest reported. It seems that difficulty in emerging on the beach encouraged turtles to lay eggs in less suitable places. They often abandoned their nesting attempts until they found an adequate part of the beach. This finding contrast with the historical proportion among nests and false crawls of each species, in which a similar ratio of nests *versus* false crawls is maintained during the three months of higher nesting activity (Fig. 4B and 4C).

Loggerhead had a nesting success lower than the historical value, even with zero

success in June while green turtles had a higher nesting success than the historic mean (Fig. 5). This finding also indicates that loggerheads can be affected easier than green turtles by obstacles at section of the beach. On the other hand, monthly high nesting success of green turtles compared with historic values, despite the increase of false crawls associated with the sargassum maximum influx, might reflect improving on beach conditions for green turtles nesting.

During the first part of the season, including the peak of the nesting (July) nest distribution on the beach was similar to 2013 pattern (Fig. 6). Afterwards, nesting pattern changed and most nesting (45 %) was concentrated in sector 4, located closer to the western part of the beach but with easier access than the last two sectors. At the same time, there was a reduction of nesting in the first three sectors. It

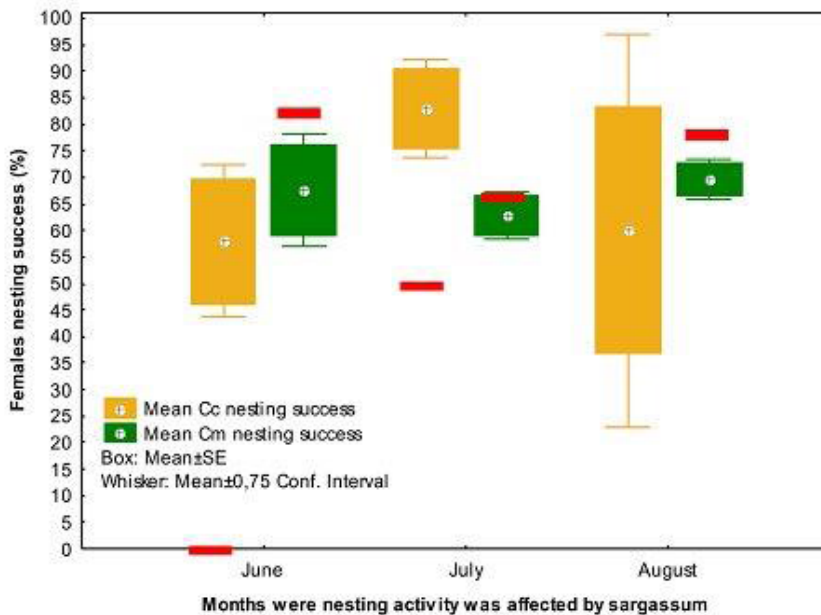


Fig. 5. Historical nesting success of marine turtles in playa La Barca. Red lines represent monthly nesting success of the 2015 nesting season. Cc: *Caretta caretta*; Cm: *Chelonia mydas*. No nesting event was reported for loggerhead in August of 2015.

and is the reason why that much nesting concentrated in the same sector. In Antigua, in the sector where sargassum was accumulated turtles displayed essentially no nesting activity. As a result, Maurer *et al.* (2015) considered that dense sargassum can hinder or altogether preclude access to preferred nesting locations, effectively shrinking the primary nesting beach by as much as 25%. In the present study, 45 % of nesting occurred in the same

is possible that turtles needed to move to the most accessible segment of the beach

section of the beach meaning that the reduction of the effective nesting area was

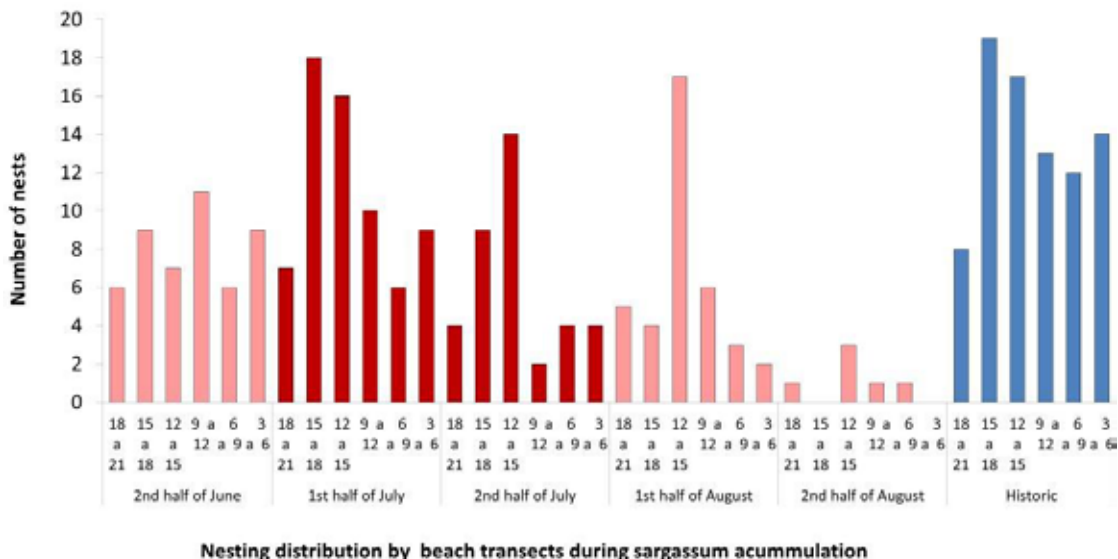


Fig. 6. Variation in the spatial distribution of nesting activity in La Barca during 2013 and 2015 nesting seasons considering a division of the beach in six equivalent sectors of 75 m. In red is highlighted the nesting frequency of sector 4 in August of 2015.



Fig. 7. Passing of loggerhead (*Caretta caretta*) hatchlings through the sargassum accumulation.

higher. Apparently, this increase in failures made that reproductive output lower than historical values since females laid on average 1,74 times rather than a value closer to 2,11 which is the historic mean for that beach.

Maurer *et al.* (2015) also found that high nesting densities will prevail in those areas unaffected by sargassum, increasing the chances of nesting females digging into previously laid nests. This was not found in La Barca where beach width seems to be larger than in Antigua studied beaches. Hatching success was not affected but access to the sea was difficult for the newborns since they had to pass through the seaweed mass (Fig. 7). Opportunely, by the time hatching began, the sargassum influx was ending and therefore damage was minimal. The danger of obstacles faced by hatchlings has been thoroughly discussed by several specialists (Kamel and Morosovsky 2004; Santidrián Tomillo *et al.* 2010; Triessing *et al.* 2012). It includes the increase in mortality through hyperthermia, exhaustion, drowning, and vulnerability to predation.

In short, the impact of the sargassum influx of 2015 on marine turtle nesting populations of Guanahacabibes was basically confined to nesting female behavior which affected their reproductive output but did not affect hatching success. The unexpected occurrence of this phenomenon made possible only to collect evidence as it was appearing without any proper research design. More studies on this natural phenomenon are required to understand how it may become a serious threat for both hatchling and nesting females. Management actions like an early alert system to detect the sargassum before it arrives to the beaches and possibly nests relocation if the sargassum mass is too large will be probably needed.

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