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RELOCATIONS OF SEA TURTLE NESTS OF *LEPIDOCHELYS OLIVACEA*, *DERMOCHELYS CORIACEA* AND *CHELONIA MYDAS* IN  
THE GALIBI NATURE RESERVE, SURINAME

by

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ABSTRACT

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Relocation of nests of the marine turtles *Lepidochelys olivacea* (ESCHSCHOLTZ 1829), *Dermochelys coriacea* (LINNAEUS 1758) and *CHELONIA MYDAS* (LINNAEUS 1758) in the Galibi Nature Reserve is performed to protect them from a number of hazards. The hatching percentage per nest is not significantly decreased by relocation, but the number of nests from which hatchlings emerge is greatly enhanced. In this situation relocation can be an effective conservation measure.

Key words: Nest relocations, hatching success, emerging success, *Dermochelys coriacea*, *Chelonia mydas*, *Lepidochelys olivacea*, marine turtles, Suriname.

INTRODUCTION

In Suriname, as in other countries, large numbers of sea turtle nests are lost due to a variety of causes. DUTTON & WHITMORE (1983) estimate that 21% of the *C. mydas* (LINNAEUS 1758) nests and 32% of the *D. coriacea* (LINNAEUS 1758) nests are deposited below the high tide line. MROSOVSKY (1983a) estimates that 37-50% of the *D. coriacea* nests on the beaches of Suriname is

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poorly located. On highly mobile sand banks numbers of nests are washed away due to erosion (pers. observ.). Eggs and hatchlings are threatened by a number of predators. In Suriname it is estimated that losses caused by the turtle egg eating ghost crab *Ocypode quadrata* (FABRICIUS 1787) can amount up to 12% of the eggs (HILL & GREEN 1971). Mole crickets (*Gryllotalpa* sp., *Scapteriscus* sp.) attack eggs. Feral domestic dogs and racoons (*Procyon cancrivorus* (CUVIER 1789)) dig up nests and attack hatchlings (REICHART & FRETEY 1993). In addition, in the Galibi Nature Reserve there are high losses because of the intensive poaching activity which is mostly directed on *L. olivacea* (ESCHSCHOLTZ 1829) nests. The reserve lies within the territory of the Carib Indians, who traditionally eat turtle eggs, but do not hunt adult turtles. In 1995, during the peak nesting season, about 40% of the *L. olivacea* nests was taken by poachers (HOEKERT *et al.* 1996).

Although abundant in the rest of the world, *L. olivacea* may be the rarest sea turtle inhabiting the western Atlantic region (REICHART 1993). Nesting occurs only in Suriname, Guyana, French Guiana and Bahia, Brazil. Of these rookeries, the Surinamese is by far the most important. In the late sixties arribadas\* were frequently observed at Eilanti beach in the Galibi Nature Reserve. However, due to over-exploitation and erosion of nesting beaches the numbers of nests laid in the Galibi region have dropped from 3,065 in 1968 (SCHULZ 1975) to 424 in 1989 (REICHART & FRETEY 1993) and to 335 in 1995 (HOEKERT *et al.* 1996).

The *D. coriacea* specimens nesting in Suriname, together with the specimens nesting in French Guiana, form the largest population of this species in the world. It is estimated to consist of approximately 15,000 nesting females (FRETEY pers. comm.), of which in 1995 about 1,200 nested in Galibi (Hoekert *et al.* 1996). The *C. mydas* population in Suriname has been stable for the last 30 years. Numbers of nests laid per year vary around 5,000 (REICHART & FRETEY 1993).

The number of nestings for all three species in Galibi in 1995 amounted to about 8,500 nestings (HOEKERT *et al.* 1996). Because of the above mentioned reasons, significant numbers of these nests are lost. To reduce the number of factors which negatively affect the nests, they can be transported to a hatchery. This is likely to increase the number of emerging nests, but may affect hatching percentages (SCHULZ 1975) and bias the sex-

\* Mass nesting aggregations (CLIFFTON *et al.* 1981).

ratio of the hatchlings (MROSOVSKY 1982). This study was executed to assess the positive and negative effects of replacing nests to a nearby central hatchery.

#### METHODS

The study was carried out in the Galibi Nature Reserve (5°72' N, 54°02' W), located at the mouth of the Marowijne river, Suriname (REICHART 1992). During the period from May 5th to June 25th, 1995, 44 *D. coriacea*, 17 *C. mydas* and 19 *L. olivacea* nests were collected from the different nesting beaches and transferred to a hatchery, located on a central beach, above springtide-height. The majority of nests was reburied during the night, within two hours from when they were laid, while a small number of nests was reburied the next morning. Infertile eggs, which occasionally occur in *L. olivacea* and *C. mydas* nests, and in large quantities in *D. coriacea* nests were not relocated, but placed back into the old nest. A week before the expected emergence, circular wire cages 45 cm in diameter and 45 cm high were erected over a number of nests, to count the number of emerging hatchlings. The base of each cage was dug in to a depth of 10 cm.

During the hatching period the nests at the hatchery were checked several times during the night and emerged animals were counted and released immediately. Each morning during the same period the beach was surveyed for hatchling tracks. Emerged natural nests found by these tracks, were recorded and marked and the number of tracks leaving each nest was estimated. Three days after emergence of the last individual the nests in the hatchery and the natural nests were dug up and results were recorded. Counts were made of the number of hatched dead specimens in or above the nest (hatchlings that were dug up alive were also recorded as hatched dead), the number of empty egg shells and the number of infertile eggs. All unhatched eggs were opened to assess the developmental stage. Possible categories were: eaten (by mole crickets), yolk (egg yolk still fresh and distinguishable from egg white), rotten (dry or wet), late embryo (visible embryo) and pipped dead (embryo completely developed but deceased in the egg before hatching).

#### RESULTS

Five of the 82 reburied nests that were replaced did not emerge at all, four *D. coriacea* nests (9% of the reburied nests) and one *C. mydas* nest (5%). All *L. olivacea* nests on the hatchery did emerge. The nests that did not emerge at all were not used in further calculations, to make a comparison possible between nests in the hatchery and the natural nests, which could only be found if emergence had taken place.

Only two emerging natural *L. olivacea* nests were observed. One of these showed a very low hatching rate. Only 2 hatchlings left this nest of 111 eggs. We found 26 late embryo's, 30 pipped dead and 20 hatched dead hatchlings, and dug up 6 live hatchlings. Clearly, at the moment of hatch-

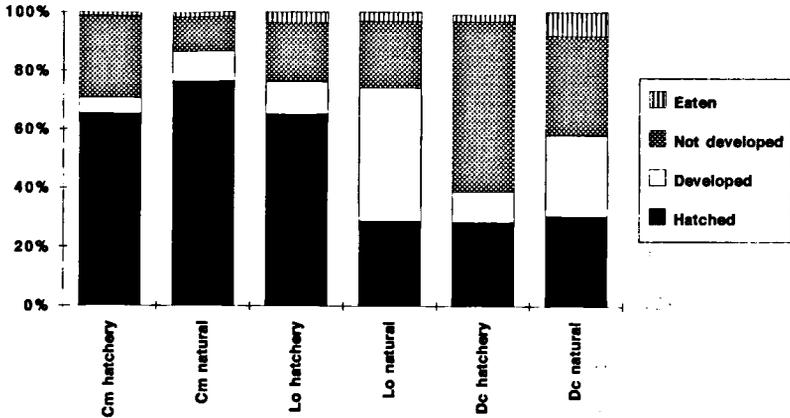


FIGURE 1.

Hatching results for the three species, in the hatchery and in the natural situation. *Chelonia mydas* = Cm, *Lepidochelys olivacea* = Lo, *Dermochelys coriacea* = Dc.

ing, an external factor caused high mortality in this nest. In the other nest 64 hatchlings emerged from a nest of 114 eggs, a 56% hatching result. The 19 nests on the hatchery showed an average hatching result of 65%, with an average of 113 eggs per nest. The *L. olivacea* nests had an average incubation time of 53 days (min. 49, max. 58 days, n=19).

The natural *C. mydas* nests showed an average hatching result of 77%, the nests on the hatchery 65%. This is no significant difference (Mann-Whitney U;  $p > 0.05$ ) On average the *C. mydas* nests contained 117 eggs and had an average incubation time of 56 days (min. 52, max. 59 days, n=16). For *D. coriacea* the hatching percentages are calculated with exclusion of the infertile eggs. The natural nest had an average hatching result of 31%. Twenty eight percent of the eggs showed far development (late embryo and pipped dead). Eight percent showed signs of mole cricket damage, the rest was not developed or rotten. In addition 28% infertile eggs were found in these nests. The nests in the hatchery had a hatching result of 29%, which is not significantly different from the natural nests (Mann-Whitney U;  $p > 0.05$ ). Only 10% of the eggs showed development up to the late embryo or pipped-dead stage though. The *D. coriacea* eggs had an average incubation time of 62 days (min. 57, max. 68 days, n=39).

## DISCUSSION

According to some authors, in the natural situation roughly 25-45% of the nests is completely lost due to natural causes (see Introduction). We have roughly estimated that about 25% of the *C. mydas* and *D. coriacea* nests in the Galibi region do not emerge at all (see explanation and HOEKERT *et al.* 1996) and assume that this is the same for *L. olivacea*. In contrast, in the hatchery all *L. olivacea* nests did emerge, and only 5% and 9% of, respectively, the *C. mydas* and *D. coriacea* nests in the hatchery did not emerge. Thus, placing the nests in to a hatchery can elevate the chances of the nests emerging considerably.

Estimation of hatching success of nests in the natural situation: In the period from May 21th to June 6th, 56 *D. coriacea* were deposited on the central beaches, of which 10 were removed by poachers or transferred to the hatchery. Of the remaining 46 nests 36 (78%) were observed to hatch. Of 26 *C. mydas* nests deposited from May 27th to June 12th, 20 (74%) were observed to hatch. This estimation is for one of the more suitable nesting beaches of the Galibi region and does not take poaching into account. A nest loss estimation of 25% should thus be considered to be a conservative estimation.

We cannot compare the hatching percentage for *L. olivacea* in the hatchery with the natural situation, since we found only two naturally emerging nests. SCHULZ (1975) found a hatching result of 59% (n=72) for natural nests, or 36% (n=20) and 50% (n=24) for replanted nests. The 65% we recorded in the hatchery is high compared to these figures. By relocating the *L. olivacea* nests to the hatchery the dangers of poaching, predation and drowning are strongly reduced, while the emerging success seems to be higher.

For *C. mydas* and *D. coriacea* the hatching percentages in the hatchery we found were lower than in the wild, but not significantly so. The number of not-hatched, developed eggs (late embryo/pipped dead) was higher in the natural situation than in the hatchery for all three species. (Mann-Whitney U: *C. mydas*;  $p < 0.05$ , *D. coriacea*;  $p < 0.01$ ) This is especially apparent for *D. coriacea*. In the wild, 58% of the eggs started to develop. Of about half of these eggs the development is terminated somewhere along the line. In the hatchery 39% of the eggs started to develop, but 75% of these made it to hatching. Thus it appears that the action of relocation kills a number of eggs, but the result of relocation, the new nest situation, has a positive effect on the development of the remaining live eggs. Consequently, a very

careful way of relocating could elevate the emergence percentage to be higher in the hatchery than in the wild.

The sex of sea turtle hatchlings is determined by the temperature in the nest. MROSOVSKY (1982) assumes that the incubation time is temperature dependent like sex determination. The average incubation time we found for the transferred nests of all three species corresponds with the times given by SCHULZ (1975) and MROSOVSKY (1982) for not transferred nests. Thus, considerable skewing of sex ratio due to the replacements of nests is not probable, but this should be checked.

In the Galibi Nature Reserve, transfers of significant numbers of nests of the small but geographically important *L. olivacea* population can, with some effort, be achieved. Thus an increase of hatchlings leaving these beaches can be accomplished. In addition to the existing effort to save the *L. olivacea* population in Suriname, relocating nests should be continued and intensified, the methods should be refined and sex-ratio bias should be investigated as soon as possible.

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