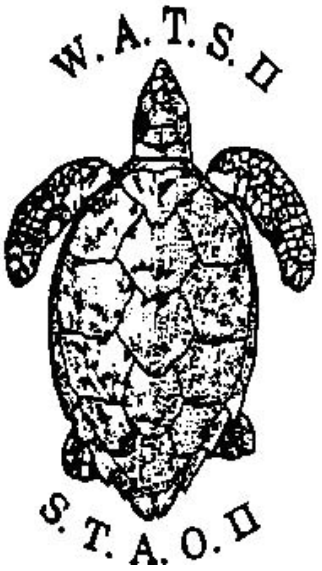
WATS II REPORT / DATA SET



National Report for Barbados

J.A. Horrocks and S. Willoughby

12 October 1987

WATS2 052

WIDECAST
Wider Caribbean Sea Turtle Conservation Network

With a grant from the U.S. National Marine Fisheries Service, WIDECAST has digitized the databases and proceedings of the **Western Atlantic Turtle Symposium (WATS)** with the hope that the revitalized documents might provide a useful historical context for contemporary sea turtle management and conservation efforts in the Western Atlantic Region.

With the stated objective of serving "as a starting point for the identification of critical areas where it will be necessary to concentrate all efforts in the future", the first Western Atlantic Turtle Symposium convened in Costa Rica (17-22 July 1983), and the second in Puerto Rico four years later (12-16 October 1987). WATS I featured National Reports from 43 political jurisdictions; 37 presented at WATS II.

WATS I opened with these words: "The talks which we started today have the multiple purpose of bringing our knowledge up to date about the biological peculiarities of the marine turtle populations of the western Atlantic; to know and analyse the scope of the National Reports prepared by the scientific and technical personnel of more than thirty nations of the region; to consider options for the orderly management of marine turtle populations; and in general to provide an adequate forum for the exchange of experiences among scientists, administrators, and individuals interested in making contributions for the preservation of this important natural resource."

A quarter-century has passed, and the results of these historic meetings have been lost to science and to a new generation of managers and conservationists. Their unique importance in providing baseline data remains unrecognized, and their potential as a "starting point" is neither known nor appreciated.

The proceedings document what was known at the time concerning the status and distribution of nesting and foraging habitat, population sizes and trends, mortality factors, official statistics on exploitation and trade, estimated incidental catch, employment dependent on turtles, mariculture operations, public and private institutions concerned with conservation and use, legal aspects (e.g. regulations, enforcement, protected areas), and active research projects.

Despite the potential value of this information to agencies responsible for conducting stock assessments, monitoring recovery trends, safeguarding critical habitat, and evaluating conservation successes in the 21st century, the National Reports submitted to WATS II were not included in the published proceedings and, until now, have existed only in the private libraries of a handful of agencies and symposium participants. To help ensure the legacy of these symposia, we have digitized the entire proceedings – including National Reports, plenary presentations and panels, species synopses, and annotated bibliographies from both meetings – and posted them online at http://www.widecast.org/What/RegionalPrograms.html.

Each article has been scanned from the original document. Errors in the scan have been corrected; however, to be true to the original content (as closely as we can discern it), potential errors of content have not been corrected. This article can be cited (with the number of pages based on the layout of the original document) as:

Horrocks, J.A. and S. Willoughby, N. 1987. National Report to WATS II for Barbados. Prepared for the Second Western Atlantic Turtle Symposium (WATS II), 12-16 October 1987, Mayagüez, Puerto Rico. Doc. 052. 25 pages.

Karen L. Eckert
WIDECAST Executive Director
June 2009

WESTERN ATLANTIC TURTLE SYMPOSIUM II

OCTOBER, 1987

MAYAGŰEZ, PUERTO RICO

THE NATIONAL REPORT FOR THE COUNTRY OF

BARBADOS

Prepared by

J. A. Horrocks and S. Willoughby

SECTION 1

A. NESTING

1. Species nesting

The locations of suitable nesting beaches, and beaches where hawksbills and leatherbacks have been reported nesting in Barbados are shown in Figure 1. Hawksbills nest primarily on the west and south coasts of the island, and more rarely on some of have only been recorded nesting on the east coast and on the higher wave energy beaches of the south east coast (Fig. 1). No other species are known to nest in Barbados. Poachers claim that each female lays two or three times in the breeding season; each nesting separated by about two weeks and occurring at a site close to the previous nest. Since few breeding females have yet been tagged, the validity of this claim remains untested.

2. Nesting Seasonality

Hawksbills

There are records of hawksbills nesting in all months except January, February, March and April. Nesting activity peaks between May and August, 86.5 % of all nesting occurring over this period ($\chi^2 = 113.73$, $P < 0.001$; see Figure 2 and Section 2). This suggests significant seasonality in nesting. Three early morning patrols of all potential nesting beaches around the island were conducted between June and August 1987 (See Section F2). A minimum of one and a maximum of three nests per night were recorded for this peak nesting period. If extrapolated, this indicates that between 90 and 270 nestings are attempted over this peak period in Barbados. Note that, although obvious false crawls are not included in this count, it was not always possible to locate eggs and in a substantial number of cases, the females may have been disturbed or slaughtered whilst in the process of nesting (Section C). These figures (i.e. between 90 and 270 nestings during the peak period) therefore represent upper estimates of successful nesting activity. Over this same period (June-August), the public reported 39 nestings and attempted nestings (Section Fl). Public reports therefore only represent 14-43 % of all nesting activity, as estimated by beach patrols. In order to estimate the number of breeding females from nest counts it is necessary to have information on renesting frequency (Carr et al 1982). Breeding females are tagged whenever possible with the intention of estimating re-nesting frequency at a subsequent time (Section J1).

Leatherbacks

There have only been 8 reports of leatherbacks nesting in Barbados; all on exposed east or south-east coast beaches (Figure 1). The reports span April-August (1984-1987) with half of the nestings (50%) occurring in June.

B. STATUS OF NESTING BEACHES

There are approximately 44 km of suitable nesting beaches in Barbados, where a suitable beach is defined as one at which some sand remains exposed at high tide. Of this, 19.4 km is on the west coast, 9.3 km on the south and southeast coasts, and 15.2 km on the east coast. A list of the nesting beaches and species nesting thereon is provided in Section 2. The west coast beaches are typically narrow (10-20 m) and composed of fine-grained calcareous sand. Shallow sandy bays are separated by fringing coral reefs. Wave action is usually low energy. The south and southeast coast beaches are often wider, composed primarily of calcareous sands but affected by waves of greater energy.

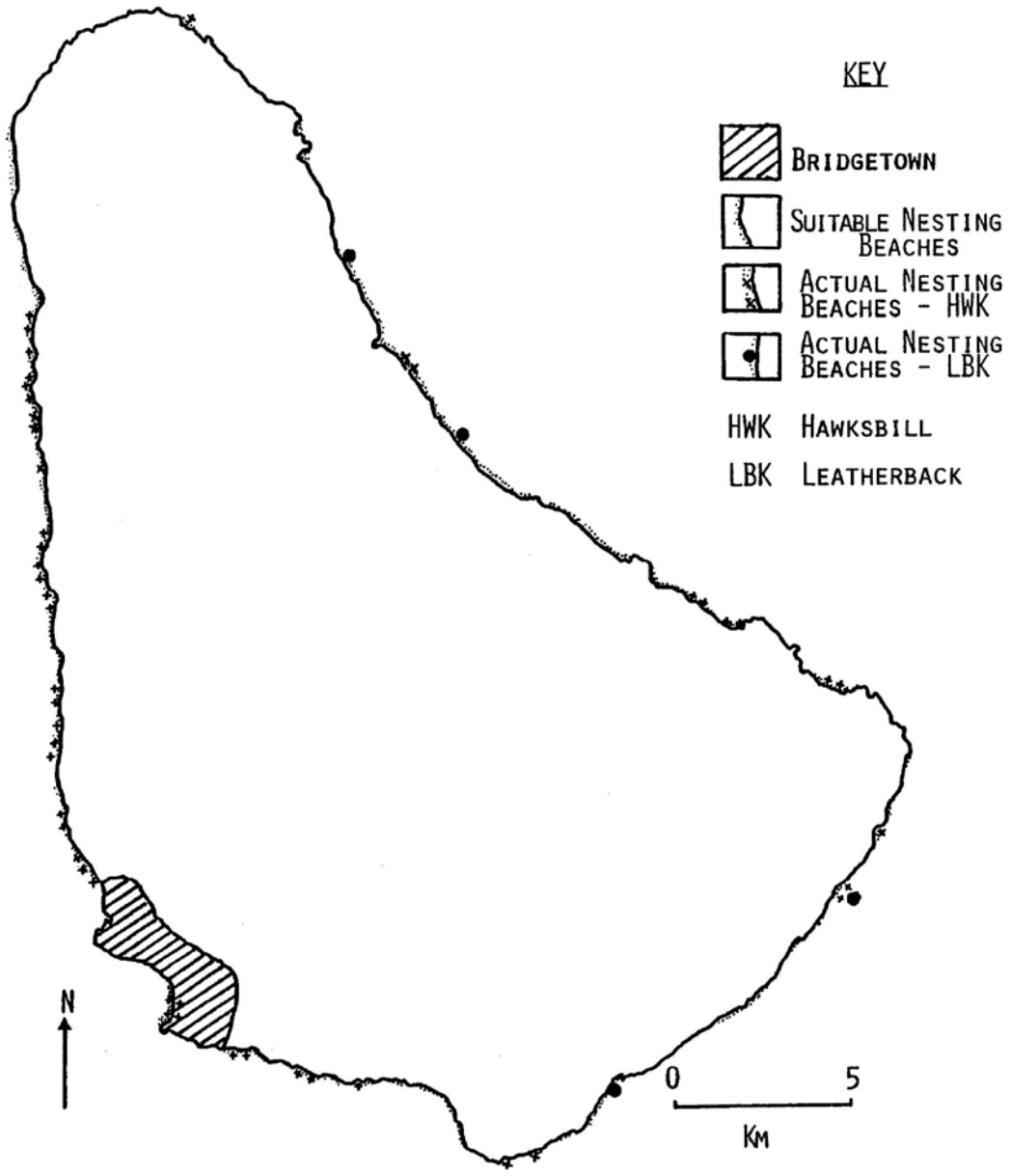


Figure 1. Map of Barbados showing suitable nesting beaches, and beaches where hawksbills and leatherbacks have been reported nesting.

Editor's note (2009): Maps and figures are reprinted exactly as they appear in the original document; we regret the poor quality exhibited in some cases.

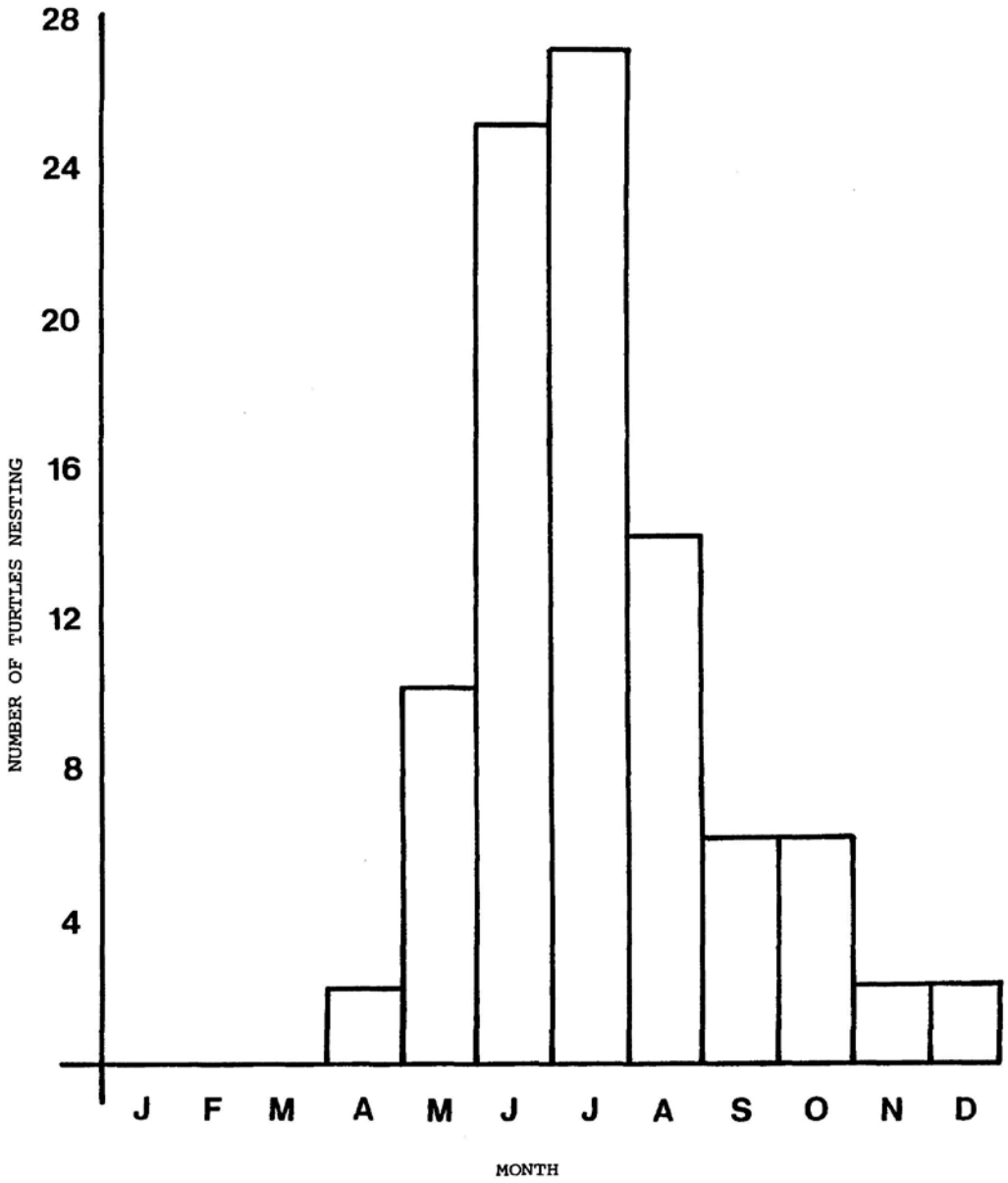


Figure 2. The number of turtles nesting per month, 1985-1987, in Barbados as reported by the public.

Beaches on both the west and south coasts are heavily affected by the activities of man. The beach vegetation (primarily coconut palm, sea grape, manchineel, and crab grasses) has typically been removed in the process of beach 'cleaning' for aesthetic purposes or for development. The backs of beaches are often lined with fortifying concrete walls or piles of boulders protecting beachfront properties. Houses and hotels line the beaches on the west and south coasts for most of their length. A consequence of the extensive development on the west and south coasts is that it is difficult for turtles to nest without being observed by people. This is advantageous in terms of the public being able to assist in the monitoring of the numbers of nestings that are occurring, but it increases the probability of poaching of nesting females.

Beach erosion is a serious problem in some areas. Factors contributing to erosion include the removal of beach vegetation and the construction of coastal defences and groynes in the shorter term, and the pollution of coastal waters and consequent death of protective reef barriers in the longer term.

Man and occasionally dogs are the only predators of turtles' eggs in Barbados. Nest flooding by salt and freshwater is the most serious threat to the successful hatching of eggs. The hatching success of eggs relocated from a nest flooded a few days after laying was only 51.9%; compared to an average of 86 % from nests not subjected to flooding. Several reports of total nest destruction by wave action have been recorded. Finally, heavy public beach use has resulted in total mortality of hatchlings even after high hatching success, due to compression of the sand preventing hatchlings from emerging. The extent of this problem is not known but is probably appreciable on Barbadian beaches, which, owing to the high population density in Barbados, serve as important recreational areas for both residents and tourists.

The east coast beaches are wide (20-40 m) composed of silica sand, and backed by dune systems in several areas. The wave action is more intense; east coast waves having amplitude of at least 4 times that of west coast waves. East coast beaches are backed by few houses, and heavy beach use is confined to a small number of beaches. East coast beaches are rarely traversed by people at night, and poaching is not as probable as it is on the west and south coasts.

C. EXPLOITATION

The turtle fishery exploits hawksbills, and more rarely greens and loggerheads. The meat, eggs and shells off hawksbills are used, the meat only of greens and loggerheads and the eggs only of leatherbacks. The fishery is seasonal in that nets are only set during the breeding season, and most turtles are caught at this time. The nets used are entangling nets that range between 8" and 12" square mesh and are typically 8 to 12 ft deep and between 20 to 150 m long. They are set both at the surface and at the bottom. Turtles are also caught as by-catch in gear set for fish or by spear fishermen.

No hawksbills of less than 23 cm SCL or greens of less than 30 cm SCL are seen in the coastal waters of Barbados. Although it is illegal to catch a turtle weighing less than 30 lb (Section H), many undersized turtles drown in nets set primarily for adults. Juvenile hawksbills have very attractive shells and until recently, when department stores were reminded of the laws protecting turtles, stuffed juveniles were offered for sale. Many turtles are caught illegally whilst nesting (See Section H) and are brought to market for sale. In 1987, 21.4 % of nestings reported by the public resulted in the female being slaughtered.

Since hawksbills are generally less migratory than other turtle species (see Witzell, 1983); they are often considered to be associated with bank and fringing reefs in the general vicinity of breeding beaches throughout the year. Hawksbill is the principal species captured in Barbados. It is therefore of interest that fishermen set nets for turtles only during the breeding season. Since fishing practices have developed to reflect availability resources, this may imply that few turtles of breeding size are in Barbadian waters outside of the breeding season. Alternatively, it may suggest that in the months when fishing occurs nets are being placed illegally close to shore to catch females on their way to and from the beach, and/or that turtles are being caught primarily whilst they nest (Section H). Reports of local divers suggest that there are indeed fewer adult hawksbills in Barbadian waters outside of the breeding season. Attempts are being made to tag as many breeding females as possible (See Section J1) to investigate their movements.

There are several market points around the island for the handling and sale of turtle meat, eggs and shell. At each of two primary sites, there are usually three turtles on sale per week

during the breeding season. How the turtles on sale at these points were captured is not known, and records of species caught are not usually kept.

Approximately half of a turtle's weight is considered to be meat, which sells at an average of Bds. $2.80 (US $ 1.40 per lb). An adult turtle yields about 6-8 lbs of shell which sells at Bds. $ 15.00 (US $ 7.50) per lb. Eggs sell at Bds. $ 2.00 (US $ 1.00) per lb. An average adult hawksbill weighs approximately 160 lb (average weight of breeding female, Olson 1985). A turtle of this size is worth Bds. $ 224.00 (US $ 112.00) in meat and Bds. $ 105.00 (US $ 52.50) in shell, making a total of Bds. $ 336.00 (US $ 168.00). At present, the fine for catching a turtle on the beach is Bds. $ 100.00 (US $ 50.00), and is clearly not an adequate deterrent. The additional threat of having turtle nets confiscated is probably more effective.

D. OTHER SOURCES OF SEA TURTLE MORTALITY

Several nesting turtles have been found on their backs in storm drains and trapped after falling and wedging between boulders placed to reinforce the coastline. The illegal practice of dynamiting for fish kills an unknown number of turtles offshore. There are increasing reports of turtles being struck by speed boats and jet skis in the waters off the west and south coasts.

E. SEA TURTLE FORAGING AREAS

Hawksbills are thought to feed primarily on sponges that are plentiful on the many fringing reefs and the offshore bank reef around Barbados. However, hawksbills reared at Bellairs have thrived on a diet of low fat fish and algae. Green turtles also forage near Barbados. The extent of sea grass common in sheltered areas on the south and east coasts than on beds around the island presently is unknown, but they are more common in sheltered areas on the south and east coasts than on the west coast.

F. SEA TURTLE SURVEYS AND RESEARCH PROJECTS (SEE SECTION J)

1. Public awareness and monitoring program

Prior to 1986 there had been no quantitative estimates of the size of the nesting turtle population in Barbados, nor any serious attempt to enforce the Fisheries Regulation originally passed in 1904 that includes the Turtle Preservation legislation (See Section H). In preparation for WATS II, Bellairs Research Institute and the Fisheries Division, Ministry of Agriculture, Barbados, collaborated in an island wide information gathering program. Through a series of articles in the press, as well as radio and television programmes, the public was informed about sea turtle biology, the need for conservation, and the existing legislation protecting turtles. In each case, the public was asked to telephone Bellairs or the Fisheries Division if a turtle was seen nesting or attempting to nest, or if hatchlings were seen. Getting the public involved was considered an effective way to tackle the problem of gathering information on hawksbills and leatherbacks, given limited and voluntary manpower. Moreover, it simultaneously served to inform people about the need for conservation and about existing legislation protecting turtles, and thereby should enhance rehabilitation of turtle populations in the long term.

2. Beach Patrols

Volunteers from the recently formed Barbados Environmental Association provided additional quantitative data on the number of turtles nesting through a series of early morning walks around Barbados. The island was divided into eight zones, each walked by a separate group of volunteers. The divisions were such that the groups could walk their designated route between 05:30 and 07:30 am, prior to most human activity on beaches. Each group recorded all nests and

false crawls as well as information on the position of the nest, any evidence of poaching, and any factors such as lights that might interfere with hatchlings reaching the sea. Any nests considered to be in danger from beach erosion, building development or location on the beach (i.e., too close to the sea) were subsequently relocated to a safer site nearby (See Section J4). As well as providing more quantitative information for the west and south coasts than public reports alone could provide, this allowed an estimate to be made of the numbers of nests made on the less populated east coast of the island.

G. PERSONS INVOLVED IN SEA TURTLE CONSERVATION / MANAGEMENT

Wayne Hunte, Director,
Bellairs Research Institute, St. James
809 422 2087

Julia Horrocks, Assistant Lecturer,
Department of Biology,
University of the West Indies,
Cave Hill, St. Michael 809 425 1310
and
Bellairs Research Institute,
St. James
809 422 2087

Stephen Willoughby, Fisheries Biologist
Fisheries Division,
Bay Street, St. Michael
809 426 3745

Hazel Oxenford, Fisheries Biologist
Bellairs Research Institute St. James,
809 422 2087

H. LEGISLATION

Summary of the Fisheries Regulation Act for Turtle Preservation 1904.

- It is illegal to take turtle eggs, and to catch any turtle on the beach or within 100 yd of the shore.
- It is illegal to set any gear for the purpose of catching turtles within 100 yd of the shore.
- It is illegal to buy, sell or possess any turtle of weight less than 30 lbs.

These offences are punished by confiscation of the turtle(s), eggs, and/or gear and by a fine of one hundred dollars.

I. TURTLE NESTING BEACHES

The locations of turtle nesting beaches, and beaches where hawksbills and leatherbacks have been reported nesting in Barbados, are shown in Figure 1.

J. OTHER INFORMATION

1. Response by Bellairs Research Institute to public calls about turtles

When a nesting or hatching event is called in to Bellairs, staff from the Institute record the exact location of the nest and/or hatching. If the turtle is still on the beach, staff will go to the site, take measurements (SCL and CW), and tag the turtle. If the call is to give information on a nesting event of the previous night, and the nest is considered to be in a dangerous position, staff from Bellairs go to the site and decide whether the nest should be moved (see Section J4).

Often the realisation that a nest has hatched occurs because hatchlings are observed inland, on verandahs and lawns, or in hotel bars gathered around bright light sources. People are encouraged to switch off the confusing light source, to reposition the hatchlings on the beach, and to allow them to re-orientate towards the sea. Occasionally calls are not received until the day following hatching. In this case, the hatchlings are kept at the Institute in sea water in dim light until the following night. They are then taken out of the water about ten minutes prior to release, put onto the beach and left to orientate towards the sea. If after thirty minutes any hatchling shows no sign of orientation or movement towards the sea, it is taken back to the Institute and reared (See Section J2). Often people walking the beaches during the daytime find a few hatchlings (2-3) indicating a hatching event from the previous night. Under normal circumstances these are usually hatchlings would have died. They are given the chance to enter the sea after dark of the same day, but typically, they rarely have the energy necessary to swim through the waves. These hatchlings are returned to Bellairs and reared.

2. Head-starting

Bellairs does not conduct a head-starting programme per se, partly because the effectiveness of head-starting has yet to be proved and partly because Bellairs does not have enough permanent tank space or sufficient funds to meet expenses involved. Only stragglers left in the nest, injured hatchlings, turtles partially drowned in nets, or turtles kept by members of the public in confined spaces or in freshwater for long periods are cared for/reared at the Institute.

3. Release of turtles kept in captivity for varying periods of time

One reason why head-starting is not practised on a wide scale is that the importance of release from the beach in the first few days of life to the subsequent breeding success of turtles (i.e. to their finding a suitable nesting beach when they reach breeding age) is not known. Moreover, it is not known whether rearing to a larger size before release actually does increase the probability of survival to sexual maturity.

Occasionally, whole batches of hatchlings are brought to the Institute older than three days post-emergence from the nest. Since these hatchlings are no longer actively swimming, release from the beach is usually ineffective; they are hatchlings that fail to orientate themselves or to move towards the sea. At nightfall, these animals are placed on the beach at the tide line so that the sea covers them. They are then picked up, taken a few miles offshore by boat and released with scattered floating objects such as broken sticks and coconut husks. The aim of this procedure is to offer hatchlings a potential source of food; the objects providing a base for algae to grow on, and to which small organisms might be attracted, but not so large that predatory fish or birds may be attracted. The effect of this type of release on reducing mortality is unknown.

Hawksbills that have started to wedge themselves under rocks in their tanks at Bellairs are considered to be at a size (approx. 15 cm SCL) when they may naturally be found in water shallow enough for them to reach the substrate. These are released from the beach in the vicinity of a fringing reef, away from human activity and during the late afternoon.

4. Nest relocation

Erosion and development, particularly on the west coast, have forced the relocation of a number of nests (See Section B). In this procedure, eggs are carefully removed, without reorienting them, and are carried in egg boxes in styrofoam containers to the new nest site. A nest site similar to that of the original nest is chosen, and the nest dug to the same depth.

Each relocated nest is monitored closely and hatching success calculated by excavating nest contents 2 days after the first emergence has occurred. Eggs are only relocated if the nest is considered to be in great danger. Experience has shown that eggs laid on heavily used public beaches can survive trampling, but that newly hatched turtles cannot dig themselves out in such circumstances. Nests likely to be heavily trampled are therefore not always relocated, but are carefully monitored towards the end of incubation, so that hatchlings can be dug out if necessary.

REFERENCES

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Olson, M.H. 1985. Population characteristics of the hawksbill turtle (*Eretomochelys imbricata*) on Mona Island, Puerto Rico: A case study of U.S. Endangered Species Act. Proc. Fifth Int. Coral Reef Cong. Tahiti, Vol. 5, 475-480.

Witzell, W.N. 1983. Synopsis of biological data on the hawksbill turtle *Eretmochelys imbricata* (Linnaues, 1766). FAO Fisheries Synopsis No. 137, Rome.

SECTION 2

WATS II SEA TURTLE SURVEY DATA FORM

TABLE III. NESTING BEACH INVENTORY

List Beaches in geographic sequence. Provide additional information on an attached page. Please list each species that occurs on beach on a separate line even if months of occurrence are the same.

COUNTRY: BARBADOS STATE: RECORDER: J. HORROCKS

Name of Beach	Length in Km	Species * Nesting	Months Peak Nesting	Months Recorded Nesting
Heywoods	0.6	Ei		June, August
Speightstown	0.2	Ei		August
Road View	0.6	Ei		May, July, August, November
Mullins	0.3	Ei		August
Gibbes	0.4	Ei		July
Alleynes Bay	1.1	Ei		June, July, August, September, October
Holetown	2.4	Ei		May, June, July, August, September
Sandy Lane Bay	0.6	Ei		June, August
Paynes Bay	0.4	Ei		July, September, October
Fitts Village	0.3	Ei		August
Batts Rock	0.3	Ei		June
Brighton	1.5	Ei		June, July, August
Drill Hall	0.3	Ei		June, August, October
Hastings	0.2	Ei		June
Worthing	0.2	Ei		June, July, September
St. Lawrence	0.1	Ei		June, July
Whitesands	0.1	Ei		July
Atlantic Shores	0.1	Ei		July, august
Long Bay	1.5	Dc		August
Ginger Bay	0.2	Dc		April
Beachy Head	0.05	Ei		May
Bottom Bay	0.1	Ei		July
Bath	0.7	Ei		May, June, July, August
Martin's Bay	0.6	Ei		June
Bathsheba	0.5	Ei		July
East Coast Rd.	4.2	Dc		June, July
Walkers	1.6	Dc		June
Abbotts Bay	0.05	Ei		July

* Cc = *Caretta caretta*; Cm = *Chelonia mydas*; Dc = *Dermochelys coriacea*; Ei = *Eretmochelys imbricata*; Lk = *Lepidochelys kempi*; Lo = *Lepidochelys olivacea*; Uk = Unknown

SECTION 3

THE BELLAIRS RESEARCH INSTITUTE
OF
McGILL UNIVERSITY

St. James
Barbados. W.I.

1st June 1987

Dear Sir/Madam,

Bellairs Research Institute and the Fisheries Division of the Ministry of Agriculture, Food and Fisheries are attempting to conserve and rehabilitate stocks of endangered sea turtles in Barbados. We are asking for the cooperation of staff employed at, all hotels and restaurants built near the beach on the south, southeast and west coasts of Barbados during this year's turtle breeding season (June-December).

In the above context, you can be of assistance in two respects. Firstly, night watchmen and security guards are in a position to assist our efforts to monitor the number of nests, both when females make their nests and when hatchlings emerge, since these activities usually occur at night. In the past few years, night watchmen and security staff have been especially helpful in this respect. Unfortunately, we have also received reports that some security guards have used the opportunity their jobs afford to slaughter nesting turtles and remove turtle eggs. This is illegal and we are requesting your co-operation in eliminating this practice. Secondly, since hatchling sea turtles are attracted to light, security and ornamental lighting that shines directly out to sea causes them to walk inland rather than towards the sea. It would be most helpful if such lights could be shaded or redirected during the breeding season. If this is impossible, could it be arranged to have hotel personnel look in the vicinity of lights on mornings in case hatchlings have been mistakenly lured in their direction?

We are requesting that all incidents of turtles nesting or hatchlings emerging be telephoned in to Bellairs Research Institute (422-2087/422-2034) where this information is being collected.

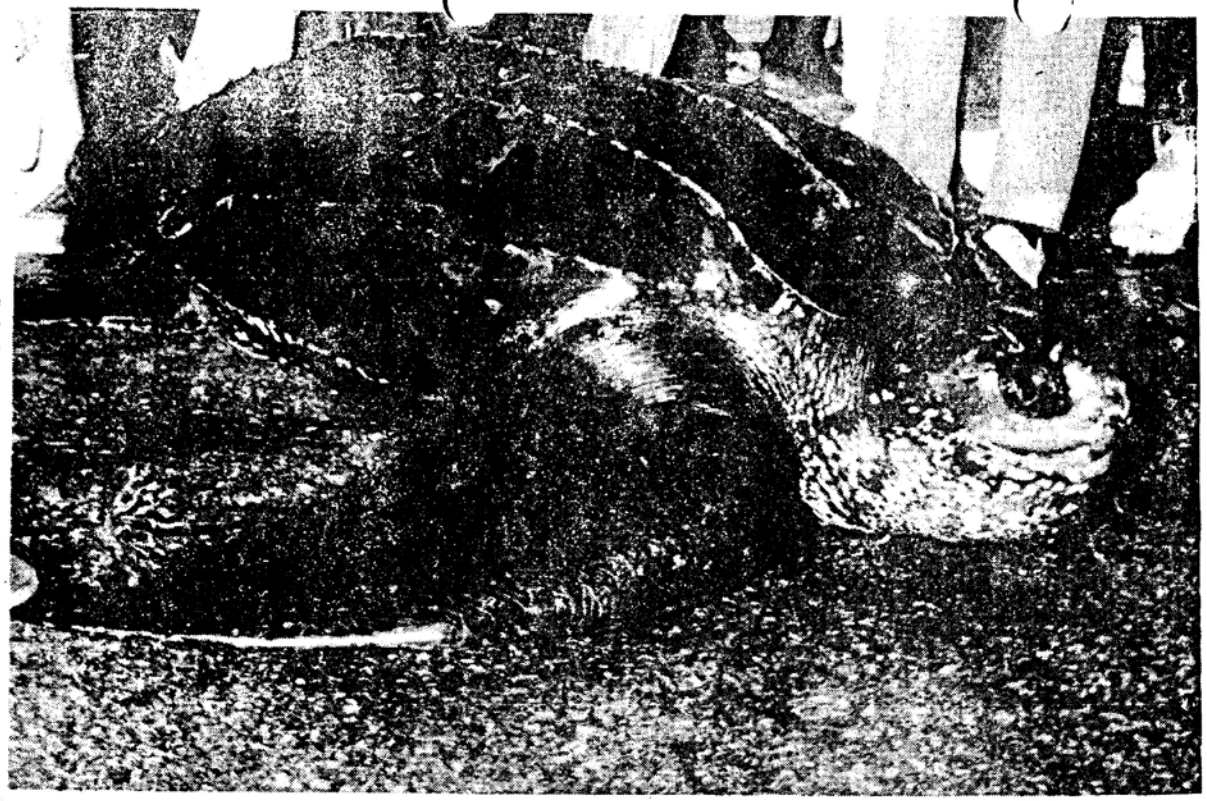
Thank you for your cooperation,

Yours sincerely,

J. A. Horrocks, Ph.D.

Sept. 12 · 13 1986. The Nation.

Save our sea turtle alert



THIS 600-POUND LEATHERBACK TURTLE is one of the few of its kind to be seen in Barbados. The hawksbill sea turtle is the type we usually see nesting alone on our beaches late at night.

SEA TURTLES of the Caribbean are an important natural resource that could significantly contribute to the regional economy if populations could be restored to levels that would permit controlled exploitation. To rehabilitate and manage turtle populations, we require better estimates of current population sizes and of hatching success.

Hawksbill sea turtles **Eretmochelys imbricaia** nest on the west, south and east coast beaches of Barbados primarily between July and November. Apart from occasional reports of leatherback turtles **Dermochelys coriacea** (see photo) nesting on the east coast, the hawksbill is the only sea turtle that nests here.

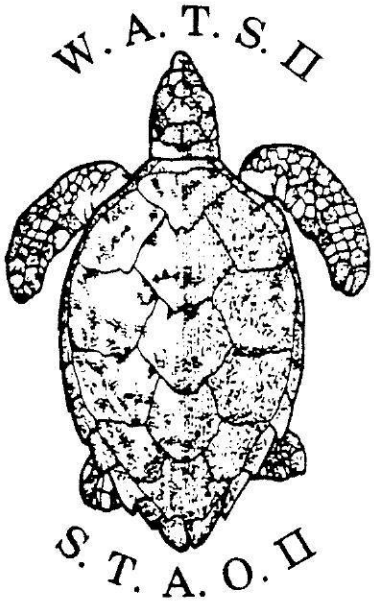
It is presently on the international endangered species list, mainly due to over-exploitation by man and to the erosion of nesting beaches. Estimates suggest that only one turtle out of every one hundred that emerges from a nest, survives long enough to reach breeding age. This is why permitting a turtle to nest in peace and leaving the nest undisturbed afterwards is so important, and why legislation protecting nesting turtles and their eggs exists here in Barbados.

The hawksbill's habit of coming ashore at night alone to nest, the total length of potential nesting beaches around the island and the lack of sufficient numbers of volunteers to survey beaches regularly, makes it difficult both to assess the numbers of turtles that are nesting here and to determine the number of successful hatchings.

Over the past few years, Bellairs Research Institute has been kept informed of nestings and hatchings by interested and concerned members of the public. This year, in collaboration with the Fisheries Division of the Ministry of Agriculture, the institute is redoubling efforts to determine the size of the nesting population and the percentage of nests that hatch.

If you have seen a turtle on a beach nesting or attempting to nest, or if you have seen turtles hatch, please call **Bellairs Research Institute, 422-2087.**

WATS II REPORT/DATA SET



National Report for Barbados

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12 October 1987

WATS2 052

WESTERN ATLANTIC TURTLE SYMPOSIUM II

OCTOBER, 1987

MAYAGUEZ, PUERTO RICO

THE NATIONAL REPORT FOR THE COUNTRY OF

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Prepared by J. A. Horrocks and S. Willoughby

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The locations of suitable nesting beaches, and beaches where hawksbills and leatherbacks have been reported nesting in Barbados are shown in Figure 1. Hawksbills nest primarily on the west and south coasts of the island, and more rarely on some of the sheltered beaches of east coast bays (Fig. 1). Leatherbacks have only been recorded nesting on the east coast and on the higher wave energy beaches of the south east coast (Fig. 1). No other species are known to nest in Barbados. Poachers claim that each female lays two or three times in the breeding season; each nesting separated by about two weeks and occurring at a site close to the previous nest. Since few breeding females have yet been tagged, the validity of this claim remains untested.

2. Nesting Seasonality

Hawksbills

There are records of hawksbills nesting in all months except January, February, March and April. Nesting activity peaks between May and August, 86.5 % of all nesting occurring over this period ($X^2 = 113.73$, $P < 0.001$; see Fig. 2 and Section 2). This suggests significant seasonality in nesting. Three early morning patrols of all potential nesting beaches around the island were conducted between June and August 1987 (See Section F2). A minimum of one and a maximum of three nests per night were

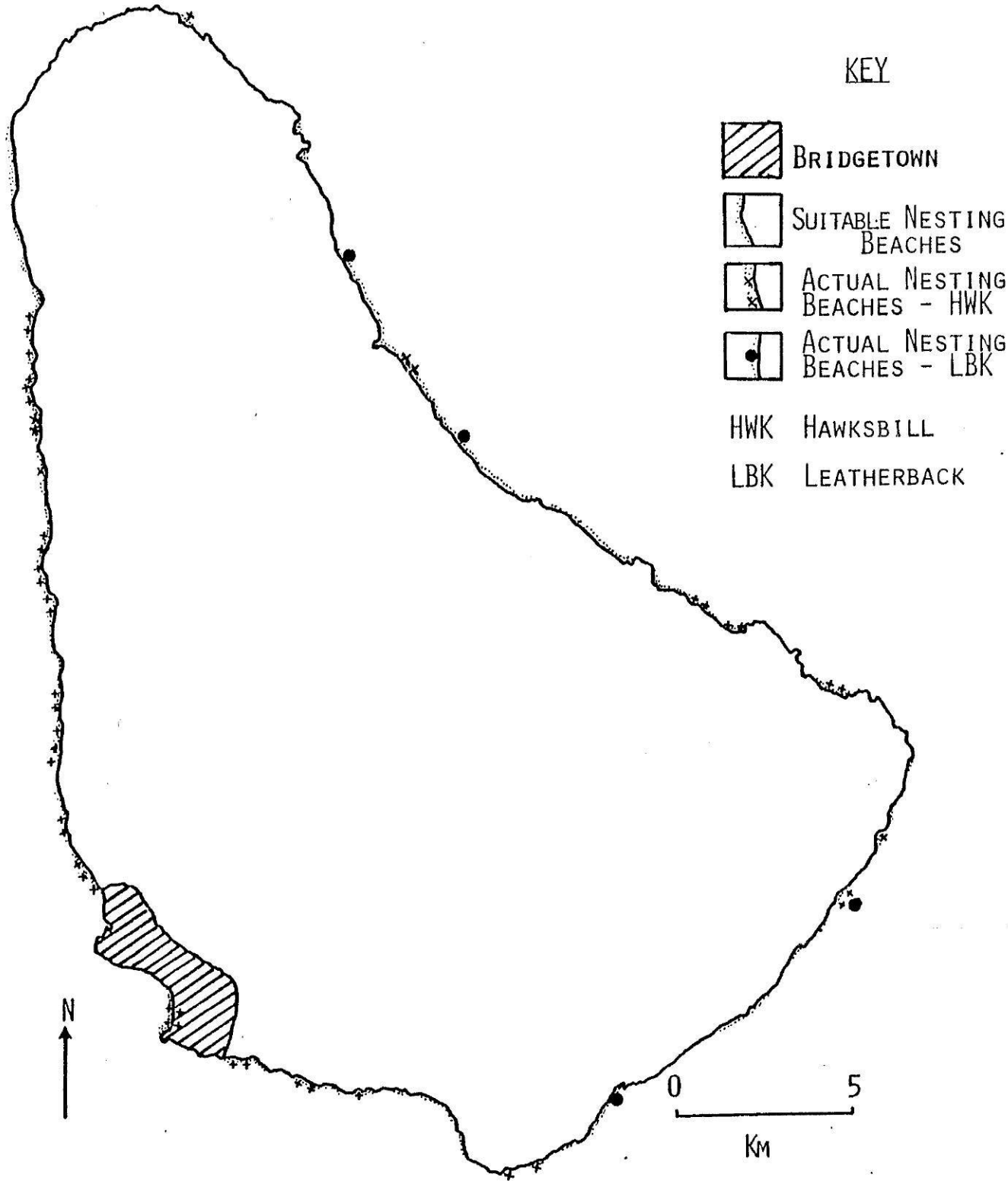

Figure 1. Map of Barbados showing suitable nesting beaches, and beaches where hawksbills and leatherbacks have been reported nesting.

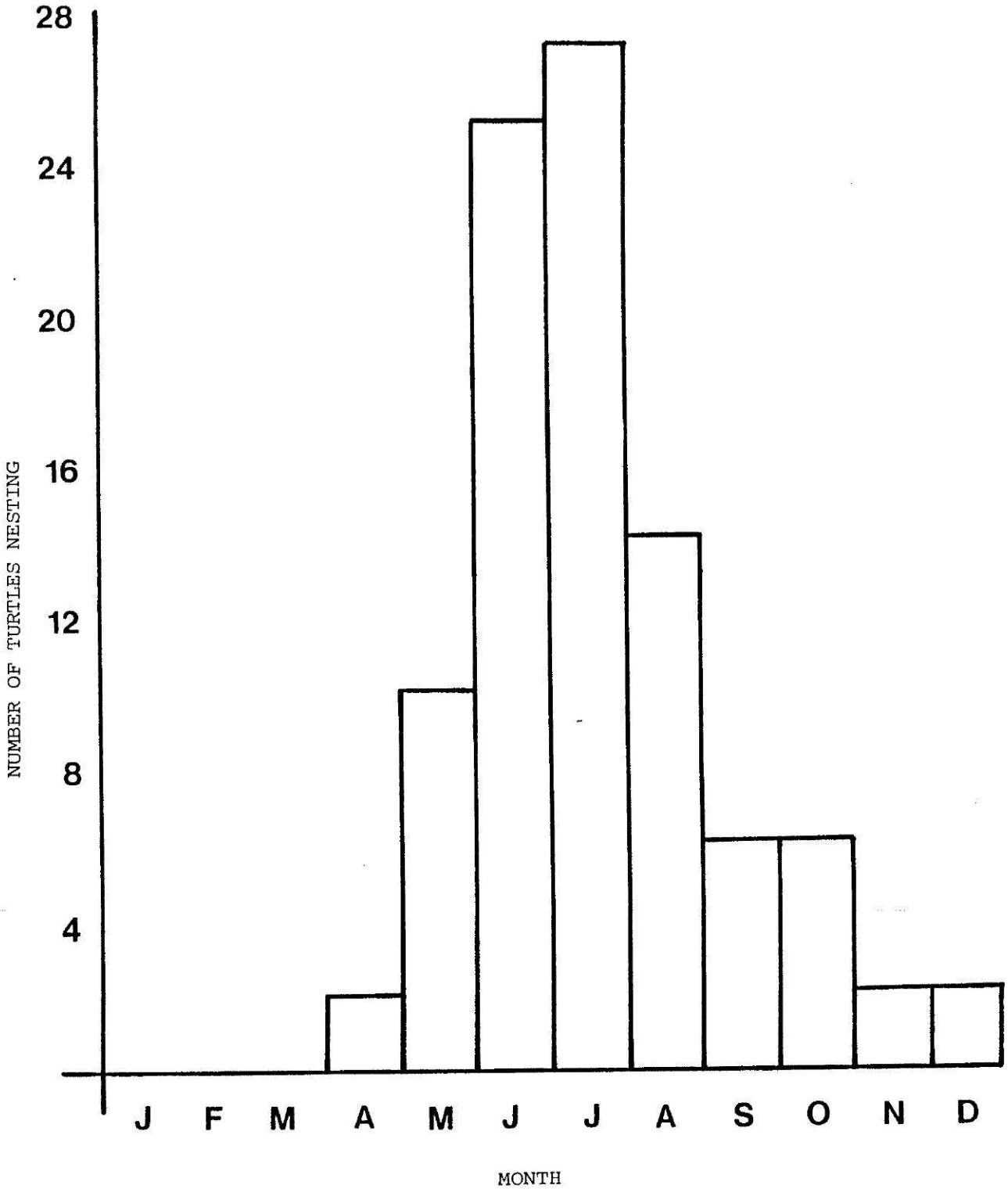

Figure 2. The number of turtles nesting per month between 1985-1987 in Barbados as reported by the general public.

recorded for this peak nesting period. If extrapolated, this indicates that between 90 and 270 nestings are attempted over this peak period in Barbados. Note that, although obvious false crawls are not included in this count, it was not always possible to locate eggs and in a substantial number of cases the females may have been disturbed or slaughtered whilst in the process of nesting (Section C). These figures (i.e. between 90 and 270 nestings during the peak period) therefore represent upper estimates of successful nesting activity. Over this same period (June-August), 39 nestings and attempted nestings were reported by the general public (Section F1). Public reports therefore only represent 14-43 % of all nesting activity, as estimated by beach patrols. In order to estimate the number of breeding females from nest counts it is necessary to have information on renesting frequency (Carr et al 1982). Breeding females are tagged whenever possible with the intention of estimating renesting frequency at a subsequent time (Section J1).

Leatherbacks

There have only been 8 reports of leatherbacks nesting in Barbados; all on exposed east or south-east coast beaches (Fig. 1). The reports span April-August (1984-1987) with half of the nestings (50%) occurring in June.

B. STATUS OF NESTING BEACHES

There are approximately 44 km of suitable nesting beaches in Barbados; where a suitable beach is defined as one at which

some sand remains exposed at high tide. Of this, 19.4 km is on the west coast, 9.3 km on the south and south east coasts, and 15.2 km on the east coast. A list of the nesting beaches and species nesting thereon is provided in Section 2. The west coast beaches are typically narrow (10-20 m) and composed of fine-grained calcareous sand. Shallow sandy bays are separated by fringing coral reefs. Wave action is usually low energy. The south and south east coast beaches are often wider, composed primarily of calcareous sands but affected by waves of greater energy.

Beaches on both the west and south coasts are heavily affected by the activities of man. The beach vegetation (primarily coconut palm, sea grape, manchineel, and crab grasses) has typically been removed in the process of beach 'cleaning' for aesthetic purposes or for development. The backs of beaches are often lined with fortifying concrete walls or piles of boulders protecting beach front properties. Houses and hotels line the beaches on the west and south coasts for most of their length. A consequence of the extensive development on the west and south coasts is that it is difficult for turtles to nest without being observed by people. This is an advantage in terms of the general public being able to assist in the monitoring of numbers of nestings that are occurring, but increases the probability of poaching of nesting females.

Beach erosion is a serious problem in some areas. Factors contributing to erosion include the removal of beach vegetation

and the construction of coastal defences and groynes in the shorter term, and the pollution of coastal waters and consequent death of protective reef barriers in the longer term.

Man and occasionally dogs are the only predators of turtles' eggs in Barbados. Nest flooding by salt and freshwater is the most serious threat to the successful hatching of eggs. The hatching success of eggs relocated from a nest flooded a few days after laying was only 51.9%; compared to an average of 86 % from nests not subjected to flooding. Several reports of total nest destruction by wave action have been recorded. Finally, heavy public beach use has resulted in total mortality of hatchlings even after high hatching success, due to compression of the sand preventing hatchlings from emerging. The extent of this problem is not known but is probably appreciable on Barbadian beaches which, owing to the high population density in Barbados, serve as important recreational areas for both residents and tourists.

The east coast beaches are wide (20-40 m) composed of silica sand, and backed by dune systems in several areas. The wave action is more intense; east coast waves having an amplitude of at least 4 times that of west coast waves. East coast beaches are backed by few houses, and heavy beach use is confined to a small number of beaches. East coast beaches are rarely traversed by people at night, and poaching is not as probable as it is on the west and south coasts.

C. EXPLOITATION

Hawksbills, and more rarely greens and loggerheads, are exploited by the turtle fishery. The meat, eggs and shells of hawksbills are used, the meat only of greens and loggerheads and the eggs only of leatherbacks. The fishery is seasonal in that nets are only set during the breeding season, and most turtles are caught at this time. The nets used are entangling nets which range between 8" and 12" square mesh and are typically 8 to 12 ft deep and between 20 to 150 m long. They are set both at the surface and at the bottom. Turtles are also caught as by-catch in gear set for fish or by spear fishermen.

No hawksbills of less than 23 cm SCL or greens of less than 30 cm SCL are seen in the coastal waters of Barbados. Although it is illegal to catch a turtle weighing less than 30 lb (Section H), many undersized turtles drown in nets set primarily for adults. Juvenile hawksbills have very attractive shells and until recently, when department stores were reminded of the laws protecting turtles, stuffed juveniles were offered for sale. Many turtles are caught illegally whilst nesting (See Section H) and are brought to market for sale. In 1987, 21.4 % of nestings reported by the general public resulted in the female being slaughtered.

Since hawksbills are generally less migratory than other turtle species (see Witzell 1983); they are often considered to be associated with bank and fringing reefs in the general vicinity of breeding beaches throughout the year. Hawksbill is

is the principal species captured in Barbados. It is therefore of interest that fishermen set nets for turtles only during the breeding season. Since fishing practises have developed to reflect availability of resources, this may imply that few turtles of breeding size are in Barbadian waters outside of the breeding season. Alternatively, it may suggest that in the months when fishing occurs nets are being placed illegally close to shore to catch females on their way to and from the beach, and/or that turtles are being caught primarily whilst they nest (Section H). Reports of local divers suggest that there are indeed fewer adult hawksbills in Barbadian waters outside of the breeding season. Attempts are being made to tag as many breeding females as possible (See Section J1) to investigate their movements.

There are several market points around the island for the handling and sale of turtle meat, eggs and shell. At each of two primary sites, there are usually three turtles on sale per week during the breeding season. How the turtles on sale at these points werer captured is not known, and records of species caught are not usually kept.

Approximately half of a turtle's weight is considered to be meat, which sells at an average of Bds. $ 2.80 (US $ 1.40) per lb. An adult turtle yields about 6-8 lbs of shell which sells at Bds. $ 15.00 (US $ 7.50) per lb. Eggs sell at Bds. $ 2.00 (US $ 1.00) per lb. An average adult hawksbill weighs approximately 160 lb (average weight of breeding female, Olson 1985). A turtle of this size is worth Bds. $ 224.00 (US $ 112.00) in meat

and Bds. $ 105.00 (US $ 52.50) in shell, making a total of Bds. $ 336.00 (US $ 168.00). At present, the fine for catching a turtle on the beach is Bds. $ 100.00 (US $ 50.00), and is clearly not an adequate deterrent. The additional threat of having turtle nets confiscated is probably more effective.

D. OTHER SOURCES OF SEA TURTLE MORTALITY

Several nesting turtles have been found on their backs in storm drains and trapped after falling and wedging between boulders placed to reinforce the coastline. The illegal practice of dynamiting for fish kills an unknown number of turtles offshore. There are increasing reports of turtles being struck by speed boats and jet skis in the waters off the west and south coasts.

E. SEA TURTLE FORAGING AREAS

Hawksbills are thought to feed primarily on sponges which are plentiful on the many fringing reefs and the offshore bank reef around Barbados. However, hawksbills reared at Bellairs have thrived on a diet of low fat fish and algae. Green turtles also forage in the vicinity of Barbados. The extent of sea grass beds around the island is presently unknown, but they are more common in sheltered areas on the south and east coasts than on the west coast.

F. SEA TURTLE SURVEYS AND RESEARCH PROJECTS (SEE SECTION J)

1. Public awareness and monitoring program

Prior to 1986 there had been no quantitative estimates of the size of the nesting turtle population in Barbados, nor any serious attempt to enforce the Fisheries Regulation originally passed in 1904 that includes the Turtle Preservation legislation (See Section H). In preparation for WATS II, Bellairs Research Institute and the Fisheries Division, Ministry of Agriculture, Barbados, collaborated in an islandwide information gathering program. Through a series of articles in the press, aa well as radio and television programmes, the public was informed about sea turtle biology, the need for conservation, and the existing legislation protecting turtles. In each case the public was asked to telephone Bellairs or the Fisheries Division if a turtle was seen nesting or attempting to nest, or if hatchlings were seen. Getting the public involved was considered to be an effective way to tackling the problem of gathering information on hawksbills and leatherbacks, given limited and voluntary manpower. Moreover, it simultaneously served to inform people about the need for conservation and about existing legislation protecting turtles, and thereby should enhance rehabilitation of turtle populations in the long term.

2. Beach Patrols

Volunteers from the recently formed Barbados Environmental Association provided additional quantitative data on the number

of turtles nesting through a series of early morning walks around Barbados. The island was divided into eight zones, each walked by a separate group of volunteers. The divisions were such that the groups could walk their designated route between 05:30 and 07:30 am, prior to most human activity on beaches. All nests and false crawls were recorded by each group, as well as information on the position of the nest, any evidence of poaching, and any factors such as lights that might interfere with hatchlings reaching the sea. Any nests considered to be in danger from beach erosion, building development or location on the beach (i.e. too close to the sea) were subsequently relocated to a safer site nearby (See Section J4). As well as providing more quantitative information for the west and south coasts than public reports alone could provide, this allowed an estimate to be made of the numbers of nests made on the less populated east coast of the island.

G. PERSONS INVOLVED IN SEA TURTLE CONSERVATION/MANAGEMENT

Wayne Hunte, Director,

Bellairs Research Institute,
St. James
809 422 2087

Julia Horrocks, Assistant Lecturer,

Department of Biology,
University of the West Indies,
Cave Hill, St. Michael
809 425 1310

and

Bellairs Research Institute,

St. James
809 422 2087

Stephen Willoughby, Fisheries Biologist

Fisheries Division,
Bay Street, St. Michael
809 426 3745

Hazel Oxenford, Fisheries Biologist

Bellairs Research Institute
St. James,
809 422 2087

H. LEGISLATION

Summary of the Fisheries Regulation Act for Turtle Preservation 1904

It is illegal to take turtle eggs, and to catch any turtle on the beach or within 100 yds of the shore.

It is illegal to set any gear for the purpose of catching turtles within 100 yds of the shore.

It is illegal to buy, sell or possess any turtle of weight less than 30 lbs.

These offences are punished by confiscation of the turtle(s), eggs, and/or gear and by a fine of one hundred dollars.

I. TURTLE NESTING BEACHES

The locations of turtle nesting beaches, and beaches where hawksbills and leatherbacks have been reported nesting in Barbados, are shown in Figure 1.

J. OTHER INFORMATION

1. Response by Bellairs Research Institute to public calls about turtles

When a nesting or hatching event is called in to Bellairs, staff from the Institute record the exact location of the nest and/or hatching. If the turtle is still on the beach, staff will go to the site, take measurements (SCL and CW), and tag the turtle. If the call is to give information on a nesting event of the previous night, and the nest is considered to be in a dangerous position, staff from Bellairs go to the site and decide whether the nest should be moved (see Section J4). Often the realisation that a nest has hatched occurs because hatchlings are observed inland, on verandahs and lawns, or in hotel bars gathered around bright light sources. People are encouraged to switch off the confusing light source, to reposition the hatchlings on the beach, and to allow them to reorientate towards the sea. Occasionally calls are not received until the day following hatching. In this case, the hatchlings are kept at the Institute in sea water in dim light until the following night. They are then taken out of the water about ten minutes prior to release, put onto the beach and left to orientate towards the sea. If after thirty minutes any hatchling shows no sign of orientation or movement towards the sea, it is taken back to the Institute and reared (See Section J2). Often a few hatchlings (2-3) are found by people walking the beaches during the daytime, indicating a hatching event from the previous night. These are

usually hatchlings which, under normal circumstances, would have died. They are given the chance to enter the sea after dark of the same day, but typically they rarely have the energy necessary to swim through the waves. These hatchlings are returned to Bellairs and reared.

2. Headstarting

Bellairs does not conduct a head-starting programme per se, partly because the effectiveness of head-starting has yet to be proved and partly because Bellairs does not have enough permanent tank space or sufficient funds to meet expenses involved. Only stragglers left in the nest, injured hatchlings, turtles partially drowned in nets, or turtles kept by members of the public in confined spaces or in freshwater for long periods of time are cared for/reared at the Institute.

3. Release of turtles kept in captivity for varying periods of time

One reason why head-starting is not practised on a wide scale is that the importance of release from the beach in the first few days of life to the subsequent breeding success of turtles (i.e. to their finding a suitable nesting beach when they reach breeding age) is not known. Moreover, it is not known whether rearing to a larger size before release actually does increase the probability of survival to sexual maturity.

Occasionally, whole batches of hatchlings are brought to the Institute older than three days post-emergence from the nest.

Since these hatchlings are no longer actively swimming, release from the beach is usually ineffective; hatchlings failing to orientate themselves or to move towards the sea. At nightfall, these animals are placed on the beach at the tide line so that the sea covers them. They are then picked up, taken a few miles offshore by boat and released with scattered floating objects such as broken sticks and coconut husks. The aim of this procedure is to offer hatchlings a potential source of food; the objects providing a base for algae to grow on, and to which small organisms might be attracted, but not so large that predatory fish or birds may be attracted. The effect of this type of release on reducing mortality is unknown.

Hawksbills that have started to wedge themselves under rocks in their tanks at Bellairs are considered to be at a size (approx. 15 cm SCL) when they may naturally be found in water shallow enough for them to reach the substrate. These are released from the beach in the vicinity of a fringing reef, away from human activity and during the late afternoon.

4. Nest relocation

Erosion and development, particularly on the west coast, have forced the relocation of a number of nests (See Section B). In this procedure, eggs are carefully removed, without reorienting them, and are carried in egg boxes in styrofoam containers to the new nest site. A nest site similar to that of the original nest is chosen, and the nest dug to the same depth.

Each relocated nest is monitored closely, and hatching success calculated by excavating nest contents 2 days after the first emergence has occurred. Eggs are only relocated if the nest is considered to be in great danger. Experience has shown that eggs laid on heavily used public beaches can survive trampling, but that newly hatched turtles cannot dig themselves out in such circumstances. Nests likely to be heavily trampled are therefore not always relocated, but are carefully monitored towards the end of incubation, so that hatchlings can be dug out if necessary.

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SECTION 2

WATS II SEA TURTLE SURVEY DATA FORM

TABLE III. NESTING BEACH INVENTORY

List Beaches in geographic sequence. Provide additional information on an attached page. Please list each species that occurs on beach on a separate line even if months of occurence are the same.

COUNTRY BARBADOS STATE _____ RECORDER J. HORROCKS

NAME OF BEACH	LENGTH IN KM	SPECIES NESTING	MONTHS PEAK NESTING	MONTHS RECORDED NESTING
HEYWOODS	0.6	Ei		JUNE, AUG
SPEIGHTSTOWN	0.2	Ei		AUG
ROAD VIEW	0.6	Ei		MAY, JUL, AUG, NOV
MULLINS	0.3	Ei		AUG
GIBBES	0.4	Ei		JUL
ALLEYNES BAY	1.1	Ei		JUN, JUL, AUG, SEPT, OCT
HOLETOWN	2.4	Ei		MAY, JUN, JUL, AUG, SEPT
SANDY LANE BAY	0.6	Ei		JUN, AUG
PAYNES BAY	0.4	Ei		JUL, SEP, OCT
FITTS VILLAGE	0.3	Ei		AUG

*Cc = Caretta caretta; Cm = Chelonia mydas; Dc = Dermochelys coriacea; Ei = Eretmochelys imbricata; Lk = Lepidochelys kempi; = Lepidochelys olivacea = Uk = Unknown

WATS II SEA TURTLE SURVEY DATA FORM

TABLE III. NESTING BEACH INVENTORY

List Beaches in geographic sequence. Provide additional information on an attached page. Please list each species that occurs on beach on a separate line even if months of occurence are the same.

COUNTRY BARBADOS STATE _____ RECORDER J. HORROCKS

NAME OF BEACH	LENGTH IN KM	SPECIES NESTING	MONTHS PEAK NESTING	MONTHS RECORDED NESTING
BATTS ROCK	0.3	Ei		JUN
BRIGHTON	1.5	Ei		JUN, JUL, AUG
DRILL HALL	0.3	Ei		JUL, AUG, OCT
HASTINGS	0.2	Ei		JUN
WORTHING	0.2	Ei		JUN, JUL, SEP
ST. LAWRENCE	0.1	Ei		JUN, JUL
WHITESANDS	0.1	Ei		JUL
ATLANTIC SHORES	0.1	Ei		JUL, AUG
LONG BAY	1.5	Dc		AUG
GINGER BAY	0.2	Dc		APR
GINGER BAY		Ei		JUL, SEP

*Cc = Caretta caretta; Cm = Chelonia mydas; Dc = Dermochelys coriacea; Ei = Eretmochelys imbricata; Lk = Lepidochelys kempi; = Lepidochelys olivacea = Uk = Unknown

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List Beaches in geographic sequence. Provide additional information on an attached page. Please list each species that occurs on beach on a separate line even if months of occurence are the same.

COUNTRY BARBADOS STATE _____ RECORDER J. HORROCKS

NAME OF BEACH	LENGTH IN KM	SPECIES NESTING	MONTHS PEAK NESTING	MONTHS RECORDED NESTING
BEACHY HEAD	0.05	Ei		MAY
BOTTOM BAY	0.1	Ei		JUL
BATH	0.7	Ei		MAY, JUN, JUL, AUG
MARTIN'S BAY	0.6	Ei		JUN
BATHSHEBA	0.5	Ei		JUL
EAST COAST RD.	4.2	Dc		JUN, JUL
WALKERS	1.6	Dc		JUN
ABBOTTS BAY	0.05	Ei		JUL

Cc = Caretta caretta; Cm = Chelonia mydas; Dc = Dermochelys coriacea; Ei = Eretmochelys imbricata; Lk = Lepidochelys kempi; = Lepidochelys olivacea = Uk = Unknown

SECTION 3

THE BELLAIRS RESEARCH INSTITUTE

OF

McGILL UNIVERSITY

ST. JAMES

BARBADOS, W.I

1st June 1987

Dear Sir/Madam,

Bellairs Research Institute and the Fisheries Division of the Ministry of Agriculture, Food and Fisheries are attempting to conserve and rehabilitate stocks of endangered sea turtles in Barbados. We are asking for the cooperation of staff employed at all hotels and restaurants built near the beach on the south, south-east and west coasts of Barbados during this year's turtle breeding season (June-December).

In the above context, you can be of assistance in two respects. Firstly, nightwatchmen and security guards are in a position to assist our efforts to monitor the number of nests, both when females make their nests and when hatchlings emerge, since these activities usually occur at night. In the past few years nightwatchmen and security staff have been especially helpful in this respect. Unfortunately we have also received reports that some security guards have used the opportunity their jobs afford to slaughter nesting turtles and remove turtle eggs. This is illegal and we are requesting your co-operation in eliminating this practice. Secondly, since hatchling sea turtles are attracted to light, security and ornamental lighting that shines directly out to sea causes them to walk inland rather than towards the sea. It would be most helpful if such lights could be shaded or redirected during the breeding season. If this is impossible, could it be arranged to have hotel personnel look in the vicinity of lights on mornings in case hatchlings have been mistakenly lured in their direction?

We are requesting that all incidents of turtles nesting or hatchlings emerging be telephoned in to Bellairs Research Institute (422-2087/422-2034) where this information is being collected.

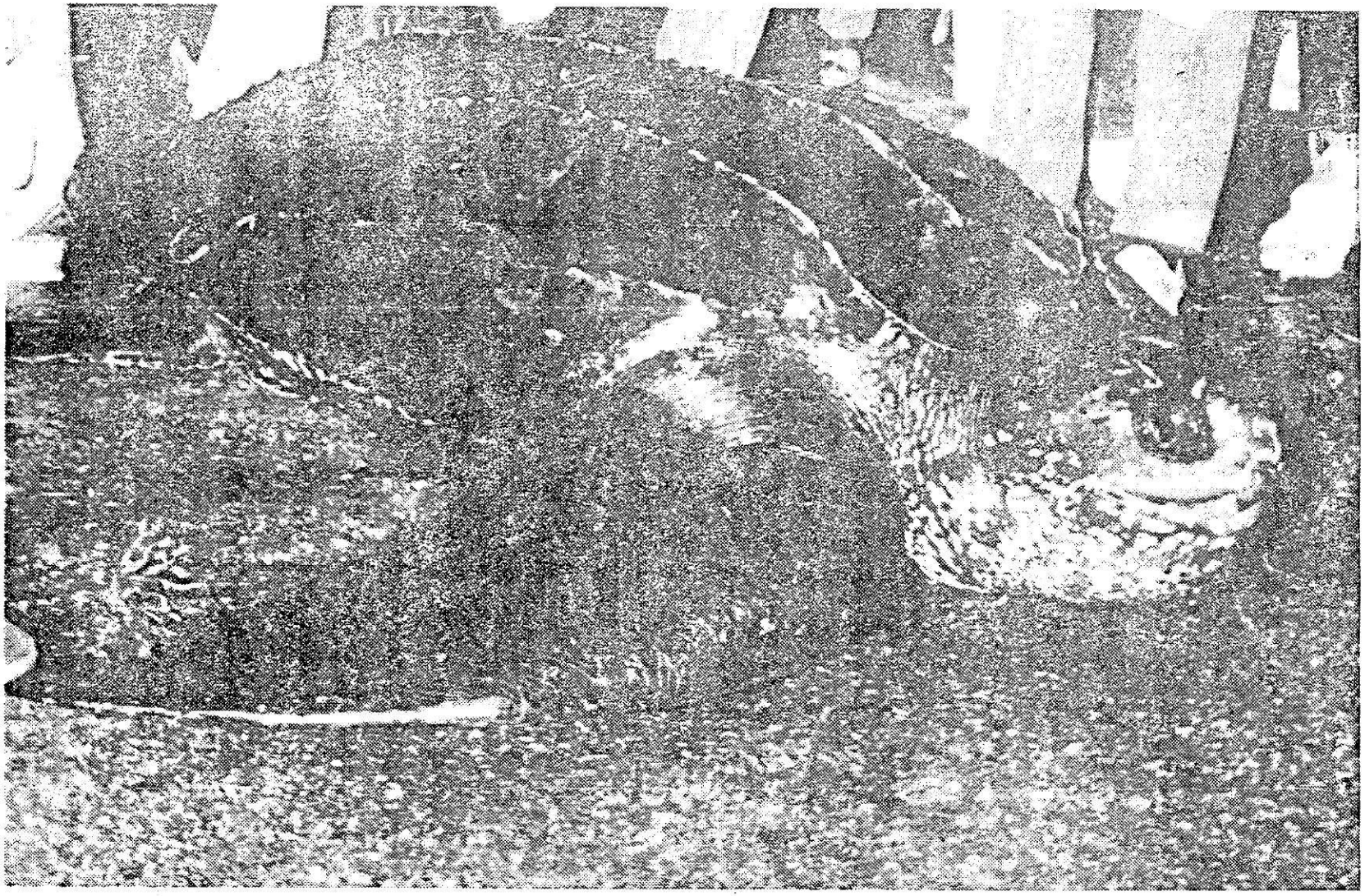
Thank you for your cooperation,

Yours sincerely,

J. A. Horrocks, Ph.D.

Sept. 12 - 13 1986. The Nation.

Save our sea turtle alert



THIS 600-POUND LEATHERBACK TURTLE is one of the few of its kind to be seen in Barbados. The hawksbill sea turtle is the type we usually see nesting alone on our beaches late at night.

SEA TURTLES of the Caribbean are an important natural resource that could significantly contribute to the regional economy if populations could be restored to levels that would permit controlled exploitation. To rehabilitate and manage turtle populations, we require better estimates of current population sizes and of hatching success.

Hawksbill sea turtles Eretmochelys imbricaia nest on the west, south and east coast beaches of Barbados primarily between July and November. Apart from occasional reports of leatherback turtles Dermochelys coriacea (see photo) nesting on the east coast, the hawksbill is the only sea turtle that nests here.

It is presently on the international endangered species list, mainly due to over-exploitation by man and to the erosion of nesting beaches. Estimates suggest that only one turtle out of every one hundred that emerges from a nest, survives long enough to reach breeding age. This is why permitting a turtle to nest in peace and leaving the nest undisturbed afterwards is so important, and why legislation protecting nesting turtles and their eggs exists here in Barbados.

The hawksbill's habit of coming ashore at night alone to nest, the total length of potential nesting beaches around the island and the lack of sufficient numbers of volunteers to survey beaches regularly, makes it difficult both to assess the numbers of turtles that are nesting here and to determine the number of successful hatchings.

Over the past few years, Bellairs Research Institute has been kept informed of nestings and hatchings by interested and concerned members of the public. This year, in collaboration with the Fisheries Division of the Ministry of Agriculture, the institute is redoubling efforts to determine the size of the nesting population and the percentage of nests that hatch.

If you have seen a turtle on a beach nesting or attempting to nest, or if you have seen turtles hatch, please call Bellairs Research Institute, 422-2087.