

SUMMARY

AN ATTEMPT AT THE NORTHWARD EXTENSION OF THE BREEDING RANGE OF THE ATLANTIC LOGGERHEAD TURTLE (*Caretta caretta caretta*) BY EGG TRANSPLANTS

The primary objective of this study is to attempt to re-establish the Loggerhead turtle breeding population northward back to its former range. The annual release of hatchlings at Chincoteague from eggs laid at Cape Island, Cape Romain NWR, could reintroduce the turtles back to the protected beaches of its original range.

The first experimental transplant in this study took place from Cape Romain to Chincoteague in 1969. Annual egg transplants continued each year (except 1976) until 1978, the last scheduled year for the program. At present a proposal is being initiated to continue the egg transplant program for an additional 3 years. The program extension is deemed necessary to gain additional information on the success of the previous years transplant efforts. It is deemed necessary because the Loggerhead does not mature until 6 - 11 years of age. At this time the female returns to the beach to lay eggs, possibly up to 3 clutches a season. The egg transplant has continued for 9 years, therefore, with the 3 year extension, the maturity age of the initial hatchlings (released in 1969) will be reached and natural nesting should occur.

The egg transplant program is a direct reflection of the efforts that the Chincoteague National Wildlife Refuge and the U.S. Fish and Wildlife Service are doing to benefit threatened and endangered species. Public awareness on the Eastern Shore concerning the fate of threatened and endangered species is heightened through interpretive programs and news releases on the Loggerhead egg transplant program.

Transplanting methods have changed little in the last few years of the study. Nests are located and marked at Cape Romain NWR beaches. Generally, the eggs cannot be handled after 48 hours of development due to the fragility of the nervous system membranes. After approximately 40 days of development the eggs can be handled gently without risk of affecting normal development. When personnel from Chincoteague arrive at Cape Romain the eggs are dug up and counted per nest and infertile eggs are discarded. The eggs are kept separate per nest and transported in individual styrofoam coolers with a covering of dampened sand. Transplanting usually takes place the next day near the primary dunes on Chincoteague Refuge. The eggs are placed in an enclosed protective basket (diagram enclosed) to prevent predation by raccoon or red fox. The egg basket is submerged in the sand so that only the top 6-8 inches are above the surface. Early morning and late evening checks are made to release emerged hatchlings which in turn traverse the beach to enter the surf.

Each years results of the egg transplant program follow:

- 1969 - On August 8, 612 Loggerhead turtle eggs were collected at Cape Romain NWR and brought to Chincoteague Refuge. A total of 272 eggs hatched for a hatchling success of 54.9%. However, 24 of the hatchlings died before entering the surf for a total of 248 released into the ocean.
- 1970 - A total of 677 eggs from six nests were transported. Only 23 eggs or 3.4% hatched. All 23 hatchlings entered the Atlantic Ocean.
- 1971 - A total of 1,488 eggs from 11 nests were transported on July 27. A total of 594 eggs (39.9%) hatched, the number entering the Atlantic Ocean was 547 (36.8%). Forty-seven hatchlings or 7.9% of the total hatch failed to completely emerge from the egg and/or sand.
- 1972 - A total of 1,346 eggs from 11 nests were transported on August 3. A total of 1,081 eggs (80.3%) hatched, the number entering the Atlantic Ocean was 1,075 (79.9%). Two hundred and sixty-five hatchlings or 19.7% of the total hatch failed to completely emerge from the egg and/or sand.
- 1973 - Ten nests containing 1,087 eggs were transferred on July 24, 1973. A total of 961 eggs (88.4%) hatched and 941 (86.6%) turtles entered the ocean.
- 1974 - There were 832 fertile eggs in eight nests transferred on July 17. The nests were transplanted when they were 42 to 46 days old and averaged 43 days compared to 47 days in 1973. Of the total 832 eggs in the eight nests, 62.6 percent hatched and all 521 young entered the ocean. Incubation periods ranged from 57 days to 79 days with an average of 63 days to start hatching and 71 days to end of hatching; a nine-day span. Despite the eggs being one to five (and averaging four) days younger than those transferred in 1973, hatching began and ended two days earlier. Again there appears to be no relation between hatching span and hatching success. Nor does there appear to be a difference in hatching success in eggs 42 days old or 46 days old this year.
- 1975 - On July 17 ten nests containing 1,294 eggs were transferred. A total of 607 eggs (46.9%) hatched and 606 turtles (46.8%) were released on the refuge beach.
- 1976 - Due to late and slow nesting, a badly washed beach, rainy weather and egg poachers, the Cape Romain personnel were unable to mark the necessary nests for transplanting.

- 1977 - On August 1, ten nests containing 742 Loggerhead sea turtle eggs were transported for the hatchling program. The nests yielded 484 hatchlings, 482 (65.3%) of these entered the ocean.
- 1978 - Eleven nests containing 988 eggs were transported in 1978. A total of 724 (73.3%) hatched and entered the surf. Age of hatchlings varied from 43-66 days old. Ninety-two percent of the unhatched eggs were waterlogged, the embryo apparently drowned. Four percent of the unhatched eggs decayed of unknown cause while the remaining 4% hatched but died before emerging from the sand.

The following table summarizes the egg transplant programs' progress through 1969-1978.

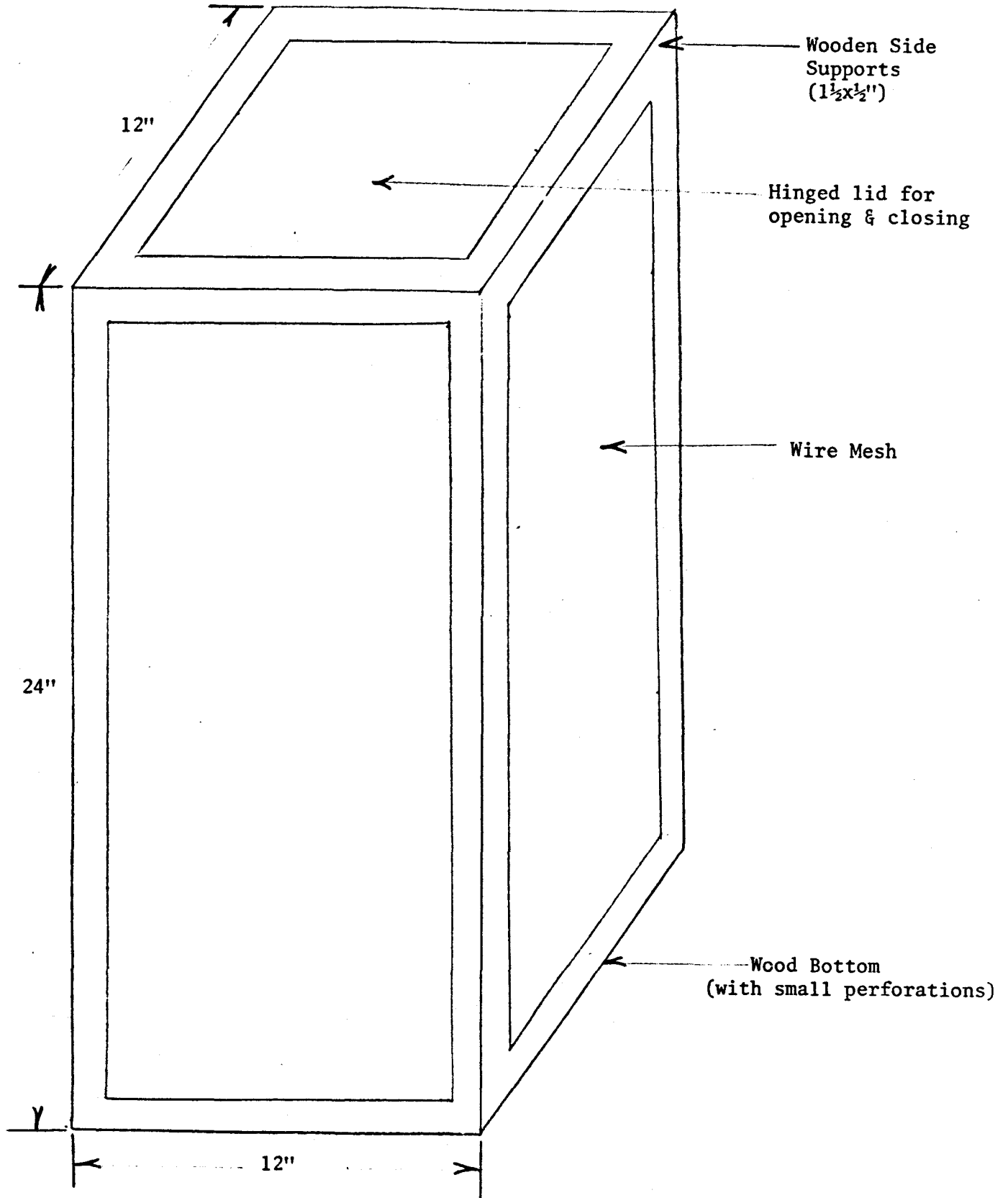
| Year | Chincoteague NWR | | | | |
|--------|-----------------------|-------|---------|----------|------|
| | Nests | Eggs | Hatched | To Ocean | % |
| 1969 | 4 | 612 | 272 | 248 | 40.5 |
| 1970 | 6 | 672 | 23 | 23 | 3.4 |
| 1971 | 11 | 1,488 | 594 | 547 | 36.8 |
| 1972 | 11 | 1,346 | 1,081 | 1,075 | 79.9 |
| 1973 | 10 | 1,087 | 961 | 941 | 86.6 |
| 1974 | 8 | 832 | 521 | 521 | 62.6 |
| 1975 | 10 | 1,294 | 607 | 606 | 46.8 |
| 1976 | NO TRANSPLANT PROGRAM | | | | |
| 1977 | 7 | 741 | 484 | 482 | 65.3 |
| 1978 | 11 | 988 | 724 | 724 | 73.3 |
| Totals | 78 | 9,060 | 5,267 | 5,167 | 57.0 |

Starting in 1974, our sixth year, daily beach patrol surveys were run in hopes of turning up a Loggerhead turtle crawl in our first year in which we could expect a return from one of our released turtles.

Four natural nests have been discovered since 1974.

1. On July 21, 1974, a nest containing 115 eggs was transferred to the egg nursery at the refuge headquarters. In October one egg was dug up and checked for development. The embryo was alive and developed with a portion of the egg sack still attached. At this point the eggs were separated, half were left in the nursery with the remaining half placed in a styrofoam container in hopes that the sand would warm the eggs and hatch them. The young were still alive in December but had not hatched. The eggs never did hatch and all young died. The embryos in the container had dehydrated but the eggs in the nursery had not. The embryos in all eggs were fully developed.
2. On June 21, 1975, a nest with 125 eggs was marked and left in place on the wild beach. On October 8, 1975, the nest was dug up. All eggs had rotted due to inundation by high tides.
3. On July 21, 1975, a nest was discovered on the wild beach. On October 8, 2 eggs were checked for development. Both young were fully developed but with a large portion of the egg sack still attached. On November 5 the nest was again checked. Eight hatchlings were found in the process of leaving the shell. Four of these were malformed possibly due to having been in the eggs so long. The eggs at the top of the nest were black and covered with mold. The embryos were dead. The eggs at the bottom of the nest were white and the embryos were alive but had not reached hatchling development. The egg sack was still attached and quite large. Documentation of subsequent checks of the nest could not be found.
4. On July 24, 1975, three crawls were discovered on Wallops Island National Wildlife Refuge, a satellite refuge located adjacent to Assateague, by NASA personnel. The refuge was not notified until July 28. At this time refuge personnel inspected the crawls but no eggs could be found.
5. On July 29, 1977, a nest with 144 eggs was discovered in an area of high public use on the refuge beach. The eggs were transferred to a more remote area of the refuge beach. The nest was checked on October 10 for development. Thirty-four eggs were obviously adled and discarded. The remaining 110 eggs were brought indoors (because of seasonal temperatures) in a styrofoam cooler and placed under a 150 watt lamp suspended 16 inches above the nest. The temperature of the sand in the nest was maintained between 80-85^oF during the day, and allowed to cool off at night (to simulate night time cooling of the beach). The nest was also periodically dampened. A total of 83 hatchlings entered the ocean.

Egg Protection Basket



During 1978 there were no natural Loggerhead nests discovered on Chincoteague Refuge. However, increased sightings have been reported of Loggerhead turtles in the Assateague area. There has also occurred an increase in the number of beached Loggerheads which have washed upon Assateague beach. The East-Coast Biologist, Mr. Otto Florschutz, recommended in his 1978 Progress Report that the transplant program be extended at Chincoteague National Wildlife Refuge.

Respectfully submitted,

Edward E. Britton

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Assistant Refuge Manager Trainee

I. Title: AN ATTEMPT AT THE NORTHWARD EXTENSION OF THE BREEDING RANGE OF THE ATLANTIC LOGGERHEAD TURTLE (*Caretta caretta caretta*) BY EGG TRANSPLANTS

II. Objectives:

- A. The primary objective of this study which began 10 years ago was to experimentally transplant Loggerhead turtle eggs from an established colony at Cape Romain NWR, South Carolina to northward coastal NWR's on which these sea turtles originally were located in Virginia and North Carolina. A permit for the annual transfer of Loggerhead turtle nests is requested.
- B. If it could be determined that these experimental egg transplants were successful, an expanded management type transplant program then could probably be set up and conducted annually to re-establish the Loggerhead firmly on newly protected ocean beaches.
- C. Refined methods of transfer, transplanting, dates, times and monitoring would be developed to increase the success of the program.

- D. The egg transplant program is a direct reflection of the efforts that the Chincoteague National Wildlife Refuge and the U.S. Fish and Wildlife Service are doing to benefit threatened and endangered species.

- E. Public awareness on the Eastern Shore concerning the fate of threatened and endangered species is heightened through interpretive programs and news releases on the Loggerhead egg transplant program.

- F. The transplant program seeks cooperation from neighboring agencies and reliable private citizens to report natural Loggerhead turtle activity.

III. Justification:

The study was begun at the recommendation of Chincoteague NWR Manager, J. C. Appel, in 1969. Loggerheads previously had been reported to nest on Assateague but extensive beach front development and use plus a reduction in the adult population resulted in only rare nesting attempts on the Maryland, New Jersey, Delaware and Virginia coasts. Slower development of much of the North Carolina coastline resulted in somewhat higher than rare Loggerhead nesting there.

Back Bay and Pea Island NWR's, at the request of their Managers, Dennis Holland and N. F. Williamson, entered the egg transplant program in 1972 because of the anticipation of additional protected beaches.

The original study outline set the conclusion of the egg transplant study from Cape Romain NWR to Chincoteague, Back Bay and Pea Island NWRs at the end of the 1977 season. However, due to severe natural nest losses at Cape Romain in 1976, no transplants were conducted that year and the study was extended until the end of 1978.

A 3-year continuance of the egg transplant program at Chincoteague is currently proposed to fully analyze the success of the previous years transplant efforts.

The extension is deemed necessary because the Loggerhead does not mature until 6-11 years of age. At this time the female returns to the beach to lay eggs, possibly up to 3 clutches a season. The egg transplant has continued for 9 years, therefore, with the 3 year extension, the maturity age of the initial hatchlings (released in 1969) will assuredly be reached and natural nesting should occur regularly if the program is successful.

The transplant program at Pea Island has already been termed successful as they feel that natural Loggerhead turtle activity is sufficient to utilize the majority of their time and efforts and prefer to end the transplant project at this time.

No natural Loggerhead nesting was observed on the Chincoteague Refuge beach in 1978, however, off-shore clam fishermen have reported increased sightings of adult Loggerheads in the area. There has also occurred an increased number of dead Loggerheads washing up on the refuge beach, (1 in 1977; 5 in 1978).

The continuance of the program is further justification to limit development and for reduction of non-wildlife oriented recreation and off-road vehicles on this important area.

Mr. Otto Florschutz, Jr., the East Coast Biologist, recommended in Progress Report No. 10, (October 13, 1978) that the Loggerhead egg transplant program be extended at the Chincoteague National Wildlife Refuge.

IV. Procedure:

A. Literature Review

Unfortunately, little pre-study data is available although Chincoteague does occur within the historic breeding range of the species.

B. Methods - Data Collecting, Analysis and Interpretation

Transplanting methods have changed little in the last few years of the study. Nests are located and marked at Cape Romain NWR beaches when just 1 or 2 days old. Generally, the eggs are not handled after 48 hours of development due to the fragility of the nervous system membranes. After approximately 40 days of development the eggs can be handled gently without risk of affecting normal development. When personnel from Chincoteague arrive at Cape Romain the eggs are dug up and counted per nest and discolored infertile eggs are discarded. The eggs are kept separate per nest and transported in individual styrofoam coolers (36"x18"x18") with a covering of dampened sand. Transplanting usually takes place the next day near the primary dunes on Chincoteague Refuge. The eggs are placed in an enclosed protective basket (diagram enclosed) to prevent predation by raccoon or red fox.

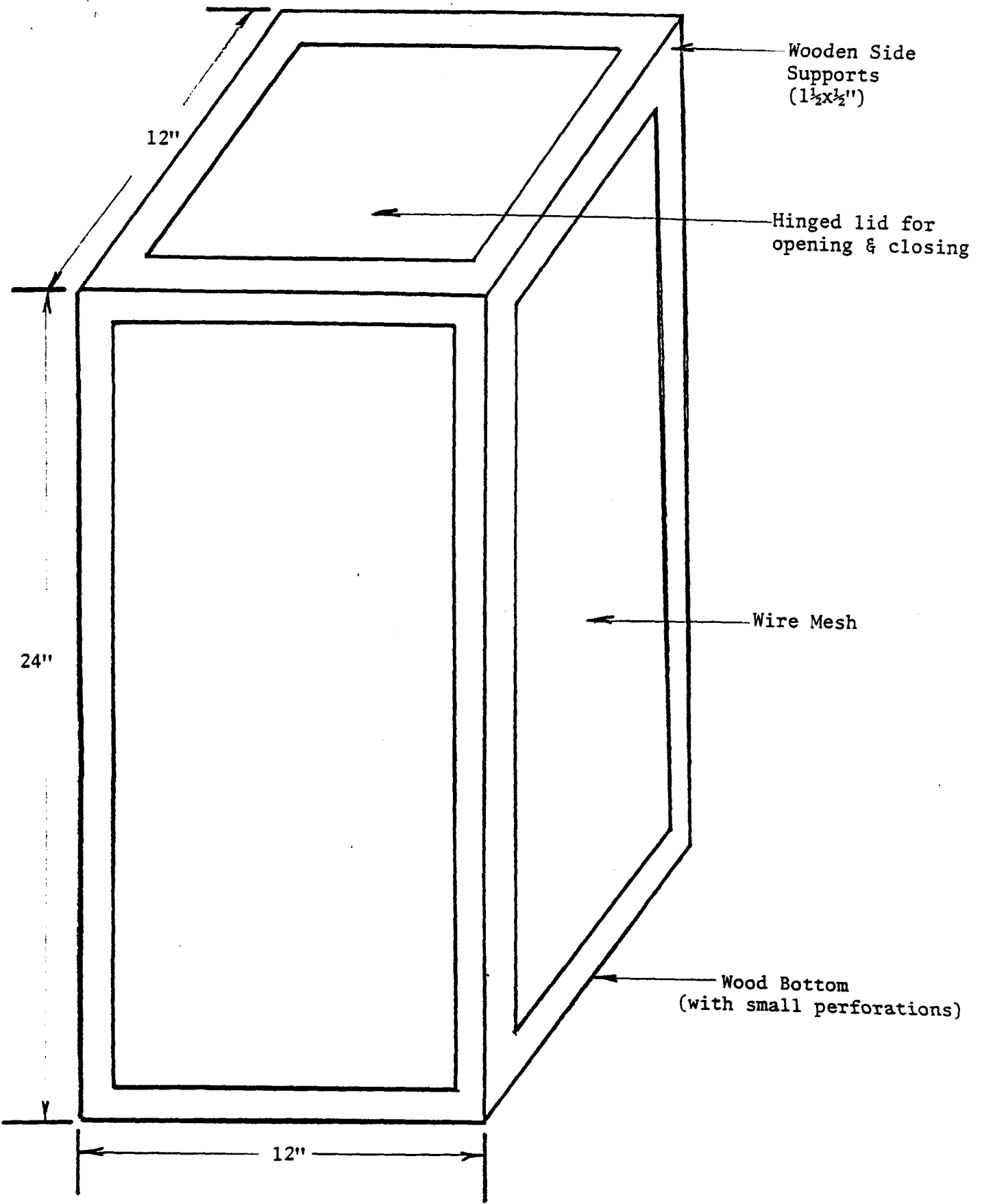
The egg basket is submerged in the sand so that only the top 6-8 inches are above the surface. Early morning and late evening checks are made to release emerged hatchlings which in turn traverse the beach to enter the surf.

Data collection includes egg hatching span, nest hatchling success, and sand temperature as correlated to hatch success.

Each years results of the egg transplant program at Chincoteague Refuge follow: Refer to Table 1.

1969 - On August 8, 612 Loggerhead turtle eggs were collected at Cape Romain NWR and brought to Chincoteague Refuge. A total of 272 eggs hatched for a hatchling success of 54.9%. However, 24 of the hatchlings died before emerging from the sand for a total of 248 released into the ocean (40.5%)

1970 - A total of 677 eggs from six nests were transported. Only 23 eggs or 3.4% hatched. All 23 hatchlings entered the Atlantic Ocean. It was determined that handling of the eggs during the critical nervous membrane development period caused partial loss of these nests.



Wooden Side Supports
(1½x½")

Hinged lid for opening & closing

Wire Mesh

Wood Bottom
(with small perforations)

12"

24"

12"

Y

1971 - A total of 1,488 eggs from 11 nests were transported on July 27. A total of 594 eggs (39.9%) hatched, the number entering the Atlantic Ocean was 547 (36.8%). Forty-seven hatchlings or 7.9% of the total hatch failed to completely emerge from the egg and/or sand.

1972 - A total of 1,346 eggs from 11 nests were transported on August 3. A total of 1,081 eggs (80.3%) hatched, the number entering the Atlantic Ocean was 1,075 (79.9%). Two hundred and sixty-five hatchlings or 19.7% of the total hatch failed to completely emerge from the egg and/or sand.

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1974 - There were 832 fertile eggs in eight nests transferred on July 17. The nests were transplanted when they were 42 to 46 days old and averaged 43 days compared to 47 days in 1973. Of the total 832 eggs in the eight nests, 62.6 percent hatched and all 521 young entered the ocean. Incubation periods ranged from 57 days to 79 days with an average of 63 days to

start hatching and 71 days to end of hatching; a nine-day span. Despite the eggs being one to five (and averaging four) days younger than those transferred in 1973, hatching began and ended two days earlier. There appeared to be no relation between hatching span and hatching success. Nor did there appear to be a difference in hatching success in eggs 42 days old or 46 days old.

1975 - On July 17 ten nests containing 1,294 eggs were transferred. A total of 607 eggs (46.9%) hatched and 606 turtles (46.8%) were released on the refuge beach.

1976 - Due to late and slow nesting, a badly washed beach, rainy weather and egg poachers, the Cape Romain personnel were unable to mark the necessary nests for transplanting.

1977 - On August 1, seven nests containing 742 Loggerhead sea turtle eggs were transported for the hatchling program. The nests yielded 484 hatchlings, 482 (65.3%) of these entered the ocean.

1978 - Eleven nests containing 988 eggs were transported in 1978. A total of 724 (73.3%) hatched and entered the surf. Age of hatchlings varied from 43-66 days old. Ninety-two percent of the unhatched eggs were waterlogged, the embryo apparently drowned. Four percent of the unhatched eggs decayed of unknown cause while the remaining 4% hatched but died before emerging from the sand.

The following table summarizes the egg transplant programs' progress through 1969-1978.

Table 1 Chincoteague NWR Loggerhead Egg Transplant Program

Results: 1969 - 1978

| Year | Chincoteague NWR | | | | |
|------|-----------------------|-------|---------|----------|------|
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| 1977 | 7 | 741 | 484 | 482 | 65.3 |
| 1978 | 11 | 988 | 724 | 724 | 73.3 |

Starting in 1974, our sixth year, daily beach patrol surveys were run in hopes of turning up a Loggerhead turtle crawl in our first year in which we could expect a return from one of our released turtles.

Four natural nests plus three additional crawls have been discovered since 1974.

1. On July 21, 1974, a nest containing 115 eggs was transferred from a high public use area to the egg nursery at the refuge headquarters. In October one egg was dug up and checked for development. The embryo was alive and developed with a portion of the egg sac still attached. At this point the eggs were separated, half were left in the nursery with the remaining half placed in a styrofoam container in hopes that the sand would warm the eggs and hatch them. The young were still alive in December but had not hatched. The eggs never did hatch and all young died. The embryos in the container had dehydrated but the eggs in the nursery had not. The embryos in all eggs were fully developed.

2. On June 21, 1975, a nest with 125 eggs was marked and left in place on the wild beach. On October 8, 1975, the nest was dug up. All eggs had rotted due to inundation by high tides.

3. On July 21, 1975, a nest was discovered on the wild beach. On October 8, 2 eggs were checked for development. Both young were fully developed but with a large portion

of the egg sac still attached. On November 5 the nest was again checked. Eight hatchlings were found in the process of leaving the shell. Four of these were malformed possibly due to having been in the eggs so long. The eggs at the top of the nest were black and covered with mold. The embryos were dead. The eggs at the bottom of the nest were white and the embryos were alive but had not reached hatchling development. The egg sac was still attached and quite large. Documentation of subsequent checks of the nest could not be found.

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5. On July 29, 1977, a nest with 144 eggs was discovered in an area of high public use on the refuge beach. The eggs were transferred to a more remote area of the refuge beach. Thirty-four eggs were obviously addled and discarded. The remaining 110 eggs were brought indoors (because of seasonal temperatures) in a styrofoam cooler and placed under a 150 watt lamp suspended 16 inches above

the nest. The temperature of the sand in the nest was maintained between 80-85^oF during the day, and allowed to cool off at night (to simulate night time cooling of the beach). The nest was also periodically dampened. A total of 83 hatchlings (57.6%) entered the ocean.

V. Cooperators

The Cape Romain National Wildlife Refuge and the East Coast Biologist are cooperators for the egg transplant program.

VI. Responsibility

The Cape Romain National Wildlife Refuge is responsible for locating, marking, coordinating and supplying the Loggerhead turtle eggs for the transfer to Chincoteague NWR.

The East Coast Biologist is responsible for coordinating the transfer and preparing an annual Progress Report on the results of the transplant program.

The Project Leader of Chincoteague NWR is responsible for transferring the eggs from Cape Romain NWR and the collection of data concerning the egg transplant program and reporting these results to the East Coast Biologist.