

COMMENTS ON THE NESTING BEHAVIOR OF ATLANTIC LOGGERHEAD SEA TURTLES, BASED PRIMARILY ON TAGGING RETURNS ¹

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INTRODUCTION

During 1959, the results of a single season's tagging of the Atlantic loggerhead sea turtle, *Caretta caretta caretta* (Linnaeus), were summarized (Caldwell, *et al.*). Certain generalizations were developed as a result of that first year's work in 1958. These were: (1) Individuals nest several times on the same stretch of beach during a single season. (2) Groups of turtles apparently nest together several times. (3) A turtle interrupted in nesting returns on the same or successive nights until she nests successfully. (4) The usual interval between nestings within the season is 12 to 15 days.

Although fewer turtles per year were tagged (Table 1) than the 72 marked in 1958, recent findings made during subsequent seasons, and reported upon here, substantiate these generalizations (Tables 2, 3 and 4), and a detailed discussion of them is not again necessary. It is my purpose to present other data that add to the overall knowledge of the nesting behavior of the Atlantic loggerhead.

The data of Caldwell, *et al.* (1959: 314) demonstrated that the tagged Atlantic loggerhead turtles always returned to the same beach to nest. Hendrickson (1958) and Carr and Ogren (1960) have discussed a similar behavior for green turtles in the Pacific and Atlantic, respectively.

An unusual situation has developed over the years on the Georgia rookery of which Jekyll Island is presently the principal part. It demonstrates one aspect of loggerhead nesting behavior which undoubtedly will influence any future studies of sea turtles there or comparisons with the present and previously published data.

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TABLE 1

NUMBERS OF ATLANTIC LOGGERHEAD SEA TURTLES TAGGED*
AT JEKYLL ISLAND, GEORGIA, IN 1959, 1960 AND 1961.

1959					
3 June	4	14 June	2	7 July	2
9 June	1	18 June	1	8 July	1
10 June	6	19 June	4	15 July	2
11 June	1	30 June	2	17 July	2
12 June	3	5 July	1	21 July	1
13 June	1	6 July	1		
Total					35
1960					
6 June	6	18 June	6	23 June	1
7 June	4	19 June	15	24 June	1
16 June	4	20 June	2	25 June	4
17 June	1	21 June	2	26 June	1
Total					47
1961					
	14 June	3		1 July	1
	18 June	1			
Total					5

* Type of tag and method of tagging discussed by Carr and Caldwell (1956) and Harrison (1956).

Old-time residents of the Brunswick area state that loggerheads once nested in large numbers on St. Simons Island, the next island north of Jekyll and separated by less than a mile of water. Erosion on the seaward side of St. Simons in recent years destroyed most of the suitable nesting beaches there, and only an occasional female is reported to lay on the few remaining sandy spots. Consequently, the sea turtle nesting is concentrated now on Jekyll and Little Cumberland Islands. The latter is the next island adjacent to Jekyll on the south. Concurrent nesting occurred on Jekyll, Little Cumberland and St. Simons, but no records are available to show whether

TABLE 2

RETURNS OF ATLANTIC LOGGERHEAD SEA TURTLES TAGGED AND RECAPTURED AT JEKYLL ISLAND, GEORGIA, IN 1959. (ld) DENOTES TURTLE LAID; (dnl) DENOTES TURTLE DID NOT LAY; (nd) DENOTES NO DATA ON NESTING ACTIVITY.

Tag Number	Date Tagged	Days Elapsed Between		Days Elapsed Between First and Second		Days Elapsed Between Second and Third	
		First	Return	First	Return	Second	Return
G 127	3 June (dnl)	15	18 June (nd)	34	22 July (ld)		
G 128	3 June (dnl)	48	21 July (dnl)				
G 129	3 June (dnl)	14	17 June (nd)	18	5 July (dnl)		
G 181	3 June (ld)	27	30 June (dnl)	12	12 July (dnl)		
G 136	9 June (dnl)	1	10 June (ld)	27	7 July (ld)		
G 131	10 June (dnl)	25	5 July (ld)	1	6 July (dnl)	13	19 July (ld)
G 182	12 June (ld)	24	6 July (dnl)	1	7 July (dnl)		
G 189	12 June (dnl)	8	20 June (nd)	19	9 July (dnl)		
G 139)*							
G 9	13 June (ld)	25	8 July (ld)	13	21 July (ld)		
G 185	14 June (ld)	25	9 July (ld)				
G 142	18 June (ld)	32	20 July (ld)				
G 102	18 June (dnl)	33	21 June (nd)				
G 191	30 June (dnl)	1	1 July (ld)				
G 199	5 July (ld)	2	7 July (ld)				
G 197	17 July (ld)	9	26 July (ld)				

* Turtle re-tagged when original tag was found unlocked during second recapture.

the relative numbers of turtles increased on Jekyll and Little Cumberland after the loss of St. Simons' beaches—as some residents believe.

In very recent years, Jekyll has passed from very closely guarded private hands into public ownership, and is now being rapidly developed as a state park, recreation and resort area. When the sea turtle study was begun there in earnest in the summer of 1958, there was little construction activity on the seaward beaches, and consequently the terrain and vegetation behind the beach was,

TABLE 3

RETURNS OF ATLANTIC LOGGERHEAD SEA TURTLES TAGGED AND RECAPTURED AT JEKYLL ISLAND, GEORGIA, IN 1960, OR TAGGED IN A PREVIOUS YEAR AND RECAPTURED MORE THAN ONCE IN 1960. (ld) DENOTES TURTLE LAID; (dnl) DENOTES TURTLE DID NOT LAY; (nd) DENOTES NO DATA ON NESTING ACTIVITY.

Tag Number	Date Tagged	Days Elapsed Between Tagging and First Return	First Return	Days Elapsed Between First and Second Return	Second Return
G 158	6 June (nd)	19	25 June (nd)		
G 159	6 June (dnl)	1	7 June (ld)		
G 161	6 June (dnl)	1	7 June (ld)	15	22 June (nd)
G 165	6 June (ld)	17	23 June (nd)		
G 169	6 June (ld)	17	23 June (dnl)		
G 190	6 June (ld)	16	22 June (ld)		
G 162	7 June (nd)	16	23 June (nd)		
G 164	7 June (ld)	10	17 June (nd)	5	22 June (ld)
G 102*	18 June (dnl)	3	21 June (nd)		
G 61	19 June (nd)	6	25 June (dnl)		
G 65	19 June (dnl)	2	21 June (ld)		
G 71	19 June (ld)	2	21 June (nd)		
G 72	19 June (ld)	43	1 August (nd)		
G 75	20 June (dnl)	1	21 June (dnl)		
G 196	20 June (dnl)	2	22 June (ld)		
G 83	23 June (dnl)	1	24 June (ld)		
G 86	25 June (dnl)	>1	25 June (ld)		

* Tagged initially in 1958, see Caldwell, *et al.* (1959: Table 2).

TABLE 4

MULTIPLE RETURNS OF ATLANTIC LOGGERHEAD SEA TURTLES NESTING AT JEKYLL ISLAND, GEORGIA, IN 1961, BUT TAGGED THERE TWO OR THREE YEARS PREVIOUSLY. (ld) DENOTES TURTLE LAID; (dnl) DENOTES TURTLE DID NOT LAY; (nd) DENOTES NO DATA ON NESTING ACTIVITY.

Tag Number	First Return	Days Elapsed Between First and Second Returns	Second Return
G 40*	25 June (ld)	13	8 July (dnl)
G 4**	25 June (nd)	16	11 July (nd)
G 189†	29 June (nd)	12	11 July (ld)

* Tagged initially in 1958.

** Tagged initially in 1959.

† Tagged initially in 1959, see Table 2 for 1959 recapture history.

for most of its length, in virgin condition. Turtle nesting could be considered to have been operating under reasonably normal circumstances. However, beginning in 1959 and continuing at an ever-increasing rate, much of the beachfront area has been cleared of vegetation and the sand dunes leveled for the construction of houses, motels and public recreation areas. As a result, nesting has not recently been conducted under normal conditions. Natural land reference points for the turtles have been destroyed, buildings and numerous automobiles with confusing bright lights (see Caldwell and Caldwell, *In press*) have been added, and "turtle watching" has become such a summer pastime for visitors to the island that often a turtle will be surrounded by as many as 100 onlookers. The probability is high that the turtle will be interrupted during the early phases of her nesting procedure and that humans will rob the relatively few completed nests.

Consequently, although the sand beaches themselves remain intact, the nesting population has begun to move again—this time to Little Cumberland Island and the northern beaches of Cumberland Island (which to all intents is actually connected to Little Cumberland, being separated by only a narrow watercourse). Aerial surveys made during 1958 and 1959 showed that some nest-

ing took place on Little Cumberland all along, but not to the extent that it is now being done there and on Cumberland. Agent Robert Kilby states that his observations and those of others of the staff of the Georgia Game and Fish Commission in 1960 and 1961 show that the turtles are rapidly abandoning Jekyll Island and that the number of nests on Little Cumberland and Cumberland Islands is increasing.

Cumberland and Little Cumberland Islands are privately owned and under tight security against trespassing. Although there is some construction in the center of Cumberland, the beach areas of both are essentially virgin. It has been proposed that this island be made a National Seaside Park, and thus hopefully the Georgia rookery will be preserved. If the nesting sites should be destroyed on these islands as well, it is hard to say what will happen to the turtles, as the beaches south of those on Cumberland lie on the rapidly developing shores of Florida. There are suitable beaches north of St. Simons Island in Georgia, and some of these are under protection by the federal government. However, to date the trend for the shift of the rookery has been to the south. On the other hand, if Cumberland and Little Cumberland should eventually be lost, the rookery may be swung around to the north of St. Simons Island and become established on beaches which offer more promise of perpetual protection.

The fact that the rookery apparently has been slowly shifting in its point of greatest nesting concentration is significant in that it indicates that offshore physical conditions are not the only criteria for the selection of a rookery site. Conditions on the beach itself, other than ones of such physical factors as sand type, may influence the site of heaviest nesting concentration.

After my departure from the Brunswick area during the early summer of 1960, efforts in the Georgia tagging program were limited almost entirely to the excellent cooperation afforded by the resident game agent. However, due to his many other official duties and lack of sufficient volunteer help, there were many nights or parts of nights when no one familiar with the project was available to pursue it. Gaps in the data, particularly in 1960 and 1961, are thus due more to human factors than to the vagaries of the turtles. The same can be said, to a lesser extent, for the results of work done there in 1958 (Caldwell, *et al.*, 1959).

REPRODUCTIVE CYCLE

An important question left unanswered by the one season's work summarized by Caldwell, *et al.* (1959) was whether each individual lays every year. The following data answer this.

TABLE 5

DATE OF INITIAL TAGGING AND FIRST RECAPTURE AFTER ABSENCES OF TWO OR THREE YEARS OF ATLANTIC LOGGERHEAD SEA TURTLES AT JEKYLL ISLAND, GEORGIA. (ld) DENOTES TURTLE LAID; (dnl) DENOTES TURTLE DID NOT LAY; (nd) DENOTES NO DATA ON NESTING ACTIVITY.

Tag Number	Date Tagged	Date First Long-Term Return
Two-Year Absence		
G 32	(?) 10 July 1958 (nd)	17 June 1960 (dnl)
G 35 *	11 July 1958 (nd)	16 June 1960 (nd)
G 33 *	11 July 1958 (dnl)	26 June 1960 (nd)
G 102 * †	16 July 1958 (dnl)	18 June 1960 (dnl)
G 4 ‡	1959 (nd)	25 June 1961 (nd)
G 181 **	3 June 1959 (ld)	1 July 1961 (dnl)
G 189 ** ‡	12 June 1959 (dnl)	29 June 1961 (nd)
G 131 **	10 June 1959 (dnl)	22 June 1961 (ld)
G 133	10 June 1959 (dnl)	22 June 1961 (nd)
G 191 **	30 June 1959 (dnl)	17 June 1961 (ld)
G 197 **	17 July 1959 (ld)	5 June 1961 (ld)
Three-Year Absence		
G 40 ‡	15 July 1958 (ld)	25 June 1961 (ld)
G 46	16 July 1958 (ld)	16 June 1961 (nd)
G 48	16 July 1958 (ld)	16 June 1961 (nd)

* For complete recapture history in 1958, see Caldwell, *et al.* (1959: Table 2).

** For complete recapture history in 1959, see Table 2.

† For complete recapture history in 1960, see Table 3.

‡ For complete recapture history in 1961, see Table 4.

No cases have been recorded of a turtle returning to nest during a season following the one in which it had nested before. The frequency of nesting periods, then, is at a greater interval than every year for the Atlantic loggerhead. Over a period of four years of study at the Jekyll Island rookery, enough tagging returns have now accumulated and enough hours have been logged by competent observers and recorders to show that this absence of yearly nesting by a given turtle is real. Harrison (1956) found this to be the case for western Pacific green turtles, and Carr and Ogren (1960: 14) showed it for western Atlantic green turtles. Harrison (1956) showed a three-year cycle for the western Pacific green turtles. Carr and Ogren (1960: 14) found a strong three-year cycle, with an undercurrent of a two-year cycle, in western Atlantic green turtles. Harrison found no such two-year cycle.

The reproductive cycle shown by the Atlantic loggerheads (Table 5) is not clearcut. Of the turtles tagged in 1958, four were recaptured in 1960, after two years, and three were retaken in 1961, after three years. Thus the returns are sufficient only to show that both a two- and a three-year cycle occur. A greater number (seven) of two-year returns were recorded in 1961 from the turtles initially tagged in 1959. The three-year period for the 1959 turtles is not up until the 1962 nesting season. Also in 1962, turtles initially tagged in 1958, and returned in 1960, might be expected back on the beach. The changes discussed in the introduction to this paper will greatly reduce the probability of getting 1962 returns. Thus the significance of a comparison with the number of two-year returns of 1959-tagged turtles will be obscured. A lack of returns will not necessarily mean a lack of three-year nesting or a renesting again after two more years by a 1958-tagged turtle.

PERIODICITY OF IN-SEASON MULTIPLE NESTING

Findings reported in Tables 2, 3 and 4 bear out the statement made by Caldwell, *et al.* (1959: 314) that in almost all cases where data are adequate, the intervals between multiple nestings during a given season at Jekyll Island took place at intervals of 12 to 15 days. Only one exception was reported—a return after only six days after laying.

In the last section of this paper I have noted returns to the beach after *laying* of only one or two days. Additional returns after un-

usual periods of time can be seen in Tables 2, 3 and 4 (see for example turtles numbered G 129, G 189, G 142, G 197, G 158, G 61 and G 4). No explanation is suggested for those returns between one or two days after nesting (discussed later), but after much less time than the usual minimum of 12 days (see Caldwell, *et al.*, 1959: 314). Long returns, as in the case of G 189, G 142, G 158 and G 4, may be the result of an observer-missed normal interval coupled with one of the almost immediate one- or two-day returns. However, they may be a combination of two of the eight- or nine-day returns. The latter is suggested by G 189, which returned after eight days and then not again until after 19 days. The observers may have missed a return midway during this latter period. This turtle was apparently back on a more expected 12-day schedule in 1961, based on one recapture (Table 4).

One entire flotilla of turtles (G 158, G 161, G 165, G 169, G 190, G 162, and G 164, Table 3) returned on a slightly long interval of 15 to 19 days. One of these turtles, G 164, returned once in between, after 10 days, and was back again with the rest after only five more days.

It has been suggested (Caldwell, *et al.*, 1959: 312, 314) that as many as four nestings by some turtles within a given season could be postulated safely, although the tagging results had to be interpolated to suggest this. A similar interpolation of the recovery history of turtles G 127 and G 128 (Table 2) extends this to possibly a five-nesting sequence, based on the time of first and last nesting emergence with approximately two-week intervals in between. On a 12 to 15 day schedule, the season is long enough theoretically to permit six to eight nestings by a turtle arriving early and staying late. If some turtles are on a slightly shorter schedule, as the above results indicate some may be, it is conceivable that as many as a dozen nestings could be accomplished in a season.

Only five turtles were tagged at Jekyll Island in 1961 (Table 1), and there is no recapture history for any of these. However, three turtles that had been tagged at Jekyll Island two or three years previously did return there more than once in 1961 (Table 4). Although the data are limited, they are included in the manner of those presented in Tables 2 and 3 for 1959 and 1960 and show a similar trend of multiple nestings on an approximately two-week schedule.

DEPLOYMENT BETWEEN EMERGENCES DURING THE SEASON

One of the questions still unanswered is where the nesting turtles go in the interim between nestings during a given season. A satisfactory answer is still needed, but a clue may be presented by the following return.

A turtle that had successfully nested on Jekyll Island on June 19, early in the season and therefore surely destined for additional visits to the nesting beach, was taken in a shrimp trawl a few days later (exact date unknown) in St. Andrews Sound near Satilla Cove. This locality is a protected one in an area bordered by marshes and is behind Jekyll Island. It is unfortunate that this recapture came so soon after the turtle nested, for it only acts as a teaser in that it cannot be said whether the turtle would have remained in the area for the full two-week inter-nesting interval or whether it would have soon moved away either alone or in company with a group, some members of which were still in the process of nesting. It does show, at least, that movement away from the waters near the nesting beach is not immediate.

This turtle very likely was a migrant to the area of the rookery. There is a resident population of loggerheads in the Jekyll Island region. However, as no tagged turtle has ever been reported taken between nesting seasons, despite extensive shrimp and crab trawling (which has produced turtles frequently at all times of the year), it is suggested that the resident population is small or made up mostly of non-breeding individuals. If this is the case, then the nesting turtles must migrate to the rookery from some distant point or series of points. The only recoveries of tagged loggerheads away from a nesting beach or in its close proximity were made far away from the rookery. One was recaptured while the nesting season was still open (Caldwell, Carr and Hellier, 1956: 292), and the other, after traveling a much greater distance, before the next nesting season had begun (Caldwell, Carr and Ogren, 1959: 296).

GROUP MOVEMENTS

Carr and Giovannoli (1957: 9) and Caldwell, *et al.* (1959: 309) suggested that, within limits, groups of turtles tagged at the same time, and later recaptured at the same time, indicated the probability of group movements by those turtles between nesting emergencies. In those experiments, although many turtles often were

tagged at the same time, they were not considered as belonging to the same group if they were recaptured at markedly different times or were not recaptured at all.

In a more recent report, Carr and Ogren (1960: 28) questioned this conclusion regarding groups. They suggested that the clumped returns might only be evidence of a strong homing behavior, although mass travel was not disregarded. Carr and Ogren felt that in the Atlantic green turtle the clumped returns were possibly only artifacts of a combination of (1) physical conditions of the environment which tended to funnel nesting individuals onto the beach at certain points, and (2) several individuals having similar or identical hormone periodicities. The net result, according to their hypothesis, is that two or more turtles from a larger breeding aggregation thus reach the beach at the same time and therefore appear to be acting as a group. Inference was made that a similar phenomenon occurs with the Atlantic loggerheads.

While Carr and Ogren's hypothesis may indeed play a large part in what appears to be group action, I believe that true and possibly permanent grouping, at least to the rookery area, must occur. This is indicated by certain results of the Jekyll Island loggerhead tagging program. Not only is grouping within a given season, as discussed by Caldwell, *et al.* (1959: 309), again strongly suggested by the results of the studies made in 1959 and 1960 (see Tables 2 and 3), but, even more significantly, it is suggested in the over-season returns of two and three years. The over-season evidence, especially as it occurred with only such a small number (probably only about 10 percent of those nesting) of turtles tagged, seems due to much more than chance, or even to physical factors of the environment and especially to hormone periodicities. Such closely related hormonal activity after such a long period of time would suggest genetic relationships and is thus even stronger evidence for true group action. Smith and Daniel (1946: 154) and Carr and Hirth (1961) have indicated that group facilitation operates in escaping the nest, and some group behavior, perhaps in navigation, may well carry through life. Thus, while Carr and Ogren's hypothesis may explain some instances of "grouping" within a given season, the over-season data should be given serious consideration as evidence for real grouping. Atlantic loggerheads move great distances (Caldwell, Carr and Hellier, 1956: 292; Caldwell, Carr and Ogren, 1959: 295). Carr and Ogren (1960: 10) and

Carr and Hirth (1962:35) have summarized similar data in greater numbers for Atlantic green turtles. With a definite geographical goal, such long-range movements might be facilitated by group action in the cooperative seeking of navigational clues.

With regards to over-season grouping, attention is called to Table 5. Turtles numbered G 131 and G 133 appear conclusively to be acting as a pair over a two-year period, having been tagged on the same date in 1959 and recaptured on the same date in 1961. Even stronger evidence for pair interaction is indicated by turtles G 46 and G 48, tagged on the same night in 1958 and recaptured on the same night *three* years later in 1961. That one such closely acting pair was on a two-year cycle, while the other was on a three-year cycle, is further evidence for a possible close genetic relationship by group members; *ie.*, differently-timed scheduling factors, seemingly unrelated to physical factors of the environment, were common to each pair and further increase the probability against chance occurrence of the pairs acting as real groups. Less striking pair interaction is suggested by turtles G 32 and G 35, tagged on possibly successive nights in 1958 and retaken on successive nights after two years, in 1960. Similar long-term "grouping," again at least to the rookery, is suggested for two of Carr and Ogren's green turtles (1960: Table 7). Their turtles numbered 377 and 379 were tagged on the same date in 1956. In 1959, after three years, they were recaptured on successive dates. In a more recent paper, Carr and Hirth (1962: 17) listed two green turtles tagged on the same date in 1957 and recovered on the same date after three years.

Evidence for genetic relationship as it relates to possible group action is shown by the flotilla mentioned above which was on an apparent "long interval" schedule. Such a long interval is unusual, and its being related to a "group" of turtles suggests that the grouping was real and more than coincidental.

Unfortunately, the tagging returns for both the loggerhead and the green turtle are not complete enough to show whether "groups" in phase for two or more emergences in one year were still in phase as a "group" for several emergences two or three years later. The outcome of such findings in later studies will strongly influence the discussion dealing with "groups." For the present, it seems best to suggest that there is evidence that both the earlier hypotheses by Carr and Giovannoli (1957) and by Cald-

well, *et al.* (1959) and the later one by Carr and Ogren (1960) may possibly be correct and interacting.

UNUSUAL NESTING BEHAVIOR

The typical patterns of Atlantic loggerhead nest building, oviposition and covering of the nest and eggs have been given in detail in an earlier report (Caldwell, Carr and Ogren, 1959). The majority of the nesting turtles observed on Jekyll Island during the summers of 1959 through 1961 followed these same stereotyped patterns. However, some notable exceptions which were observed are described below.

Caldwell, *et al.* (1959: 314) noted that "a turtle interrupted in her nesting will return either later that night or on successive nights until she has fulfilled her mission." Subsequent observations show that some individuals apparently do not complete their nesting in one visit to the beach, even without molestation. For example, turtle G 199 (Table 2) was recorded as laying eggs on July 5 and July 7. Agent Kilby made the following special note of her first emergence: "Laid 20 eggs, did not cover, without [detected] molestation started back to water laying eggs all the way (about 18 more)." Another observer noted simply that she "laid" on July 7. Such interrupted behavior suggests inexperience in nesting.

In other examples of apparent incomplete nesting in one visit to the beach, turtle G 131 (Table 2) laid one night and the following night was back on the beach, but did not lay. Turtle G 71 (Table 3) laid one night and two nights later was back on the beach, although her nesting activity was not recorded by the observer.

Related nesting (laying) behavior was recorded by Agent Kilby for two other individuals and shows that the laying process may be interrupted for a much shorter period of time. Turtle G 72 (Table 3) laid 104 eggs, started to cover, laid one more egg, and then completed her nest in a normal manner. This occurred on June 19, relatively early in the nesting season. In addition to making record of this unusual procedure, Kilby also noted that G 72 was a small individual. Her size, the relatively small number of eggs deposited (see Baldwin and Lofton, 1959: 332), the earliness of the season, and her aberrant behavior all suggest that she was inexperienced.

Another turtle, G 175, also laid in a similar manner even earlier in the season, on June 7, 1960. Her size was not noted, but she laid even fewer eggs (78) in the following sequence: 74 eggs laid; covered with three flipperfuls of sand; 4 eggs laid; completed covering of nest. Inexperience is also suggested by her actions. Lehrman (1956) discussed the fact that certain inexperienced birds and mammals were more retarded in their maternal activities than experienced individuals of the same species. Nesting activities in relation to inexperience were discussed by Lehrman.

Injuries to sea turtles are frequently seen and are often extensive, but seem to heal well and these crippled turtles still try to obey the nesting urge. Those with severe damage to one or both front flippers, or even the loss of most of one, seem to have little difficulty in ascending the beach and in completing their nest. However, those turtles that have lost most of a hind flipper do find difficulty in nesting, as it is these flippers that are most important in nest digging (see Caldwell, Carr and Ogren, 1959). One turtle with such an injury was noted by Agent Kilby to dig four holes of a sort with her one hind flipper. However, these holes apparently were unsatisfactory to her, and after being on the beach for over three hours she proceeded to lay her eggs on the flat beach below the base of the dunes but well away from the edge of the water. Eggs thus deposited would not survive.

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ADDENDUM

After this paper had gone to the printer and was set in type, the 1962 nesting season in south Georgia ended. Due to circumstances discussed in the introduction to this paper, observer-effort was so poor that no turtles tagged in previous years were reported from the nesting beach, and no new individuals were tagged. Therefore no three-year returns were achieved from the 1959 tagging operations, and no turtles tagged in 1958, and returned in 1960, and which might have been expected back again in 1962 on a two-year cycle, were recorded. As no returns from the beach were obtained, the significance of a comparison with the number of two-year returns of 1959-tagged turtles is obscured (see below for a three-year return not on the beach).

That a three-year return was in the making is evidenced by the recapture on about May 15, 1962, of a marked turtle (G 128), see Table 2, by a shrimp trawler working about four miles east (off-shore) of the south end of Jekyll Island. Unfortunately, the date of the 1962 return is such that it cannot even be speculated whether the turtle had remained in the area during the three intervening years or whether she was migrating back to the rookery after spending the three years elsewhere. May 15 is almost exactly the time when the nesting season begins at Jekyll Island. This was the only tag return recorded in 1962.

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