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## THE CALENDAR OF WIDEAWAKE FAIR

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Years before I ever saw a Sooty Tern alive I had read, in the volume on birds in the Cambridge Natural History (Evans, 1900:312), a brief reference to the "Wideawake Fair," that celebrated nesting colony of *Sterna fuscata* on Ascension Island described by Collingwood (1867), Sperling (1868), Mrs. Gill (1878: 206-213), Penrose (1879), and many others since then. Little could I have foreseen that one day I might have to make a serious decision affecting the fate of that vast bird society, or that for ten years thereafter I should be so deeply concerned with its doings and its welfare.

During the first half of 1942, an American air-base was being constructed on the southwest corner of Ascension Island, with a broad runway extending right down into the valley where the Wideawakes were most thickly concentrated during their nesting periods. By the time this construction approached completion, the terns had all left the island, then around the last week in July they began to re-assemble in numbers. At first they came in flocks toward nightfall to roost on the sand and lava near the southeast end of the air-strip. Soon thousands remained all day, and by August 20 they were laying their eggs. Our aviators for weeks had regarded them as a menace, because clouds of birds rose in the path of each airplane taking off from the runway.

Rather drastic measures were taken to move thousands of the terns to safer areas a little farther from the air-strip. There were of course a number of other well-populated colonies on the same corner of the island, but those did not interfere with military operations. It was clear that the preservation of the adult breeding stock was far more important than their first eggs of the season. Some 40,000 or 45,000 eggs were accordingly broken in the bottom of the valley, close to the far end of the runway; and after ten days scarcely a bird would be



SOOTY TERN COLONIES ON ASCENSION ISLAND, showing two types of terrain occupied.

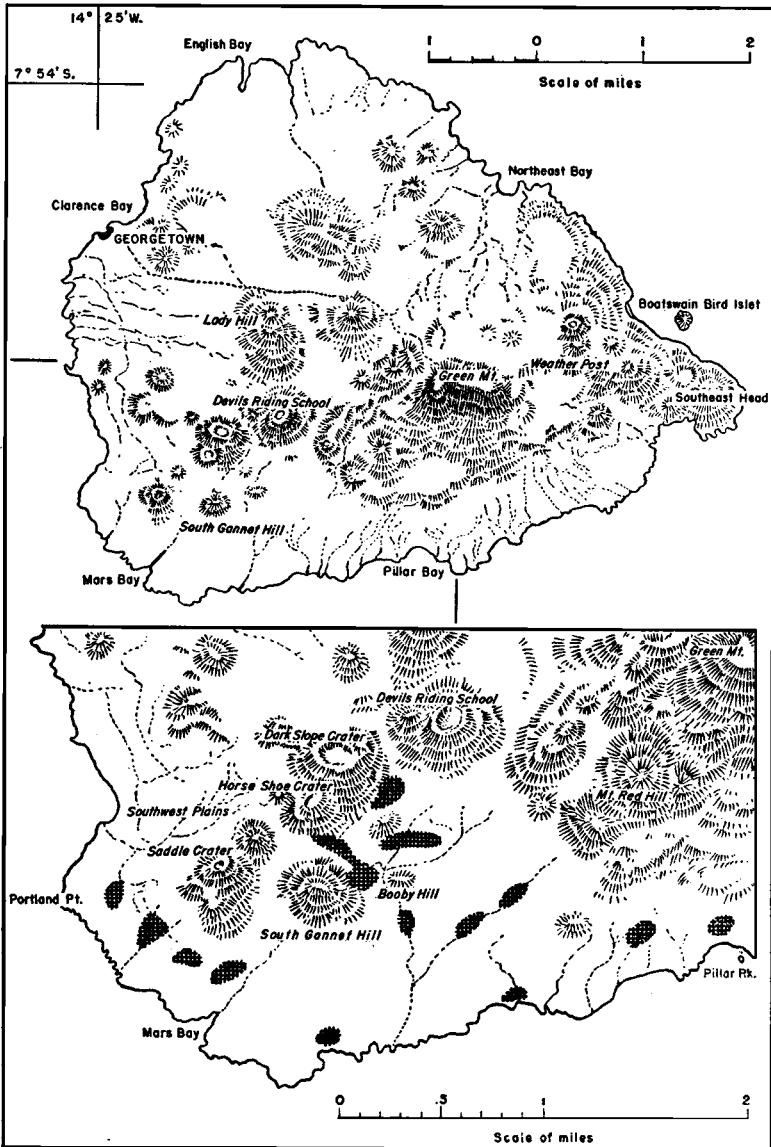


FIGURE 1. Ascension Island in the South Atlantic. The lower map shows the southwestern part of the island; the crosshatched areas are those occupied by nesting colonies of Sooty Terns between 1942 and 1946.

seen alighting in that area. I had good reason to suppose that they would lay again elsewhere that same season; indeed it might mean only a delay of a few weeks in bringing off a nearly normal number of young.

But the same problem was likely to arise periodically as long as Wideawake Air Field continued in operation, so before the end of my month's stay on Ascension I recommended that each time the Sooty Terns attempted to reoccupy the area close to the air-strip their eggs should all be taken while still fresh. They could then be used for food, and the birds should move away. But from what I heard during the next few years it seemed that my advice was not always followed to the letter. In 1943, when laying began in mid-May, it was reported that some 23,000 eggs were collected by our Quartermaster's men, and many others by the residents of the island. But there were times when hundreds of dead terns were noted by other visitors; some shooting evidently went on.

After the war ended, however, I was gratified to hear from Colonel J. Noel Tomlinson, representing on Ascension His Majesty's Government of St. Helena, that in his opinion the total population of Wideawakes had not diminished during our occupation. After several years on the island, he had not yet been able to decide whether they might number one million or perhaps two. It is my belief that in 1942 there may possibly have been a million.

Ever since the British Navy first occupied Ascension Island in 1815, numbers of eggs have probably been taken each time laying began; they are very good to eat, and supposedly the first eggs are quickly replaced. Before long it became evident that the interval between successive layings was shorter than twelve months. At first it was commonly said, as by Penrose in 1879, that the period was of 8 or 9 months, and for the next 60 years no one seemed to keep any accurate record. Various scientific missions stopped at Ascension; they often published their observations on the Wideawakes, if these birds happened to be breeding. Those random observations could scarcely be arranged in such a way as to reveal the average length of the breeding cycle. British naval personnel and employees of the cable station have often remained many years at Ascension, but I was unable to find that any accurate consecutive notes had been compiled before 1942. Dr. Robert Cushman Murphy (1936: 1120-1132) had concluded that the reproductive cycle on Ascension must require close to 9 months, so that 4 nestings might be expected every three years. It was evident that the Wideawakes were not governed by our 12-month Gregorian calendar.

Although I could not expect any opportunity to revisit the island after my own stay there from September 5 to October 5 in 1942, I resolved to keep in touch with men on Ascension who would tell me of the beginning of each successive nesting period. For more than 30 years, I had been concerned with the reproductive seasons of birds in equatorial Africa. Here was a most unusual situation; even though Ascension lies almost eight degrees south of the equator, it might offer an illuminating comparison.

Luckily I made the acquaintance of several men who might be expected to remain on Ascension for some time. Among them were Colonel J. Noel Tomlinson, mentioned above, also Thomas Dodge and Glen Addison-Williamson, both representing Cable and Wireless Ltd. which has an important installation there. Several officers of our Air Force very kindly provided me with all the ornithological information they could, but they were not apt to stay very long on the island. Other friends who called there in the course of Atlantic crossings were sometimes able to fill in gaps.

Thomas Dodge had spent some years on Ascension; in 1942 he was harbor master and farm superintendent. He was concerned, as was I, over the fate of the Wideawake Fair. He recalled that in the latter part of 1941 the Sooty Terns had begun laying some time in the first half of November. He was positive that very early in that same year there had been another breeding period, but could not be certain that the first eggs were laid in January, as I now feel justified in assuming. If the interval were exactly 9 months, another year with two layings would be expected in 1944.

During 1943 and 1944, it was Dodge who provided my best information. The last few terns of the 1942 convocation left around January 24, 1943. New arrivals made their appearance about April 7. On April 24, no eggs could be found, but laying had begun in earnest by May 15. From the date of the first eggs, one may usually count about five to five and a half months as the normal length of continued sojourn.

In 1944 the Wideawakes reappeared around January 17 and began to lay eggs March 1. Such persecution as they suffered did not delay the normal course of events, for they left the island with their young after the usual five months. Indeed in the second half of November, 1944, they were once more heard calling as they flew over at night. That is usually the first announcement of the return. By the end of December the birds were settling in numbers near the runway, but no eggs had yet been laid. It was evident now that their cycle exceeded 9 months.



SOOTY TERNS ON ASCENSION. (*Above*) A chick has strayed beyond its territory, causing a quarrel between two parent birds. (*Below*) Result of the quarrel, the chick at left has been pecked on the head by one of the parent birds and lies dead.

Dodge had by this time been transferred to a cable station in the Orient. It was fortunate that Lieutenant D. C. Alexander at this time was stationed on the island; he informed me that the first egg was noted on January 3, 1945, and that some few were still being incubated as late as April 22, when he left Ascension. What happens to chicks hatched from such late eggs is not clear, for presumably the nesting grounds were deserted by early June. Three different informants reported that after the customary absence, the Wideawakes returned again by September 1, and possibly even a few days earlier. Colonel Tomlinson felt this time that egg-laying was noticeably delayed. He saw his first eggs, 30 of them, on November 6, 1945; but Major L. E. Buckley reported a few eggs as early as November 1. In any case, this was the first year since 1941 with two actual layings; and the average interval now appeared to be 9.3 months.

It must be remembered, of course, that my informants were not able to go over the ground every day, and while they usually looked for eggs near the air-strip or along the south coast not very far away, there was always a possibility of the very first eggs being overlooked. Furthermore, as I believe I proved in 1942, the first eggs in some colonies hatch at least a week earlier than in others; there may be an even greater deviation in initial laying between separate groups. On the whole, nevertheless, all the Wideawakes on the entire southwest side of Ascension come and go as a body, and the average dates over a sufficient period of years are of real importance.

Wideawake Field was still in operation, and I was determined to get a record of successive breeding seasons as long as I possibly could. Colonel Tomlinson and I kept up our correspondence until he went back to England late in 1946. The second convocation of 1945 held on into the next year, and I was informed that the last stragglers disappeared some time in the last week of May, 1946. This time the birds stayed away at sea for little more than two months; they were certainly noticed again in the first week of August, 1946. The first eggs were noted by Colonel Tomlinson on August 19, yet others were still to be seen as late as November 12. It is clear that early losses are commonly made good, and we must doubt that a second egg is normally laid after the first chick has been successfully reared and has learned to fly.

By mid-March of 1947 most or all of the terns had departed, but on June 4 they were heard again by Glen Williamson, who now became my faithful reporter. There were eggs again by June 18 or 19, and some young seemed still not quite able to fly on November 17. Yet all had left Ascension by November 28, 1947. In 1948 the Wide-

awakes were heard again on March 7; eggs were taken on April 11, but laying was thought to have begun by April 4. On August 9 many young were still unable to fly, all quit the island by the first week of October, and the returning travelers were heard again on December 25.

In 1949 the first eggs were seen on January 21. On June 5 the young were still not all strong fliers; presumably all left by early July. Again there was to be a second laying within the year, but Williamson left in October for a long vacation in Australia. Fortunately he asked Arthur Wood to keep watch on the birds for him. Wood later reported that eggs were first laid, as expected, during the first week of November. By now it had become clear that the average interval was a little longer than I had thought in 1946.

In 1950, according to Wood, the birds remained about Ascension till some time in April. I had expected them to begin laying in this year about August 20; but the first eggs were actually found, according to Williamson, on September 5. That this was correct is rendered nearly certain by the date of the first eggs in 1951, June 26 as reported by Williamson. In 1952 this same informant noted April 25 as the date when the first egg was found. This is a trifle later than I should have expected, since it is 304 days (approximately 10 months) after date the received for 1951.

It might seem more precise to record each period in days, but in view of the rather casual method of obtaining the dates this would be a needless refinement. Our records appear to show a variation between 268 and 307 days, which may or may not be correct. From August 1942 to April 1952 the average interval is close to 292.6 days, or 9.61 months. The most useful figure at present will be 9.6 months, and the way in which laying recommenced toward early November of 1941, 1945, and 1949 is good confirmation.

The difficulty of continuing the calendar back through the years before 1941 has been mentioned. If the cycle was exactly 9.6 months, then the years in which laying began twice were 1937, 1933, 1929, and 1925. For 1937 and 1933 I can find no observations. But in 1929 J. W. Feiss visited the Wideawake Fair on June 9 or 10. He saw no eggs, only young well past the downy stage; so the Wideawakes were soon to leave their breeding grounds, as would be expected if eggs had been laid around January or February, and were due to be laid again before the end of the year. Then in 1930 there should have been a laying toward August or September. This agrees well with the observation by R. E. Moreau (1931) of great numbers of Wideawakes flying out from the northern point of Ascension Island on October 1, 1930.



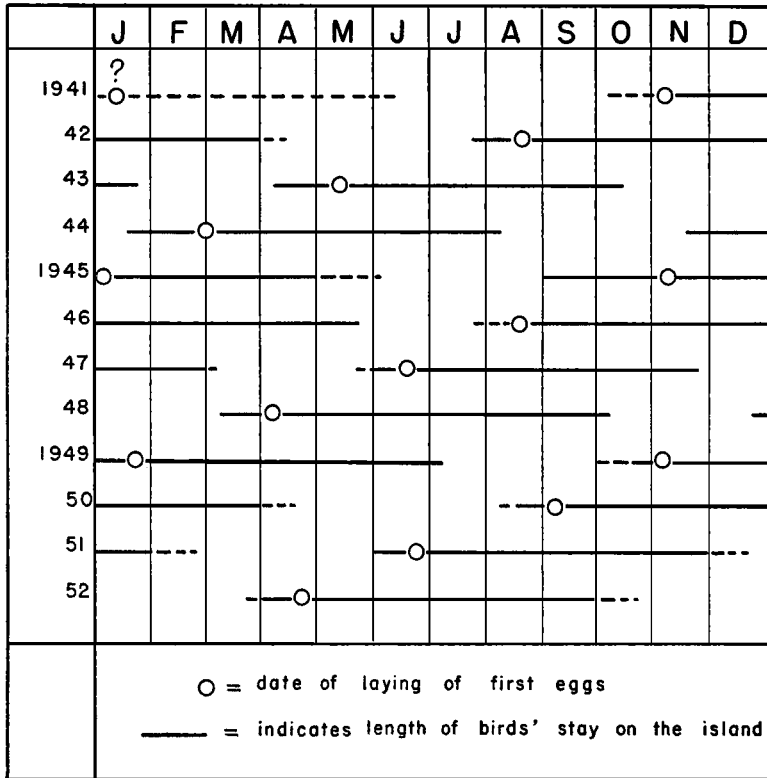


FIGURE 2. The calendar of Wideawake Fair, 1941 to 1952.

The year 1925 was very likely another year with two layings. The first eggs were certainly laid by November 20, when two were collected by members of the Discovery Expedition. These are in the British Museum. The Blossom Expedition visited the Wideawake Fair between December 8 and 15, 1925, and found many eggs. So there may have been another laying very early in 1925.

A note by Huckle (1924) here introduces an element of doubt. If his observations were made early in that same year, and many eggs were destroyed by heavy rains in February and March, then the year 1924, instead of 1925, may have been the year with two layings. This view is strengthened by the note of G. H. Wilkins (1923:510), who reported that on August 3, 1922, most of the eggs at the Wideawake Fair had already hatched. In that year laying must have begun before the end of June; and in 1923 the starting date would have been around April.

Now that we have records as precise as can be hoped for from the years 1942 to 1952, inclusive, and approximate dates for the year 1941, I feel that it is time to publish this interesting calendar. It may be explained that the black horizontal lines are intended to show, in so far as it is known, the length of stay of the Wideawakes at Ascension for each nesting period. A small circle marks the date on which the first eggs were reported. This record refers only to the southwestern section of the island, for in recent years there has been no report of any Sooty Terns nesting on Boatswain Bird Islet or the adjacent portion of the main island. In view of the way tern chicks are gobbled up by frigate birds, I deem it very unlikely that the terns could breed successfully anywhere in the vicinity of Boatswain Bird Islet.

The old navigation charts indicate that the principal Wideawake Fair was once on the wide Donkey Plain, much closer to the Cable Station at Georgetown than the Waterloo Plain and the valley into which the air-strip runs. Within the past twenty years, however, it is reasonably certain that no Wideawakes have bred there; and it may well be that the proximity of the town and the continued gathering of eggs near it forced the terns to withdraw toward the south for greater security. It is possible, too, that the population may have been considerably reduced during the past half-century, although I cannot offer any evidence of such reduction. Now that the airport has been little used since 1947 it may be hoped that their numbers will be kept up, or perhaps slowly augmented. Feral cats, which appear to be quite numerous, are probably their worst enemies; these account for numbers of dead adults found on the nesting grounds, with only the breast-muscles eaten away.

The departure of the old and young Wideawakes at the end of each breeding period is stated to be rather abrupt, even though there may have been a previous diminution in numbers; but not often is the final date of departure recorded accurately. The average period of absence is evidently from  $2\frac{1}{2}$  to 3 months. The date of return is much more apt to be noted with fair exactness, for then the birds come flying about noisily at night, even over Georgetown, and thus are very apt to attract attention. Close to their nests the birds' voices may sound rather disagreeable and squawky, but a flock high in the air produces a more ringing chorus, which to my ears at least is all but bell-like and very pleasing.

More than one competent authority has said that the situation on Ascension, with regard to the reproductive cycle of the Sooty Tern, is unique. It certainly is utterly different from that prevailing at the

Dry Tortugas in latitude  $24^{\circ} 37'$  north, where the terns appear to belong to the same subspecies, *Sterna fuscata fuscata*. In early May, 1930, I watched those terns on Bird Key just after their return, before nesting began; they seem bound to a 12-month cycle by seasonal weather conditions prevailing there. Alexander Sprunt tells me that they are frequently heard flying over at night in the second half of February, two months before they begin to alight on their breeding grounds.

I feel of course that the abbreviated cycle on Ascension is not a mere curiosity, but rather an example of something that deserves still closer study elsewhere. About St. Helena, which lies in lat.  $15^{\circ} 50'$  south, the Sooty Terns were said by Melliss (1875:98) to return each year toward the end of December so that there too they adhered to a twelve-month cycle. I have done my utmost to verify the statement, and have been assured by several correspondents, in different years, that the nesting season on the islets close to St. Helena comes annually, between October and January. As late as January 27, 1949, very young chicks as well as eggs were noted on George Island, while on that same day on Shore Island there were only unhatched eggs. Yet at some places egg-laying was said to begin in October. In 1952 there were many eggs on some of the islets on November 25, none yet hatched.

In the South Pacific at the southern edge of the range of *Sterna fuscata*, I watched these terns at a nesting colony on Motu Nui, an islet off the southwest corner of Easter Island. There the birds are said to return annually in September, and the presence of some eggs as late as January 17, 1935, may be attributed to continued raiding by the islanders. A few centuries ago their ancestors regarded this as their sacred bird ("manu tara") and each year staged a swimming contest, which was aimed at obtaining the first egg of the season.

During this same cruise of the yacht Zaca, we had noted gatherings of Sooty Terns on rocky islets off Nukuhiva in the Marquesas around October 8, and later on we visited the island of San Felix off the coast of Chile, finding a colony of the same species with young mostly on the wing by February 18, 1935. Their first eggs must have been laid by November. It is clear that in both northern and southern hemispheres, wherever there is any marked change from winter to summer, one period of egg-laying is the rule, and it comes in springtime.

In view of what I learned at Ascension in 1942, I could not help wondering whether there might not be other islands in the Atlantic, Pacific, or Indian oceans, so situated near the equator that Sooty Terns might return to breed more often than once in 12 months. Ascension

has no summer or winter, no rainy season, and any wind that blows is apt to come from the southeast. Frigate birds and Masked Boobies in very low latitudes often give the impression of nesting through most if not all twelve months of the year. A Sooty Tern colony differs in that its members all gather at the breeding ground at about the same time, courtship takes but a few weeks, and suddenly eggs are produced in great numbers. No doubt many are lost by accident or predation, new eggs are laid, and the rearing of many chicks is retarded. But a stay of four to six months allows time for all that. Eventually the last young take wing, the breeding season is terminated, and the whole population disappears over the ocean.

It is generally agreed that most birds must have a physiological cycle which includes a period of sexual activity and one of relative inactivity during which molt of the plumage, and often migratory movements, may be carried out. For suitable adaptation to the environment in most regions some regulator of that cycle will be essential. It has been proved beyond a doubt that in many cases in the Temperate Zones the increasing duration of daily illumination serves as such a regulator, by stimulating the organs of reproduction—presumably through a gonadotropic hormone. Yet it is perfectly evident that birds living in a narrow equatorial belt where there is no appreciable change of daylight must have their cycles regulated by other influences if they are to have any regular period of reproduction. I have been unable to find any climatic regulator for the Wideawakes of Ascension, so it would seem that their social instincts alone affect their innate physiological rhythm.

On what other islands, one may ask, would similar conditions prevail? The Blossom Expedition, after finding the Wideawakes busily nesting on Ascension in December, 1925, had gone on to Rocas Reef, latitude 3° 52' South, off the coast of Brazil. There in April of 1926, many Sooty Terns were incubating eggs (Simmons, 1937). It was evident that their nesting season was not synchronized with the one on Ascension, but it would require more than one visit to prove that it did not follow a 12-month rhythm. I wrote to several Brazilian naturalists, and learned only that because there were no residents on Rocas, no record could be provided of successive nesting dates of Sooty Terns there.

My attention was drawn again to the Pacific by a film made by Lowell Thomas in June 1945 on Johnston Island, near latitude 16° 45' North, in which a colony of Sooty Terns was shown close to the airport. Correspondence with General B. E. Nowland and Captain A. S. Hill of the American Forces revealed that the terns were back again and

nesting in the same month of 1946. There was a hint that some had returned to nest on the same island in November or December. That seemed curious, but no confirmation could be obtained.

From Christmas Island, at about 1° 45' North latitude, I learned from Major J. T. Carter that thousands of Sooty Terns began nesting in May of 1947 and 1948, while D. K. Bailey who had visited that island in 1946 told me that during the first ten days of July he had seen many eggs of that same tern, some just hatching. But Major Carter further informed me that in the latter part of November, 1947, another nesting period had started, so that there were definitely two seasons of egg-laying, about six months apart.

This was confirmed by Kelvin Nicholson, District Officer in the Line Islands, who wrote me on December 11, 1948, that the Sooty Terns were then laying on Christmas Island, and that they had had eggs in January and June of 1948. The numbers of birds present during the two different seasons were much the same.

It was Nicholson, too, who first told me of a mimeographed report on the birds of Palmyra Island, near 5° 50' N. lat., which Dr. G. H. Castle prepared in 1944. On Palmyra, Dr. Castle noted, between 50,000 and 100,000 Sooty Terns arrived in mid-May and soon began to lay. After the chicks had been reared the great majority of adults and young left the island, then a few terns came back "for the late fall nesting period. The nesting ground in the late fall is located on a road on Pelican Island"—evidently a somewhat different spot from the one used in May-June.

There cannot be any doubt of the breeding twice in a year by the Sooty Terns in some of the islands in the Central Pacific. Even on the islets of Manana and Moku Manu, off the eastern end of Oahu in the Hawaiian Islands, near latitude 21° 20' and 21° 25' North, Richardson and Fisher (1950:293-295) found that Sooty Terns laid eggs and incubated on Manana from April to July and on Moku Manu from about November to March. It would seem impossible that any individual tern could complete a successful nesting and be ready to start over again in six months. Far more likely would be a division of the population into two groups, one group beginning to nest in April, the other in November. Where these Hawaiian birds went in their off season should not make very much difference, since few would seem likely to wander very far south of the equator. Weather conditions at the breeding stations might seem far more likely to provide two optimum periods for nesting. At Christmas Island, too, there might be two seasons of relative dryness, best suited for breeding. On Ascension exceptional spells of heavy rain, usually coming at intervals

of several years, have been said to cause havoc among the nesting Wideawakes. But it need only be said that my search for another equatorial island with a population of terns having a breeding cycle of anything near 9 or 10 months has gone unrewarded.

Let us switch our attention next to conditions on a continent crossed by the equator. Africa will be best, since the breeding seasons of its birds are now beginning to be investigated seriously; and we may be able to make some suggestive comparisons. Regular annual breeding periods are characteristic of birds in tropical savanna regions on both sides of the equator, even to within 3 or 4 degrees of that line. There the seasonal variation in length of daylight is very slight, but a well-marked dry season produces changes in the atmosphere, soil conditions, and vegetation that must surely affect the internal physiologic rhythm of most birds. It is clear that most if not all of them have become adapted to nesting in precise periods of the year, and that while many do so during rainy months, not a few species just as plainly select the dry season.

Close to the equator in western Africa there is usually a broad belt of lowland rain forest, and within its northern and southern borders the dry period of the year lasts for scarcely more than a month or two. This forest ends rather abruptly in the Ituri, Kivu, and Manyema districts near the 29th meridian of East longitude. Farther east, in Uganda and Kenya Colony, forests are of small size; the annual precipitation is considerably reduced. Along the equator there, two dry spells normally come in each year, and two wetter periods, the "long" and the "short" rains.

At the northern and southern edges of the Cameroon-Congo forest the dry periods come at opposite months in the year. Across its central area, as might be expected, stretches a band where the rains vary but little throughout the year, and length of daylight not at all. Here the birds are adapted to a perpetual rainy season; and of many species, as pointed out by Bates (1908) and Chapin (1932:301-321), nests are to be found in every month of the year.

In the northeastern Congo, on the other hand, at 4 degrees north of the equator, the common Village Weaver-bird (*Textor cucullatus*) will cease nesting from December to April; and in the Kasai District at 5 degrees south, its off-season lasts from June to October. Close to the equator there is no month when active colonies of this weaver are not to be seen in clearings near villages. We can scarcely assume that the individual birds have 12-month reproductive cycles. The lack of external regulators almost certainly permits them to join or desert the colony at any time. My own feeling is that the internal rhythm may



SOOTY TERNS ON ASCENSION. (*Above*) Chapin being "threatened" by a tern.  
(*Below*) Close-up of two adults in the threat posture.

be less than 12 months, and here the birds need not wait for rains or new green foliage.

Back in the shade of the rain forest, conditions remain even more uniform. As Bates first pointed out, the males of a paradise flycatcher and a fruit pigeon appear to retain enlarged gonads throughout life. Their nests may be found in any month. North and south of the equatorial forest, these same species have representatives with a definite breeding cycle. But even in those drier regions it might be advantageous if the internal rhythm tended to be slightly shorter than twelve months. Any individual bird would be ready for breeding just as soon as the weather or vegetation became favorable.

Nevertheless there is one environmental factor, even directly on the equator, which clearly regulates the breeding time of certain birds. Large rivers fall periodically, exposing sandbars where skimmers (*Rynchops*), lapwings (*Xiphidiopterus*), pratincoles (*Galachrysis*), River Martins (*Pseudochelidon*), and other birds nest. Such birds cannot nest when a river is in flood. The Congo River has two periods of low water annually, but the River Martin nests only once a year. Some of the others may breed twice.

In Uganda and the adjacent parts of Kenya Colony, prolonged study of nesting seasons by Jackson (1938), van Someren (1916), van Someren and van Someren (1949), and Belcher (1919) has shown that many insectivorous birds tend to have two separate periods of reproductive activity in the year. Drier weather seems to inhibit their nesting, but just when they go through the molt is not clear.

Thus in equatorial Africa there are some birds that nest at two different seasons of the year, like the Sooty Terns on some Pacific Islands, and others relieved of external regulators that nest in any month. The latter might be compared to the Wideawakes of Ascension, but they lack the strong social bond that causes the Wideawakes to reassemble in a body.

Great progress has now been made, by close observation and controlled experiment, in the study of breeding cycles of birds in the Temperate Zones. But a start has barely been made in the investigation of corresponding conditions in rainy areas on the equator, where length of daylight remains uniform the year round and seasonal variation of weather is negligible.

#### SUMMARY

Records compiled over a period of eleven years prove that Sooty Terns on Ascension Island assemble to begin nesting at average intervals of 9.6 months. Thus instead of nesting four times in every period



of three years, as has often been said, they begin to nest five times in every four-year period.

The reason for this unusual cycle of reproduction appears to be the lack of any marked seasonal change in the weather at Ascension Island, and the pronounced social bond between the members of a Sooty Tern population. Relieved of any seasonal hindrance, it must be supposed, they follow an internal rhythm.

A search for some other island where terns behave in like fashion has not yet succeeded. But on some islands in the central Pacific, from Christmas Island north to the vicinity of Oahu, Sooty Terns are now known to have two distinct breeding seasons in each year.

It is recommended that further study be given to breeding seasons of the many birds resident in rainy equatorial belts around the world, where seasons are virtually lacking and change in the length of daylight is at its minimum. If definite breeding periods can be found there, what environmental factors regulate them? If no definite breeding seasons exist, what is the physiological rhythm of the individual, and how is it adjusted to pair-formation and the perpetuation of the species?

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*Boîte Postale 217, Bukavu, Kivu, Belgian Congo, January 7, 1953.*